

CAMPUS SITE AND LANDSCAPE STANDARDS



Indiana University Architect's Office

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INTRODUCTION

The design of site and landscape elements is very important in enhancing the campus environment and maintaining its distinctive character. These elements are the basis for creating a campus environment which is cohesive and preserves its sense of continuity.

Changes in technology, economic markets, and the composition of the 'traditional student' are creating new challenges for universities to provide state of the art facilities, while maintaining their distinctive campus character.

Part of the development process of providing state-of-the-art facilities includes implementation of campus planning and development standards. Standards which serve as the foundation for creating an aesthetic learning environment where achievements in teaching and research can continue. Standards which also have the flexibility to encourage creative solutions to future challenges.

The campus site and landscape standards which follow are intended to be used as basic design guidelines during the site design process and for the preparation of contract documents. They are also intended to be used as tools to aid the Design Consultant in making their planning and design decisions.

SITE SURVEY AND EXISTING CONDITIONS

A surveyor registered in the state of Indiana is required to provide a site survey and inventory of existing site conditions that include the following:

- AutoCAD release 2000-2006 files on CD-ROMS, or diskettes in either a .DWG or a .DFX file format on DOS formatted diskettes. Refer to I.U. Cad/GIS standards. The preferred format for graphic files is .DWG. .DFX is acceptable if the file can be imported into AutoCAD release 2000 and retain the specifications outlined in the I.U. Cad/GIS standards.
- Temporary Bench Marks (T.B.M.) referenced to Indiana State Plane Coordinate System (NAD 83) - foot. The west zone should be used for the Bloomington and Northwest (Gary) campuses. The east zone should be used for the Columbus, East (Richmond), IUPUI, Kokomo, South Bend, and South East (New Albany) campuses. The vertical datum should be based on National Geodetic Vertical Datum of 1929.
- One foot contour intervals, with appropriate spot elevations such as concrete pads, building corners, finished floor elevations, steps, top and bottom of walls and curbs, trees 6" dia. or greater, etc.
- Property boundaries, easements and rights-of-ways, deed restrictions and legal description.
- Available utility services and lines, both public and private, above and below grade, including inverts and depths, manhole and vault interior dimensions, pipe size, pipe material, electrical duct bank configuration, telecommunications duct bank configuration (and a designation of fiber optic and/or copper conductors), meter pits, valves, hydrants, light poles, transformers, power poles, and ownership of each utility.
- Existing site features such as walls, fences, asphalt pavement, gravel, signs, outcroppings, trees indicating type, size, and canopy, shrubs and other significant vegetation.
- Consultant will visit project site to verify and become familiar with site survey elements.
- Show magnetic North. Title drawing, name and address of owner and surveyor, date, scale and legal title of property.
- Seal: Affix seal of Register Professional Surveyor.

SITE CLEARING, DEMOLITION AND EROSION CONTROL

Site clearing and demolition plan will be developed to indicate site elements which are required to be removed, modified or relocated. Plan elements should include but not be limited to the following:

- Location of staging area, dumpster(s), site entrance and exit and construction limits fence.
- Plant materials which are designated to remain and protected, relocated, or removed. Plant material to remain will be protected by a construction fence which encompasses its drip line. No construction equipment, materials or debris shall be located within tree protection boundaries.
- Location of stockpiled site materials which are to be reused such as; topsoil, subsoil, gravel, etc.
- Concrete sidewalks and curbs to be removed will be saw cut at the nearest joint to the demolition limits, and requires removal of full sidewalk sections or panels.
- Demolition of utilities will include removal to the property line or source and capped.
- Protect existing storm drain inlets, drainage swales, streams, and water impoundments from sediment and pollutants resulting from construction operations. Provide Erosion Control Plan which satisfies section 108.03 of IDOT Standard Specifications.

SITE GRADING

A site grading plan will be developed which satisfies the project's functional requirements, such as drainage and accessibility. It must also provide an aesthetic setting which complements the building's architecture and respects the existing campus landscape features.

- Grading and excavations will not occur within the drip line of existing plant materials which have been identified to remain.
- To minimize storm water impacts on the existing watershed, post development discharges will not exceed present condition discharges. Storm water calculations are required to determine control or detention methods.
- Storm drainage systems will equal or exceed the requirements as specified in Section 715, 719, 720, 906 and 909 of the most recent edition of the Indiana Department of Highways Standard Specifications.

FINISH GRADING

Finish grading requirements will be included on the grading plan and in the project specifications.

- Landscape contractor will be pre-qualified with five years minimum experience in finish grading and lawn installation for similar size projects.
- Existing on site topsoil may be reused for lawns and plant beds, provided it meets the following topsoil requirements. Friable loam with minimal amounts of clay and free of subsoil, roots, grass, weeds, stones, debris, and foreign matter. A pH range of 5.9 to 7.0 and containing a minimum of 6% and a maximum of 25% organic matter.
- Topsoil mix for plant beds: 3/4 topsoil and 1/4 peat moss or composted organic material. For each 100 square feet of plant bed incorporate the following: 5 lbs. of slow release all-organic fertilizer such as plant-tore, 5 lbs. of green sand or sea sand, and 5 lbs. gypsum.
- Topsoil tests will be made by an independent agency before topsoil delivery and placement. Tests will also determine requirements for topsoil additives.

SEEDING AND SODDING

Seeding and sodding requirements will be included on the grading and/or landscape plans and in the project specifications. The decision to seed and/or sod will be based on site and climatic conditions and project schedule.

- Identify on landscape or grading plan, areas to be seeded or sodded. Seeding will include areas to receive shade seed mix and/or general seed mix.
- Sod will be either a blue grass blend or a turf-type tall fescue blend depending on site conditions such as lawn use, maintenance level, irrigation, and orientation.
- Seed mixes:

General Mixture:

- 15% Parade Kentucky Blue Grass
- 15% Park Kentucky Blue Grass
- 20% Delray Perennial Rye
- 20% Pennant Perennial Rye
- 30% Pennlawn Creeping Red Fescue

Shade Mixture:

- 25% Glade Kentucky Blue Grass
- 15% Nugget Kentucky Blue Grass
- 10% Delray Perennial Rye
- 25% Ruby Creeping Red Fescue
- 25% Scaldis Hard Fescue

PLANT MATERIALS AND INSTALLATION

Landscape contractor will be pre-qualified with five years minimum experience in landscape installation of similar size projects.

- All plant material will conform to the current issue of the American Standard for Nursery stock published by the American Association of Nurserymen.
- Plant material must be selected from nurseries which are located in hardiness zones similar to the project's location. Nurseries must also be inspected and approved by state and federal agencies.
- Plant materials must be approved by the landscape architect prior to digging and delivery. Plant material inspections and approvals can be done at the nursery or by photographs. A minimum of two photographs per plant type with a front and side view is required. Photographs must indicate size, shape, color, and nursery growing conditions.
- Plant materials will have the following minimum sizes:

| | |
|--------------------------------------|---------------|
| Deciduous shade type trees | 2 ½" caliper |
| Deciduous ornamental trees | 1 ¾" caliper |
| Deciduous shrubs, dwarf & semi-dwarf | 15" - 18" |
| Deciduous shrubs, medium | 18" - 24" |
| Deciduous shrubs, large | 24" - 30" |
| Evergreen Trees | 7' - 8' ht. |
| Evergreen shrubs, dwarf & semi-dwarf | 15" - 18" |
| Evergreen shrubs, medium | 18" - 24" |
| Evergreen shrubs, large | 24" - 30" |
| Perennials, 2 year plants | 2 gal. |
| Roses, No. 1 grade | 2 gal. |
| Ground Covers, 2 year plants | No. 1 |
| Bulb | Top size |
| Annual flowers | 18 pack flats |

PARKING LOTS & DRIVES

New and renovated campus parking lots and drives for automobiles and light and medium duty trucks will be constructed of asphaltic concrete. Parking lots and drives used predominantly by buses, heavy duty trucks and equipment will be constructed of concrete. Gravel parking lots and drives may be constructed as temporary facilities, however, they will be removed or converted to permanent asphalt facilities within the next construction season. New and renovated parking lots and drives will include accessibility requirements, lighting, landscaping, emergency phones, and sidewalks, as required for access to and from the lot. Parking lots will not extend beyond the front building line.

- Parking facilities will equal or exceed the requirements as specified in the most recent edition of the Indiana Department of Highways standard specifications.
- Storm drainage calculations will be performed to determine requirements for storm water storage and/or detention.
- New or renovated parking facilities will be accessible by individuals with disabilities. Facilities will comply with the Uniform Federal Accessibility Standards (UFAS) and the Indiana Handicapped Accessibility Standards (IHAS). The access aisle shall become part of an accessible sidewalk route without requiring entry into a vehicular drive. Van accessible parking spaces will be 9 feet wide with a 9 feet wide access aisle. Parking lot emergency phones will be accessible.
- Material certificates will be provided during construction which will be signed by material producer and contractor, certifying that each material item complies with specifications.
- Parking facilities will be designed with the following minimum dimensions:

| | |
|-----------------------------------|-------------------------------|
| Parking spaces | 9' x 18' |
| Parking drives | 24' |
| Accessible parking spaces | 9' x 18' with 5' access aisle |
| Van accessible parking spaces | 9' x 18' with 9' access aisle |
| Compacted stone base | 6" - #53 stone |
| Asphalt base course | 3" - #5D |
| Asphalt surface course | 1 ½" - #11B |
| White striping | 4" |
| Blue striping (Accessible spaces) | 4" plus ADA symbol and sign |

- Landscaping requirements:

The following landscaping requirements are intended to screen parking areas from the street, prevent large uninterrupted pavement areas, to shade paved areas, and provide storm water run-off and storage areas.

1. Parking areas may not extend beyond the set-back line of the front/Main entrance of buildings unless required for accessible and or service parking.
2. Provide a minimum 10' wide landscape buffer zone between parking lot edge and public right-of-ways. Minimum 6' wide between parking lot edge and campus drives, and sidewalks. Buffer zone will be planted with a minimum of one deciduous tree, and 10 shrubs, or a minimum of two ornamental or two evergreen trees per 35 linear feet. Shrubs will be evergreen or dense deciduous varieties and must reach a minimum height of 30" within three years of installation and be at least 18" tall when planted. Side slopes of buffer zones will not exceed 3:1.
3. All rows of parking will include a 9'x18' minimum curbed terminal landscaped islands. A 9'x36' minimum curbed landscaped mid-island is required for every 15 spaces or less. Islands should be evenly spaced throughout the parking lot and provided as required to control vehicular circulation and define drives. Islands will be backfilled with a 2' minimum depth of topsoil. Lighting and communication conduits will extend along the backside of the island curb and not through the middle of landscaped islands. Islands will be planted with at least one deciduous tree and shrubs as described in item #2. Ground cover, grass or landscape mulch may be used in lieu of shrubs.

SIDEWALKS, RAMPS, STEPS AND CURBS

Sidewalks will have a minimum width of 6'-0" and be constructed of concrete, beige colored concrete, exposed aggregate concrete, brick, or interlocking concrete pavers. Special circumstances may require unique paving materials, such as decorative crushed stone for a garden path. Curbs will be 6" x 24" straight type poured in place concrete, and/or slip form curb and gutter. Beige colored concrete will be used for curbs to match or complement adjacent sidewalk types. Sidewalks and curbs will be designed with the following specifications:

- All sidewalks and curbs will have a 4,000 PSI minimum concrete strength with polypropylene fiber reinforcement. Welded wire mesh will not be specified. Expansion joints will be ½" resilient, closed cell polyurethane foam material with a one part self-leveling polyurethane sealant, and ½" dia. stainless steel dowel bars. Joint patterns for sidewalks and adjacent curbs will be consistent with each other.
- Concrete sidewalks will have a minimum concrete thickness of 4" with a 4" minimum compacted stone base, unless they are also used as service vehicle drives. Thickness and reinforcing will be designed to accommodate all uses.
- Ramps will comply with the Uniform Federal Accessibility Standards (UFAS) and the Indiana Handicapped Accessibility Standards (IHAS). Ramps six feet in length or greater will not exceed a 1:14 (7.14%) slope. Ramps shall be constructed of concrete, concrete with stone/brick veneers and temporary pressure treated wood, painted. Two types of concrete curb ramps, type A and type B, are shown in Appendix 1, Typical Details.
- Steps will be constructed of concrete, brick, limestone or temporary pressure treated wood, painted. Preferred riser and tread dimensions are 7" and 15" respectively. Concrete steps will incorporate an 8" wide cheek wall extending 4" above treads. See typical details in Appendix 1. Maximum number of risers without a landing shall be six. When a landing is required, total number of risers will be equally distributed, below and above the landing.
- Handrails will be 1 ½" dia., schedule 10, stainless steel, installed 36" above ramp or step tread. End returns, end posts and corners will have a 2 ½" center line radius. Protection railings will be installed 42" above grade and include ½" x 1" true bar, stainless steel pickets 4" O.C.
- Concrete curbs constructed along city and campus streets will include asphalt or concrete patching. The existing street edge will be saw cut a minimum of 2'-0" wide and removed for curb installation. Asphalt patching will include compacted stone base filler, a 9" minimum concrete base thickness and a 1 ½" minimum asphalt surface course. Local community standards may exceed these minimums and will be specified accordingly.

- Beige colored concrete: L.M. Schofield Co. Chromix Admixture, Color I.U. Beige J177, Essroc. cmt., IMI #23 Sand, sample dated 9/20/94.
- Exposed Aggregate Concrete: Standard grey concrete with a fine and coarse aggregate content of #5L washed river gravel.
- Brick Pavers: Brick pavers shall comply with ASTM C216, ASTM C67, Type FBS, Grade SW and shall not show efflorescence. Manufacturers certification of test results shall be submitted. Two types of brick pavers are used on the Bloomington campus, one for major campus entrance facilities and the other for brick walkways. Campus entrance bricks will be Medium Ironspot #46 paver by Endicott. Walkway bricks will be Azalia, gas fired blend, paving brick by Glen Gary. Brick pavers will be installed on a concrete base with a ¾" asphalt setting bed.
- Interlocking Concrete Pavers: Interlocking pavers shall comply with ASTM C936 and equal uni-stone pavers as manufactured by Inter-Pave Corp. of Cincinnati, OH and Hessit Works, Inc., Freedom, IN Concrete pavers will be installed on a compacted stone base with a sand leveling course and edge restraints, or concrete base with a ¾" asphalt setting bed. Installation technique depends upon paver location and use.

WALLS

There are six major types of free standing and retaining walls. They are smooth random ashlar limestone, split face random limestone, limestone fieldrock, dry laid limestone fieldrock, Brown County stone and brick. Wall type and configuration shall be designed to reflect and compliment existing architecture and campus landscape features.

- Walls will be constructed with either a reinforced concrete or reinforced concrete block core and concrete footers, unless a dry laid type wall is specified.
- Dry laid stone walls will be constructed with a concrete or large stone footer with random stone, 2" - 7" thick, laid with a batter of 6" per foot. Capstone will be mortared.
- All retaining walls will include waterproofing, footer drains, and/or 1" min. dia. weep holes with clean #5 stone backfill.
- Whenever possible, walls shall be designed with heights between 18" - 30" to provide seating.

FENCES AND BARRIERS

These elements are placed to control pedestrian and vehicular movement and/or to screen an unsightly area or object. There are three types of fences and barriers; cedar wood fence, vinyl coated chain link fence, and steel post and chain barrier.

- Cedar wood fences are composed of 4 x 4 pressure treated wood posts, 2 x 4 pressure treated wood frame, 1 x 6 rough hewn cedar siding with ½" spaces, 2 x 10 rough hewn cedar cap and ½" x 1 ½" x 24" painted steel post mounting straps. Cedar wood fences which are used as dumpster screens, will also include a 2 x 6 pressure treated wood bumper rail installed at a height equal to the dumpsters lifting bars.
- Vinyl coated chain link fence varies in height from a 4' playground fence to a 12' tennis court fence. Vinyl coated chain link fencing will equal or exceed the Chain Link Fence Manufacturers Institute's Standards, and ASTM A120, A123, A569, A570, and D1499. Vinyl coating shall be 10 mils minimum, meeting Federal Specifications RR-F-101/3A and inert to normal corrosive atmospheres. Vinyl coating color shall be black or brown. Fabric will be 2" diamond mesh, 1 ¾" for tennis courts, interwoven and 11 gauge minimum before vinyl coating.
- Steel post and chain barrier is composed of 5' long x 2 ½" dia. steel post set in 8" dia. concrete base, 1 ½" x 3" threaded post cap and a general purpose low carbon steel chain with a minimum trade size of 3/16". Chain height will not be less than 2'-4" and not exceed 2'-6". Posts and chain will be painted with two coats of Pratt & Lambert colonial brown, rust proof, exterior enamel paint.
- Black vinyl coated pedestrian rail barrier (IUPUI). Black vinyl coated pipe and rail fence 42" high with double rails. 6' long x 2" dia. Posts set in 8" dia. Concrete base, with 1 5/8" dia. Rails. All pipe to be schedule 40.

SITE FURNITURE

Site furniture shall be compatible with the environment into which it is placed. Textures, colors, and design should relate to materials and finishes of adjacent architecture. They should complement the buildings setting and not dominate it.

- Various types of site furniture have been placed within the campuses; such as; limestone benches, limestone and wood benches, wood garden type benches, metal benches and tables, pre-cast concrete trash receptacles and ash urns, limestone ash urns, fiberglass trash receptacles, pre-cast concrete and fiberglass planters, wood kiosks, and bus shelters.
- Manufacturers and suppliers who have provided campus site furniture include the following:

Boruff Limestone - Bloomington, IN
D.M. Braun & Company - Santa Fe Springs, CA
Dave Hawkins Limestone - Spencer, IN
Forms + Surfaces – Carpinteria, CA
Gardenside, Ltd. - Walnut Creek, CA
Landscape Forms - Kalamazoo, MI
Smith & Hawken - Mill Valley, CA
Unit Step Inc. – Indianapolis, IN
Victor Stanley, Inc. - Dunkirk, MD
Wausau Tile - Wausau, WI

- IUB site furniture standards:

Bench – Limestone bench, 5’ long, by Boruff Limestone. Limestone and wood bench, 6’ long, by IUB Physical Plant. See details.

Trash receptacles – Pre-cast concrete model C #TF1090, WS sand, with Aluminum dome top and liner, by Wausau Tile Inc.

Ash receptacle – Classic Buttler ash receptacle, medium and large, color aluminum, surface and pole mount, by Forms + Surfaces Site Form Company.

Bicycle rack – The Bike Rib bike rack, model BR8, surface mount, color brown, by Function First Bike Security.

- IUPUI site furniture standards:

Bench – Classic series, CS – 48, 6’ long, cast iron bench, color black, by Victor Stanley, Inc.

Trash receptacle – Ironsites model S-42(36 gal.) and S-35(24 gal.), color black, by Victor Stanley, Inc.

Ash receptacle – Classic Buttler ash receptacle, medium and large, color black, surface and pole mount, by Forms + Surfaces Site Form Company.

Bicycle rack – The Bike Rib bike rack, model BR8, surface mount, color black, by Function First Bike Security.

Walkway lights – Pole mounted high pressure sodium outdoor type spherical light fixture, model # VS 4409 contempo by Hadco or approved equal. Fully enclosed and gasketed; pole, matching pole top adapter, dark bronze anodized finish; one piece, seamless, transparent bronze tinted, high impact, 18” dia., acrylic diffuser with internal prismatic glass refractor for symmetric distribution; heat shield above lamp; ballast mounted pole; ballast tap for 120/208/240/277 volt; UL listed for wet location; one 100 watt high pressure sodium; one sphere per pole; 3-3/8” extruded aluminum, round, straight, 14’ high pole; pole base cover plate flush with sidewalk; cast aluminum pole tenon and pole base cover.

APPENDIX 1

TYPICAL DETAILS

APPENDIX 2

SAMPLE SPECIFICATIONS

SECTION 02110
SITE CLEARING

PART 1 - GENERAL

1.01 RELATED WORK

- A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division - 1 Specifications Sections, apply to work of this Section.
- B. Section 02200 - Earthwork

1.02 DESCRIPTION OF WORK

- A. Provide site clearing work as shown and indicated.
- B. Site clearing work includes, but is not limited to:
 - 1. Protect existing or newly planted trees and plants as shown on drawings or as directed by Architect/Engineer.
 - 2. Removal of trees and other vegetation.
 - 3. Topsoil stripping.
 - 4. Clearing and grubbing.
 - 5. Removing above-grade improvements.
 - 6. Removing below-grade improvements.
 - 7. Installation of erosion control fabric.

1.03 JOB CONDITIONS

- A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.
- B. Protection of existing improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
 - 1. Protect existing drainage swales, streams and water impoundments from sediment and pollutants resulting from construction operations, as required by Section 108.03 of the IDOT Standard Specifications.

2. Protect improvements on adjoining properties and on Owner's property.
 3. Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.
- C. Erect protection prior to any disturbance associated with new construction on site.
 - D. Salvageable Improvements: Carefully remove items indicated to be salvaged, and store on Owner's premises where indicated or directed.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Fence: Plastic mesh safety fence no less than 4' in height.
- B. Stakes: Steel Channel Posts
- C. Wire: Galvanized iron wire, 12 gauge.

PART 3 - EXECUTION

3.01 SITE CLEARING:

- A. General: Remove trees, shrubs, grass and other vegetation, improvements, or obstructions interfering with installation of new construction. Remove such items elsewhere on the site or premises as specifically indicated. Removal includes digging out stumps and roots.
 1. Carefully and cleanly cut roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction.
 2. Clear all material collected at base of tree to original grade. Remove collected material and clear area from trunk to dripline.
- B. Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 3/4" in diameter, and without weeds, roots, and other objectionable material.

1. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.
 - a. Remove heavy growths of grass from areas before stripping.
 - b. Where trees are indicated to be left standing, stop topsoil stripping a sufficient distance to prevent damage to main root system.
 2. Stockpile topsoil in storage piles where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent wind-blown dust.
- C. Clearing and Grubbing: Clearing site of trees, shrubs and other vegetation, except for those indicated to be left standing..
1. Completely remove vegetation and other debris protruding through the ground surface.
- D. Installation of Protection Fence: Drive stakes 6' o.c. along the line designated by the greatest reach of a branch from the trunk. Drive stakes 18" deep. Place fence outside the stakes and secure with wire. Overlap fence by 4' on the ends and secure with wire. Allow no gate for access into dripline area through snow fence.
- E. Use only hand methods for grubbing inside drip line of trees indicated to be left standing.
- F. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
1. Place fill material in horizontal layers not exceeding 6" loose depth, and thoroughly compact to a density equal to adjacent original ground.
- G. Removal of Improvements: Remove existing above-grade and below-grade improvements as necessary to permit construction, and other work as indicated.
1. Do not interrupt existing sewers or utility service until relocation work has been completed and proper authorization has been obtained.

2. Removal of abandoned underground piping or conduit interfering with construction is included under this section.

3.02 DISPOSAL OF WASTE MATERIALS

- A. Burning is not permitted on Owner's property.
- B. Removal from Owner's Property: Remove waste materials and unsuitable and excess topsoil from Owner's property and dispose of off site in a legal manner.

3.03 CLEANUP

- A. When construction is complete on site secure approval from the Architect/Engineer for tree protection removal. Dispose of barricade off site.

END OF SECTION

EARTHWORK
SECTION 02200

PART 1 - GENERAL

1. 01 RELATED WORK

- A. Section 02110 - Site Clearing

1. 02 DESCRIPTION OF WORK

- A. Provide earthwork as shown and indicated.
 - 1. Preparation of subgrade for pavers, walks, curbs, pavements and foundations is included as part of this work.
 - 2. Each Prime Contractor shall provide all labor and materials required for their respective scope of work.
- B. Excavation for Utilities: Excavation and backfill required in conjunction with underground utilities systems and appurtenances is included as work of this section.
- C. Definition: "Excavation" consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.

1. 03 QUALITY ASSURANCE

- A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Testing and Inspection Service:
 - 1. An independent testing laboratory will be employed to perform soil testing and inspection service for quality control testing during earthwork operations.
 - 2. Testing laboratory shall have Soils Engineer present to observe and perform tests at all times earthwork operations are in progress.
 - a. Testing Service Shall: Determine suitability of materials for compacted fill, backfill and engineered fill.
 - b. Determine preparation and placing of materials for fill, backfill, and engineered fill.

- c. Determine maximum density and optimum moisture content for placing and compacting materials.
- d. Perform necessary field density tests to insure adequate compaction for fill, backfill, and engineered fill, for each compacted layer of fill.
- e. Perform necessary field inspection of different phases of earthwork.
- f. Perform necessary field inspection for borrow pits.

1.04 SUBMITTALS

A. Test Reports - Excavating: Testing Service shall submit following reports with their recommendations directly to Architect/Engineer with copy to the Contractor:

- 1. Test reports on borrow materials.
- 2. Verification of each footing subgrade.
- 3. Field density test reports.
- 4. One optimum moisture maximum density curve for each type of soil encountered.
- 5. Report of actual unconfined compressive strength and results of bearing tests of each strata tested.

1.05 JOB CONDITIONS

A. Existing Utilities: 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.

- 1. 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 at Contractor's expense.
- 2. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, during occupied hours, except when permitted in writing by Architect/ Engineer and then only after acceptable temporary utility services have been provided.
 - a. Provide minimum of 48 hour notice to Architect/ Engineer, and receive written notice to proceed before interrupting any utility.

B. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

1. Operate warning lights as recommended by authorities having jurisdiction.
2. Protect structures, utilities, sidewalks pavements, and other facilities from damages caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
 - a. Perform excavation within drip line of large trees to remain by hand, and protect the root system from damage or dry out to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with burlap. Paint root cuts of 1" diameter and larger with emulsified asphalt tree paint.

PART 2 - PRODUCTS

2. 01 SOILS MATERIALS

A. Definitions

1. Satisfactory soils materials are as defined by the Testing Service.
2. Base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed sand.
3. Drainage Fill: Clean granular material: Sand, pit run gravel containing a maximum of 2%, by weight, passing the 200 sieve, 100% passing the 3/4" sieve.
4. Backfill and Fill Materials: Satisfactory soil materials free of rock or gravel larger than 2" in any dimension, debris, waste, frozen materials, vegetable and other deleterious matter.
5. Aggregate for Under Drains: Coarse aggregate Class A, B, C, D and E, Size No. 5 in accordance with I.D.O.H. Standard Specification 903.02.

PART 3 - EXECUTION

3. 01 EXCAVATION

- #### A. Excavation is unclassified, and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

- B. The Contractor shall excavate rock, if encountered, shall dispose of the excavated material, and shall furnish acceptable material for backfill in the area of the excavated rock. Rock excavation shall be in accordance with Section 203.15 of the I.D.O.H. Standard Specification.
- C. C. Excavation and rock excavation shall be a part of the base bid price. Each prime Contractor is responsible for removal of all rock associated with all work required for a complete and proper installation.
- D. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Soils Engineer. Unauthorized excavation, as well as remedial work directed by Soils Engineer, shall be at Contractor's expense.
 - 1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Soils Engineer.
 - 2. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classifications, unless otherwise directed by Soils Engineer.
- E. Additional Excavations: When excavation has reached required subgrade elevations, notify Soils Engineer who will make an inspection of conditions.
 - 1. If unsuitable bearing soils are encountered at required subgrade elevations, carry excavations deeper and replace excavated materials as directed by the Soils Engineer.
- G. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
 - 1. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- H. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition.
 - 1. Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.

2. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
- I. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
 1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction, and discharge lines, and other dewatering system components necessary to convey water away from excavations.
 2. 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. Do not use trench excavations as temporary drainage ditches.
 - J. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
 1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
 2. Dispose of excess soil material and waste materials as herein specified.
 - K. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet, and extending sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of service, other construction, and for inspection.
 1. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - L. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as shown.
 - M. Excavations for Trenches: Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room. Provide 6" to 9" clearance on both sides of pipe or conduit.

1. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations.
2. Where rock is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of crushed stone or gravel prior to installation pipe.
3. For pipes or conduit 5" or less in nominal size and for flat bottomed multiple duct conduit units, do not excavate beyond indicated depths. Hand excavate bottom cuts to accurate elevations and support pipe or conduit on undisturbed soil.
4. For pipes or conduit 6" or larger in nominal size, tanks and other mechanical/ electrical work indicated to receive base material, excavate to depth indicated, or, if not otherwise indicated, to 6" below bottom of work to be supported.
5. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.
6. Do not backfill trenches until tests and inspections have been made and backfilling authorized by Architect/ Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

N. Backfill Trenches: Backfill trenches to subgrade elevation with base material and satisfactory soils material as indicated.

O. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F (1 degree C).

3.02 COMPACTION

A. General: Control soil compaction during construction, providing minimum percentage of density as specified, or as directed by Soils Engineer, for each area of classification indicated.

1. Fill areas shall be compacted using equipment capable of compacting each lift its full depth. Moisture during compaction operations shall be maintained at optimum content.
2. Compacting equipment shall be approved equipment of such design, weight, and quantity to obtain the required density in accordance with soils report and drawings.

3. Any areas inaccessible to a roller shall be consolidated and compacted by mechanical tampers.
4. Operate equipment so that hardpan, cemented gravel, clay, or other chunky soil material will be broken up into small particles and become incorporated with the material in the layer.

B. Compaction Density: Minimum soil compaction density for site elements are as follows:

1. Under pavements, structures, and foundations; 95%.
2. Under plant beds and lawn areas; 88%.

C. Cut Areas: Disk to 6" below subgrade and compact to density as determined by Soils Engineer.

1. Compaction by flooding is not acceptable.

D. Proof-rolling: At the end of each work day of filling and compaction operations, proof roll with smooth tired vehicle to leave smooth surface sealed to shed all water.

E. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.

1. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
2. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing, until moisture content is reduced to a satisfactory value.

3. 03 BACKFILL AND FILL

A. General: Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.

1. In excavations and trenches, use satisfactory excavated or borrow material, or base material.

2. Under piping and conduit, use base material where base is indicated under piping or conduit.
 3. Underdrains, use aggregate for underdrains.
 4. Under grassed areas, use satisfactory excavated or borrow material and topsoil.
 5. Under walks and pavements, use base material, or drainage fill material, or combination of both.
 6. Under steps, use base material, or drainage fill material.
- B. Backfill excavation as promptly as work permits, but not until completion of the following:
1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 2. Inspection, testing, approval, and recording locations of underground utilities.
 3. Removal of concrete formwork.
 4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
 5. Removal of trash and debris.
 6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
- C. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
1. When existing ground surface has a density less than that specified for particular area classification, break up ground surface, pulverize, moisture condition to optimum moisture content, and compact to required depth and percentage of maximum density.
- D. Placement and Compaction: Place backfill and fill materials in layers not more than 8" loose depth for material compacted by heavy compaction equipment,

and not more than 4" loose depth for material compacted by hand operated tampers.

1. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum density indicated on soils report. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Place backfill and fill materials evenly adjacent to structures, piping or conduit to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping or conduit to approximately same elevation in each lift.
3. Field Density tests shall be performed on each lift as necessary to insure adequate compaction is being achieved.

3.04 GRADING

- A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surfaces within specified tolerances, compact with uniform levels or slopes between points and existing grades.
- B. Grading: Grade areas adjacent to site elements to ensure positive drainage and to prevent ponding.
 1. Finish surfaces free from irregular surface changes, and as follows:
 - a. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10' above or below required subgrade elevations.
 - b. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 1/2" above or below required subgrade elevation.
 - c. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/2" above or below required subgrade elevation.
- C. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum density.

3.05 PAVEMENT AGGREGATE BASE COURSE

- A. General: Aggregate base course consists of placing base material, in layers of

specified thickness, over compacted subgrade surface to support a pavement base course.

1. See other Division-2 Sections for paving specifications.

B. Grade Control: During construction, maintain lines and grades including crown and cross slope of aggregate base course.

C. Placing: Place aggregate base course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting aggregate base material during placement operations.

1. Aggregate base course material placed for access and service roads shall not be used for construction traffic.

2. The Contractor shall install and maintain temporary entrances and drives for use by construction traffic.

3. 06 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve subgrades, fill and backfill (including trenches) layers before further construction work is performed.

1. Perform field density tests in accordance with ASTM D 1556 (sand cone method) or ASTM D2167 (rubber balloon method), as applicable.

2. Footing Subgrade: For each strata of soil on which footings will be placed, conduct at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to Soils Engineer.

3. Paved Areas: Make at least one field density test of subgrade for every 2000 sq. ft. of paved area but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2000 sq. ft. of overlaying paved area, but in no case less than 3 tests.

B If in opinion of Soils Engineer, based on testing reports and inspection, subgrade, fill, or backfill which have been placed are below specified density, provide additional compaction and testing at no additional expense.

3. 07 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
 - 1. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.
- C. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surfaces (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3. 08 DISPOSAL OF EXCESS AND WASTE MATERIAL

- A. Removal from Owner's Property: Remove unacceptable excavated material, trash and debris, and dispose of it off Owner's property.

END OF SECTION

SECTION 02260

FINISH GRADING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Finish grade sub-soil.
- B. Replenish topsoil in areas where clearing has been completed and not scheduled to receive new base course materials.
- C. Place, finish grade and compact topsoil.

1.02 RELATED WORK

- A. Section 02485: Seeding
- B. Section 02200: Earthwork

1.03 PROTECTION

- A. Prevent damage to existing features. Correct damage at no cost to the owner.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Existing topsoil on site: existing topsoil shall be removed where advantageous. This soil may be reused for lawns and plant beds, provided that it meets the topsoil requirements below.
- B. Topsoil: friable loam free from subsoil, roots, grass, excessive amount of weeds, stones, and foreign matter; acidity range pH of 6.0 to 7.0; containing a minimum of 6% and a maximum of 25% organic matter; soluble salts shall not be higher than 500 parts per million.
- C. Lime: shall be ground limestone containing not less than 85% of total carbonates and shall be ground to such a fineness that 50% will pass through a 100-mesh sieve and 90% will pass through a 20 mesh sieve.

2.02 TESTING

- A. Soil sample tests: the Landscape Contractor shall take three (3) representative samples from the topsoil source and submit

them for soil sample tests. If the ph range of topsoil is not between 6.0 and 7.0 then it shall be amended by the Landscape Contractor according to the guide below or the Landscape Contractor may select another topsoil sources and submit new soil sample tests.

1. If the Ph level is below 6.0 add limestone at a rate of 2.5 lbs. per cubic yard or 92 lbs. per 1,000 square feet to raise Ph one full point.
2. If the Ph level is above 7.0 add aluminum sulfate at a rate of 2.5 lbs. per cubic yard or 92 lbs. per 1000 square feet to lower Ph one full point.

PART 3 - EXECUTION

3.01 SUB-SOIL PREPARATION

- A. Rough grade subsoil systematically to allow for a maximum amount of settlement and compaction. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, etc. Remove subsoil which has been contaminated with petroleum products.
- B. Excavate and fill where necessary to bring sub-soil to required levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- C. Cultivate sub-grade to depth of 6 inches where topsoil is to be placed. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted subsoil.
- D. Compact materials to meet the following minimum percentages of modified proctor density, ASTM D1557, method C or D: Compact subsoil to the following:
 1. 88% where topsoil is to be placed.

3.02 PLACING TOPSOIL

- A. Use topsoil in relatively dry state. Place during dry weather.
- B. Fine grade topsoil eliminating rough or low areas to ensure positive drainage. Maintain levels, profiles and contours of sub-grades.
- C. Remove stone, roots, grass, weeds, debris and other foreign material while spreading.
- D. Manually spread topsoil around trees to prevent damage which may be caused by grading equipment.

E. Lightly compact placed topsoil.

3.03 SURPLUS MATERIAL

A. Remove surplus subsoil and topsoil from site.

Leave stockpile areas and entire job site clean and raked, ready to receive landscaping.

END OF SECTION

**SECTION 02485
SEEDING**

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. Seeding and fertilizing
- B. Maintaining seeded areas until owner's acceptance.

1.02 DELIVERY, STORAGE AND HANDLING

- A. Deliver grass seed in original containers showing analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging and location of packaging. Damaged packages are not acceptable.
- B. Deliver fertilizer in waterproof containers showing weight, chemical analysis, and name of manufacturer.

1.03 QUALITY ASSURANCE

- A. Contractor qualifications: Landscape contractor with five years minimum experience in finish grading and lawn installation.
- B. Seed will be fresh, clean, pure live seed equal in quality to the standards for "Certified Seed". It will be capable of passing the USDA test for germination of eighty five percent (85%) and for purity of ninety percent (90%). Seed shall be used within nine months of its most recent germination test. Seed will be free of all noxious or objectionable weeds and shall have a maximum weed crop of one-tenth percent (0.1%). The owner at contractor's expense may require seed verification tests.

1.04 EXISTING CONDITIONS

- A. Landscape contractor will inspect the project site prior to starting work. Start of finish grading and seeding work means acceptance of existing conditions.

PART 2 – PRODUCTS

2.01 GROWING MEDIA

- A. Topsoil: Natural, fertile, agricultural soil typical of locality, capable of sustaining vigorous plant growth, from well drained site free of flooding, not in frozen or muddy condition, not less than 6% organic matter, and pH value of 5.9 to 7.0. Topsoil shall be free from subsoil, slag, clay, stones, lumps, live plants, roots, sticks, crabgrass, noxious weeds and foreign matter.

- B. Fertilizer: 13 – 13 – 13 commercial type, quick release lawn fertilizer with 50% of elements derived from organic sources.

2.02 SEED

- A. Before any work is begun, the owner's representative and contractor will inspect the site to determine the use of General and shade seed mixtures.
- B. General mixture: 70% Kentucky Bluegrass. A minimum of three bluegrass cultivars with each ranging from a minimum of 10% to a maximum of 35% of the mixture by weight. No more than 15% of two perennial ryegrass cultivars that are resistant to Grey Leaf Spot, and 15% of one creeping red fescue cultivar.
- C. Shade mixture: 60% blend of at least two creeping red fescue cultivars and 40% blend of at least two shade tolerant Kentucky bluegrass cultivars. Each cultivar ranging from a minimum of 10% to a maximum of 35% of the mixture by weight.

2.03 ACCESSORIES

- A. Mulching material: Oat or wheat straw, reasonably free from weeds, foreign matter detrimental to plant life, and in dry condition. Hay or chopped corn stalks is not acceptable.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Protect existing underground improvements and adjacent facilities from damage. Verify locations of underground utilities with owner's representative prior to beginning work.
- B. Remove foreign materials, plants, roots, stones, and debris, from site. Do not bury foreign material.
- C. Remove contaminated subsoil.
- D. Cultivate area to receive seeding, to a depth of 6". Repeat cultivation in areas where equipment has compacted the subgrade.
- E. All uneven surfaces shall be raked until a uniform surface is established. All stones $\frac{3}{4}$ " diameter and larger shall be raked out and removed.

3.02 FERTILIZING

- A. Applying fertilizer at a rate of 25 lbs. Per 1,000 square feet. Do not apply grass seed and fertilizer at same time, in same machine. Lightly water to aid breakdown of fertilizer and to provide moist soil for seed.

3.03 SEEDING

- A. Apply seed at a rate of 8lbs. Per 1,000 square feet evenly in two intersecting directions with a cyclone type seeder, Brillion type drop seeder or slice seeder.
- B. Do not sow immediately following rain, when ground is too dry, or during windy conditions.
- C. Roll seeded area with roller not exceeding 112 lbs.
- D. Apply water with fine spray immediately after each area has been sown.
- E. Approved dates for applying lawn seed are between April 15 and May 30, and August 15 through September 30. Dates may vary depending on weather conditions.
- F. Mulch: Apply an even layer of straw mulch with a Goosen mulch spreader or approved equal. In small or confined areas, apply straw mulch by hand which has been diced by a mulch spreader.

3.04 HYDROSEEDING

- A. Seed and fertilizer may be sprayed on the previously prepared seedbed in the form of an aqueous mixture by using the following procedure:
 - 1. Seed: Type and rate is the same as described in the dry measure.
 - 2. Fertilizer may be applied during hydroseeding if the rate used during soil preparation is reduced in half. 25 lbs. Per 1,000 sq. ft. of 13-13-13 shall be applied to the soil. Therefore, 12.5 lbs. Per 1,000 sq. ft. may be applied during soil preparation and the remaining 12.5 lbs. Per 1,000 sq. ft. may be applied with the seed and water mixture.
- B. All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seed bed.
- C. Care shall be exercised to insure a uniform coverage and to guard against misses and overlaps. The water seed fertilizer mixture shall be applied at a minimum rate of 23 gal. Per 1,000 sq. ft.

- D. Straw shall be used as the protective covering. The same procedure shall be followed as described in the dry application.
- E. A cellulose fiber or approved equal may be used in the aqueous mixture at the rate of 35lbs. Per 1,000 sq. ft. instead of applying straw after seeding.
- F. Clean up: Excess and waste material shall be removed daily. All pavements shall be left broom cleaned and all damaged areas in existing turf shall be restored to their original condition before seeding operation. Clean mixture from adjacent site elements such as light poles, walls, benches, etc.

3.05 MAINTENANCE PERIOD

- A. Establishment period shall be in effect until an even stand of turf is established.
- B. Maintenance during this period shall be weed eradication, finish grading washed areas, and over seeding.

3.06 MAINTENANCE

- A. Maintain surfaces and supply additional topsoil where necessary, including areas affected by erosion. Mowing to take place as required until owner's final acceptance.
- B. Water to ensure uniform seed germination and to keep soil surface damp.
- C. Apply water slowly so that surface of soil will not puddle or crust.
- D. Replant damaged grass areas showing root growth failure, deterioration, bare or thin spots, and eroded areas.
- E. Maintain fencing or barriers as necessary to protect newly seeded area from pedestrian traffic.

3.07 ACCEPTANCE

- A. Seeded areas will be accepted at the end of maintenance period when all seeded areas are properly established and there is an even stand of grass 2" tall.
- B. At the time of inspection, the owner reserves the right to postpone final acceptance until that time in the future when a positive acceptance or rejection can be determined.

END OF SECTION

SECTION 02486 SODDING

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. Prepare subgrade to receive topsoil.
- B. Place, rake and level topsoil as required to prepare for sod.
- C. Place and maintain sod.

1.02 RELATED WORK

- A. Section 02260: Finish grading

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Sod: Shall be fibrous, well rooted Warren's Frontrunner turf-type tall fescue, (*or Kentucky blue grass*) complying with ASPA specifications, and nursery grown on clay loam soil. Sod shall not be grown on peat soil. Sod shall be free from stones, weeds, undesirable native grasses, and burned or bare spots. Edges of sod to be cleanly and evenly cut to a uniform width of not less than 18" and thickness of not less than 1-1/2". Rolled sod is acceptable for larger projects. Grass shall be cut to a height of not more than 2". Sod shall be the properly protected from drying out and shall be laid within 48 hours after cutting at the nursery.
- B. Topsoil: Natural, fertile, agricultural soil typical of locality, capable of sustaining vigorous plant growth, from well drained site free of flooding, not in frozen or muddy condition, not less than 6% organic matter, and pH value of 5.9 to 7.0. Topsoil shall be free from subsoil, slag, clay, stones, lumps, live plants, roots, sticks, crabgrass, noxious weeds and foreign matter.
- C. Fertilizer: Commercial slow release type recommended for grass, with 50% of the elements derived from organic sources to the following proportions; nitrogen 10%, phosphoric acid 8%, and soluble potash 4%.

PART 3 – EXECUTION

3.01 NOTIFICATION

- A. Landscape contractor will be notified when other work divisions have progressed sufficiently to commence work on the lawn areas. Upon receipt of such notice, landscape contractor will commence placing topsoil to finish grade. Thereafter the finished grade shall be maintained through completion

of the lawns. Landscape contractor will be responsible for notifying and insuring that final grade is not disturbed by other contractors.

3.02 PREPARATION OF LAWN AREAS

- A. The Landscape contractor shall inspect the prepared subgrade to insure the elevation is parallel with the desired finished grade and that the subgrade is uniformly compacted. Report any defects to the owner's representative before placement of any topsoil.
- B. After the subgrade has been accepted, the placement of topsoil may commence. The topsoil shall be spread evenly on the subgrade and lightly compacted. No topsoil shall be spread in a frozen or muddy condition. Areas to be sodded shall be brought to finished grade and raked smooth.
- C. All uneven surfaces shall be raked until a uniform surface is established. All stones $\frac{3}{4}$ " and larger shall be raked out and removed from project site. Areas to be sodded shall be brought to within the thickness of the sod to the finished grade. Finish grade to be approved by owner before sodding.

3.03 APPLYING LIME

- A. Lime shall be added at the rate indicated in the soil sample tests, Section 02260, and when added shall be thoroughly mixed into the topsoil prior to placement.

3.04 APPLYING FERTILIZER

- A. Fertilizer shall be applied at a rate of 25 lbs. Per 1,000 sq. ft. to all areas being prepared for lawn. This rate may be increased, at the direction of the Landscape Architect, based upon the soil sample analysis.

3.05 RECONDITIONING LAWNS

- A. Use sod to recondition existing lawn areas damaged by contractor's operations including storage of materials or equipment and movement of vehicles.

3.06 LAYING SOD

- A. Before any sod is laid, all soft spots and inequalities in grade shall be corrected. Fertilizer shall be spread and raked in. The first row of sod shall be laid in a straight line with subsequent rows placed parallel to and tightly against each other. Lateral joints shall be staggered to promote more uniform growth and strength. Care shall be exercised to insure the sod is not stretched or overlapped, and that all joints are butted tight, in order to prevent voids which would cause air drying of the roots.

- B. On 3:1 rounded slopes or greater, sod shall be laid with staggered joints and secured by wood pegs and tamping.
- C. Landscape contractor shall water sod immediately after transplanting to prevent excessive drying during progress of work. As sodding is completed in any one section, the entire area shall be rolled. It shall then be thoroughly watered to a depth sufficient that the underside of the new sod pad and soil immediately below are thoroughly wet. The Landscape contractor shall be responsible for having adequate water available at the site prior to and during the sod transplanting.

3.07 INSPECTION AND MAINTENANCE

- A. Maintenance prior to inspection shall be the contractor's responsibility. Maintenance shall begin immediately after lawn is planted and continue for a minimum of 30 days. Maintenance will include watering, mowing, topsoil dressing of edges and seams, repair, and replacement. A two to three day notice shall be given to the owner indicating an inspection/approval date. After inspection and acceptance by owner, all maintenance shall be taken over by the owner.
- B. Landscape contractor shall provide adequate protection during installation against pedestrian traffic and damage, including erosion and settlement.
- C. Damage to lawn areas due to vandalism or on the part of others prior to acceptance by owner will be the responsibility of the Landscape contractor.

END OF SECTION

**SECTION 02490
PLANT MATERIALS**

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. Trees, shrubs, perennials, bulbs and flowers.
- B. Topsoil bedding and mulching.
- C. Maintenance

1.02 RELATED WORK

- A. Section 02260: Finish grading.
- B. Section 02485: Seeding.
- C. Section 02486: Sodding.

1.03 QUALITY ASSURANCE

- A. Perform work with personnel experienced in the technical and construction tasks required of this section under the direction of a skilled foreman.
- B. Plant materials will be approved by Landscape Architect prior to digging and shipping. Contractor will submit photos from at least two sides of material indicating size, shape and condition to the Landscape Architect for approval if material is located more than 50 miles from project site.
- C. Ship landscape materials with certificates of inspection required by governing authorities. Comply with regulations applicable to landscape materials. Indiana Nurserymen's Association, American Association of Nurserymen's American Standard for nursery stock and Federal specifications Q-F-241D and A-P-166E.
- D. Do not make substitutions. If specified landscape material is unavailable, submit proof of non-availability and proposal for use of equivalent material to Landscape Architect.
- E. Analysis and Standards: Packaged standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Immediately before digging, all plant material shall be marked to indicate north side at time of digging. Provide freshly dug trees and shrubs. Do not prune prior to delivery. Do not bend or bind-tie trees or shrubs in such a manner as to damage bark, break branches, or destroy natural shape. Provide protective covering during delivery.
- B. Root ball size: The minimum root ball diameter for trees and shrubs shall be as follows:

1. Trees

Caliper inches

Minimum Root Ball Diameter

1" – 1-1/4"

18 times larger than caliper

1-1/2" – 2-1/4"

15 times larger than caliper

2-1/2" – up

13.5 times larger than caliper

2. The minimum root ball diameter for trees shall be 1/3 the tree height when tree size is specified by height, i.e.; 8 ft. high tree will have a minimum root ball diameter of 32".
3. The minimum root ball diameter for shrubs (36" high and larger) shall be 1/3 their height. Shrubs less than 36" high shall have a minimum root ball size equal to their spread.
4. Root ball depths:
- Root balls with diameters less than 48" shall have a depth of not less than 75% of their diameter.
 - Root balls with diameters 48" to 60" shall have a depth of not less than 66-2/3% of their diameter.
 - Root balls with diameters over 60" will have the depth scaled down proportionately
- C. Deliver trees and shrubs after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, then store plant material in shade. Protect from weather and mechanical damage and keep roots moist. Provide cover if necessary.
- D. Reject plants when ball of earth surrounding roots has been cracked or broken during delivery or planting process.
- E. Reject plants when burlap, staves, and ropes required in connection with transporting have been displaced prior to acceptance.

1.05 WARRANTY

- A. Provide one year warranty from plant material acceptance.

- B. Replace dead, unhealthy, and misshapen plant materials.
- C. Replacements: Plant materials of same size and species, with a new warranty commencing on date of replacement.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Trees and shrubs: Species and size as identified on landscape plan, grown in climatic conditions similar to those in locality of the project site.
- B. Perennials: Grown in 6” pots, minimum; 2 year old plants.
- C. Annual flowers: Grown in flats or peat pots with an established white fibrous root system.
- D. Bulbs: Top size; Top bedding or garden size.
- E. Graded topsoil: Type specified in Section 02260. Add fertilizer as required.
- F. Topsoil mix: Backfill around trees and shrubs by alternating 4”-6” layers of topsoil mix and existing soil.
- G. Plant bed soil mix: $\frac{3}{4}$ topsoil and $\frac{1}{4}$ peat moss or composted organic material. In addition, for each 100 sq. ft. of plant bed incorporate the following; 5 lbs. Of slow release all organic fertilizer such as Plant-Tone, 5 lbs. Of green sand or sea sand, and 5 lbs. Gypsum. Mix amendments thoroughly.
- H. Fertilizer: For trees and shrubs, provide slow release granular fertilizer with not less than 10% available phosphoric acid and 3-5% total nitrogen and from 3-5% soluble potash.
- I. Mulch: Shredded native hardwood bark. 3” minimum layer, pieces shall not exceed $\frac{1}{2}$ ” x 1” x 4” and contain a minimum of 25% organic material.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Verify topsoil and plant bed soil is ready for planting operations. Prepare planting areas and beds for plant installation.

3.02 INSTALLATION

- A. Place plant materials or location stake for review and final orientation by Landscape Architect prior to installation.

- B. Excavate for plant materials.
 - 1. Plant pits shall be circular in outline and shall have vertical sides and flat bottoms. They must be excavated at least 6" deeper than the root balls. Their diameter shall be:
 - a. At least 3' larger than plant root balls 5 feet larger in diameter.
 - b. At least 2' larger than tree plant root balls 2 to 5 feet in diameter.
 - c. A minimum of 18" larger than plant root balls less than 2 feet in diameter.
- C. Set plant materials relative to grade as originally grown, after settlement, and orient north side of plant.
- D. Set plants in pits partly filled with prepared topsoil mixture, at a minimum depth of at least 6" as indicated under each plant. Pull away burlap, ropes wires, etc. from top of root ball. All covering and ropes other than burlap and hemp shall be completely removed.
- E. Backfill soil mixture in 6" layers. Maintain plant materials in vertical/plumb position. Dish top of backfill to allow for mulching.
- F. Thoroughly water soil when the hole is half full, even if it is raining, and again when full. Water plant materials as indicated.
- G. Mulch pits and plant beds. Provide 3" thickness of mulch and work into top of backfill and finish level with adjacent grades. Mulched tree pits shall be a diameter of 6 feet. Unless pit area is restricted by site elements.
- H. If deciduous trees or shrubs are moved in full leaf, water root zone thoroughly and spray with anti-desiccant at nursery before moving and again two weeks after planting.
- I. Pruning: Thin out and shape trees and shrubs in accordance with standard horticultural practice. Prune trees to required height and spread. Do not cut tree leaders, and remove only injured or dead branches. Prune shrubs to retain natural character. Do not shear.
- J. Annual flowers and perennials shall be planted in plant bed soil mix and not in mulch layer. Plant in staggered pattern. Whenever possible, mulch flower and perennial beds as plants are planted.
- K. Bulbs shall be planted at a depth of 2-1/2 times their diameter, unless otherwise specified by bulb grower. Apply bulb booster fertilizer as per manufacturer's instructions.

3.04 TRANSPLANTING EXISTING PLANTS

- A. Indicate north side of plants before digging. Before digging deciduous plants which are in full leaf, water root zone thoroughly and spray with anti-desiccant as per manufacturer's instruction and again two weeks after transplanting.
- B. All transplanted plants shall be balled and burlapped. Minimum size and depth of root ball shall be as specified in paragraph 1.04B.
- C. Temporary storage: Existing plants which have been removed and cannot be replanted immediately shall be "healed-in" with topsoil, mulch, or sawdust. "healed-in" plants shall be kept shaded and their root balls kept moist until they can be replanted. Replant according to specifications outlined in Part 3 – Execution.
- D. Warranty: Transplanted material in full leaf shall not be warranted. All other warranties apply.

3.05 INSPECTION OR INITIAL ACCEPTANCE

- A. Maintenance and warranty shall begin after landscape inspection and acceptance. This inspection can be on all or partially completed work under this contract.
- B. At the time of final inspection, the Landscape Architect and owner reserve the right to postpone final acceptance until that time in the future when positive acceptance or rejection can be determined.

3.06 MAINTENANCE AFTER INITIAL ACCEPTANCE OR INSPECTION

- A. Begin maintenance of plant materials immediately after planting and continue until 30 days after initial acceptance.
- B. Maintenance shall include measures necessary to establish and maintain plants in a vigorous and healthy growing condition. Include the following:
 - 1. Cultivation and weeding tree pits. When herbicides are used for weed control, apply in accordance with manufacturer's instructions. Remedy damage resulting from use of herbicides.
 - 2. Water sufficient to saturate root system.
 - 3. Pruning, including removal of dead and broken branches, and treatment of prune wounds.
 - 4. Disease and insect control.
 - 5. Replumb trees and stake if required. Repair or replace accessories when required.
- B. Job site will be kept neat and attractive during 30 day maintenance period.

END OF SECTION

SECTION 02511
CRUSHED STONE

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Crushed stone.

1.02 STANDARD SPECIFICATIONS

- A. Where the words "highway specifications" are used they shall refer to Indiana Department of Transportation Standard Specifications.

PART 2 - PRODUCTS

2.01 PAVING MATERIALS

- A. Aggregate Materials shall conform to the requirements of Section 903, IDOTSS and to the requirements of subsections referenced therein.
 - 1. Base Course: #53 crushed stone.

PART 3 - EXECUTION

3.01 SUBGRADE

- A. The subgrade shall be shaped to true lines and elevations. Adequate drainage shall be provided at all times to prevent water from standing on the subgrade. Work shall conform to the requirements of IDOTSS Section 207.
- B. All boulders, organic materials, soft clay, spongy material and any other objectionable material shall be removed and replaced with approved materials. Subgrade shall be properly shaped, rolled and uniformly compacted to conform with the accepted cross section.

3.02 GRANULAR BASE CONSTRUCTION

- A. Placement - The contractor shall use skilled workers, up to date methods and modern equipment suitable to the size of the work in spreading, compacting and finishing the gravel pavement. Other requirements are as follows:
 - 1. 6" deep under asphalt pavement and 4" deep under concrete pavement.

2. Section 303.09, IDOTSS. Compacted to 95% of maximum dry density.
3. An approved vibrating device shall be used to compact gravel base. It may be supplemented by a 10 ton, three wheel, tandem or pneumatic-tire roller conforming to Section 401.09 of the IDOT Standard Specifications. Contractor shall use such construction procedures, including sufficient wetting and number of passes to insure that the above density is attained.
4. All edges should be neatly cut and edges made uniform. All surplus and remainders should be carried away from the work site.

3.03 REPAIRING FINAL WORK

- A. The gravel pavement shall be checked as specified herein.
- B. Gravel paving shall be free of low spots, pockets, or high spots and shall be sloped as required for proper drainage.

END OF SECTION

SECTION 02513
ASPHALT CONCRETE PAVING

PART 1-GENERAL

1.01 WORK INCLUDED

- A. Publications of the following institutes, associations, societies, and agencies are referred to in this Section.
 - 1. Indiana Department of Transportation, Standard Specifications, Latest Edition, IDOT.
 - 2. American Society for Testing and Materials, ASTM.
 - 3. Federal Specifications, FS.

1.02 QUALITY REQUIREMENTS

- A. Provide final surface of uniform texture conforming to required grades and cross sections.
- B. Surface smoothness, when tested with 10 ft. Straight-edge:
 - 1. Base Course: 1/4" in 10 ft. Max.
 - 2. Surface Course: 1/8" in 10 ft. Max.
- C. Provide Owner with duplicate copy of all crushed stone base and asphalt delivery tickets.

PART 2- PRODUCTS

2.01 MATERIALS

- A. Materials shall conform with the following requirements:
 - 1. Coarse Aggregates: Class A or B, Crushed or Uncrushed Gravel or Stone conforming to IDOTSS, Section 903.02.
 - 2. Fine Aggregates: Natural Sand, Well Graded from Coarse to Fine conforming to IDOTSS, Section 903.01.
 - 3. Tack: Rapid Cure Liquid Asphalt or Asphalt Emulsion conforming to IDOTSS, Section 409.
 - 4. Bituminous Materials: Petroleum Asphalt Cement conforming to IDOTSS, Section 902.

2.02 PAVING MIXES

- A. Asphalt materials shall conform to the requirements of Section 402, (HAE), or Section 403 (HAC), IDOT Standard Specifications and to the requirements of subsections referenced therein.
- B. The surface mixture shall be made using suitably graded coarse aggregate and fine aggregate of the size and combination as indicated in Table 1, 2, and 3, Section 403.04, preparation of mixtures, IDOT Standard Specifications.
 - 1. Surface course: HAC Type - 11 B Max, Aggregate size ?".
 - 2. Base course: HAC Type 5D.

PART 3 - EXECUTION

3.01 ASPHALT PAVEMENT CONSTRUCTION

- A. Subgrade shall be proof-rolled using pneumatic tired roller capable of exerting minimum of 90 psi pressure uniformly over the subgrade surface. Conforming to IDOT standard specification, Section 401.09.
 - 1. Proof-rolling shall provide two complete coverages.
 - 2. Remove and replace soft spots with stable material, compact and re-proof.
- B. All materials shall be spread using approved spreading equipment. Tail gating of aggregates directly onto subgrades will not be accepted.
 - 1. Asphalt pavers shall be self-propelled with receiving hopper of sufficient capacity to provide a uniform spreading operation.
 - 2. Contact surfaces of curbs, manholes, catch basins, etc. shall be painted with thin uniform coating of bituminous material prior to placing mixture against them.
 - 3. The mix temperature at the site shall be a minimum of 285° F. - maximum of 325° F.
 - 4. All joints shall be carefully made in such a manner as to insure a neat junction, thorough compaction, continuous band and seal.
 - 5. The pavement shall be compacted to 95%.
 - 6. All edges shall be neatly cut and made uniform. All asphalt surplus and remainders shall be removed from work site.
- C. Contractor shall have on hand at the site prior to paving operation all necessary portable and hand tools and one stand-by roller.

3.02 COMPACTION

- A. Subgrade and compacted aggregate base courses shall be compacted to 95% of maximum dry density in accordance with ASTM designation D698.
 - 1. Each lift of aggregate base shall be compacted to density specified above.
 - 2. Soft spots found during proof-rolling which are replaced with fill material shall be compacted to density specified above.

3.03 SPREADING AND ROLLING

- A. Base Course:
 - 1. Spread and roll to minimum finish depths indicated on details.
- B. Surface Course:
 - 1. Spread and roll to minimum finish depths as indicated on details.
 - 2. Finish installation shall be true to line and grade and within 1/2" true elevation.
- C. Tack:
 - 1. Base Course and Binder Course of hot asphalt concrete shall be tacked prior to installation of subsequent courses using 0.15 gallons per square yard of cut-back rapid cure (RD-70 asphalt emulsion (AE-T)).

3.04 COMPACTING

- A. Compacting shall conform to requirements of IDOT. Standard specification, Section 401.12. Compaction shall be completed before temperature of the mixture has dropped below 180° F.
- B. Density test shall be made at each lift if so directed by the Project Manager.
- C. Tests shall be made by soils engineer approved by the Project Manager.
 - 1. Results of each test shall be certified to the Project Manager within 72 hours after tests are made.

3.05 SURFACE TOLERANCES

- A. Surface of pavement shall meet requirements of IDOT standard specification Section 401.15.
- B. Paving shall be free of low spots, pockets, or high spots and shall be sloped as required for proper drainage.

- C. Any areas which develop an excess of bitumen shall be removed and replaced with proper materials.
- D. Contractor shall maintain courses during the curing period.

END OF SECTION

SECTION 02517

BRICK PAVERS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Brick paving.

1.02 RELATED WORK

- A. Section 03300 - Cast-in-Place Concrete

1.03 REFERENCE STANDARDS

- A. ASTM C216-77 - Standard Specifications
- B. ASTM C902 - 79a - Pedestrian and Light Traffic Paving Brick
- C. Uniform Building Code
- D. Structural Clay Products Institute
- E. Installer: Subcontract masonry paving work to a firm with not less than 5 years of successful experience in equivalent paving applications.
- F. Do not change source of brands for masonry units, setting materials, or grout during progress of work.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each product, including certification that each product complies with specified requirements.
- B. Masonry Paving Unit samples showing full range of colors and textures. Furnish samples made up of actual units or sections of units.
- C. Submit cured samples of colored grout, showing range of color which can be expected in the finished work.

1.05 PROTECTION AND JOB CONDITIONS

- A. Protect masonry materials during storage and construction against wetting by rain, snow or ground water and against soilage. Protect grout and mortar materials from deterioration by moisture and

temperature. Store in dry location or waterproof container.

- B. Do not use frozen materials or build on frozen subgrade or setting beds. Do not use anti-freeze or calcium chloride in mortar or grout.
- C. Install setting bed only when temperature is above 40° F (4° C), and when base is clean and dry.
- D. Protect masonry in hot weather to prevent excessive evaporation of setting beds and grout. Provide shade, wind breaks as required.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Paving Brick: For walks, shall be solid uncured brick of same face size and color to match existing brick in walk behind Bryan Hall; Azalia (gas fired blend) 2-1/4" thick, comply with ASTM C216, type FBS, Grade SW. Paving brick to be manufactured by Glen Gary or approved equal.

(Paving Brick: For entryways; Medium Ironspot #46 paver TK by Endicott. Size: 4" x 8" x 1-5/8". Paving Brick, when tested in accordance with ASTM C67, shall not show efflorescence. Submit manufacturer's certification of test results.)

- B. Portland Cement: ASTM C150, Type 1.
- C. Lime: ASTM C207, Type 5.
- D. Sand: ASTM C144, Washed, clean and graded.
- E. Water: clean, fresh and potable.
- F. Asphalt Base: provided under Section 02515.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine substrates and installation conditions. do not start brick paving work until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Do not use paving units with chips, cracks, voids, discolorations, or other visible defects.
- B. Cut brick paving units with masonry saws to provide clean, sharp unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible. Where cutting is required, use the largest size units possible. Avoid the use of small pieces of brick or large joint spaces.
- C. Set brick pabvers in Herrignbone pattern indicated with level surface and uniform joints of width indicated. Match existing brick patterns in walk behind Bryan Hall. Cross slope surfaces at low or level areas of walk to ensure proper drainage.

(For entryways; set brick pavers in patterns indicated with level surface and uniform joints of width indicated.)
- D. Provide brick edging as indicated. Install edging prior to placing brick paving.

3.03 INSTALLATION: MORTARLESS PAVING OVER RIGID BASE

- A. Clean existing concrete base. Remove dirt and debris.
- B. Install mortar mix cushion over existing base.
- C. Set brick pavers with hand tight joints. Sweep dry fine sand-portland cement mixture over the surface to fill joint irregularities. Completely fill joints. Clean brick of any cement stains.
- D. Damp cure sand-portland cement joint filler for minimum 3 days.

(Apply tack coat of AE-T, or RL-70 if applied between November and March, to asphalt base.)

3.04 PROTECTION

- A. Restrict traffic from brick paving surfaces during setting of units and for at least 24 hours after installation.
- B. Protect brick paving from damage until final acceptance.

3.05 CLEANING

- A. Remove and replace brick paving units which are broken, chipped, stained, or otherwise damaged. Provide new matching units, install as specified and to eliminate evidence to replacement.

- B. Clean brick paving not less than 6 days after completion of work, using clean water, trisodium phosphate, and stiff-bristle brushes. Do not use wire brushes, acid type cleaning agents, or other cleaning compounds with caustic or harsh filler. Proprietary cleaning agents subject to Landscape Architects or Owner's Representative approval to use.

- C. Perform cleaning during installation of work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from brick paving operations.

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END OF SECTION

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SECTION 02518

INTERLOCKING CONCRETE PAVERS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Supply and place sand/mortar mix leveling course.
- B. Supply and install interlocking concrete paver stones, as manufactured on multi-layer equipment, in quality, shape, thickness and color as specified. Consult Standard Specification ASTM C936 for Interlocked Paver Stone.
- D. Supply and install all accessory items as required by the contract.

PART 2 - SITE WORK

2.01 EXCAVATION

Unsuitable, unstable, or unconsolidated subgrade material shall be excavated to reach a solid sub-state. The Owner's Representative shall inspect sub-state prior to compaction and addition of granular base.

PART 3 - MATERIALS

3.01 INTERLOCKED PAVER STONES

- A. Paver stones shall be: Uni-stone pavers as manufactured by Inter-Pave Corp. of Cincinnati, OH. (513) 474-3783 or approved equal. Uni-stone pavers shall be as follows:

Flag Pole Plaza; 9" x 5" x 2" Uni-decor pavers.

Sidewalk edging; triple row of 4" x 8" x 2" Holland stone pavers.

Color of Uni-stone pavers shall match color blend of existing brick pavers, and be approved by Owner.

3.02 SAND/MORTAR MIX LAYING COURSE

- A. The sand laying course shall consist of clean, coarse, concrete sand, not Mason sand, with the following gradation limits:

| Sieve Size | % Passing |
|------------|-----------|
| 3/8" | 100 |
| 4 | 90-100 |
| 8 | 80-95 |
| 16 | 55-85 |
| 50 | 10-35 |
| 200 | 0-5 |

- B. Mortar shall comply with Section 04100.
- C. Mix ratio shall be 5 parts sand and 1 part mortar.

3.03 EDGE RESTRAINT

- A. All edges of the paver stone installation shall be restrained with beige colored concrete.
- B. Edge restraint should be in place and secure before paver stones are compacted.

PART 4 - EXECUTION

4.01 CONSTRUCTION OF THE BASE COURSE

- A. The finished sub-grade shall be approved before placement of concrete base course.
- B. The base course shall be spread in layers which when compacted will not exceed 6".
- C. The base course shall be compacted with suitable compaction equipment that will ensure a minimum 95% of ASTM Designation D1557.
- D. The base course shall be shaped to grade and cross section with an allowable local tolerance of 1/4".

4.02 CONSTRUCTION OF THE SAND/MORTAR MIX LAYING COURSE

- A. The finished base course shall be approved before the placement of the laying course.
- B. The laying course shall be spread evenly over the area to be paved and screeded to a level that will produce the required 1" thickness when the

paving stones have been placed and vibrated.

- C. Once screeded and leveled, the laying course shall not be disturbed in any way.

4.03 LAYING OF CONCRETE PAVER STONES

- A. The paver stones shall be laid in such a manner that the desired pattern is maintained and the joints between the stones do not exceed 1/8". Periodically during installation, review paver layout and make adjustments to minimize cutting and installation of odd shaped pieces.
- B. The gaps at the edge of the paved surface shall be filled with standard pavers or with pavers cut to fit. The pavers shall be cut to a straight even surface without cracks or chips.
- C. The paver stones shall be vibrated to their final level by 3 or more passes of a vibrating plate compactor.
- D. After first vibration, sand/mortar mix shall be brushed over the surface and vibrated into the joints with additional passes of the plate vibrator so as to completely fill the joints.
- E. Surplus material shall then be swept from the surface and the entire site left clean.
- F. After final vibrating, the surface shall be true to grade and shall not vary by more than 1/4" when tested with a 10' board at any location on the surface.

END OF SECTION

SECTION 02720
STORM SEWERAGE SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: provide storm sewerage system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
 - 1. Document affecting work of this section include, but are not limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications, and Sections 715, 719, 720, 906 and 909 of the 1988 Edition of the Indiana Department of Highways Standard Specifications.

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

1.03 SUBMITTALS

- A. Product Data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this section;
 - 2. Manufacturer's specifications and other data needed to provide compliance with the specified requirements;
 - 3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on this work.

PART 2 - PRODUCTS

2.01 PIPE MATERIALS

- A. Materials shall comply with applicable portions of Section 715.02 of the

Indiana Department of Highways Standard Specifications.

2.02 DRAINAGE

A. General

1. Construct manholes, inlets, tile drains, and junction structures of reinforced concrete or precast reinforced concrete, complete with metal frames, and covers or grating, and with fixed ladder rungs where indicated on the Drawings or required by codes.
2. Individual wall mounted aluminum or plastic covered steel are acceptable.

B. Materials

1. Materials shall comply with applicable sections of the Indiana Department of Highways Standard Specifications Sections 715.02, 719.02, 720.02, and 909.05.

C. Frames and Covers, or Gratings

1. Provide all gratings or covers from the same manufacturer.
2. Provide standard black finish, supplied as a total unit, size as shown on the Drawings or larger sizes except where in a pavement area.
3. Acceptable Products: Manufactured by Neenah Foundry, or East Jordan Foundry.

D. Precast Concrete Catch Basins

1. Contractor may select this option in lieu of cast in place concrete catch basins.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS:

- A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 EXCAVATING, TRENCHING AND BEDDING

- A. Excavate, trench and bed for site drains in accordance with pertinent provisions of Section 715.03 of the Indiana Department of Highways Standard Specifications and the following:

- B. Movement of Construction Machinery
 - 1. Use means necessary to avoid displacement of, and injury to, pipe and structure while compacting by rolling or operating equipment parallel to the pipe.
 - 2. Movement of construction machinery over a culvert or storm drain at any stage of construction is solely at the Contractor's risk.

- C. Laying of Pipe
 - 1. Shall be in accordance with Section 715.04 of the Indiana Department of Highways Standard Specifications.
 - 2. Provide a bedding surface for the pipe with a firm foundation of uniform density throughout the entire length of the pipe.
 - 3. Bed the pipe carefully in a soil foundation accurately shaped and rounded to conform to the lower 1/4 of the outside perimeter of circular pipe, or set the pipe in a bed of sand.
 - 4. Tamp bedding where necessary.
 - 5. Provide bell holes and depressions for pipe joints of only the length, depth, and width required for making the particular pipe joint properly.
 - 6. Where plastic pipe is used, provide a minimum of 4" of sand bedding over the top and under the pipe.

3.03 INSTALLING PIPE

A. GENERAL

- 1. Carefully examine each pipe prior to placing. Promptly set aside defective pipe and damaged pipe. Do not install defective pipe or damaged pipe.
- 2. Place pipe to the grades and alignment indicated, with a tolerance of one in 1000 vertical and one in 500 horizontal, unless otherwise directed by the Architect.
- 3. Provide adequate facilities for lowering pipe safely into the trenches.
- 4. Do not place pipe in water, nor place pipe when trench or weather is unsuitable for such work.

- B. Concrete Pipe: Place by proceeding upgrade with the spigot ends of bell and spigot pipe, and the tongue ends of tongue and groove pipe, pointing in the direction of the flow.

3.04 MANHOLES AND INLETS

- A. General: This work shall consist of the construction and adjustment to grade of manholes and inlets in accordance with this specification and as reasonably close conformance with the line and grades shown on the plans and as directed.
- B. Construction requirements for manholes and inlets shall comply with applicable sections of 720.03 of the Indiana Department of Highways Standard Specifications.
- C. Adjusting existing structures to grade shall comply with applicable sections of 720.04 of the Indiana Department of Highways Standard Specifications.

END OF SECTION

SECTION 02831
CHAIN LINK FENCE
(VINYL COATED)

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Excavation for Post Bases.
- B. Concrete Anchorage for Posts.
- C. Gates and Related Hardware.
- D. Fence Framework and fabric.

1.02 ERECTOR QUALIFICATIONS

- A. Minimum of two years experience installing similar fencing.

1.03 REFERENCE STANDARDS

- A. Chain Link Fence Manufacturers Institute (CIMI) - Voluntary Standard for Chain Link Fence Installation.
- B. ASTM A120 - Welded and Seamless Steel Pipe.
- C. ASTM A123 - Hot Dip Galvanizing.
- D. ASTM A569 - Cold Rolled Steel.
- E. ASTM A570 - Roll-Formed Steel Shapes.
- F. ASTM C94 - Ready-Mixed Concrete

1.04 SHOP DRAWINGS AND PRODUCT DATA

- A. Clearly indicate plan layout, grid, spacing of components, accessories, fitmits, and anchorage.
- B. Submit manufacturer's installation instructions and procedures, including standard details of fence and gate installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Cold Bond II, tennis court fence.
- B. American Tube Co., Inc.
- C. Continental Steel Co., Kokomo, Indiana
- D. Anchor Fence, Inc.
- E. Substitutions are acceptable in accordance with General Conditions.

2.02 MATERIALS

- A. Framework: ASTM A120; Type I; Schedule 40, butt weld, standard weight, hot dip galvanized to 1.8 oz./sq. ft. prior to vinyl coating.
- B. Fabric: ASTM A392, Class I, Galvanized after weaving, then vinyl coated.
- C. Vinyl coating: PVC coating shall be 10 mils minimum, meeting Federal Specifications RR-F-101/3A and inert to normal corrosive atmospheres. Vinyl coating color shall be Brown or Black and match existing vinyl coated fence.
- D. Concrete: ASTM C94, (normal) Portland cement, 3000 psi @ 28 days, 3 inch-4 inch slump.

2.03 COMPONENTS

- A. Line Posts: C-Section 2.25 x 1.70 inches or 2 inch diameter. Schedule 40 Steel Tubing.
- B. Corner and Terminal Posts: 3 inch nominal diameter, Steel Tubing, Schedule 40.
- C. Gate Posts: 4 inch nominal diameter, Steel Tubing Schedule 40.
- D. Top and Brace Rail: 1-5/8 inch nominal diameter, Steel Tubing Schedule 40.

- E. Gate Frame: 2 inch nominal diameter, Steel Tubing Schedule 40.
- F. Caps: Cast or pressed steel, or malleable iron, hot dip galvanized, sized to post dimension, set screw retained, vinyl coated.
- G. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fitting, steel galvanized, vinyl coated.
- H. Fabric: 1-3/4 or 2 inch diamond mesh, interwoven, 11 gauge, top selvage knuckle, bottom selvage knuckle end closed. Galvanized after weaving to 1.2 oz/sq. ft., vinyl coated.
- I. Gate Hardware: gate center rest, piece drop latch, gate hinge 180 degree male and female, fork latch and latch catch, drop bolt, vinyl coated.
- J. Bottom Tension Wire, 6 gauge steel single strand, galvanized.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install line posts, corner posts, top rails, post caps and fabric and gates, to provide a rigid structure for fence. Use manufacturer's standard fittings, fasteners and hardware.
- B. Maximum spacing of posts: CLFMA Standard.
- C. Install line, corner, and terminal posts plumb, set in concrete footings as specified in CLFMA Standard.
- D. Set post to within 6 inches from bottom of concrete footing. Slope top of concrete for water runoff. Set top of footing 2 inches above finished grade. Set bottom of footing a minimum of 2'-6" below finished grade.
- E. Position bottom of fabric at finish grade with tension wire stretched taut between posts.
- F. Pass top rail through line post tops to form continuous bracing. Install 7 inch long couplings midspan at pipe ends.
- G. Brace each gate and corner post back to adjacent line post with horizontal center brace rail. Install brace rail, one bay from end and gate posts.

- H. Install center and bottom brace rail on corner and gate leaves.
- I. Fasten fabric to top rail, line posts, braces, and bottom tension wire with wire ties maximum 15 inches centers.
- J. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- K. Stretch fabric between terminal posts or at least intervals of 100 ft. maximum whichever is the least dimension.
- L. Install gates using fabric to match fence. Install 3 hinges per leaf, latch, catches, foot bolts and sockets, retainer and locking clamp.
- M. Provide concrete center rest and drop bolt retainers at center of double gate openings.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED WORK

- A. Section 02200 - Earthwork
- B. Section -02511 - Crushed Stone
- C. Section 02518 - Interlocking Concrete pavers.

1.02 DESCRIPTION OF WORK

- A. Provide concrete paving as shown and indicated, including curbs, gutters, walks and pavement.

1.03 QUALITY ASSURANCE

- A. ACI-347 - Recommended Practice for Concrete Formwork
- B. ACI-318 - Reinforced Concrete; ACI-315 Manual of Standard Practice; CRSI-63; ASTM-A615.
- C. ASTM-C94 - Ready-Mixed Concrete; ACI-304, 305 & 306; ASTM-C150; ASTM-C260; ASTM-C33.
- D. Codes and Standards: Comply with Indiana Department of Highways, Standard Specifications Section 501, unless more stringent requirements are herein indicated.

1.04 SUBMITTALS

- A. Furnish samples, manufacturer's product data, mix designs, test reports, and materials' certifications of all materials used in this section and as required by Division One specifications..

1.05 JOB CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Utilize flagmen, barricades, warning signs and warning lights as required.

1.06 MOCKUPS

- A. Concrete paving: Provide mock-up of beige colored concrete paving complete with full depth expansion joint and sealant.
 - 1. Size, 4'-0" x 4'-0"
 - 2. Show integral color and light broom finish.
 - 3. Approved mock-ups must remain as part of work and become the standard of quality for the balance of work. Mock-ups may not be part of the completed work. Mock-ups will be demolished and removed from site after acceptance of concrete paving.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Forms: Steel, wood or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
 - 1. Use flexible spring steel forms or laminated boards to form radius bends as required. Coat forms with a nonstaining form release agent that will not discolor or deface surface of concrete.
- B. Fine and Coarse aggregate: ASTM C33. 3/4" max. size for coarse aggregate.
- C. Concrete Reinforcing Fibers: Polypropylene, collated, fibers from Fiber Mesh, Inc., 4019 Industry Drive, Chattanooga, TN 37417, or equal.
- D. Joint Dowel Bars: Stainless steel bars, ASTM A 615, Grade 40. Cut bars true to length with ends square and free of burrs.
- E. Metal Expansion Caps: Furnish for one end of each dowel bar in expansion joints. Design caps with one end closed and a minimum length of 3" to allow bar movement of not less than 1", unless otherwise indicated.
- F. Air Entraining - ASTM C260; equal to W.R. Meadows Air Entraining Agent.
- G. Expansion Joint Materials: 1" x 4" resilient, closed cell polyurethane foam material; equal to W.R. Meadows Sealant Rescore expansion joint filler.

- H. Sealant: One part self-leveling polyurethane sealant like Sonneborns "Sonolastic SL 1", ASTM C-920, Type S, Grade P, Class 25, Limestone color.
- I. Liquid-Membrane Forming Curing Compound: Complying with ASTM C309, Type I, Class A, clear unless other type acceptable to Architect/Engineer. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.
1. Products: Subject to compliance with requirements, provide one of the following:
 - "Masterseal"; Master Builders
 - "A-H 3 Way Sealer"; Anti-Hydro Waterproofing Co.
 - "Ecocure"; Euclid Chemical Co.
 - "Clear Seal"; A.C. Horn
 - "J-20 Acrylic Cure"; Dayton Superior
 - "Sure Cure"; Kaufman Products, Inc.
 - "Spartan-Cote"; The Burke Co.
 - "Sealkure"; Toch Div. - Carboline
 - "Kure-N-Seal"; Sonneborn-Contech
 - "Polyclear"; Upco. Chemical /USM Corp.
 - "L&M Cure"; L&M Construction Chemicals
 - "Klearseal"; Setcon Industries.
 - "LR-152"; Protex Industries
 - "Hardtop"; Gifford-Hill
- J. Concrete Sealer: Silane type sealer; Hydrozo Enviroseal 40, Sonneborn penetrating sealer 40, BSM 40 by Chem-Treat, Nitocote Dekguard by FASROC or approved equal.
- K. Concrete Materials: Integral color for light broom finish concrete paving.
1. L.M. Schofield Co. Chromix Admixture, Color I.U. Beige J177, Essroc. Cmt., IMI #23 Sand. Sample dated 9/20/94. Placed at Library entrance plaza, I.U. Kokomo campus and McKinney Fountain Plaza, I.U. Bloomington campus.

2.02 CONCRETE MIX, DESIGN AND TESTING

- A Design mix to produce standard weight concrete consisting of Portland cement, aggregate, water reducing or high range water reducing admixture (super-plasticize), air entraining admixture and water to produce the following properties:
1. Compressive Strength: 4500 psi, minimum at 28 days.
 2. Slump Range: 8" for concrete containing HRWR admixture (sup34-plasticizer); 3" for other concrete.
 3. Air Content: Type 1A (5-7% air), Portland Type, ASTM C150.
 4. Mix concrete in accordance with ASTM C94.

PART 3 - EXECUTION

3.01 SURFACE PROTECTION

- A. Proof roll prepared subgrade surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

3.02 AGGREGATE BASE

- A. Place aggregate base where required to conform with Section 02200, Earthwork, and Section 02511 Crushed Stone.
- B. Remove loose material from compacted subgrade or aggregate base surface immediately before placing concrete.

3.03 FORM CONSTRUCTION

- A. Set forms to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
- B. Check completed formwork for grade and alignment to following tolerances:
 - 1. Top of forms not more than 1/8" in 10'.
 - 2. Vertical face on longitudinal axis, not more than 1/4" in 10'.
- C. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

3.04 REINFORCEMENT

- A. Locate, place and support reinforcement.

3.05 CONCRETE PLACEMENT

- A. Skip-pour all concrete paving, allowing pours, expansion joint materials and dowels to set fully before placing concrete into the adjacent formed areas. Do not force materials into wet concrete. All joint materials, dowels, etc. must be integral with the formwork. Install expansion joints and control joints as shown on drawings.
- B. Do not place concrete until forms have been checked for line and grade. Moisten subgrade or aggregate base if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

- C. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
- D. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than ? hour, place a construction joint.
- E. Curbs and Gutters: Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed specified minimums. Machine placement must produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

3.06 JOINTS

- A. General: Construct expansion, weakened plane (contraction), and construction joints true to line with face perpendicular to surface of concrete, Construct transverse joints at right angles to the centerline, unless otherwise indicated.
 - 1. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Weakened Plane (Contraction) Joints: Provide weakened plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened plane joints for a depth equal to at least 1/4 concrete thickness, as follows:
 - 1. Tooled Joints: Form weakened plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
 - 2. Sawed Joints: Form weakened plane joints using powered saws equipped with shatterproof abrasive or diamond rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.
 - 3. Inserts: Use embedded strips of metal or sealed wood to form weakened plane joints. Set strips into plastic concrete and carefully remove strips after concrete has hardened.
- C. Construction Joints: Place construction joints where placement operations are stopped for a period of more than ? hour, except where such pours terminate at expansion joints.
 - 1. Construct joints as shown or, if not shown, use standard metal keyway section forms.
 - 2. Where load transfer slip dowel devices are used, install so that one end of each dowel bar is free to move.

- D. Expansion Joints: Provide expansion joints of pre-molded joint filler at a maximum of 40' o.c., unless otherwise indicated, and at all curb radii and locations abutting concrete curbs, catch basins, manholes, inlets, structures, walks, or other fixed objects.
1. Extend joint filler full width and depth of joint, and not less than 3/4" or more than 1' below finished surface.
 2. Furnish joint fillers in one piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.
 3. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.
 4. Fillers and Sealants: Comply with the requirements of this Section Paragraph 2.01 G & H.

3.07 CONCRETE FINISHING

- A. After striking off and consolidating concrete, smooth surface by screeding and floating. Use hand method only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.
1. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.
 2. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 3/4" radius, unless otherwise indicated. Eliminate tool marks on concrete surface.
 3. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing as indicated on plans or, if not shown, finish as follows:
- B. Trowel Finish: Initial troweling shall be delayed as long as practicable to avoid troweling while concrete is too soft. Water sheen shall have disappeared from the surface. Dry cement and sand shall not be used to take up surface moisture.
1. First troweling shall be sufficient to produce a smooth surface.
 2. Final troweling shall be done with a tilted trowel and heavy pressure after the concrete has become hard enough to give a ringing sound under the trowel and shall produce a smooth plane surface free of defect.
- C. Sweat Finish: After screeding and floating, an initial troweling shall be given the surface when it has hardened enough so that water and fine material are not worked to the top.
1. Final troweling shall be done with the trowel worked flat on the surface producing a fine, non-slip, swirled sandy texture.

2. Walks and Steps finish; medium broom finish, perpendicular to line of traffic. Repeat operation if required to provide texture acceptable to Architect/Engineer.
3. On Entrance Drive surfaces, provide a coarse, nonslip finish by scoring surface with a stiff bristled broom, perpendicular to line of traffic.
4. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect/Engineer.

3.08 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply, according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- C. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.
- D. Provide moisture curing by the following methods:
 1. Keep concrete surface continuously wet by covering with water.
 2. Use continuous water-fog spray.
 3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4-inch lap over adjacent absorptive covers.
- E. Provide moisture-retaining cover curing as follows:
 1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproofed tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- F. Apply curing compound on exterior slabs, walks, and curbs as follows:

1. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
2. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.

3.09 REPAIRS AND PROTECTIONS

- A. Repair or replace broken or defective concrete, as directed by Architect/Engineer.
- B. Drill test cores where directed by Architect/Engineer, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy resin grout.
- C. Protect concrete from damage and graffiti until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END OF SECTION

SECTION 03351

EXPOSED AGGREGATE CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Exposed aggregate walks and pads.

1.02 RELATED WORK

- A. Section 03300 - Cast-in-Place Concrete

1.03 QUALITY ASSURANCE

- A. Materials and methods of construction shall comply with:
 - 1. American Society for Testing and Materials (ASTM)
 - 2. American Concrete Institute, (ACI).
- B. Applicator Qualifications: Three years minimum experience in producing exposed aggregate concrete surfaces.
- C. Do not change source or brands of cement and aggregate materials during course of work.

1.04 SUBMITTALS

- A. Sample panel: Before installing concrete work, provide a 4' x 4' x 4" sample panel using specified materials. Correct until Owner's Representative accepts work. Retain panel as standard for completed concrete paving work. Sample panel and paving work to match exposed aggregate walks located at Physical Science Building.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Concrete:
 - 1. Cement: air entraining portland cement, ASTM C150, Type 1A, 4000 psi exposed Agg-mix.
 - 2. Aggregates: ASTM C33: 5L clean washed river gravel, free of dust.
 - 3. Water: clean and free of substances harmful to concrete.
- B. Retarders, Curing Compound and sealers:
 - 1. Type 'S' concrete surface retarder for exposed aggregate concrete as manufactured by The Euclid Chemical Company, or approved equal. 800-321-7628.
 - 2. Sealers: Kure & Seal #30 as manufactured by Sonneborn or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine area scheduled to receive exposed aggregate surfaces for conditions that will adversely affect execution permanence or quality of work as follows:
 - 1. Formwork erected and clean.
 - 2. Reinforcement placed in position.
 - 3. Expansion joint material set.
 - 4. Water removed from forms.
- B. Do not start work until satisfactory conditions are corrected.

3.02 INSTALLATION

- A. Dampen sub-base before pouring concrete.
- B. Dampen aggregate before use.
- C. Immediately after final finishing operations, apply Type 'S' concrete surface retarder with a low pressure sprayer. Cover surface with wet burlap, or plastic to prevent surface from drying out. Within 12-24 hours after application, use a low pressure hose to remove the retarded surface mortar. Do not use excessive force during removal which can dislodge exposed aggregate.
- D. Apply concrete cure & seal to new exposed Aggregate concrete, as per manufacturer's instructions. Lightly broadcast Silica sand with a seed/fertilizer type spreader, immediately after applying final coat for skid resistance surface

3.03 CLEANING

- A. Brush and rinse exposed aggregate surface. Clean adjacent areas.

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END OF SECTION

2.02 MORTAR MATERIALS

- A. Portland Cement: ASTM C150 normal-Type I; gray color.
- B. Masonry Cement: ASTM C91 for general use.
- C. Aggregates: standard masonry type, ASTM C144, clean, dry and protected against dampness, freezing and foreign matter.
- D. Hydrated Lime: conforming to requirements of ASTM C207 Type S.
- E. Premix Mortar: commercially prepared type, ASTM C387 Mortar Type using gray cement.
- F. Water: clean and free from injurious amounts of oil, alkali, organic mater or other deleterious material.

2.03 MORTAR MIX

- A. Provide minimum 1800 psi mortar, Type S, for masonry walls.

PART 3- EXECUTION

3.01 MIXING MORTAR

- A. Thoroughly mix mortar ingredients, in quantities needed for immediate use.
- B. Do not use anti-freeze compounds to lower the freezing point of mortar.
- C. Use mortar within two hours of mixing at tempatures over 80° F., and two and one half hours at temperatures under 50° F.
- D. If necessary, retemper mortar within two hours of mixing to replace water lost by evaporation. Do not retemper mortar after two hours of mixing.

END OF SECTION

SECTION 04220

CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Concrete unit masonry exterior walls, complete with reinforcement and anchorages.
- B. Cut and fit for other sections of work.
- C. Finish.

1.02 RELATED WORK

- A. Related Sections

1.03 QUALITY ASSURANCE

- A. Perform concrete unit masonry work in accordance with requirements of ANSI A41.1, unless indicated otherwise herein.

1.04 REFERENCE STANDARDS

- A. ASTM C150 - Portland Cement.
- B. ASTM C90- Hollow Load Bearing Concrete Masonry Units.
- C. ANSI A41.1- Building Code Requirements for Masonry.

1.05 PROTECTION

- A. Provide temporary bracing during erection of masonry work. Maintain in place until building structure provides permanent bracing.

1.06 DUST PROTECTION

- A. Contain dust from cutting operations. Prevent dust from intruding into electrical motors, switch gear, panels, etc. by erecting dust-proof enclosures at cutting area or utilizing wet-cutting equipment.

PART 2 - PRODUCTS

2.01 CONCRETE UNIT MASONRY

- A. Concrete Block: ASTM C90 Hollow Core grade type modular size

complete with corners, bases, bond beams and fillers to match and compliment block units, standard weight.

2.02 REINFORCEMENTS AND ANCHORAGES

- A. Reinforcing Steel for Bond Beams Lintels, ASTM A615 Grade 60, unless otherwise indicated.
- B. Single Wythe Wall horizontal reinforcing: truss type; 3/16 side rods with cross ties; composite type manufactured by Dur-O-Wall Inc.

2.03 CONCRETE

- A. Cement: ASTM C150, normal-Type I.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Ensure items built-in by other trades for this work are properly located and sized.
- B. Establish all lines, levels and coursing. Protect from disturbance.

3.02 WORKMANSHIP AND INSTALLATION

- A. Place concrete block in accordance with lines and levels indicated on drawings.
- B. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.
- C. All joints concave, except where covered by finish materials.
- D. Perform jobsite cutting with proper power tools to provide straight and true, unchipped edges.
- E. Ensure masonry courses are of uniform height. Make vertical and horizontal joints equal and of uniform thickness.
- F. Lay concrete block in full bed of mortar, properly jointed with other work.
- G. Remove excess mortar and projections. Take care to prevent breaking block corners.
- H. Lay concrete unit masonry in running bond. Course one block unit and one mortar joint to equal 8 inches.

3.03 TOLERANCES

- A. Maximum variation from masonry unit to adjacent masonry unit to be 1/32 inch.

3.04 REINFORCEMENT AND ANCHORAGES

- A. Place masonry reinforcing and anchorages for concrete unit masonry as follows:
 1. Provide single wythe walls with horizontal masonry reinforcing in every second block joint.
 2. Place horizontal masonry reinforcing in first and second joints above and below openings.
 3. Lap masonry reinforcing splices minimum 6 inches. Extend minimum 16 inches each side of openings

3.05 CUTTING AND FITTING

- A. Cut and fit for pipes, conduit, sleeves, and other openings. Cooperate fully with other sections of work to ensure correct size, shape and location.
- B. Obtain Architect/Engineer's approval prior to cutting or fitting any area which is not indicated on drawings, or which may impair appearance or strength of masonry work.

3.06 CLEANING

- A. Remove excess mortar and smears upon completion of masonry work.
- B. Point or replace defective mortar. Match adjacent work.

END OF SECTION

SECTION 04320

BRICK VENEER

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Include all material, labor, and equipment for the completion of all brick work as shown on drawings.
- B. Owner will provide bricks for contractor to install.

1.02 RELATED WORK

- A. Section 04100: Mortar
- B. Section 04220: Concrete Unit Masonry

1.03 REFERENCES

- A. ASTM C216 - Facing Brick

1.04 DUST PROTECTION

- A. Contain dust from cutting operations. Prevent dust from intruding into electrical motors, switch gear, panels, etc. by erecting dust-proof enclosures at cutting area or utilizing wet-cutting equipment.

PRODUCTS

2.01 METAL TIES

- A. Corrugated metal ties, 22 Ga., not less than 6" in length.

2.02 BRICK

- A. All bricks required in this job will be provided by the Owner for the contractor to install.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Verify items provided by other sections of work are properly sized and located.
- B. Establish lines, levels, and coursing. Protect from disturbance.

- C. Provide temporary bracing during erection of masonry work. Maintain in place until building structure provides permanent bracing.

3.02 COURSING

- A. Lay brick in pattern to match existing. Course three (3) brick units and three (3) mortar joints to equal eight (8) inches.

3.03 CAVITY SPACE

- A. Do not let mortar fall into cavity air space or plug weep holes, clean out promptly.
- B. Install weep holes in veneer at 6'-0" on center above shelf angles and at bottom of walls, use 1/4" O.D. plastic tubing.

3.04 REINFORCEMENT AND ANCHORAGES

- A. Secure wall ties to back-up for veneer at maximum 16 inches on center horizontally.

3.04 CLEANING

- A. Remove excess mortar and smears.
- B. Replace defective mortar.
- C. Clean soiled surfaces with a non-acidic solution which will not harm masonry or adjacent materials.

END OF CENTER

SECTION 04400

STONEWORK

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Random Ashlar
- B. Cut Stone

1.02 RELATED WORK

- A. Section 04100 - Mortar
- B. Section 04450 - Natural Limestone Veneer

1.03 QUALITY ASSURANCE

- A. Provide stone which complies with recommendations of the Indiana Limestone Institute of America, Inc.
- B. Obtain stone from quarry with consistent color range and texture throughout the work.
- C. Subcontract fabrication of stone to a firm which has successfully fabricated stone similar to the quality specified for a period of not less than five years.
- D. Job Mock-Up:

Prior to installation of stonework, provide 4'-0" sample panel of new wall veneer stonework with proposed range of color, texture and workmanship to be expected in complete work. Build mock-ups at site, as directed, using stone, anchors and jointing as shown and specified and in accordance with final shop drawings.

Obtain Owner's acceptance of visual qualities of sample panel before start of stonework. Replace unsatisfactory mock-up work, as directed, until acceptable. Retain sample panel during construction as a standard for judging completed stonework.

- E. Stone shall match existing stone on exterior stair walls located at north entrance of Goodbody Hall.

1.04 SUBMITTALS

- A. Shop Drawings: Submit cutting and setting drawings showing sizes, dimensions, sections and profiles of stonework units, arrangement and provisions for jointing, anchoring and fastening supports.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect stone during storage and construction against moisture, soiling, staining and physical damage.
- B. Handle stone to prevent chipping, breakage, soiling or other damage. Do not use pinch or wrecking bars without protecting edges of stone with wood and other rigid materials. Lift with wide-belt type slings wherever possible; do not use wire rope or ropes containing tar or other substances which might cause staining. If required, use wood rollers and provide cushion at end of wood slides.
- C. Store stone on wood skids or pallets, covered with non-staining, waterproof membrane. Place and stack skids on stones to distribute weight evenly and to prevent breakage or cracking of stones. Protect stored stone from weather with waterproof, non-staining covers or enclosures, but allow air to circulate around stones.
- D. Protect mortar materials and stonework accessories from weather, moisture and contamination with earth and other foreign materials.

1.06 JOB CONDITIONS

- A. Installer shall review installation procedures and coordination with other work, with Contractor, and other contractors and subcontractors whose work will be affected by stonework.

1.07 COLD WEATHER PROTECTION

- A. Remove all ice or snow formed on stonework bed by carefully applying heat until top surface is dry to touch.
- B. Remove stonework determined to be frozen or damaged by freezing conditions.

- C. Perform the following construction procedures while work is progressing:
1. When air temperature is from 40 deg. F (4 deg. C) to 32 deg. F (0 deg. C), heat sand or mixing water to produce mortar temperatures between 40deg F (4 deg. C) and 120 deg. F (49 deg. C).
 2. When air temperature is from 32 deg. F (0 deg. C) to 25 deg. F (-4 deg. C), heat sand or water to produce mortar temperatures between 40 deg. F (4 deg. C) and 120 deg. F (49 deg. C); maintain temperature of mortar on boards above freezing.
 3. When air temperature is from 25 deg. F (-4 deg. C) to 20 deg. F (-7 deg. C), heat sand and mixing water to produce mortar temperatures between 40 deg. F (4 deg. C) and 120 deg. F (49 deg. C); maintain temperature of mortar on boards above freezing; use other heat sources on both sides of walls under construction; use wind breaks when wind is in excess of 15 miles per hour.
 4. When air temperature is 20 deg. F (-7 deg. C) and below, heat sand and mixing water to produce mortar temperatures between 40 deg. F (4 deg. C) and 120 deg. F (49 deg. C); provide enclosures and auxiliary heat to maintain air temperature above 32 deg. F (0 deg. C); do not lay units which have a surface temperature of 20 deg. F (-7 deg. C).
- B. Perform following protection for completed stonework and partially completed stonework not being work on:
1. When mean daily temperature is from 40 deg F (4 deg. C) to 32 deg. F (0 deg. C), protect stonework from rain or snow for at least 24 hours by covering with weater-resistive membrane.
 2. When mean daily temperature is from 32 deg F (0 deg. C) to 25 deg. F (-4 deg. C), completely cover stonework with weather- resistive membrane for at least 24 hours.
 3. When mean daily temperature is from 25 deg F (-4 deg. C) to 20 deg. F (-7 deg. C), completely cover stonework with insulating blankets or similar protection for at least 24 hours. When mean daily temperature is 20 deg. F (-7 deg. C) and below, maintain stonework temperature above 32 deg. F (0 deg. C) for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps, or other acceptable methods.
- C. Do not use frozen materials or materials mixed or coated with ice or frost. Do not use salt to thaw ice in anchor holes or slots. Do not lower the freezing point of mortar by use of admixtures or anti-freeze agents, and do not use calcium chloride in mortar or grout.

- D. Do not build on frozen work; remove and replace stonework damaged by frost or freezing.
- E. During all seasons, protect partially completed stonework against weather when work is not in progress. Cover top of walls with strong waterproof, non-staining membrane extending at least two feet down both sides of walls and anchor securely in place.

1.08 DUST PROTECTION

- A. Contain dust from cutting operations. Prevent dust from intruding into electrical motors, switch gear, panels, etc. by erecting dust-proof enclosures at cutting area or utilizing wet-cutting equipment.

PART 2 - PRODUCTS

2.01 STONE

- A. Limestone shall be Indiana (Oolitic) limestone complying with ASTM C 568, Category 11 (medium density) and as follows:
 - 1. Minimum compressive strength 4000 psi per ASTM C 170 and maximum absorption 7.5 percent per ASTM C 97.
 - 2. Limestone shall match the stone on the existing exterior walls located at north entrance of Goodbody Hall.
- B. Ashlar Limestone:
 - 1. Finish of existing stone which is chat sawn or fine shot sawn, depending on quarry, may match existing.
 - 2. There are 4 course heights in the existing stone. They are 2-1/4", 5", 7-3/4" and 10-1/2". The quantity of each course height shall match existing.
 - 3. Lengths of Ashlar stone varies from 8" to 30".
 - 4. Ashlar stone shall be 3-1/2" to 3-3/4" thick with finished heads.
- C. Cut Stone:
 - 1. Cut stone copings shall be smooth finish in standard buff finish.
- D. Mortar and Grout:
 - 1. Cement: Provide white cement as follows:
 - a. Portland Cement: ASTM C 150, except complying with the staining requirements of ASTM C 91 for not more than 0.03 percent water soluble alkali. Furnish Type 1, except Type 111 may be used for setting stonework in cold weather.

- b. Masonry Cement: ASTM C 91, non-staining.
 2. Hydrated Lime: ASTM C 207, Type S.
 3. Sand: ASTM C 144, except graded with 100 percent passing the No. 16 sieve for .25 inch and narrower joints.
 4. Mortar Color: Match existing or as directed by Owner.
 5. Water: Clear and free of deleterious materials which would impair the work.
- E. Fabrication:
 1. General: Fabricate as shown and as detailed on final shop drawings and in compliance with recommendations of applicable stone association. Provide holes and sinkages cut or drilled for anchors, fasteners, supports secure stonework in place. Cut and back-check as required for proper fit and clearance. Shape beds to fit supports.
 2. Cut accurately to shape and dimensions shown on final shop drawings, maintaining fabrication tolerances of applicable stone associations.
 - a. Dress joints (bed and vertical) straight and at 90 deg. angle to face, unless otherwise indicated.
 - b. Provide quirk-mitered corners, unless otherwise shown. Provide for cramp anchorage in top and bottom bed joints.
 - c. Joint Width: Cut to provide joint widths as indicated or, if not indicated, cut to allow for uniform 1/2" wide joints.
 3. Thickness: Provide stone of thickness indicated. Sawcut back surfaces which will be concealed in finished work.
 - b. Allow not less than one inch clearance between back face of units and structure framing.
 4. Fabricate molded work to profiles indicated, with arrisses sharp and true and matched at joints between units.
 5. Veneer Anchors: Shall be 16 guage galvanized steel 1-1/4" wide x 3-1/2" long, hole type with corrugated shank and 1-1/2" bend similar to Heckman Building Products No. 187.
 6. Dowels: And other anchors required to secure coping stones shall be Type 302 stainless steel.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Installer shall examine supporting structure and conditions under which the stonework is to be installed, and notify Contractor in writing of any conditions detrimental to proper and timely completion of work. Do not proceed with the installation of stonework until unsatisfactory conditions have been corrected in a manner acceptable to installer.

- B. Do not use stone units with chips, cracks, voids, stains or other defects which might be visible in the finished work unless otherwise acceptable to installer. C. Do not build on frozen work; remove and replace stonework damaged by frost or freezing.
- D. Do not use frozen materials or materials mixed or coated with ice or frost. Do not use salt to thaw ice in anchor holes or slots. Do not lower freezing point of mortar by use of admixtures or anti-freeze agents, and do not use calcium chloride in mortar or grout.

3.02 PREPARATION

- A. Clean stone before setting by thoroughly scrubbing with fiber brushes followed by a thorough drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh fillers or abrasives. If not thoroughly wet at time of setting, drench or sponge stone. Do not wet expansion or control joint surfaces.

3.03 INSTALLATION

- A. Execute stonework by skilled mechanics, and employ skilled stone fitters at the site to do necessary field cutting as stone is set.
- B. Provide expansion joints where shown. Do not fill with mortar. Install continuous strips of preformed joint filler to allow for installation of backer rod and sealant.
- C. Set stone in accordance with drawings and final shop drawings for stonework. Provide anchors, supports, fasteners and other attachments shown or necessary to secure stonework in place. Shim and adjust accessories for proper setting of stone. Completely fill holes, slots and other sinkages for anchors, dowels, fasteners and supports with mortar during setting of stones.

3.04 WALLS

- A. Erect building walls plumb and true with joints uniform in width and accurately aligned. Set in full bed of mortar, unless otherwise indicated. Provide setting buttons as required to prevent extrusion of mortar. Do not set units above until mortar in courses below is set sufficiently to maintain alignment and prevent extrusion. All vertical joints in stone shall be square.
- B. Cavity Construction: Where open space between back of stone units and

back-up or framing is shown, keep cavity open; do not fill with mortar or grout.

- C. Joints: Butter vertical joints for full width before setting and set units in full bed of mortar, unless otherwise indicated. All joints are to be square.
 - 1. Point joints after setting by tooling to profile shown or, if not shown, tool slightly convex for building wall facing.
 - 2. Rake out joints of facing 0.75 inch deep before mortar sets to allow for mortar pointing. Clean face of stone after raking. After mortar is set, wet rake joints thoroughly and force pointing mortar into joints. Tool to profile to match existing. Provide pointing mortar using specified materials to match sample.
 - 3. Rake out joints before mortar is set to allow for sealant pointing as shown. Refer to Division 7 Sections for backer rod and sealant.
- D. Weepholes: Provide one inch round medium density polyethylene plastic tubes to form weepholes at 6'-0" o.c.
- E. Anchor limestone veneer to backing with metal ties as follows:
 - 1. Anchor veneer to structure with metal anchors embedded in masonry joints and attached to concrete with Rawl Zamac Nailin fasteners or other method as approved by the Owner.
 - 2. Set anchors as required to properly secure the work. For ashlar, provide minimum of one anchor for each stone, two anchors for stones over 18" long. Provide additional anchors at corners and openings.

3.05 ADJUST AND CLEAN

- A. Remove and replace stone units which are broken, chipped, stained or otherwise damaged. Where directed, remove and replace units which do not match adjoining stonework. Provide new matching units, install as specified and point-up joints to eliminate evidence of replacement. Repoint defective and unsatisfactory joints as required to provide a neat, uniform appearance.
- B. Clean stonework not less than six days after completion of work, using clean water, soap and stiff-bristle brushes. Do not use wire brushes, acid type cleaning agents or other cleaning compounds with caustic or harsh fillers. Provide a second cleaning same as specified above immediately before Date of Substantial Completion.
- C. Install shall advise Contractor of proper procedures required to protect the stonework from collapse, deterioration, discoloration or damage during subsequent construction and until acceptance of the work.

D. Just prior to substantial completion, clean all stone as specified.

END OF SECTION

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**SECTION 04450
NATURAL LIMESTONE VENEER WALLS**

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. Native limestone field rock veneer for exterior walls as indicated on plans and as specified. Limestone field rock shall match existing stone wall located at the Indiana Memorial Union building's north entrance circle drive on the Bloomington Campus.
- B. Metal anchors, mortar and joint grouting.
- C. Joint sealant.

1.02 RELATED WORK

- A. Section 03300: Cast in place concrete.
- B. Section 04100: Mortar.
- C. Section 04400: Stonework
- D. Section 04220: Concrete unit masonry.

1.03 QUALITY ASSURANCE

- A. Provide native Indiana limestone field rock which complies with the recommendations of the Indiana Limestone Institute of America, Inc.
- B. Obtain stone quarried in Monroe or Lawrence County, with consistent size, color range and texture throughout work. Color size and texture of stone shall also be consistent with existing stone wall located at the Indiana Memorial Union building's north entrance circle drive on the Bloomington Campus.

1.04 JOB MOCK-UP

- A. Prior to installation of stonework, provide 8' sample run of stonework with proposed range, color, texture, random pattern and workmanship to be expected in completed work. Build sample on site, as directed, using stone, ties, and jointing as shown on plans and as specified.
- B. Obtain Architect's acceptance of sample wall before start of stonework. Replace unsatisfactory mock-up work, as directed, until acceptable to Architect. Retain approved sample run during construction as a standard for judging completed stonework.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. During freezing or near freezing temperatures, provide equipment and cover to maintain a minimum of 40 degrees F and to protect stonework completed or in progress.
- B. At end of working day, or during rainy weather, cover stonework exposed to weather with waterproof coverings, securely anchored.
- C. Protect mortar materials and stonework accessories from weather, moisture, soil contamination and other foreign materials.
- D. Contain dust from cutting operations. Prevent dust by erecting dust-proof enclosures at cutting area or utilizing wet cutting equipment.

PART 2 – PRODUCTS

2.01 NATIVE LIMESTONE FIELD ROCK

- A. Quarried in Monroe or Lawrence County with color range and texture consistent with existing stone wall located at the Indiana Memorial Union building's north entrance circle drive on the Bloomington Campus.
- B. Stone to be free of defects detrimental to appearance or durability with a thickness of 2-1/2' to 4" unless otherwise indicated.

2.02 ACCESSORY MATERIALS

- A. Anchors, dowels, and ties will be stainless steel and of sizes and configurations required for support of stone and applicable superimposed loads.

2.03 MORTAR MIX

- A. Non-staining cement/lime mortar, complying with ASTM-C270, type S. Thoroughly mix mortar ingredients in quantities needed for immediate use. Ensure uniformity of mix and coloration. Do not use anti-freeze compounds in mortar.
- B. Use Mortar within 2 hours after mixing at temperatures of 80 degrees F and 2-1/2 hours at temperatures under 50 degrees F. If necessary, retemper mortar within 2 hours of mixing to replace water lost by evaporation. Do not retemper mortar after 2 hours from mixing.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Installer must examine support structure and conditions under which the stone work is to be installed, and notify contractor in writing of any conditions

detrimental to proper and timely completion of work. Do not proceed with installation of stonework until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Execute stonework by skilled masons and employ skilled stone fitters for necessary field cutting as stone is being set.
- B. Erect stone horizontal as indicated on plans and as specified. Arrange stone pattern to provide consistent joint work throughout and also consistent with existing stone wall located at the Indiana Memorial Union building's north entrance circle drive on the Bloomington Campus.
- C. Provide anchors, ties, and supports necessary to secure stonework in place. Shim and adjust accessories for proper setting of stone. Erect wall plumb and true with joints consistent in width and alignment,
- D. Provide setting buttons as required to prevent extrusion of mortar. Do not set units above until mortar courses below are set sufficiently to maintain alignment and prevent extrusion. Hold mortar back 2" for loose-laid appearance. Install veneer ties @ 24" on center.
- E. When wall is required to retain an earth bank, then install 1" and 2" PVC pipe weep holes and backfill behind wall with a 12" wide clean coarse #5 gravel.
- F. Capstones shall be full width of wall plus overhang, whenever possible. Width of cap stone shall not be less than 12". If pieces are required, then pieces smaller than 6" x 6" shall be placed and secured in center of cap, and not along edges. Crown cap 1" for drainage.

3.03 CUTTING AND FITTING

- A. Obtain Architect's approval before cutting or fitting any item not indicated on plans. Do not impair appearance or strength of stone.

3.04 CLEANING

- A. Remove excess mortar and sealant upon completion of work.
- B. Clean soiled stone surfaces using solution which will not harm stone, joint materials, and adjacent surfaces. Use non-metallic tools in cleaning operations. Do not use wire brushes, acid type cleaning agents or other cleaning compound with caustic or harsh fillers.
- C. Seal cap stones with Thompson Water Seal or approved equal. Apply as per manufacturers instructions.

END OF SECTION

SECTION 04451

NATURAL STONE TREE WELLS AND OUTCROPPINGS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Native Limestone Field Rock for outcropping and tree well wall as indicated on drawings and as specified.
- B. Prepare and lay stone.

1.02 RELATED WORK

- A. Section 02219: Excavation and Backfill
- B. Section 02260: Finish Grading
- C. Section 02486: Sodding

1.03 QUALITY ASSURANCE

- A. Provide Native Indiana Limestone Fieldrock which complies with recommendations of the Indiana Limestone Institute of America, Inc.
- B. Obtain stone quarried in Monroe or Lawrence County, with consistent size, color range and texture throughout the work. Color, size and texture of stone shall resemble, in character only, the rock in garden north of the I.U. Auditorium.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. During freezing or near freezing weather, provide equipment and cover to protect stone to 40` F. (4` C.) and to protect stone work completed or in progress.
- B. At end of working day, or during rainy weather, cover stone work exposed to weather with waterproof coverings, securely anchored.
- C. Protect mortar materials and stone work accessories from weather, moisture contamination with earth and other foreign materials.

PART 2 - PRODUCTS

2.01 NATIVE LIMESTONE FIELD ROCK

- A. Supplier: quarried in Monroe or Lawrence County.
- B. Type: Color range and texture consistent with existing stone wall located north of I.U. Auditorium.
- C. Stone Dimension for tree well:
Width - 12" to 24" (except anchor stones, which shall have minimum width of 3'-0")
Length - 8" to 48" with one straight weathered edge.
Thickness - 3" to 12". All of these stones to have a flat bottom and a flat top. Anchor stones to be placed in proportion of 5% of the total stone in the wall. All coping stone to be selected stones the full width of wall. All dimensions are to be in even proportions per total pieces of stone.
- D. Limestone Boulders to be naturally weathered and range in size from 3 to 25 cubic feet.
- E. Crushed Stone Bed and Backfill: #7 crushed stone.
- F. Premixed Mortar: Commercially prepared non-shrinking mortar containing not more than 0.03% of water-soluble alkali; ASTM C91.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Inspection: Installer must examine support structure and conditions under which the stone work is to be installed, and notify contractor in writing of any conditions detrimental to proper and timely completion of work. Do not proceed with installation of stone work until satisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Execute stonework by skilled masons and employ skilled stone fitters for necessary field cutting as stone is set.

- B. Stone must be laid so only weathered surfaces will show. Stone shall be laid so that stone touches stone. Mortar is to be used only to fill voids in order to level stones and shall be kept back from the face minimum of two (2) inches.
- C. Weep Holes: Provide #7 crushed stone backfill, 12" wide and 1" dia., p.v.c. pipe weepholes, 10'-0" o.c.

3.03 CUTTING AND FITTING

- A. Obtain Architect's (Owner's Representative) concurrence prior to cutting or fitting any item not indicated on drawings. Do not impair appearance or strength of stone work.

3.04 CLEANING

- A. Remove excess mortar and sealant upon completion of work.
- B. Clean soiled surfaces using solution which will not harm stone, joint materials or adjacent surfaces.
- C. Use non-metallic tools in cleaning operations. Do not use wire brushes, acid type cleaning agents or other cleaning compounds with caustic or harsh fillers.

END OF SECTION