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02000.00 GENERAL PROVISIONS

02000.10 EXCAVATION PRECAUTIONS

Contractors must call “Miss Dig” before any excavation on Campus. Site work plans and/or any plans involving excavation must bear the “Miss Dig” transparent sticker. These may be obtained free of charge by calling toll free (800) 482 – 7171.

02000.20 LAYING OUT WORK

The project layout for new buildings or building additions shall be performed by a Licensed Professional Engineer or Land Surveyor.

Verification of the site layout information. Before proceeding with the actual layout of the project site, verify that ALL of the site layout information (dimensions, notes, elevations, and etc.) conform to the existing and proposed work in the exact relationship that is illustrated on the drawings. If a discrepancy, between the contract drawings and the existing site is found, contact the Project Representative for a resolution BEFORE any actual layout of the work is begun.

02001.00 GENERAL PROVISIONS

02001.10 EXCAVATION PRECAUTIONS

Contractors must call "Miss Dig" before any excavation on Campus. Site work plans and/or any plans involving excavation must bear the "Miss Dig" transparent sticker. These may be obtained free of charge by calling toll free (800) 482-7171.

02010.00 SUBSURFACE INVESTIGATION

02010.10 DESCRIPTION

Soils investigation report: A soils investigation report has been prepared for the site of this Work by the soil engineer named on the Project Directory in the Project Manual. The soils investigation report may be inspected at the Office of the Architect, and copies may be obtained at the cost of reproduction and handling upon required addressed to the Architect and accompanied by full payment.

Use of data: The report is available for bidder’s information, but is not a warranty of subsurface conditions. Bidder’s should visit the site and acquaint themselves with existing conditions. Bidders may make their own investigation of the site prior to bidding during time schedules and arrangements approved by the Architect.

02024.00 LAYING OUT WORK

The project layout for new buildings or building additions shall be performed by a Licensed Professional Engineer or Land Surveyor.

Verification of the site layout information.

Before proceeding with the actual layout of the project site, verify that ALL of the site layout information (dimensions, notes, elevations and etc.) conform to the existing and proposed work in the exact relationship that is illustrated on the drawings. If a discrepancy between the contract drawings and the existing site is found, contact the Project Representative for a resolution BEFORE any actual layout of the work is begun.
02026.00 SITE CONDITIONS

02026.10 SOIL BORINGS

Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that the Owner will not be responsible for interpretations or conclusions developed by the Contractor. Data is made available for the convenience of the Contractor. Additional test borings and other exploratory operations may be made by the Contractor at no cost to the Owner. The Contractor should promptly notify Project Representative should earthwork operations disclose different conditions than that which is represented in the soil boring data.

02026.20 EXISTING UTILITIES

The Contractor shall contact Miss Dig at 1-800-482-7171 to locate all existing underground utilities in areas of work. The Contractor shall be held responsible for verifying the designated locations which are shown on drawings or as marked in the field. Timely verification of field located utilities is the responsibility of the Contractor.

The Contractor shall make every possible effort to locate any interference’s with existing utilities and mark all existing utilities in the project site before starting any excavation. Carefully excavate soil to the required width and depth for all work. Hand excavate where utilities are expected to be encountered. Bottoms of excavations will be free of stones, lumps of earth, and other irregularities.

If utilities are to remain in place, the Contractor shall provide adequate means of support and protection as required or directed by the Project Representative during earthwork operations.

Should uncharted, incorrectly charted, piping, or other utilities be encountered during excavation, the Contractor should consult with the utility owner immediately for directions. Cooperation with the Owner and utility companies is necessary to maintain operation of respective services and facilities. The Contractor shall repair any damaged utilities to the satisfaction of utility owner at the Contractor’s expense.

Existing utilities serving facilities occupied and used by Owner or others shall not be interrupted during occupied hours, except when permitted in writing by Project Representative and then only after acceptable-temporary utility services have been provided if required.

The Contractor shall provide a minimum of 48-hour notice to Project Representative and receive a written notice to proceed before interrupting any utility.

02026.30 OCCUPATION OF STREETS

The length of time and amount of a street which may be removed from public service will be minimized. Only when there is no other solution, shall the Contractor request a road closure. The Contractor must obtain permission to disrupt traffic from the Department of Public Safety through the Project Representative not less than 48 hours (excluding weekends and holidays) in advance of the requested closure time. If a traffic lane is allowed to be closed, the Contractor shall do so following the requirements set forth in Part 6 of the Michigan Manual of Uniform Traffic Control Devices.

02026.40 BRACING AND SHEETING

The Contractor shall furnish, install, and maintain sheeting, bracing, and shoring as may be required to properly support the sides of any excavation and to prevent any movement of earth which could in any way injure the work under construction.
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If the Project Representative is of the opinion that at any point sufficient or proper supports have not been provided, he/she may order additional supports at the expense of the Contractor, but neither the placing of such additional supports by the order of the Project Representative nor the failure of the Project Representative to order such additional supports placed shall release the Contractor from his responsibility of the sufficiency of such supports and the integrity of the work.

In the removing of sheeting and bracing, special care shall be taken to prevent any caving of the sides of excavation and injury to the completed work or the adjacent property.

02026.50 WATER AND SEWAGE DISPOSAL

The Contractor shall remove by pumping, bailing, or other acceptable methods, any water which may accumulate or be found in trenches and other excavations made under this contract and he/she shall take all necessary precautions to keep the trenches and other excavations entirely clear of water while working in the excavations.

The waste water shall pass through an improvised sediment, acceptable to the Project Representative, prior to entering the storm sewers. Water, other than sewage, shall not be pumped into sanitary sewers. Where existing sewers will be encountered in the construction of new work, the contractor shall make adequate provision for diverting the flow of the existing sewers so as to keep the new work entirely dry during construction. The Contractor shall at all times have upon the work, sufficient pumping equipment ready for immediate use to carry out the intent of this paragraph.

02026.60 DISPOSAL OF EXCESS AND WASTE MATERIALS

Removal of Excess Subsoil-

Prior to the completion of bidding documents the Architect/Engineer shall consult with the Division of Campus Planning regarding the availability of an on-campus soil disposal site. If one exists, the following two paragraphs apply. If not, excess soil shall be removed from the owner's property and disposed of legally.

Excess natural subsoil, free of refuse, lumber, stumps, brush, and objects larger than 3 inches in diameter, which is not needed on the Project Site, shall be hauled off-site to designated areas on Owner's property, if available, as directed by the Project Representative.

Prior to disposal of excess subsoil, the Contractor shall strip all topsoil from the spoil area and stockpile as specified under 02102.20 TOPSOIL STRIPPING. Spoiled subsoil shall be placed and graded as directed by the Project Representative. Then replace stockpiled topsoil over spoiled subsoil and fine grade all disturbed area to the satisfaction of the Project Representative.

Removal from Owner's Property-

Waste materials, including unacceptable excavated material, trash and debris, shall be removed from Owner's property and disposed of legally from Owner's property by the Contractor.

02060.00 BUILDING DEMOLITION

02060.10 SUBTTALS

Shop Drawings and Demolition Schedule: Required.

Regulatory Requirements: Applicable codes for demolition of structure, safety of adjacent structures, dust control, service utilities, discovered hazards, and [______].
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Cap and identify/Remove utilities; Remove foundations; Sawcut, break and remove concrete slabs on grade; Backfill areas excavated and all open pits and holes.

Schedules on drawings.

02070.00 SELECTIVE DEMOTION

02070.10 SUBMITTALS

Shop Drawings and Demolition Schedule: Required.

02070.20 QUALITY ASSURANCE

Regulatory Requirements: Applicable codes for demolition of structure, safety of adjacent structures, dust control, service utilities and discovered hazards.

02070.30 DEMOLITION

Closures for Exterior Openings: Weatherproof, airtight and insulated.

Temporary Partitions: Construction: Wood or Metal framing with gypsum board sheeting.

Schedules: On Drawings; Products to be removed and disposed of; Products to be Removed, Stored and Protected; Products to be Removed for Owner's Use.

02100.00 CLEARING

02102.00 CLEARING AND GRUBBING

02102.10 PLANTING REMOVAL

This work will be thoroughly reviewed with the Project Representative before starting to establish exact limits of work, including plantings to be protected.

The Contractor shall remove only those plantings within the contract limits that are specifically shown on drawings to be removed. Removal of designated trees or shrubs will include the stump.

Only hand methods will be used for grubbing inside dripline of trees indicated to be left standing.

Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated. Place fill material in horizontal layers not exceeding 8 inches loose depth and thoroughly compact to a density equal to adjacent and undisturbed ground.

Refer to Section 01532.20 Protection of Plantings.

02102.20 REMOVAL OF VINES

Projects requiring vine removal will be discussed with representatives of Campus Construction and Campus Landscaping during the design stage.

All vines to be removed shall be done only by the Grounds Maintenance Department. Major restoration work may have all vines removed prior to design and bidding by Campus Park and Planning to provide good inspections by designers and contractors.
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Or, major or minor projects with any vines restricting access to work shall be cut just below the area of work and all vegetation above the cut removed. No vegetation shall be left hanging. No removals shall be performed without prior approval from Project Representative. Special care will be exercised to avoid damaging window screens. If work must be performed immediately above the stump of a vine plant, the Contractor shall notify the Project Representative so that the Owner may trim the plant without injury.

02102.30 TOPSOIL STRIPPING

Topsoil is defined as friable clay loam surface soil containing 2.5% to 12% organic matter. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects larger than 1” in diameter, and without weeds, roots, and other objectionable materials.

The Contractor shall strip all available topsoil to its full depth, from the entire site excluding areas around trees designated to remain as shown on drawings and as directed by the Project Representative.

The Contractor shall stockpile topsoil in a storage pile in an area shown on the drawings or as directed by the Project Representative. Storage pile shall be constructed to freely drain surface water. A properly installed 2411 high soil erosion control fence shall be installed and maintained around the base of the stockpile.

Stripping and stockpiling topsoil should be done under reasonably dry conditions. Stripping and stockpiling under wet conditions will not be allowed.

02110.00 DEMOLITION

02110.10 GENERAL

The Contractor shall be responsible for disposing of debris from demolition and salvage operations. Disposal of debris shall be off WMU property, except those items specifically requested for salvage by WMU. Burning of debris will not be permitted.

Quality Assurance: Regulatory Requirements: Applicable DNR regulations for disposal of debris.

Products: Herbicide: as approved by WMU, Landscape Services.

02110.20 SALVAGED ITEMS

At the direction of the Owner, certain items within the project limits will be salvaged by the Contractor. Salvaged materials or equipment will be shown on the drawings or specified. Salvaged items not shown or noted to be reinstalled will be delivered to WMU as directed.

Typical items to be salvaged are:

Existing door hardware and doors, face bricks required for patch work, raised letter metal signs, street and area light fixtures, chalkboards, tackboards, mirrors, areas of carpet, equipment, lab furniture, and light fixtures.

The following items shall be salvaged and delivered to the Grounds Maintenance Storage Yard: Post and chain fencing, catch basins and/or manhole frames and covers, bike racks, benches, and wastecans. Prime Contractor shall obtain and submit a receipt from the WMU Grounds Maintenance.
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020110.30 EXECUTION

Protect trees, plant growth, and features designated to remain; Identify and stake or flag known utilities; Clear affected areas of site of stumps, vegetation, debris, rubbish, and site improvement. Grub out roots; Strip topsoil and stockpile; Remove trees and shrubs as indicated on drawings; Apply herbicide to remaining stumps or plant life to inhibit growth; Remove debris, large rocks, and extracted plant life from site.

02112.00 SITE WORK DEMOLITION

Pavements-

At all locations where existing sections are shown to be removed with the adjoining section to remain, the line of removal shall be neatly saw cut for concrete pavements. The saw cut shall always be on an existing joint nearest the location shown on the drawings.

For trench excavations, pavement shall be removed to a point that is a minimum of 5 feet outside the edge of the excavated trench and to the next existing joint.

Asphalt Recycling--

Cold-mill, bituminous surface to the specified depth shall be executed in accordance with MDOT Specification 4.00. All milled material becomes the property of the Contractor.

Curb and Gutter-

Saw cut asphalt pavement with near vertical edge 12 inches back from gutter pan. Remove curb and gutter and asphalt to saw cut.

02114 BUILDING DEMOLITION

The removal of a building or portions of a building will include the footings and any other large pieces of concrete unless specifically exempted.

02118 SELECTIVE DEMOLITION

02118.10 SALVAGE OF BRICK AND STONE

Salvage brick and stone for patching. All materials shall be carefully pelletized and stored at the site. The Contractor shall take special care in handling to avoid chipping corners and scarring faces.

02120.00 HAZARDOUS MATERIALS

02120.10 GENERAL

On every project involving existing facilities, the design professional shall check for the existence of asbestos, PCB’S, and any other hazardous materials, and incorporate strategies acceptable to the University into the project documents. A record of test sites in various locations in various buildings is on record at the Environmental Health and Safety.
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02121.00 ASBESTOS REMOVAL

02121.01 GENERAL

Prior to renovation activities or demolition of a building, a licensed asbestos abatement contractor shall remove any asbestos containing materials (ACM) that are exposed or will be exposed. Prior to the renovation or demolition, the owner will have identified all ACM to be removed.

The licensed abatement contractor shall furnish all labor, materials, insurance, and equipment necessary to remove ACM. The removal procedures shall comply with the State, Local, and Federal rules, codes, and/or regulations relative to asbestos removal and disposal in effect at the time of the removal.

If during the course of the renovation or demolition, additional suspected ACM is found, the Contractor shall immediately contact the owner to make arrangements for removal.

The Contractor shall notify the owner’s representative immediately if an inspector from any of the regulatory agencies for asbestos arrives to inspect the abatement activities.

The owner will specify the location for disposal of asbestos waste materials. The Contractor shall complete all disposal manifests and/or other applications necessary to obtain disposal approval.

2121.03 QUALITY ASSURANCE

The execution of the asbestos removal shall be in accordance with the EPA, MDEQ, and MIOSHA standards for asbestos abatement in effect at the time of the project.

Abatement contractors working on any project for WMU must be pre-approved by the owner and shall be licensed in the State of Michigan as required by Michigan Public Act 55, June 1993.

02121.04 MONITORING

WMU will contract an independent Industrial Hygiene testing firm as a neutral third party to provide industrial hygiene consultation, to conduct air monitoring, and to assure Contractor compliance with applicable asbestos abatement standards, regulations, and procedures.

02121.05 CONTRACTOR'S QUALIFICATIONS

The Contractor shall have at least five (5) years experience in asbestos removal projects. The Contractor’s Field Superintendent shall have a minimum of three (3) years of asbestos abatement experience with at least one (1) year of experience with the current contractor.

Three references, copies of applicable safety programs, pending or issued citations from the previous three years shall be submitted with the contractor’s bid.

The contractor shall submit copies of the workers’ and supervisor’s Michigan Accreditation Cards and proof of 2-hour awareness training for demolition workers (if applicable.)

02121.70 EXECUTION

The Contractor shall provide all equipment and labor necessary to properly complete the work as described herein and in the project scope of work.
DIVISION 2 - SITEWORK

02200 EARTHWORK

02205 GENERAL

02205.10 RELATED WORK ELSEWHERE

Site Drainage - 02500

Pawing and Surfacing - 02600

02205.20 DEFINITIONS

Excavation-
Consists of removal of material encountered to indicated subgrade elevations and subsequent disposal of materials removed.

Subgrade-
Compacted soil either existing or provided as part of the work, upon which new construction is to be installed.

Subbase-
Compacted soil layer used in pavement systems between the subgrade and the pavement or pavement base course material.

Contract Limits-
Those areas of the project site on which or upon which work will be done in accordance with the Contract Documents.

Building Compacted Areas-
Areas under slabs on ground within the building line. Exterior concrete slabs attached to the building, such as at entrances, shall be considered within the building line.

Site-Compacted Areas-
Areas outside of the building line within the Contract limits.

MDOT-
Michigan Department of Transportation, Standard Specifications for Construction.

Backfilling-
Consists of the placement of fill soil, either provided on site or Contractor furnished; which shall be uniformly compacted to the required density.

Debris-
Debris includes ALL waste materials used in construction. Special attention shall be given to liquid materials that if deposited on the ground could leach into the soil and contaminate it. This includes lime based materials including chemicals and any liquids except clean water.

02210 SUBSURFACE INVESTIGATION

Soil Samples: Required

Allow for lawn maintenance and equipment when establishing subgrades at new buildings. The grade for lawn areas will not exceed 1 foot of rise to 4 feet of run. The grade at beds of ground cover will not exceed 1 foot of rise to 3 feet of run. Where new grades will be above the existing grades, the fill will be compacted as specified under backfilling.
Topsoil stockpiled by Contractor will be spread by Contractor.

Do all rough grading to lines, contours and/or spot elevations as shown on drawings.

Finished grades are shown on the plot plan with solid contour lines and/or spot elevations. Except where otherwise shown, the rough grades shall be kept down to allow for finish as shown and noted:

- Standard Duty Concrete Pavement 6”
- Heavy Duty Concrete Pavement 8”
- Floors and slabs on grade In accordance with drawings
- Bituminous parking lots and approaches 11”
- Bituminous roads and drives 16-1/2”
- Bus stops and approach drives (bituminous) 18-1/2”
- Topsoil 6”
- Gravel Roads 8”

Accuracy of rough grading shall be maintained within the limits of \( \pm 0.10 \) ft.
Accuracy of finish grading shall be maintained within limits of \( \pm 0.05 \) ft.

02210.10 SUBMITTALS

02210.20 PRODUCTS

Manufacturers/Products: Topsoil: Reusable excavated friable loam.; Subsoil: Imported/excavated material; Granual Material: Coarse natural stone/gravel, angular/crushed, washed/Pea Gravel, graded from _____ to _____ inch (______ to ______mm); Sand: Natural river or bank washed.

02210.30 SUBSOIL EXCAVATION

Excavation subsoil from marked areas required for building foundations: constructions, construction operations, and other Work.

02210.31 TRENCHING

Excavate for storms sewer, sanitary sewer, ductbank, water and gas piping to municipal utilities.

Support pipe and conduit during placement and compaction of bedding fill.

Backfill trenches to required contours and elevations.

02210.32 BACKFILLING

Backfill areas to required contours and elevations.

Place and compact fill materials in continuous layers not exceeding 8 inches loose depth.

Slope grade away from building minimum 2 inches in 10ft.

02210.33 PLACING TOPSOIL

Place topsoil in areas where seeding, sodding and planting is scheduled.
DIVISION 2 - SITEWORK

02210.34 FIELD QUALITY CONTROL

Field Compaction Tests: Required.
Field Inspection: Required.

02210.35 SCHEDULES

On Drawings.

02220 EXCAVATION

02220.10 GENERAL

The work in this section is for all required excavating.

The size of an excavation and the length of time it will be allowed to be open will be defined and specified for the project.

Excavation material is unclassified, and includes excavation to required subgrade-elevations, regardless of character of materials and obstructions encountered. The contractor shall accept the site as he/she finds it.

Unauthorized Excavation-

Consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction by Project Representative. Unauthorized excavation, as well as remedial work directed by the Project Representative shall be at Contractor's expense.

Undermining of existing footings or disturbing the bearing soil shall not be done unless it is specifically covered in underpinning.

Additional Excavation-

When excavation has reached required subgrade elevations, the Contractor shall notify Project Representative who will make an inspection of conditions.

If the Contractor encounters unsuitable bearing materials at required subgrade elevations, he/she shall carry excavations deeper and replace excavated material as directed by the Project Representative.

Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work, unless it is known that unsuitable materials exist prior to contract award, and the removal and replacement of such materials is specified as part of the work.

Material Storage-

Stockpile satisfactory excavated materials where directed, in accordance with MDOT Standards, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.

Locate and retain soil materials away from edge of excavations. Do not store within twice the diameter of tree crown for trees indicated to remain.

02220.20 QUALITY ASSURANCE
DIVISION 2 - SITEWORK

The contractor shall notify the Project Representative when the excavation is complete. A visual subgrade inspection shall be performed prior to placing reinforcing steel, concrete, pipe beddings, and other work items that will be covered up by subsequent work.

If satisfactory soil conditions are not found at the depths indicated, immediately notify the Project Representative in writing before proceeding further. Should the Contractor fail to notify the Project Representative, all settlements and damage caused by new work resting on soft or unsound earth shall be made good at the sole expense of the Contractor.

02220.30 EXCAVATION FOR STRUCTURES

Excavations should extend a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

Care should be taken not to disturb bottom of excavation. Trim bottoms to required lines and grades to leave solid base to receive concrete.

02220.40 EXCAVATION FOR PAVEMENT

Cut surface under pavements to comply with cross-sections, elevations, and grades as shown.

02220.50 EXCAVATION FOR UTILITIES

Steam Tunnels-

Widths at bottom of trench shall be 3 feet wider than the overall width of tunnel or vault and shall at all times be of sufficient width to permit the tunnel and vaults to be built using first-class construction methods.

Widths of trenches for pipelines will allow for proper compaction of the haunching. The trench width at the spring line of the pipe for pipes less than 48 inches, will be 1-1/2 times the diameter, but not less than 12 inches. The width for pipes larger than 48 inches will be the pipe diameter plus 30 inches.

Electric and Telephone Ducts-

Trench shall be the proper width for the duct bank allowing a minimum of 3 inches of concrete on each side of the duct formation.

Street Light Cable-

Minimum trench width shall be 6 inches, maximum width shall be 12 inches, and minimum depth shall be 30 inches.

Length of Trenches-

The excavation shall be finished to the required grade for an adequate distance in advance of the completed installation, but unless otherwise permitted by the Engineer, the amount of trench that shall be open in advance of the construction shall not exceed the following limits:

- Steam Tunnels: 50'
- Buried Steam Systems: 200'
- Sewers: 50'
- Water Mains: 50'
DIVISION 2 - SITEWORK

Electric and Telephone Ducts - the amount of duct that can be laid and encased in concrete in one day.

Street Light Cable - the amount of cable that can be laid in one day.

02220.60 EXCAVATION FOR LAWNS AND UNPAVED AREAS

Subsoil grade in lawn and unpaved areas shall be 6” below finished grade unless noted otherwise on drawings.

02221 BACKFILLING

02221.20 QUALITY ASSURANCE

Testing

The Owner shall retain a competent soils testing engineer, and shall submit to the Owner four (4) copies of a report containing testing procedure, test results, and a statement that all soil has been compacted in accordance with the specifications.

Where more than one lift of soil is being placed, the soil testing engineer shall be present during the entire filling operation.

Perform a maximum density test conforming to ASTM D1557 (Modified Proctor) for each type of soil encountered.

The Project Representative shall give final approval on the backfill before construction continues.

Field in place density tests shall conform to ASTM D2922 - Nuclear Method

The frequency of testing shall be per lift as follows:

- Footing Subgrade: as required by Project Representative
- Paved Areas and Building Slabs Subgrade: 1 test per 2000 S.F. and 1 test per each 1500 S.F.
- Footing & Trench Backfill: 1 test per 30 L.F.

The following submittals shall be submitted directly to the Project Representative from the testing services with a copy to the Contractor:

1. Test reports on borrow material
2. Verification of each footing subgrade
3. Field density test reports
4. One optimum moisture-maximum density curve for each type of soil encountered.

02221.30 GUARANTEE

Failures of any surface areas caused by settlement shall be repaired at the Contractor's expense for a period of 3 years after completion of Contract.

02221.40 MATERIALS
Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP.

Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.

Granular Materials-

Per MDOT Specification for Class I and II materials except no foundry sand permitted. Granular material shall contain sufficient binder to provide fill capable of supporting construction equipment without displacement.

Lean Concrete-

A mixture of Portland cement, aggregate and water having compressive strength of 2,000 psi at 28 days.

**02221.50 BACKFILL AND FILL**

**GENERAL**

Place specified soil material in layers to required subgrade elevations, (up to, but not including sub-base material) for each area classification listed below:

- In excavations, use approved excavated or borrow material except as otherwise specified.
- Under grassed areas use satisfactory excavated or borrow material.
- Under pavement use satisfactory excavated or Class II granular material.
- Under building slabs, use Class I or II granular material.

Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and which are carried below bottom of such footings, or which pass under wall footings. Place concrete to level of bottom of adjacent footing.

For piping or conduit less than 2 feet 6 inches below surface or roadways, provide 4 inch thick concrete base slab support. After installation and testing of piping or conduit, provide minimum 4 inch thick encasement (sides and top of concrete) prior to backfilling or placement of roadway sub-base.

**BACKFILL RESTRICTIONS**

Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice. Backfill material shall be free of frozen lumps of earth and of rocks larger than 6" in diameter.

Backfill excavations as promptly as work permits, but not until completion of the following:

- Acceptance by Project Representative of construction below finish grade including where applicable, damproofing, waterproofing, and perimeter insulation.
- Removal of debris.
DIVISION 2 - SITEWORK

Permanent or temporary horizontal bracing is in place on horizontally supported walls.

Removal of concrete form work.

Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities. The Contractor shall leave items to be embedded in the backfill of the trench or other excavation, only for the purpose of preventing injury to the completed structure or other adjacent structures or property. The ends of all sheeting, bracing, or timber left embedded in the backfill shall be cut off and removed at least two (2) feet below the established grade. Record items left in place on "as built" drawings.

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.

To prevent the development of a soil "hardpan" layer in lawn areas only, prior to placing fill over the construction grade, the existing subsoil shall be brought to a friable condition to a depth of 18 inches minimum by scarifying, discing, or harrowing. The Owner's representative shall inspect this work before filling operations begin.

If, after rough grade has been achieved in cut areas and prior to placement of fill in fill areas, the exposed subgrade has a density less than that specified under "Compaction" for particular area classification, break-up ground surface, pulverize, adjust moisture condition to optimum moisture content, and compact to required depth and percentage of maximum density. Entire area should be proof rolled with a heavy rubber-tired vehicle, such as a loaded scraper or loaded dump truck, to locate areas of extreme pumping and yielding. Any such areas shall be repaired as follows: Soft areas due to moisture laden clay may be corrected by applying an appropriate soil stabilization procedures to be specified under Section 02241 or as directed by Project Representative. If required density cannot be obtained, the objectionable material will be removed and replaced as ordered by the Project Representative.

The cost of corrective measures incurred as a result of stabilizing poor subgrade conditions will be paid on basis of contract conditions relative to changes in work unless such conditions were known or could have been reasonably inferred from information available to the Contractor prior to bidding.

PLACEMENT OF BACKFILL

Place backfill and fill materials evenly adjacent to structures, to required elevations. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around structure to approximately same elevation in each lift.

Existing Utilities-

Where existing utilities are required to be tunneled under, the area under the utility will be filled with compacted sand and have the pipe embedment reconstructed as for new piping.

Pipe Embedment-

All new piping will be laid on a sand leveling bed compacted to maximum thickness of 6 inches. Dig holes in bedding for bells and fittings so pipe bears uniformly along its length. Hand compact
the haunching under the spring line of the pipe. Take extra care to control the density of the haunching on plastic pipe in accordance with the manufacturer's instructions.

02221.60 COMPACTION

GENERAL

NO backfill will be placed without it being compacted in place.

All backfill material shall be compacted in layers not exceeding 6” in compacted thickness. Granular, non-cohesive soils shall be compacted with mechanical tamping or vibration type compactors. Sand may be compacted by flooding the trench when water is available. When clays are encountered, a mechanical tamper or sheep's foot roller shall be used to compact the soil. Manual mechanical tamping equipment shall have a rammer which weighs not less than 20 lbs. with a surface area of not more than 36 sq. in. Hand compaction is not acceptable unless area to be compacted is not accessible to any mechanical tamping equipment and is approved by the project representative.

Large areas will be compacted with a pneumatic tired compactor. With ballast, the compactor will weight not less than 20 tons.

Trench Backfill

All backfill layers shall not exceed 6” and shall be compacted to 95% maximum density regardless of location.

MOISTURE CONTROL

Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content.
DIVISION 2 - SITWORK

Dry soil-
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.

Wet soil-
Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

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.

SCHEDULE OF COMPACTIONS
Compact undisturbed subgrade and each layer of fill to required percentage of maximum dry density or relative dry density for each area classification as follows:

<table>
<thead>
<tr>
<th>area to receive fill or backfill</th>
<th>depth of subgrade to be compacted</th>
<th>min.% of max. density compaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>structures, bldg. slabs and steps</td>
<td>18”</td>
<td>95%</td>
</tr>
<tr>
<td>roadways and parking areas</td>
<td>18”</td>
<td>95%</td>
</tr>
<tr>
<td>lawn or unpaved areas</td>
<td>6” beneath the required 18” of friable subsoil</td>
<td>90%</td>
</tr>
<tr>
<td>walkways</td>
<td>6”</td>
<td>95%</td>
</tr>
<tr>
<td>under existing utilities</td>
<td>6”</td>
<td>95%</td>
</tr>
<tr>
<td>sand pipe bedding</td>
<td>6”</td>
<td>95%</td>
</tr>
</tbody>
</table>

02241 SOIL STABILIZATION
When soil stabilization is necessary, the method used will depend on the soil condition: Method shall be approved by the Project Representative.

02245 FINISH GRADING

02245.30 GRADING

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 where elevations are indicated, or between such points and existing grades.
DIVISION 2 - SITEWORK

Grading Outside Building Lines-

Grade areas adjacent to building lines to drain away from structures and to prevent ponding.

Finish surfaces free from irregular surface changes, and as follows:

- **Lawn or Unpaved Areas:** Areas to receive topsoil will be finish graded by Owner.
- **Pavements:** Shape surface of areas under pavement to line, grade and cross section, with finish surface not more than 1/2 inch above or below required subgrade elevation.

Grading Under Building Slabs-

Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within tolerance of 1/2 inch when tested with a 10 foot straightedge.

Compaction-

Before grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

**02245.40 PAVEMENT SUBBASE COURSE**

General-

Subbase course consists of placing subbase material in layers of specified thickness, over subgrade surface to support a pavement base course.

Grade Control-

During construction, maintain lines and grades including crown/cross-slope of subbase course.

Placing-

Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations. When a compacted subbase course is shown to be 6 inches thick or less, place material in a single layer. When shown to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches in thickness when compacted.

Under parking lots and approaches, use 8” of MODT specification Class II granular material.

Under concrete walk and curb-gutter, use 2” MDOT-specification Class II granular material.

Under roads and drives use 10” of MDOT Class II Granular Material

**02245.50 BUILDING SLAB SUBBASE**

Subbase consists of placement of subbase material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.

Place subbase material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.
DIVISION 2 - SITEWORK

When a compacted subbase is shown to be 6 inches thick or less, place material in a single layer. When shown to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches in thickness when compacted.

02245.60 TOPSOILING

Shall be performed by others under separate contract.

02245.70 MAINTENANCE

Protect newly graded areas from traffic and erosion. Keep free of trash and debris by policing on a daily basis.

After grading, install 24" high erosion control silt fence along the edge of all paved surfaces. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

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.

REPAIRS

Where settling is measurable or observable at previously excavated areas during the construction or general project warranty period, remove surface (pavement and lawn, add backfill material and compact). Restore appearance, quality, and condition of hard surface finish type to match originally installed work. TOPSOILING, fine grading, seeding mulching and erosion control measures will be arranged by Campus Park and Planning and paid for by the Contractor.

02282 TERMITE CONTROL

02282.10 SUBMITTALS

Product Data: Required

Manufacturer’s Certificate: Required.

02282.11 QUALITY ASSURANCE


02282.12 WARRANTY

Special Warranty for Termite Damage and Repairs to Building and Components: 5 years.

2282.20 PRODUCTS

Toxicant Chemical: DNR approved; synthetically color dyed to permit visual identification of treated soil

Dilutant: Recommended by toxicant manufacturer
DIVISION 2 - SITEWORK

02282.30 EXECUTION

Application: Spray apply or inject toxicant at locations indicated in Schedule.

Apply extra treatment to structure penetrations such as pipe or ducts, and soil penetrations such as pipe or ducts, and soil penetrations such as grounding rods or posts.

02300 PILES AND CAISSONS

The Architect/Engineer shall specify the number, base length and type of pile or caisson to be used.

Consideration shall be given to auger cast piles whenever possible. Driven piles on WMU Campus will be discouraged due to associated problems with vibration.

A unit price per linear foot for either add or deduct shall be determined by dividing the total length of piling or caisson into the total bid.

All pile installations shall have a pile load test conducted. The Architect/Engineer shall submit the method and test procedure for approval.

During all pile installations, an independent testing agency shall be on site to verify the desired bearing strata is met for each pile.

02500 SITE DRAINAGE

02510 ASPHALTIC CONCRETE PAVING

02510.10 SYSTEM DESCRIPTION

Design Requirements – Paving: Designed for parking, light duty commercial vehicles, main street arteries and movement of trucks up to 60,000 lbs.

02510.20 SUBMITTALS

Product Data: Required – material certificates.

02510.30 QUALITY ASSURANCE

Quality Standards: State of Michigan, Department of Transportation, (MDOT), Standard Specifications for Construction.

02510.40 MATERIALS

Aggregate Base Course Material

Crushed stone or air cooled blast furnace slag, conforming to MDOT section 8.02, graded 21AA.

- Prime Coat
- Lond Coat
- Slow setting asphalt emulsion ‘SS-1h’, conforming to MDOT section 8.04.
- Bituminous Surface Course Materials:
  - Level and topping courses formulated to meet requirements of MDOT section 4.00.
  - Level Course; Mixture No. 1800F, 20AAA, conforming to MDOT section 7.10.
  - Asphalt cement: 85 – 100 penetration at 4.5 to 8.5 percent by weight of total mix.
- Topping Course; Mixture No. 1800T, 36A, conforming to MDOT section 7.10.
  Asphalt cement:
- Asphalt content; Optimize asphalt content within prescribed limits.

02510.50 ACCESSORIES
Bumper: Pre-cast concrete

02510.60 EXECUTION

Installation –

Place base course material in continuous layers not exceeding loose depth to thickness scheduled at end of section. Compact to 95 percent.

Place two course asphalt pavement to thickness scheduled at end of section. Roller compact.

02510.70 FIELD QUALITY CONTROL

Field Tests: Required.

Field Inspection: Required.

02510.80 SCHEDULES

Parking Areas:
  Base Course: 6 inches thick.
  Binder Course: 1 ½ inches thick.
  Wearing Course: 1 ½ inches thick.

Drives:
  Base Course: 8 inches thick.
  Binder Course: 2 inches thick.
  Wearing Course: 2 inches thick.

02511 FOUNDATION DRAINAGE

02511.10 GENERAL

All foundations will have perforated drain tile and gravel bed drainage around the building foundation and under the building floor. Gravity drainage to storm sewers from a catch basin will be used wherever possible.

Considerations will be given to raising proposed building elevations marginal amounts to accomplish gravity drainage.

Site drainage shall be a stand-alone section and not incorporated into Division 15 or any other Division.

02511.20 PRODUCT DESCRIPTION

Drain tile and fittings will be corrugated polyethylene tubing with narrow slits on 3 sides and with a silt filter sox cover. All fittings will be corrugated polyethylene specially designed and manufactured for use with the drain tiles furnished.

Gravel drainage fill shall be evenly graded natural or crushed, with 100% passing a 1/2 inch sieve and not more than 5% passing a No. 50 sieve.
DIVISION 2 - SITEWORK

02511.70 INSTALLATION

Install tile well below the basement floor line with uniform grade to drain. Hold tile firmly in place when placing topfill peastone to prevent the tile from floating.

Encapsulate peastone surrounding drain tile with continuous filter fabric.

02513 DRAINAGE STRUCTURES

02513.10 GENERAL

Storm and sanitary sewers are two separate systems.

All new manholes and catch basins will be pre-cast construction except for bases. Modifications and repairs to existing block structures shall be as required for the project.

Maximum manhole spacing shall be 350'. (This is limited by our sewer cleaning equipment.)

Surface drainage shall be to catch basins. No storm water shall pass into a storm manhole without first passing through a catch basin. No more than two catch basins shall be connected in series before connecting to a manhole. Catch basin outlets shall be equipped with traps.

All connections and changes in direction or grade shall be made at manholes.

Avoid inverted siphons, lift stations, tide gates, and connections to interceptors below water level.

Required drops will be installed only at sanitary drainage structure.

Allowable infiltration shall not exceed 500 gallons per inch diameter per mile per day. Allowable exfiltration shall equal that of infiltration with a 10% increase. Test to be run between manholes whenever called for by the Project Representative.

Before commencing work, the Contractor will provide an affidavit from the material manufacturers, that their materials meet the ASTM specifications. All manholes and catch basins will be constructed as specified herein and shown on Standard Drawings in Division 17.

02513.20 RELATED WORK SPECIFIED ELSEWHERE

Cast-in-Place Concrete - 03200

Mortar 04100
Laying of brick and block: Brick Masonry 04210 Concrete Unit Masonry 04220

02513.30 PRODUCT DESCRIPTIONS

 Manufactured products for manholes and catch basins shall be equal to the following:

- Precast Concrete Sections -ASTM C-478 (Cone section shall be eccentric to allow for a straight vertical ladder)
- Manhole Block -ASTM C-139
- Portland Cement -ASTM C-150 Type 1
- Hydrated Lime -ASTM C-207
- Sand and Gravel Aggregate -ASTM C-33
- Masonry Cement -ASTM C-91
- Concrete -( see section 03300- Cast-in-Place Concrete)
- Manhole Steps -( see section 02557.23- Ladders
DIVISION 2 - SITEWORK

Corrugated Perforated Polyethylene Pipe - ASTM F405 & F667
PDS30 - As Mfg. by Prodrain Systems 1-800-621-7001

East Jordon Iron Works cat. no. Neenah Foundry
Manhole Rings & Covers - 1060 Type B R-1784
Catch Basin Rings & Covers - 7045-Ml Grate R3031B
- straight curb - 5105-Ml Grate R3036B
- square/flat - 1060-M2 Grate R1784 with R2510 C Grate
- round (heavy duty in paved areas) - 1130-M2 Grate Neenah R2510
- round (light duty in lawn areas) - 5964 WMU Standard
- traps

02513.40 INSTALLATION

All connections and changes in direction or grade shall be made in manholes.

Base slabs for manholes and catch basins will be cast-in-place concrete, transit mixed 3000 psi at 28 days, formed and finished level. Precast bases may be used on written approval of the Project Representative where required by extremely difficult site conditions. Base slab shall be fully set before precast portions are set.

Precast concrete shall be used to construct all structures. Only when precast sections are not manufactured in the size and shape required shall block constructed structures be permitted. The Project Representative shall be notified prior to construction of any block structures.

Set precast sections in full mortar bed.

When brick and block construction is used only upon approval of the Project Representative, they shall be laid in accordance with Division 4. The outside of all masonry construction will receive a ½” latex cement plaster finish. The inside joints will be tooled flush and smooth. Build-in steps in manholes in accordance with drawings and code.

Rings will be set in full mortar bed on three courses of brickwork or with adjusting rings for future elevation adjustments.

Tile shall be laid through the manhole and 3000 psi concrete shall be placed around the tile up to 1/2 of the diameter. The concrete shall slope from the walls of the manhole to the sewer. When there is a change in grade, direction, or pipe size, the flow channel shall be built from bricks and 3000 psi concrete to make a uniform, smooth change in grade, direction or pipe size.

Drop manholes shall be constructed where the difference between inverts is three (3) feet or more on Sanitary Sewers only, unless otherwise specified, the drop pipe shall consist of a tee at the upper end. The drop pipe and fittings shall be of the same material as used in the sewer construction. The entire drop shall be encased in concrete. A 90 degree bend shall be installed at the lower end of the drop.

Vertical elevation of the invert shall, at any point, be within plus or minus 0.04 foot (1/2 inch) of plan elevation. Horizontal alignment must meet the same tolerance.
Connections with existing sewers shall be made at points noted on the plans and in a manner designated on the plans. All connections must be approved by the Project Representative. All sewers being disconnected shall be sealed off with concrete.

Catch basin sump shall extend two feet below the outlet invert of the trap.

All catch basins shall be constructed with a peripheral drainage system using either of the following two designs:

1. A 4” corrugated perforated polyethylene drain pipe drainage system. The polyethylene pipe will enter the catch basin with a “tee” connector, 2” above the invert at two locations 90 degrees to the concrete outlet pipe opening. High points in the polyethylene pipe will be located directly opposite the concrete outlet pipe and at both ends of the plastic pipe that abut the concrete outlet pipe to encourage positive flow of water to the two outlets into the catch basin. The polyethylene pipe shall be surrounded by peastone from the invert of the plastic pipe and against the catch basin structure with a section of 12” by 12”. The peastone shall be separated from the existing soil by properly installed non-woven geotextile Amoco 4551 or approved equal.

2. A Pro Drain System 30 (PDS 30). Install the PDS 30 according to the manufacturers specifications positioned identical to that of the 4” corrugated perforated plastic pipe. Use a PDS outlet tee and short section of 4” corrugated pipe to enter the catch basin. Carefully backfill with MDOT Class 2 granular material to the appropriate density. The product is available from Construction supply, Inc. in the Highland, MI at 1-800-621-7001

The Project Representative must approve the installation before backfilling.

The Contractor shall install the trap into the wall of the catch basin as shown on the drawing. The connection of the trap to the pipe should occur prior to the last section of pipe being laid. The bell of the pipe being connected to the trap must be removed. When ordering traps from EJIW, you must specify that they will be used for WMU.

02515 PORTLAND CEMENT CONCRETE PAVING

02515.10 SYSTEM DESCRIPTION

Design Requirements – Paving: Designed for parking, light duty commercial vehicles, residential streets, main street arteries and movement of trucks up to 60,000 lbs.

02515.11 SUBMITTALS

Samples: Required.

02515.12 QUALITY ASSURANCE

Quality Standards: State of Michigan, Department of Transportation standards.

02515.20 MANUFACTURERS/PRODUCTS

Provide in accordance with State of Michigan, Department of Transportation standards.

Exposed Aggregate Finish: Quartz; Marble; Limestone; Gravel; washed natural mineral aggregate, ( ) inch, (mm) size, ( ) color.
02515.21 ACCESSORIES/MIXES

Bumpers: Precast concrete.
Concrete Mix: Compressive Strength at 28 days: 4000 psi; Air Entrapment: 5-7 percent.

02515.30 EXECUTION

02515.31 CONSTRUCTION

Place expansion and contraction joints at 20 foot intervals as indicated.
Place reinforcement at top and bottom of slabs.
Place concrete in accordance with Section 03300.
Finish concrete as scheduled at end of section.

02515.32 FIELD QUALITY CONTROL

Field Tests: Required.
Field Inspection: Required.

02515.33 SCHEDULE

Sidewalk Surfaces: Light broom.
Curbs and Gutters: Light broom.

02520 DRAINAGE PIPE

02520.10 GENERAL

Storm and sanitary sewers are two separate systems.
All storm sewers shall use a rubber "O" ring joint.
Sanitary sewers smaller than 36" shall be vitrified clay.
Sanitary sewers equal to or larger than 36" will be concrete.
Concrete storm sewer pipe shall have "O ring" joints where possible.

02520.20 RELATED WORK SPECIFIED ELSEWHERE

Utility Marker Tape - 02599
Pipe embedments: Backfill - 02221
DIVISION 2 - SITEWORK

02520.30 MATERIALS

Sewer piping will be as follows:

<table>
<thead>
<tr>
<th>Pipe</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrugated Perforated</td>
<td>- ASRM F405 with sox filter</td>
</tr>
<tr>
<td>Polyethylene Pipe</td>
<td>Vitrified Clay</td>
</tr>
<tr>
<td></td>
<td>- Extra strength conforming to</td>
</tr>
<tr>
<td></td>
<td>ASTM C700 and NCPI ER-4 with PVC couplings meeting</td>
</tr>
<tr>
<td></td>
<td>ASTM C 425-77.</td>
</tr>
<tr>
<td>Vitrified Clay</td>
<td>- Extra strength conforming to</td>
</tr>
<tr>
<td></td>
<td>ASTM C700 and NCPI ER-4 with PVC couplings meeting</td>
</tr>
<tr>
<td></td>
<td>ASTM C 425-77.</td>
</tr>
<tr>
<td>Nonreinforced Concrete Pipe</td>
<td>- ASTM C14, sizes 10 inches and smaller only.</td>
</tr>
<tr>
<td>Reinforced Concrete Pipe</td>
<td>- ASTM C76 for round and</td>
</tr>
<tr>
<td></td>
<td>ASTM C507 for elliptical.</td>
</tr>
<tr>
<td>Joint Mastic for Concrete</td>
<td>- Asbestos reinforced asphaltic equal</td>
</tr>
<tr>
<td>Pipe</td>
<td>- to Dewitt #10, or Sewertite.</td>
</tr>
<tr>
<td>External Sealing Bands for</td>
<td>- &quot;Cadillock&quot; or equal rubber and</td>
</tr>
<tr>
<td>Concrete Pipe</td>
<td>- mastic sealing band meeting</td>
</tr>
<tr>
<td>Concrete Pipe &quot;O&quot; Ring</td>
<td>- ASTM C877.</td>
</tr>
<tr>
<td></td>
<td>- ASTM 443</td>
</tr>
</tbody>
</table>

02520.40 INSTALLATION

Clay pipe deeper than 15 ft. may require special bedding. See National Clay Pipe Institute Engineering Manual for proper design information.

All sewers shall be laid straight in both line and grade from manhole to manhole. For installations greater than 100 linear feet a laser shall be used for alignment.

All sewers leading from buildings to main sewer lines shall be designed with a slope of 0.3% grade, unless conditions dictate otherwise.

All piping will be carefully embedded on a compacted sand bed as specified in Backfilling.

Handle clay pipe carefully. Clean and lubricate each tile and coupling immediately before assembly. The specification ASTM C12 will establish minimum installation requirements.

Clean the tongue and groove of each concrete pipe immediately before installation and fill the space with joint mastic. The maximum allowable annular space will be 1/41". Wrap the exterior of the joint with the exterior sealing band in accordance with the manufacturer's instructions. Take extra care in backfilling to avoid damaging the joint rap.

For Roads and Drives: Unless otherwise specified install 6" corrugated perforated polyethylene pipe in the granular backfill in front of the curb/gutter under the pavement. Make an approved tap into each catchbasin along the curb/gutter.

For Parking Lots and Approaches: Install 4" corrugated perforated under drainage as shown on drawings.

Contractor's Fault: If the contractor undercuts the trench bottom below plan grade, the trench shall be restored to plan grade with compacted MDOT Class II Granular Material or flowable fill at no additional cost to the Owner. Pipe found to be off-grade and alignment shall be removed and replaced at the Contractor's expense.
DIVISION 2 - SITEWORK

02550 SITE UTILITIES

02550.10 GENERAL

The design of all utilities shall be coordinated with the site plan to eliminate conflicts with other utilities or with the site development. Utility drawings shall show all utilities within the site limits with notes to cover relocation, raising or lowering of manholes, fire hydrants, valves, valve boxes, etc.

The recommended location of all utilities with respect to the roadway is shown on the Typical Roadway Cross Section included with the details in Division 17.

The following statements include design criteria and system requirements which are good practice or unique for the Michigan State University systems.

02551 GAS DISTRIBUTION SYSTEM

Gas service shall be ordered and paid for by the Mechanical Contractor from Consumers Power Company who shall perform the installation. Provide sleeves in exterior wall for gas main and vent pipe. Install seal at wall penetration as specified in Division 15.

Gas meters will be located on the exterior of the building in an inconspicuous location.

02555 WATER DISTRIBUTION SYSTEM

02555.10 GENERAL

Water system pressure is approximately 55 psi minimum – to be field verified.

Provide three valves at all building connections to main line.

No corporation cocks are to be used.

Provide three or four valves, as required, at all intersections.

The construction of domestic water systems and chilled water systems are to be essentially the same. The pipe for either system shall be ductile iron.

02555.20 MATERIALS

02555.21 PIPE

Pipe shall be Ductile Iron "Clow Enameline" or approved equal with mechanical or Bell-Tite Joints. The pipe shall be coated inside and out with coal tar dip coating. The pipe shall be manufactured under specification ASA-A21.51. Pipes with 12” diameter or smaller shall have thickness class of 3. Pipes with diameters of 14” through 24” shall have a thickness class of 2.

02555.22 FITTINGS AND ACCESSORIES

All fittings shall be mechanical joints and made in accordance with the latest revision of the A.W.W.A. Standard Specification C100. The fittings shall be coated inside and out with coal tar dip coating. The mechanical joint shall be made in accordance with American Standard Specification A21.11 and the gasket shall be a plain rubber gasket.
DIVISION 2 - SITEWORK

02555.23 VALVES AND VALVE BOXES

All valves shall be secured to the nearest fitting with a minimum of 2-3/4" threaded rods. All valves 2" to 12" nominal diameter shall be iron body, bronze double disc gate, parallel seat, non-rising stem, mechanical joint, square valve nut operator and shall meet Federal Specifications A.W.W.A. C500. The valve shall open left, counterclockwise. The valve shall be T.C.I.W. A-230-M or approved equal. The valve box shall be T.C.I.W. A-295 or approved equal.

All valves 14" nominal diameter and larger shall be gear operated butterfly type, tapped lug, iron body style, with bronze disc, Hycar resilient seat and shaft seals, and 316 stainless steel shaft. Valves shall in all ways meet the most recent revisions of A.W.W.A. Standard C504 for class 150B rubber seated butterfly valves. Valve boxes shall equal to DeZurick Figure 341.

Acceptable butterfly valve manufacturers are DeZurick, Traverse City, and Allis Chalmers.

02555.23 FIRE HYDRANTS

For a new building, if no fire hydrants exist in the building vicinity, new hydrants will be installed as indicated by the WMU Department of Public Safety.

Fire hydrants shall be a five (5) inch valve opening, six (6) inch mechanical joint main connection, two (2) two and one-half (2-1/2) inch base connections, one (1) four (4) inch pumper connection, National Standard Threads, five (5) foot trench and open left, counterclockwise.

Locate fire hydrants 6 feet back of curb.

Fire hydrants shall be Traverse City Iron Works to match existing on Campus.

02555.30 INSTALLATION

02555.31 PIPE INSTALLATION

Ductile iron pipe shall be installed in accordance with A.W.W.A. C 600 and as herein specified. The pipe shall be laid to line and grade without objectionable breaks. The pipe shall have a minimum cover of four (4) feet six (6) inches and laid on a six (6) inch compacted sand cushion. Bell holes shall be excavated to obtain proper bearing for the pipe, and the hole shall be large enough to provide access to all bolts. All water main material shall be carefully lowered into the trench to prevent any damage.

Special care shall be taken when tightening the bolts so that the gland will be brought up to the flange evenly. The pipe shall be secured in place with an approved backfill material, tamped in six (6) inch layers until the pipe is covered, and then an additional one (1) foot of fill shall be placed over the pipe to protect it when the trench is backfilled. When pipe laying is not in progress the open end shall be sealed with a watertight plug to prevent any dirt, water, etc., from entering the pipe.

All piping will be marked with non-metallic identification tape.

02555.32 VALVE BOXES

Valve boxes shall be installed for each valve. The base shall rest three (3) inches above the flange of the joint to prevent any shock or stress to the valve. The box shall be plumb and centered over the valve nut, and the box cover shall be flush with the finished grade.
02555.33 THRUST BLOCKS

All plugs, tees and bends more than 45 degrees shall be provided with reaction backing of concrete to be placed between the fitting and the ground with a piece of felt paper between the fitting and the concrete. All thrust blocks shall have two lift hooks installed to facilitate removal.

02555.34 TEST

Water line shall be hydrostatically tested at 125 psi with an allowable loss of 60 gallons per inch diameter of pipe per mile per day. Lines shall be air free. No test nipples will be left on water lines that are to be buried or otherwise be inaccessible.

02555.35 DISINFECTING

Disinfecting of water mains shall be performed in accordance with A.W.W.A. C601 and as herein specified. Sufficient amounts of a chlorinating agent shall be placed in each pipe so as to have a chlorine residual of at least 50 parts per million. This solution shall remain in the pipe for at least twenty-four (24) hours, after which pipes shall be flushed and water sample shall be taken by the Engineer. If water sample results are not negative, the pipes will be re-chlorinated. Any openings on the water system shall be posted with a red tag as "UNSAFE FOR DRINKING" until a water sample has been approved.

02557 STEAM DISTRIBUTION SYSTEM

02557.10 GENERAL

Service steam leaves the Power Plant at approximately 90 psi and 400F. Design expansion in the system to tolerate temperatures up to 500F.

Condensate is returned to the substation through a vacuum return system; all other areas of the campus utilize a pressure return. The condensate return lines will normally operate at 20 psi and 180F, but the system shall be designed to tolerate expansion from temperatures up to 250F.

All condensate will be returned to the Power Plant uncontaminated.

All steam distribution system piping shall be in tunnels except long lines to comparatively small or temporary buildings. Consult with Engineering Services on marginal applications.

02557.11 STEAM TUNNELS & VAULTS (General Requirements)

Steam tunnels and vaults shall be constructed of reinforced concrete with sufficient interior cross section to provide space for all distribution piping, and a minimum manway space 2'-0" wide x 6 1/2" high. Vaults will be a minimum of 7'-2" high. Minimum depth of cover over steam tunnels will be 5'-0" and over vaults will be 2'-6". Tunnels will be poured in continuous sections not exceeding 40'-0". Construction joints will be continuous through the walls, floor, and ceiling. Tops of tunnels and vaults will be pitched 1/4" per ft. to the side of the tunnel to allow ground water to drain off. The tunnel floor will be pitched to drain seepage and drain-down spillage to the nearest vault. Where the amount of fall is prohibitive, the tunnel will be sloped in sections to intermediate floor drains.

02557.20 ACCESS
DIVISION 2 - SITEWORK

02557.21 DOORS

A hollow metal door (all steel stiffener construction), will be installed at all building to tunnel connections. The doors will be self-closing and positive latching. Doors will be minimum of 3' wide. Bottoms will be rustproofed as specified in Division 8.

02557.22 MANHOLES

Steam vaults will have a minimum of two manholes. Vaults with over 200 sq. ft. of floor area will have one additional manhole for each additional 100 sq. ft. of floor area for ventilation. The manhole cone will be an eccentric design, (preferable precast concrete), which provides for a straight, non-overhanging ladder. Manhole rings shall be no. 1030 by East Jordan Iron Works or no. R-1721 by Neenah Foundry Company with fabricated ventilated lids. (See Division 17-Standard Drawings). Fabricated lids will be hot-dipped galvanized.

02557.23 LADDERS

Ladders will be all steel welded construction in accordance with OSHA regulations. Ladders will be centered on the side of the manhole opening, have rungs not more than 1411 1/2 in. o.c., the top rung not more than 4" below the top of the manhole, and be hot-dipped galvanized.

Ladders against cast-in-place or precast concrete shall be plastic covered insert type as manufactured by M. A. Industries, (404) 487-7761. Plastic covering will be .300" thick copolymer polypropylene.

02557.24 SECURITY

The tunnel system will be kept secure at all times during alterations and additions. Temporary doors will be furnished by the Contractor and keyed by the Owner. All steam tunnel manhole lids will be secured with a chain binder as shown on standard drawings. Lids on vaults not connected to the tunnel system will be secured by the Owner, only as required.

02557.30 PIPE SUPPORT

02557.31 GENERAL

The construction of all pipe support, (stanchions, rollers, saddles, anchors, and guides), will be detailed on the drawings. The Contractor will also set-up a complete stanchion, roller, and protection saddle assembly for review before proceeding with construction. All steel parts and assemblies part of the pipe supports will be hot dipped galvanized after fabrication.

02557.32 STANCHIONS

Pipe will be supported by stanchion supports at 16'-0" o.c. or less for smaller pipes, (see Division 15). Location of stanchions will be staggered with any stanchions located on opposite walls to provide additional manway space. Stanchions will be fabricated of hot rolled steel sections, welded, and hot dipped galvanized. Heavy gauge and large size Unistrut or Powerstrut systems with all sections, fittings, and bolts hot-dipped galvanized, may also be used. Each stanchion will set on and be bolted to a 4" high concrete curb to keep all metal off the floor. All drilled-in concrete anchors will be steel expansion shield type anchors.

02557.33 ROLLER SUPPORTS

All roller supports used shall have solid steel rollers with 3" diameter and a 1-1/2" width, (3/4" bearing face against the saddles). The center hole in the rollers shall be drilled and be in the true
center of the roller. The roller shall roll on a 1/2" pin connected to 1/4" support angles and be held with heavy duty copper pins to allow easy replacement of any part of the roller assembly.

The angles or other supports holding the rollers shall have a minimum vertical clearance of three-quarters of an inch (3/4") from the bearing surface of the roller.

02557.34 SADDLES

Each set of roller supports at stanchions and guides will have a pipe covering and insulation protection saddle, Crawford Co., No. 22. Height of saddles will be equal to the thickness of the insulation used. The contour of the saddle will match the radius of the pipe insulation and overhang the edges of the outside rollers a maximum of 1/2". Lengths of saddles shall be as follows:

For the first 1/4 of the distance from the anchor to the expansion joint - 25% of travel length of joint.

For the second 1/4 of the distance from the anchor to the expansion joint 50% of travel length of joint.

For the third 1/4 of the distance from the anchor to the expansion joint - 75% of travel length of joint.

For the last 1/4 of the distance from the anchor to the expansion joint travel length of joint + 25%.

02557.35 ANCHORS AND GUIDES

Anchors and guides will be as detailed on the standard drawings. Anchors will be located not more than 250 ft. o.c. Guides will be located immediately adjacent to the expansion joint.

02557.40 WATERPROOFING

02557.41 MEMBRANE WATERPROOFING

All tunnels and vaults will be waterproofed with a membrane waterproofing. The membrane will cover the top and sides, down to 811 below the joint between the wall and floor of the tunnel or vault. Special attention will be given to connections of tunnels to vaults, and buildings.

02557.42 WATERSTOPS

All construction joints in tunnels, vaults, and tunnel to building connections will have cast-in vinyl waterstops.

02557.50 DRAINAGE

02557.51 FOUNDATION DRAINAGE

All tunnels and vaults will have foundation drains covered with peastone in pervious fabric. Drains will connect to a sump at each vault or pair of vaults. Sumps will have gravity drain to the storm sewer where possible. Provide submersible sump pump as required. Sumps will be centered under the manhole above to be accessible for maintenance, and covered with a grating to serve as a floor drain. Outlet line of sumps shall have a backwater valve whether the sump is above or below the University high flood level. Backwater valves will have a cast iron body with brass flapper and seat, and bolted access cover equal to J. R. Smith Mfg. Co. #7010. Sumps may be cast iron or plastic with cast iron grate as manufactured by Handcor.
DIVISION 2 - SITEWORK

02557.52 FLOOR DRAINS

Extra vault floor drains or intermediate tunnel floor drains shall be cast iron with bottom outlet, cast iron grate, and cast iron sediment bucket: "Wade" No. W-1220-TD, or approved equal. Floor drains that do not drain to the sump, will have a backwater valve as specified for sumps in vaults above.

02557.53 DRAIN TILE AND PIPE

Foundation tile will be 411 corrugated polyethylene with drainage slits, "ADS, Inc." or equal. Drain pipe from any extra floor drains and from sump to catch basins, shall be ductile iron when under the vault or tunnel and vitrified clay when outside. (See section 02520.30).

02557.60 ELECTRICAL REQUIREMENTS

02557.61 GENERAL

All materials and workmanship will be in accordance with Division 16.

02557.62 LIGHTING AND RECEPTACLES

Provide porcelain base, incandescent light fixtures with grounding receptacles and pull-chain switch at approximately 30 ft. o.c. throughout the tunnel system. Provide at least one fixture in each vault. Lights will not be located in the manway when the ceiling height is less than 7 ft. The lighting in each section of the tunnel will be controlled by 3-way switches located at each end of that section. Exposed conduits and boxes will be secured with non-plastic anchors.

The light fixtures should be located off center of the aisle way to provide for maximum headroom clearance.

Install expansion joints in conduit system using flexible sealtite.

02557.63 CONTROL

Some sections of tunnel have master control. Contact Engineering Services.

02557.70 PIPING

02557.70.1 GENERAL

All the following pipes, fittings, valves, etc. except direct buried pipe shall be located within tunnels, vaults, or buildings with space for convenient operation and maintenance. The transition between the direct buried piping, and the tunnel and vault piping, will be at the vault or building wall.

All pipe and fittings shall have the maker's identifying mark stenciled, stamped, or rolled into the surface, in accordance with ASTM Specifications.

02557.70.2 TUNNEL AND VAULT PIPE

Steam Piping 4" to 24" shall be ASTM A-53, Grade B, Seamless, Standard-Weight with the following wall thickness:

<table>
<thead>
<tr>
<th>Size</th>
<th>Wall Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>0.237&quot;</td>
</tr>
<tr>
<td>6&quot;</td>
<td>0.280&quot;</td>
</tr>
<tr>
<td>8&quot;</td>
<td>0.322&quot;</td>
</tr>
<tr>
<td>10&quot;</td>
<td>0.365&quot;</td>
</tr>
<tr>
<td>12&quot;</td>
<td>0.375&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>0.375&quot;</td>
</tr>
</tbody>
</table>

Steam piping larger than 24" shall be API 5L Grade B.
Condensate Piping shall be ASTM A-53, Grade B, Seamless, extra strong weight with the following wall thickness:

- 2" - 0.218"
- 3" - 0.300"
- 4" - 0.337"
- 5" - 0.375"
- 6" - 0.432"
- 8" to 18" - 0.500"

02557.70.3 DIRECT BURIED PIPE

Direct buried steam and condensate piping shall be a prefabricated pipe/conduit system as manufactured by "Ric-will" or "Perma-Pipe." The pipe of the system shall be as specified for tunnels and vaults above. The conduit will be heat and chemical resistant fiberglass reinforced plastic. The system will be insulated with calcium silicate insulation as specified in Division 15 and this section, and an annular air space between the insulation and the conduit. The system will include pipe manufacturers furnished connection insulation, fiberglass fabric, and epoxy resins for constructing waterproof conduit splices.

Direct buried piping will be marked with non-magnetic identification tape.

02557.70.4 ACCESSORY PIPING

All accessory piping shall be extra heavy (Schedule 80) ASTM A-53, Grade B, seamless, all welded construction except as otherwise specified.

02557.70.5 PIPE FITTINGS

Welding fittings shall comply with American Standard for steel butt-welding fittings (Bl6.11) where applicable, and material shall conform to ASTM Specifications A216, A217 or A234 or material conforming to the requirements of paragraph 105. Each fitting shall have manufacturer's name or symbol such as Tube Turn or approved equal, marked on the fitting.

Pipe fittings shall have same wall thickness as adjoining pipe.

02557.71 VALVES

02557.71.1 GENERAL

Valves shall be located at each end of each section of steam and condensate lines. These provide three valves at all "T" intersections and four valves at all "cross" intersections to allow isolation of each valve and each line for maintenance.

02557.71.2 STEAM AND CONDENSATE VALVES

All steam and condensate valves shall be welded gate valves with trim for steam service and outside screw and yoke such as Jenkins Fig. 2009 CM, Lunkenheimer Fig. 1503, or equivalent Crane, R.P.& C., O.I.C., Walworth, Powell, or Pacific. All steam valves 4" or larger shall be by-passed. By-pass shall be installed in the field with forged steel Y-type globe valve having stellate seat and disc, equal to Edwards 3624. By-pass pipe and valve shall be 1" on all steam valves 18" and smaller.

By-pass and valve shall be 2" on all steam valves 20" or larger. All valves 20"or larger shall be provided with manual operators with reduction gearing. Condensate valves need no by-pass.
DIVISION 2 - SITEWORK

02557.71.3 ACCESSORY PIPING VALVES

All accessory piping valves on steam line shall be forged steel gate valve with screwed ends or approved equal. Threads on steam side of valve shall be back welded.

All other accessory piping valves shall have solid wedge, union bonnet and traveling spindle and shall be a gate valve such as Jenkins Fig. 47 U or equivalent Lunkenheimer, Crane, R.P. & C., O.I.C. or Walworth.

Bleeders shall be installed on both sides of the main line valves on both the steam and condensate lines. Bleeders shall be one inch in size. Valves on bleeders shall be placed so that they are easily accessible. An elbow and two nipples shall be placed on the valve outlet so as to direct the water and steam away from the tunnel walkway.

All valves shall have their bonnets horizontal or above.

2557.72 EXPANSION JOINTS

Expansion joints shall be as follows:

Each expansion joint shall have "Guns" located on the circumference of the joint to allow the installation of plastic packing. The number of ports shall be as listed below. A lubrication fitting shall be located between any two packing ports.

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>MINIMUM NUMBER OF &quot;GUNS&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1/2&quot; - 3&quot;</td>
<td>1</td>
</tr>
<tr>
<td>4&quot;</td>
<td>2</td>
</tr>
<tr>
<td>5&quot; – 6&quot;</td>
<td>3</td>
</tr>
<tr>
<td>8&quot; – 10&quot;</td>
<td>4</td>
</tr>
<tr>
<td>12&quot; – 14&quot;</td>
<td>5</td>
</tr>
<tr>
<td>16&quot; - 18&quot;</td>
<td>6</td>
</tr>
<tr>
<td>20&quot; - 24&quot;</td>
<td>8</td>
</tr>
</tbody>
</table>

Materials to be used in the construction of expansion joints shall be as follows:

The body and sleeve shall be constructed of seamless steel pipe (ASTM A53, Grade:B), the body and sleeve of joints for use on condensate lines shall be extra strong weight, the body of joints to be used on steam lines shall be standard weight and the sleeve shall be Schedule 40, all sleeves shall have a heavy plating of chromium on the sliding surface, the gland shall be ASTM A216 WCB cast steel, the limit stops shall be stainless steel. Guides shall be self lubricating bronze.

All expansion joints used on steam lines will be subjected to a normal working pressure of 90 psi and temperature of 400F with superheat to 500F.

The packing cylinder shall be lock welded to the gland to prevent the cylinder from being inadvertently removed.

All expansion joints shall be of the single end, welding type, without bases.
DIVISION 2 - SITEWORK

The manufacturer shall guarantee all joints to be free from defects in materials and workmanship for a period of five (5) years from the date they are put in service.

02557.72.1 INSTALLATION OF EXPANSION JOINTS

Particular attention shall be paid to the installation of expansion joints in regard to alignment. Piping shall be welded into place and then piping shall be cut to allow expansion joint to be placed in line.

02557.73 PRESSURE GAUGES

02557.73.1 GENERAL

Pressure gauges shall be installed before and after each steam or condensate main line valve. Gauges will have 4-1/2" stainless steel bodies and be installed on 1” nipples.

02557.73.2 STEAM GAUGES

Steam pressure gauges will have a 1/4” coil syphon between the pipe and gauge, and be graduated 0-200 psi, with figures every 20 psi and intermediate graduations every 2 psi. Gauges shall be "Ashcroft" Dura-gauge No. 1320 or equal, by Trerice.

02557.73.3 CONDENSATE GAUGES

Condensate pressure gauges shall be graduated 0-100 psi, with figures every 10 psi and intermediate graduations every 1 psi. Gauges shall be "Ashcroft" Dura-gauge No. 1320 with No. 1106 pulsation damper attached or equal by Trerice.

02557.74 THERMOMETERS

One thermometer shall be installed on the incoming steam lines and on the outgoing condensate return line at each vault.

Thermometers for use on the steam lines shall be Ashcroft 50-6060 AHT "Every Angle" bi-metal dial thermometers with a range of 5OF to 55OF or a Trerice B85606 thermometer with a range of 5OF to 500F. The thermometers shall have a 5" dial size, 6" stem length, and 304 stainless steel case.

Thermometers for use on condensate lines shall be the same as specified above for steam except the range shall be-OF to 25OF for the Ashcroft or 2OF to 24OF for the Trerice.

A 316 stainless steel well with 21’ lagging extension shall be Ashcroft 39K6 or Trerice 76-4JC6.

02557.75 STEAM TRAP CIRCUITS

02557.75.1 GENERAL

A steam trap circuit will be installed at each low point of the steam line. (See standard drawing Division 17.)

02557.75.2 STEAM TRAP

Traps shall be one inch inverted bucket only, such as Armstrong No. 883, or approved equal. Trap shall be equipped with a built-in check valve and strainer. Working steam pressure is 90 psi.
02557.75.3 CHECK VALVE

Check valve shall be Jenkins #996 lift check, Lunkenheimer 300 lb. bronze Renewoll lift check, or approved equal.

02557.75.4 EDUCTOR

Eductor (ejector) shall have stainless steel body, stem, and delivery as manufactured by Penberthy. Series and model shall be selected and sized according to Penberthy engineering data. Fabricate and install special tailpiece as shown on standard drawing in Division 17.

02557.76 PIPE INSULATION & JACKET

02557.76.1 GENERAL

All new steam and condensate lines in vaults and tunnels subject to flooding will have aluminum jacketed calcium silicate insulation. All other steam and condensate lines shall have fiberglass insulation. Calcium silicate insulation will be supplied and installed as specified in Division 15. Thickness of insulation will be as follows:

<table>
<thead>
<tr>
<th>Pipe Size:</th>
<th>Calcium Silicate Insulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steam</td>
<td></td>
</tr>
<tr>
<td>1-1/2&quot; or less</td>
<td>2&quot;</td>
</tr>
<tr>
<td>2 - 3&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>3-1/2&quot; and up</td>
<td>4&quot;</td>
</tr>
<tr>
<td>Condensate</td>
<td></td>
</tr>
<tr>
<td>1-1/2&quot; or less</td>
<td></td>
</tr>
<tr>
<td>2&quot; – 4&quot;</td>
<td></td>
</tr>
<tr>
<td>4-1/2&quot; and up</td>
<td></td>
</tr>
</tbody>
</table>

02557.76.2 JACKETING

All insulated piping, including fittings, and valves in steam vaults, will be aluminum jacketed. Pre-jacketed insulation may be used equal to Johns-Manville "Metal-On." Jacket will be equal to the following:

Aluminum covering shall be used in the steam tunnels. Aluminum covering shall be .016 aluminum attached to a divorcing felt with slip joint construction and shall be connected at each joint with a 300 Series stainless band over an end strap.

All jackets removed or damaged during installation of new piping shall be reinstalled according to specifications herein specified for these items.

02557.76.3 EXPANSION JOINT INSULATING

Expansion joints and steam traps will be covered with an insulating blanket which can be removed and reinstalled for maintenance. The blanket and securing straps shall be as specified in Division 15.

02557.77 FINISHES

All structural steel, embedments, ladders, hanger rods, etc. will be hot-dipped galvanized.

All canvas insulation jacket - one coat "Rustoleum" No. 740.

All valve wheels and other operators - one coat "Pittsburgh" latex machinery enamel, floral red 32-80.

02557.80 PIPE INSTALLATION
02557.81 GENERAL

All piping materials furnished and all procedures followed in fabrication and erection shall, unless otherwise specifically specified, comply with requirements of applicable sections of "Code for Pressure Piping" ASA B31-1 latest revision.

Piping will be furnished and installed with the longest lengths commercially available.

Where hangers are supported from new concrete slabs, they shall be attached by inserts mounted in the concrete.

Where hangers are supported from existing concrete slabs, they shall be attached by steel expansion shield anchors.

Direct buried piping will be marked with non-magnetic identification tape.

02557.82 WELDING

Prior to welding any pipe, the contractor shall submit for approval of the Engineer, four (4) copies of his welding procedure.

All welds shall comply with the National Certified Pipe Welding Bureau standard welding procedure specification No. 1.

02557.83 PIPE CLEANING

Before the piping is put in service, the Mechanical Contractor shall clean it, using a pressure tank with a hose equipped with a nozzle to direct a high velocity stream of water against the inside wall of the pipe. The contractor shall make a minimum of two passes through the pipe with the hose. A minimum pressure of 250 psi shall be developed at the nozzle.

02557.84 TESTING

Tests called for in the above codes and material specifications shall be adhered to. Pipe, valves, fittings, etc., shall be hydrostatically tested in accordance with Paragraph 121, Section 1, of ASA B31-1 "Code for Pressure Piping" latest revision. The requirements of hydrostatic tests, indicated herewith, will be considered met if the hydrostatic test applied to the erected piping system is completed to the satisfaction of the Engineer. In testing, before pipe joints are covered the piping shall be given a hydrostatic test by the Contractor at a pressure of 1-1/2 times the designed working pressure but in no case less than 50 psi. All welded joints shall have a hammer test during the test, and if leaks occur during the test they shall be repaired and the test repeated.

02557.90 DIRECT BURIED PIPE INSTALLATION

02557.90.1 PROTECTIVE CONDUIT

After the inner steam or condensate piping has been tested and insulating completed, the protective conduit will be telescoped shut to a tight butt joint. The butt joints shall be wrapped with multiple layers minimum 6" wide of fiberglass cloth, mat, and isophthalic resin.

The final closure shall be in a cylindrical form with a single longitudinal split and shall be the same thickness as the conduit and sealed similar to conduit butt joints.

All field joints shall be tested at 15 psi air pressure. Each joint shall be checked with soap suds and any leaks shall be repaired.
DIVISION 2 - SITEWORK

02557.90.2 BACKFILLING

See Backfilling 02221 - including pipe embedments. Piping will be handled in accordance with the manufacturer's instructions and laid on a sand bed.

02591 ELECTRIC AND COMMUNICATION DISTRIBUTION (Underground)

02591.10 GENERAL

Much of the original campus is served by a 4160 volt loop system having a short circuit capacity of approximately 100,000 KVA at the source.

New areas are served by a 13,200 volt primary selective system with two parallel cables each having a short circuit capacity of approximately 664,000 KVA at the Power Plant.

All new cable on either system shall be rated 15,000 volts so that 4160 volt areas may in the future be converted to 13,200 volts without replacing comparatively new cable.

Primary voltage to all new buildings shall be 13,200 volts delta. When major alterations or additions are made to buildings presently fed by the 4,160 volt system, they shall be upgraded to the 13,200 volt system.

In all areas of the campus, (except outlying areas, farms, etc.), all primary cables and most secondary and communication cables will be installed in ducts with vaults at each change in direction.

Incoming primary shall be two 2/0 AWG, 15,000 volt, three conductor cables terminated in potheads on a selector switch unit.

See Standard Drawings in Division 17.

In general, four 5" fiber or plastic feeder ducts are required for each building for communications. These feeder ducts should have no pull boxes or short radius bends and should terminate, two in the Broadband Utility Room and two in the Telephone Utility Room.

02591.30 ELECTRIC & COMMUNICATION VAULTS

02591.31 DESCRIPTION

Electric and communication vaults shall be constructed of reinforced concrete with sufficient interior space for all cable ways, pulling equipment, and work space. Electric and communication vaults are generally constructed in pairs with a common sump. Tops of vaults will be pitched ¼" /ft. to the side to allow ground water to drain off. Floors will be pitched 1/8"/ft. to drain. Sizes of vaults will generally be as shown on the standard drawings in Division 17.

02591.32 ACCESS

Manholes will be centered in the ceiling of each vault.

Manholes shall have a 30" diameter clear opening. Manhole covers shall be heavy duty type with machined bearing surfaces and shall be lettered with words “Electric” or “Communication.” Covers shall have six (6) 1” diameter pick holes a minimum of three (3) inches in from outside edge of cover. Ring and cover shall be Neenah #R-1640-C or approved equal.

Manhole ring will set on two courses of brick to allow for future grade adjustments.
DIVISION 2 - SITEWORK

02591.33 SECURITY
Covers on electric and communication vaults will be secured by the Owner, only as required.

02591.34 CABLE RACKS
Cable racks shall be installed in all vaults to properly support new cable at a distance of not greater than three feet on centers.

Cable racks shall be Joslyn Stock No. J5126-30" overall, complete with 10"
Cable Rack hooks #J5133A and No. J5122 cable rack insulators, or equal by McGraw-Edison.

Concrete inserts for cable rack bolts will be hot-dipped galvanized.

Plated steel expansion shield equal to "Phillips," or "A & J" may be used in lieu of inserts.

02591.35 PULL-IN IRONS
Each wall of each vault will have a 7/8" hot-dipped galvanized pull-in iron centered under the new and future duct line openings. Pull-in irons will be "McGraw-Edison," "Joslyn," or Oliver #4579.

02591.36 GROUND RODS
All electric vaults shall have two (2) 5/8" x 8'0" copper weld ground rods driven in diagonally opposite corners of the manhole floor. The 4/0 THW ground cable shall be neatly clamped to manhole wall and connected to each ground rod by the exothermic method.

02591.40 WATERPROOFING

02591.41 MEMBRANE WATERPROOFING
All vaults will be waterproofed with a modified asphalt membrane waterproofing. The membrane will cover the cove, the top, and sides, down to 8" below the joint between the wall and floor. Membrane will be flashed tight to conduits and reinforcing dowels at duct entrance.

02591.42 WATER STOPS
All construction joints will have cast-in vinyl waterstops.

02591.50 DRAINAGE

02591.51 FOUNDATION DRAINAGE
Same as for steam vaults and tunnels. See Section 02557.51 FOUNDATION DRAINAGE.

02591.52 FLOOR DRAINS
Same as for steam vaults and tunnels. See Section 02557.52 FLOOR DRAINS.

02591.53 DRAIN TILE AND PIPE
Same as for steam vaults and tunnels. See Section 02557.53 DRAIN TILE AND PIPE.

02591.60 DUCT BANK CONSTRUCTION
DIVISION 2 - SITWORK

02591.61 GENERAL

Primary distribution will be run in fiber or plastic duct with reinforced concrete encasement. Size, location, and elevation will be shown on drawings. The duct bank will be pitched to drain any seepage to a vault. Duct banks entering buildings will pitch away from the building. Slope will not be less than 4 in./100 ft. of duct. Grade shots will be taken at least every 25 ft. to assure uniform pitch.

Duct banks should have no pull boxes or short radius bends. Any change in direction should take place at a manhole, one for electric and one for communications.

Duct banks will be marked with a marker tape buried in the trench above the duct.

02591.62 DUCT LINES

All underground duct line, including conduit, couplings, bends, and bells, and any special fillings shall be heavy duty impregnated fiber duct or plastic duct. Fiber duct shall be as manufactured by "McGraw-Edison," and plastic duct as manufactured by "Carlon Products Corporation."

Plastic duct and fittings shall be Type I, corrosion-resistant and not adversely affected by acids, alkalis, salts or organic matter. Fittings shall be of a type especially made for use with plastic duct for electrical service. All plastic conduit and fittings shall be joined by a solvent welding cement. A 4" plastic duct shall have a minimum wall thickness of 0.150".

The Contractor may, at his option, use "Carlon" PVC power and communication ducts with a wall thickness of 0.110" inch in lieu of the duct specified.

Duct end bells shall have a minimum opening diameter of 5".

All joints in the duct lines will be made water tight.

02591.63 DUCT BANK ENCASEMENT

Lay concrete blocks at 4 ft. on center to establish grade and tie duct lines to blocks to make secure. Plastic separators shall be used to maintain space between duct lines, 1-1/2 inches between electric ducts, 1-1/2 inches between communication duct, and 3 inches between electric and communication ducts.

In lieu of the blocks a 3 inch concrete pad may be poured and leveled to the grade established, with the wires inserted every four feet to secure ducts.

A concrete envelope of 3000 PSI test, using pea stone, shall be poured around ducts with low enough slump to be worked into all openings. When concrete is poured, some method of deflecting the concrete shall be employed to minimize force on the ducts.

The concrete shall cover the fiber or plastic duct a minimum of 3 inches on both sides and top, except as follows:

a. Under roadways, the concrete shall cover the ducts a minimum of 6 inches on top and the duct bank shall be reinforced with two 5/8 inch steel rods laid parallel to and below the duct.

b. Where duct enters manholes or buildings, or where duct is to cross new utilities installed, or indicated as proposed, or where duct is to be installed in fresh fill, the duct shall have minimum of 4 inches of concrete top and bottom and shall be reinforced with four 5/8 inch steel bars laid parallel to the duct. Two reinforcing steel rods shall be laid in the concrete envelope below the duct and two above, each with one end resting on the building or manhole wall and the other extending back to undisturbed soil.
Where duct line crosses a steam line, there shall be a minimum of 6 inches of sand fill between the outside of the concrete envelope and the insulation around the steam line.

There shall be a minimum separation of 12 inches between the concrete envelope of the duct line and any existing or new gas main or line.

The concrete envelope of the duct line shall not come in contact with any water or sewer line.

The minimum distance between the top of the concrete envelope of the duct line and final grade shall be 30 inches, unless otherwise specified or special permission is obtained from the Owner.

02591.70 PRIMARY CABLE

02591.70.1 GENERAL

15 KV cable will be used for extensions to the 13.2 KV system and for alteration to the 4.16 KV system.

When buildings are connected to the 13.2 KV system, 15 KV cable sized at 2/0 AWC or 350 MCM should be used as service conductors depending on building load.

13.2 KV circuits shall be comprised of 500 MCM 15 KV cable from the Power. Plant on, and 350 MCM 15 KV cable towards the end of the circuit.

02591.70.2 15,000 VOLT CABLE; PAPER INSULATED LEAD COVERED

Approved Manufacturers

Okonite
CABLEC
Perilli

Product Description

The cable shall meet specifications for solid type paper insulated lead covered cable, A.E.I.C. latest edition, unless otherwise specified below.

Medium voltage cable shall be 3/C, copper power cable, 15 KV ungrounded HPS paper and lead with high density polyethylene jacket for use in underground ducts.

It shall be comprised of compact sector annealed copper, Class B stranded conductors, each insulated with 215 mils of impregnated paper with semi-conducting paper tape over and under insulation. Each insulated conductor shall be covered with 3 mils of copper tape intercalated with carbon black paper tape.

The three insulated conductors shall be cabled together with paper fillers and the cabled conductors covered with a 5 mil bronze tape intercalated with carbon black paper tape and copper bearing lead sheath. The entire cable assembly shall be covered with a high density polyethylene jacket.
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<table>
<thead>
<tr>
<th>Conductor Size</th>
<th>Lead Sheath</th>
<th>Polyethylene Jacket</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/0 AWG</td>
<td>95 mils</td>
<td>90 mils</td>
</tr>
<tr>
<td>350 MCM</td>
<td>105 mils</td>
<td>110 mils</td>
</tr>
<tr>
<td>500 MCM</td>
<td>110 mils</td>
<td>110 mils</td>
</tr>
</tbody>
</table>

02591.70.3 15,000 VOLT CABLE; SOLID DIELECTRIC

CABLE CONSTRUCTION
High voltage cable shall be 2/0 AWG, 350 MCM, or 500 MCM, size(s) as noted on the drawing, 1/C, copper power cable, 15 KV ungrounded (133% insulation level) suitable for normal installation, indoors or outdoors, in conduit or underground ducts, intermittent or continuous submersion in water and direct burial.

The cable shall be comprised of uncoated soft or annealed copper conductors made up of concentric-lay Class B round stranding in accordance with the current requirements of ASTM standards.

Extruded over each conductor shall be a non-conducting energy suppression layer at a minimum average thickness of 18 mils. The layer shall be tested during manufacture at a minimum 1KV DC between electrodes and conductor to prove its electrical integrity.

Extruded over the stress control layer shall be the primary insulation at a thickness of 220 mils. The insulation shall be a high quality ozone and discharge resistant, High Temperature Kerite, ethylene-propylene-rubber compound containing no more than a maximum of 55% ethylene. The entire insulation system shall be suitable for normal use at 90 degrees Centigrade continuous conductor temperature, 130 degree C. for emergency overload conditions, and 250 degree C. for short circuit operation.

Over the insulation shall be an extruded non-metallic semiconducting shield of black thermoplastic having a thickness as follows:

<table>
<thead>
<tr>
<th>Diameter Over Insulation</th>
<th>Shield Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Inches)</td>
<td>(Mils)</td>
</tr>
<tr>
<td>Up to 1.000</td>
<td>30</td>
</tr>
<tr>
<td>1.001 to 1.500</td>
<td>40</td>
</tr>
<tr>
<td>1.501 and larger</td>
<td>50</td>
</tr>
</tbody>
</table>

Over the semiconducting shield 5-#34 AWG copper wires shall be helically applied. Over the 5-#34 AWG copper wires, 26-#14 copper wires shall be contrahelically applied.

Over the shield apply a 80 mil polyethylene jacket.

Three Conductor Cable Assembly
Three single conductor cables of equal length shall have the overall jacket continuously marked as follows: first cable - manufacturers name, manufacturing date, PHASE X, red band; second cable - same as first except PHASE Y, blue band; third cable - same as first except PHASE Z, black band.

The three single conductor cables shall be wound parallel on the shipping reel.

Cable ends shall be sealed to prevent the ingress of water and other contaminants. Attach a pulling eye to the three conductors.

Production Cable Testing
Each length of cable provided will be tested in accordance with the following tests.

After the application of the primary insulation system, and before any other layers or coverings are applied, each production length of cable shall be immersed in water at room temperature and tested at a minimum of 70 KV DC for 5 minutes after 16 hours minimum immersion time, and then a minimum of 35KV AC for 5 minutes after 24 hours minimum immersion time. While still immersed in water the insulation resistance shall be measured. The insulation resistance constant shall not be less than 21,000 megohms/1000 ft. at 60 degrees C.

The complete cable, while on the shipping reel, shall be tested at room temperature at a minimum of 35 KV AC for one minute. The insulation resistance shall also be measured and the insulation resistance constant shall not be less than 21,000 megohms/1000 ft. corrected to 60 degrees C.

The conductor resistance and shield continuity shall be measured on each shipping length of cable and recorded. Each end of every shipping length shall also be inspected for water in strands and checked dimensionally for conformance with the above standards.

**Discharge Resistance Test**

The cable supplier shall submit to the purchaser, at the time of the proposal, a Certified Test Report showing that the proposed insulation system is unaffected by electrical discharge when tested in accordance with the procedures specified in ICES S-19-81 (latest edition) except that the test potential shall be a minimum of 250 volts per mil of nominal insulation system thickness and the test duration a minimum of 1,000 hours.

The test shall be made on #2 (7) AWG copper or aluminum conductor insulated with an 18 mil stress control layer over the conductor and 175 mils of thermosetting rubber based compound (insulation as specified above), over the stress control layer.

**Approved Manufacturer**

Kerite

**Cable Terminations**

Kerite cable terminations on overhead lines and in switchgear shall be outdoor type, class I terminations manufactured by Raychem HVT-150 or 3M 5630 K series.

**Cable Support Bracket**

A cable support bracket shall be used on overhead line risers to support the Kerite cable above riser conduit.

**02591.70.4 CABLE INSTALLATION**

15 KV cable installed in conduit, in tray, or on trapeze hangers shall have a minimum bending radii of 4 feet.

Pulling compound shall be Albentonite or other material as recommended by the cable manufacturer for polyethylene or neoprene jacket.

**02591.70.5 FIRE PROOFING**

All 15 KV cable exposed in manholes, vaults, and buildings shall be covered with fire proof tape.
DIVISION 2 - SITEWORK

Fire proof tape shall be 3M Irvington No. 77 arc and fire proofing tape.

Two layers of fire proofing tape shall be applied, 1/2 lapped and wound in opposite direction.

02591.70.6 SPlicing

Paper Insulated Lead Covered

Splices are to be carefully made according to the best methods of standard practice and in accordance with General Electric Company, G and W Electric Specialty Co., or Cable Mfg. specifications.

Lead sleeves used for splices in cable shall be of ample size for the cable on which they are used.

Sleeves shall be filled with compound, allowed to settle and refilled before sealing.

The compound used for filling splice sleeves shall be of a type approved in General Electric Company, G and W Electric Specialty Co., or Cable Mfg. specifications.

Bond each splice in manhole to nearest ground rod or bus with a No. 4 bare copper stranded wire. Solder wire to lead sleeve, use mechanical connector on ground rod or bus.

Solid Dielectric

Raychem splices shall be used on solid dielectric cable. Refer to Architect/Engineer.

02591.70.7 Tagging of cables

Cables shall be tagged at each duct bank window in all manholes and in building at entry point.

Tags shall be 1/2 inch by 4 inch cm lead, attached to cables with self-locking tie-wrap.

Information on tags shall be as noted and shown on drawing. All letters and numbers shall be stamped on tags. Printing or painting letters and number on tags will not be accepted.

Tags shall be approved by Architect/Engineer prior to installation.

02591.80 Ground Cable

The contractor shall furnish and install a new 4/0 THW, stranded copper cable the entire length of the concrete envelope of all new electric duct lines, all joints in the ground cable shall be brazed or cadwelded.

In manholes, the ground cable shall be neatly clamped to the wall.

02599 Utility Marker Tape

All underground utilities, except steam tunnels, will be marked with a plastic identifying tape buried in the trench directly above the utility at 8 to 12 inches below finished grade. The tape will be printed with the name of the buried utility, and be non-magnetic at all conductive piping and magnetic at all non-conductive piping. Tape will be as manufactured by "Allen Systems, Inc." or "Terra Tape."

The tape shall be imprinted continuously over its entire length in permanent black ink to identify type of line and be a vivid opaque color as follows:
a. Caution Electric Line buried below - red  
b. Caution Gas Line buried below - yellow  
c. Caution Telephone Line buried below - orange  
d. Caution Sewer Line buried below - green  
e. Caution Water Line buried below - blue

Tape shall be buried directly above the buried line, 8 to 12 inches below earth surface and in the following widths:

<table>
<thead>
<tr>
<th>Line Width</th>
<th>Tape Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 18 inch line</td>
<td>3 inch wide tape</td>
</tr>
<tr>
<td>20 inch and up</td>
<td>6 inch wide tape</td>
</tr>
</tbody>
</table>

02600 PAVING AND SURFACING

02612 BITUMINOUS CONCRETE PAVING

02612.01 GENERAL

In general, handicapped parking areas shall in grade per stall from front to back and side to side.

All roads and parking areas on the WMU campus will have an asphalt concrete surface with positive slope to drain. All elevations determining drainage will be shown on drawings. Road beds will be prepared to their full width plus one foot outside of curbs.

02612.02 RELATED WORK SPECIFIED ELSEWHERE

Demolition - 02110  
Earthwork - 02200  
Site Drainage - 02500

02612.03 QUALITY ASSURANCE

TESTING

Provide test reports as specified in section 01400 and herein.

Provide in-place testing and inspection during the paving operation that the materials placed meet or exceed minimum MDOT requirements for bond coat application method and coverage (4.00.08), placement technique and temperature (4.00.09), rolling method (4.00.11) and finished material density (4.00.11).

Inspection and sampling frequency shall be at the discretion of agency and Project Representative.

The Project Representative shall be notified immediately should any tests fail. Further construction shall not continue until the cause of failure has been corrected to the satisfaction of the Project Representative.

CONTRACTOR CERTIFICATION

The Contractor must be pre-qualified by Michigan Department of Transportation and capable of performing all the various items of work.

02612.06 JOB CONDITIONS
DIVISION 2 - SITEWORK

Weather and seasonal limitations shall not exceed those specified in MDOT 4.00.14.

02612.10 MATERIALS

Base Course-For roads and loop drive entrances only -

Shall meet all requirements of MDOT specification No. 500 bituminous mixture.

Leveling and Surface Course -

Shall meet all requirements of MDOT specifications 7.10 No. 1300 (20AA) bituminous mixture.

Bond Coat –

Shall meet all requirements of MDOT specifications 8.04 for Bond Coat SS-1h.

Asphalt Cement –

Shall conform to requirements of MDOT specification 8.04 for Asphalt Cement AC10, 85-100 penetration.

02612.40 PREPARATION

Prepare subgrade according to MDOT Specifications and project requirements.

Where entire pavement thickness is to be completely removed, cut existing pavement neatly with a concrete saw. Prepare subgrade (6-1/211) inches below pavement elevation. Edges to be cut straight down to allow for a full six (6) inch pavement throughout.

Clean all cold-milled asphalt surfaces to a "broom clean" condition where existing asphalt or concrete pavement is to remain. Dispose of the material off of property., Where the gravel sub-base or subgrade has been exposed in the cold-milling operation, remove an additional 3 inches of material and patch with a mixture 500 as specified in MDOT specification.

Test roll subgrade to check for unstable areas and areas requiring additional compaction. Perform test rolling according to MDOT specification. Subgrade shall be tested in accordance with section 02221.

The Project Representative shall notify Contractor of unsatisfactory conditions. Do not begin paving work until deficient subgrade areas have been corrected, tested and approved by the Project Representative.

02612.50 INSTALLATION OF PAVEMENT

General -

Place bituminous pavement and bond coats over approved subgrade or existing pavement according to MDOT specifications through .10.

Pavement Thickness –

(Unless specified otherwise on the drawings.)

For Roads and Drives -

A compacted subbase of 6" of NDIT Class II granular material over the compacted pavement thickness shall be 5 inches of base course and 1-1/2 inches of surface course. For bus stops, or the drive lanes 1001 each side of a bus stop, the base course shall be
DIVISION 2 - SITEWORK

7". Over existing pavements, the compacted surface course shall be of a sufficient thickness to reach the design elevation but not less than 1-1/2 inches thick. Additional existing pavement shall be removed if the 1-1/2 inch surface course thickness is not attainable.

For Parking Lots and Approaches -
Over 8" of compacted subbase of Class II granular material shall be 31" of surface course in two equal lifts.

Bond Coat -
Apply a fog coat of SS-Ih at a rate of .10 to .15 gallon per square yard uniformly over the entire surface of the pavement to be surfaced.

Protection -
After final rolling, protect pavement of vehicular traffic until the surface has cooled sufficiently to eliminate surface abrasion.

02618 TRAFFIC CROSSWALK AND PARKING STALL LINES

GENERAL

Product(s) to be used will be specified on drawings.

02618.20 PRODUCTS

TRAFFIC PAINT - Alkyd type, TT-P-115, Type I base traffic lane-marking paint, factory mixed, quick-drying, and non-bleeding. Color: White and Yellow as required by the Project. O'Leary 71 Series, Coronado, Sherwin-Williams, or approved equal.

THERMOPLASTIC PAVEMENT MARKINGS - According to current MDOT special provision. Color: White and yellow as specified on the project.

02618.30 EXECUTION

TRAFFIC PAINT CENTERLINES

a. Cleaning –
   Sweep and clean surface to eliminate loose material, dust, and oil. Line painting will not be permitted when humidity exceeds 85% or when air temperature falls below 40 degree F.

b. Layout of Traffic Lines -
   For drives, follow MDOT specifications for skip line layout.

c. Application of Traffic Paint –
   Apply specified color with mechanical equipment to produce uniform straight edges. Apply in 1 coat, 4 inches in width, with glass beads for night reflection, at rate recommended by manufacturer.

THERMOPLASTIC PAVEMENT MARKINGS FOR STOP BARS, CROSSWALKS, AND PARKING STALL LINES.

a. Install according to the current MDOT special provision specifications.

b. Install at locations specified on the drawings.
DIVISION 2 - SITEWORK

02619 GRAVEL SURFACING

02619.03 QUALITY ASSURANCE

Test roll finished surface according to MDOT specifications. All failed areas shall be repaired and retested until made acceptable.

02619.40 MATERIAL

Shall be MDOT specification 22A with a loss by washing of between 4% to 8%.

02619.50 INSTALLATION

Prepared subgrade shall be approved by the Project Representative prior to gravel replacement. 8-1/2" of gravel shall be placed according to MDOT specifications. The finished grade shall be as required by the project as shown on the drawings and as approved by the Project Representative.

02620 CURBS AND GUTTERS

02620.01 GENERAL

All roads and parking areas on the campus will have concrete curbs and gutters, unless otherwise exempted.

Section 02620 shall not be incorporated into Division 3 in any way. Site concrete shall be a separate section.

02620.02 RELATED WORK SPECIFIED ELSEWHERE

Earthwork - 02200

02620.03 QUALITY ASSURANCE

Provide the required testing and inspection as indicated in 01400. Concrete sampling, testing, and inspection shall conform to the following requirements:

a. Sampling Fresh Concrete

ASTM C172, except initial samples will be taken immediately after first 1/4 c.y. has been discharged and subsequent samples will be taken as specified herein. If in non-conformance, the concrete will be removed from the forms.

b. Slump

ASTM C143, except initial sample will be taken in accordance paragraph “a”. Additional tests will be made for each set of compressive strength test specimens and additional tests may be required by the Project Representative.

c. Air Content

ASTM C231, except as specified in paragraph "a", and additional tests at the end of the load, if possible.
d. Concrete Temperature

Taken each time compression test specimens are made and hourly when temperature is below 41 deg. F. or over 80 deg. F.

e. Unit Weight

ASTM C138, except the sample volume will be equal to air content specimen.

f. Compressive Strength

ASTM C31 and C39, except-on set of 3 cylinders for every 40 c.y. or fraction thereof. One specimen will be tested at 7 days and the remaining 2 specimens will be tested at 28 days. Strength level of the concrete will be considered unsatisfactory if the 7day compressive strength does not equal or exceed 60% of the 28 day design strength. Strength level of concrete will be considered satisfactory if the average compressive strength of two consecutive 28 day tests equals or exceeds the 28 day design strength, and neither individual strength test result falls below the specified compressive strength requirement by more than 100 psi.

g. Inspection

All concrete placed shall also conform to the installation procedures of this specification.

h. Frequency

Testing and inspection will be required for all concrete placed.

i. Concrete Replacement

Failure of any test or to follow proper installation procedures will require that the concrete be removed and properly replaced at Contractor's expense.

j. Additional Tests

The Contractor may have the testing service make additional tests of in-place concrete when test results indicated specified concrete strengths and other characteristics have not been attained. The testing inspection agency may conduct tests to with ASTM C42.

Adequacy of concrete by cored cylinders complying shall pay for all such tests conducted. Any holes made shall be patched by the Contractor at his expense.

02620.04 SUBMITTALS

Provide reports as specified in section 01400.

The Contractor shall provide the Owner's Representative with delivery tickets which shall list slump, sack mix, moisture of aggregates, all batch weights, type and quantity of add mixtures, percent of air entraining agent, time the truck left the plant, arrival on the job site and departed the job site, and water added at the site.

When requested, the Contractor shall provide documentation from the concrete supplier certifying that the concrete meets the specifications of this section.

02620.10 MATERIALS

Cement-
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Shall be Portland cement conforming to the requirements of the current specifications for Portland cement ASTM C150 Type 1A.

Air Entraining Admixture-
Shall conform to ASTM C260 for concrete.

Fine Aggregate-
Shall conform to the MDOT Specifications for Sand 2NS.

Coarse Aggregate-
Shall be well-graded gravel and crushed stone of hard, durable, uncoated particles or limestone, if specifically required. Gradation and physical requirements to conform to MDOT Specifications 6AA.

Water-
Shall be potable.

Reinforcement-
Shall be #4 bar reinforcement of new billet stock of intermediate grade in accordance with ASTM A615.

Formed Keyway-
Shall be standard Keyway 1-5/8" x 1-3/4" X 2-3/4" as manufactured by Dee Concrete Accessories Company, P.O. Box 11119, Chicago, IL 60611 or approved equal.

Asphalt Isolation (Expansion Joints)-

Joint Sealer-
TremSeal HP by Tremco, 1-800-227-8736.

Curing and Anti-Spalling Compound-
Shall be a heavy bodied water emulsified linseed oil and resin type equal to Tri-Dar 44/1 manufactured by Darling Company, 4650 South Racine Avenue, Chicago, IL 60609.

Admixtures-
Approved by Project Representative.

Fill Sand-
Clean, bank run sand, free from lumps of clay, uniformly graded from coarse to fine, with all material passing a 3/8 inch sieve and containing not more than 7% clay and silt.

02620.12 CONCRETE MIX

The mixture shall contain 6 sacks of Portland cement concrete, coarse aggregate, fine aggregate admixtures, and water. The concrete mix design shall be a minimum of 4000 psi at 28 days. The maximum allowable slump shall be 4 1/2". Aggregates will be batched by weight. Air content shall be 5% to 8%. Maximum water/cement ratio of .50 pounds of water per pound of cement.

02620.20 FORMS

Steel or wood forms of an approved section shall be used throughout the construction. On radii 3 feet or less, 1/4 inch plywood or masonite shall be used. All forms shall have a height equal to concrete thickness. Build-up, battered, bent, twisted, or broken forms shall be removed from the work. Expansion joint materials shall not be used.
Forms shall be so constructed and set as to resist without springing or settlement the pressure of
the concrete. On curbs of sharp radius, plywood or other approved flexible material shall be used
in sections short enough to form a smooth, uninterrupted curb which shall not vary from the true
radius by more than 1/4 inch. Forms shall not deviate more than 1/8 inch in 10 feet from the true
horizontal alignment and no more than 1/8 inch in vertical alignment.

Where forms are set above general surrounding area, earth shall be placed along outside edges
of forms to insure stability.

All forms shall be cleaned and oiled each time they are used.
Forms must be approved by the Project Representative prior to concreting.

02620.25 REINFORCEMENT

Place two bars in gutter pan as specified in drawings and in the following areas:

1. Where the curb crosses a recently filled trench and extending a minimum of 5 feet.
2. Where a fill of 18" or more occurs.
3. As directed by the Project Representative.

02620.30 PLACING CONCRETE

Placing the concrete shall not commence until the subgrade and forms have been approved. The
subgrade shall be moistened in advance of concreting, but shall not be muddy or excessively wet.
A sufficient quantity of forms shall be placed to accommodate all of the concrete that is scheduled
to be poured at any one time. Concrete shall be deposited with a minimum of rehandling and
shall be spaded adjacent to forms and joints. In the case of isolation joints, concrete shall be
placed simultaneously against both sides of the joint.

Concreting shall not be continued when the air temperature is below 45F unless the aggregates
and/or water are heated to produce a placing temperature of the concrete between 60F and 90F
and unless adequate provisions are made for maintaining protection against freezing of the
concrete for at least 7 days after placing. No concrete shall be placed on frozen subgrade.

02620.40 JOINTING

Control (contraction) joints shall be perpendicular to the curb edge 1-1/4 inches deep, open and
free of all excess concrete. They shall be placed at intervals of not more than 10 feet.

Isolation (expansion) joints shall be placed at all points of curvature, tangency, and at intervals of
not more than 50 ft. Construction joints shall be limited to isolation joint locations unless noted
otherwise on drawings.

02620.50 FINISHING

Concrete shall be struck off true to cross section, after which it shall be finished smooth and even.
Face forms, if used, shall be left in place until the concrete has set sufficiently so that they can be
removed without injury to the curb. The remaining forms shall not be removed for at least 6
hours. The edges shall be rounded with an edging tool. No tool marks are to be left on exposed
edges.

A straight edge check is to be made while concrete is still plastic. Any irregularity exceeding 1/8
inch shall be corrected. Finished surface shall not vary from the required cross section as shown
on plan by more than 1/8 inch. It shall not vary from the true horizontal alignment by more than
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1/4 inch in 10 L.F. Any section exceeding those limitations is subject to rejection and replacing at Contractor's expense.

Water added to the surface to assist finish shall be applied only with a fog spray when approved by the Project Representative.

02620.60 CURING

All concrete shall be cured by the use of an approved curing compound as specified in 02630.04 in accordance with manufacturer's specifications at the rate of 200 S.F. per gallon, no exceptions. Also, immediately after the curb forms are removed, coat vertical surfaces of the curb as well.

When required by the Project Representative or as conditions demand, frost control shall be required to maintain a minimum temperature on the concrete surface of 34 degree F for 10 days.

02630 CONCRETE SITE PAVEMENT

02630.01 GENERAL

All pedestrian walks, bicycle paths, loading dock areas and approaches to rubbish bins or compactors.

Section 02630 shall not be incorporated into Division 3 in any way. Site concrete shall be a separate section.

02630.02 RELATED WORK SPECIFIED ELSEWHERE

Earthwork - 02200
Curbs and Gutters - 02620

02630.03 QUALITY ASSURANCE

Provide the required testing and inspection as indicated in 01400. Concrete sampling, testing, and inspection shall conform to the following requirements:

a. Sampling Fresh Concrete
   ASTM C172, except initial samples will be taken immediately after first 1/4 coy. has been discharged and subsequent samples will be taken as specified herein. If found to be in non-conformance, the concrete will be removed from the forms.

b. Slump
   ASTM C143, except initial sample will be taken in accordance paragraph “a”. Additional tests will be made for each set of compressive strength test specimens and additional tests may be required by the Project Representative.

c. Air Content
   ASTM C231, except as specified in paragraph “a”, and additional tests at the end of the load, if possible.

d. Concrete Temperature
   Taken each time compression test specimens are made and hourly when temperature is below 41 dig. F. or over 80 dig. F.

e. Unit Weight
   ASTM C138, except the sample volume will be equal to air content specimen.
f. Compressive Strength
ASTM C31 and C39, except on set of 3 cylinders for every 40 coy. or fraction thereof. One specimen will be tested at 7 days and the remaining 2 specimens will be tested at 28 days. Strength level of the concrete will be considered unsatisfactory if the 7day compressive strength does not equal or exceed 60% of the 28 day design strength. Strength level of concrete will be considered satisfactory if the average compressive strength of two consecutive 28 day tests equals or exceeds the 28 day design strength, and neither individual strength test result falls below the specified compressive strength requirement by more than 100 psi.

g. Inspection
All concrete placed shall also conform to the installation procedures of this specification.

h. Frequency
Testing and inspection will be required for all concrete placed.

i. Concrete Replacement
Failure of any test or to follow proper installation procedures will require that the concrete be removed and properly replaced at Contractor's expense.

J. Additional Tests
WMU may have the testing service make additional tests of in-place concrete when test results indicated specified concrete strengths and other characteristics have not been attained. The testing inspection agency may conduct tests to de adequacy of concrete by cored cylinders complying with ASTM C42. WMU shall pay for all such tests conducted. Any holes made shall be patched by the Contractor at his expense.

02630.04 SUBMITTALS
Provide reports as specified in section 01400.

The Contractor shall provide the Owner's Representative with delivery tickets which shall list slump, sack mix, moisture of aggregates, all batch weights, type and quantity of add mixtures, percent of air entraining agent, time the truck left the plant, arrival on the job site and departed the job site, and water added at the site.

When requested, the Contractor shall provide documentation from the concrete supplier certifying that the concrete meets the specifications of this section.

02630.10 MATERIALS

Cement-
Shall be Portland cement conforming to the requirements of the current specifications for Portland cement ASTM C150 Type 1A.

Air Entraining Admixture-
Shall conform to ASTM C260 for concrete.

Fine Aggregate-
Shall conform to the MDOT Specifications for Sand 2NS.

Coarse Aggregate-
Shall be well-graded gravel and crushed stone of hard, durable uncoated particles or limestone, if specifically required. Gradation and physical requirements to conform to MDOT Specifications 6AA.

Water-
Shall be potable.

Reinforcement-
Shall be (6” x 6” W2.9 x W2.9) welded wire fabric mats conforming to ASTM A185. Rolled material shall not be acceptable.

Formed Keyway-
Shall be standard keyway 1-5/8” x 1-3/4” X 2-3/4” as manufactured by Dee Concrete Accessories Company, P.O. Box 11119, Chicago, IL 60611 or approved equal.

Asphalt Isolation (Expansion Joints)-

Joint Sealer-
TremSeal HP by Tremco, 1-800-227-8736.

Curing and Anti-Spalling Compound-
Shall be Tri-Dar 44/1 manufactured by Darling Company, 4650 South Racine Avenue, Chicago, IL 60609.

Admixtures-
Approved by Project Representative.

Fill Sand-
Clean, bank run sand, free from lumps of clay, uniformly graded from coarse to fine, with all material passing a 3/8 inch sieve and containing not more than 7% clay and silt.

02630.12 CONCRETE MIX

The mixture shall contain 6 sacks of Portland cement concrete, coarse aggregate, fine aggregate admixtures and water. The concrete mix design shall be a minimum 4,000 psi at 28 days. The maximum allowable slump shall be 4-1/2”. Aggregates will be batched by weight. Air content shall be 5% to 8%. Maximum water/cement ratio of .50 pounds of water per pound of cement.

02630.20 FORMS

Steel or wood forms of an approved section shall be used throughout the construction. On radii 3 feet or less, 1/4 inch plywood or masonite shall be used. All forms shall have a height equal to concrete thickness. Build-up, battered, bent, twisted, or broken forms shall be removed from the work. Expansion joint materials shall not be used.

Forms shall be so constructed and set as to resist without springing or settlement the pressure of the concrete. Forms shall not deviate more than 1/8 inch in 10 feet from the true horizontal alignment and no more than 1/8 inch in vertical alignment.

Where forms are set above general surrounding area, earth shall be placed along outside edges of forms to insure stability.

All forms shall be cleaned and oiled each time they are used. Forms must be approved by the Project Representative prior to concreting.

02630.25 REINFORCEMENT

Place reinforcement mesh in gutter pan where shown on drawings and in the following areas:
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1) Where the pavement crosses a recently filled trench and extending a minimum of 5 feet on either side.

2) Where a fill of 18" or more occurs.

3) As directed by the Project Representative.

Concrete shall be placed in two (2) layers when mesh reinforcing is used. Use of brick, stones, etc., or unusual raising with bars or tools will not be permitted. The first layer of concrete shall be placed and consolidated to the elevation of the reinforcement. The reinforcing shall be installed and the top layer deposited.

02630.30 PLACING CONCRETE

Placing the concrete shall not commence until the subgrade and forms have been approved. The subgrade shall be moistened in advance of concreting, but shall not be muddy or excessively wet. A sufficient quantity of forms shall be placed to accommodate all of the concrete that is scheduled to be poured at any one time. Concrete shall be deposited with a minimum of rehandling and shall be spaded adjacent to forms and joints. In the case of isolation joints, concrete shall be placed simultaneously against both sides of the joint.

Concreting shall not be continued when the air temperature is below 45F unless the aggregates and/or water are heated to produce a placing temperature of the concrete between 6OF and 9OF and unless adequate provisions are made for maintaining protection against freezing of the concrete for at least 7 days after placing. No concrete shall be placed on frozen subgrade.

02630.40 JOINTING

Shall occur as shown on plan, as directed in the field by the Project Representative and in the following situations, unless otherwise specified:

Control (Contraction) joints shall ordinarily be placed at intervals equal to the width of the slab or 8 feet, whichever is less. They shall be 1/4 inch wide and 1-1/4 inch deep, or 1/4 the thickness of the slab, whichever is greater. In addition, the aggregate will be sufficiently separated through the entire thickness of the slab to provide a plane of weakness. Where slabs exceed 8 feet in width, a straight longitudinal control joint shall be placed along the centerline of the slab. This joint shall begin and end only at isolation or construction joints.

Isolation (Expansion) joints shall be placed as shown on drawings and if not conflicting with drawings at intervals of at least every 40ft. adjacent to all footings and foundations, adjacent to all curbs when required, adjacent to existing concrete where new concrete is to abut, at next available joint that is parallel to the edge of the existing concrete, continue joints in adjoining concrete, in the same location as existed in the concrete that was removed, and where two or more walks intersect. They shall be placed in a vertical position through the entire slab thickness.

Construction joints shall be installed when pouring operations are delayed more than 1/2 hour at locations where normal control joints would occur, as shown on drawings and as directed by the Project Inspector.

All joints shall be perpendicular to the edge and tangents and normal to curves. The joints shall also not vary from the true line more than 1/4 inch.

When new walkways are adjacent to new curb and gutter or when required by the Project Representative, the Contractor shall install a formed keyway (not premolded tongue and groove expansion material).
02630.50 FINISHING

Concrete shall be placed and struck off with a straight board until all voids are removed in the surface at the required grade and cross section.

Adding water to the surface of the concrete to assist in finishing operations shall not be permitted unless specifically approved by the Project Representative in which it shall be applied in a fog spray only.

Immediately after the concrete has been struck off, the surface shall be floated with a magnesium bull float just enough to produce a smooth surface free from irregularities. All edges shall be rounded to a radius of 1/4 inch with an approved edging tool. All jointing shall then commence immediately after edging and before the large aggregate in the concrete has started to settle.

The entire surface shall then be steel troweled so that the large aggregate are set and the surface is free of edging joints and trowel marks.

The surface shall then be broomed lightly across the walk, being careful to keep mortar out of the joints. The brooming direction shall generally be in a transverse direction to the normal path of travel. However, the Project Representative may change the direction depending on the specific location.

Surface variations greater than 1/8 inch in 10 feet are not acceptable.

Walks shall be protected against pedestrian traffic for two (2) days and vehicles for seven (7) days. All concrete shall be stamped at each end of the work with the contractor’s name and the current year.

02630.60 CURING AND ANTI-SPALLING

All concrete shall be cured by the use of an approved curing compound as specified in 02630.04 in accordance with manufacturer's specifications at the rate of not more than 200 s.f. per gallon, no exceptions.

When required by the Project Representative or as conditions demand, frost control shall be required to maintain a minimum temperature on the concrete surface of 34F for ten (10) days.

02640 UNIT PAVERS

02640.01 GENERAL

This work is limited to exterior brick or concrete mortarless pavers.

02640.02 RELATED WORK ELSEWHERE

Earthwork - 02200
Site Drainage - 02300

02640.03 QUALITY ASSURANCE

Subcontractor Qualifications:

a. Shall be thoroughly familiar with installation of on-grade unit pavers.
b. Primary business shall be the installation of on-grade unit pavers.
c. Shall have been in business for a minimum of three years.
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Field Constructed Mock-up:
A minimum of three weeks prior to the installation of the unit pavers, fabricate a mock-up using
the actual materials that will be incorporated into the project. This mock-up will be approved by
the Project Representative prior to actual construction. Minimum mock-up size shall be 6 feet by
6 feet. The mock-up will include all the various angles, corners, designs and special shapes and
will contain the complete range of color that will occur in the actual project. A larger size may be
required by the Project Representative to incorporate all the requirements of the mock-up. Retain
the mock-up during construction to be used as the minimum standard of quality.

Product changes:
Do not change brands, colors or size of pavers during the progress of the work without written
approval.

02640.04 SUBMITTALS

Unit pavers: Submit enough brick or concrete pavers to provide a two square foot sample. A
larger sample may be required if the range of color cannot be shown.

02640.20 MATERIALS

UNIT PAVERS:
a. Fired brick designed for exterior applications selected by Campus Planning.
b. Precast concrete pavers shall be manufactured by:
   Unilock Michigan, Inc.  Fendt Builder's Supply, Inc.  Oaks Precast Industries
   P.O. Box270  22005 Gill Road  1298 Clarke Road
   Brighton, MI 48116  Farmington Hills, MI 48204  London, Ontario N5V 3B5
   313-437-1380  313-474-3211  519-451-8850

(Note: The Division of Campus Planning will select the unit paver brand, shape, and color.)

AGGREGATE: Drainage aggregate - MDOT 5G open grated aggregate

SAND: Washed mortar - 2NS

GEOTEXTILE FABRIC: AMOCO 4551 or equal

DRAINAGE PIPE: Corrugated perforated polyethylene pipe - ASTM F 405 with soz filter.
   Fittings - Shall match corrugated polyethylene pipe.

2640.30 INSTALLATION

Upon a properly compacted subgrade, install 4” drainage pipe as shown on the drawings. The
pipe shall have positive flow to the catch basin outlet shown. Connect the outlet of the pipe into
the concrete catch basin through a hole not more than 2 inches larger than the diameter of the pipe.
Securely mortar the pipe into the wall of the catch basin so that the end of the pipe is flush
with the inside of the catch basin. Properly connect pipe together in accordance with the
manufacturer’s specifications using fittings manufactured by the same company as the pipe
manufacturer.

Directly over the compacted subgrade and around the drainage pipe, place 6 inches of
compacted drainage aggregate.

Install geotextile fabric on top of the drainage aggregate. Overlay seams of the fabric 1foot.
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Place approximately 1 inch of compacted 2NS sand over the geotextile separation fabric to be used as a setting bed for the unit pavers.

Directly over the sand setting bed, install the unit pavers in the pattern as shown on the plan, placing unit pavers closely together. A minimal amount of space is permitted between unit pavers to compensate for variations in the unit paver size. Upon commencing the unit paver installation, gain approval from the Project Representative of the acceptable spacing permitted between pavers. After pavers are placed level, true and firmly set in position, sweep washed mortar sand into the joints to completely fill the void between the pavers.

02710 SUBDRAINAGE SYSTEM

02710.10 GENERAL

SUBITIALS:
Product Data: Required.
Shop Drawings: Required.

02710.20 MANUFACTURERS/PRODUCTS

Pipe: Polyvinyl chloride, 6 inch inside diameter, with fittings as required.

02710.21 ACCESSORIES/MIXES

Filter Aggregate; and Bedding; Material: Pea Gravel.
Joint Cover: Polyethylene.
Filter Fabric: Water Pervious type; black polyolefin.

02710.30 EXECUTION

02710.31 INSTALLATION

Place drainage pipe on clean-cut subsoil, sloped to 1/8 inch per foot.
Loosely butt pipe ends. Place joint cover strip 12 inches wide, around pipe diameter centered over joint.

02710.32 FIELD QUALITY CONTROL

Field Tests: Required.
Field Tests: Required.

02710.33 SCHEDULES

Building perimeter and under slab-on-fill: Drainage pipe, filter aggregate, and filter fabric.
Retaining walls: Drainage pipe and filter aggregate.

02800 LANDSCAPING
DIVISION 2 - SITEWORK

02800.10 GENERAL

The responsibilities of topsoiling, seeding, mulching, and related work will be administrated by Campus Construction. The parking area access route, work and storage areas must be established as project limits. Any site restoration required outside these limits will be charged to the Contractor.

02810 LANDSCAPE IRRIGATION

02810.10 GENERAL

Submittals:

- Product Data: Required.
- Shop Drawings: Required.

02810.20 PRODUCTS

02810.21 MANUFACTURERS/PRODUCTS

Source: ________ Product ________ Model________

Pipe and Fittings: ABS solvent-weld sockets.
- Outlets: Rotary, Spray type sprinkler heads, emitters and bubblers.
- Controller: Automatic type, microprocessor solid state control with relay switches.

02810.30 EXECUTION

02810.31 INSTALLATION

Install pipe, valves, controls, and outlets in accordance with manufacturer's instructions.

02810.32 FIELD QUALITY CONTROL

Field Tests: Required.
Field Inspection: Required.

02810.33 SCHEDULES

Perimeter of Grassed Areas: Pop-Up half circle heads.
Corners of Grassed Areas: Pop-Up quarter circle heads.
Within grasses Areas: Pop-Up full circle heads.
Planters: Fixed square pattern head, and one emitter per 4sq. ft. of planter area.

02831 CHAIN LINK FENCES AND GATES

02831.10 GENERAL

Submittals:

- Product Data: Required.
- Shop Drawings: Required.
02831.10  QUALITY ASSURANCE

02831.20  PRODUCTS

02831.21  MANUFACTURERS/PRODUCTS
Fabric Size: CLFMI Standard Industrial, service.
Intermediate Posts: Round.
Terminal, Corner, Rail, Brace, and Gate posts: Round.

02831.22  ACCESSORIES/MIXES
Concrete: Type Specified in Section 03300.
Gate Hardware: Center gate-stop and drop-rod, Mechanical keepers; 180 degree gage hinges and hardware for padlock.

02831.23  FABRICATION
Shop/Factory Finishing: Galvanized.

02831.30  EXECUTION

02831.31  INSTALLATION
Install framework, fabric, accessories and gates in accordance with manufacturer’s instructions.
Set intermediate, terminal and gate posts in concrete footings with top of footing.
Fence Height: as indicated on Drawings.
Line Post Spacing: Maximum 10 feet on center.
Install gates with fabric to match fence.

02831.32  SCHEDULES
Property Perimeter: 6 feet high.
Fencing at transformer: 8 feet high.

02870  SITE AND STREET FURNISHINGS

02870.10  GENERAL
Submittals:
- Product Data: Required.
- Shop Drawings: Required.

02870.20  PRODUCTS
DIVISION 2 - SITEWORK

02870.21 MANUFACTURERS/PRODUCTS

Planters:
  Source: ______
  Products ________,
  Model ________,
  Size ________
  Finish ________

Benches:
  Source: ______
  Size: ________
  Finish ________

(__________):
  Source: ______
  Product: _______
  Model _________
  Size __________
  Finish __________

02870.30 EXECUTION

02870.31 INSTALLATION

Planter: Set plumb and level.

Benches: Attach to substrate with anchor bolts.

02870.32 SCHEDULES

On drawings.

02905 LANDSCAPING

02905.10 GENERAL

Warranty: Special Warranty against Death or Unhealthy Conditions: One year.

02905.20 PRODUCTS

02905.21 MANUFACTURERS/PRODUCTS

Sod: Nursery grown, machine cut grass sod; with strong fibrous root system; Kentucky Bluegrass type.

Trees, Plants and Ground Cover: Species and size identified in Plant Schedule.

02905.22 ACCESSORIES/MIXES

Topsoil: Excavated from site and reused.

Edging: Galvanized steel.

02905.30 EXECUTION
DIVISION 2 - SITEWORK

02905.31 INSTALLATION

Spread topsoil to a minimum depth of 6 inches.

Hydroseed evenly in two intersection directions. Immediately following seeding, apply agricultural mulch.

Lay sod with tight staggered joints.

Water seeded and sodded areas immediately after placement.

Set plants in pits or beds, partly filled with prepared topsoil mixture. Backfill with soil mixture. Saturate soil with water.

Mow grass at regular intervals. Water to prevent grass and soil from drying out.

02905.32 SCHEDULE On drawings