



**PUBLIC WORKS
STANDARD SPECIFICATIONS**

CITY OF HUDSON, WISCONSIN

2014

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Dated: November 27, 2013

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CITY OF HUDSON

QUALITY ASSURANCE

PRECONSTRUCTION CONFERENCE

1. A preconstruction conference shall be scheduled by the Engineer to ensure the understanding of and compliance with the approved Project Drawings and Specifications, and to discuss the schedule, methods, and means of construction and all other matters necessary to planning the Project work.
2. All pertinent parties shall attend or be represented, and specifically the Contractor's job site supervisor/foreman shall be in attendance.
3. At a minimum, the following items should be discussed at or received prior to the preconstruction conference:
 - Project Schedule - Submitted in bar chart form prior to the preconstruction conference for review and approval.
 - List of Subcontractors.
 - List of Material Suppliers.
 - List of Testing Companies.
 - Applicable Permits Required.
4. The locations of construction facilities, staging areas, product stockpiles, material storage, and temporary construction should be decided upon at the preconstruction conference and shall be removed upon completion of work.

COORDINATION BY CONTRACTOR

1. Coordinate scheduling and work of the various Sections of the Project Specifications to assure efficient and orderly sequence of installation of construction elements.
2. Cooperate with others performing work within and adjacent to the Project Site. Coordinate the sequence of the work of this Project and the use of Project space with the work of others as necessary to the efficient and orderly progress of the development of the Project Site as a whole.
3. Contractor and/or subcontractor shall have approved set of Drawings and Specifications on Project Site at all times during construction.

INSPECTION AND MATERIALS TESTING

1. Any work on Public Works infrastructure shall be witnessed by Public Works personnel, the City Engineer and/or authorized resident Project representative prior to acceptance by the City. Notify Public Works or City Engineer 48 hours prior to commencing construction.

2. All inspectors and lab technicians must be certified by the Wisconsin Highway Technician Certification Program, or supervised by approved personnel from City of Hudson.

DEVELOPER'S RESPONSIBILITY

1. The developer or the developer's engineer shall be responsible to furnish the City with the following:
 - As-built/record drawings (as outlined elsewhere in these standard Specifications).
 - Copies of recorded easements.
 - Copies of all applicable quality control and/or materials test results.
 - Statement saying construction was accomplished according to these approved Specifications.
 - Payment for all costs associated with inspection by the City Engineer.
 - Payment for all costs (i.e.: labor, materials, transportation, and lab) attributed to the proper methods and procedures involved with all applicable tests and punch lists/defective work notices.

PERMITS AND LICENSES

1. All permits and licenses necessary for the execution of the Project shall be secured by the Contractor prior to the commencement of work. Contractor shall also pay all public utility charges, governmental charges, and inspection fees associated with required permits and licenses.

PRIVATE UTILITIES

1. Contractor shall notify Digger's Hotline at 1 (800) 242-8511 prior to excavation for location of underground utility lines.
2. Notify local utility company personnel of schedule and sequence of work so that adequate control measures can be taken to locate and protect existing utility lines.
3. Cooperate with local utility company personnel in locating, moving, protecting, and working around in-place underground facilities.

PROJECT SITE MAINTENANCE

1. Contractor shall maintain stockpiles, excavations, access roads, and all other work areas free from dust. Contractor shall employ dust abatement techniques whenever a dust nuisance or hazard occurs, or as directed by Public Works personnel or the City Engineer. Comply with all local ordinances.
2. Protect hazardous work areas and hazardous material storage areas.
3. Protect trees, unless specifically indicated for removal on the Project Drawings.

4. Clean access roads and haul routes with mechanical street sweeper.
5. If Contractor fails to maintain Project Site, Public Works or the City Engineer will provide Written Notice of Contractor's defective work. Contractor will be given 24 hours from the Notice to clean Project Site. After the 24 hours, Public Works or City Engineer may correct and remedy the defective work with all associated costs incurred charged to Contractor.

CITY OF HUDSON

AS-BUILT/RECORD DRAWING REQUIREMENTS

Required For All Projects:

1. 2 "As-Built" Drawings stamped and signed as "RECORD DRAWINGS" by the Engineer.
2. 2 electronic files of Record Drawings in "AutoCAD.Dwg" format on CD's.
3. 2 copies of recorded easements.
4. Coordination of Final Project Inspection Summary Sheet (See copy at end of Section.).
5. For All Projects Not Funded By City: All as-built drawings must be submitted to City within 6 months of placement of final wear course. Failure to do so will result in the City Engineer completing the as-built drawings at the Developer's Expense.

WATER

Note any change in elevation from the Drawings.

Document any change in location of water main, hydrant, and valves.

Each service valve must have 2 or more swing ties. Swing ties should consist of permanent items above ground - hydrants, electric or telephone pedestals, streetlights, street signs, and mailboxes (if permanent). Sanitary manholes, storm manholes, and catch basins may also be used for swing ties.

The following documentation is required:

1. 2 copies of conductivity tests.
2. 2 copies of pressure tests.
3. 2 copies of bacteria tests.
4. Statement saying construction was accomplished according to these approved Specifications.
5. Payments for cost of inspections by City Engineer.
6. Payment for costs (i.e.: labor, materials, transportation, and lab) attributed to the proper methods and procedures involved with abandonment, installation, valving, flushing, conductivity tests, pressure tests, bacteria sampling, and punch lists.

7. Provide Certification of Compliance from the manufacturer certifying that the following products meet the respective requirements listed in 1.02:
 - A. DIP.
 - B. Fittings.
 - C. Valves.
 - D. Hydrants.
8. Elevations/Data Required for Record Drawings:
 - A. Hydrant top nut.
 - B. Curb stop top nut.
 - C. Gate valves (lid and lower operating nut).
 - D. 2 way swing ties to structures for water valves and curb stops.
 - E. Exploded views where needed for detail.

SANITARY SEWER

The following documentation is required:

1. As-Built elevations of the rim and invert of each manhole should be recorded. The percentage of grade between manholes should be changed accordingly.
2. Measure distance between manholes or verify cut sheet distances.
3. Record any change in service risers.
4. Record wye stations.
5. Statement saying construction was accomplished according to these approved Specifications.
6. Payments for cost of inspections by City Engineer.
7. Reports on Test Results Passing:
 - A. 2 copies of Televising report and video in DVD or USB/Jump Drive format. (1 copy provided to each, City and City Engineer).
 - B. 2 copies of Air Test.

- C. 2 copies of Mandrell (Deflection Test).
 - D. Verify – 1/4 inch per foot minimum (reference to proposed building or house pad assuring gravity flow to proposed building or house) service lateral and percent of fall from wye lateral to proposed house pad. Supply exact end location and elevation of services.
8. Elevations/Data Required for Record Drawings:
- A. Rims (MH's).
 - B. All inverts (MH's), including size and direction.
 - C. Structure tie-ins (MH's) 2 way swing.
 - D. Exploded views where needed for detail.
 - E. Supply exact end location and elevation of service lateral.

STORM SEWER

The following documentation is required:

1. As-Built elevations of the rim and invert of each manhole and catch basin shall be recorded. The percentage of grade between each structure should be changed accordingly.
2. Measure distance between manholes and other structure, or verify cut sheet distances.
3. Document existing ground profiles using pay shots from cut sheets for utility lines (sanitary and storm sewer) which are installed down lot lines.
4. Statement saying construction was accomplished according to these approved Specifications.
5. Payments for cost of inspections by City Engineer.
6. Elevations/Data Required for Record Drawings:
 - A. Rims (MH's, CB's, and CBMH's).
 - B. All inverts (MH's, CB's, CBMH's, FES's), including size and direction.
 - C. Emergency overflow elevation and structure.
 - D. Structure tie-ins (MH's, CB's, CBMH's, FES's).

- E. Exploded views where needed for detail.

STREETS

The following documentation is required:

1. Record any change in grade or alignment made during construction.
2. 2 Copies of All Lab Reports Passing For: Concrete, bituminous, and aggregates used in street for paving and utilities.
3. Core Streets: For proper depths, compactions, and conformity. Provide results to City and City Engineer.
4. Identify private utility street crossings.
5. Statement saying construction was accomplished according to these approved Specifications.
6. Payments for cost of inspections by City Engineer.
7. Elevations Required for Record Drawings: Curb in strategic locations (including but not limited to low points, high points, begin and end curves, begin and end curb returns).

SPECIAL STRUCTURES

The following documentation is required:

1. As-Built elevations of critical piping, slabs, etc.
2. Document any other changes which may have occurred from the original plan.

END OF SECTION



CITY OF HUDSON

FINAL PROJECT INSPECTION SUMMARY

PROJECT NAME _____ FILE NO. _____

DEVELOPER _____ CONTRACTOR _____

DESIGN ENGINEER _____ DATE _____

INSPECTOR _____ SIGNATURE _____

GENERAL PROJECT & MISC		DATE	INITIAL
<input type="checkbox"/>	Entire project constructed to stage indicated in plans and specs		
<input type="checkbox"/>	Site grades checked and approved		
<input type="checkbox"/>	Materials test results checked – All failures corrected		
<input type="checkbox"/>	All unacceptable work & cleanup items documented in inspection reports corrected & resolved		
<input type="checkbox"/>	Turf acceptably established (30-day growing period)		
<input type="checkbox"/>	As-built drawings submitted / Record Drawing requirements met		

SANITARY SEWER		DATE	INITIAL
<input type="checkbox"/>	Lines lamped, televised, and acceptable		
<input type="checkbox"/>	Mandrel test passed		
<input type="checkbox"/>	Air test passed		
<input type="checkbox"/>	Infiltration test passed		
<input type="checkbox"/>	Manhole structures properly constructed (casting & cover, rings set in a full bed of mortar, invert, final rim setting & build)		

WATER MAIN OR FIRE SERVICE		DATE	INITIAL
<input type="checkbox"/>	Entire system properly chlorinated & flushed		
<input type="checkbox"/>	Entire system pressure, conductivity, and bacteria tested		
<input type="checkbox"/>	All valve boxes accessible, plumb, set to grade, and keyed		
<input type="checkbox"/>	All valves opened or closed as appropriate		
<input type="checkbox"/>	All hydrants set to proper grade and verified operational		

SERVICES		DATE	INITIAL
<input type="checkbox"/>	All wye locations confirmed		
<input type="checkbox"/>	All curb boxes exposed, plumb, set to grade, keyed, and marked with steel fence post		
<input type="checkbox"/>	All curb stops opened or closed as appropriate		

STORM SEWER		DATE	INITIAL
<input type="checkbox"/>	Lines lamped and acceptable		
<input type="checkbox"/>	Manhole and catch basin structures properly constructed (casting & cover, rings set in a full bed of mortar, invert, final rim setting & build)		
<input type="checkbox"/>	Aprons, FES's, Dissipaters, and riprap properly installed		

STREETS		DATE	INITIAL
<input type="checkbox"/>	Materials tests passing – {concrete compressive strength, slump, & air content} {bituminous extraction, gradation, & density} {gravel base gradation & density} {subgrade density}		
<input type="checkbox"/>	Utility structures and lines clear & free of debris& gravel		
<input type="checkbox"/>	Signs & pavement markings in place		
<input type="checkbox"/>	All conc. and bit. work in compliance (curb & gutter, driveways, sidewalks, and ped. Ramps)		
<input type="checkbox"/>	Street lights installed and operational		

**Public Works Department
Technical Specifications**

**City of Hudson
Wisconsin**

November 27, 2013



**DNR Approval Number for Sanitary Sewer: S-2013-0587
Approval Date: December 2, 2013**

DIVISION 1
GENERAL REQUIREMENTS

SECTION 01 55 26

TRAFFIC CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Construction Staging and Traffic Control Plan.

1.02 RELATED SECTIONS

- A. Conditions of the Contract, Supplemental Conditions of the Contract, and other Sections of Division 1 - General Requirements apply to this Section.

1.03 REFERENCES

- A. State of Wisconsin Department of Transportation "Standard Specifications for Highway and Structure Construction" - latest edition including all current supplements (WisDOT).
 - 1. 643 – Traffic Control.
- B. "Traffic Controls for Construction and Maintenance Operations," Part VI of the Wisconsin Manual on Uniform Traffic Control Devices (MUTCD) - latest edition.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 TRAFFIC CONTROL

- A. Furnish, install, and maintain in proper order all traffic control devices needed to guide, warn, control, and protect traffic throughout the Project Site. All traffic control devices and other protective measures shall conform to Wisconsin MUTCD.
- B. Remove and dispose of all traffic control devices at the conclusion of the Project
- C. Maintain traffic to local residents at all times, except as outlined below.
- D. If and where required, flaggers and how they are used shall conform to the requirements set forth in the Manual on Uniform Traffic Control Devices.

3.02 RESTRICTION OF TRAFFIC

- A. Traffic shall be maintained on the roads in accordance with the provisions of WisDOT Spec. 643 and the following:
 - 1. Traffic shall be maintained on all areas of this Project.
 - 2. The County and the City reserve the right to modify these time restrictions or to impose other restrictions as may be necessary to safely provide for traffic.

3.03 TRAFFIC WARNING DEVICES

- A. The Contractor shall furnish, install, maintain, and remove all warning signs, including advance construction area signing, as required by his sequence of construction or as otherwise required. All signs shall conform to the Manual on Uniform Traffic Control Devices. All warning signs shall be of the type and size shown in the Drawings or required by the sequence of construction and all letters, spacing, borders, dimensions, materials, and other sign details shall be as specified in WisDOT Standard Signs Manual. All signs shall be of metal, either steel or aluminum. All sign and device sheeting shall conform to Standard No. 2, Encapsulated Lens (High Intensity Reflective Sheeting). All safety drums and barricades shall be anchored with enough sand bags to prevent wind from shifting the traffic control devices. All sand bags shall be at ground level. No hand-lettered signs will be approved for traffic control use. All barricades shall conform to the MUTCD.

3.04 SEQUENCE OF CONSTRUCTION AND TRAFFIC CONTROL

- A. Within 10 days following the approval of the Contract, the Contractor shall provide the Engineer with a planned sequence of construction and traffic control clearly outlining the sequence of operations, streets closed or restricted during any stage of construction, provisions for routing any detoured traffic as permitted, and specific signs and other traffic control devices to be utilized if different than the staging shown in the Drawings. All sequences of construction shall reflect the following conditions:
 - 1. The Contractor shall provide a method of protecting traffic from open excavation areas. All areas of excavation shall be backfilled at the end of each work day or protected by fence and barricades.
 - 2. The Contractor shall prosecute his work in a manner which will allow access to all areas within the Project by fire and police departments. If the Contractor cannot maintain access to any property, he shall notify the Engineer as soon as possible prior to any work in that vicinity and no work

shall commence that would impede access until the Engineer has given approval to proceed.

- 3 The Engineer will determine the viability of any planned sequence revisions and may accept, reject, or suggest alterations to the planned sequence. The Contractor may not begin any construction operations without complete approval of the planned sequence of construction by the Engineer.

The Contractor may request changes to the planned sequence of construction at any time. No change or deviation will be permitted without approval of the Engineer. If the Contractor wishes to revise the traffic control shown on the Drawings, he shall submit a complete, revised Traffic Control Plan to the Project Engineer. All such requests shall be made in writing at least 7 days before the signing for this stage would be put into effect. No such change shall be implemented without the written approval of the Project Engineer. The Engineer shall be contacted 24 hours prior to any changes in traffic control so he/she may oversee the changes.

3.05 INSPECTION OF DEVICES

- A. Prior to the start of any construction operations that necessitate lane closures or internal traffic control signing that is the Contractor's or subcontractor's responsibility, the Contractor shall make available for inspection (prior to the installation) his proposed method of traffic control and all traffic control devices to be furnished and used by the Contractor in order to insure conformance with the Manual on Uniform Traffic Control Devices and the WisDOT Standard Sign Manuals. The Contractor shall modify his proposed traffic control methods and/or traffic control devices as deemed necessary by the Engineer.

3.06 INPLACE SIGNS

- A. The Contractor shall not remove any traffic control signs, except as authorized by the Engineer. Signs and posts authorized for removal necessitated by construction shall be carefully removed and stored by the Contractor or delivered to the County or City as directed by the Engineer. Actual replacement costs will be assessed the Contractor for all signs or posts that are damaged or lost. Where it is necessary to remove "Stop" or prohibition signs on roads open to traffic, the Contractor shall provide qualified flagmen as necessary until such time as the signs are reinstalled or as otherwise directed by the Engineer.

Signs which must be removed along roads which are open to traffic and which are necessary for proper warning or regulation of traffic shall be relocated or mounted temporarily to the satisfaction of the Engineer.

All signs not being replaced as part of this Contract or being reinstalled by others shall be reinstalled by the Contractor in compliance with the Manual on Uniform Traffic Control Devices, unless otherwise directed by the Engineer.

3.07 MAINTENANCE

- A. The Contractor shall be responsible for the immediate repair or replacement of all traffic control devices which become damaged, moved, or destroyed; of all lights which cease to function properly; and of all barricade weights which are damaged, destroyed, or otherwise fail to stabilize the barricades. The maintenance of the traffic control devices shall be the responsibility of the Contractor and shall be continuous throughout the term of the Contract, including periods of suspension. The traffic control devices shall be checked at least twice daily, including once at the end of the work day, for proper alignment, proper visibility, and reflectively. The check shall include immediate correction of deficiencies. At least 1 night time inspection shall be made each week. The Contractor should document daily inspection dates and times to be furnished upon request to the Engineer.

The Contractor shall keep all traffic control signs and devices furnished by him in a legible condition. This shall include but not be limited to removing any grime deposited on any traffic control devices by traffic, construction, or natural causes. The Contractor shall supply, position, and maintain all of the traffic control devices as shown on the Drawings and described herein. The Contractor will be required to respond to any call from the County or City for maintenance of traffic control devices within 2 hours from the time of notification. The Contractor shall provide a means of receiving calls for maintenance on a 24 hour a day basis throughout the term of the Contract. The Contractor shall furnish the names, addresses, and phone numbers of at least 2 local individuals responsible for traffic control devices to:

The Engineer.
The St. Croix County Sheriff.
The Hudson Public Works Departments.

If the barricades and warning signs are not properly installed or maintained, the Engineer and/or City of Hudson reserve the right to properly arrange them and deduct twice the daily unit cost thereof from any monies due the Contractor.

For any disruption of traffic due to traffic signal construction, the Contractor shall notify the following at least 48 hours in advance of such disruptions:

- | | | |
|----|--------------------------------|-----------------|
| 1. | The Engineer | (651) 636-4600. |
| 2. | St. Croix County Sheriff | (715) 386-4701. |
| 3. | Hudson Public Works Department | (715) 386-4767. |
| 4. | Hudson Police Department | (715) 386-4771. |

3.08 OPEN EXCAVATION

- A. All open excavations in excess of 2 inches in depth adjacent to the pavement shall be delineated with warning lights at a minimum of 50 foot intervals or as directed by the Engineer. In order to further warn traffic of construction adjacent to the traveled roadway, the Contractor shall furnish, erect, and maintain barricades with appropriate warning signs and warning lights attached at each work area or at intervals not to exceed 1/4 mile or as directed by the Engineer. The sign shall have the message "NO SHOULDER," "LOW SHOULDER," or "SOFT SHOULDER," whichever is appropriate.

3.09 PARKING

- A. The parking of Contractor's or workmen's vehicles within the limits of the construction area in a manner that interferes with the parking of local residents will not be permitted.

The parking of Contractor's vehicles that obstruct any traffic control device will not be permitted.

3.10 MATERIALS, STORAGE, AND DEBRIS

- A. The Contractor shall not deposit materials, store materials, or park equipment on or alongside any roadway open to traffic if it in any way interferes with the safe flow of traffic, nor shall they be placed within the "clear zone" as determined by the Engineer and as defined by AASHTO's 1977 "Guide for Selecting Locations and Designing Traffic Barriers," unless adequately protected by a traffic barrier.

The Contractor shall keep the "open to traffic" sections of roadway free from debris, dirt, etc. at all times. The Contractor shall provide such protective devices as may be necessary to protect traffic and pedestrians from all hazards of drop-offs and openings of any nature from falling objects, splatter, and other hazards which may exist during construction operations.

3.11 PEDESTRIAN TRAFFIC

- A. The Contractor shall provide all signs, barricades, flashers, snow fence, and other means to protect his work and to protect pedestrians using the area abutting his work.

3.12 FIELD QUALITY CONTROL

- A. Provide a person on a daily basis to inspect and insure that all traffic control devices required by the construction are in accordance with the Manual on Uniform Traffic Control Devices. Any discrepancy between the actual devices in use and the required devices shall be immediately rectified.

3.13 CLEANING

- A. Keep all traffic control signs and devices in a legible condition. This shall include but not be limited to removing grime and dust deposited on any device by traffic or natural causes or when request by the Engineer.

3.14 MEASUREMENT AND PAYMENT

- A. A Bid Item has been provided for Traffic Control. Measurement will be Lump Sum and shall be compensation in full for all traffic control signs and devices furnished by the Contractor to complete the work in Part 1 through Part 5 of the Bid Form. This includes daily maintenance of all devices.
- B. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

SECTION 01 57 13

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Temporary measures to control soil erosion and sedimentation.

1.02 RELATED SECTIONS

- A. Section 31 23 00 – Excavation and Fill.

1.03 REFERENCES

- A. State of Wisconsin Department of Transportation "Standard Specifications for Highway and Structure Construction" - latest edition including all current supplements (WisDOT):

- 1. 628 - Erosion Control.

- B. Wisconsin DNR Storm Water Management Technical Standards.

1.04 SEQUENCING AND SCHEDULING

- A. Install silt fence prior to starting any construction operation, which might cause any sedimentation or siltation.

- B. Contractor is responsible for the establishment of permanent turf to prevent excessive soil erosion.

- C. Remove silt fence installations after the site has become stabilized and turf is developed to the extent that future erosion is unlikely:

- 1. Any ridge or depression left as a result of fence removal will be appropriately repaired and restored.

- 2. Materials remaining after removal shall become the property of the Contractor and shall be disposed of off the Project Site.

- D. Furnish and apply water for dust control and compaction within the Project Site as necessary. This shall include application of water on weekends and holidays if necessary, as determined by Public Works or the City Engineer.

PART 2 - PRODUCTS

2.01 SILT FENCE

A. Machine Sliced Silt Fence:

1. Geotextile Fabric: Monofilament/tape (vertical/horizontal respectively) or Monofilament/Monofilament Geotextile with the following physical properties:
 - a. Grab Tensile Strength (ASTM D4632): 130 lb.
 - b. Flow Rate (ASTM D4491): 100 gal/min/sq. ft.
 - c. Apparent Opening Size (ASTM D4751): #30 – 40 sieve.
 - d. Width: 36 inches.
 - e. Ultraviolet Resistance (ASTM D4355): 70 percent.
 - f. Furnish geotextile with protective wrapping to protect the fabric from ultraviolet radiation and abrasion due to shipping and handling.
2. Posts: Standard steel fence posts weighing not less than 1.33 pounds per lineal foot. Minimum length 30 inches plus burial depth.

B. Standard Silt Fence:

1. Geotextile Fabric: Woven wire fabric with the following physical properties:
 - a. Grab Tensile Strength (ASTM D4632): 100 lb.
 - b. Apparent Opening Size (ASTM D4751): #20 – 70 sieve.
 - c. Width: 36 inches.
 - d. Ultraviolet Resistance (ASTM D4355): 70 percent.
 - e. Furnish geotextile with protective wrapping to protect the fabric from ultraviolet radiation and abrasion due to shipping and handling.
2. Posts: 2 inch x 2 inch wood.

2.02 EROSION BALES

- A. Conforming to WisDot Spec. 628.
- B. All bales shall be either bound with wire or tied with nylon string.
- C. Hardwood stakes shall be 1-1/2 inch x 1-1/2 inch x 36 inches.

2.03 TEMPORARY ROCK CONSTRUCTION ENTRANCE

- A. 2 inch size (minimum) washed river rock.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Silt Fence:

1. Install silt fence in accordance with the appropriate provisions of WisDOT Spec. 628.3.4.
2. Silt fences will be installed in the locations shown on the Drawings and according to the manufacturer's specifications.
3. If the silt fence is longer than 600 feet, it shall be constructed in separate independent units, with each unit having a length less than 600 feet. All splices shall be avoided whenever possible. If necessary, splices will be made at a fence post and according to the manufacturer's specifications.

- B. Storm Sewer Inlets:

1. Install and construct erosion control methods at catch basins according to Detail Plate ERO-3 through ERO-6.

- C. Temporary Rock Construction Entrance:

1. Rock construction entrance shall be installed in locations shown on the Drawings.
2. Rock construction entrance shall be constructed before grading begins on the Project Site.
3. Inspect rock construction entrance regularly for mud accumulation. Remove and replace contaminated rock as directed by the Engineer.

- D. Erosion Bales:

1. Install bales in accordance with the appropriate provisions of WisDOT Spec. 628.3.

3.02 MAINTENANCE

- A. Comply with recommended practices as described in the "Wisconsin DNR Storm Water Management Technical Standards" and as follows:

1. Contractor is responsible for inspection, maintenance, and repair of any washouts or accumulations of sediment that occur as a result of the grading or construction. Restoration consists of grade repair, turf reestablishment, and street sweeping of mud and debris tracked from the Project Site.
2. Contractor is responsible for the maintenance and repair of all temporary erosion control devices.
3. Inspection of all erosion control items will take place immediately after each runoff event and at least daily during prolonged rainfall. Any required repairs shall be made immediately.

3.03 MEASUREMENT AND PAYMENT

- A. A Bid Item has been provided for Silt Fence. Measurement will be along the base of the fence from outside to outside of the end posts for each section of fence. Payment will constitute compensation in full for all work and cost to furnish and install. Maintenance of Silt Fence will be considered incidental.
- B. A Bid Item has been provided for Protection at Catch Basins. Measurement for either street or non-street Catch Basin Protection shall be each in accordance with Detail Plates ERO-3 and ERO-6.
- C. Dust Control: No separate measurement, this work is incidental to other items of the Project.
- D. Cleaning Sediment: No separate measurement, this work is incidental to other items of the Project.
- E. A Bid Item has been provided for Temporary Rock Construction Entrance. Measurement will be by the ton of rock acceptably placed.
- F. A Bid Item has been provided for Temporary Ditch Checks. Measurement will be by the linear foot.
- G. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

DIVISION 2
EXISTING CONDITIONS

SECTION 04 41 13

SELECTIVE SITE DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Complete or partial removal and disposal or salvage of at grade, above grade and below grade structures and miscellaneous items.

1.02 RELATED SECTIONS

- A. Section 31 23 00 – Excavation and Fill.

1.03 REFERENCES

- A. State of Wisconsin Department of Transportation “Standard Specifications for Highway and Structure Construction” – latest edition including all current supplements (WisDOT)
 - 1. 2104 – Removing Pavement and Miscellaneous Structures.

1.04 DEFINITIONS

- A. Remove: To take away or eliminate from the Site by any method selected by the Contractor, including disposal of material.
- B. Salvage: To dismantle, disassemble, or remove carefully without damage so the item can be re-assembled, replaced, or reused in a workable condition equal to that existing before removal.
- C. Abandon: To fill, bulkhead, or close off pipes and structures so that no settlement or flow can occur.

1.05 REGULATORY REQUIREMENTS

- A. Conform to WisDOT Section 204, with the following modifications:
 - 1. Dispose of all materials designated for removal outside the Site at locations selected by Contractor.
 - 2. Stockpile or temporarily store materials designated for salvage at locations provided by Contractor.

1.06 SCHEDULING

- A. Prior to starting Work, submit for review by the Engineer and approval by the Owner, a schedule showing the commencement, order, and completion dates of the various parts of this Work.
- B. Fill holes or depressions resulting from removal or salvage immediately.
- C. Provide temporary surface restoration for traffic continuity where removal or salvage operations are completed within streets, driveways, or parking lots.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 GENERAL

- A. Dispose of all items removed, except for those items identified to be salvaged or recycled. Said disposal shall be in accordance with all laws, regulations, statutes, etc.
- B. Perform removal work without damage to adjacent retained work. Where such Work is damaged, the Contractor shall patch, repair, or otherwise restore same to its original condition at no expense to the Owner.
- C. Remove debris from the work area as often as necessary, but not less than at least once at the end of each workday. Debris shall be placed in approved containers to prevent the spread of dust and dirt.
- D. Execute the Work in a careful and orderly manner with the least possible disturbance to the public and occupants of buildings.
- E. Fill holes resulting from removals consistent with Section 02315.

3.02 EXAMINATION

- A. Meet with owners of signs to determine requirements for salvage, storage, and replacement.
- B. Develop plan acceptable to Engineer and postal service for maintaining mail service. Temporary relocations of mailboxes will be necessary.

3.03 PROTECTION

- A. Take all necessary precautions to adequately protect personnel and public and private property in the areas of Work. All Site fencing shall be in place prior to the start of any removal work.
- B. All street signs, traffic control signs, guy wires, mailboxes, posts, wood fence, etc. which may interfere with construction shall be removed, stored safely, and replaced.
- C. Approved barriers or warning signs shall be provided as necessary.
- D. Provide and maintain temporary protection of existing structures designated to remain where removal work is being done, connections made, materials handled, or equipment moved.
- E. Do not close or obstruct walkways or roadways. Do not store or place materials in passageways or other means of egress. Conduct operations with minimum traffic interference.
- F. Take reasonable precautions to limit damage to existing turf.
- G. Holes or depressions created by removals shall not be left open for more than 1 day. Any hole within 10 feet of sidewalks shall be filled, suitably marked, or covered immediately.
- H. Avoid disturbance to any material beyond the limits required for new construction.

3.04 SAWING PAVEMENT

- A. Concrete Pavement: Saw along the removal line to a depth of 1/3 of the thickness of the concrete prior to breaking off the pavement.
- B. Bituminous Pavement: Saw along the removal line to a minimum depth of 3 inches prior to breaking off the pavement.

3.05 REMOVE CONCRETE PAVEMENT

- A. Remove in accordance with WisDOT Section 204.3.2.2, except as modified below.
- B. Sawcut concrete pavement and concrete base prior to mechanical pavement removal equipment. Remove concrete in such a manner that the remaining pavement is not damaged.
- C. Prior to restoring trench areas, the edges of the trench shall be trimmed back to a vertical face on a straight line which is parallel with the centerline of the trench.

3.06 REMOVE BITUMINOUS PAVEMENT, PATH, DRIVEWAY

- A. Remove in accordance with WisDOT Section 204.3.2.2, except as modified below.
- B. Sawcut bituminous pavement at the removal limits prior to that removal, unless otherwise approved by the Engineer.
- C. Prior to restoring trench areas, the edges of the trench shall be trimmed back to a vertical face on a straight line which is parallel with the centerline of the trench.

3.07 REMOVE CURB AND GUTTER

- A. Sawcut at removal limits.
- B. Concrete Curb and Concrete Curb and Gutter: Do not disturb any material beyond the limits required to form for new construction (assumed 12 inches maximum from the back of new Work and 6 inches beyond the edge of new driveways).

3.08 PAVEMENT MILLING

- A. Bituminous:
 - 1. Sawcut at removal limits prior to milling process.
 - 2. Mill bituminous surface to the depth specified as shown on the Drawings or as directed by the Engineer.
- B. Concrete:
 - 1. Mill surface to the depth specified as shown on the Drawings or as directed by the Engineer.

3.09 REMOVE CONCRETE SURFACING

- A. Work includes sidewalks, pedestrian ramps, medians, and driveways.
- B. Sawcut concrete surfacing prior to removal.
- C. Remove concrete in such a manner that the remaining surfacing is not damaged.
- D. When removing existing sidewalks, the Contractor shall not disturb any material beyond the limits required for new construction (assumed as 6 inches maximum beyond and 8 inches maximum below existing grade).
- E. When removing existing driveways, the Contractor shall not disturb any material beyond the limits required to form for new construction (assumed 12 inches

maximum from the back of new Work and 6 inches beyond the edge of new driveways).

- F. Prior to restoring trench areas, the edges of the trench shall be trimmed back to a vertical face on a straight line which is parallel with the centerline of the trench.

3.10 REMOVE BITUMINOUS SURFACING

- A. Work includes pathways and driveways.
- B. Sawcut bituminous surfacing to full depth at the limits of partial removal prior to that removal, unless otherwise approved by the Engineer.
- C. Remove bituminous in such a manner that the remaining surfacing is not damaged.
- D. Prior to restoring trench areas, the edges of the trench shall be trimmed back to a vertical face on a straight line which is parallel with the centerline of the trench.
- E. When removing existing pathways and driveways, the Contractor shall not disturb any material beyond the limits required to form for new construction (assumed 12 inches maximum from the back of new Work and 6 inches beyond the edge of new driveways).

3.11 REMOVE MANHOLES AND CATCHBASINS

- A. Remove casting and cone section of structures a minimum of 3 feet below final grade.
- B. Knock holes in lower section of manhole and fill cavity with granular material.

3.12 REMOVE SECTIONS OF EXISTING PIPE

- A. Pipes to be abandoned shall be bulkheaded with brick, non-shrink concrete grout, or concrete block masonry 8 inches thick at the upstream ends, at the downstream ends that connect to catch basins, manholes, and at locations as determined by the Engineer.
- B. Pipe to be abandoned shall be filled with suitable material as directed by the Engineer.
- C. Pipe to be abandoned shall be removed if the top of pipe is within 3 feet of final surface elevation.

3.13 REMOVE RETAINING WALL

- A. Avoid damage to sections of wall to remain.

- B. Dispose of materials off Site at a predetermined location.
- C. Remove wall in its entirety, including footings and tiebacks.

3.14 SALVAGE AND REINSTALL

A. Signs:

1. In no case shall a traffic sign or street sign be removed or disturbed by Contractor without prior notification being given to Engineer and then only after satisfactory arrangements have been made for a temporary installation or its disposition:
 - a. Street identification signage shall be maintained at all times due to its importance to the 911 Emergency Response System.
2. Remove and salvage all posts, A-frame angle brackets, stringers, as well as the nuts, bolts, and washers.
3. Exercise reasonable care against damage to in-place signs during storage and installation.
4. Remove signs damaged during construction and replace with new signs.

B. Mailboxes:

1. Remove and salvage existing mailboxes that interfere with the Work or whose access is restricted by the construction activities.
2. Place at temporary locations as directed by Engineer or as shown on Drawings.
3. Removal, temporary re-installation, and replacement shall occur such that mail delivery is not interrupted.
4. Reinstall in locations as shown on Drawings or as directed by Engineer.
5. Mailboxes, posts, and appurtenances damaged during construction shall be replaced with new at no charge to Owner.

C. Fences:

1. Salvage and store fence and post material where they are in conflict with the Work.

2. After completion of Work, reinstall fence to the condition existing prior to removal.
3. Install temporary snow fence or similar barrier at the end of the working day while the permanent fence is removed.

D. Culverts and Flared End Sections:

1. Where possible, salvage existing pipe in areas to be disturbed by the construction.
2. Reinstall in original condition and location as shown on the Drawings.
3. If requested by the Owner, deliver salvaged material to Owner's Maintenance Facility.

3.15 FIELD QUALITY CONTROL

- A. Items damaged during removal or salvaging operations shall be replaced with new material of equal type and quality of the damaged item when it was new.

3.16 DISPOSING OF MATERIAL

- A. Dispose of all materials outside of the Site at disposal location selected by Contractor in compliance with state and local regulations. Burying of material and debris is not allowed within the Site.

3.17 MEASUREMENT AND PAYMENT

- A. Bid Items have been provided for removal items. Payment at the Bid Unit Price will be considered compensation in full for all Work necessary to complete the Bid Item in full, including removal, salvage, storage, disposal, and reinstallation.
- B. Measurement will be based upon the units as listed below for items removed, abandoned, or salvaged complete as specified. No measurement will be made of any removals that are not required. The actual quantity removed multiplied by the appropriate Bid Unit Price will be compensation in full for all Work and costs of the following Bid Items:
1. Sawing Concrete Pavement: Per lineal foot along the saw cut line as staked.
 2. Sawing Bituminous Pavement: Per lineal foot along the saw cut line as staked.
 3. Remove Bituminous Pavement: Per square yard without regard to thickness, including integral bituminous curb.

4. Remove Concrete Pavement: Per square yard without regard to thickness.
 5. Remove Concrete Sidewalk: Per square foot without regard to thickness.
 6. Remove Concrete Base: Per square yard without regard to thickness, including integral concrete curb and gutter.
 7. Remove Concrete Curb and Gutter: Per lineal foot of the type specified.
 8. Remove Concrete Driveway Pavement: Per square yard without regard to thickness.
 9. Remove Hydrant: Per each.
 10. Remove Catch Basin or Manhole: Per each.
 11. Remove Wall: Per square yard, measured to existing ground level.
 12. Remove Pipe: Per lineal foot of the type specified, measured from center of junction fittings, catch basins, or manholes, and will include the length of any aprons.
 13. Salvage and Reinstall Fence: Per lineal foot of the type specified.
 14. Salvage and Reinstall Culvert: Per lineal foot of the type specified.
 15. Salvage and Reinstall Flared End Section: Per each of the size specified.
 16. Bulkheading and abandoning of existing pipe will be incidental.
 17. Salvage and reinstall signs and mailboxes will be incidental.
- C. All other Work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

DIVISION 26
ELECTRICAL

SECTION 26 05 05

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. References used in Division 26 - Electrical.
- B. Regulatory requirements for electrical construction.
- C. Requirements of equipment and materials.
- D. Workmanship.

1.02 RELATED SECTIONS

- A. Conditions of the Contract, Supplemental Conditions, and Division 1 – General Requirements Sections apply to all work of Division 16 - Electrical.
- B. Section 01 29 00 – Price and Payment Procedures.
- C. Section 01 33 00 – Submittal Procedures.

1.03 REFERENCES

- A. ANSI - American National Standards Institute:
 - 1. C2 - National Electrical Safety Code.
 - 2. C62.41-IEEE - Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- B. ICEA - Insulated Cable Engineers Association:
 - 1. S-95-658 - Thermoplastic-Insulated Wire and Cable.
 - 2. S-65-375 – Rubber-Insulated Wire and Cable.
- C. NECA - National Electrical Contractors Association:
 - 1. NECA 1 – Standard Practices for Good Workmanship in Electrical Contracting.
- D. NEMA - National Electrical Manufacturers Association:

1. TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
 2. PB 2 - Deadfront Distribution Switchboards.
 3. 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
 4. WC 5 – (See ICEA S-95-658).
 5. WC 7 – (See ICEA S-95-658).
- E. OSHA - Occupational Safety and Health Administration:
1. 29 CFR 1910 – Occupational Safety and Health Standards.
- F. UL - Underwriters Laboratories, Inc.:
1. UL 6 - Rigid Metal Conduit.
 2. UL 83 - Thermoplastic - Insulated Wires and Cables.
 3. UL 467 – Electrical Grounding and Bonding Equipment.
 4. UL 486D – Insulated Wire Connector Systems for Underground Use or in Damp or Wet Locations.
 5. UL 651 - Schedule 40 and 80 Rigid PVC Conduit.
 6. UL 891 - Dead-Front Switchboards.
 7. UL 1029 - High-Intensity-Discharge Lamp Ballasts.
 8. UL 1572 - High Intensity Discharge Lighting Fixtures.

1.04 REGULATORY REQUIREMENTS

- A. All work performed under this Contract shall conform to the latest editions of the National Electrical Code (NFPA70), the National Electrical Safety Code (ANSI C2), and the Wisconsin State Building Code.

1.05 INSTRUCTIONS AND PARTS LITERATURE

- A. Instruction and parts literature is generally packed with electrical equipment and devices. Contractor shall remove this literature from the packing container or equipment enclosure, identify the literature with the equipment to which it applies, and file the literature in loose-leaf binders with index tabs. Each binder shall have an index which lists each piece of equipment and the literature which applies to it. An index tab shall be provided for each piece of equipment.

1.06 SUBMITTALS

- A. Shop drawings shall be submitted with Contractor's stamp of approval as specified in Section 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS

- A. All equipment and materials shall be provided as specified in Division 26 - Electrical Sections and Section 8 of the Conditions of the Contract.
- B. All equipment and materials shall be new and shall bear the Underwriters Laboratories (UL) label if such products are listed by UL.
- C. Where applicable, equipment and materials shall conform to ANSI, ICEA, IEEE, and NEMA standards.

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. All work shall be performed in a neat and workmanlike manner consistent with the high quality standards of the electrical trade. "A neat and workmanlike manner" shall be as required by NFPA 70, Section 110-12; and shall conform to NECA 1, Standard Practices for Good Workmanship in Electrical Contracting. Each electrician shall be knowledgeable and well-trained in the particular tasks to be performed.

3.02 IDENTIFICATION

- A. Nameplates shall be used to identify all field devices, such as disconnect switches, breakers, contactors, service entrance panels, etc.
- B. All nameplates shall be engraved phenolic nameplates attached with stainless steel screws or a permanent stamped brass tag.

3.03 RECEIVING AND STORING EQUIPMENT

- A. All equipment shall be handled and stored in accordance with the manufacturer's instructions.
- B. In general, equipment packaging is not designed to protect the contents for outdoor storage. As a minimum, Contractor shall store the equipment prior to installation in a clean, dry location free from excessive temperatures, humidity, or foreign materials normally encountered at a Project Site. If the storage facility is unheated,

Contractor shall provide heating to protect control equipment from condensation, which could cause electronic components to corrode or to be otherwise damaged.

3.04 ALTERNATE

- A. Refer to Section 0129 00 – Price and Payment Procedures for a description of work to be performed under the Alternate.

3.05 MEASUREMENT AND PAYMENT

A. Mobilization:

- 1. Measurement shall be Lump Sum for Mobilization. Payment at the Bid Unit Price shall be full compensation necessary to complete the work. The total sum shall not exceed the original Contract amount, regardless of the fact that the Contractor may have shut down work on the Project and/or moved equipment away for the Project and back again.

- B. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

SECTION 26 05 19

WIRES AND CABLES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. 600 volt wire and cable.
- B. Terminals and connectors.
- C. Installation.
- D. Splices and terminations.
- E. Identification.

1.02 SUBMITTALS

- A. Product data sheets shall be submitted for all wire and cable.

PART 2 - PRODUCTS

2.01 600 VOLT WIRE

- A. Feeder and Branch Circuit Wire:
 - 1. Stranded copper conductor, solid copper for lighting and convenience receptacle circuits only.
 - 2. XHHW insulation.
- B. Control Wire:
 - 1. #14 AWG, 7 or 9 strand copper.
 - 2. THWN or XHHW insulation.
 - 3. Solid color.
- C. Insulation of all wire shall conform to ICEA S-95-658, NFPA 70, and UL-83.
- D. All Wire and Cable Shall Be:
 - 1. New and coiled or on reels.

2. Each coil and/or reel shall have a label with the manufacturer's name, trade name of wire, size of wire, and UL label.

2.02 TERMINALS AND CONNECTORS

- A. Tool compressed terminals and connectors shall be made of 1 piece seamless highly conductive copper with a uniform tin-plate coating to minimize corrosion; Burndy, 3M, or equal.
- B. Step-down adapters shall be copper compression type; Greaves PT-R Series, or equal.
- C. Electrical spring connectors shall be 3M “Scotchlok” or “Ranger,” Ideal “Wing-Nut,” or equal.
- D. Fork Terminals:
 1. Vinyl or nylon self-insulated locking type.
 2. Terminal insulation that supports wire insulation.
 3. Thomas & Betts Type FL, Burndy Type TP-LF, Panduit Type PNF, 3M Type MNG, or equal.
- E. Waterproof kits shall be utilized for all outdoor below-grade splices and connections as follows:
 1. Heavy wall, heat shrinkable with interior coating of hot melt adhesive – sealant. Tubing shall be chemically cross linked, thermally stabilized polyolefin.
 2. UL listed (UL 486D).
 3. 3M – ITCSN, or approved equal.

2.03 WIRE COLOR CODING

- A. Contractor may use color coding at his discretion, except for the following colors which shall be used only as designated below for both power and control circuits:
 1. Control Circuits:
 - a. Dark Blue - Direct current circuits.
 - b. Light Blue - Intrinsically safe conductors.
 - c. Green - Grounding conductor.
 - d. White - Neutral conductor.

2. Power Circuits (Use solid colors through Size No. 8 AWG. Use black conductors with tape color identification No. 6 AWG and larger):

	<u>Voltage</u>	<u>120/240</u>	<u>208Y/120</u>	<u>480Y/277</u>
a.	Phase A	Black	Black	Brown
b.	Phase B	Red	Red	Orange
c.	Phase C		Blue	Yellow
d.	Neutral	White	White	Gray
e.	Ground	Green	Green	Green

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All wire shall be installed in the specified raceways. Wire pulling shall be performed through the system in such a manner as to not exceed the maximum tensile strength of the cable being pulled as allowed by the NFPA 70 and/or cable manufacturer. All handling and installation of wire and cables shall be done by competent and skilled workmen who shall use methods which will prevent damage to the wire and cable. Pulling compound shall dry to a fine lubricating non-conductive powder and shall be approved by the cable manufacturer.
- B. Adequate measures shall be employed to determine that the raceways are free of foreign material and moisture before pulling wire or cable.
- C. Any conductor used for equipment grounding purposes shall be green in color, unless it is bare. Conductors with white or green covering shall not be used to indicate other than neutral or grounding. This limitation applies to all power and control circuits.
- D. Conductors shall be without splice from termination to termination, unless indicated otherwise on the Drawings.

3.02 SPLICES AND TERMINATIONS

- A. All splices, taps, and terminations shall be made with tool compressed connectors. Contractor shall provide all wire connectors, lugs, and terminals, unless indicated otherwise.
- B. Bolted compression lugs furnished as an integral part of the equipment shall be used to terminate the conductors to that equipment.
- C. Motor leads shall be connected with tool-compressed ring terminals which are bolted together, insulated with varnished cambric tape, and protected with an over-wrap of 3M No. 33, or approved equal weather resistant tape, or protected with

Raychem MCK motor connection kit. Electrical spring connectors may be used to connect motor leads to #12 or #10 AWG branch circuit conductors.

- D. Electrical spring connectors shall be used for splices and taps in lighting and 120 volt receptacle circuits.
- E. Every bolt, lug, and screw termination shall be tightened with a torque wrench or torque screwdriver to the torque values specified in UL Standards and/or as specified by the device manufacturer.

3.03 MEASUREMENT AND PAYMENT

A. Wire:

- 1. Measurement shall be by the linear feet between end terminals along the centerline of each type and size of wire installed. Payment at the Bid Unit Price shall be full compensation for furnishing and installation of all materials, including:
 - a. The wire as specified, splicing materials, terminals, and equipment required for making connections.
 - b. Installation of the underground wire as specified, including splicing, pulling, making required connections, and testing.
 - c. All other miscellaneous items required for a complete installation of the underground wire

- B. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

SECTION 26 05 26

GROUNDING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. A grounding electrode system shall be provided for the service entrance.
- B. System and equipment grounding shall be provided as shown on the Drawings and as specified herein.

1.02 RELATED SECTIONS

- A. Section 26 27 00 - Service Entrance.
- B. Section 26 08 00 - Testing and Commissioning.

1.03 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. UL 467 - Electrical Grounding and Bonding Equipment.

PART 2 - PRODUCTS

2.01 WIRE

- A. Class B stranded copper; either bare or with green insulation.
- B. Size shall be as specified herein and/or as shown on the Drawings.

2.02 GROUND RODS

- A. 5/8 inch x 10 feet copperweld.

2.03 CONNECTORS AND TERMINATORS

- A. Tool-compressed connectors and lugs which are UL listed (UL 467); Burndy "Hyground," Thomas & Betts 53,000 Series, or approved equal.
- B. Bar taps for connection to bus bars which are UL listed (UL 467); Burndy Type QGFL, or approved equal.
- C. Exothermic welding components; Continental Industries "Thermoweld," Erico Products "Cadweld," or approved equal.

- D. Ground clamps shall be cast brass or bronze, UL listed (UL E10661); American Electric GC, Thomas & Betts CTG102, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The Power Company will provide grounding electrodes at the transformer and make the connections from the grounding electrode to the transformer neutral.
- B. The Power Company's transformer neutral shall be connected to the service entrance panel ground bus with the grounding conductors provided with the service entrance phase conductors.
- C. Contractor shall provide 1 grounding electrode (ground rod) at the service entrance panel as shown on the Drawings. The grounding electrode system shall be connected to the neutral bus and the ground bus of the service entrance panel in accordance with NFPA 70, Articles 250.24 and 250.32.
- D. An equipment grounding conductor shall be installed with each feeder circuit and the lighting branch circuits. Conductor shall be connected to the equipment ground bus or to the enclosure if there is no ground bus.

3.02 SPECIAL REQUIREMENTS

- A. Contractor shall determine if there are any other special grounding requirements for equipment furnished on this Project and shall provide grounding as specified by the manufacturer.

3.03 SPLICES AND TERMINATIONS

- A. In general, splices and terminations of the grounding electrode system shall be brazed, shall be exothermic welded, or shall be made with tool-compressed fittings.
- B. Connections to bus bars or equipment enclosures shall be made with tool-compressed lugs which are bolted to the equipment or with bar taps.
- C. Connections to ground rods shall be exothermic welded. Provide adapter sleeves as required for #6 AWG conductors or smaller.

3.04 TESTING

- A. The ground resistance of each grounding electrode shall be measured before it is connected to the grounding electrode system. A ground resistance measurement shall be made of the grounding electrode system for the service entrance panel. A ground measurement shall be made of the complete grounding system after all grounding conductor terminations have been made.

- B. Ground resistance measurements shall be made as specified in Section 16950 – Testing and Commissioning.

3.05 MEASUREMENT AND PAYMENT

- A. Ground Rods:

- 1. Ground rods and wiring to ground rods shall be considered as incidental to lighting unit, service panels, and etc.

- B. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

SECTION 06 05 33

RACEWAYS AND FITTINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Conduit.
- B. Conduit fittings.
- C. Underground warning tape.

1.02 SUBMITTALS

- A. Product data sheets for each type of conduit shall be submitted.

PART 2 - PRODUCTS

2.01 RIGID METAL CONDUIT

- A. Steel:
 - 1. Galvanized inside and outside.
 - 2. NFPA 70, Article 344.
 - 3. UL Listed.

2.02 RIGID METAL CONDUIT FITTINGS

- A. Threaded couplings and fittings only; no set screw, gland type, or split fittings.
- B. Grounding type insulated bushings; O-Z/Gedney Type BLG, or equal.
- C. Insulated bushings; Midwest Electrical Mfg. Co., O-Z/Gedney Type B, or equal.
- D. Sealing locknuts; Midwest Electrical Mfg. Co., RACO, or equal.
- E. Expansion Fittings:
 - 1. 4 inch conduit movement.
 - 2. External bonding jumper.

- F. Pull Fittings (C, LB, etc.): Clamp type, stamped covers with gaskets and stainless steel screws and clamps.
- G. Conduit Hubs:
 - 1. Full contact type with sealing "O" ring.
 - 2. Myers "Scru-tite," or equal.
- H. Material: Fittings, hubs, etc. shall be galvanized steel for galvanized steel conduit and copper free aluminum for aluminum conduit.
- I. Corrosion Resistant Coatings: All rigid metal conduit installed underground or in contact with concrete shall be painted with 1 coat of Carboline Carbocryllic 120 (for both steel and aluminum conduit), or equal, as a pre-treatment followed by 2 coats of Carboline Bitumastic 300M, or coated with 3M Scotchrap Pipe Primer, and wrapped with 3M Scotchrap Corrosion Protection Tape.

2.03 RIGID NONMETALLIC CONDUIT AND FITTINGS

- A. EPC-40-PVC and EPC-80-PVC for Type II and Type III applications.
- B. Sunlight resistant.
- C. NEMA TC2.
- D. NFPA 70, Article 352.
- E. UL Listed.
- F. Carlon, CertainTeed, or approved equal.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Galvanized steel core.
- B. Built-in continuous copper ground in 1/2 inch through 1-1/4 inch.
- C. PVC jacket.
- D. NFPA 70, Article 350.
- E. UL listed.
- F. Amer-Tite Type UL, Anamet Anaconda Sealtite Type U.A., Electri-Flex Liguatite Type L.A., or equal.

- G. Connectors:
 - 1. Grounding ferrule and insulated throat.
 - 2. Appleton STB, Crouse-Hinds LTB, Midwest Electric LTB, or equal.

2.05 UNDERGROUND WARNING TAPE

- A. 6 inches wide, 4 mil polyethylene film.
- B. Vivid, opaque, long-lasting red color with bold, black letters.
- C. Lettering:
 - 1. Top line – “...CAUTION CAUTION CAUTION...”
 - 2. Bottom line – “...ELECTRIC LINE BURIED BELOW...”
- D. Seton Name Plate Corp. No. 210 ELE, EMED Co. Stock No. UT27737-6, or equal.

2.06 CONDUIT CLAMPS

- A. Conduit clamps for rigid metal conduit shall be malleable iron, 1 hole clamps with malleable iron clamp backs; Crouse-Hinds MW500 Series, Raco 1303/1324, Appleton CL75M/600M, or equal.

PART 3 - EXECUTION

3.01 CONDUIT INSTALLATION

- A. Conduit size shall be as shown on the Drawings or as required by the NFPA 70 with a minimum size of 3/4 inch, except that 1/2 inch may be used to connect to devices which have a knock-out or fitting for only 1/2 inch conduit. All raceways shall be installed in accordance with NECA 1, Standard Practices for Good Workmanship in Electrical Contracting, and as specified herein.
- B. Expansion fittings shall be installed where the length of straight run requires it.
- C. All conduits shall be kept dry and free of water or debris with pipe plugs or caps.
- D. Conduit terminations to terminal boxes, cabinets, and enclosures shall have double locknuts and insulated bushings. External locknuts shall be sealing locknuts.
- E. All conduits which enter major equipment, such as the service entrance switchboard and motor control centers, shall have grounding type insulating bushings.

- F. Conduit terminations to outdoor or below ground NEMA 3R, 4, and 4X terminal boxes, pull boxes, cabinets, and enclosures shall use full contact hubs.
- G. Liquidtight flexible metal conduit shall be used to connect from the rigid conduit system to equipment and devices if a rigid connection is improper or impractical.
- H. Underground conduit runs shall have a minimum cover of 2 feet and shall be rigid nonmetallic conduit, unless noted otherwise:
 - 1. Conduit shall be sloped to drain to handholes or pull boxes.
 - 2. Rigid metal conduit shall be used for the vertical elbow and riser out of the ground.
 - 3. Rigid metal conduit installed underground or in contact with concrete shall have a corrosion resistant coating or covering.
- I. Contractor shall do all trenching for underground conduit with a minimum size trench. 3 inches of sand shall be placed below and above buried conduit in trench. All fill material shall be placed in 12 inch lifts and compacted to 90 Percent Standard Proctor Density. Underground warning tape shall be laid in the trench approximately 9 inches below the surface.
- J. A nylon pull cord shall be installed in each empty conduit.
- K. Only raceway types which are specified herein shall be used.
- L. The roadway, sidewalk, or grade beneath which conduit is routed shall be restored to its original or better condition.

3.02 MEASUREMENT AND PAYMENT

- A. Conduit
 - 1. Measurement shall be by the linear feet between end terminals along the centerline of each type and diameter of conduit installed. Payment at the Bid Unit Price shall be full compensation for furnishing and installation of the conduit, including:
 - a. Conduit as specified, conduit sleeves, couplings, weatherheads, elbows, bushings, internal wiring, underground warning tape, terminals and connectors, fastening hardware, sealing around the conduit where it enters a pull box, and sealing conduit ends in concrete foundations and in pull boxes.
 - b. Installation of the conduit as specified.
 - c. Grounding and bonding of the conduit.
 - d. Trenching, jacking, and augering.

- e. Backfilling and restoring sod, sidewalks, pavement, and any other surface restoration.
 - f. Traffic control.
 - g. Rental equipment.
 - h. All other miscellaneous items required for a complete installation of the light bases.
- B. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

SECTION 26 08 00

TESTING AND COMMISSIONING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. All equipment checks, adjustments, tests, and system energization shall be performed as specified below. If any test specified will void the warranty of any equipment to be tested, the Engineer shall be notified and further instructions received before proceeding with the test.
- B. The following items shall be tested:
 - 1. Grounding system resistance.
 - 2. Receptacle outlets.
- C. When the work is complete, a final inspection will be made and the Contractor shall demonstrate that all equipment and systems conform to the Drawings and Specifications.

1.02 RELATED SECTIONS

- A. Bidding Requirements, Contracting Requirements, and Division 1 – General Requirements Specification Sections apply to all work of Division 26 - Electrical.

1.03 QUALIFICATION OF PERSONNEL

- A. All personnel responsible for testing and commissioning equipment as a part of this Project shall be specially trained for the tasks they are to perform.
- B. Personnel operating test equipment shall have had previous training and experience in using the equipment and shall be thoroughly familiar with the equipment capabilities and limitations.
- C. All tests shall be made by or under the direct supervision of service personnel who are factory-trained in the application and operation of the device being tested.
- D. Evidence of the experience of test personnel in the form of certificates of training or other acceptable documentation shall be made available upon request of the Engineer.

- E. The Engineer reserves the right to require the Contractor to provide different test personnel if those performing the tests do not demonstrate competency in their work.

1.04 SCHEDULING AND REPORTING

- A. All tests shall be scheduled 48 hours in advance with the Engineer and shall be conducted in his presence or the presence of his representative. Test results shall be tabulated neatly and legibly on the test forms, which are included at the end of this Section and which are available from the Engineer. Any other report forms shall be submitted for approval at least 4 weeks before tests are made. Test reports shall include the pertinent readings or observations, a description of the method used, and a list of the equipment employed.
- B. If the materials or equipment fail under test, the test reports shall include the following:
 - 1. Pertinent readings or observations made up to the point of failure.
 - 2. Any abnormal readings.
 - 3. Any data which might indicate the cause of failure.
 - 4. The cause of the failure, if determined.
 - 5. Corrective measures taken.
- C. In all cases of test failure, the Contractor shall demonstrate that the corrective measures proposed are adequate before making any repairs, adjustments, or replacements.
- D. 6 copies of all test reports shall be submitted to the Engineer within 24 hours after completion of the test. In addition, 1 complete set of test reports shall be included in each Operation and Maintenance Manual.

1.05 TESTING EQUIPMENT

- A. Testing equipment used for a given test shall be recommended by the manufacturer for that particular test and shall be approved by the Engineer.
- B. Ground resistance measurements shall be made with a 3 terminal, null balance instrument that has an accuracy of +/- 2 percent of full scale reading of selected range, and which provides direct reading down to 0.5 ohm; AEMC Model 3640, AVO (Megger) Catalog No. DET62D, or approved equal. Approved Alternates are the AEMC Model 3711 and the AMPROBE Catalog No. AMPDGC1000 clamp-on ground testers.

C. Voltage and current measurements shall be made with a true RMS instrument, which has an accuracy of ± 1 percent of full scale. Scale shall be selected so that the reading is not less than one-half scale.

D. All test equipment shall be provided by the Contractor.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 INSPECTION

A. All equipment shall be given a thorough visual inspection by the installer to detect insofar as possible any loose or erroneous connections, damaged components, the presence of foreign objects or materials, poor workmanship, incorrect rating of protective devices, or other abnormal conditions.

B. Every bolted or screwed connection or terminal with a torque rating shall have a torque wrench or torque screwdriver applied to assure tightness before any equipment is energized. This shall apply to both factory made and field made connections and terminations. Any problem or damage resulting from a faulty connection or termination shall be the responsibility of the Contractor.

C. Covers shall be installed on all pull boxes, junction boxes, and raceway fittings before the final inspection.

3.02 GROUND RESISTANCE MEASUREMENTS

A. The resistance of each ground rod shall be measured with a 3 terminal connection. Another measurement shall be made after all ground connections are made.

3.03 RECEPTACLE TESTS

A. After the system is energized, each receptacle shall be checked with a receptacle tester to verify proper connection of the hot, neutral, and grounding conductors.

3.04 MEASUREMENT AND PAYMENT

A. Testing:

1. Testing shall be considered as incidental to lighting units, service entrance panels, and etc.

B. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

GROUND RESISTANCE TEST REPORT

GENERAL	Project:	File Number:	Date:
	Contractor:	Inspector:	Tested By:
	Equipment Name:		Location:
	Manufactured By:		Serial Number:
	Auxiliary Device:		Manufacture Check:
EQUIPMENT	Test Method		
	_____ 3-Terminal Connection		_____ Other (Specify)
	Potential Electrode		Current Electrode
	Type:		Type:
	Distance:		Distance:
Measured Resistance			
Ohms:			
TEST SET	Manufacturer:		Type:
REMARKS	Acceptance Criteria (Spec. Standard)		

END OF SECTION

SECTION 26 07 00

SERVICE ENTRANCE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Service Entrance Panel.
- B. Meter Socket.
- C. Installation.
- D. Testing and Commissioning.

1.02 RELATED SECTIONS

- A. Conditions of the Contract, Supplemental Conditions, and Division 1 – General Requirements Sections apply to all work of Division 26 - Electrical.

1.03 REFERENCES

- A. ANSI C62.41 - IEEE Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- B. NEMA PB 2 - Deadfront Distribution Switchboards.
- C. NFPA 70 - National Electrical Code.
- D. UL 891 - Dead-Front Switchboards.

1.04 SUBMITTALS

- A. Drawings submitted for approval of the service entrance panel shall include the following information:
 - 1. Detailed top, front, and end views.
 - 2. Outline dimensions, including weights.
 - 3. Electrical line diagrams and schematics.
 - 4. Metering and other wiring diagrams.
 - 5. Component device and material lists.

6. Time-current curves for the circuit breakers and fuses.
7. Nameplate entries and schedules.
8. Features and accessories furnished to meet Specification requirements.
9. Cable access and exit areas, termination spaces, pull boxes.

PART 2 - PRODUCTS

2.01 EQUIPMENT RATINGS (Applicable to all products specified herein, unless noted otherwise)

- A. Voltage: 120/240 volt, 1 phase, 3 wire, 60 Hz.
- B. Amperage: 100 amp.
- C. Fault Current Available: 22,000 amp, RMS symmetrical fault at rated voltage.

2.02 SERVICE ENTRANCE PANEL

- A. Enclosure:
 1. NEMA 4X enclosure.
 2. Hinged door with hasp and meter seal provisions.
 3. Provide provisions for mounting to a wood pole.
 4. Dimensions which comply with NFPA 70.
 5. Neutral bar for service entrance cables, grounding electrode conductor, and load cables.
 6. American Midwest Power, Inc., Electro-Mechanical Industries, Inc., States Electric Mfg. Co., or approved equal.
- B. Circuit Breakers:
 1. Thermal magnetic, molded case circuit breakers.
 2. Service entrance rated as required.
 3. Operating mechanisms shall be with provisions for padlocking in the open position.

4. Open type for mounting in an enclosure.
 5. Circuit breaker shall be Cutler-Hammer, General Electric, Siemens, Square D, or approved equal.
- C. Laminated Plastic Nameplates:
1. Nameplates shall have 1/2 inch white lettering on a black background.
 2. Nameplates shall be provided to identify all devices that extend thru the door or are visible with the door closed.
- D. Photo Electric Cell:
1. Light level selector to adjust activation.
 2. Time-delay activation and de-activation.
 3. SPST contacts rated 15 amps tungsten or 8.3 amps ballast at 120 Vac.
 4. 1/2 inch male thread for mounting.
 5. Intermatic K4100, Tork 2100, or approved equal.
- E. Lighting Contactor:
1. 600 volt electrically held.
 2. Ampere rating and number of poles per the Drawings.
 3. NEMA 1 enclosure or open type if mounted in enclosure with other components.
 4. Cutler-Hammer CN35, General Electric CR360L, Square D Class 8903 Type S, or approved equal.
- F. Single Pull Double Throw Switch:
1. Grounding.
 2. Double-throw Ctr-OFF momentary contact.
 3. 15 amp.
 4. 1/2 HP – 120 V 2 HP – 240 V – 277 V.
 5. Termination on back and side.

6. Gray in color.
7. UL certification.
8. Industrial grade.
9. Type FS or FD copper-free aluminum cast device boxes for all surface mounted small boxes.
10. Surface mounted switches and receptacles in FS or FD cast device boxes shall have a stamped aluminum cover, Appleton, or approved equal, or a gasketed, cast plate, Crouse-Hinds Feraloy, or approved equal.
11. Leviton 1256 Series, or equal.

G. Receptacle:

1. Specification grade, 3 wire grounding type.
2. Side wired.
3. Rated 20 amperes, 125 volts.
4. Gray color.
5. Eagle 5362, General Electric GE 4108, Hubbel 5362, Leviton 5362, Pass & Seymour 5342-I, or approved equal.
6. Type FS or FD copper-free aluminum cast device boxes for all surface mounted small boxes.
7. Surface mounted switches and receptacles in FS or FD cast device boxes shall have a stamped aluminum cover, Appleton, or approved equal, or a gasketed, cast plate, Crouse-Hinds Feraloy, or approved equal.

2.03 METER SOCKET

- A. Power company approved meter socket.

2.04 WEATHERHEAD

- A. Utility approved weatherhead.

2.05 WOOD POLE

- A. Utility approved wood pole.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install service entrance equipment as shown on the Drawings.
- B. The neutral leads from the service transformer shall be connected to the service entrance panel ground bus.
- C. Coordination of Work with the Utility:
 - 1. Contractor responsible for all coordination with the utility with regard to the service connection.
 - 2. Provide and install riser up wood pole, whether-head, wiring, grounding, meters socket, panels,
 - 3. Install items furnished but not installed by the utility, i.e. meter.

3.02 TESTING AND COMMISSIONING

- A. All equipment shall be tested in the presence of the Engineer and all operations proved satisfactory.

3.03 MEASUREMENT AND PAYMENT

- A. Service Entrance Panel:
 - 1. Measurement shall be by each type of Service Entrance Panel installed. Payment at the Bid Unit Price shall be full compensation for furnishing and installation of the service cabinets, including:
 - a. Service Entrance Panel as specified, circuit breakers, laminated plastic nameplates, photo electric cell, lighting contactor, switch, receptacle, service entrance riser, grounding equipment, and mounting hardware.
 - b. Installation of the service cabinet as specified.
 - c. All other miscellaneous items required for a complete installation of the service cabinet(s).
- B. Meter Socket:
 - 1. Meter socket shall be considered as incidental to the Service Entrance Panel.

- C. Whether-Head:
 - 1. Whether-head shall be considered as incidental to the Service Entrance Panel.

- D. Wood Pole:
 - 1. The wood pole shall be considered as incidental to the Service Entrance Panel.

- E. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

SECTION 26 56 19

LIGHTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. A Complete Lighting System Consisting of the Following:
 - 1. Luminaires, including lamps.
 - 2. Luminaire ballasts as required.

1.02 RELATED SECTIONS

- A. Section 33 05 05 – Trenching and Backfill.

1.02 REFERENCES

- A. FCC - Federal Communications Commission.
- B. NFPA 70 - National Electrical Code.
- C. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
- D. OSHA - Occupational Safety and Health Administration.
- E. UL 1029 - Ballasts, High-Intensity Discharge Lamp.
- F. UL 1572 - Lighting Fixtures, High-Intensity - Discharge.

1.03 SUBMITTALS

- A. Product cut sheets with specified features highlighted for each luminaire.
- B. Product photometric data for each luminaire which is not listed in the Specifications or which does not have prior approval.

PART 2 - PRODUCTS

2.01 LUMINAIRES

- A. Traditional acorn shaped luminaire with the following features:
 - 1. One (1) 100W metal halide lamp.

2. Multi-tap (120, 208, 240, 277 volt) high power factor ballast.
3. Plug-in electrical modules.
4. Molded thermal resistant borosilicate glass refractor and top reflector mounted within decorative aluminum ribs and banding. A top glass reflector shall redirect 50 percent of the upward light to the controlling refractor while allowing a soft uplight component to define the traditional acorn shape of the fixture. Provide a stainless steel hinge and latch for re-lamping. The lower refractor uses precisely molded prisms to maximize pole spacing while maintaining uniform illuminance. IES Type III distribution shall be provided.
5. The housing and door shall be cast aluminum.
6. Finish shall be a polyester powder paint applied after a seven stage pretreatment process. Finishes shall be green in color.
7. UL listed.
8. Trim shall be ribs and band with a hinged top.
9. Standard finial.
10. Finial and trim shall be gold.
11. Pole:
 - a. The lighting post shall be all aluminum, 1 piece construction, with a hexagonal fluted and tapered base design.
 - b. The base shall be heavy wall, cast aluminum produced from certified ASTM 356.1 ingot per ASTM B179-95a or ASTM B26-95. The straight shaft shall be extruded from aluminum, ASTM 6061 alloy, heat treated to a T6 temper. The tapered shaft shall be extruded from aluminum, ASTM 6063 alloy, spun to a tapered shape, then heat treated to a T6 temper. All hardware shall be tamper resistant stainless steel. Anchor bolts to be completely hot dip galvanized.
 - c. The post shall be a direct burial type base.
 - d. 4 inch diameter fluted shaft 12 feet tall.
 - e. The color shall be dark green.
 - f. All pole installations shall be capable of withstanding the forces produced by 90 mph winds with a 1.3 gust factor and the total number of luminaires required per pole.

12. Holophane PT12F/18FB-CA-GVU100DMHMTN3RSG, or approved equal.
- B. City Standard – Specification grade luminaire for parking areas, office parks and walkways with the following features:
1. One (1) 250W high pressure sodium lamp.
 2. Multivolt (120, 208, 240, 277 volt) high power factor ballast.
 3. Flat Lens
 4. Arm Mount.
 5. Horizontal Type III Distribution.
 6. Specular, anodized aluminum reflectors.
 7. The housing and door shall be cast aluminum.
 8. Finish shall be a polyester powder paint finish. Finishes shall be dark bronze in color.
 9. UL listed.
 10. Pole:
 - a. The lighting post shall be single piece, multi-sided 201L stainless steel with 6' mast.
 - b. Standard anchor base, 304L stainless steel.
 - c. Sixteen sided shaft 35 feet tall.
 - d. Millerbernd 16-SDA-6-350
 - e. Breakaway bases shall be Transpo Industries Pole-Safe Model 4100.
 - f. All pole installations shall be capable of withstanding the forces produced by 90 mph winds with a 1.3 gust factor and the total number of luminaires required per pole.
 11. Hubbell (Spaulding Lighting) CM-A-S25-H3-F-Q-DB-L, including adaptor sleeves.
- C. Alternate to City Standard – Specification grade luminaire for parking areas, office parks and walkways with the following features:
1. Prior approval from Public Works Staff required.
 2. One (1) 250W high pressure sodium lamp.

3. Multivolt (120, 208, 240, 277 volt) high power factor ballast.
4. Flat Lens
5. Arm Mount
 - a. Aluminum arm
 - b. 6' distance from center of pole to end of arm.
 - c. 2'-6" arm rise, 2'-0" rise from top of pole.
 - d. Mounted to pole with an extruded aluminum split clamp.
 - e. Flagpoles, Inc FPEA.
6. Horizontal Type III Distribution.
7. The housing and door shall be cast aluminum.
8. Finish shall be a polyester powder paint finish. Finishes shall be dark bronze in color.
9. UL listed.
10. Pole:
 - a. The lighting post shall be tapered alluminum tube "D" Wall Alloy 6063-T6.
 - b. Standard anchor base, Alloy 356-T6.
 - c. Circular shaft 30 feet tall.
 - d. FlagPoles, FPEA352375-6C-30-4.5-WISDOT
 - e. Speeds greater then 40mph
 - i. Breakaway bases shall be Transpo Industries Pole-Safe Model 4100.
 - f. Speeds less then 40mph
 - i. Breakaway bases shall be Transpo Industries Pole-Safe Model 4100.
 - ii. Breakaway bases shall be Akron Foundry Co. TB2-17".
 - g. All pole installations shall be capable of withstanding the forces produced by 90 mph winds with a 1.3 gust factor and the total number of luminaires required per pole.
9. GE MDCL-25-s-0-H-1-F-MC3-1-U

2.02 BALLASTS

- A. High Pressure Sodium and Metal Halide Ballasts:
 1. High power factor (90 percent or higher).

2. Minimum starting temperature of -20° F.
3. Crest factor not greater than 1.7.

2.03 LAMPS

A. High Pressure Sodium:

1. Medium or mogul base reflector or non-reflector as required by luminaire.
2. Wattage as specified in the luminaire description.
3. Color temperature 2000 K.
4. Shall have a minimum Color Rendering Index (CRI) of 21 (or greater).
5. Philips, or pre-approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. In general, luminaires shall be located where shown on the Drawings.
- B. Lenses, refractors, and glassware shall be clean and free from cracks or chips. All reflectors, shades, luminaire bodies, etc. shall be free from dents and scratches, thoroughly cleaned, and properly aligned before installation is accepted by the Owner. All exposed tags and labels other than UL shall be removed.
- C. Pole erection and mounting shall be done according to pole manufacturer's recommendations.

3.03 IDENTIFICATION

- A. Each pole shall be identified on the inside of the handhole cover with the number shown on the Drawings.

3.02 MEASUREMENT AND PAYMENT

A. Lighting Units:

1. Measurement shall be by each luminaire and pole installed. Payment at the Bid Unit Price shall be full compensation for furnishing and installation of the Lighting Units, including:

- a. Installation of the Lighting Units as specified, including the luminaire, lamps of the specified wattage, ballast, pole and bracket, conductors between pole base and fixtures, and the numbering of the light standards.
 - b. Installation of the Lighting Units and poles as specified.
 - c. Bonding and grounding materials and connections.
 - d. All other miscellaneous items required for a complete installation of the Lighting Units, including but not limited to removing rocks and replacing them when the installation is complete.
- B. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

DIVISION 31
EARTHWORK

SECTION 31 23 00

EXCAVATION AND FILL

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Excavation and fill for roadways, foundations, channels, ponds and other areas.

1.02 RELATED SECTIONS

- A. Section 01 57 13 – Temporary Erosion and Sediment Control.
- B. Section 31 23 13 – Subgrade Preparation.
- C. Section 33 05 05 – Trenching and Backfilling
- D. Section 23 13 14 – Concrete Walks, Medians, and Driveways.

1.03 REFERENCES

- A. State of Wisconsin Department of Transportation "Standard Specifications for Highway and Structure Construction" - latest edition including all current supplements (WisDOT).

1.04 SUBMITTALS

- A. Submit the following items consistent with Section 01 33 00:
 - 1. Gradation tests for borrow materials.

1.05 DEFINITIONS

- A. The definitions of the different classifications of excavation and borrow material shall conform to WisDOT Spec. 205.2, or as modified herein:
 - 1. Grading Grade: Bottom of the aggregate base as shown on the Drawings.
 - 2. Common Excavation: In locations where the design cross-section is in a cut section, common excavation shall be classified as all excavation below the grading grade. In areas where the design cross-section is in a fill section, common excavation shall consist of excavation below topsoil stripping.
 - 3. Subgrade Excavation: Excavation and removal of soft and unstable soils within an established rough graded section.

4. Rock Excavation: Includes rocks exceeding 1 cubic yard that are not decomposed, weathered, or shattered, and which require blasting, barring, wedging, or use of air tools for removal. Also included are any boulders, concrete, or masonry structure (except concrete pavement, curb, gutter, and sidewalk).

1.06 QUALITY ASSURANCE

- A. Assist testing laboratory by excavating for density tests. Assist testing laboratory with obtaining material samples.

1.07 SEQUENCING AND SCHEDULING

- A. Perform excavation as soon as possible after sewer and water construction.
- B. Complete subgrade for streets, driveways, walks, and parking lots immediately after trench backfill and compaction.
- C. Complete finish grading of turf areas within 5 calendar days after backfill.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Granular Backfill:
 1. Conform to WisDOT Spec. 209.2.2, Grade 2.

PART 3 - EXECUTION

3.01 GENERAL

- A. Conform to the following:
 1. Establish traffic control prior to excavations.
 2. Establish the specified erosion control devices according to Section 01570 – Erosion and Sediment Control prior to all excavations.
 3. Notify utility companies of progress schedule so they can accomplish relocations, removals, and holding of lines.
 4. Strip topsoil in all areas required prior to performing any excavation.

3.02 PREPARATION OF EMBANKMENT

- A. Conform to WisDOT Spec. 207.3, or as modified herein:

1. Engineer's approval is required of all areas where preparation work has been performed prior to the placement of the embankment or fill material.
2. Where embankment is to be constructed over locations where the foundation material is unstable, the foundation shall be excavated to remove all or part of the unstable material.
3. Use selected borrow material for upper portions of subgrade where subgrade excavation areas are performed.

3.03 EXCAVATION OPERATIONS

A. Conform to WisDOT Spec. 205.3 and 208.3, or as modified herein:

1. Perform excavations to grade as shown on the Drawings.
2. Excavation of unstable material below grade shall be done under the direction of the Engineer as the subsurface conditions are disclosed.
3. Remove marsh excavation material by utilizing a backhoe so as to minimize disruption to the bottom of the excavation.
4. Notify Engineer immediately of any large boulders or ledge rocks encountered so proper measurement or profile can be made for pay quantities.
5. No solid rock will be allowed within 8 inches of the subgrade.
6. Provide and maintain temporary drainage facilities until permanent facilities are completed.
7. After the roadway excavation is complete and prior to backfilling operations, notify the Engineer 24 hours in advance so all excavation areas can be cross-sectioned to determine quantities.
8. Cut, fill, and grade Project Site to elevations and contours shown on the Drawings, with allowances for pavements, topsoil, and structures.

3.04 DISPOSITION OF EXCAVATED MATERIAL

A. Conform to WisDOT Spec. 205.3, or as modified herein:

1. Strip topsoil prior to any excavation.
2. Stockpile topsoil at a location on Project Site.

3. Excavated material not used for embankments shall be disposed of off Project Site or as directed by the Engineer.

3.05 PLACING EMBANKMENTS

- A. Conform to WisDOT Spec. 207.

3.06 COMPACTING EMBANKMENTS

- A. Conform to WisDOT Spec. 207.3.6, or as modified herein:
 1. Compaction required for embankment materials shall conform to Special Compaction with the testing location and rates being determined by the Engineer.

3.07 FINISH OPERATIONS

- A. Conform to WisDOT Spec. 211, or as modified herein:
 1. Finish grading of granular backfill for subgrade prior to placement of an aggregate base course shall conform to the following tolerances:
 - a. Not vary by more than 0.05 feet above or below the prescribed elevation at any point where a measurement is made.
 2. Finish grading of grading grade prior to placement of granular backfill shall conform to the following tolerances:
 - a. Not vary by more than 0.10 feet above or below the prescribed elevation at any point where a measurement is made.
 3. Grading of the soils beneath the proposed topsoil shall be reviewed and approved by the Engineer prior to the start of the topsoil placement.

3.08 MEASUREMENT AND PAYMENT

- A. A Bid Item has been provided for Common Excavation. Measurement will be by volume of material in its original position, based on cross sections performed by the Engineer, and computed by the average end area method using the original and final cross sections.
- B. A Bid Item has been provided for Subgrade Excavation. Measurement will be by volume of material removed below the grading grade in its original position, based on cross sections performed by the Engineer and computed by the average end area method using the original and final cross sections.

- C. A Bid Item has been provided for Sidewalk Excavation. Measurement will be by the cubic yards of material removed to the subgrade.
- D. A Bid Item has been provided for Granular Backfill. Measurement will be by the ton of material compacted in place as determined from weight tickets delivered to the Engineer.
- E. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

SECTION 31 23 13

SUBGRADE PREPARATION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Grading, shaping, and compacting subgrade prior to placing a base or surface course.

1.02 RELATED SECTIONS

- A. Section 31 23 00 – Excavation and Fill.
- B. Section 32 11 23 – Aggregate Base Course.

1.03 REFERENCES

- A. State of Wisconsin Department of Transportation "Standard Specifications for Highway and Structure Construction" - latest edition including all current supplements (WisDOT):
 1. 205 – Roadway and Drainage Excavation.
 2. 207 – Embankment.
 3. 211 – Preparing the Foundation.

1.04 SEQUENCING AND SCHEDULING

- A. Subgrade preparation shall be performed if subgrade excavation is not required.
- B. Subgrade preparation shall be performed prior to placement of the aggregate backfill material if excavation and rough grading of subgrade is not performed under this Contract.
- C. Subgrade preparation shall be performed on the existing gravel base prior to placement of additional gravel base material.
- D. Subgrade preparation shall be performed prior to placement of the concrete curb and gutter.
- E. Subgrade preparation shall be performed prior to placement of the bituminous/aggregate base course.

- F. Complete subgrade for streets, driveways, walks and parking lots immediately after installation of pipe as part of trench backfill and compaction.

PART 2 – PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 GENERAL

- A. Subgrade preparations shall be performed to produce the required density, grade, and cross-section.

3.02 PREPARATION

- A. Inspection of subgrade by test rolling:
 - 1. The equipment used for test rolling shall be a Tandem Truck with a gross weight of 45,000 pounds.
 - 2. The roadbed will be considered unstable if yielding and rutting is greater than 1-1/2 inch.

3.03 COMPACTION

- A. Conform to WisDOT Spec. 207.3.6.3, or as modified herein:
 - 1. For the Specified Density Method, the Engineer will sample and test the soils to determine the Maximum Density and Optimum Moisture.
 - 2. Compact the subgrade to 95 percent of the determined Maximum Density when more than 3 feet below the final grade. Compact the subgrade to 100 percent of the determined Maximum Density when less than 3 feet below the final grade.
 - 3. Density and moisture tests will be taken on the compacted subgrade at the location and testing rates designated by the Engineer. Nuclear density testing shall be considered an approved method.

3.04 FINISH OPERATIONS

- A. Subgrade Tolerance:
 - 1. Not vary by more than 0.05 feet above or below the prescribed elevation at any 1 point where a measurement is made.

3.05 MEASUREMENT AND PAYMENT

- A. A Bid Item has been provided for Subgrade Preparation. Measurement shall be by the units of square yards and shall be based on a width of 1 foot behind the back of curb.
- B. Payment at the Bid Unit Price shall include all costs related to performing the work in accordance with these Specifications, including shaping, grading, compacting, tolerancing, and test rolling.
- C. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

DIVISION 32
EXTERIOR IMPROVEMENTS

SECTION 32 11 23

AGGREGATE BASE COURSE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Production and placement of dense graded base course for roadway and sidewalk base material.

1.02 RELATED SECTIONS

- A. Section 31 23 13 – Subgrade Preparation.
- B. Section 33 40 00 – Storm Drainage Utilities.
- C. Section 32 12 01 – Flexible Paving (Municipal Projects).
- D. Section 23 16 13 – Concrete Curb and Gutter.
- E. Section 32 13 14 – Concrete Walks, Medians, and Driveways.

1.03 REFERENCES

- A. State of Wisconsin Department of Transportation "Standard Specifications for Highway and Structure Construction" - latest edition including all current supplements (WisDOT):
 - 1. 301 – General Requirements for Base Aggregates.
 - 2. 305 – Dense Graded Base.

1.04 SUBMITTAL

- A. Submit gradation report on sample of aggregate base to be used.

1.05 SEQUENCING AND SCHEDULING

- A. Place aggregate base only after all of the following have been completed to the satisfaction of the Engineer:
 - 1. Subgrade has been corrected for instability problems and successfully passed the rolling test.

2. Subgrade has been checked for conformance to line and grade tolerances (string line).

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Dense Graded Base: Conform to the requirements of WisDOT Section 305.2, 100 Percent Crushed Stone, except as modified below:
 1. Use 1 ¼ inch aggregate for all dense graded base course.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Confirm Engineer's acceptance of the subgrade before placing dense graded base course.

3.02 PREPARATION

- A. Prepare the subgrade in accordance with WisDOT Section 301.3.2.

3.03 CONSTRUCTION REQUIREMENTS

- A. Construct the Dense Graded Base Course in accordance with the requirements of WisDOT Spec. 305.3, except as modified below:
 1. Compact the aggregate base according to WisDOT Spec. 301.3.4.3 – Special Compaction, except that each layer shall be compacted to 100 percent of the determined maximum density using a Standard Proctor Test.
 2. Install aggregate base in accordance with details on Drawings.
 3. Deliver weight tickets to Engineer daily.

3.04 FIELD QUALITY CONTROL

- A. The Owner shall have an independent testing laboratory sample the aggregate base materials, determine the moisture/density relationships and gradation, and perform field moisture/density tests at locations determined by Engineer. Nuclear density testing shall be considered an approved method.
- B. Line and Grade Tolerance: The final aggregate base surface will be checked for conformance to specified tolerances by the “stringline” method prior to approval to pave the surface. Grade shall be ± 0.03 feet of grade.

3.05 PROTECTION

- A. Protect aggregate base until it is covered by surface pavement.
- B. Keep aggregate base free of ruts and irregularities until covered by surface paving.
- C. Place water on aggregate base for dust control as required to eliminate nuisance conditions for adjacent properties.

3.06 MEASUREMENT AND PAYMENT

- A. A Bid Item for Base Aggregate Dense 1 ¼ Inch has been provided on the Bid Form. Measurement and payment will be by the ton of material compacted in place, as determined from weight tickets delivered to the Engineer, and as specified in WisDOT Spec. 305.4, except as modified below:
 - 1. If the aggregate base course material is being wasted or placed excessively thick, the Owner reserves the right to deduct quantities that are in excess of plan thickness. Said quantities shall be based on material weighing 110 pounds per square yard of area per inch of thickness.
- B. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

SECTION 32 12 01

FLEXIBLE PAVING (MUNICIPAL PROJECTS)

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Hot plant mixed asphalt-aggregate mixtures for wearing and non-wearing pavement courses.
- B. Bituminous tack coat.
- C. Bituminous trail surfacing.

1.02 RELATED SECTIONS

- A. Section 33 05 17 – Adjust Miscellaneous Structures.
- B. Section 32 11 23 - Aggregate Base Course.
- C. Section 32 16 13 – Concrete Curb and Gutter.
- D. Section 32 12 36 – Seal Coat.

1.03 REFERENCES

- A. State of Wisconsin Department of Transportation "Standard Specifications for Highway and Structure Construction" - latest edition including all current supplements (WisDOT), except as modified herein:
 - 1. 450 – General Requirements for Asphaltic Pavements.
 - 2. 455 – Asphaltic Materials.
 - 3. 460 – Hot Mix Asphalt Paving.
 - 4. 465 – Asphaltic Surface.

1.04 SUBMITTALS

- A. Submit mix design(s) at the preconstruction conference that will be used on the Project. If mix design is not available at the time of the preconstruction conference, submit mix design at least 15 days before commencement of paving.

1.05 QUALITY CONTROL

- A. Provide and maintain a QC Program conforming to WisDOT Section 460.2.8 – Quality Management Program, except as modified below:
 - 1. Engineer shall have authority to increase frequency of testing.

1.06 SEQUENCING AND SCHEDULING

- A. Aggregate base and concrete curb and gutter to be completed and approved by the Engineer prior to placement of bituminous surfaces.
- B. The Contractor shall provide a 48 hour notice for scheduling and noticing of the residents prior to paving operations.
- C. Adjust structures prior to placement of bituminous wearing course as specified in Section 02280 – Adjust Miscellaneous Structures.
- D. Bituminous cores for testing shall be taken 12 to 48 hours after paving operations.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Mixture shall conform to WisDOT Section 460 – Table 460-2, except as modified on typical section Detail Drawings and Bid Form.
- B. Aggregate shall conform to the gradation requirements of WisDOT Section 460.2.2, except as modified below:
 - 1. Nominal size of aggregate shall be 1/2 inch for all mixtures, unless otherwise approved by City Engineer.
 - 2. Thickness of lift shall be as shown on Drawings.
- C. Asphaltic Binder In Mixture: Conform to the requirements of WisDOT Section 455.2, except as modified below:
 - 1. Asphaltic binder in mixture shall be PG 58-28, unless otherwise approved by City Engineer.
- D. Bituminous Materials for Tack Coat shall conform to the requirements of WisDOT Section 455.2.5 for type CSS-1 tack coat, or approved equal.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Dense Graded Aggregate Base Course: Prepare the Dense Graded Aggregate Base Course as required in Section 32 11 23 - Aggregate Base Course.
- B. Hot Mix Asphalt:
 - 1. Apply tack at the rate of 0.05 gallon per square yard.
 - 2. Tack the full face of gutter and full surface of in-place street before paving.
 - 3. Tack full face of existing bituminous transitions, including patches.

3.02 CONSTRUCTION

- A. The Contractor to review the proposed paving sequence with the Engineer prior to placement of each bituminous course (lift).
- B. The Proposed Sequence Shall Address The: Longitudinal seams, compaction, traffic control, hauling routes, and placement of pavement markings.
- C. Preparation of Bituminous Non Wear Course:
 - 1. Final clean up of the bituminous surface with the use of a power pickup broom and front end loader
 - 2. Adjustment of structures as specified in Section 33 05 17 – Adjustment Miscellaneous Structures.
- D. Joints:
 - 1. Where new construction meets existing bituminous surfacing, the existing surface shall be uniformly milled or saw-cut straight, and bituminous tack coat applied prior to placement of each bituminous course (lift).
- E. A rubber tire roller shall be used on the bituminous surface course as an intermediate roller to finish the final paved surface as specified and at the direction of the Engineer. Tire marks shall not be visible in the final finished surface. The work shall be incidental to other work of the Project.

3.03 RESTRICTIONS

- A. All street surfaces shall be checked and approved by the Engineer prior to paving.

- B. Existing bituminous surfaces and aggregate bases must be dry prior and during placement of any bituminous pavements.
- C. Wearing course shall not be placed when the air temperature in the shade and away from artificial heat is 50 degrees or less, unless otherwise approved by the City Engineer.
- D. Diesel fuel shall not be used to coat rubber tires or hand tools to prevent asphalt from sticking.

3.04 THICKNESS REQUIREMENTS

- A. Conform to WisDOT Spec. 460.3.2, except as modified herein:
 - 1. After compaction, the thickness of each course shall be within 1/8 inch of the thickness shown on the Drawings.
 - 2. The portion of any course constructed more than the maximum allowable of 1/8 inch will be excluded from pay quantities or may require removal and replacement at the direction of the Engineer.
 - 3. The Engineer may require end of Project core samples for verification of pavement thickness and uniformity.

3.05 PAVEMENT DENSITY

- A. Conform to the requirements of WisDOT Section 460.3.3 “Minimum Required Density,” except as modified:
 - 1. Measurement of pavement density shall be by nuclear density.
 - 2. Required minimum compaction is 91.5 percent of the target maximum density. Target maximum density shall be determined each day by the Contractor using a Standard Rice Test. Contractor shall provide the target maximum density to the Engineer at the start of paving operations.
- B. Pathways, driveways, small parking lots, leveling courses, and patching shall conform to Section 450.3.2.6.2 – Ordinary Compaction.

3.06 MEASUREMENT AND PAYMENT

- A. Method of measurement shall be in accordance with WisDOT Sections 450.4, 455.4, 460.4, and 465.4, except as modified below:
 - 1. Hot Mix Asphalt Pavement: Measurement will be by weight in tons with tickets furnished by the Contractor on a daily basis.

2. Asphaltic Binder Material for Mixture: No separate measurement will be made for asphaltic binder material.
 3. Tack Coat: As outlined in WisDOT Section 455.4, except as modified below:
 - a. Measured by volume in gallons at 60° F.
 - b. Payment for bituminous material used for Tack Coat includes compensation in full for all costs incidental to the furnishing and application at the Bid Unit Price per gallon.
 - c. Cleaning of all debris and dirt from the previous bituminous surfaces prior to placement of Tack Coat is included in the Bid Unit Price for Tack Coat.
 - d. Payment for tacking exposed edges of existing bituminous surfaces and concrete curb and gutter in conjunction with base course placement is considered incidental to the placement of the base course.
 4. No measurement will be made for QMP HMA mixture.
- B. Basis of payment shall be in accordance with WisDOT Sections 450.5, 455.5, 460.5, and 465.5, except as modified below:
1. Asphaltic Mixtures: Payment at the Contract Bid Unit Price and as outlined in WisDOT Section 450.5 shall be compensation in full for each hot mix asphalt course placed and accepted as stated on the Bid Form and on the typical section of the Drawings.
 2. Asphaltic Binder Material for Mixture: No explicit direct payment shall be made. Cost of asphaltic binder material will be incidental to the cost of the mixture.
 3. Payment for QMP of hot mix asphalt mixture is incidental for each hot mix asphalt course (lift) specified and placed.
 4. Tack Coat: As outlined in WisDOT Section 455.5 by the gallon.
 5. Payment of the incentive for HMA Pavement Density will not be allowed.
- C. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

SECTION 32 12 36

SEAL COAT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Application of bituminous material followed by placement of an aggregated material on an existing bituminous pavement.

1.02 RELATED SECTIONS

- A. Section 32 12 01 – Flexible Paving (Municipal Projects).

1.03 REFERENCES

- A. State of Wisconsin Department of Transportation "Standard Specifications for Highway and Structure Construction" - latest edition including all current supplements (WisDOT).
 - 1. 475 – Seal Coat.

1.04 SEQUENCING AND SCHEDULING

- A. All repairs to existing bituminous pavement shall be completed as directed by the City Engineer prior to application of seal coat.
- B. Aggregate must be delivered and stockpiled 14 days prior to the start of construction to allow the Owner time to perform the necessary testing.
- C. Aggregate stockpiling shall be as indicated on the Drawings or as directed by the Engineer.
- D. Prior to starting work, the Contractor shall meet the City Engineer and Owner to discuss the method and means of material, means of material supply, a work schedule, and a general review of the Specifications.
- E. Contractor to clean existing bituminous pavement with power pickup broom and front end loader.
- F. The Contractor is responsible for notifying the City Engineer 72 hours in advance of the seal coating operations for developments to allow the City Engineer time to distribute notification to the residents restricting parking and use during the seal coat operation.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Asphaltic Material:
 - 1. Conform to WisDOT Spec. 455 – Asphaltic Materials.
- B. Seal Coat Aggregate:
 - 1. Provide granite or trap rock conforming to WisDOT Spec. 475.2.

PART 3 – EXECUTION

3.01 GENERAL

- A. Prospective Bidders are advised to inspect all streets and verify existing conditions to their own satisfaction prior to submitting a Bid.

3.02 RESTRICTIONS

- A. Conform to WisDOT Spec. 475.3, except as modified herein:
 - 1. Seal coating operations conducted only between 7:00 A.M. and 7:00 P.M.
 - 2. The City prohibits the indiscriminate use of all water hydrants by persons other than the City's forces.
 - 3. Assign at least 1 laborer strictly to walk behind the chip spreader operation to hand broom or clean up any missed area or piles of aggregate.
 - 4. Application of bituminous material to concrete curb surfaces and into city storm sewers is prohibited. The Contractor will be responsible for the immediate removal of said material.
 - 5. Contractor shall take measures to prevent overlapping of seal coat onto other newly placed seal coat layers.

3.03 EQUIPMENT

- A. Conform to WisDOT Spec. 475.3.2, except as modified herein:
 - 1. Aggregate spreader shall be a self-propelled and computerized.
 - 2. The sweeping broom shall be a power pick up broom.

3.04 SURFACE PREPARATIONS

- A. All street surfaces shall be carefully cleaned, scraped, swept, and approved by the City Engineer prior to seal coating.
- B. Application of water may be required to minimize the creation of air borne dust and assist in the sweeping and cleaning operation.
- C. Hand cleanup used as necessary.
- D. Cover all manhole and gate valve box covers with fine aggregate or sand prior to seal coating, so that seal coat material does not adhere to the cover surface:
 - 1. Clean all fine aggregate and seal coat material from manhole and gate valve box covers once work is completed.
 - 2. Dispose of all fine aggregate and seal coat material at an acceptable location outside the City limits.

3.05 BITUMINOUS MATERIAL APPLICATION

- A. Conform to WisDOT Spec. 475.3.4, except as modified herein:
 - 1. Application rates shall be modified only as directed by the City Engineer or an authorized representative.
 - 2. Application rates will be determined based on existing surface conditions and traffic volumes.

3.06 AGGREGATE APPLICATION

- A. Conform to WisDOT Spec. 475.3.5, except as modified herein:
 - 1. Application rates shall be modified only as directed by the City Engineer or an authorized representative.
 - 2. The Contractor is responsible to perform the test strip and calibration of the chip spreader in accordance to the “Standard Method for Determining the Transverse Spread Rate for Surface Treatment Application” (Modified Method ASTM D5624-95):
 - a. Complete this procedure on the first day of seal coat application and 1 additional time during construction as requested by the City Engineer.
 - b. All cost associated with this test are considered incidental to the aggregate placement Bid Item.

3. Hand spreading or brooming of seal coat aggregate will be required of the Contractor where non-uniform application of seal coat bitumen and/or aggregate occurs, and small irregular areas.

3.07 ROLLING OPERATIONS

- A. Conform to WisDOT Spec. 475.3.5, except as modified herein:
 1. Rolling operations shall be performed to allow the aggregate to properly be embedded into the binder material prior to the binder “breaks.”
 2. A minimum of 3 rollers will be required.
 3. Compact for a minimum of 3 passes over all areas with 5 passes required on heavily traveled roadways with speed limits greater than 30 mph.
 4. Roller speed not to exceed 5 mph.

3.08 INITIAL SWEEPING OF EXCESS AGGREGATE

- A. Sweeping operations shall begin approximately 1 to 3 days after seal coat has been allowed to set up.
- B. City Engineer to determine the exact date to begin sweeping operations.
- C. In the event that the Contractor has not completed the sweeping within the specified time of the completion of application, a penalty of \$100 per calendar day will be charged until the sweeping is completed.
- D. Utilize more than 1 power pick-up broom if necessary to meet time requirement.
- E. The Contractor shall be responsible for the sweeping and removal of the excess aggregate from the streets shall be disposed of off the Project Site.

3.09 PROTECTION

- A. The Contractor shall be responsible for damage done to any adjacent driving surfaces, shoulders, or boulevards.
- B. Traffic Control:
 1. It will be the Contractors responsibility to install and maintain warning signs at the entrances to developments or the ends of the streets being seal coated:
 - a. These signs shall be 30 inch x 30 inch with the wording “Loose Gravel.”

- b. Signs equipped with warning lights.
 - c. Signs to remain in-place until the sweeping of excess aggregate is complete.
 - d. Compensation for all work related as part of the Bid Item "Traffic Control."
2. Flexible Raised Reflector Pavement Marking Devices:
- a. Provide new flexible raised reflector pavement marking devices to identify all existing pavement markings where applicable.
 - b. The color must correspond to the existing pavement markings.
 - c. Install these devices 5 days prior to seal coating each specific street.
 - d. The interval or spacing for this work shall be a minimum of 100 feet or where changes are made in the existing stripping.
 - e. The cost for this work shall be included in the Traffic Control Bid Item on a lump sum basis.
 - f. The repainting of the pavement markings **will not** be done under this Contract.
3. Traffic rerouting is the responsibility of the Contractor.
4. All flag persons, barricades, flashers, and safety measures are the sole responsibility of the Contractor.
5. Provide sufficient direction and warning signs on the Project to minimize inconvenience to property owners and the traveling public.
6. Provide reasonable access at all times for abutting property owners and for emergency vehicles. Utilize flares or approved flashers from sunset to sunrise if required by the construction.

3.10 FIELD QUALITY CONTROL

- A. The Contractor shall submit for review by the City Engineer at the Pre-Construction Conference, a report from an independent testing laboratory indicating the gradation, median aggregate size, flakiness index, bulk specific gravity, and loose unit weight of the aggregate being supplied for the Project. This information shall be used to determine the design application rates for the aggregate and bituminous material.
- B. The Contractor shall submit for review by the City Engineer at the Pre-Construction Conference information regarding the anticipated residual asphalt content of the proposed binder material.

- C. The Contractor is responsible for notifying the City Engineer of pit location, bituminous supply, scale location, and any other correlated items in advance of starting time, so that adequate control measures can be established.

3.11 MEASUREMENT AND PAYMENT

A. Bituminous Material:

1. Measurement shall be based on the bituminous material applied by volume in gallons at 60° F.
2. Payment shall be made based on the Bid Item provided on the Bid Form and shall include the following:
 - a. Delivery of material.
 - b. Distributor calibration.
 - c. Distribution and application.
3. Bid Form quantity is estimated based on an application rate of 0.35 gallon per square yard.

B. Seal Coat Aggregate:

1. Measurement shall be based on tons of material placed and accepted:
 - a. Stockpiled aggregate material requires weight tickets specifically noting the gross, net, and tare weights of material delivered.
2. Payment shall be made based on the Bid Item provided on the Bid Form for each specific aggregate type and include the following:
 - a. Delivery and stockpile of aggregate.
 - b. Initial aggregate testing.
 - c. Specified surface preparation.
 - d. Calibration of aggregate spreader.
 - e. Hauling and spreading of aggregate.
 - f. Rolling and compaction of aggregate.
 - g. Initial sweeping costs (except the second sweeping).
3. The second sweeping will be paid for on an hourly basis under the Bid Item for Pick-Up Broom, Including Operator.
4. Bid Form quantity is estimated based on an application rate of 25 pounds per square yard.

- C. Traffic Control paid for as a Lump Sum based on the Bid Unit Price stated on the Bid Form.
- D. The Owner reserves the right to add or decrease the Bid Form quantities without a change in the Bid Unit Price.
- E. If any application rate of the aggregate or bituminous material, as determined by the Engineer, is greater than 10 percent that designated by the Engineer at the start of the Project, the materials in excess shall be incidental to the remainder of the Project.
- F. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

SECTION 32 13 14

CONCRETE WALKS, MEDIANS, AND DRIVEWAYS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Cast-in-place concrete walkways, medians, driveways, and valley gutters.

1.02 RELATED SECTIONS

- A. Section 31 23 00 – Excavation and Fill.
- B. Section 32 11 23 – Aggregate Base Course.
- C. Section 32 12 01 – Flexible Paving (Municipal Projects).
- D. Section 32 16 13 – Concrete Curb and Gutter.

1.03 REFERENCES

- A. American Society of Testing Materials (ASTM):
 - 1. C260 - Air-Entraining Admixtures for Concrete.
- B. State of Wisconsin Department of Transportation "Standard Specifications for Highway and Structure Construction" - latest edition including all current supplements (WisDOT):
 - 1. 501 – Concrete.
 - 2. 602 – Concrete Sidewalks, Loading Zones, Safety Islands and Steps.

1.04 SUBMITTALS

- A. Submit one (1) 7 day and two (2) 28 day concrete test results for all concrete pours in any given day.
- B. Submit WisDOT approved design mix for concrete that will be used on the Project at the preconstruction conference. If mix design is not available at the time of the preconstruction conference, submit mix design at least 15 days before commencement of concrete walk, median, or driveway installation.

1.05 SEQUENCING AND SCHEDULING

- A. Construction of pedestrian curb ramps and sidewalk shall be completed in the same year as the curb and gutter.
- B. Construction of pedestrian curb ramps shall be completed following the placement of the bituminous walk or pathway.
- C. Construction of the concrete driveway apron shall begin no sooner than 24 hours after placement of the adjacent concrete curb and gutter with completion within 5 days of curb placement.
- D. Construct concrete medians no sooner than 72 hours after placement of the concrete curb and/or walks.
- E. Construct concrete valley gutter prior to the placement of the bituminous base.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Concrete: Conform to WisDOT Spec. 501: Concrete, except as modified below:
 - 1. Portland Cement:
 - a. Conform to WisDOT 501.2.
 - b. Concrete shall be air-entrained.
 - 2. Air-Entraining Admixtures:
 - a. Conform to WisDOT 501.2.
 - b. Not to be added to the concrete mixtures in the field without approval from City Engineer.
 - 3. Mix Designation and Classification for Concrete Curb and Gutter:
 - a. Manual Placement: Grade A.
 - b. Slip Form Placement: Grade A2.
 - c. 28-day compressive strength requirement: 4,000 psi.
- B. High Early Strength Concrete: Conform to WisDOT 501.2, except as modified:
 - 1. High early strength concrete shall be designed to provide a maximum water/cementitious ratio of 0.40.

2. High early strength concrete shall be designed to provide a minimum flexural strength of 500 psi and a minimum compressive strength of 3,000 psi in 48 hours.
- C. Pre-Formed Joint Filler: Conform to WisDOT Spec. 415.2.3.
- D. Curing Compound: Conform to WisDOT Spec. 415.2.4.
- E. Sub-Grade Base Material:
1. Aggregate base material shall be required below all concrete walks, unless granular sub-base material is found suitable by City Engineer:
 - a. Aggregated Base Material: Conform to Section 32 11 23 - Aggregate Base Course.
 - b. Granular Sub-base Material: Conform to WisDOT Spec. 350 - Sub-Base.
- F. Truncated Dome Panels: Use approved products and colors listed below, or approved equal:
1. East Jordan Iron Works Cast Iron Detectable Warning Plates:
 - a. Color: Natural Finish
 2. Neenah Cast Iron Detectable Warning Plate:
 - a. Color: Natural Finish.

PART 3 - EXECUTION

3.01 GENERAL

- A. Provide copies of batch tickets for concrete mix at the time of material delivery to Project Site.
- B. Construct concrete walkways, curb ramps, medians, driveways, and valley gutters at the locations and elevations indicated on the Drawings.
- C. Verify locations with Engineer in the field prior to construction.
- D. The completed concrete work shall give the appearance of uniformity in surface contour and texture, and shall be accurately constructed to line and grade. The required joints, edges, and flow lines shall show neat workmanship.

- E. Retempering of concrete which has partially hardened with or without additional materials or water is prohibited.

3.02 FOUNDATION PREPARATIONS

- A. Placement and compaction of the aggregate base or granular material to support the concrete work shall conform to Section 02720 - Aggregate Base Course or Section 02318 – Subgrade Preparation.
- B. The foundation shall be approved by the Engineer prior to placement of concrete material.

3.03 FORMS

- A. Conform to WisDOT Spec. 602.3.2.2.

3.04 JOINT CONSTRUCTION

- A. Conform to WisDOT Spec. 602.3.2.5, except as modified herein:
 - 1. Maximum spacing of expansion joints for walkways shall be 60 feet.
 - 2. Match joints of adjacent concrete work.

3.05 METAL REINFORCEMENT

- A. Conform to WisDOT Spec. 602.3.2.4, except as modified herein:
 - 1. Install three (3) #4 steel reinforcing rods in lower portion of the valley gutter section with minimum 2 inch coverage on all sides as shown in Hudson Detail Plate STR-4.
 - 2. Install two (2) #4 steel reinforcing rods in lower portion of the concrete gutter at commercial driveway entrances with 2 inch coverage on all sides as shown in Hudson Detail Plate STR-5.

3.06 PLACING AND FINISHING

- A. Conform to WisDOT Spec. 602.3.2.3, except as modified herein:
 - 1. Any deviation in the design curvature of concrete edges in excess of 3/8 of an inch, measured with a 10 foot straight edge, will be considered unacceptable.
 - 2. Any surface area allowing the entrapment of water at a depth 1/8 inch or greater will be considered unacceptable.

3. Unacceptable work shall be removed and replaced with acceptable work as directed by the Engineer. Acceptance of work by price reduction will not be allowed.

B. Pedestrian Curb Ramp - Truncated Dome:

1. Truncated Dome Panels - Conform to the manufacturer's recommendations for placement.
2. Truncated Dome Panels shall be placed (wet set) on a minimum of 6 inches concrete and prior to finishing the adjacent concrete surface of the pedestrian ramp. The joint between the panel and concrete shall be finished with 1/2 inch radius edging tool.
3. Conform to WisDOT Standard Detail Drawing 8D5-14e for specified Truncated Dome surface pattern dimensions. Refer to the Drawings for actual ramp size, shape, and slopes.
4. Multiple Truncated Dome panels shall be of equal size and shall be joined together per the manufacturer's recommendation.
5. Joint space between Truncated Dome panels shall be no greater than 1/4 of an inch in width.

3.07 CONCRETE CURING AND PROTECTION

A. Conform to WisDOT Section 415.3.12 and 415.3.16, except as modified herein:

1. All surfaces shall be coated with membrane curing compound immediately after finishing at the specified rate.
2. The membrane curing compound must contain a fugitive dye and be applied in 2 different directions perpendicular to each other to provide a uniform solid white opaque coverage (equal to a white sheet of typing paper) on all exposed concrete surfaces.
3. A second application of membrane curing compound shall be applied 4 to 8 hours after the first application at the specified rate.
4. The freshly finished surface shall be protected, surfaces pitted by rain will be considered unacceptable.
5. Removal and replacement of any curb section damaged by traffic, rain, cold weather, or other causes occurring prior to final acceptance shall be the responsibility of the Contractor.

B. Mixing and Protection During Cold Weather: Comply with WisDOT Section 415.3.15 - Cold Weather Concreting, except as modified herein:

1. A curing material that has water resistance, strength, and insulation properties will be required.
2. If temperatures are projected to fall below 32 degrees Fahrenheit within 24 hours of concrete placement, insulated blankets shall be used for curing.
 - a. All costs associated with insulated blanket curing shall be incurred by the Contractor.

3.08 BACKFILLING

A. Conform to WisDOT Spec. 602.3.2.7, except as modified herein:

1. Perform backfilling to protect the concrete no sooner than 72 hours after placement of the concrete.

3.09 FIELD QUALITY CONTROL

A. Any curb damaged by the Contractor shall be removed and replaced by the Contractor, and will be incidental to the Project.

B. The Owner shall have an independent testing laboratory perform the following minimum tests. The test locations shall be determined by the Engineer:

1. 1 air entrainment test per day, per Project.
2. 1 slump test per day, per Project.
3. 1 set of cylinders for compression test per day, per Project.

3.10 MEASUREMENT AND PAYMENT

A. Measurement of sidewalks shall be measured by an in-place square foot basis:

1. Payment of this Bid Item shall include the following:
 - a. Concrete materials.
 - b. Sub grade and base preparation.
 - c. Placement of materials.
 - d. Finishing.
 - e. Curing and protection.
 - f. Reinforcement.
 - g. Backfilling.

2. Excavation for concrete sidewalk shall be measured and compensated per Section 31 23 00 - Excavation and Fill.
 3. Aggregate base beneath concrete sidewalk shall be measured and compensated per Section 32 11 23 - Aggregate Base Course.
- B. A Bid Item has been provided for Concrete Pedestrian Curb Ramp. Measurement shall be on the basis of square feet of ramp actually constructed:
1. Measurement of ramp shall not include adjacent concrete curb and gutter, which shall be measured and compensated separately.
 2. Payment shall include the following:
 - a. Concrete materials.
 - b. Aggregate base material.
 - c. Sub grade and base preparation.
 - d. Saw cutting of existing concrete sidewalk or bituminous pathway pavement.
 - e. Placement of materials.
 - f. Finishing.
 - g. Curing and protection.
 - h. Backfilling.
- C. A Bid Item has been provided for the Truncated Dome Panel which is part of the Concrete Pedestrian Curb Ramp. Measurement shall be on the basis of square feet of truncated dome panels actually constructed:
1. Payment shall include the following:
 - a. Truncated panel materials
 - b. Placement of truncated panels
 - c. Protection of truncated panels during construction.
- D. A Bid Item for 6 Inch Thick Concrete Driveway Apron has been included in the Bid Form. Measurement shall be on the basis of in-place square yard:
1. Payment of the Bid Item shall include the following:
 - a. Concrete materials.
 - b. Sub grade and base preparation.
 - c. Placement of materials.
 - d. Finishing.
 - e. Curing and protection.
 - f. Reinforcement (keyway substitution)
 - g. Backfilling.

2. Excavation for concrete driveway apron shall be measured and compensated per Section 31 23 00 - Excavation and Fill.
 3. Aggregate base beneath concrete driveway apron shall be measured and compensated per Section 32 11 23 - Aggregate Base Course.
- E. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

SECTION 32 16 13

CONCRETE CURB AND GUTTER

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Construction of concrete curbs, and curb and gutter.

1.02 RELATED SECTIONS

- A. Section 33 40 00 – Storm Drainage Utilities.
- B. Section 32 11 23 –Aggregate Base Course.
- C. Section 32 12 01 – Flexible Pavement (Municipal Projects).
- D. Section 32 13 14 – Concrete Walks, Medians, and Driveways.

1.03 REFERENCES

- A. American Society of Testing Materials (ASTM):
 - 1. ASTM C260 – Air-Entraining Admixtures for Concrete.
- B. State of Wisconsin Department of Transportation "Standard Specifications for Highway and Structure Construction" - latest edition including all current supplements (WisDOT):
 - 1. 501 – Concrete.
 - 2. 601 – Concrete Curb and Gutter.

1.04 SUBMITTALS

- A. Submit one (1) 7 day and two (2) 28 day concrete cylinder test results for all concrete pours in any given day.
- B. Submit WisDOT approved design mix for concrete that will be used on the Project at the preconstruction conference. If mix design is not available at the time of the preconstruction conference, submit mix design at least 15 days before commencement of curb and gutter installation.

1.05 SEQUENCING AND SCHEDULING

- A. Install concrete curb and gutter within 1 week after aggregate base has been completed and approved. Minimum cure time of 72 hours is required prior to backfilling curb and gutter.
- B. Concrete curb and gutter construction precedes installation of pavement.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Concrete: Conform to WisDOT Spec. 501: Concrete, except as modified below:
 - 1. Portland Cement:
 - a. Conform to WisDOT 501.2.
 - b. Concrete shall be air-entrained.
 - 2. Air-Entraining Admixtures:
 - a. Conform to WisDOT 501.2.
 - b. Not to be added to the concrete mixtures in the field without approval from City Engineer.
 - 3. Mix Designation and Classification for Concrete Curb and Gutter:
 - a. Manual Placement: Grade A.
 - b. Slip Form Placement: Grade A2 or A-S2.
 - c. 28-day compressive strength requirement: 4,000 psi.
- B. High Early Strength Concrete: Conform to WisDOT 501.2, except as modified:
 - 1. High early strength concrete shall be designed to provide a maximum water/cementitious ratio of 0.40.
 - 2. High early strength concrete shall be designed to provide a minimum flexural strength of 500 psi and a minimum compressive strength of 3,000 psi in 48 hours.
- C. Pre-Formed Joint Filler: Conform to WisDOT Spec. 415.2.3.
- D. Curing Compound: Conform to WisDOT Spec. 415.2.4.

PART 3 - EXECUTION

3.01 GENERAL

- A. Provide copies of batch tickets for concrete mix at the time of material delivery to Project Site.
- B. The concrete curb and gutter shall be constructed at the locations and elevations indicated on the Drawings and in accordance with Hudson Detail Plate STR-1.
- C. The style or type of curb and gutter shall conform to shape and size as shown on the Drawings.
- D. Construct intersection curb radii and transitions sections to conform to the detail on the Drawings.
- E. Construct 10 foot transition sections at inlet structures to conform to the detail on the Drawings.
- F. Concrete curb ramp depressions shall be constructed to conform to the detail on the Drawings.
- G. Construct curb transitions for driveways per the detail on the Drawings. Locations to be verified by Engineer at the time of construction.
- H. The completed concrete work shall give the appearance of uniformity in surface contour and texture, and shall be accurately constructed to line and grade. The required joints, edges, and flow lines shall show neat workmanship.
- I. Retempering of the concrete which has partially hardened with or without additional materials or water is prohibited.
- J. Full curb and gutter panels shall be removed and replaced for all major cracks, breaks, or chips $\geq 1/2$ inch.
- K. All handwork to streets, sidewalks, driveways, and curb and gutter, including around catch basins, shall be mechanically vibrated with absolutely no voids or honey-combing allowed.

3.02 FOUNDATION PREPARATIONS

- A. Support on a compacted aggregate base extending 1 foot behind the back of curb conforming to Section 32 11 23 –Aggregate Base Course. (100 Percent Maximum Density).

3.03 FORMS

- A. Conform to WisDOT Spec. 601.3.3.

3.04 JOINT CONSTRUCTION

- A. Conform to WisDOT Spec. 601.3.6, except as modified herein:
 - 1. Maximum spacing of expansion joints for slip formed shall be 200 feet.
 - 2. Control joints 10 foot intervals.
 - 3. All expansion joints and control joints shall be uniform and cleaned 1/4 inch to 3/8 inch in depth.
 - 4. All expansion and control joints shall be tooled along entire top and front face of curb and gutter.
 - 5. All control joints shall be knifed through entire depth.
 - 6. All expansion joints shall be vertical, tooled, clean and flush with felt, no voids accepted.

3.05 METAL REINFORCEMENT

- A. Conform to WisDOT Spec. 505, except as modified herein:
 - 1. When required, install two (2) #4 steel reinforcing rods in lower portion of the curb section, with a minimum 2 inches coverage on all sides:
 - a. Placement shall extend 10 feet on each side of a catch basin.

3.06 CONCRETE SIDEWALK AND PEDESTRIAN RAMPS

- A. Pedestrian ramp curb openings adjacent to bituminous pathways shall be 6 feet wide with 2 foot tapers (total 10 feet wide), as shown on Detail Plate No. STR-11.
- B. Pedestrian ramp curb openings adjacent to concrete walkways shall match the width of the adjacent concrete walk, but shall not be less than 3 feet wide nor greater than 6 feet wide, with 2 foot tapers (total varying from 7 feet to 10 feet wide), as shown on Detail Plate No. STR-12.

3.07 PLACING AND FINISHING

- A. Conform to WisDOT Spec. 601.3.4 and 601.3.5, except as modified herein:
 - 1. The top surface of the curb and gutter shall have a brush finish at right angles to the curb line.

3.08 CONCRETE CURING AND PROTECTION

- A. Conform to WisDOT Section 415.3.12 and 415.3.16, except as modified herein:
 - 1. All surfaces shall be coated with membrane curing compound immediately after finishing at the specified rate.
 - 2. The membrane curing compound must contain a fugitive dye and be applied in 2 different directions perpendicular to each other to provide a uniform solid white opaque coverage (equal to a white sheet of typing paper) on all exposed concrete surfaces.
 - 3. A second application of membrane curing compound shall be applied 4 to 8 hours after the first application at the specified rate.
 - 4. The freshly finished surface shall be protected, surfaces pitted by rain will be considered unacceptable.
 - 5. Removal and replacement of any curb section damaged by traffic, rain, cold weather, or other causes occurring prior to final acceptance shall be the responsibility of the Contractor.

- B. Mixing and Protection During Cold Weather: Comply with WisDOT Section 415.3.15 - Cold Weather Concreting, except as modified herein:
 - 1. A curing material that has water resistance, strength, and insulation properties will be required.
 - 2. If temperatures are projected to fall below 32 degrees Fahrenheit within 24 hours of concrete placement, insulated blankets shall be used for curing.
 - a. All costs associated with insulated blanket curing shall be incurred by the Contractor.

3.09 BACKFILLING

- A. Initial Backfilling:
 - 1. Follow the 72 hour curing period with completion within 6 days of original placement.
 - 2. Tolerance within 0.3 feet to the top of curb elevation.

- B. Final Grading:

1. Following completion of private utility work by others.
- C. Curb damaged during backfilling is the responsibility of the Contractor.

3.10 WORKMANSHIP

- A. Conform to WisDOT Spec. 601.3, except as modified herein:
1. Any deviation in the design curvature of concrete edges in excess of 3/8 of an inch, measured with a 10 foot straight edge, will be considered unacceptable.
 2. Acceptance of work by price reduction will not be allowed.

3.11 FIELD QUALITY CONTROL

- A. Any curb damaged by the Contractor shall be removed and replaced by the Contractor, and will be incidental to the Project.
- B. The Owner shall have an independent testing laboratory perform the following minimum tests. The test locations shall be determined by the Engineer:
1. 1 air entrainment test per day, per Project.
 2. 1 slump test per day, per Project.
 3. 1 set of cylinders for compression test per day, per Project.

3.12 MEASUREMENT AND PAYMENT

- A. Bid Items have been provided for Concrete Curb and Gutter. Measurement of curb and gutter shall be by the lineal foot measured along the face of the curb at the gutter line for each type. Payment shall include materials, preparation, placement, finishing, curing, protection, reinforcement, and backfilling.
- B. No separate measurement or payment for modifications at curb ramps, transition sections, or curb installed at catch basins and radii.
- C. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKINGS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Furnishing and applying pavement markings for control and guidance of traffic.

1.02 RELATED SECTIONS

- A. Section 32 12 01 – Flexible Pavement (Municipal Projects).

1.03 REFERENCES

- A. State of Wisconsin Department of Transportation "Standard Specifications for Highway and Structure Construction" - latest edition including all current supplements (WisDOT).
- B. State of Wisconsin, Department of Transportation, Facilities Development Manual.
- C. The Wisconsin Manual on Uniform Traffic Control Devices (MUTCD) - latest edition.

1.04 SUBMITTALS

- A. Conform to WisDOT Spec. 646.2.
- B. 1 copy of the chosen paint/epoxy lot or batch formulation.
- C. Pavement Marking Contractor Qualifications/Certifications.

1.05 STORAGE, SEQUENCING AND SCHEDULING

- A. Upon delivery to the Project Site, the Contractor shall store the materials at least 10 feet away from any construction areas or traveled roadways. Vehicles and equipment shall not be stored, even temporarily, in the buffer zone of the work area or where it would be so close to moving traffic that it is, in the judgment of the Engineer, a potential hazard to motorists.
- B. The Contractor shall notify the Engineer at least 48 hours prior to commencing the work under this Section of the Contract, so spotting or marking of pavement marking locations can be completed.
- C. Per WisDOT Spec. 646.3.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Paint:

1. Conform to WisDOT Spec. 646.2.2.
2. Furnish paint from WisDOT's Approved Products List.

B. Epoxy:

1. Conform to WisDOT Spec. 646.2.4.
2. Furnish epoxy from WisDOT's Approved Products List.

C. Preformed Plastic Pavement Markings:

1. Conform to WisDOT Spec 646.2.5.
2. Furnish preformed markings from WisDOT's Approved Products List.

D. Glass Beads:

1. Conform to WisDOT Section 646.2.3.

2.02 EQUIPMENT

A. All pavement marking equipment shall conform to the applicable requirements of WisDOT Spec. 646.3.2.:

1. Vehicles used shall be deployed and equipped with traffic control devices set forth in the "Wisconsin Manual on Uniform Traffic Control Devices."
2. Shadow vehicle with truck-mounted attenuator shall be used on streets with posted speed equal to or greater than 40 m.p.h. or ADT greater than 1500 vehicles per day.
3. Equipment used for spray applications shall be capable of applying glass beads by a pressurized system at a rate of at least 25 lbs/gal.
4. Capable of accumulating footage applied per gun.
5. Stainless steel components in the delivery system required for water-based materials.

PART 3 - EXECUTION

3.01 GENERAL

- A. The pavement marking crew shall include at least 1 technical expert knowledgeable in each of the following areas:
 - 1. Equipment operation.
 - 2. Application techniques.
 - 3. Traffic control.
 - 4. Safety regulations.
- B. The filling of tanks, pouring of materials, or cleaning of equipment shall not be performed on unprotected pavement surfaces, unless adequate provisions are made to prevent spillage of material.
- C. All preparation shall conform to WisDOT Spec. 646.3.3.
- D. The Engineer shall be notified at least 48 hours prior to the Contractor applying any pavement markings so all staking and preliminary marking may be accomplished.

3.02 SCHEDULE

- A. Paint/Epoxy Pavement Markings:
 - 1. Place following completion of bituminous wear course:
 - a. No sooner than 24 hours after placement of bituminous.
 - b. Within 5 working days of completion of bituminous placement.
- B. Preformed Pavement Markings:
 - 1. Place in conjunction with bituminous wear course paving as per manufacturer.
 - 2. Place all markings indicated as PPF on Drawings.

3.03 PREPARATION

- A. Locations:
 - 1. In general accordance with the Drawings:

- a. Location of marking designating no passing zones to be coordinated with corresponding traffic signs.
2. The Engineer will place necessary "Spotting" at appropriate points:
 - a. Horizontal control.
 - b. Starting and stopping points.
 - c. Broken line intervals will not be marked.
 - d. Longitudinal joints, pavement edges, and existing markings shall serve as horizontal control when so directed.
 - e. Contractor shall notify Engineer at least 48 hours in advance when requesting spotting locations.
3. Edge lines and lane lines are to be broken only at intersections with public roads and at private entrances if they are controlled by a yield sign, stop sign, or traffic signal.
4. The break point is to be at the start of the radius for the intersection or at marked stop lines or crosswalks.

B. Street Surface:

1. Engineer may direct cleaning of surface as necessary immediately prior to marking application:
 - a. Brushing with non-metallic rotary broom.
 - b. Other cleaning method approved by Engineer.
 - c. Air blast following cleaning.
2. Surface must be dry.
3. Minimum surface temperature is 50° F, or higher if recommended by the manufacturer.

3.04 APPLICATION

A. Conform to WisDOT Spec. 646.3 and the following:

1. Tolerance:

- a. Width: A tolerance of 1/4 inch under or 1/4 inch over the specified width will be allowed for striping provided the variation is gradual and does not detract from the general appearance.
 - b. Length: Broken line segments may vary up to 2-3/4 inches from the specified lengths provided the over and under variations are reasonably compensatory.
 - c. Alignment: Deviations from the control guide shall not exceed 2 inches.
 - d. Establishment of application tolerances shall not relieve the Contractor of his responsibility to comply as closely as practicable with the planned dimensions.
2. Material shall not be applied over longitudinal joints.
 3. 4 inch broken line consists of 12.5 feet of paint and 37.5 feet space (1 cycle).
 4. If same equipment used for different color material with change in color, an amount of material equal to fifteen (15) 12.5 foot long stripes shall be wasted prior to beginning application with the new color.
 5. Conditions:
 - a. Markings shall not be applied when wind or other conditions cause a film of dust to be deposited on the pavement surface after cleaning and before the marking material can be applied.
 - b. Except when used as a temporary marking, pavement markings shall only be applied in seasonable weather when air temperature is 50° F. or higher.

3.05 CORRECTION OF DEFECTS

- A. All pavement markings not conforming to the requirements of the Specifications shall be removed and replaced, or otherwise repaired to the satisfaction of the Engineer.
- B. Where yield computations show a deficiency in material usage of not more than 20 percent, Owner may require satisfactory repair or may accept the work at a reduced Bid Unit Price that is in direct proportion to the percent of the deficiency.
- C. Where yield computations show a deficiency in material usage in excess of 20 percent, Owner will require removal and replacement to the satisfaction of the Engineer, unless other means are approved by the Engineer.
- D. If removal and replacement is required, at least 90 percent of the deficient line shall be removed.

- E. Width of removal shall be 1 inch wider on all sides than the nominal width of the marking to be removed.
- F. Removal of unacceptable work shall be accomplished with suitable blasting or grinding equipment, unless other means are authorized by the Engineer. Bituminous street surfacing shall not be damaged by the removal operation.

3.06 MEASUREMENT AND PAYMENT

A. Lines:

- 1. Lines shall be measured by the lineal foot on the basis of length actually applied:
 - a. Separate measurement made on the basis of color and nominal width.
 - b. Separate measurement will be made for paint markings and preformed markings.
- 2. The second application shall be measured the same as the first application; for example: 1,000 LF of application painted twice would be paid as 2,000 LF.

B. Messages:

- 1. Messages shall be measured on the basis of each applied:
 - a. Separate measurement will be made for each type of message.
 - b. Separate measurement will be made for paint messages and preformed messages.

C. Bid Items for pavement markings of each type are provided. Payment of each Bid Item shall be compensation in full for all costs incidental thereto, including but not limited to surface preparation, traffic control measures, maintaining the work, removal of temporary pavement markers, together with any other expenses incurred in completing the work that are not specifically included for payment under the Contract Bid Items.

D. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

DIVISION 33
UTILITIES

SECTION 33 05 05

TRENCHING AND BACKFILL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Trenching requirements for sanitary sewers, storm sewers, water main, and appurtenances, including requirements for excavation, backfill, and compaction.
- B. Identification of Contractor Responsibilities for: Bracing, shoring, and sheeting; protection of the excavation and Project Site; working around existing utilities and other obstructions; and excesses and shortages of backfill.

1.02 RELATED SECTIONS

- A. Section 31 23 00 – Excavation and Fill.
- B. Section 33 31 00 – Sanitary Sewer.
- C. Section 33 31 14 – Sanitary Sewer Services.
- D. Section 33 40 00 – Storm Drainage Utilities.
- E. Water Main -- Hudson Public Water Utilities - Water Distribution Technical Specifications, City of Hudson.

1.03 REFERENCES

- A. State of Wisconsin Department of Transportation "Standard Specifications for Highway and Structure Construction" - latest edition including all current supplements (WisDOT):

1.04 DEFINITIONS

- A. Bedding: The soil material adjacent to the pipe which makes contact with the pipe foundation, walls of the trench, and upper level of backfill. The general dimensions of the bedding zone are illustrated on Hudson Detail Plate No.'s BED-1 and BED-2. The purpose of bedding is to secure the pipe to true line and grade and to provide structural support to the pipe barrel.
- B. Foundation: Soil material beneath the pipe bedding.
- C. Improved Pipe Foundation: Foundation provided by importing material from sources outside the Project Site. Required when foundation is soft or unstable.

- D. Rock Excavation: Includes such rocks that are not decomposed, weathered or shattered, and which will require blasting, barring, wedging, or use of air tools for removal. Also included are any boulders, concrete, or masonry structure (except concrete pavement, curb and gutter, and sidewalk) exceeding 1 cubic yard.
- E. Pipe Zone: That part of the trench below a distance of 1 foot above the top of the pipe.
- F. Sand Cushion: Aggregate bedding material used around pipe in areas where rock excavation is encountered, where pipe insulation is used, and when crossing existing utilities.

1.05 SEQUENCING AND SCHEDULING

- A. Known existing underground utilities are shown on the Drawings in a general way. Owner does not guarantee the locations as shown on the Drawings. Contractor shall anticipate variations in both the vertical and horizontal locations of underground utility lines from those shown on the Drawings.
- B. Uncover utilities and verify both horizontal and vertical alignments sufficiently in advance of construction to permit adjustments in the work. Determine location of existing utilities and identify conflicts before excavating trench for pipe installation.
- C. Notify Digger's Hotline (1-800-242-8511) before starting construction in a given area, requesting utility locations in the field.
- D. Provide continuance of flow of existing sewer and other facilities.
- E. Backfill all trench excavations promptly after the pipe is laid.

1.06 WARRANTY

- A. Trench settlements which occur during the warranty period that are greater than 1 inch as measured by a 10 foot straight edge will be repaired by the Contractor in a manner that is acceptable to the Owner at the Contractor's expense.

PART 2 - PRODUCTS

2.01 PIPE BEDDING MATERIAL

- A. Polyvinyl Chloride (PVC) Pipe and High Density Polyethylene (HDPE) Pipe:
 1. Comply with WisDOT Spec. 209.2.2, Grade 2 for granular borrow.

B. Ductile Iron Pipe (DIP) and Reinforced Concrete Pipe (RCP):

1. Class C-1 Bedding:

- a. Undisturbed soil.

2.02 IMPROVED PIPE FOUNDATION MATERIAL

A. Comply with WisDOT Spec. 501.2.5:

1. Fine Aggregate: Use a well-graded fine aggregate conforming to the size requirements of WisDOT Spec. 501.2.5.3.4.
2. Course Aggregate: Use a well-graded fine aggregate conforming to the size requirements of WisDOT Spec. 501.2.5.4.4.

2.03 BACKFILL MATERIAL

- A. Suitable materials selected from the excavated materials to the extent available and practical.
- B. Suitable materials are mineral soils free of rubbish, trees, stumps, branches, debris, frozen soil, oversize stone, concrete and bituminous chunks, and other similar unsuitable material.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Inspect existing utility structures and surface features with the Engineer and document condition.
- B. Re-inspect foundation soils if rain fall or snow has occurred after initial inspection but prior to placing pipe and bedding.
- C. Verify with Engineer that all permits and easements necessary to do the work are obtained.
- D. Verify that all erosion control facilities are in place.

3.02 PREPARATION

- A. Call diggers hotline (1-800-242-8511) to have utility owners field mark their utility locations and verify exact location of existing utilities.

- B. Protect as necessary surface features, such as utility poles, trees, structures, pavement, etc., that are not designated on the Drawings to be removed.
- C. Notify utility companies of progress schedule so they can accomplish any necessary relocations and removals that they have agreed to relocate, remove, or support.
- D. Implement traffic control.
- E. Complete temporary removal or relocation of surface features, such as fences, shrubs, signs, and mailboxes.
- F. Strip off existing topsoil from within the trench excavation limits and stockpile adjacent to the Project Site for respreading. Separate vegetation stripping from salvageable topsoil and dispose of as appropriate.
- G. Crossing Under Existing Utility Lines:
 - 1. Use extreme care when excavating in the vicinity of underground utility lines to avoid damage to protective coatings or surfaces.
 - 2. Where possible and as authorized by the utility, temporarily remove the utility line, install the new pipe, and reinstall the utility line.
 - 3. Where existing line cannot be removed or is not feasible to remove, securely support, excavate under, backfill under and around the utility line to 95 percent of maximum density.
 - 4. Report and repair damaged lines prior to backfilling trench.

3.03 CONSTRUCTION

- A. Excavation:
 - 1. Trench Construction:
 - a. Excavate trench to alignment and grade shown on the Drawings and staked by the Engineer.
 - b. The trench width at the surface may vary and depend upon the depth of trench and the nature of the excavated material encountered. However, it shall be of ample width to permit the pipe to be laid and jointed properly and the backfill to be placed and compacted properly.

- c. Minimum width of unsheeted trench is 18 inches, except for pipe 10 inches or larger wherein the minimum width will be at least 1 foot greater than nominal diameter of the pipe.
 - d. Correct any part of the trench that is inadvertently excavated below grade with approved material compacted to 95 percent of maximum density.
 - e. Brace, shore, or sheet and drain trench so that workmen may work safely. Comply with applicable State Regulations relating to industrial safety to a safe angle of repose. Angle of repose may be no less than that required by State Regulations or the requirements of the Occupational Safety and Health Act (OSHA), whichever is most restrictive.
 - f. Pile all excavated material in a manner that will not endanger or damage trees designated to be saved.
 - g. Pile all excavated material in a manner that will not endanger the work or obstruct sidewalks, driveways, gutters, etc.
 - h. Segregate soils in the excavated material that are not suitable for trench backfill and dispose of in a manner that is consistent with the requirements specified herein under "Backfill Above Pipe Zone."
 - i. Dispose of excess excavated materials off of right-of-ways and easements in a suitable site selected by the Contractor.
 - j. Haul materials, other than natural soil materials that are suitable as backfill material, to an approved landfill as directed by the Engineer.
2. Leave trench sheeting or bracing in place until pipe has been laid, tested, repaired (if necessary), and the backfill placed and compacted to a depth of 1 foot above the top of the pipe. Written permission by the Engineer is necessary prior to removal.
 3. Dewater the ground as necessary to excavate the trench and install the pipe and structures.
 4. Direct all surface and groundwater discharges to natural drainage channels, drains, or storm sewers.
 5. Excavate to a sufficient depth to insure adequate foundation when the bottom of the trench is soft or where in the opinion of the Engineer unsatisfactory foundation conditions exist. Bring excavation up to pipe grade with thoroughly compacted granular materials meeting the requirements of Improved Foundation Material.
 6. Provide temporary support, remove, relocate, or reconstruct existing utilities located within the trench excavation as necessary. Utility Owner shall designate method employed. Use particular care and provide

compacted fill or other stable support for utility crossings to prevent detrimental displacement, rupture, or failure.

7. Excavate to expose existing utilities that cross in close proximity to the planned pipe line to determine the utility's exact location sufficiently ahead of pipe installation to plan for the avoidance of grade conflict. Engineer will assist in the measurements to determine the utilities' location relative to the planned pipe line location. A deviation from the alignment, grade, and location to avoid conflict may be ordered by the Engineer with City Engineer's approval if in his opinion an alternate alignment, grade, or location is more feasible. Plan the work with the Engineer at the pre-construction conference and coordinate the activities as necessary during the course of work progress.
8. In locations where rock affects the pipe foundation, excavate the trench 6 to 12 inches below the pipe and place sand cushion material up to the proposed invert elevation. The remainder of the trench up to the top of rock elevation shall be backfilled with granular backfill material meeting the requirements of Part 2.03.B of this Section:
 - a. Sand Cushion: The removal and disposal of the unsuitable material within the trench and below the invert elevation, and the replacement up to invert elevation with the appropriate bedding material.
 - b. Granular Backfill: The removal and disposal of unsuitable material within the trench, above the invert elevation, and replacement up to the surface with appropriate backfill material. No additional compensation will be allowed for wider or deeper trenches in rock excavations.
 - c. For PVC and HDPE Pipe, the sand cushion shall be placed to 1 foot above the pipe and shall be paid as pipe bedding. The remainder of the trench up to the top of the rock shall be backfilled with granular backfill material.
9. Install and maintain barricades, guards, and warning lights as necessary to protect persons from injury and to avoid property damage.

B. Backfill In the Pipe Zone:

1. Bed polyvinyl chloride (PVC) pipe in accordance with ASTM D2321 and Standard Detail Plate No. BED-2. If native soil does not comply with Article 2.01.A of this Section, supply material of the specified quality from other sources. Give special attention to compacting the backfill material around the pipe to at least 95 percent of maximum density to a distance of 1 foot above the top of pipe.

2. Bedding for DIP is Type C-1 as outlined on Hudson Detail Plate No. BED-1.
3. For Type C-1 bedding, use only selected materials free from rock, boulders, debris, or other high void contact substances to a level 1 foot above the top of pipe. Remove ledge rock, boulders, and large stones to provide at least 6 inch clearance from pipe.
4. Dig bell holes of ample dimension in the pipe bedding at each joint, such that the pipe barrel rests continuously on the bedding.
5. Place backfill completely under the pipe haunches in uniform layers not exceeding 4 inches in depth. Carefully and uniformly tamp each layer to eliminate the possibility of lateral displacement and to provide uniform support under the pipe haunches.
6. Bed pipe in rock excavation with thoroughly compacted granular material listed in 2.01.A.

C. Backfill Above Pipe Zone:

1. Backfill with suitable materials selected from the excavated materials to the extent available and practical.
2. Suitable materials are mineral soils free of rubbish, trees, stumps, branches, debris, frozen soil, oversize stone, concrete and bituminous chunks, and other similar unsuitable material.
3. Place backfill materials in uniform depth layers not to exceed 8 inches before compaction. Acceptably complete the compaction of each layer before placing material for the succeeding layer.
4. Compact each layer by mechanical means until it meets the requirements of WisDOT Section 207.3.6.3, "Special Compaction," except that the upper 3 feet of the subgrade in roadway areas shall be compacted to 100 percent of maximum density.
5. The Engineer has full authority to suspend the placement of additional backfill materials if the preceding layer has not been compacted and its surface properly leveled.
6. The method and means of placement and type of compaction equipment used is at the discretion of the Contractor. However, all portions of the trench backfill must meet minimum specified compaction requirements.

7. Any deficiency in quantity of backfill material caused by shrinkage or settlement will be supplied by the Contractor at no additional cost to the Owner.
8. Excavated material not suitable or required for backfill is to be disposed of by the Contractor outside of the Project Site at a disposal location of his choosing.

3.04 FIELD QUALITY CONTROL

- A. The Engineer will have an independent testing company sample and test the soils that are to be used to determine the Maximum Density and Optimum Moisture, and to make density and moisture tests on the compacted backfill. The rate and location of such tests shall be at the discretion of the Engineer.
- B. Assist the Engineer with testing by excavating for density tests where, when, and in the manner prescribed by the Engineer. Assist with obtaining material samples when requested.
- C. Failed density test areas shall be excavated and re-compacted until the density requirements are met.

3.05 MEASUREMENT AND PAYMENT

- A. Trench Excavation: Excavation and backfilling of trench shall be included in the price of pipe furnished and installed.
- B. Pipe Bedding: Considered incidental and shall be included in the price of pipe furnished and installed.
- C. Rock Excavation: For measurement purposes, volume will be computed based from the top of the rock to a point 6 inches below the outside barrel of pipe and 12 inches from each side of outside diameter of pipe (at bell). Payment for Rock Excavation shall be at the Bid Unit Price per cubic yard.
- D. Temporary Bracing and Sheeting: Considered part of the excavation costs with no additional compensation to Contractor, unless provided for otherwise.
- E. Density Tests:
 1. Passing Tests: All costs paid by Owner.
 2. Failing Tests: All costs charged to and paid by the Contractor.
- F. Dewatering: Any dewatering necessary will be considered incidental to the Bid Unit Price for the installation of the pipe or structure.

- G. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

SECTION 33 05 17

ADJUST MISCELLANEOUS STRUCTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Adjusting catch basin, manhole and inlet covers.
- B. Adjusting valve boxes.

1.02 RELATED SECTIONS

- A. Section 33 31 00 – Sanitary Sewer.
- B. Section 33 40 00 – Storm Drainage Utilities.
- C. Section 32 12 01 – Flexible Pavements (Municipal Projects).

1.03 REFERENCES

- A. State of Wisconsin Department of Transportation "Standard Specifications for Highway and Structure Construction" - latest edition including all current supplements (WisDOT):
 - 1. 611 – Catch Basins, Manholes, and Inlets.
- B. American Society of Testing and Materials (ASTM):
 - 1. A48 – Specification for Gray Iron Casting.
 - 2. A240 – Specification for Heat – Resisting Chromium – Nickel Stainless Steel Plate Sheet and Strip for Pressure Vessels.
 - 3. C6 – Specification for Normal Finishing Hydrating Lime (Mortar).
 - 4. C141 – Specification for Hydraulic Hydrated Lime for Structural Purposes (Mortar).
 - 5. C150 – Specification for Portland Cement (Concrete Rings/Mortar).
 - 6. C923 – Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Materials.

7. D1248 – Polyethylene Plastics Molding and Extrusion Materials.

1.04 DEFINITIONS

- A. Adjusting Catch Basin, Manhole and Inlet Covers: A change in rim elevation accomplished for catch basins, manholes or inlets through the addition or removal of adjustment rings only. Adjustment does not include the addition or removal of sections from the structure.
- B. Adjust Valve Box: A change in elevation of the top of the valve box accomplished through the raising or lowering of the existing top section of the valve box only. Adjustment does not include the addition or removal of sections from the valve box.

1.05 SEQUENCING AND SCHEDULING

- A. Contractor, Engineer and Owner shall inspect all existing structures prior to beginning construction.
- B. Owner will remove any foreign material found in the existing structures prior to construction. Contractor is responsible for removing any foreign material that enters the structures during construction.

PART 2 – PRODUCTS

2.01 ADJUSTING RING

- A. Concrete (Catch Basins):
 - 1. Size to match cone or opening in top slab.
 - 2. Concrete Compressive Strength: Minimum 3000 psi.
 - 3. Reinforcing: Single hoop 8 gauge steel wire.
 - 4. Total Adjusting Ring Thickness: Minimum 3 inches, maximum 12 inches.

2.02 ADHESION MATERIALS

- A. Ram-Nek material, or approved equal.
- B. Mortar:
 - 1. Standard Portland Cement: Type I, ASTM C150.
 - 2. Normal Finishing Hydrated Lime: ASTM C6.

3. Hydraulic Hydrated Lime for Structural Purposes: ASTM C141.
4. Mix Proportions: 1 part cement to 3 parts mortar sand; lime may be added to mixture: maximum amount 15 percent by volume.

2.03 VALVE BOX EXTENSIONS

A. Risers:

1. As described in the Hudson Public Water Utilities - Water Distribution Technical Specifications, City of Hudson.

2.04 FRAMES, GRATES AND LIDS

A. Manhole, Catch Basin Frames, and Covers:

1. Requirement: ASTM A48.
2. Material: Class 35 cast iron. Best grade. Free from injurious defects and flaws.
3. Finish: Coal tar pitch varnish.
4. Finish Preparation: Sandblast.
5. Machine cover and frame contact surface for non-rocking protection.
6. Type and Style: NEENAH R1642, Type "B" Lid, or approved equal, for sanitary and storm sewer manholes, and NEENAH R3067, Type "V" Grate, or approved equal, for storm sewer catch basin manholes and catch basins. Covers without grate openings stamped with "SANITARY SEWER" or "STORM SEWER" as appropriate. Use 2 inch letters.

2.05 GEOTEXTILE

- #### A. Woven filter fabric, 4-1/2 ounce for use in conjunction with adjustment rings.

2.06 HYDRANT EXTENSIONS

- #### A. Match existing hydrant manufacture and model.

PART 3 - EXECUTION

3.01 GENERAL

- A. The necessary vertical alignment will be determined by the Engineer and generally as indicated on the schedule of adjustments.
- B. Where existing frame is within 0.10 feet of plan grade, no adjustment is to be made.
- C. The frame shall be raised or lowered to match the street or gutter.
- D. Protect existing structures from damage.
- E. Prevent sand, concrete, or any other debris from entering the structures.

3.02 PREPARATION

- A. Call utility owners to field mark their utility locations.
- B. Contractor shall verify exact location of existing utilities.

3.03 ADJUSTING CATCH BASIN, MANHOLE AND INLET COVERS

- A. Remove all dirt, debris, dust, and other deleterious material from surface prior to placement of first adjusting ring.
- B. Concrete Adjusting Ring:
 - 1. Mortar on top and bottom surfaces of all concrete adjusting rings; between surface of top slab or cone and bottom ring; between surface of top ring and casting; on entire surface of area of ring with no gaps:
 - a. Mortar Thickness: 1/4 to 1/2 inch.
 - 2. No shims of any material allowed.
 - 3. Required cross slope of casting to be achieved by varying thickness of mortar.
 - 4. Do not plaster the inside surface of rings.
 - 5. Wipe clean all excess mortar from the joints inside all rings and frame.
 - 6. Remove all mortar spills from the structure.
 - 7. Use a 6 inch ring where applicable.

3.04 ADJUST VALVE BOX

- A. Adjust box by screwing top section up or down.
- B. Prevent sand, chunks of concrete, or any other debris from entering the valve box:
 - 1. Short sections inserted inside the existing top section are not allowed to perform adjustment, unless specified.
- C. Install approved sections as needed.
- D. Patch road to match existing pavement section.

3.05 HYDRANT EXTENSIONS

- A. Remove upper section.
- B. Install extension kit as per manufacturer's requirements.
- C. Replace upper and lower rod assemblies with heavy-duty for extensions in excess of 18 inches.
- D. Replace upper section.

3.06 FIELD QUALITY CONTROL

- A. For adjustments made within bituminous surfaced areas, any settlements of the bituminous surface greater the 3/8 inch below the rim of the adjustment structure will require removal and replacement of the bituminous surfacing at the Contractor's expense.
- E. Secure manholes and structures immediately after completion or before suspension of operations at the end of working day with castings or suitable alternative device.
- F. Adjust manholes and catch basin frames 1/2 inch below grade prior to placing the final wear course. Thorough tamping of the material around manhole and catch basin frames is required. Where existing frame is within 0.10 feet of plan grade, no adjustment is to be made. In such cases, the crown or gutter shall be either lowered or raised, as the case may be, to put the street and frame at the same grade.
- G. Adjust frame upward with standard concrete or HDPE adjustment rings of the same size as the cone or slab opening. Place each adjustment ring and frame in a full mortar or sealant bed. Adjusting rings needed to raise the casting to grade shall be incidental to the adjustment item.
- H. Adjust frame downward by removing the necessary number of adjustment rings from the structure and resetting the frame in a full mortar bed to grade.

- I. Regardless of the direction of adjustment, no shims of any material will be allowed. The minimum thickness of all mortar joints shall be at least 1/4 inch with a maximum allowable thickness of 1/2 inch. All excess mortar from the joint shall be wiped clean from the inside of all rings and frame. All manhole castings must be replaced prior to the placing of the final wear course.
- G. Adjust valve boxes to 1/2 inch below grade prior to placing the final wear course. Thorough tamping of the material around the valve box is required. All valve boxes are the sectional screw-threaded adjustable type.
- H. All bituminous or concrete pavement shall be saw cut square (diamond-shaped relative to the roadway), full depth through pavement as shown in standard detail plate no. STR-16. Compaction of the gravel base shall be accomplished via a vibratory plate compactor.
- I. Adjust utility structures (manholes and valve boxes) to 1/2 inch below grade being proposed for the Winter Season. No burying of manholes or gate valves will be allowed over the Winter Season. All structures shall be readjusted prior to placement of asphaltic concrete surface course.
- J. Utilize 1/2 inch thick pucks on gate valves and 1/2 inch thick circular plates on manholes for all paving of streets, driveways, paths, and parking areas.
- K. Clean all lids of all gravel, bituminous, or concrete during paving operations while bituminous is hot and/or concrete is plastic.

3.07 MEASUREMENT AND PAYMENT

- A. A Bid Item has been provided on the Bid Form for Adjusting Manhole Covers. Payment will be by each existing frame and ring assembly adjusted to final grade within the bituminous street section. Manholes located within the street but outside the paving area will be adjusted under a separate contract. All other manholes will be adjusted to final grade and be considered incidental to the installation of the structure.
- B. A Bid Item has been provided on the Bid Form for Adjust Valve Box. Payment will be by each existing valve box adjusted to final grade within the bituminous street section. Valve boxes located within the street but outside the paving area will be adjusted under a separate contract. All other valve boxes will be adjusted to final grade and be considered incidental to the installation of the valve box.
- C. A Bid Item has been provided on the Bid Form for Extend Hydrant Barrel. Payment will be by linear foot of extension.

- D A Bid Item has been provided on the Bid Form for Adjusting Catch Basin and Inlet Covers. Payment will be by each existing frame and ring assembly adjusted to final grade. All adjustments for catch basins and inlets installed under this Contract will be considered incidental to the installation of the structure.
- E. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

SECTION 33 31 00

SANITARY SEWER

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Sanitary sewer gravity pipe, manholes, fittings and miscellaneous appurtenances.

1.02 RELATED SECTIONS

- A. Section 33 05 17 – Adjust Miscellaneous Structures.
- B. Section 33 05 05 – Trenching and Backfill.
- C. Section 33 31 05 – Sewage Force mains.
- D. Section 33 31 14 – Sanitary Sewer Services.

1.03 REFERENCES

- A. American Society of Testing and Materials (ASTM):
 - 1. A48 - Specification for Gray Iron Castings.
 - 2. A615 - Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 3. C76 – Specification for Reinforced Concrete Culvert, Drain, and Sewer Pipe.
 - 4. C139 - Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
 - 5. C150 - Specification for Portland Cement.
 - 6. C206 - Specification for Finishing Hydrated Lime.
 - 7. C361 – Specification for Reinforced Concrete Low Head Pressure Pipe.
 - 8. C478 - Specification for Precast Reinforced Concrete Manhole Sections.
 - 9. D16 – Terminology Relating for Paint, Varnish, Lacquer, and Related Products.

10. D698 – Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
11. D1784 – Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (PVC) Compounds.
12. D1785 - Specification for PVC Plastic Pipe, Schedule 40, 80, and 120.
13. D2321 - Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity – Flow Applications.
14. D3034 – Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
15. D3212 – Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
16. F477 – Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
17. F794 – Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
18. F894 – Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe.

B. American Water Works Association (AWWA):

1. C104 – Cement Mortar Lining for Ductile and Cast Iron Pipe and Fittings.
2. C105 – Polyethylene Encasement for Ductile Iron Pipe.
3. C110 – Ductile – Iron and Gray – Iron Fittings, 3 Inches through 48 Inches, for Water and Other Liquids.
4. C111 – Rubber-Gaskets Joints for Ductile-Iron Pressure Pipe and Fittings.
5. C151 – Ductile – Iron Pipe, Centrifugally Cast for Water.

1.04 PROJECT SITE CONDITIONS

- A. Sanitary sewer lines are shown on the Drawings in a general way. Contractor should anticipate minor variations in both horizontal and vertical directions in locating existing system.

1.05 SUBMITTALS

- A. Shop Drawings: Indicating information for fabrication and installation of manholes.
- B. Manufacture's Certification of Compliance:
 - 1. Precast structures fabrication and installation.
 - 2. Certification of compliance for each diameter and class of pipe.
 - 3. Gray iron castings.
- C. PVC Pipe: Certification of resin compounding by pipe manufacturer prior to shipment of pipe to Project Site.
- D. Service Risers: Location of riser, including distance along sewer main from downstream manhole and offset distance from sewer main centerline.
- E. Video copy on VHS format of sewer televising and 2 copies of the written report on conditions.
- F. Details of proposed methods for leak testing.

1.06 SEQUENCING AND SCHEDULING

- A. Do not pursue work causing shut off of utility services (gas, water, electric, telephone, TV, etc.) to consumers until the utility owner is contacted and all consumers are notified of the shut-off schedule.
- B. Verify vertical and horizontal location of sanitary sewers sufficiently in advance of installing new pipe to determine the extent of conflict, if any.
- C. Successfully complete required inspections and testing before restoration of surface.
- D. Commence closed circuit TV inspection after all of the backfill is compacted in place.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Concrete Materials:

1. Standard Portland Cement Type 1, clean washed sand, and crushed rock and gravel free from deleterious materials for monolithic concrete manholes and all manhole bases.
2. Portland Cement: Comply with the requirements of ASTM C150.
3. Design Mix: Subject to the approval of the City Engineer. Use proper water-cement ratio to obtain (4000 psi) in 28 days.

B. Mortar Materials:

1. Cement: Type 1 Standard Portland Cement conforming to ASTM C150.
2. Lime: Normal finishing hydrated lime meeting the requirements of ASTM C206.
3. Mix Proportions:
 - a. 1 part cement to 3 parts of suitable plaster sand for mortar used for plastering the exterior walls of block manholes and catch basins, adjusting rings, and lift holes. Use lime or mortar mix in the amount necessary to make a suitable mixture for plastering purposes, but not to exceed 15 percent by volume.
 - b. 1 part Portland cement to 2 parts of sand to which lime or mortar mix may be added but not to exceed 15 percent by volume for mortar used for laying concrete block.

C. Reinforcing Steel: Comply with the requirements of ASTM A615, Grade 60.

2.02 MANHOLES

- A. Precast concrete sections conforming to ASTM C478, details on the Drawings.
- B. Joints: Rubber o-ring gasket type, or approved equal.
- C. Structure Bases:
 1. Pre-cast integral with bottom section of manhole.
 2. Pre-cast invert.
 3. Outside Drop: Manhole bottom section to be pre-cast as monolithic base containing lower DIP elbow for drop.
- D. Manhole Steps:

1. Reinforced polypropylene plastic steps with No. 2 deformed grade steel rod.
2. Neenah Foundry Step No. R1981J, Badger F-15, or approved equal.

E. Pipe Connections:

1. All manholes shall be fabricated with pipe openings consisting of a rubber boot and stainless steel band to seal off the joint from allowing dirt, ground water, or other objectionable material from entering. These materials shall be installed with the fabrication on all new manholes.

2.03 MANHOLE FRAMES AND COVERS

- A. Requirement: ASTM A48.
- B. Material: Class 35 cast iron. Best grade. Free from injurious defects and flaws.
- C. Finish: Coal tar pitch varnish
- D. Finish Preparation: Sandblast.
- E. Machine cover and frame contact surface for non-rocking protection.
- F. Type and Style: As shown on Drawings.
- G. Covers with 2 concealed pick holes of approved design. Rubber gasket type self sealing covers shall be used in wet locations as show on the plans or as directed by the City Engineer.
- H. Weight: Minimum of 380 lbs.
- I. Cast labels "SANITARY SEWER" on each cover. Use 2 inch letters.

2.04 PIPE MATERIAL

- A. PSM Polyvinyl Chloride (PVC) Plastic Pipe and Fittings (4 Inch Through 15 Inch Diameter):
 1. General: Pipe and fittings conform to ASTM D3034.
 2. Materials: PVC plastics having a minimum cell classification of 12454B, 12454C, or 13364B as defined in ASTM D1784. Pipe materials shall have a minimum hydrostatic design stress of 2,000 psi as certified by the Plastic Pipe Institute. Additives and fillers, including but not limited to stabilizers,

antioxidants, lubricants, colorants, etc., shall not exceed 20 parts by weight per 100 of PVC resin in the compound.

3. Design: Integral wall bell and spigot joint and a minimum wall thickness conforming to SDR 35 and/or SDR 26:
 - a. SDR 35 for main line piping with depth up to 16 feet.
 - b. SDR 26 for main line piping with depths greater than 16 feet, unless otherwise noted.
 - c. Schedule 40 for all service laterals.
 - d. Schedule 40 for all service riser pipe.
4. Joints: Conform to ASTM D3212. Push-on type only with the bell-end grooved to receive a gasket. Elastomeric Seal (Gasket): A basic polymer of synthetic rubber conforming to ASTM F477. Natural rubber gaskets will not be accepted.
5. Marking: Each pipe shall be identified with the name of the manufacturer or trademark and code, nominal pipe size in inches, the PVC cell classification, and "Specification D3034."

B. Polyvinyl Chloride (PVC) Pipe and Fittings (15 Inch Through 42 Inch Diameter):

1. General Requirements: Pipe and fittings shall conform to ASTM F794.
2. Materials: Polyvinyl chloride compounds which comply with the requirements for a minimum Cell Classification of 12454B, 12364A, or 13343C as defined by ASTM D1784. Homopolymer PVC compounds must meet or exceed the requirements of the above listed minimum cell classification number. PVC compounds of other cell classifications shall be pre-qualified. Additives and fillers, including but not limited to stabilizers, antioxidants, lubricants, colorants, etc., shall not exceed 10 parts by weight per 100 of PVC resin in the compound.
3. Design: Integral wall bell and spigot joint with elastomeric seal joints. Minimum Pipe Stiffness: 46 pounds per square inch (psi) at 5 percent deflection.
4. Joints: Conform to ASTM D3212. Push-on type only with the bell-end grooved to receive a gasket. Elastomeric Seal (Gasket): Basic polymer of synthetic rubber conforming to ASTM F477, and be factory installed and chemically bonded to the bell-end of the pipe. Natural rubber gaskets will not be accepted.

5. Marking: Each pipe shall be identified with the name of the manufacturer's, or trade name or trademark, and code, nominal pipe size in inches, the PVC minimum cell classification, the legend "PS 46 PVC Series Pipe," and ASTM F794.

C. Polyvinyl Chloride (PVC) Pipe and Fittings (36 Inch Through 54 Inch Diameter):

1. General Requirement: Controlled inside diameter with an integral bell and elastomeric seal joints which meet the requirements of ASTM F1803, closed profile.
2. Materials: Pipe and fitting shall be made from polyvinyl chloride compounds which comply with the requirements for a minimum Cell Classification of 12364A as defined by ASTM D1784.
3. Dimensions: Pipe sizes, inside diameters, and typical dimensions shall conform to those shown on Drawings. Outside diameter shall be constant along the length.
4. Joints: All pipe joints shall be of the bell and spigot type with elastomeric seals and conform to the requirements of ASTM D3212. Gaskets shall be factory installed and chemically bounded to the bell end of the pipe. Gasket material shall conform to the requirements of ASTM F477.
5. Fittings: All fittings shall be fabricated from pipe meeting the requirements of these standards. Fabricated miter joints shall be reinforced by fusion heat welding.
6. Pipe Stiffness: Minimum pipe stiffness shall be 46 psi when tested in accordance with ASTM D2412.
7. Impact Resistance: No visual cracking or splitting of the waterway shall be evidenced when tested in accordance with ASTM D2444 with a 30 lb. weight, Type B, flat plate holder B to a level of 220 ft. lbs.
8. Fusion Quality: There shall be no sign of flaking or disintegration when immersed in anhydrous acetone for 20 minutes as described in ASTM D2152.
9. Ductility: There shall be no evidence of cracking or splitting when pipe is flattened in a circumferential orientation between 2 flat plates to 60 percent of the original inside diameter.
10. Air Tightness: Each length of pipe shall pass a factory 3.5 psi air test as described in ASTM F1803.

11. Marking: Each pipe shall be identified with the name of manufacturer, nominal size, cell classification, ASTM designation F1803, the pipe stiffness designation "PS-46," and manufacturer's date code.

D. Reinforced Concrete (RCP) Pipe and Fittings:

1. General Requirement: ASTM C76, Wall B with circular reinforcing, synthetic rubber gasketed R-4 joint.
2. Materials: Conform to the requirements of ASTM C76, Wall B with circular reinforcing. O-ring gaskets shall be synthetic rubber, circular in cross-section, and conform to ASTM C361.
3. Pipe Joints: Bell and spigot conforming to ASTM C361.
4. Pipe Class: As shown on the Drawings.
5. Marking: Each pipe shall be identified with the name of the manufacturer, or trade name or trademark, and code, identification of plant, date of manufacture, the pipe class, and specification design.
6. Liner:
 - a. PVC: PVC liner shall be Amerplate T-Lock as manufactured by Ameron Protective Liner Division, Brea, California, or approved equal. The liner shall be installed in the entire 360 degree of the pipe interior surface.
 - b. HDPE: HDPE liner shall be Studliner as manufactured by GSE Lining Technology, Inc., SureGrip (CPL) as manufactured by AGRU, or approved equal. The liner shall be installed in the entire 360 degree of the pipe interior surface.

E. Ductile Iron (DIP) Pipe and Fittings:

1. General Requirement: AWWA C151.
2. Joints: Mechanical or push-on conform to AWWA C111.
3. Lining: 40 mil nominal thickness. Joint components shall be coated. Thickness on sealing areas in the bell socket interior and on the spigot end of the pipe exterior shall be 6 mil nominal.

4. The acceptable linings are as follows:
 - a. Polyurethane Coating System: 100 percent solids polyisocyanate resin and polyol resin mixed in 1:1 ratio at the time of application by an ASTM D16, Type V system. It must be applicable at surface temperatures ranging from 40° F. to 150° F.
 - b. The lining shall be a composite lining utilizing a primer coating containing fusion bonded epoxy (FBE) and a surface coating containing fusion bonded polyethylene (FBP). The lining shall be Polybond*Plus*® as manufactured by the American Cast Iron Pipe Company (Birmingham, Alabama), or approved equal. All lining application must be performed by the pipe manufacturer at the pipe manufacturer's facility.
 - c. The lining shall be PROTECTO 401 Ceramic Epoxy, or approved equal, 40 mils thick.

5. Testing Requirements:
 - a. All ductile iron pipe and fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC-PA-2 Film Thickness Rating.
 - b. The interior lining of all pipe barrels and fittings shall be tested for pinholes with a nondestructive 2,500 volt test. Any defects found shall be repaired prior to shipment.
 - c. Each pipe joint and fitting shall be marked with the date of application of the lining system, along with its numerical sequence of application on that date, and records maintained by the applicator of his work.

6. Pipe Class: As shown on Drawings.

7. Marking: Each pipe shall be identified with the manufacturer, or trade name or trademark, and code, country where cast, nominal pipe size, year in which the pipe was produced, and "DI" or "Ductile."

2.05 TRACER WIRE FOR SANITARY SEWER MAIN AND SERVICES

A. Tracer Wire

1. Conform to the applicable requirements of NEMA WC3, WC5, and WC7.
2. Shall be Underwriters Laboratories (UL) listed for use in direct burial applications (e.g. USE, UF, or tracer wire).

3. Conductor: Minimum AWG No. 12 in copper rated to 30 volts.
4. Outside Identification: Volts (or V), AWG size, UL and designation (ex. “tracer wire”). Wire shall be green for sanitary.
5. Splice shall be accomplished by joining the 2 bare ends of the wires with either a copper mechanical split bolt compression fitting or a crimp-type compression sleeve for copper connections. No other connection is allowed.
6. All joined splices shall be fully enclosed using a 3M Brand Scotchfil™ Electrical Insulation Putty. The putty shall be fully sealed and bonded on all side.
7. Splices shall not be more frequent than 1 splice per 250 feet.

B. Access box devices

1. Heavy Duty for Traffic Load.
2. Manufacturers/models:
 - a. Snake Pit, by Copperhead Industries, LLC.
<http://www.copperheadwire.com/pdf/snakepit.pdf>
 - b. Cathodic Test Box P200 series, by Bingham & Taylor
<http://www.binghamandtaylor.com/cathodic.htm>.
 - c. Approve Equal

2.06 INSULATION

- A. Insulate in accordance with Section 2.08 - Hudson Public Water Utilities Water Distribution Technical Specifications, City of Hudson Public Utilities Commission Specification.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Excavation and Preparation of Trench: Conform to Section 02320 – Excavating, Backfilling, and Compacting for Utilities.
- B. By-Pass Pumping: Contractor shall be responsible for all items required to maintain sewer flows during construction of the new sanitary sewer line. All work and costs for this are considered incidental to the Project, unless otherwise specified.

3.02 INSTALLATION

A. Installing Pipe:

1. Excavation and Preparation of Trench: Conform to Section 02320 - Excavating, Backfill, and Compacting for Utilities.
2. Lay and maintain pipe and appurtenances to the alignment, grade, and location shown on the Drawings and/or staked in the field. No deviation from the Drawing and/or staked alignment, grade, or location is allowed, unless approved by the City Engineer. Deviation from grade in excess of 0.05 percent may be cause for removal and relaying pipe at the Contractor's expense.
3. Permanently support, remove, relocate, or reconstruct existing utility pipes, cables, structures, or other appurtenances when they obstruct the line, grade, or location of the pipe or appurtenance. Do the work in cooperation with the owner of the utility. Utility owner will determine which method is to be used.
4. General Pipe Installation Procedure: Use joint lubricant in accordance to manufacturer's instructions. Lubricate joint, center spigot in bell, push spigot home, bring pipe to proper line and grade, and secure pipe in place by properly bedding.
5. Lay pipe upgrade with spigot ends pointing in the direction of flow.
6. Plug all openings to the installed pipe with suitable stoppers to prevent water, dirt, and debris from entering the sewer.
7. Remove all foreign matter or dirt from inside the pipe. Keep the bell and spigot clean during and after installation. Take care to prevent dirt from entering the joint space. Remove any superfluous material from inside the pipe after pipe installation by means of an approved follower or scraper.
8. All joints must be watertight. Repair any leaks discovered.
9. No pipe is to be laid in water or when trench conditions are unsuitable for such work.

B. Installing Structures and Appurtenances:

1. Furnish and install structures in accordance with Detail Plates as shown on Detail Plate No. SAN-1, SAN-2, and SAN-3.

2. Place precast integral base section on compacted subgrade.
 3. Set precast concrete sections plumb with a 1/8 inch per foot maximum out of plumb tolerance allowed. Structures more than 1/8 inch per foot out of plumb shall be re-installed at the Contractor's expense.
 4. Install short precast section (maximum 16 inch height) immediately below the eccentric cone or precast top slab.
 5. Position vertical wall of the eccentric cone on the downstream side.
 6. Steps:
 - a. Locate over downstream pipe, except for pipe 24 inches in diameter or greater. Then place where most appropriate to provide the most suitable access.
 - b. Secure and neatly mortar in place 15 inches on center spacing.
 7. Install Rings and Adjust Structure: Conform to Section 02280 – Adjust Miscellaneous Structures.
 8. Neatly mortar lift holes.
 9. All pipes entering the manhole must be cut with a power saw to provide a clean, smooth pipe surface.
- C. Drop Manhole Inlets: Conform to details shown on the Drawings.
- D. Construct Manhole Over Existing Pipe:
1. Construct manhole over existing pipe at locations shown on the Drawings.
 2. Saw cut existing pipe to fit flush with inside wall of new structure.
 3. Seal any openings in manhole.
- E. Sanitary Sewer Service Connections:
1. Wye:
 - a. Wye to be at 10 and 2 o'clock positions.
 - b. Plugs installed with Atlastic 77, Sonolastic Sealant, or approved equal, or specifically designed for the opening to be plugged.

2. PVC Risers:
 - a. Pour concrete casement around connection.
 - b. Pipe to be supported on undisturbed trench slope for entire riser length.

F. Connect to Existing System:

1. Connect to Existing Structure:
 - a. Connect to existing structure at location shown on the Drawings.
 - b. Core the hole in the structure, trimming the pipe flush with the structure, trimming the pipe flush with the pipe to seal it within the wall.
 - c. Reconstruct manhole bench/invert.
 - d. Make repairs to the structure.
2. Connect to End of Existing Pipe (Stub):
 - a. Locate and expose end of existing stub.
 - b. Remove or salvage existing plug and connect to pipe.

G. Installation of Insulation:

1. Insulation over pipe in locations as shown on the Drawings.
2. Insulation is to be placed wherever sanitary sewer line comes within 3 feet of any storm structure or line, or within 5 feet of the ground surface.

3.03 PROTECTION

- A. Plug most downstream point of line or points if multiple separate lines to prevent runoff from entering City's system. Plug to remain in place until testing is completed.
- B. Plug all entrances and openings to the system promptly and before suspension of operations at the end of working day.
- C. Secure manholes and structures immediately after completion or before suspension of operations at the end of working day with casting or suitable alternative device.
- D. Mark structure susceptible to being hit by construction or vehicular traffic.
- E. Mark each plug location with 4 inch x 4 inch timber to above existing grade.

3.04 FIELD QUALITY CONTROL

A. Scope:

1. Provide all labor, materials, and equipment to perform tests.
2. City Engineer to observe and verify all tests and to visually inspect the final work for compliance.

B. Cleanup:

1. Clean pipe and all structures:
 - a. If newly installed mains and structures are kept clean during construction, cleaning will not be required.
 - b. If newly installed mains and/or structures become dirty due to negligence of the Contractor, cleaning will be performed at the sole expense of the Contractor. TV testing to be done following cleanup.
2. The bailing or flushing method of cleaning pipe is acceptable only if adequate provisions, acceptable to the Engineer, for keeping dirt and debris out of the existing sewer system or ponds are employed. Jetting may be required.
3. Complete prior to final inspection for acceptance.

C. Required Tests and Inspections:

1. Commence test procedures only when pipe and structures are clean and free of dirt, water, or other foreign matter, and for buried pipe, trench has been backfilled.
2. Infiltration Test: Test all systems for excessive leakage before being put in service. Test in section length increments deemed necessary by the Engineer, but in no case greater than 2,000 feet:
 - a. Construct measuring weirs and devices as necessary and directed by the City Engineer. The maximum allowable rate of leakage shall not exceed 100 gallons per mile per inch of diameter per day.
3. Lamping: City Engineer will verify installation for true line and grade, joints are home, no broken or defective pipes exist, the installed pipe is structurally sound, and that the structures conform to the specified requirements.

4. Deflection Testing: Required for all flexible pipe (CCF, PVC, and HDPE). Deflection testing shall be conducted at least 30 days after the pipe has been backfilled to the desired finish grade. Deflection testing shall be done in the presence of the Engineer:
- a. Pipe Diameters Through 24 Inches: Deflections shall be determined by pulling mandrel through the sewer main.
 - b. Pipe Diameters 24 Inches Through 36 Inches: Deflections shall be determined by use of a mandrel or a method submitted to and approved by the Engineer.
 - c. Pipe Diameters Greater Than 36 Inches: Deflection measurements shall be determined using a mandrel, rigid bar, a circular rigid template, or by a method approved by the Engineer.
 - d. Mandrel Requirements: The mandrel shall have a minimum diameter equal to 95 percent of the average internal diameter of the pipe. The 5 percent deflection allowance shall include both deflection occurring after burial and deformation which occurs as a result of the manufacturing process, shipping, and pipe storage:
 - 1) The Average Internal Diameter shall be determined as specified below:
 - a) Average Internal Diameter = (Average Outside Diameter) minus $2 \times$ (Minimum Pipe Wall Thickness).
 - b) The Average Outside Diameter will be computed as the average of 16 Project Site field measurements of the pipe prior to installation. 4 outside diameter measurements will be made on each of 4 lengths of the particular diameter pipe to be tested. Measurements shall be made by the Contractor in the presence of the Engineer.
 - c) No adjustments to the average internal diameter will be allowed for out-of-roundness, diameter variation, or thickness variation due to manufacture, shipping, and handling.
 - 2) Mandrel shall be constructed of rigid steel, be non-adjustable, and have an odd number of legs (9 legs minimum). Its effective length shall not be less than its nominal diameter.
 - 3) Deflection Template/Bar Requirements:
 - a) The circular template diameter (or rigid bar length) shall be equal to the average internal diameter as determined in Articles 3.4.C. 2.
 - b) Circular templates shall be constructed of rigid materials and be non-adjustable.
 - c) Rigid bars shall have a 1 inch diameter circular section, be constructed of steel, and be non-adjustable.

- e. Owner reserves the right to measure the deflection of all flexible pipe at any time during the correction period. Deflections greater than 5 percent of the inside diameter of the pipe shall be considered failure. Contractor may be required to re-excavate the trench, re-compact the backfill material, and restore the surface with no additional compensation for such work.

5. Low Pressure Air Test:

- a. Must meet criteria set forth in ASTM C924 and ASTM F1417.
- b. Pipe shall be cleaned but may be wetted. Pneumatic balls shall be used to plug the ends at manholes. Low-pressure air shall be introduced into plugged line until the internal air pressure reaches 4.0 psig greater than the average back pressure of any groundwater pressure that may submerge the pipe. At least 2 minutes shall be allowed for the pressure to stabilize before readings are taken and the timing started. During this time, check all plugs with soap solution to detect plug leakage. If any plugs are found to leak, air shall be bled off, the plugs shall be retightened, and the air shall be reintroduced into the line.
- c. The sewer line under test will be accepted as having passed the air test, if the pressure does not drop more than 0.6 psig in less time than 1/2 minute per inch in diameter of the pipe being tested. The minimum starting pressure is 3.6 psig.

- 6. Inspect the newly installed pipe by remote TV. The video tape of each sewer line shall include audio description and printed stationing of service lateral locations. Provide both the City Engineer and the City with a copy of the TV inspection tape, DVD or USB/Jump Drive format. Also provide each with 2 copies of the written report on conditions.

3.05 MEASUREMENT AND PAYMENT

Bid Items have been provided for the following:

- A. Bid Items have been provided for Sanitary Sewer Pipe. Measurement will be based upon units of lineal feet for each size, type, and depth increment 0 feet to 8 feet, 8 feet to 10 feet, and in 2 foot increments thereafter for furnishing and installing pipe complete in place as specified, including excavation, backfilling, and compaction. Pipe will be measured from centerline to centerline of manholes or to the connection point of the existing pipe. Depth of pipe shall be measured from the existing ground profile over the pipe at the time of construction to the design pipe invert:
 - 1. PVC pipe bedding will be paid in accordance with Section 02320 – Excavating, Backfilling, and Compacting for Utilities.

2. Improved pipe foundation material, if necessary, shall be per Section 02320 – Excavating, Backfilling, and Compacting for Utilities.
- B. Bid Items have been provided for Sanitary Sewer Manhole Structures. Measurement will be based on the diameter of the manhole up to a depth of 8 feet. Payment will include the manhole, manhole frame and casting, and adjusting rings in place as specified on the Drawings.
 - C. A Bid Item has been provided for Structure Overdepth. Measurement will be based upon lineal feet for depths greater than 8 feet for each diameter. Measurement will be made from final rim elevation to center of invert. Payment will include the cost of furnishing and installing the manhole sections.
 - D. A Bid Item has been provided for Construct Manhole Over Existing Pipe. Measurement will be based on the diameter of each manhole constructed over the existing pipe, up to a depth of 8 feet. Payment will include the cost of the manhole and installation over the existing line, manhole frame and casting, and adjusting rings in place as specified on the Drawings.
 - E. A Bid Item has been provided for Connect to Existing Manhole. Measurement shall be on the basis of each and shall be considered to include all excavation, labor, materials, and equipment necessary to make the required connection, including core drilling and reconstructing bench/invert.
 - F. A Bid Item has been provided for Connect to Existing Pipe. Measurement shall be on the basis of each and shall be considered to include all excavation, labor, materials, and equipment necessary to make the required connection, including removal/salvaging of existing plug.
 - G. A Bid Item has been provided for Riser Pipe for Drop Sections. Drop inlets will be measured by length from the lowest invert of the manhole to the invert of the pipe being served by the drop inlet. Payment shall be considered compensation in full for all work, including encasement, drop pipe, base slab, fittings, DIP, and concrete collar.
 - H. Bid Items have been provided for Wyes. Measurement will be based on units of each for each wye or tee branch of each diameter and classification furnished and installed complete in place. Payment at the Bid Unit Price will be considered compensation in full for all work and costs, including coring, support sleeves, mechanical joint restraint, and all necessary items to complete the connection.
 - I. Bid Items have been provided for Service Riser Pipe. Measurement will be based on units of lineal feet measured vertically from the centerline of the sewer to the top of the last riser section. Payment at the Bid Unit Price will be considered payment in

full for all work and costs associated with this Bid Item, including concrete reinforcement of the riser, wye, and main sewer.

- J. Bid Items have been provided for Plug. Measurement will be based on each Plug installed according to size and type. Payment at the Bid Unit Price includes furnishing and installing the Plug and any blocking required.
- K. A Bid Item has been provided for Closed Circuit TV Inspection. Measurement will be by lineal foot. Payment will include all costs related to televise the line as specified, including submittals.
- L. A Bid Item has been provided for Manhole Protective Coating. Measurement will be based on the lineal feet of structure which is coated, according to the diameter of the structure. Payment will include all costs to clean and coat the structure.
- M. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

SECTION 33 31 05

SEWAGE FORCEMAINS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Pressure Sewer Lines.

1.02 RELATED SECTIONS

- A. Section 33 05 05 – Trenching and Backfilling.
- B. Section 33 31 00 – Sanitary Sewer

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 1. D16 - Terminology Relating to Paint, Varnish, Lacquer, and Related Products.
 2. D1248 - Polyethylene Plastics Extrusion Materials for Wire and Cable.
 3. D2321 - Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity – Flow Applications.
 4. D2683 – Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
 5. D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
 6. F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
 7. F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 8. G8 - Test Method for Cathodic Disbonding of Pipeline Coatings.
- B. American Water Works Association (AWWA):
 1. C104 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.

2. C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
3. C110 - Standard for Ductile Iron and Gray Iron Fittings, 3 Inch through 48 Inch.
4. C111 - Rubber-Gasketed Joints for Ductile Iron Pressure Pipe and Fittings.
5. C151 - Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.
6. C153 - Standard for Ductile Iron Compact Fittings, 3 Inch through 12 Inch, for Water and Other Liquids.
7. C900 - Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 Inch through 12 Inch (100 mm to 300 mm), for Water Distribution.
8. C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4 Inch (100 mm) through 63 Inch (1,575 mm), for Water Distribution and Transport.

1.04 SUBMITTALS

- A. Certificates of Compliance for each diameter of pipe and fittings to be installed.
- B. Manufacturer's recommendations for installation of pipe.

PART 2 - PRODUCTS

2.01 HIGH DENSITY POLYETHYLENE PIPE

- A. General Requirement (4 Inch through 24 Inch): AWWA C906:
 1. Minimum Hydrostatic Design Basis (HDR): 1,600 psi, in accordance with ASTM D2837.
 2. DR Series: 11.
 3. Minimum Working Pressure Rating (WPR): 160 psi.
 4. Marking: Each pipe shall be identified with the manufacturer's name, trade name or trademark and code from which plant location, machine and date of manufacturer; nominal pipe size in inches; the Ring Stiffness Constant Classification; and ASTM F714.
 5. Fittings: Meeting requirements of ASTM D2683 for socket-type fittings or ASTM D3261 for butt-type fittings.

2.02 POLYVINYL CHLORIDE (PVC) PRESSURE SEWER PIPE

- A. General Requirements: 4 Inch through 12 Inch in Diameter, AWWA C900:
 - 1. Cast iron pipe equivalent O.D.
 - 2. DR Series: 18.
 - 3. Minimum Pressure Rating: 150 psi.
 - 4. Joints: Elastomeric-gasket conforming to ASTM F477 and AWWA C900.
 - 5. Fittings: Shall be ductile iron fittings:
 - a. Consistent with AWWA C110 cast iron or AWWA C153 ductile iron:
 - 1) Working Pressure: 250 psi.

2.03 UTILITY STRUCTURES

- A. In accordance with Section 33 31 00 – Sanitary Sewer.

2.04 TRACER WIRE

- A. Wire
 - 1. Conform to the applicable requirements of NEMA WC3, WC5, and WC7.
 - 2. Shall be Underwriters Laboratories (UL) listed for use in direct burial applications (e.g. USE, UF, or tracer wire).
 - 3. Conductor: Minimum AWG No. 12 in copper rated to 30 volts.
 - 4. Outside Identification: Volts (or V), AWG size, UL and designation (ex. “tracer wire”). Wire shall be green for sanitary.
 - 5. Splice shall be accomplished by joining the 2 bare ends of the wires with either a copper mechanical split bolt compression fitting or a crimp-type compression sleeve for copper connections. No other connection is allowed.
 - 6. All joined splices shall be fully enclosed using a 3M Brand Scotchfil™ Electrical Insulation Putty. The putty shall be fully sealed and bonded on all side.

7. Splices shall not be more frequent than 1 splice per 250 feet.

B. Access box devices

1. Heavy Duty for Traffic Load.

2. Manufacturers/models:

a. Snake Pit, by Copperhead Industries, LLC.

<http://www.copperheadwire.com/pdf/snakepit.pdf>

b. Cathodic Test Box P200 series, by Bingham & Taylor

<http://www.binghamandtaylor.com/cathodic.htm>.

c. Approve Equal

2.05 MECHANICAL JOINT RESTRAINT

A. All pipe restraints shall be ductile iron. All joint restraints shall have a minimum of 150 psi pressure rating.

B. Minimum Working Pressure: 150 psi.

C. For PVC: EBAA Iron Series 1500 and 2500 bell restraints for C-900 PVC pipe and Uni-Flange Series 1500 Circle-Lock.

PART 3-EXECUTION

3.01 PREPARATION

A. Pipe and Fittings:

1. Inspect before buried pipe or fitting is lowered into the trench.

2. Clean ends of pipe thoroughly, remove foreign matter and dirt from inside of pipe.

3.02 LAYING PIPE

A. General:

1. Lay pipe and fittings consistent with manufacturer's instructions, and alignment and elevations shown.

2. Special Tools and Devices: As required for proper installation.

3. Do not lay pipe in water or when in the opinion of the Engineer trench conditions are unsuitable.
4. Prevent uplift and floating of pipe prior to backfilling.
5. Minimum Pipe Cover: 6 feet, unless otherwise shown.
6. Measure for grade at the pipe invert, not at the top of the pipe.
7. Check for alignment and grade and correct any irregularities found:
 - a. Maximum Deviation: 2 inches from line and 1/4 inch from grade.
8. Prevent foreign material from entering pipe at all times during placement.
9. Do not vary actual horizontal position of the pipe centerline on alignment around curves by more than 1.75 feet from position shown.
10. Close and block the open end of the last laid section of pipe at all times when laying operations are not in progress, at the close of the day's work, or when the workers are absent from the job to prevent entry of foreign material or creep of the gasketed joints.

B. PVC Pipe:

1. Use pipe joint lubricant per manufacturer's recommendations; no substitutions are permitted.
2. Dig bell holes of ample dimensions at joint locations in the bottom and sides of the trench as required to permit visual inspection of the entire joint.
3. Lay pipe with bell ends facing in the upstream direction.
4. After a section of pipe has been lowered into the prepared trench, clean the end of the pipe to be joined, the inside of the joint, and the gasket immediately prior to joining the pipe.
5. Check the gasket position feeler gauge supplied by the pipe manufacturer to assure proper seating:
 - a. Feeler Gauge: Of proper size, type, and shape for use during installation for each type of pipe furnished.
6. After the joint has been made as specified under paragraph "JOINING PIPE," check the pipe for alignment and grade.

7. Joint Deflection:

- a. Deflect pipe at joints for pipelines laid on a curve using unsymmetrical closure of the spigot into bell.
- b. Maximum Deflection: 50 percent of maximum deflection permitted by pipe manufacturer.
- c. Use 1 of the following methods if joint deflection of standard pipe lengths will not accommodate horizontal or vertical curves in alignment:
 - 1) Shorter pipe lengths.
 - 2) Special mitered joints.
 - 3) Standard or special fabricated bends.
- d. Install thrust blocking if special mitered joints or bends are used.

8. Place sufficient pipe zone material to secure the pipe from movement before the next joint is made.

9. Joining Pipe:

- a. Bell-and-Spigot with Rubber Gasket Joints (Push-On Joints): Assemble in accordance with the manufacturer's instructions and the following:
 - 1) As next section of pipe is being readied for laying, clean bell of previously laid pipe of foreign material and apply thin film of specified lubricant to entire surface of bell ring.
 - 2) At same time, lubricate gasket and install in spigot groove.
 - 3) Ensure gasket tension is uniform around groove before placing pipe in trench.
 - 4) Lower pipe section into trench until approximately in line with previously laid pipe section and spigot is centered in bell.
 - 5) Then force pipe "home" as defined in manufacturer's installation instructions and secure to proper alignment and grade with specified pipe zone material.

C. High Density Polyethylene Pipe (HDPE):

1. Install piping and fittings consistent with the provisions of ASTM D2321 and with the manufacturer's recommendations for installation.
2. Cut out and remove pipe sections with cuts or gouges with depth over 10 percent of the wall thickness. Rejoin undamaged portions of the section using butt fusion joining method.

3. Install mechanical couplings according to the coupling manufacturer's recommendations.
4. HDPE pipe has a high coefficient of temperature expansion/contraction (approximately 1.2×10^{-4} in./in.° F.). Make final tie-ins to structures at a temperature as close to operating temperature as possible.

3.03 THRUST RESTRAINT

A. Location:

1. At pipeline tees, plugs, caps, bends, and other locations where unbalanced forces exist.
2. Thrust blocks where required whether or not shown.

B. Thrust Blocking:

1. Verify allowable soil pressure; do not exceed 1,000 pounds per square foot.
2. Place between undisturbed ground and fitting to be anchored.
3. Quantity of Concrete: Sufficient to cover area of bearing on pipe as shown or as approved.
4. Place blocking so that pipe joints will be accessible for repairs, unless otherwise approved.

3.04 TRENCH EXCAVATION AND BACKFILL

- #### A. Conform to the requirements of Section 02320 – Excavating, Compacting, and Backfilling for Utilities.

3.05 TRANSITION TO DISSIMILAR PIPE

- #### A. Install consistent with the manufacturer's written instructions.

3.06 MARKING TAPES

- #### A. Install in accordance with Section 02320 – Excavating, Compacting, and Backfilling for Utilities.

3.07 CORROSION PROTECTION

- #### A. General:

1. Piping Accessories: Provide corrosion protection for ferrous metal piping appurtenances:
 - a. Tie-Rods and Similar Items: Heat shrink tube wrapped.
 - b. Flexible Couplings Grooved Couplings and Similar Items: Heat shrink wrapped, or cement-coated, and as shown on the Drawings.
 - c. Exposed Nuts and Bolts: Bituminous paint-coated.

3.08 FIELD QUALITY CONTROL

- A. City Engineer will observe all tests and visually inspect the work for compliance.
- B. Leak test of forcemains required by hydrostatic pressure testing of 150 lbs. per square inch. The test must be conducted under the observation of the Engineer. A drop in pressure over a 2 hour test period exceeding 3 pounds shall be cause for rejection of the pipe. All leaks shall be corrected and the test repeated until the pressure drop is within the 3 pound limit. Introduction of sealant substances by means of the test water will not be permitted. All repair and replacement work shall be at the Contractor's expense.
- C. Continuity Test:
 1. Applies to all pipe pressure sewer.
 2. Energize location wire to show continuity from structure to structure.

3.09 CLEANING

- A. Following assembly, testing, and final acceptance, flush pipelines with water to remove accumulated construction debris and other foreign matter.
- B. Flush until all foreign matter is removed from the pipeline.
- C. Provide hoses, temporary pipes, ditches, and other items as required to properly dispose of flushing water without damage to adjacent properties.
- D. Minimum Flushing Velocity: 2.5 fps.
- E. For large diameter pipe where it is impractical to flush the pipe at 2.5 fps velocity, clean the pipeline in place from the inside by brushing and sweeping, then flush the line at a lower velocity.
- F. Insert cone strainers in the flushing connections to attached equipment and leave in place until cleaning has been accomplished.

- G. Remove accumulated debris through drains 2 inches and larger, or by removing spools and valves from piping.

3.10 MEASUREMENT AND PAYMENT

- A. A Bid Item has been provided for PVC or HDPE Forced Main Pipe. Measurement will be by lineal feet along the centerline of pipe from center of structure to center of structure or from center of MH to end of pipe. Payment shall be compensation in full for all work and cost to furnish and install pipe, tracer wire, excavation, backfill and compaction, pipe encasement, testing, and surface restoration.
- B. A Bid Item has been provided for Fittings. Measurement will be per pound installed based on ductile iron fittings, excluding both mechanical joint, restraining sleeves, and all joint accessories.
- C. All other work and costs of this Section shall be incidental to the Project included in the TOTAL BASE BID.

END OF SECTION

SECTION 33 31 14

SANITARY SEWER SERVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Sanitary sewer service pipe placement and all appurtenances.

1.02 RELATED SECTIONS

- A. Section 33 05 05 – Trenching and Backfilling
- B. Section 33 31 14 – Sanitary Sewer Services.

1.03 REFERENCES

- A. American Society of Testing Materials (ASTM):
 - 1. D698 – Test Method for Coefficient of Linear Thermal Expansion of Plastics.
 - 2. D1784 – Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (PVC) Compounds.
- B. American Water Works Association (AWWA):
 - 1. C900 – Polyvinyl Chloride (PVC) Pressure Pipe 4 Inch through 12 Inch Water Main.

1.04 SYSTEM DESCRIPTION

- A. This work shall consist of the construction of sanitary sewer services in accordance with the requirements of the Contract.
- B. It is the intent of these Specifications to require the same quality of work be received on the services in the way of grade and alignment as shall be required on the main lines and laterals.

1.05 SUBMITTALS

- A. Submit to Engineer at the End of Each Week: Depth of service record, wye location, and length of service lines.

1.06 PROJECT SITE CONDITIONS

- A. All work must be confined to within the limits of construction easements or public right-of-way.
- B. Verify sanitary sewer service locations prior to the start of any construction.

1.07 SEQUENCING AND SCHEDULING

- A. Install sanitary sewer, water main, and all pipe deeper than the services prior to the installation of the services.
- B. Install sanitary sewer service in same trench as the water service or as directed by the City Engineer.

PART 2 – PRODUCTS

2.01 MANUFACTURED UNITS

- A. PSM Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings (4 Inch through 15 Inch Diameter):
 - 1. General: Pipe and fittings conform to ASTM D3034.
 - 2. Materials: PVC plastics having a minimum cell classification of 1254B, 12454C, or 13364B as defined in ASTM D1784. Pipe materials shall have a minimum hydrostatic design stress of 2,000 psi as certified by the Plastic Pipe Institute. Additives and fillers, including but not limited to stabilizers, antioxidants, lubricants, colorants, etc., shall not exceed 20 parts by weight per 100 of PVC resin in the compound. Certification of resin compounding shall be provided by the pipe manufacturer prior to shipment to the Project Site.
 - 3. Design: Integral wall bell and spigot joint and a minimum wall thickness conforming to Schedule 40 and as shown on the Drawings.
 - 4. Joints: Conform to ASTM D3212, glue type.
 - 5. Marking: Each pipe shall be identified with the name of the manufacturer or trademark and code, nominal pipe size in inches, the PVC cell classification, and “Specification D3034.”

2.02 BEDDING MATERIAL

- A. See Section 33 05 05 – Trenching and Backfill.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Governing Code: Wisconsin Plumbing Code and any local ordinances which may apply.
- B. Minimum 1/4 inch per foot grade, unless otherwise directed by the City Engineer.
- C. PVC Pipe and Fittings:
 - 1. Similar to main line sanitary sewer pipe installation.
- D. Terminate at 15 feet past property line or as shown on Drawings.
- E. All proposed service line locations are shown on the Drawings.
- F. Record Actual Depth and Station at End of Service:
 - 1. Exercise care in determining the depth.
 - 2. The depth recording is incorporated into the “Record Plans” and becomes a permanent part of City Records.
- G. Plug ends with 4 inch plug and necessary blocking.

3.02 FIELD QUALITY CONTROL

- A. Do not backfill trench until the service has been inspected and approved by the City Engineer.

3.03 PROTECTION

- A. Mark end of new service with a wooden 2 inch x 2 inch x “variable” marker:
 - 1. Extend 6 inches below and adjacent to the plug. Extend 2 feet above the ground line.
 - 2. Continuous without any breaks.
 - 3. Vertical or plumb.

3.04 MEASUREMENT AND PAYMENT

- A. Bid Items have been provided for 4 Inch PVC, Schedule 40 Service Pipe. Measurement will be by linear foot of each size and type of pipe installed as measured along the axis of the pipe with no regard to intervening fittings. Payment at the Bid Unit Price shall be compensation in full for all work and costs, including excavation, pipe, bedding, backfill, and trench compaction.
- B. No Bid Items have been included for service plugs or marking service ends. Payment for these items shall be included in the lineal foot price for 4 Inch PVC Service Pipe.
- C. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION

SECTION 33 40 00

STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Storm sewers and appurtenances.

1.02 RELATED SECTIONS

- A. Section 33 05 17 – Adjust Miscellaneous Structures.
- B. Section 33 05 05 – Trenching and Backfilling.
- C. Section 32 11 23 – Aggregate Base Course.
- D. Section 32 16 13 – Concrete Curb and Gutter.

1.03 REFERENCES

- A. State of Wisconsin Department of Transportation "Standard Specifications for Highway and Structure Construction" - latest edition including all current supplements (WisDOT):
- B. American Society of Testing and Materials (ASTM):
 - 1. A48 – Specification for Gray Iron Castings.
 - 2. A153 – Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 3. A615 – Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 4. A760 – Specification for Corrugated Steel Pipe, Metallic – Coated for Sewers and Drains.
 - 5. C76 – Specification for Reinforced Concrete Culvert, Drain, and Sewer Pipe.
 - 6. C150 – Specification for Portland Cement.
 - 7. C206 – Specification for Finishing Hydrated Lime.

8. C361 – Specification for Reinforced Concrete Low Head Pressure Pipe.
9. C443 – Specification for Joints for Circular Concrete Sewer and Pipe, Using Rubber Gaskets.
10. C478 – Specification for Precast Reinforced Concrete Manhole Sections.
11. D1248 – Specification for Polyethylene Plastic Molding and Extrusion Materials for Wire and Cable.
12. D3212 – Specification for Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Seals.

1.04 PROJECT SITE CONDITIONS

- A. Storm sewer lines are shown on the Drawings in a general way. Contractor should anticipate minor variations in both horizontal and vertical directions in locating existing system.

1.05 SUBMITTALS

- A. Shop Drawings: Indicating information for fabrication and installation of manholes.
- B. Manufacturer's Certificate of Compliance for:
 1. Gray iron castings.
 2. Precast manhole sections.
 3. Storm sewer pipe.
 4. Rip rap.

1.06 SEQUENCING AND SCHEDULING

- A. Do not pursue work causing shut-off of utility service (gas, water, electric, telephone, TV, etc.) to consumers until the utility owner is contacted and all consumers are notified of the shut-off schedule.
- B. Successfully complete required inspections and tests before commencement of Aggregate Base Course – Section 32 11 23 and Concrete Curb and Gutter – Section 32 16 13.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete Materials:

1. Standard Portland Cement Type 1, clean washed sand and crushed rock and gravel free from deleterious materials for monolithic concrete manholes and all manhole bases.
2. Portland Cement: Comply with the requirements of ASTM C150.
3. Design Mix: Subject to the approval of the City Engineer. Use proper water-cement ratio to obtain (4000 psi) in 28 days.

B. Mortar Materials:

1. Cement: Type 1 Standard Portland Cement conforming to ASTM C150.
2. Lime: Normal finishing hydrated lime meeting the requirements of ASTM C206.
3. Mix Proportions:
 - a. 1 part cement to 3 parts of suitable plaster sand for mortar used for plastering the exterior walls of block manholes and catch basins, adjusting rings, and lift holes. Use lime or mortar mix in the amount necessary to make a suitable mixture for plastering purposes, but not to exceed 15 percent by volume.
 - b. 1 part Portland cement to 2 parts of sand to which lime or mortar mix may be added but not to exceed 15 percent by volume for mortar used for laying concrete block.

C. Reinforcing Steel: Comply with the requirements of ASTM A615, Grade 60.

2.02 STORM MANHOLE AND CATCH BASIN FRAMES AND COVERS

A. Requirement: ASTM A48.

B. Material: Class 35 cast iron. Best grade. Free from injurious defects and flaws.

C. Finish: Coal tar pitch varnish.

D. Finish Preparation: Sandblast.

E. Machine cover and frame contact surface for non-rocking protection.

- F. Type and Style: As shown on Drawings.
- G. Covers without grate openings shall have 2 concealed pick holes of approved design.
- H. Weight: Minimum of 380 lbs.
- I. Cast labels “STORM SEWER” on each cover without grate openings as appropriate. Use 2 inch letters.

2.03 STORM MANHOLES AND CATCH BASINS

A. General:

- 1. Requirements: ASTM C478, details on the Drawings.
- 2. Diameter and special requirements are shown on the Drawings.
- 3. Structures shall be of precast concrete.
- 4. Manhole Joints: Rubber o-ring gasket type meeting ASTM C443.
- 5. Structure bases shall be pre-cast.
- 6. Manhole Steps: Reinforced polypropylene plastic steps with No. 2 deformed grade steel rod:
 - a. All such steps shall be M.A. Industries (SP-1-PF) Manhole Step, or approved equal.

2.04 PIPE MATERIALS

A. Reinforced Concrete (RCP) Pipe and Fittings:

- 1. General Requirement: ASTM C76, Wall B with circular reinforcing.
- 2. Materials: Conform to the requirements of ASTM C76, Wall B with circular reinforcing. O-ring gaskets shall be synthetic rubber, circular reinforcing in cross-section, and shall conform to ASTM C361.
- 3. Pipe Joints: Bell and spigot ASTM C361.
- 4. Pipe Class: As shown on the Drawings.

5. Marking: Each pipe shall be identified with the name of the manufacturer trade name or trademark and code, identification of plant, date of manufacture, and the pipe class and specification design.

2.05 TRASH GUARDS

A. General:

1. General Requirement: ASTM A153.
2. Materials: Galvanized steel rods meeting the requirements in ASTM A153.
3. Bar size and configuration as shown on the Drawings.
4. Securely attached to end section.

2.06 RIP RAP

A. General Requirement: Conform to WisDOT Section 606 – Rip Rap:

1. All riprap to be “medium rip rap.”

2.07 INSULATION

- ### A. Insulate in accordance with Section 2.08, Hudson Public Water Utilities Water Distribution Technical Specifications, City of Hudson Public Utilities Commission Specification.

2.08 SOURCE QUALITY CONTROL

- A. All materials are subject at the discretion of the City to inspection and approval at the plant of the manufacturer.
- B. Inspect all pipe and accessories for loss or damage during unloading.
- C. Promptly remove from the Project Site any pipe or accessories that are damaged or found to be defective after delivery.

PART 3 - EXECUTION

3.01 PREPARATION

- #### A. See Section 33 05 05 – Trenching and Backfilling.

- B. By-Pass Pumping: Contractor responsible for all items required to maintain sewer flows during construction of the new storm sewer. All work and costs for by-pass pumping is considered incidental to the Project, unless otherwise specified.
- C. Notify all affected utility owners to schedule shutoffs of their system, if necessary. Do not operate valves or other control devices of existing utilities without the permission of the utility owner.

3.02 INSTALLATION

A. Connect to Existing Structure:

1. Connect to existing structure at location shown on the Drawings.
2. Core the hole in the structure and saw cut the pipe flush with the inside wall of the structure.
3. Bulkhead void between outside wall of pipe and edge of opening with mortar and brick.
4. Reconstruct manhole bench/invert.

B. Connect to End of Existing Pipe:

1. Connect to existing pipe at locations shown on the Drawings.
2. Locate and expose end of existing pipe.
3. Remove existing bulkhead or plug and dispose of off Project Site:
 - a. Take care not to damage existing pipe.
 - b. Any segment of pipe damaged by Contractor shall be replaced with new materials at no expense to the Project.
4. Utilize standard bell and spigot joint with rubber o-ring gasket if possible.
5. If butt connection must be made to existing pipe, construct concrete collar around joint. Collar shall be minimum 12 inches thick in all locations and shall extend a minimum of 12 inches each way of the joint.

C. Pipe Installation:

1. Lay and maintain pipe appurtenances to the alignment, grade, and location shown on the Drawings and/or staked in the field. No deviation from the Drawing and/or staked alignment, grade, or location is allowed, unless

approved by Engineer. Deviation from grade in excess of 0.05 percent may be cause for removal and relaying pipe at the Contractor's expense.

2. General Pipe Installation Procedures:

a. Wipe joints clean; apply the manufacturer's recommended lubricant compound over the entire joint surface; center spigot in bell and push spigot home; take care to prevent dirt from entering the joint space; bring pipe to proper line and grade, and secure pipe in place by properly bedding.

3. Lay pipe upgrade with spigot ends pointing in the direction of flow.

4. All joints must be watertight.

5. Remove all foreign matter or dirt from inside the pipe. Keep the bell and spigot clean during and after installation. Take care to prevent dirt from entering the joint space. Remove any superfluous material from inside the pipe after pipe installation by means of an approved follower or scraper.

6. Where cut-ins make it impossible to construct bell and spigot joints or when dissimilar pipe materials are joined, a reinforced concrete collar shall be placed completely surrounding the joint or the connection shall be made by using an approved adapter.

7. Any pipe which has been disturbed after being laid must be taken up, the joint cleaned and properly relaid as directed by the Engineer.

8. Where a sewer line outlets to grade or where the line is terminated with a flared end section:

a. Fasten at least the last 3 joints together using 2 "U" bolt fasteners per joint approved and as recommended by the pipe manufacturers.

D. Structures and Appurtenances Installation:

1. Furnish and install structures in accordance with the Drawings.

2. Excavate to depth and size as shown in the Drawings.

3. Pour inverts shaped to the half section of equivalent size pipe conforming to the inlet and outlet pipe so as to allow for a free, uninterrupted flow with all surfaces sloping to the flow line.

4. Prefomed inverts not allowed where pipe grades are 2 percent or greater, unless design grade is built through the manhole.

5. All concrete pipes entering manholes must be cut with a concrete saw.
 6. Steps:
 - a. Locate on the downstream side, except for pipe 24 inches in diameter or greater. Then place where most appropriate to provide the most suitable access.
 - b. Secure and neatly mortar in place 16 inches on center spacing.
 7. Position vertical wall of the eccentric cone on the downstream side.
 8. On structures with a build that contains more than 1 barrel section, the section immediately below the precast top slab shall be maximum 16 inch height.
 9. Set precast concrete sections plumb with a 1/8 inch per foot maximum out of plumb tolerance allowed. Structures more than 1/8 inch per foot out of plumb shall be re-installed at the Contractor's expense.
 10. Lift holes neatly mortared up.
 11. Install Adjustment Rings and Adjust Frames and Covers: Conforming to Section 02280 – Adjust Miscellaneous Structures.
- E. Construct Manhole Over Existing Pipe:
1. Construct manhole over existing pipe at locations shown on the Drawings.
 2. Saw cut existing pipe to fit flush with inside wall of new structure.
 3. Seal any openings in manhole.
- F. Rip Rap:
1. General: Conform to WisDOT Spec. 606.3.3.
- G. Bulkhead Pipe:
1. Bulkhead pipe at locations shown on Drawings with brick, non-shrink concrete grout, or concrete block masonry 8 inches thick.
 2. Precast concrete plugs may be used in lieu of bulkhead. Plug must fit snugly into pipe opening and be watertight.
- H. Seepage Collar:

1. Construct at location indicated on Drawings.
2. Construct per Detail on Drawings.

3.03 FIELD QUALITY CONTROL

A. Scope:

1. All pipeline testing is considered incidental to the Bid cost of the pipe.
2. Engineer to observe and verify that all tests and visual inspections have been completed prior to final acceptance.

B. Cleaning:

1. Consists of Cleaning the Pipe and Structures:
 - a. If newly installed mains and structures are kept clean during construction, cleaning will not be required.
 - b. If newly installed mains and/or structures become dirty due to negligence of the Contractor, cleaning will be performed at the sole expense of the Contractor.
2. The bailing or flushing method of cleaning pipe is acceptable only if adequate provisions acceptable to the Engineer for keeping dirt and debris out of the existing sewer system or ponds are employed. Jetting may be required.
3. Complete prior to final inspection for acceptance.

C. Required Tests and Inspections:

1. Infiltration:
 - a. To determine the amount of ground water infiltration into the sewers.
 - b. Test waived if no visible infiltration is observed during the lamping inspection.
 - c. Measurement made by means of 90 degree v-notch weirs placed in the lines as directed by the Engineer.
 - d. Measurements taken at the points where in the Engineer's opinion the flow of water in the sewer is greater than the maximum allowable leakage.
 - e. Maximum Allowable Rate of Leakage: Not more than 100 gallons per mile per inch diameter per day.

- f. Tests may be taken between individual manholes and the infiltration in any given line must not exceed the specified maximum allowable rate.
- g. Method of Measurement: Measurement of time for a predetermined volume of flow to occur.

2. Lamping:

- a. Verify installation is to true line and grade.
- b. Verify installed pipe is structurally sound.
- c. Verify there are no broken or defective pipes.
- d. Verify that joints are all home.
- e. Verify structures conform to specified requirements.

3.04 PROTECTION

- A. Plug all entrances and openings to the system promptly and before suspension of operations at the end of working day.
- B. Secure manholes and structures immediately after completion or before suspension of operations at the end of working day with casting or suitable alternative device.
- C. Mark structures susceptible to being hit by construction or vehicular traffic.
- D. Install or employ temporary erosion control measures or other means around storm sewer inlet structures to prevent entrance of erosion and sediment.
- E. Mark plug locations with 4 inch x 4 inch timber to above existing grade.

3.05 MEASUREMENT AND PAYMENT

- A. Bid Items have been provided for Storm Sewer Pipe. Measurement will be based upon units of lineal feet for each size, type, and class of pipe furnished and installed complete in place as specified, including excavation, backfilling, and compaction. Pipe will be measured from centerline of structure to centerline of structure:
 - 1. Pipe bedding will be paid in accordance with Section 33 05 05 – Trenching and Backfilling.
 - 2. Improved pipe foundation material, if necessary, shall be per Section 33 05 05 – Trenching and Backfilling.
- B. Bid Items have been provided for Catch Basin, Catch Basin Manhole, and Manhole Structure. Measurement will be based upon units of each, according to

type and size, to a depth of 8 feet, for furnishing and installing structures complete, including frame and cover, and adjusting rings in place as specified.

- C. Bid Items have been provided for Structure Overdepth. Measurement will be based upon lineal feet for depths greater than 8 feet for each diameter. Measurement will be made from final rim elevation to center of invert. Payment will include the cost of furnishing and installing the manhole sections.
- D. Bid Items have been provided for Flared Ends. Measurement will be based upon units of each size installed at locations indicated in the Drawings complete in place as specified, including trash guard, excavation, backfilling, and compaction:
 - 1. Where a sewer line is terminated with a flared end section, tying the last 3 joints as specified is considered incidental to the installation of the pipe.
- E. A Bid Item has been provided for Rip Rap. Measurement will be based upon units of cubic yards of Rip Rap placed according to class. Payment shall include placement of geotextile fabric.
- F. A Bid Item has been provided for Connect to Existing Pipe. Measurement shall be per each connection made, regardless of type of existing bulkhead or plug, or type of connection made. Payment will include all costs related to making the connection, including removal and disposal of the existing bulkhead or plug, and construction of concrete collar if necessary.
- G. A Bid Item has been provided for Connect to Existing Structure. Measurement shall be per each connection made, regardless of size of opening, type of existing bulkhead, or type of existing structure. Saw cutting of the pipe installed in the opening if necessary shall be considered incidental. Core cutting the connection and reconstruction of existing structure invert if necessary shall also be considered incidental to the connection.
- H. A Bid Item has been provided for Bulkhead Storm Sewer Pipe. Measurement will be per each bulkhead installed according to size. Payment will include all costs related to bulkheading or plugging the pipe as described in this Section.
- I. A Bid Item has been provided for Construct Manhole Over Existing Pipe. Measurement will be based on the diameter of each manhole constructed over the existing pipe, up to a depth of 8 feet. Payment will include the cost of the manhole and installation over the existing line, casting frame and cover, and adjusting rings in place as specified.
- J. All other work and costs of this Section shall be incidental to the Project and included in the TOTAL BASE BID.

END OF SECTION