2026

STANDARD SPECIFICATIONS

FOR

CITY OF OSHKOSH, WISCONSIN

City of Oshkosh
2026 Standard Specifications
Summary of Revisions

1. Revised **Section 900.2.2.4.2**, changed STATE SPECIFICATIONS reference of **Section 501.2.5.**4 to **Section 501.2.7.3** and removed STATE SPECIFICATIONS reference of **Section 501.2.5.4.2**.
2. Revised **Section 900.2.10.8.2**, changed STATE SPECIFICATIONS reference to **Section 416.2.2.2.**
3. Revised **Section 900.2.10.13.1**, changed STATE SPECIFICATIONS epoxy reference to **Section 416.2.2.2** and tie bar reference to **Section 416.2.2.**
4. Revised Section 1300.3.2.4, removed reference to STATE SPECFICATIONS **Section 501.2.5.4.5**.
5. Revised **Section 1500.4.11**, changed STATE SPECIFICATIONS epoxy reference to **Section 416.2.2.2** and tie bar reference to **Section 416.2.2.**
6. Revised **Section 1600.1.3**, changed to reference that Bid Item #1600 shall include trees planted with a minimum 2″ caliper (diameter measured at 6″ above topsoil) and not to exceed 2½″ caliper; and to reference that tree species shall be determined by the City Forester and shall be planted in locations specified on the Plans with final species and locations being approved by the City Forester.
7. Revised **Section 1900.5.3.1**, changed Nominal Size No. 5's Minimum Layer Thickness to 1.25 inches.
8. Revised **Section 2000.3.2.3**, deleted reference to requirements for No. 1 stone, and changed reference of **Section 501.2.5.4** of the STATE SPECIFICATIONS to **Section 608.2.2**.
9. Revised **Section 2200.3.1.2.3**, deleted reference to requirements for No. 1 stone, and changed reference of **Section 501.2.5.4** of the STATE SPECIFICATIONS to **Section 608.2.2**.
10. Revised **Section 2300.3.1.2.3**, deleted reference to requirements for No. 1 stone, and changed reference of **Section 501.2.5.4** of the STATE SPECIFICATIONS to **Section 608.2.2**.
11. Revised **Section 2600.2.9.1**, removed reference to balled and burlapped trees.
12. Revised **Section 2600.3.8.2,** added reference to removing ball wire, burlap, strings, etc. from the top half of the root ball, after positioning tree in hole.
13. Revised **Section 2600.3.8.4**, changed to reference placing 3″-4″ of shredded hardwood mulch in a 2′ diameter ring around the tree and that mulch shall not be piled against the tree.
14. Revised **Section 2600.3.8.5**, added reference to stake and guy tree as directed by the City Forester.
15. Revised Section **2600.3.9.4**, changed to reference placing 3″-4″ of shredded hardwood mulch in a 2′ diameter ring around the shrub and that mulch shall not be piled against the shrub.
16. Revised **Section 2750.2.1.1**, added requirements that the Engineer must determine it is not practical to excavate material so firmly cemented they present all the characteristics of solid rock without first blasting, rock grinding, or using a hydraulic break hammer; and added requirement that Contractor shall be required to take all practical steps to excavate existing ground conditions prior to the use of rock excavation methods for purposes of demonstrating that the existing ground cannot practically be excavated without performing rock excavation.
17. Added **Section 2750.4.1.3,** Measurement of Utility Trench Rock Excavation Bid Item.
18. Revised **Section 2750.5.1**, added Bid Item #2751.
19. Revised **Section 3100.2.7.1**, deleted **Sections 3100.2.7.1.C., 3100.2.7.1.D, 3100.2.7.1.D**, and **3100.2.7.1.F**.

20. Added **Section 3100.2.7.2**, added reference that Internal Sealing System Flex Seal Utility Sealant Kit is to be used on existing manholes or flat deck structures **only when external chimney seal is not applicable**.
21. Added **Section 3100.2.7.3**, added reference that manufacturer's guidelines shall be used as described to prepare the concrete structure surface, as needed, to allow for a proper bonding surface.
22. Revised **Section 3100.3.7.1**, added reference to seal extensions and internal manhole chimney sealants.
23. Revised **Section 3100.5.1**, revised description of Bid Item #3118 to Furnish and Install Sanitary Sewer Internal Sealing System Flex Seal Utility Sealant Kit.
24. Revised **Section 3100.5.1**, revised description of Bid Item #3119 to Furnish and Install Sanitary Sewer Internal Sealing System Flex Seal Utility Sealant Kit Extension.
25. Revised **Section 3100.5.4**, removed reference to Internal Manhole Chimney Seals and added references to Internal Sealing System Flex Seal Utility Sealant Kits, and Internal Sealing System Flex Seal Utility Sealant Kit Extensions.
26. Revised **Section 3600.2.1.1**, added requirements that the Engineer must determine it is not practical to excavate material so firmly cemented they present all the characteristics of solid rock without first blasting, rock grinding, or using a hydraulic break hammer; and added requirement that Contractor shall be required to take all practical steps to excavate existing ground conditions prior to the use of rock excavation methods for purposes of demonstrating that the existing ground cannot practically be excavated without performing rock excavation.
27. Added **Section 3600.4.1.3,** Measurement of Utility Trench Rock Excavation Bid Item.
28. Revised **Section 3600.5.1**, added Bid Item #3601.
29. Revised **Section 4000.2.5.1**, added reference that curb stops shall be constructed of three-piece heavy-duty brass with threaded compression pack nut-style connections only.
30. Revised **Section 4800.2.1.1**, added requirements that the Engineer must determine it is not practical to excavate material so firmly cemented they present all the characteristics of solid rock without first blasting, rock grinding, or using a hydraulic break hammer; and added requirement that Contractor shall be required to take all practical steps to excavate existing ground conditions prior to the use of rock excavation methods for purposes of demonstrating that the existing ground cannot practically be excavated without performing rock excavation.
31. Added **Section 4800.4.1.3,** Measurement of Utility Trench Rock Excavation Bid Item.
32. Revised **Section 4800.5.1**, added Bid Item #4801.
33. Added **Standard Detail Drawing 53** Terrace Tree Planting Details.
34. Revised **Designated Truck Routes Map**.

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SECTION 100
GENERAL CONDITIONS

100.1 Scope of Work

1. The work that shall be done under this Contract consists of furnishing all labor, tools, equipment, machinery and appliances, and all materials, except where definitely specified to the contrary, for the purpose of providing the CITY with a finished project described in the Contract which is complete, in working order, and ready for its intended use.

2. The CONTRACTOR shall, for the price bid for all items under this Contract, do all work prescribed in these Specifications; shall make the required excavation for the specified work; shall do all ditching and diking, pumping, bailing and draining, and all sheeting and shoring; make all provisions necessary to maintain and protect all buildings, walls, fences, trees, water pipes, conduits, sewers, railings, railways, and other structures; shall repair all damages occurring to same during the progress of the work; shall provide all bridges, fences, and other means of maintaining travel on intercepting streets, roads, railroads, alleys, and public places, and on streets, alleys, and roads on which trenches are excavated, after giving due notice to parties affected thereby; shall maintain the same in good condition so long as may be necessary; shall then remove such temporary expedients and restore such ways to their proper conditions; shall provide watchmen, fences, red lights, and all other precautionary measures for protection of persons and property; shall refill all trenches and do all repaving and repairing of streets disturbed by this work as herein provided; shall furnish all materials and tools, implements, and transportation required to build and put in complete working order the Contract awarded to the CONTRACTOR and shall do each and all to the satisfaction of the ENGINEER; shall timber all railroads; and shall remove all tree roots, timber and masonry structures, and other obstacles, whether shown on the Plans or not, by reason of being underground, or otherwise and no extension of other work shall be allowed for delay or expense occurred by any of the above.

100.2 Character of Work and Workers

1. The work that shall be done under this Contract shall be performed in the best and most workmanlike manner in strict accordance with the approved Plans and Specifications.

2. CONTRACTOR'S Employees, Agents, and Subcontractors:
   A. The CONTRACTOR shall, at all times, enforce strict discipline and good order among personnel, subcontractors, and others employed on the work, and shall not employ on the work any unfit person or anyone not skilled in the work assigned.
   B. All supervisors and workers shall have sufficient skill and experience to properly perform the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment and tools required to perform all work properly and satisfactorily.

C. If any person employed on the work by CONTRACTOR, including employees, agents, subcontractors, suppliers, and vendors, shall refuse or neglect to obey the directions of the ENGINEER, as to quality of work, character of the work, or quality of the materials, or be so incompetent or disorderly as to endanger the proper fulfillment of this Contract, such person shall, upon the written order of said ENGINEER, be at once removed from the project and not again employed on any part of the work.
D. If any person employed on the work by CONTRACTOR, including employees, agents, subcontractors, suppliers, and vendors, willfully, negligently, or ignorantly fails to perform any of the duties or assignments or is disobedient or abusive and disrespectful to a fellow employee or to the OWNER or ENGINEER or anyone associated with OWNER or ENGINEER, then such person shall, upon written order of the ENGINEER, be at once removed from the project and not again involved in any part of the work.
E. Should any CONTRACTOR fail to remove such person or persons as required above, or fail to furnish suitable and sufficient personnel for the proper prosecution of the work, the ENGINEER may suspend the work by written notice until such orders are complied with. Any suspension of work due to these or similar circumstances will not extend the time allowed for completion of the project.
F. Any person previously discharged by order of ENGINEER from work on any City Contract shall not be permitted to work on this project without first obtaining permission from the ENGINEER.

3. The CONTRACTOR shall work in harmony with other contractors and with utility or City forces engaged in collateral work. They shall arrange their operations to prevent interference or damage to the work of others. In case of dispute, the decision of the ENGINEER shall be final and binding upon the parties affected.

100.3 Site Investigation and Representations

1. The CONTRACTOR acknowledges it is satisfied as to the nature and location of the work and the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads, and uncertainties of weather, river stages, or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed for and during the prosecution of the work and all other matters upon which information is reasonably obtainable and which can in any way affect the work or the cost thereof under this Contract. The CONTRACTOR further acknowledges that it is satisfied as to the character, quality, and quantity of surface and subsurface materials to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the Drawings and Specifications made a part of this Contract. Any failure by the CONTRACTOR to acquaint itself with all the available information will not relieve him/her from responsibility for estimating properly the difficulty or cost of successfully performing the work. The CITY assumes no responsibility for any understanding or representations made by any of its officers or agents during or prior to the execution of this Contract, unless: (1) such understanding or representations are expressly stated in the Contract; and (2) the Contract

expressly provides that the responsibility thereof is assumed by the CITY. Representations made, but not so expressly stated and for which liability is not expressly assumed by the CITY regarding the Contract, shall be deemed only for the information of the CONTRACTOR.

100.4 Contract Documents

1. Unless otherwise excluded in writing, the Contract documents for the work shall consist of the Official Notice to Contractors; Instructions to Bidders; Standard Specifications for City of Oshkosh, Wisconsin; Special Conditions; Contract; Insurance Requirements; Bond; CONTRACTOR's Proposal; Plans and Addenda; and provisions which may apply to contractors and subcontractors for a particular project.

2. The General Conditions describe the conditions under which the CITY expects the project will proceed and will apply to all contractors performing work at the site. The CONTRACTOR shall ensure all of its employees, agents, subcontractors, suppliers, and vendors at the site perform the necessary work as required and to conduct themselves accordingly. Provisions herein contained that do not apply to a particular Contract shall be disregarded, but only upon the written approval of the ENGINEER after the CONTRACTOR has brought the particular issue to the ENGINEER's attention.

100.5 Intent of Contract Document

1. The Contract documents are complimentary, and what is called for by any one shall be as binding as if called for by all. The intention of this Contract document is to include in the Contract price, without limitation, all labor, material, equipment, lighting, power sources, transportation, incidentals, contingencies, overhead, profit, and all other expenses as may be necessary for the proper execution of the work.

2. In interpreting the Contract documents, words describing materials or work which may have a well-known technical or trade meaning, unless otherwise specifically defined in the Contract documents or reasonably inferred through reviewing the documents as a whole, shall be construed in accordance with such well known meaning recognized by architects, engineers, and the trade.

100.6 Assignment of Contract

1. The CONTRACTOR shall not assign this Contract or any part thereof, or monies due or to become due hereunder, without the written consent of the CITY. The CITY shall have no obligation to approve any assignment of this Contract. In the event that the CITY may wish to agree to an assignment, the CITY may, at its sole discretion, require the incorporation of any term it believes is necessary for the public interest.

100.7 Subcontractors

1. The CONTRACTOR shall not subcontract any work performed or any materials to be furnished in the performance of this Contract without the written notification to, and consent of, the CITY. If the CONTRACTOR shall sublet any part of this Contract, the CONTRACTOR shall be as fully responsible to the CITY for acts and omissions of their subcontractor and of the persons either directly or indirectly employed by the subcontractor, as if they were the acts and omissions of the CONTRACTOR's employees, agents, and representatives.

2. The CONTRACTOR shall provide a complete list of all subcontractors and materials provided for written approval by the CITY. This list shall be provided to the CITY within three (3) business days of the bid opening and subject to approval by the CITY prior to the award of the Contract. In the event the CONTRACTOR changes subcontractors at any time during the project, the new subcontractor cannot perform any work on the project until the CONTRACTOR notifies the CITY in writing of this change and receives written approval of the change from the CITY. The ENGINEER shall have the authority to stop all work on the project immediately and without notice upon identifying any previously-unapproved subcontractor at the work site. CONTRACTOR shall not be eligible for any extension of time to complete the project for delays caused by unapproved subcontractors at the work site **(see *Attachment A* of the *Proposal*)**.

100.8 Other Contracts

1. The CITY may award other Contracts for additional work on the same, related, or adjoining projects, and the CONTRACTOR shall fully cooperate with such other contractors and carefully fit in its own work to that provided under other Contracts as may be directed by the CITY. The CONTRACTOR shall not commit or permit any act which will interfere with the performance of work by any other contractor.

100.9 Definitions

1. CITY, MUNICIPALITY, BOARD, DISTRICT, or OWNER shall be understood to mean the City of Oshkosh, Wisconsin, represented by its Board of Public Works.

2. ENGINEER shall be understood to mean the City Engineer of the City of Oshkosh, Wisconsin, or any person designated by the City Engineer to perform a particular task. The ENGINEER shall have the full decision-making authority on behalf of the CITY as described or reasonably implied in this Contract.

3. ATTORNEY shall be understood to mean the Attorney for the City of Oshkosh, Wisconsin.

4. SURETY shall be understood to mean the person or corporation, which is bound with the CONTRACTOR (who is primarily liable), who engaged to be responsible for payment of all debts pertaining to the Contract and for an acceptable performance of the work for which they has contracted.

5. CONTRACTOR shall be understood to mean the person, firm, or corporation entering into a Contract with the CITY for the work described herein.

6. PLANS shall be understood to mean all drawings or reproductions of drawings, including profiles, sections, and sketches which have been made for the purpose of representing the work to the CONTRACTOR, all of which are to be considered a part of the Contract. PLANS and DRAWINGS are used synonymously.

7. "OR EQUAL", whenever, in any part of the Contract documents, an article, material, or equipment is defined by a proprietary product, or by using the name of a manufacturer or vendor, the term "or equal", if not inserted, shall be implied. The specific article, material, or equipment mentioned shall be understood as indicating the type, function, minimum standard of design, efficiency, and quality desired and shall not be construed in such manner as to exclude manufacturer's products of comparable quality, design, and efficiency. The ENGINEER shall have the sole discretion to make this determination. The CONTRACTOR shall comply with the requirements of the Contract documents relative to the CITY's approval of materials and equipment before they are incorporated in the project.

8. "NOTICE", where in any of the Contract documents there is any provision in respect to the giving of any notice, such notice shall be deemed to have been given: as to the CITY – when written notice shall be delivered to the ENGINEER of the CITY, or shall have been placed in the United States mail addressed to the Clerk or Secretary of the CITY at the place where the bids or proposals for the Contract are opened; as to the CONTRACTOR – when a written notice shall be delivered to the chief representative of the CONTRACTOR at the site of the project or by mailing such written notice in the United States mail addressed to the CONTRACTOR at the place stated in the papers prepared by him to accompany his proposal as the address of his permanent place of business; and as to the Surety of the Performance Bond – when a written notice is placed in the United States mail addressed to the SURETY at the home office of such surety or to its agent or agents who execute such Performance Bond in behalf of such surety.

9. "SUBSTANTIALLY COMPLETED WORK" is understood to mean the time at which the CONTRACTOR has completed all Contract Bid Items and change order work, except punch list and clean-up work. Assessment of Contract time will be stopped by the ENGINEER at this point. As applicable, the following must have occurred:
   A. All lanes of traffic are open on a finished surface.
   B. All permanent signage and traffic control devices are in place and operating.
   C. All drainage, erosion control, excavation, and embankments are completed.

10. "COMPLETED AND ACCEPTED AS FINAL" is understood to mean the time at which the ENGINEER determines that the project is Completed and Accepted as Final. The CITY may, at its discretion, identify parts, portions, or sections of a project as Completed and Accepted as Final before the project as a whole is Completed and Accepted as Final. The ENGINEER will give the CONTRACTOR written notice of final acceptance effective on the date of the final inspection. If the CONTRACTOR has not submitted the required documents or materials tests are not complete at the time of the final inspection, the ENGINEER will grant conditional acceptance subject to receipt of the required documents and satisfactory test reports. Failure to discover defective work or materials at the time of the final inspection does not prevent the CITY from rejecting defective work once it is discovered. The CITY may revoke its final acceptance if the CITY discovers defective work after it has accepted the work.

11. "STATE SPECIFICATIONS" is understood to mean the "*State of Wisconsin Standard Specifications for Highway and Structure Construction*", current edition at the time of bid opening, including all Supplemental Specifications.

12. "STANDARD DETAILS" is understood to mean the "*City of Oshkosh Standard Detail Drawings*" as included in the *Standard Specifications for City of Oshkosh, Wisconsin* in effect at the time of bid opening.

100.10 Contract Surety

1. The CONTRACTOR shall furnish a Bid Bond, Performance Bond, and Payment Bond on forms required by the CITY. Copies of these forms are enclosed at the end of **Section 100**. The amount of the Bid Bond shall be as required by State Statute. The Performance and Payment Bonds shall be in an amount not less than 100 percent (100%) of the Contract price as surety for the faithful performance of this Contract and for the payment of all persons performing labor and furnishing materials in connection with this Contract. The term of the Performance Bond shall extend for a period of two (2) years after the project is Completed and Accepted as Final by the CITY to provide security to the CITY for the purpose of carrying out work required to fulfill the CONTRACTOR'S Warranty obligations.

100.11 CONTRACTOR's Insurance

1. CONTRACTOR shall carry all insurance required by the CITY's standard insurance requirements. The CITY's insurance requirements will vary based upon the specific type of project. The CITY's specific insurance requirements will be identified in the Project Specifications. All of the CITY's insurance requirements can be viewed on the CITY's website, https://www.oshkoshwi.gov/CityOfOshkoshInsuranceRequirements.pdf. A copy can also be provided upon request from the Department of Public Works.

100.12 Proof of Carriage of Insurance

1. The CONTRACTOR shall furnish the CITY with satisfactory proof of carriage of the insurance required before the CONTRACTOR will be allowed to begin any work on the project.

100.13 Work Hours

1. Normal work week for the CONTRACTOR shall be five days a week, Monday through Friday. Normal working hours for the Engineering Division of the Department of Public Works field employees are 7:00 a.m. – 5:00 p.m., Monday through Friday. If the CONTRACTOR wishes to work hours other than these normal hours, he shall obtain written approval from the ENGINEER two (2) days in advance of such work. No work will be allowed on a Holiday observed by the City of Oshkosh. Should an observed holiday fall on a Friday or Monday, no work will be allowed on the adjacent weekend. The CONTRACTOR shall notify adjacent property owners when construction activity is anticipated to occur beyond normal work hours, including saw cutting concrete pavement after 10:00 p.m.

2. Failure to comply with the provisions of this Section will result in liquidated damages of Two Hundred Dollars ($200) per hour to the CONTRACTOR. All fractions of hours will be rounded up to the next whole hour.

3. The parties also recognize the actual loss suffered by the CITY if work hour conditions are not followed is difficult to prove in a legal proceeding. Accordingly, instead of requiring such proof, the CITY and CONTRACTOR agree that as liquidated damages for damages, but not as a penalty, CONTRACTOR shall pay to the CITY the above-listed charge per hour. In addition, if the CITY deems the non-scheduled work required unanticipated inspection services by the CITY or ENGINEER, the CONTRACTOR shall reimburse the CITY for said costs. All work completed outside of approved working hours not documented by the CITY and/or ENGINEER is subject to non-acceptance by the CITY.

100.14 Minimum Wage Scale

1. **2015 Wisconsin Act 55** repealed the State prevailing wage law for local governmental units. Therefore, the minimum wage scale no longer applies.

100.15 Safety

1. The CONTRACTOR shall be responsible for all OSHA safety requirements. Failure of the CONTRACTOR to follow OSHA requirements may result in a stop work order from the CITY until the violation is corrected, or termination of the Contract, at the CITY's option. The CONTRACTOR shall not be entitled to any additional compensation, over the original Contract amount, or additional time to complete the project, for any delay resulting from a sanction pursuant to this section.

2. Make all pipe trenches wide enough to provide free working space on each side of the pipe. Preferably, this space shall not exceed one-half (½) the nominal diameter of the pipe, and shall not be less than six inches (6"). The required working space shall depend upon the size of the pipe and the character of the materials encountered in the excavation. Also, provide sufficient space between the pipe and the sides of the trench to allow for preparing the foundation, laying the pipe, and placing and compacting of the backfill.

3. CONTRACTOR shall contact Digger's Hotline a minimum of three (3) working days prior to any activity that disturbs or penetrates the ground surface.

100.16 Plans and Specifications

1. The work shall be executed in strict conformity with the Plans and Specifications, and the CONTRACTOR shall do no work without proper Drawings and Specifications.

100.17 Drawings

1. Unless otherwise provided in the Contract documents, the CITY will furnish the CONTRACTOR, free of charge, copies of all Drawings and Specifications reasonably necessary to carry out the work.

100.18 Shop Drawings

1. The CONTRACTOR shall submit to the ENGINEER or ENGINEER's representative all shop or setting drawings and schedules required for the work. The CONTRACTOR shall make any corrections in the drawings required by the ENGINEER or ENGINEER's representative and resubmit same without delay.

2. All shop drawings for structures (manholes, inlets, etc.) shall include a "plan view", a "section view", and a list of materials (base section, riser sections, cone section adjustment, casting, etc.) necessary to construct the structure in the field. Elevations shall be listed for rim and all pipe inverts, showing only a measurement from either the top or bottom of the structure is insufficient to allow for proper review of the drawings. Shop drawings not conforming to these requirements will be rejected by the ENGINEER without review.

3. The CONTRACTOR shall keep at the site of the work an approved or confirmed copy of the Drawings and Specifications, and shall at all times give the ENGINEER access thereto.

4. Structures delivered to the site that do not comply with approved shop drawings will immediately be rejected by ENGINEER or ENGINEER's representative.

100.19 Rules and Regulations

1. The CONTRACTOR's attention is called to all conditions entering into the performance of this work, including the delivery point of all materials, hauling of materials, employment of labor, location of streets, state trunk highways, county highways, traffic conditions on these streets and highways, all laws of the state of Wisconsin and federal government, and ordinances and regulations of the CITY insofar as they may affect their operations.

100.20 Permits, Surveys, and Compliance With Laws

1. The CONTRACTOR shall pay for all permits, licenses, and fees necessary for the prosecution of the work unless otherwise specifically provided.

2. Where permit and/or plan approval is required, work shall not commence until such approvals are received and delays caused by not receiving said approval will not be the responsibility of the CITY.

3. **Section 71.80 (16)** of the Wisconsin Statutes provides that any nonresident of Wisconsin whether a corporation, partnership, or individual performing a construction contract in this state shall either file a bond with the Wisconsin Department of Taxation or deposit cash with the State Treasurer to guarantee payment of Wisconsin Income Tax on the net income derived from the contract if the contract equals or exceeds Fifty Thousand Dollars ($50,000) in amount. This bond must be filed or deposit made within sixty (60) days of the date on which construction begins.

100.21 Notifications and Permits

1. Notice to Proceed: The ENGINEER will notify the CONTRACTOR of the date to commence work covered by the Contract. Upon receipt of such notice, the CONTRACTOR shall comply with all notice requirements set forth below and in the Specifications. No work shall be started under the Contract and no materials or equipment shall be brought upon the site of the work prior to the date named in the ENGINEER's written notice to proceed with the work. The CONTRACTOR shall commence work within fourteen (14) calendar days of the date specified in the Notice.

2. Notice to Police and Fire Departments: The CONTRACTOR shall give notice in writing to the Fire Department, Police Department, and Winnebago County 911 Operator at least three (3) days before excavating in or obstructing traffic on any City street. If County Trunk Highways, State Trunk Highways, or U.S. Highways are involved, three (3) days written notice shall be given to the County Sheriff, County Highway Commissioner, and State Highway Commission.

3. Notice to Railroad: The CONTRACTOR shall send by registered mail a notice to the district or division engineer or persons in charge of operations of trains for any railroad at least ten (10) days prior to doing any work in the right-of-way of any track zone. They shall ascertain the schedule of all trains and shall comply with all rules and regulations requested by the Railroad Company.

4. Notice to Transit: The CONTRACTOR shall send notice to the Transportation Director at least ten (10) days prior to performing any work that impacts a bus route. Bus route maps can be obtained from: http://www.ci.oshkosh.wi.us/Transit/routes_and_times.htm.

5. Permits: The CONTRACTOR shall take out, at their own expense, all permits and licenses required by the State, the County, or by any contiguous governmental units for the performance of the work that the CITY has not already obtained or is in the process of obtaining. Any fees for obtaining required City permits, for work included in the Contract that is paid for by the City, will be paid for by the CITY.

6. Permit for Storage of Materials: When the CONTRACTOR finds it necessary to store materials on a street beyond the confines of the work site, they must obtain the required permit(s).

7. City Contracts only include work within the CITY's right-of-way or easements. Any work performed by the CONTRACTOR outside of the Contract's (i.e. work paid for by others) construction limits or outside of the CITY's right-of-way or easements may require obtaining permits from the CITY's Inspection Department, per the *Municipal Code of the City of Oshkosh* (i.e. plumbing permits, building permits, electrical permits, etc.).

100.22 Conflicts

1. In the case of differences between the Drawings and Specifications, the Specifications shall govern. On all Plans and Drawings, figured dimensions shall govern in case of discrepancies between the scale and figures. The CONTRACTOR shall not take advantage of any error or omission in the Plans or of any discrepancy between the Plans and Specifications, but shall refer all such conditions to the ENGINEER. All interpretations of the Plans, as construed by the ENGINEER, shall be considered final and binding on all parties involved.

2. Any verbal information obtained from or statement made by representatives of the Department of Public Works at the time of the examination of the Contract documents or the site for the purpose of bidding, which apparently corrects or in any way amends the Contract documents, shall be invalid. The CITY will not be responsible for such verbal information or statements. Only such corrections and amendments to the Contract documents which are issued to all bidders as formal addenda shall become a part of the Contract. If any person contemplating the submission of a bid for the proposed Contract is in doubt as the true meaning of any part of the Plans, Specifications, or other Contract documents, they may submit to the ENGINEER a written request for an interpretation thereof.

100.23 Points and Instructions

1. The CONTRACTOR shall provide reasonable and necessary opportunities and facilities to allow the ENGINEER to set points and make measurements, and shall provide ENGINEER with no less than two (2) working days of advance notice of such opportunity. **The CONTRACTOR shall also provide ENGINEER with no less than two (2) working days to complete necessary work.** They shall not proceed until they has made timely request upon the ENGINEER and has received from him/her such points and instructions as may be necessary as the work progresses. The work shall be done in strict conformity to such points and instructions. The CONTRACTOR shall carefully preserve such marks, reference points, and stakes and in case of careless destruction, they shall be charged with the additional expense and shall be responsible for any mistakes that may be caused by such unnecessary loss or disturbances. The CONTRACTOR shall furnish all tools, except engineering tools, necessary to stake out and properly lay out the work and, when requested to do so, furnish men to assist the engineering party in staking off the work.

2. The CONTRACTOR must bear sole responsibility for the correct transfer of all construction lines and grades from the primary lines and grade points. They shall take such measurements from existing work as may be necessary to insure the proper construction of their work.

100.24 Unauthorized Work

1. The CONTRACTOR will receive compensation only for work that is authorized and accepted by the CITY or ENGINEER. Unauthorized work includes, without limitation, work done without lines or grades or instructions from the ENGINEER or CITY, work done beyond the limits of this Contract as designated by the Plans, or work done beyond the project's Plans without written authority. The CITY shall have the right, at its sole discretion, to order the unauthorized work to be removed or replaced at the CONTRACTOR's expense.

100.25 Use of Job Site

1. The CONTRACTOR shall confine their equipment, apparatus, storage of materials, and operations of their workmen to areas indicated by project scope, directions of the CITY, law ordinances, permits, or other permissions the CONTRACTOR may receive.

2. The construction limits and staging limits shall be contained within the project limits shown on the project Plans, unless otherwise approved by ENGINEER.

3. Do not disturb any area outside of project limits without written permission of the affected property owner or approval of ENGINEER. Prior to final payment, the CONTRACTOR shall provide to the CITY a signed statement from the owner of each property that has been disturbed in this manner stating that the cleanup and restoration is acceptable to that owner.

4. Sanitary Regulations: The CONTRACTOR shall provide approved properly-sheltered sanitary conveniences for their employees and their use must be strictly enforced.

100.26 Street Damage and Cleanup

1. The CONTRACTOR shall be liable for any damage to streets caused by its operations. This includes any damage to the street, other than the necessary opening up of the streets for pipe installation or paving, and any damage which occurs beyond the construction limits or along haul routes.

2. The CONTRACTOR shall ensure a street sweeper is on site at **EACH** location where the CONTRACTOR is working. The only acceptable means of sweeping the streets shall be a street sweeper. Broom attachments on skid steers, or other pieces of equipment are not acceptable.

3. The CONTRACTOR shall clean up all mud, gravel, or debris from any streets or haul routes, which were deposited by its operations. This includes streets being worked on as a part of the project. Streets shall be cleaned daily, or more often, if required.

4. The CONTRACTOR shall at all times keep the construction area free from an accumulation of rubbish and discarded materials caused by its employees or the project work. Upon completion of the work and before acceptance and final payment will be made, the CONTRACTOR shall remove all surplus and discarded materials, rubbish, and temporary structures from the construction area, as well as from adjacent property for which it is responsible. The CONTRACTOR shall leave these areas in a neat and presentable condition.

5. The CONTRACTOR shall restore all property, both public and private, which has been damaged in performance of the work to an acceptable condition as determined by the CITY. Restoration shall be to a condition equivalent to or better than that which existed prior to the start of construction.

6. If the ENGINEER determines the final cleanup is unsatisfactory and this deficiency is not rectified by the CONTRACTOR in a reasonable period of time, such cleanup operations as are deemed necessary will be completed by the CITY and charged to the CONTRACTOR. Charges for this work will be as the CITY determines to be reasonable.

7. All work involved in the clean-up operations shall be considered part of and/or incidental to the other items of the Contract and no separate or additional compensation will be made therefore.

100.27 Erosion and Sediment Control

1. The CONTRACTOR shall provide all work and materials necessary to protect the construction site from erosion and sediment transport during and after the construction of the proposed project. The CONTRACTOR shall comply with all requirements of the *WPDES General Permit for Storm Water Discharges Associated with Construction Activities*. This work is considered

incidental to the Contract, except for those items having separate Bid Items. Those items having separate Bid Items will be paid for under the appropriate Bid Items. The *Storm Water Management and Erosion/Sediment Control Plans* are on file in Room 301 of City Hall. The Plan may be viewed and copies requested there.

2. The CONTRACTOR shall install all erosion and sediment control practices as indicated on the Plans, and as directed by the ENGINEER in the field. The CONTRACTOR shall perform maintenance on erosion and sediment control practices as directed by the ENGINEER in the field. After the site has been completely stabilized (pavement placed and at least seventy percent (70%) vegetative cover achieved), the CONTRACTOR **MUST** remove all temporary erosion and sediment control practices.

3. Failure to properly install, maintain, and/or remove erosion and sediment control practices will result in a reduction of pay quantities for appropriate Items.

4. The CONTRACTOR's site supervisor and all subcontractors' anticipated foremen shall attend a City of Oshkosh Ground Control training seminar prior to the start of construction. The CONTRACTOR shall schedule the conference with the CITY prior to the start of construction. The CITY will hold one (1) conference per project. The CITY will not pay for work performed prior to conducting the conference.

5. Failure to follow the CITY's Ground Control Training Seminar principles once construction activities have started will result in required attendance at a City Ground Control Training refresher course for all parties involved in the violation. The refresher course will occur on the following City business day if the violation involves dewatering practices, any work associated in "Waters of the State" or "Waters of the US", or habitual violations of common erosion control best management practices. The CONTRACTOR's site supervisor, foremen, and all of the crew members from the violating crew shall be required to attend the City Ground Control Training refresher course. The CONTRACTOR shall schedule the conference with the CITY for the next morning or other time approved by the CITY. The CITY will not pay for any work performed until after the refresher course has been completed by the offending parties.

6. Failure to make repairs to erosion and sediment control practices within twenty-four (24) hours of being notified by the City Inspector will result in Two Hundred Dollars ($200) per each occurrence in liquidated damages to the CONTRACTOR.

7. The parties also recognize the damage, the actual cost of additional inspection, and fines suffered by the CITY, when erosion and sediment control practices are not properly maintained, is difficult to prove in a legal proceeding. Accordingly, instead of requiring such proof, the CITY and CONTRACTOR agree that as liquidated damages for damages, but not as a penalty, CONTRACTOR shall pay to the CITY the above-listed charge per each occurrence.

100.28 Sewer and Water Requirements

1. Disposal of Water and Sewage: All storm or groundwater, which is to be removed from the site of the work, must be conveyed to a point approved by the ENGINEER. All sanitary sewage must be conveyed by closed pipe or hose to a point approved by the ENGINEER. Proper precautions must be taken to prevent excessive quantities of clay, sand, silt, or other materials from entering existing sewers. Proper precautions must be taken to prevent excessive surface water from entering the sanitary sewer system.

2. Interruption of Sewage and Storm Water Flow: The CONTRACTOR must provide for the flow in existing sewers, water courses, culverts, gutters, catch basins, drains, etc., which are affected by the prosecution of the work. All such existing structures which are disturbed shall be restored to the satisfaction of the ENGINEER.

100.29 Trench Dewatering

1. All trench dewatering pumps shall have a sediment control/capture mechanism at the discharge of the pump hose. Discharging into an inlet that has inlet protection installed does not count as having sediment control/capture mechanism installed. There are several different mechanisms available to the CONTRACTOR to minimize the impact of sediment from trench dewatering pumps. All trench dewatering shall be in accordance with *Wisconsin Department of Natural Resources (WDNR) Technical Standard 1061*. Per *WDNR Technical Standard 1061*, Type II bags with clay loams, silty clays, and clay soils require a polymer additive for effective treatment.

2. It shall be noted the **minimum size of a Geotextile Bag is one hundred (100) square feet**. Larger bags may be required depending on the capacity of the pump being utilized for trench dewatering. If Geotextile Bags are utilized for sediment control at the discharge of a pump hose, the bag shall be placed upon a pallet, or some other means of raising the bag above the surface of the ground. If Geotextile Bags are not providing adequate sediment control, additional practices, such as polymer additive or additional secondary containment, may be required.

3. It shall be noted that portable sedimentation tanks are only intended for use on sand, loamy sand, and sandy loam soils. These soil types are NOT present in this project area. Portable sedimentation tanks may be utilized for loam, silty loam, and silt soils. The portable sedimentation tanks may ONLY be utilized in these soil types if a polymer additive is utilized to facilitate increased flocculation of sediments within the trench dewatering pump discharge hose. These soils types are present on portions of this project site. Refer to the *Storm Water Management and Erosion and Sediment Control Plan* for further soils information, or consult with the Erosion Control Inspector.

4. *Wisconsin Department of Natural Resources Technical Standard 1061* contains information regarding additional types of sediment control/capture mechanisms. If practices other than those listed above are planned to be used, please consult with the Erosion Control Inspector.

100.30 Dewatering

1. All dewatering shall be done in accordance with applicable Federal, State, and Local code requirements.

2. Under no conditions shall the Work be laid in or under water. No water shall flow over the Work until the joints are complete or the concrete has set. Wherever necessary, the CONTRACTOR shall excavate in advance of the completed Work, lead the water into sumps or pump wells, and provide erosion control measures to prevent water or sediment damage.

3. The expense for making all extra excavations necessary to prevent water from interfering with the proper construction of the Work and for forming of all dams, digging sumps or pump wells, bailing and pumping, and erosion control shall be borne by the CONTRACTOR. Any permits necessary for the dewatering operations shall be obtained and paid for by the CONTRACTOR. No extra payment will be made for dewatering of the trench, whether accomplished by the use of sumps and pumps, well point systems, or deep wells.

4. The CONTRACTOR's dewatering system shall ensure that soils within the trench will not be destabilized by hydrostatic uplift pressures from adjacent groundwater. If conditions warrant, the CONTRACTOR shall furnish and install well point systems or deep wells. Spacing and depth of well points or wells shall be adequate to lower the piezometric level to at least one foot (1') below the bottom of the excavation. Additional lowering shall be provided as necessary to create a stable subgrade. The control of groundwater shall be such that softening or heaving of the bottom of excavations or formation of quick conditions or boils shall be prevented. Dewatering systems shall be designed and operated to prevent the migration or removal of soils. In areas where rock is encountered, the water level shall be kept at or below top of rock, but at least six inches (6") below bottom of concrete. Additional rock shall be removed as needed to provide clearances.

5. The CONTRACTOR shall take all necessary precautions during the dewatering operation to protect adjacent structures against subsidence, flooding, or other damage. The dewatering system shall be installed and operated so that the groundwater level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property. Any such facilities and structures damaged shall be repaired or replaced to the satisfaction of their owner.

6. Prior to dewatering, the CONTRACTOR shall take into account the effect of its proposed dewatering operation on existing private water supply systems and shall make arrangements with property owners for protecting their supplies or providing alternative supply. If the CONTRACTOR's dewatering operation adversely affects private water supply systems, the CONTRACTOR shall provide property owners with alternative potable and non-potable supplies until dewatering operations are ceased and groundwater levels return to normal. If the water in private water supply wells is contaminated through no fault of the CONTRACTOR after restoration of original groundwater levels, the CITY will provide measures to restore water potability. The CONTRACTOR is responsible for restoration of the water supply, not its potability after restoration.

7. In areas where continuous operation of dewatering pumps is necessary, the CONTRACTOR shall avoid noise disturbance to nearby residences and businesses to the greatest extent possible by using electric-driven pumps, intake and exhaust silencers, or housing to minimize noise.

8. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted fill or backfill, and prevent floatation or movement of all structures and pipelines.

100.31 Dust Control

1. The CONTRACTOR shall maintain dust control at all times, both within the project limits and areas outside the projects where dust is caused or created by the CONTRACTOR's operations. The CONTRACTOR shall take any responsibility for damage or claims, which may arise from a lack of dust control.

2. All streets along the haul routes shall be kept clean and free of dust and mud at all times.

3. All dust control practices shall comply with *Wisconsin Department of Natural Resources Technical Standard 1068*.

100.32 Supervision

1. The CONTRACTOR must at all times have an authorized representative present on the work site during seventy-five percent (75%) of project working hours each week. For those twenty-five percent (25%) of project working hours the authorized representative is not present, then they shall be able to physically appear on the work site no later than sixty (60) minutes after demanded to do so by the ENGINEER. An authorized representative is one who has the full authority to supervise, represent without limitation, and direct the CONTRACTOR's employees, agents, subcontractors, and suppliers to carry out all orders given by the ENGINEER and to otherwise ensure that the project progresses in an orderly and efficient manner. During the construction and maintenance period of the work of this Contract, any order or direction given by the ENGINEER to the CONTRACTOR's authorized representative shall have the same force and effect as if given to the CONTRACTOR as an entity. In the event the CONTRACTOR's

authorized representative does not physically appear on the site within sixty (60) minutes of such request by the ENGINEER, then the ENGINEER shall have full and complete authority, but not the obligation, to stop the project until such time as all issues causing such stoppage have been resolved. Neither the CITY nor the ENGINEER shall be responsible to the CONTRACTOR or to the CONTRACTOR's employees, agents, subcontractors, or suppliers for work for any work delays as described above.

2. Prior to commencing the work, the CONTRACTOR shall designate in writing to the ENGINEER the name and contact information of its authorized representative who shall be in complete charge of the CONTRACTOR's interests for the project.

3. For all times the CONTRACTOR's authorized representative is absent from the site, they shall designate a representative that has the authority to both receive orders from the ENGINEER and act for the CONTRACTOR. The designated representative shall be thoroughly familiar with the work and be acceptable to the ENGINEER. The representative shall be capable of directing the work as called for by the Contract documents.

4. The CONTRACTOR is solely responsible for the means, methods, techniques, sequences, and procedures of construction. The CONTRACTOR is not responsible for the negligence of others in the design or specification of specific means, methods, techniques, sequences, or procedures of construction described in and expressly required by the Contract.

100.33 ENGINEER's Authority

1. The ENGINEER shall have general supervisory authority over the project and the authority to direct all work related to the project. The ENGINEER has authority to stop the work whenever such stoppage may be necessary to insure proper execution of the Contract. The ENGINEER shall in all cases make the final determination of the amount and quantities of classification of the several kinds of work or material which are to be paid for under this Contract. The ENGINEER shall have the sole authority to decide all questions which may arise relative to the performance of this Contract. All the decisions of the ENGINEER shall, when so requested, be rendered in writing. Decisions of the ENGINEER shall be final and conclusive in all matters except the financial consideration involved. The ENGINEER's decisions related to financial considerations shall be final unless, within ten (10) days after such decisions, the CONTRACTOR applied in writing to the CITY's Board of Public Works for a review of such decisions.

100.34 Authority and Duties of Inspector

1. The ENGINEER, and any designee including the CITY's Project Inspectors, shall at all times have access to the work wherever it is and the CONTRACTOR shall provide proper facilities for such access and inspection. The Project Inspectors shall at all times be provided by the CONTRACTOR with access to all parts of the project area, and shall be authorized to inspect all work done and materials furnished. Such Inspectors shall report to the ENGINEER as to the

progress of the work and the manner in which it is being performed. They shall report to the ENGINEER any failure on the part of the CONTRACTOR to fulfill the requirements of these Specifications and the Contract that has been observed by the Project Inspector. Any action on the part of the CONTRACTOR that does not fulfill the requirements of these Specifications which is not observed by the Inspector or which is not reported to the ENGINEER does not constitute or act as a waiver of any term of these Specifications or of any Contract. The CONTRACTOR shall always retain the obligation to perform all the work strictly in accordance with the requirements of the Specifications. Disagreements between the Inspector and the CONTRACTOR regarding the sufficiency of any work on the project shall be referred to and to be decided by the ENGINEER. The Inspector is not authorized to alter the Plans and Specifications or to accept any part of the work. Unless specifically designated and authorized by the ENGINEER, the Inspector is in no case to act as foreman or to perform any duties for the CONTRACTOR or to interfere in any way with the management of the work by the latter. Unless acting pursuant to the specific designation and authority of the ENGINEER, any advice which the Inspector may give shall not be construed as binding on the CITY or the ENGINEER, or release the CONTRACTOR from fulfilling the terms of the Contract. No work shall be done under this Contract except in the presence of an Inspector or the ENGINEER. Any work not done in accordance with these provisions shall not be considered authorized work.

2. Inspectors shall have the authority to order the CONTRACTOR to stop work and correct any deficiencies noted in the implementation of the *Storm Water Management and Erosion and Sediment Control Plan*. When notified of the deficiencies, the CONTRACTOR shall immediately correct all deficiencies prior to continuing work.

100.35 Material and Workmanship

1. Right to Inspect Test Materials: All materials to be used in the work are subject to the inspections, testing, and approval of the ENGINEER according to standards as set forth in current ASTM Specifications or as specified by the CITY at the place of manufacture, the site of the work, or other location, and before use, or before, during, or after the incorporation of such materials into the work. The CONTRACTOR shall, at all times, afford the necessary facilities for the ENGINEER to examine or sample all materials and to inspect the work, plant, equipment, and finished work.

2. Unless otherwise stipulated in the Specifications, all workmanship, equipment, materials, and articles incorporated in the work covered by this Contract are to be new and of the best grade of their respective kinds for the purpose intended. If any work, or quality of workmanship or materials is needed which are not directly or indirectly identified or described in these Specifications or Drawings, but are nevertheless necessary to the proper execution according to the obvious intent thereof, the CONTRACTOR shall understand the same to be implied as a condition of this Contract and shall be required to provide it in their Proposal as fully as if it were fully and particularly described.

3. When required by the Specifications, or when called for or requested by the CITY, the CONTRACTOR shall furnish the CITY with all information concerning the materials or articles which they contemplate incorporating in the work. Work cannot proceed without the CITY's approval of the materials or articles at issue.

4. The CONTRACTOR shall furnish to the CITY, for its approval, names of the manufacturers of machinery, mechanical or other equipment, which they contemplate installing, together with their performance capacities and other pertinent information. Samples of materials shall be submitted for approval when requested by the CITY. Machinery, equipment, materials, and articles installed or used without such approval shall be at the risk of subsequent rejection.

100.36 Inspection and Testing

1. All materials and workmanship (if not otherwise designated by the Specifications) shall be subject to inspection, examination, and test by the CITY at any and all times.

2. The CONTRACTOR shall furnish promptly and without additional charge, all reasonable facilities, labor, and materials necessary for safe and convenient inspection and testing by the CITY. The CITY may elect, at its discretion, to require the CONTRACTOR, at the CONTRACTOR's expense, submit materials samples to a testing laboratory for any tests required by the CITY. The CONTRACTOR shall take all actions to ensure that inspections and testing does not unnecessarily delay the work. Special, full-size, and other performance tests shall be carried out as described in the Specifications or as further requested by the CITY.

3. The CITY may decide, at its sole discretion, at any time before final acceptance of the entire work to examine and/or test the work already completed through removal of the subject of the examination. The CONTRACTOR shall on request promptly furnish all necessary facilities, labor, and materials.
   A. If such work is determined by the CITY to be defective in any material respect, due to the fault of the CONTRACTOR or his agents or subcontractors, the CONTRACTOR shall be responsible for all costs and expenses related to such testing, examination, and satisfactory reconstruction of the affected area. No additional days towards completion of the project will be allowed if this defective material is identified before the Substantial Completion of the project.
   B. If, however, the work tested and examined is found by the CITY to meet the requirements of the Contract, then the CITY shall be responsible for the actual reasonable cost of labor, materials, and costs necessarily involved in the testing, examination, and reconstruction, and:
      1. The CONTRACTOR will be entitled to an additional payment of fifteen percent (15%) of the reasonable costs for testing, examination, and constructing;
      2. The CONTRACTOR shall be granted a suitable extension of time to complete the project due to delays associated with testing, examination, and reconstruction.

4. All materials or workmanship not conforming to the requirements of the CITY's Specifications or requirements of the project Contract shall be considered as defective, and all such materials, whether in place or not, shall be rejected and shall be removed immediately from the work, unless otherwise permitted. Material which has been rejected, and defects of which have not been corrected, shall not be used until approval has been given. All work which has been rejected or condemned shall be remedied, or if necessary, removed and replaced in an acceptable manner by the CONTRACTOR at the CONTRACTOR's sole expense.

5. An equitable deduction from the Contract price to be calculated by the ENGINEER shall be made for damaged work or corrected work not done in accordance with the Contract, when the ENGINEER deems it in the CITY's best interests to accept.

6. Noncompliance with Contract Documents: In case the ENGINEER points out to the CONTRACTOR any defective work, neglect, or disregard of the Plans, Specifications, or other requirements of the Contract documents, the CONTRACTOR shall immediately remove such faulty work, discontinue such procedure, and exercise proper care in complying with the Plans, Specifications, and other requirements of the Contract documents. The right to final acceptance or rejection of the work however will not in any way be waived by reason thereof nor shall the final inspection relieve the CONTRACTOR of any subsequently discovered material breach of the Contract including Plans, Specifications, and applicable special or general requirements.

100.37 Extra, Additional, or Omitted Work Payment

1. The CITY may authorize changes in, additions to, or deductions from the work to be performed or the materials to be furnished pursuant to the provisions of the Contract or any Contract document. Changes, whether additions to or deductions from, will require Change Orders. The CONTRACTOR should be aware the CITY is bound by the bidding requirements of the Wisconsin Statutes and the *Municipal Code of the City of Oshkosh*. Therefore, proposed additions to the Contract may require additional project bidding, depending on the size and scope of the proposed changes.

2. Adjustments, if any, in the amounts to be paid to the CONTRACTOR by reason of any damage to the project, addition, or deduction shall be calculated by the CITY through one or more of the methods listed below, with the CITY giving priority to these options in descending order. The CITY reserves the right to reject any or all of the following methods when following such guidance would not be in the CITY's best interests.
   A. By unit prices contained in the CONTRACTOR's original bid which has been incorporated into the construction Contract.
   B. By a supplement schedule of prices contained in the CONTRACTOR's original bid and incorporated in the construction Contract.
   C. By a lump sum proposal from the CONTRACTOR that is acceptable to the CITY.
   D. On a "cost plus basis" not to exceed a specified limit.

3. A "cost plus basis" is defined as the actual cost of labor and materials, plus fifteen percent (15%) of the said cost to cover superintendence, general expense, and profit. Eligibility for the "cost plus" payment will be as follows:
   A. The CONTRACTOR will be allowed payment on the cost-plus basis for the work actually performed by the CONTRACTOR. Subcontractors performing this work will be allowed to invoice on the cost-plus basis for the work the subcontractor performs.
   B. The CONTRACTOR shall not include in its requests for payment any additional charges for its benefit for work performed by a subcontractor and equipment rental. Additional payments to the CONTRACTOR for extra or additional work performed by a subcontractor will be negotiated with the CITY on a case-by-case basis, but shall not exceed five percent (5%). The CONTRACTOR'S payment in these circumstances will be calculated based upon the actual cost of work and materials of the subcontractor before fifteen percent (15%) is added.

4. Claims for additions to the Contract scope, quantities, or price will not be recognized by the CITY unless they have been specifically approved in writing by the CITY.

5. The CITY reserves the right to increase or decrease the estimated quantities on a unit price Contract fifteen percent (15%) without affecting the unit prices fixed by the Proposal. The CONTRACTOR agrees to execute all Change Orders necessary to allow the CITY to carry out this authority. The final payment shall be based upon the actual number of units of completed work as determined by final measurements taken by the ENGINEER.

6. Claims for extra work shall be filed at such intervals as directed by the ENGINEER or as designated in the Contract documents, but in all cases not later than five (5) days after the date of completion of the specified extra work.

100.38 Incidentals Absorbed

1. Prices and amounts mentioned in the CONTRACTOR's Proposal shall include all work, materials, expenses, costs, overhead, whether specifically covered or reasonably inferred from the information given by these Specifications; or the Drawings illustrating same; or any Contract document; and any tools, appliances, or supplemental structures, necessary to carry out this work.

100.39 CONTRACTOR's Responsibility for Damaged Work

1. Until the project has been Completed and Accepted as Final by the CITY, the CONTRACTOR shall be responsible for the project site and they shall take every necessary precaution against injury or damage of the work completed or any part thereof, by any natural or man-made action. The CONTRACTOR shall build, repair, and restore at its own expense any injuries or damage of any character whatever to any part of the work in place, or any material to be used in the work. Upon order of the ENGINEER, the CONTRACTOR shall remove any materials which might have been damaged, and will make good any damage of the work which may have

occurred through any cause whatsoever while the CONTRACTOR is responsible for the project site. The required work will not be considered Completed and Accepted as Final until such damages have been acceptably repaired.

2. Any damage or cost caused by defective or ill-timed work caused by the CONTRACTOR, or their employees, agents, suppliers or subcontractors, shall be the responsibility of the CONTRACTOR.

100.40 Cutting and Patching

1. The CONTRACTOR shall do all cutting, fitting, or patching, or any work that may be required to make its several parts fit together, or to receive the work of other contractors, or to fit together with existing adjoining work, which is shown upon, or reasonably implied by, the Plans and Specifications for the completed structure and they shall make conform their work as directed by the CITY or CITY's representative.

2. The CONTRACTOR shall not endanger any work by cutting, digging, or otherwise shall not cut or alter the work of any other contractor without the consent of the CITY or CITY's authorized representative.

100.41 Delays

1. If the CONTRACTOR is delayed in the completion of the work by act or neglect of the CITY or CITY's representative or by any other contractor employed by the CITY, or by causes beyond the CONTRACTOR's control, including strikes, lockouts, fire, or unavoidable casualties, then the time of completion may be extended for such reasonable time as may be agreed upon by the CITY and the CONTRACTOR, but only after the CONTRACTOR provides such notices in writing to the CITY of the existence of, and cause of, such delay. **Such notice must be given by the CONTRACTOR to the CITY within five (5) days following the beginning of such delay. The CONTRACTOR'S failure to provide notice as required will waive any time allowances or extensions based upon the above reasons.**

2. Inclement weather days are NOT considered a delay.

100.42 Suspension of Work

1. The CITY may at any time suspend the work, or any part thereof, for any reason by giving the CONTRACTOR written notice five (5) days before the suspension of work. The CONTRACTOR shall resume work on the project within ten (10) days after receiving written notice from the CITY requiring that the project be restarted. Except as indicated by other terms, the CITY shall provide additional time to complete the project and reimburse the CONTRACTOR for actual expenses incurred by the CONTRACTOR related to this Contract as a result of such suspension of work by the CITY. The CITY shall not be responsible for any other damages including, without limitation, incidental, special, or other damages including lost

profits. The CONTRACTOR shall not be reimbursed for costs associated with such suspension of work by the CITY where the suspension of work is ordered due to the gross negligence or misconduct of the CONTRACTOR, to secure compliance with the terms of this Contract, to prevent public or private harm caused by the project, or in response to the requests or demands of other governmental entities. The CONTRACTOR will not be provided with additional days to complete the project if the suspension of work is caused by the actions of the CONTRACTOR, their employees, agents, suppliers, or subcontractors. Work on the project may be suspended by the CITY for up to sixty (60) days, unless an extended time is otherwise agreed to by the CITY and the CONTRACTOR. If the CITY does not give notice in writing to the CONTRACTOR to resume work within sixty (60) days, or a longer time if agreed upon, of the suspension of the project, then the CONTRACTOR may abandon the portion of the work so suspended, and will be entitled to receive the CITY's estimate for payment for all completed work on that portion abandoned.

100.43 Termination for Breach

1. In the event that any of the provisions of this Contract are violated by the CONTRACTOR or by any subcontractors, the CITY may serve written notice upon the CONTRACTOR and his SURETY of the CITY's intention to terminate such Contract.
   A. Written notice of termination must contain the reasons for such intention to terminate the Contract.
   B. The CONTRACTOR shall have ten (10) days after being served with this notice to remedy or cure any default or violation of any Contract term, or to provide a firm schedule to remedy the default or violation that is acceptable to the CITY.
   C. The CITY shall have no obligation to extend past ten (10) days the time to cure any default or violation.
   D. If the CONTRACTOR fails to cure a breach or violation within the allowed time, then the CONTRACTOR'S involvement in the project shall cease, but their obligations as described in the Contract shall continue for all applicable statutes of limitation.

2. In the event of such termination, the CITY shall immediately serve written notice of the removal of the CONTRACTOR from the project upon the CONTRACTOR and its SURETY. The SURETY shall have the right to take over and perform the Contract, provided, however, that if the SURETY does not commence performance on the project within thirty (30) days from the date of the mailing notification of the CONTRACTOR's removal, the CITY may at its option take over the work and prosecute the same to completion at the expense of the CONTRACTOR and their SURETY. The CONTRACTOR and their SURETY shall be liable to the CITY for any excess cost occasioned by the CITY thereby, and in such event, the CITY may take possession and utilize in completing the work, such materials, appliances, and equipment as may be on the site of the work and necessary therefore.

100.44 OWNER's Right to Do Work

1. If the CONTRACTOR should neglect to prosecute the work properly or fail to perform any provision of this Contract, the CITY may, after three (3) days written notice to the CONTRACTOR and their SURETY describing these performance issues, without prejudice to any other remedy the CITY may have, take any necessary actions to cure such deficiencies and may deduct without further notice the cost thereof from the payment the CITY would otherwise owe the CONTRACTOR. Costs associated with the CONTRACTOR's failure to prosecute the work may include liquidated damages.

2. The CITY reserves the right of entry to any portion of the site of the work and also to City work forces, utilities, or contractors for the purpose of constructing collateral work or making emergency repairs. The CONTRACTOR shall not be entitled to any damage for delays or hindrances resulting from such work.

100.45 Liquidated Damages

1. The CONTRACTOR and the CITY recognize that time is of the essence for this Contract and the CITY will suffer a financial loss if the work is not completed within the times specified by the CITY, plus any extensions allowed by the CITY. The parties also recognize the delays, expense, and difficulties involved in proving in a legal proceeding the actual loss suffered by the CITY if the work is not completed on time. Accordingly, instead of requiring such proof, the CITY and the CONTRACTOR agree that as liquidated damages for delay, but not as a penalty, the CONTRACTOR shall pay to the CITY the following daily charges:

Original Contract Amount		Daily Charge
From (More Than)	To (and Including)	(Calendar Day)
$ 0	$ 100,000	$ 500
$ 100,000	$ 500,000	$ 800
$ 500,000	$ 1,000,000	$ 1,000
$ 1,000,000	$ 3,000,000	$ 1,500
$ 3,000,000	$ 5,000,000	$ 2,000
$ 5,000,000		$ 2,500

100.46 Payment

1. Once a month, the CITY will make partial payment to the CONTRACTOR on the basis of a fully-certified, approved estimate of the completed work, but the CITY will retain five percent (5%) of the amount of each estimate until fifty percent (50%) of the work has been completed. At fifty percent (50%) completion, further partial payments shall be made in full to the CONTRACTOR. Amounts previously retained shall not be paid to the CONTRACTOR until final completion and acceptance of all work covered by this Contract.

2. In addition to other payment and retainage procedures, payment for concrete pavement will be made according to the following criteria:
   A. Payment for pavement removal, excavation, base course, and/or fine grading will be made after the first slab (first half of the street) is placed.
   B. Payment for the first slab will be made after the second slab (second half of the street) is placed.
   C. Payment for the second slab will be made when the street is Completed and Accepted as Final, including all terrace work, driveway restoration, sidewalk, and all other incidentals necessary to complete the street.

100.47 CITY's Right to Withhold Certain Amounts and Make Application Thereof

1. In addition to the payment to be retained by the CITY under preceding provisions of these General Conditions, the CITY may withhold a sufficient amount of any payment otherwise due the CONTRACTOR to cover work that has not been performed or defective work not remedied. The CITY shall not be responsible for payments to the CONTRACTOR's employees, agents, suppliers, and subcontractors.

100.48 No Third Party Beneficiaries

1. The terms of this Contract are intended by the parties to benefit the two parties. No other person or entity shall obtain any rights pursuant to the terms of this Contract.

100.49 Correction of Work After Final Payment

1. The CONTRACTOR shall provide a two (2) year warranty, or other period as required by law, on the work performed for the project. The warranty shall be interpreted in the broadest possible way for the benefit of the CITY. Any document submitted by the CONTRACTOR which seeks to limit this warranty shall be without effect. Neither the final payment or any provisions in the Contract documents shall relieve the CONTRACTOR of the responsibility for negligence or faulty materials or workmanship within the extent and period provided by law and, upon written notice, the CONTRACTOR shall remove any defects due thereto, and pay for any damage due to other work resulting there from which shall appear within two (2) years after date of completion and acceptance.

2. The CONTRACTOR shall give a minimum of one (1) week advance notice to CITY and ENGINEER prior to mobilizing to the site to correct any work identified as needing correction.

100.50 Use of Completed Portions

1. The CITY shall have the right to take possession of and use any completed or partially completed portion of the work, notwithstanding the time of completion of the entire project. If such prior use increases the cost of, or delays the work, the CONTRACTOR shall be entitled to extra compensation, extension of time, or both, as the ENGINEER may determine.

100.51 Patents and Trade Secrets

1. It is hereby expressly agreed that alleged ownership by any contractor of trade secrets as defined by Wisconsin Statutes as to materials used in any part of the work or preparation of any fixtures for such work shall not be recognized by the CITY in the performance of this Contract. The ENGINEER shall at all times have the right to demand and shall be furnished information concerning the materials or samples of ingredients for any materials used or proposed to be used in the work, nor shall mixtures once agreed upon be changed in any manner without the knowledge and written consent of the ENGINEER.

100.52 Pre-Construction Conference and Progress Meetings

1. A pre-construction conference will be held prior to commencement of the project and weekly progress meetings will be held once the work has begun. It is anticipated the pre- construction and weekly progress meetings will have representation from the successful CONTRACTOR, all affected public and private utility interests, and all other interested parties. The purpose of these meetings will be to coordinate the activities of all parties involved in the completion of this project.

2. All parties attending the pre-construction conference and progress meetings will be encouraged to take notes regarding pertinent issues discussed at this meeting. The ENGINEER shall coordinate, take formal meeting minutes, and provide copies of meeting minutes to all parties in attendance. Parties present at this meeting are encouraged, but not required, to notify ENGINEER of any errors, misunderstandings, or disputes related to the meeting minutes. Weekly progress meetings shall be held at the Oshkosh City Hall during regular business hours.

3. The CONTRACTOR shall update and provide documentation on all requested extra work at each progress meeting for work performed during the previous week. Failure to do so may result in non-payment of said extras.

100.53 Maintenance of Traffic

1. Prior to the pre-construction conference for the Contract, the CONTRACTOR must submit to the ENGINEER, for approval, a schedule indicating the order in which the streets will be constructed and closed. The schedule shall also identify the timing of construction of utilities, paving, driveway, sidewalk, landscaping, and final restoration. The schedule shall accommodate the coordination with all aspects of the project and management.

2. Prior to the beginning of any construction, the CONTRACTOR will be responsible to furnish all necessary barricades, detour signs, road closing signs, flares or flashers, fencing, flag persons, etc. to provide adequate traffic control and still maintain the accesses as described herein. The signs shall conform to **Sections 637** and **643** of the STATE SPECIFICATIONS.

3. The CONTRACTOR shall provide a variable message board in each oncoming direction one (1) week prior to closure of all arterials and collectors. Arterials and collectors are shown on the **Permit Jurisdiction and Streets to Remain Open Map** of these Specifications.

4. Where the street will remain open to local traffic, the CONTRACTOR will be required to provide and maintain temporary stop signs or other temporary traffic control signs and devices.

5. The CONTRACTOR must set up and maintain road closed signs one (1) block on either side of the project street intersections and on all cross streets not left open. **ALL SIGNAGE SHALL BE IN COMPLIANCE WITH THE *MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES*. THERE WILL BE AN EMPHASIS ON TRAFFIC CONTROL INCLUDING SIGNAGE RELATED TO LANE AND SIDEWALK CLOSURES.**

6. All trenches or pavement disruptions located in the traveled way of the public streets that remain open to through traffic shall be maintained with temporary hot mix asphalt or concrete pavement until permanent pavement can be installed. If the CONTRACTOR does not patch these areas in a timely manner, the CITY may, without notice, perform the repairs itself and bill the CONTRACTOR for the work.

7. The CONTRACTOR must notify property owners in writing of the schedule one (1) week before the commencement of work and/or street closures. Multiple notices will be required. **The CITY will provide the appropriate written notices.** In addition to the hand-delivered, written notice, a message board shall be provided at each access point to the construction project notifying residents a minimum of one (1) week prior to driveway closures. Driveway access can be closed for a maximum of five (5) consecutive weeks. CONTRACTOR shall keep track of date and method of notice delivery. **Notices shall be delivered to owners on all dead end streets that abut any streets on the Contract.**

8. The CONTRACTOR must notify the local post office at least one (1) week before any rural type mailboxes can be removed, or if mail delivery will be hindered, so that alternate mail deliveries can be arranged. The CONTRACTOR must cooperate with the property owners and provide access whenever possible. The CONTRACTOR must provide reasonable access for any handicapped person who lives on any of the streets scheduled for construction. The CONTRACTOR shall provide adequate access to all churches and schools, business and industrial establishments at all times necessary for them to maintain their operation.

9. All costs associated with traffic control shall be considered incidental to the Contract.

10. The CONTRACTOR shall be required to follow the designated haul route as outlined in the project Specifications to the designated truck route. Haul trucks shall be limited to haul routes and truck routes designated by the CITY.

11. The ENGINEER may require temporary roads or gaps in the pavement to provide required access. Where temporary roads are required, or ordered by the ENGINEER, the CONTRACTOR must provide them, and all costs must be included in the paving costs, as no extra monies will be paid for said work.

12. The CONTRACTOR shall give to the City Engineer, the City Street Division, and the City Police Department the name, address, and the telephone number of the individual who will be responsible for barricades, signs, and the condition of travel ways during all off-duty hours. **The individual must be someone who can be called at all times, day or night, in case of an emergency and who will have the authority to perform or correct work immediately, if required.**

13. The CONTRACTOR shall coordinate with the CITY for collection of garbage/recycling. The CITY will collect areas under construction early in the day unless other mutually agreed upon arrangements are made. The CONTRACTOR shall provide access.

14. CONTRACTOR must allow a minimum ten-foot (10′) wide emergency vehicle access at all times, unless approved otherwise by the ENGINEER.

15. For intersections designated as arterial or collector streets, as shown in the **Map Section** of these Specifications, the CONTRACTOR must maintain counter-directional traffic at all times. A minimum of a ten-foot (10′) lane, one (1) in each direction, must be provided at all times. A single ten-foot (10′) lane with a flagger may be allowed for short durations with prior approval of ENGINEER.

16. No storage of material or equipment shall be allowed outside of the Contract limits.

17. CONTRACTOR must phase all work such that adequate parking exists within one thousand feet (1,000′) of all residents and businesses on all streets.

18. For handicapped persons who live on any of the streets scheduled for construction, the CONTRACTOR must provide temporary handicap parking signs and/or spaces, as designated by the ENGINEER. All costs associated will be incidental to the Contract.

100.54 Maintenance of Pedestrian Walkways and Gutters

1. Suitable pedestrian crossings at least four feet (4′) in width shall be provided and maintained by the CONTRACTOR at all intersections, unless otherwise directed by the ENGINEER. Gutters must not be obstructed at any time and where it is necessary to cover them, a continuous pipe or timber drain ample to carry off the storm water shall first be laid along the gutter and such pipe or drain shall be kept open and free from obstruction.

2. **THERE WILL BE AN EMPHASIS ON TRAFFIC CONTROL INCLUDING SIGNAGE RELATING TO SIDEWALK CLOSURES. ALL WORK WILL CONFORM TO THE *MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES*.**

3. When driveway access is not able to be maintained to a property, adequate, level pedestrian walkways shall be maintained to each affected property.

100.55 Removal and Abandonment of Manholes and Inlets

1. Any manholes and inlets that are abandoned or removed from service shall have the castings hauled to the City Garage. Broken and unbroken castings shall be kept separate and stockpiled neatly at the City Garage. Some inlet castings may have plates in place of the curb boxes. The plates shall be taken to the City Garage. All costs of hauling and placing castings at the City Garage shall be included in the cost of the Contract, with no extra monies will be paid for this work.

100.56 Manholes, Inlets, and Sewers to be Kept Clean

1. The CONTRACTOR is responsible to see that manholes, inlets, and sewer lines are free of dirt, gravel, and debris, from its operations, at all times. The CITY will charge the CONTRACTOR for the cleaning of any manholes, inlets, sewer lines, or inlet leads on this project, whether they require cleaning during construction or after. The CONTRACTOR shall be responsible for obtaining reimbursement or payment from any person it believes is responsible for the damage.

2. **UPON COMPLETION OF THE WORK, CLEAN OUT ALL MANHOLES, INLETS, AND PIPE ALONG THE ENTIRE PROJECT BEFORE LEAVING THE CONSTRUCTION SITE.**
   A. Manhole and inlet cleaning shall be conducted with a Vac-Truck or similar suction removal method to completely remove all debris, water, etc. so the structure can be properly inspected by the CITY during the final walk through.

100.57 Drives and Entrances

1. The layout of all drives and entrances as shown on the Plans should be checked and verified with the CITY, for their accuracy in the field, at the time of construction.

100.58 Concrete Pavement Curing Compounds

1. All concrete, including sidewalks and driveways, must be treated with a surface treatment of linseed oil.

2. Linseed oil must be sprayed in two (2) applications. The first application is to be a mixture of fifty percent (50%) boiled linseed oil and fifty percent (50%) mineral spirits applied at a rate of forty (40) square yards per gallon of mixture. The second application is to be a mixture of seventy-five percent (75%) linseed oil to twenty-five percent (25%) mineral spirits applied at a rate of seventy (70) square yards per gallon.

3. In lieu of the above linseed oil application, the CONTRACTOR may elect to use a linseed oil emulsion curing compound consisting of, by volume exclusive of the pigment, ±50% linseed oil and ±50% water. The CONTRACTOR shall ensure that the oil phase is, by weight, 80% boiled linseed oil and 20% high viscosity (Z-8) linseed oil. Modify **AASHTO M148** as follows:

   – waive the drying time requirement.

4. If the CONTRACTOR elects to use this material on a low traffic area, i.e. sidewalks, crosswalks, etc., the CITY reserves the right to re-inspect the work the following spring and may require any objectionable residue not worn off by traffic to be removed by power washing or other suitable means.

100.59 Asphalt Placed Before April 15th or After November 1st

1. No asphalt paving will be allowed when the air temperature, approximately three feet (3') above grade, in shade, and away from artificial heat sources, is **less than thirty six degrees Fahrenheit (36°F) for upper layers of asphalt, or thirty two degrees Fahrenheit (32°F) for lower layers of asphalt**.

2. No asphalt paving will be allowed before April 15th or after November 1st, except with written approval of the ENGINEER and an approved **Cold Weather Paving Plan**.

3. ENGINEER's approval, either at request or by order, does not relieve the CONTRACTOR of responsibility for the quality of hot-mixed asphalt pavement placed before April 15th or after November 1st. Final inspection and approval thereof will be deferred to the following May. The CONTRACTOR will be responsible for any deficiencies, as determined by the ENGINEER.

100.60 Property Irons

1 . There are property irons existing in various locations of this project. Most of these irons are located at lot corners, angle points, or at points of curvature in the right-of-way. The CONTRACTOR shall protect property irons from disturbance. A Professional Land Surveyor shall replace any property monuments that are bent, removed, or damaged during construction. This work shall be done at the cost of the CONTRACTOR for property monuments not approved by ENGINEER under **Section 1650** of the current edition of the *Standard Specifications for the City of Oshkosh, Wisconsin*.

100.61 Trench Backfill For Utility Work

1. Under paved areas that will be paved within thirty-six (36) months of utility completion:
   A. Trench backfill shall not commence until pipe has been properly bedded in accordance with the appropriate utility Specification Section.
   B. Material:
      1. ¾″ crushed stone or gravel meeting the requirements of ¾″ Dense Graded Base per **Section 305** of the STATE SPECIFICATIONS.
      2. Crushed concrete may be used provided it meets the requirements of **Section 301.2** of the STATE SPECIFICATIONS. Material shall be free of contaminants with the source approved by the ENGINEER if it is not produced by a Commercially Licensed Quarry.
      3. The CONTRACTOR may use material from the trench excavation provided that material meets the granular backfill requirements. If the CONTRACTOR decides to use the excavated material, they must supply a gradation analysis showing that it meets the minimum requirements of granular backfill.
      4. 1¼″ crushed stone or gravel meeting the requirements of 1¼″ Dense Graded Base per **Section 305** of the STATE SPECIFICATIONS may be used as trench backfill on this project. The installation will follow the requirements of **Section 100.61.1.C**.
   C. Installation:
      1. First lift: Two feet (2′).
      2. Subsequent Lifts: Ten inches (10″).
      3. Compaction:
         a. Vibratory Compactor.
         b. Ninety five percent (95%) Modified Proctor.

2. Under paved areas that will **NOT** be paved within thirty-six (36) months of utility completion (new subdivisions, for example):
   A. Trench backfill shall not commence until pipe has been properly bedded in accordance with the appropriate utility Specification Section.
   B. Material:
      1. Native materials.
   C. Installation:
      1. First lift: Two feet (2′).
      2. Subsequent Lifts: Twelve inches (12″).
      3. Compaction:
         a. Vibratory Compactor.
         b. Minimum of eighty percent (80%) Modified Proctor, maximum of ninety percent (90%) Modified Proctor.

3. Under areas to remain unpaved:
   A. Trench backfill shall not commence until pipe has been properly bedded in accordance with the appropriate utility Specification Section.
   B. Material:

1. CONTRACTOR to provide, or assist the CITY-selected testing agency with collecting, sufficient quantity and quality of laboratory test samples of the clay to be used for backfilling approximately one (1) week prior to placement.
2. Contains fifty percent (50%) or greater of fines (passing #200 sieve) or contains clay material approved by ENGINEER.
3. All material will be consistent in nature and will have all debris or dissimilar soils removed.
4. Contains no rocks which are larger than two inches (2″) in any direction.

C. Installation:
1. First lift: Maximum two feet (2′) of loose lift thickness.
2. Subsequent Lifts: Maximum twelve inches (12″) of loose lift thickness.
3. Place clay backfill to final elevations indicated on Plans.
4. Compaction:
   a. Vibratory and/or Sheepsfoot Compactor.
   b. Minimum of ninety percent (90%) Modified Proctor.
   c. Clay to be placed and compacted plus/minus four percent (+/-4%) of optimum moisture content as defined in **ASTM D-1557**, Modified Proctor.

4. In areas where the Plans call for clay bedding and backfill:

A. Clay backfill to be provided and installed by CONTRACTOR at the locations indicated on the Drawings.

B. Materials
1. CONTRACTOR to provide, or assist the CITY-selected testing agency with collecting, sufficient quantity and quality of laboratory test samples of the clay to be used for backfilling approximately one (1) week prior to placement.
2. Contains fifty percent (50%) or greater of fines (passing #200 sieve) or contains clay material approved by ENGINEER.
3. All material will be consistent in nature and will have all debris or dissimilar soils removed.
4. Contains no rocks which are larger than two inches (2″) in any direction.

C. Installation
1. First Lift: Maximum two feet (2′). Loose lift thickness.
2. Subsequent Lifts: Maximum twelve inches (12″). Loose lift thickness.
3. Place clay backfill to final elevations indicated on Plans.
4. Compaction:
   a. Vibratory and/or Sheepsfoot Compactor.
   b. Minimum of ninety percent (90%) modified Proctor.
   c. Clay to be placed and compacted plus/minus four percent (+/-4%) of optimum moisture content as defined in **ASTM D-1557**, Modified Proctor.

5. Around Manholes and Other Utility Appurtenances:

A. Special compaction methods shall be utilized insure proper compaction.

B. Backfilling shall simultaneously occur around all sides so that appurtenances do not suffer damage and remain plumb.

6. General:
   A. If using sheeting or shoring in excavation, the backfill must conform to the requirements above. The CONTRACTOR shall carefully draw, and remove all sheeting and braces in a manner that will not disturb the completed work. The CONTRACTOR shall carefully refill all openings left from the pulled sheeting with an ENGINEER-approved backfill material and compact.
   B. Do not walk or work on completed pipes, except as necessary to tamp or backfill, until the trench has been backfilled to at least two feet (2') above the top of the pipe.
   C. The CONTRACTOR shall backfill the trenches to the surface in a timely manner and haul away all surplus materials.
   D. Backfilling shall in every case be conducted in a manner which will insure that the pipes and appurtenances are not damaged in any way. To this end, backfilling materials shall be placed with a minimum drop. In case of breakage or disturbance to the sewer pipe or appurtenances, the CONTRACTOR will be required at their own expense to re-excavate, repair, and replace in-kind.
   E. The CONTRACTOR shall leave streets, sidewalks, and other places disturbed or affected by the excavation in, as near practicable, the same condition as they were prior to being disturbed; and must keep said streets, sidewalks, and places disturbed in good condition, satisfactory to the ENGINEER throughout the project. Trench disruptions located in the traveled way of public streets or sidewalks that remain open to through pedestrian or vehicular traffic shall be maintained with temporary asphalt or concrete pavement until permanent pavement is installed. If the CONTRACTOR does not patch these areas in a timely manner, the CITY will patch and bill the CONTRACTOR for the work.
   F. Debris, frozen material, large clods or stones, organic matter, or other unstable materials may not be used for backfill.

100.62 Surface Restoration for Utility Work

1. Concrete Streets:
   A. Pavement Section:
      1. Six inches (6") base aggregate dense.
      2. Match existing concrete thickness, with a minimum thickness of seven inches (7").
      3. Saw and seal all concrete pavement joints per **Section 900.2.10.1**.
   B. Materials:
      1. Crushed Aggregate Base Course: ¾" – 1 ¼" Base Aggregate Dense in accordance with **Section 305** of the STATE SPECIFICATIONS.
      2. Concrete Pavement:
         a. Type 1 Portland Cement, Grade A or
         b. Type 1 Portland Cement, Grade A2 with an approved water reducer.
      3. Curing Compound: Conform with **Section 415.2.4** of the STATE SPECIFICATIONS.
      4. Tie-Bars: Number 6 epoxy-coated deformed bar, twelve inches (12") in length.
      5. Dowel Bars: Install 1" and 1¼" epoxy-coated dowel bars, eighteen inches (18") in length.
   C. Installation:

1. Drill tie bars into existing concrete in accordance with details on **Sheet 13** of **Standard Details**.
2. Drill dowel bars into existing concrete in accordance with details on **Sheets 9, 10, 12,** and **13** of **Standard Details.**

2. Asphalt over Concrete Streets:
   A. Pavement Section:
      1. Five inches (5″) crushed aggregate base course.
      2. Match existing concrete thickness, with a minimum thickness of seven inches (7″).
      3. 2″ – 5″ of asphalt pavement.
   B. Materials:
      1. Crushed Aggregate Base Course: 1 ¼ ″ Dense Graded Base Course in accordance with **Section 305** of the STATE SPECIFICATIONS.
      2. Concrete Pavement:
         a. Type 1 Portland Cement, Grade A or
         b. Type 1 Portland Cement, Grade A2 with an approved water reducer.
      3. Curing Compound: Conform with **Section 415.2.4** of the STATE SPECIFICATIONS.
      4. Tie-Bars: Number 6 epoxy-coated deformed bar, twelve inches (12″) in length.
      5. Asphalt Pavement:
         a. Local Street: 5 LT 58-28 S.
         b. Collector Street: 4 LT 58-28 S.
         c. Arterial Street: 4 MT 58-28 S.
      6. Asphalt Emulsion Tack Coat: Emulsified asphalt CSS-1 or SS-1 conforming to the requirements of the STATE SPECIFICATIONS for Emulsified Asphalt **AASHTO M140**.
   C. Installation:
      1. Installation of concrete base and tie bars shall conform to Items 1 and 4 above.
      2. Apply tack coat:
         a. Rate: Approximately 0.07 gallons per square yard.
         b. Do not apply more than will be covered with asphalt pavement on same day.

3. Asphalt Streets:
   A. Pavement Section:
      1. Local Streets:
         a. Ten inches (10″) of 1¼″ base aggregate dense.
         b. 2¼″ lower course asphalt pavement.
         c. 1¾″ upper course asphalt pavement.
      2. Collector Streets:
         a. Ten inches (10″) of 1¼″ base aggregate dense.
         b. Three inches (3″) lower course asphalt pavement.
         c. Two inches (2″) upper course asphalt pavement.
      3. Arterial Streets:
         a. Ten inches (10″) of 1¼″ base aggregate dense.
         b. Three inches (3″) lower course asphalt pavement.
         c. Two inches (2″) upper course asphalt pavement.

B. Materials:
   1. Crushed Aggregate Base Course: ¾″ – 1 ¼″ Base Aggregate Dense in accordance with **Section 305** of the STATE SPECIFICATIONS.
   2. Lower Course Asphalt Pavement:
      a. Local Streets: 4 LT 58-28 S.
      b. Collector Streets: 3 LT 58-28 S.
      c. Arterial Streets: 3 MT 58-28 S.
   3. Upper Course Asphalt Pavement:
      a. Local Streets: 5 LT 58-28 S.
      b. Collector Streets: 4 LT 58-28 S.
      c. Arterial Streets: 4 MT 58-28 S.
   4. Asphalt Emulsion Tack Coat: Emulsified asphalt CSS-1 or SS-1 conforming to the requirements of the STATE SPECIFICATIONS for Emulsified Asphalt AASHTO M140.

4. Cold-Mix Streets:
   A. Comply with above for Asphalt Streets.

5. Terrace or Parkway:
   A. Install six inches (6″) of topsoil, roll, and rake.
   B. Furnish Seed Mixture Number 40 in accordance with **Section 630** of the STATE SPECIFICATIONS.
   C. Install Seed Mixture at rate of four pounds (4 lbs.) per one thousand (1,000) square feet.
   D. Furnish and install fertilizer in accordance with **Section 629** of the STATE SPECIFICATIONS.
   E. Furnish and install Class I, Urban, Type A Erosion Mat over disturbed area.
      1. Trench edges of mat in accordance with manufacturer's recommendation.
      2. Utilize approved anchoring devices for Urban Mat.
   F. Should settlement occur within a two (2) year timeframe after completion of the work, the CONTRACTOR shall fill settled areas with topsoil, and re-apply seed as noted above.

100.63 Terrace Trees

1. Terrace trees must be preserved. Roots shall be cut by the CONTRACTOR using a root pruner to allow for paving, excavation, or sidewalk construction. The CONTRACTOR, as directed by the City Forester or the ENGINEER, will do all branch cutting or root pruning.

2. When tree roots are encountered, the following provisions shall apply:
   A. Sidewalk Construction:
      1. The root system on the walk side of the tree shall be cut not deeper than **nine inches (9″)** below the finished grade of the new walks, and not more than **five inches (5″)** from the edge of the new walk. Roots in the walk area shall be removed only to a depth of **nine inches (9″)** below the finished grade of the new walk.

2. All old sidewalks should be removed prior to any root cutting where sidewalks are to be narrowed. If necessary, the root system should be cut within **one-quarter inch (¼")** of the edge of the proposed new walk and no more than **nine inches (9")** below the finished grade of the new walk.
3. Sidewalks are to be removed, and roots cut, by use of **hand implements** only.

B. Carriage Walk Construction:
1. When constructing or replacing carriage walks, **root shall not be cut by means of mechanical root cutting machines**. If root removal is essential to carriage walk replacement, **roots shall be manually cut with hand implements**. Roots shall be removed no deeper than **nine inches (9")** below the finished grade of the new carriage walk.
2. Move the carriage walk to a position that does not interfere with the street tree, or eliminate the carriage walk.

C. Curb, Gutter, and Road Construction:
1. The root system on the curbside shall be cut no more **than two inches (2")** behind the back edge of the new curb and not more than **eighteen inches (18")** in depth when constructing the new curb and gutter.
2. When constructing or replacing driveways or driveway approaches, **roots shall not be cut by means of mechanical root cutting machines**. If root removal is essential to driveway replacement, **roots shall be manually cut with hand implements**. The driveway approach flares will need to be adjusted in order to save the trees.
3. Exposed tree roots shall be covered with mulch and watered from a period immediately following curb and gutter removal until the area is backfilled following construction.

D. General Requirements:
1. All cutting for the removal of sod and soil in order to establish a finished grade within four (4') feet of existing trees must be done manually, if necessary.
2. No construction equipment, cars, trucks, or materials shall be parked or stored on any median or tree border on this project or adjacent roadways.
3. Root foundations must remain adequate to withstand heavy windstorms.
4. Root systems of street trees **shall not be cut** for the installation of any type of cable by the CONTRACTOR. Contact the **Forestry Division at (920)232-5314** for directional boring specifications.

3. Caution should be used during the construction process to avoid damage to the roots, trunks, and branches of all street trees. Damage caused to any street tree or irrigation system will be repaired by the Forestry Division and the costs of repair, rejuvenation, and/or value lost will be billed to the CONTRACTOR or credited against the Contract at the option of the CITY.

4. All costs related to root pruning shall be incidental to the excavation Bid Item as no other payment for pruning shall be allowed.

100.64 Mailboxes

1. Rural type mailboxes may exist along streets included in this Contract. The CONTRACTOR will be responsible so as not to damage said mailboxes during construction. The CONTRACTOR will also be responsible for removing and resetting each mailbox immediately behind the curb and to a height of forty-one to forty-five inches (41″ to 45″) above the flow line and such that the face of the mailbox is set six to eight inches (6″ to 8″) behind the face of the curb. The CONTRACTOR must reset the mailboxes within three (3) weeks of initial concrete placing operations on that particular street.

100.65 City Street Signs and Painting

1. The CONTRACTOR must give the Maintenance Supervisor (232-5348 or 232-5351) twenty four (24) hours notice to remove any city street signs. **All signs are to be removed by the CITY unless written permission is obtained from the Maintenance Supervisor.** The CONTRACTOR will be liable for any signs he removes. Also, the Maintenance Supervisor should be notified at the earliest possible time to replace any necessary signs and perform any necessary painting before a particular street is open to through traffic.

100.66 Excavated Material

1. All excess excavated material from this Contract shall be the property of the CONTRACTOR, and must be disposed of by the CONTRACTOR at no cost to the CITY.

100.67 Confined Space Entry Policy

1. Note that the City of Oshkosh maintains a Confined Space Entry Policy for its employees. CONTRACTOR is responsible for developing and enforcing their own policies. City employees will not enter trenches or excavated areas that do not meet the requirements of **OSHA 29 CFR Part 1926, Subpart P, Excavations and Trenches**.

100.68 Backfill Around Private Utilities

1. Care shall be taken when backfilling around private utilities. The CONTRACTOR shall coordinate closely with all impacted private utility companies to insure proper backfill occurs around the utility. This is considered incidental to the Contract.

100.69 Excavation and Backfilling for Cast-In-Place Reinforced Concrete Structures

100.69.1 Materials

1. Structural Fill:

A. Gravels and gravel-sand mixtures, sands and gravelly sands, or other approved granular material, of two-inch (2") maximum size, free from organic and deleterious materials. Classified as GW, GP, SW, or SP in Unified Soil Classification System.
B. Plasticity Index: **ASTM D-4318**, 6 or less.
C. Maximum Fines: **ASTM D-422**, 10% passing No. 200 sieve.
D. Uniformity Coefficient: 5 or greater.

2. Earth Fill:
   A. Subsoil or sand, free of wood, peat, cinders, organic and deleterious matter, or other rubbish.

100.69.2 Filter Fabric

1. Porous non-woven fabric with multiple layers of randomly arranged fibers, weighing not less than 4.0 oz./sq. yd. (typical). Mirfafi 140NL by Ten Cate Nicolon or Approved Equal.

100.69.3 Sheeting, Shoring, and Bracing

1. Type, design, detail, and installation of shoring, sheeting, and bracing shall be determined by and sole responsibility of the CONTRACTOR.

2. Sheeting, shoring, and bracing shall be designed by a Professional Engineer registered in the State of Wisconsin. It shall conform to safety requirements of federal, state, or local public agency having jurisdiction over such matters. The most stringent of these requirements shall apply.

3. Whenever necessary to prevent caving during excavation and to protect adjacent structures, property, workers, and public, excavations shall be sheeted, shored, and braced. When sheeting, shoring, and bracing is required, drive/install to prevent soil from entering excavation below or through sheeting. The CONTRACTOR shall keep sheeting in place until structure is placed, tested, and backfilled. The CONTRACTOR shall remove sheeting, shoring, and bracing in manner not damaging structure or permitting voids within backfill. The CONTRACTOR shall fill settled areas that remain after sheeting has been pulled with sand or other approved material.

100.69.4 Fill Usage

1. Structural: Within influence zone of footings and foundation slabs.

2. Earth: Other areas not previously specified.

3. Surface Preparation:

A. The CONTRACTOR shall fill settled areas where excavations or trenches were backfilled and holes made by demolition, tree removal, and site preparation work. The CONTRACTOR shall remove and replace or re-compact natural soils or compacted fill softened by frost, flooding, groundwater, or weather. The CONTRACTOR shall remove frozen soils within influence zone and replace with structural fill.

100.69.5 Excavation

1. The CONTRACTOR shall excavate to elevations and dimensions necessary to complete construction. Method of excavation shall be consistent with soil types encountered and result in undisturbed foundation sub-grade. Loosened soils shall be re-compacted or removed and replaced with fill material meeting these Specifications. The CONTRACTOR shall remove unsuitable material within influence zone of footings and foundations. The CONTRACTOR shall protect excavated areas from freezing.

100.69.6 Placing Fill

1. The CONTRACTOR shall notify the CITY before placing fill material. Do not use frozen material or place fill on frozen subgrade. The CONTRACTOR shall place filter fabric where shown on Drawings in accordance with manufacturer's recommendations. The CONTRACTOR shall fill excavations below bottom of foundation or footing elevations within influence zone with concrete or structural fill. Do not backfill until new concrete is properly cured and required tests accepted. Do not operate power-operated earth moving or backfill equipment closer to foundation walls or other structures than distance equal to one-half (½) height of backfill above top of footing. The CONTRACTOR shall place fill simultaneously on all sides of free-standing structures. The CONTRACTOR shall place fill against foundation walls enclosing interior spaces after construction such as cross-walls or slabs are in place to brace wall and such construction has reached its design strength. The CONTRACTOR shall begin compaction of each layer at structure wall to minimize lateral forces against structure due to wedging action of soil. The CONTRACTOR shall stop backfill at specified or indicated grade to allow for placing of topsoil when required.

2. Lift Thickness and Compaction: The CONTRACTOR shall place and compact fill materials in maximum lift thickness and to minimum densities listed.
   A. Footing or Foundation Slab Influence Zone:
      1. Eight inches (8″) Loose Lift Thickness, ninety five percent (95%) Modified Proctor.
   B. General Areas
      1. Twelve inches (12″) Loose Lift Thickness, eighty percent (80%) Modified Proctor.

100.69.7 Adjustment and Cleaning

1. Excess Material: The CITY has first right to excess excavated material suitable for backfilling or site grading, not required at job site. The CONTRACTOR shall deliver to site not greater than ten (10) miles away as determined by the CITY. The CONTRACTOR shall remove material not required by the CITY from site.

100.70 Cast-In-Place Reinforced Concrete Structures

100.70.1 Quality Assurance

1. Plant Certification:
   A. Plant or concrete supplier shall comply with requirements of National Ready Mixed Concrete Association (NRMCA) certification plan as regards material storage and handling, batching equipment, central mixer, truck mixers with counters, agitators, non-agitating units, and ticketing system.

2. Tolerances:
   A. Conform to requirements of **ACI 117**.

100.70.2 Project Site Conditions

1. Hot Weather:
   A. The CONTRACTOR shall comply with **ACI 305.1**. Concrete temperature shall not exceed ninety degrees Fahrenheit (90°F) at placement. At air temperatures of eighty degrees Fahrenheit (80°F) or above, the CONTRACTOR shall keep concrete as cool as possible during placement and curing. Fog spray forms, steel reinforcement, and subgrade just before placing concrete. When concrete temperatures exceed eighty degrees Fahrenheit (80°F), water-reducing, set-retarding admixtures shall be used in accordance with manufacturer's recommendations.

2. Cold Weather:
   A. The CONTRACTOR shall comply with **ACI 306.1**. Temperature of reinforcement, forms, fillers, and other materials in contact with concrete at time of placement shall not be less than thirty five degrees Fahrenheit (35°F). The CONTRACTOR shall preheat if temperature is below thirty five degrees Fahrenheit (35°F). The CONTRACTOR shall maintain air and forms in contact with concrete sections having minimum dimension less than twelve inches (12") at temperature above fifty degrees Fahrenheit (50°F) for at least first three (3) days and at temperature above thirty two degrees Fahrenheit (32°F) for remainder of specified curing period. The CONTRACTOR shall maintain air and forms in contact with concrete in more massive sections at temperature above forty degrees Fahrenheit (40°F) for at least first three (3) days and at temperature above thirty degrees Fahrenheit (32°F) for remainder of specified curing period.

100.70.3 Materials

1. Portland Cement:
   A. **ASTM C-150**, Type I or II except Tricalcium Aluminate (C3A) content of Type I shall not exceed eight percent (8%). If this type of Type I is not available, Type I with C3A content less than twelve percent (12%) shall be used in combination with fly ash or Ground Granulated Blast Furnace (GGBF) slag. When aggregates are determined to be deleteriously reactive, as defined by **Appendix XI** of **ASTM C-33**, alkali content of cement defined by **Table 1A** of **ASTM C-150** shall not exceed 0.60%.

2. Fly Ash:
   A. **ASTM C-618**, Class C or F, including requirements of **Table 1A**.

3. Ground Granulated Blast Furnace Slag:
   A. **ASTM C-989**, slag activity classification: Grade 100.

4. Aggregates:
   A. **ASTM C-33**, free of foreign materials. Potential reactivity of aggregates shall be determined in accordance with **Appendix XI** of **ASTM C-33**.
      1. Fine Aggregate:
         a. Natural sand.
      2. Coarse Aggregate:
         a. Crushed gravel; crushed stone; or gravel Size 467 (1½ inches maximum), Size 67 (¾ inches maximum), Size 8 (3/8 inches maximum).

5. Admixtures for Concrete:
   A. Air-Entraining: **ASTM C-260**.
   B. Chemical Admixtures: **ASTM C-494**, non-corrosive and chloride free.
      1. Water Reducing: Type A.
      2. Retarding: Type B.
      3. Water Reducing and Retarding: Type D.

6. Water:
   A. Potable.

7. Steel Reinforcing Bars:
   A. Deformed bars conforming to **ASTM A-615**, grade 60.

8. Membrane Forming Curing Compound:
   A. **ASTM C-309**, and compatible with scheduled finishes and coatings. Masterseal by BASF Admixtures, Inc.; Dress and Seal WB by L&M Construction Chemicals, Inc.; or Approved Equal.

9. Patterned Concrete Form Liner:

A. Pattern as designated in Specifications or on Plans.
B. Color as designated in Specifications or on Plans.
C. The CITY to approve color scheme prior to placement.

10. Finishing Grout:
    A. Thoroseal with Acryl 60 by Thoro, DRYLOK Powdered Waterproofer with DRYLOK Latex Bonding Agent, or Approved Equal.

11. Cement Grout:
    A. Mixture of cement and fine sand in proportions.

12. Evaporation Retardant:
    A. E-CON by L&M Construction Chemicals, Inc.; SikaFilm by Sika Corporation; or Approved Equal.

13. Fiber Reinforcement:
    A. **ASTM C-1116** Type III, ½" to ¾" collated fibrillated virgin polypropylene fibers. Fibermesh Company, W.R. Grace & Company, or Approved Equal.

14. Patching Mortar:
    A. Polymer modified cementitious system consisting of two (2) components.
        1. Component A: Liquid polymer emulsion of acrylic copolymerbase and additives.
        2. Component B: Blend of selected Portland cements, specially graded aggregates, organic accelerator, and admixtures for controlling setting time, water reducers for workability, and corrosion inhibitor.
        3. System shall not contain chlorides, nitrates, added gypsum, added lime or high alumina cements.
        4. System shall be noncombustible, before or after cure.
        5. Color: Concrete gray.
        6. Minimum Compressive Strength: 5,000 psi.
        7. Bond Strength: 100% concrete substrate failure (pull off method), minimum 400 psi.
        8. System shall not produce vapor barrier, shall be thermally compatible with concrete, and freeze-thaw resistant.
        9. Sikatop by Sika Corporation, Duratop by L&M Construction Chemicals, or Approved Equal.

15. Waterstops:
    A. Virgin polyvinyl chloride (PVC) waterstop conforming to CRD C572, dumbbell or serrated type, six inches (6") wide by 3/8 inches thick at center.

100.70.4 Concrete Mix Design

1. Concrete Mix:
   A. Measure and combine cement, aggregates, water, and admixtures in accordance with **ASTM C-94** and **ACI 211.1**.
2. Cement:
   A. When used in exposed concrete shall be one brand from one (1) source. Do not mix different cements in same element or portion of work.

3. Nominal maximum size of coarse aggregate shall not exceed ¾ of minimum clear spacing between reinforcing bars, 1/5 of narrowest dimension between sides of forms, or 1/3 of thickness of slab.

4. Air-Entrainment:
   A. Air-entrain all concrete.

5. Chemical Admixtures:
   A. Use is optional to aid concrete properties and allow for efficient placement. Manner of use and amount shall be in accordance with manufacturer's written recommendations and as approved by ENGINEER. Do not use admixtures which increase shrinkage or negatively affect finishing.

6. Fly Ash:
   A. Use is optional unless otherwise noted. Combine fly ash with cement at rate of 1.0 lb. fly ash/lb. reduction in cement. Amount of fly ash shall not be less than fifteen percent (15%) or more than twenty-five percent (25%) of weight of cement plus fly ash. When fly ash is used, minimum amount of cement given in **Section 100.70.4.1** and **Section 100.70.4.2** of these Specifications may be proportionately reduced. Water to cementitious ratio shall not exceed water to cement ratio given in **Section 100.70.4.1** and **Section 100.70.4.2** of these Specifications.

7. Ground Granulated Blast-Furnace Slag (GGBF Slag):
   A. Use is optional unless otherwise noted. Combine GGBF slag with cement at rate of 1.0 lb. GGBF slag /lb. reduction in cement. Amount of GGBF slag shall not be less than twenty-five percent (25%) or more than fifty percent (50%) of weight of cementitious material. When GGBF slag is used, minimum amount of cement given in **Section 100.70.4.1** and **Section 100.70.4.2** of these Specifications may be proportionately reduced. Water to cementitious ratio shall not exceed water to cement ratio given in **Section 100.70.4.1** and **Section 100.70.4.2** of these Specifications.

8. Fly Ash and GGBF Slag Mix Ternary Systems:
   A. Use is optional unless otherwise noted. Combinations of Portland cement, GGBF slag, and fly ash will be allowed. Minimum amount of Portland cement shall be 337 lb./cu. yd. of concrete. Total replacement of cement with fly ash and GGBF slag shall not exceed fifty

percent (50%). Total replacement of cement with fly ash shall not exceed twenty-five percent (25%). Water to cementitious ratio shall not exceed water to cement ratio given in **Section 100.70.4.1** and **Section 100.70.4.2** of these Specifications.

9. Use no admixtures other than as specified, unless approved by ENGINEER.

100.70.4.1 Class A Concrete

1. Minimum Cement Content: 564 lbs/cu. yd.

2. Minimum 28-Day Strength: 4,500 psi.

3. Air Content: 6%, +1.5%.

4. Slump: four inches (4") maximum.
   A. When mid range water reducer used: 5.5 inches maximum.
   B. When high range water reducer used: 10 inches maximum.

5. Water/Cement Ratio: 0.42 maximum.

100.70.4.2 Class B Concrete

1. Minimum Cement Content: 446 lbs./cu. yd.
2. Minimum 28-Day Strength: 3,000 psi.

3. Air Content: 6%, +1.5%.

4. Slump: four inches (4") maximum.
   A. When mid range water reducer used: 5.5 inches maximum.
   B. When high range water reducer used: 10 inches maximum.

5. Class B concrete shall be fiber reinforced.
   A. Dosage Rate:
      1. 1½ lbs./cu. yd. minimum. The CONTRACTOR shall comply with manufacturer's recommendations and as specified in **ASTM C-94**.

100.70.4.3 Concrete Usage

1. Class A: Locations except where Class B specified.

2. Class B: Concrete benches and where noted.

100.70.5 Mixing and Delivery

1. The CONTRACTOR shall use ready-mixed concrete.

2. The CONTRACTOR shall deliver and complete discharge within one and one-half (1½) hours of commencing of mixing or before three hundred (300) revolutions of drum or blades, whichever comes first. Includes revolutions required by transit mix trucks. Limitations may be waived by ENGINEER if, after one and one-half (1½) hours or three hundred (300) revolution limit reached, concrete can be placed without addition of water. In hot weather, time or number of revolutions criteria may be reduced by ENGINEER.

3. Do not add water on site unless slump and water-cement ratio, after addition of water, are below maximum allowed. If water added, mix concrete at site additional thirty (30) revolutions of drum.

4. The CONTRACTOR shall deliver concrete to site having temperature not less than fifty degrees Fahrenheit (50°F) or greater than ninety degrees Fahrenheit (90°F).

5. If high range water-reducing admixture added on site, mix concrete at site additional eighty five (85) revolutions of drum after addition of high range water-reducing admixture.

100.70.6 Reinforcement Placement

1. Placement of reinforcing steel shall be approved by ENGINEER before covered with concrete.

2. Correct displacement of reinforcement prior to and during concrete pouring operations. The CONTRACTOR shall maintain clear cover as noted on Drawings. Tolerances shall be in accordance with **ACI 117** and **ACI 318**, unless noted otherwise.

3. The CONTRACTOR shall support reinforcing steel in accordance with CRSI "Placing Reinforcing Bars," with maximum spacing of four feet zero inches (4′0″).

4. The CONTRACTOR shall tie reinforcing steel at intersections in accordance with CRSI "Placing Reinforcing Bars."
   A. Maximum Tie Spacing for Footings and Walls: Every third intersection or three feet zero inches (3′0″).
   B. Maximum spacing for Slabs and Other Work: Every fourth intersection or three feet zero inches (3′0″).
   C. Tie each dowel in-place.

5. The CONTRACTOR shall locate reinforcing to avoid interference with items drilled in later, such as concrete anchors.

6. Reinforcement shall be continuous through construction joints.

7. Reinforcement may be spliced at construction joints, provided the entire lap is placed within only one (1) concrete pour.

8. The CONTRACTOR shall use concrete brick for supporting bottom mat reinforcing on grade. The CONTRACTOR shall use bolsters or chairs supported on concrete brick or tied to bottom mat for supporting upper reinforcing mat on grade. The CONTRACTOR shall use bolsters or chairs for supporting reinforcing on mud slabs and forming.

9. Do not field bend bars, including bars partially embedded in concrete unless indicated or approved by the CITY.

10. Do not place bars having kinks and bends other than approved by the CITY.

11. Welding of reinforcing bars is not permitted.

12. Reinforcement shall be clean and free from loose mill scale, dirt, grease, oil, form release agent, dried concrete, or any material reducing bond with concrete.

100.70.7 Forms

1. Formwork design, detailing, and installation shall be the CONTRACTOR's responsibility and shall conform to requirements of **ACI 347R**.

2. Materials and Construction: Type of forms used is the CONTRACTOR's option, except as otherwise indicated below or on Drawings. Plywood and other wood surfaces shall have smooth, level surfaces treated with form oil or sealer to produce clean release of concrete from forms.
   A. Where walls remain exposed, use plywood, prefabricated metal, or wood forms. Do not use boards.
   B. The CONTRACTOR shall use bolts, rods, or other approved devices for form ties.
   C. Plastic cone snap ties are approved as form ties. Do not use wire ties on exposed concrete.
   D. Ties shall be removed minimum of one inch (1") from formed surface. Removal of ties shall leave holes clean cut and without appreciable spalling at face of concrete. The CONTRACTOR shall provide plastic cone or other approved device.
   E. The CONTRACTOR shall provide ¾ inches chamfer on external corners of exposed concrete walls and exposed edges of construction joints.
   F. The CONTRACTOR shall provide openings at base of vertical forms as access for cleaning and inspection of forms and reinforcing prior to depositing concrete.

3. Treat or Wet Contact Forms: The CONTRACTOR shall coat plywood and wood moldings with non-staining form release agent. The CONTRACTOR shall apply release agent before reinforcement is placed.

4. Repairing and Cleaning: The CONTRACTOR shall clean, patch, and repair form material before reusing.

5. Workmanship:
   A. Formwork shall prevent leakage of mortar, shall not deflect under weight of concrete and workmen, and shall withstand fluid pressures of concrete.
   B. Removal of wall ties shall leave holes clean cut and without appreciable spalling at face of concrete.

100.70.8 Subgrade Preparation

1. Subgrade and bedding shall be compacted and free of frost. If placement allowed at temperatures below freezing, the CONTRACTOR shall provide temporary heat and protection to remove frost. Do not place concrete on frozen material.

2. The CONTRACTOR shall provide mud slabs where noted, where necessary, and when required to obtain dry and stable working platform for placement of slabs on grade. Mud slabs shall be two inches (2") thick minimum.

3. The CONTRACTOR shall remove standing water, ice, mud, and foreign matter before concrete deposited.

100.70.9 Placing Concrete

1. Notify the CITY twenty-four (24) hours in advance of placing operation.

2. Concrete will not be allowed to drop freely where reinforcing will cause segregation of mix.
   A. Superplasticized Concrete: T e n foot (10') maximum drop.
   B. Other Concrete: F i v e foot (5') maximum drop.

3. If pumping is used, do not use aluminum piping for delivery system.

4. When placing of concrete is temporarily halted or delayed, the CONTRACTOR shall provide construction joints as shown on Drawings and as specified.

5. The CONTRACTOR shall place in lifts not exceeding twenty-four inches (24") and compact with internal mechanical vibrator equipment.

6. The CONTRACTOR shall insert vibrator so area visibly affected by vibrator overlaps adjacent just-vibrated area by few inches.
   A. Slabs: The CONTRACTOR shall insert vibrators for full depth of slab.
   B. Walls: The CONTRACTOR shall insert vibrators along each face (i.e., just behind reinforcing) and allow vibrator to sink into previous lifts as deep as will easily penetrate. Do not spread concrete laterally with vibrators.

7. If while in process of pouring wall, pour is stopped unexpectedly, leave surface of joint level but rough. Roughened surface shall have amplitude of one-quarter inches (¼″) minimum.

8. Avoid damage to reinforcing, and ensure accurate positioning after concrete placed.

9. The CONTRACTOR shall place concrete with aid of internal mechanical vibrator equipment capable of seven thousand (7,000) impulses/min. The CONTRACTOR shall transmit vibration directly to concrete. Duration of vibration at any location shall be necessary to produce thorough consolidation and to cause maximum amount of air bubbles to migrate to top of pour.

10. Joints:
    A. The CONTRACTOR shall limit size of concrete pours. Maximum length of wall and slab pours shall not exceed fifty feet (50′), unless previously approved by the CITY.
    B. Before concrete placed, construction joints shall be cleaned and laitance removed and surface wetted. The CONTRACTOR shall remove standing water.
    C. Construction joints shall have roughened surfaces. Surface shall have amplitude of one-quarter inches (¼″) minimum.

100.70.10 Waterstops

1. The CONTRACTOR shall provide waterstop in construction joints as shown on Drawings.

2. Installation:
    A. The CONTRACTOR shall secure waterstop utilizing hog rings or grommets spaced maximum twelve inches (12″) on center and within one inch (1″) of edge. The CONTRACTOR shall wire tie to adjacent reinforcements.
    B. The CONTRACTOR shall splice joints in waterstop to form continuous watertight diaphragm. The CONTRACTOR shall splice in accordance with manufacturer's recommendations.

100.70.11 Embedded Items

1. The CONTRACTOR shall cast pipe and other embedded items into concrete as placement progresses. Do not provide blockouts.

2. The CONTRACTOR shall place items constructed of dissimilar metals to avoid physical contact with reinforcing. The CONTRACTOR shall secure item and reinforcing to ensure they will not shift and come into contact during pouring. Contact between reinforcing and other metal, other than bare, coated, or plated carbon steel not permitted.

3. The CONTRACTOR shall support wall pipes from formwork to prevent contact with reinforcing.

100.70.12 Repair of Surface Defects

1. General: Prior to starting repair work, except as specified otherwise, the CONTRACTOR shall obtain the CITY's approval of proposed repair techniques and mixes. The CONTRACTOR shall develop patching techniques and mixes on portion of as-cast surface selected by the CITY for this purpose. The CONTRACTOR shall dress surface of patches remaining exposed to view to match color and texture of adjacent surfaces.

2. Tie Holes: The CONTRACTOR shall fill tie holes, except where sealant is indicated, with patching mortar, as specified. The CONTRACTOR shall apply and cure patching mortar in accordance with manufacturer's written recommendations.

3. Defective Areas: The CONTRACTOR shall remove honeycombing, stone pockets, spalls, and other defective concrete down to sound concrete. If chipping required, make edges perpendicular to surface. Do not feather edges. The CONTRACTOR shall fill defective area with patching mortar, as specified. The CONTRACTOR shall apply and cure patching mortar in accordance with manufacturer's written recommendations.

100.70.13 Finishing Slabs and Flatwork

1. Slab Finishes:
   A. Slab surfaces to receive grout: Float.
   B. Submerged and Buried Slabs: Float.
   C. Exterior exposed slabs: Float and Broom Finish.
   D. Top of Retaining Walls: Float.

2. After placement, the CONTRACTOR shall screed concrete with straightedges, power strike-offs, or vibrating screeds.

3. After screeding, bull float or darby surface to eliminate ridges and to fill in voids left by screeding.

4. Float:
   A. The CONTRACTOR shall use magnesium or aluminum hand floats or power floats with slip on float shoes after concrete has stiffened to point where one-quarter inch (¼") maximum indentation can be imparted by normal foot pressure. Do not use combination blades for floating. Float finish shall result in uniform smooth granular texture. After floating, the CONTRACTOR shall check slab tolerances with ten-foot (10') straightedge. The CONTRACTOR shall fill low spots with fresh concrete. Do not sprinkle with dry cement or add water.

5. Broom Finish:
   A. The CONTRACTOR shall use fine, soft-bristled broom and broom at right angles to direction of traffic to give nonskid finish. Texture shall be approved by the CITY.

100.70.14 Finishing Formed Concrete

1. Ordinary Finish:
   A. Finish resulting directly from formwork for surfaces which will be hidden from view by earth, submergence in water or wastewater, or subsequent construction.
   B. The CONTRACTOR shall patch honeycombing, stone pockets, form ties, spalls, and other irregularities as specified in this section. Where joint marks or fins on submerged surfaces exceed one-quarter inches (¼"), the CONTRACTOR shall grind smooth.

2. Smooth Finish:
   A. Interior concrete surfaces permanently exposed to view.
   B. After removal of forms, the CONTRACTOR shall patch or point up defects as described for ordinary finish. The CONTRACTOR shall grind joint marks and fins smooth with adjacent surface. The CONTRACTOR shall remove oil stains and rinse surface. After grinding and cleaning, the CONTRACTOR shall dampen concrete and paint entire surface with Cement Grout. Work Cement Grout into surface with cork or other suitable float. When grout has set to where it will not be pulled out of holes or depressions, the CONTRACTOR shall brush off surface with dry burlap or carpet.

3. Rubbed Finish:
   A. Exterior cast-in-place concrete surfaces permanently exposed to view extending to six inches (6") below finish grade unless otherwise and where indicated on Drawings.
   B. After removal of forms, the CONTRACTOR shall patch or point up defects as described for ordinary finish. The CONTRACTOR shall remove joint marks, fins, and stains as described for smooth finish. The CONTRACTOR shall apply heavy coat of Finishing Grout. After first coat has set, apply second coat. When second coat has set, float to uniform texture. Follow manufacturer's written instructions for finishing concrete. Finish color shall be gray to match form liner color pattern.

100.70.15 Protection and Curing

1. The CONTRACTOR shall protect concrete from frost and keep moist for minimum curing period of seven (7) days after placing in accordance with **ACI 308**.

2. Formed Surfaces:
   A. The CONTRACTOR shall wet cure by spraying surfaces during curing period as frequently as drying conditions may require to keep concrete surfaces moist. Walls may be cured by leaving forms in place. For vertical surfaces, apply water to run down on inside of forms, if necessary, to keep concrete wet. After forms are removed, wet cure for remainder of curing period or apply curing compound. Do not use curing compound where epoxy, urethane, mortar bed, grout, additional concrete, or other coatings or adhesives will be applied.

3. Concrete Flatwork:

A. The CONTRACTOR shall start curing activities as soon as free water has disappeared from surface of concrete after placing and finishing. Cure flatwork using liquid curing compound or wet cure. Do not use curing compound where epoxy, urethane, mortar bed, grout, additional concrete, or other coatings or adhesives will be applied.

4. Curing Compound:
   A. The CONTRACTOR shall apply curing compound at uniform rate sufficient to comply with requirements for water retention as specified and as measured in accordance with **ASTM C-156**. The CONTRACTOR shall cover areas subjected to direct sunlight during curing period with ambient temperature expected to exceed eighty degrees Fahrenheit (80°F) with white pigmented compound; others may be covered with fugitive dye compound.

5. The CONTRACTOR shall protect from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration.

6. The CONTRACTOR shall protect finished concrete surfaces from damage caused by construction equipment, materials or methods, and rain or running water.

7. Do not load self-supporting structures to overstress concrete.

100.70.16 Removal of Forming and Shoring

1. Do not remove forming or shoring until member supported has acquired sufficient strength to safely support own weight and any imposed loads. Forming shall remain in place for at least minimal time recommended by **ACI 347**. In addition, forming for horizontal members, such as elevated slabs and beams, shall remain in place minimum of seven (7) days. In no case shall forming for horizontal members be removed before concrete has reached at least seventy percent (70%) of its specified design strength.

2. The CONTRACTOR shall re-shore areas as required to carry additional imposed loads.

3. The CONTRACTOR shall repair damage to structure caused by early removal of forming and shoring at no additional cost to the CITY.

100.71 Utility Locates

1. If the CONTRACTOR, subcontractor, or any other entity calls in a Diggers Hotline relocate ticket within the project limits, it is the responsibility of the CONTRACTOR to locate all City-owned utilities until the project is complete

2. The CITY will notify CONTRACTOR in writing upon receipt of locate ticket from Diggers Hotline. Prior to project commencement, CONTRACTOR to provide contact information.

100.72 Buy American

1. All steel and iron materials permanently incorporated in this project shall be domestic products and all manufacturing and coating processes for these materials must have occurred within the United States. Coating includes epoxy coating, galvanizing, painting, and any other coating that protects or enhances the value of a material subject to the requirements of Buy America. The exemption of this requirement is the minimal use of foreign materials if the total cost of such material permanently incorporated in the product does not exceed one-tenth of one percent (1/10 of 1%) of the total contract cost or Two Thousand Five Hundred Dollars ($2,500), whichever is greater. For purposes of this paragraph, the cost is that shown to be the value of the subject products as they are delivered to the project.

100.73 Notice to Proceed

1. The Notice to Proceed is a short document, but it should contain some specific information. It should be addressed directly to the CONTRACTOR and reference the specific project, or a portion of the project, for which most of the work is to be accomplished. Most importantly, it shall include the date work is authorized to commence and the number of days allowed or date of substantial completion, all followed by the signature of the CITY.

2. This form will be sent to the CONTRACTOR from the CITY. A sample *Notice to Proceed* form is enclosed at the end of **Section 100**.

100.74 Substantial Completion

1. The Notice of Substantial Completion is a short document, but it should contain some specific information. It should be addressed directly to the CONTRACTOR and reference the specific project, or a portion of the project, for which most of the work is completed. Most importantly, it shall include the date the work is sufficiently complete to permit the CITY to use the project for its intended purpose. The CITY takes partial or full responsibility for the project, and the two (2) year correction period begins. Therefore, the date is important to both the CITY and the CONTRACTOR. On most projects, there is a single date of substantial completion when the CITY takes possession of and occupies the project. On large and complex projects, there may be different dates of substantial completion for separate parts of the project.

2. This form will be sent to the CONTRACTOR from the CITY. A sample *Substantial Completion* form is enclosed at the end of **Section 100**.

100.75 Punch Lists

1. The Punch List is a document that consists of a list of deficiencies noticed by the CITY during the course of construction. Long Punch Lists are time consuming and costly to prepare, review, and complete. It is to everyone's advantage the list be as short as possible. Deficiencies noted by the CITY during the course of construction should be corrected by the CONTRACTOR in a

timely manner. They should not be allowed to accumulate until the end of the project. The CITY should use the same standards used during the construction process to evaluate the completed project. The following procedure is the schedule for correcting Punch List items:

2026 PROCEDURE FOR CONTRACT CLOSEOUT

For all Contracts let in 2026 which are single year contracts:

If Contracts are completed by September 1, 2026, a **Final Punch List** will be created and all Punch List items must be completed by November 1, 2026.

If Contracts are completed between September 2, 2026 and December 31, 2026, the CITY will do a walk-through in April of 2027 and a **Final Punch List** will be created. All items on the Final Punch List must be corrected by June 30, 2027 or the CITY will hire a Contractor of their choice to complete the work. All monies necessary for this correction work will be deducted from the Contract's retained amounts. **If CONTRACTOR fails to complete the Final Punch List, they will not be allowed to submit bids on any City Contracts in 2028.**

Upon completion of the Final Punch List corrections, the remainder of the Contract's retained money will be released to the CONTRACTOR.

In the fall of 2028, the CITY will televise the storm and sanitary sewer and once again walk all contracts let in 2026 to check for warranty work. If corrections are required, a **Warranty Work List** will be supplied to the CONTRACTOR by November 1, 2028. All of this warranty work must be completed by June 30, 2029 to the CITY's satisfaction. **If CONTRACTOR fails to correct all warranty work within this timeframe, they will not be allowed to submit bids on any upcoming City Contracts in 2029 and will not be allowed to prequalify for any City Contracts in 2030.**

Upon receiving a notice of any hazardous or dangerous Punch List or Warranty Work List items, the CONTRACTOR must remedy the hazardous situation within thirty (30) days of receiving the notice.

CONTRACTOR shall have Performance Bond expire on November 30, 2027. If delays or unseen circumstances cause the Contract not to be finished within the calendar year, the CITY will require the CONTRACTOR to extend their Warranty Bond to two years from the completion date of the Contract.

For all Contracts let in 2026 which are multi-year contracts:

If Contracts are completed by September 1, 2027, a **Final Punch List** will be created and all Punch List items must be completed by November 1, 2027.

If Contracts are completed between September 2, 2027 and December 31, 2027, the CITY will do a walk-through in April of 2028 and a **Final Punch List** will be created. All items on the Final Punch List must be corrected by June 30, 2028 or the CITY will hire a Contractor of their choice to complete the work. All monies necessary for this correction work will be deducted from the Contract's retained amounts. **If CONTRACTOR fails to complete the Final Punch List, they will not be allowed to submit bids on any City Contracts in 2029.**

Upon completion of the Final Punch List corrections, the remainder of the Contract's retained money will be released to the CONTRACTOR.

In the fall of 2029, the CITY will televise the storm and sanitary sewer and once again walk all contracts let in 2026 to check for warranty work. If corrections are required, a **Warranty Work List** will be supplied to the CONTRACTOR by November 1, 2029. All of this warranty work must be completed by June 30, 2030 to the CITY's satisfaction. **If CONTRACTOR fails to correct all warranty work within this timeframe, they will not be allowed to submit bids on any upcoming City Contracts in 2029 and will not be allowed to prequalify for any City Contracts in 2030.**

Upon receiving a notice of any hazardous or dangerous Punch List or Warranty Work List items, the CONTRACTOR must remedy the hazardous situation within thirty (30) days of receiving the notice.

CONTRACTOR shall have Performance Bond expire on November 30, 2029. If delays or unseen circumstances cause the Contract not to be finished within the calendar year, the CITY will require the CONTRACTOR to extend their Warranty Bond to two (2) years from the completion date of the Contract.

100.76 Project Closeout

1. At or near the end of a project, there are a number of submittals that must be processed including the following:
   A. Written notices of substantial completion and final completion.
   B. Final change order which would be a fund balancing of specified and actual amounts.
   C. Final application for payment.
   D. List of General Contractor's subcontractors and suppliers.
   E. **Signed releases of liens and waivers of debts and claims:**
      1. **General Contractor.**
      2. **Suppliers to General Contractor.**
      3. **All Subcontractors.**
   F. CONTRACTOR's certification of substantial and final completion.

2. The *Lien Waiver* forms and *List of Subcontractors and Suppliers* form required to be used by all contractors, subcontractors, and suppliers are enclosed at the end of **Section 100**.

100.77 Railroad Insurance

1. The CONTRACTOR shall obtain Railroad Insurance as required by the Railroad related to any work over, under, or near the Railroad Company's tracks and right-of-way. Proof shall be submitted to the CITY indicating approval from the Railroad prior to commencing any work.

2. Railroad Insurance, at a minimum, shall be with the limits of not less than Five Million Dollars ($5,000,000) per occurrence for Bodily Injury Liability, Property Damage Liability, and Physical Damage to Property, with Ten Million Dollars ($10,000,000) aggregate for the term of the policy.

3. The Railroad Insurance will be paid for under Bid Item #1999 and shall include all costs related to obtaining and purchasing this insurance.

100.78 Experimental Aircraft Association (EAA) Air Venture

1. The annual EAA Air Venture is scheduled for July 20 – 26, 2026. During EAA Air Venture, and the week prior, traffic is considerably increased throughout the City of Oshkosh. There will be no lane restrictions allowed on arterial streets during EAA Air Venture. The street surface shall be per **Section 100.53** and **Section 100.62**. Only concrete and hot mix asphalt will be acceptable materials for maintaining traffic.

100.79 Stamping Concrete Placed in Right-of-Way

1. The CONTRACTOR is required to stamp all concrete placed in the City of Oshkosh right-of-way. The stamp shall include the CONTRACTOR's name and installation date. The cost for stamping is considered incidental to the concrete placement. The stamp shall be placed at each end of the pour. Single squares require one (1) stamp.

100.80 Pavement Ties for Concrete Pavement Deductions

1. A 30 percent (30%) deduct will be applied to all applicable Concrete Paving Bid Items that do not meet the required tie bar spacing. A tie bar spacing of three feet (3') on center is required for all sawed longitudinal joints.

100.81 Late Night Sawing of Concrete Pavement

1. No sawing of concrete pavement will be permitted between 12:00 a.m. and 6:00 a.m., unless special written permission is obtained from CITY. The CONTRACTOR shall phase pours to eliminate late night sawing.

100.82 Designated Haul Routes

1. According to **Section 27-14**, *Municipal Code of the City of Oshkosh*, "Truck Routes Designated", heavy traffic means all vehicles not operating completely on pneumatic tires and vehicles or combination of vehicles, other than motor buses, designed or used in transporting property of any nature and having a gross weight of more than 15,000 pounds.

2. **The CONTRACTOR shall use the designated haul routes as shown in the Plans and called out in the Special Conditions, and the designated truck routes for the City of Oshkosh, to obtain access to or leave from the proposed construction activities.**

3. If the CONTRACTOR desires to truck on a non-designated haul or truck route, they must do the following prior to trucking on said route:
   - Submit to the ENGINEER in writing the proposed truck route and purpose for trucking on said proposed route.
   - If approval is granted, the CONTRACTOR shall set up an onsite meeting with the ENGINEER, CONTRACTOR Representative, and any Subcontractor Representatives (that may use the roadway) to log and document the proposed route's existing condition and any deficiencies within the roadway. This shall be done with both a video camera and a list of deficiencies.
   - Upon completion of trucking on said roadway, the CONTRACTOR and ENGINEER will log the roadway again and document any damage caused by the CONTRACTOR trucking on said roadway.
   - ENGINEER will determine the type and quality of repair required and CONTRACTOR will restore roadway to ENGINEER's satisfaction at CONTRACTOR's expense.

4. Approval of the non-designated haul route does not authorize the use of the haul route for transporting loads exceeding statutory size and weight limitations.

5. **Failure to truck only on the designated haul routes and designated truck routes will result in Two Hundred Dollars ($200) per occurrence in liquidated damages to the CONTRACTOR**.

6. **The parties also recognize the damage, the actual loss suffered by the CITY if the non-haul route is damaged caused by hauling on non-designated haul routes/truck routes, is difficult to prove in a legal proceeding. Accordingly, instead of requiring such proof, the CITY and CONTRACTOR agree that as liquidated damages for damages, but not as a penalty, CONTRACTOR shall pay to the CITY the above-listed charge per occurrence. If the CITY deems the non-designated haul routes requires immediate repair, the CONTRACTOR shall repair the roadway to ENGINEER's satisfaction at their own expense**.

100.83 Construction Access Agreements

1. The City of Oshkosh Department of Public Works is now required to obtain *Construction Access Agreements* for every parcel within the construction limits. These agreements allow the CITY's CONTRACTOR to perform work on private property; all work behind the sidewalk.

2. The CITY's projects are designed assuming that all of the signed *Construction Access Agreements* would be returned to us. If the CITY does not receive a signed copy of the *Construction Access Agreement* from each property owner, the scope of work for that parcel will drastically change from what is shown on the Plans. The laterals will be reconnected within the right-of-way and no sidewalk will be replaced. Temporary sidewalk/driveways may be installed on each side of the non-signing parcel to match the proposed sidewalk and driveway aprons. The temporary sidewalk will be paid for under Bid Item #1500, 4" concrete sidewalk with 3" CABC and grading. Temporary asphaltic aprons will be paid for under Bid Item #1917, 2" asphaltic surface with 6" CABC and grading.

3. The CITY will attempt to acquire all of the *Construction Access Agreements* prior to the start of the Contract, but the CONTRACTOR should be aware of these potential changes. No additional time will be granted for the installation of the asphaltic sidewalk/driveways.

4. Prior to the start of construction, the CITY will supply a list of addresses that have yet to sign the *Construction Access Agreements* to the CONTRACTOR. CONTRACTOR will make note of this and will not encroach on those properties during any construction activities.

100.84 Slip-Form Paving

1. The use of a self-propelled slip-form paving machine is required for the placement of all mainline pavements that are three hundred feet (300') or more in length, are a minimum of ten feet (10') in width, and are of a constant width. In areas inaccessible to self-propelled slip-form paving equipment, such as paving gaps, small pours, and irregularly-shaped areas, CONTRACTOR shall construct the pavement using fixed-form methods, as approved by the ENGINEER.

100.85 As-Built Invert Elevations

1. The CONTRACTOR will be required to provide as-built invert elevations to the ENGINEER or designee upon completion of each utility structure. The information shall include elevations of all pipes and flow line of the structure. This information shall be obtained prior to placing the structure's top.

100.86 Prequalification

1. CONTRACTOR's prequalification now includes a financial size component. For each project being bid, the *Proposal* will identify what level of prequalification is necessary in order to submit a bid as a General Contractor for that project. Contractor bid prices may exceed the prequalification level, as long as the CONTRACTOR has been prequalified for the level required as identified on the *Proposal*.

100.87 Lending of Water Distribution Parts Inventory

1. The previous practice of lending, loaning, or borrowing Water Distribution Division parts inventory to contractors has been discontinued. Contractors are expected to work with their parts suppliers to ensure that adequate parts inventory and supply are available during construction activity.

100.88 Joint Sealing for Concrete Pavement/Patches

1. All concrete pavement joints shall be sealed using a hot-poured elastic-type joint sealer meeting the requirements of **Section 1300.3.13**. All costs shall be incidental to the appropriate paving Bid Item.

100.89 Coordination of Private-Side Water Service Replacement

1. The CITY requires property owners to replace lead water service lines any time an existing lead-impacted water service line is disturbed on the public or private side. The CITY does not replace the private side of the water service; as a result, the property owner needs to hire a private contractor to complete the replacement. The CONTRACTOR (City-hired Contractor) shall provide access and allow privately-hired contractors access within the construction site for the replacement of water service lines when the private-side work will not materially interfere with the CONTRACTOR's work. CONTRACTOR shall, at the private contractor's request, delay filling their excavation resulting from the installation of the public water service and its reconnection to the existing private-side water service for up to five (5) working days to allow the private contractor to complete the water service line replacement into the property owner's structure. CONTRACTOR shall notify the private contractor of the completion of the public-side work when delayed backfilling has been requested by the private contractor.

NOTICE TO PROCEED

Date

Contractor Name
Address
City, ST Zip

RE: **City Contract** _____

You are hereby notified to commence work in accordance with the above-stated Contract on _____. In accordance with **Section SP-1** of the *Special Conditions*, the date of Final Completion is _____. Construction Windows for each portion of the Work shall be as noted in **Section SP-1** of the *Special Conditions*. At least one (1) day prior to commencing work on any portion of the Project, all notifications listed in **Section 100.21** of the current edition of the *Standard Specifications for City of Oshkosh, Wisconsin* (CITY SPECIFICATIONS) shall be provided to the Police and Fire Departments, the Railroad, and Transit, as required, in accordance with the time frames listed in **Section 100.21**.

Prior to any Work commencing, you shall:

1. Deliver Performance Bond in accordance with **Section 100.10** of the CITY SPECIFICATIONS and as provided in the *Special Conditions*.
2. Deliver Payment Bond in accordance with **Section 100.10** of the CITY SPECIFICATIONS and as provided in the *Special Conditions*.
3. Deliver a Certificate of Insurance in accordance with **Section 100.11** of the CITY SPECIFICATIONS.
4. Schedule Ground Control Conference in accordance with **Section 100.27** of the CITY SPECIFICATIONS.
5. Provide the name and contact information of the Authorized Representative in accordance with **Section 100.32** of the CITY SPECIFICATIONS.
6. Schedule Pre-Construction Conference in accordance with **Section 100.52** of the CITY SPECIFICATIONS.
7. Submit Project Schedule in accordance with **Section 100.53** of the CITY SPECIFICATIONS.

Please sign both copies, keep one (1) for your records, and return the other copy in the enclosed self-addressed envelope.

Authorized By:	_____	Accepted By:	_____
	Signature		Signature
	_____		_____
	Name		Name
	_____		_____
	Title		Title
	City of Oshkosh_____		_____
	Owner		Contractor Name
	_____		_____
	Date		Date

City Hall, 215 Church Avenue P.O. Box 1130 Oshkosh, WI 54903-1130 http://www.oshkoshwi.gov

CERTIFICATE OF SUBSTANTIAL COMPLETION

Date

Contractor Name
Address
City, ST Zip

RE: **City Contract** _____

The work performed under this Contract has been reviewed and has been found to the ENGINEER's best knowledge, information, and belief to be substantially complete as of the date listed above.

The date of Substantial Completion is understood to mean the date at which the CONTRACTOR has completed all Contract Bid Items and change order work, except punch list and clean-up work. Assessment of Contract time will be stopped by the ENGINEER at this point. As applicable, the following must have occurred:

1. All lanes of traffic are opened on a finished surface.
2. All permanent signage and traffic control devices are in place and operating.
3. All drainage, erosion control, excavation, and embankments are completed.

A list of items to be completed or corrected is attached hereto. The failure to include any items on such list does not alter the responsibility of the CONTRACTOR to complete all work in accordance with **Section 100.49** and **Section 100.75** of the current edition of the *Standard Specifications for City of Oshkosh, Wisconsin* (CITY SPECIFICATIONS).

The CONTRACTOR will complete or correct the work on the list of items attached hereto in accordance with the closeout procedure in **Section 100.75** of the CITY SPECIFICATIONS.

Authorized By: _____	Accepted By: _____
Signature	Signature
_____	_____
Name	Name
_____	_____
Title	Title
City of Oshkosh_____	_____
Owner	Contractor Name
_____	_____
Date	Date

City Hall, 215 Church Avenue P.O. Box 1130 Oshkosh, WI 54903-1130 http://www.oshkoshwi.gov

CERTIFICATE OF FINAL COMPLETION

Date

Contractor Name
Address
City, ST Zip

RE: **City Contract** _____

The work performed under this Contract has been reviewed and has been found to the ENGINEER's best knowledge, information, and belief to be complete as of the date listed above.

The date of Final Completion is understood to mean the date at which the CONTRACTOR has completed all Contract Bid Items and change order work, except warranty work.

Authorized By:	Accepted By:
Signature	Signature
Name	Name
Title	Title
City of Oshkosh Owner	Contractor Name
Date	Date

City Hall, 215 Church Avenue P.O. Box 1130 Oshkosh, WI 54903-1130 http://www.oshkoshwi.gov

PARTIAL WAIVER OF LIEN

§779.05 Wis. Stats.

Date: _____

Contractor: _____

Address: _____

_____

RE: **City Contract** _____

For value actually received, waiver of rights and claims is hereby made for labor performed and/or material furnished at any time, in the past or in the future, for improvements about to be erected, being erected, erected, altered, or repaired and to the appurtenances thereunto for the City Contract listed above, for property situated in Winnebago County, State of Wisconsin, for **City of Oshkosh**, Owner, by the CONTRACTOR listed above for:

(check one) _____ all work, labor, or materials furnished through _____.
Date

_____ the following work, labor, or materials only _____.
Specify

_____ all work, labor, or materials, except _____.
Specify

By signature below, I hereby acknowledge I have read and understand this Waiver of Lien and, if for an entity, sign it on behalf of the entity as a duly-authorized act of such entity and by its authority.

Accepted By: _____
Signature of Officer/Owner

_____
Name

_____
Title

_____
Contractor Name

_____
Date

§779.05 Waivers of Lien, provides, in part, "(1) Any document signed by a lien claimant or potential claimant and purporting to be a waiver of construction lien rights under this subchapter, is valid and binding as a waiver whether or not consideration was paid therefor and whether the document was signed before or after the labor, services, materials, plans, or specifications were performed, furnished, or procured, or contracted for. Any ambiguity in such document shall be construed against the person signing it. Any waiver document shall be deemed to waive all lien rights of the signer for all labor, services, materials, plans, or specifications performed, furnished, or procured, or to be performed, furnished, or procured, by the claimant at any time for the improvement to which the waiver relates, except to the extent that the document specifically and expressly limits the waiver to apply to a particular portion of such labor, services, materials, plans, or specifications. A lien claimant or potential lien claimant of whom a waiver is requested is entitled to refuse to furnish a waiver unless paid in full for the labor, services, materials, plans, or specifications to which the waiver relates. A waiver furnished is a waiver of lien rights only, and not of any contract rights of the claimant otherwise existing."

FINAL WAIVER OF LIEN

§779.05 Wis. Stats.

Date: _____

Subcontractor: _____

Address: _____

_____

RE: **City Contract** _____

For value actually received, waiver of all rights and claims is hereby made for all labor performed and/or material furnished at any time, in the past or in the future, for improvements about to be erected, being erected, erected, altered, or repaired and to the appurtenances thereunto for the City Contract listed above, for property situated in Winnebago County, State of Wisconsin, for **City of Oshkosh**, Owner, by the Subcontractor listed above.

By signature below, I hereby acknowledge I have read and understand this Waiver of Lien and, if for an entity, sign it on behalf of the entity as a duly-authorized act of such entity and by its authority.

Accepted By: _____
Signature of Officer/Owner

_____
Name

_____
Title

_____
Subcontractor Name

_____
Date

§779.05 Waivers of Lien, provides, in part, "(1) Any document signed by a lien claimant or potential claimant and purporting to be a waiver of construction lien rights under this subchapter, is valid and binding as a waiver whether or not consideration was paid therefor and whether the document was signed before or after the labor, services, materials, plans, or specifications were performed, furnished, or procured, or contracted for. Any ambiguity in such document shall be construed against the person signing it. Any waiver document shall be deemed to waive all lien rights of the signer for all labor, services, materials, plans, or specifications performed, furnished, or procured, or to be performed, furnished, or procured, by the claimant at any time for the improvement to which the waiver relates, except to the extent that the document specifically and expressly limits the waiver to apply to a particular portion of such labor, services, materials, plans, or specifications. A lien claimant or potential lien claimant of whom a waiver is requested is entitled to refuse to furnish a waiver unless paid in full for the labor, services, materials, plans, or specifications to which the waiver relates. A waiver furnished is a waiver of lien rights only, and not of any contract rights of the claimant otherwise existing."

City Hall, 215 Church Avenue P.O. Box 1130 Oshkosh, WI 54903-1130 http://www.oshkoshwi.gov

LIST OF SUBCONTRACTORS AND SUPPLIERS
For Project Close Out

Name:	Name:
Street Address:	Street Address:
City, St, Zip:	City, St, Zip:
Phone Number:	Phone Number:
Name:	Name:
Street Address:	Street Address:
City, St, Zip:	City, St, Zip:
Phone Number:	Phone Number:
Name:	Name:
Street Address:	Street Address:
City, St, Zip:	City, St, Zip:
Phone Number:	Phone Number:
Name:	Name:
Street Address:	Street Address:
City, St, Zip:	City, St, Zip:
Phone Number:	Phone Number:
Name:	Name:
Street Address:	Street Address:
City, St, Zip:	City, St, Zip:
Phone Number:	Phone Number:

Copy this page if you have more than eight (8) entries.

BID BOND CITY OF OSHKOSH

Contract Number **Bond Number**

Date Bond Executed (Date of Contract or Later)

PRINCIPAL/CONTRACTOR (Legal Name and Business Address)

Type of Organization

___ *Individual* ___ *Partnership*
___ *Corporation*

State of Incorporation

SURETY(IES) (Legal Name(s) and Business Address(es))

Penal Sum of Bond

OWNER (Legal Name and Business Address)

CITY OF OSHKOSH
215 Church Avenue
PO Box 1130
Oshkosh, Wisconsin 54903-1130

OBLIGATION

The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the amount of the penal sum identified above if the Owner accepts the bid of this Contractor within the time specified in the Bid documents or within such time period as may be agreed upon between the Owner and the Contractor, and the Contractor shall fail to execute the Contract within five (5) business days of written notice to the Contractor and Surety of Owner's intent to make a claim upon this Bond.

The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the Bid.

If the Contractor either enters into a contract with Owner in accordance with the terms of the Bid and gives such bond(s) that may be specified in the Bidding documents for the faithful performance of the Contract and for the prompt payment of labor, materials, and supplies furnished for the purpose thereof; or pays to the Owner the difference between the amount specified in the Bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered in such Bid, then the Surety and the Contractor shall have no obligation under this Bond.

Notice to the Contractor or Surety shall be deemed to have been given: (i) upon delivery to an officer or person entitled to such notice, if hand delivered; or (ii) two (2) business days following deposit in the United States mail, postage prepaid; (iii) upon delivery by a commercial carrier that will certify the date and time of delivery; or (iv) upon transmission if by facsimile, e-mail, or other form of electronic transmission. Notices shall be provided to the Owner, Surety, and/or Contractor at their address as specified on this Bond or to a facsimile, e-mail or other electronic address that has been provided in writing to the other party to be used for this purpose.

The laws of the State of Wisconsin shall govern the interpretation and construction of this Bond. Winnebago County shall be the venue for all disputes arising under this Bond. Any provision in this Bond that may conflict with statutory or other legal requirement shall be deemed deleted herefrom and provisions conforming to the statutory or other legal requirement shall be deemed incorporated herein.

Name of Principal/Contractor	Name of Surety
Title	Title

PAYMENT BOND CITY OF OSHKOSH

Contract Number **Bond Number**

Date Bond Executed (Date of Contract or Later)

PRINCIPAL/CONTRACTOR (Legal Name and Business Address)

Type of Organization

___ *Individual* ___ *Partnership*
___ *Corporation*

State of Incorporation

SURETY(IES) (Legal Name(s) and Business Address(es))

Penal Sum of Bond

OWNER (Legal Name and Business Address)

CITY OF OSHKOSH
215 Church Avenue
PO Box 1130
Oshkosh, Wisconsin 54903-1130

OBLIGATION

The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Contract identified above, which is incorporated herein by reference, subject to the following terms.

If the Contractor promptly makes payment of all sums due to claimants, and defends, indemnifies, and holds harmless the Owner from all claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Contract, then the Surety and the Contractor shall have no obligation under this Bond.

If there is no Owner Default to pay the Contractor as required under the Contract for work performed or to perform or complete any material term of the Contract, then the Surety(ies) obligation under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Contract and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.

Amounts owed by the Owner to Contractor under the Contract shall be used for performance of the Contract and to satisfy claims, if any, under any Performance Bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

Upon notice and tendering of claims as specified above, the Surety shall promptly and at Surety's expense defend, indemnify, and hold harmless the Owner against such claim, demand, lien, or suit.

Surety shall answer claimants, with a copy to Owner, within sixty (60) days of the date of the claim, stating the amount that are disputed and the specific basis for challenging any amount that is disputed or pay or arrange for payment of any undisputed amount claimed.

Surety shall not be obligated to the Owner, claimants, or others for obligations of the Contractor under this Bond that are unrelated to the Contract. The Owner shall not be liable for the payment of any costs or expenses of any claimant under this Bond and shall have no obligation to make payments to, or give notice on behalf of claimants, or otherwise have any obligation to claimants under this Bond.

Notice to the Contractor or Surety shall be deemed to have been given: (i) upon delivery to an officer or person entitled to such notice, if hand delivered; or (ii) two (2) business days following deposit in the United States mail, postage prepaid; (iii) upon delivery by a commercial carrier that will certify the date and time of delivery; or (iv) upon transmission if by facsimile, e-mail, or other form of electronic transmission. Notices shall be provided to the Owner, Surety, and/or Contractor at their address as specified on this Bond or to a facsimile, e-mail, or other electronic address that has been provided in writing to the other party to be used for this purpose.

The laws of the State of Wisconsin shall govern the interpretation and construction of this Bond. Winnebago County shall be the venue for all disputes arising under this Bond. Any provision in this Bond that may conflict with statutory or other legal requirement shall be deemed deleted herefrom and provisions conforming to the statutory or other legal requirement shall be deemed incorporated herein.

Name of Principal/Contractor	Name of Surety
Title	Title

PERFORMANCE BOND CITY OF OSHKOSH

Contract Number **Bond Number**

Date Bond Executed (Date of Contract or Later)

PRINCIPAL/CONTRACTOR (Legal Name and Business Address)

Type of Organization

___ *Individual* ___ *Partnership*
___ *Corporation*

State of Incorporation

SURETY(IES) (Legal Name(s) and Business Address(es))

Penal Sum of Bond

OWNER (Legal Name and Business Address)

CITY OF OSHKOSH
215 Church Avenue
PO Box 1130
Oshkosh, Wisconsin 54903-1130

OBLIGATION

The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for payment of the sum shown above or the performance of the Contract identified above, which is incorporated herein by reference.

This Bond shall cover any work performed during initial construction and any warranty period required by the Contract.

If there is no Owner Default to pay the Contractor as required under the Contract for work performed or to perform or complete any material term of the Contract, then the Surety(ies) obligation under this Bond shall arise after:

1. The Owner provides notice to the Contractor and Surety that the Owner is considering declaring the Contractor in default of the Contract. Within five (5) business days of the Owner's notice, either the Contractor or the Surety may request a conference with the Owner to discuss such default and the remedy therefor. If a conference is requested, the conference shall be scheduled to take place at Owner's principal place of business or another agreed-upon location within five (5) business days of the request for conference. If the Owner, Contractor, and Surety agree, the Contractor may be allowed a reasonable

time to perform the Contract, but such agreement shall not waive the Owner's right, if any, to subsequently declare the Contractor in default;

2. The Owner declares the Contractor in default and notifies the Surety of the declaration of default; and
3. The Owner agrees to pay the balance of the Contract price in accordance with the terms of the Contract to the Surety or to a qualified Contractor selected to perform the Contract.

Failure of the Owner to comply with the notice requirement specified above shall not release the Surety from its obligations.

Upon notice from the Owner as provided above, the Surety shall promptly and at Surety's expense take one of the following actions:

1. Arrange for the Contractor, with consent of the Owner, to perform and complete the Contract;
2. Undertake to perform and complete the Contract itself, through qualified agents or independent contractors;
3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner to enter into a contract with the Owner for performance and completion of the Contract, to be secured with performance and payment bonds, and to pay to the Owner as damages any amount in excess of the original Contract amount for the completion of the Contract; any additional legal, design professional, architect, or consultant fees resulting from any delay in the completion of the Contract; and any applicable liquidated damages specified within the Contract resulting from any delay in the completion of the Contract.
4. Make payment to the Owner, as soon as practicable after an amount is determined for completion of the Contract; or
5. Deny liability in whole or in part and notify the Owner, citing with specificity the reasons for such denial.

If the Surety does not proceed with reasonable promptness, Owner may give notice to the Surety and the Surety shall be deemed in default on this Bond five (5) business days after notice by the Owner demanding the Surety perform its obligations under this Bond. Owner shall be entitled to enforce any remedy available to Owner upon default.

Except for default of the Surety and Surety's election to perform or complete the Contract itself under **Paragraph 2** above, Surety's liability shall be limited to the amount of this Bond.

Notice to the Contractor or Surety shall be deemed to have been given: (i) upon delivery to an officer or person entitled to such notice, if hand delivered; or (ii) two (2) business days following deposit in the United States mail, postage prepaid; (iii) upon delivery by a commercial carrier that will certify the date and time of delivery; or (iv) upon transmission if by facsimile, e-mail, or other form of electronic transmission. Notices shall be provided to the Owner, Surety, and/or Contractor at their address as specified on this Bond or to a facsimile, e-mail or other electronic address that has been provided in writing to the other party to be used for this purpose.

The laws of the State of Wisconsin shall govern the interpretation and construction of this Bond. Winnebago County shall be the venue for all disputes arising under this Bond. Any provision in this Bond that may conflict with statutory or other legal requirement shall be deemed deleted herefrom and provisions conforming to the statutory or other legal requirement shall be deemed incorporated herein.

The above obligation is void if the Contractor performs and fulfills all the terms, conditions, and agreements of the Contract and any authorized modifications during the term of the original Contract and any extensions thereof. Notice to the Surety is waived for any modifications agreed upon by Owner and Contractor.

Name of Principal/Contractor	Name of Surety
Title	Title

GENERAL PAVING SPECIFICATIONS

SECTION 500
SALVAGED CRUSHED CONCRETE CREDIT

500.1 Description

1. The work covered by this Section of the Specifications shall consist of an alternate credit to furnish all labor and equipment to load, transport, place, and compact salvaged, crushed concrete for utility fill and base course. The CITY may accept and require this credit from the CONTRACTOR for the CITY to supply 1¼"-minus salvaged, crushed concrete material to be used for all or a portion of stone backfill in all sanitary, storm, and water utility trenches. If the quantity bid is not used up in the utility trenches, the CITY may accept and require this credit from the CONTRACTOR for the CITY to supply 1¼"-minus salvaged, crushed concrete material to be used for all or a portion of base course for all pavement Bid Items which include base course as part of their Bid. It will be up to the CONTRACTOR to determine how to use, place, and/or trim the salvaged material. No additional payment will be made for special placement or trimming. The CITY may elect not to accept the Credit Item if the ENGINEER deems the credit is not sufficient. It is the CITY's intent the salvaged, crushed concrete be used under paving projects based on the CITY's assumption that the material will be of significant value to the CONTRACTOR and that a credit will be offered to the CITY for the material. If the CONTRACTOR intends to pay the credit to the CITY, the Bid price will be a negative number. If the CONTRACTOR's intent is for the CITY to pay the CONTRACTOR, the Bid price would be a positive number.

500.2 Measurement

1. The quantity of salvaged, crushed concrete will be determined by the ENGINEER based on the average weight of the CONTRACTOR's loaded trucks. The CONTRACTOR shall be responsible for all costs to establish certified scale weights for the unloaded trucks and for the trucks loaded with the salvaged, crushed concrete at the start of the project. The ENGINEER will determine when a reasonable average weight has been determined and may require the CONTRACTOR to provide additional random truck weights after the initial average weight has been determined.

500.3 Payment

1. The CITY will pay for the measured quantities at the Contract price for the following Bid Items:

Bid Item	Description	Units
SALVAGED CRUSHED CONCRETE		
500	Salvaged Crushed Concrete Credit	TON

2. The ENGINEER will provide the CONTRACTOR with a salvaged crushed concrete delivery ticket form. The CONTRACTOR shall fill out this ticket for each truckload delivered to the project and, upon delivery, shall provide this ticket to the ENGINEER. The CONTRACTOR shall account for each truckload delivered by the end of each working day subject to approval by the ENGINEER. The decision of the ENGINEER as to the number of truckloads and weight of material delivered each day shall be final.

SECTION 900
GENERAL CONCRETE STREET PAVEMENT CONSTRUCTION

900.1 Clearing, Grading, and Subgrade Preparation

900.1.1 Scope

1. The work covered by this Section of the Specifications consists of furnishing all labor, equipment, materials, and supplies, and in performing all operations in connection with the clearing and grubbing; the excavation, including burrow and grading, pertaining thereto for streets; and the preparation of subgrade, as required, in strict accordance with this Section of the Specifications and the applicable Drawings.

900.1.2 Clearing and Grubbing

1. See **Section 1000** of these Specifications.

900.1.3 Excavation

1. See **Section 1200** of these Specifications.

900.1.4 Subgrade

1. The bottom of the excavation for the base course shall be known as the subgrade and shall conform to the lines, grade, and cross-section as shown on the Plans and Detail sheets. See the Detail sheets for definition of pavement, base course, and subgrade.

2. All soft and yielding material and other portions of the subgrade, which will not compact readily when rolled or tamped, shall be removed as directed and replaced with suitable material and compacted as specified herein.

3. The subgrade shall have uniform density and be compacted to at least ninety five percent (95%) of maximum density. The maximum density shall be determined in accordance with the Standard Method of Test for the Moisture-Density Relations of Soils, **AASHTO T99**, Method C, with replacement of the fraction of material retained on the ¾" sieve with No. 4 to ¾" material. The density of compacted subgrade material shall be determined in accordance with the Test for Density of Soil-in-Place by the Sand-Cone Method, **ASTM D-1556**, or by other approved methods at the direction of the ENGINEER.

4. All sewer trenches and structure excavations shall be backfilled to natural or finished grade as soon as conditions permit. All backfill shall be compacted with mechanical tampers in layers of not over ten inches (10") loose material. Vibratory compactors that are small enough to operate within the limited area are satisfactory.

900.1.5 Base Course

1. Material furnished under the Contract for base course shall conform to the requirements of **Section 1800** of these Specifications. A gradation report must be submitted before any material is placed.

2. The base course shall be placed in a single layer to give a compacted thickness of five to six inches (5" to 6") depending on the thickness of the concrete pavement. It shall be finished in an acceptable condition for at least one (1) day's progress in advance of the pavement construction at all times. The work shall, in general, proceed from a point on the project nearest the source of supply of the aggregate in order that the hauling equipment will travel over the previously placed material, and the hauling equipment shall be routed as uniformly as possible over all portions of the previously constructed base course. The material shall be deposited on the subgrade in such a manner that it may be spread to a uniform layer of the required dimensions. After the base course has been placed and spread to the required thickness, width, and contour, it shall be compacted to the extent necessary to produce a condition such that there will be no appreciable displacement of the material laterally or longitudinally under traffic as determined by the ENGINEER. Compaction of the base course shall be done by suitable compaction equipment approved by the ENGINEER. Required degree of compaction shall be to at least ninety five percent (95%) of the maximum density.

3. The maximum density shall be determined in accordance with the Standard Method of Test for the Moisture-Density Relations of Soils, **AASHTO T99**, Method C, with replacement of the fraction of material retained on the ¾" sieve with No. 4 to ¾" material. The density of compacted base course material shall be determined in accordance with the Test for Density of Soil-in-Place by the Sand-Cone Method, **ASTM D-1556**, or by other approved methods.

4. Testing of the base course material will be at the discretion and expense of the CITY.

900.1.6 Protection of the Base Course

1. The finished base course shall be maintained in a smooth and compacted condition until the concrete has been placed.

2. The mixer, ready-mix trucks, or other equipment shall not operate between the forms in the pavement lane unless conditions of the job will not permit operation from the shoulder or outside the lane. Mixer or ready-mix trucks shall not be permitted to operate from previously paved lanes until the pavement is at least seven (7) days old or a compressive strength of not less than 3,000 psi is attained.

3. If it is necessary to operate trucks between the forms and the trucks cause rutting or displacement of the base course material, either lighter trucks shall be used or suitable runways shall be provided. The CONTRACTOR shall re-roll or hand-tamp the base to correct any ruts or other objectionable irregularities which may have been caused by the trucking of materials.

900.2 Concrete Paving with Integral Curb

900.2.1 Scope

1. The work covered by this Section of the Specifications consists in furnishing all labor, equipment and materials, and in performing all operations in connection with the construction of air-entrained Portland Cement concrete pavement with integral curb for City streets in strict accordance with this Section of the Specifications, and applicable Drawings and Detail sheets.

900.2.2 Materials

900.2.2.1 Concrete

1. Concrete shall be composed of Portland Cement, aggregates and water. Air entrainment shall be provided by the addition of air-entraining agents to Type I or III Portland Cement. These materials shall be furnished only from the sources of supply approved by the ENGINEER before shipments are started. The basis of approval of such sources shall be the ability to produce materials of the quality and quantity required.

2. The concrete mixture shall be either:
   A. Type 1, Grade A,
   B. Type 1, Grade A2-WR,
   C. Type 1, Grade C for High Early Strength Concrete, or
   D. Type 1, Grade E for Special High Early Strength Concrete.

3. All concrete placed under these Bid Items shall be treated with a surface treatment of linseed oil as specified under **Section 100.58** of these Specifications.

900.2.2.2 Portland Cement

1. Use cement conforming to ASTM specifications as follows:
   A. Type I Portland Cement – **ASTM C-150**.
   B. Type III Portland Cement – **ASTM C-150**, for high early strength.

2. Cement which for any reason has become partially set or which contains lumps of caked cement shall be rejected. Either packaged or bulk cement may be used.

900.2.2.3 Air-Entraining Agent

1. Air-entraining admixtures shall conform to the requirements of the current ASTM Specifications for Air-Entraining Admixtures for Concrete (**ASTM C-260**).

900.2.2.4 Aggregates

1. Aggregates for the concrete shall conform to **Section 501** of the STATE SPECIFICATIONS. Tests of the aggregates made by an independent testing firm shall be submitted to the ENGINEER and approved before aggregates will be accepted for the work. Such tests are to be paid for by the CONTRACTOR.

2. Coarse aggregate used for the concrete shall conform to **Section 501.2.7.3** of the STATE SPECIFICATIONS, except that the maximum amount of chert allowed shall be less than two percent (2%) by weight.

3. The aggregate (both fine and coarse) shall be so handled that its moisture content and gradation are reasonably uniform and does not change appreciably from batch to batch or hour to hour.

4. No aggregates shall be used which have become mixed, while in storage, with foreign material. Frozen aggregates or aggregates containing frozen lumps shall be thawed before use.

900.2.2.5 Water

1. Water used in mixing or curing concrete shall be clean and free from injurious amounts of oil, salt, alkali, organic materials, or other substances harmful to concrete. Water from public supplies or which is suitable for drinking is always satisfactory.

900.2.2.6 Reinforcing Steel

1. Reinforcing steel, if specified, shall conform to the latest ASTM Specifications as follows:

Type	ASTM Designation
Bars and rods	**A-15** or **A-16**
Steel wire fabric	**A-185**

2. Tie bars which are to be bent after one (1) end is encased in concrete shall be structural grade.

900.2.2.7 Expansion Joints

1. All expansion joints shall be constructed using ½" to 1" REFLEX Rubber Expansion Joint. Equivalent products must be approved by the ENGINEER prior to installation. Furnish expansion joint filler conforming to **AASHTO M153** or **AASHTO M213**. Furnish the filler in lengths equal to the width of the pavement lanes, and to the thickness and height that the Plans show. If dowel bars are required, use filler with clean-cut punched holes, not greater than one-eighth inch (1/8") larger in diameter than the nominal size of the dowel bar the Plans require.

900.2.2.8 Joint Sealing Compound

1. All joints shall be sealed using hot-poured elastic-type joint sealer which shall meet the requirements of the Standard Specifications for Concrete Joint Sealer, Hot-Poured Elastic Type, **ASTM D-3405**.

900.2.2.9 Metal Supports

1. Metal chairs used to support tie bars or reinforcing bars shall be channel-shaped, pressed out of sheet steel of not less than twelve (12) gauge (U.S. Std.) metal, and conforming to Details shown on the Plans.

900.2.2.10 Expansion Tubes

1. Metal dowel caps or tubes shall be manufactured from thirty-two (32) gage sheet metal, shall be indented to provide a limiting stop for the dowel bar, and shall provide unobstructed expansion space of not less than one inch (1") to permit movement of the dowel bar. They shall be of proper size to fit the specified bars tightly and the closed end shall be water-tight.

900.2.3 Mixing and Placing

900.2.3.1 Batching

1. Measurement and batching of cement and fine and coarse aggregates shall be by weight on scales accurate to within ½ of 1%. One (1) sack of cement shall be considered to weigh ninety-four (94) pounds net. Bulk cement from fractional sacks shall be weighed.

900.2.3.2 Proportioning Concrete

1. The CONTRACTOR shall submit a mix design, and have it approved, before any concrete is placed. The mix shall conform to the standard proportions for pavement concrete of the STATE SPECIFICATIONS for Grade A, Grade A2, Grade C, or Grade E; except if water-reducing admixtures are incorporated in the concrete mix, they shall conform to the requirements of the specifications for chemical admixtures for concrete, **AASHTO M194**, Type 4 or Type D. The minimum cement content shall not be less than 5.6 sacks (ninety-four (94) pounds per sack) per cubic yard of concrete.

2. The maximum size aggregate shall not exceed ¼ of the slab thickness. The maximum water content shall not exceed six (6.0) gallons per sack of cement, including the surface water on the aggregate. Concrete shall have minimum compression strength of three thousand five hundred (3,500) pounds per square inch at twenty-eight (28) days.

900.2.3.3 Air Entrainment

1. All concrete shall be air entrained and the volume of air in the freshly-mixed concrete shall be based on the following table:

Maximum size of coarse aggregate	Air content by volume
1½", 2", and 2½"	6% +/- 1½% (hand work) 6% to 7.5% (in front of slip-form paver)

2. The entraining air shall be obtained by using either air-entraining cement or an air-entraining admixture. For a method of measuring air content, see **Section 900.2.3.11** of these Specifications. If an admixture is used, the CONTRACTOR will be required to follow an approved procedure for adding the specified amount of the admixture to each batch and will be held responsible for its uniform operation during the progress of the work. The CONTRACTOR shall provide separate and approved scales for such admixtures as are proportioned by weight, and accurate measuring devices for such admixtures as are proportioned by volume.

3. Field or commercially prepared solutions of the admixtures shall be added to the batch as follows: When used in connection with mixers having a rated capacity of twenty-one (21)

cubic feet or more, the solution shall be introduced into the batch at the required rate by means of automatic dispensing devices, which shall accurately measure and deliver the required volume of air-entraining agent into the drum of the mixer. The dispensing device shall be so constructed that the volume of air-entraining agent can be varied within a range of ±50% of the standard volume, and shall be calibrated throughout this range and be provided with an indicator showing the volume which it is set to deliver. The device shall be connected to the mixer mechanism in a manner so that it will be automatically operated through one (1) cycle each time a batch of concrete ingredients is charged into the drum.

4. For mixers with a rated capacity of less than twenty-one (21) cubic yards, the air-entraining agent may be introduced by means of an automatic dispensing device of a design approved by the ENGINEER, or it may be introduced by pouring it in the aggregates in the skip of the mixer.

900.2.3.4 Consistency

1. The slump of the concrete shall be from one to three inches (1" to 3"), as determined by the ENGINEER. If the amount of water produces concrete having a slump of more than three inches (3"), the water shall be reduced until the slump is not more than three inches (3"), nor less than one inch (1"). If the slump is less than one inch (1"), the amount of water shall be increased until the slump is not less than one inch (1"), nor more than three inches (3"), increasing the cement at the same time so that the amount of water per sack of cement does not exceed that amount specified. The consistency shall be measured as described in the current ASTM Standard Method of Slump Test for Consistency of Portland Cement Concrete (**ASTM C-143**) or the method of test for ball penetration for Portland Cement Concrete, **ASTM C-360**.

900.2.3.5 Workability

1. Concrete shall at all times be of such consistency that it can be worked into corner and angles of the forms and around joints, dowels, and tie bars by the construction methods used without excessive spading, segregation, or undue accumulation of water or laitance on the surface.

900.2.3.6 Site-Mixed Concrete

1. Site-mixed concrete shall be mixed in a drum mixer, which shall conform to the concrete paving mixer standards of the Mixer Manufacturers Bureau of the Associated General Contractors of America. The mixer shall be capable of combining the aggregates, cement, and water into a thoroughly mixed and uniform mass within the specified time, and of discharging the material without segregation. The entire contents of the drum shall be discharged before recharging. The volume of the mixed materials per batch shall not exceed the manufacturer's guaranteed capacity (one hundred ten percent (110%) of rated capacity) of mixer. Site-mixed concrete shall meet all requirements of **Section 501.3.6** of the STATE SPECIFICATIONS.

900.2.3.7 Time of Mixing

1. The mixing of each batch shall continue for not less than one (1) minute after all materials, excepting water, are in the mixer. All mixing water shall be introduced in the drum before one-quarter (¼) of the mixing time has elapsed. The mixer shall rotate at the rate recommended by the manufacturer.

2. The mixer shall be provided with a batch-timing device, which shall be subject to inspection and adjustment by the ENGINEER at any time.

900.2.3.8 Ready-Mixed Concrete

1. Ready-mixed concrete shall be mixed and transported in accordance with the current ASTM Specification for Ready-Mixed Concrete (**ASTM C-94**). Any concrete which is not plastic and workable when it reaches the subgrade shall be rejected. Ready-mixed concrete shall also meet all the requirements of the STATE SPECIFICATIONS.

2. When construction conditions are such that it is absolutely necessary for trucks hauling concrete to operate on the grade between forms, they shall not back over previously deposited concrete.

900.2.3.9 Remixing

1. Concrete or mortar that has stiffened, but not set, may be used after remixing if it is plastic enough to be compacted in the forms. Water must not be added at time of remixing.

900.2.3.10 Batch-Mixed Concrete

1. Batching plants shall conform to **Section 501.3.4.5** of the STATE SPECIFICATIONS. The CONTRACTOR shall have all scales checked and approved by a certified sealer before they are used for production. A copy of that report shall be submitted to the ENGINEER.

900.2.3.11 Air Content

1. The air content of freshly mixed air-entrained concrete shall be checked at least twice daily. Concrete with air contents above or below the amount specified in **Section 900.2.3.3** of these Specifications shall be corrected by adjustments in the mix design or quantities of air-entraining admixture being used.

2. The air content shall be measured in accordance with ASTM Tentative Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method (**ASTM C-231**) or ASTM Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method (**ASTM C-173**).

900.2.3.12 Delivery Tickets

1. With each load of concrete delivered to the job, there shall be furnished by the ready-mixed concrete producer, or the CONTRACTOR, a delivery ticket for the ENGINEER that contains the date, street location, and amount of concrete in load in cubic yards delivered.

900.2.4 Forms

900.2.4.1 General

1. Forms shall be made of metal and shall have a depth equal to, or greater than, the prescribed edge thickness of the pavement slab, except when curb form is added after machine finishing. They shall have a base width of not less than eight inches (8") for all forms eight inches (8″) or more in height. All side forms less than eight inches (8") in height shall have a base width of not less than six inches (6"). The minimum length of each section of form used shall be ten feet (10'). Each section of form shall be straight and free from bends or warps.

2. The maximum deviation of the top surface of any section shall not exceed one-eighth inch (1/8"), or the inside face not more than one-fourth inch (¼") from a straight line. The method of connection between sections shall be such that the joint thus formed shall be free from movement in any direction. Forms shall be of such cross-section and strength and so secured as to resist the pressure of concrete when placed, and the impact and vibration of any equipment which they support, without springing or settlement.

3. Each ten foot (10') length of form shall have at least three (3) form braces and pin sockets, which shall be spaced at intervals of not more than five feet (5') from the end of the form.

Approved flexible forms shall be used for construction where the radius is one hundred fifty feet (150') or less. Wood forms will be permitted only on irregular shapes, short curves, and curb openings for driveways.

900.2.4.2 Setting Forms

1. The subgrade under the forms shall be compacted and cut to grade so that the form, when set, will be uniformly supported for its entire length at the specified elevation. Forms shall be jointed neatly and in such manner that the joints are free from play, or movement, in any direction. Forms shall be set, as herein specified, for at least one day's construction ahead of the actual placing of the concrete. The supply of forms shall be sufficient to permit their remaining in place for at least twelve (12) hours after the concrete has been placed. All forms shall be cleaned and oiled each time they are used.

900.2.4.3 Grade and Alignment

1. The alignment and grade elevations of the forms shall be checked by the CONTRACTOR and the necessary corrections made by the CONTRACTOR immediately before placing the concrete. When any form has been disturbed or any subgrade thereunder has become unstable, the form shall be reset and rechecked. The CONTRACTOR shall have a level and rod on the job for checking and transferring grades.

900.2.4.4 Slip-Form Paving

1. The use of a self-propelled slip-form paving machine is required for the placement of all mainline pavements that are three hundred feet (300') or more in length, are a minimum of ten feet (10') in width, and are of a constant width. In areas inaccessible to self-propelled slip-form paving equipment, such as paving gaps, small pours, and irregularly-shaped areas, CONTRACTOR shall construct the pavement using fixed-form methods, as approved by the ENGINEER.

2. Continuously place concrete on the base course in a manner that minimizes segregation. Place to a depth sufficiently above grade so, after consolidating and finishing, the required slab thickness is obtained and the surface conforms to the specified grade and slope.

3. Deposit concrete at joint installations so as not to displace or disarrange the installations. Completely fill joint assemblies with concrete. Simultaneously place concrete on both sides of expansion joints. Deposit the concrete at and in advance of contraction joint assemblies to prevent the formation of segregated concrete in the assembly.

4. Strike off and screed the concrete to the required grade, and cross section as the Plans show, as soon as the concrete is placed.

5. If a temporary shutdown occurs, cover the concrete at the unfinished end of the placement to maintain moisture. Install a construction joint if an interruption is long enough for concrete to develop initial set.

6. Check the surface of the fresh concrete with a long-handled straightedge that is ten feet (10′) or longer. Remove high areas indicated by the straightedge. Overlap each successive pass of the straightedge by about one-half (½) the length of the straightedge. Fill any depressions immediately with freshly-mixed concrete; and strike off, consolidate, and re-finish the concrete. Also, strike off and re-finish all projections.

900.2.4.5 Slip-Formed Pavement

1. Operate slip-form paving equipment with a continuous forward movement, as practicable; and coordinate mixing, delivering, and spreading concrete to provide uniform progress. Check and adjust string lines, sensors, and other paver guidance equipment during paving to assure uninterrupted placement to the Plan alignment and grade.

2. Carry a sufficient amount of concrete forward ahead of the paver. Minimize starting and stopping the paver. If it is necessary to stop the forward movement of the paver, stop vibrating and tamping immediately, and restart when forward motion resumes.

3. Uniformly consolidate the concrete throughout its entire width and depth. Vibrate concrete adjacent to transverse construction joints with hand vibrators.

4. When placing concrete adjacent to previously-constructed pavement, provide the part of the equipment that is supported on the previously-constructed pavement with protective pads, crawler tracks, or rubber-tire wheels; and operate a sufficient distance from the edge of the pavement to avoid breaking the pavement edge. Do not operate this equipment on the pavement surface until the opening to service requirements have been met.

5. Maintain a maximum edge slump tolerance of 3/8″ at free edges and 1/8″ at locations with adjacent concrete construction. Correct edge slump in excess of these requirements before the concrete sets.

900.2.4.6 Manual Fixed-Formed Pavement

1. Deposit concrete as near as possible to its final location to minimize segregation.

2. Use single-spud hand vibrators to consolidate the concrete along the full length of all transverse joint assemblies. Vibrate to a depth that consolidates the concrete above and below the dowel bars and assembly.

3. Use single-spud hand vibrators on concrete adjacent to all transverse construction joints, forms, and fixtures to prevent voids.

4. Supplemental vibration with hand-held spud vibrators is required when placing concrete thicker than five inches (5″) when using a vibratory screed and is always required when using a roller screed. Insert vibrators using vertical plunges, leaving the vibrator head inserted for five to fifteen (5 – 15) seconds to properly consolidate the concrete. Do not drag spud vibrators through the concrete nor attempt to move the concrete laterally.

5. Use surface-type vibratory screeds for hand strike-off and to supplement internal vibration. Do not over vibrate, if using the internal spud vibrator and the vibratory screed. Maintain a sufficient amount of concrete, during operations, in front of the screed to fill all voids or low areas. Do not allow excessive amounts of concrete to accumulate in front of the screed, causing the concrete to surge under the screed, or to produce ridges or waves in the surface. Do not make more than two (2) passes of the vibratory screed on a given area of concrete. Regulate the speed of the forward movement of the screed, and the speed of the vibrator, to produce the best results. Do not vibrate the concrete with the screed in a stationary position.

900.2.5 Placing Concrete

1. Concrete shall not be placed upon a soft, spongy, or frozen base course, the stability of which is, in the opinion of the ENGINEER, unsuitable for the placement of concrete.

2. Immediately prior to placing the concrete, the base shall be tested for conformity with the cross-section shown on the Plans. If necessary, material shall be removed or added, as required, to bring all portions of the subgrade to correct elevation. It shall then be thoroughly compacted and again tested. Concrete shall not be placed on any portion of the base which has not been tested for correct elevation. The base should also be cleared of any loose material which may have fallen upon it.

3. The base shall be in a moist condition at the time the concrete is placed. It shall be thoroughly wetted a sufficient time in advance of the placing of the concrete to insure there will be no puddles or pockets of mud when the concrete is placed, but shall not be allowed to dry out before the concrete is placed.

4. The concrete shall be mixed in quantities required for immediate use and shall be deposited on the subgrade to the required depth and width of the construction lane in successive batches and in a continuous operation without the use of intermediate forms or bulkheads. The concrete shall be placed as uniformly as possible in order to minimize the amount of additional spreading necessary. While being placed, the concrete shall be spaded or vibrated and compacted with suitable tools so that the formation of voids, or honeycomb pockets, is prevented. The concrete shall be especially well spaded and vibrated and tamped against the forms and along all joints. Care shall be taken in the distribution of the concrete to deposit a sufficient volume along the outside form lines so the curb section can be finished simultaneously with the slab.

5. No concrete shall be placed around manholes, or other structures, until they have been brought to the required grade and alignment.

6. The CONTRACTOR is required to stamp all concrete placed in the City of Oshkosh right-of-way. The stamp shall include the CONTRACTOR's name and installation date. The cost for stamping is considered incidental to the concrete placement. The stamp shall be placed at each end of the pour. Single squares require one (1) stamp.

900.2.6 Cold Weather Concreting

1. Except by specific written authorization, concreting shall cease when the descending air temperature in the shade and away from artificial heat falls below 40°F. It shall not be resumed until the ascending air temperature in the shade and away from artificial heat rises to 35°F.

2. Cold Weather Covering Bid Items shall only be utilized when the CONTRACTOR is directed by the CITY to cover previously-placed concrete due to local weather forecasts.

3. The CONTRACTOR shall arrange to have available a sufficient quantity of material to provide thermal protection for concrete that has yet to conform to the opening criteria specified. The CONTRACTOR may provide clear, black, or white polyethylene sheeting conforming to the requirements, except for color and reflectance, specified in **AASHTO M171**. The ENGINEER may allow other curing materials with suitable water resistance, strength, and insulating properties.

4. If the National Weather Service forecast for the construction area predicts temperatures of less than 17°F (-8°C) within the next twenty-four (24) hours, arrange to have available a sufficient quantity of straw or hay to protect all concrete that has yet to conform to the opening criteria specified. If the ENGINEER approves, the CONTRACTOR may use other materials placed to the thickness necessary to provide the same insulating protection as the required thickness of loose, dry straw or hay.

5. At any time of the year, if the National Weather Service forecast for the construction area predicts freezing temperatures within the next twenty-four (24) hours, or when freezing temperatures actually occur, provide the minimum level of thermal protection specified below for concrete that has yet to conform to the opening criteria specified:

PREDICTED OR ACTUAL TEMPERATURE	MINIMUM EQUIVALENT LEVEL OF PROTECTION
22° to <28°F (-6° to <-2°C)	single layer of polyethylene
17° to <22°F (-8° to <-6°C)	double layer of polyethylene
<17°F (<-8°C)	6" loose, dry straw or hay between 2 layers of polyethylene

6. The CONTRACTOR shall place protective material as soon as the concrete is finished and sets sufficiently to prevent excessive surface marring. Maintain the protective material in place until the concrete conforms to the opening criteria specified. If necessary to remove the coverings to saw joints or perform other required work, and if the ENGINEER approves, the CONTRACTOR may remove the covering for the minimum time required to complete that work. Any such removing and re-covering for sawing, sealing, or other work shall be incidental to these Items.

7. These Bid Items are being bid as undistributed quantities. The CONTRACTOR will be paid based on the actual installed quantities **only** and no adjustments in unit prices will be made for any increases or decreases of quantities used.

900.2.7 Consolidating and Finishing

900.2.7.1 General

1. The pavement shall be struck off and consolidated with a mechanical finishing machine or by hand-finishing methods. When a mechanical finishing machine is used, the concrete shall be struck off at such height that, after consolidation and final finishing, it shall be at the exact elevation as shown on the Plans. A depth of at least two inches (2") of concrete shall be carried in front of the strike-off screed for the width of the slab, whenever the screed is being used to strike off the pavement. The finishing machine shall be provided with a screed which will consolidate the concrete by pressure. The concrete shall, through the use of this machine, be brought to a true and even surface, free from rock pockets, with the fewest possible number of passages of the machine. The edge of the screeds along the curb line may be notched out to allow for sufficient concrete to form the integral curb. Hand-finishing tools shall be kept available for use in case the finishing machine breaks down.

2. When hand finishing is used, the pavement shall be struck off and consolidated, by a vibrating screed to the exact elevation as shown on the Plans. When the forward motion of the vibrating screed is stopped, the vibrator shall be shut off; it shall not be allowed to idle on the concrete.

900.2.7.2 Longitudinal Floating

1. After the concrete has been struck off and consolidated, it shall be further smoothed by means of a longitudinal float. If a mechanical longitudinal float is not used, a longitudinal hand float shall be operated from foot bridges spanning the pavement, and shall be worked with a wiping motion, parallel to the pavement centerline, and passing from one (1) side of the pavement to the other. Movement ahead along the centerline of the pavement shall be in successive advances of not more than one-half (½) of the length of the float. The float shall be not less than twelve feet (12′) in length and six inches (6″) in width, and shall be properly stiffened and provided with handles at each end.

900.2.7.3 Scraping

1. After the passage of the longitudinal float, the pavement shall be scraped with a straightedge ten feet (10′) long, equipped with a handle to permit it to be operated so that any excess water and laitance are removed from the surface of the pavement.

900.2.7.4 Straightedging

1. After the longitudinal floating and scraping have been completed and any excess water removed, but while the concrete is still plastic, the slab surface shall be tested for smoothness with a ten-foot (10') straightedge swung from handles three feet (3') longer than one-half (½) the width of the slab. The straightedge shall be placed on the surface parallel to the centerline of the pavement and at not more than five-foot (5') intervals transversely. After each test, the straightedge shall be moved forward one-half (½) its length and the operation repeated. When irregularities are discovered, they shall be corrected by adding, or removing, concrete. All disturbed placed shall be floated with a wooden float not less than three feet (3') long and not less than six inches (6") wide, and again straightedged. The pavement surface shall have no depression in which water will stand.

2. The use of long-handled wood floats shall be confined to a minimum. They may be used behind the longitudinal float to correct surface unevenness not taken care of by the longitudinal float, but shall not be used to float the entire surface of the pavement in lieu of, or supplementing, the use of the longitudinal float.

900.2.7.5 Edging

1. Before final finishing is completed and before the concrete has taken its final set, the edges of the slab and curb shall be carefully finished with an edger of the radius shown on the Plans.

900.2.7.6 Final Surface Finish

1. An astroturf drag shall be used as the final finishing method. The drag shall be at least three feet (3') in width and long enough to cover the entire pavement width. It shall be laid on the surface of the pavement and dragged forward in the direction in which the pavement is being laid. The curb shall have the same final finish as the pavement.

2. The final surface of the concrete pavement and curb shall have a uniform gritty texture, free from excessive harshness, and true to the grades and cross-section shown on the Plans. The ENGINEER may require changes in the final finishing procedure as required to produce the desired final surface texture.

900.2.8 Integral Curb

1. Integral curbs shall be required along the edges of all street pavement as indicated on the Plans, except at such locations as the ENGINEER may direct. Depressed curbs shall be provided at all driveway entrances and at such other locations as designated by the ENGINEER.

2. The integral curb shall be constructed immediately following the finishing operations. Special care shall be taken so that the curb construction does not lag the pavement construction and form a "cold joint".

3. Steel curb forms shall be required to form the backs of all curbs except where street returns of small radius or other special sections make the use of steel forms impractical.

4. In placing the concrete curb, sufficient spading shall be done to secure adequate bond with paving slab and eliminate all voids in the curb.

5. Curbs shall be formed to the cross-section as shown on the Drawings with a mule or templates supported on the side forms and a wood float not less than four feet (4') in length.

6. The finished surface of the curb and gutter shall be checked by the use of the ten-foot (10') straightedge and corrected, if necessary. While the concrete is still plastic, drainage at the gutter should be checked by pouring water at the gutter summit and observing its flow to the inlet. In order to prevent damage to the concrete surface, water should be poured onto a piece of burlap or curing paper.

900.2.9 Curing

900.2.9.1 General

1. Concrete shall be cured by protecting it against loss of moisture; rapid temperature change; and from rain, flowing water, and mechanical injury for a period of not less than five (5) days from the beginning of the curing operation. Moist curing, waterproof paper, white polyethylene sheeting, liquid membrane compound, or a combination thereof may be used for curing. Immediately after the finishing operations as the free water has disappeared, the entire surface of the newly laid concrete shall be covered by the curing medium which is applicable to local conditions and approved by the ENGINEER. The edge of the concrete slabs shall be protected immediately to provide these surfaces with continuous curing treatment equal to the method selected for curing the slab surface and to prevent injury to pavement edges.

2. The use of a covering material which contains or becomes contaminated with sugar in any form, tannic acid, or any other substances considered detrimental to Portland Cement will not be permitted. The initial curing medium shall be effective and shall be applied so as to prevent checking, cracking, and the appearance of dry spots in the surface of the concrete. The CONTRACTOR shall have the equipment needed for adequate curing at hand and ready to install before actual concrete placement begins. In all cases in which the curing medium requires the use of water, the curing shall have prior right to all water supply. Failure to provide sufficient cover material of the type selected, failure to maintain saturation for the entire curing period in the moist curing methods, lack of water to adequately care for both curing and other requirements, or other failures to comply with curing requirements shall be cause for immediate suspension of concreting operations.

900.2.9.2 Concrete Curing Compounds

1. All concrete, including sidewalks and driveways, shall be treated with a surface treatment of linseed oil as specified under **Section 100.58** of these Specifications.

2. The curing compound must be applied to cover the surface completely and uniformly at a rate which will achieve the performance requirements of these Specifications. This method of curing shall be applied immediately behind the final finishing operation or after the initial curing when a combination of methods are used. Failure to provide complete and uniform coverage at the required rate will be cause for discontinuance of this method of curing and

the substitution of one of the other approved methods. The compound shall be kept agitated to prevent the pigment from settling. Special care shall be taken to apply the curing compound to the pavement edges immediately after the forms have been removed.

900.2.10 Joints

900.2.10.1 General

1. Longitudinal and transverse joints shall be constructed as shown on the Detail sheets.

2. Longitudinal joints are those joints parallel to the lane of construction. They may be either intermediate center joints or the construction joints between construction lanes.

3. Transverse joints shall be contraction joints or construction joints. Construction joints are put in transversely wherever construction operations require them.

4. Expansion joints may be either longitudinal or transverse. They are used only where specifically shown on the Detail sheets.

5. The edges of the pavement and those joints where such edging is shown on the Detail sheets shall be rounded with an edger having a radius of not larger than 1/8". Transverse joints, except keyed and tied construction joints, shall be continuous across the entire paved area including the curb.

6. All sawing of concrete shall be done when directed by the ENGINEER. Saw cuts shall be one-quarter inch (¼") wide.

7. All joints shall be sealed per **Section 900.2.2.8** of these Specifications.

900.2.10.2 Transverse Joints – General

1. Transverse joints shall be contraction, expansion, or construction joints. Contraction and expansion joints shall be placed as indicated on the Plans and Detail sheets and construction joints wherever construction may require them. They shall make a right angle with the centerline of the pavement and surface of the subgrade.

900.2.10.3 Transverse Expansion Joints

1. All expansion joints shall be constructed using ½" REFLEX Rubber Expansion Joint. Equivalent products must be approved by the ENGINEER prior to installation. Expansion joints, where shown on the Plans and Detail sheets, shall conform to the specifications of **Section 900.2.2.7** in these Specifications. They shall extend the entire width of the pavement from the subgrade to one inch (1") below the surface of the pavement. They shall be of the

dimensions and spacing as shown on the Plans and Detail sheets. The filler shall be held accurately in place during the placing and finishing of the concrete by a bulkhead, a metal channel cap, or other approved method.

2. Under no circumstances shall any concrete be left above the expansion material or across the joint at any point. Any concrete spanning the ends of the joint next to the forms shall be carefully cut away after the forms are removed.

3. Before the pavement is opened to traffic, the groove above the filler shall be cleaned and sealed with specified joint sealing material covered under Section **900.2.2.8** of these Specifications.

900.2.10.4 Transverse Contraction Joints

1. Transverse contraction joints shall be of the sawed or formed dummy groove type.

900.2.10.5 Transverse Sawed Contraction Joints

1. When transverse contraction joints are to be formed by sawing, care must be taken to saw the grooves soon after placing to prevent the formation of cracks due to contraction of the slab. All transverse joints shall be sawed to one-third (1/3) of the concrete pavement depth. Any procedure for sawing joints that results in premature and uncontrolled cracking shall be revised immediately by adjusting the time interval between the placing of the concrete and the cutting of the joints.

900.2.10.6 Transverse Construction Joints

1. All construction joints shall be constructed as shown on the Plans and shall be placed at the normal joint interval as shown on the Plans, or as directed by the ENGINEER, except in case of emergency. If an emergency transverse construction joint is required, it shall result in a slab of no less than six feet (6') in length, and shall be tied together with the bars as shown on the Plans.

900.2.10.7 Transverse Formed Dummy Groove Joints

1. Transverse dummy groove joints shall be formed by a groove or cleft in the top of the slab of the dimensions shown on the Plans and Detail sheets. The groove made in the plastic concrete by a suitable device shall extend vertically downward one-third (1/3) of the slab depth from the surface and shall be true to line.

900.2.10.8 Dowels

1. If joints are to be equipped with dowels, they shall be of the dimensions and at the spacing and location indicated on the Plans and Detail sheets. They shall be firmly supported in place, accurately aligned parallel to the pavement grade and the centerline of the pavement by means of a dowel support which will remain in the pavement, and will insure that the dowels are not displaced during construction.

2. Drill holes into the edge of the existing concrete to the dimensions the Plans show. Use hydraulic gang drill with a minimum of one (1) independently-powered and driven drill. Control the forward and reverse travel of the drills by mechanically-applied pressure. Mount the drill on a suitable piece of equipment, such that it is quickly transported and positioned. Rest and reference the drill rig frame on the pavement surface, such that the drilled holes are cylindrical, perpendicular to the surface being drilled, and repeatable in terms of position and alignment on the surface being drilled. Hand-held drills are not permitted. Anchor the dowel bars into the existing concrete with an epoxy as specified in **Section 416.2.2.2** of the STATE SPECIFICATIONS.

3. Clean drilling dust, debris, and excess moisture from drill holes before inserting the epoxy and dowel bar.

4. Inject the epoxy into the back of the drill hole. Use an epoxy with a workable viscosity, is pumpable, but is thick enough to remain in the hole. Insert a sufficient volume of epoxy into the hole to provide a small quantity of excess material at the face of the concrete after fully inserting the dowel.

5. Insert dowel bars in the drill holes and rotate one-half (½) turn. Do not force drive dowels bars into the drill holes.

6. Completely fill the annular space between the dowel bar and the concrete with epoxy. Insert a retaining ring over the bar, and push the ring flush against the concrete surface to retain the epoxy.

7. Drill holes such that, when the dowels are anchored, the longitudinal axes of the protruding dowels are parallel to the pavement centerline, the pavement surface, and each other, $\pm$1/8", measured at the saw cut face and the dowel end.

8. Coat the protruding portion of each dowel bar with a thin uniform layer of bond breaking lubricant.

900.2.10.9 Longitudinal Joints – General

1. Longitudinal joints shall be placed as shown on the Detail sheets. They shall be sawed, dummy groove, or the keyed construction type. Joints between construction lanes shall be the keyed construction type.

900.2.10.10 Longitudinal Center Joints

1. Longitudinal center joints shall be sawed or formed dummy groove.

900.2.10.11 Sawed Longitudinal Center Joints

1. Sawed longitudinal center joints shall be sawed grooves made with a concrete saw after the concrete has hardened. The saw cut shall be one-third (1/3) of the concrete pavement depth. The joints shall be sawed within seventy-two (72) hours after the placement of concrete. The joints should be sawed before any heavy equipment or vehicles are allowed on the pavement. These joints are otherwise formed in the same manner as the transverse sawed contraction joints specified in **Section 900.2.10.5** of these Specifications.

900.2.10.12 Longitudinal Construction Joints

1. Longitudinal construction joints (i.e., joints between construction lanes) shall be sawed and constructed as shown on the Detail sheets. The key shall be constructed by placing a deformed metal plate against the form when the first lane adjacent to the joint is placed. This metal plate shall be removed with the form. When placing the second slab, care must be taken that no concrete is left to overhang the lip formed in the first slab by the edging tool.

900.2.10.13 Pavement Ties

1. Pavement ties, when shown on the Detail sheets, shall be of deformed steel and of the dimensions and at the spacing specified. The pavement ties shall consist of #6 x 12" epoxy-coated, deformed bars spaced thirty inches (30") or thirty six inches (36") center on center at the locations shown on the Plans. Drill holes into the edge of the existing concrete to the dimensions that the plans show. Anchor the tie bars into the existing concrete with an epoxy conforming to **Section 416.2.2.2** of the STATE SPECIFICATIONS and install the tie bars, conforming to **Section 416.2.2** of the STATE SPECIFICATIONS, except that no bond breaker is required. The hole for the bar shall be drilled to a depth of seven inches (7"). The bars shall be located at one-half (½) thickness of the existing concrete pavement. All pavement ties shall be epoxy-coated in conformance with **Section 505.2.4** of the STATE SPECIFICATIONS.

900.2.10.14 Joint Sealer

1. This material shall conform to the requirements of **Section 900.2.2.8** of these Specifications.

2. Sealing of joints shall be performed in accordance with plan requirements and as directed by the ENGINEER. The joints, when sealing material is applied, shall be clean and free from all concrete spurs, dust, dirt, or other foreign material. Sealing material shall be applied when the joint surfaces are dry and the air temperature is 40°F or higher.

3. The sealing compounds shall be heated to the pouring temperature recommended by the manufacturer in an approved kettle or tank, constructed as a double boiler, with the space between the inner and outer shells filled with oil or other satisfactory heat transfer medium. The heating kettle shall be equipped with a mechanical agitator, positive temperature control, and an approved dial thermometer for checking temperatures of the compound. The heating kettle, if and when operated on concrete, shall be properly insulated against the radiation of heat to the concrete surface. The material, when charging the kettle, shall be cut or broken into small chunks to facilitate melting. The sealing compound shall not be heated above the maximum safe heating temperature. The maximum safe heating temperature shall be that as determined from tests made on samples from each lot or shipment of the material delivered to the project. Where relatively small quantities of sealer are used, the manufacturer's recommended maximum safe heating temperature may be used in lieu of test determinations. Any material heated above the maximum safe heating temperature shall be discarded and not used.

4. Pouring of joints shall be made when the sealing material is at the required temperature and, insofar as practicable, the sealing compound shall be maintained at uniform temperature during pouring operations. Pouring shall not be permitted when the temperature of the sealing compound in the applicator, as it is applied to the joint, is more than 10°F below the recommended pouring temperature. Pouring of the molten sealer in the joint opening shall be done with such equipment that the sealer completely fills the joint opening without overflowing on the adjoining surface and when finished, after shrinkage, the sealer is approximately flush with the adjoining surfaces. In the event satisfactory sealing of a joint is not accomplished in a single pouring, the sealing compound shall be placed in two (2) pourings. At least one-half (½) of the required amount shall be placed in the first pouring, and the second pouring shall follow the first as soon as practicable after the first pouring has attained maximum shrinkage, but not later than one (1) hour after the first pouring.

900.2.10.15 Integral Curb Joints

1. In the construction of transverse joints of concrete integral curb pavement, special care must be taken to see that all transverse joints extend continuously through the pavement and curb.

900.2.11 Structures

1. All manholes, catch basins, or structures of a permanent nature encountered in the area to be paved shall be raised or lowered, as the case may be, to the surface of the new pavement. Multiple adjustment rings will not be allowed. **Concrete-grade rings shall be three-inch (3") minimum thickness. Rings less than three inches (3") thick shall be rubber.** All sanitary structures shall be fitted with the specified chimney seal.

2. Any castings that are abandoned, or are unfit for use, must be hauled to the City Garage and exchanged for new castings. Some inlet castings will have plates in place of the curb boxes. The plates must be taken to the City Garage and exchanged for boxes. The boxes must then be bolted in place by the CONTRACTOR. All costs of hauling and placing castings and boxes must be included in the cost of the pavement, as no extra monies will be paid for this work.

900.2.12 Turf Restoration

1. The limits of restoration shall include the area between the curb and property line and any disturbed area behind the property line. The CONTRACTOR shall backfill with earth suitable for growing grass and fine grade the **entire** terrace area behind the new curb. Also, included in the terracing limits are all areas that are disturbed by the utility construction related to this project.

2. Prior to backfilling behind the curb or edge of gravel, all stones, concrete, and any other debris must be removed. Backfill material must be clean clay or dirt, thoroughly compacted, and held down **six inches (6")** from the finished surface.

3. The CONTRACTOR must furnish and haul all necessary backfill and topsoil material, as the CITY will not supply this material. It will be the CONTRACTOR's responsibility to determine the amount of topsoil needed to meet the Specifications.

4. The topsoil shall be **six-inch (6") thick** rich earth pulverized to a depth of **six inches (6")** with no clods of earth larger than one inch (1") in diameter and be free of lumps, stones, sticks, or any other foreign material, and must be approved by the ENGINEER prior to placement. The topsoil shall consist of natural loam, sandy loam, or silt loam humus-bearing soils adapted to the sustenance of plant life, and such topsoil shall neither be excessively acid nor excessively alkaline. A minimum organic content of five percent (5%) is required. Prior to placement, the CONTRACTOR shall have all topsoil tested and certified to meet these Specifications by a soil-testing firm to be approved by the ENGINEER.

5. The restoration areas shall be cut or filled to proper grade in accordance with the typical cross-section and then restored as described above. The cost for cut or fill shall be included in the cost of Turf Restoration. If the existing terrace area has good grass and is reasonably close to proposed grade, the CONTRACTOR shall contact the property owner. If the property owner desires to salvage the existing grass, the CONTRACTOR shall not disturb it.

6. The CONTRACTOR shall compact any fill so as to guarantee no settlement. Any settlement that appears within a two (2) year period must be corrected as per **Section 100.39** of these Specifications.

7. Any backfill or topsoil material that is placed and is not acceptable to the ENGINEER must be removed at the CONTRACTOR's expense. Any restored areas that do not exhibit adequate germination or have excessive weed growth shall be corrected in the following spring prior to final payment being made.

8. All driveway approaches are intended to be paved as part of the Contract; however, if an approach or driveway will remain gravel, the disturbed area or area designated by the ENGINEER must be replaced with either ¾" minus graded, crushed stone or screenings, whichever more closely matches the existing material. The following Specification shall be used for the screenings: Well graded from course to fine containing sufficient fines to bind material when compacted, but with a maximum ten percent (10%) by weight passing the No. 200 sieve. The stone must be placed in layers and thoroughly graded and compacted. All stone must be new; **no salvaged base material will be allowed to be used in gravel driveway approaches**. All costs of gravel driveway and approach work will be paid for per square yard acceptably placed.

9. Seed, fertilizer, and erosion control mat or hydraulically-applied erosion control products shall be provided and installed by the CONTRACTOR in accordance with **Section 2600** of these Specifications.

10. Erosion mat shall be Urban Class I, Type A; American Excelsior Company's Curlex QG QM excelsior blanket is an allowed material.

11. Watering of the seeded restored areas will be the responsibility of the adjacent property owner. However, the CONTRACTOR shall notify each property owner of watering schedule recommendations immediately upon completion of the seeding. The notice shall be provided by the CITY and delivered by the CONTRACTOR "door to door".

12. The CONTRACTOR will be required to restore all terraces and disturbed areas per **Section 2600** of these Specifications.

13. The use of rubber-tired equipment operating from the pavement is the preferred method of operation for this type of work. Alternate equipment and methods must be approved by the ENGINEER prior to the start of work. **The CONTRACTOR shall operate all equipment in such a manner that equipment tires or tracks do not discolor, mark, or damage sidewalk, driveway, and/or pavement**.

900.2.13 Tests of Concrete

1. All cylinder tests of concrete will be prepared by and tested by the CONTRACTOR. No less than one (1) air test for each one hundred fifty (150) cubic yards of concrete for each class of

concrete placed will be required; and in any event, not less than one (1) air test and one (1) set of concrete cylinders for each day's pour for each class of concrete will be required. Not less than four (4) specimens shall be made and cured in accordance with current **ASTM Specifications C-39** and **C-31**, Standard Method of Making Concrete Compression and Flexural Test Specimens in the Field. The cylinders shall be prepared by an ACI-certified Contractor or subcontracted to an ACI-certified staff and cured and tested at a WDOT-certified, ACI-certified, or similarly-accredited laboratory. The reports generated from these tests shall be submitted to the CITY within three (3) working days.

2. For regular-strength concrete mix (6) bag, tests shall be made at seven (7) days and twenty-eight (28) days.

3. **Special high early strength concrete cylinder breaks** shall be done in accordance with **ASTM C-94**. **Special high early strength concrete (9) bag compressive strength tests** shall be done at one (1) day and twenty-eight (28) days. High early strength concrete (7) bag compressive strength tests shall be done at three (3) days and twenty-eight (28) days.

4. The cylinder test will be evaluated on the basis of **ASTM C-94** with the design strength f'c = 3,500 psi. For a strength test, two (2) standard test specimens shall be made from a composite sample. A test shall be the average of the strengths of the two (2) specimens at twenty-eight (28) days. If the differential strength of the two (2) specimens is 350 psi or greater, the low strength specimen shall be discarded and the strength of the remaining cylinder shall then be the test result. If the test result is below 3,500 psi, the test result is considered a failure. Also, if either of the two (2) 28-day specimens falls below 3,000 psi, the test result is considered a failure.

5. In the event of a failed test result, the ENGINEER shall have the right to order the inferior concrete removed and replaced with new concrete by and at the expense of the CONTRACTOR.

6. In addition where there is a question as to the quality of the concrete in the pavement, the ENGINEER may require tests in accordance with the Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete (**ASTM C-42**). Core samples shall be taken from the pavement where deemed necessary. If the tests do not meet standards, the CONTRACTOR shall be required when ordered by the ENGINEER to remove and replace the pavement in question. All core testing shall be at the expense of the CONTRACTOR. The core test will be evaluated against the twenty-eight (28) day design strength.

900.2.14 Opening to Traffic

1. The CONTRACTOR shall protect the pavement against all damage prior to final acceptance of the work by the CITY. Traffic shall be excluded from the pavement by erecting and maintaining barricades and signs until an average of two (2) test cylinders reaches 3,000 psi

compressive strength with neither of the test cylinders being less than 2,700 psi (i.e. ten percent (10%) of 3,000 psi). These cylinders shall be cured under conditions similar to those prevailing for the pavement which they represent. In the absence of test cylinders, the following chart shall be followed:

TYPE	CONCRETE GRADE	CEMENT CONTENT LBS. (# BAGS)	>70ºF AVG TEMP # DAYS TO OPEN	>60ºF AVG TEMP # DAYS TO OPEN	<60ºF AVG TEMP # DAYS TO OPEN
TYPE I	A	565 (6)	7	10	21
TYPE 1 WITH WATER REDUCER	A2 - WR	530 (5.6)	7	10	21
HIGH EARLY	C	660 (7)	3	4	7
SPECIAL HIGH EARLY	----	846 (9)	8 HRS	8 HRS	8 HRS

2. All grades are to be air entrained. Special High Early Strength concrete pavement may need admixtures to reach 3,000 psi in eight (8) hours at < 70ºF average temperatures.

3. All concrete supplied by ready-mix companies shall be discharged within one (1) hour of batching (adding water at plant). Grade A and Grade A2-WR discharge time can be increased to 1.5 hours when temperature is generally < 60ºF.

4. In all cases, the pavement shall be cleaned, and the joints shall be cleaned and sealed before traffic of any kind is permitted to use the pavement.

5. The pavement shall not be used at any time within this period for transporting or operating equipment. The work under construction shall not be opened to traffic until so directed or authorized by the ENGINEER.

6. As a construction expedient, the subgrade planer, concrete finishing machine, and similar equipment may be permitted to ride upon the edges of previously constructed slabs, provided the concrete is more than seventy-two (72) hours old, and the equipment has rubber-tired wheels to run on the finished slab.

7. One (1) lane of traffic on intersecting streets so indicated in the *Special Conditions* shall be left open to traffic at all times.

900.2.15 High Early Strength Concrete

1. If the concrete pavement placed under a High Early Strength Bid Item does not obtain 3,000 psi compressive strength within the specified or generally accepted time limit, the quantity of concrete placed will be paid for under the appropriate regular strength Concrete Pavement Bid Item.

900.2.16 Chloride Free Admixtures

1. All concrete pavement admixtures shall be chloride free.

900.2.17 Paving Schedule

1. Paving operations for the second side of a street must commence immediately upon curing of the first side, but no longer than ten (10) days after initial placement.

PAVING SPECIFICATIONS

SECTION 1000
CLEARING AND GRUBBING

1000.1 Description

1. The work covered by this Section of the Specifications consists of furnishing all labor, equipment, materials, and supplies needed to perform all operations in connection with cutting and disposing of trees, brush, windfalls, logs, and other vegetation occurring within the clearing limits; and removing and disposing of roots, stumps, stubs, logs, and other timber occurring within the grubbing limits. The CONTRACTOR shall be responsible for disposal of the terrace tree and stump materials, for backfilling with appropriate material, and for compacting any void left by the stump removal. The CONTRACTOR shall, at the adjacent property owner's request, leave the wood for the property owner's use.

1000.2 Construction

1. Clear and grub all areas within the clearing and grubbing limits defined as follows:
   A. All undesirable trees, brush, shrubs, stumps, and other vegetation designated for removal;
   B. Designated clear zone and clear vision areas; and
   C. With the ENGINEER's approval, areas with vegetation that interferes with excavation.

2. Preserve vegetation within the clearing limits as the Plans show or as the ENGINEER directs. Cut off and dispose of all other trees, brush, shrubs, or other vegetation occurring within the clearing limits. Within the grubbing limits, remove debris not suitable for the roadway or terrace foundation, stumps and associated roots, logs, timber, brush, and matted roots to the following minimum depths:
   A. In cut areas, one foot (1′) below final subgrade and
   B. In embankment areas, one foot (1′) below the existing grade.

3. Do not remove trees and shrubs located beyond the clearing limits unless the ENGINEER specifically authorizes their removal. If clearing where grubbing is not required, cut shrubs and brush to within three inches (3″) of the ground surface. Cut trees as nearly flush with the ground surface as is practical with tools ordinarily used for these operations.

4. If feasible, fall trees toward the center of the area being cleared. If this is not possible due to danger to traffic or injury to other trees, structures, or property, cut them into sections from the top down.

5. Do not injure or damage trees and shrubs left in place on the right-of-way. Symmetrically trim lower limbs or branches of trees left in place and overhanging the roadbed to at least fourteen feet (14′) above the finished grade. This work shall be performed under the direction of the City Forester. Trim using generally-accepted horticultural practices.

6. Unless the Contract specifies otherwise, the CONTRACTOR shall consult with the adjacent owners about disposing of trees cut on the land adjacent to their property. The property owners have first right to the cut wood. If adjacent property owner rejects the wood, the CONTRACTOR shall remove from the right-of-way and dispose of trees, or portions of trees. Set aside all logs and timber greater than four inches (4") in diameter to the extent feasible for commercial or fuel use.

7. Dispose of stumps, roots, brush, waste logs and limbs, timber tops, and debris resulting from clearing and grubbing or occurring within the clearing and grubbing limits by chipping or removing from the right-of-way.

8. For disposal by mechanical chipping, recover all material as it leaves the chipping machine.

9. Unless disposed of in another manner, dispose of material off the right-of-way according to applicable solid waste disposal regulations. Obtain written permits for this disposal from the owner of the property where placing the material, unless disposing of this material at a licensed waste disposal operation. Furnish permits, or copies of permits, to the ENGINEER before disposal begins.

10. Debark all elm logs salvaged and all elm wood or stumps not disposed of by chipping, burning, or burying; and chip, burn, or bury the bark. For clearing and grubbing operations performed between April 1st and September 30th, perform final disposal of elm wood, bark, or debris within thirty (30) days. For clearing and grubbing operations performed between October 1st and March 31st, perform final disposal of elm wood, bark, or debris before the succeeding May 1st.

11. Dispose of all clearing and grubbing debris before proceeding with grading operations.

12. **Where trees are to be preserved**, see **Section 100.63** of these Specifications for permissible limits of root cutting.

13. If the CONTRACTOR in the tree or stump removal process damages sidewalk or pavement that is to remain in place, the CONTRACTOR shall be responsible for all costs of replacing the damaged area.

14. All limbing shall be to a minimum height of eight feet (8') above the sidewalk and ten feet (10') above the street and shall be done under the direction of the CITY's Forestry Division. The CITY has option to pull this work from the Contract if the work is completed by the property owners or the CITY's Forestry Division.

1000.3 Measurement

1000.3.1 General

1. The CITY will measure clearing and rubbing separately; either by the station, or inch of diameter, as the Contract indicates.

2. The CITY will not measure incidental clearing and grubbing operations required to perform the work as follows:
   A. Clearing areas of light brush, shrubs, and other vegetation that the CONTRACTOR can cut with a brush scythe or mowing machine;
   B. Clearing areas containing logs, tree roots, roots of brush and shrubs, and other vegetation having a woody structure that the CONTRACTOR can remove with a rooter; or
   C. Clearing small trees of less than three inches (3″) in diameter.

3. The CITY will measure Limbing Existing Trees as each individual tree that is acceptably completed.

1000.3.1.1 By the Station

1. The CITY will measure clearing and grubbing by the full 100′ station acceptably completed, measured along the roadway centerline or reference line with each full 100′ station starting and ending at a +00 station. If two (2) or more separate roadways occur, the CITY will measure along the centerline or reference line of each roadway. For divided highways, the CITY will extend measurement units for each roadway, in width, from five feet (5′) outside the grading limit of that roadway to a line midway between the reference lines or centerlines for each roadway.

2. The CITY will only include stations with a total of twelve inches (12″) or more of diameter determined as specified under **Section 1000.3.1.2** of these Specifications. The CITY will include each station conforming to this criterion as a full station.

1000.3.1.2 By the Inch of Diameter

1. The CITY will measure clearing and grubbing by the inch of diameter acceptably completed. The CITY will determine tree diameter by measuring the circumference approximately four feet (4′) above the existing ground level, but above the ground swell, and dividing by three (3). The CITY will determine stump diameter, for stumps not resulting from the CONTRACTOR's clearing operations, by computing the average diameter of the stump top. The CITY will include only those in-place trees or stumps with a three-inch (3″) or greater diameter. The CITY will round circumference measurements and diameters to the nearest inch.

1000.4 Payment

1. The CITY will pay for measured quantities at the Contract unit price under the following Bid Items:

Bid Item	Description	Units
CLEARING		
1010	Clearing	STA
1011	Clearing	ID
1012	Limbing Existing Trees	EA
GRUBBING		
1020	Grubbing	STA
1021	Grubbing	ID

2. Payment for clearing and grubbing is full compensation for the following:
   A. All clearing and all grubbing required under this Section and performed within the clearing and grubbing limits, as defined in **Section 1000.2** of these Specifications, and
   B. Handling, hauling, piling, burning, burying, trimming, chipping, wound treatment, re-handling, and disposing of waste and debris.

3. The CITY will pay for clearing and grubbing ordered and performed beyond the clearing and grubbing limits, as defined in **Section 1000.2** of these Specifications at the Contract unit price per inch of diameter. If the Contract does not contain Clearing and Grubbing Bid Items using those units, the CITY will pay for this additional clearing and grubbing as extra work.

4. The incidental clearing and grubbing described in **Section 1000.3.1** of these Specifications is incidental to the Excavation Bid Items.

5. Payment for Bid Item #1012 is for full compensation for mobilizing to the site; removing the necessary tree limbs; handling, hauling, piling, burning, burying, trimming, chipping, treating of tree wounds, re-handling, and disposing of waste and debris; and cleaning of the site.

SECTION 1050
MOBILIZATION

1050.1 Description

1. The work covered by this Section of the Specifications consists of furnishing all labor, equipment, materials, and supplies needed to initially mobilize to the site.

1050.2 Construction

1050.3 Measurement

1. The CITY will measure mobilization as twenty-five percent (25%) complete when equipment required to perform work has been delivered to site and initial deliveries of materials have been completed. The next twenty-five percent (25%) of the mobilization will be measured when equipment and excess materials have been removed from the site. The remaining fifty percent (50%) of the mobilization will be equally spread across the anticipated duration of the Contract.

2. The CITY will only pay for one (1) mobilization per project. If multiple crews are required at various times throughout the project or the CONTRACTOR de-mobilizes and re-mobilizes to the site, only one (1) mobilization will be considered.

1050.4 Payment

1. The CITY will pay for measured quantities at the Contract unit price under the following Bid Items:

Bid Item	Description	Units
MOBILIZATION		
1050	Mobilization	LS

2. Payment for the Mobilization Bid Item is full compensation for providing all necessary labor, equipment, and materials to deliver necessary equipment and materials to the site to perform the work as shown in the Plans and Specifications; for providing adequate project management to ensure the project is completed in accordance with the Plans and Specifications; and for providing all necessary labor, equipment, and materials to remove the necessary equipment and excess materials from the project site.

SECTION 1100
REMOVALS

1100.1 Description

1. The work covered by this Section of the Specifications consists of furnishing all labor, equipment, materials, and supplies used in performing all operations in connection with the pavement, sidewalk, and driveway removals as detailed in the Specifications and as shown on the applicable Drawings.

1100.2 Materials

1100.2.1 Removal Classification

1. The CITY classifies removals as pavement, curb and gutter, sidewalk and driveway, railroad rails and ties, and building foundations.

1100.2.1.1 Pavement Removal

1. Pavement removals will consist of concrete pavement, full-depth asphalt pavement (five inches (5″) or thicker), or hot mixed asphalt surface over concrete pavement. Cold mixed, seal-coated, or hot mixed asphalt surface will be considered as part of Excavation.

2. Curb and gutter removal will be paid for as Pavement Removal.

3. Removal of cold mixed or seal-coated roadway surfaces will be considered Excavation and paid for per **Section 1200** of these Specifications.

1100.2.1.2 Sidewalk and Driveway Removal

1. The removal of sidewalks and drive approaches consisting of concrete and hot mixed asphalt will be classified as Sidewalk and Driveway Removal.

2. Removal of cold mixed or seal coated sidewalk or driveway surfaces will be considered Excavation.

1100.3 Construction

1100.3.1 Removals

1. If retaining a portion of the existing structure, avoid damaging that portion during construction operations. Do not use any equipment or devices that might damage structures, facilities, or property to be preserved and retained. Complete all operations necessary to remove or abandon an existing structure and that might endanger the new construction before constructing new work.

2. During the removing of pavement, curb, gutter, sidewalk, crosswalk, and similar structures, and if portions of the existing structure are to remain in the surface of the finished work, remove the structure to an existing joint, or saw the structure to a true line with a face perpendicular to the surface of the existing structure. Remove enough of the structure to provide proper grades and connection to the new work. Maintain drainage as specified for drainage during construction.

3. Unless specified otherwise, remove all structures the Contract designates for removal or that interfere with the new construction.

4. All material removed under these Bid Items will become the property of the CONTRACTOR, and shall be disposed of by the CONTRACTOR.

1100.3.1.1 Railroad Rail Removal

1. All material removed under Railroad Rail Removal shall become property of the CONTRACTOR and shall be disposed of by the CONTRACTOR.

1100.3.1.2 Railroad Tie Removal

1. The railroad ties may be embedded in the concrete and they will need to be separated from the concrete before hauling. All costs associated with separating railroad ties from the concrete base will be included in the bid price for Railroad Tie Removal.

2. Railroad Tie Removal shall include hauling railroad ties to the landfill. CONTRACTOR will have to verify if the landfill in Oshkosh, Wisconsin is still accepting railroad ties.

3. If petroleum-impacted railroad ties are encountered, they shall be hauled to the Valley Trail Landfill in Berlin, Wisconsin. The cost for hauling petroleum-impacted railroad ties will be paid for under the Excavation Special (Paving) Bid Item.

1100.3.1.3 Building Foundation Removal

1. The foundations shall be removed to a depth of at least two feet (2′) below the subgrade. The unit price shall also include providing, placing, and compacting granular backfill material.

1100.4 Measurement

1. Unless specified otherwise, the CITY will measure this work in the original position of the removed structures. If the Contract does not include Bid Items for removing the listed miscellaneous structures from within the roadway, the CITY will measure the excavation for those removals as common excavation. The CITY will determine the volume of excavation for removing concrete structures as the area of the structure times the depth removed.

2. The CITY will measure removing pavement by the square yard acceptably complete, regardless of the depth or number of courses encountered.

3. If removing curb, gutter, or curb and gutter is required in conjunction with removing pavement, the CITY will measure removing these structures by the square yard acceptably completed, under the Removing Pavement Bid Item. If removing a rigid base with an asphaltic surface extending beyond the lateral limits of the rigid base, as in a widened pavement, the CITY will measure only the area occupied by the rigid base under the Removing Pavement Bid Item. The CITY will measure the portion of the asphaltic surfacing beyond the rigid base removed under the Excavation Bid Items. The CITY will make no deductions for any opening in the removed pavement having an area of three (3) square yards or less.

4. The CITY **will** deduct from the volume measured under the Excavation Bid Items for pavement removed under the Removing Pavement Bid Item.

5. If removing curb, gutter, or curb and gutter that is separate from and not removable in conjunction with removing pavement, the CITY will measure removing curb, removing gutter, and removing curb and gutter by the linear foot and payment will be made under the Removing Curb and Gutter Bid Item.

6. The CITY will measure removing concrete sidewalk by the square foot acceptably completed. The CITY will include steps based on the area of the horizontal projection of the steps.

7. The CITY will measure Railroad Rail Removal by the linear foot of railroad rails acceptably removed. The unit price for Railroad Rail Removal shall include all necessary labor, equipment, and materials to remove, haul away, and dispose of all existing railroad rails from the limits of the street right-of-way in those locations specified by the Plans.

8. The CITY will measure Railroad Tie Removal by the ton that is acceptably removed. The CITY will pay the tipping fees directly to the landfill separate from the Railroad Tie Removal Bid Item. The unit price for Railroad Tie Removal shall include all necessary labor, equipment, and materials to separate, load, and haul away old railroad ties encountered during construction.

9. The CITY will measure Building Foundation Removal by the linear footage of foundations acceptably removed. The unit price for Building Foundation Removal shall include the necessary labor, equipment, and materials to remove, haul away, and dispose of building foundations encountered within the construction limits as shown on the Plans.

1100.5 Payment

1100.5.1 General

1. The CITY will pay for measured quantities at the Contract unit price under the following Bid Items:

Bid Item	Description	Units
	REMOVALS	
1100	Removing Pavement	SY
1101	Removing Railroad Rails	LF
1102	Removing Railroad Ties	TON
1103	Removing Building Foundations	LF
1110	Removing Curb and Gutter	LF
1120	Removing Concrete and Asphalt Sidewalk and Driveway	SF

SECTION 1200
EXCAVATION

1200.1 Description

1. The work covered by this Section of the Specifications consists of furnishing all labor, equipment, materials, and supplies used in performing all operations in connection with the excavation and removal to proper grade, and to haul away from the site all material necessary to construct the pavement and curb and gutter to the line and grade as shown on the Plans and Special Details. These Bid Items shall also include any cost to remove and haul away any miscellaneous debris encountered during the excavation process. Any dewatering will be considered incidental to the Contract.

1200.2 Unclassified Excavation

1200.2.1 Unclassified Street Excavation

1. Unclassified excavation shall consist of the excavation and satisfactory disposal of all materials taken from within the right-of-way for the construction of the earth subgrade of the proposed street. Except when otherwise provided, this work shall also include the removal and disposal of existing surface and base courses, masonry walls, foundations of the buildings, stone fences, stone piles, and other surplus and unsuitable materials.

2. Unclassified excavation shall conform to **Section 205** of the STATE SPECIFICATIONS.

3. Any dewatering will be considered incidental to the Contract.

4. During construction, the CONTRACTOR must provide support for any affected utilities and side slopes. The CONTRACTOR must protect the affected utilities and will be required to pay repair costs due to lack of required support and protection.

5. Where material encountered within the limits of the work is considered unsuitable by the ENGINEER, such material shall be excavated below the grade shown on the Drawings or as directed by the ENGINEER, and replaced with suitable material. All excavated materials which are considered unsuitable, and any surplus of excavated material which is not required for embankments, shall be disposed of by the CONTRACTOR as directed by the ENGINEER. All excess excavated material will become the property of the CONTRACTOR.

6. It should be noted that **undercutting** that is authorized by the ENGINEER will be paid for under this Item. The payment will be based on the in-place volume of material removed.

7. All suitable material removed from the excavation shall be used, insofar as practicable, for backfilling between curb and sidewalk and for such other purposes as directed by the ENGINEER.

8. The CONTRACTOR will be paid on the basis of the total amount of excavation. All excess material and/or debris removed from the roadbed shall become the property of the CONTRACTOR.

9. It should be noted that the excavation quantity as shown on the Proposal is the total cut or the total amount of material to be removed to construct the pavement. This quantity does not include topsoil stripping for any fill areas. The yardage was calculated for the Proposal by cross-sectioning and Average End Area Method. The final pay quantities may vary depending on conditions found in the field. Where conditions vary significantly from the Proposal, the area will be cross-sectioned and recalculated. The CONTRACTOR shall accept the number of cubic yards as determined by the ENGINEER and will be paid for as such. **The volume of pavement removal (as defined under Section 1100 of the current edition of the *Standard Specifications for City of Oshkosh, Wisconsin*) within the excavation limits will be deducted from the Excavation Item and paid under the appropriate Removal Item. The volume of Excavation Special (as defined under Section 1200 and Section 1250 of the current edition of the *Standard Specifications for City of Oshkosh, Wisconsin*) within the excavation limits will be deducted from the Excavation Item and paid under the appropriate Excavation Special Item.**

1200.2.1.1 Unclassified Sidewalk Excavation

1. Unclassified excavation shall consist of the excavation and satisfactory disposal of all materials taken from within the right-of-way for the construction of the earth subgrade of the proposed sidewalk. Except when otherwise provided, this work shall also include the removal and disposal of existing surface and base courses, masonry walls, foundations of the buildings, stone fences, stone piles, and other surplus and unsuitable materials.

2. Unclassified excavation shall conform to **Section 205** of the STATE SPECIFICATIONS.

3. Any dewatering will be considered incidental to the Contract.

4. During construction, the CONTRACTOR must provide support for any affected utilities and side slopes. The CONTRACTOR must protect the affected utilities and will be required to pay repair costs due to lack of required support and protection.

5. Where material encountered within the limits of the work is considered unsuitable by the ENGINEER, such material shall be excavated below the grade shown on the Drawings or as directed by the ENGINEER, and replaced with suitable material. All excavated materials which are considered unsuitable, and any surplus of excavated material which is not required for embankments, shall be disposed of by the CONTRACTOR as directed by the ENGINEER. All excess excavated material will become the property of the CONTRACTOR.

6. It should be noted **undercutting,** that is authorized by the ENGINEER, will be paid for under this Item. The payment will be based on the in-place volume of material removed.

7. All suitable material removed from the excavation shall be used, insofar as practicable, for backfilling between curb and sidewalk and for such other purposes as directed by the ENGINEER.

8. The CONTRACTOR will be paid on the basis of the total amount of excavation. All excess material and/or debris removed from the roadbed shall become the property of the CONTRACTOR.

9. It should be noted the excavation quantity as shown on the Proposal is an estimated amount of material to be removed to construct the sidewalk/driveway. This quantity does not include topsoil stripping for any fill areas. The yardage was calculated by Average End Area Method. The final pay quantities may vary depending on conditions found in the field. The CONTRACTOR shall accept the number of cubic yards as determined by the ENGINEER and will be paid for as such.

10. The material used to fill the excavated areas shall be paid for under Bid Items #1800 through 1811.

1200.2.2 Borrow Excavation

1. Borrow excavation shall consist of excavating, hauling, placing, and leveling of material required to construct the street subgrade when sufficient quantities of fill material cannot be obtained within the limits of the right-of-way.

2. Borrow excavation shall conform to **Section 208** of the STATE SPECIFICATIONS.

3. The borrow excavation quantity listed on the Proposal is estimated. The final borrow excavation quantity will be computed by the Average End Area Method based on actual cross-section measurements taken within the right-of-way area at the time of setting grade stakes. Borrow excavation will be paid per cubic yard as bid on the Proposal.

1200.2.3 Over-Excavation

1. Where the CONTRACTOR over-excavates, they shall place select fill material to the proposed subgrade elevation according to the Specifications at their expense.

1200.2.4 Fills and Excess Material

1. In areas where fill is needed to bring the subgrade up to grade, the CONTRACTOR shall utilize excess materials taken from other streets on the Contract. If there is an insufficient amount of excess material for fill, the CONTRACTOR shall be required to bring in fill material. Fill material brought in from outside the project area will be paid as borrow excavation. Unless otherwise noted, fill required in terrace areas will be incidental to the Terracing Bid Item and no extra monies shall be paid.

2. In areas of fill within the right-of-way, the CONTRACTOR shall remove all topsoil, humus, bushes, trees, and roots, etc. prior to depositing the select fill material. The select fill material shall be free from sod, stumps, logs, and other perishable matter. The material shall be deposited, spread, leveled, and compacted in layers which do not exceed twelve inches (12") in thickness.

3. Hauling, depositing, spreading, and leveling excess material obtained from the project shall be considered as subsidiary work pertaining to and included in the bid price for Excavation.

4. Where excess material is not utilized, the material shall become the property of the CONTRACTOR, and the CONTRACTOR shall remove and dispose of it from the job site. The cost of removal and disposal shall be included in the bid price for Excavation.

1200.2.5 Excavation Special

1. Refer to **Section 1250** of these Specifications.

1200.2.6 Ground Stabilization Fabric

1. Ground stabilization fabrics shall consist of woven polyester, polypropylene, stabilized nylon, polyethylene, or polyvinylidene chloride and shall comply with the following minimum physical requirements:

Parameter	Method	Value
Trapezoid Tear (lbs.)	**ASTM D-4533**	100 lbs.
Permittivity (sec-1)	**ASTM D-4491**	.02
Apparent Opening Size (sieve size)	**ASTM D-4751**	30/70
Ultraviolet Degradation (% strength retained)	**ASTM D-4355**	70
Grab Tensile Strength (lbs.)	**ASTM D-4632-86**	280 lbs. min.
Puncture Strength (lbs.)	**ASTM D-4833**	115 lbs. min.
Mullen Burst (psi)	**ASTM D-3786**	600 psi min.
Elongation at Required Strength (%)	**ASTM D-4632-86**	25% max.

2. Woven fabric shall have the minimum strength values in the weakest principal direction.

3. All numerical values represent minimum/maximum average roll values (i.e., the average of test results on any roll in a lot should meet or exceed the minimum values in the table).

4. The rolls of fabric are to be kept dry until installed and shall be clearly marked showing the type of fabric. The fabric shall be insect-, rodent-, mildew-, and rot-resistant and be furnished in a wrapping which will protect the fabric from ultraviolet radiation and from abrasions due to shipping and handling.

1200.2.7 Over-Excavation in Utility Trenches

1. In areas where over-excavation of the utility trench is required as shown on the Plans or approved by the ENGINEER, the CONTRACTOR shall undercut the proposed utility trench to natural clay material, haul away material from the site, and backfill with material and installation methods conforming to **Section 100.61** of these Specifications.

2. The unit price for these Bid Items shall include all necessary labor, equipment, and materials to undercut the water main trench to natural clay material, haul away material from the site, and to backfill to proper grade.

3. These Bid Items shall also include any cost to remove and haul away old wood and organic material noted in the Geotechnical Report, which is included in these Specifications. Any dewatering will be considered incidental to the Contract.

4. These Bid Items will be measured by the cubic yard for the trench backfill material that is installed.

5. The quantity in the estimate of quantities is only an estimate. The CONTRACTOR will be paid based on the actual, installed quantities only and no adjustments in unit prices will be made for any increases or decreases of quantity installed.

1200.3 Measurement

1. All classes of roadway excavation will be measured by the cubic yard acceptably completed.

2. Ground stabilization fabric will be measured per square yard in-place installed. No extra money will be paid for required overlap of fabric.

1200.4 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
	EXCAVATION	
1200	Unclassified Excavation	CY
1205	Unclassified Excavation (Sidewalk)	CY
1210	Borrow Excavation	CY
	GROUND STABILIZATION FABRIC	
1230	Ground Stabilization Fabric	SY
	OVER-EXCAVATION	
2954	Over-Excavation (Storm)	CY
3896	Over-Excavation (Sanitary)	CY
4994	Over-Excavation (Water)	CY

SECTION 1250
EXCAVATION SPECIAL AND BENTONITE SLURRY DAMS

1250.1 Description

1. The work covered by this Section of the Specifications consists of furnishing all labor, equipment, materials, and supplies used in performing all operations in connection with the excavation, removal, and hauling away of material designated as containing contaminated soils.

1250.2 Materials

1250.2.1 Disclosure – Chemical Characteristics of Impacted Material

1. ENGINEER will furnish or make available to CONTRACTOR documents and information available from CITY that relate to the identity, location, quantity, nature, or characteristics of contamination at, or under, the site. ENGINEER shall furnish other available reports, data, studies, plans, specifications, documents, and other information or surface and subsurface site conditions required, as requested by CONTRACTOR, for proper performance of CONTRACTOR's services. ENGINEER and CITY, however, assume no responsibility or liability for their accuracy or completeness, and all such documents and information will remain the property of the CITY.

2. Results of chemical analyses on soil, sediment, and/or groundwater samples collected from soil borings installed at the proposed construction site indicate petroleum or other impacted material is present in the shallow subsurface environment.

1250.2.2 Decontamination Plan

1. CONTRACTOR will develop written plan and procedures for decontamination of equipment and workers who exit the site. The decontamination plan and procedures shall be submitted to CITY and ENGINEER prior to site work.

2. A portion or portions of the site will be designated as the decontamination zone. Workers and equipment are required to follow decontamination procedures prior to exiting the site. Soil and sediments removed during decontamination procedures will be incorporated with the material to be loaded, hauled, and disposed of at the licensed landfill.

3. The decontamination zone will provide a structure or platform area to contain and prevent the soil or sediments from migrating off site. Soils or sediments shall be transported and managed as solid waste. CONTRACTOR shall meet all local, state, and federal regulations to handle, store, transport, and dispose of the petroleum-impacted soils.

1250.2.3 Health and Safety Requirements

1. The services to be performed under the Contract are on a site that contains impacted soils and/or groundwater on the surface and/or subsurface. Therefore, as a minimum, the CONTRACTOR shall comply with the requirements of this Section in order to satisfy all Federal, State and local statutes, regulations, and ordinances regarding health and safety, including but not limited to, **Title 29 Code of Federal Regulations (CFR) 1910.120 Hazardous Waste Operations and Emergency Response**, U.S. Department of Labor, Occupational Safety and Health Administration (OSHA).

2. CONTRACTOR shall provide forty (40) hour health and safety training to all CONTRACTOR personnel who will have the reasonable probability of exposure to safety or health hazards associated with the contaminated material in compliance with OSHA requirements. CONTRACTOR will supply current certificate of clearance for each worker upon award of Contract and within forty eight (48) hours prior to entering site.

3. The CONTRACTOR shall prepare a site-specific Health and Safety Plan complying with **29 CFR 1910.120**. The Health and Safety Plan shall incorporate the decontamination plan. The site-specific Health and Safety Plan shall be submitted to the ENGINEER five (5) business days prior to the start of any excavations, which shall be approved by signature of a designated CONTRACTOR representative and provided to ENGINEER and CITY upon request, prior to commencing site work activities. All CONTRACTOR personnel who will be working on site shall attend a health and safety briefing presented by ENGINEER and/or the ENGINEER's Representative prior to entering the site.

4. The CONTACTOR shall be and remain liable for compliance by its employees, agents, and subcontractors with the CONTRACTOR's Health and Safety Plan and procedures for the site and shall hold ENGINEER and CITY harmless from all claims, damages, suits, losses, and expenses in any way arising from non-compliance with the Health and Safety Plan.

5. Notify ENGINEER of any chemical products to be used by CONTRACTOR while on the project site premises and furnish Material Safety Data Sheets (MSDS) for the chemical products, to ENGINEER, before any such chemicals are brought on the premises throughout the duration of the Contract. Comply with standards set in **Title 29 CFR 1910.1200** in providing such notifications and MSDS.

6. Provide all necessary safety equipment needed to perform the required work. Provide and properly utilize adequate ventilation and personal protection equipment, including respirators as required according to OSHA regulations in order to minimize any contact with the impacted material (soil and/or groundwater) through ingestion and/or inhalation. Train personnel in the use, limitations, and proper fit of all necessary safety equipment.

7. Follow closed-space entry procedures for personnel entering any excavations, storm sewers, or manholes on site.

8. Follow appropriate measures to guard against cold- and heat-related hazards, including frost-bite, hypothermia, heat stroke, heat exhaustion, and heat cramps. Be prepared to treat these hazards, if encountered.

1250.2.4 Public Safety

1. Protect finished and unfinished work against any damage, loss, or injury during the performance of and up to the completion day of the work.

2. Provide adequate protection around all openings wherever required to safeguard the work and the public.

3. Protect all openings and surface obstructions with barricades, signs, and warning devices in accordance with local, state, and federal requirements.

4. Place barricades at a reasonable distance from the location of the obstruction when a street is closed or there is impedance to traffic. Signs and barricades must be clearly visible at all times and conform to Federal, State, and local standards.

1250.2.5 Excavations

1. Form sidewalls of excavations to provide a stable and safe working environment in the base of the excavation. Provide sheeting and bracing or properly sloped excavations as required by all applicable Federal, State, and OSHA codes, and as may be necessary to protect life or property.

2. Eliminate activity around the top of the excavation, particularly the use of heavy equipment and machinery, while personnel are within the excavation.

3. Erect and maintain a four-foot (4') high fence around unattended excavations.

4. Current regulations promulgated by OSHA require that employers whose employees enter excavations have a "competent person" conduct inspection of these excavations and review supporting system (see **29 CFR, Part 1926 (Subpart P**)). In the event that the work defined by the Contract includes an excavation into which workers may enter, CONTRACTOR shall furnish a properly qualified "competent person" and shall be responsible for the duties of inspection and/or monitoring of excavations required of the "competent person" under **29 CFR, Part 1926 (Subpart P)**.

1250.3 Construction

1. This work shall consist of excavating, segregating, and loading of all material excavated for the Contract and the hauling and disposing of impacted material at a facility designated by the CITY. CONTRACTOR shall be responsible to furnish all labor, equipment, materials, and supplies used in performing all operations in connection with the excavation, removal, and hauling away of material designated as containing contaminated soils. Any dewatering will be considered incidental to the Contract.

2. Within the project limits, there is the potential for excavating material which is considered to be either solid waste or impacted material (soil, sediment and/or groundwater). The CONTRACTOR is advised a Contract-specific report describing existing conditions and the impacted areas is available from the CITY. If contaminated materials are encountered elsewhere on the project, the CONTRACTOR shall terminate excavation activities in the area and notify the ENGINEER.

1250.3.1 Excavation and Handling of Contaminated Material

1250.3.1.1 Protection

1. During construction, the CONTRACTOR shall provide support for any affected utilities and side slopes. No excavation shall be performed until site utilities have been field located. The CONTRACTOR shall take the necessary precautions to ensure no damage occurs to existing structures and utilities. Damage to existing structures and utilities resulting from the CONTRACTOR's operations shall be repaired at no additional cost to the CITY. Utilities encountered that were not previously shown or otherwise located shall not be disturbed without written approval from the CITY or ENGINEER.

1250.3.1.2 References

1. Wisconsin Administrative Code Chapter NR 500 rule series – Solid and Hazardous Waste Management

2. Wisconsin Administrative Code Chapter NR 700 rule series – Investigation and Remediation of Environmental Contamination

1250.3.1.3 Stockpiling of Soil

1. Impacted excavated soil may be placed directly onto trucks for hauling to a landfill designated by the CITY, if prior approval was obtained for the impacted soil. However, if there is no approval for disposal, then the impacted soil shall be placed on a 6-mil polyethylene sheet and, upon completion of work for the day, covered with a 6-mil polyethylene sheet to prevent storm water runoff and reduce public exposure (inhalation of dust or direct contact/ingestion). Impacted soil shall be stockpiled in this manner until

approval for disposal at a landfill is obtained. Any use of polyethylene and stockpiling of soil by the CONTRACTOR will be considered incidental to the Contract. Multiple stockpiles may be established.

1250.3.1.4 Impacted Sediment, If Encountered

1. Due to the high moisture content of this material, CONTRACTOR should anticipate the need for liners in the trucks used to transport the sediments. Prior to transporting the sediments and following their removal, the impacted sediments shall be placed in a bermed area on an impervious surface (asphalt/concrete pavement or 6-mil polyethylene sheet) for at least twenty four (24) hours to allow the water to drain. The bermed area will be constructed such that there is one (1) drainage point for the water to flow into the adjacent water body, and placing a silt fence across the drainage way. If there is no area available within or adjacent to the project limits for the sediment to drain, then an enclosed berm drainage area shall be constructed and water shall be pumped from the storage area and appropriately disposed per ENGINEER's instruction.

2. All sediment shall be allowed to adequately dewater prior to hauling to the disposal facility. The CITY will not be responsible for additional charges from the facility due to CONTRACTOR hauling improperly dewatered materials.

3. ENGINEER will review the consistency of the sediment to determine when landfill disposal can occur. If necessary, the CONTRACTOR may have to occasionally stir the sediment to allow for drainage of all trapped liquids. As an option, and considered as incidental to the cost, the CONTRACTOR may add suitable material to facilitate liquid absorption. Loading and transportation cannot occur during rain events. Landfilling will not occur without approval of the ENGINEER. In general, the following conditions need to be met before landfilling will be approved:
   A. All free liquids have been removed and material will support its own weight after transportation to the landfill.
   B. No liquids leak from the truck during loading or transportation.
   C. The landfill reserves the right to reject leaking loads, limit the daily volume, and restrict or limit the time frame for disposal of the sediment.

1250.3.1.5 Spill Response Materials

1. The CONTRACTOR shall provide spill response materials, including, but not limited to, the following: containers, adsorbents, shovels, and personal protective equipment. Spill response materials shall be available at all times in which hazardous materials/wastes are being handled or transported. Spill response materials shall be compatible with the type of materials and contaminates being handled.

1250.3.1.6 Roll-off Units

1. Watertight roll-off units may be used to temporarily store contaminated material. An impermeable cover shall be placed over the units to prevent precipitation from contacting the stored material. The units shall be located in an area approved by the ENGINEER or the CITY. Liquid, which collects inside the units, shall be removed and stored in accordance with **Section 1250.3.1.7** of these Specifications.

1250.3.1.7 Impacted Liquid Storage

1. Impacted liquid collected from excavation and stockpiles shall be temporarily stored in fifty five (55) gallon barrels until the liquid can be characterized and approved for disposal at a designated facility or temporary discharge to the CITY's sanitary sewer system. Liquid storage containers shall be watertight and shall be located in an area approved by the ENGINEER or the CITY. Storage containers shall be clearly labeled and dated.

1250.3.1.8 Spills

1. In the event of a spill or release of a hazardous substance, pollutant, contaminate, or oil, the CONTRACTOR shall notify the ENGINEER immediately. Immediate containment actions shall be taken to minimize the effect of any spill or leak. Cleanup shall be in accordance with applicable Federal, State, and local regulations. As directed by the ENGINEER, additional sampling and testing shall be performed to verify spills have been cleaned up. Spill cleanup and testing shall be done at no additional cost to the CITY.

1250.3.2 Transportation and Disposal of Contaminated Material

1250.3.2.1 References

1. Wisconsin Administrative Code Chapter NR 500 rule series – Solid and Hazardous Waste Management

2. Wisconsin Administrative Code Chapter NR 600 rule series – Hazardous Waste Management

1250.3.2.2 Certificates of Disposal

1. These certificates document the ultimate disposal of impacted soils. Receipt of these certificates will be required for final payment.

1250.3.2.3 Shipping Documents and Packaging Certification

1. All transportation-related shipping documents go to the ENGINEER, including waste manifests, land disposal restriction modifications, and bills of lading for materials.

1250.3.2.4 Notices of Non-Compliance and Notices of Violation

1. Upon receipt of notices of non-compliance or notices of violation by a Federal, State, or local regulatory agency issued to the CONTRACTOR in relation to any work performed under the Contract, the CONTRACTOR shall immediately provide copies of such notices to the ENGINEER. The CONTRACTOR shall also furnish all relevant documents regarding the incident and any information requested by the ENGINEER and shall coordinate its response to the notice with the ENGINEER or his designated representative prior to submission to the notifying authority. The CONTRACTOR shall also furnish a copy to the ENGINEER of all documents submitted to the regulatory authority, including the final reply to the notice and all other materials until the matter is resolved.

1250.3.2.5 Qualifications

1. The CONTRACTOR shall designate, by position and title, one person to act as the Transportation and Disposal Coordinator (TDC) for the Contract. The TDC shall serve as the single point of contact for all environmental regulatory matters and shall have overall responsibility for total environmental compliance at the site, including, but not limited to, determination of proper shipping names; identification of marking, labeling, packaging, and placarding requirements; completion of waste profiles, manifests, bills of lading, and exception and discrepancy reports; and all other environmental documentation.

2. The CONTRACTOR and/or subcontractors transporting contaminated soils shall possess a current certificate of registration as required under **NR 502.06**, and the CONTRACTOR shall be responsible for verifying that vehicles used to transport contaminated material are licensed for such activity in accordance with applicable State and Federal regulations.

1250.3.2.6 Laws and Regulations Requirements

1. Work shall meet or exceed the minimum requirements established by Federal, State, and local laws and regulations, whichever are applicable. These requirements are amended frequently, and the CONTRACTOR shall be responsible for complying with amendments, as they become effective. In the event that compliance exceeds the scope of work or conflicts with specific requirements of the Contract, the CONTRACTOR shall notify the ENGINEER immediately.

1250.3.2.7 Equipment and Tools

1. The CONTRACTOR shall provide miscellaneous equipment and tools necessary to handle the impacted material in a safe and environmentally sound manner.

1250.3.2.8 Waste Minimization

1. The CONTRACTOR shall minimize the generation of impacted materials to the maximum extent practicable. The CONTRACTOR shall take all necessary precautions to avoid mixing clean and impacted materials. **Should the CONTRACTOR not follow the waste minimization instructions, all costs associated with disposing of the material shall become the responsibility of the CONTRACTOR, including the landfill's tipping fees.**

1250.3.2.9 Recordkeeping

1. The CONTRACTOR shall be responsible for maintaining adequate records to support information provided to the ENGINEER regarding exception reports, annual reports, and biennial reports.

1250.3.3 Bentonite Slurry Dam

1. The CONTRACTOR shall furnish and install a bentonite slurry dam as indicated on the Plans or at both ends of the contamination zone of a utility trench. CONTRACTOR shall construct a form three feet (3') wide from the natural clay to a point four feet (4') below the finish surface elevation the width of the trench. The bentonite slurry dam material shall be a redi-mix design.

1250.4 Measurement

1250.4.1 Excavation Special

1. The Bid Items shall include any cost to remove and landfill all contaminated soil and/or sediment that may be found during excavation. Measurement for excavation, handling, transportation, and disposal of contaminated materials shall be based on the actual tonnage of impacted material as documented by weigh tickets from the disposal/treatment facility. Any dewatering will be considered incidental to the Contract.

2. The contaminated material will generally need to be disposed of at the Valley Trail Landfill facility in Berlin, Wisconsin. The landfill facility will be specified in the Contract's *Special Conditions* and *Material Management Plan*, and based on what contaminates are found during the CITY'S geotechnical exploration program.

3. Landfill tipping fees will be paid for by the CITY, unless otherwise specified.

1250.4.2 Bentonite Slurry Dam

1. The CITY will measure the bentonite slurry dam as each individual unit that is acceptably completed per utility trench type. Payment for the Bentonite Slurry Dam Bid Items is for full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for constructing forms; for providing bentonite slurry redi-mix material; for backfilling; for compacting; for removing sheeting and shoring; and for cleaning out and restoring the site of the work.

1250.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
	EXCAVATION SPECIAL	
1220	Excavation Special (Paving)	TON
2950	Excavation Special (Storm)	TON
2952	Bentonite Slurry Dam (Storm)	EA
3892	Excavation Special (Sanitary)	TON
3894	Bentonite Slurry Dam (Sanitary)	EA
4990	Excavation Special (Water)	TON
4992	Bentonite Slurry Dam (Water)	EA

SECTION 1300
CONCRETE PAVEMENTS

1300.1 Description

1. The work covered by this Section of the Specifications consists of furnishing all labor, equipment, materials, and incidentals necessary for the construction of the concrete pavement in accordance with the Contract Plans and Specifications. The work is listed on the *Proposal* and consists essentially of concrete paving, excavation, base preparation, backfilling, terrace restoration, miscellaneous sewer construction, and other miscellaneous items. The unit price for these Bid Items shall include all labor, equipment, materials, and forming necessary to construct the concrete pavement as specified by the Plans and Special Details.

2. It is the intent of the CITY to install water service stop boxes outside of the "clear zone" of the pavement to allow for integral pavement operations. If construction does not allow this, it is the CONTRACTOR's responsibility to determine the best construction practice at their own cost.

3. Sundry items which are required to complete the work, but are not included as items on the *Proposal*, shall be considered an integral part of the Contract and the cost of such items shall be included in the unit price bid for other items of work. The CONTRACTOR shall view the work sites and acquaint themselves with the conditions to be met.

4. The CONTRACTOR shall provide written notice to all affected property owners/residents one (1) week prior to any changes in access. **The CITY will provide the appropriate written notices.** During times that residents do not have driveway access, all sidewalk access shall be maintained on a clear and level surface suitable for wheelchair access. The sidewalks shall provide routes to the adjacent streets designated for parking.

1300.2 Public Relations

1. The City of Oshkosh desires to cause as little disruption and inconvenience to the abutting property owners as possible. The work shall be scheduled so there is a minimum of delay between grading and paving operations, and so the paving of the second side of the street is completed immediately after the cure time of the first side. Backfilling, cleanup, and opening of the street to traffic shall take place as soon as possible after the necessary cure time has elapsed.

2. While a given street is under construction, the CONTRACTOR shall cooperate in providing access for residents that are moving, to people who require handicap access, and to building contractors.

1300.3 Materials

1300.3.1 General

1. The source of supply of each material or product shall be subject to the approval of the ENGINEER before delivery is started.

2. A certificate of compliance or test results of the material, if required, shall be furnished to the ENGINEER before installation of the material.

1300.3.2 Concrete Mix Design

1. Concrete design mix shall be submitted and approved before any concrete is placed.

2. The concrete mixture shall be either:
   A. Type 1, Grade A,
   B. Type 1, Grade A2-WR,
   C. Type 1, Grade C for High Early Strength Concrete, or
   D. Type 1, 846 lbs. Cement, for Special High Early Strength Concrete.

3. All concrete placed under these Bid Items shall be treated with a surface treatment of linseed oil as specified under **Section 100.58** of these Specifications.

4. The concrete shall be Grade A, air-entrained concrete containing a minimum of five hundred sixty four (564) pounds of Portland Cement per cubic yard. The course aggregate shall be comprised of thirty five percent (35%) to sixty five percent (65%) of size No. 1 (¾" maximum) and the remainder of the course aggregate shall be size No. 2 (1½" maximum).

5. Concrete containing 6% plus or minus 1.5% air shall be used for the concrete pavement, curb and gutter, and sidewalk. Design strength for the concrete shall be 3,500 pounds/square inch in twenty-eight (28) days. Concrete being placed with the use of a slip-form paving machine shall contain 6% to 7½% air in front of machine.

6. Air-Entrained Portland Cement shall comply with the Specifications for Air-Entraining Portland Cement for Concrete Pavements, **ASTM Designation C-175**, Type 1A, or Standard Portland Cement conforming to the Standard Specifications for Portland Cement, **ASTM Designation C-150**, may be used with the addition of air-entraining mixtures conforming to the ASTM Specifications for Air-Entraining Mixtures for Concrete, **Designation C-260**.

7. High Early Strength concrete (three-day) shall meet design strength of 3,000 pounds/square inch in three (3) days. The mixture shall be free of calcium chloride.

8. Super High Early Strength concrete (one [1] day) shall contain a minimum of eight hundred forty six (846) pounds of cement per cubic yard and design strength shall be 3,000 pounds/square inch in twenty four (24) hours. The mixture shall be free of calcium chloride.

1300.3.3 Alternate Concrete Mix Design – Water Reducing Admixture

1. To incorporate a water reducing admixture into the composition of the concrete mixes, the following additional requirements shall apply:
   A. Water reducing admixture meeting the requirements of **AASHTO Designation M194**, Type A, or water reducing-retarding admixture meeting the requirements of **AASHTO Designation M194**, Type D, may be substituted for a maximum one-half (½) sack (47 pounds) of Portland Cement per cubic yard for concrete mixes. Design strength shall remain the same as specified in **Section 900** in these Specifications.
   B. The specific type of admixture and rate of use will be determined on the basis of the atmospheric conditions, desired properties of the finished concrete, and the manufacturer's recommended rates to meet the requirements of **AASTHO Designation M194**. The admixture shall be free of calcium chloride.

1300.3.4 Fly Ash and Slag

1. The CITY will not allow the use of fly ash (grade A-FA) or slag (grade A-S) in concrete mix designs.

1300.3.5 Tests of Concrete

1. See **Section 900.2.13** of these Specifications.

1300.3.6 Aggregates for Concrete

1. See **Section 900.2.2.4** of these Specifications.

1300.3.7 Aggregates for Gravel Base and Trench Backfill

1. See **Section 1800** of these Specifications.

1300.3.8 Stone Base for Concrete Pavement

1. See **Section 1800** of these Specifications.

2. Crushed stone base shall meet the following requirements:
   A. Six Inch (6") Stone Base:
      Aggregates for six inch (6") base course, where called for on the Plans, may either include Wisconsin Department of Transportation (WDOT) 1¼" dense graded base or WDOT ¾" base (see **Section 305** of the STATE SPECIFICATIONS). Crushed concrete and recycled asphalt is allowed and may either include WDOT 1¼" dense graded base or WDOT ¾" base (see **Section 305** of the STATE SPECIFICATIONS), given that all gradation specifications are met.
   B. Five Inch (5") Stone Base:
      Aggregates for five inch (5") base course, where called for on the Plans, may either include WDOT 1¼" dense graded base or WDOT ¾" base (see **Section 305** of the STATE SPECIFICATIONS). Crushed concrete and recycled asphalt is allowed and may either include WDOT 1¼" dense graded base or WDOT ¾" base (see **Section 305** of the STATE SPECIFICATIONS), given that all gradation specifications are met.

1300.3.9 Miscellaneous

1. The CONTRACTOR may use approved, select salvaged road stone for gravel base. It shall conform to the gradations, as specified above.

2. Select road stone may be salvaged for backfill for storm sewer, inlet leads, around inlets or manholes, and driveways, only with the approval of the ENGINEER.

3. Aggregate slurry backfill, where required on the Plans, in the Special Conditions, or in the field by the ENGINEER, shall consists of aggregate specified for Grade "A" concrete in **Section 501** of the STATE SPECIFICATIONS, with the cement omitted. This material shall be mixed with water to inundate the aggregate and provide an approximate three-inch (3") slump.

1300.3.10 Aggregate Testing

1. Aggregate from other than approved sources shall be tested at the CONTRACTOR's expense by an independent testing firm and test reports shall be submitted to the CITY for approval.

1300.3.11 Reinforcement

1. All deformed bars shall be epoxy coated in conformance with **Section 505.2.4** of the STATE SPECIFICATIONS.

2. Dowels, expansion caps, and wire mesh shall conform to the STATE SPECIFICATIONS. Dowels shall be epoxy coated.

3. Dowels at joints shall be held firmly in place by rigid baskets of "OO" gauge steel wire while the concrete is placed so they retain their proper place and spacing.

1300.3.12 Expansion Joint Filler

1. Expansion joint filler shall conform to the requirements of **Section 415.2.3** of the STATE SPECIFICATIONS. All expansion joints shall be constructed using one-half inch (½") REFLEX Rubber Expansion Joint. Equivalent products must be approved by the ENGINEER prior to installation.

1300.3.13 Joint Sealer

1. All joints shall be sealed with a hot-poured elastic-type joint sealer, which shall conform to the Specification for Joint Sealants, Hot-Poured, for Concrete and Asphalt Pavements, **ASTM Designation D-3405**.

1300.3.14 Concrete Curing Compound

1. See **Section 900.2.9** of these Specifications.

1300.3.15 Cold Weather Covering

1. Clear, black, or white polyethylene sheeting conforming to the requirements, except for color and reflectance, specified in **AASHTO M171**. The ENGINEER may allow other curing materials with suitable water resistance, strength, and insulating properties.

1300.3.16 Pavement Ties

1. Number 6 epoxy-coated, deformed bars, twelve inches (12") in length.

1300.3.17 Drilled Dowel Bars

1. Epoxy-coated, smooth bars, eighteen inches (18") in length.

1300.3.18 Salvaged Base Course

1. Salvaged base material shall conform to the gradations as specified in **Section 305** of the STATE SPECIFICATIONS.

1300.3.19 Topsoil

1. Conform to the requirements of **Section 2600** of these Specifications.

2. CONTRACTOR shall have all topsoil tested and certified to meet these Specifications by a soil-testing firm to be approved by the ENGINEER.

1300.4 Construction

1300.4.1 Concrete Cylinder Testing

1. CONTRACTOR to perform concrete cylinder tests per **Section 900.2.13** of these Specifications. **Test results required by Section 900.2.13.1 shall be submitted to the CITY via e-mail to Alyssa Deckert (adeckert@oshkoshwi.gov) and Tracy Taylor (ttaylor@oshkoshwi.gov).**

1300.4.2 Cold Weather Covering

1. The CONTRACTOR shall arrange to have available a sufficient quantity of material to provide thermal protection for concrete that has yet to conform to the opening criteria specified.

2. If the National Weather Service forecast for the construction area predicts temperatures of less than 17°F (-8°C) within the next twenty-four (24) hours, arrange to have available a sufficient quantity of straw or hay to protect all concrete that has yet to conform to the opening criteria specified. If the ENGINEER approves, the CONTRACTOR may use other materials placed to the thickness necessary to provide the same insulating protection as the required thickness of loose, dry straw or hay.

3. At any time of the year, if the National Weather Service forecast for the construction area predicts freezing temperatures within the next twenty-four (24) hours, or when freezing temperatures actually occur, provide the minimum level of thermal protection specified below for concrete that has yet to conform to the opening criteria specified:

PREDICTED OR ACTUAL TEMPERATURE	MINIMUM EQUIVALENT LEVEL OF PROTECTION
22° to <28°F (-6° to <-2°C)	single layer of polyethylene (Bid Item #1380)
17° to <22°F (-8° to <-6°C)	double layer of polyethylene (Bid Item #1382)
<17°F (<-8°C)	6″ loose, dry straw or hay between 2 layers of polyethylene (Bid Item #1384)

4. The CONTRACTOR shall place protective material as soon as the concrete is finished and sets sufficiently to prevent excessive surface marring. Maintain the protective material in place, until the concrete conforms to the opening criteria specified. If necessary to remove the coverings to saw joints or perform other required work, and if the ENGINEER approves, the CONTRACTOR may remove the covering for the minimum time required to complete that work. Any such removing and re-covering for sawing, sealing, or other work shall be incidental to these Items.

1300.4.3 Pavement Ties

1. Install the pavement ties, as shown on the Plans and in accordance with **Section 900.2.10.13** of these Specifications.

1300.4.4 Drilled Dowel Bars

1. Install the pavement ties, as shown on the Plans and in accordance with **Section 900.2.10.8** of these Specifications.

1300.5 Measurement

1. All classes of concrete paving will be measured by the square yard acceptably completed. The unit price shall include all jointing, jointing material, tie bars, dowel bars, bond breaker, and sealing material, all as specified. Expansion joints shall be included where shown on the Plans and constructed with a thickened pavement section, as shown on the Special Details. The concrete pavement shall include all cost of furnishing, placing, fine-grading, and compacting the specified thickness of gravel or crushed stone base.

2. Crushed Aggregate Base Course (CABC) will be measured by the ton or will be paid based on the average end area of undercut areas converted at a rate as specified in **Section 1800.6** of these Specifications.

3. Pavement Ties will be measured on per each basis for each tie acceptably installed.

4. Drilled Dowel Bars will be measured on per each basis for each dowel bar acceptably anchored.

5. Adjust Manholes and Inlets will be measured for each structure acceptably adjusted.

6. Turf Restoration will be measured on a square yard basis for each unit acceptably completed, either by the street or the street segment, as designated in the Plans and Proposal.

7. Cold Weather Covering (Concrete Pavement) will be measured per square yard acceptably installed (see **Section 900.2.6** of these Specifications).

8. Concrete Pavement Gaps will be measured on per each basis for each gap acceptably installed.

1300.6 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
	CONCRETE PAVEMENTS	
1300	7″ Concrete Pavement, Base in Place and Grading	SY
1301	7″ Concrete Pavement, with 5″ CABC and Grading	SY
1302	7″ Concrete Pavement HES, Base in Place and Grading	SY
1303	7″ Concrete Pavement HES, with 5″ CABC and Grading	SY
1308	7″ Concrete Pavement Removal and Replacement, including Sawing, Pavement Ties, Dowel Bars, Bond Breaker, Integral Curb and Fine Grading, Turf Restoration, and Traffic Control	SY
1309	7″ Concrete Pavement HES Removal and Replacement, including Sawing, Pavement Ties, Dowel Bars, Bond Breaker, Integral Curb and Fine Grading, Turf Restoration, and Traffic Control	SY
1310	8″ Concrete Pavement, Base in Place and Grading	SY
1311	8″ Concrete Pavement, with 6″ CABC and Grading	SY
1312	8″ Concrete Pavement HES, Base in Place and Grading	SY
1313	8″ Concrete Pavement HES, with 6″ CABC and Grading	SY
1314	8″ Concrete Pavement Doweled, Base in Place and Grading	SY
1314A	8″ Concrete Pavement Doweled, with 6″ CABC and Grading	SY
1314B	8″ Concrete Pavement Doweled, HES, Base in Place and Grading	SY
1315	8″ Concrete Pavement Doweled, HES, with 6″ CABC and Grading	SY
1316	8″ Concrete Pavement SHES, Base in Place and Grading	SY
1317	8″ Concrete Pavement SHES, with 6″ CABC and Grading	SY
1318	8″ Concrete Pavement Removal and Replacement, including Sawing, Pavement Ties, Dowel Bars, Bond Breaker, Integral Curb and Fine Grading, Turf Restoration, and Traffic Control	SY
1319	8″ Concrete Pavement HES Removal and Replacement, including Sawing, Pavement Ties, Dowel Bars, Bond Breaker, Integral Curb and Fine Grading, Turf Restoration, and Traffic Control	SY
1320	9″ Concrete Pavement, Base in Place and Grading	SY
1321	9″ Concrete Pavement, with 6″ CABC and Grading	SY
1322	9″ Concrete Pavement HES, Base in Place and Grading	SY

Bid Item	Description	Units
1323	9″ Concrete Pavement HES, with 6″ CABC and Grading	SY
1324	9″ Concrete Pavement Doweled, Base in Place and Grading	SY
1325	9″ Concrete Pavement Doweled, HES, with 6″ CABC and Grading	SY
1328	9″ Concrete Pavement Removal and Replacement, including Sawing, Pavement Ties, Dowel Bars, Bond Breaker, Integral Curb and Fine Grading, Turf Restoration, and Traffic Control	SY
1329	9″ Concrete Pavement HES Removal and Replacement, including Sawing, Pavement Ties, Dowel Bars, Bond Breaker, Integral Curb and Fine Grading, Turf Restoration, and Traffic Control	SY
1330	7″ Concrete Pavement Speed Hump, with 7″ CABC and Grading	SY
1332	8″ Concrete Pavement Speed Hump, with 6″ CABC and Grading	SY
1334	Concrete Pavement Gap	EA
1335	Concrete Pavement Approach Slab, HES	SY
MISCELLANEOUS CONSTRUCTION		
1340	Crushed Aggregate Base Course	TON
1350	Pavement Ties	EA
1352	Drilled Dowel Bars – 1″	EA
1354	Drilled Dowel Bars – 1.25″	EA
1356	Drilled Dowel Bars – 1.5″	EA
1360	Adjust Manholes and Inlets	EA
1370	Turf Restoration	SY
1372	Restore Gravel Driveway/Apron	SY
MANHOLE REHABILITATION		
1373	Replace and Set CITY-Supplied Manhole Castings and Frames	EA
1374	Furnish and Install Concrete Adjustment Rings	VF
1375	Furnish and Install Rubber Adjustment Rings	VF
1376	Tuck Point Manholes	EA
COLD WEATHER COVERING		
1380	Cold Weather Covering (Concrete Pavement) – Single Visquine	SY
1382	Cold Weather Covering (Concrete Pavement) – Double Visquine	SY
1384	Cold Weather Covering (Concrete Pavement) – Double Visquine with 6″ Hay	SY
1390	Up-Charge for Late Season Cold Weather Concrete Pavement	CY

2. The CONTRACTOR may use approved, select salvaged material for gravel base under Bid Items #1300 through #1332. Salvaged base material shall conform to the gradations as specified in **Section 305** of the STATE SPECIFICATIONS.

1300.6.1 Concrete Paving

1. The unit price for Concrete Paving Bid Items shall include all labor, equipment, materials, and forming necessary to construct the concrete pavement as specified on the Plans and Special Details and is full compensation for providing all materials, including concrete, reinforcement, and expansion joints; for excavating and preparing the foundation backfilling and disposing of surplus material; for placing, finishing, protecting, and curing; and for restoring the work site. Payment also includes providing sawing, joint sealing, tie bars, dowel bars, and bond breaker in unhardened concrete. For tie bars and dowel bars provided in concrete not placed under the Contract, the CITY will pay for these separately under the corresponding Bid Item, as specified.

2. When preparing the foundation, the CONTRACTOR may use granular sub-base, or aggregate base; in this case, the CITY will not pay additional compensation for this Item.

3. **Concrete Paving Bid Items #1300, #1302, #1310, #1312, #1314, #1314B, #1316, #1320, #1322,** and **#1324** shall be placed on streets where adequate base exists and shall include fine-grading and compacting the existing base and constructing the integral curb concrete pavement to the thickness and type as specified. If the ENGINEER determines the existing base is inadequate, the CONTRACTOR will be paid for the excavation under Bid Item #1200 and for the base under Bid Item #1801.

4. **Concrete Paving Bid Items #1301, #1303, #1311, #1313, #1314A, #1315, #1317, #1321, #1323, and #1325** shall include the cost of furnishing, placing, fine-grading, and compacting the specified gravel or crushed stone base and the concrete pavement thickness and type, as specified.

5. **Concrete Paving Bid Items #1308, #1309, #1318, #1319, #1328, and #1329** shall include all costs of placing the specified concrete pavement, sawing, removing pavement, pavement ties, dowel bars, bond breaker, turf restoration, and traffic control. If the ENGINEER determines the existing base is inadequate, the CONTRACTOR will be paid for the excavation under Bid Item #1200 and for the base under Bid Item #1801.

6. Each repair shall be placed in one continuous full-depth operation. The concrete shall be consolidated in place by use of an immersion-type vibrator and the surface shall be finished by screeding twice, floating, and texturing. The screed shall be operated parallel to the pavement centerline, unless the repair is over twelve feet (12′) in length. The transverse edges of the finished repair shall be flush with the edges of the existing concrete pavement. The longitudinal surface shall form a straight line from edge to edge within a tolerance of plus or minus 0.1″. The final surface of the full-depth concrete repair shall have a broom finish, parallel to the centerline. Each patch shall be dated with the month and year of construction.

7. **Concrete Paving Bid Items #1330 and #1332 (Concrete Speed Humps)** shall include the cost of furnishing, placing, fine-grading, and compacting gravel or crushed stone base as specified and installing concrete speed hump with curb and gutter as shown on the Detail sheet.

8. **Concrete Paving Bid Item #1334 (Concrete Pavement Gap)** shall include all necessary labor, equipment, and materials to construct and maintain gaps in the concrete pavement for vehicular access, as shown on the Plan sheets. The gaps shall be wide enough to accommodate semi-trailer truck access, if required. The location shall be determined in the field by the CONTRACTOR and approved by the ENGINEER. The unit price shall also include providing, placing, and maintaining granular ramps for access to adjoining pavement. Payment for furnishing and placing concrete material in gap areas will be paid for under the pertinent Concrete Paving Bid Item. Drilled pavement tie bars, dowel bars, and bond-breaker shall be incidental to this Bid Item.

9. **Concrete Paving Bid Item #1335 (Concrete Pavement Approach Slab, HES)** shall include all costs for furnishing, placing, fine grading, and compacting a six-inch (6″) crushed aggregate base course; providing and installing pavement tie bars, dowel baskets, and doweled expansion joints; furnishing and placing twelve-inch (12″) non-reinforced, HES, integral curb concrete pavement, as shown on the Plans. All work shall conform to the requirements of **Section 415.3.19** of the STATE SPECIFICATIONS.

10. The CONTRACTOR is required to stamp all concrete placed in the City of Oshkosh right-of-way. The stamp shall include the CONTRACTOR's name and installation date. The cost for stamping is considered incidental to the concrete placement. The stamp shall be placed at each end of the pour. Single squares require one (1) stamp.

1300.6.2 CABC

1. The unit price for this Bid Item shall include all labor, equipment, and materials to furnish, place, and compact crushed stone base course. This Bid Item will only be used where the ENGINEER has directed the CONTRACTOR undercut below the proposed subgrade and for base and shouldering for pavements where the stone base is not included in the unit price for pavement. Base material for all other streets and other Bid Items must be furnished, as specified, with that Bid Item (see **Section 900.1.5** of these Specifications).

1300.6.3 Pavement Ties and Drilled Dowel Bars

1. The unit price for this Bid Item shall include all the necessary labor, equipment, and materials to install the pavement ties, as shown on the Plans (see **Section 900.2.10.13** of these Specifications).

2. The unit price for this Bid Item shall include all the necessary labor, equipment, and materials to install the drilled dowel bars, as shown on the Plans (see **Section 900.2.10.8** of these Specifications).

1300.6.4 Adjust Manholes and Inlets

1. The unit price for this Bid Item shall include all the necessary labor, equipment, and materials to raise or lower, adjust and shim existing manhole and inlet castings to the **required elevation, a**nd then **g**rout them into place as to be permanently supported. Included in the adjustment shall be the repair of the upper twelve inches (12″) of the existing masonry manhole or inlet structure, if such repair is needed. Also included in this Item is the removal of all concrete adjustment rings that do not meet the requirements of **Sections 2200.2.5, 2200.3.3.3, 3100.2.6, and 3100.3.6** of these Specifications.

2. **There will be an Adjustment Bid Item for every manhole and inlet in the project limits.**

3. Any castings that are abandoned, or are unfit for use, must be hauled to the City Garage and exchanged for new castings. Some inlet castings will have plates in place of the curb boxes. The plates must be taken to the City Garage and exchanged for boxes. The boxes must then be bolted in place by the CONTRACTOR. All costs of hauling and placing castings and boxes must be included in the cost of the pavement, as no extra monies will be paid for this work.

4. If a new casting is required, this Bid Item shall also cover the cost to remove and replace an existing casting or inlet, if necessary. **All new manhole castings will be supplied by the CITY, unless otherwise noted on the Plans or Specifications, and picked up by the CONTRACTOR at the CITY's storage yard located on West Fernau Avenue. Inlet castings are to be supplied by the CONTRACTOR unless otherwise specified.**

5. Bid Item #1373 shall be utilized when such construction requires the rebuilding, reconstructing, or rehabilitating of an existing structure and no other construction is anticipated. This Bid Item shall include all necessary labor, equipment, and transportation costs for picking up the CITY-supplied castings from the CITY's storage yard located on West Fernau Avenue, including the necessary placement of the casting, cover, and joint sealant on the final structure adjustment and delivery of the old casting and cover to the CITY's storage yard. Broken and unbroken castings returned to the CITY's storage yard shall be separated and stockpiled neatly. The CONTRACTOR shall place the frames on a 3½″ x 3/8″ bed of flexible joint sealant when using Infra-Shield type external manhole seals. The CITY shall measure each set of newly-replaced manhole castings and frames as a combined unit, i.e. one (1) manhole frame and one (1) manhole lid will be measured as one (1), not two (2), set of castings for manholes acceptably completed. Bid Item #1373 shall be used specifically for Manhole Rehabilitation Projects or when specifically bid.

6. Bid Item #1374 shall be utilized when such construction requires the rebuilding, reconstructing, or rehabilitating of an existing structure and no other construction is anticipated. This Bid Item shall include all labor, equipment, and materials to furnish and install the concrete adjustment rings and joint sealant. The minimum allowable concrete ring thickness is three inches (3″). One (1) adjustment ring shall be used in lieu of multiple rings, i.e. one (1) eight-inch (8″) ring shall be used instead of two (2) four-inch (4″) rings (see **Section 3100.2.6 of these Specifications**). If the top of the riser or cone is uneven, the ENGINEER may require a 1¼″ diameter flexible joint sealant be used. The CITY will measure the concrete ring adjustment per vertical foot that is acceptably installed. Bid Item #1374 shall be used specifically for Manhole Rehabilitation Projects or when specifically bid.

7. Bid Item #1375 shall be utilized when such construction requires the rebuilding, reconstructing, or rehabilitating of an existing structure and no other construction is anticipated. This Bid Item includes all labor, equipment, and materials to furnish and install the rubber adjustment ring. The CONTRACTOR shall furnish and install Infra-Riser rubber adjusting ring (or APPROVED EQUAL), per manufacturer's specifications (see **Section 3100.3.6 of these Specifications**). CONTRACTOR shall not install more than a single three-inch (3″) rubber adjusting ring at any manhole. Taper rings shall be used in paved areas to match the roadway cross slope. The CITY shall measure the tapered rubber adjustment ring based on the thickest portion of the ring acceptably completed. The CITY shall measure the rubber adjustment rings per vertical foot that is acceptably installed. Bid Item #1375 shall be used specifically for Manhole Rehabilitation Projects or when specifically bid.

8. Bid Item #1376 shall include all labor, equipment, and materials to tuck point manholes at the locations shown and required as part of the Project and Plans. The CONTRACTOR shall trowel cement mortar to all joints within the manhole to a neat finish. Tuck pointing new castings within new pavement for the purpose of completing installed, rebuilt, or reconstructed manholes is incidental to that work and not paid for as part of this Bid Item. The CITY shall measure tuck pointing manholes per each structure acceptably completed. Bid Item #1376 shall be used specifically for Manhole Rehabilitation Projects or when specifically bid.

1300.6.5 Turf Restoration (including Seeding, Fertilizing, and Erosion Control)

1. The square yard bid price for this Bid Item shall include all necessary labor, equipment, and materials to backfill and topsoil, fine-grade, fertilize, seed, and erosion mat or apply hydraulically-applied erosion control product the area as described in **Section 900.2.12** of these Specifications.

1300.6.6 Restore Existing Gravel Driveways and Aprons

1. **The per square yard bid price for this Item** shall include all necessary labor, equipment, and materials to excavate the old driveway area and provide either six inches (6") of screenings, or ¾" CABC as specified; fine grade; and compact the area as indicated in **Section 900.2.12** of these Specifications.

1300.6.7 Cold Weather Covering

1. Payment for the Cold Weather Covering Bid Items shall only be utilized when the CONTRACTOR is directed by the CITY to cover previously-placed concrete, due to local weather forecasts (see **Section 900.2.6** of these Specifications).

2. Bid Items #1380 through #1384 are being bid as undistributed quantities. The CONTRACTOR will be paid based on the actual installed quantities **only** and no adjustments in unit prices will be made for any increases or decreases of quantities used.

1300.6.8 Cold Weather Concrete Pavement Up-Charge

1. Bid Item #1390 will only be used when the CONTRACTOR is directed to use heated concrete for late season work. This Bid Item will cover the up-charge for added hot water and/or utilizing heated materials for concrete pavements, whether redi-mixed or plant-mixed. The additional cost will be paid on a cubic yard basis and will be paid in addition to the unit bid prices for the concrete pavement.

SECTION 1350
CONCRETE PAVEMENT CORE HOLE PATCHING

1350.1 Description

1. This Section describes the materials, supplies, and incidentals necessary in performing all preparation, placement, finishing, and protection for the construction of full-depth core hole patching in concrete pavement.

1350.2 Materials

1. Use only the pre-approved product materials listed in this Section or an Approved Equal only when given written approval by the ENGINEER.

APPROVED CONCRETE PATCH PRODUCT LIST	PRODUCT MANUFACTURER
HD 50	Dayton Superior
Pave Patch 3000	Dayton Superior
Rapid Road Repair	Quikrete
Duracal Cement	USG Industrial
Highway Patch	Five Star
Polypatch FR	US Spec

1350.3 Construction

1. The CONTRACTOR shall follow all applicable manufacturer's specifications as it applies to each individually-approved cementitious product to properly repair the core hole. The core patch shall be finished in such a manner that all excess material or defects are properly removed while the mortar is still plastic to the extent necessary, such that only a flush surface with the adjacent concrete pavement remains. Core patching shall only be placed where allowed in conformance with **Chapter 25 Section 25-20 (C)** and **Chapter 25 Section 25-22** of the *Municipal Code of the City of Oshkosh*.

1350.4 Curing and Protection

1. The CONTRACTOR shall protect the pavement core patch for a minimum of three (3) hours following the installation and finishing of the core patch or until it reaches a compressive strength of 3,000 psi, whichever takes longer. Traffic shall be excluded from the pavement core patch by erecting and maintaining proper traffic control measures, as required by the *Manual of Uniform Traffic Control Devices* (MUTCD).

SECTION 1400
CONCRETE CURB, AND CURB AND GUTTER

1400.1 Description

1. The work shall consist of furnishing all labor, equipment, materials, and incidentals necessary for the construction of the concrete curb and curb and gutter in accordance with the Contract Plans and Specifications. The work is listed on the *Proposal* and consists essentially of constructing concrete curb or curb and gutter with or without reinforcement. The unit price for these Bid Items shall include all labor, equipment, materials, and forming, necessary to construct the concrete curb and/or curb and gutter as specified by the Plans and Special Details.

2. Sundry items which are required to complete the work, but are not included as items on the *Proposal*, shall be considered an integral part of the Contract and the cost of such items shall be included in the unit price bid for other items of work. The CONTRACTOR shall view the work sites and acquaint themselves with the conditions to be met.

1400.2 Materials

1. All materials shall conform to **Section 1300** and **Section 900** of these Specifications.

1400.3 Construction

1. All construction methods, including curing and covering, shall conform to **Section 1300** and **Section 900** of these Specifications.

1400.3.1 Integral Construction

1. Unless specified otherwise in the Contract, the CONTRACTOR must construct curb, gutter, or curb and gutter by slip forming integrally with the pavement. Extend the joints in the pavement through the integral curb, gutter, or curb and gutter. Space these joints to match the joints in the adjacent pavement.

2. The ENGINEER will not require pavement reinforcing steel and load transfer dowels within the limits of the integral curb, gutter, or curb and gutter, as the Plans show. Construct integral curb, gutter, or curb and gutter to the section the Plans show.

1400.4 Measurement

1. The CITY will measure all Curb, Gutter, and Curb and Gutter Bid Items under this Section by the linear foot acceptably completed.

2. The length measured equals the distance along the base of the curb face, or along the flow line of the gutter. The CITY will measure continuously along a line extended across driveway and alley entrance returns or ramps.

3. The CITY will not make deductions in length for drainage structures installed in the curbing, such as inlets, etc.

4. The CITY will measure all excavation required for and performed during this work, if covered by a Bid Item in the Contract, as specified in the Specifications. However, if the Contract does not provide a Bid Item for Excavation, it is incidental to the work.

1400.5 Payment

1. The CITY will pay for measured quantities at the Contract unit price under the following Bid Items:

Bid Item	Description	Units
	CONCRETE CURB AND CURB AND GUTTER	
1400	18″ Standard Type "B" Curb with 6″ CABC and Grading	LF
1410	12″ Radius Curb with 6″ CABC and Grading	LF
1420	18″ Curb and Gutter, 7″, with 5″ CABC and Grading	LF
1421	18″ Curb and Gutter, Plain, 7″, with 5″ CABC and Grading	LF
1422	18″ Curb and Gutter, 8″, with 6″ CABC and Grading	LF
1423	18″ Curb and Gutter, Plain, 8″, with 6″ CABC and Grading	LF
1428	18″ Concrete Curb and Gutter Removal and Replacement, including Sawing, Pavement Ties, Dowel Bars, Bond Breaker, Integral Curb and Fine Grading, Turf Restoration, and Traffic Control	LF
1430	24″ Curb and Gutter, 7″, with 5″ CABC and Grading	LF
1431	24″ Curb and Gutter, Plain, 7″, with 5″ CABC and Grading	LF
1432	24″ Curb and Gutter, 8″, with 6″ CABC and Grading	LF
1433	24″ Curb and Gutter, Plain, 8″, with 6″ CABC and Grading	LF
1438	24″ Concrete Curb and Gutter Removal and Replacement, including Sawing, Pavement Ties, Dowel Bars, Bond Breaker, Integral Curb and Fine Grading, Turf Restoration, and Traffic Control	LF
1440	30″ Curb and Gutter, 7″, with 5″ CABC and Grading	LF
1441	30″ Curb and Gutter, Plain, 7″, with 5″ CABC and Grading	LF
1442	30″ Curb and Gutter, 8″, with 6″ CABC and Grading	LF
1443	30″ Curb and Gutter, Plain, 8″, with 6″ CABC and Grading	LF
1445	36″ Curb and Gutter, Plain, (12″ Curb Head), 8″, with 6″ CABC and Grading	LF

Bid Item	Description	Units
1448	30″ Concrete Curb and Gutter Removal and Replacement, including Sawing, Pavement Ties, Dowel Bars, Bond Breaker, Integral Curb and Fine Grading, Turf Restoration, and Traffic Control	LF
1450	36″ Mountable Curb and Gutter, 8″, with 6″ CABC and Grading	LF
1460	Sidewalk Curb	LF

2. Payment for Curb and Gutter, Plain Bid Items shall be made when clearance for integral curb and gutter does not exist and Curb and Gutter, Plain is specified on the Plans.

3. Payment for all the Curb, Gutter, and Curb and Gutter Bid Items under this Section is full compensation for all foundation excavation and preparation; all special construction required at driveway and alley entrances or curb ramps; for providing all materials, including concrete and expansion joints; for placing, finishing, protecting, and curing; for sawing joints; for disposing of surplus excavation material; and for restoring the work site. However, if the Contract provides a Bid Item for excavation, then the CITY will pay for excavation required for this work as specified in the Contract. Payment also includes providing tie bars in unhardened concrete. For tie bars provided in concrete not placed under the Contract, the CITY will pay separately under the Pavement Ties Bid Item as specified in **Section 1300.5.3** in these Specifications.

4. The thickness of gravel base shall be as specified.

5. Payment for Bid Items #1428, #1438, and #1448 under this Section is full compensation for all foundation excavation and preparation. Payment also includes providing tie bars in unhardened concrete. Payment shall also include excavating to subgrade; sawing; removing pavement, pavement ties, dowel bars, bond breaker, six inch (6″) CABC, turf restoration, and traffic control; all special construction required at driveway and alley entrances or curb ramps; for providing all materials, including concrete and expansion joints; for placing, finishing, protecting, and curing concrete; for sawing joints; for disposing of surplus excavation material; and for restoring the work site.

SECTION 1500
CONCRETE SIDEWALKS, DRIVEWAYS, RAMPS, AND STEPS

1500.1 Description

1. The work covered by this Section of the Specifications shall consist of furnishing all necessary labor, equipment, and materials necessary for the construction of concrete sidewalk, driveways, ramps, and steps as specified and shown on the Plans, with or without reinforcement.

1500.2 Public Relations

1. The City of Oshkosh desires to cause as little disruption and inconvenience to the abutting property owners as possible. The work shall be scheduled so there is a minimum of delay between phases of all operations. Backfilling, cleanup, and opening of the street to traffic shall take place as soon as possible after the necessary cure time has elapsed.

2. While a given street is under construction, the CONTRACTOR shall cooperate in providing access for residents that are moving, to people who require handicap access, and to building contractors.

3. The CONTRACTOR shall provide written notice to all affected property owners/residents one (1) week prior to any changes in access. **The CITY will provide the appropriate written notices.** During times residents do not have driveway access, all sidewalk access shall be maintained on a clear and level surface suitable for wheelchair access. The sidewalks shall provide routes to adjacent streets designated for residents to park.

1500.3 Materials

1. Concrete:
   A. Conform to **Section 1300** and **Section 900** of these Specifications.
   B. The concrete shall be air-entrained and shall be finished similar to adjacent walks and conform to **Section 1300** of these Specifications.

2. Expansion joint filler: Conform to **Section 1300** of these Specifications.

3. Aggregates: Conform to **Section 1300** of these Specifications.

4. Reinforcement: Conform to **Section 1300** of these Specifications.

5. Crushed aggregate base course: Conform to **Section 1800** of these Specifications.

6. Curb Ramp Detectable Warning Fields:

A. Neenah R-4984 cast iron detectable warning plate and CAST-DWD cast iron detector plate manufactured by Pioneer Detectable LLC, supplied in its natural state, and uncoated are approved products.
B. Standard section shall be twenty four inch (24″) square with bolt lugs on the underside edges providing anchorage and the means for fastening two (2) plates together with two (2) three-eighths inch (3/8″) steel bolts and nuts. The minimum plate thickness shall be five-sixteenth of an inch (5/16″) with a weight of sixty two (62) pounds.
C. The plates shall have four (4) vent holes to allow entrapped air to escape during installation. These vent holes shall be countersunk to allow optional, stainless steel countersunk flathead anchor screws to be inserted through the holes into the concrete below. The top surface shall be truncated domes that meet the size and spacing as specified in ADA and ABA guidelines. The plate surface and dome truncation surface shall have a tight pattern of raised conical points to increase the coefficient of friction.
D. The plates generally are supplied in either 2′ x 1′, 2′ x 2′, 2′ x 2.5′, 2′ x 3′, or 2′ x 4′ sizes. The ENGINEER will advise the CONTRACTOR on which size to use.

7. Reinforcing Rods: Number 4 epoxy-coated, deformed reinforcing bars, minimum length twenty feet (20′).

8. Sidewalk Tie Bars: Number 4 epoxy-coated, deformed bars, nine inches (9″) in length.

9. Cold Weather Covering: Clear, black, or white polyethylene sheeting conforming to the requirements, except for color and reflectance, specified in **AASHTO M171**. The ENGINEER may allow other curing materials with suitable water resistance, strength, and insulating properties.

1500.4 Construction

1. All construction methods shall conform to **Section 1300** and **Section 900** of these Specifications.

1500.4.1 General

1. These Bid Items must include the cost of any excavation necessary to construct the sidewalk or driveway. Removal of existing sidewalk and driveway will be paid for under the Removal Item.

2. These Bid Items shall include at least three inches (3″) of crushed stone base, placed under the walk. The base shall be thoroughly tamped and wetted prior to pouring the walk. Salvaged base material shall conform to the gradations as specified in **Section 305** of the STATE SPECIFICATIONS.

3. The sidewalks shall meet all appropriate requirements of the Paving Specifications, as herein specified.

4. It should be noted some sidewalks replaced across dr**i**veways, as shown on the Plans, will have to be rolled downward with a greater than normal slope, so as to create a smooth approach. All wheelchair ramps, as shown on the Plans, will be paid for as sidewalk under Bid Items #1510 through #1524.

5. No extra monies will be paid for any sidewalk removed and replaced abutting existing buildings, structures, or pavements. Cost must be included in that particular Bid Item.

6. Treatment of terrace trees shall conform to **Section 100.63** of these Specifications.

1500.4.2 Sidewalks

1500.4.2.1 Preparing the Foundation

1. Form **the foundation** b**y** excavating or filling to the required elevation of the sub-base bottom, or concrete bottom, if specified. Tamp or compact the foundation to ensure stability. In cuts, make the foundation wide enough to allow placing forms and performing concrete placement and finishing. On embankments, construct the foundation at least two feet (2′) wider than the proposed sidewalk and extend it at least one foot (1′) beyond each end of the sidewalk.

2. Unless specified otherwise, fill all holes, ruts, and other depressions in the foundation with materials similar to those in the existing foundation. The CONTRACTOR may use granular sub-base or aggregate base, as specified in **Section 1800** of these Specifications.

3. Unless specified otherwise, place granular sub-base or aggregate base to a three-inch (3″) thickness and section as the Plans show. All material placed shall be compacted.

1500.4.3 Forms

1. Furnish and use wood or metal forms straight and of sufficient strength to resist springing, tipping, or other displacement during depositing and consolidating the concrete. If using wood forms, provide surfaced planks, at least two-inch (2″) nominal thickness stock except for sharply curved sections. If using metal forms, ensure they are the ENGINEER-approved section with a flat surface on top. Use forms as deep as the depth of the sidewalk. Securely stake, brace, and hold the forms firmly to the required line. Make the forms tight to prevent mortar leakage. Clean and oil all forms before placing concrete against them.

1500.4.4 Placing and Finishing Concrete

1. Conform to **Section 1300** of these Specifications. The ENGINEER will check and approve the foundation, forms, and reinforcement, if required, before placing the concrete. Place the concrete on a moist foundation, deposit it to the required depth, and consolidate sufficiently to bring the mortar to the surface, then strike-off and finish to a true and even surface. Before the mortar sets, brush or lightly broom the surface. Before performing the final surface finish, check the sidewalk surface with a ten-foot (10′) straightedge, and correct all areas that vary a quarter-inch (¼″) from the testing edge by adding or removing concrete while the concrete is still plastic.

2. If the ENGINEER allows, the CONTRACTOR may construct concrete sidewalks with suitable, ENGINEER-approved, slip-form equipment. The CONTRACTOR may omit wood floating, if the slip-form equipment produces a suitable finish.

3. Construct curb ramps at the locations and conforming to the details and dimensions the Plans show. Install detectable warning fields as specified for curb ramps conforming to manufacturer-recommended procedures.

4. The CONTRACTOR is required to stamp all concrete placed in the City of Oshkosh right-of-way. The stamp shall include the CONTRACTOR's name and installation date. The cost for stamping is considered incidental to the concrete placement. The stamp shall be placed at each end of the pour. Single squares require one (1) stamp.

1500.4.5 Reinforcement

1. If required, use reinforcement conforming to the Plans and place it as specified on the Plans.

1500.4.6 Joints

1. For sidewalks of uniform width, construct transverse joints at right angles to the sidewalk centerline, and construct longitudinal joints parallel to the centerline, unless specified otherwise. For sidewalks of variable or tapering widths, make the transverse and longitudinal joints at right angles to each other, if possible, and construct the joints as the ENGINEER laid them out the field.

2. Use contraction joints to divide the sidewalk into sections.

3. Place one-half inch (½″) wide transverse expansion joint filler through the sidewalk at uniform intervals not greater than ninety six feet (96′) apart.

4. Place one-half inch (½") wide expansion joint filler between the sidewalk and back of abutting parallel curb or gutter and raise the sidewalk above the curb one-half inch (½"). Place one inch (1") wide expansion joint filler between sidewalk and buildings or other rigid structures.

5. Place one-half inch (½") wide expansion joint filler between driveway approaches and the back of curb or gutter or edge of pavement, between the front of sidewalk and top of driveway apron, and between the back of sidewalk and existing or proposed concrete driveway.

6. No joint may deviate more than five degrees (5°) from perpendicular to the surface of the finished concrete. Ensure all joint axis do not deviate more than one-half inch (½") from a straight line, or from the designated alignment at any point. If constructing the joints in sections, do not use offsets or concrete struts between adjacent units.

7. If constructing the sidewalk in partial width slabs, place transverse joints so they match like joints in adjacent slabs. If widening existing sidewalks, place transverse joints in line with like joints in the existing sidewalk.

8. If possible, do not divide sidewalks into sections less than three feet (3'), or greater than six feet (6'), in any dimension. Sidewalk joints shall be placed to create generally square sections.

9. A contraction joint in sidewalk may consist of a slot or groove, at least one-quarter (¼) of the walk depth and one-quarter inch (¼") wide. The edges of the sidewalk along the forms shall be rounded with an edger of one-quarter inch (¼") radius.

10. The CONTRACTOR may form contraction joints by cutting the concrete not less than one-quarter (¼) of the depth through with a pointed trowel or other suitable tool. Edge-finish the joint with a one-quarter inch (¼") radius.

11. The CONTRACTOR may saw sidewalk contraction joints at least one inch (1") in depth and approximately one-eighth inch (1/8") wide. Perform the sawing as soon as possible after the concrete sets sufficiently to prevent raveling during sawing and before shrinkage cracking occurs.

12. Extend the expansion joint filler to the concrete's full depth and make the top slightly below the finished surface of the sidewalk.

13. For sidewalk, consolidate the concrete thoroughly at all expansion joint faces to fill the voids, and finish the surface smooth and true to grade. Also round sidewalk edges along forms, un-sawed joints, and metal slab division forms with a one-quarter inch (¼") radius edger. For all other work under this Section, use mechanical vibration at all expansion joint faces to fill the voids, and finish the surface smooth and true to grade.

14. Do not seal joints except where specified near buildings.

1500.4.7 Protecting and Curing

1. Cure the concrete as specified in **Section 100.58** of these Specifications.

2. Protect sidewalks as specified for **concrete pavement** in **Section 415.3.14** of the STATE SPECIFICATIONS, except the ENGINEER may allow the CONTRACTOR to open sidewalks to pedestrian traffic after the concrete has developed sufficient strength to prevent damage to the surface.

1500.4.8 Backfilling and Restoring the Site of the Work

1. If the sidewalk does not touch curb, curb and gutter, pavement, or other structures and if the concrete is cured and the forms removed, then backfill the spaces along the sides with satisfactory soil and thoroughly compact. For the backfill, conform to the section the Plans show. Dispose of surplus excavation and restore the work site to a neat and orderly condition. The CONTRACTOR will be required to restore all terraces and disturbed areas per **Section 2600** of these Specifications.

1500.4.9 Steps

1. If constructing steps and landings is included in the Contract, build them at the locations and as specified in the design, dimensions, and details the Plans show. This work includes reinforcement and necessary excavating, backfilling, and disposing of excess excavation material.

2. Provide a rubbed surface finish on formed surfaces of landings, risers, and sides of steps as specified for concrete bridges in **Section 502.3.7.3** of the STATE SPECIFICATIONS.

3. Furnish and use materials and construction methods conforming to **Section 602** of the STATE SPECIFICATIONS, except as specified otherwise.

1500.4.10 Reinforcing Rods

1. Install three (3) reinforcing rods, eight feet (8′) to twenty feet (20′) in length over utility trenches within sidewalk. Space reinforcing rods fifteen inches (15″) apart. ENGINEER in field may approve shorter length rods depending on field conditions. Rods shall extend a minimum of one foot (1′) beyond any trench excavations.

1500.4.11 Sidewalk Tie Bars

1. Drill and install a minimum of two (2) nine-inch (9″) long tie bars, located at a minimum of one and half feet (1½′) from each edge of the sidewalk. Anchor the tie bars into the existing concrete with an epoxy conforming to **Section 416.2.2.2** of the STATE SPECIFICATIONS and install the tie bars, conforming to **Section 416.2.2** of the STATE SPECIFICATIONS, except that no bond breaker is required. The hole for the bar shall be drilled to a depth of five inches (5"). The bars shall be located at one-half (½) thickness of the existing concrete pavement. All pavement ties shall be epoxy-coated in conformance with **Section 505.2.4** of the STATE SPECIFICATIONS.

1500.4.12 Cold Weather Covering

1. The CONTRACTOR shall arrange to have available a sufficient quantity of material to provide thermal protection for concrete that has yet to conform to the opening criteria specified.

2. If the National Weather Service forecast for the construction area predicts temperatures of less than 17°F (-8°C) within the next twenty-four (24) hours, arrange to have available a sufficient quantity of straw or hay to protect all concrete that has yet to conform to the opening criteria specified. If the ENGINEER approves, the CONTRACTOR may use other materials placed to the thickness necessary to provide the same insulating protection as the required thickness of loose, dry straw or hay.

3. At any time of the year, if the National Weather Service forecast for the construction area predicts freezing temperatures within the next twenty-four (24) hours, or when freezing temperatures actually occur, provide the minimum level of thermal protection specified below for concrete that has yet to conform to the opening criteria specified:

PREDICTED OR ACTUAL TEMPERATURE	MINIMUM EQUIVALENT LEVEL OF PROTECTION
22° to <28°F (-6° to <-2°C)	single layer of polyethylene (Bid Item #1580)
17° to <22°F (-8° to <-6°C)	double layer of polyethylene (Bid Item #1582)
<17°F (<-8°C)	6″ loose, dry straw or hay between 2 layers of polyethylene (Bid Item #1584)

The CONTRACTOR shall place protective material as soon as the concrete is finished and sets sufficiently to prevent excessive surface marring. Maintain the protective material in place, until the concrete conforms to the opening criteria specified. If necessary to remove the coverings to saw joints or perform other required work, and if the ENGINEER approves, the CONTRACTOR may remove the covering for the minimum time required to complete that work. Any such removing and re-covering for sawing, sealing, or other work shall be incidental to these Items.

1500.5 Measurement

1. The CITY will measure the Concrete Sidewalk Bid Items by the square foot acceptably completed. Measurement includes the area of the curb ramp and warning field.

2. The CITY will measure the Curb Ramp Detectable Warning Field Bid Items by the square foot acceptably completed.

3. The CITY will measure Concrete Steps by the square foot acceptably completed. The measured area of steps, including landings, equals the sum of the areas of the treads and landings, computed by multiplying the tread and landing width by the tread and landing length.

4. The CITY will measure No. 4 Reinforcing Rods Bid Item acceptably completed on a linear foot basis.

5. The CITY will measure Drilled No. 4 Sidewalk Tie Bar Bid Item acceptably completed on per each basis.

6. The CITY will measure Cold Weather Covering Bid Items acceptably completed on a square foot basis.

1500.6 Payment

1500.6.1 General

1. The CITY will pay for measured quantities at the contract unit price under the following Bid Items:

Bid Item	Description	Units
CONCRETE SIDEWALKS, DRIVEWAYS, RAMPS, AND STEPS		
1500	4″ Concrete Sidewalk with 3″ CABC and Grading	SF
1502	4″ Concrete Sidewalk with 3″ CABC and Grading, Water Dept. Locations	SF
1506	4″ Concrete Sidewalk with False Curb, 3″ CABC, and Grading	SF

Bid Item	Description	Units
1510	6″ Concrete Sidewalk/Driveway/Ramp with 3″ CABC and Grading	SF
1512	6″ Concrete Sidewalk/Driveway/Ramp with 3″ CABC and Grading, Water Dept. Locations	SF
1514	6″ Concrete Sidewalk/Driveway/Ramp (HES) with 3″ CABC and Grading	SF
1516	6″ Concrete Sidewalk/Driveway/Ramp with False Curb, 3″ CABC, and Grading	SF
1520	8″ Concrete Sidewalk/Driveway/Ramp with 3″ CABC and Grading	SF
1524	8″ Concrete Sidewalk/Driveway/Ramp (HES) with 3″ CABC and Grading	SF
1526	6″ Concrete Sidewalk with 3″ CABC and Grading, London Paver Pattern	SF
1530	6″ Concrete Step	SF
1540	Curb Ramp Detectable Warning Field (Natural/Non-Painted)	SF
1541	Curb Ramp Detectable Warning Field (Natural/Non-Painted) – Radial	SF
1550	No. 4 Reinforcing Rods – Deformed, Epoxy-Coated	LF
1560	Drilled No. 4 Sidewalk Tie Bars – Deformed, Epoxy-Coated	EA
1570	Turf Restoration (Sidewalk)	SY
1580	Cold Weather Covering (Sidewalk) – Single Visquine	SF
1582	Cold Weather Covering (Sidewalk) – Double Visquine	SF
1584	Cold Weather Covering (Sidewalk) – Double Visquine with 6″ Hay	SF
1590	Up-Charge for Late Season Cold Weather Concrete Sidewalk	CY

2. The CONTRACTOR may use approved, select salvaged material for gravel base under Bid Items #1500 through #1530. Salvaged base material shall conform to the gradations as specified in **Section 305** of the STATE SPECIFICATIONS.

3. Bid Item #1500 will also be used for the temporary concrete walk when *Construction Access Agreements* are not returned. Payment for this Bid Item will also be utilized when the CONTRACTOR is directed by the CITY to install temporary sidewalk. The quantity in the estimate of quantities is only an estimate. The CONTRACTOR will be paid based on the actual, installed quantities only and no adjustments in unit prices will be made for any increases or decreases of quantity installed.

4. If *Construction Access Agreements* are not returned, temporary sidewalk and aprons will be installed, therefore potentially decreasing the quantity of Bid Item #1510. The quantity in the estimate of quantities is only an estimate. The CONTRACTOR will be paid based on the actual, installed quantities only and no adjustments in unit prices will be made for any increases or decreases of quantity used.

5. **Any Water Utility sidewalk patches outside of the designated sidewalk rehabilitation limits shall be paid for under Bid Items #1502 and #1512. All Water Utility sidewalk patches inside the designated sidewalk rehabilitation limits will be paid for under Bid Items #1500 or #1510 as appropriate.**

6. Bid Item #1526 shall include London Paver pattern sidewalk as shown on the Plan Sheets and the Detail Drawing included in a Project's *Special Conditions*.

1500.6.2 Concrete Sidewalk and Steps

1. Payment for the Concrete Sidewalk Bid Items, including the area of curb ramp and warning field, or Concrete Steps Bid Item, including landings, is full compensation for providing all materials, including concrete, reinforcement, and expansion joints; for excavating and preparing the foundation backfilling and disposing of surplus material; for placing, finishing, protecting, and curing; and for restoring the work site. Payment also includes providing tie bars and dowel bars in unhardened concrete. For tie bars and dowel bars provided in concrete not placed under the Contract, the CITY will pay separately under the Drilled No. 4 Sidewalk Tie Bars Bid Item, as specified. Payment for Bid Item #1530 shall extend from back of sidewalk to eleven inches (11") beyond the topmost step. Vertical risers shall be included in the square foot quantity.

2. Bid Items #1506 and #1516 shall be constructed according to the Standard Detail Drawing. Payment will be made based on square footage measured to the face of curb. When preparing the foundation, the CONTRACTOR may use granular sub-base, or aggregate base; in this case, the CITY will not make additional compensation for this Item.

1500.6.3 No. 4 Reinforcing Rods and Sidewalk Tie Bars

1. The unit price for No 4. Reinforcing Rods – Deformed, Epoxy-Coated shall include all labor, equipment, and materials necessary to place reinforcing rods over utility trenches as directed by the ENGINEER.

2. The unit price for Drilled No. 4 Sidewalk Tie Bars – Deformed, Epoxy-Coated shall include all labor, equipment, and materials necessary to install the Sidewalk Tie Bars, as shown on the Plans. The unit price shall also include all costs associated with anchoring the bars with epoxy.

1500.6.4 Curb Ramp Detectable Warning Fields

1. Payment for the Curb Ramp Detectable Warning Field Bid Item is full compensation for providing all necessary labor, equipment and materials to install the detectable warning field plates. The plates will be paid on a square foot unit price.

1500.6.5 Cold Weather Covering

1. Payment for the Cold Weather Covering (Sidewalk) Bid Items shall only be utilized when the CONTRACTOR is directed by the CITY to cover previously-placed concrete, due to local weather forecasts (see **Section 900.2.6** of these Specifications).

2. Bid Items #1580 through #1584 are being bid as undistributed quantities. The CONTRACTOR will be paid based on the actual installed quantities **only** and no adjustments in unit prices will be made for any increases or decreases of quantities used.

1500.6.6 Turf Restoration (Sidewalk)

1. The square yard payment for Turf Restoration (Sidewalk) shall include all necessary labor, equipment, and materials to backfill and topsoil, fine-grade, fertilize, seed, and stabilize the soil in any areas that extend beyond eighteen inches (18") in any direction from the newly-placed concrete sidewalk or driveway in Bid Items #1500 through #1530. **The turf restoration of the area within eighteen inches (18") of the newly-poured concrete is incidental to the appropriate Concrete Sidewalk or Driveway Bid Item and shall conform to Section 2600 of these Specifications**.

2. Bid Item #1570 is being bid as an undistributed quantity. The CONTRACTOR will be paid based on the actual installed quantities **only** and no adjustments in unit prices will be made for any increases or decreases of quantities used.

3. This Bid Item only applies when Bid Item #1370 is not being used.

4. The use of an approved hydromulch in lieu of the specified erosion control mat will be considered on a case-by-case basis. Material, application methods, and rates shall be approved by the ENGINEER. An appropriate deduction for Bid Item #1570 must be submitted. The specified erosion control mat shall be used unless hydromulch is approved.

1500.6.7 Cold Weather Concrete Sidewalk Up-Charge

1. Bid Item #1590 will only be used when the CONTRACTOR is directed to use heated concrete for late season work. This Bid Item will cover the up-charge for added hot water and/or utilizing heated materials for concrete sidewalks, whether redi-mixed or plant-mixed. The additional cost will be paid on a cubic yard basis and will be paid in addition to the unit bid prices for the concrete pavement.

SECTION 1600
TREES

1600.1 Description

1. The bid price for this Item shall include furnishing and installing balled and burlap trees. The trees shall be furnished and installed in conformance with **Section 632** of the STATE SPECIFICATIONS and **Section 2600.3.7** of these Specifications, or as otherwise directed by the City Forester.

2. The normal spring planting season for all plants shall extend to June 1st. The normal fall planting season for all plants, except evergreens, begins on October 1st. Perform fall evergreen planting between September 1st and October 1st. Unless approved otherwise, the CONTRACTOR shall not plant if the ground is frozen or if the soil is unsatisfactory for planting. The CONTRACTOR shall not plant if the temperature is below freezing unless the plant roots are protected to prevent damage. Do not drag, lift, or pull balled and burlapped plants by the trunk, branches, or foliage. Do not drop or handle in any manner that damages the ball or the plant.

3. This Bid Item shall include trees planted with a minimum of 2″ caliper (diameter measured at 6″ above topsoil) and not to exceed 2½″ caliper. Tree species shall be determined by the City Forester and shall be planted in locations specified on the Plans with final species and locations being approved by the City Forester.

1600.2 Measurement

1. The CITY will pay for EACH acceptably planted tree.

1600.3 Payment

1. The CITY will pay for measured quantities at the Contract unit price under the following Bid Item:

Bid Item	Description	Units
	TREES	
1600	Furnish and Install Tree	EA

SECTION 1650
LOCATE AND REPLACE EXISTING PROPERTY MONUMENTS

1650.1 Description

1. The Locate Existing Property Monuments Bid Item includes locating existing property monuments located within the project construction limits, which may be lost or disturbed by construction operations, as directed by the ENGINEER, and as hereinafter provided. This provision does not relinquish the CONTRACTOR of their responsibility under **Section 100.60** of these Specifications.

2. Prior to the beginning of construction, locate and document the adjacent property monuments located within the project construction limits, as shown on the Plans. The monuments that are required to be located are shown on the Plan Sheets. Even though the Plan Sheets may not indicate any additional monuments, the CONTRACTOR should be aware of the possibility that more may exist; and if discovered, they must also be located and documented.

3. Prepare a property monument location map showing the type of monument found, along with their original coordinates. The CITY will provide an AutoCAD map to be used as a base map. Provide a copy of the property monument location map to the ENGINEER.

4. All work under this Section will be performed by, or under the direction of, a Land Surveyor registered in the State of Wisconsin.

5. After construction is completed, property monument locations will be verified by the CONTRACTOR, under the direction of the ENGINEER. Any that have been disturbed will be reset, if necessary, under the Bid Item #1652 Replace Existing Property Monuments.

6. The Replace Existing Property Monuments Bid Item includes replacing existing property monuments located within the project construction limits, which may have been lost or disturbed by construction operations, as directed by the ENGINEER, and as hereinafter provided. This provision does not relinquish the CONTRACTOR of their responsibility under **Section 100.60** of these Specifications.

7. Provide replacement property monuments that are one inch (1″) inside diameter by twenty four inches (24″) long iron pipe or three-quarter inch (¾″) diameter iron rod or rebar that is twenty four inches (24″) long in locations outside of pavement areas; a Bernstein Steel Nail Marker for placement in asphalt pavement; or a Bernstein BP1 Brass Marker with anchoring plug for placement in concrete pavement.

8. After construction is substantially complete, the CONTRACTOR will verify which property monuments have been disturbed. Replace or reset, as necessary, any property monuments that are lost or disturbed.

9. Prepare a property monument replacement map showing the type of monuments originally found, and the type of replacement monument used to replace or reset the lost or disturbed monuments, with their coordinates. The CITY will provide an AutoCAD map to be used as a base map. The property monument replacement map shall explicitly state the replaced or reset monuments are not being certified as an actual property monument; only that evidence of a property monument was found and reset. Provide a copy of the property location map to the ENGINEER and the County Surveyor.

10. There are section corners existing along the project route. These corners will need to be replaced, along with new ties. All work for the Replace Section Corner Bid Item shall follow **Section 621** of the STATE SPECIFICATIONS.

1650.2 Measurement

1. The CITY will measure the Locate Existing Property Monument Bid Item acceptably completed on per each basis.

2. The CITY will measure the Replace Existing Property Monument Bid Item acceptably completed on per each basis.

3. The CITY will measure the Replace Section Corner Bid Item acceptably completed on per each basis.

1650.3 Payment

1. The CITY will pay for measured quantities at the Contract unit price under the following Bid Items:

Bid Item	Description	Units
	LOCATE AND REPLACE EXISTING PROPERTY MONUMENTS	
1650	Locate Existing Property Monuments	EA
1651	Replace Section Corner	EA
1652	Replace Existing Property Monuments	EA

2. Payment for Bid Item #1650 is full compensation for all work necessary to verify the location of all property monuments within the permanent easement, temporary easement, and construction easement areas, within the construction limits, that may be lost or disturbed by construction operations, as directed by the ENGINEER; to furnish a registered land surveyor; and to prepare a property monument location map showing the type of monument found along with the original coordinates.

3. Payment for Bid Item #1651 is for full compensation for all surveying work necessary to verify the location of said section corners; replacing said section corners and ties; furnishing and installation section monuments; furnishing a registered land surveyor; preparing, annotating, delineating, and filing the appropriate tie sheet with the ENGINEER and the county surveyor; and for furnishing all labor, equipment, materials, tools, and incidentals necessary to complete the Contract work.

4. Payment for Bid Item #1652 is full compensation for all survey work necessary to verify the location of all property monuments previously located under Bid Item #1650 Locate Existing Property Monuments; replacing or resetting, as necessary, property monuments that are lost or disturbed from their original location; furnishing property monuments; furnishing a registered land surveyor; preparing, annotating, and delivering the property monument location map; and for furnishing all labor, equipment, materials, tools, and incidentals necessary to complete the Contract work.

5. The CITY will pay for EACH acceptably located and replaced survey monument.

SECTION 1700
SAW CUTTING

1700.1 Description

1. This Section describes sawing of existing concrete or asphalt including pavement, curb and gutter, driveways, sidewalks, and similar work. Sidewalk sawing at control joints is incidental to the Sidewalk Removal Bid Item and no further compensation will be allowed.

1700.2 Construction

1700.2.1 Equipment

1. Use diamond blades for sawing concrete where a full-depth cut is required. The CONTRACTOR may use carbide cutting wheels to saw concrete that will be overlaid or for full-depth cuts where the cut face does not join the new concrete.

1700.2.2 Sawing Asphalt

1. Make straight saw cuts at least two inches (2″) deep. Saw so the surface remaining is generally vertical over its full depth. Saw to the depth the Plans indicate or as the ENGINEER directs or allows.

1700.2.3 Sawing Concrete

1. Do not extend saw cuts into newly placed concrete pavement or into existing pavements more than four inches (4″) beyond the limits the ENGINEER designates. Saw full depth, unless the Plans indicate otherwise or the ENGINEER directs or allows otherwise.

2. Remove sawing sludge after completing each saw cut. Minimize sludge on live traffic lanes. Remove sludge from all traffic control devices each day before dark. Dispose of sludge at an acceptable material disposal site.

1700.2.4 Profile Saw Cut Concrete Curb

1. The intent of the Profile Saw Cut Concrete Curb Bid Item is to create an ADA-compliant wheelchair opening in existing vertical-faced concrete curb pavement with flares. Chipping, grinding, and polishing may be required.

1700.3 Measurement

1. The CITY will measure Sawing Existing Pavement, Sawing Concrete Pavement Full Depth, and Profile Saw Cut Concrete Curb Bid Items by the linear foot acceptably completed. The CITY will not measure overcuts beyond the limits the Plans show or the ENGINEER directs.

2. If performing Sawing Concrete in conjunction with concrete pavement repair and replacement or concrete base patching, the CITY will measure the applicable total quantity of the following:
   A. One (1) full-depth longitudinal cut through the repair area if the ENGINEER deems that cut necessary.
   B. Two (2) full-depth transverse cuts, one (1) at each limit of the repair area.
   C. Additional transverse cuts as necessary to reduce the removal slabs to a transportable size. The CITY will not measure cuts made to reduce removal slabs to a width less than seven feet (7′).
   D. Additional full-depth cuts the ENGINEER directs to extend the repair limits, unless those cuts were required because of damage the CONTRACTOR's operations caused.

3. The CITY will measure and pay for composite cuts through both asphalt and concrete as the Sawing Concrete Pavement Full Depth Bid Item.

1700.4 Payment

1. The CITY will pay for measured quantities at the Contract unit price under the following Bid Items:

Bid Item	Description	Units
	SAW CUTTING	
1700	Sawing Existing Pavement	LF
1710	Sawing Concrete Pavement Full Depth	LF
1720	Profile Saw Cut Concrete Curb	LF

2. Payment is full compensation for all sawing and sludge removal. The unit price for all Saw Cutting Bid Items shall include all labor, equipment, materials, tools, and incidentals necessary to complete the work.

SECTION 1800
BASE COURSES

1800.1 Description

1. The work covered by this Section of the Specifications shall consist of furnishing all labor, equipment, and materials to furnish, place, grade, and compact aggregate base courses to the thickness and gradations as shown on the Contract Plans and Special Details.

1800.2 Materials

1. All aggregates provided for the materials specified shall conform to the requirements of **Section 301** of the STATE SPECIFICATIONS.

1800.3 Gradations

1. Gradations for the materials specified shall conform to the requirements of **Section 305**, **Section 311**, and **Section 312** of the STATE SPECIFICATIONS.

1800.4 Construction

1. Construction methods for the materials specified shall conform to the requirements of **Section 301.3** of the STATE SPECIFICATIONS. Additional requirements for compacting dense, graded bases and constructing gravel shoulders are specified in **Section 305.3.2** and **Section 305.3.3** of the STATE SPECIFICATIONS.

1800.5 Measurement

1. The CITY will measure Base Courses and Gravel Shoulder Bid Items by the ton acceptably completed.

1800.6 Payment

1. The CITY will pay for the measured quantities at the Contract price for the following Bid Items:

Bid Item	Description	Units
	BASE COURSES	
1800	Base Aggregate Dense, ¾"	TON
1801	Base Aggregate Dense, 1¼"	TON
1802	Base Aggregate Dense, 3"	TON
1810	Breaker Run	TON
1811	Select Crushed Material	TON

2. The CITY will pay for the material to fill the excavation below subgrade based on the average end area of undercut converted at a rate shown in the table below:

Bid Item	Description	Unit Weight Rate
1800	Base Aggregate Dense, ¾″	2.1 Tons/Cubic Yards
1801	Base Aggregate Dense, 1¼″	2.0 Tons/Cubic Yards
1802	Base Aggregate Dense, 3″	2.2 Tons/Cubic Yards
1810	Breaker Run	1.8 Tons/Cubic Yards
1811	Select Crushed Material	1.9 Tons/Cubic Yards

SECTION 1900
ASPHALTIC PAVEMENTS

1900.1 Description

1. The work covered by this Section of the Specifications shall consist of furnishing all labor, equipment, and materials necessary for the production of and construction of asphaltic pavements in accordance with the Contract Plans and Specifications. Additional requirements for excavation work are specified in **Section 1200** of these Specifications.

1900.2 Public Relations

1. The City of Oshkosh desires to cause as little disruption and inconvenience to the abutting property owners as possible. The work shall be scheduled so there is a minimum of delay between grading and paving operations.

2. While a given street is under construction, the CONTRACTOR shall cooperate in providing access for residents that are moving, to people who require handicap access, and to building contractors.

1900.3 General

1. Requirements common to asphaltic pavements such as, but not limited to, aggregate sampling and testing, temperature and time of year restrictions, equipment, construction, and compaction shall conform to **Section 450** of the STATE SPECIFICATIONS.

2. The CITY will perform aggregate sampling and testing of asphaltic pavements by an independent, certified testing firm. All sampling and testing methods shall conform to **Section 450.2.2** of the STATE SPECIFICATIONS.

1900.4 Asphaltic Materials

1. All asphaltic materials provided shall conform to the requirements of **Section 455** of the STATE SPECIFICATIONS. Furnish **PG 58-28 S Asphaltic Material**, unless otherwise specified in the *Special Conditions*.

1900.4.1 Tack Coat

1. Materials, application methods, and equipment for furnishing and applying tack coat shall conform to the requirements of **Section 455** of the STATE SPECIFICATIONS. **Tack coat shall be applied at a rate of 0.070 gallons per square yard**. An application of tack coat will be required on all asphalt lower layer courses prior to laying the asphalt surface course unless otherwise directed by the ENGINEER.

1900.5 Hot Mix Asphalt Pavement

1. Hot mix asphalt pavement and mixtures shall conform to the requirements of **Section 460** of the STATE SPECIFICATIONS; shall conform to the type, thickness, and gradation shown on the Contract Plans; and as specified in the *Special Conditions*.

1900.5.1 Aggregates

1. All aggregates provided and blending of aggregates to meet gradation requirements shall conform to the requirements of **Section 460.2.2** of the STATE SPECIFICATIONS.

1900.5.2 Hot Mix Asphalt Mixture Design

1. All hot mix asphalt (HMA) mixture types shall conform to the requirements of **Section 460.2.7** of the STATE SPECIFICATIONS. A report of HMA mixture design will be required to be submitted for approval by the ENGINEER before any asphalt is laid. Furnish **Asphaltic Mixture LT**, unless otherwise specified in the *Special Conditions*.

1900.5.3 Thickness

1. Provide the Plan thickness for lower and upper layers as specified and conform to **Section 460.3.2** of the STATE SPECIFICATIONS. Thickness for lower and upper layers shall be limited as follows:

NOMINAL SIZE	MINIMUM LAYER THICKNESS (in inches)	MAXIMUM LOWER LAYER THICKNESS (in inches)	MAXIMUM UPPER LAYER THICKNESS (in inches)
No. 3 (19.0 mm)	2.25	4	3
No. 4 (12.5 mm)	1.75	3	2.5
No. 5 (9.5 mm)	1.25	3	2
No. 6 (4.75 mm)	0.75	1.25	1.25

1900.5.4 Density

1. Compact No. 6 mixtures in lower layers as specified in **Section 450.3.2.6.2** of the STATE SPECIFICATIONS, and compact No. 6 mixtures in upper layers as specified in **Section 450.3.2.6.3** of the STATE SPECIFICATIONS. All other layers of hot mix asphalt pavement shall be compacted to provide the required density and conform to **Table 460-3** of **Section 460.3.3.1** of the STATE SPECIFICATIONS as shown below:

TABLE 460-3 MINIMUM REQUIRED DENSITY[1]

LOCATION	LAYER	PERCENT OF TARGET MAXIMUM DENSITY		
		MIXTURE TYPE		
		LT and MT	HT	SMA
TRAFFIC LANES[2]	LOWER	93.0[3][5]	93.0[4][5]	---
	UPPER	93.0	93.0	93.0
SHOULDERS & APPURTENANCES	LOWER	91.0[5]	91.0[5]	---
	UPPER	92.0	92.0	92.0

[1]The table values are for average lot density. If any individual density test result falls more than 3.0 percent below the minimum required target maximum density, the ENGINEER will investigate the acceptability of that material according to **CMM 815.11**.

[2]Includes side roads, crossovers, turn lanes, ramps, parking lanes, bike lanes, and park-and-ride lots as defined by the Contract Plans.

[3]Minimum reduced by 2.0 percent for a lower layer constructed directly on cold in-place recycle (CIR), crushed aggregate, or recycled base courses.

[4]Minimum reduced by 1.0 percent for a lower layer constructed directly on cold in-place recycle (CIR), crushed aggregate, or recycled base courses.

[5]Minimum reduced by 1.0 percent for a 1.25-inch thick No. 5 mix lower layer constructed on a paved or milled surface.

2. The CONTRACTOR will determine the target maximum density. The CITY will measure pavement density by an independent, certified testing firm. All density determinations will conform to **Section 460.3.3.2** of the STATE SPECIFICATIONS.

3. In the event of a failed test, the ENGINEER shall have the right to order the inferior asphalt removed and replace at the expense of the CONTRACTOR or administer density disincentives in accordance with **Section 460.5.2.2** of the STATE SPECIFICATIONS.

1900.5.5 Asphalt Placed Before April 15th or After November 1st

1. Comply with the requirements of **Section 100.59** of these Specifications.

1900.5.6 Cold Weather Paving

1. The CONTRACTOR will be required to submit a Cold Weather Paving Plan for approval by the ENGINEER before any asphalt is laid. The Plan will outline material, operational, and equipment changes for paving when the air temperature, approximately three feet (3') above grade, in shade, and away from artificial heat sources, is **less than 40°F**. ENGINEER acceptance of the Plan does not relieve the CONTRACTOR of responsibility for the quality of hot-mixed asphalt pavement placed in cold weather under any circumstances. The Cold Weather Paving Plan and cold-weather paving operations shall conform to the requirements of **Section 450.3.2.1.2** of the STATE SPECIFICATIONS.

1900.6 Asphaltic Pavement, Transition, and Surface

1. Asphaltic pavement, transition, and surface shall include constructing asphaltic pavements for new construction including, but not limited to, pavement patches, driveways, paths, sidewalks, and transitions from new concrete pavement to existing surface as shown on the Contract Plans and Special Details. All materials and construction methods shall conform to **Section 450**, **Section 455**, **Section 460**, and **Section 465** of the STATE SPECIFICATIONS.

1900.6.1 Layer Thickness and Gradation

1. The layer thickness and gradation for asphaltic pavements (Asphaltic Pavement Bid Items #1905 through #1907) and asphaltic transitions (Asphaltic Pavement Bid Items #1910 through #1912) shall be as follows:

SPECIFIED THICKNESS	LOWER LAYER THICKNESS/GRADATION	UPPER LAYER THICKNESS/GRADATION
5 inches	3 inches/(19.0mm) No. 3	2 inches/(12.5mm) No. 4
4 inches	2.25 inches/(12.5mm) No. 4	1.75 inches/(9.5mm) No. 5
2 inches	---	2 inches/(9.5mm) No. 5

2. The layer thickness and gradation for asphaltic surfaces (Asphaltic Pavement Bid Items #1915 through #1917) shall be as follows:

SPECIFIED THICKNESS	LOWER LAYER THICKNESS/GRADATION	UPPER LAYER THICKNESS/GRADATION
5 inches	3 inches/(12.5mm) No. 4	2 inches/(12.5mm) No. 4
4 inches	2.25 inches/(9.5mm) No. 5	1.75 inches/(9.5mm) No. 5
2 inches	---	2 inches/(9.5mm) No. 5

1900.7 Measurement

1. The CITY will measure tack coat by the gallon acceptably completed. CONTRACTOR shall provide a material ticket to the ENGINEER on the day tack coat is applied.

2. The CITY will measure HMA pavement by the ton acceptably completed. CONTRACTOR shall provide a scale ticket for **each** truck of asphalt pavement material. Payment will be determined by scale tickets delivered to ENGINEER. Tickets must be provided on the day the asphalt material is placed. Tickets will not be accepted "after the fact" without prior written approval.

3. The CITY will measure asphaltic pavement and asphaltic transition by the square yard acceptably completed.

4. The CITY will measure asphaltic surface by the square yard acceptably completed.

5. The CITY will measure Hot-Mixed Asphalt (HMA) Cold Weather Paving Up-Charge by the ton of HMA mixture placed conforming to the ENGINEER-accepted Cold Weather Paving Plan. This Bid Item will cover the up-charge for cold weather asphalt paving. This will be paid in addition to the unit prices for HMA pavement.

6. The CITY will measure Asphaltic Cold Weather Paving Up-Charge by the square yard of HMA mixture placed conforming to the ENGINEER-accepted Cold Weather Paving Plan. This Bid Item will cover the up-charge for cold weather asphalt paving. This will be paid in addition to the unit prices for HMA pavement

7. The CITY will measure Asphaltic Base Patching by the Square Yard acceptably completed.

1900.8 Payment

1. The CITY will pay for the measured quantities at the Contract unit price under the following Bid Items:

Bid Item	Description	Units
ASPHALTIC PAVEMENTS		
1900	Tack Coat	GAL
1901	HMA Pavement LT	TON
1902	HMA Pavement MT	TON
1903	HMA Cold Weather Paving Up-Charge	TON
1904	Remove and Replace HMA Pavement, including Sawing, Fine Grading, Turf Restoration, and Traffic Control	SY
1905	5″ Asphaltic Pavement MT with 10″ CABC and Grading	SY
1906	4″ Asphaltic Pavement LT with 10″ CABC and Grading	SY
1907	2″ Asphaltic Pavement LT with 10″ CABC and Grading	SY
1910	5″ Asphaltic Transition MT with 10″ CABC and Grading	SY
1911	4″ Asphaltic Transition LT with 10″ CABC and Grading	SY
1912	2″ Asphaltic Transition LT with 10″ CABC and Grading	SY
1915	5″ Asphaltic Surface MT with 6″ CABC and Grading	SY
1916	4″ Asphaltic Surface LT with 6″ CABC and Grading	SY
1917	2″ Asphaltic Surface LT with 6″ CABC and Grading	SY
1918	Asphaltic Cold Weather Paving Up-Charge	SY
1920	Asphaltic Base Patching	SY
TEMPORARY ASPHALTIC PAVEMENTS		
1930	Temporary Cold Mix Asphaltic Patch	SY

2. The unit price for Asphaltic Pavement Bid Items shall include asphaltic material as specified.

3. The CONTRACTOR may use approved, select salvaged road material for gravel base under Bid Items #1905 through #1917, and Bid Item #1920. Salvaged base material shall conform to the gradations as specified in **Section 305** in the STATE SPECIFICATIONS.

4. Bid Item #1917 will be used for the temporary aprons when the *Construction Access Agreements* are not returned. Payment for this Bid Item shall only be utilized when the CONTRACTOR is directed by the CITY to install the temporary surface. The quantity in the estimate of quantities is only an estimate. The CONTRACTOR will be paid based on the actual, installed quantities **only** and no adjustments in unit prices will be made for any increases or decreases of quantity installed.

5. Asphaltic Pavement Bid Items #1905 through #1917 shall include the cost of furnishing, placing, fine grading, and compacting the specified gravel or crushed stone base and asphaltic pavement thickness, as specified. These Bid Items do not include excavation. Excavation will be paid for under Bid Item #1200.

6. The unit price for Bid Item #1903 will cover the up-charge for all additional labor, equipment, and materials to install HMA pavement conforming to the ENGINEER-accepted Cold Weather Paving Plan. The additional cost will be measured by the ton and will be paid in addition to the unit bid prices for HMA Pavement Bid Items #1901 and #1902. The CITY will not pay for this Bid Item if the minimum density is not met as specified in **Table 460-3** of the STATE SPECIFICATIONS. The CONTRACTOR is responsible for the quality of HMA pavement placed in cold weather.

7. The unit price for Bid Item #1918 will cover the up-charge for all additional labor, equipment, and materials to install asphaltic pavement conforming to the ENGINEER-accepted Cold Weather Paving Plan. The additional cost will be based on a square yard basis and will be paid in addition to the unit bid prices for Asphaltic Pavement Bid Items #1905 through #1917, and Bid Item #1920. The CONTRACTOR is responsible for the quality of HMA pavement placed in cold weather.

8. The unit price for Bid Item #1920 shall include all costs for sawing; removing pavement; excavating to subgrade; disposing of surplus material; and furnishing, placing, grading, and compacting the specified gravel or crushed stone base and the asphaltic pavement thickness, as specified.

9. Bid Item #1920 shall consist of a 4" asphaltic pavement with an 8" CABC section in designated repair areas, as directed by the ENGINEER in the field. All work shall conform to the requirements of **Section 390** of the STATE SPECIFICATIONS.

10. Bid Items #1903, #1918, and #1920 are being bid as undistributed quantities. The CONTRACTOR will be paid based on the actual, installed quantities **only** and no adjustment in unit prices will be made for any increases or decreases of quantities used.

11. Bid Item #1904 shall consist of removal and replacement of the existing asphalt back to existing depth with a minimum thickness of four inches (4″) of hot mix asphalt (HMA) on top of a minimum base thickness of ten-inch (10″) aggregate base dense. This Bid Item shall include all saw cutting, tack coating, turf restoration, labor, equipment, and materials to remove the existing HMA pavement and aggregate base as marked on the Plans or in the field by the ENGINEER. Full-depth saw cutting shall not extend into the remaining pavement more than six inches (6″) beyond the limits designated on the Plans or marked by the ENGINEER. Disposal of all excavated asphalt and base material shall be the responsibility of the CONTRACTOR. The CONTRACTOR shall place newly-installed HMA per **Section 1900.6.1** of these Specifications. A one-foot (1′) shelf of existing base materials shall remain unexcavated around the patch limits to protect adjacent pavement from losing proper subgrade support.

12. Bid Item #1930 shall include all labor, equipment, and materials to place cold mix patch in disturbed pavement areas after isolated manhole reconstruction, rebuilding, or rehabilitation is complete and prior to permanent patch restoration. The CONTRACTOR shall be responsible for maintaining cold mix patch prior to permanent patch restoration. CONTRACTOR is responsible for the disposal of all temporary pavement materials at such time final patch restoration is performed.

SECTION 1950
ASPHALTIC PAVEMENT MILLING

1950.1 Description

1. The work covered by this Section of the Specifications shall consist of furnishing all labor and equipment to remove the asphaltic pavement by milling to the thickness, as shown on the Contract Plans and as specified in the *Special Conditions*. All construction methods shall conform to the requirements of **Section 330** of the STATE SPECIFICATIONS.

2. Surplus material will become the property of the CONTRACTOR and shall be picked up and disposed of by the CONTRACTOR.

3. Upon completion of milling operations, the CONTRACTOR shall ramp all driveway entrances and butt joints along the project route, as directed by the ENGINEER. The ramps shall provide a reasonably smooth transition from existing pavement to milled surface. The CONTRACTOR shall be required to maintain these ramps until new asphalt is placed.

1950.2 Measurement

1. The CITY will measure milling by the square yard acceptably completed.

1950.3 Payment

1. The CITY will pay for the measured quantities at the Contract unit price under the following Bid Item:

Bid Item	Description	Units
ASPHALTIC PAVEMENT MILLING		
1950	Asphaltic Pavement Milling	SY

2. The unit price for this Bid Item shall include all costs of picking up and hauling surplus milled material.

3. The unit price for this Bid Item shall include construction of butt joints with a face perpendicular to the surface of the existing pavement as shown on the Contract Plans.

4. The unit price for this Bid Item shall include all costs to provide, maintain, and remove ramps.

SECTION 1955
ASPHALTIC PAVEMENT PULVERIZING

1955.1 Description

1. The work covered by this Section of the Specifications shall consist of furnishing all labor and equipment to pulverize, grade, and compact the existing asphalt pavement, as shown on the Contract Plans and as specified in the *Special Conditions*. All construction methods shall conform to the requirements of **Section 325** of the STATE SPECIFICATIONS.

2. The existing asphalt surface shall be thoroughly pulverized and mixed with a sufficient amount of existing gravel base to produce a homogenous, well-graded material. The pulverized material shall then be graded and compacted to the required density to maintain traffic until new asphalt pavement is laid. Add water, as required, both before and during compaction.

1955.2 Measurement

1. The CITY will measure pulverizing by the square yard acceptably completed.

1955.3 Payment

1. The CITY will pay for the measured quantities at the Contract unit price under the following Bid Item:

Bid Item	Description	Units
ASPHALTIC PAVEMENT PULVERIZING		
1955	Asphaltic Pavement Pulverizing	SY

2. The unit price for this Bid Item shall include all costs for pulverizing, mixing, adding water, grading, and compacting.

3. The unit price for this Bid Item shall also include the cost of the water for compaction and dust control.

SECTION 1960
PREPARE FOUNDATION FOR ASPHALTIC PAVING

1960.1 Description

1. The work covered by this Section of the Specifications shall consist of furnishing all labor, equipment, and materials to restore, correct, strengthen, or prepare pavement foundation to a condition suitable for applying and supporting the intended asphalt pavement for all streets under the Contract. The pavement foundation will be considered to be the finished base course (aggregate, asphaltic, or concrete) upon which the asphalt pavement is to be constructed. The preparation of foundation for asphalt paving will include the restoring, preparing, and conditioning of the existing foundation in the manner prescribed in **Section 211** of the STATE SPECIFICATIONS.

2. Any saw cutting, pavement removal, excavation, and replacement of base course or sub-base material, below the pavement foundation, shall be measured and paid for separately under the pertinent Contract Bid Items.

1960.2 Measurement

1. The CITY will measure the lump sum Prepare Foundation for Asphaltic Paving for each unit acceptably completed (either by the street or by the street segment, as designated in the Proposal).

1960.3 Payment

1. The CITY will pay for the measured quantities at the Contract unit price under the following Bid Item:

Bid Item	Description	Units
PREPARE FOUNDATION FOR ASPHALTIC PAVING		
1960	Prepare Foundation for Asphaltic Paving	LS

SECTION 1970
PAVEMENT MARKINGS

1970.1 Description

1. The work covered by this Section of the Specifications shall consist of furnishing all labor, equipment, and materials to provide pavement markings consistent with the Plans and Special Conditions. All materials and construction methods shall comply with **Section 646** of the STATE SPECIFICATIONS.

1970.2 Measurement

1. The CITY will measure the Pavement Markings Bid Items acceptably completed on per each basis, or by the linear foot acceptably completed, as specified in **Section 1970.3** of these Specifications.

1970.3 Payment

1. The CITY will pay for the measured quantities at the Contract unit price under the following Bid Items:

Bid Item	Description	Units
	PAVEMENT MARKINGS	
1974	Pavement Markings, Epoxy, 4" (white)	LF
1975	Pavement Markings, Epoxy, 4" (yellow)	LF
1976	Pavement Markings, Epoxy, 8" (white)	LF
1977	Pavement Markings, Cross-Walk Epoxy, 6" (white)	LF
1978	Pavement Markings, Stop-Line Epoxy, 18" (white)	LF
1979	Pavement Markings, Arrow Epoxy, Type 1 (white)	EACH
1980	Pavement Markings, Arrow Epoxy, Type 2 (white)	EACH
1981	Pavement Markings, Arrow Epoxy, Type 3 (white)	EACH
1982	Pavement Markings, Epoxy, 12" Diagonal (yellow)	LF
1983	Pavement Markings, Word, Epoxy (White)	EACH
1984	Pavement Markings, Symbol, Epoxy (White)	EACH
1985	Temporary Pavement Markings, Paint, 4" (White)	LF
1986	Remove Pavement Markings	LF
1987	Remove Pavement Markings	EACH
1988	Pavement Markings, Railroad Cross, Epoxy (White)	LS

2. Bid Items #1986 and #1987 shall consist of furnishing all labor and equipment to completely remove pavement markings, as shown on the Plan Sheets or as directed by the ENGINEER in the field, and to collect and dispose of all residue from the removals. All work shall conform to the requirements of **Section 646.3.1.4** of the STATE SPECIFICATIONS.

3. The lump sum unit price for Bid Item #1988 shall include all costs for supplying and applying the R X R symbol and transverse lines (twenty four inches [24"]), as shown on the Plans. All work shall conform to the requirements of **Section 646** of the STATE SPECIFICATIONS.

4. Bid Item #1985 shall be installed as directed by the ENGINEER in the field in the event weather conditions preclude the application of permanent pavement markings. Temporary pavement markings will be removed and permanent pavement markings applied once weather permits. Costs to remove temporary pavement markings shall be considered incidental to this Bid Item.

STORM SEWER SPECIFICATIONS

SECTION 2000
STORM SEWER PIPES

2000.1 Description

1. This Section describes excavating required trenches or tunnels, and laying or constructing storm sewer pipe inside, then backfilling and cleaning out as necessary.

2000.2 Materials

2000.2.1 General

1. Use materials conforming to the requirements for the class of the material named and specified below:
   A. Polyvinyl Chloride Sewer Pipe and Fittings (15″ and smaller) — **ASTM D-3034**
   B. Polyvinyl Chloride Sewer Pipe and Fittings (18″ - 27″) — **ASTM F-679**
   C. Round Reinforced Concrete Pipe and Fittings — **ASTM C-76**
   D. Horizontal Elliptical Reinforced Concrete Pipe and Fittings — **ASTM C-507**
   E. Reinforced Concrete Box Culvert Pipe and Fittings — **ASTM C-1433**
   F. Fiberglass Reinforced Polymer Mortar Pipe — **ASTM D-3262**
   G. Double Wall Polypropylene Pipe (12″ – 27″) — **ASTM F-2881**
   H. Triple Wall Polypropylene Pipe (30″ – 60″) — **ASTM F-2764**

2. Storm sewer pipes shall be clearly marked as follows at intervals of five feet (5′) or less:
   A. Manufacturer's name or trademark.
   B. Nominal pipe size.
   C. Pipe classification.
   D. The legend, i.e. "SDR-35 PVC Sewer Pipe".
   E. ASTM designation (Including Table and Depth for Box Culvert Sections).
   F. Extrusion date, period of manufacture, or lot number.

3. Packaging, handling, and shipment of sewer pipes shall be in accordance with manufacturer's instructions and specifications.

4. CONTRACTOR shall install all storm sewer pipe per the manufacturer's recommended bury depth chart.

2000.2.2 Polyvinyl Chloride Pipe

1. PVC pipes shall not be used where the height of cover from the top of pipe to the existing ground elevation or proposed finished grade, whichever is less, is less than two feet (2′).

2. Pipes shall be stored in the supplier's yard or on the project site in accordance with AWWA M23 and manufacturer's recommendations.

3. Pipe shall not be stacked higher than four feet (4′) or on the bell ends.

4. Cover PVC pipe with an opaque material to protect it from the sun's ultraviolet radiation. PVC pipe that has been subjected to excessive ultraviolet radiation is identified by color fading or chalking and shall not be used. The determination as to the acceptability of the pipe rests solely on the ENGINEER's decision.

5. Pipe that has been contaminated in any way with petroleum products on the inside or outside of the pipe shall not be used.

2000.2.3 Reinforced Concrete Pipe (Round and Horizontal Elliptical)

1. Pipe Class shall be as noted on the Plans.

2. Include tie bars where noted on the Plans and/or in the Specifications.

3. Pipes shall be stored in the supplier's yard or on the project site in accordance with manufacturer's recommendations.

4. Pipe shall not be stacked more than two (2) pipe segments high.

2000.2.4 Reinforced Concrete Box Culvert Pipe

1. Design table and depth of earth cover shall be as noted on the Plans and/or in the *Special Conditions*.

2. Include tie bars where noted on the Plans and/or in the Specifications.

3. Box Culvert Pipe sections shown on Plans and specified to have manhole risers (MH Riser) above them shall be supplied with a twenty-four inch (24″) round opening cast in the roof.

4. Pipes shall be stored in the supplier's yard or on the project site in accordance with manufacturer's recommendations.

5. Pipe shall not be stacked more than two (2) pipe segments high.

2000.2.5 Centrifugally Cast Fiberglass Reinforced Polymer Mortar Pipes

1. Pipes shall be stored in the supplier's yard or on the project site in accordance with manufacturer's recommendations.

2000.2.6 Polypropylene Pipe (Double and Triple Wall)

1. Pipes shall be stored in the supplier's yard or on the project site in accordance with manufacturer's recommendations.

2. Pipes shall not be used where the height of cover from the top of pipe to the existing ground elevation or proposed finished grade, whichever is less, is less than two feet (2').

2000.3 Construction

2000.3.1 Excavation

2000.3.1.1 General

1. Unless otherwise specified in the Contract or the ENGINEER allows, perform sewer construction in open trenches and in a manner that protects the pipelines or sewers from unusual stresses.

2. Excavate the trenches in reasonably close conformity with the Plans and as the ENGINEER laid out in the field. Begin each trench excavation at the proposed sewer outlet and proceed to the upper end.

3. Keep trenches dewatered at all times.

4. If the Contract specifies or the ENGINEER allows, the CONTRACTOR may construct sewers by tunneling or jacking instead of open trenches. Adhere to the Construction Details, Construction Specifications, and ENGINEER's decision.

5. Understand the proposed elevations for the storm sewers, as shown on the Plans, are subject to revisions in order to fit field conditions; therefore, the ENGINEER may have to adjust the profile grades from those shown on the Plans.

2000.3.1.2 Rock Excavation for Storm Sewer

1. Classify rock excavation for storm sewer as specified for Rock Excavation in **Section 2750** of these Specifications, except classify the necessary removal of all rock boulders with a volume of one-half (½) cubic yard or more, as Rock Excavation.

2000.3.2 Constructing Foundation

1. Construct the foundation in the trench to prevent subsequent settlement and rupture of the storm sewer pipe.

2. The CONTRACTOR may not lay the pipe in rock, wet conditions, or on a firm earth subgrade, unless otherwise specified.

3. Unless otherwise specified, the CONTRACTOR shall lay the pipe on a backfilled granular foundation or bed. When placing the pipe on backfilled granular foundation, excavate the trench to at least six inches (6") below the elevation established for the bottom of the pipe. Backfill this depth with **"¾-inch clear stone"** meeting the requirements in **Section 608.2.2** of the STATE SPECIFICATIONS. Compact the material before laying the pipe on the backfilled granular material.

4. After laying the pipe, bedding material shall be placed around the sides of the pipe, except reinforced concrete pipe, up to a level six inches (6") above the top of the pipe. This material shall be placed by hand or equally careful means. When reinforced concrete pipe is installed, the bedding stone shall extend to the spring line of the pipe.

5. Excavate recesses to receive bells as necessary.

6. If the Construction Details show types of bedding, or required trench widths other than described above, conform to the Construction Details.

2000.3.3 Laying Storm Sewer Pipes

1. Begin pipe-laying in finished trenches at the lowest point and proceed towards the upper end. Also lay the pipe so the spigot or tongue ends point in the direction of flow.

2. Clean sockets carefully before lowering pipes into trenches. Lower and place to avoid unnecessary handling in the trench or damage to the pipe. Provide a firm bearing beneath the entire length of each section and make it substantially true to the line and grade required.

3. Lay all pipes with ends abutting. Take care when shoving the pipes together so that the joints are properly adjusted and not overly large. Fit pipes so they form a sewer with a smooth and uniform invert.

4. SDR 35 PVC shall not be used when bury depths exceed twenty feet (20'). If depths exceed twenty feet (20'), then a SDR 26 PVC or concrete pipe shall be used.

5. The laying of polypropylene pipes shall comply with the guidelines set forth in the *Corrugated Plastic Pipe Storm Installation Guide* published by ADS.

2000.3.4 Laying of Pipes in Cold Weather

1. The ENGINEER reserves the right to order pipe-laying discontinued whenever, in their opinion, there is a danger of the quality of work being impaired because of cold weather.

2. The CONTRACTOR shall be responsible for heating the pipe and jointing material so as to prevent freezing of joints.

3. No pipe shall be laid on or in frozen ground.

2000.3.5 Joints

1. For Polyvinyl Chloride Sewer Pipe, the CONTRACTOR shall use either factory installed rubber gaskets conforming to **ASTM F-477** or solvent cemented joints conforming to **ASTM D-2672**.
   A. When factory installed rubber gaskets are used, the outside of the gasket and the inside of the bell or groove of the pipe shall be lubricated with an approved lubricant. The spigot or tongue of the pipe being laid shall be introduced into the bell or groove end of the previously laid pipe. The pipe shall be carefully set to line and grade and then shall be pushed or jacked home. Care should be taken that the entering pipe is completely home. The ENGINEER may order the use of a jack or "come-along", if deemed necessary to ensure that the joint is completely tight.
   B. When solvent cemented joints are used, the bell and spigot ends of the pipe shall be cleaned and dried prior to the application of the solvent cement with a cloth moistened with methyl-ethyl-ketone. Using a brush, the solvent cement is liberally applied to the spigot a distance equal to the joint depth and lightly applied to the inside of the bell. Immediately thereafter, the joint shall be made by inserting the spigot into the bell and pushing it home as far as possible. The pipe then shall be rotated 30 to 90° to distribute the cement.

2. For circular reinforced concrete pipe, the CONTRACTOR shall use rubber gaskets conforming to **ASTM C-433**. When rubber gaskets are used, the gasket shall be placed over the spigot end or tongue of the entering pipe. Immediately before making the joint, the outside of the gasket and the inside of the bell or groove of the last pipe shall be lubricated with an approved lubricant. Care should be taken the gasket and ends of the pipe are clean and free of sand or gravel. The spigot or tongue of the pipe being laid with the gasket in place shall be introduced into the bell or groove of the previously-laid pipe. The pipe shall be carefully set to line and grade and then shall be pushed or jacked home. Care should be taken the entering pipe is completely home. The ENGINEER may order the use of a jack or "come-along", if deemed necessary to ensure the joint is completely tight.

3. For horizontal-elliptical reinforced concrete pipe, the CONTRACTOR has the following pipe joint options:
   A. Rubber gaskets conforming to **ASTM C-433**. When rubber gaskets are used, the gasket shall be placed over the spigot end or tongue of the entering pipe. Immediately before making the joint, the outside of the gasket and the inside of the bell or groove of the last pipe shall be lubricated with an approved lubricant. Care should be taken the gasket and ends of the pipe are clean and free of sand or gravel. The spigot or tongue of the pipe being laid with the gasket in place shall be introduced into the bell or groove of the previously-laid pipe. The pipe shall be carefully set to line and grade and then shall be pushed or jacked home. Care should be taken the entering pipe is completely home. The ENGINEER may order the use of a jack or "come-along", if deemed necessary to ensure that the joint is completely tight.
   B. Butyl rope sealant conforming to **ASTM C-990**. The minimum rope size shall be one-half inch (½") x one-half inch (½"). The CONTRACTOR shall take care to ensure a proper seal is formed while pushing the pipe sections home. A straight, even force shall be applied against the subsequent pipe section to ensure a proper seal is achieved. Applying an uneven force may result in cracking of the bell or spigot of the pipe section. Should a bell or spigot crack, the damaged sections shall be removed and replaced at the CONTRACTOR's expense.
   C. Hydro-cement grout conforming to **ASTM C-1107**. Hydro-cement grout applied to seal the joint from the inside of the pipe sections after the sections have been "pushed home." The hydro-cement grout shall be high-quality, non-shrink grout to ensure a water tight joint.
   D. Exterior Butyl Rubber Joint Wrap conforming to **ASTM C-877** (Type III). CONTRACTOR shall utilize a minimum nine-inch (9") wide external butyl rubber joint wrap.
   E. Trowelable Butyl Rubber Sealant conforming to **ASTM C-990**. CONTRACTOR shall apply sufficient amount of sealant such the sealant pushes out from the joint when the pipe sections are "pushed home." A straight, even force shall be applied against the subsequent pipe section to ensure a proper seal is achieved. Applying an uneven force may result in cracking of the bell or spigot of the pipe section. Should a bell or spigot crack, the damaged sections shall be removed and replaced at the CONTRACTOR's expense.
   F. Combination of the above methods.

4. For reinforced concrete box culvert pipe, the CONTRACTOR shall use rubber gaskets conforming to **ASTM C-1677**. When rubber gaskets are used, the gasket shall be placed over the spigot end or tongue of the entering pipe. Immediately before making the joint, the outside of the gasket and the inside of the bell or groove of the last pipe shall be lubricated with an approved lubricant. Care should be taken so the gasket and ends of the pipe are clean and free of sand or gravel. The spigot or tongue of the pipe being laid with the gasket in place shall be introduced into the bell or groove of the previously-laid pipe. The pipe shall be carefully set to line and grade and then shall be pushed or jacked home. Care

should be taken the entering pipe is completely home. The ENGINEER may order the use of a jack or "come-along", if deemed necessary to ensure the joint is completely tight. Additional measures may be taken by the CONTRACTOR to ensure a watertight system.

A. Installation of joint ties at location noted in Plans are considered incidental to the Bid Item.
B. Macwrap or similar product may be used for joint-sealing materials in lieu of neoprene gaskets only with **prior** ENGINEER approval.

5. For centrifugally cast fiberglass reinforced polymer mortar pipe, the CONTRACTOR shall use Elastomeric gaskets conforming to **ASTM F-477**, and unless specified, the pipe shall be field connected with fiberglass sleeve couplings that utilize the elastomeric sealing gaskets as the sole means to maintain watertightness. The joints must meet the performance requirements of **ASTM D-4161**. The CONTRACTOR must clean ends of pipe and couplings components. An approved lubricant is applied to pipe ends and elastomeric gasket and pipes are pushed together. The pipes shall be carefully set to line and grade.

6. Polypropylene pipes (both double and triple wall) shall have watertight joints conforming to the requirements of **ASTM D-3212**. The spigot of each pipe shall have one (1) factory-installed gaskets manufactured of material conforming to **ASTM F-477**. The outside of the gasket and the inside of the bell or groove of the pipe shall be lubricated with an approved lubricant. The spigot or tongue of the pipe being laid shall be introduced into the bell or groove end of the previously-laid pipe. The pipe shall be carefully set to line and grade and then shall be pushed or jacked home. Care should be taken the entering pipe is completely home.

7. All rubber gaskets installed in pipe located within contaminated soil shall utilize nitrile gaskets.

2000.3.6 Backfilling

1. Backfill all storm sewers as described in **Section 100.61** of these Specifications.

2000.3.7 Cleaning of Storm Sewer

1. Clean all new or re-laid sewers of accumulations of silt, debris, and other foreign matter, and before acceptance, test all installations with the testing procedures described in **Section 2700** of these Specifications.

2000.4 Measurement

2000.4.1 Pipe Sewers

1. The CITY will measure the Storm Sewer Pipe Bid Items by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the pipe:
   A. From manhole to manhole.
   B. To the end of end section (apron endwall of tapered end section) minus the length of the end section.
   C. To the end of the installed pipe.

2. The CITY will make no deductions from these measured lengths for intermediate fittings. No deductions will be made for manholes unless the internal diameter of the pipe is twenty-four inches (24″) or larger, in which case the internal dimension of the manholes will be deducted from the total measurement by the CITY.

2000.4.2 Pipe End Section

1. The CITY will measure the Pipe End Sections Bid Items on per each basis.

2000.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
	STORM SEWER	
2000	Furnish and Install 6" Storm Sewer	LF
2001	Furnish and Install 8" Storm Sewer	LF
2002	Furnish and Install 10" Storm Sewer	LF
2003	Furnish and Install 12" Storm Sewer	LF
2004	Furnish and Install 12" RCP Class III Storm Sewer	LF
2005	Furnish and Install 12" RCP Class V Storm Sewer	LF
2006	Furnish and Install 15" Storm Sewer	LF
2007	Furnish and Install 15" RCP Class III Storm Sewer	LF
2008	Furnish and Install 15" RCP Class V Storm Sewer	LF
2009	Furnish and Install 18" Storm Sewer	LF
2010	Furnish and Install 18" RCP Class III Storm Sewer	LF
2011	Furnish and Install 18" RCP Class V Storm Sewer	LF
2012	Furnish and Install 21" Storm Sewer	LF
2013	Furnish and Install 21" RCP Class III Storm Sewer	LF
2014	Furnish and Install 21" RCP Class V Storm Sewer	LF
2015	Furnish and Install 24" Storm Sewer	LF

Bid Item	Description	Units
2016	Furnish and Install 24" RCP Class III Storm Sewer	LF
2017	Furnish and Install 24" RCP Class V Storm Sewer	LF
2018	Furnish and Install 27" Storm Sewer	LF
2019	Furnish and Install 27" RCP Class III Storm Sewer	LF
2020	Furnish and Install 27" RCP Class V Storm Sewer	LF
2021	Furnish and Install 30" Storm Sewer	LF
2022	Furnish and Install 30" RCP Class III Storm Sewer	LF
2023	Furnish and Install 30" RCP Class V Storm Sewer	LF
2024	Furnish and Install 36" Storm Sewer	LF
2025	Furnish and Install 36" RCP Class III Storm Sewer	LF
2026	Furnish and Install 36" RCP Class V Storm Sewer	LF
2027	Furnish and Install 42" Storm Sewer	LF
2028	Furnish and Install 42" RCP Class III Storm Sewer	LF
2029	Furnish and Install 42" RCP Class V Storm Sewer	LF
2030	Furnish and Install 48" Storm Sewer	LF
2031	Furnish and Install 48" RCP Class III Storm Sewer	LF
2032	Furnish and Install 48" RCP Class V Storm Sewer	LF
2033	Furnish and Install 54" Storm Sewer	LF
2034	Furnish and Install 54" RCP Class III Storm Sewer	LF
2035	Furnish and Install 54" RCP Class V Storm Sewer	LF
2036	Furnish and Install 60" Storm Sewer	LF
2037	Furnish and Install 60" RCP Class III Storm Sewer	LF
2038	Furnish and Install 60" RCP Class V Storm Sewer	LF
2039	Furnish and Install 66" Storm Sewer	LF
2040	Furnish and Install 66" RCP Class III Storm Sewer	LF
2041	Furnish and Install 66" RCP Class V Storm Sewer	LF
2042	Furnish and Install 72" Storm Sewer	LF
2043	Furnish and Install 72" RCP Class III Storm Sewer	LF
2044	Furnish and Install 72" RCP Class V Storm Sewer	LF
2045	Furnish and Install 14" x 23" HERCP Class III Storm Sewer	LF
2046	Furnish and Install 14" x 23" HERCP Class V Storm Sewer	LF
2047	Furnish and Install 19" x 30" HERCP Class III Storm Sewer	LF
2048	Furnish and Install 19" x 30" HERCP Class V Storm Sewer	LF
2049	Furnish and Install 24" x 38" HERCP Class III Storm Sewer	LF
2050	Furnish and Install 24" x 38" HERCP Class V Storm Sewer	LF
2051	Furnish and Install 29" x 45" HERCP Class III Storm Sewer	LF
2052	Furnish and Install 29" x 45" HERCP Class V Storm Sewer	LF
2053	Furnish and Install 34" x 53" HERCP Class III Storm Sewer	LF
2054	Furnish and Install 34" x 53" HERCP Class V Storm Sewer	LF
2055	Furnish and Install 38" x 60" HERCP Class III Storm Sewer	LF
2056	Furnish and Install 38" x 60" HERCP Class V Storm Sewer	LF

Bid Item	Description	Units
2057	Furnish and Install 43" x 68" HERCP Class III Storm Sewer	LF
2058	Furnish and Install 43" x 68" HERCP Class V Storm Sewer	LF
2059	Furnish and Install 48" x 76" HERCP Class III Storm Sewer	LF
2060	Furnish and Install 48" x 76" HERCP Class V Storm Sewer	LF
2061	Furnish and Install 53" x 83" HERCP Class III Storm Sewer	LF
2062	Furnish and Install 53" x 83" HERCP Class V Storm Sewer	LF
2063	Furnish and Install 58" x 91" HERCP Class III Storm Sewer	LF
2064	Furnish and Install 58" x 91" HERCP Class V Storm Sewer	LF
2065	Furnish and Install 2' x 4' Box Culvert Storm Sewer	LF
2066	Furnish and Install 3' x 4' Box Culvert Storm Sewer	LF
2067	Furnish and Install 4' x 4' Box Culvert Storm Sewer	LF
2068	Furnish and Install 3' x 5' Box Culvert Storm Sewer	LF
2069	Furnish and Install 4' x 5' Box Culvert Storm Sewer	LF
2070	Furnish and Install 5' x 5' Box Culvert Storm Sewer	LF
2071	Furnish and Install 3' x 6' Box Culvert Storm Sewer	LF
2072	Furnish and Install 4' x 6' Box Culvert Storm Sewer	LF
2073	Furnish and Install 5' x 6' Box Culvert Storm Sewer	LF
2074	Furnish and Install 6' x 6' Box Culvert Storm Sewer	LF
2075	Furnish and Install 4' x 7' Box Culvert Storm Sewer	LF
2076	Furnish and Install 5' x 7' Box Culvert Storm Sewer	LF
2077	Furnish and Install 6' x 7' Box Culvert Storm Sewer	LF
2078	Furnish and Install 4' x 8' Box Culvert Storm Sewer	LF
2079	Furnish and Install 5' x 8' Box Culvert Storm Sewer	LF
2080	Furnish and Install 6' x 8' Box Culvert Storm Sewer	LF
2081	Furnish and Install 5' x 9' Box Culvert Storm Sewer	LF
2082	Furnish and Install 6' x 9' Box Culvert Storm Sewer	LF
2083	Furnish and Install 5' x 10' Box Culvert Storm Sewer	LF
2084	Furnish and Install 6' x 10' Box Culvert Storm Sewer	LF
2085	Furnish and Install 4' x 11' Box Culvert Storm Sewer	LF
2086	Furnish and Install 6' x 11' Box Culvert Storm Sewer	LF
2087	Furnish and Install 4' x 12' Box Culvert Storm Sewer	LF
2088	Furnish and Install 6' x 12' Box Culvert Storm Sewer	LF
2089	Furnish and Install 2' x 4' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2090	Furnish and Install 3 'x 4' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2091	Furnish and Install 4' x 4' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2092	Furnish and Install 3' x 5' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF

Bid Item	Description	Units
2093	Furnish and Install 4' x 5' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2094	Furnish and Install 5' x 5' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2095	Furnish and Install 3' x 6' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2096	Furnish and Install 4' x 6' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2097	Furnish and Install 5' x 6' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2098	Furnish and Install 6' x 6' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2099	Furnish and Install 4' x 7' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2100	Furnish and Install 5' x 7' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2101	Furnish and Install 6' x 7' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2102	Furnish and Install 4' x 8' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2103	Furnish and Install 5' x 8' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2104	Furnish and Install 6' x 8' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2105	Furnish and Install 5' x 9' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2106	Furnish and Install 6' x 9' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2107	Furnish and Install 5' x 10' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2108	Furnish and Install 6' x 10' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2109	Furnish and Install 4' x 11' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2110	Furnish and Install 6' x 11' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2111	Furnish and Install 4' x 12' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF
2112	Furnish and Install 6 'x 12' Box Culvert Storm Sewer with Manhole or Inlet Riser	LF

Bid Item	Description	Units
	PIPE END SECTIONS	
2140	Furnish and Install 12" RCP Class III Apron Endwall with Joint Ties	EA
2141	Furnish and Install 15" RCP Class III Apron Endwall with Joint Ties	EA
2142	Furnish and Install 18" RCP Class III Apron Endwall with Joint Ties	EA
2143	Furnish and Install 21" RCP Class III Apron Endwall with Joint Ties	EA
2144	Furnish and Install 24" RCP Class III Apron Endwall with Joint Ties	EA
2145	Furnish and Install 27" RCP Class III Apron Endwall with Joint Ties	EA
2146	Furnish and Install 30" RCP Class III Apron Endwall with Joint Ties	EA
2147	Furnish and Install 36" RCP Class III Apron Endwall with Joint Ties	EA
2148	Furnish and Install 42" RCP Class III Apron Endwall with Joint Ties	EA
2149	Furnish and Install 48" RCP Class III Apron Endwall with Joint Ties	EA
2150	Furnish and Install 54" RCP Class III Apron Endwall with Joint Ties	EA
2151	Furnish and Install 60" RCP Class III Apron Endwall with Joint Ties	EA
2152	Furnish and Install 66" RCP Class III Apron Endwall with Joint Ties	EA
2153	Furnish and Install 72" RCP Class III Apron Endwall with Joint Ties	EA
2154	Furnish and Install 14" x 23" RCP Class III Apron Endwall with Joint Ties	EA
2155	Furnish and Install 19" x 30" RCP Class III Apron Endwall with Joint Ties	EA
2156	Furnish and Install 24" x 38" RCP Class III Apron Endwall with Joint Ties	EA
2157	Furnish and Install 29" x 45" RCP Class III Apron Endwall with Joint Ties	EA
2158	Furnish and Install 34" x 53" RCP Class III Apron Endwall with Joint Ties	EA
2159	Furnish and Install 38" x 60" RCP Class III Apron Endwall with Joint Ties	EA
2160	Furnish and Install 43" x 68" RCP Class III Apron Endwall with Joint Ties	EA
2161	Furnish and Install 48" x 76" RCP Class III Apron Endwall with Joint Ties	EA
2162	Furnish and Install 53" x 83" RCP Class III Apron Endwall with Joint Ties	EA
2163	Furnish and Install 58" x 91" RCP Class III Apron Endwall with Joint Ties	EA
2164	Furnish and Install 2' x 4' Box Culvert End Section with Joint Ties	EA
2165	Furnish and Install 3' x 4' Box Culvert End Section with Joint Ties	EA
2166	Furnish and Install 4' x 4' Box Culvert End Section with Joint Ties	EA
2167	Furnish and Install 3' x 5' Box Culvert End Section with Joint Ties	EA
2168	Furnish and Install 4' x 5' Box Culvert End Section with Joint Ties	EA
2169	Furnish and Install 5' x 5' Box Culvert End Section with Joint Ties	EA

Bid Item	Description	Units
2170	Furnish and Install 3' x 6' Box Culvert End Section with Joint Ties	EA
2171	Furnish and Install 4' x 6' Box Culvert End Section with Joint Ties	EA
2172	Furnish and Install 5' x 6' Box Culvert End Section with Joint Ties	EA
2173	Furnish and Install 6' x 6' Box Culvert End Section with Joint Ties	EA
2174	Furnish and Install 4' x 7' Box Culvert End Section with Joint Ties	EA
2175	Furnish and Install 5' x 7' Box Culvert End Section with Joint Ties	EA
2176	Furnish and Install 6' x 7' Box Culvert End Section with Joint Ties	EA
2177	Furnish and Install 4' x 8' Box Culvert End Section with Joint Ties	EA
2178	Furnish and Install 5' x 8' Box Culvert End Section with Joint Ties	EA
2179	Furnish and Install 6' x 8' Box Culvert End Section with Joint Ties	EA
2180	Furnish and Install 5' x 9' Box Culvert End Section with Joint Ties	EA
2181	Furnish and Install 6' x 9' Box Culvert End Section with Joint Ties	EA
2182	Furnish and Install 5' x 10' Box Culvert End Section with Joint Ties	EA
2183	Furnish and Install 6' x 10' Box Culvert End Section with Joint Ties	EA
2184	Furnish and Install 4' x 11' Box Culvert End Section with Joint Ties	EA
2185	Furnish and Install 6' x 11' Box Culvert End Section with Joint Ties	EA
2186	Furnish and Install 4' x 12' Box Culvert End Section with Joint Ties	EA
2187	Furnish and Install 6' x 12' Box Culvert End Section with Joint Ties	EA
2190	Supply Outfall End Section Steel Plate	EA

2000.5.1 Storm Sewer Pipes

1. Payment for Storm Sewer Pipes Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for by-pass pumping (if necessary); for forming foundation; for laying pipe; for sealing joints; for providing backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and cleaning out and restoring the site of the work. Rock Excavation, Connections to Existing Mains and Coring into Existing Manholes or Inlets will be paid for under separate Bid Items.

2. Apply Contract unit prices, without adjustment, to the quantities of storm sewer pipes constructed at elevations not greater than one foot (1') above or below what the Plans show. If the ENGINEER orders the construction of the storm sewer pipes or portions of the pipes at elevations greater than one foot (1') above or below what the Plans show, then the CITY will pay for this work as specified extra work.

3. Work performed one foot (1') or less below the pipe bottom to form a satisfactory foundation as specified is incidental to the work. The CITY will pay for work required at depths greater than one foot (1') below the pipe bottom as extra work.

2000.5.2 Pipe End Sections

1. Payment for Storm Sewer Pipe End Sections Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for by-pass pumping (if necessary); for forming foundation; for laying pipe; for sealing joints, for providing and connecting all necessary fittings; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; for providing and installing end section grates as specified; and for cleaning out and restoring the site of the work. Rock Excavation, Connections to Existing Mains, and Coring into Existing Manholes will be paid for under separate Bid Items.

2. Apply Contract unit prices, without adjustment, to the quantities constructed at elevations not greater than one foot (1′) above or below what the Plans show. If the ENGINEER orders the construction of the relay pipes or portions of the pipes at elevations greater than one foot (1′) above or below what the Plans show, then the CITY will pay for this work as specified extra work.

3. Work performed one foot (1′) or less below the pipe bottom to form a satisfactory foundation as specified is incidental to the work. The CITY will pay for work required at depths greater than one foot (1′) below the pipe bottom as extra work.

2000.5.3 Joint Ties

1. If joint ties are called for on the Plans and/or in the *Special Conditions*, the cost of furnishing and installing the joint ties shall be included in the unit price cost of the storm sewer pipe. Joint ties shall be installed as follows:
   A. Round Reinforced Concrete Pipe: One (1) joint tie on each side located at the springline of the pipe.
   B. Horizontal Elliptical Reinforced Concrete Pipe: One (1) joint tie on each side located at the springline of the pipe.
   C. Reinforced Concrete Box Culvert Pipe: Two (2) joint ties on each side of the pipe section, located one-thirds (1/3) and two-thirds (2/3) of the way between the crown and invert of the pipe.

SECTION 2100
NOT USED

SECTION 2200
STORM SEWER STRUCTURES

2200.1 Description

1. This Section describes constructing, reconstructing, or rebuilding storm manholes, storm junction chambers, storm inlet manholes, and storm inlets, made of concrete, concrete masonry or concrete block with necessary reinforcement, metal frames, covers, including excavating and backfilling.

2200.2 Materials

2200.2.1 Concrete

1. Use materials conforming to the requirements for the class of the material named and specified below:

A. Precast Concrete	**ASTM C-478**
B. Cast in Place Concrete	**Section 100.70** of these Specifications
C. Concrete Block	**ASTM C-139**

2. Precast manholes shall have the following requirements, which shall govern when they alter the ASTM standards. Precast manhole tops shall be eccentric cone, whenever possible. Flat tops may be utilized when eccentric cones are not feasible. In some cases, a steel plate may be required in lieu of a precast concrete flat top. The Plans and/or *Special Conditions* will note the steel plate thickness required.

3. Precast reinforced concrete circular manhole risers and tops shall have a minimum wall thickness (in inches) equal to the inside diameter (in inches) divided by twelve (12) plus one (1). Reinforced integral floors shall have a minimum thickness of six inches (6").

4. Precast reinforced concrete box manhole risers and tops shall be designed by a structural engineer working for the CONTRACTOR or the precast manufacturer.

5. Junction chamber designs will be provided by the CITY within the Plans. The junction chamber designs are prepared under the assumption of the structure being constructed as "cast in place." Should the CONTRACTOR choose to have these structures precast, the CONTRACTOR or precast manufacturer shall submit an alternative design for review and approval by the ENGINEER. If CONTRACTOR wishes to use precast junction chamber and outlet structures, this will require submittal, for ENGINEER's approval, of the precast structure supplier's design, indicating compliance with project design criteria, prior to the installation of the precast junction chamber and outlet structures. The precast structure supplier's design must be stamped by a registered Professional Engineer.

6. Each precast reinforced concrete manhole riser and top section shall be clearly marked with the name or trademark of the manufacturer and the date of manufacture. This marking shall be indented into the manhole section or shall be painted on with waterproof paint.

7. Precast reinforced concrete manhole risers and top sections shall be subject to rejection for failure to conform to any of the Specification requirements. In addition, individual sections of manhole risers and tops may be rejected because of any of the following reasons:
   A. Fracture cracks passing through the walls, except for a single end crack that does not exceed the depth of the joint.
   B. Defects that indicate imperfect proportioning, mixing, or molding.
   C. Surface defects indicating honey-combed or open texture.
   D. Damaged ends, where such damage would prevent making a satisfactory joint.
   E. Manhole steps out of line or improperly spaced.
   F. The interval diameter of the manhole section shall not vary more than one percent (1%) of the nominal diameter.
   G. Any continuous cracking having a surface width of 0.01" or more and extending for a length of twelve inches (12") or more, regardless of the position in the section wall.

8. Concrete block for manholes shall be seven and three-quarters inches (7¾") thick, curved to fit a four-foot (4') inside diameter manhole, notched to fit manhole steps and with corbel blocks to fit manhole ring as shown in the Detailed Drawings. Mortar shall be one (1) part Portland cement and two (2) parts mortar sand.

9. Concrete block for the entire manhole may only be used where specified or with permission of the ENGINEER. A one-half inch (½") cement mortar back-plaster shall be used.

10. When the size or number of connections prelude the practical use of a precast bottom section, concrete block may be used up to approximately eight inches (8") above the top of the pipe.

2200.2.2 Butyl Rubber Sealant

1. Use materials conforming to the requirements for the class of the material named and specified below:
   A. Butyl Rubber Sealant **ASTM C-990**
   B. External Butyl Rubber Joint Wrap **ASTM C-877 (Type III)**

2200.2.3 Manhole Steps

1. Unless otherwise called for in the Plans and Specifications, **manhole steps shall NOT be installed**.

2200.2.4 Structure Frames and Covers

1. Use materials conforming to the requirements for the class of material named and specified below:
   A. Grey Iron **ASTM A-48 Class 35B**
   B. Ductile Iron **ASTM A-536 Grade 80-55-06**

2. Unless otherwise called for in the Plans and Specifications, frames and covers shall conform to the following:
   A. Manhole: Neenah R-1710 frame with solid Type B cover with the word "STORM" cast in the cover. Cover shall be locking, non-rocking with open pick hole.
   B. Inlet Manhole:
      1. In curb and gutter: Neenah R-3067 with Type R grate.
      2. In other locations: Neenah R-1710 frame with Type A grate, R-2560D, or R-2560D3.
   C. Junction Chamber: Neenah R-1710 frame with Type B cover with the word "STORM" cast in the cover. Cover shall be locking, non-rocking with open pick hole.
   D. Type 1 Inlet:
      1. In curb and gutter: Neenah R-3015 with Type R grate.
      2. In other locations: Neenah R-1700A frame with Type A grate, R-2560D, or R-2560D3.
   E. Type 3 Inlet: Neenah R-3067 with Type R grate.
   F. Manhole Riser: Comply with manhole requirements.
   G. Inlet Manhole Riser: Comply with inlet manhole requirements.
   H. Type 3 Inlet Riser: Comply with Type 3 inlet requirements.
   I. Outlet Structures: Comply with Details in Plans.

3. Supply of frames and covers:
   A. Manhole and Manhole Riser: CITY.
   B. Inlet, Inlet Manhole, Inlet Riser, and Inlet Manhole Riser: CONTRACTOR.
   C. Junction Chambers:
      1. Neenah R-1710: CITY.
      2. Other than Neenah R-1710: CONTRACTOR.
   D. Outlet Structures: CONTRACTOR.

4. Frames and covers, which are not Neenah Foundry, must be approved by the ENGINEER and meet the following requirements:
   A. All castings shall be uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion, or other effects. They shall be smooth and well-cleaned by shot-blasting.
   B. All castings shall be manufactured true to pattern; component parts shall fit together in a satisfactory manner. Round frames shall have machined bearing surfaces.
   C. All dimensions of frame and cover shall match Neenah frame and cover proposed to be replaced.
   D. Cover shall have indented top design. The word "STORM" shall be cast into the cover.

E. Both frame and cover shall be designed for heavy duty use.

2200.2.5 Manhole Adjustment Rings

1. Use materials conforming to the requirements for the class of material named and specified below:
   A. Precast Concrete Adjustment Rings **ASTM G-478**
   B. Rubber Adjustment Rings **ASTM D-573-04**

2. Precast manhole concrete adjustment rings shall have an outside diameter of thirty-six inches (36″) and an inside diameter of twenty-four inches (24″), with a minimum allowable thickness of three inches (3″).

3. Manhole rubber adjustment rings shall have an outside diameter of thirty-six inches (36″) and an inside diameter of twenty-four inches (24″), with a minimum allowable thickness of two inches (2″). The rubber adjustment rings shall be "**Infra-Riser Multi-Purpose Rubber Adjustment Riser**" or Approved Equal.

4. Precast Type 3 inlet concrete adjustment rings shall have inside dimensions of twenty four inches (24″) x thirty six inches (36″). Outside dimensions shall be thirty four inches (34″) x forty six inches (46″).

5. Type 1 inlet adjustment rings shall comply with manhole adjustment ring requirements (precast concrete and rubber).

6. Junction Chamber adjustment rings shall comply with manhole adjustment ring requirements (precast concrete and rubber).

7. Adequate adjustment is required to ensure that the above specified castings are utilized. Castings shall not be changed to facilitate "ease" of paving operations.

2200.3 Construction

2200.3.1 Excavation

2200.3.1.1 General

1. The excavation shall be limited to the size required for the manhole to be constructed and shall be sheathed and braced as necessary to protect the workmen and prevent loss of ground.

2. Understand that the proposed elevations for the manholes as shown on the Plans are subject to revisions in order to fit field conditions; therefore, the ENGINEER may have to adjust the grades from those shown on the Plans.

3. Manholes shall be installed at the end of each line, at all changes in grade, size, or alignment, and at all mainline pipe intersections.

4. Manholes shall be located at intervals not greater than four hundred feet (400').

2200.3.1.2 Constructing Foundation

1. Construct the foundation in the excavation to prevent subsequent settlement or rupture of the concrete manhole base.

2. The CONTRACTOR may not set the concrete manhole base in rock, wet conditions, or on a firm earth subgrade.

3. The CONTRACTOR shall set the concrete manhole base section on a backfilled granular foundation or bed. When placing the pipe on backfilled granular foundation, excavate the trench to at least six inches (6") below the elevation established for the bottom of the concrete manhole base. Backfill this depth with **"¾-inch clear stone"** meeting the requirements in **Section 608.2.2** of the STATE SPECIFICATIONS. Compact the material before setting the concrete manhole base section.

4. If the Contract details types of bedding or required excavation widths others than those described above, conform to the Construction Details.

2200.3.2 Manholes Bases

2200.3.2.1 Field Poured Base for Concrete Block Manholes

1. The concrete base shall have a minimum of six inches (6") as shown in the standard Detail Drawings. The manhole base shall substantially conform to the required shape and dimensions; the excavation shall be back formed, if necessary, to achieve this end. If excavation in stable soil has been carried below the required depth, such excess depth shall be filled with concrete. Excess concrete shall not be deposited around the manhole in such a manner that will interfere with future connections. The pipe shall be supported on brick or solid concrete blocks for the pouring of the concrete base. The concrete of the base shall extend under the flexible pipe to where it rests in undisturbed soil. This concrete support for rigid pipe shall end in a vertical plane flush with the face of the bell.

2200.3.2.2 Field Poured Base for Precast Manholes

1. The precast manhole bottom barrel section shall be set on concrete brick or block so that the bottom section is below the spring line of the outlet pipe, set for proper location and plumbed. The manhole base of Class D concrete shall then be poured.

2200.3.2.3 Precast Manhole with Integral Base

1. The excavation shall be deep enough so that after the bottom has been placed thereon, set to grade and plumbed, there remains a six-inch (6") minimum depth of bedding material below the bottom of the base. The annular space between the manhole excavation and the outside wall of the manhole section shall be backfilled with bedding material up to the spring line of the incoming pipe. The invert shall not be poured until the manhole is completely built and backfilled. The invert shall be the same diameter as the larger of the adjoining sewers and shall be shaped as shown in the Special Details.

2200.3.3 Concrete Walls and Chimneys

2200.3.3.1 Precast Concrete Manholes

1. Set manhole base on graded bedding material per project Specifications making sure that boots or pipe connections match design elevations. Level top of manhole base section in both directions.

2. The manhole walls shall be constructed at the specified diameter as shown on the Plans.

3. Use appropriate lifting slings that will adequately lift weight of units. The use of an approved weight spreader bar is preferred. When lifting manhole bases and risers, make sure chain or cable lengths are long enough to prevent contact with tongue and groove area, and are kept at appropriate lifting angles. Use wooden blocks between sling and manhole wall, if necessary.

4. Clean and inspect tongue and groove surfaces. Surfaces should be clean from all dust and debris. On tongue-up manholes, place butyl material next to the vertical surface or tongue. Wrap material completely around unit overlapping ends. Knead the ends together to form a uniform splice. Make sure that all protective paper is removed. Lower bell end of the next section. If steps were called for in Plans or Specifications, make sure steps are aligned into final position. If bell is up, place butyl material next to vertical surface of groove and follow above procedure. All sections, as shown on the Shop Drawings, should be completed in this manner.

5. Lifting holes shall be sealed by inserting a rubber plug or other approved material into hole, and filling with non-shrink mortar from inside and outside.

6. Backfill around manhole equally to prevent tipping. Compact fill in lifts same as the standard trench procedures, as stated in **Section 2000** of these Specifications.

2200.3.3.2 Concrete Block Manholes

1. Manhole walls constructed of concrete block shall be constructed at the diameter shown on the Plans up to the beginning of the corbel section. From this point, the manhole shall be corbelled in at approximately one-half inch (½″) horizontal to one inch (1″) vertical to the diameter of the manhole frame. If manhole steps are called for, the face of the manhole in which the steps are installed shall be kept vertical.

2. Backfill around manhole equally to prevent tipping. Compact fill in lifts same as the standard trench procedures, as stated in **Section 2000** of these Specifications.

2200.3.3.3 Manhole Chimneys and Adjustment Rings

1. Chimneys three inches (3″) or more in height shall be constructed using concrete adjustment rings. The height of the grade ring shall equal (to within an inch (1″) and not to exceed) the height of adjustment to minimize the number of joints in the chimney section. Multiple grade rings will not be allowed where one (1) will suffice.

2. Chimneys less than three inches (3″) in height shall be constructed using rubber grade rings.

3. Grade rings shall be laid in a bead of flexible joint sealant as specified. If the top of the precast riser is uneven, the ENGINEER may require a one and one-quarter inch (1¼″) diameter flexible sealant be used. Frames should be placed on 3½″ x 3/8″ bead of flexible joint sealant. On new subdivision (unimproved) streets, flexible sealant shall be omitted and the frames placed directly on the grade ring.

4. If final casting adjustment cannot be achieved using flexible sealant and/or rubber rings, the ENGINEER may allow the use of Class C concrete instead. The rubber rings and/or flexible sealant should be removed and concrete should be vibrated around the casting using a suitable spud-type vibrator. Monolithic concrete shall be vibrated into the grade ring area and finished smooth on the inside of the structure.

5. The adjustment of rings and frame shall not exceed a total height of twenty-one inches (21″).

2200.3.4 Reconstructing Manholes and Inlet Manholes

1. Reconstructing storm sewer manholes and inlet manholes consists of the following:
   A. Remove existing casting.
   B. Remove existing adjustment.
   C. Remove top (cone section or other top that may be installed).

D. Remove up to one (1) barrel section.
E. Replace barrel sections and top as required to meet elevations shown in Plans.
F. Install new adjustment.
G. Install new casting.

2200.3.5 Rebuilding Manholes and Inlet Manholes

1. Rebuilding storm sewer manholes and inlet manholes consists of the following:
   A. Remove existing casting.
   B. Remove existing adjustment.
   C. Remove top (cone section or other top that may be installed).
   D. Remove all barrel sections to manhole base.
   E. Replace barrel sections and top as required to meet elevations shown in Plans.
   F. Install new adjustment.
   G. Install new casting.

2200.4 Measurement

1. The CITY will measure the Storm Sewer Structure Bid Items that have been acceptably completed, in accordance with the units listed in the table below. For Bid Items that are measured by the vertical foot (VF), the measurement shall be from the flow line or invert of the outgoing sewer to the top of the structure. For structures whose frame and lid were supplied by the CITY, the measurement for payment shall not include the height of the frame.

2200.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
	STORM SEWER MANHOLES	
2200	Furnish and Install Standard Storm Sewer Manhole (2' diameter)	VF
2201	Furnish and Install Standard Storm Sewer Manhole (4' diameter)	VF
2202	Furnish and Install Standard Storm Sewer Manhole (5' diameter)	VF
2203	Furnish and Install Standard Storm Sewer Manhole (6' diameter)	VF
2204	Furnish and Install Standard Storm Sewer Manhole (7' diameter)	VF
2205	Furnish and Install Standard Storm Sewer Manhole (8' diameter)	VF
2206	Furnish and Install Standard Storm Sewer Manhole (9' diameter)	VF
2207	Furnish and Install Standard Storm Sewer Manhole (4' x 4' Box)	VF
2208	Furnish and Install Standard Storm Sewer Manhole (5' x 5' Box)	VF
2209	Furnish and Install Standard Storm Sewer Manhole (6' x 6' Box)	VF
2210	Furnish and Install Standard Storm Sewer Manhole (7' x 7' Box)	VF

Bid Item	Description	Units
2211	Furnish and Install Standard Storm Sewer Manhole (8' x 8' Box)	VF
2212	Furnish and Install Standard Storm Sewer Manhole (9' x 9' Box)	VF
2213	Furnish and Install Standard Storm Sewer Inlet Manhole (4' diameter)	VF
2214	Furnish and Install Standard Storm Sewer Inlet Manhole (5' diameter)	VF
2215	Furnish and Install Standard Storm Sewer Inlet Manhole (6' diameter)	VF
2216	Furnish and Install Standard Storm Sewer Inlet Manhole (7' diameter)	VF
2217	Furnish and Install Standard Storm Sewer Inlet Manhole (8' diameter)	VF
2218	Furnish and Install Standard Storm Sewer Inlet Manhole (9' diameter)	VF
2219	Furnish and Install Standard Storm Sewer Inlet Manhole (4' x 4' Box)	VF
2220	Furnish and Install Standard Storm Sewer Inlet Manhole (5' x 5' Box)	VF
2221	Furnish and Install Standard Storm Sewer Inlet Manhole (6' x 6' Box)	VF
2222	Furnish and Install Standard Storm Sewer Inlet Manhole (7' x 7' Box)	VF
2223	Furnish and Install Standard Storm Sewer Inlet Manhole (8' x 8' Box)	VF
2224	Furnish and Install Standard Storm Sewer Inlet Manhole (9' x 9' Box)	VF
2225	Furnish and Install Storm Sewer Junction Chamber	EA
2226	Furnish and Install Storm Sewer Outlet Structure	EA
2227	Furnish and Install Standard Storm Sewer Manhole Riser (4' diameter)	VF
2228	Furnish and Install Standard Storm Sewer Manhole Riser (5' diameter)	VF
2229	Furnish and Install Standard Storm Sewer Manhole Riser (6' diameter)	VF
2230	Furnish and Install Standard Storm Sewer Inlet Manhole Riser (4' diameter)	VF
2231	Furnish and Install Standard Storm Sewer Inlet Manhole Riser (5' diameter)	VF
2232	Furnish and Install Standard Storm Sewer Inlet Manhole Riser (6' diameter)	VF
INLETS		
2235	Furnish and Install Type 1 Inlet (with 18" Sump)	EA
2236	Furnish and Install Type 1 Inlet	EA
2237	Furnish and Install Type 3 Inlet (with 18" Sump)	EA
2238	Furnish and Install Type 3 Inlet	EA
2239	Furnish and Install Type 3 Inlet Riser	EA

Bid Item	Description	Units
RECONSTRUCT STORM SEWER MANHOLE		
2245	Reconstruct 2' Diameter Storm Sewer Manhole	VF
2246	Reconstruct 4' Diameter Storm Sewer Manhole	VF
2247	Reconstruct 5' Diameter Storm Sewer Manhole	VF
2248	Reconstruct 6' Diameter Storm Sewer Manhole	VF
2249	Reconstruct 7' Diameter Storm Sewer Manhole	VF
2250	Reconstruct 8' Diameter Storm Sewer Manhole	VF
2251	Reconstruct 9' Diameter Storm Sewer Manhole	VF
2252	Reconstruct 4' x 4' Storm Sewer Box Manhole	VF
2253	Reconstruct 5' x 5' Storm Sewer Box Manhole	VF
2254	Reconstruct 6' x 6' Storm Sewer Box Manhole	VF
2255	Reconstruct 7' x 7' Storm Sewer Box Manhole	VF
2256	Reconstruct 8' x 8' Storm Sewer Box Manhole	VF
2257	Reconstruct 9' x 9' Storm Sewer Box Manhole	VF
2258	Reconstruct 4' Diameter Storm Sewer Inlet Manhole	VF
2259	Reconstruct 5' Diameter Storm Sewer Inlet Manhole	VF
2260	Reconstruct 6' Diameter Storm Sewer Inlet Manhole	VF
2261	Reconstruct 7' Diameter Storm Sewer Inlet Manhole	VF
2262	Reconstruct 8' Diameter Storm Sewer Inlet Manhole	VF
2263	Reconstruct 9' Diameter Storm Sewer Inlet Manhole	VF
2264	Reconstruct 4 'x 4' Storm Sewer Box Inlet Manhole	VF
2265	Reconstruct 5' x 5' Storm Sewer Box Inlet Manhole	VF
2266	Reconstruct 6' x 6' Storm Sewer Box Inlet Manhole	VF
2267	Reconstruct 7' x 7' Storm Sewer Box Inlet Manhole	VF
2268	Reconstruct 8' x 8' Storm Sewer Box Inlet Manhole	VF
2269	Reconstruct 9' x 9' Storm Sewer Box Inlet Manhole	VF
REBUILD STORM SEWER MANHOLE		
2274	Rebuild 2' Diameter Storm Sewer Manhole	VF
2275	Rebuild 4' Diameter Storm Sewer Manhole	VF
2276	Rebuild 5' Diameter Storm Sewer Manhole	VF
2277	Rebuild 6' Diameter Storm Sewer Manhole	VF
2278	Rebuild 7' Diameter Storm Sewer Manhole	VF
2279	Rebuild 8' Diameter Storm Sewer Manhole	VF
2280	Rebuild 9' Diameter Storm Sewer Manhole	VF
2281	Rebuild 4' x 4' Storm Sewer Box Manhole	VF
2282	Rebuild 5' x 5' Storm Sewer Box Manhole	VF
2283	Rebuild 6' x 6' Storm Sewer Box Manhole	VF
2284	Rebuild 7' x 7' Storm Sewer Box Manhole	VF
2285	Rebuild 8' x 8' Storm Sewer Box Manhole	VF
2286	Rebuild 9' x 9' Storm Sewer Box Manhole	VF

Bid Item	Description	Units
2287	Rebuild 4' Diameter Storm Sewer Inlet Manhole	VF
2288	Rebuild 5' Diameter Storm Sewer Inlet Manhole	VF
2289	Rebuild 6' Diameter Storm Sewer Inlet Manhole	VF
2290	Rebuild 7' Diameter Storm Sewer Inlet Manhole	VF
2291	Rebuild 8' Diameter Storm Sewer Inlet Manhole	VF
2292	Rebuild 9' Diameter Storm Sewer Inlet Manhole	VF
2293	Rebuild 4' x 4' Storm Sewer Box Inlet Manhole	VF
2294	Rebuild 5' x 5' Storm Sewer Box Inlet Manhole	VF
2295	Rebuild 6' x 6' Storm Sewer Box Inlet Manhole	VF
2296	Rebuild 7' x 7' Storm Sewer Box Inlet Manhole	VF
2297	Rebuild 8' x 8' Storm Sewer Box Inlet Manhole	VF
2298	Rebuild 9' x 9' Storm Sewer Box Inlet Manhole	VF

2. Granular backfill material required for backfilling is incidental to the work.

3. Payment for Storm Sewer Structures Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for forming foundation; for sheeting and shoring; for dewatering; for providing all masonry; for backfilling; for compacting; for disposing of surplus material; and for the cleaning out and restoring the work site. Connecting existing pipes into new structures shall be considered incidental to the cost of the new structure in cases where the existing pipe can be directly connected to the new structure. In cases where a section of new pipe must be installed to connect to the manhole, the connection of the new pipe to the existing pipe shall be paid for under a separate Bid Item. Storm sewer manhole frames and lids that are supplied by the CITY and will not be compensated for. Adjustment of the Storm Sewer Structures, where required, will be paid for under a separate Bid Item.

SECTION 2300
STORM SEWER CASING PIPES

2300.1 Description

1. This Section describes furnishing and installing steel casing pipes of various sizes by means of open cut excavation or through trenchless technology.

2300.2 Materials

1. Use materials conforming to the requirements for the class of the material named and specified below:

A. Steel Casing Pipes	**ASTM A-36**
B. Concrete Casing Pipe	**ASTM C-76**
C. Cast Iron Casing Pipe	**WW-P-421b**
D. Ductile Iron Casing Pipe	**ASTM A-716**
E. Centrifugally Cast Fiberglass Reinforced Polymer Mortar Pipe	**ASTM D-3262**
F. Prestressed Concrete Pipe	**AWWA C300**
G. Polyvinyl Chloride	**ASTM D-1785**

2. Unless otherwise tested or approved by the CITY, only use encasement pipe or uncased carrier pipe that is new and has smooth interior and exterior walls.

2300.3 Construction

2300.3.1 Open Cut Installation

2300.3.1.1 Excavation

2300.3.1.1.1 General

1. Unless otherwise specified in the Contract or if the ENGINEER allows, perform casing pipe installation in open trenches and in a manner that protects the casing pipe from unusual stresses.

2. Excavate the trenches in reasonably close conformity with the Plans and as laid out by the ENGINEER in the field.

3. Keep trenches dewatered at all times.

4. Understand the proposed elevations for the casing pipes as shown on the Plans are subject to revisions in order to fit field conditions; therefore, the ENGINEER may have to adjust the profile grades from those shown on the Plans.

2300.3.1.1.2 Rock Excavation for Casing Pipes

1. Classify rock excavation for storm sewer as specified for Rock Excavation in **Section 2750** of these Specifications, except classify the necessary removal of all rock boulders with a volume of one-half (½) cubic yard or more, as Rock Excavation.

2300.3.1.2 Constructing Foundation

1. Construct the foundation in the trench to prevent subsequent settle or rupture of the casing pipe.

2. The CONTRACTOR may not lay the casing pipe in rock, wet conditions, or on a firm earth subgrade.

3. The CONTRACTOR shall lay the casing pipe on a backfilled granular foundation or bed. When placing the casing pipe on backfilled granular foundation, excavate the trench at least six inches (6″) below the elevation established for the bottom of the casing pipe. Backfill this depth with **"¾-inch clear stone"** meeting the requirements in **Section 608.2.2** of the STATE SPECIFICATIONS. Compact the material before laying the casing pipe on the backed granular material.

4. If the Contract details types of bedding, or required trench widths, other than described above, conform to the Construction Details.

2300.3.1.3 Laying Casing Pipe

1. Begin laying the casing pipe in finished trenches at the lowest point and proceed towards the upper end.

2300.3.1.4 Backfilling

1. Backfill casing pipes in accordance with **Section 100.61** of these Specifications.

2300.3.2 Trenchless Installation

2300.3.2.1 General

1. Jack and bore is a method of installing a product (often called a casing) that may serve as a direct conduit for liquids or as a duct for a carrier pipe. It is a multi-stage process consisting

of constructing a temporary horizontal jacking platform and a starting alignment track in an entrance pit at a desired elevation. The product is then jacked by manual control along the starting alignment track with simultaneous excavation of the soil being accomplished by a rotating cutting head in the leading edge of the product's annular space. The ground up soil (spoil) is transported back to the entrance pit by helical wound auger flights rotating inside the product. Jack and bores typically provide limited tracking and steering, as well as limited support to the excavation face.

2. Micro-tunneling is conducted similar to jack and bores with the exception that it is a remotely-controlled, guided pipe jacking process that provides continuous support to the excavation face. The guidance system usually consists of a laser mounted in the tunneling drive shaft, which communicates a reference line to a target mounted inside the micro-tunneling machine's articulated steering head. The micro-tunneling process provides the ability to control the excavation face stability by applying mechanical or fluid pressure to counterbalance the earth and hydrostatic pressures.

3. Removal and disposal of excess material varies, is the responsibility of the boring Contractor, and is not covered under this Specification. However, the cost of the removal and final disposition in included in the cost of the trenchless operation.

4. The minimum wall thickness for steel casing pipes shall be as follows:

Nominal Casing Diameter (Inches)	Nominal Wall Thickness (Inches)
18	0.312 (5/16)
24	0.375 (3/8)
30	0.469 (15/32)
36	0.531 (17/32)
42	0.625 (5/8)
48	0.688 (11/16)
54	0.781 (25/32)
60	0.844 (27/32)
66	0.938 (15/16)
72	1.000 (1)
84	1.156 (1-5/32)
96	1.312 (1-5/16)

5. Conduit being installed by trenchless means may **NOT** be left open without the approval of the ENGINEER to prevent the conduit from acting as a drainage structure.

6. For all non-reinforced concrete carrier pipes, casing spacers shall be designed to support the carrier pipe in the casing pipe. Standard casing spacers shall consist of 14 gauge AISI Type 304 stainless steel and not less than four (4) – 10 Gauge AISI Type 304 stainless steel risers. Each riser shall be equipped with a removable, ultra-high molecular weight polymer or

glass-reinforced plastic runner. Attachment hardware shall be AISI Type 304 stainless steel. Spacer shall have a minimum width of two inches (2″). Standard casing spacers shall be Cascade Waterworks or Approved Equal. Spacers shall be installed at a maximum spacing of six feet (6′).

2300.3.2.2 Steel Pipe Casing and Welds

1. In addition to meeting or exceeding the material requirements listed above, meet the following requirements:
   A. The size of the steel casing must be at least six inches (6″) larger than the largest outside diameter of the carrier pipe.
   B. The casing pipe must be straight seam pipe or seamless pipe.
   C. All steel pipe may be bare inside and outside, with the manufacturer's recommended minimum nominal wall thickness to meet the greater of installation, loading, or carrier requirements.
   D. All steel casing pipe must be square cut and have dead-even lengths, which are compatible with the equipment being utilized to install the casing pipe.

2. Use steel pipe casings and welds meeting or exceeding the thickness requirements to achieve the service life requirements. For purposes of material classification, consider steel pipe casing structural plate steel pipe. Ensure steel pipe casing of sufficient length achieves the required length through fully-welded joints. Ensure joints are air-tight and continuous over the entire circumference of the pipe, with a bead equal to or exceeding the minimum of either that is required to meet the thickness criteria of pipe wall for jacking and loading or service life. A qualified welder must perform all welding.

2300.3.2.3 Reinforced Concrete Pipe Casing

1. In addition to meeting or exceeding the material requirements listed above, meet the following requirements:
   A. 5,000 psi concrete compressive strength.
   B. Class III, IV, or V as required by load calculations, with a C-wall.
   C. Full circular inner and outer reinforcing cage.
   D. Multiple layers of steel reinforcing cages, wire splices, laps, and spacers are permanently secured together by welding in place.
   E. Straight outside pipe wall with no bell modification.
   F. No elliptical reinforcing steel is allowed.
   G. Single cage reinforcement with a one-inch (1″) minimum cover from the inside wall.
   H. Double cage reinforcement with a one-inch (1″) minimum cover from each wall.
   I. Joints are gasket type.
   J. Additional joint reinforcement.

2. Upon installation, the ENGINEER may, at their discretion, require the CONTRACTOR to perform concrete wiping or injection of the joints if it is believed the joints have not maintained their water tightness during the jacking operation. No additional payment will be made for this operation.

2300.3.2.4 Plastic Pipe Casing

1. Plastic pipe may be jacked and bored if its physical properties are sufficient, and it is rigid such that when supported or suspended at midpoint, it maintains a straight alignment. If plastic pipes are jacked and bored, it may not be used as a pressurized pipe. Plastic pipe casing installed by the jack and bore method requires the use of an auger. Open end jacking without the use of an auger for continuous cleanout of the bore as the pipe is advanced is not permitted. Closed end jacking is not permitted.

2300.3.2.5 Pipe Couplings and Joints

1. In addition to meeting or exceeding the material requirements listed above, meet the following requirements:
   A. Steel Couplings and Joints
      1. Welds must comply with **Section 2300.3.2.2** of these Specifications when couplings are not used or when the coupling thickness is less than the casing thickness.
      2. When couplings are used, the casing joint needs only to be tack welded. Couplings must have a full bead weld such that the thickness, when measured at an angle of forty-five degrees (45°) to the casing and coupling interface, must be no less than the casing thickness.
   B. Plastic Pipe Couplings and Joints
      1. Must meet or exceed all ASTM strength and composition standards established for the casing material to which they are being attached.
      2. Joints must be made sufficiently strong to withstand the pressures of jacking. All chemical welds must be completely set and cured before jacking is attempted.

2300.3.2.6 Quality Control

1. Take control of the operation at all times. Have a representative who is thoroughly knowledgeable of the equipment, boring, and City procedures present at the job site during the entire installation and available to address immediate concerns and emergency operations. Notify the ENGINEER forty-eight (48) hours in advance of starting work. Do not begin the installation until the ENGINEER is present at the job site and agrees the proper preparations have been made.

2. For all installations, submit sufficient information to establish the proposed strategy for providing the following:

A. An indication where the leading edge of the casing is located with respect to line and grade and the intervals for checking line and grade. Indication may be provided by using a water gauge (Dutch level) or electronic transmitting and receiving devices. Other methods must have prior approval. Maintain a record of the progress at the job site.
B. Equipment of adequate size and capability to install the product and including the equipment manufacturer's information for all power equipment used in the installation.
C. A means of controlling line and grade.
D. A means for centering the cutting head inside the borehole.
E. Provide a means for preventing voids by assuring:
    1. The rear of the cutting head from advancing in front of the leading edge of the casing by more than one-third (1/3) times the casing diameter and in stable cohesive conditions not to exceed eight inches (8").
    2. In unstable conditions, such as granular soil, loose or flowable materials, the cutting head is retracted into the casing a distance that permits a balance between pushing pressure, pipe advancement, and soil conditions.
    3. Development of a maintaining a log of the volume of spoil material removed relative to the advancement of the casing.
F. Adequate casing lubrication with a bentonite slurry or other approved technique.
G. An adequate band around the leading edge of the casing to provide extra strength in loose, unstable materials when the cutting head has been retracted into the casing to reduce skin friction, as well as providing a method for the slurry lubricant to coat the outside of the casing.
H. At least twenty feet (20') of full diameter auger at the leading edge of the casing. Subsequent auger size may be reduced, but the reduced auger diameter must be at least seventy-five percent (75%) of the full auger diameter.
I. Water to be injected inside the casing to facilitate spoil removal. The point of injection shall be no closer than two feet (2') from the leading edge of the casing.

2300.3.2.7 Testing

2300.3.2.7.1 Product Testing

1. When there is any indication that the installed product has sustained damage and may leak, stop the work, notify the ENGINEER and investigate damage. The ENGINEER may require a pressure test and reserves the right to be present at the test. Perform pressure test within twenty-four (24) hours, unless otherwise approved by the ENGINEER. Furnish a copy of the test results to the ENGINEER for review and approval. The ENGINEER shall be allowed up to seventy-two (72) hours to approve or determine if the product installation is not in compliance with Specifications. The ENGINEER may require non-compliant installations to be filled with excavatable, flowable fill.

2300.3.2.7.2 Testing Methods

1. Testing may consist of one (1) of the following methods, but always must meet or exceed City testing requirements:
   A. Follow the product manufacturer's pressure testing recommendations.
   B. Ensure the product carrier pipes installed without a casing meet the pressure requirements set by the CITY and/or ENGINEER.
      1. The CITY requires a water-tight pipe and joint configuration where the product is installed beneath any pavement (including sidewalk). The ENGINEER will determine when and where water-tight joint requirements shall be applied to the ultimate roadway section for future widening. When under the pavement, conduct an air pressure test for leaks in the presence of the ENGINEER at a minimum test pressure of twenty (20) PSI by either of the following methods.
         a. Standard twenty-four (24) hour pressure test with a recording chart or
         b. A dragnet-type leak detector or equivalent device capable of detecting pressure drops of one-half (½) PSI for a time period recommended by the manufacturer.
      2. When a product is not located under the pavement, the pipe and point configuration must meet or exceed soil tight joint requirements. The test for soil tight joint allows up to 0.10 gallons of water leakage at a sustained pressure of 5 PSI. Conduct test for joint integrity for one (1) hour.

2300.3.2.8 Augering Fluids

1. Use a mixture of bentonite clay or other approved stabilizing agent mixed with potable water with a minimum pH of 6.0 to create the drilling fluid for lubrication and soil stabilization. Vary the fluid viscosity to best fit the soil conditions encountered. Do not use other chemicals or polymer surfactant in the drilling fluid without written consent of the ENGINEER. Certify in writing to the ENGINEER any chemicals to be added are environmentally safe and not harmful or corrosive to the facility. Identify the source of water for mixing the drilling fluid. Approvals and permits are required for obtaining water from such sources as streams, rivers, ponds, or fire hydrants. Any water source used, other than potable water, may require a pH test.

2300.3.2.9 Micro-Tunneling and Micro-Tunnel Boring Machine Requirements

1. The micro-tunnel boring machine must meet the following minimum performance requirements:
   A. Capable of providing positive face support regardless of the micro-tunneling boring machine type.
   B. Articulated to enable controlled steering in both vertical and horizontal direction to a tolerance of plus or minus one inch (1″) from the designed alignment.
   C. All functions are controlled remotely from a surface control unit.

D. Capable of controlling rotation, using a bi-directional drive on the cutter head, or by using anti-roll fins or grippers. The ENGINEER must approve either method.
E. Capable of injecting lubricant around the exterior of the pipe being jacked.
F. Indication of steering direction.
G. For slurry systems, the following is also required:
    1. Indication of the volume of slurry flow in both the supply and return side of the slurry loop.
    2. Indication of slurry bypass valve position.
    3. Indication of pressure of the slurry in the slurry chamber.

2300.3.2.10 Failed Bore Path

1. If conditions warrant removal of any materials installed during a failed bore path, as determined by the ENGINEER, it will be at no cost to the CITY. Promptly fill all voids by injecting all taken-out service products that have any annular space with excavatable, flowable fill.

2300.3.2.11 Jack and Bore and Micro-Tunneling Operations

1. Provide continuous pressure to the face of the excavation to balance groundwater and earth pressures. Ensure the shafts are of sufficient size to accommodate equipment, the pipe selected, and to allow for safe working practices. Provide entry and exit seals at the shaft walls to prevent inflows of groundwater, soil, slurry, and lubricants. Use thrust blocks designed to distribute loads in a uniform manner so any deflection of the thrust block is uniform and does not impart excessive loads on the shaft itself or cause the jacking frame to become misaligned.

2. The jacking system must have the capability of pushing the pipe in jack and bore operations or micro-tunneling bore machines for micro-tunneling operations through the ground in a controlled manner and be compatible with the anticipated jacking loads and pipe capacity. Monitor the jacking force applied to the pipe and do not exceed the pipe manufacturer's recommendations.

3. Ensure the pipe lubrication system is functional at all times and sufficient to reduce jacking loads. Use pipe lubrication systems that include a mixing tank, holding tank, and pumps to convey lubricant from the holding tank to application points at the rear of the micro-tunneling boring machine. Maintain sufficient fluids on site to avoid loss of lubrication.

4. Power distribution system must be identified in the plans package or permit provisions, as well as identifying any noise constraints. Identify spoil removal capability and method to avoid creating hindrance to other activities which may be necessary in the area.

2300.3.2.12 Excess Material and Fluids

1. Monitor the pumping rate, pressures, viscosity, and density of the boring fluids to ensure adequate removal of soil cuttings and the stability of the bore hole. Contain excess drilling fluids, slurry, and soil cuttings at entry and exit points in pits until they are recycled or removed from the site. Ensure all boring fluids are disposed of or recycled in a manner acceptable to the appropriate local, state, and federal regulatory agencies. When jacking and boring in suspected contaminated ground, test the boring fluid for contamination and dispose of appropriately. Remove any excess material upon completion of the bore. If it becomes evident the soil is contaminated, contact the ENGINEER immediately. Do not continue boring without the ENGINEER's approval.

2300.3.2.13 Boring Failure

1. If any obstruction is encountered, which prevents completion of the installation in accordance with the design location and Specifications, the pipe may be taken out of service and left in place at the discretion of the ENGINEER. Immediately fill the product left in place with excavatable, flowable fill. Submit a new installation procedure and revised plans to the ENGINEER for approval before resuming work at another location. If damage is observed to any property, cease all work until a plan of action to minimize further damage and restore damaged property is submitted and approved by the ENGINEER.

2300.3.3 Inserting the Carrier Pipe

1. Insert the carrier pipe into the casing pipe in accordance with the pipe laying requirements of **Section 2000** of these Specifications.

2. Casing spacers shall be designed to support the carrier pipe in the casing pipe. Standard casing spacers shall consist of 14 gauge AISI Type 304 stainless steel attachment band with a PVC liner and not less than four (4) – 10 Gauge AISI Type 304 stainless steel risers. Each riser shall be equipped with a removable, ultra-high molecular weight polymer or glass-reinforced plastic runner. Attachment hardware shall be AISI Type 304 stainless steel. Spacer shall have a minimum width of two inches (2″). Standard casing spacers shall be Cascade Waterworks or Approved Equal. Spacers shall be installed at a maximum spacing of six feet (6′) for PVC carrier pipe. The cost of furnishing and installing the spacers shall be incidental to the construction of the casing pipe.

2300.3.4 Groundwater Control

1. Investigate all sites for the possibility of having to manage groundwater problems that may occur due to seasonal changes or natural conditions.

2300.4 Measurement

1. The CITY will measure Storm Sewer Casing Pipes Bid Items by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the casing pipe.

2300.5 Payment

1. The CITY will pay the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
STORM SEWER OPEN CUT CASING PIPES		
2300	Furnish and Install 18" Storm Sewer Open Cut Casing Pipes	LF
2302	Furnish and Install 24" Storm Sewer Open Cut Casing Pipes	LF
2304	Furnish and Install 30" Storm Sewer Open Cut Casing Pipes	LF
2306	Furnish and Install 36" Storm Sewer Open Cut Casing Pipes	LF
2308	Furnish and Install 42" Storm Sewer Open Cut Casing Pipes	LF
2310	Furnish and Install 48" Storm Sewer Open Cut Casing Pipes	LF
2312	Furnish and Install 54" Storm Sewer Open Cut Casing Pipes	LF
2314	Furnish and Install 60" Storm Sewer Open Cut Casing Pipes	LF
2316	Furnish and Install 66" Storm Sewer Open Cut Casing Pipes	LF
2318	Furnish and Install 72" Storm Sewer Open Cut Casing Pipes	LF
2320	Furnish and Install 84" Storm Sewer Open Cut Casing Pipes	LF
2322	Furnish and Install 96″ Storm Sewer Open Cut Casing Pipes	LF
STORM SEWER TRENCHLESS CASING PIPES		
2350	Furnish and Install 18" Storm Sewer Casing Pipe by Trenchless Methods	LF
2352	Furnish and Install 24" Storm Sewer Casing Pipe by Trenchless Methods	LF
2354	Furnish and Install 30" Storm Sewer Casing Pipe by Trenchless Methods	LF
2356	Furnish and Install 36" Storm Sewer Casing Pipe by Trenchless Methods	LF
2358	Furnish and Install 42" Storm Sewer Casing Pipe by Trenchless Methods	LF
2360	Furnish and Install 48" Storm Sewer Casing Pipe by Trenchless Methods	LF
2362	Furnish and Install 60" Storm Sewer Casing Pipe by Trenchless Methods	LF

Bid Item	Description	Units
2364	Furnish and Install 66" Storm Sewer Casing Pipe by Trenchless Methods	LF
2366	Furnish and Install 72" Storm Sewer Casing Pipe by Trenchless Methods	LF
2368	Furnish and Install 84" Storm Sewer Casing Pipe by Trenchless Methods	LF
2370	Furnish and Install 96" Storm Sewer Casing Pipe by Trenchless Methods	LF

2300.5.1 Open Cut Casing Pipes

1. Payment for Storm Sewer Open Cut Casing Pipe Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for de-watering; for forming foundation; for laying casing pipe; for providing backfill, including bedding material; for backfilling; for compacting; for removing sheeting and shoring; and for clean out and restoring the site of the work.

2300.5.2 Trenchless Casing Pipes

1. Payment for Storm Sewer Trenchless Casing Pipe Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating boring pit and receiving pit; for sheeting and shoring; for de-watering; for forming foundation; for laying casing pipe; for providing backfill, including bedding material; for backfilling; for compacting; for removing sheeting and shoring; and for clean out and restoring the site of the work.

2300.6 Submittals

1. Qualifications
   A. Submit the name of the Subcontractor that will perform the horizontal auger boring or shield tunneling work and submit qualifications for the Subcontractor and Subcontractor's superintendent. In addition, submit names and training/qualifications of personnel that will perform air quality monitoring and the name of the site safety representative.

2. Horizontal Auger Boring Operations
   A. Submit for review a tunneling work plan with complete Subcontractor's construction drawings and written description identifying details of the proposed method of construction and the sequence of operations to be performed during construction, as required by the method of tunneling. The drawings and descriptions shall be sufficiently detailed to demonstrate to the ENGINEER whether the proposed materials and procedures will meet the requirements of this Section. The tunneling work plan shall be

submitted to the ENGINEER for review. All submissions shall be sealed by a professional engineer licensed in the State of Wisconsin. The tunneling work plan, including drawings, shall, at a minimum, include the following items:

1. Subcontractor shall submit arrangement drawings and technical specifications of the horizontal auger boring machine, experience record with this type of machine, and experience and training records for the equipment operator. Provide certification from the manufacturer that the proposed equipment and materials are compatible and suitable for use with the subsurface conditions defined in this Section. Include the following information concerning the horizontal auger boring machine:
    a. Dimensions.
    b. Cutters.
    c. Cutter head position relative to casing.
    d. Casing and band diameters.
    e. Torque, speed, and thrust.
    f. Auger and muck casing diameters.
2. Method of maintaining and controlling line and grade of tunneling operation.
3. Method and details of spoil removal, including equipment type and numbers, processing, and disposal.
4. Electrical system.
5. Grouting techniques to be used for contact grouting, including equipment, pumping and injection procedures, pressure grout types, and mixtures in accordance with this Section.
6. Details of the horizontal auger boring and operation.
7. Plans for storage and handling of casing or liner plate.
    A. Shaft Layout Drawings: Submit the layout and design of proposed access shafts for review.

3. Quality Control Methods: At least thirty (30) days prior to the start of tunneling, the Subcontractor shall submit to the ENGINEER a description of the quality control methods proposed for the tunneling operations. The Submittal shall include:
    A. Supervision: Supervisory control to ensure that the work is performed in accordance with the Plans and Specifications, and the tunneling work plan and drawings.
    B. Line and Grade: Procedures for surveying, controlling, and checking line and grade, including field forms. Procedures for resetting guidance system if its alignment shifts or is moved off design alignment and grade for any reason.
    C. Movement Monitoring: Procedures for monitoring movements along the tunnel alignment as specified herein.
    D. Tunneling Observation and Monitoring: Procedures for preparing and submitting daily logs of tunneling operations, including field forms.
    E. Products and Materials: A plan for testing and submittal of test results to demonstrate compliance with the Specifications and Subcontractor's criteria for permanent products, materials, and installations. The plan shall identify all applicable standards and procedures for testing and acceptance.

4. Jacking Pipe: Submit detailed drawings of the jacking pipe indicating casing pipe material, including the standard to which it is manufactured, outside diameter, wall thickness, and any joint details. Indicate the ultimate and allowable jacking capacity, the required fabrication tolerances to prevent damage to the pipe during installation, and provide a certification indicating that the pipe meets these tolerances and is designed to meet all anticipated loading conditions with an adequate factor of safety.

5. Details of casing spacers, **including recommended spacing.**

6. Safety Plan: A safety plan for tunneling operations including air monitoring equipment and procedures, and provisions for lighting, ventilation, and electrical system safeguards. The plan should also include, at a minimum:
   A. Protection against soil instability and groundwater inflow.
   B. Safety for tunnel and shaft access and exit, including ladders, stairs, walkways, and hoists.
   C. Protection against mechanical and hydraulic equipment operations, and for lifting and hoisting equipment and material.
   D. Monitoring for hazardous gases.
   E. Means for emergency evacuation and self-rescue.
   F. Protection of shaft, including traffic barriers, accidental or unauthorized entry, and falling objects.

7. Calculations: Calculations shall be submitted in a neat, legible format. Assumptions used in calculations shall be consistent with information provided in this Section. All calculations shall be prepared by professional engineer licensed in the State of Wisconsin, who shall stamp and sign calculations, including:
   A. Design calculations demonstrating that the proposed jacking pipe is capable of supporting the maximum stresses to be imposed during jacking. The calculations shall take into account earth and hydrostatic loads; jacking forces; external loads, such as live loads due to traffic; and any other loads that may be reasonably anticipated during jacking. All loads shall be shown and described. Include assumed maximum drive length.
   B. Calculations demonstrating that the soils behind the thrust block can transfer the maximum planned jacking forces exerted by the jacks to the ground during pipe installation with a factor of safety, without excessive deflection or displacement.

8. Schedule: Provide a schedule for all tunneling work, identifying all major construction activities as independent items. The schedule shall include, at a minimum, the following activities: mobilization; Wisconsin "One call" utility locate requests; confirmation of underground utilities, as required on the Plans and in the Specifications; groundwater control at launching and receiving shafts; shaft excavation and support; working slab construction; thrust wall construction; jacking equipment setup; entry ring installation for launch of the casing; horizontal auger boring; contact grouting; installation of the carrier

pipe; shaft backfill; site restoration; cleanup and disposal; and demobilization. The schedule shall also include the work hours and workdays for each activity, and a written description of the construction activities. The schedule will be reviewed by the ENGINEER and shall be updated and resubmitted by the Subcontractor every two (2) weeks, or more frequently, if requested by the ENGINEER.

9. Before Each Drive: Submit the following to the ENGINEER at least twenty four (24) hours prior to the start of each drive:
   A. Results of line and grade survey to ensure that the thrust block, jacking frame, guide rails, entry seal, and exit seals are installed properly prior to launch of each drive.

10. Daily Records: The following daily records shall be submitted to the onsite ENGINEER by noon on the day following the shift for which the data or records were taken:
    A. Tunneling Records: The Subcontractor shall provide complete tunneling records to the ENGINEER. These records shall include, at a minimum: date, time, name of operator, tunnel crossing identification, installed ground support element/pipe number and corresponding tunnel length, rate of advance, jacking forces, spoil feed rates, changed face conditions encountered, steering jack positions, line and grade offsets, shield inclination and roll, any movement of the guidance system from the horizontal auger boring machine or other components or equipment, and durations of and reasons for delays. Computer-recorded data should be referenced to time and distance and should be recorded at time intervals of one (1) minute or less. Manually recorded observations should be made at intervals of not less than once per four feet (4'), as conditions change, and as directed by the ENGINEER. At least seven (7) days prior to the start of auguring, the Subcontractor shall submit samples of the automated and manual tunneling records. Samples shall include electronic data and any necessary programs to interpret data, and the manual logs or records to be used.
    B. Survey Measurements: Survey measurements of casing alignment, and monitoring data of all surface and subsurface settlement monitoring points as required herein.

11. Contingency Plans: The following list includes problem scenarios that may be encountered during the tunneling operations. The Subcontractor shall submit contingency plans for dealing with each problem scenario while satisfying the Specifications. These plans shall include the observations and measurements required to clearly identify the cause of the problems:
    A. Machine unable to advance:
       1. Possible obstructions (including boulders, old foundations, metallic debris, or reinforced concrete; i.e., jammed cutter head).
       2. Insufficient auger torque or jacking capacity.
       3. Shield or machine malfunction.
    B. Laser distorted by heat, humidity, or physical disturbance.
    C. Spoil Feed Problems: Strong hydrocarbon smell is detected in the spoils or in the shaft.
    D. Jacking Forces:

1. Jacking forces increase dramatically or suddenly.
2. Jacking forces reach design capacity of casing, jacking frame, or thrust wall (treat these scenarios as separate incidents).

E. Settlement and Subsidence:
1. Survey measurements indicate deformations exceed limits as defined herein.
2. Excavated volumes significantly exceed tunnel or casing volume installed, as applicable.
3. Rapid excess lost ground results in large voids or sinkholes.

F. Line and grade tolerances being exceeded.

G. Control is lost. Cannot monitor position, torque, thrust, steering jack position, or other performance parameters.

H. Pipe has been damaged or has been found to be out of compliance with Specifications during, or after, installation.

I. Thrust block deforms excessively under jacking loads, or provides insufficient capacity to advance casing.

J. Large volumes of water are encountered, threatening face stability.

12. Abandonment Contingency Plan: The Subcontractor shall prepare an abandonment contingency plan to handle the possibility that the Subcontractor cannot complete a tunneled crossing. The Subcontractor shall follow all provisions of the approved plan.

13. Contact Grout Work Plan and Methods:
A. Submit work plan including contact grouting methods and details of equipment, grouting procedures and sequences, injection pressures, monitoring and recording equipment, pressure gauge calibration data, methods of controlling grout pressure, method of transporting grouting equipment and materials within the initial tunnel support, and provisions to protect interior of pipe and shaft supports.
B. Submit details of grout mix proportions; admixtures, including manufacturers' literature; and laboratory test data verifying the strength of the proposed grout mix.

14. Contact Grout Reports and Records: Maintain and submit daily logs of grouting operations, including grouting locations, pressures, volumes, and grout mix pumped, and time of pumping. Note any problems or unusual observations on logs.

SECTION 2400
STORM SEWER LATERALS

2400.1 Description

1. This Section describes excavating required trenches or tunnels, and laying or constructing sanitary sewer lateral pipe inside, then backfilling and cleaning out as necessary.

2400.1.1 Storm Sewer Lateral Televising

1. Storm sewer laterals within the project limits have been televised and can be made available for viewing during construction, if requested. The majority of the storm laterals are also marked where they cross the right-of-way line with a six-inch (6″) spike and ribbon.

2400.2 Materials

1. Use materials conforming to the requirements for the class of the material named and specified below:
   A. Polyvinyl Chloride Sewer Pipe — **Schedule 40 – ASTM D-1785**
   B. Polyvinyl Chloride Sewer Fittings — **ASTM D-2564**
   C. Insert-A-Tee or Wye Gasketed Sewer Fittings — **ASTM D-3034 with ASTM F-477 Gaskets**

2. Storm sewer lateral pipes shall be clearly marked as follows at intervals of five feet (5′) or less:
   A. Manufacturer's name or trademark.
   B. Nominal pipe size.
   C. Pipe classification.
   D. The legend, i.e. "Schedule-40 PVC Sewer Pipe".
   E. ASTM designation.
   F. Extrusion date, period of manufacture, or lot number.

3. Packaging, handling, and shipment of sanitary sewer pipes shall be in accordance with manufacturer's instructions and specifications.

2400.2.1 Polyvinyl Chloride (PVC) Pipes

1. Pipes shall be stored in the supplier's yard or on the project site in accordance with AWWA M23 and manufacturer's recommendations.

2. Pipe will not be stacked higher than four feet (4′) or on the bell ends.

3. Cover PVC pipe with an opaque material to protect it from the sun's ultraviolet radiation. PVC pipe that has been subjected to excessive ultraviolet radiation is identified by color fading or chalking and shall not be used. The determination as to the acceptability of the pipe rests solely on the ENGINEER's decision.

4. Pipe that has been contaminated in any way with petroleum products on the inside or outside of the pipe shall not be used.

2400.2.2 Lateral Inlet

1. Nyloplast 2808AG Drain as manufactured by Advanced Drainage Systems, Inc., or Approved Equal.

2. Inlet shall be installed with standard light duty open grate, NyloPlast 0899 CGSF, or Approved Equal. Inlet grate shall be locking type, and shall include a "No Dumping, Drains to Waterway" grate marker.

2400.3 Construction

2400.3.1 Excavation

2400.3.1.1 General

1. Unless otherwise specified in the Contract or the ENGINEER allows, perform sewer construction in open trenches and in a manner that protects the pipelines or sewers from unusual stresses.

2. Excavate the trenches in reasonably close conformity with the Plans and as the ENGINEER laid out in the field. Begin each trench excavation at the proposed sewer outlet and proceed to the upper end.

3. Keep trenches dewatered at all times.

4. If the Contract specifies or the ENGINEER allows, the CONTRACTOR may construct sewer laterals by tunneling or jacking instead of open trenches. Adhere to the Construction Details, Construction Specifications, and ENGINEER's decision.

5. Understand the proposed elevations for the storm sewers as shown on the Plans are subject to revisions in order to fit field conditions; therefore, the ENGINEER may have to adjust the profile grades from those the Plans show.

2400.3.1.2 Rock Excavation for Storm Sewer Laterals

1. Classify rock excavation for storm sewer laterals as specified for Rock Excavation in **Section 2750** of these Specifications, except classify the necessary removal of all rock boulders with a volume of one-half (½) cubic yard or more, as Rock Excavation.

2400.3.2 Constructing Foundation

1. Construct the foundation in the trench to prevent subsequent settlement and rupture of the sewer pipe.

2. The CONTRACTOR may not lay the pipe in rock, wet conditions, or on a firm earth subgrade.

3. The CONTRACTOR shall lay the pipe on a backfilled granular foundation or bed. When placing the pipe on backfilled granular foundation, excavate the trench to at least six inches (6″) below the elevation established for the bottom of the pipe. Backfill this depth with **"¾-inch clear stone"** meeting the requirements for No. 1 stone in **Section 501.2.5.4** of the STATE SPECIFICATIONS. Compact the material before laying the pipe on the backfilled granular material.

4. After laying the pipe, bedding material shall be placed around the sides of the pipe, except reinforced concrete pipe, up to a level six inches (6″) above the top of the pipe. This material shall be placed by hand or equally careful means. When reinforced concrete pipe is installed, the bedding stone shall extend to the spring line of the pipe.

5. Excavate recesses to receive bells as necessary.

6. If the Contract details types of bedding, or required trench widths other than described above, conform to the Construction Details.

2400.3.3 Laying Storm Sewer Lateral

1. Begin pipe-laying in finished trenches at the lowest point and proceed towards the upper end. Also lay the pipe so the spigot or tongue ends point in the direction of flow. Each pipe shall be laid in a straight grade, and unless otherwise specified, at right angles to the storm sewer main.

2. Clean sockets carefully before lowering pipes into trenches. Lower and place to avoid unnecessary handling in the trench or damage to the pipe. Provide a firm bearing beneath the entire length of each section and make it substantially true to the line and grade required.

3. Lay all pipes with ends abutting. Take care when shoving the pipes together so the joints are properly adjusted and not overly large. Fit pipes so they form a sewer with a smooth and uniform invert.

4. Storm sewer laterals will be laid at a minimum slope of one-quarter inch (¼″) per foot, unless otherwise approved by the ENGINEER.

5. Storm sewer lateral connections to new PVC main line sewers shall be by factory wye, factory tee, Insert-A-Tee, Kor-N-Tee, or EZ Tee connections. No saddle connections will be allowed.

6. Storm sewer lateral connections to new reinforced concrete main line sewers shall utilize Kor-N-Seal connections.

7. No storm sewer laterals shall discharge directly into a manhole unless approved by the ENGINEER.

8. The minimum size of storm laterals shall be six inches (6″) in diameter.

9. The storm lateral should have a minimum depth of three feet (3′) (four feet (4′) is preferred) at property line or right-of-way. If the storm main is not sufficiently deep enough to give this depth, then the lateral shall be laid to a minimum grade of one-eighth inch (1/8″) per foot.

10. When the storm main is deeper than normal, the CONTRACTOR may choose to install the lateral on a slant off the main in lieu of installing a standard riser section. The lateral must be laid on undisturbed soil with base in place, if this method is chosen. If the CONTRACTOR chooses to not construct a riser, no extra monies will be paid for slanting the lateral up to normal levels.

2400.3.4 Laying of Pipes in Cold Weather

1. The ENGINEER reserves the right to order pipe-laying discontinued whenever, in their opinion, there is a danger of the quality of work being impaired because of cold weather.

2. The CONTRACTOR shall be responsible for heating the pipe and jointing material so as to prevent freezing of joints.

3. No pipe shall be laid on or in frozen ground.

2400.3.5 Joints

1. For Polyvinyl Chloride Sewer Pipe, the CONTRACTOR shall use solvent cemented joints, the bell and spigot ends of the pipe shall be cleaned and dried prior to the application of the solvent cement with a cloth moistened with methyl-ethyl-ketone. Using a brush, the solvent cement is liberally applied to the spigot a distance equal to the joint depth and lightly applied to the inside of the bell. Immediately thereafter, the joint shall be made by inserting the spigot into the bell and pushing it home as far as possible. The pipe then shall be rotated thirty degrees (30°) to ninety degrees (90°) to distribute the cement.

2. As with any solvent-cemented joints, the pipe must be cut square and cleaned. A circular blade with twenty (20) or less teeth is preferred over a finer blade that tends to heat the PVC material as it cuts, resulting in a molten PVC residue producing a rough cut.

3. After the pipe is cut to length, the outside and inside edges are to be deburred. This can be easily achieved by scraping these edges with a sharp-edged piece of steel (i.e. file). This is a relatively easy step and only takes a few moments, but it is a critical step.

4. Align the pipe and fittings as close to its final position as possible. Elevate both the pipe and fittings so the entire circumference is accessible.

5. Mechanical devices, such as come-alongs, are strongly recommended to pull the pipe into the fitting socket. The use of chains to "grasp" the pipe is an option, but they may also slip. Sufficient cable or chain, enough to run the entire length of the twenty feet (20') of pipe must be laid out on either side of the joint, prior to assembly. Additional cable must be laid out to secure it to four inch (4") x four inch (4") block, extending approximately one foot (1') beyond the pipe on side. Cumbersome as it might appear, this method offers a more positive pull than other methods.

2400.3.6 Backfilling

1. Backfill all storm sewer laterals as described in **Section 100.61** of these Specifications.

2400.3.7 Cleaning of Storm Sewer Laterals

1. Clean all new or re-laid sewers of accumulations of silt, debris, and other foreign matter, and before acceptance, test all installations with the testing procedures described in **Section 2700** of these Specifications.

2400.3.8 Sewer Factory Wyes/Tees

1. Factory wyes or injection molded wyes, where available, shall be required on all storm sewer lateral tap connections to PVC sewer mains less than fifteen inches (15") in diameter. Wyes shall point downstream and enter the main at an angle of not less than five degrees (5°) and no more than forty-five degrees (45°) off vertical.

2. For sewer depth greater than fifteen feet (15') in depth, a factory tee or injection molded tee, where available, must be used. A bell-to-bell connection shall be used for the SDR 35 to Schedule 40 adaptor.

3. When factory rubber gaskets are used, the outside of the gasket and the inside of the bell or groove shall be lubricated with an approved lubricant. The spigot or tongue of the pipe being laid shall be introduced into the bell or groove of the factory wye or tee.

4. For sewers fifteen inches (15") or greater in diameter, the CONTRACTOR has the option to use either an Insert-A-Tee, Kor-N-Tee, or EZ Tee in lieu of factory wyes/tees.

2400.3.9 Gasketed Insert-A-Tee and Insert-A-Wye Fittings

1. For storm sewer mains fifteen inches (15") or greater in diameter, the CONTRACTOR has the option to use either Insert-A-Tee, EZ Tee, Kor-N-Tee or Insert-A-Wye in lieu of factory wyes or tees. All gasketed wye and tee fittings shall be manufactured and supplied per **ASTM D-3034** and consist of molded and fabricated fittings to meet **ASTM F-1336**. All fitting gaskets shall be an elastomeric seal and meet **ASTM D-3212** and **ASTM F-477** for flexible elastomeric seal joint connections and joining plastic pipe.

2. The CONTRACTOR shall core the proper size into the sewer main.

3. The CONTRACTOR shall insert the rubber sleeve into the cored hole to the gold vertical line on the rubber sleeve facing to the side of the main line sewer. The upper segment should be on top of the wall and the lower segment should be on the inside of the pipe.

4. Apply the Insert-A-Tee solution to the inside of the rubber sleeve and the outside of the PVC hub adaptor. Caution, using pipe lubricant may cause the hub adaptor to pop out.

5. Place the PVC hub adaptor into the rubber sleeve. Make sure the red vertical line on the PVC hub adaptor is in line with the gold vertical line on the rubber sleeve.

6. Place a 2" x 4" board on top of the PVC hub adaptor.

7. The red horizontal line at the top of the hub adaptor is a depth mark. Using a board and hammer, drive the PVC hub adaptor into the rubber sleeve to where the red horizontal line on the PVC hub adaptor meets the top of the rubber sleeve.

8. Place the stainless steel band around the top of the rubber sleeve and tighten down.

9. Install side service lateral pipe in normal manner.

10. The CONTRACTOR has the option to use an EZ-Tee lateral connection in lieu of the ADS Insert-a-Tee brand. CONTRACTOR shall follow these Specifications and manufacturer's installation procedure for an EZ Tee lateral connection.

2400.3.10 Kor-N-Tees

1. The CONTRACTOR shall core into the sewer main line consistent with the model number of the lateral pipe outside diameter.

2. Inspect the inside surface of the cored hole. If there is porosity or wire to cement separation, use patching or hydraulic cement to smooth the surface.

3. Insert the Kor-N-Tee assembly into the sewer main and expand the wedge or Toggle Korband.

4. Inset the lateral until it bottoms on the positive stop of the Kor-N-Tee.

5. Install the lateral pipe clamp and tighten to sixty (60) pounds using T-Handle Torque wrench.

2400.3.11 Storm Sewer Marker Balls

1. Effective December 31, 2006, **ACT 425**, **Chapter 182.0715(2r)** of the Wisconsin State Statutes requires all non-metallic building sewers (including sanitary laterals, private sanitary sewers, and storm laterals), installed within the City right-of-way, shall be accompanied by means of locating the newly-installed underground pipe. Sewer mains that have a manhole or inlet structure on both ends within the City right-of-way are considered exempt from this legislation.

2. The City of Oshkosh's marker system includes the installation of marker balls over the storm facilities.

3. The **3M ScotchMark Electronic Marker System Full Range Marker (Model 1408-XR for general purpose)** shall be considered an acceptable marker device for this Specification. If an alternate marker is selected, the CONTRACTOR shall provide specifications and data sheets of the selected device to the ENGINEER prior to construction in order for the CITY to confirm that the proposed marker device is compatible with the CITY's marking equipment.

4. Each storm lateral shall have a minimum of two (2) marker balls: one (1) to be located above the connection to the main line sewer and one (1) to be located at or near the property line or at the end of the proposed relay/new installation. Additional marker balls shall be required at all horizontal and vertical alignment changes.

5. The marker balls must be installed at a **maximum** of a five-foot (5') depth in order for the locator to locate the marker ball.

6. The CONTRACTOR shall securely fasten the marker ball to a CONTRACTOR-supplied No. 4 rebar, set plumb over the desired location at the required depth below the finished grade (see **Standard Detail Drawing**).

7. Upon completion, the CITY will test each sanitary marker ball to confirm it was installed and functioning properly. If it is determined the lateral marker ball has not been installed or is not functioning, the CONTRACTOR will be responsible for the re-installation of a new marker ball. No additional compensation will be provided for the additional marker balls or labor to install the marker balls at the same location.

2400.3.12 Storm Sewer Clay Dams

1. After installation of the storm sewer lateral pipe, a clay dam will be installed at each lateral (see **Standard Detailed Drawing**).

2. The clay dam shall be placed in the terrace area, and be excavated to a depth of one foot (1') below the bottom of the lateral.

3. The CONTRACTOR shall place no stone in the trench in this area, and shall backfill and compact the entire trench with clay to a depth of one foot (1') below finished grade.

4. The clay shall extend the entire width of the trench and be a minimum length along the trench of four feet (4').

5. The CONTRACTOR cannot substitute other materials, unless approved by the ENGINEER.

2400.3.13 Slurry Backfill in Lateral Trenches

1. In areas where the *Construction Access Agreement* has not been signed and returned, the ENGINEER will order the CONTRACTOR to use an aggregate slurry backfill for the lateral trenches at the connection.

2. The unit price for this Bid Item shall include all necessary labor, equipment, and materials to slurry the lateral trench.

3. This Bid Item will be measured by the cubic yard for the trench backfill material that is installed.

4. The quantity in the estimate of quantities is only an estimate. The CONTRACTOR will be paid based on the actual, installed quantities **only** and no adjustments in unit prices will be made for any increases or decreases of quantity installed.

2400.3.14 Tunnel Underneath Retaining Walls for Laterals

1. In areas where the CONTRACTOR is required by the ENGINEER to install a utility lateral to the property underneath an existing retaining wall, the CONTRACTOR shall carefully excavate on each side of the retaining wall in order to avoid damage to the existing retaining wall and push the lateral pipe through the excavated opening. CONTRACTOR then shall slurry the trench with an aggregate slurry backfill. The cost of the slurry will be included in the unit price of the Tunnel Underneath Existing Retaining Walls (Storm Laterals) Bid Item.

2400.3.15 Storm Lateral Inlet Adjustments

1. In areas where the CONTRACTOR is required by the ENGINEER to adjust the lateral inlet post construction, the CONTRACTOR shall carefully excavate and raise or lower the top of the lateral inlet to the specified elevation.

2400.4 Measurement

2400.4.1 Storm Sewer Laterals

1. The CITY will measure the Storm Sewer Lateral Pipe Bid Items by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the pipe, from sewer main to the end of the lateral installed. All additional piping and fittings required for riser sections will also be paid for by the linear foot and incorporated into the final length of the storm sewer laterals.

2. Connections of the storm sewer lateral to new storm sewer main will be considered incidental to installation of the storm sewer lateral.

3. Connections of the storm sewer lateral to existing storm sewer main shall be in accordance with **Section 2850** of these Specifications.

4. Connections of the new storm sewer lateral to an existing storm sewer lateral shall be in accordance with **Section 2850** of these Specifications.

2400.4.2 Storm Sewer Marker Balls

1. The CITY will measure the Storm Sewer Marker Ball Bid Items as each individual unit that is acceptably completed.

2400.4.3 Storm Sewer Clay Dams

1. The CITY will measure the Storm Sewer Clay Dam Bid Item as each individual unit that is acceptably completed.

2400.4.4 Storm Sewer Lateral Inlets

1. The CITY will measure the Storm Sewer Lateral Inlet Bid Item as each individual unit that is acceptably completed.

2400.4.5 Tunnel Underneath Retaining Walls (Storm Laterals)

1. The CITY will measure the Tunnel Underneath Existing Retaining Wall Bid Item as each tunnel that is acceptably completed.

2400.4.6 Storm Lateral Inlet Adjustments

1. The CITY will measure the Storm Lateral Adjustments Bid Item as each adjustment that is acceptably completed.

2. The intent of this Bid Item is for after landscaping has been completed and if there are lateral inlets that need to be adjusted because of a change in grade.

2400.4.7 Perforated Drain Tile

1. The CITY will measure the Perforated Drain Tile Bid Item by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the pipe, from structure to structure.

2. Connections of the perforated drain tile to new storm sewer structures or cleanouts will be considered incidental to the installation of the perforated drain tile.

3. Connections of the perforated drain tile to a storm sewer structure or cleanout shall be in accordance with **Section 2850** of these Specifications.

2400.4.8 Cleanouts

1. The CITY will measure the Cleanouts Bid Item as each individual unit that is acceptably completed.

2. Connections of the cleanout to a new or existing storm sewer pipe or lateral shall be in accordance with **Section 2850** of these Specifications.

2400.5 Payment

1. The CITY will pay for the measured quantities at the contract unit price for the following Bid Items:

Bid Item	Description	Units
	STORM SEWER LATERALS	
2400	Furnish and Install 6" Storm Sewer Lateral	LF
2402	Furnish and Install 8" Storm Sewer Lateral	LF
2404	Furnish and Install Storm Sewer Marker Balls	EA
2406	Furnish and Install Storm Sewer Clay Dams	EA
2408	Furnish and Install Storm Sewer Lateral Inlet	EA
2410	Tunnel Underneath Existing Retaining Walls (Storm Laterals)	EA
2412	Slurry Backfill (Storm Services)	CY
2414	Storm Lateral Inlet Adjustments	EA
2416	Perforated Drain Tile	LF
2418	Cleanouts	EA

2400.5.1 Storm Sewer Factory Wyes/Tees, Insert-A-Tees, Insert-A-Wye, or Kor-N-Tees

1. Payment for Storm Sewer Factory Wyes/Tee, Insert-A-Tees, EZ Tees, or Kor-N-Tee Bid Items for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for by-pass pumping; for forming foundation; for sealing joints; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work is considered incidental to the Storm Sewer Lateral Bid Item. Rock Excavation, Connections to Existing Storm Sewer Mains, and Coring into Existing Manholes or Inlets will be paid for under separate Bid Items.

2400.5.2 Storm Sewer Laterals

1. Payment for Storm Sewer Lateral Bid Items is full compensation for providing all necessary labor, equipment, and materials (including all necessary bends and fittings); for excavating; for sheeting and shoring; for by-pass pumping; for forming foundation; for connecting to new storm sewer mains; for laying pipe; for sealing joints; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation, Connections to Existing Storm Sewer Mains, and Coring into Existing Manholes or Inlets will be paid for under separate Bid Items.

2. Apply Contract unit prices, without adjustment, to the quantities of storm sewer lateral pipes constructed at elevations not greater than one foot (1') above or below what the Plans show. If the ENGINEER orders the construction of the storm sewer lateral pipes or portions of the pipes at elevations greater than one foot (1') above or below what the Plans show, then the CITY will pay for this work as specified extra work.

3. Work performed one foot (1') or less below the pipe bottom to form a satisfactory foundation, as specified, is incidental to the work. The CITY will pay for work required at depths greater than one foot (1') below the pipe bottom as extra work.

2400.5.3 Storm Sewer Marker Balls

1. Payment for Storm Sewer Marker Balls Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring, for providing No. 4 Re-bar; for placing marker balls; for testing of marker balls for functionality; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation, Storm Sewer Laterals, Connections to Existing Sewer Mains, and Coring into Existing Manholes or Inlets will be paid for under separate Bid Items.

2. Upon installation and backfilling, the CONTRACTOR will test each storm sewer marker ball to confirm that it is installed and functioning properly. If it is determined the storm sewer marker ball has not been installed or is not functioning properly, the CONTRACTOR will replace said non-functioning marker ball with a new marker ball. No additional compensation will be provided for the additional balls required for non-functioning marker balls.

2400.5.4 Storm Sewer Clay Dams

1. Payment for the Storm Sewer Clay Dam Bid Item is for full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for providing clay backfill material; for backfilling; for compacting; for removing sheeting and

shoring; and for cleaning out and restoring the site of the work. Rock Excavation, Storm Sewer Laterals, and Connections to Existing Sewer Mains will be paid for under separate Bid Items.

2400.5.5 Storm Sewer Lateral Inlet

1. Payment for the Storm Sewer Lateral Inlet Bid Item is for full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for providing the storm lateral inlet, grate, and grate marker; for backfilling; for compacting; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation, Storm Sewer Laterals, and Connections to Existing Sewer Mains will be paid for under separate Bid Items.

2. Upon removal of construction site erosion control measures, the CONTRACTOR will remove inlet protection from each storm sewer lateral inlet.

2400.5.6 Tunnel Underneath Retaining Walls (Storm Laterals)

1. Payment for the Tunnel Underneath Retaining Wall Bid Item is for full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for excavating and pushing the utility lateral underneath the existing retaining wall; and for cleaning out and restoring the site of the work.

2. The quantity in the estimate of quantities is only an estimate. The CONTRACTOR will be paid based on the actual, installed quantities **only** and no adjustments in unit prices will be made for any increases or decreases of quantity installed.

2400.5.7 Storm Lateral Inlet Adjustments

1. Payment for the Storm Lateral Inlet Adjustment Bid Item is for full compensation for providing all necessary labor, equipment, and materials; for mobilizing the site; for excavating; for adding topsoil as directed by the ENGINEER, for seeding, and for installing a soil-stabilizing material; and for cleaning up and restoring the site of the work.

2. The quantity in the estimate of quantities is only an estimate. The CONTRACTOR will be paid based on the actual, installed quantities **only** and no adjustments in unit prices will be made for any increases or decreases of quantity installed.

2400.5.8 Perforated Drain Tile

1. Payment for Perforated Drain Tile Bid Item is full compensation for providing all necessary labor, equipment, and materials (including all necessary bends and fittings); for excavating, sheeting, and shoring; for dewatering; for constructing foundation; for connecting to

structures or cleanouts; for laying six-inch (6″) or eight-inch (8″) diameter Schedule 40 PVC drain tile; for sealing joints; for providing granular backfill material; for backfilling; for compacting; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation and Coring into Existing Manholes or Inlets will be paid for under separate Bid Items.

2400.5.9 Cleanouts

1. Payment for Cleanout Bid Items is full compensation for providing all necessary labor, equipment, and materials to construct a six-inch (6″) or eight-inch (8″) PVC cleanout (including all necessary bends and fittings); for excavating, sheeting, and shoring; for dewatering; for constructing foundation; for completing any necessary connections to the existing or proposed storm lateral; for providing and installing a frost sleeve and cap; for backfilling; for compacting; for removing sheeting and shoring; and for cleaning out and cleaning of the site related to cleanout installation.

2. Upon installation and backfilling, the CONTRACTOR will ensure each frost sleeve cap is flush with the ground surface and fully exposed. If it is determined the cleanout has not been installed correctly and to grade, the CONTRACTOR will replace or adjust cleanout and/or frost sleeve to the correct elevation.

3. Cleanouts shall only be installed in grass or turf areas.

SECTION 2500
EROSION AND SEDIMENT CONTROL

2500.1 Description

1. This Section describes furnishing, installing, maintaining, and removing temporary erosion and sediment control devices and practices.

2500.1.1 Definitions

1. HDPE: High Density Polyethylene.

2. PAL: Product Acceptability List.

3. Stabilization:
   A. Vegetated areas: Uniform perennial vegetative cover established with a density of at least seventy percent (70%) cover.
   B. Impervious area: Impervious surface installed.

4. TS: Technical Standard.

5. WDNR: Wisconsin Department of Natural Resources.

6. WISDOT: Wisconsin Department of Transportation.

2500.2 Materials

2500.2.1 Inlet Protection

1. Materials for inlet protection shall comply with the WISDOT PAL, WDNR TS 1060, and **Section 645** of the STATE SPECIFICATIONS.

2. Type of inlet protection shall be as called out on the Plans.

3. Manufactured Type D inlet protection with styrofoam in place of the two inch (2″) x four inch (4″) board is acceptable.

2500.2.2 Stone Tracking Pad

1. Stone: Three inches (3″) – six inches (6″) Clear Stone in accordance with *WDNR TS 1057*.

2. Filter Fabric: Type HR in accordance with **Section 645** of STATE SPECIFICATIONS.

2500.2.3 Silt Fence

1. Materials for silt fence shall comply with *WDNR TS 1056*.

2500.2.4 Stone Bag

1. HDPE Bag:
   A. Thirty inches (30″) in length.
   B. Eighteen inches (18″) in diameter.
   C. HDPE draw string knitted directly into bag.
   D. Eighty percent (80%) Fabric Closure with apparent opening no larger than 1/8″ x 1/8″.
   E. Rolled seam with minimum 480 Denier Polyester Sewing Yarn.

2. Stone:
   A. **AASHTO M43**, Size 67.

2500.2.5 Sediment Logs

1. Curlex Sediment Log by American Excelsior.

2. AEC Premier Wattle by American Excelsior.

3. Aspen Xcel Excelsior Log by Western Excelsior.

4. Nominal diameter as shown in Plans.

2500.2.6 Ditch Check

1. Stone Bag Ditch Check: Comply with **Section 2500.2.4** of these Specifications.

2. Sediment Log Ditch Check: Comply with **Section 2500.2.5** of these Specifications.
   A. Provide nominal twenty-inch (20″) diameter Sediment Log.

2500.2.7 Dewatering Tank System

1. Provide dewatering tank system as shown in standard Detail Drawings.

2. Provide polymer flocculent log at the inlet to the dewatering tank system. Polymer flocculent shall meet the requirements of *WDNR TS 1051*.

3. Provide Excelsior bales (not straw bales) as filtering media.

2500.2.8 Turbidity Barrier

1. Materials for turbidity barrier shall comply with *WDNR TS 1069*.

2500.3 Construction

2500.3.1 Installation

2500.3.1.1 Inlet Protection

1. Inlet protection devices shall be installed in all existing inlets prior to commencing construction in an area.

2. **NEW** inlet protection devices shall be installed in all new inlets as they are constructed.

3. Filter fabric shall extend a minimum of ten inches (10″) around the perimeter of the inlet grate for all inlet protections, **EXCEPT** Type D Modified. Type D Modified shall have three inches (3″) of filter fabric extending around the perimeter.

4. Type C, D, and D Modified inlet protection devices shall a minimum of eighteen inches (18″) of fabric wrapped and stapled to two inch (2″) x four inch (4″) board, which is sized to have a minimum of four inches (4″) of board extending on each side of the curb inlet opening.

2500.3.1.2 Stone Tracking Pad

1. Stone tracking pads shall be constructed at all vehicle egress points from the construction area prior to work commencing in that area.

2. Excavate adequate depth to properly install stone tracking pad.

3. Install layer of filter fabric on subgrade prior to installing stone.

4. Tracking pad shall be a minimum of twelve inches (12″) in thickness.

5. Tracking pad shall be the full width of the egress point, with a desired minimum width of twelve feet (12′).

6. Tracking pad length shall be a minimum of fifty feet (50′).

7. Surface flow shall **NOT** be allowed to flow through the tracking pad. Flows shall be diverted around the tracking pad.

2500.3.1.3 Silt Fence

1. Silt fence shall be installed with a minimum of eight inches (8″) trenched into the ground.

2. Soil shall be backfilled over the trenched-in portion of the silt fence and compacted.

3. Support Posts:
   A. Wooden:
      1. Minimum size of 1-1/8″ x 1-1/8″ made of air or kiln-dried hickory or oak.
      2. Fabric shall be stapled with a minimum one-half inch (½″) staple located on the upslope side of the post.
      3. Posts shall be a minimum of three feet (3′) in length for a twenty-four (24″) high fence and four feet (4′) for a thirty-six (36″) high fence.
   B. Steel:
      1. Full height of the fence shall be supported by steel posts of at least five feet (5′) in length.
      2. Fabric shall be attached to the post in at least three (3) locations per post with fifty (50) pound plastic tie straps or wire fasteners.
   C. Posts spacing shall not exceed three feet (3′) for non-woven silt fence fabric and eight feet (8′) for woven silt fence fabric.

2500.3.1.4 Stone Bag

1. Bags shall be filled with stone aggregate such that the bag is full enough to properly tie the bag shut.

2. Stone bags installed on disturbed ground shall be trenched into the ground two inches (2″).

3. Stone bags installed on vegetated ground or pavement does not require trenching.

2500.3.1.5 Sediment Logs

1. Sediment logs shall be installed with wooden stakes (minimum size of 1-1/8″ x 1-1/8″) driven through the sediment logs at approximately a thirty-degree (30°) angle from vertical with the top of the stake pointing towards the direction of the flow.

2. Sediment logs installed on disturbed ground shall be trenched into the ground two inches (2″).

3. Sediment logs installed on vegetated ground do not require trenching.

4. Stakes shall be installed at each end of the log and every ten feet (10′) along the sediment log.

5. Stakes shall be driven a minimum of twenty-four inches (24″) into the ground and shall extend a minimum of twelve inches (12″) above the sediment log.

2500.3.1.6 Ditch Check

1. Ditch checks shall be installed utilizing either stone bags or nominal twenty-inch (20″) diameter sediment logs.

2. Ditch checks installed on disturbed ground shall be trenched into the ground two inches (2″).

3. Ditch checks installed on vegetated ground do not require trenching.

4. Ditch checks shall be installed such that one (1) ditch check is installed for each eighteen inches (18″) of elevation drop in the channel.

5. Ditch checks shall be installed such that the center of the ditch check is lower than the outside edge to prevent water from bypassing the ditch check around the outside.

6. Sediment log ditch checks shall be installed with wooden stakes (minimum size of 1-1/8″ x 1-1/8″) driven through the sediment logs at approximately a thirty-degree (30°) angle from vertical with the top of the stake pointing towards the direction of the flow. Stakes shall be installed at the top of each log, and in the bottom of the channel, and every ten feet (10′) along the sediment log. Stakes shall be driven a minimum of twenty-four inches (24″) into the ground and shall extend a minimum of twelve inches (12″) above the sediment log.

2500.3.1.7 Dewatering Tank System

1. The dewatering tank system shall be constructed in accordance with the standard Detail Drawing.

2. Dewatering tank system shall be placed such that pump discharge hoses can easily be placed into the system, and such that the tank outlet does not discharge onto grade where it can pick up and transport sediment from the site.

2500.3.1.8 Turbidity Barrier

1. Turbidity barriers shall be installed in accordance with *WDNR TS 1069*.

2500.3.2 Maintenance

2500.3.2.1 Inlet Protection

1. Inlet protection devices shall have sediment deposits removed and the device restored to its original dimensions when the sediment has accumulated to approximately one-third (1/3) to one-half (½) of the design depth of the device, or when the device is no longer functioning as designed.

2. Removal of sediment is to be included in the maintenance of all inlet protection, **EXCEPT** Type D Modified. Sediment Removal for Type D Modified Inlet Protection shall be paid as a separate Bid Item.

3. Care must be taken when removing the sediment to ensure that sediment is not allowed to fall into the inlet. Any material that does fall into the inlet shall be removed immediately.

2500.3.2.2 Stone Tracking Pad

1. Stone tracking pads shall be maintained by removing the sediment-laden top and replacing with additional stone to maintain the minimum required depth, or by applying additional stone.

2500.3.2.3 Silt Fence

1. Silt fence shall be replaced when sections of the fence become damaged, decomposed, or when runoff begins to undercut the silt fence.

2. Sediment shall be removed from behind the silt fence when the accumulated sediment reaches approximately one-third (1/3) to one-half (½) the height of the silt fence.

2500.3.2.4 Stone Bag

1. Stone bags shall be replaced at such time as the bag material has degraded to a point that the bag is no longer sound.

2. Sediment shall be removed from behind the stone bags when the accumulated sediment reaches approximately one-third (1/3) to one-half (½) the height of the stone bags.

2500.3.2.5 Sediment Logs

1. Sediment log sections shall be replaced at such time as the sediment logs become damaged, decomposed, or when runoff begins to undercut the sediment logs.

2. Sediment shall be removed from behind the sediment logs when the accumulated sediment reaches approximately one-third (1/3) to one-half (½) the height of the sediment log.

2500.3.2.6 Ditch Check

1. Stone bag ditch checks shall be maintained in accordance with **Section 2500.3.2.4** of these Specifications.

2. Sediment log ditch checks shall be maintained in accordance with **Section 2500.3.2.5** of these Specifications.

2500.3.2.7 Dewatering Tank System

1. The polymer flocculent log shall be replaced when the flocculent has been fully used up.

2. The Excelsior bales shall be replaced when the bales become clogged with sediment.

2500.3.2.8 Turbidity Barrier

1. Turbidity barriers shall be replaced should they become damaged and no longer effective isolate the waterbody from the work area.

2500.3.3 Removal

2500.3.3.1 Inlet Protection

1. Inlet protection devices shall be removed once the contributing area has been stabilized or as directed by the ENGINEER in the field.

2. Inlet protection devices shall be removed prior to snow fall in autumn to facilitate proper snow removal for the winter months. Areas that are not adequately stabilized shall have inlet protection devices installed in the spring until stabilization has been completed.

2500.3.3.2 Stone Tracking Pad

1. Stone tracking pads shall be removed when the construction entrance is no longer needed. Partial removal of the stone tracking pad is not allowed.

2500.3.3.3 Silt Fence

1. Silt fence shall be removed when the contributing area has been stabilized, or as directed in the field by the ENGINEER.

2. Silt fence may be removed to facilitate the installation and final seeding, provided that the areas to be seeded are immediately seeded and fertilized in accordance with the Plans and Specifications, and the area is covered with an erosion control mat.

2500.3.3.4 Stone Bag

1. Stone bags shall be removed once the contributing area has been stabilized, or, in the case of stone bags that are used to protect existing structures, when the existing structure has been removed from service, or as directed in the field by the ENGINEER.

2500.3.3.5 Sediment Logs

1. Sediment logs shall be removed once the contributing area has been stabilized, or, in the case of sediment logs that are used to protect existing structures, when the existing structure has been removed from service, or as directed in the field by the ENGINEER.

2500.3.3.6 Ditch Check

1. Ditch checks shall be removed once the contributing area has been stabilized, or as directed by the ENGINEER in the field.

2500.3.3.7 Dewatering Tank System

1. Remove dewatering tank system from site when pumping activities have been completed.

2500.3.3.8 Turbidity Barrier

1. Turbidity barriers shall **NOT** be removed until the water behind the barrier has equal or greater clarity than the water within the waterway or waterbody.

2. Care shall be taken during removal to avoid or minimize the re-suspension of accumulated sediment.

3. Turbidity barrier shall **NOT** be re-used on any other site. Buoys and chains may be re-used on other sites in the future, but **MUST** be disinfected with vinegar or cleaned with water with a temperature in excess of 104°F.

2500.4 Measurement

1. The replacement of any erosion and sediment control device due to damage, decomposition, or the device otherwise reaching the end of its useful life shall be considered maintenance, and will not be measured as an additional installation.

2500.4.1 Inlet Protection

1. The CITY will measure the Inlet Protection Bid Items on per each basis that is acceptably completed.

2. New inlets require the installation of a new inlet protection. The CITY will mark each inlet protection device and old devices that are installed in new inlets will not be counted as acceptably completed.

2500.4.2 Sediment Removal – Type D Modified Inlet Protection

1. The CITY will measure the Sediment Removal – Type D Inlet Protection Bid Items on per each basis that is acceptably completed, upon an order for the sediment removed from the device. Measurement will only be made based upon Type D Modified inlet protection devices ordered to have sediment removed.

2500.4.3 Stone Tracking Pad

1. The CITY will measure the Stone Tracking Pad Bid Item on per each basis that is acceptably completed.

2500.4.4 Silt Fence

1. The CITY will measure the Silt Fence Bid Item on a linear foot basis that is acceptably completed.

2500.4.5 Stone Bag

1. The CITY will measure the Stone Bag Bid Item on per each basis that is acceptably completed.

2500.4.6 Sediment Logs

1. The CITY will measure the Sediment Logs Bid Items on a linear foot basis that is acceptably completed.

2500.4.7 Ditch Check

1. The CITY will measure the Ditch Check Bid Item on per each basis that is acceptably completed.

2500.4.8 Dewatering Tank System

1. The CITY will measure the Dewatering Tank System Bid Item on per each basis that is acceptably completed.

2500.4.9 Turbidity Barrier

1. The CITY will measure the Turbidity Barrier Bid Item on per each basis that is acceptably completed.

2500.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
	EROSION AND SEDIMENT CONTROL	
2500	Furnish, Install, Maintain, and Remove Type A Inlet Protection	EA
2502	Furnish, Install, Maintain, and Remove Type B Inlet Protection	EA
2504	Furnish, Install, Maintain, and Remove Type C Inlet Protection	EA
2506	Furnish, Install, Maintain, and Remove Type D Inlet Protection	EA
2508	Furnish, Install, Maintain, and Remove Type D Modified Inlet Protection	EA
2510	Sediment Removal – Type D Modified Inlet Protection	EA
2512	Furnish, Install, Maintain, and Remove Stone Tracking Pad	EA
2514	Furnish, Install, Maintain, and Remove Silt Fence	LF
2516	Furnish, Install, Maintain, and Remove Stone Bag	EA
2518	Furnish, Install, Maintain, and Remove 12" Diameter Sediment Logs	LF
2520	Furnish, Install, Maintain, and Remove 20" Diameter Sediment Logs	LF
2522	Furnish, Install, Maintain, and Remove Ditch Check	EA
2524	Furnish, Install, Maintain, and Remove Dewatering Tank System	EA
2526	Furnish, Install, Maintain, and Remove Turbidity Barrier	EA

2500.5.1 Inlet Protection

1. Payment for Inlet Protection Bid Items is full compensation for providing all necessary labor and equipment for furnishing, transporting, and installing all materials; and for maintaining and removing the inlet protection devices.

2500.5.2 Sediment Removal – Type D Modified Inlet Protection

1. Payment for the Sediment Removal – Type D Inlet Protection Bid Item is full compensation for providing all necessary labor and equipment for removing the inlet protection device, for cleaning the accumulated sediment from the device, and for reinstalling the device.

2. If the CONTRACTOR fails to perform the sediment removal within the time frame identified within the order, a ten percent (10%) reduction of the Contract price for Bid Item #2860 will be assessed against the Contract per occurrence.

2500.5.3 Stone Tracking Pad

1. Payment for the Stone Tracking Pad Bid Item is full compensation for providing all necessary labor and equipment for furnishing, transporting, and installing all materials; and for maintaining and removing the stone tracking pads.

2500.5.4 Silt Fence

1. Payment for the Silt Fence Bid Item is full compensation for providing all necessary labor and equipment for furnishing, transporting, and installing all materials; and for maintaining and removing the silt fence.

2500.5.5 Stone Bag

1. Payment for the Stone Bag Bid Item is full compensation for providing all necessary labor and equipment for furnishing, transporting, and installing all materials; and for maintaining and removing the stone bags.

2500.5.6 Sediment Logs

1. Payment for Sediment Log Bid Items is full compensation for providing all necessary labor and equipment for furnishing, transporting, and installing all materials; and for maintaining and removing the sediment logs.

2500.5.7 Ditch Check

1. Payment for the Ditch Check Bid Item is full compensation for providing all necessary labor and equipment for furnishing, transporting, and installing all materials; and for maintaining and removing the ditch checks.

2500.5.8 Dewatering Tank System

1. Payment for the Dewatering Tank System Bid Item is full compensation for providing all necessary labor and equipment for furnishing, transporting, and installing all materials; and for maintaining and removing the tank dewatering systems.

2500.5.9 Turbidity Barrier

1. Payment for the Turbidity Barrier Bid Item is full compensation for providing all necessary labor and equipment for furnishing, transporting, and installing all materials; and for maintaining and removing the turbidity barriers.

SECTION 2600
SITE RESTORATION

2600.1 Description

1. This Section describes furnishing, installing, and maintaining permanent site restoration. This Section does **NOT** describe the restoration work required in the terraces within the right-of-way.

2600.1.1 Definitions

1. PAL: Product Acceptability List.

2. PLS: Pure Live Seed.

3. TS: Technical Standard.

4. USDA: United States Department of Agriculture.

5. WDNR: Wisconsin Department of Natural Resources.

6. WISDOT: Wisconsin Department of Transportation.

2600.2 Materials

2600.2.1 General

1. Tag or label each seed bag with the following information:
   A. Vendor's name.
   B. Type of seed contained within the bag.
   C. Percentage of purity and germination of seed contained within bag.
   D. Percentage of hard seed contained, if any.
   E. Percentage of weed seed contained, if any.
   F. Any other information required by State of Wisconsin law.

2600.2.2 Topsoil

1. Topsoil: Loam, sandy loam, silt loam, silty clay loam, or clay loam humus bearing soils adapted to sustain plant life with a minimum organic content of five percent (5%) and a pH between 6.0 and 7.0. Topsoil shall be pulverized and contain no clods larger than one inch (1") in diameter and be free of lumps, stones, sticks, or any other foreign material.

2. Salvaged Topsoil: Soil, meeting the above conditions, which was removed from within the project limits.

2600.2.3 Wetland Plugs

1. Nursery grown plant stock supplied in containers.

2. Root structure shall be developed sufficiently such that root mass maintains shape and holds together when removed from container. Root system shall be free from root rot.

3. Bare root plants are not acceptable.

4. Types of plants shall be as called out in the Plans and Specifications.

5. If called for in Plans and/or Specifications, Aquascaping fence:
   A. Fence material: Two foot (2') tall green "snow fence".
   B. Posts: 1-1/8" x 1-1/8" hardwood kiln or air dried, three feet (3') minimum length.

2600.2.4 Native Plant Seeding

1. Seed stock shall be wild ecotype indigenous to the upper Midwest and shall originate from within USDA Hardiness Zones 4 or 5.

2. Grasses shall be classified as "Agricultural Grasses" and shall be PLS to weights indicated in Plans and/or Specifications.

3. All seed shall be cold and dry stratified.

4. Legumes shall be inoculated with proper rhizobia immediately prior to planting (six (6) hours or less).

5. Seed mixture types shall be as called out in the Plans and Specifications.

2600.2.5 Turf Grass

1. Provide Seed Mixture 40 in accordance with **Section 630** of the STATE SPECIFICATIONS.

2. Unless otherwise noted in the Plans and/or Specifications, provide Type A fertilizer in accordance with **Section 629** of the STATE SPECIFICATIONS.

2600.2.6 No-Mow Fescue

1. Conform to the following Table:

Latin Name	Common Name	Percentage
	SR3100 Hard Fescue	40%
	Scaldis Hard Fescue	20%
Festuca Rubra	Dawson Red Fescue	25%
	Creeping Red Fescue	5%
	SR5100 Chewings Fescue	5%
Festuca Ovina	Sheep Fescue	5%

2. Or equal as approved by ENGINEER.

2600.2.7 Annual Cover Crop

1. Planting prior to August 15th: Annual Rye.

2. Planting after August 15th: Winter Wheat.

2600.2.8 Shredded Bark Mulch

1. Shredded bark mulch shall be finely-shredded bark mulch and shall be the product of a mechanical chipper, hammermill, or tub grinder.

2. The material shall be fibrous and uniformly dark brown in color; free of large wood chunks; and shall be substantially free of mold, dirt, sawdust, and foreign material. No portion of the material shall be in an advanced state of decomposition. The material shall contain no bark mulch of the black walnut tree.

3. The material shall not contain chipped-up manufactured boards or chemically-treated wood, including, but not limited to, wafer board, particle board, and chromated copper arsenate or penta-treated wood.

4. The material, when air dried, shall all pass a four-inch (4") screen and no more than twenty percent (20%) by mass of the material shall pass a 0.10" sieve. Unattached bark or greenleaf composition, either singly or combined, shall not exceed twenty percent (20%) each by mass. The maximum length of individual pieces shall not exceed four inches (4").

2600.2.9 Trees

1. Furnish trees in accordance with **Section 632** of the STATE SPECIFICATIONS.

2. Trees shall be a minimum of three inches (3″) in diameter at a point four feet (4′) above the ground.

3. "Park Grade" trees shall not be allowed.

4. Tree species shall be as noted in the Plans and/or Specifications. No substitutions shall be allowed, without prior approval from the ENGINEER.

5. Mulch: Shredded Hardwood Mulch.

2600.2.10 Shrubs

1. Furnish container grown stock in accordance with **Section 632** of the STATE SPECIFICATIONS.

2. Unless otherwise noted in the Plans and/or Specifications, plants shall be a minimum two (2) gallon container size.

3. Shrub species shall be as noted in the Plans and/or Specifications. No substitutions shall be allowed without prior approval from the ENGINEER.

2600.2.11 Erosion Control Mat

1. Materials for erosion control mat shall comply with the WISDOT PAL.

2. Classes and types of erosion control mat shall be as indicated in the Plans and/or Specifications.

3. Anchoring devices for urban mat shall be approved Urban Anchoring Devices in accordance with the WISDOT PAL.

4. Unless otherwise noted in the Plans and/or Specifications, the use of metal anchoring devices conforming to **Section 628** of the STATE SPECIFICATIONS is allowed in locations other than as noted in **Section 2600.2.10.3** above.

2600.2.12 Turf Reinforcement Mat System

1. A turf reinforcement mat system includes the following materials:
   A. Turf Reinforcement Mat
      1. Materials shall comply with the WISDOT PAL.
      2. Type of mat shall be as indicated in the Plans and/or Specifications.
   B. Topsoil
      1. Comply with **Section 2600.2.2** of these Specifications.

C. Seed.
   1. Native Seed: Comply with **Section 2600.2.4** of these Specifications.
   2. No-Mow Fescue: Comply with **Section 2600.2.6** of these Specifications.
   3. Annual Cover Crop: Comply with **Section 2600.2.7** of these Specifications.
   4. Turf Grass: Comply with **Section 2600.2.5** of these Specifications.

D. Erosion Control Mat
   1. Comply with **Section 2600.2.10** of these Specifications.

E. Soil Stabilizer
   1. Type B soil stabilizer in accordance with **Section 628** of the STATE SPECIFICATIONS.

2600.2.13 Reinforced Grass Pavement System

1. Presto GeoBlock™ 5150 porous pavement system.

2. Presto GeoWeb© GW30V with a six-inch (6″) cell depth.

3. Or Approved Equal.

4. Provide base course mixture in accordance with manufacturer's recommendation.

5. Provide topsoil in accordance with **Section 2600.2.2** of these Specifications.

6. Provide seed in accordance with **Section 2600.2.4** through **Section 2600.2.7** of these Specifications.

2600.2.14 Reinforced Gravel Pavement System

1. Presto GeoPave™ porous pavement system.

2. Or Approved Equal.

3. Provide base course mixture in accordance with manufacturer's recommendation.

4. Provide Dense Graded Based Course (¾″ Gradation) in accordance with **Section 305** of the STATE SPECIFICATIONS.

2600.2.15 Hydraulically-Applied Erosion Control Products

1. Profile Hydro-Blanket BFM, Bonded Fiber Matrix.

2. Profile ProMatrix EFM, Engineered Fiber Matrix.

3. Or Approved Equal, which shall include a minimum of sixty percent (60%) wood, forty percent (40%) paper, and at least ten percent (10%) tackifier.

2600.2.16 Rip-Rap

1. Provide rip-rap in accordance with **Section 606** of the STATE SPECIFICATIONS.

2. Type of rip-rap shall be as noted in the Plans and/or Specifications.

3. Provide Type HR geotextile fabric in accordance with **Section 645** of the STATE SPECIFICATIONS.

2600.2.17 Permeable Articulating Concrete Block Materials

1. Permeable Articulating Concrete Block
   A. Closed cell blocks with an arched storage chamber.
   B. Structural performance: Capable of supporting **AASHTO H-25** and **HS-25** truck loading. The block design shall be analyzed as unreinforced concrete arches supporting a uniform truck tire load with impact per AASHTO standards. Design shall include considerations for subgrade soils, geosynthetic, and base preparation.
   C. Product:
      1. PaveDrain®
         PaveDrain, LLC
         Global Water Center
         247 West Freshwater Way, #520
         Milwaukee, WI 53204
         info@pavedrain.com
         Telephone No. (888)575-5339
         www.pavedrain.com
      2. ENGINEER-Approved Equal.

2. ¾" Angular Stone Base
   A. Clear angular stone that has been washed of fines.
   B. Compact in place per manufacturer's recommendation.

2600.3 Construction

2600.3.1 Topsoil

1. Prepare subgrade to finished grade minus the depth of topsoil specified for each area.

2. Scarify subgrade to a depth of one inch (1") prior to placement of topsoil.

3. Place topsoil to depth shown on Plans; grade, rake, and roll with a roller weighing not more than 100 lbs./lin. ft. and not less than 25 lbs./lin. ft.

4. Remove any rocks, clumps, or clods larger than one inch (1") in diameter.

5. CONTRACTOR shall provide sufficient raking to provide a well-graded appearance.

2600.3.2 Wetland Plugs

1. Do not install wetland plugs until water has reached normal levels.

2. If called for in Plans and/or Specifications, construct Aquascaping fence around inner perimeter.

3. Install wetland plugs in rows three feet (3') apart, staggering the plant plugs on three-foot (3') centers.

4. If called for in Plans and/or Specifications, construct Aquascaping fence around outer perimeter.

2600.3.3 Native Plant Seeding

1. Remove from site any seed which has become wet, moldy, or otherwise damaged and replace without extra cost to CITY.

2. Apply seed at rates as indicated in Plans and/or Specifications.

2600.3.4 Turf Grass

1. Unless otherwise noted in the Plans and/or Specifications, apply seed at rate of 200 lbs/acre.

2. Unless otherwise noted in the Plans and/or Specifications, apply fertilizer at rate of 300 lbs/acre.

2600.3.5 No-Mow Fescue

1. Unless otherwise noted in Plans and/or Specifications, apply at rate of 250 lbs/acre.

2600.3.6 Annual Cover Crop

1. Unless otherwise noted in Plans and/or Specifications, apply at rate of 75 lbs/acre.

2600.3.7 Shredded Bark Mulch

1. Prepare subgrade to finished grade minus the depth of topsoil and bark mulch specified for each area.

2. Backfill a minimum of eight inches (8″) of clean fill/topsoil material suitable for vegetative growth.

3. Install landscaping fabric and place shredded bark mulch to a depth of three to four inches (3″ – 4″) as to not damage plants already in place.

4. CONTRACTOR shall provide sufficient raking to provide a well-graded appearance.

2600.3.8 Trees

1. Excavate hole in accordance with **Section 632** of the STATE SPECIFICATIONS.

2. Install balled and burlapped trees by removing the ball wire, burlap, strings, etc. from the top half of the root ball, after positioning tree in hole, in accordance with **Section 632** of the STATE SPECIFICATIONS.

3. Backfill hole with mixture of six (6) parts topsoil to one (1) part compost in accordance with **Section 632** of the STATE SPECIFICATIONS.

4. Place three to four inches (3″-4″) of shredded hardwood mulch in a two-foot (2′) diameter ring around the tree after backfilling hole. Mulch shall not be piled against the tree.

5. Stake and guy tree, as directed by the City Forester, in accordance with **Section 632** of the STATE SPECIFICATIONS.

2600.3.9 Shrubs

1. Excavate hole in accordance with **Section 632** of the STATE SPECIFICATIONS.

2. Install container grown stock shrubs in accordance with **Section 632** of the STATE SPECIFICATIONS.

3. Backfill hole with mixture of six (6) parts topsoil to one (1) part compost in accordance with **Section 632** of the STATE SPECIFICATIONS.

4. Place three to four inches (3″-4″) of shredded hardwood mulch in a two-foot (2′) diameter ring around the shrub after backfilling hole. Mulch shall not be piled against the shrub.

2600.3.10 Erosion Control Mat

1. Install erosion control mat in accordance with manufacturer's requirements and **Section 628** of the STATE SPECIFICATIONS.

2. On slopes, trench a minimum of six inches (6″) of the upper edge of the mat into the ground and backfill trench.

3. Within five feet (5′) of active traffic lanes, either trench a minimum of three inches (3″) of mat into the ground, or provide anchors at a maximum spacing of twelve inches (12″).

4. All mat overlaps shall be a minimum of three inches (3″).

5. Erosion control mat is required on all disturbances greater than two feet (2′) in any direction.

2600.3.11 Turf Reinforcement Mat System

1. Turf Reinforcement Mat:
   A. Install turf reinforcement mat in accordance with manufacturer's requirements and **Section 628** of the STATE SPECIFICATIONS.
   B. On slopes, trench a minimum of six inches (6″) of the upper edge of the mat into the ground and backfill trench.
   C. Within five feet (5′) of active traffic lanes, either trench a minimum of three inches (3″) of mat into the ground, or provide anchors at a maximum spacing of twelve inches (12″).
   D. All mat overlaps shall be a minimum of six inches (6″).

2. Topsoil: Comply with **Section 2600.3.1** of these Specifications, except depth of topsoil shall be sufficient to fill all void spaces within the turf reinforcement mat plus one inch (1″) of depth above the mat.

3. Seed: Comply with **Section 2600.3.3** through **Section 2600.3.6** of these Specifications.

4. Erosion Control Mat: Comply with **Section 2600.3.9** of these Specifications.

5. Soil Stabilizer: Apply in accordance with **Section 628** of the STATE SPECIFICATIONS.

2600.3.12 Reinforced Grass Pavement System

1. Install base course in accordance with manufacturer's recommendations.

2. Install GeoBlock™ 5150 porous pavement system in accordance with manufacturer's recommendations.

3. Fill GeoBlock™ 5150 porous pavement system with topsoil to a depth of one inch (1″) above the top of the units.

4. Roll topsoil in accordance with **Section 2600.3.1** of these Specifications.

5. Install seed in accordance with **Section 2600.3.3** through **Section 2600.3.6** of these Specifications.

2600.3.13 Reinforced Gravel Pavement System

1. Install base course in accordance with manufacturer's recommendations.

2. Install GeoPave™ porous pavement system in accordance with manufacturer's recommendations.

3. Fill GeoPave™ porous pavement system with dense graded base course to a depth of one inch (1″) above the top of the units.

4. Roll dense graded base course with roller in accordance with **Section 2600.3.1** of these Specifications.

2600.3.14 Hydraulically-Applied Erosion Control Product

1. Install in accordance with manufacturer's recommendations.

2. Install only with properly-sized application equipment to ensure that proper ground cover is achieved.

3. Installation shall be performed utilizing a "wide fan" fifty-degree (50°) spray nozzle.

2600.3.15 Rip-Rap

1. Prepare subgrade in accordance with **Section 606** of the STATE SPECIFICATIONS.

2. Install geotextile fabric in accordance with **Section 645** of the STATE SPECIFICATIONS.

3. Place rip-rap in accordance with **Section 606** of the STATE SPECIFICATIONS.

4. Unless otherwise noted in the Plans and/or Specifications, rip-rap shall be placed in the following depths:
   A. Light: Twelve inches (12″).
   B. Medium: Eighteen inches (18″).
   C. Heavy: Twenty four inches (24″).

D. Extra Heavy: Thirty inches (30″).

2600.3.16 Install Permeable Articulating Concrete Block (PACB)

2600.3.16.1 General

1. Scope of Work
   A. Furnish all labor, equipment, materials, and incidentals required and perform all operations in connection with the installation of the PACB in accordance with the lines, grades, design, and dimensions shown on the Contract Drawings and the *Special Conditions*.

2. Submittals
   A. Prior to purchase and installation of the PACB, submit to the ENGINEER:
      1. Manufacturers' performance research results and calculations supporting the PACB system proposed for use.
      2. Manufacturer's certificates of compliance for the PACB and geotextiles.

3. Acceptability
   A. All units shall be sound and free of defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction. Surface cracks incidental to the usual methods of manufacture, or surface chipping resulting from customary methods of handling in shipment and delivery will be acceptable. Blocks with cracks exceeding 0.25″ in width and/or one inch (1.0″) in depth shall be deemed grounds for rejection.

2600.3.16.2 Execution

1. Preparation
   A. Visually inspect all PACB materials for acceptability. Remove and replace those deemed unacceptable.
   B. Verify that areas on which PACB will be placed are constructed to the lines and grades shown on the Contract Drawings and to acceptable tolerances.
   C. All boundary edges between PACB and concrete must be perpendicular and smooth finished.

2. Foundation
   A. Subgrade: Compact subgrade to provide a stable base capable of supporting the stone gallery and PACB.
   B. Geotextile Separator: Install geotextile on the bottom and sides of the installation to prevent contamination of stone gallery.

C. Perforated PVC Pipe: Install perforated pipe above the geotextile fabric. Lay perforated pipe to the lines and grades shown on the Contract Drawings. Perforated pipe shall be surrounded on sides and topped with clear angular stone. A filter sleeve shall not be allowed to be placed around the perforated pipe.
D. Grading and Compaction: Place the clear angular stone base in loose lifts no greater than six inches (6″). Grade the clear angular stone to a smooth plane surface and compact clear stone with vibratory roller until there is no further movement of stone. Plane and compact surface to ensure intimate contact between the legs of the PACB and the clear angular stone.
E. Install a heavy biaxial geogrid over the prepared stone gallery where the PACB will be placed.
F. Foundation Observation: Prior to placing the PACB, contact the ENGINEER to observe the prepared area. Do not place blocks until the area has been observed.

3. Placement
   A. Place the PACB on the stone gallery to produce a smooth plane surface. No individual block shall protrude more than one-quarter of an inch (¼″) in a vertical direction.
   B. Individual blocks in the PACB shall be staggered, beveled, and interlocked for enhanced stability. Each row of blocks shall be laterally offset by one-half (½) block width from the adjacent row, so that any given block is interlocked to four (4) other blocks (two (2) in the row above and two (2) in the row below). Six (6) adjacent blocks shall also surround each block.
   C. Finishing: Leave the joints between the PACB open. These joints do not require backfilling with smaller aggregates or sand in order to function properly.
   D. Place non-woven geotextile over blocks and run a roller or compactor over the blocks to establish a uniform surface.
   E. Post-Installation Certification: Upon completion of the PACB installation, verify the surface infiltration rate of the pavement per **ASTM C-1701M-09** or **ASTM C-1781** to confirm the required infiltration rate of 1,500 inches per hour has been achieved. If the system fails to perform as required, remove and replace.

2600.4 Measurement

2600.4.1 General

1. For Bid Items that are paid for on an area basis, the measurement will be based upon a "plan view" area, and not an "on the slope" area.

2. For items that include an overlap, such as an erosion control mat, the overlap areas are not measured twice.

3. The CITY reserves the right to survey the Bid Items via GPS to determine the final quantity of Bid Items that are acceptably completed.

2600.4.2 Topsoil

1. The CITY will measure the Topsoil Bid Items on a square yard basis that is acceptably completed.

2600.4.3 Wetland Plugs

1. The CITY will measure the Wetland Plug Bid Item on a square yard basis that is acceptably completed.

2600.4.4 Native Plant Seeding

1. The CITY will measure the Native Plant Seeding Bid Items on a square yard basis that is acceptably completed.

2. Native Plant Seeding areas included within a Turf Reinforcement Mat System will be measured under the Native Seeding Bid Items.

2600.4.5 Turf Grass

1. The CITY will measure the Turf Grass Bid Item on a square yard basis that is acceptably completed.

2. Turf Grass Seeding areas included within a Turf Reinforcement Mat System will be measured under the Turf Grass Bid Item.

2600.4.6 No-Mow Fescue

1. The CITY will measure the No-Mow Fescue Bid Item on a square yard basis that is acceptably completed.

2. No-Mow Fescue Seeding areas included within a Turf Reinforcement Mat System will be measured under the No-Mow Fescue Bid Item.

2600.4.7 Annual Cover Crop

1. The CITY will measure the Annual Cover Crop Bid Item on a square yard basis that is acceptably completed.

2. Annual Cover Crop Seeding areas included within a Turf Reinforcement Mat System will be measured under the Annual Cover Crop Bid Item.

2600.4.8 Shredded Bark Mulch

1. The CITY will measure the Shredded Bark Mulch Bid Item on a square yard basis that is acceptably completed.

2600.4.9 Trees

1. The CITY will measure the Trees Bid Item on per each basis that is acceptably completed.

2600.4.10 Shrubs

1. The CITY will measure the Shrubs Bid Item on per each basis that is acceptably completed.

2600.4.11 Erosion Control Mat

1. The CITY will measure the Erosion Control Mat Bid Items on a square yard basis that is acceptably completed.

2. Erosion Control Mat areas included within a Turf Reinforcement Mat System will be measured under the Erosion Control Mat Bid Items.

2600.4.12 Turf Reinforcement Mat System

1. The CITY will measure the Turf Reinforcement Mat System Bid Item on a square yard basis that is acceptably completed.

2600.4.13 Reinforced Grass Pavement System

1. The CITY will measure the Reinforced Grass Pavement System Bid Item on a square yard basis that is acceptably completed.

2. Seed that is applied to a Reinforced Grass Pavement System will be measured under the appropriate Seeding Bid Items.

2600.4.14 Reinforced Gravel Pavement System

1. The CITY will measure the Reinforced Gravel Pavement System Bid Item on a square yard basis that is acceptably completed.

2600.4.15 Rip-Rap

1. The CITY will measure the Rip-Rap Bid Items on a square yard basis that is acceptably completed.

2600.4.16 Install Permeable Articulating Concrete Block

1. The CITY will measure installing permeable articulating concrete block on a square yard basis of work acceptably completed. The CONTRACTOR shall account for any half blocks or other necessary waste when determining the per square yard pricing.

2600.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
	RESTORATION	
2600	Furnish and Install Topsoil 6" Depth	SY
2602	Install Salvaged Topsoil 6" Depth	SY
2604	Furnish and Install Topsoil 12" Depth	SY
2606	Install Salvaged Topsoil 12" Depth	SY
2608	Furnish and Install Wetland Plugs	SY
2610	Furnish and Install Native Seeding	SY
2612	Furnish and Install Native Seeding	SY
2614	Furnish and Install Native Seeding	SY
2616	Furnish and Install Native Seeding	SY
2618	Furnish and Install Native Seeding	SY
2620	Furnish and Install Turf Grass	SY
2622	Furnish and Install No-Mow Fescue	SY
2624	Furnish and Install Annual Cover Crop	SY
2625	Furnish and Install Shredded Bark Mulch	SY
2626	Furnish and Install Trees	EA
2628	Furnish and Install Shrubs	EA
2630	Furnish and Install Class I, Type A Erosion Control Mat	SY
2632	Furnish and Install Class I, Urban, Type A Erosion Control Mat	SY
2634	Furnish and Install Class II, Type B Erosion Control Mat	SY
2636	Furnish and Install Class III, Type A Erosion Control Mat	SY
2638	Furnish and Install Turf Reinforcement Mat System	SY
2640	Furnish and Install Reinforced Grass Pavement System	SY
2642	Furnish and Install Reinforced Gravel Pavement System	SY
2644	Furnish and Install Hydraulically-Applied Erosion Control Product	SY
2646	Furnish and Install Light Rip-Rap with Filter Fabric	SY
2648	Furnish and Install Medium Rip-Rap with Filter Fabric	SY
2650	Furnish and Install Heavy Rip-Rap with Filter Fabric	SY
2652	Furnish and Install Extra-Heavy Rip-Rap with Filter Fabric	SY
2658	Install Permeable Articulating Concrete Block (PACB)	SY

2600.5.1 Topsoil

1. Payment for Topsoil Bid Items is full compensation for providing all necessary labor and equipment for furnishing, excavating, loading, hauling, and placing the material; and for undercutting excavations, or under filling embankments necessary to receive this material.

2600.5.2 Salvaged Topsoil

1. Payment for Salvaged Topsoil Bid Items is full compensation for providing all necessary labor and equipment for removing, stockpiling, reclaiming, hauling and placing the material; and for undercutting excavations, or under filling embankments necessary to receive this material.

2600.5.3 Wetland Plugs

1. The CITY will measure the Wetland Plug Bid Item on a square yard basis that is acceptably completed.

2600.5.4 Native Plant Seeding

1. Payment for the Native Plant Seeding Bid Items is full compensation for providing, handling, and storing all seed; for providing the required culture and inoculating seed as specified; and for preparing the seed bed, sowing, covering, and firming the seed.

2600.5.5 Turf Grass

1. Payment for the Turf Grass Seeding Bid Item is full compensation for providing, handling, and storing all seed; for providing the required culture and inoculating seed as specified; and for preparing the seed bed, sowing, covering, and firming the seed.

2600.5.6 No-Mow Fescue

1. Payment for the No-Mow Fescue Seeding Bid Item is full compensation for providing, handling, and storing all seed; for providing the required culture and inoculating seed as specified; and for preparing the seed bed, sowing, covering, and firming the seed.

2600.5.7 Annual Cover Crop

1. Payment for the Annual Cover Crop Seeding Bid Item is full compensation for providing, handling, and storing all seed; for providing the required culture and inoculating seed as specified; and for preparing the seed bed, sowing, covering, and firming the seed.

2600.5.8 Shredded Bark Mulch

1. Payment for the Shredded Bark Mulch Bid Item is full compensation for providing, handling, and storing of shredded bark mulch and landscaping fabric; for any potential excavating, backfilling, and placement of bark mulch and landscaping fabric; and for disposing of all excess and waste materials and cleaning of the site related to bark mulch installation.

2600.5.9 Trees

1. Payment for the Trees Bid Item is full compensation for providing, transporting, handling, storing, pruning, placing, and replacing plant materials; for excavating all plant holes, salvaging topsoil, mixing and backfilling; for providing and applying any required fertilizer, weed barrier fabric, mulch, water, wrapping, guys, and braces; and for disposing of all excess and waste materials.

2600.5.10 Shrubs

1. Payment for the Shrubs Bid Item is full compensation for providing, transporting, handling, storing, pruning, placing, and replacing plant materials; for excavating all plant holes, salvaging topsoil, mixing and backfilling; for providing and applying any required fertilizer, weed barrier fabric, mulch, water, wrapping, guys, and braces; and for disposing of all excess and waste materials.

2600.5.11 Erosion Control Mat

1. Payment for the Erosion Control Mat Bid Items is full compensation for providing and delivering acceptable erosion control mat materials and anchoring devices; for storing and protecting on site; for placing and anchoring the mat, including anchoring devices; for installing end trenching; for repairing and reseeding any damaged areas and applying water; and for disposing of all surplus and waste material.

2600.5.12 Turf Reinforcement Mat System

1. Payment for the Turf Reinforcement Mat Bid Item is full compensation for providing and delivering acceptable turf reinforcement mat materials, anchoring devices, and topsoil; for storing and protecting on site; for placing and anchoring the mat, including anchoring devices and filling with topsoil; for preparing for seed application above turf reinforcement mat; for installing end trenching; for repairing and reseeding any damaged areas and applying water; and for disposing of all surplus and waste material.

2600.5.13 Reinforced Grass Pavement System

1. Payment for the Reinforced Grass Pavement Bid Item is full compensation for providing and delivering acceptable reinforced grass pavement system materials and anchoring devices and topsoil; for storing and protecting on site; for placing and anchoring the pavement devices, including anchoring devices and topsoil; for repairing and reseeding any damaged areas and applying water; and for disposing of all surplus and waste material.

2600.5.14 Reinforced Gravel Pavement System

1. Payment for the Reinforced Gravel Pavement Bid Item is full compensation for providing and delivering acceptable reinforced gravel pavement system materials and anchoring devices and dense graded base course; for storing and protecting on site; for placing and anchoring the pavement devices, including anchoring devices and dense graded base course; for repairing and reseeding any damaged areas and applying water; and for disposing of all surplus and waste material.

2600.5.15 Hydraulically-Applied Erosion Control Product

1. Payment for the Hydraulically Applied Erosion Control Product Bid Item is full compensation for providing and delivering acceptable hydraulically applied erosion control product materials; for storing and protecting on site; for placing the material in accordance with these specifications and manufacturer's recommendations; for repairing and reseeding any damaged areas and applying water; and for disposing of all surplus and waste material.

2600.5.16 Rip-Rap

1. Payment for the Rip-Rap Bid Items is full compensation for excavating, for preparing the subgrade, for providing and placing the geotextile fabric, for providing and placing the rip-rap, for restoring adjacent work, and for disposing of surplus material and waste.

2600.5.17 Permeable Articulating Concrete Block (PACB)

1. Payment for the PACB Bid Item is full compensation for providing all necessary labor, equipment, and materials for installing the PACB in accordance with the Plans; for disposing of any access blocks; and for cleaning up the site.

SECTION 2700
STORM SEWER TESTING

2700.1 Description

1. This Section describes the testing of storm sewer manholes and pipes, and other appurtenances, including mandrel testing and closed circuit televising.

2700.2 Materials

1. This Section is left vacant.

2700.3 Construction

2700.3.1 General

1. Tests shall be performed by the CONTRACTOR under the observation of the ENGINEER, unless special provisions call for CITY-provided testing. The CITY shall notify the CONTRACTOR not less than twenty-four (24) hours in advance if the testing is to be done by the CITY.

2. The CONTRACTOR is required to repair all visible defective joints or leaks in pipes or manholes.

3. The cost of the labor, equipment, and materials necessary to perform testing shall be included in the unit bid prices of the storm sewer.

2700.3.2 Mandrel Test

1. The entire length of the installed storm sewer main (except reinforced concrete pipe materials) shall be tested for acceptance with an approved go-no-go acceptance testing device. This device shall conform substantially to that shown on **Files No. 30** and **30A** of **Part IX**, of the *Standard Specifications for Sewer and Water Construction in Wisconsin*, dated December 22, 2004. The dimensions of the testing device are shown in *Table 1*, *Table 2*, and *Table 3* located at the end of this Section, which is based on 5 or 7.5% deflection of the following base inside diameter. NOTE: The base inside diameter (I.D.) is a minimum pipe I.D. derived by subtracting a statistical tolerance package from the pipe's average I.D. The tolerance package is defined as the square root of the sum of squared standard manufacturing tolerances.

Ave ID = Ave OD – 2(1.06)t
Tolerance Package = $(A^2 + B^2 + C^2)$ ½

Where:
A = OD Tolerance (**ASTM D-3034** for 8″ - 15″) & (**ASTM F-679** for 18″ - 27″)
B = Excessive Wall Thickness Tolerance = 0.06t
C = Out of Roundness Tolerance (**ASTM D-3034** for 8″ - 15″) & (**ASTM F-679** for 18″ - 27″)
T = Minimum Wall Thickness (**ASTM D-3034** for 8″ - 15″ solid wall),
(**ASTM F-679** for 18″ - 27″), &
(**ASTM F-949** for 8″ - 10″ corrugated)

2. The CONTRACTOR shall furnish the testing device, all labor, equipment, and materials for making this acceptance test.

3. The test shall be conducted after all backfill has been placed and consolidated, but before paving is constructed. The 95% device shall be used if the testing is done less than thirty (30) days after consolidation. The 92.5% device may be used if testing is done thirty (30) days or more after consolidation. Any section of the completed sewer failing to pass this test shall be repaired and retested. All testing shall be done under the observation of the ENGINEER.

4. For acceptance, the device must pass through the entire section between manholes or other structures in one (1) pass when pulled by hand without the use of excessive force.

2700.3.3 Closed Circuit Televising

1. The intent of closed circuit televising inspection (CCTI) is to observe and record the conditions of the sewer sections being inspected. The location of the laterals will also be documented on the report.

2. **EQUIPMENT**: The camera, television monitor, and other components of the video system shall be capable of producing a quality, color picture. The television camera used for the inspection shall be one specifically designed and constructed for such inspection and shall be capable of radial view for inspection of the entire pipe, including lateral connections. The camera shall be mounted on adjustable skids, or self-propelled, and positioned in the center of the pipe. Lighting of the camera shall be supplied by a lamp on the camera and shall be capable of lighting the entire periphery of the pipe. The camera shall be operative in one hundred percent (100%) humidity conditions and shall have a minimum of six hundred fifty (650) lines of resolution. The view seen on by the televising camera shall be transmitted to a monitor of not less than seventeen inches (17″).

3. **PROCEDURES**: A minimum of one (1) pass with a jet shall be made prior to televising. The television camera shall be moved through a sewer at a uniform rate, stopping when necessary to insure properly documentation of the sewer. The television camera shall not be pulled at a speed greater than thirty feet (30') per minute.

4. During the inspection operation, if the television camera will not pass through the entire sewer section, the CONTRACTOR shall reset their equipment in a manner so the inspection can be performed from the opposite manhole. If, again, the camera fails to pass through the entire section, the CONTRACTOR shall excavate and repair or replace the defective section. All costs for the reset and repair due to an obstruction shall be done at the CONTRACTOR's expense.

5. If the camera becomes submerged due to a sag in the pipe, a high velocity jet will be utilized to pull water away from the camera lens. If the ENGINEER deems the sag is not acceptable, the CONTRACTOR will excavate and repair or replace the defective section of pipe at their own expense.

6. If the camera becomes trapped within the sewer, it is the responsibility of the CONTRACTOR to remove the camera. All costs for removal, including possible excavation and restoration, are the responsibility of the CONTRACTOR.

7. **INSPECTION LOGS**: The logs shall be computer printed. One (1) copy in a PDF format shall be supplied to the CITY. Television inspection logs must include the following:
   A. Date, time, City, Street, basin, sewer section, reference manhole number, name of operator, inspector, and weather conditions.
   B. Pipe diameter, pipe material, section length, depth of pipe, length between joints, and corresponding video recording identification.
   C. Location of each point of leakage and estimate of flow.
   D. Location of each service connection.
   E. Location of any damaged sections, nature of damage, and location with respect to pipe axis (such as mineral deposits, cracked pipe, sags, etc.).

8. **RECORDINGS**: The purpose of video recording is to supply a visual record and audio record of the condition of sewers. Recording playback shall be done at the same speed that it was recorded. Upon final payment of the work, all video recording shall become the property of the CITY, and shall be in a digital format. A complete video and audio recording shall be made of each line televised. Recordings and packages shall be labeled with location information and inspection date. Television inspection reports shall include the following:
   A. Visual (on screen in corner):
      1. Report number.
      2. Date of television inspection.
      3. Sewer section and number.

4. Current distance along reach (tape counter footage).

B. Audio:
   1. Date and time of television inspection, operator name, name of overlaying or adjacent street, and manhole numbers.
   2. Verbal confirmation of sewer section and televising direction in relation to the direction of flow.
   3. Verbal description of pipe size, type, and pipe joint length.
   4. Verbal description and location of each service connection and pipe defect.
   5. Type of weather during inspection.

2700.4 Measurement

2700.4.1 Mandrel Test

1. The CITY will not measure the mandrel test; it is incidental to the construction of the storm sewer.

2700.4.2 Closed Circuit Televising

1. The CITY will not measure the closed circuit televising; it is incidental to the construction of the storm sewer.

2700.5 Payment

2700.5.1 Mandrel Testing

1. Payment for the mandrel testing is included in the cost of the construction of the storm sewer.

2700.5.2 Closed Circuit Televising

1. Payment for the closed circuit televising is included in the cost of the construction of the storm sewer.

2. If the CITY deems the televising of the storm sewer mains is not of good quality, the CONTRACTOR will redo the section at their own expense.

3. **If the CONTRACTOR fails to deliver a copy of the televising reports, including discs containing the videos, to the City at least two (2) working days or one (1) working day, with ENGINEER's approval, prior to paving of the street, a five percent (5%) deduction of the price of the Bid Items not properly televised, up to a maximum of Two Dollars ($2.00) per linear foot will be assessed against the Contract**.

4. Any pipe segments requiring repair shall be re-televised after the repair has been completed. ENGINEER to review this re-televising, prior to the paving of the street. One (1) copy of the televising report, including discs containing the videos, shall be submitted within three (3) working days.

TABLE 1
TESTING DEVICE DIMENSIONS FOR PVC PIPE

SDR 35 D3034			
Minimum Diameter (Inches)			
Nominal Size (In)	Base ID	5% Deflection	7.5% Deflection
8	7.67	7.28	7.09
10	9.56	9.08	8.85
12	11.36	10.79	10.51
15	13.90	13.20	12.85
18	16.98	16.13	15.70
21	20.00	19.00	18.50
24	22.48	21.54	20.79

F949			
Minimum Diameter (Inches)			
Nominal Size (In)	Base ID	5% Deflection	7.5% Deflection
8	7.66	7.27	7.08
10	9.55	9.07	8.83
12	11.34	10.77	10.49
15	13.86	13.17	12.82
18	16.96	16.12	15.69
21	20.16	19.16	18.65
24	22.63	21.50	20.94
30	28.20	26.79	26.08
36	34.18	32.47	31.61

F679, PS46, 12454C			
Minimum Diameter (Inches)			
Nominal Size (In)	Base ID	5% Deflection	7.5% Deflection
18	16.98	16.13	15.70
21	20.00	19.00	18.70
24	22.48	21.36	20.79
27	25.33	24.06	23.43

TABLE 1 (continued)

F679, PS46, 12364C			
Minimum Diameter (Inches)			
Nominal Size (In)	Base ID	5% Deflection	7.5% Deflection
18	17.06	16.20	15.78
21	20.10	19.09	18.59
24	22.59	21.46	20.89
27	25.45	24.17	23.54

TABLE 2
TESTING DEVICE DIMENSION FOR ABS OR PVC COMPOSITE PIPE

Nominal Size (In)	Specified Minimum ID (In)	Installed Minimum ID (In)
8	7.75	7.36
10	9.75	9.36
12	11.75	11.16

ID = Inside Diameter

TABLE 3
TESTING DEVICE DIMENSION FOR POLYPROPYLENE PIPE

Pipe Type	Pipe Diameter	Minimum Inside Diameter	Inside Diameter with 5% Deflection	Inside Diameter with 7.5% Deflection
Dual Wall	12″	11.90	11.31	11.01
	15″	14.85	14.11	13.74
	18″	17.93	17.03	16.59
	24″	23.90	22.71	22.11
	30″	29.79	28.30	27.56
Triple Wall	30″	29.62	28.14	27.40
	36″	35.40	33.63	32.75
	42″	41.31	39.24	38.21
	48″	47.31	44.94	43.76
	60″	59.30	56.34	54.85

SECTION 2750
STORM SEWER ROCK EXCAVATION

2750.1 Description

1. This Section describes excavating and disposing of rock taken from within the right-of-way for project construction.

2750.2 Materials

2750.2.1 Rock Excavation

1. Under the Rock Excavation Bid Item, excavate all hard, solid rock in ledges, bedded deposits, and unstratified masses, and all conglomerate deposits or any other material so firmly cemented they present all the characteristics of solid rock and the ENGINEER determines it is not practical to excavate this material without first blasting, rock grinding, or using a hydraulic break hammer. The CONTRACTOR shall be required to take all practical steps to excavate existing ground conditions prior to the use of rock excavation methods for purposes of demonstrating that the existing ground cannot practically be excavated without performing rock excavation. Rock Excavation also includes the removing of rock boulders having a volume of one (1) cubic yard or more.

2. The classification of Rock Excavation does not apply to crushed aggregate or asphaltic base or surface courses, or to Portland cement base or surface courses.

2750.3 Construction

2750.3.1 General

1. Remove rock, if encountered in excavation, to a depth of approximately six inches (6″) below the earth subgrade between the limits of the shoulder slopes. If the Plans show design details covering the depth of rock excavation, perform the work in accordance to the Details. If the Plans or special provisions do not require specific materials, then use selected material obtained from roadway and drainage excavation to backfill areas of excavation below subgrade (EBS) in rock excavation. If excavation methods leave undrained pockets in the rock surface, drain the depressions properly. If allowed by the ENGINEER, the CONTRACTOR may fill the depressions with ENGINEER-approved impermeable material, at no expense to the CITY.

2. Excavate rock cuts using methods and equipment so the resulting backslopes substantially conform to the slopes the Plans show or to the slopes established from stakes set for excavation. Avoid creating depressions in or substantial displacement of material outside the lines, limits, or slope planes defined by the stakes. Scale the backslopes in rock cuts to dislodge loose rock and dispose of removed material.

3. Undercut the slope of rock cuts if designated to receive topsoil, or salvaged topsoil, to the depth necessary to allow placing the specified amount of topsoil or salvaged topsoil, and finish to the required section.

2750.3.2 Pre-Splitting Rock

1. If the Plans show or the ENGINEER authorizes, employ the pre-splitting technique to split the face of the rock cut in a relatively smooth plane along the designated backslope, before removing the interior portion of the cut by blasting.

2. Remove all soil and loose or decomposed rock overlying the surface of the rock to be split to the elevation the ENGINEER designates or approves before drilling the pre-splitting holes.

3. At the beginning of the pre-splitting operation or if encountering material of different geologic characteristics, drill, blast, and excavate short test sections, up to one hundred feet (100') in length, to determine the optimum spacing, size, and loading of the holes. Do not perform testing until the ENGINEER approves a CONTRACTOR-prepared plan of the test section. After pre-splitting the test section, expose the presplit face to allow the ENGINEER to examine and evaluate the results. If the results are unsatisfactory, make adjustments in hole size and spacing of charges, and other aspects of the plan to produce an acceptable split face.

4. Drill holes no larger than three and one-half inches (3½") in diameter at a spacing determined from the test section, but not less than twenty-four inches (24") and not more forty-two inches (42").

5. Drill holes on the required slope line and at the required slope inclination to the full depth of the cut or to a predetermined stage elevation. If the depth of cut is greater than is practical to maintain the required alignment of drilled holes, drill, blast, and excavate the cut in two (2) or more lifts. If the cut is too deep for pre-splitting to the full required depth in one (1) operation, the ENGINEER will allow a maximum offset of twelve inches (12") at the bottom of each lift for use in drilling the next lower pre-splitting pattern. Plan the offset benches so the toe of the completed rock slope coincides with the toe of slope the Plans show.

6. Carefully charge all drill holes for pre-splitting with manufactured cartridge-type explosives, fully stem each hole, and detonate the charges simultaneously.

7. Before blasting the interior portion of the excavation area, pre-split rock slopes, either by separate operations or by time-delay fuses that fracture the slope line before the charges detonates in the interior portion.

8. Position drill holes for production blasting to avoid damage to the pre-split face. Do not place the bottom of the production holes below the bottom of the pre-split holes. Do not drill portions of production drill holes within four feet (4') of a pre-split plane, except as approved by the ENGINEER.

9. Use explosive charges, detonating cord, spacing, and other items necessary for the blasting operation conforming to the explosive manufacturer's recommendations and instructions.

2750.4 Measurement

2750.4.1 Rock Excavation

1. The CITY will measure Rock Excavation Bid Items in ledges and solid masses by the cubic yard that is acceptably completed. The CITY will perform this measurement by making vertical measurements for determining average end areas within the limits of the roadbed as defined by the shoulder slopes. These vertical measurements will extend from the surface of the rock to an elevation six inches (6") below the subgrade or ground surface, to the depth indicated on the Plans, to the bottom of the solid ledge or mass if the rock does not extend downward to the elevation specified, or indicated below the established grade.

2. The CITY will measure boulders and surface stone with a volume of one (1) cubic yard or more individually and compute the volume from average dimensions taken in three (3) directions.

3. The CITY will measure Utility Trench Rock Excavation Bid Items by the linear foot that is acceptably completed. Utility trench rock excavation shall be paid per **Section 2750.5.1** of these Specifications. The CITY will perform this measurement by taking the linear footage along the centerline of the pipe where rock is encountered, until a location where methods of rock excavation are no longer needed.

2750.4.2 Pre-Splitting Rock

1. The CITY will measure Pre-Splitting Rock Bid Items by the linear foot of drilled holes, including test section holes, drilled along the face of acceptable pre-split rock slopes. The CITY will take the measurement from the top of the drilled hole at the rock surface to the elevation of the roadway ditch, to a pre-determined bench elevation, or to the bottom of the rock ledge or mass where the rock does not extend to the roadway ditch or pre-determined bench elevation. The CITY will include overbreak quantities in the measurement of Rock Excavation where pre-splitting is used.

2750.5 Payment

1. The CITY will pay measured quantities at the Contract unit price under the following Bid Items:

Bid Item	Description	Units
STORM SEWER ROCK EXCAVATION AND PRE-SPLITTING		
2750	Rock Excavation	CY
2751	Utility Trench Rock Excavation (Storm)	LF
2752	Pre-Splitting Rock	LF

2750.5.1 Rock Excavation

1. Payment for Rock Excavation Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating the rock material; for disposing of surplus material; and for cleaning out and restoring the project site.

2. The CITY will not pay for the removal of hard pan rock ledges. If the ENGINEER determines the rock ledges can be excavated with a ripper tooth from a backhoe, it shall be classified as hardpan and shall be incidental to Contract Items.

2750.5.2 Pre-Splitting Rock

1. Payment for Pre-Splitting Rock Bid Items is full compensation for all drilling, stemming, and blasting, and providing all materials, including explosives.

SECTION 2800
STORM SEWER ABANDONMENTS

2800.1 Description

1. This Section describes the abandoning of existing storm sewer structures and storm sewer pipe, either through crushing, filling, or removal of the existing storm sewer.

2800.2 Materials

1. This Section is left vacant.

2800.3 Construction

1. The ENGINEER shall order storm sewer structures and pipes which are no longer in use to be bulkheaded and abandoned, or removed.

2. The abandonment of storm sewer structures and pipes shall conform to **Section 3.2.24** in the *Standard Specifications for Sewer and Water Construction in Wisconsin*, dated December 22, 2004, including all addenda.

2800.3.1 Abandon Storm Sewer Manholes and Inlets

1. The abandonment of storm sewer manholes and inlets shall also include the following specifications:
   A. All abandoned manholes and inlets shall be removed to a depth of three feet (3') below the proposed or established grade or existing street grade, whichever is greater.
   B. The manhole structure base shall be cracked to allow drainage.
   C. The manhole structure shall be backfilled with a granular backfill material suitable for the location of the existing structure.
   D. All castings on such abandoned structures are property of the CITY and shall be salvaged by the CONTRACTOR and delivered to the Central Garage as directed.

2. For all abandonment of storm sewer manholes and inlets, the CONTRACTOR will have the option to completely remove the existing structures and backfill trench with appropriate backfill material. This will be paid for at the same unit cost as abandoning in place.

2800.3.2 Abandon Storm Sewer Pipes

1. The abandonment of eight inch (8") to twelve inch (12") storm sewer shall also include the following specifications:

A. The CONTRACTOR shall construct a bulkhead at each exposed end of the abandoned pipe consisting of a five-inch (5") brick wall. The abandoned pipe may stay in its existing location if the proposed storm sewer alignment does not coincide with the existing alignment.
B. When the existing alignment coincides with the proposed alignment, the existing pipe shall be completely removed and considered incidental to the installation of the proposed storm sewer.

2. The abandonment of fifteen inch (15") or larger storm sewer shall also include the following specifications:
   A. The CONTRACTOR shall construct a bulkhead at each exposed end of the abandoned pipe consisting of a five-inch (5") brick wall. In addition to the bulkheads, the abandoned pipe shall be filled with either sand or cellular concrete if the proposed alignment does not coincide with the existing alignment.
   B. When the existing alignment coincides with the proposed alignment, the existing pipe shall be completely removed and considered incidental to the installation of the proposed storm sewer.

3. For all abandonment of storm sewer pipe, the CONTRACTOR will have the option to completely remove the existing storm sewer and backfill trench with appropriate backfill material. This will be paid for at the same unit cost as abandoning in place.

2800.3.3 Remove Storm Sewer Pipes

1. The removal of storm sewer pipes also includes the following specifications:
   A. All abandoned storm sewer pipes shall be excavated and removed from the roadway as shown on the Plans or ordered by the ENGINEER. The trench will then be backfilled with a crushed aggregate base course conforming to **Section 100.61** of these Specifications.

2800.4 Measurement

2800.4.1 Abandon Storm Sewer Manholes and Inlets

1. The CITY will measure the Storm Sewer Manhole and Inlet Abandonment Bid Item by each individual unit that is acceptably completed.

2800.4.2 Abandon Storm Sewer Pipes

1. The CITY will measure the Storm Sewer Pipe Abandonment Bid Items by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the pipe, from storm manhole to manhole or to the end of the existing storm sewer pipe. The CITY will make no deductions from those measured lengths for intermediate fittings. No

deductions for manholes will be made unless the internal diameter of the storm sewer is twenty-four inches (24″) or larger, in which case the internal diameters of the manholes will be deducted from the total measurement by the CITY.

2800.4.3 Remove Storm Sewer Pipes

1. The CITY will measure the Removal of the Storm Sewer Pipe Bid Items by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the pipe that is to be removed. The CITY will make no deductions from those measured lengths for intermediate fittings.

2800.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
	STORM SEWER ABANDONMENTS	
2800	Abandon 8" - 12" Storm Sewer	LF
2802	Abandon 15" and Larger Storm Sewer	LF
2804	Remove 30″ and Smaller Storm Sewer	LF
2806	Remove 33″ - 60″ Storm Sewer	LF
2808	Remove 66″ and Larger Storm Sewer	LF
2810	Abandon Storm Sewer Manholes and Inlets	EA
2812	Remove Storm Sewer Manholes and Inlets	EA

2800.5.1 Abandon Storm Sewer Manholes and Inlets

1. Payment for Abandoning Storm Sewer Manhole and Inlet Bid Item is full compensation for providing all necessary labor, equipment, and materials; for excavating; for breaking down or removal of existing manhole; for providing granular backfill material; for backfilling; and for cleaning out and restoring the site of the work. Rock Excavation will be paid for under a separate Bid Item.

2800.5.2 Remove Storm Sewer Manholes and Inlets

1. Payment for Removing Storm Sewer Manhole and Inlet Bid Item is full compensation for providing all necessary labor, equipment, and materials; for excavating; for providing granular backfill material; for backfilling; and for cleaning out and restoring the site of the work. Rock Excavation will be paid for under a separate Bid Item.

2800.5.3 Abandon Storm Sewer Pipes

1. Payment for Abandoning Storm Sewer Pipes Bid Items is full compensation for providing all necessary labor, equipment, and materials to remove, break down, brick ends, and slurry or sand fill existing storm sewer pipes. It also includes providing granular backfill material, for backfilling, and for cleaning out and restoring the site of the work.

2800.5.4 Remove Storm Sewer Pipes

1. Payment for the Removal of Storm Sewer Pipes Bid Item is full compensation for providing all necessary labor, equipment, and materials to remove existing storm sewer pipes. It also includes providing granular backfill material, for backfilling, for compacting, and for cleaning up and restoring the site of the work. Removal of Structures shall be included in the appropriate Bid Item for Structure Removal.

SECTION 2850
STORM SEWER CONNECTIONS

2850.1 Description

1. This Section describes constructing connections to existing storm sewer mains by means of flexible couplings, concrete collars, or coring into existing manholes, including excavating and backfilling.

2850.2 Materials

1. Use materials conforming to the requirements for the class of the material named and specified below:
   A. Flexible Coupling (Stock Couplings) **ASTM D-5926**
   B. Flexible Coupling (Large Diameter) **ASTM D-5926**
   C. Concrete Collars **Class C Concrete**

2850.3 Construction

2850.3.1 Excavation

1. Unless otherwise specified in the Contract or the ENGINEER allows, perform sewer construction in open trenches and in a manner that protects the pipelines or sewers from unusual stresses.

2. Understand the proposed elevations for the storm sewers as shown on the Plans are subject to revisions in order to fit field conditions; therefore, the ENGINEER may have to adjust the profile grades from those shown on the Plans.

2850.3.2 Rock Excavation for Storm Sewer Connections

1. Classify rock excavation for storm sewer connections as specified for Rock Excavation in **Section 2750** of these Specifications, except classify the necessary removal of all rock boulders with a volume of one-half (½) cubic yard or more, as Rock Excavation.

2850.3.3 Constructing Foundation

1. Construct the foundation in the trench to prevent subsequent settlement and rupture of the sewer pipe.

2. The CONTRACTOR may not lay the pipe in rock, wet conditions, or on a firm earth subgrade.

3. The CONTRACTOR shall lay the pipe on a backfilled granular foundation or bed. When placing the pipe on backfilled granular foundation, excavate the trench to at least six inches (6") below the elevation established for the bottom of the pipe. Backfill this depth with **"¾-inch clear stone"** meeting the requirements for No. 1 stone in **Section 501.2.5.4** of the STATE SPECIFICATIONS. Compact the material before laying the pipe on the backfilled granular material.

4. After laying the pipe, bedding material shall be placed around the sides of the pipe, except reinforced concrete pipe, up to a level six inches (6") above the top of the pipe. This material shall be placed by hand or equally careful means. When reinforced concrete pipe is installed, the bedding stone shall extend to the spring line of the pipe.

5. Excavate recesses to receive bells as necessary.

6. If the Contract details types of bedding, or required trench widths other than described above, conform to the Construction Details.

2850.3.4 Laying of Pipes in Cold Weather

1. The ENGINEER reserves the right to order pipe-laying discontinued whenever, in their opinion, there is a danger of the quality of work being impaired because of cold weather.

2. The CONTRACTOR shall be responsible for heating the pipe and jointing material so as to prevent freezing of joints.

3. No pipe shall be laid on or in frozen ground.

2850.3.5 Flexible Couplings to Existing Pipes

1. Reconnect all existing live storm sewer pipes to the proposed storm sewer. When a new storm pipe is connected to an existing pipe, a watertight joint using a flexible coupling (**Fernco** or **Approved Equal**) and the following installation instructions.

2. Loosen the stainless steel clamps, but do not remove them from coupling.

3. Slide flexible coupling over the plain spigot ends of the two (2) pipes.

4. Tighten clamps to 60 inch-pounds of torque.

5. Pressure test before backfilling or concealing joint. Bed and backfill properly.

2850.3.6 Flexible Couplings for Insertions

1. Fernco couplings can be used to couple pipe when there is a break or insertions are needed.

2. Remove pipe sections, then slide flexible couplings over both pipe ends.

3. Insert new pipe or fitting, then slide flexible coupling over new and old pipe ends.

4. Tighten clamps to 60 inch-pound torque.

5. Pressure test before backfilling or concealing joint. Bed and backfill properly.

6. When utilizing Fernco type couplings with polypropylene pipe, it is necessary to utilize an adapter ring which fits into the corrugation of the pipe in order to form a watertight connection.

2850.3.7 Flexible Couplings for Large Diameter Storm Sewer Pipes

1. Lay the proper bedding.

2. When cutting pipe sections, take care to cut as straight as possible.

3. Clean the pipe sections; they should be clean from any dirt or debris.

4. Slide the Fernco reducer bushing onto the smaller pipe section. Slide it far enough to allow room for the entire coupling (the lip of the bushing first).

5. Slide the coupling onto the reducer bushing with the end of the pipe exposed.

6. Place other pipe section into position.

7. Slide the coupling and bushing assembly down the pipe, so there is an even amount of the coupling on each of the two (2) pipe sections.

8. Tighten the stainless steel clamps to 60 inch-pound torque.

9. Pressure test before backfilling or concealing joint. Bed and backfill properly.

2850.3.8 Concrete Collars

1. Use concrete collars only when approved by the ENGINEER and then only to make connections between dissimilar pipes or where Fernco couplings are impractical.

2. Place the collars using an approved, commercial concrete bonding agent applied to all surfaces in contact with the collar. When concrete closure collars are necessary to join PVC pipe, prepare the PVC surface first for bonding to the concrete by applying a dense coating of clean mortar sand to the pipe using PVC solvent cement. After the cement has cured, apply only an approved, commercial bonding agent to the surface prior to placement of the concrete.

3. The collar should be six inches (6″) thick by twenty-four inches (24″) in width and be reinforced with a 6 x 6 or 10 x 10 gauge steel mesh reinforcing.

4. Remove any projections at the connection that might cut or damage the sealing band. Take special care when backfilling around the sealing band to help prevent disturbance to the connection.

2850.3.9 Connect into Existing Manholes and Inlets

1. In cases where there is not an existing hole in the structure, the CONTRACTOR shall core a hole of adequate size to fit the proposed pipe into the existing manhole or inlet, without creating an excessively large hole.

2. In cases where there is an existing hole in the structure, the CONTRACTOR shall adjust the size of the hole to an adequate size to fit the proposed pipe into the existing manhole or inlet. In cases of enlarging an existing hole, the hole created shall not be created excessively large.

3. CONTRACTOR shall install the pipe such that it is flush with the inside face of the existing manhole or inlet.

4. CONTRACTOR shall seal the remainder of the hole with a hydro-cement grout as described in **Section 2000.3.5** of these Specifications.

2850.3.10 Connect into Existing Storm Sewer Main

1. No connections shall be made to existing storm sewer mains within two feet (2′) of an existing joint.

2. PVC storm sewer mains over eighteen inches (18″) in diameter may use Insert-A-Tee or Kor-N-Tee connections. No saddle connections will be allowed.

3. Storm sewer lateral connections to reinforced concrete main line sewers shall utilize Insert-A-Tee or Kor-N-Tee connections.

4. Storm sewer lateral connections to corrugated metal pipe (CMP) shall utilize the following procedure:
   A. Use metal hole saw to cut hole in metal pipe just large enough to fit proposed storm sewer lateral pipe into. Hole shall be between spring-line of pipe and forty-five degrees (45°) from vertical.
   B. Cut short piece of pipe (no greater than six inches (6″) in length) with bell still in place.
   C. Insert short pipe into CMP with bell to outside.
   D. Pour concrete collar around connection to seal connection.
   E. Utilize normal pipe installation practices to connect to the bell of the pipe that was inserted into the main.

2850.3.11 Lateral Connections to New Storm Sewer Main

1. Storm sewer lateral connections to new PVC main line sewers between twelve inches (12″) and eighteen inches (18″) in diameter shall be by factory wye or tee. PVC storm sewer mains over eighteen inches (18″) in diameter may use Insert-A-Tee or Kor-N-Tee connections. No saddle connections will be allowed.

2. Storm sewer lateral connections to reinforced concrete main line sewers shall utilize Kor-N-Tee or Insert-A-Tee connections.

3. Storm sewer lateral connections to polypropylene pipe shall utilize factory wye, factory tee, or Insert-A-Tee connections.

2850.4 Measurement

2850.4.1 Connect to Existing Storm Sewer Main

1. The CITY will measure Connect to Existing Storm Sewer Main Bid Item as each individual unit that is acceptably completed.

2850.4.2 Connect to Existing Storm Sewer Lateral

1. The CITY will measure Connect to Existing Storm Sewer Lateral Bid Item as each individual unit that is acceptably completed.

2850.4.3 Connect Lateral to Existing Storm Sewer Main

1. The CITY will measure Connect Lateral to Existing Storm Sewer Main Bid Item as each individual unit that is acceptably completed.

2850.4.4 Connect to Existing Manhole or Inlet

1. The CITY will measure the Connect to Existing Manhole or Inlet Bid Items as each individual unit that is acceptably completed. Each existing manhole or inlet connected to will be measured as one (1) connection, regardless of the number of pipes connected to the existing manhole or inlet.

2850.5 Payment

1. The CITY will pay for the measured quantities at the contract unit price for the following Bid Items:

Bid Item	Description	Units
	MISCELLANEOUS CONNECTIONS	
2850	Connect to Existing Storm Sewer Main	EA
2852	Connect to Existing Storm Sewer Lateral	EA
2854	Connect Lateral to Existing Storm Sewer Main	EA
2856	Connect to Existing Manhole	EA
2858	Connect to Existing Inlet	EA

2850.5.1 Connect to Existing Storm Sewer Main

1. Payment for the Connect to Existing Storm Sewer Mains Bid Item is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for by-pass pumping; for forming foundation; for flexible coupling; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of work.

2850.5.2 Connect to Existing Storm Sewer Lateral

1. Payment for the Connect to Existing Storm Sewer Laterals Bid Item is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for by-pass pumping; for forming foundation; for flexible coupling; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of work.

2850.5.3 Connect Lateral to Existing Storm Sewer Main

1. Payment for the Connect Laterals to Existing Storm Sewer Mains Bid Item is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for by-pass pumping; for forming foundation; for flexible coupling; for providing Insert-A-Tees; for providing Kor-N-Tees, for providing concrete collar; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of work.

2850.5.4 Connect to Existing Manhole or Inlet

1. Payment for the Connect to Existing Manhole or Inlet Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for by-pass pumping; for forming foundation; for coring into existing manhole; for expanding an existing opening in the structure, if required; for connecting to proposed pipe; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of work.

2850.5.5 Lateral Connections to New Storm Sewer Main

1. Payment for storm sewer lateral connections to new storm sewer main shall be considered incidental to the Storm Sewer Lateral Bid Item.

SECTION 2900
GENERAL SITE WORK

2900.1 Description

1. This Section describes general site preparation work, and work related to the construction of storm water management detention basins.

2900.2 Materials

2900.2.1 Clay Liner Material

1. Contain fifty percent (50%) or greater fines (passing the #200 sieve).

2. Liquid Limit: Twenty five (25) or greater.

3. Plasticity Index: Twelve (12) or greater.

4. Hydraulic Conductivity: $1x10^{-7}$ cm/sec or less.

2900.3 Construction

2900.3.1 Strip and Stockpile Topsoil

1. Cut or mow and **remove** grass, weeds, and other vegetation prior to stripping topsoil.

2. Strip topsoil and stockpile as shown in the Plans and/or Specifications, or at a location approved by the ENGINEER.

3. Remove topsoil to entire depth in areas where grade is to be raised or lowered and in areas to be covered by a structure, walk, or paving.

4. Provide erosion and sediment control practices in accordance with the Erosion and Sediment Control Plan, or as directed by the ENGINEER in the field.

5. CONTRACTOR shall be required to provide seed and soil stabilization measures on any topsoil stockpile that will sit for more than seven (7) days.

2900.3.2 Clear Trees

1. Coordinate with ENGINEER in the field to mark and measure all trees requiring clearing prior to commencing work.

2. Clear all trees within the area marked and measured.

3. Comply with **Section 201** of the STATE SPECIFICATIONS.

2900.3.3 Clear Shrubs

1. Comply with **Section 201** of the STATE SPECIFICATIONS.

2900.3.4 Grub Stumps

1. Coordinate with ENGINEER in the field to mark and measure all stumps requiring grubbing prior to commencing work.

2. Grub all stumps within the area marked and measured.

3. Comply with **Section 201** of the STATE SPECIFICATIONS.

2900.3.5 Utility Line Opening (ULO)

1. CONTRACTOR shall give ENGINEER a minimum of three (3) working days notice, prior to conducting each ULO.

2. CONTRACTOR shall excavate each ULO, allow ENGINEER sufficient time to survey the elevation of the crossing utility, backfill opening with granular material, compact, and place and maintain temporary pavement.

3. Temporary pavement shall consist of a minimum of four inches (4″) of asphalt, cold mix, or concrete. This temporary pavement shall be considered incidental to the ULO.

4. ULO Bid Items must be completed a minimum of **TWO (2) WEEKS** prior to any utility work taking place in the vicinity of the ULO.

5. Restoration shall occur on the same day as the opening.

6. Each ULO shall include excavating to expose up to ten feet (10′) of utility.

2900.3.6 Excavation

2900.3.6.1 General

1. Comply with **Sections 205** and **206** of the STATE SPECIFICATIONS.

2. Provide adequate under-cutting to allow for placement of clay liner, when called for in Plans and/or Specifications, and topsoil.

3. Placement of fill material to attain required subgrade elevations shall be included in General Excavation.

4. CONTRACTOR shall be required to provide seed and soil stabilization measures on any stockpile that will sit for more than seven (7) days.

2900.3.6.2 Rock Excavation

1. Classify rock excavation as specified for Rock Excavation in **Section 2750** of these Specifications, except classify the necessary removal of all rock boulders with a volume of one-half (½) cubic yard or more, as Rock Excavation.

2900.3.7 Import Clay Material

1. Locate source of clay material meeting requirements of **Section 2900.2.1** of these Specifications.

2. Excavate clay material from borrow site, and haul to project site.

3. CONTRACTOR is responsible to obtain any Construction Site Permit coverage required for the borrow site. This potentially includes local and state agencies. Borrow sites are not covered under the Project Construction Site Permit.

4. CONTRACTOR is responsible to maintain the borrow site in a safe manner.

2900.3.8 Construct Clay Liner

1. Remove any unsuitable material from the subgrade prior to commencing construction of clay liner.

2. Compact subgrade to a minimum of ninety percent (90%) of dry compaction, Modified Proctor.

3. Provide a minimum of two (2) days notice to ENGINEER, prior to placing clay liner material.

4. Coordinate with CITY's Geotechnical Engineer for testing of subgrade, prior to placement of clay liner material.

5. Place clay material in six-inch (6") loose lifts.

6. Compact with sheepsfoot compactor.

7. Maximum compacted lift thickness: six inches (6"), but not greater than the depth of the sheepsfoot compactor being utilized.

8. Compact to ninety percent (90%) of dry compaction, Modified Proctor.

9. Maximum permeability: $1x10^{-7}$ cm/sec.

10. Uniformly distribute and disc each lift of clay prior to compaction.

11. Dry clay material to proper moisture content to obtain proper compaction.

12. Do not place clay at a moisture content less than optimum, as defined in **ASTM D-1557**.

13. Place layers of clay to form continuous, monolithic material, so leaking does not occur.

14. Knead each lift into previously-placed lift with sheepsfoot compactor, or similar kneading-type compactor.

15. Compactors shall be of sufficient weight to form continuous, monolithic material.

16. Compact clay against anti-seep collars to prevent leakage along pipe.

17. Construct liner to thickness shown in Plans and/or Specifications.

2900.4 Measurement

2900.4.1 Strip and Stockpile Topsoil

1. The CITY will measure stripping and stockpiling topsoil on a square yard basis of work acceptably completed. Any excess topsoil that is left over at the end of the project shall be hauled offsite and disposed of by CONTRACTOR.

2900.4.2 Clear Trees

1. The CITY will measure clearing trees in one (1) of two (2) manners:
   A. On an inch-diameter basis of work acceptably completed. Diameter of trees shall be measured at a height of four feet (4') above the adjacent ground. Diameter will be measured by measuring the circumference of the tree and dividing by 3.14. Measurement will be made prior to tree clearing work commencing, and measured trees will be marked. Trees removed prior to measurement and marking will not be considered acceptably completed, and will not be measured.

B. On a lump sum basis. Measurement in this basis will be made once all clearing trees work has been completed.

2900.4.3 Clear Shrubs

1. The CITY will measure clearing shrubs on a lump sum basis. Measurement will be made once all shrub clearing work has been acceptably completed.

2900.4.4 Grub Stumps

1. The CITY will measure grubbing stumps in one (1) of two (2) manners:
   A. On an inch-diameter basis of work acceptably completed. Diameter of stumps shall be measured as indicated in **Section 2900.4.3** of these Specifications for trees which were cleared as a part of the project. Diameter of stumps that were not from trees cleared as a part of the project shall be measured at top of the existing stump. Measurement will be made prior to stump grubbing work commencing, and measured trees will be marked. Stumps grubbed prior to measurement and marking will not be considered acceptably completed, and will not be measured.
   B. On a lump sum basis. Measurement in this basis will be made once all stump grubbing work has been completed.

2900.4.5 Utility Line Opening (ULO)

1. CITY will measure the ULO's based upon the number of openings successfully performed.

2900.4.6 General Excavation

1. The CITY will measure General Excavation on a lump sum basis. General Excavation described in this Section is not related to excavation necessary for the construction of streets. Excavation necessary for the construction of streets is paid for under a separate Bid Item. The ENGINEER's estimate of excavation quantity will be shown in the Plans and/or Specifications.

2. Measurement of this Item will be based on an estimate of amount of work completed, and not based upon actual measured quantities.

2900.4.7 Import Clay Material

1. The CITY will measure importing clay material on a cubic yard basis of work acceptably completed. Importing of clay material will only be measured if sufficient clay material is not present on site to meet the needs of the project.

2900.4.8 Construct Clay Liner

1. The CITY will measure constructing a clay liner within a detention basin on a lump sum basis. The CITY will measure the clay liner construction once the entire clay liner has been constructed.

2900.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
GENERAL SITE PREPARATION		
2902	Strip and Stockpile Topsoil	SY
2904	Clear Trees	ID
2906	Clear Trees	LS
2908	Clear Shrubs	LS
2910	Grub Stumps	ID
2912	Grub Stumps	LS
2914	Storm Sewer Utility Line Opening (ULO)	EA
3890	Sanitary Sewer Utility Line Opening (ULO)	EA
4950	Water Main Utility Line Opening (ULO)	EA
DETENTION BASINS		
2930	General Excavation	LS
2932	Import Clay Material	CY
2934	Construct Clay Liner	LS

2900.5.1 Strip and Stockpile Topsoil

1. Payment for the Strip and Stockpile Topsoil Bid Item is full compensation for providing all necessary labor, equipment, and materials to strip the existing topsoil from the site; for stockpiling in a suitable location for reuse on site, as necessary and as called for in the Plans and/or Specifications; and for removing excess topsoil from the site.

2900.5.2 Clear Trees

1. Payment for the Clear Trees Bid Items is full compensation for providing all necessary labor, equipment, and materials to clear the existing trees from the site, and for removing the trees from the site. Grubbing the Stumps of the Existing Trees will be paid for under a separate Bid Item.

2900.5.3 Clear Shrubs

1. Payment for the Clear Shrubs Bid Item is full compensation for providing all necessary labor, equipment, and materials to clear the existing shrubs from the site; for removing the shrubs from the site; and for removing stumps from the shrubs.

2900.5.4 Grub Stumps

1. Payment for the Grub Stumps Bid Items is full compensation for providing all necessary labor, equipment, and materials to grubbing existing stumps, and stumps from existing trees that were removed as a part of the project from the site, and for removing the stumps from the site.

2900.5.5 Utility Line Opening (ULO)

1. Payment for the ULO Bid Items is full compensation for providing all necessary labor, equipment and materials to excavate each opening, allowing time for the ENGINEER to survey the elevation of the crossing utility; for backfilling and compacting the opening; and for furnishing, installing, and maintaining temporary pavement patch.

2900.5.6 General Excavation

1. Payment for the General Excavation Bid Item is full compensation for providing all necessary labor, equipment, and materials to excavate the site to the lines and grades shown in the Plans, including any over-excavation required for the placement of topsoil; for stockpiling suitable clay material on site for future use as a clay liner, if required; and for hauling excess material from the site. The Placement of Topsoil and Construction of a Clay Liner are paid for under separate Bid Items.

2900.5.7 Import Clay Material

1. Payment for the Import Clay Material Bid Item is full compensation for providing all necessary labor, equipment, materials, hauling, and stockpiling to import clay material suitable for the construction of a clay liner when sufficient clay material is not present on site. Stockpiling of Suitable Clay Material that is present on site is paid for under a separate Bid Item. Construction of the Clay Liner is paid for under a separate Bid Item.

2900.5.8 Construct Clay Liner

1. Payment for the Construct the Clay Liner Bid Item is full compensation for providing all necessary labor, equipment, materials, hauling of clay material from stockpiles on site, and compacting clay liner material. Stockpiling of Clay Material on site is paid for under separate Bid Items. Geotechnical engineering work will be provided by the CITY. Drying of material is considered incidental to the Construction of the Clay Liner Bid Item, and no additional money will be paid for drying clay liner material.

SANITARY SEWER SPECIFICATIONS

SECTION 3000
SANITARY SEWER PIPES

3000.1 Description

1. This Section describes excavating required trenches or tunnels, laying or constructing sanitary sewer pipe inside, and then backfilling and cleaning out as necessary.

3000.2 Materials

3000.2.1 General

1. Use materials conforming to the requirements for the class of the material named and specified below:
   A. Polyvinyl Chloride Sewer Pipe and Fittings (24″ and smaller) **ASTM D-3034**
   B. Polyvinyl Chloride Sewer Pipe and Fittings (18″ - 27″) **ASTM F-679**
   C. Double Wall Polypropylene Pipe (12″ - 27″) **ASTM F-2736**
   D. Triple Wall Polypropylene Pipe (30″ - 60″) **ASTM F-2764**
   E. Concrete Pipe and Fittings **ASTM C-76**
   F. Cast Iron Pipe and Fittings **WW-P-421b**
   G. Fiberglass Reinforced Polymer Mortar Pipe **ASTM D-3262**

2. Sanitary sewer pipes shall be clearly marked as follows at intervals of five (5) feet or less:
   A. Manufacturer's name or trademark.
   B. Nominal pipe size.
   C. Pipe classification.
   D. The legend, i.e. "SDR-35 PVC Sewer Pipe".
   E. ASTM designation.
   F. Extrusion date, period of manufacture, or lot number.

3. Packaging, handling, and shipment of sanitary sewer pipes shall be in accordance with manufacturer's instructions and specifications.

4. CONTRACTOR shall install all sanitary sewer pipes per the manufacturer's recommended bury depth chart.

3000.2.2 Polyvinyl Chloride (PVC) Pipe

1. Pipes shall be stored in the supplier's yard or on the project site in accordance with **AWWA M23** and manufacturer's recommendations.

2. Pipe will not be stacked higher than four feet (4′) or on the bell ends.

3. Cover PVC pipe with an opaque material to protect it from the sun's ultraviolet radiation. PVC pipe that has been subjected to excessive ultraviolet radiation is identified by color fading or chalking and shall not be used. The determination as to the acceptability of the pipe rests solely on the ENGINEER's decision.

4. Pipe that has been contaminated in any way with petroleum products on the inside or outside of the pipe shall not be used.

3000.2.3 Concrete Pipe

1. Pipes shall be stored in the supplier's yard or on the project site in accordance with manufacturer's recommendations.

2. Pipe shall not be stacked higher than four feet (4′) in height.

3000.2.4 Cast Iron Pipes

1. Pipes shall be stored in the supplier's yard or on the project site in accordance with manufacturer's recommendations.

2. Pipe shall not be stacked higher than four feet (4′) in height.

3000.2.5 Centrifugally Cast Fiberglass Reinforced Polymer Mortar Pipes

1. Pipes shall be stored in the supplier's yard or on the project site in accordance with manufacturer's recommendations.

3000.2.6 Double Wall and Triple Wall Polypropylene Pipes

1. Pipes shall be stored in the supplier's yard or on the project site in accordance with manufacturer's recommendations.

3000.3 Construction

3000.3.1 Excavation

3000.3.1.1 General

1. Unless otherwise specified in the Contract or the ENGINEER allows, perform sewer construction in open trenches and in a manner that protects the pipelines or sewers from unusual stresses.

2. Excavate the trenches in reasonably close conformity with the Plans and as the ENGINEER laid out in the field. Begin each trench excavation at the proposed sewer outlet and proceed to the upper end.

3. Keep trenches dewatered at all times.

4. If the Contract specifies or the ENGINEER allows, the CONTRACTOR may construct sewers by tunneling or jacking instead of open trenches. Adhere to the Construction Details, Construction Specifications, and ENGINEER's decision.

5. Understand that the proposed elevations for the sanitary sewers as shown on the Plans are subject to revisions in order to fit field conditions, and the ENGINEER may adjust the profile grades from those the Plans show.

3000.3.1.2 Rock Excavation for Sanitary Sewer

1. Classify rock excavation for sanitary sewer as specified for Rock Excavation in **Section 3600** of these Specifications, except classify the necessary removal of all rock boulders with a volume of one-half (½) cubic yard or more, as Rock Excavation.

3000.3.2 Constructing Foundation

1. Construct the foundation in the trench to prevent subsequent settlement and rupture of the sewer pipe.

2. The CONTRACTOR may not lay the pipe in rock, wet conditions, or on a firm earth subgrade.

3. The CONTRACTOR shall lay the pipe on a backfilled granular foundation or bed. When placing the pipe on backfilled granular foundation, excavate the trench to at least six inches (6") below the elevation established for the bottom of the pipe. Backfill this depth with **"¾-inch clear stone"** meeting the requirements for No. 1 stone in **Section 501.2.5.4** of the STATE SPECIFICATIONS**.** Compact the material before laying the pipe on the backfilled granular material.

4. After laying the pipe, bedding material shall be placed around the sides of the pipe, except reinforced concrete pipe, up to a level six inches (6") above the top of the pipe. This material shall be placed by hand or equally careful means. When reinforced concrete pipe is installed, the bedding stone shall extend to the spring line of the pipe.

5. Excavate recesses to receive bells as necessary.

6. If the Contract details types of bedding, or required trench widths other than described above, conform to the Construction Details.

3000.3.3 Laying Sanitary Sewer Pipes

1. Begin pipe-laying in finished trenches at the lowest point and proceed towards the upper end. Also lay the pipe so the spigot or tongue ends point in the direction of flow.

2. Clean sockets carefully before lowering pipes into trenches. Lower and place to avoid unnecessary handling in the trench or damage to the pipe. Provide a firm bearing beneath the entire length of each section and make it substantially true to the line and grade required.

3. Lay all pipes with ends abutting. Take care when shoving the pipes together so that the joints are properly adjusted and not overly large. Fit pipes so that they form a sewer with a smooth and uniform invert.

4. The mainline sanitary sewer shall be constructed at the following minimum slopes in feet/100 feet:
   A. 8″ Sanitary Sewer 0.40
   B. 10″ Sanitary Sewer 0.28
   C. 12″ Sanitary Sewer 0.22
   D. 15″ Sanitary Sewer 0.15
   E. 18″ Sanitary Sewer 0.12
   F. 21″ Sanitary Sewer 0.10
   G. 24″ Sanitary Sewer 0.08
   H. For Sanitary Sewers larger than 24″, the ENGINEER will determine the slope on a case-by-case basis.

5. SDR 35 PVC pipes shall not be used where the height of cover from the top of pipe to the existing ground elevation or proposed subgrade, whichever is less, is less than two feet (2′).

6. SDR 35 PVC shall not be used when bury depths exceed twenty feet (20′). If depths exceed twenty feet (20′), then a SDR 26 PVC or concrete pipe shall be used.

7. When sanitary sewer pipe enters a manhole, the CONTRACTOR shall keep the pipe flush with the interior wall or the manhole or saw the top of the pipe off to allow for future jetting and cleaning operations.

3000.3.3.1 Laying Double and Triple Wall Polypropylene Pipes

1. Double and Triple Wall Polypropylene shall be installed per manufacturer's specifications.

3000.3.4 Laying of Pipes in Cold Weather

1. The ENGINEER reserves the right to order pipe-laying discontinued whenever, in their opinion, there is a danger of the quality of work being impaired because of cold weather.

2. The CONTRACTOR shall be responsible for heating the pipe and jointing material so as to prevent freezing of joints.

3. No pipe shall be laid on or in frozen ground.

3000.3.5 Relation to Water Mains and Storm Sewers

1. Sanitary sewers must be laid at least eight feet (8′) horizontally from any existing or proposed water main. The distance is to be measured center to center. Should specific conditions prevent this separation; the CONTRACTOR shall notify the ENGINEER for specific instructions regarding the treatment of the separation. It may be necessary to install 150 psi water main pipe and joints as sanitary sewer pipe for the congested areas.

2. Whenever a sanitary sewer crosses a water main, it should be laid at least eighteen inches (18″) below the main or the water main should be re-laid with fittings to cross over the sanitary sewer.

3. Sanitary sewers must be laid at least eight feet (8′) horizontally from any existing or proposed storm sewer. The distance is to be measured center to center. Should specific conditions prevent this separation, the CONTRACTOR shall notify the ENGINEER for specific instructions regarding the treatment of the separation. It may be necessary to install 150 psi water main pipe and joints as sanitary sewer pipe for the congested areas.

3000.3.6 Joints

1. For Polyvinyl Chloride Sewer Pipe, the CONTRACTOR shall use either factory-installed rubber gaskets conforming to **ASTM F-477** or solvent-cemented joints conforming to **ASTM D-2672**. When factory-installed rubber gaskets are used, the outside of the gasket and the inside of the bell or groove of the pipe shall be lubricated with an approved lubricant. The spigot or tongue of the pipe being laid shall be introduced into the bell or groove end of the previously laid pipe. The pipe shall be carefully set to line and grade and then shall be pushed or jacked home. Care should be taken that the entering pipe is completely home. The ENGINEER may order the use of a jack or "come-along", if deemed necessary to ensure that the joint is completely tight. When solvent-cemented joints are used, the bell and spigot ends of the pipe shall be cleaned and dried prior to the application of the solvent cement with a cloth moistened with methyl-ethyl-ketone. Using a brush, the solvent cement is liberally applied to the spigot a distance equal to the joint depth and lightly applied to the

inside of the bell. Immediately thereafter, the joint shall be made by inserting the spigot into the bell and pushing it home as far as possible. The pipe then shall be rotated 30° to 90° to distribute the cement.

2. For circular concrete pipe, the CONTRACTOR shall use rubber gaskets conforming to **ASTM C-433**. When rubber gaskets are used, the gasket shall be placed over the spigot end or tongue of the entering pipe. Immediately before making the joint, the outside of the gasket and the inside of the bell or groove of the last pipe shall be lubricated with an approved lubricant. Care should be taken that the gasket and ends of the pipe are clean and free of sand or gravel. The spigot or tongue of the pipe being laid with the gasket in place shall be introduced into the bell or groove of the previously-laid pipe. The pipe shall be carefully set to line and grade and then shall be pushed or jacked home. Care should be taken that the entering pipe is completely home. The ENGINEER may order the use of a jack or "come-along", if deemed necessary to ensure that the joint is completely tight.

3. For cast iron pipe, the CONTRACTOR shall use rubber gaskets conforming to **ASTM C-564-09a**. When rubber gaskets are used, the gasket shall be placed over the spigot end or tongue of the entering pipe. Immediately before making the joint, the outside of the gasket and the inside of the bell or groove of the last pipe shall be lubricated with an approved lubricant. Care should be taken that the gasket and ends of the pipe are clean and free of sand or gravel. The spigot or tongue of the pipe being laid with the gasket in place shall be introduced into the bell or groove of the previously-laid pipe. The pipe shall be carefully set to line and grade and then shall be pushed or jacked home. Care should be taken that the entering pipe is completely home. The ENGINEER may order the use of a jack or "come-along", if deemed necessary to ensure the joint is completely tight.

4. For centrifugally cast fiberglass reinforced polymer mortar pipe, the CONTRACTOR shall use Elastomeric gaskets conforming to **ASTM F-477** and, unless specified, the pipe shall be field connected with fiberglass sleeve couplings that utilize the elastomeric sealing gaskets as the sole means to maintain watertightness. The joints must meet the performance requirements of **ASTM D-4161**. The CONTRACTOR must clean ends of pipe and couplings components. An approved lubricant is applied to pipe ends and elastomeric gasket and pipes are pushed together. The pipes shall be carefully set to line and grade.

5. Polypropylene pipes shall have watertight joints conforming to the requirements of **ASTM D-3212**. The spigot of each pipe shall have two (2) factory-installed gaskets manufactured of material conforming to **ASTM F-477**. The outside of the gasket and the inside of the bell or groove of the pipe shall be lubricated with an approved lubricant. The spigot or tongue of the pipe being laid shall be introduced into the bell or groove end of the previously-laid pipe. The pipe shall be carefully set to line and grade and then shall be pushed or jacked home. Care should be taken that the entering pipe is completely home.

3000.3.7 Backfilling

1. Backfill all sanitary sewers as described in **Section 100.61** of these Specifications.

3000.3.8 Cleaning of Sanitary Sewer

1. Clean out all new or re-laid sewers of accumulations of silt, debris, and other foreign matter, and, before acceptance, test all installations with the testing procedures described in **Section 3700** of these Specifications.

3000.4 Measurement

3000.4.1 Pipe Sewers

1. The CITY will measure the Sanitary Sewer Pipe Bid Items by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the pipe, from sanitary manhole to manhole or to the end of the installed sanitary pipe. The CITY will make no deductions from these measured lengths for intermediate fittings. No deductions will be made for manholes unless the internal diameter of the sanitary sewer is twenty-four (24″) or larger, in which case the internal diameters of the manholes will be deducted from the total measurement by the CITY.

3000.4.2 Sanitary Sewer Drop

1. The CITY will measure the Sanitary Sewer Drop Bid Items by the vertical foot that is acceptably completed. The measurement shall be from the flow line of the upper sanitary sewer pipe to the flow line of the lower sanitary pipe. The CITY will make no deductions for any fittings.

3000.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
SANITARY SEWER (RELAY)		
3000	Furnish and Install 8″ Sanitary Sewer (Relay)	LF
3002	Furnish and Install 10″ Sanitary Sewer (Relay)	LF
3004	Furnish and Install 12″ Sanitary Sewer (Relay)	LF
3006	Furnish and Install 15″ Sanitary Sewer (Relay)	LF
3008	Furnish and Install 18″ Sanitary Sewer (Relay)	LF
3010	Furnish and Install 21″ Sanitary Sewer (Relay)	LF
3012	Furnish and Install 24″ Sanitary Sewer (Relay)	LF

Bid Item	Description	Units
3013	Furnish and Install 27″ Sanitary Sewer (Relay)	LF
3014	Furnish and Install 30″ Sanitary Sewer (Relay)	LF
3015	Furnish and Install 33″ Sanitary Sewer (Relay)	LF
3016	Furnish and Install 36″ Sanitary Sewer (Relay)	LF
3018	Furnish and Install 42″ Sanitary Sewer (Relay)	LF
3020	Furnish and Install 48″ Sanitary Sewer (Relay)	LF
3022	Furnish and Install 54″ Sanitary Sewer (Relay)	LF
3024	Furnish and Install 60″ Sanitary Sewer (Relay)	LF
3026	Furnish and Install 66″ Sanitary Sewer (Relay)	LF
3028	Furnish and Install 72″ Sanitary Sewer (Relay)	LF
SANITARY SEWER (NEW)		
3030	Furnish and Install 8″ Sanitary Sewer (New)	LF
3032	Furnish and Install 10″ Sanitary Sewer (New)	LF
3034	Furnish and Install 12″ Sanitary Sewer (New)	LF
3036	Furnish and Install 15″ Sanitary Sewer (New)	LF
3038	Furnish and Install 18″ Sanitary Sewer (New)	LF
3040	Furnish and Install 21″ Sanitary Sewer (New)	LF
3042	Furnish and Install 24″ Sanitary Sewer (New)	LF
3044	Furnish and Install 30″ Sanitary Sewer (New)	LF
3045	Furnish and Install 33″ Sanitary Sewer (New)	LF
3046	Furnish and Install 36″ Sanitary Sewer (New)	LF
3048	Furnish and Install 42″ Sanitary Sewer (New)	LF
3050	Furnish and Install 48″ Sanitary Sewer (New)	LF
3052	Furnish and Install 54″ Sanitary Sewer (New)	LF
3054	Furnish and Install 60″ Sanitary Sewer (New)	LF
3056	Furnish and Install 66″ Sanitary Sewer (New)	LF
3058	Furnish and Install 72″ Sanitary Sewer (New)	LF
SANITARY SEWER DROPS		
3060	Furnish and Install 8″ Sanitary Sewer Drop	VF
3062	Furnish and Install 10″ Sanitary Sewer Drop	VF
3064	Furnish and Install 12″ Sanitary Sewer Drop	VF
3066	Furnish and Install 15″ Sanitary Sewer Drop	VF
3068	Furnish and Install 18″ Sanitary Sewer Drop	VF
3070	Furnish and Install 21″ Sanitary Sewer Drop	VF
3072	Furnish and Install 24″ Sanitary Sewer Drop	VF
3074	Furnish and Install 30″ Sanitary Sewer Drop	VF
3076	Furnish and Install 36″ Sanitary Sewer Drop	VF
3078	Furnish and Install 42″ Sanitary Sewer Drop	VF
3080	Furnish and Install 48″ Sanitary Sewer Drop	VF

Bid Item	Description	Units
3082	Furnish and Install 54″ Sanitary Sewer Drop	VF
3084	Furnish and Install 60″ Sanitary Sewer Drop	VF
3086	Furnish and Install 66″ Sanitary Sewer Drop	VF
3088	Furnish and Install 72″ Sanitary Sewer Drop	VF

3000.5.1 Sanitary Sewer Relay Pipes

1. Payment for Sanitary Sewer Relay Pipes Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavation; for sheeting and shoring; for by-pass pumping; for forming foundation; for laying pipe; for sealing joint; for providing backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation, Factory Wyes, Connections to Existing Sanitary Mains, and Coring into Existing Manholes will be paid for under separate Bid Items.

2. Apply Contract unit prices, without adjustment, to the quantities of sanitary sewer relay pipes constructed at elevations not greater than one foot (1′) above or below what the Plans show. If the ENGINEER orders the construction of the sanitary sewer relay pipes or portions of the pipes at elevations greater than one foot (1′) above or below what the Plans show, then the CITY will pay for this work as specified extra work.

3. Work performed one foot (1′) or less below the pipe bottom to form a satisfactory foundation as specified is incidental to the work. The CITY will pay for work required at depths greater than one foot (1′) below the pipe bottom as extra work.

3000.5.2 Sanitary Sewer New Pipes

1. Payment for Sanitary Sewer New Pipes Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavation; for sheeting and shoring; for forming foundation; for laying pipe; for sealing joints; for providing backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation, Factory Wyes, Connections to Existing Sanitary Mains, and Coring into Existing Manholes will be paid for under separate Bid Items.

2. Apply Contract unit prices, without adjustment, to the quantities of sanitary sewer new pipes constructed at elevations not greater than one foot (1′) above or below what the Plans show. If the ENGINEER orders the construction of the sanitary sewer new pipes or portions of the pipes at elevations greater than one foot (1′) above or below what the Plans show, then the CITY will pay for this work as specified extra work.

3. Work performed one foot (1′) or less below the pipe bottom to form a satisfactory foundation as specified is incidental to the work. The CITY will pay for work required at depths greater than one foot (1′) below the pipe bottom as extra work.

3000.5.3 Sanitary Sewer Drop Pipes

1. Payment for Sanitary Sewer Drop Pipes Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavation; for sheeting and shoring; for by-pass pumping; for forming foundation; for laying pipe; for sealing joints; for providing and connecting all necessary fittings; for providing backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation, Connections to Existing Sanitary Mains, and Coring into Existing Manholes will be paid for under separate Bid Items.

2. Apply Contract unit prices, without adjustment, to the quantities of sanitary sewer drop pipes constructed at elevations not greater than one foot (1′) above or below what the Plans show. If the ENGINEER orders the construction of the sanitary sewer relay pipes or portions of the pipes at elevations greater than one foot (1′) above or below what the Plans show, then the CITY will pay for this work as specified extra work.

3. Work performed one foot (1′) or less below the pipe bottom to form a satisfactory foundation as specified is incidental to the work. The CITY will pay for work required at depths greater than one foot (1′) below the pipe bottom as extra work.

SECTION 3100
SANITARY SEWER MANHOLES
AND CHIMNEY SEALS

3100.1 Description

1. This Section describes constructing or reconstructing sanitary manholes, made of concrete, concrete masonry, or concrete block with necessary reinforcement, and metal frames and covers, including excavating and backfilling.

3100.2 Materials

3100.2.1 Concrete

1. Use materials conforming to the requirements for the class of the material named and specified below:
   A. Precast Concrete **ASTM C-478**
   B. Concrete Block **ASTM C-139**

2. Precast sanitary manholes shall have the following requirements, which shall govern when they alter the ASTM standards. Precast sanitary manhole tops shall be the eccentric cone type. Flat tops may be used only with the permission of the ENGINEER.

3. Precast reinforced concrete sanitary manhole risers and tops shall have a minimum wall thickness of four and one-half inches (4½″) for forty two inch (42″) diameter manholes and five inches (5″) for forty eight inch (48″) diameter manholes. All other diameter manholes must have a minimum wall thickness of six inches (6″). Reinforced integral floors shall have a minimum thickness of six inches (6″).

4. Each precast reinforced concrete manhole riser and top section shall be clearly marked with the name or trademark of the manufacturer and the date of manufacture. This marking shall be indented into the manhole section or shall be painted on with waterproof paint.

5. Precast reinforced concrete manhole risers and top sections shall be subject to rejection for failure to conform to any of the Specification requirements. In addition, individual sections of manhole risers and tops may be rejected because of any of the following reasons:
   A. Fracture cracks passing through the walls, except for a single end crack that does not exceed the depth of the joint.
   B. Defects that indicate imperfect proportioning, mixing, or molding.
   C. Surface defects indicating honey-combed or open texture.
   D. Damaged ends, where such damage would prevent making a satisfactory joint.
   E. Manhole steps out of line or improperly spaced.

F. The interval diameter of the manhole section shall not vary more than one percent (1%) of the nominal diameter.
G. Any continuous cracking having a surface width of 0.01" or more and extending for a length of twelve inches (12") or more, regardless of the position in the section wall.

6. Concrete block for manholes shall be seven and three-quarters inches (7¾") thick, curved to fit a four-foot (4') inside diameter manhole, notched to fit manhole steps, and with corbel blocks to fit manhole ring as shown in the Detailed Drawings. Mortar shall be one (1) part Portland Cement and two (2) parts mortar sand.

7. Concrete block for the entire manhole may only be used where specified or with permission of the ENGINEER. A one-half inch (½") cement mortar back-plaster shall be used.

8. When the size or number of connections precludes the practical use of a precast bottom section, concrete block may be used up to approximately eight inches (8") above the top of the pipe.

3100.2.2 Butyl Rubber Sealant

1. Use materials conforming to the requirements for the class of the material named and specified below:
   A. Butyl Rubber Sealant **ASTM C-990**

3100.2.3 Manhole Steps

1. Unless otherwise called for in the Plans and Specifications, **manhole steps shall NOT be installed**.

3100.2.4 Sanitary Pipe to Manhole Connectors

1. Use materials conforming to the requirements for the class of material named and specified below:
   A. A-Lok Connectors **ASTM C-923**
   B. Z-Lok Connectors **ASTM C-923**
   C. Quick-Lok Connectors **ASTM C-923**

3100.2.5 Manhole Frames and Covers

1. Use materials conforming to the requirements for the class of material named and specified below:
   A. Grey Iron **ASTM A-48 Class 35B**
   B. Ductile Iron **ASTM A-536 Grade 80-55-06**

2. Manhole frames and covers shall be Neenah R-1710 frames with a solid Type B cover, with the word "SANITARY" cast in the cover, with locking cover and concealed pick holes. **Frames and covers are to be supplied by the City of Oshkosh.**

3. Manhole frames and covers, which are not Neenah Foundry, must be approved by the ENGINEER and meet the following requirements:
   A. All castings shall be uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion, or other effects. They shall be smooth and well-cleaned by shot-blasting.
   B. All castings shall be manufactured true to pattern and component parts shall fit together in a satisfactory manner. Round frames shall have machine bearing surfaces.
   C. Manhole frames shall have the following dimensions:
      1. Outside diameter: 35".
      2. Inside diameter: 24½".
      3. Diameter at cover flange: 20".
      4. Height: 9".
      5. Frame and cover shall not weigh less than 300 pounds.
      6. Cover and lid shall be twenty-two inches (22") diameter and one and one-half inches (1½") thick at outside edge, with indented top design. The word "SANITARY" shall be cast into the cover.
      7. Both frame and cover shall be designed for heavy duty use.

3100.2.6 Sanitary Manhole Adjustment Rings

1. Use materials conforming to the requirements for the class of material named and specified below:
   A. Precast Concrete Adjustment Rings **ASTM G-478**
   B. Rubber Adjustment Rings **ASTM D-573-04**

2. Precast concrete adjustment rings shall have an outside diameter of thirty-six inches (36") inches and an inside diameter of twenty-four inches (24"), with a minimum allowable thickness of three inches (3").

3. Rubber adjustment rings shall have an outside diameter of thirty-six inches (36") inches and an inside diameter of twenty-four inches (24"), with a minimum allowable thickness of two inches (2"). The rubber adjustment rings shall be "**Infra-Riser Multi-Purpose Rubber Adjustment Riser"** or Approved Equal.

3100.2.7 Internal/External Manhole Chimney Seals and Extensions

1. Use materials conforming to the requirements for the class of material and specified below:
   A. Cretex External Manhole Chimney Seal.
   B. Cretex External Manhole Chimney Seal Extension.

C. Infi-shield External Chimney Seals on Manhole Rehabilitation Project **ONLY**.

2. Internal Sealing System Flex Seal Utility Sealant kit to be used on existing manholes or flat deck structures **only when external chimney seal is not applicable**.

3. Manufacture guidelines shall be used as described to prepare the concrete structure surface as needed to allow for a proper bonding surface.

3100.3 Construction

3100.3.1 Excavation

3100.3.1.1 General

1. The excavation shall be limited to the size required for the manhole to be constructed and shall be sheathed and braced as necessary to protect the workman and prevent loss of ground.

2. Understand the proposed elevations for the sanitary manholes, as shown on the Plans, are subject to revisions in order to fit field conditions, and the ENGINEER may adjust the grades from those shown on the Plans.

3. Manholes shall be installed at the end of each line, at all changes in grade, size, or alignment, and at all pipe intersections.

4. Manholes shall be located at intervals not greater than four hundred feet (400') for sanitary sewers with diameters of fifteen inches (15") or less, not less than five hundred feet (500') for sanitary sewers between eighteen inches (18") and thirty inches (30"), and will be on a case-by-case basis for sanitary sewers larger than thirty inches (30") in diameter. See Project Plans for actual locations.

5. During the reconstruction of roadways, all sanitary manholes shall be installed to allow for access at all times. The manholes shall also be installed to allow positive drainage away from the cone opening. Care should be taken during construction to limit the amount of infiltration of clear water into the sanitary manholes. Sanitary manhole covers should be kept above grade during construction and sand bags shall be placed around the sanitary manhole covers. If sanitary manhole covers are removed and plated, the plates shall be caulked to obtain a watertight connection to the cone section. Sanitary manholes shall be covered at all times during reconstruction. Any other methods shall be approved by the ENGINEER.

3100.3.2 Constructing Foundation

1. Construct the foundation in the excavation to prevent subsequent settlement or rupture of the concrete manhole base.
2. The CONTRACTOR may not set the concrete manhole base in rock, wet conditions, or on a firm earth subgrade.

3. The CONTRACTOR shall set the concrete manhole base section on a backfilled granular foundation or bed. When placing the pipe on backfilled granular foundation, excavate the trench to at least six inches (6″) below the elevation established for the bottom of the concrete manhole base. Backfill this depth with **"¾-inch clear stone"** meeting the requirements for No. 1 stone in **Section 501.2.5.4** of the STATE SPECIFICATIONS**.** Compact the material before setting the concrete manhole base section.

4. If the Contract details types of bedding or required excavation widths others than those described above, conform to the Construction Details.

3100.3.3 Manhole Bases

3100.3.3.1 Field-Poured Base for Concrete Block Manholes

1. The concrete base shall have a minimum of six inches (6″) as shown in the standard Detail Drawings. The manhole base shall substantially conform to the required shape and dimensions; the excavation shall be back formed, if necessary, to achieve this end. If excavation in stable soil has been carried below the required depth, such excess depth shall be filled with concrete. Excess concrete shall not be deposited around the manhole in such a manner that will interfere with future connections. The pipe shall be supported on brick or solid concrete blocks for the pouring of the concrete base. The concrete of the base shall extend under the flexible pipe to where it rests in undisturbed soil. This concrete support for rigid pipe shall end in a vertical plane flush with the face of the bell.

3100.3.3.2 Field-Poured Base for Precast Manholes

1. The precast manhole bottom barrel section shall be set on concrete brick or block so the bottom section is below the spring line of the outlet pipe, set for proper location and plumbed. The manhole base of Class D concrete shall then be poured.

3100.3.3.3 Precast Manhole with Integral Base

1. The excavation shall be deep enough so that after the bottom has been placed thereon, set to grade and plumbed, there remains a six-inch (6″) minimum depth of bedding material below the bottom of the base. The annular space between the manhole excavation and the outside wall of the manhole section shall be backfilled with bedding material up to the

spring line of the incoming pipe. The invert shall not be poured until the manhole is completely built and backfilled. The invert shall be the same diameter as the larger of the adjoining sewers and shall be shaped as shown in the Special Details.

3100.3.4 Sanitary Manhole to Pipe Connections

1. A-Lok, Z-Lok, or Quick-Lok connectors shall be cast into the precast concrete manhole base section whenever possible. The connector shall be sized specifically for the type of pipe being used and shall be installed in accordance with the recommendations of the manufacturer.

2. When the A-Lok, Z-Lok, or Quick-Lok connector is made out in the field, the concrete manhole section must be cored per manufacturer's installation instructions. The connector shall be sized specifically for the type of pipe being used and shall be installed in accordance with the recommendations of the manufacturer. The seal between the connector and the pipe shall be made by compressing the connector against the outside circumference of the pipe by means of a stainless steel take down band.

3100.3.5 Concrete Walls and Chimneys

3100.3.5.1 Precast Concrete Manholes

1. Set manhole base on graded bedding material per Contract Specifications making sure that boots or pipe connections match design elevations. Level top of manhole base section in both directions.

2. The manhole walls shall be constructed at the specified diameter as shown on the Plans.

3. Use appropriate lifting slings that will adequately lift weight of units. The use of an approved or rate spreader bar is preferred. When lifting manhole bases and risers, make sure chain or cable lengths are long enough to prevent contract with tongue and groove area, and are kept at appropriate lifting angles. Use wooden blocks between sling and manhole wall, if necessary.

4. Clean and inspect tongue and groove surfaces. Surfaces should be clean from all dust and debris. On tongue-up manholes, place butyl material next to the vertical surface or tongue. Wrap material completely around unit overlapping ends. Knead the ends together to form a uniform splice. Make sure all protective paper is removed. Lower bell end of the next section making sure steps are aligned into final position. If bell is up, place butyl material next to vertical surface of groove and follow above procedure. All sections, as shown on the Shop Drawings, should be completed in this manner.

5. Lifting holes shall be sealed by inserting a rubber plug or other approved material into the hole, and filling it with non-shrink mortar from the inside and outside.

6. Backfill around manhole equally to prevent tipping. Compact fill in lifts same as the standard trench procedures, as stated in **Section 100.61** of these Specifications.
7. Testing procedures shall conform to **Section 3700** of these Specifications.

3100.3.5.2 Concrete Block Manholes

1. The manhole wall constructed of concrete block shall be constructed at the specified diameter as shown on the Plans up to the beginning of the corbel section. From this point, the manhole shall be corbelled in at approximately one-half inch (½″) horizontal to one inch (1″) vertical to the diameter of the manhole frame. The face of the manhole in which the steps are installed shall be kept vertical.

2. Backfill around manhole equally to prevent tipping. Compact fill in lifts same as the standard trench procedures, as stated in **Section 100.61** of these Specifications.

3. Testing procedures shall conform to **Section 3700** of these Specifications.

3100.3.6 Manhole Chimneys and Adjustment Rings

1. Chimneys three inches (3″) or more in height shall be constructed using concrete adjustment rings. The height of the grade ring shall equal (to within one inch (1″) and not to exceed) the height of adjustment to minimize the number of joints in the chimney section. Multiple grade rings will not be allowed where one (1) will suffice.

2. Chimneys less than three inches (3″) in height shall be constructed using rubber grade rings.

3. Concrete grade rings less than three inches (3″) in thickness are not allowed.

4. Grade rings shall be laid in a bead of flexible joint sealant, as specified. If the top of the precast riser is uneven, the ENGINEER may require a one and one-quarter inch (1¼″) diameter flexible sealant be used. Frames should be placed on 3½″ x 3/8″ bead of flexible joint sealant. On new subdivision (unimproved) streets, flexible sealant shall be omitted and the frames placed directly on the grade ring.

5. If final casting adjustment cannot be achieved using flexible sealant and/or rubber rings, the ENGINEER may allow the use of Class C concrete instead. The rubber rings and/or flexible sealant should be removed and concrete should be vibrated around the casting using a suitable spud type vibrator. Monolithic concrete shall be vibrated into the grade ring area and finished smooth on the inside of the structure.

6. The adjustment of rings and frame shall not exceed a total height of twenty-one inches (21″).

3100.3.7 External/Internal Manhole Chimney Seals and Extensions

1. Chimney seals, seal extensions, and internal manhole chimney sealants shall be installed in accordance with the recommendations of the manufacturer.

3100.3.8 Reconstructing Manholes

1. Reconstructing sanitary sewer manholes consist of the following:
   A. Remove existing casting.
   B. Remove existing adjustment.
   C. Remove top (cone section or other top that may be installed).
   D. Remove up to one barrel section.
   E. Replace barrel sections and top as required to meet elevations shown in Plans.
   F. Install new adjustment.
   G. Install new casting.

3100.3.9 Rebuilding Manholes

1. Rebuilding sanitary sewer manholes consist of the following:
   A. Remove existing casting.
   B. Remove existing adjustment.
   C. Remove top (cone section or other top that may be installed).
   D. Remove all barrel sections to manhole base.
   E. Replace barrel sections and top as required to meet elevations shown in Plans.
   F. Install new adjustment.
   G. Install new casting.

3100.3.10 Manhole Lid Plugs

1. All open pick holes on existing sanitary manholes within the limits of the project shall be plugged with a pick hole plug.

2. The CONTRACTOR shall furnish and install Cretex Manhole Lid Plugs and Style No. 3 Pick Holes Plugs or approved equal.

3. The CONTRACTOR shall determine the type and quantity of plugs required at each manhole.

4. The CONTRACTOR shall install plugs recessed into the hole being plugged. Do not allow plugs to extend above cover.

3100.4 Measurement

1. The CITY will measure the Sanitary Sewer Manhole Bid Items by the vertical foot that is acceptably completed. The measurement shall be from the flow line or invert of the outgoing sanitary sewer to the top of the structure. Since sanitary manhole castings are furnished by the CITY, they shall not be incorporated into the final measurement.

2. The CITY will measure the Reconstruct Sanitary Manhole and Rebuild Sanitary Manhole Bid Items by the vertical foot that is acceptably completed. The measurement shall be from the bottom of the newly installed barrel section to the top of the newly installed barrel section. If the reconstruct or rebuild sanitary manhole includes the manhole casting, the measurement for the casting will not be incorporated into the final measurement, since sanitary manhole castings are furnished by the CITY.

3. The CITY will measure the Sanitary Sewer External Manhole Chimney Seal, External Manhole Chimney Seal Extension, Internal Manhole Chimney Seal, or Internal Manhole Chimney Extensions Bid Items as each unit that is acceptably completed.

4. The CITY will measure the Manhole Lid Plug Bid Item as each unit that is acceptably completed.

3100.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
SANITARY SEWER MANHOLES		
3100	Furnish and Install Standard Sanitary Sewer Manhole (4′ Diameter)	VF
3101	Furnish and Install Standard Sanitary Sewer Manhole (4′ Diameter) with Slurry Backfill	VF
3102	Furnish and Install Standard Sanitary Sewer Manhole (5′ Diameter)	VF
3103	Furnish and Install Standard Sanitary Sewer Manhole (5′ Diameter) with Slurry Backfill	VF
3104	Furnish and Install Standard Sanitary Sewer Manhole (6′ Diameter)	VF
3106	Furnish and Install Standard Sanitary Sewer Manhole (7′ Diameter)	VF
3108	Furnish and Install Standard Sanitary Sewer Manhole (8′ Diameter)	VF
3110	Furnish and Install Standard Sanitary Sewer Manhole (9′ Diameter)	VF
3112	Furnish and Install Standard Sanitary Sewer Manhole (10′ Diameter)	VF
SANITARY SEWER MANHOLE CHIMNEY SEALS & EXTENSIONS		
3114	Furnish and Install Sanitary Sewer External Manhole Chimney Seal	EA
3116	Furnish and Install Sanitary Sewer External Manhole Chimney Seal	EA

Bid Item	Description	Units
	Extension	
3117	Furnish and Install 7″ Sanitary Sewer Internal Manhole Chimney Seal Extension	EA
3118	Furnish and Install Sanitary Sewer Internal Sealing System Flex Seal Utility Sealant Kit	EA
3119	Furnish and Install Sanitary Sewer Internal Sealing System Flex Seal Utility Sealant Kit Extension	EA
3120	Furnish and Install Sanitary Sewer Internal Chimney Seal Extension	EA
RECONSTRUCT SANITARY SEWER MANHOLES		
3122	Reconstruct Sanitary Sewer Manhole (4′ Diameter)	VF
3123	Reconstuct Sanitary Sewer Manhole (4′ Diameter) with Slurry Backfill	VF
3124	Reconstruct Sanitary Sewer Manhole (5′ Diameter)	VF
3125	Reconstruct Sanitary Sewer Manhole (5′ Diameter) with Slurry Backfill	VF
3126	Reconstruct Sanitary Sewer Manhole (6′ Diameter)	VF
3128	Reconstruct Sanitary Sewer Manhole (7′ Diameter)	VF
3130	Reconstruct Sanitary Sewer Manhole (8′ Diameter)	VF
3132	Reconstruct Sanitary Sewer Manhole (9′ Diameter)	VF
3134	Reconstruct Sanitary Sewer Manhole (10′ Diameter)	VF
REBUILD SANITARY SEWER MANHOLES		
3136	Rebuild Sanitary Sewer Manhole (4′ Diameter)	VF
3138	Rebuild Sanitary Sewer Manhole (5′ Diameter)	VF
3140	Rebuild Sanitary Sewer Manhole (6′ Diameter)	VF
3142	Rebuild Sanitary Sewer Manhole (7′ Diameter)	VF
3144	Rebuild Sanitary Sewer Manhole (8′ Diameter)	VF
3146	Rebuild Sanitary Sewer Manhole (9′ Diameter)	VF
3148	Rebuild Sanitary Sewer Manhole (10′ Diameter)	VF
MANHOLE LID PLUGS		
3150	Manhole Lid Plugs	EA
MANHOLE BENCHES		
3160	Pour and Reshape Manhole Bench	EA

2. Granular backfill material required for backfilling is incidental to the work.

3. Payment for the Sanitary Sewer Manholes Bid Items including New, Reconstructs, and Rebuilds is full compensation for providing all necessary labor, equipment, and materials; for excavation; for forming foundation; for sheeting and shoring; for dewatering; for all masonry; for backfilling; for compacting; for disposing of surplus material; and for cleaning

out and restoring the work site. Sanitary sewer manhole frames and lids are supplied by the CITY and will not be compensated for. Adjustment of the Sanitary Manhole will be paid for under a separate Bid Item.

4. Payment for the Sanitary Sewer External Manhole Chimney Seals, External Chimney Seal Extensions, Internal Sealing System Flex Seal Utility Sealant Kits, Internal Chimney Seal Extensions, and Internal Sealing System Flex Seal Utility Sealant Kit Extensions Bid Items is full compensation for providing all necessary labor, equipment, and materials to install the manhole chimney seal or extension; for sheeting and shoring; for dewatering; for backfilling; for compacting; for disposing of surplus material; and for cleaning out and restoring the work site.

5. Payment for the Manhole Lid Plugs Bid Item is full compensation for providing all necessary labor, equipment, and materials to install the manhole lid plug, and for cleaning out and restoring the work site.

6. Bid Items #3101 and #3103 shall be paid per **Section 3100.4** of these Specifications and shall be constructed following the requirements outlined in **Section 3100.5.3** of these Specifications, with the exception that the backfill materials shall be aggregate slurry backfill and shall be included in the cost per vertical foot of newly-installed manholes acceptably completed.

7. Bid Items #3117 and #3119 shall include the furnishing and installation of a Cretex internal chimney seal (or APPROVED EQUAL) of the specified size per the manufacturer's specifications. Bid Items #3117 and #3119 shall include all labor, equipment, and material to install either the specified seven-inch (7") or ten-inch (10") internal chimney seal extension.

8. Bid Items #3123 and #3125 shall be paid per **Section 3100.5.3** of these Specifications, with the exception that backfill material shall be aggregate slurry backfill and shall be included in the cost per vertical foot of reconstructed sanitary sewer manhole acceptably completed. The CONTRACTOR shall remove casting, adjustment, and existing cone and barrel sections, as necessary. The CONTRACTOR shall furnish and install new concrete rise/cone sections, as necessary, on top of the existing manhole sections. The CONTRACTOR shall supply concrete sections conforming to **Section 3100** of these Specifications. When using flat bottom sections, CONTRACTOR shall seal the outside of the manhole between the joint of the existing (flat, block, or concrete) structure and the new section(s) with a minimum of eight inches (8") of butyl wrap. The wrap shall be a minimum of sixty (60) mils thick and shall have the tensile strength conforming to **ASTM D-12** or APPROVED EQUAL.

9. Bid Item #3160 shall include all labor, equipment, and materials to form and reshape the flowline/bench of the manhole at required locations. The CONTRACTOR shall trowel hydro-cement mortar to form or reshape a manhole base in order to create a defined and neatly-finished flowline/bench. This Bid Item will be paid per each manhole bench acceptably completed.

SECTION 3200
SANITARY SEWER LATERALS

3200.1 Description

1. This Section describes excavating required trenches or tunnels, laying or constructing sanitary sewer lateral pipe inside, and then backfilling and cleaning out as necessary.

3200.1.1 Sanitary Sewer Lateral Televising

1. Sanitary sewer laterals within the Project limits have been televised and can be made available for viewing during construction, if requested. The majority of the sanitary laterals are also marked where they cross the right-of-way line with a six-inch (6″) spike and ribbon.

3200.2 Materials

1. Use materials conforming to the requirements for the class of the material named and specified below:
   A. Polyvinyl Chloride Sewer Pipe — **ASTM D-1785** or **SDR-40**
   B. Polyvinyl Chloride Sewer Fittings — **ASTM D-2564**
   C. Insert-a-Tee or Wye Gasketed Sewer Fitting — **ASTM D-3034 with ASTM F-477 Gaskets**

2. Sanitary sewer pipes shall be clearly marked as follows at intervals of five feet (5′) or less:
   A. Manufacturer's name or trademark.
   B. Nominal pipe size.
   C. Pipe classification.
   D. The legend, i.e. "SDR-40 PVC Sewer Pipe".
   E. ASTM designation.
   F. Extrusion date, period of manufacture, or lot number.

3. Packaging, handling, and shipment of sanitary sewer pipes shall be in accordance with manufacturer's instructions and specifications.

3200.2.1 Polyvinyl Chloride (PVC) Pipes

1. Pipes shall be stored in the supplier's yard or on the project site in accordance with **AWWA M23** and manufacturer's recommendations.

2. Pipe will not be stacked higher than four feet (4′) or on the bell ends.

3. Cover PVC pipe with an opaque material to protect it from the sun's ultraviolet radiation. PVC pipe that has been subjected to excessive ultraviolet radiation is identified by color fading or chalking and shall not be used. The determination as to the acceptability of the pipe rests solely on the ENGINEER's decision.

4. Pipe that has been contaminated in any way with petroleum products on the inside or outside of the pipe shall not be used.

3200.3 Construction

3200.3.1 Excavation

3200.3.1.1 General

1. Unless otherwise specified in the Contract or the ENGINEER allows, perform sewer lateral construction in open trenches and in a manner that protects the pipelines or sewers from unusual stresses.

2. Excavate the trenches in reasonably close conformity with the Plans and as the ENGINEER laid out in the field. Begin each trench excavation at the proposed sewer outlet and proceed to the upper end.

3. Keep trenches dewatered at all times.

4. If the Contract specifies or the ENGINEER allows, the CONTRACTOR may construct sewer laterals by tunneling or jacking instead of open trenches. Adhere to the Construction Details, Construction Specifications, and ENGINEER's decision.

5. Understand the proposed elevations for the sanitary sewers as shown on the Plans are subject to revisions in order to fit field conditions, and the ENGINEER may adjust the profile grades from those the Plans show.

3200.3.1.2 Rock Excavation for Sanitary Sewer Laterals

1. Classify rock excavation for sanitary sewer laterals as specified for Rock Excavation in **Section 3600** of these Specifications, except classify the necessary removal of all rock boulders with a volume of one-half (½) cubic yard or more, as Rock Excavation.

3200.3.2 Constructing Foundation

1. Construct the foundation in the trench to prevent subsequent settlement and rupture of the sewer pipe.

2. The CONTRACTOR may not lay the pipe in rock, wet conditions, or on a firm earth subgrade.

3. The CONTRACTOR shall lay the pipe on a backfilled granular foundation or bed. When placing the pipe on backfilled granular foundation, excavate the trench to at least six inches (6″) below the elevation established for the bottom of the pipe. Backfill this depth with **"¾-inch clear stone"** meeting the requirements for No. 1 stone in **Section 501.2.5.4** of the STATE SPECIFICATIONS**.** Compact the material before laying the pipe on the backfilled granular material.

4. After laying the pipe, bedding material shall be placed around the sides of the pipe, except reinforced concrete pipe, up to a level six inches (6″) above the top of the pipe. This material shall be placed by hand or equally careful means. When reinforced concrete pipe is installed, the bedding stone shall extend to the spring line of the pipe.

5. Excavate recesses to receive bells as necessary.

6. If the Contract details types of bedding, or required trench widths other than described above, conform to the Construction Details.

3200.3.3 Laying Sanitary Sewer Lateral

1. Begin pipe laying in finished trenches at the lowest point and proceed towards the upper end. Also lay the pipe so the spigot or tongue ends point in the direction of flow. Each pipe shall be laid in a straight grade and, unless otherwise specified, at right angles to the sanitary sewer main.

2. Clean sockets carefully before lowering pipes into trenches. Lower and place to avoid unnecessary handling in the trench or damage to the pipe. Provide a firm bearing beneath the entire length of each section and make it substantially true to the line and grade required. Laterals should be constructed by means of using the least amount of joints as possible.

3. Lay all pipes with ends abutting. Take care when shoving the pipes together so the joints are properly adjusted and not overly large. Fit pipes so they form a sewer with a smooth and uniform invert. Lateral joint connection shall be joined by solvent cement per **ASTM D-2564.**

4. Sanitary sewer laterals will be laid at a minimum of one-quarter inch (¼″) per foot, unless otherwise approved by the ENGINEER.

5. Sanitary sewer lateral connections to the main line sewer between eight inches (8″) and twelve inches (12″) in diameter shall be by factory wye or tee. Sanitary sewer mains fifteen

inches (15″) in diameter or larger may use Insert-A-Tee, Kor-N-Tee, or EZ Tee connections. No saddle connections will be allowed except for where allowed by **Section 3200.3.11** of these Specifications.

6. Sanitary sewer lateral connections to the existing laterals shall be made with a Fernco connection.

7. No sanitary sewer laterals shall discharge directly into a manhole unless approved by the ENGINEER.

8. The minimum size of sanitary laterals shall be four inches (4″) in diameter.

9. The sanitary lateral should have a minimum depth of eight feet (8′) at property line or right-of-way. If the sanitary main is not sufficiently deep enough to give this depth, then the lateral shall be laid to a minimum grade of one-eighth inch (1/8″) per foot.

10. When the sanitary main is deeper than normal, the CONTRACTOR may choose to install the lateral on a slant of the main in lieu of installing a standard riser section. The lateral must be laid in undisturbed soil with base in place if this method is chosen. If the CONTRACTOR chooses to not construct a riser, no extra monies will be paid for slanting the lateral up to normal levels.

11. If the CONTRACTOR chooses to install a lateral, it shall be installed per the standard Detail Drawings.

12. Sanitary laterals are to be relayed to the back of the sidewalk. CONTRACTOR may have to remove sidewalk squares in order to accomplish this and should coordinate with the City Inspector or ENGINEER on the amount of sidewalk removal prior to the removal taking place.

3200.3.4 Laying of Pipes in Cold Weather

1. The ENGINEER reserves the right to order pipe laying discontinued whenever, in their opinion, there is a danger of the quality of work being impaired because of cold weather.

2. The CONTRACTOR shall be responsible for heating the pipe and jointing material so as to prevent freezing of joints.

3. No pipe shall be laid on or in frozen ground.

3200.3.5 Joints

1. For Polyvinyl Chloride Sewer Pipe, the CONTRACTOR shall use solvent cemented joints; the bell and spigot ends of the pipe shall be cleaned and dried prior to the application of the solvent cement with a cloth moistened with methyl-ethyl-ketone. Using a brush, the solvent cement is liberally applied to the spigot a distance equal to the joint depth and lightly applied to the inside of the bell. Immediately thereafter, the joint shall be made by inserting the spigot into the bell and pushing it home as far as possible. The pipe then shall be rotated thirty degrees (30°) to ninety degrees (90°) to distribute the cement.

2. As with any solvent cemented joints, the pipe must be cut square and cleaned. A circular blade with twenty (20) or less teeth is preferred over a finer blade which tends to heat the PVC material as it cuts, resulting in a molten PVC residue producing a rough cut.

3. After the pipe is cut to length, the outside and inside edges are to be deburred. This can be easily achieved by scraping these edges with a sharp-edged piece of steel (i.e. file). This is a relatively easy step and only takes a few moments, but is a critical step.

4. Align the pipe and fittings as close to its final position as possible. Elevate both the pipe and fittings so the entire circumference is accessible.

5. Mechanical devices, such as come-alongs, are strongly recommended to pull the pipe into the fitting socket. The use of chains to "grasp" the pipe is an option, but they may also slip. Sufficient cable or chain, enough to run the entire length of the twenty feet (20') of pipe must be laid out on either side of the joint, prior to assembly. Additional cable must be laid out to secure it to four inch (4") x four inch (4") block, extending approximately one foot (1') beyond the pipe on side. Cumbersome as it might appear, this method offers a more positive pull than other methods.

3200.3.6 Backfilling

1. Backfill all sanitary sewer laterals as described in **Section 100.61** of these Specifications.

3200.3.7 Cleaning of Sanitary Sewer Laterals

1. Clean all new or relayed sewers of accumulations of silt, debris, and other foreign matter, and before acceptance, test all installations with the testing procedures described in **Section 3700** of these Specifications.

3200.3.8 Sanitary Sewer Factory Wyes/Tees

1. Factory-wyes or tees or injection molded wyes or tees, where available, for lateral connections shall be required on all sanitary sewer mains that are twelve inches (12″) or less in diameter. Wyes shall point downstream and enter the sanitary main at an angle of not less than five degrees (5°) and no more than forty-five degrees (45°) off vertical.

2. For sanitary sewer depth greater than fifteen feet (15′) in depth, a factory tee or injection molded tee, where available, must be used. A bell-to-bell connection shall be used for the SDR 35 to SDR 40 adaptor.

3. When factory rubber gaskets are used, the outside of the gasket and the inside of the bell or groove shall be lubricated with an approved lubricant. The spigot or tongue of the pipe being laid shall be introduced into the bell or groove of the factory wye or tee.

4. For sanitary sewers mains fifteen inches (15″) or greater in diameter, the CONTRACTOR has the option to use either Insert-A-Tee, or Insert-A-Wyes in lieu of factory wyes or tees.

5. Sanitary sewer lateral connections to the main line sewer between and including eight inches (8″) and twelve inches (12″) in diameter shall be by factory wye or tee. Sanitary sewer mains fifteen inches (15″) or greater may use Insert-A-Tee, EZ Tee, or Kor-N-Tee connections. No saddle connections will be allowed, except as listed in **Section 3200.3.11** of these Specifications.

6. For all existing sanitary sewer mains which are made of vitrified clay, concrete, cast iron, or other materials and which are twelve inches (12″) or less in diameter, the CONTRACTOR shall cut out a section of the existing sanitary main and install either a factory wye or tee with a minimum two-foot (2′) piece of PVC pipe on each side of the factory wye or tee and use a shear Fernco on each end to attach to the existing sanitary main. In existing sanitary sewer mains where there is an extremely high flow, the ENGINEER may approve an alternate method for lateral connection.

3200.3.9 Gasketed Insert-A-Tee and Insert-A-Wye Fittings

1. For sanitary sewer mains fifteen inches (15″) or greater in diameter, the CONTRACTOR has the option to use either Insert-A-Tee, EZ Tee, Kor-N-Tee, or Insert-A-Wye in lieu of factory wyes or tees. All gasketed wye and tee fittings shall be manufactured and supplied per **ASTM D-3034** and consist of molded and fabricated fittings to meet **ASTM F-1336**. All fitting gaskets shall be an elastomeric seal and meet **ASTM D-3212** and **ASTM F-477** for flexible elastomeric seal joint connections and joining plastic pipe. All gasketed lateral fitting connections shall be installed to be watertight.

2. The CONTRACTOR shall core the proper size into the sanitary sewer.

3. The CONTRACTOR shall insert the rubber sleeve into the cored hole with the gold vertical line on the rubber sleeve facing to the side of the main line sewer. The upper segment should be on top of the wall and the lower segment should be on the inside of the pipe.

4. Apply the Insert-A-Tee solution to the inside of the rubber sleeve and the outside of the PVC hub adaptor. Caution, using pipe lubricant may cause the hub adaptor to pop out.

5. Place the PVC hub adaptor into the rubber sleeve. Make sure the red vertical line on the PVC hub adaptor is in line with the gold vertical line on the rubber sleeve.

6. Place a 2″ x 4″ board on top of the PVC hub adaptor.

7. The red horizontal line at the top of the hub adaptor is a depth mark. Using a board and hammer, drive the PVC hub adaptor into the rubber sleeve to where the red horizontal line on the PVC hub adaptor meets the top of the rubber sleeve.

8. Place the stainless steel band around the top of the rubber sleeve and tighten down.

9. Install side service lateral pipe in normal manner.

10. The CONTRACTOR has the option to use an EZ-Tee lateral connection in lieu of the ADS Insert-a-Tee brand. CONTRACTOR shall follow these Specifications and manufacturer's installation procedure for an EZ Tee lateral connection.

3200.3.10 Kor-N-Tee

1. For concrete sanitary sewer mains twelve inches (12″) or greater in diameter, the CONTRACTOR has the option to use Kor-N Tees in lieu of factory wyes or tees.

2. The CONTRACTOR shall core into the sanitary sewer main line consistent with the model number of the lateral pipe outside diameter.

3. Inspect the inside surface of the cored hole. If there is porosity or wire to cement separation, use patching or hydraulic cement to smooth the surface.

4. Insert the Kor-N-Tee assembly into the hole and expand the wedge or Toggle Korband.

5. Inset the lateral until it bottoms on the positive stop of the Kor-N-Tee.

6. Install the lateral pipe clamp and tighten to sixty (60) pounds using T-Handle Torque wrench.

3200.3.11 PVC Saddles

1. For existing PVC sanitary sewer mains eight inches (8″) or greater in diameter, the CONTRACTOR has the option to install a PVC saddle for each lateral connection per manufacturer's directions.

2. For all existing sanitary sewer mains which are made of vitrified clay, concrete, cast iron, or other materials, which are eight inches (8″) or greater in diameter, and the street is listed on the five-year Capital Improvement Program, the CONTRACTOR may install a PVC saddle with mastic. The CONTRACTOR shall install the saddle prior to core drilling the hole into the pipe.

3200.3.12 Sanitary Sewer Marker Balls

1. Effective December 31, 2006, ACT 425, **Chapter 182.0715(2r)** of the Wisconsin State Statutes requires all non-metallic building sewers (including sanitary laterals, private sanitary sewers, and storm laterals) installed within the City Right-of-Way, shall be accompanied by means of locating the newly-installed underground pipe. Sewer mains that have a manhole or inlet structure on both ends within the City Right-of-Way are considered exempt from this legislation.

2. The CITY's marker system includes the installation of marker balls over the sanitary facilities.

3. The **3M ScotchMark Electronic Marker System Full Range Marker (Model 1404-XR for wastewater)** shall be considered an acceptable marker device for this Specification. If an alternate marker is desired, the CONTRACTOR shall provide specifications and data sheets of the proposed device to the ENGINEER prior to construction in order for the CITY to confirm that the proposed marker device is compatible with the CITY's marking equipment.

4. Each sanitary lateral shall have a minimum of two (2) marker balls: one (1) to be located above the connection to the main line sanitary sewer and one (1) to be located at or near the property line or at the end of the proposed relay/new installation (two feet (2′) off the back edge of the sidewalk into the right-of-way is preferred). Additional marker balls shall be required at all horizontal alignment changes.

5. The marker balls are to be installed to a depth of no more than five feet (5′) below finish grade.

6. The CONTRACTOR shall securely fasten the marker ball to a CONTRACTOR-supplied No. 4 rebar, set plumb over the desired location at the required depth below the finished grade (see **Standard Detail Drawing**).

7. Upon completion, the CITY will test each sanitary marker ball to confirm it was installed and functioning properly. If it is determined the lateral marker ball has not been installed or not functioning, the CONTRACTOR will be responsible for the re-installation of a new marker ball. No additional compensation will be provided for the additional marker balls or labor to install the marker balls at the same location.

3200.3.13 Sanitary Sewer Clay Dams

1. After installation of the sanitary sewer lateral pipe, a clay dam will be installed at each lateral (see **Standard Detailed Drawing**).

2. The clay dam shall be placed in the terrace area, and be excavated to a depth of one foot (1′) below the bottom of the lateral.

3. The CONTRACTOR shall place no stone in the trench in this area, but shall backfill and compact the entire trench with clay to a depth one foot (1′) below finished grade.

4. The clay shall extend the entire width of the trench and be a minimum length thickness of four feet (4′).

5. The CONTRACTOR cannot substitute other materials, unless approved by the ENGINEER.

3200.3.14 Slurry Backfill in Lateral Trenches

1. In areas where the *Construction Access Agreement* has not been signed and returned, the ENGINEER will order the CONTRACTOR to use an aggregate slurry backfill for the lateral trenches at the connection.

2. The unit price for this Bid Item shall include all necessary labor, equipment, and materials to slurry the lateral trench.

3. This Bid Item will be measured by the cubic yard for the trench backfill material that is installed.

4. The quantity in the estimate of quantities is only an estimate. The CONTRACTOR will be paid based on the actual, installed quantities only and no adjustments in unit prices will be made for any increases or decreases of quantity installed.

3200.3.15 Tunnel Underneath Retaining Walls for Laterals

1. In areas where the CONTRACTOR is required by the ENGINEER to install a utility lateral to the property underneath an existing retaining wall, the CONTRACTOR shall carefully excavate on each side of the retaining wall in order to avoid damage to the existing retaining

wall and push the lateral pipe through the excavated opening. CONTRACTOR then shall slurry the trench with an aggregate slurry backfill. The cost of the slurry will be included in the unit price of the Tunnel Underneath Retaining Walls for Laterals Bid Item.

2. The unit price for this Bid Item shall include all necessary labor, equipment, and materials to excavate and push the utility lateral underneath the existing retaining wall.

3. This Bid Item will be measured by each tunnel that is acceptably completed.

4. The quantity in the estimate of quantities is only an estimate. The CONTRACTOR will be paid based on the actual installed quantities only and no adjustments in unit prices will be made for any increases or decreases of quantity installed.

3200.4 Measurement

3200.4.1 Sanitary Sewer Factory Wyes or Tees, Insert-A-Tee, Insert-A-Wye, Kor-N-Tee, or PVC Saddles

1. The CITY will measure the Sanitary Sewer Factory Wyes/Tees, Insert-A-Tees, Insert-A-Wye, Kor-N-Tee, or PVC Saddles Bid Items as each individual unit that is acceptably completed.

3200.4.2 Sanitary Sewer Laterals and Risers

1. The CITY will measure the Sanitary Sewer Lateral Pipe Bid Items by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the pipe, from sanitary sewer factory wye/tee to the connection of the existing sanitary lateral. All additional piping and fittings required for riser sections will also be paid for by the linear foot and paid for by the linear foot of sanitary lateral riser length installed under the Riser Bid Item.

3200.4.3 Sanitary Sewer Marker Balls

1. The CITY will measure the Sanitary Sewer Marker Ball Bid Item as each individual unit that is acceptably completed.

3200.4.4 Sanitary Sewer Clay Dams

1. The CITY will measure the Sanitary Sewer Clay Dam Bid Item as each individual unit that is acceptably completed

3200.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
SANITARY SEWER FACTORY WYES/TEES		
3200	Furnish and Install Sanitary Sewer 8″ x 4″ Factory Wye or Tee	EA
3202	Furnish and Install Sanitary Sewer 10″ x 4″ Factory Wye or Tee	EA
3204	Furnish and Install Sanitary Sewer 12″ x 4″ Factory Wye or Tee	EA
3206	Furnish and Install Sanitary Sewer 15″ x 4″ Factory Wye or Tee	EA
3208	Furnish and Install Sanitary Sewer 18″ x 4″ Factory Wye or Tee	EA
3210	Furnish and Install Sanitary Sewer 8″ x 6″ Factory Wye or Tee	EA
3212	Furnish and Install Sanitary Sewer 10″ x 6″ Factory Wye or Tee	EA
3214	Furnish and Install Sanitary Sewer 12″ x 6″ Factory Wye or Tee	EA
3216	Furnish and Install Sanitary Sewer 15″ x 6″ Factory Wye or Tee	EA
3218	Furnish and Install Sanitary Sewer 18″ x 6″ Factory Wye or Tee	EA
3219	Furnish and Install Sanitary Sewer 8″ x 8″ Factory Wye or Tee	EA
3220	Furnish and Install Sanitary Sewer 4″ Insert-A-Tee or Kor-N-Tee	EA
3222	Furnish and Install Sanitary Sewer 6″ Insert-A-Tee or Kor-N-Tee	EA
3224	Furnish and Install Sanitary Sewer PVC Saddle	EA
SANITARY SEWER RELAY LATERAL PIPE		
3230	Furnish and Install 4″ Sanitary Sewer Lateral (New)	LF
3231	Furnish and Install 4″ Sanitary Sewer Riser (New)	LF
3232	Furnish and Install 6″ Sanitary Sewer Lateral (New)	LF
3233	Furnish and Install 6″ Sanitary Sewer Riser (New)	LF
3234	Furnish and Install 4″/6″ Sanitary Sewer Lateral (Relay)	LF
3235	Furnish and Install 4″/6″ Sanitary Sewer Riser (Relay)	LF
SANITARY SEWER MARKER BALLS		
3236	Furnish and Install Sanitary Sewer Lateral Marker Balls	EA
SANITARY LATERAL CLAY DAMS		
3238	Furnish and Install Sanitary Sewer Lateral Clay Dams	EA
SANITARY LATERAL TUNNEL UNDERNEATH EXISTING RETAINING WALLS		
3240	Tunnel Underneath Existing Retaining Walls (Sanitary Laterals)	EA
SANITARY LATERAL SLURRY BACKFILL		
3242	Slurry Backfill (Sanitary Laterals)	CY

3200.5.1 Sanitary Sewer Factory Wyes/Tees, Insert-A-Tees, Insert-A-Wye, Kor-N-Tee, or PVC Saddles

1. Payment for Sanitary Sewer Factory Wyes/Tees, Insert-A-Tees, Insert-A-Wye, Kor-N-Tee, EZ Tee or PVC Saddle Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for by-pass pumping; for forming foundation; for sealing joints; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation, Lateral Pipe Laying, Connections to Existing Sanitary Mains, and Coring into Existing Manholes will be paid for under separate Bid Items.

3200.5.2 Sanitary Sewer Laterals (New)

1. Payment for Sanitary Sewer Lateral (New) Bid Items is full compensation for providing all necessary labor, equipment, and materials (including all necessary bends, fittings, and cleanouts); for excavating; for sheeting and shoring; for by-pass pumping; for forming foundation; for laying pipe; for sealing joints; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation, Factory Wyes, Connections to Existing Sanitary Mains, and Coring into Existing Manholes will be paid for under separate Bid Items.

2. Apply Contract unit prices, without adjustment, to the quantities of sanitary sewer new pipes constructed at elevations not greater than one foot (1′) above or below what the Plans show. If the ENGINEER orders the construction of the sanitary sewer lateral new pipes or portions of the pipes at elevations greater than one foot (1′) above or below what the Plans show, then the CITY will pay for this work as specified extra work.

3. Work performed one foot (1′) or less below the pipe bottom to form a satisfactory foundation as specified is incidental to the work. The CITY will pay for work required at depths greater than one foot (1′) below the pipe bottom as extra work.

3200.5.3 Sanitary Sewer Laterals (Relay)

1. Payment for Sanitary Sewer Lateral (Relay) Bid Items is full compensation for providing all necessary labor, equipment, and materials (including all necessary bends, fittings, and cleanouts); for excavating; for sheeting and shoring; for forming foundation; for laying pipe; for sealing joints; for connecting to the existing lateral with a Fernco connection; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation, Factory Wyes, Connections to Existing Sanitary Mains, and Coring into Existing Manholes will be paid for under separate Bid Items.

2. Apply Contract unit prices, without adjustment, to the quantities of sanitary sewer relay pipes constructed at elevations not greater than one foot (1′) above or below what the Plans show. If the ENGINEER orders the construction of the sanitary sewer relay pipes or portions of the pipes at elevations greater than one foot (1′) above or below what the Plans show, then the CITY will pay for this work as specified extra work.

3. Work performed one foot (1′) or less below the pipe bottom to form a satisfactory foundation as specified is incidental to the work. The CITY will pay for work required at depths greater than one foot (1′) below the pipe bottom as extra work.

3200.5.4 Sanitary Sewer Marker Balls

1. Payment for Sanitary Sewer Marker Balls Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for No. 4 Rebar; for placing marker balls; for testing of marker balls for functionality; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation, Factory Wyes, Sanitary Sewer Laterals, Connections to Existing Sanitary Mains, and Coring into Existing Manholes will be paid for under separate Bid Items.

2. Upon installation and backfilling, the CONTRACTOR will test each sanitary sewer marker ball to conform it is installed and functioning properly. If it is determined the sanitary sewer marker ball has not been installed or functioning properly, the CONTRACTOR will replace said non-functioning marker ball with a new marker ball. No additional compensation will be provided for the additional balls required for non-functioning marker balls.

3200.5.5 Sanitary Sewer Clay Dams

1. Payment for the Sanitary Sewer Clay Dam Bid Item is for full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for providing clay backfill material; for backfilling; for compacting; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation, Factory Wyes, Sanitary Sewer Laterals, Connections to Existing Sanitary Sewer Mains will be paid for under separate Bid Items.

SECTION 3300
SANITARY SEWER CONNECTIONS

3300.1 Description

1. This Section describes constructing connections to existing sanitary sewer mains by means of flexible couplings, concrete collars, or coring into existing manholes, and it includes all necessary excavating and backfilling.

3300.2 Materials

1. Use materials conforming to the requirements for the class of the material named and specified below:

A. Flexible Coupling (Stock Couplings)	**ASTM D-5926**
B. Flexible Coupling (Large Diameter)	**ASTM D-5926**
C. Non-Flexible Coupling	**ASTM D-5926**
D. Concrete Collars	**Class C Concrete**

3300.3 Construction

3300.3.1 Excavation

1. Unless otherwise specified in the Contract or the ENGINEER allows, perform sewer construction in open trenches and in a manner that protects the pipelines or sewers from unusual stresses.

2. Understand the proposed elevations for the sanitary sewers as shown on the Plans are subject to revisions in order to fit field conditions. The ENGINEER may have to adjust the profile grades from those shown on the Plans.

3300.3.2 Rock Excavation for Sanitary Sewer Connections

1. Classify rock excavation for sanitary sewer connections as specified for Rock Excavation in **Section 3600** in these Specifications, except classify the necessary removal of all rock boulders with a volume of one-half (½) cubic yard or more, as Rock Excavation.

3300.3.3 Constructing Foundation

1. Construct the foundation in the trench to prevent subsequent settlement and rupture of the sewer pipe.

2. The CONTRACTOR may not lay the pipe in rock, wet conditions, or on a firm earth subgrade.

3. The CONTRACTOR shall lay the pipe on a backfilled granular foundation or bed. When placing the pipe on backfilled granular foundation, excavate the trench to at least six inches (6") below the elevation established for the bottom of the pipe. Backfill this depth with **"¾-inch clear stone"** meeting the requirements for No. 1 stone in **Section 501.2.5.4** of the STATE SPECIFICATIONS**.** Compact the material before laying the pipe on the backfilled granular material.

4. After laying the pipe, bedding material shall be placed around the sides of the pipe, except reinforced concrete pipe, up to a level six inches (6") above the top of the pipe. This material shall be placed by hand or equally careful means. When reinforced concrete pipe is installed, the bedding stone shall extend to the spring line of the pipe.

5. Excavate recesses to receive bells as necessary.

6. If the Contract details types of bedding, or required trench widths other than described above, conform to the Construction Details.

3300.3.4 Laying of Pipes in Cold Weather

1. The ENGINEER reserves the right to order pipe laying discontinued whenever, in their opinion, there is a danger of the quality of work being impaired because of cold weather.

2. The CONTRACTOR shall be responsible for heating the pipe and jointing material so as to prevent freezing of joints.

3. No pipe shall be laid on or in frozen ground.

3300.3.5 Flexible Couplings to Existing Mains

1. Reconnect all existing live sanitary sewer main line pipes to the proposed sanitary sewer. When a new sanitary pipe is connected to an existing pipe, a watertight joint using a flexible coupling **(Ferncoe** or **Approved Equal)** is required along with the following installation instructions:
   A. Loosen the stainless steel clamps, but do not remove them from coupling.
   B. Slide flexible coupling over the plain spigot ends of the two (2) pipes.
   C. Tighten clamps to 60 inch-pounds of torque.
   D. Pressure test before backfilling or concealing joint. Bed and backfill properly.

3300.3.6 Flexible Couplings for Insertions

1. Ferncoe couplings can be used to couple pipe when there is a break or insertions are needed.

2. Remove pipe sections, then slide flexible couplings over both pipe ends.

3. Insert new pipe or fitting, then slide flexible coupling over new and old pipe ends.

4. Tighten clamps to 60 inch-pound torque.

5. Pressure test before backfilling or concealing joint. Bed and backfill properly.

3300.3.7 Flexible Couplings for Large Diameter Sanitary Sewer Pipes

1. Lay the proper bedding.

2. When cutting pipe sections, take care to cut as straight as possible.

3. Clean the pipe sections; they should be clean from any dirt or debris.

4. Slide the Ferncoe reducer bushing onto the smaller pipe section. Slide it far enough to allow room for the entire coupling (the lip of the bushing first).

5. Slide the coupling onto the reducer bushing with the end of the pipe exposed.

6. Place other pipe section into position.

7. Slide the coupling and bushing assembly down the pipe so there is an even amount of the coupling on each of the two (2) pipe sections.

8. Tighten the stainless steel clamps to 60 inch-pound torque.

9. Pressure test before backfilling or concealing joint. Bed and backfill properly.

3300.3.8 Concrete Collars

1. Use concrete collars only when approved by the ENGINEER and then only to make connections between dissimilar pipes or where Ferncoe couplings are impractical.

2. Place the collars using an approved commercial concrete bonding agent applied to all surfaces in contact with the collar. When concrete closure collars are necessary to join PVC pipe, prepare the PVC surface first for bonding to the concrete by applying a dense coating of clean mortar sand to the pipe using PVC solvent cement. After the cement has cured, apply only an approved commercial bonding agent to the surface prior to placement of the concrete.

3. When connecting to an existing stub, provide a watertight joint by wrapping the connection with a sealing band (Cadilloc or Approved Equal) meeting the requirements of **ASTM C877**. Place the concrete collar containing Class "C" concrete around the connection.

4. The collar should be six inches (6″) thick by twenty-four inches (24″) in width and be reinforced with a 6 x 6 or 10 x 10 gauge steel mesh reinforcing.

5. Remove any projections at the connection that might cut or damage the sealing band. Take special care when backfilling around the sealing band to help prevent disturbance to the connection.

3300.3.9 Core into Existing Manholes

1. The CONTRACTOR shall core the proper size hole into the existing manhole.

2. The CONTRACTOR shall install an A-Lok connector in accordance with the recommendations of the manufacturer.

3. Slide the pipe into the A-Lok connector.

4. Check for proper alignment and grade.

5. Tighten the stainless steel clamps to 60 inch-pounds torque.

3300.4 Measurement

3300.4.1 Connections to Existing Sanitary Sewer With Flexible Couplings

1. The CITY will measure the Connection to Existing Sanitary Sewer with Flexible Coupling Bid Items as each individual unit that is acceptably completed.

3300.4.2 Sanitary Sewer Concrete Collars

1. The CITY will measure the Sanitary Sewer Concrete Collar Bid Item as each individual unit that is acceptably completed.

3300.4.3 Core into Existing Sanitary Sewer Manhole

1. The CITY will measure the Core into Existing Sanitary Sewer Manhole Bid Item as each individual unit that is acceptably completed.

3300.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
CONNECTIONS TO EXISTING SANITARY SEWER MAINS		
3300	Furnish and Install Connection to Existing Sanitary Sewer 8″ Mains	EA
3302	Furnish and Install Connection to Existing Sanitary Sewer 10″ Mains	EA
3304	Furnish and Install Connection to Existing Sanitary Sewer 12″ Mains	EA
3306	Furnish and Install Connection to Existing Sanitary Sewer 15″ Mains	EA
3308	Furnish and Install Connection to Existing Sanitary Sewer 18″ Mains	EA
3310	Furnish and Install Connection to Existing Sanitary Sewer 21″ Mains	EA
3312	Furnish and Install Connection to Existing Sanitary Sewer 24″ Mains	EA
3313	Furnish and Install Connection to Existing Sanitary Sewer 27″ Mains	EA
3314	Furnish and Install Connection to Existing Sanitary Sewer 30″ Mains	EA
3315	Furnish and Install Connection to Existing Sanitary Sewer 33″ Mains	EA
3316	Furnish and Install Connection to Existing Sanitary Sewer 36″ Mains	EA
3318	Furnish and Install Connection to Existing Sanitary Sewer 42″ Mains	EA
3320	Furnish and Install Connection to Existing Sanitary Sewer 48″ Mains	EA
3322	Furnish and Install Connection to Existing Sanitary Sewer 54″ Mains	EA
3324	Furnish and Install Connection to Existing Sanitary Sewer 60″ Mains	EA
3326	Furnish and Install Connection to Existing Sanitary Sewer 66″ Mains	EA
3328	Furnish and Install Connection to Existing Sanitary Sewer 72″ Mains	EA
SANITARY SEWER CONCRETE COLLARS		
3330	Furnish and Install Sanitary Sewer Concrete Collars	EA
CORE INTO EXISTING SANITARY SEWER MANHOLES		
3332	Core into Existing Sanitary Sewer Manhole	EA

3300.5.1 Connections to Existing Sanitary Sewer with Flexible Couplings

1. Payment for the Connections to Existing Sanitary Sewer with Flexible Couplings Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for by-pass pumping; for forming foundation; for flexible coupling; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of work.

3300.5.2 Sanitary Sewer Concrete Collars

1. Payment for the Sanitary Sewer Concrete Collars Bid Item is full compensation for providing all necessary labor, equipment, and materials; for excavation; for sheeting and shoring; for by-pass pumping; for forming foundation; for concrete collars; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of work.

3300.5.3 Core into Existing Sanitary Sewer Manholes

1. Payment for the Core into Existing Sanitary Sewer Manholes Bid Item is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for by-pass pumping; for forming foundation; for coring into existing manhole; for installing the A-Lok connector; for connecting to proposed pipe; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of work.

SECTION 3400
SANITARY SEWER CASING PIPES
TRENCHLESS AND OPEN CUT METHODS

3400.1 Description

1. This Section describes furnishing and installing casing pipes of various sizes by the open cut or the following trenchless methods: Jack and Bore, Horizontal Drilling, Micro-Tunneling, or Hand Mining.

3400.2 Materials

1. Use materials conforming to the requirements for the class of the material named and specified below:

A. Steel Casing Pipes	**ASTM A-36**
B. Ductile Iron Casing Pipe	**ASTM A-716**
C. Concrete Casing Pipes	**ASTM C-76**
D. Fiberglass Reinforced Polymer Mortar Pipe	**ASTM D-3262**
E. Pre-Stressed Concrete Pipe	**AWWA C300**
F. Polyvinyl Chloride	**ASTM D-1785**
G. Cast Iron Casing Pipe	**WW-P-421b**

2. Unless otherwise tested or approved by the CITY, only use encasement pipe or uncased carrier pipe that is new and has smooth interior and exterior walls.

3400.3 Construction

3400.3.1 General Rules for Trenchless Installation

1. Jack and bore is a method of installing a product (often called a casing) that may serve as a direct conduit for liquids or as a duct for a carrier pipe. It is a multi-stage process consisting of constructing a temporary horizontal jacking platform and a starting alignment track in an entrance pit at a desired elevation. The product is then jacked by manual control along the starting alignment track with simultaneous excavation of the soil being accomplished by a rotating cutting head in the leading edge of the product's annular space. The ground up soil (spoil) is transported back to the entrance pit by helical wound auger flights rotating inside the product. Jack and bores typically provide limited tracking and steering, as well as limited support to the excavation face.

2. Micro-tunneling is conducted similar to jack and bores with the exception that it is a remotely-controlled, guided pipe jacking process that provides continuous support to the excavation face. The guidance system usually consists of a laser mounted in the tunneling drive shaft, which communicates a reference line to a target mounted inside the Micro-

tunneling machine's articulated steering head. The Micro-tunneling process provides the ability to control the excavation face stability by applying mechanical or fluid pressure to counterbalance the earth and hydrostatic pressures.

3. Removal and disposal of excess material varies; it is the responsibility of the boring contractor and is not covered under this Specification. However, the cost of the removal and final disposition in included in the cost of the trenchless operation.

4. The minimum wall thickness for steel casing pipes shall be as follows:

Nominal Casing Diameter (Inches)	Nominal Wall Thickness (Inches)
6	Use 6″ Ductile Iron Water Main
8	Use 8″ Ductile Iron Water Main
10	Use 10″ Ductile Iron Water Main
12	Use 12″ Ductile Iron Water Main
15	Use 15″ Ductile Iron Water Main
18	0.312 (5/16)
20	0.375 (3/8)
24	0.375 (3/8)
30	0.469 (15/32)
36	0.531 (17/32)
42	0.625 (5/8)
48	0.688 (11/16)
54	0.781 (25/32)
60	0.844 (27/32)
66	0.938 (15/16)
72	1.000 (1)
84	1.156 (1-5/32)
96	1.312 (1-5/16)

5. Casing spacers shall be designed to support the carrier pipe in the casing pipe. Standard casing spacers shall consist of 14 gauge **AISI Type 304** stainless steel attachment band with a PVC liner and not less than four 10 gauge **AISI Type 304** stainless steel risers. Each riser shall be equipped with a removable ultra-high molecular weight polymer or glass-reinforced plastic runner. Attachment hardware shall be **AISI Type 304** stainless steel. Spacer shall have a minimum width of two inches (2″). Standard casing spacers shall be **Cascade Waterworks** or Approved Equal. Spacers shall be installed at a maximum spacing of six feet (6′) for PVC or other approved carrier pipe.

6. No Jack and Bore conduit may be left open, without the approval of the ENGINEER, to prevent the conduit from acting as a drainage structure.

3400.3.2 Steel Pipe Casing and Welds

1. In addition to meeting or exceeding the material requirements listed above, meet the following requirements:
   A. The size of the steel casing must be at least six inches (6″) larger than the largest outside diameter of the carrier pipe.
   B. The casing pipe must be straight seam pipe or seamless pipe.
   C. All steel pipe may be bare inside and out, with the manufacturer's recommended minimum nominal wall thickness to meet the greater of installation, loading, or carrier requirements.
   D. All steel casing pipe must be square cut and have dead-even lengths, which are compatible with the jack and bore equipment.

2. Use steel pipe casings and welds meeting or exceeding the thickness requirements to achieve the service life requirements. For purposes of material classification, consider steel pipe casing structural plate steel pipe. Ensure steel pipe casing of sufficient length achieves the required length through fully-welded joints. Ensure joints are air-tight and continuous over the entire circumference of the pipe with a bead equal to or exceeding the minimum of either that required to meet the thickness criteria of pipe wall for jacking and loading or service life. A qualified welder must perform all welding.

3400.3.3 Reinforced Concrete Pipe Casing

1. In addition to meeting or exceeding the material requirements listed above, meet the following requirements:
   A. 5000 psi concrete compressive strength.
   B. Class III, IV, or V as required by load calculations, with a C-wall.
   C. Full circular inner and outer reinforcing cage.
   D. Multiple layers of steel reinforcing cages, wire splices, laps, and spacers are permanently secured together by welding in place.
   E. Straight outside pipe wall with no bell modification.
   F. No elliptical reinforcing steel is allowed.
   G. Single cage reinforcement with a one-inch (1″) minimum cover from the inside wall.
   H. Double cage reinforcement with a one-inch (1″) minimum cover from each wall.
   I. Joints are gasket type.
   J. Additional joint reinforcement.

2. Upon installation, the ENGINEER may, at their discretion, require the CONTRACTOR to perform concrete wiping or injection of the joints if it is believed the joints have not maintained their water tightness during the jacking operation. No additional payment will be made for this operation.

3400.3.4 Pipe Couplings and Joints

1. In addition to meeting or exceeding the material requirements listed above, meet the following requirements:
   A. **Steel Couplings and Joints**
      1. Welds must comply with **Section 3400.3.2** of these Specifications when couplings are not used or when the coupling thickness is less than the casing thickness.
      2. When couplings are used, the casing joint needs only to be tack welded. Couplings must have a full bead weld such that the thickness, when measured at an angle of forty-five degrees (45°) to the casing and coupling interface, must be no less than the casing thickness.
   B. **Plastic Pipe Couplings and Joints**
      1. Must meet or exceed all ASTM strength and composition standards established for the casing material to which they are being attached.
      2. Joints must be made sufficiently strong to withstand the pressures of jacking. All chemical welds must be completely set and cured before jacking is attempted.

3400.3.5 Groundwater Control

1. Investigate all sites for the possibility of having to manage groundwater problems that may occur due to seasonal changes or natural conditions.

3400.3.6 Quality Control

1. Take control of the operation at all times. Have a representative who is thoroughly knowledgeable of the equipment, boring, and CITY procedures present at the job site during the entire installation and available to address immediate concerns and emergency operations. Notify the ENGINEER forty eight (48) hours in advance of starting work. Do not begin the installation until the ENGINEER is present at the job site and agrees the proper preparations have been made.

2. For all installations, submit sufficient information to establish the proposed strategy for providing the following:
   A. An indication where the leading edge of the casing is located with respect to line and grade and the intervals for checking line and grade. Indication may be provided by using a water gauge (Dutch level) or electronic transmitting and receiving devices. Other methods must have prior approval. Maintain a record of the progress at the job site.
   B. Equipment of adequate size and capability to install the product and including the equipment manufacturer's information for all power equipment used in the installation.
   C. A means of controlling line and grade.
   D. A means for centering the cutting head inside the borehole.
   E. Provide a means for preventing voids by assuring:

1. The rear of the cutting head from advancing in front of the leading edge of the casing by more than one-third (1/3) times the casing diameter and in stable cohesive conditions not to exceed eight inches (8").
2. In unstable conditions, such as granular soil, loose or flowable materials, the cutting head is retracted into the casing a distance that permits a balance between pushing pressure, pipe advancement, and soil conditions.
3. Development of maintaining a log of the volume of spoil material removed relative to the advancement of the casing.

F. Adequate casing lubrication with a bentonite slurry or other approved technique.

G. An adequate band around the leading edge of the casing to provide extra strength in loose unstable materials when the cutting head has been retracted into the casing to reduce skin friction as well as providing a method for the slurry lubricant to coat the outside of the casing.

H. At least twenty feet (20') of full diameter auger at the leading edge of the casing. Subsequent auger size may be reduced, but the reduced auger diameter must be at least seventy-five percent (75%) of the full auger diameter.

I. Water to be injected inside the casing to facilitate spoil removal. The point of injection shall be no closer than two feet (2') from the leading edge of the casing.

3400.3.7 Testing

3400.3.7.1 Product Testing

1. When there is any indication the installed product has sustained damage and may leak, stop the work, notify the ENGINEER, and investigate damage. The ENGINEER may require a pressure test and reserves the right to be present at the test. Perform pressure test within twenty-four (24) hours, unless otherwise approved by the ENGINEER. Furnish a copy of the test results to the ENGINEER for review and approval. The ENGINEER shall be allowed up to seventy-two (72) hours to approve or determine if the product installation is not in compliance with Specifications. The ENGINEER may require non-compliant installations to be filled with excavatable, flowable fill.

3400.3.7.2 Testing Methods

1. Testing may consist of one (1) of the following methods but always must meet or exceed CITY testing requirements:
   A. Follow the product manufacturer's pressure testing recommendations.
   B. Ensure the product carrier pipes installed without a casing meet the pressure requirements set by the OWNER and/or ENGINEER.
      1. The CITY requires a water-tight pipe and joint configuration where the product is installed beneath any pavement (including sidewalk). The ENGINEER will determine when and where water-tight joint requirements shall be applied to the ultimate roadway section for future widening. When under the pavement, conduct

an air pressure test for leaks in the presence of the ENGINEER at a minimum test pressure of 20 PSI by either of the following methods:

a. Standard twenty-four (24) hour pressure test with a recording chart or
b. A dragnet-type leak detector or equivalent device capable of detecting pressure drops of ½ PSI for a time period recommended by the manufacturer.

2. When a product is not located under the pavement, the pipe and point configuration must meet or exceed soil tight joint requirements. The test for soil tight joint allows up to 0.10 gallons of water leakage at a sustained pressure of 5 PSI. Conduct test for joint integrity for one (1) hour.

3400.3.8 Product Locating and Tracking

1. Install all facilities such that their location can be readily determined by electronic designation after installation. For non-conductive installations, attach a minimum of two (2) separate and continuous conductive tracking (tone wire) materials, either externally or integral with the product. Use either a continuous, green-sheathed solid conductor copper wire line (minimum #12 AWG for external placement or minimum #14 AWG for internal placement in the conduit/casing) or a coated conductive tape. Ensure the conductors are located on the opposite sides when installed externally. Connect any break in the conductor line before construction with an electrical clamp or solder, and coat the connection with a rubber or plastic insulator to maintain the integrity of the connection from corrosion. Clamp connections must be made of brass or copper and the butt end type with wires secured by compression. Soldered connections must be made by tight spiral winding of each wire around the other with a finished minimum length of three-inch (3″) overlap. Tracking conductors must be extended two feet (2′) beyond bore termini. Conductors must be tested for continuity. Identify each conductor that passes by removing the last six inches (6″) of the sheath. No deductions are allowed for failed tracking conductors. Failed conductors ends must be wound into a small coil and left attached for future use.

3400.3.9 Augering Fluids

1. Use a mixture of bentonite clay or other approved stabilizing agent mixed with potable water with a minimum pH of 6.0 to create the drilling fluid for lubrication and soil stabilization. Vary the fluid viscosity to best fit the soil conditions encountered. Do not use other chemicals or polymer surfactant in the drilling fluid without written consent of the ENGINEER. Certify in writing to the ENGINEER that any chemicals to be added are environmentally safe and not harmful or corrosive to the facility. Identify the source of water for mixing the drilling fluid. Approvals and permits are required for obtaining water from such sources as streams, rivers, ponds, or fire hydrants. Any water source used other than potable water may require a pH test.

3400.3.10 Micro-Tunneling and Micro-Tunnel Boring Machine Requirements

1. The micro-tunnel boring machine must meet the following minimum performance requirements:
   A. Capable of providing positive face support regardless of the micro-tunneling boring machine type.
   B. Articulated to enable controlled steering in both vertical and horizontal direction to a tolerance of plus or minus one inch (1″) from the designed alignment.
   C. All functions are controlled remotely from a surface control unit.
   D. Capable of controlling rotation, using a bi-directional drive on the cutter head, or by using anti-roll fins or grippers. The ENGINEER must approve either method.
   E. Capable of injecting lubricant around the exterior of the pipe being jacked.
   F. Indication of steering direction.
   G. For slurry systems, the following is also required:
      1. Indication of the volume of slurry flow in both the supply and return side of the slurry loop.
      2. Indication of slurry bypass valve position.
      3. Indication of pressure of the slurry in the slurry chamber.

3400.3.11 Failed Bore Path

1. If conditions warrant removal of any materials installed during a failed bore path, as determined by the ENGINEER, it will be at no cost to the CITY. Promptly fill all voids by injecting all taken-out service products that have any annular space with excavatable, flowable fill.

3400.3.12 Jack and Bore and Micro-Tunneling Operations

1. Provide continuous pressure to the face of the excavation to balance groundwater and earth pressures. Ensure the shafts are of sufficient size to accommodate equipment and the pipe selected and to allow for safe working practices. Provide entry and exit seals at the shaft walls to prevent inflows of groundwater, soil, slurry, and lubricants. Use thrust blocks designed to distribute loads in a uniform manner so that any deflection of the thrust block is uniform and does not impart excessive loads on the shaft itself or cause the jacking frame to become misaligned.

2. The jacking system must have the capability of pushing the pipe in jack and bore operations or micro-tunneling bore machines for micro-tunneling operations through the ground in a controlled manner and be compatible with the anticipated jacking loads and pipe capacity. Monitor the jacking force applied to the pipe and do not exceed the pipe manufacturer's recommendations.

3. Ensure the pipe lubrication system is functional at all times and sufficient to reduce jacking loads. Use pipe lubrication systems that include a mixing tank, holding tank, and pumps to convey lubricant from the holding tank to application points at the rear of the micro-tunneling boring machine. Maintain sufficient fluids on site to avoid loss of lubrication.

4. Power distribution system must be identified in the plans package or permit provisions, as well as any noise constraints. Identify spoil removal capability and method to avoid creating hindrance to other activities which may be necessary in the area.

3400.3.13 Excess Material and Fluids

1. Monitor the pumping rate, pressures, viscosity, and density of the boring fluids to ensure adequate removal of soil cuttings and the stability of the bore hole. Contain excess drilling fluids, slurry, and soil cuttings at entry and exit points in pits until they are recycled or removed from the site. Ensure all boring fluids are disposed of or recycled in a manner acceptable to the appropriate Local, State, and Federal regulatory agencies. When jacking and boring in suspected contaminated ground, test the boring fluid for contamination and dispose of appropriately. Remove any excess material upon completion of the bore. If it becomes evident the soil is contaminated, contact the ENGINEER immediately. Do not continue boring without the ENGINEER's approval.

3400.3.14 Boring Failure

1. If any obstruction is encountered, which prevents completion of the installation in accordance with the design location and Specifications, the pipe may be taken out of service and left in place at the discretion of the ENGINEER. Immediately fill the product left in place with excavatable, flowable fill. Submit a new installation procedure and revised plans to the ENGINEER for approval, before resuming work at another location. If damage is observed to any property, cease all work until a plan of action to minimize further damage and restore damaged property is submitted and approved by the ENGINEER.

3400.3.15 General Rules for Open Cut Installation

1. Unless otherwise specified in the Contract or if the ENGINEER allows, perform casing pipe installation in open trenches and in a manner that protects the casing pipe from unusual stresses.

2. Perform trenching as specified in **OSHA 29 CFR part 1926, subpart P** for excavations and trenches. Make trenches wide enough to provide working space on each side of the pipe. The required working space will depend upon the size of the casing pipe and the character of material encountered in the excavation; however, always provide sufficient space between the casing pipe and the sides of the trench to allow preparing the foundation, laying the casing pipe, and placing and compaction of backfill as specified.

3. Excavate the trenches in reasonably close conformity with the Plans and as laid out by the ENGINEER in the field.

4. Keep trenches dewatered at all times

5. Understand the proposed elevations for the casing pipes as shown on the Plans are subject to revisions in order to fit field conditions, and the ENGINEER may adjust the profile grades from those shown on the Plans.

6. Unless noted by ENGINEER, steel casing pipe shall be used for all casing pipes.

3400.3.15.1 Constructing Foundation

1. Construct the foundation in the trench to prevent subsequent settle or rupture of the casing pipe.

2. The CONTRACTOR may not lay the casing pipe in rock, wet conditions, or on a firm earth subgrade.

3. The CONTRACTOR shall lay the casing pipe on a backfilled granular foundation or bed. When placing the casing pipe on backfilled granular foundation, excavate the trench at least six inches (6″) below the elevation established for the bottom of the casing pipe. Backfill this depth with **"¾-inch clear stone"** meeting the requirements for No. 1 stone in **Section 501.2.5.4** of the STATE SPECIFICATIONS**.** Compact the material before laying the casing pipe on the backed granular material.

4. If the Contract details types of bedding, or required trench widths, other than described above, conform to the Construction Details.

3400.3.15.2 Laying Casing Pipe

1. Begin laying the casing pipe in finished trenches at the lowest point and proceed towards the upper end.

3400.3.15.3 Laying Carrier Pipe

1. Insert the carrier pipe into the casing pipe per the requirements of **Section 3000** of these Specifications.

2. All carrier pipes are to have stainless steel casing spacers installed, unless approved by the ENGINEER. The installation of the casing spacers shall be done prior to the insertion into the carrier pipe. All casing spacers shall be incidental to the construction.

3400.3.15.4 Carrier Pipe End Seals

1. Advanced Products & Systems End Seals shall be installed on each end of the carrier pipe per manufacturer's specifications. End seals shall be incidental to the Contract.

3400.3.16 Backfilling

1. Backfill all sanitary sewer mains as described in **Section 100.61** of these Specifications.

3400.3.17 General Rules for Casing Pipe Installation for Sanitary Laterals

1. ENGINEER is to use discretion at all times when deciding when to use casing pipe for laterals; but in general, casing pipes for laterals are to be installed under the following conditions:
   A. Whenever the sanitary lateral crosses under a box culvert.
   B. Whenever there is less than two feet (2′) of cover from a storm sewer with a diameter of forty-eight inches (48″) or greater.
   C. Whenever the sanitary lateral crosses under a storm sewer with a diameter of thirty-six inches (36″) or larger and has an invert elevation of 747.00 or below.

3400.4 Measurement

1. The CITY will measure the Sanitary Sewer Casing Pipe Bid Items by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the casing pipe.

3400.5 Payment

1. The CITY will pay the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
SANITARY SEWER CASING PIPES – OPEN CUT		
3400	Furnish and Install 6″ Sanitary Sewer Open Cut Casing Pipes	LF

Bid Item	Description	Units
3402	Furnish and Install 8″ Sanitary Sewer Open Cut Casing Pipes	LF
3404	Furnish and Install 10″ Sanitary Sewer Open Cut Casing Pipes	LF
3406	Furnish and Install 12″ Sanitary Sewer Open Cut Casing Pipes	LF
3408	Furnish and Install 16″ Sanitary Sewer Open Cut Casing Pipes	LF
3410	Furnish and Install 18″ Sanitary Sewer Open Cut Casing Pipes	LF
3411	Furnish and Install 20″ Sanitary Sewer Open Cut Casing Pipes	LF
3412	Furnish and Install 24″ Sanitary Sewer Open Cut Casing Pipes	LF
3414	Furnish and Install 30″ Sanitary Sewer Open Cut Casing Pipes	LF
3416	Furnish and Install 36″ Sanitary Sewer Open Cut Casing Pipes	LF
3418	Furnish and Install 42″ Sanitary Sewer Open Cut Casing Pipes	LF
3420	Furnish and Install 48″ Sanitary Sewer Open Cut Casing Pipes	LF
3422	Furnish and Install 54″ Sanitary Sewer Open Cut Casing Pipes	LF
3424	Furnish and Install 60″ Sanitary Sewer Open Cut Casing Pipes	LF
3426	Furnish and Install 66″ Sanitary Sewer Open Cut Casing Pipes	LF
3428	Furnish and Install 72″ Sanitary Sewer Open Cut Casing Pipes	LF
3430	Furnish and Install 84″ Sanitary Sewer Open Cut Casing Pipes	LF
3432	Furnish and Install 96″ Sanitary Sewer Open Cut Casing Pipes	LF
SANITARY SEWER CASING PIPES - TRENCHLESS		
3500	Furnish and Install Trenchless 18″ Sanitary Sewer Casing Pipe	LF
3501	Furnish and Install Trenchless 20″ Sanitary Sewer Casing Pipe	LF
3502	Furnish and Install Trenchless 24″ Sanitary Sewer Casing Pipe	LF
3504	Furnish and Install Trenchless 30″ Sanitary Sewer Casing Pipe	LF
3506	Furnish and Install Trenchless 36″ Sanitary Sewer Casing Pipe	LF
3508	Furnish and Install Trenchless 42″ Sanitary Sewer Casing Pipe	LF
3510	Furnish and Install Trenchless 48″ Sanitary Sewer Casing Pipe	LF
3512	Furnish and Install Trenchless 60″ Sanitary Sewer Casing Pipe	LF
3514	Furnish and Install Trenchless 66″ Sanitary Sewer Casing Pipe	LF
3516	Furnish and Install Trenchless 72″ Sanitary Sewer Casing Pipe	LF
3518	Furnish and Install Trenchless 84″ Sanitary Sewer Casing Pipe	LF
3520	Furnish and Install Trenchless 96″ Sanitary Sewer Casing Pipe	LF

3400.5.1 Sanitary Sewer Trenchless Casing Pipes

1. Payment for the Sanitary Sewer Trenchless Casing Pipe Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating of boring pit and receiving pit; for sheeting and shoring; for de-watering; for forming foundation; for laying casing pipe; for providing backfill, including bedding material; for backfilling; for compacting; for furnishing and installing stainless steel casing pipe spacers; for end seals, for removing sheeting and shoring; and for cleaning out and restoring the site of the work.

3400.5.2 Sanitary Sewer Open Cut Casing Pipes

1. Payment for the Sanitary Sewer Open Cut Casing Pipe Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavation; for sheeting and shoring; for de-watering; for forming foundation; for laying casing pipe; for providing backfill, including bedding material; for backfilling; for compacting; for furnishing and installing stainless steel casing pipe spacers; for end seals; for removing sheeting and shoring; and for cleaning out and restoring the site of the work.

3400.6 Submittals

1. Qualifications
   A. Submit the name of the Subcontractor that will perform the horizontal auger boring or shield tunneling work and submit qualifications for the Subcontractor and Subcontractor's superintendent. In addition, submit names and training/qualifications of personnel that will perform air quality monitoring and the name of the site safety representative.

2. Horizontal Auger Boring Operations
   A. Submit for review a tunneling work plan with complete Subcontractor's construction drawings and written description identifying details of the proposed method of construction and the sequence of operations to be performed during construction, as required by the method of tunneling. The drawings and descriptions shall be sufficiently detailed to demonstrate to the ENGINEER whether the proposed materials and procedures will meet the requirements of this Section. The tunneling work plan shall be submitted to the ENGINEER for review. All submissions shall be sealed by a professional engineer licensed in the State of Wisconsin. The tunneling work plan, including drawings, shall, at a minimum, include the following items:
      1. Subcontractor shall submit arrangement drawings and technical specifications of the horizontal auger boring machine, experience record with this type of machine, and experience and training records for the equipment operator. Provide certification from the manufacturer that the proposed equipment and materials are compatible and suitable for use with the subsurface conditions defined in this Section. Include the following information concerning the horizontal auger boring machine:
         a. Dimensions.
         b. Cutters.
         c. Cutter head position relative to casing.
         d. Casing and band diameters.
         e. Torque, speed, and thrust.
         f. Auger and muck casing diameters.
      2. Method of maintaining and controlling line and grade of tunneling operation.
      3. Method and details of spoil removal, including equipment type and numbers, processing, and disposal.

4. Electrical system.
5. Grouting techniques to be used for contact grouting, including equipment, pumping and injection procedures, pressure grout types, and mixtures in accordance with this Section.
6. Details of the horizontal auger boring and operation.
7. Plans for storage and handling of casing or liner plate.
    A. Shaft Layout Drawings: Submit the layout and design of proposed access shafts for review.

3. Quality Control Methods: At least thirty (30) days prior to the start of tunneling, the Subcontractor shall submit to the ENGINEER a description of the quality control methods proposed for the tunneling operations. The Submittal shall include:
    A. Supervision: Supervisory control to ensure that the work is performed in accordance with the Plans and Specifications, and the tunneling work plan and drawings.
    B. Line and Grade: Procedures for surveying, controlling, and checking line and grade, including field forms. Procedures for resetting guidance system if its alignment shifts or is moved off design alignment and grade for any reason.
    C. Movement Monitoring: Procedures for monitoring movements along the tunnel alignment as specified herein.
    D. Tunneling Observation and Monitoring: Procedures for preparing and submitting daily logs of tunneling operations, including field forms.
    E. Products and Materials: A plan for testing and submittal of test results to demonstrate compliance with the Specifications and Subcontractor's criteria for permanent products, materials, and installations. The plan shall identify all applicable standards and procedures for testing and acceptance.

4. Jacking Pipe: Submit detailed drawings of the jacking pipe indicating casing pipe material, including the standard to which it is manufactured, outside diameter, wall thickness, and any joint details. Indicate the ultimate and allowable jacking capacity, the required fabrication tolerances to prevent damage to the pipe during installation, and provide a certification indicating that the pipe meets these tolerances and is designed to meet all anticipated loading conditions with an adequate factor of safety.

5. Details of casing spacers, **including recommended spacing.**

6. Safety Plan: A safety plan for tunneling operations including air monitoring equipment and procedures, and provisions for lighting, ventilation, and electrical system safeguards. The plan should also include, at a minimum:
    A. Protection against soil instability and groundwater inflow.
    B. Safety for tunnel and shaft access and exit, including ladders, stairs, walkways, and hoists.
    C. Protection against mechanical and hydraulic equipment operations, and for lifting and hoisting equipment and material.

D. Monitoring for hazardous gases.
E. Means for emergency evacuation and self-rescue.
F. Protection of shaft, including traffic barriers, accidental or unauthorized entry, and falling objects.

7. Calculations: Calculations shall be submitted in a neat, legible format. Assumptions used in calculations shall be consistent with information provided in this Section. All calculations shall be prepared by professional engineer licensed in the State of Wisconsin, who shall stamp and sign calculations, including:
   A. Design calculations demonstrating that the proposed jacking pipe is capable of supporting the maximum stresses to be imposed during jacking. The calculations shall take into account earth and hydrostatic loads; jacking forces; external loads, such as live loads due to traffic; and any other loads that may be reasonably anticipated during jacking. All loads shall be shown and described. Include assumed maximum drive length.
   B. Calculations demonstrating that the soils behind the thrust block can transfer the maximum planned jacking forces exerted by the jacks to the ground during pipe installation with a factor of safety, without excessive deflection or displacement.

8. Schedule: Provide a schedule for all tunneling work, identifying all major construction activities as independent items. The schedule shall include, at a minimum, the following activities: mobilization; Wisconsin "One call" utility locate requests; confirmation of underground utilities, as required on the Plans and in the Specifications; groundwater control at launching and receiving shafts; shaft excavation and support; working slab construction; thrust wall construction; jacking equipment setup; entry ring installation for launch of the casing; horizontal auger boring; contact grouting; installation of the carrier pipe; shaft backfill; site restoration; cleanup and disposal; and demobilization. The schedule shall also include the work hours and workdays for each activity, and a written description of the construction activities. The schedule will be reviewed by the ENGINEER and shall be updated and resubmitted by the Subcontractor every two (2) weeks, or more frequently, if requested by the ENGINEER.

9. Before Each Drive: Submit the following to the ENGINEER at least twenty four (24) hours prior to the start of each drive:
   A. Results of line and grade survey to ensure that the thrust block, jacking frame, guide rails, entry seal, and exit seals are installed properly prior to launch of each drive.

10. Daily Records: The following daily records shall be submitted to the onsite ENGINEER by noon on the day following the shift for which the data or records were taken:
    A. Tunneling Records: The Subcontractor shall provide complete tunneling records to the ENGINEER. These records shall include, at a minimum: date, time, name of operator, tunnel crossing identification, installed ground support element/pipe number and corresponding tunnel length, rate of advance, jacking forces, spoil feed rates, changed

face conditions encountered, steering jack positions, line and grade offsets, shield inclination and roll, any movement of the guidance system from the horizontal auger boring machine or other components or equipment, and durations of and reasons for delays. Computer-recorded data should be referenced to time and distance and should be recorded at time intervals of one (1) minute or less. Manually recorded observations should be made at intervals of not less than once per four feet (4'), as conditions change, and as directed by the ENGINEER. At least seven (7) days prior to the start of auguring, the Subcontractor shall submit samples of the automated and manual tunneling records. Samples shall include electronic data and any necessary programs to interpret data, and the manual logs or records to be used.

B. Survey Measurements: Survey measurements of casing alignment, and monitoring data of all surface and subsurface settlement monitoring points as required herein.

11. Contingency Plans: The following list includes problem scenarios that may be encountered during the tunneling operations. The Subcontractor shall submit contingency plans for dealing with each problem scenario while satisfying the Specifications. These plans shall include the observations and measurements required to clearly identify the cause of the problems:
    A. Machine unable to advance:
        1. Possible obstructions (including boulders, old foundations, metallic debris, or reinforced concrete; i.e., jammed cutter head).
        2. Insufficient auger torque or jacking capacity.
        3. Shield or machine malfunction.
    B. Laser distorted by heat, humidity, or physical disturbance.
    C. Spoil Feed Problems: Strong hydrocarbon smell is detected in the spoils or in the shaft.
    D. Jacking Forces:
        1. Jacking forces increase dramatically or suddenly.
        2. Jacking forces reach design capacity of casing, jacking frame, or thrust wall (treat these scenarios as separate incidents).
    E. Settlement and Subsidence:
        1. Survey measurements indicate deformations exceed limits as defined herein.
        2. Excavated volumes significantly exceed tunnel or casing volume installed, as applicable.
        3. Rapid excess lost ground results in large voids or sinkholes.
    F. Line and grade tolerances being exceeded.
    G. Control is lost. Cannot monitor position, torque, thrust, steering jack position, or other performance parameters.
    H. Pipe has been damaged or has been found to be out of compliance with Specifications during, or after, installation.
    I. Thrust block deforms excessively under jacking loads, or provides insufficient capacity to advance casing.
    J. Large volumes of water are encountered, threatening face stability.

12. Abandonment Contingency Plan: The Subcontractor shall prepare an abandonment contingency plan to handle the possibility that the Subcontractor cannot complete a tunneled crossing. The Subcontractor shall follow all provisions of the approved plan.

13. Contact Grout Work Plan and Methods:
    A. Submit work plan including contact grouting methods and details of equipment, grouting procedures and sequences, injection pressures, monitoring and recording equipment, pressure gauge calibration data, methods of controlling grout pressure, method of transporting grouting equipment and materials within the initial tunnel support, and provisions to protect interior of pipe and shaft supports.
    B. Submit details of grout mix proportions; admixtures, including manufacturers' literature; and laboratory test data verifying the strength of the proposed grout mix.

14. Contact Grout Reports and Records: Maintain and submit daily logs of grouting operations, including grouting locations, pressures, volumes, and grout mix pumped, and time of pumping. Note any problems or unusual observations on logs.

SECTION 3500
NOT USED

SECTION 3600
SANITARY SEWER ROCK EXCAVATION

3600.1 Description

1. This Section describes excavating and disposing of rock taken from within the right-of-way for project construction.

3600.2 Materials

3600.2.1 Rock Excavation

1. Under the Rock Excavation Bid Item, excavate all hard, solid rock in ledges, bedded deposits, and unstratified masses, and all conglomerate deposits or any other material so firmly cemented they present all the characteristics of solid rock, and the ENGINEER determines it is not practical to excavate this material without first blasting, rock grinding, or using a hydraulic break hammer. The CONTRACTOR shall be required to take all practical steps to excavate existing ground conditions prior to the use of rock excavation methods for purposes of demonstrating that the existing ground cannot practically be excavated without performing rock excavation. Rock Excavation also includes the removing of rock boulders having a volume of one (1) cubic yard or more.

2. The classification of Rock Excavation does not apply to crushed aggregate or asphaltic base or surface courses, or to Portland cement base or surface courses.

3600.2.2 Seismograph

1. Use seismographs that are in accordance to **Chapter COMM 7** of the Wisconsin Administrative Code.

3600.3 Construction

3600.3.1 General

1. Remove rock, if encountered in excavation, to a depth of approximately six inches (6″) below the earth subgrade between the limits of the shoulder slopes. If the Plans show design details covering the depth of rock excavation, perform the work in accordance to the Details. If the Plans or *Special Conditions* do not require specific materials, then use selected material obtained from roadway and drainage excavation to backfill areas of excavation below subgrade (EBS) in rock excavation. If excavation methods leave undrained pockets in the rock surface, drain the depressions properly. If allowed by the ENGINEER, the CONTRACTOR may fill the depressions with ENGINEER-approved impermeable material, at no expense to the CITY.

2. Excavate rock cuts using methods and equipment so the resulting backslopes substantially conform to the slopes the Plans show or to the slopes established from stakes set for excavation. Avoid creating depressions in or substantial displacement of material outside the lines, limits, or slope planes defined by the stakes. Scale the backslopes in rock cuts to dislodge loose rock and dispose of removed material.

3. Undercut the slope of rock cuts if designated to receive topsoil, or salvage topsoil to the depth necessary to allow placing the specified amount of topsoil or salvaged topsoil, and finish to the required section.

3600.3.2 Pre-Splitting Rock

1. If the Plans show or the ENGINEER authorizes, employ the pre-splitting technique to split the face of the rock cut in a relatively-smooth plane along the designated backslope, before removing the interior portion of the cut by blasting. Not less than two (2) weeks prior to commencing blasting operations, or at any time the CONTRACTOR proposes to change the drilling and blasting methods, the CONTRACTOR shall submit a blasting plan to the ENGINEER for review, and the following submittals shall be required:
   A. The blasting plan shall contain full details of the drilling and blasting patterns and controls the CONTRACTOR proposes to use for both the controlled and production blasting.
   B. The blasting plan shall contain the following minimum information:
      1. Station limits of proposed shot.
      2. Plan and section view of proposed drill pattern including face, burden, blast-hole spacing, blast-hole diameter, blast-hole angles, lift height, and sub-drill length.
      3. Loading diagram showing type and amount of explosives, primers, initiator, and location and depth of stemming.
      4. Initiation sequence of blast holes including delay times and delay system.
      5. Manufacture's data sheets for all explosives, primers, and initiates to be employed.
   C. The blasting plan submittal is for quality control and record keeping purposes. Review of the blasting plan by the ENGINEER shall not relieve the CONTRACTOR of their responsibility for the accuracy and adequacy of the plan when implemented in the field.
   D. If rock excavation is completed utilizing methods other than blasting, CONTRACTOR is required to prepare and submit, for review, a Rock Removal Plan.

2. Blasting Regulations and Safety
   A. Adhere to federal, state, and local ordinances regulating blasting operations, if blasting is to be done. Obtain permits from authorities having jurisdiction before explosives are brought to site or drilling is started.
   B. All blasting shall be done in compliance with **Chapter COMM 7** of the Wisconsin Administrative Code.
   C. Follow **NFPA 495 – Explosive Materials Code** for handling explosive materials.

D. The CITY must be immediately notified by the CONTRACTOR of any incidents of fly rock, damage to any personal property, or any violations of the **COMM 7** code. Failure to do so is a safety violation and all work on the project will be stopped, until the situation has been corrected.
E. The CONTRACTOR shall observe the entire blast area for a minimum of five (5) minutes following a blast to guard against rock or debris fall before commencing work in the area.
F. The CITY shall, at all times, have the authority to prohibit or halt the CONTRACTOR's blasting operations, if it is apparent, through the methods being employed, the required slopes are not being obtained in a stable condition, the safety of the public is being jeopardized, or vibration levels above the allowable levels occur.

3. Remove all soil and loose or decomposed rock overlying the surface of the rock to be split to the elevation the ENGINEER designates or approves before drilling the pre-splitting holes.

4. At the beginning of the pre-splitting operation or if encountering material of different geologic characteristics, drill, blast, and excavate short test sections, up to one hundred feet (100') in length, to determine the optimum spacing, size, and loading of the holes. Do not perform testing, until the ENGINEER approves a CONTRACTOR-prepared plan of the test section. After pre-splitting the test section, expose the presplit face to allow the ENGINEER to examine and evaluate the results. If the results are unsatisfactory, make adjustments in hole size and spacing of charges, and other aspects of the plan to produce an acceptable split face.

5. Drill holes no larger than three and one-half inches (3½") in diameter at a spacing determined from the test section, but not less than twenty-four inches (24") and not more than forty-two inches (42").

6. Drill holes on the required slope line and at the required slope inclination to the full depth of the cut or to a predetermined stage elevation. If the depth of cut is greater than is practical to maintain the required alignment of drilled holes, drill, blast, and excavate the cut in two (2) or more lifts. If the cut is too deep for pre-splitting to the full required depth in one (1) operation, the ENGINEER will allow a maximum offset of twelve inches (12") at the bottom of each lift for use in drilling the next lower pre-splitting pattern. Plan the offset benches so the toe of the completed rock slope coincides with the toe of slope the plans show.

7. Carefully charge all drill holes for pre-splitting with manufactured cartridge-type explosives, fully stem each hole, and detonate the charges simultaneously.

8. Before blasting the interior portion of the excavation area, pre-split rock slopes, either by separate operations or by time delay fuses that fracture the slope line before the charges detonate in the interior portion.

9. Position drill holes for production blasting to avoid damage to the pre-split face. Do not place the bottom of the production holes below the bottom of the pre-split holes. Do not drill portions of production drill holes within four feet (4') of a pre-split plane except as approved by the ENGINEER.

10. Use explosive charges, detonating cord, spacing, and other items necessary for the blasting operation conforming to the explosive manufacturer's recommendations and instructions.

3600.3.3 Vibration Monitoring Using Seismograph

1. Monitoring procedures shall be in accordance to **Chapter COMM 7** of the Wisconsin Administrative Code, and the following Specification: Take seismograph readings prior to construction activities to establish an ambient index.
   A. Place the seismograph to continuously monitor all construction activities, or as directed by the ENGINEER. If construction activities generate ground vibration in excess of the Peak Particle Velocity Limits, as shown in **Chapter COMM 7** of the Wisconsin Administrative Code, stop the construction operation in progress and consider and implement alternate construction methods.

2. Submittals Required:
   A. Complete listing of seismograph equipment and its conformance to **Chapter COMM 7** of the Wisconsin Administrative Code.
   B. Written stamen of qualifications for operators.
   C. Written plan for seismograph placement, monitoring, and reporting**.**

3600.4 Measurement

3600.4.1 Rock Excavation

1. The CITY will measure the Rock Excavation Bid Item in ledges and solid masses by the cubic yard that is acceptably completed. The CITY will perform this measurement by making vertical measurements for determining average end areas within the limits of the roadbed as defined by the shoulder slopes. These vertical measurements will extend from the surface of the rock to an elevation six inches (6") below the subgrade or ground surface, or to the depth indicated on the Plans, or to the bottom of the solid ledge or mass if the rock does not extend downward to the elevation specified, or indicated below the established grade.

2. The CITY will measure boulders and surface stone with a volume of one (1) cubic yard or more individually and compute the volume from average dimensions taken in three (3) directions.

3. The CITY will measure Utility Trench Rock Excavation Bid Items by the linear foot that is acceptably completed. Utility trench rock excavation shall be paid per **Section 3600.5.1** of these Specifications. The CITY will perform this measurement by taking the linear footage along the centerline of the pipe where rock is encountered, until a location where methods of rock excavation are no longer needed.

3600.4.2 Pre-Splitting Rock

1. The CITY will measure the Pre-Splitting Rock Bid Item by the linear foot of drilled holes, including test section holes, drilled along the face of acceptable pre-split rock slopes. The CITY will take the measurement from the top of the drilled hole at the rock surface to the elevation of the roadway ditch, to a pre-determined bench elevation or to the bottom of the rock ledge or mass where the rock does not extend to the roadway ditch or pre-determined bench elevation. The CITY will include over-break quantities in the measurement of the Rock Excavation Bid Item where pre-splitting is used.

3600.5 Payment

1. The CITY will pay measured quantities at the Contract unit price under the following Bid Items:

Bid Item	Description	Units
SANITARY SEWER ROCK EXCAVATION & PRE-SPLITTING ROCK		
3600	Rock Excavation	CY
3601	Utility Trench Rock Excavation (Sanitary)	LF
3602	Pre-Splitting Rock	LF

3600.5.1 Rock Excavation

1. Payment for the Rock Excavation Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating the rock material; for disposing of surplus material; and for cleaning out and restoring the project site.

2. The CITY will not pay for the removal of hard pan rock ledges. If the ENGINEER determines the rock ledges can be excavated with a ripper tooth from a backhoe, it shall be classified as hardpan and shall be incidental to Bid Items.

3600.5.2 Pre-Splitting Rock

1. Payment for the Pre-Splitting Rock Bid Item is full compensation for all drilling; stemming; blasting; and providing all materials, including explosives.

3600.5.3 Vibration Monitoring

1. Payment for the vibration monitoring using seismograph will be considered incidental to the Rock Excavation Bid Items.

SECTION 3650
CRACK AND DAMAGE SURVEY

3650.1 Description

1. This Section describes the requirements of performing a crack and damage survey for affected properties, as required by the Contract Documents.

3650.2 Construction

3650.2.1 General

1. Conduct a crack and damage survey of the businesses and residences located adjacent to the project limits. Crack and damage survey limits are to be established by the CONTRACTOR, as required by the scaled-distance equation specified in **Chapter COMM 7** of the Wisconsin Administrative Code, but, at a minimum, should include the properties outlined in the *Special Conditions*.

2. Prior to any construction activities, thoroughly inspect the building structures for existing defects, including interior and exterior walls. Submit a written report to the ENGINEER, including the Inspector's name, date of inspection, descriptions and locations of defects, and photographs. The intent of the written report and photographs is to procure a record of the general physical condition of the building's interior and exterior walls and foundation, prior to construction. The report shall be typed on bond paper and be in text form.

3. A letter will be sent by the CITY to all affected property owners, informing them of the crack and damage survey process, prior to the CONTRACTOR making initial contact with the property owners.

4. The CONTRACTOR shall notify the CITY a minimum of three (3) working days prior to making initial contact with the property owners. The ENGINEER shall be present when contacting the property owners concerning access for the survey work. Should a property owner refuse entry to a property, the CONTRACTOR shall have the property owner sign a waiver indicating they have refused entry and are releasing the CONTRACTOR and the CITY from any potential liability related to a claimed change in condition of the structure. If the property owner refuses all requests, this shall be documented and signed by both the CONTRACTOR and ENGINEER present at the time of the property owner visit.

3650.2.2 Report

1. The crack and damage survey should consist of two (2) parts. The first part, performed prior to construction activities, shall include visual inspection, photographs, and a written report describing any existing defects in the buildings and pavements being inspected. The second

part, performed after construction activities, shall also include a visual inspection, photographs, and written report describing any changes in the structure or pavement condition. In lieu of photographs, a professional videographer may be hired to use a video camera capable of producing a DVD with the clarity required to perform this work.

2. The photographs shall be capable of producing sharp, grain-free, high-contrast colored pictures with good shadow details. The photographs shall be formatted into a hard copy photo log. Each sheet shall hold four (4) prints. A note shall be provided adjacent to each photograph and shall contain the following information:
   A. I.D.
   B. Building Location.
   C. View Looking.
   D. Date.
   E. Photographer.

3. Prior to the start of any construction activities pertinent to this survey, submit a copy of the written report and photographs to the ENGINEER.

4. After the construction activities are complete, conduct another survey in the same manner, take photographs, and submit another written copy to the ENGINEER.

5. In addition to a hard copy photo log, a digital copy of each photograph shall be submitted on CD or DVD.

6. CONTRACTOR shall provide two (2) copies of the pre- and post-construction reports to the ENGINEER.

3650.3 Measurement

1. The CITY will measure the Crack and Damage Survey Bid Item as each individual unit that is acceptably completed.

3650.4 Payment

1. The CITY will pay measured quantities at the Contract unit price under the following Bid Item:

Bid Item	Description	Units
CRACK AND DAMAGE SURVEY		
3650	Crack and Damage Survey	EA

2. Payment is for full compensation for providing the before and after written reports; photographs or videotapes; and providing all labor, equipment, and incidentals necessary to complete the contract work. Payment of fifty percent (50%) of this Bid Item will be made after the successful completion of the pre-construction report. The final payment of this Bid Item will be made after the successful completion of the post-construction report.

SECTION 3700
SANITARY SEWER TESTING

3700.1 Description

1. This Section describes the testing of sanitary sewer manholes and pipes, and other appurtenances, including low pressure air tests, mandrel test, closed circuit televising, water infiltration test, and exfiltration test.

3700.2 Materials

1. This Section is left vacant.

3700.3 Construction

3700.3.1 General

1. All sanitary sewers, except relays with active connected buildings' sewers, shall be required to pass a leakage test before they are accepted by the ENGINEER. The permitted leakage tests for sewers thirty-six inches (36") and less in nominal size are the water infiltration test or the low pressure air test. The CONTRACTOR may perform either of these tests. The permitted leakage test for sewers larger than thirty-six inches (36") in nominal diameter is the water infiltration test or the water exfiltration test.

2. A visual inspection and an infiltration test shall be done on all completed sewers larger than thirty-six inches (36") when they are submerged by groundwater. All sanitary sewers larger than thirty-six inches (36") not submerged by groundwater shall be visually inspected and tested for exfiltration or by low pressure air testing of individual joints.

3. Tests shall be performed by the CONTRACTOR under the observation of the ENGINEER, unless *Special Conditions* call for CITY-provided testing. The CITY shall notify the CONTRACTOR not less than twenty-four (24) hours in advance if the testing is to be done by the CITY.

4. The water infiltration or water exfiltration test may be substituted for a low pressure air test when testing pressure pipe used for gravity sewer service, if the pressure fails the low pressure air test.

5. The groundwater height above the installed pipe may be determined by attaching a transparent plastic tube to the provided opening in the manhole and using the plastic tube as a manometer.

6. The end branches, laterals, tees, wyes, and stubs to be included in the test should be plugged to prevent leakage. When the lateral is connected to a saddle fitting on the main line under the same Contract, that section of the main sewer shall be included in the lateral test.

7. The CONTRACTOR is required to repair all visible defective joints or leaks in pipes or manholes, even though the leakage test requirements are met.

8. The cost of the labor, equipment, and materials necessary to perform leakage tests shall be included in the unit bid prices of the sanitary sewer. If the low pressure air test is required in the Contract documents and the ENGINEER determines that the performance of the test is not needed, a credit will be taken.

3700.3.2 Low Pressure Air Test

1. This test method is applicable to all gravity sewer lines made of thermoplastic pipe, reinforced thermosetting resin (RTRP) pipe, and reinforced plastic mortar (RPM) pipe. The apparatus for the low pressure air test shall be set up per **File No. 31** in **Part IX** of the *Standard Specifications for Sewer and Water Construction in Wisconsin*, dated December 22, 2004. The air test will be based upon an allowable leakage rate of 0.0015 cubic feet per minute per square foot of internal surface area.

2. Pipe diameters of thirty-six inches (36") and above will not be accepted by means of the low pressure air test. In all cases, the length of the laterals shall be ignored.

3. Only after the sanitary sewers, including appurtenances and sanitary laterals, have been installed, backfilled, and cleaned, shall the CONTRACTOR proceed with an air test on the installed facilities.

4. The procedure is as follows:
   A. The section of sewer line to be tested should be flushed and cleaned prior to conducting the low pressure air test.
   B. Isolate the section of the sewer line to be tested by means of inflatable stoppers or other suitable plugs. Plug or cap the ends of all branches, laterals, tees, wyes, and stubs to be included in the test to prevent air leakage. One (1) of the plugs should have an inlet tap, or other provisions for connecting a hose to a portable air control source.
   C. If the test section is below the groundwater level, determine the height of the groundwater above the top of the pipe at the upstream end of the test section. If the groundwater is two feet (2') above the top of the pipe at the upstream end, then the air pressure test cannot be used. For every foot of groundwater above the pipe spring line, increase the gauge test pressures by 0.43 pounds per square inch.
   D. Connect the air hose to the inlet tap and portable air control source. The air equipment should consist of necessary valves and pressure gauges to control the rate at which air

flows into the test section and to enable monitoring of the air pressure within the test section. Also testing apparatus should be equipped with a pressure relief device set no higher than 9.0 psig to prevent the possibility of loading the test section with the full capacity of the compressor.

E. Add air slowly to the test section until the pressure inside the pipe is raised to 4.0 psig greater than the average back pressure of any groundwater that may be over the pipe. Do not exceed 9.0 psig.

F. After the pressure of 4.0 psig is obtained, regulate the air supply so the pressure is maintained between 3.5 and 4.0 psig (above the average groundwater back pressure) for a period of two (2) minutes. This allows the temperatures to stabilize in equilibrium with the temperature of the pipe walls. The pressure will normally drop slightly until temperature equilibrium is obtained. During this period, all plugs should be checked with a soap solution to detect any plug leakage.

G. Determine the rate of air loss by the time pressure drop method. After the two (2) minute stabilization period, air is slowly introduced into the section of pipe to be tested until the pressure is raised to approximately 4.0 psig. The air supply is then disconnected and the test pressure is allowed to decrease to 3.5 psig. The time required for the pressure to drop from 3.5 psig to 2.5 psig is determined by means of a stopwatch and this time interval is then compared to the Specification from ***Table 1***, located at the end of this Section to determine if the rate of air loss is within the allowable time limit. If the time is equal or greater, than the times indicated in the Table, the pipe line shall be deemed acceptable.

H. Upon completion of the test, the bleeder valve is opened and all air is allowed to escape. Plugs should not be removed until all the air pressure in the test section has been released. No one should be allowed in the trench or manhole while the pipe is being decompressed.

3700.3.3 Mandrel Test

1. The entire length of the installed sanitary sewer main shall be tested for acceptance with an approved go/no-go acceptance testing device. This device shall conform substantially to that shown on **Files No. 30** and **30A** of **Part IX**, of the *Standard Specifications for Sewer and Water Construction in Wisconsin*, dated December 22, 2004. The dimensions of the testing device are shown in ***Table 2***, located at the end of this Section, which is based on five (5) or seven and one-half percent (7.5%) deflection of the following base inside diameter. **NOTE:** The base inside diameter (I.D.) is a minimum pipe I.D. derived by subtracting a statistical tolerance package from the pipe's average I.D. The tolerance package is defined as the square root of the sum of squared standard manufacturing tolerances.

Ave ID = Ave OD – 2(1.06)t
Tolerance Package = $(A^2 + B^2 + C^2)$ ½

Where:
A = OD Tolerance (**ASTM D-3034** for 8″ - 15″) & (**ASTM F-679** for 18″ - 27″)
B = Excessive Wall Thickness Tolerance = 0.06t
C = Out of Roundness Tolerance (**ASTM D-3034** for 8″ - 15″) &
(**ASTM F-679** for 18″ - 27″)
T = Minimum Wall Thickness (**ASTM D-3034** for 8″ - 15″ solid wall)
(**ASTM F-679** for 18″ - 27″) &
(**ASTM F-949** for 8″ - 10″ corrugated)

2. The CONTRACTOR shall furnish the testing device and all labor, equipment, and materials for making this acceptance test.

3. The test shall be conducted after all backfill has been placed and consolidated, but before paving is constructed. The 95% device shall be used if the testing is done less than thirty (30) days after consolidation. The 92.5% device may be used if testing is done thirty (30) days or more after consolidation. Any section of the completed sewer failing to pass this test shall be repaired and retested. All testing shall be done under the observation of the ENGINEER.

4. For acceptance, the device must pass through the entire section between manholes or other structures in one (1) pass when pulled by hand without the use of excessive force.

3700.3.4 Closed Circuit Televising

1. The intent of closed circuit televising inspection (CCTI) is to observe and record the conditions of the sewer sections being inspected. The location of the laterals will also be documented on the report. All sewer structures, which are connected to each end of a televised sewer section, shall be included within at least one (1) televised sewer section video for all sewer sections fully surveyed from end to end.

2. **EQUIPMENT:** The camera, television monitor, and other components of the video system shall be capable of producing a quality color picture. The television camera used for the inspection shall be one specifically designed and constructed for such inspection and shall be capable of radial view for inspection of the entire pipe, including lateral connections. The camera shall be mounted on adjustable skids, or self-propelled, and positioned in the center of the pipe. Lighting of the camera shall be supplied by a lamp on the camera and shall be capable of lighting the entire periphery of the pipe. The camera shall be operative in one hundred percent (100%) humidity conditions and shall have a minimum of six hundred and fifty (650) lines of resolution. The view seen on by the televising camera shall be transmitted to a monitor of not less than seventeen inches (17″).

3. **PROCEDURES:** A minimum of one (1) pass with a jet shall be made prior to televising. The television camera shall be moved through a sewer at a uniform rate, stopping when necessary to insure properly documentation of the sewer. The television camera shall not be pulled at a speed greater than thirty feet (30') per minute.

4. During the inspection operation, if the television camera will not pass through the entire sewer section, the CONTRACTOR shall reset his equipment in a manner so the inspection can be performed from the opposite manhole. If, again, the camera fails to pass through the entire section, the CONTRACTOR shall excavate and repair or replace the defective section. All costs for the reset and repair due to an obstruction shall be done at the CONTRACTOR's expense.

5. If the camera becomes submerged due to a sag in the pipe, a high velocity jet will be utilized to pull water away from the camera lens. If the ENGINEER deems the sag is not acceptable, the CONTRACTOR will excavate and repair or replace the defective section of pipe at their own expense.

6. If the camera becomes trapped within the sewer, it is the responsibility of the CONTRACTOR to remove the camera. All costs for removal, including possible excavation and restoration are the responsibility of the CONTRACTOR.

7. **INSPECTION LOGS:** The logs shall be computer printed. One (1) copy in a PDF format shall be supplied to the CITY. Television inspection logs must include the following:
   A. Date, time, City, Street, basin, sewer section, reference manhole number, name of operator, inspector, and weather conditions.
   B. Pipe diameter, pipe material, section length, depth of pipe, length between joints, and corresponding video recording identification.
   C. Location of each point of leakage and estimate of flow.
   D. Location of each service connection.
   E. Location of any damaged sections, nature of damage, and location with respect to pipe axis (such as mineral deposits, cracked pipe, sags, etc.).

8. **RECORDINGS:** The purpose of video recording is to supply a visual record and audio record of the condition of sewers. Recording playback shall be done at the same speed that it was recorded. Upon final payment of the work, all video recording shall become the property of the CITY, and shall be in a digital format. A complete video and audio recording shall be made of each line televised. Recordings and packages shall be labeled with location information and inspection date. Television inspection reports shall include the following:
   A. Visual (On screen in corner)
      1. Report number.
      2. Date of television inspection.
      3. Sewer section and number.

4. Current distance along reach (Tape counter footage).

B. Audio:
   1. Date and time of television inspection, operator name, name of overlaying or adjacent street, and manhole numbers.
   2. Verbal confirmation of sewer section and televising direction in relation to the direction of flow.
   3. Verbal description of pipe size, type, and pipe joint length.
   4. Verbal description and location of each service connection and pipe defect.
   5. Type of weather during inspection.

3700.3.5 Water Infiltration Test

1. The water infiltration test shall not be considered a valid leakage test unless the top surface of the groundwater is at least two feet (2') above the top of the pipe for the entire test length of the tested section during the test measurement. The CONTRACTOR may simulate this condition, at no cost to the CITY by flooding the trenches, with prior approval of the ENGINEER.

2. The rate of infiltration of water into the sewer project, including manholes, shall not exceed two hundred (200) gallons per day, per inch diameter, per mile of sewer.

3. The maximum infiltration rate for manholes tested separately and independently shall be 0.1 gallons per foot of diameter per foot of head per vertical foot of manhole per hour.

4. The maximum allowable infiltration, expressed in gallons per hour is shown in ***Table 3***, located at the end of this Section for various pipe sizes. Visible leaks, defective joints, and defective pipe shall be satisfactorily repaired or replaced.

3700.3.6 Water Exfiltration Test

1. The water exfiltration test shall only be used if the existing groundwater level is less than two feet (2') above the crown of the pipe measured from the highest elevation of the sewer section being tested.

2. Any arrangement of testing equipment which will provide observable and accurate measurement of water leakage under the specified conditions will be permitted. The rate of exfiltration of water out of the sewers, including manholes and appurtenances, shall not exceed two hundred (200) gallons per day, per inch diameter, per mile of sewer.

3. The maximum exfiltration rate for manholes tested separately and independently shall be 0.1 gallons per foot diameter per vertical foot of manhole per foot of head per hour.

4. The sewer test section shall be filled a minimum of four (4) hours and up to a maximum of seventy-two (72) hours prior to the time of exfiltration testing to permit normal absorption into the sewer walls to take place. After the absorption period, the pipe shall be re-filled to a minimum of two feet (2') above the crown of the pipe or at least two feet (2') above existing groundwater, whichever is higher.

5. The maximum allowable exfiltration, expressed in gallons per hour, is the same as for the infiltration and is shown in ***Table 3***, located at the end of this Section. The minimum test period is fifteen (15) minutes and the maximum shall not exceed twenty-four (24) hours. Visible leaks, defective joints, and defective pipe shall be satisfactorily repaired or replaced.

6. The ENGINEER reserves the right to waive the exfiltration test on any section of sewer based on their evaluation of the results of previous tests of the project. When exfiltration tests are waived, a credit will be taken.

3700.3.7 Closed Circuit Televising Using Push Camera

1. The intent of closed circuit televising inspection using push camera is to observe the conditions of the sewer sections being inspected.

2. **EQUIPMENT:** The camera, television monitor, and other components of the video system shall be capable of producing a quality picture. The television push camera used for the inspection shall be one specifically designed for and constructed for such inspection. Lighting of the camera shall be supplied by a lamp on the camera and shall be capable of lighting the entire periphery of the pipe. The camera shall be operative in one hundred percent (100%) humidity conditions.

3. **PROCEDURES:** When ordered by the ENGINEER, the television camera shall be moved through a sewer at a uniform rate, stopping when necessary to insure proper documentation of the sewer section. The television camera shall not be pulled at a speed greater than thirty feet (30') per minute.

4. During the inspection operation, if the television camera will not pass through the entire sewer section, the CONTRACTOR shall reset their equipment in a manner so the inspection can be performed from the opposite end. If the camera fails to pass through the entire section again, the ENGINEER will make a determination on the excavation of the defective section.

5. If the camera becomes trapped within the sewer, it is the responsibility of the CONTRACTOR to remove the camera. All costs for removal, including possible excavation and restoration are the responsibility of the CONTRACTOR.

3700.4 Measurement

3700.4.1 Low Pressure Air Test

1. The CITY will not measure the low pressure air test, since it is incidental to the construction of the sanitary sewer.

3700.4.2 Mandrel Test

1. The CITY will not measure the mandrel test, since it is incidental to the construction of the sanitary sewer.

3700.4.3 Closed Circuit Televising

1. The CITY will measure the Closed Circuit Televising Bid Item by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the pipe, from sanitary manhole to manhole or to the end of the existing sanitary sewer pipe. The CITY will make no deductions from those measured lengths for intermediate fittings. No deductions will be made for sanitary manholes.

3700.4.4 Water Infiltration Test

1. The CITY will not measure the water filtration test, since it is incidental to the construction of the sanitary sewer.

3700.4.5 Water Exfiltration Test

1. The CITY will not measure the water exfiltration test, since it is incidental to the construction of the sanitary sewer.

3700.4.6 Closed Circuit Televising Using Push Camera

1. The CITY will measure the Closed Circuit Televising Using Push Camera Bid Item as an individual unit that is acceptably completed.

3700.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Item:

Bid Item	Description	Units
CLOSED CIRCUIT TELEVISING		
3700	Closed Circuit Televising	LF

Bid Item	Description	Units
3701	Lateral Launch and Setup	EA
3702	Lateral Televising	LF
3710	Closed Circuit Televising Using Push Camera	EA

3700.5.1 Low Pressure Air Test

1. Payment for low pressure air testing the sanitary sewer is included in the cost of the construction of the sanitary sewer.

3700.5.2 Mandrel Testing

1. Payment for the mandrel testing is included in the cost of the construction of the sanitary sewer.

3700.5.3 Closed Circuit Televising

1. Payment for the Closed Circuit Televising Bid Item of the sanitary sewer is full compensation for providing all necessary labor, equipment, and materials to satisfactorily complete the test procedure.

2. Payment for Lateral Launch and Setup Bid Item of sewer laterals is full compensation for providing all necessary labor, equipment, and materials to satisfactorily complete the lateral camera launch into the lateral line upstream of the main line connection. Only one (1) lateral launch per lateral will be paid. Lateral launches shall only be paid where survey of the lateral is required for those locations where the lateral cannot be visually verified to be capped or terminated from within the sewer main.

3. Payment for Lateral Televising is full compensation for providing all necessary labor, equipment, and materials to satisfactorily survey the sewer lateral as specified in **Section 3700.3.4** of these Specifications to the point of termination, right-of-way line, or greatest extent possible as determined necessary by the ENGINEER. This Bid Item will be measured per linear foot for the section of lateral acceptably televised upstream of the main line connection.

4. When lateral televising is required, a pre-construction survey shall be completed by the CONTRACTOR to identify existing lateral locations. Each lateral shall be located and marked at the mainline connection and where the lateral leaves the public right-of-way. The lateral shall be marked at the right-of-way line by installing a ribboned survey nail in order for the lateral marker to be easily identified and surveyed. The CONTRACTOR shall notify the CITY after each block is surveyed and marked to allow the CITY to survey the existing utility features.

5. If the CITY deems the televising of the sanitary mains is not of good quality, the CONTRACTOR will redo the section at their own expense.

6. **If the CONTRACTOR fails to deliver a copy of the televising reports, including discs containing the videos, to the CITY at least two (2) working days or one (1) working day with ENGINEER's approval prior to paving of the street, a five percent (5%) deduction of the price of the bid items not properly televised, up to a maximum of two dollars ($2.00) per linear foot, will be assessed against the Contract.**

7. **If a section of pipe is determined that a fix must be made to it, the CONTRACTOR shall make the necessary repair and shall re-televise the fixed section of pipe at their own expense. The new re-televised section must be delivered to the ENGINEER within three (3) working days of the fix.**

3700.5.4 Water Infiltration Test

1. Payment for the water infiltration test is included in the cost of the construction of the sanitary sewer.

3700.5.5 Water Exfiltration Test

1. Payment for the water infiltration test is included in the cost of the construction of the sanitary sewer.

3700.5.6 Closed Circuit Televising Using Push Camera

1. Payment for the Closed Circuit Televising Using Push Camera Bid Item is full compensation for providing all necessary labor, equipment, and materials to satisfactorily complete the test procedure.

TABLE 1
MINIMUM SPECIFIED TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PIPE INDICATED

Specification Time for Length (L) Shown: Minutes

Pipe Dia. In.	Min. Time, Min.	Length for Min. Time, Feet	Time for Longer Lengths	100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	0.380L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.694L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

TABLE 2
TESTING DEVICE DIMENSIONS FOR PVC PIPE

SDR 35 D3034

	Minimum Diameter (Inches)		
Nominal Size (Inch)	Base ID	5% Deflection	7.5% Deflection
8	7.67	7.28	7.09
10	9.56	9.08	8.85
12	11.36	10.79	10.51
15	13.90	13.20	12.85
18	16.98	16.13	15.70
21	20.00	19.00	18.50
24	22.48	21.54	20.79

F949

	Minimum Diameter (Inches)		
Nominal Size (Inch)	Base ID	5% Deflection	7.5% Deflection
8	7.66	7.27	7.08
10	9.55	9.07	8.83
12	11.34	10.77	10.49
15	13.86	13.17	12.82
18	16.96	16.12	15.69
21	20.16	19.16	18.65
24	22.63	21.50	20.94
30	28.20	26.79	26.08
36	34.18	32.47	31.61

F679, PS46, 12454C

	Minimum Diameter (Inches)		
Nominal Size (Inch)	Base ID	5% Deflection	7.5% Deflection
18	16.98	16.13	15.70
21	20.00	19.00	18.70
24	22.48	21.36	20.79
27	25.33	24.06	23.43

F679, PS46, 12364C

	Minimum Diameter (Inches)		
Nominal Size (Inch)	Base ID	5% Deflection	7.5% Deflection
18	17.06	16.20	15.78
21	20.10	19.09	18.59
24	22.59	21.46	20.89
27	25.45	24.17	23.54

TABLE 2A
TESTING DEVICE DIMENSIONS FOR POLYPROPYLENE PIPE

Pipe Type	Pipe Diameter	Minimum Inside Diameter	Inside Diameter with 5% Deflection	Inside Diameter with 7.5% Deflection
Dual Wall	12″	11.90	11.31	11.01
	15″	14.85	14.11	13.74
	18″	17.93	17.03	16.59
	24″	23.90	22.71	22.11
	30″	29.79	28.30	27.56
Triple Wall	30″	29.62	28.14	27.40
	36″	35.40	33.63	32.75
	42″	41.31	39.24	38.21
	48″	47.31	44.94	43.76
	60″	59.30	56.34	54.85

TABLE 3
ALLOWABLE LIMITS OF INFILTRATION
BASED ON 200 GAL./INCH. DIA./MILE

DIAMETER OF SEWER INCHES	INFILTRATION GALLONS PER FT. PER HOUR	DIAMETER OF SEWER INCHES	INFILTRATION GALLONS PER FT. PER HOUR
4	0.0063	24	0.0378
6	0.0095	27	0.0426
8	0.0126	30	0.0474
10	0.0158	36	0.0568
12	0.0190	42	0.0663
15	0.0237	48	0.0758
18	0.0284	60	0.0947
21	0.0332		

SECTION 3800
SANITARY SEWER ABANDONMENTS

3800.1 Description

1. This Section describes the abandoning of existing sanitary structures and sanitary sewer pipe, either through crushing, filling, or removal of the existing sanitary sewer.

3800.2 Materials

1. This Section is left vacant.

3800.3 Construction

1. The ENGINEER shall order sanitary sewer manholes and pipes which are no longer in use to be bulkheaded and abandoned.

2. The abandonment of sanitary sewer manholes and pipes shall conform to **Section 3.2.24** in the *Standard Specifications for Sewer and Water Construction in Wisconsin*, dated December 22, 2004.

3800.3.1 Abandon Sanitary Manholes

1. The abandonment of sanitary manholes shall also include the following specifications:
   A. All abandoned manholes shall be removed to a depth of three (3') below the proposed or established grade or existing street grade, whichever is greater.
   B. The manhole structure base shall be cracked to allow drainage.
   C. The manhole structure shall be backfilled with a granular backfill material suitable for the location of the existing sanitary manhole.
   D. All castings on such abandoned structures are property of the CITY and shall be salvaged by the CONTRACTOR and delivered to the City yard as directed.

3800.3.2 Abandon Sanitary Sewer Pipes

1. The abandonment of eight-inch (8") to twelve-inch (12") sanitary sewer shall also include the following specifications:
   A. The CONTRACTOR shall construct a bulkhead at each exposed end of the abandoned pipe consisting of a five-inch (5") brick wall. The abandoned pipe may stay in its existing location, if the proposed sanitary sewer alignment does not coincide with the existing alignment.
   B. When the existing alignment coincides with the proposed alignment, the existing pipe shall be completely removed and considered incidental to the installation of the proposed sanitary sewer.

2. The abandonment of fifteen-inch (15″) or larger sanitary sewer shall also include the following specifications:
   A. The CONTRACTOR shall construct a bulkhead at each exposed end of the abandoned pipe consisting of a five-inch (5″) brick wall. In addition to the bulkheads, the abandoned pipe shall be filled with either sand or cellular concrete if the proposed alignment does not coincide with the existing alignment.
   B. When the existing alignment coincides with the proposed alignment, the existing pipe shall be completely removed and considered incidental to the installation of the proposed sanitary sewer.

3. For all abandonment of sanitary sewer pipe, the CONTRACTOR will have the option to completely remove the existing sanitary sewer and backfill trench with appropriate backfill material. This will be paid for at the same unit cost as abandoning in place.

3800.3.3 Remove Sanitary Sewer Pipes

1. The removal of sanitary sewer pipes also includes the following specifications:
   A. All abandoned sanitary mains shall be excavated and removed from the roadway as shown on the Plans or ordered by the ENGINEER. The trench will then be backfilled with a crushed aggregate base course conforming to **Section 100.61** of these Specifications. Removal of structures shall be considered incidental to the removal of the pipes.

3800.3.4 Remove Sanitary Sewer Manholes

1. The removal of sanitary sewer manholes also includes the following specifications:
   A. All sanitary sewer manholes shall be excavated and removed from the roadway as shown on the Plans or ordered by the ENGINEER. The trench will then be backfilled with a crushed aggregate base course conforming to **Section 100.61** of these Specifications. Removal of structures shall be considered incidental to the removal of the pipes.

3800.4 Measurement

3800.4.1 Abandon Sanitary Sewer Manholes

1. The CITY will measure the Sanitary Sewer Manhole Abandonment Bid Item by each individual unit that is acceptably completed.

3800.4.2 Abandon Sanitary Sewer Pipes

1. The CITY will measure the Sanitary Sewer Pipe Abandonment Bid Items by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of

the pipe, from sanitary manhole to manhole or to the end of the existing sanitary sewer pipe. The CITY will make no deductions from those measured lengths for intermediate fittings.

2. No deductions for manholes will be made unless the internal diameter of the sanitary sewer is twenty-four inches (24″) or larger, in which case the internal diameters of the manholes will be deducted from the total measurement by the CITY.

3800.4.3 Remove Sanitary Sewer Pipes

1. The CITY will measure the Removal of Sanitary Sewer Pipes Bid Item by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the pipe that is to be removed. The CITY will make no deductions from those measured lengths for intermediate fittings. No deductions for manholes will be made unless the internal diameter of the sanitary sewer is twenty-four inches (24″) or larger, in which case the internal diameters of the manholes will be deducted from the total measurement by the CITY.

3800.4.4 Remove Sanitary Sewer Manholes

1. The CITY will measure the Removal of Sanitary Sewer Manholes Bid Item by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the pipe that is to be removed. The CITY will make no deductions from those measured lengths for intermediate fittings. No deductions for manholes will be made unless the internal diameter of the sanitary sewer is twenty-four inches (24″) or larger, in which case the internal diameters of the manholes will be deducted from the total measurement by the CITY.

3800.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
ABANDON SANITARY SEWER MANHOLES		
ABANDON SANITARY SEWER PIPES		
REMOVE SANITARY SEWER PIPE		
MISCELLANEOUS SANITARY SEWER CONSTRUCTION		
3800	Abandon Sanitary Sewer Manholes	EA
3801	Abandon 6″ Sanitary Sewer	LF
3802	Abandon 8″ Sanitary Sewer	LF
3804	Abandon 10″ Sanitary Sewer	LF
3806	Abandon 12″ Sanitary Sewer	LF

3808	Abandon 15″ Sanitary Sewer	LF
3810	Abandon 18″ Sanitary Sewer	LF
3812	Abandon 21″ Sanitary Sewer	LF
3814	Abandon 24″ Sanitary Sewer	LF
3816	Abandon 27″ Sanitary Sewer	LF
3818	Abandon 30″ Sanitary Sewer	LF
3819	Abandon 33″ Sanitary Sewer	LF
3820	Abandon 36″ Sanitary Sewer	LF
3822	Abandon 42″ Sanitary Sewer	LF
3824	Abandon 48″ Sanitary Sewer	LF
3826	Abandon 54″ Sanitary Sewer	LF
3828	Abandon 60″ Sanitary Sewer	LF
3830	Abandon 66″ Sanitary Sewer	LF
3850	Abandon 72″ Sanitary Sewer	LF
3852	Remove Sanitary Sewer Manholes	EA
3854	Remove Sanitary Sewer	LF

3800.5.1 Abandon Sanitary Sewer Manholes

1. Payment for the Abandon Sanitary Sewer Manholes Bid Item is full compensation for providing all necessary labor, equipment, and materials; for excavating; for breaking down or removing existing manhole; for providing granular backfill material; for backfilling; and for cleaning out and restoring the site of the work. Rock Excavation will be paid for under a separate Bid Item.

3800.5.2 Abandon Sanitary Sewer Pipes

1. Payment for the Abandon Sanitary Sewer Pipes Bid Items is full compensation for providing all necessary labor, equipment, and materials to remove, to break down, to brick ends, and to slurry or sand fill existing sanitary sewer pipes. It also includes providing granular backfill material, for backfilling, and for cleaning out and restoring the site of the work.

3800.5.3 Remove Sanitary Sewer Pipes

1. Payment for the Removal of Sanitary Sewer Pipes Bid Item is full compensation for providing all necessary labor, equipment, and materials to remove existing sanitary sewer pipes. It also includes providing granular backfill material, for backfilling, for compacting, and for cleaning up and restoring the site of the work. Removal of structures shall be included in the unit price bid for Removing Pipe.

SECTION 3900
SANITARY SEWER SYSTEM TRENCHLESS REHABILITATION

3900.1 Description

1. This Section describes the use of trenchless technologies for sanitary sewer rehabilitation.

3900.2 Materials

3900.2.1 Cast-in-Place Pipe (CIPP)

1. Summary
   A. The installation and curing process for CIPP pipe is known to produce various amounts of vapors, fumes and suspended particulates, which may release noxious volatile organic compounds and hazardous air pollutants into the atmosphere and connected enclosed spaces. The CONTRACTOR shall take all necessary steps to minimize any hazardous materials from entering adjacent buildings and structures which are directly or indirectly connected to the sewer system where exposure to such substances is possible. The CONTRACTOR shall comply with **NASSCO Guidelines for Safe Use and Handling of Styrene-Based Resins in Cured-in-Place Pipe**. The CONTRACTOR shall take actionable steps to purge the sewer main of any post-curing vapors, fumes, and residual suspended particulates prior to reinstating lateral connections. The CONTRACTOR shall be responsible for ensuring all curing water released downstream into the existing sanitary sewer shall be adequately diluted to avoid fumes migrating further downstream. The CONTRACTOR may be required to introduce additional flows to the main if sufficient flows within the system at the point of discharge do not exist to adequately dilute curing water. All quality control measures shall be incident to the Contract.
   B. Each installer must satisfy all insurance, financial, and bonding requirements of the CITY, and have at least three (3) years of active experience in the installation of the product. In addition, the installer must have successfully installed at least 25,000 linear feet of the product in wastewater collection systems.
   C. The site superintendent in charge of the CIPP installation shall have extensive experience in the installation of CIPP. Information documenting who the superintendent will be and their experience in CIPP installation shall be submitted to the CITY. The CITY's decision regarding the qualification of the site superintendent shall be final. If the initial site superintendent does not meet the experience criteria, the CONTRACTOR shall submit a more qualified individual or otherwise satisfy the CITY regarding the installation supervision and quality control.
   D. Video of the proposed segments are available upon request.

2. References
   A. American Society for Testing and Materials (ASTM):
      1. **ASTM D-543**: Test method for resistance of plastics to chemical reagents.

2. **ASTM D-638**: Test method for tensile properties of plastics.
3. **ASTM D-790**: Test methods for tensile properties of un-reinforced plastics and electrical insulating materials.
4. **ASTM F-1216**: Rehabilitation of existing pipelines and conduits by inversion and curing of a resin-impregnated tube.

3. Submittals
   A. Product Data
      1. Manufacturer's product literature, application, and installation requirements for materials used in the liner.
      2. Manufacturer's product certification for materials used in the liner.
      3. Liner pipe thickness design:
         a. Liner pipe thickness data shall be accordance with **Appendix XI** of **ASTM F-1216**. The existing sewer shall be considered to be in a fully-deteriorated gravity pipe condition and the original pipe is not considered structurally sound and cannot support soil and live loads. The CIPP shall be designed to support hydrostatic, soil, and live loads. Hydrostatic load shall assume a groundwater elevation of two feet (2') below the existing ground. In the liner thickness calculations, the minimum ovality of the host pipe shall be determined from the City video available for review, but no less than 1%; the enhancement factor (K) shall not be greater than 7.0; the minimum factor of safety shall be 2.0; and the flexural modulus of elasticity shall be reduced 50% to account for long-term effects and used in the design equation EL.
         b. The CONTRACTOR shall be responsible for all aspects of the design of the liner pipe. The CONTRACTOR shall guarantee the installed liner is capable of sustaining outside loads, resist chemical attack that normally occurs in sanitary sewer, and will maintain hydraulic characteristics over a fifty (50) year design life. No design shall rely on bonding to the existing pipe or rely on the remaining strength of the existing pipe.
         c. No liner shall be installed until the design has been approved for installation.
         d. No liner will be approved for installation until liner thickness calculations have been submitted and reviewed for conformance with the Specifications and installation requirements.
   B. Miscellaneous Submittals
      1. Video of the existing pipe condition (pre-lining) of both the sanitary sewer main and the sanitary sewer laterals.
      2. Post-lining televising with report showing all the reinstated connections. Report shall be handed in within one (1) month of the lining. If the televising is not received within one (1) month, the CITY reserves the right to hire a Contractor to televise and the cost for performing these services will be deducted from the Contract.
      3. Test results as required in the Specifications.
      4. Proposed plan for bypassing sewerage during liner installation.
      5. Detailed construction schedule incorporating traffic control.

6. Business and residential notification letters.

4. Quality Assurances
   A. Corrosion
      1. Fabricate finished liner from materials which, when cured, will be chemically resistant to withstand internal exposure to domestic sewerage.
   B. Manhole Connections
      1. All manhole connections shall be watertight.
   C. Testing
      1. Test finished pipe liner in accordance with **Section 3900.3.4** of these Specifications.
      2. Test finished pipe for leakage in accordance with the requirements of **ASTM F-1216.8.2**.
      3. Products for Cured-In-Place liner.
   D. Resin
      1. Polyester resin for general chemical applications:
         a. Resin shall not contain fillers, except for those required for viscosity control. Up to five percent (5%) mass thixotropic agent, which will not interfere with visual inspection, may be added for viscosity control.
         b. Resins may contain pigments, dyes, or colorants, which will not interfere with the visual inspection of the cured liner.
   E. Reinforcing Material
      1. Non-woven, needle-interlocked polyester felt formed into sheets or required thickness:
         a. Felt tubes may be made of single or multiple layer construction, with any layer not less than 1.5 mm thick.
         b. Mechanical strengthener membrane or strips may be sandwiched in between layers, where required, to control longitudinal stretching.
         c. Polyurethane membrane used during inversion of tube may be left on internal surfaces of lining after curing.
         d. Minimum thickness of bonded polyurethane membrane and inner liner, if used, shall be 0.25 mm, +5%, and shall not affect structural dimension requirements of cured liner.
   F. Felt Content
      1. Content shall ensure a cured thickness of liner, as specified.
      2. Thickness of cured liner to be as specified (+4% - 10%) and shall not include thickness of polyurethane inner liner.
   G. Resin Content
      1. Ten percent (10%) to fifteen percent (15%) by volume greater than volume of felt in liner bag.

H. Cured liner shall conform to the minimal structural standards listed:

Description	Standard	Value
Tensile Strength	**ASTM D-638**	3,000 psi
Flexural Modulus of Elasticity	**ASTM D-790**	250,000 psi
Flexural Strength	**ASTM D-790**	4,500 psi

I. Fabricate liner to size that, when installed, will fit internal circumference of pipe. Allowance shall be made for circumferential stretching during insertion.
J. Meet requirements of **ASTM F-1216**.

3900.2.2 Mainline Grouting

1. Summary
   A. Each installer must satisfy all insurance, financial, and bonding requirements of the CITY, and have at least three (3) years of active experience in the installation of the product. In addition, the installer must have successfully installed at least 25,000 linear feet of the product in wastewater collection systems.
   B. The site superintendent in charge of the pressure testing and grouting shall have extensive experience in the testing and installation of said grout. Information documenting who the superintendent will be and their experience in pressure testing and grouting shall be submitted to the CITY. The CITY's decision regarding the qualification of the site superintendent shall be final. If the initial site superintendent does not meet the experience criteria, the CONTRACTOR shall submit a more qualified individual or otherwise satisfy the CITY regarding the installation supervision and quality control.
   C. Video of the proposed segments are available upon request.

2. References
   A. American Society for Testing and Materials (ASTM):
      1. **ASTM F-2304**: Standard Practice for Rehabilitation of Sewers using Chemical Grouting (latest revision).
      2. **ASTM F-2454**: Standard Practice for Sealing Lateral Connections and Lines from the Mainline Sewer Systems by Lateral Packer Method, Using Chemical Grouting (latest revision).

3. Submittals
   A. Equipment operating procedures and systems.
   B. Chemical Grout Information:
      1. Description of chemical grout materials to be used per **Section 3900.2.2.5** of these Specifications.
      2. Description of proposed additives to be used per **Section 3900.2.2.6** of these Specifications.

3. Manufacturer's recommended procedures of restoring, mixing, testing, and handling of chemical grouts.
4. MSDS sheets for all materials to be used.

C. Identify the manufacturers and models of the packers to be utilized on the project.

D. Upon completion of each pipe segment, submit to the ENGINEER a report showing the following data for each joint and/or lateral connection tested, grouted, or attempted to be grouted, as required by the National Association of Sewer Service Companies' (NASSCO's) Pipeline Assessment and Certification Program (PACP).
1. Identification of the sewer pipe section tested by manhole number to manhole number (example: 03-456 to 03-457) and length.
2. Type of pipe material, diameter, and depth of pipe to the surface at manholes.
3. Length of pipe sections between joints.
4. Test pressure used and duration of test.
5. Pass/fail results for each joint/connection tested.
6. Location stationing of each joint/connection tested and location of any joints/connections not tested with an explanation for not testing.
7. Volume of grout material used on each joint/connection.
8. Gel set time used (cup test results from tanks)
9. Grout mix record of the batches mixed, including amount of grout, catalyst, additive, and temperature of the grout solution in tanks.
10. Operator conducting testing and sealing shall be noted on the reports.
11. Video recordings:
    a. Video of existing pipe condition (pre-air pressure testing and grouting) of both the sanitary sewer main and the sanitary sewer laterals.
    b. Video recording shall include testing and sealing operations for each joint/lateral (including inflation and deflation over the joint/lateral) and displaying the final air test of joints or laterals.
    c. Additional final recording shall include inspection of the pipe and laterals after all grouting work has been completed. Report shall be handed in within one (1) month of the grouting and testing. If the televising is not received within one (1) month, the CITY reserves the right to hire a Contractor to televise and the cost for performing these services will be deducted from the Contract.

E. Proposed plan for bypassing sewerage during air pressure testing and grouting.

F. Detailed construction schedule incorporating traffic control.

G. Business and residential notification letters.

4. Testing and Grouting Equipment

A. The basic equipment used for mainline pipe joints and for laterals connected to the mainline shall consist of a remotely-operated color television camera capable of pan and tilt, joint testing device (referred to hereafter as a packer), and test monitoring equipment. The equipment shall be constructed in such a way as to provide means for introducing air under pressure into the void area created by the expanded ends of the packer against the host pipe and a means for continuously measuring, viewing, and recording the actual

static pressure of the test medium and grout within the void area only. The packer shall be of a size less than the diameter of the host pipe, with the cables at either end used to pull it through the line and may be constructed in such a manner as to allow a restricted amount of sewage to flow at all times. Packer shall be expanded by air pressure. Packers shall be of low void space construction with void volume given by the packer manufacturer.

B. The device for testing lateral connections shall consist of inflatable mainline end elements and a lateral grouting plug that creates a void area extending beyond the main connection. Whenever possible, use a lateral grouting plug sized to match the diameter of the lateral being grouted with an effective sealing length of at least three feet (3'). Where the lateral is capped, utilize alternate lateral grouting plug or equipment sized appropriately for the capped lateral. In cases where the lateral transitions from six inches (6") to four inches (4") in diameter, use a four-inch (4") lateral grouting plug. However, it is possible that, due to physical restrictions, the lateral plug may not launch and thus the service may not be able to be grouted.

C. Void pressure data shall be transmitted from the void area to the monitoring equipment or video picture of a pressure gauge mounted on the packer and connected to the void area. All test monitoring shall be above ground and in a location to allow for simultaneous and continuous observation of the televising monitor and test monitoring equipment.

D. Grouting equipment shall consist of the packer and appropriate pumping and hosing systems capable of supplying an uninterrupted flow of sealing materials to completely fill the voids. Grout pumping system shall be sized to deliver a mixed volume of grout at a minimum of three (3) gpm and thirty (30) gallons of uninterrupted flow within ten (10) minutes.

E. Volume of mixed grout pumped must be capable of being measured and recorded for each grouted joint/connection. Generally, the equipment shall be capable of performing the specified operations in sewers where flows do not exceed twenty five percent (25%) of pipe diameter, unless permitted by ENGINEER.

F. Connection and lateral service sealing shall be accomplished using the lateral grouting plugs and push packers specified above. Provide back-up bladders for each packer onsite at all times during grouting procedures.

G. Equipment for cleaning lateral blockages shall be readily available while any lateral grouting work is being performed.

5. Grouts
   A. General
      1. All grout materials must have the following characteristics:
         a. While being injected, the grout must be able to react/perform in the presence of water (groundwater).
         b. The ability to increase grout mix viscosity, density, and gel strength by increased concentration of constituents or the use of approved additives.
         c. The cured grout must withstand submergence in water without degradation.

d. The resultant grout formation must be homogeneous and prevent the passage of water (infiltration) through the pipe joint.
e. The grout must not be biodegradable.
f. The cured grout should be chemically stable and resistant to organics found in sewage.
g. Residual grout shall be easily removable from the sewer line to prevent blockage of the sewage flow.

2. Handle, mix, and store grout in accordance with the manufacturer's recommendations. The materials shall be delivered to the site in unopened, original manufacturer's containers.

B. Chemical Grouts

1. Water-based chemical grouts shall have the following characteristics:
   a. A minimum of ten percent (10%) acrylamide base material by weight in the total grout mix. A higher concentration of acrylamide base material is recommended to increase strength or offset dilution during injection.
   b. The ability to tolerate some dilution and react in moving water during injection.
   c. A viscosity of approximately two (2) centipoise, which can be increased with approved additives.
   d. A reaction (curing) that produces a homogenous, chemically-stable, non-biodegradable, firm, flexible gel.
   e. Product Manufacturer
      i. Avanti AV-100, Avanti AV-118, or Approved Equal.
2. Acrylate base grout shall have the following characteristics:
   a. A minimum of ten percent (10%) acrylate base material by weight in the total grout mix.
   b. The ability to tolerate some dilution and react in moving water during injection.
   c. A viscosity of approximately 1 - 3 centipoise, which can be increased with approved additives.
   d. A controllable reaction time from ten (10) seconds to one (1) hour.
   e. A reaction (curing) that produces a homogenous, chemically-stable, non-biodegradable, firm, flexible gel.
   f. Product Manufacturer: DeNeef AC-400, DeNeef Gelacryl SR, Avanti AV-160 or Approved Equal.

6. Additives

A. At the CONTRACTOR'S discretion and according to field conditions, additives may be selected and used within the manufacturer's recommended quantities.

B. Strengthening Agents

1. For joint grouting, a latex or "diatomaceous earth" additive may be added to increase compressive and tensile strength. The quantity of strengthening agent additive shall be as recommended by the manufacturer and approved by ENGINEER.
2. Product Manufacturer: Avanti AV-257 Icoset, DeNeef Reinforcing Agent, or Approved Equal.

C. Root Inhibitor
    1. When roots are present, for joint and lateral connection joint grouting, a root deterrent chemical shall be added to control root re-growth. The quantity of inhibitor shall be as recommended by the manufacturer and approved by ENGINEER.
    2. Project Manufacturer: Avanti AC-50W or Approved Equal.
D. Dye
    1. A manufacturer-approved, water-soluble dye without trace metals may be added to the grout tank(s) for visual confirmation.
E. Gel Time Modifier
    1. A gel time-extending agent may be used in accordance with the manufacturer's recommendations to extend gel time as necessary.
F. Freeze/Thaw
    1. In those lines where the grouting material may be exposed to a freeze-thaw cycle, ethylene glycol or other ENGINEER-approved additive shall be used to prevent chemical grout cracking, once it is set.
G. When using non-soluble additives, the grout tanks must have mechanical mixing devices to keep the additives in suspension and maintain a uniform solution of grout and additive.

7. Control Tests
    A. Packer Tests – Demonstrate the acceptable performance of air test.
        1. To ensure the accuracy, integrity, and performance capabilities of the testing equipment, a demonstration test will be performed in an aboveground, eight-inch (8") nominal diameter test cylinder suitable to contain the full length of the packer and sustain the void test pressure. The test cylinder shall be equipped with a void release valve to exercise a controlled release of pressurized air from the void area to test the packer under both sound and leaking conditions. The test cylinder shall also be equipped with a local pressure gauge (0 - 25 psi) within the void space.
            a. With the void release valve sealed, inflate the packer and air test void at 7 - 10 psi. The observed void pressure at the test cylinder pressure gauge must be within ±1.0 psi of the reading in the control center/studio void pressure gauge and follow both up and down pressure changes (allowing time for pressure equalization).
            b. If above test passed, crack the release valve to simulate a very small leak. The cylinder shall be equipped with a void release valve to exercise a controlled release of the test media with the associated pressure drop to be equally displayed ±1.0 psi on the cylinder gauge and test monitoring equipment.

2. After entering each pipeline segment with the test equipment, but prior to the commencement of joint testing, position the packer on a section of sound sewer pipe between pipe joints, and perform a test, as specified. The equipment shall hold a 7 - 10 psi test pressure for a period of fifteen (15) seconds with a pressure drop of less than one (1) psi. In the event of a failed test, repair any defective equipment and re-test to verify proper operation of all equipment at no additional compensation. Should it be found the surface or porosity conditions of the barrel of the sewer pipe cannot meet the joint test requirements, then the performance testing shall be waived or modified, as determined by the ENGINEER.
3. If air testing cannot be performed successfully, repair or otherwise modify air test equipment and repeat the tests. This test may be required at any other time during the performance of joint testing work if the ENGINEER suspects the testing equipment is not functioning properly.

B. Pump Tests – At the beginning of the Contract, prior to application of grout, perform a pump test to determine if proper ratios are being pumped from the grout component tanks at the proper rates and to measure pump rates. Use separate containers to capture the discharges from each of the grout component hoses, to simulate the actual volumes of each component through the interconnected hoses, hose reel, and length of grout hose, and confirm accuracy of grout pump totalizer. Take corrective action if ratios or rates are not within manufacturer's recommended standards.

C. Grout Tests – Perform and record a grout gel test in the presence of the ENGINEER by recording the grout tank solution temperature, catalyst tank solution temperature, ambient air temperature in truck, and gel time of the sample whenever the following conditions occur:
1. At the beginning of each day. The material in the hoses shall be recycled to the tanks and a sample shall be taken.
2. When new batches of grout are mixed.
3. Whenever the temperature in the tanks or ambient temperature have changed by more than ±10°F from the previous gel test.

3900.2.3 Manhole Grouting

1. General
   A. The CONTRACTOR shall provide cleaning, grouting, and testing of manholes.
   B. The CONTRACTOR shall furnish labor, supervision, power equipment, and materials to perform work.
   C. CONTRACTOR to supply all water necessary for the cleaning of the manholes prior to grouting. The price for this water is to be included in the unit bid price of the Bid Item. **Water is available for purchase at the City of Oshkosh's Water Department Yard, located at 757 West 3rd Avenue**.

2. Products
   A. Chemical Sealing Materials

1. Acrylamide base gel grout.
2. Polyurethane gel grout.
3. The CONTRACTOR shall mix and handle chemical sealing materials in accordance with manufacturer's recommendations.

B. Chemical Sealing Material Performance Standards
   1. Product shall conform to the following standards:
      a. Reacts in moving water while being injected.
      b. Withstand submergence in water without degradation over the life of the grout.
      c. Impervious to water penetration over the life of the grout.
      d. Flexible material.
      e. Withstand freeze-thaw and wet-dry cycles without changes to grout properties.
      f. Not biodegradable.
      g. Chemically stable and resistant to concentrations of acids, alkalis, and organics found in normal sewage.
      h. Meet or exceed the chemical grout sealing effectiveness of "Chemical Sealants for Elimination of I/I", Page 23, United States Environmental Protection Agency (EPA).

C. Chemical Sealing Material Application Requirements
   1. Conform to the following requirements:
      a. Easily transportable by common carrier.
      b. Component materials packaging compatible with field storage requirements.
      c. Provide for maximum worker safety by packaging in a manner that reduces handling of materials and minimizes spillage when preparing for use.
      d. Mixing of components compatible with field applications not requiring precise measurements.
      e. Catalyzation occurs at point of injection/repair.
      f. Clean up without use of flammable or hazardous chemicals.
      g. Capable of being pumped through a minimum of five hundred feet (500') of one-half inch (½") to three-quarter inch (¾") diameter hose.
      h. CONTRACTOR shall remove residual sealing materials from manhole and sewer after injection.

D. Acrylamide Properties
   1. Product shall conform to the following requirements:
      a. Controllable reaction time from ten (10) seconds to one (1) hour.
      b. Viscosity near one (1) centipoise or greater.
      c. Constant viscosity throughout induction period.
      d. Tolerates some dilution and reaction in moving water.
      e. Produces a continuous, irreversible, impervious, stiff gel at final reaction.
      f. Not rigid or brittle.
      g. Negligible corrosion rate on mild steel plates.

3. Submittals
   A. Grouting Report

1. The CONTRACTOR shall prepare written report summarizing the results and locations of completed repairs.
2. The CONTRACTOR shall submit two (2) copies of report to CITY within thirty (30) days of work completion.
3. Report preparation is incidental to grouting.

3900.2.4 Manhole Cementitious Liner

1. General
   A. It is the intent of this Specification to provide minimum standards for materials and methods for waterproofing, sealing, structural reinforcement, and corrosion protection of existing manholes, wet wells, and similar underground structures. This Specification provides flexibility in design by offering technologies available for repairing the various defects found in sanitary sewer structures from minor leaks to complete structural failure.
   B. These repair systems may be engineered for the depth, diameter, shape, traffic loading, groundwater pressures, and condition of each manhole as a system of products, methods, and certified applicators.

2. Referenced Standards
   A. **ASTM C-109**: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.
   B. **ASTM C-157**: Modified Standard Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete.
   C. **ASTM C-293**: Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading).
   D. **ASTM C-309**: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
   E. **ASTM C-403**: Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance.
   F. **ASTM C-469**: Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression.
   G. **ASTM C-496**: Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
   H. **ASTM C-882**: Standard Test Method for Bond Strength of Epoxy Systems Used with Concrete by Slant Shear.
   I. **ASTM C-1090**: Standard Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic-Cement Grout.
   J. **ASTM C-1202** (**AASHTO T277** Equivalent): Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.
   K. **ASTM F-2551**: Standard Practices for Installing a Protective Cement Liner System in Sanitary Sewer Manholes.
   L. **ASTM F-2561-20**: Standard Practice for Rehabilitation of Sewer Service Lateral and its Connection to the Main Using a One-Piece Main and Lateral Cured-In-Place Liner.

M. **ASTM F-1216-22**: Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of Resin-Impregnated Tube.
N. **ASTM D-5813-04**: Standard Specification for Cured-in-Place Thermosetting Resin Sewer Piping Systems.
O. **ASTM F-2599**: Standard Practice for Sectional Repair of Damaged Pipe by Means of an Inverted Cured-In-Place Liner.

3. Infiltration Elimination
   A. Leak Plugging and Patching Material
      1. Permacast-Plug™
         a. A quick-setting, hydraulic cement compound used to quickly stop running water or seepage leaks in masonry and concrete. The Permacast-Plug™ formulation is non-shrinking, non-metallic, and non-corrosive. Permacast-Plug™ requires only potable water for mixing and achieves initial set in one (1) to three (3) minutes, even when applied under water.
         b. Permacast-Plug™ is used above or below grade, interior or exterior, to stop seepage and flowing water leaks in most concrete and masonry walls and floors. The fast initial set, high strength, and controlled expansion make Permacast-Plug™ an effective patching material for use in manholes, wet wells, lift stations, and other structures with leakage. Permacast-Plug™ will not permanently seal running water leaks that are caused by either thermal or structural movement.
      2. Permacast-Patch™
         a. A fast-setting, ready-to-use, cement-based concrete and masonry patching compound formulated specifically for underwater use. It requires only potable water for mixing. Permacast-Patch™ achieves initial set in three (3) to five (5) minutes and final set within twenty (20) minutes even under water. After initial set, Permacast-Patch™ may be shaved to conform to the contours of the surrounding surface. Properly mixed and applied, Permacast-Patch™ quickly develops a high strength and a tenacious bond.
         b. Permacast-Patch™ is used underwater or below grade on vertical, overhead, and horizontal surfaces. It is used for the patching of manholes in preparation for the PERMACAST® liner application and is particularly well suited to fill offset bricks in the corbel area.
         c. MS-10,000 UL™
            i. PERMACAST® MS-10,000 UL™ is designed to provide a thick base layer that fills mortar joints, cracks, and voids in brick and masonry manholes. The base layer provides a sound substrate onto which the structural liner is spun cast at the specified thickness of one-half inch (½″) – two inches (2″) to reinforce and seal the existing structure.
   B. Chemical Grout
      1. All chemical sealing materials needed for severe leaks in the performance of work specified shall conform to the latest edition of **ASTM F-2304** Standard Practice for Rehabilitation of Sewers Using Chemical Grouting.

4. Structural Cementitious Liner
   A. MS-10,000 Structural Liner
      1. The material is an ultra, high-strength, high-build, corrosion-resistant mortar, based on silica-modified Portland cement. When mixed with the appropriate amount of water, a paste-like material will develop which may be sprayed, cast, pumped, or gravity-flowed into any gap one-half inch (½") and wider. This mortar will harden quickly without any special curing.
      2. The hardened binder is dense and highly impermeable. The above performance is achieved by a complex formulation of mineral, organic, and densifying agents and sophisticated chemical admixtures. Graded quartz sands are used to enhance particle packing and further improve the fluidity and hardened density. The composition also possesses excellent thin-section toughness, high modulus of elasticity, and is self-bonding. Fibers are added as an aid to casting, for increased cohesion, and to enhance flexural strength.
      3. The water content may be adjusted to achieve consistencies ranging from thin motor oil to modeling clay. Despite its high fluidity, the mortar has good wet adhesion and does not sag or run after placement. The mortar may be cast against soil, metals (including aluminum and lead), wood, plastic, cardboard, and other normal construction material.
      4. Physical properties:

Unit Weight	125 pcf
Set Time at 70°F **ASTM C-403**	
Initial Set	min. 120 minutes
Final Set	min. 240 minutes
Modulus of Elasticity **ASTM C-469**	
28 days	min. 1,500,000 psi
Flexural Strength **ASTM C-293**	
24 hours	min. 400 psi
28 days	>1250 psi
Compressive Strength **ASTM C-109**	
24 hours	3,000 psi
28 days	10,000 psi
Split Tensile Strength **ASTM C-496**	>700 psi
Shear Bond **ASTM C-882**	>1,500 psi
Shrinkage **ASTM C-157**, RH 90%	None
Shrinkage **ASTM C-1090**, RH 90%	None
Chloride Permeability **ASTM C-1202**	<550 Coulombs

   B. Design Criteria
      1. Consult ***Tables 1*** and ***2*** for the appropriate thickness of the cementitious liner.

2. If additional thickness is desired at any level, simply place the rotating applicator at that level and recommence pumping and retrieval until that area is thickened. Additional layers may be applied at any time.
3. The CONTRACTOR shall refer to ISU Design Guide.

Table 1: Thickness Design of PERMACAST® Liner for Traffic Loads

Diameter (in.)	Depth (ft.)	Light Traffic			Heavy Traffic		
		12 hours	24 hours	7 days	12 hours	24 hours	7 days
		Thickness (in.)	Thickness (in.)	Thickness (in.)	Thickness (in.)	Thickness (in.)	Thickness (in.)
24	1	1	1	0.75	1.75	1.25	1.25
24	> 2	0.5	0.5	0.5	0.5	0.5	0.5
36	1	1.25	1	1	2	1.75	1.5
36	> 2	0.5	0.5	0.5	0.5	0.5	0.5
48	1	1.5	1.25	1	2.25	1.75	1.75
48	> 2	0.5	0.5	0.5	0.5	0.5	0.5

Table 2: Thickness Design of PERMACAST® Liner for Hydrostatic Loads

Depth (ft.)	Diameter 24 in.			Diameter 36 in.			Diameter 48 in.		
	12 hours	24 hours	7 days	12 hours	24 hours	7 days	12 hours	24 hours	7 days
	Thickness (in.)	Thickness (in.)	Thickness (in.)	Thickness (in.)	Thickness (in.)	Thickness (in.)	Thickness (in.)	Thickness (in.)	Thickness (in.)
4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
8	0.5	0.5	0.5	0.75	0.5	0.5	0.75	0.75	0.5
12	0.5	0.5	0.5	0.75	0.75	0.5	0.75	0.75	0.5
16	0.75	0.5	0.5	0.75	0.75	0.75	1	1	0.75
20	0.75	0.75	0.5	1	0.75	0.75	1	1	0.75
30	0.75	0.75	0.75	1	1	0.75	1.25	1	1
40	1	0.75	0.75	1	1	1	1.25	1.25	1

NOTE: Material which develop strengths less than 3,000 psi in twenty-four (24) hours shall be applied at 1½ times the thickness as shown above.

5. Submittals
   A. All submittals shall conform to the requirements of the Contract documents.
   B. In addition, the following items are required of the installer to be submitted to the ENGINEER prior to commencing work:
      1. Reference submittals
         a. Contractor certification.
         b. Material certification.

2. Product data
    a. Patching and plugging material.
    b. Cementitious lining material.
    c. Cementitious lining with admixture.

3900.3 Construction

3900.3.1 CIPP Preparation

1. Examination
    A. Examine video of condition of pipe interior before starting work.

2. Preparation
    A. Prior to entering access areas such as manholes, and performing inspection or cleaning operations, an evaluation of the atmosphere to determine the presence of toxic or flammable vapors or lack of oxygen must be undertaken in accordance with local, state, and federal safety regulations.
    B. Prior to liner installation, sufficiently clean roots, grease, mineral deposits, and other debris from both the sanitary sewer main and sanitary sewer laterals to provide a minimum of ninety-five percent (95%) opening throughout the pipe and to provide for proper installation of product. This can be achieved by means of a root cutter or chemical agents.
    C. Remove or repair offset joints, protruding services, or collapsed pipe that will prevent insertion of liner, as determined from the City video available for review by the CONTRACTOR. The CONTRACTOR shall receive additional payments for additional excavation spot repairs required due to further deterioration of the pipe from the pre-bid video to the pre-lining video. The CITY reserves the right to delete the lining on any particular manhole to manhole section.
    D. If the CONTRACTOR or ENGINEER determines that existing pipe is fifteen percent (15%) or more out of roundness, CONTRACTOR shall redesign liner.
    E. Sewerage Bypassing:
        1. Provide for flow of sewage around sections of pipe to be lined.
        2. Pump or bypass lines shall be of adequate size and capacity to handle the existing flow of sanitary sewer main.
        3. Coordinate bypassing operations with CITY.
    F. It shall be the responsibility of the CONTRACTOR to notify individuals and businesses whose sanitary sewer will be interrupted during lining operations. It shall be the responsibility of the CONTRACTOR to provide necessary service to businesses affected by the lining operations.
    G. One (1) stretch of pipe at a time (manhole to manhole) shall be installed, unless otherwise approved by the ENGINEER.

3900.3.2 CIPP Installation

1. Preparation of Liner
   A. Resin Impregnation
      1. Designate location where uncured resin in containers and unimpregnated liner will be vacuum-impregnated prior to installation. CONTRACTOR shall allow ENGINEER to inspect materials and "wet-out" procedure.
      2. Resin and catalyst system compatible with requirements of this method shall be used. Quantities of liquid thermosetting materials shall be to manufacturer's standards to provide lining thickness required.
      3. Liner tube shall be impregnated with resin not more than seven (7) days prior to the proposed time of installation and stored out of direct sunlight at temperatures less than forty degrees (40°) Fahrenheit (four degrees (4°) Celsius). Any liner stored longer than seven (7) days must be certified by the installer prior to placement. The certification must state the liner and resin are still viable for installation, and the curing process has not advanced so far to impede inversion or affect the properties of the final finished product. Any liner stored onsite longer than seven (7) days must be tested for flexural strength (**ASTM D-790**) by the CONTRACTOR at no additional cost to the CITY. Test results must be submitted to the ENGINEER prior to final payments of the Contract.
      4. Transport resin-impregnated liner to site immediately prior to inversion in suitable, lightproof containers with temperature maintained below forty degrees Fahrenheit (40°F) (four degrees Celsius (4°C)).

2. Inversion of Liner
   A. Using Hydrostatic Head – The wet-out tube should be inserted through an existing manhole or other approved access by means of an inversion process and the application of hydrostatic head sufficient to fully extend it to the next designated manhole or termination point. The tube should be inserted into the vertical inversion standpipe with the impermeable plastic membrane side out. At the lower end of the inversion standpipe, the tube should be turned inside out and attached to the standpipe so a leak-proof seal is created. The inversion head should be adjusted to be of sufficient height to cause the impregnated tube to invert from point of inversion to point of termination and hold the tube tight to the pipe wall, producing dimples at side connections.
      1. Care should be taken during the inversion process, so as not to overstress the felt fiber.
      2. The tube manufacturer should provide information on the maximum allowable tensile stress for the tube.
   B. Using Air Pressure – The wet-out tube should be inserted through an existing manhole or other approved access by means of an inversion process and the application of air pressure sufficient to fully extend it to the next designated manhole or termination point. The tube should be connected by an attachment at the upper end of the guide chute so a leak-proof seal is created and with the impermeable plastic membrane side out. As the tube enters the guide chute, the tube should be turned inside out. The inversion air

pressure should be adjusted to be of sufficient pressure to cause the impregnated tube to invert from point of inversion to point of termination and hold the tube tight to the pipe wall, producing dimples at side connections.

1. Care should be taken during the inversion so as not to overstress the woven and non-woven materials.
2. **Warning**: Suitable precautions should be taken to eliminate hazards to personnel in the proximity of the construction when pressurized air is being used.

C. Required Pressures – Before the inversion begins, the tube manufacturer shall provide the minimum pressure required to hold the tube tight against the existing conduit, and the maximum allowable pressure so as not to damage the tube. Once the inversion has started, the pressure shall be maintained between the minimum and maximum pressure until the inversion has been completed. Should the pressure deviate from within the range of the minimum and maximum pressures, the installed tube shall be removed from the existing conduit.

D. Lubricant – The use of lubricant during inversion is recommended to reduce friction during inversion. This lubricant should be poured into the inversion water in the down tube or applied directly to the tube. The lubricant used should be a non-toxic, oil-based product that has no detrimental effects on the tube or boiler or pump system, will not support the growth of bacteria, and will not adversely affect the fluid to be transported.

3. Curing Liner

A. Using Circulating Heated Water – After inversion is completed, a suitable heat source and water recirculation equipment are required to circulate heated water throughout the pipe. The equipment should be capable of delivering hot water throughout the section to uniformly raise the water temperature above the temperature required to affect a cure of the resin. Water temperature in the line during the cure period should be as recommended by the resin manufacturer.

1. The heat source should be fitted with suitable monitors to gauge the temperature of the incoming and outgoing water supply. Another such gauge should be placed between the impregnated tube and the pipe invert at the termination to determine the temperatures during cure.
2. Initial cure will occur during temperature heat-up and is completed when exposed portions of the new pipe appear to be hard and sound and the remote temperature sensor indicates the temperature is of a magnitude to realize an exo-therm reaction or cure in the resin. After initial cure is reached, the temperature should be raised to the post-cure temperature recommended by the resin manufacturer. The post-cure temperature should be held for a period as recommended by the resin manufacturer, during which time the recirculation of the water and cycling of the boiler to maintain the temperature continues. The curing of the CIPP must take into account the existing pipe material, the resin system, and ground conditions (temperature, moisture level, and thermal conductivity of the soils).

B. Using Steam – After inversion is completed, suitable steam-generating equipment is required to distribute steam throughout the pipe. The equipment should be capable of

delivering steam throughout the section to uniformly raise the temperature within the pipe above the temperature required to affect the cure of the resin. The temperature in the line during the cure period should be recommended by the resin manufacturer.

1. The steam-generating equipment should be fitted with a suitable monitor to gauge the temperature of the outgoing steam. The temperature of the resin being cured should be monitored by placing gauges between the impregnated tube and the existing pipe at both ends to determine the temperature during cure.
2. Initial cure will occur during temperature heat-up and is completed when exposed portions of the new pipe appear to be hard and sound and the remote temperature sensor indicates the temperature is of a magnitude to realize an exo-therm reaction or cure in the resin. After initial cure is reached, the temperature should be raised to post-cure temperatures recommended by the resin manufacturer. The post-cure temperature should be held for a period as recommended by the resin manufacturer, during which time the distribution and control of steam to maintain the temperature continues. The curing of the CIPP must take into account the existing pipe material, the resin system, and ground conditions (temperature, moisture level, and thermal conductivity of the soils).

C. Required Pressures – Before the curing begins, the pressure required to hold the flexible tube tight against the existing conduit shall be provided by the tube manufacturer. Once the cure has started and dimpling for laterals is completed, the required pressure shall be maintained until the cure has been completed. Should the pressure deviate more than 2.3' of water (1 psi) from the required pressure, the installed tube shall be removed from the existing conduit. If required by the CITY, a continuous log of pressure during cure shall be maintained.

D. Air Monitoring – The CONTRACTOR shall be responsible for monitoring air quality where the presence of unwanted VOC and Styrene-based particulates odors could build up in confined spaces connected to the sewer system, such as, but not limited to, internal sewer manholes spaces, adjacent building spaces, and residential homes during the active CIPP curing process. If VOC and Styrene-based odors are noticed or suspected within any adjacent confined space, a rapid on-site air quality test shall be conducted to determine the presence and levels of potentially-harmful suspended particles, vapors, fumes, and emissions produced by the liner curing process. The air quality test must be sensitive enough to determine air emission levels for hazardous VOC and Styrene-based particulates do not exceed permissible exposure limits (PELs) or time-weighted average limits (TWAs) set by the CDC and NIOSH exposure limits.

4. Cooling Lines
   A. Using Cooling Water After Heated Water Cure – The new pipe should be cooled to a temperature below one hundred degrees Fahrenheit (100°F) (thirty-eight degrees Celsius (38°C)) before relieving the static head pressure in the inversion standpipe. Cool-down may be accomplished by the introduction of cool water into the inversion standpipe to replace water being drained from a small hole made in the downstream end. Care should be taken in the release of the static head pressure so a vacuum will not be developed that could cause damage to the newly-installed pipe.
   B. Using Cool Water After Steam Cure - The new pipe should be cooled to a temperature below one hundred thirteen degrees Fahrenheit (113°F) (forty-five degrees Celsius (45°C)) before relieving the internal pressure within the section. Cool-down may be accomplished by the introduction of cool water into the section to replace the mixture of air and steam being drained from a small hole made at the downstream end. Care should be taken in the release of the air pressure so a vacuum will not be developed that could cause damage to the newly installed pipe.

3900.3.3 CIPP Connections

1. Locations
   A. Determine service connection locations from televising inspection video completed by the CONTRACTOR.

2. Reinstatements
   A. Reinstate and reconnect all service connections unless service connection is positively identified as bulk-headed on the CONTRACTOR's pre-televising inspection, and the CITY gives written instructions not to reinstate or reconnect specific services.
   B. Reconnect services without excavation by television camera and remote control cutting device that re-establishes services for minimum of ninety-five percent (95%) of the flow capacity.
   C. Sanitary services shall not be out of service for more than six (6) hours, without the ENGINEER's permission during lining process. Any lining section anticipated to take longer than six (6) hours must be presented at the preconstruction meeting with a proposed schedule indicating proposed time for inversion, curing, cool down, and lateral opening.
   D. Services shall be cut round and edges shall be smooth and brushed.

3. Manhole Connections
   A. Reconnect benches and channels in manholes with grout to match new invert elevations.
   B. At the connection to the manhole, provide a watertight seal between the host pipe and the liner pipe with a resin mixture compatible with the CIPP and/or o-ring end seals. The seal shall also meet the requirements of **ASTM C-443**.

3900.3.4 CIPP Field Quality Control

1. Finished Liner
   A. Liner shall be continuous over the entire length of inversion run and be free of visual defects such as foreign inclusions, dry spots, pinholes, excessive ovality, and de-laminations. If these conditions are present, remove and replace the CIPP in these areas.
   B. During the curing process, gauge water tightness under positive head pressure.
   C. Liner shall conform to shape of pipe existing before installation and not be out of round more than fifteen percent (15%).

2. Liner Thickness
   A. Cured liner shall be accurately measured and shall not be more than five percent (5%) less than thickness specified.

3. Felt and Resin Content of Liner
   A. Visually inspect liner to ensure number of layers of felt conforms to specified number of layers and thickness.
   B. Calculate resin to felt ratio by weight.
   C. The ratio and supporting calculations is to be given to the ENGINEER prior to acceptance of the project. The ratio shall fall in the range of 1.0:1 to 1.15:1.

4. Testing
   A. Flexural strength and Modulus of Elasticity.
   B. Test in accordance with **ASTM D-790**.
   C. Specimens tested shall be actual thickness of fabricated liner.
   D. Do not machine specimen on surface.
   E. Make test with smooth (inner) face in compression using five (5) specimens.

5. Examination
   A. Televise interior of pipe after completion of work and provide video to CITY.
   B. Use pan and tilt color 3 lux camera to account for and view the sewer service lateral connection reinstatement and to insure they are unobstructed.
   C. No infiltration of groundwater should be observed.

3900.3.5 CIPP Cleaning and Restoration

1. At completion of work, remove rubbish, debris, dirt, equipment, and excess material from site. Clean adjacent surfaces soiled by and during course of work.

3900.3.6 Mainline Grouting Preparation

1. Pipe Preparation
   A. Prior to the application of the chemical grouting materials, the CONTRACTOR shall thoroughly clean the sewer designated to receive the chemical grouting. Cleaning shall constitute removal of all loose debris and solids which inhibit proper seating of the packer. If mineral deposits are present, they shall be removed and be considered incidental to the Air Pressure Testing and Grouting Bid Item. If protruding taps are present, they shall be removed and paid for under the applicable Bid Item.
   B. Remove all roots and loose debris from laterals for the length of lateral that is to be tested/grouted.
   C. During mainline sewer cleaning or joint testing, document all lateral connections containing roots, mineral deposits, or obstructive conditions that are either: (a) greater than fine roots; or (b) of a nature to prevent testing and sealing of connection. For each such connection, submit a screen shot image clearly showing the extent of roots or obstructive condition to the ENGINEER. Submit images in electronic format, labeled and organized by house number (example 234 West 24th Avenue). The list of lateral connections with roots shall include upstream and downstream manhole numbers. ENGINEER will review the list of lateral connections containing roots and obstructions and direct CONTRACTOR as to which laterals are to be: (a) cleaned and grouted; (b) grouted without cleaning – in which case such lateral connection would be excluded from warranty testing; or (c) removed from the scope of work – in which case no payment for such lateral will be made. Cleaning of lateral connections shall be considered incidental to the Connection Grouting Bid Item.

2. Grout Preparation
   A. Follow the manufacturer's recommendations for the mixing and safety procedures.
   B. Adjust gel time as necessary to compensate for changes in temperature in grout component tanks or hoses. The addition of dilution water to extend gel times is not acceptable unless resulting base grout tank-only material exceeds twenty percent (20%) by weight for solution grouts.
   C. Gel times shall be calculated using the following formula unless CONTRACTOR experience and/or field conditions dictate otherwise. Any alterations of the gel time formula shall be approved by the ENGINEER.

$$Gel\ Time = \left(\frac{Volume\ of\ Pipe / Packer Void\ Space\ (gal)}{Pumping\ Rate\ (gpm)} \right) \left(\frac{60\,\text{sec}}{1\,\text{min}} \right) + 20\,\text{sec}(+/-5\,\text{sec})$$

   D. Packer/Pipe void shall be defined as the volume between the inflated packer and the inside pipe wall when the packer is inflated per manufacturer recommendations.

E. For example: an eight-inch (8″) pipe with a packer void space of 0.3 gallons and a three (3) gpm pumping rate would provide:

$$Gel\ Time = \left(\frac{.3(gal)}{3(gpm)}\right)\left(\frac{60\,\text{sec}}{1\,\text{min}}\right) + (20\,\text{sec}) = 26\,\text{sec}(+/-5\,\text{sec})$$

3. Testing
   A. Testing and Grouting Defects
      1. Testing and grouting will not be required on pipe exhibiting the following conditions or characteristics:
         a. Longitudinally cracked, fractured, or broken pipe.
         b. Sections of the pipe with structural defects between joints.
         c. Any sections of pipe or joints that are in such poor structural condition that, in the judgment of ENGINEER or CONTRACTOR, significant structural damage of the pipe would occur as a result of the pressure test.
      2. Any structurally undamaged joint that structurally fails (breaks) during testing and grouting that are documented on video to have been done under normal pressure conditions shall be the CITY's responsibility and cost to repair.
      3. Grout all circumferential cracks and fractures or other defects, as specified or as directed by ENGINEER. Do not test or grout any other pipe defects, unless so specified or shown or directed by ENGINEER to do so. Any structurally failed pipe or joint that is grouted at the ENGINEER's direction that further fails/breaks during testing and grouting that are documented on video to have been done under normal pressure conditions shall be the CITY's responsibility and cost to repair. Promptly repair any other sewer damage resulting from the CONTRACTOR's operations at no additional compensation.
   B. Joint Testing Procedure for Mainline Sewer
      1. Joint testing pressure shall be equal to 0.5 psi per vertical foot of pipe depth plus 2 psi; however, test pressure shall not exceed 10 psi without the approval of the ENGINEER.
      2. Individually test each sewer pipe joint at the above-specified pressure (and retest after sealing) in accordance with the following procedure:
         a. Air Test Procedure
            i. The packer shall be positioned within the pipe in such a manner as to straddle the joint to be tested.
            ii. The packer ends shall be expanded so as to isolate the joint from the remainder of the pipe and create a void area between the packer and the pipe joint. The ends of the testing device shall be expanded against the pipe, as per manufacturer's recommendations. If all attempts to isolate the joint fail, pump grout in an attempt to seal the leak around the packer end elements. The CONTRACTOR shall be paid the unit price for grout to seal the packer, unless the ENGINEER determines the sewer was inadequately cleaned or the packer is not performing properly, but will not be paid the unit price for joint grouting for this activity.

iii. After the void pressure is observed to be equal to or greater than the required test pressure, the air flow shall be stopped. If the void pressure decays by more than 1.0 psi within fifteen (15) seconds, the joint will have failed the test and shall be sealed.

b. Upon completing the testing of each individual joint, the packer shall be deflated with the void pressure meter continuing to display void pressure. Should the void pressure meter fail to drop to 0.0 +/- 0.5 psi, clean the test equipment of residual grout material or make the necessary equipment repairs to provide for an accurate void pressure reading.

C. Lateral Connection Testing Procedure

1. Lateral connection joint testing pressure shall be equal to 0.5 psi per vertical foot of pipe depth plus 2 psi; however, test pressure shall not exceed 10 psi without approval of the ENGINEER.
2. Air testing lateral connections shall be accomplished by isolating the area to be tested with the lateral connection packer and by applying positive pressure into the isolated void area. A pan and tilt camera shall be used to position the lateral packer for laterals directly connected to the main line sewer. The lateral bladder shall be inverted from the main line assembly into the lateral pipe and inflated. The main line elements shall then be inflated to isolate the lateral connection and the portion of the lateral to be tested. A sensing unit shall monitor the pressure of the packer void and will accurately transmit a continuous readout of the void pressure to the control panel at the grouting truck or to a pressure gauge on the packer recorded by the CCTV camera.
3. The test procedure will consist of applying a controlled air pressure into each isolated void area. Air shall then be slowly introduced into the void area until a pressure equal to or greater than the required test pressure, but in no cases greater than 2 psi above the required test pressure, is observed on the pressure monitoring equipment. Once the designated pressure in the isolated void is displayed on the meter of the control panel, the application of air pressure will be stopped and a fifteen (15) second waiting period will commence. The void pressure will be observed during this period. If the void pressure drop is greater than 2.0 psi within fifteen (15) seconds, the lateral shall be considered to have failed the air test and shall be grouted and retested.
4. After completing the air test for each individual lateral specified herein, deflate the lateral packer, with the void pressure meter continuing to display void pressure. If the void pressure does not drop to 0.0 ± 0.5 psi, the equipment shall be adjusted to provide a zero void pressure reading at the monitor.

3900.3.7 Mainline Grouting

1. General

A. Grout all joint and lateral connections that failed the pressure test by the injection method. This shall be accomplished by forcing grout through a system of pumps and hoses into and through the joints of the sewer from the packer within the sewer pipe.

2. Pipe Joint Sealing by Packer Injection Grouting for Main Line Sewers
   A. Position the main line packer over the joint or defect to be sealed by means of a CCTV camera in the line. Position the push/pull packer over the joint or defect to be sealed by a means of visual observation, marked push rod, or where a cleanout is available, through a CCTV camera in the lateral. For push packers, start work at the most distant point to be grouted. Take an accurate measurement of the location of the defect to be sealed using a portion of the packer as a point of reference for positioning the injection area of packer over the defect.
   B. Pneumatically expand the packer sleeves such that they seal against the inside periphery of the pipe to form a void area at the joint now completely isolated from the remainder of the pipe line.
   C. Pump grout materials, in stages if needed, into this isolated area to refusal and until the void or surrounding soil has been filled or solidified with the goal of applying 0.25 to 0.5 gallons of grout per inch-diameter per pipe joint. Refusal is when the packer void pressure during grout pumping instantaneously rises or "spikes" by 4 to 5 psi or more above the normal void pressure experienced during grout pumping operation. Refusal may also be revealed when pumping void pressure exceeds the holding pressure of the packer end elements as evidenced by "blow-by" past the packer sealing end elements. Refusal shall mean when the joint will not accept any more grout because it has flowed throughout the void, through any joint failure, and into the surrounding soil; gelled or filled the available void space; and formed a cohesive seal stopping further grout flow, then the joint will have then been sealed. Record the amount of grout pumped on the sealing log. If sealing is not achieved, refer to **Section 3900.3.7.2.E** of these Specifications.
   D. Upon completion of the injection, deflate the packer to break away from the ring of gel formed by the packer void. The packer should then be re-inflated and the joint retested at a pressure equal to the initial test pressure. If the joint fails this air test, repeat the grouting procedure at no additional cost to the CITY, except for the additional grout used. Repeat this sequence of air testing, grouting, and subsequent air testing until either the joint is sealed or it is determined the grout consumption is too high (see **Section 3900.3.7.2.E** of these Specifications). The final determination to stop subsequent attempts to seal a joint will be made jointly between the ENGINEER and the CONTRACTOR. Should the void pressure meter not read zero ± 0.5 psi, clean the equipment of residual grout or make the necessary equipment repairs/adjustments to produce accurate void pressure readings.
   E. If a main line or lateral joint requires more than 0.5 gallon of grout per inch-diameter per pipe joint, modify grouting procedure to perform stage grouting by pumping additional grout in up to four (4) gallon increments, waiting one (1) gel set cycle time or one (1) full minute, whichever is greater between stages. Maximum number of stages shall not exceed two (2) stages of four (4) gallons each unless approved by ENGINEER.

3. Lateral Connection Sealing from the Main Line by Packer Injection Grouting
   A. Lateral connection sealing begins if the lateral connection does not pass the air test, shows evidence of leakage, has been successfully cleaned to remove roots, or where

CONTRACTOR has been directed. The lateral packer shall remain in position during the pressure test, thus maintaining the isolated void. Pressure inject grout through the lateral packer into the annular space between the lateral grouting plug and the lateral pipe.

B. When pumping grout, operate the pumps until the mixed grout has flowed through any joint failure, through any annular space, and into the surrounding soil; gelled or filled the available void space; formed a cohesive seal stopping further grout flow; and minimum of 8 psi back pressure is achieved while pumping. As grout pumping continues, the void pressure will slowly rise to a range of about 2 to 4 psi; continue pumping until a point where there is a sudden increase in the void pressure. This increase from 2 to 4 psi to over 8 to 10 psi takes place in a matter of a few seconds. If the grout pumped exceeds one (1) gallon per foot of lateral bladder plus three (3) gallons, it will be suspected there are significant voids on the outside of the pipe or the packer is not properly sealed. Check the packer is sealed properly. If it is, modify grouting procedure to stage grouting by pumping additional grout equivalent to one (1) gallon plus 0.25 gallon per foot of lateral bladder, waiting one (1) full minute, and retesting. The maximum number of stages shall not exceed two (2) stages, unless authorized by ENGINEER.

C. Upon completion of the lateral connection sealing procedure, deflate the lateral bladder, re-inflate and air test the lateral connection a second time to confirm the sealing of the connection in accordance with the air testing procedure. If the lateral connection fails this air test, repeat the grouting procedure at no additional cost to the CITY, except for the additional grout used. Air tests after grouting laterals containing roots is not required.

D. Confirm lateral flow after sealing of each lateral connection. If a grout blockage exists, the CONTRACTOR shall immediately clear the lateral at no additional cost to the CITY. Blockages in the lateral that are not the result of grouting operations shall not be the responsibility of the CONTRACTOR.

E. After grouting lateral connections (with the appropriate size lateral bladder), a thin residual grout film may be present inside the lateral wall. The amount of residual grout film present is dependent on the lateral bladder used, geometry of the lateral, and positioning of the packer. The residual chemical grout film is not "sandwiched" between two (2) structures and will eventually peel off the sidewall of the pipe. This residual chemical grout film is not considered excess grout. Removal of residual grout shall be requested by the ENGINEER and be incidental to the Lateral Grouting Bid Item.

4. Joint Sealing Verification

A. Record grouting of joints in conjunction with the testing of joints. Record the void pressure drop continuously on video and in writing immediately before sealing, and immediately after grouting. After the packer is deflated and moved, record on video the visual inspection of the joint.

B. Use of standardized test and seal data sheets and PACP data codes is required.

5. Post-Construction Inspection
   A. After grouting is complete, all pipe sections shall be final inspected by means of a color CCTV system. The inspection shall be conducted as per the NASSCO PACP. One (1) set of DVD's and reports shall be submitted.

3900.3.8 Manhole Grouting

1. Execution
   A. Preparatory Cleaning of Manholes
      1. The CONTRACTOR shall furnish equipment for high-pressure water jetting and brushing of leaks to be repaired.
      2. The CONTRACTOR shall remove deposits, scale, and sediments from the repair area.
      3. The CONTRACTOR shall perform work in a manner that does not interfere with normal sewer operation.
      4. The CONTRACTOR shall remove solids or semi-solids resulting from cleaning operation and dispose at a site approved by the CITY.
   B. Grouting of Manholes
      1. The CONTRACTOR shall use equipment specially designed for the work.
      2. The CONTRACTOR shall pass chemical grout or sealing material to the packer using a pumping system with adjustable, flow-controlled, proportioning pumps at a maximum rate of five (5) gpm at 30 psi.
      3. The CONTRACTOR shall proportion materials to deal with changing conditions and back pressures.
      4. The CONTRACTOR shall drill 3/8" holes in the joint(s) or crack(s) at approximately twelve inch (12") to twenty four (24") centers.
      5. The CONTRACTOR shall insert packer and probe, grouting as needed to establish a continuous grout wall completely along the joint or crack.
      6. The CONTRACTOR shall use dehydration-resisting additives where prolonged dry conditions are expected, such as the upper six feet (6') of manholes or above the groundwater table.
   C. Pumping and Bypassing
      1. The CONTRACTOR shall pump to divert sufficient flow to perform work.
      2. Required pumping and bypassing cost is incidental to work and should be included in bid prices.

3900.3.9 Structural Cementitious Manhole Liner - PERMACAST® by AP/M PERMAFORM®

1. Cementitious Structural Liner Installation
   A. Design Strength/Thickness Ratio
      1. Many factors impact optimum design thickness and these include: the condition of the existing manhole; its material composition; depth; degree of ovality; groundwater pressure; and traffic loads. The ENGINEER shall determine the most appropriate

engineering parameters in each case. Check the manufacturer's design guide for detail. At the strength levels of PERMACAST® materials, a thickness of one-half inch (½") is appropriate for most manholes up to depths of twelve feet (12').

B. Preparation
   1. Cover the manhole base to prevent washed debris from entering the sewer line. Wash the interior surface with a high-pressure water blast, usually 3,500 psi, sufficient to remove all laitance and loose material and flush debris downward to the covered base. Pressures sufficient to etch the existing surface will improve adhesion. Plug any active leaks with plugging material according to the instructions on data sheets, and fill voids and overhangs with patching material.

C. Equipment
   1. Mortar mixers, compressors, and pumps are standard commercial models. The high-speed, rotating-applicator device is used to provide a densely-compacted liner of uniform thickness and thorough coverage.

D. Mixing
   1. Combine fifty (50) pounds of the packaged dry mix with the specified amount of potable water, while mixing with a high-speed shear mixer for four (4) minutes. Continue to agitate the mortar to prevent thickening beyond the desired fluidity. If it thickens, it may be re-tempered. The working time is approximately forty (40) minutes.

2. Product Handling
   A. Special handling is not required for PERMACAST® mortar. Normal precautions for "nuisance dust" shall be observed. Consult Material Safety Data Sheet for details.
   B. Personnel entry is not required to rebuild the interior wall of most manholes when using the PERMACAST® spinner head. If personnel entry becomes necessary for any reason, OSHA standards for confined space entry shall be strictly observed.

3. Quality Assurance and Acceptance
   A. Two (2) test cubes of the PERMACAST® material may be taken randomly as directed by the ENGINEER at the CITY's expense to verify strengths. Thickness can be verified with a wet gauge at any random point of the new interior surface. Any areas found to be thinner than the minimum specified thickness shall immediately receive additional material. Visual inspection should verify a leak-free, uniform appearance.

4. Application
   A. Position the bi-directional SpinCaster applicator within the center of the manhole at the lowest point desired for the new wall and then commence pumping the mixed mortar. As the mortar begins to be centrifugally cast evenly around the interior, retrieve the applicator head at the prescribed speed for applying the thickness that has been selected. Controlled multiple passes are then made until the desired finished thickness is attained. If the procedure is interrupted for any reason, simply arrest the retrieval of the applicator head until flows are resumed.

B. The retrieval speed can be easily varied to create different thickness to provide the best strengths as the condition or depth of the manhole may dictate in any portion of the manhole. Because of the even application throughout the circumference, thickness may be verified at any point with a wet gauge.
C. Clean Up: Upon completion, the base covering shall be removed and any debris disposed properly. Additional material shall be hand applied to bench surfaces at a thickness of three inches (3") tapering from the wall to the edge of the channel. Flows at bottom channels may remain active during the procedure.
D. Hot Weather Application (Above eighty degrees Fahrenheit (80°F))
    1. Do not apply PERMACAST® mortars when ambient and surface temperatures are one hundred degrees Fahrenheit (100°F) and above. Shade the material and prepare the surface to keep it cool.
    2. To extend the working time, mix the material with cool water or ice-cooled water. Be certain the substrate is saturated surface-dry (SSD) before application begins.
    3. When finishing is required, work the material quickly once it has stiffened – when a finger pressed against the material will mark it lightly, but not sink beneath the surface.
    4. Proper curing is always required and is particularly important in hot weather. Refer to **Section 3900.3.9.4.F** of these Specifications on curing.
E. Cold Weather Application (Above forty-five degrees Fahrenheit (45°F))
    1. Do not apply PERMACAST® mortars when ambient temperatures are expected to fall below forty-five degrees Fahrenheit (45°F) within seventy-two (72) hours of placement. Both ambient and substrate temperatures must be at least forty-five degrees Fahrenheit (45°F) at the time of placement.
    2. Low substrate and ambient temperatures slow down rate of set and strength development. At temperatures below forty-five degrees Fahrenheit (45°F), warm the material, water, and substrate. Properly ventilate the area when heating. Protect the new liner from freezing.
F. Curing/Finishing
    1. Avoid overly windy and arid curing conditions; use curing membranes per **ASTM C-309** to create the most optimal curing conditions possible. The use of Cor+Gard ER evaporative reducer will help keep mortar hydrated during the curing phase. Apply Cor+Gard ER immediately after mortar placement, and then finish mortar with a brush. After finishing, a follow up application of 1315 Sealer will further aid in proper mortar curing. If epoxy topcoats are to follow, 1315 Sealer should not be used. Only use products that will be compatible to enhance the epoxy bond.

3900.4 Measurement

3900.4.1 Sanitary Sewer CIPP Lining and CIPP Spot Repair

1. The CITY will measure the sanitary sewer main CIPP lining by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the pipe,

from sanitary manhole to sanitary manhole or to the end of the CIPP lining limits. No deductions will be made for manholes unless the internal diameter of the sanitary sewer is twenty-four inches (24") or larger, in which case the internal diameter of the manholes will be deducted from the total measurement by the CITY.

2. The CITY will measure a CIPP Sanitary Sewer Lateral Connection Liner and "Top Hat" Sewer Lateral Connection Liner per each liner that is acceptably completed. The installation of a "Top Hat" Sewer Lateral Connection Liner shall only be utilized where sewer main diameters exceed twenty-one inches (21") or in such instances where the main and lateral conditions will not permit a water-tight connection by means of installing a CIPP Sanitary Sewer Lateral Connection Liner.

3. The CITY will measure Sanitary Sewer Intruding Lateral Connection Removal per each removal that is acceptably completed.

3900.4.2 Sanitary Sewer Air Pressure Testing and Grouting

1. The CITY will measure the sanitary sewer main that was air pressure tested and that is acceptably completed. The measurement equals the number of joints tested from sanitary manhole to sanitary manhole or to the end of the grouting limits.

3900.4.3 Additional Grout

1. The CITY will measure the additional grout by the grout that is acceptably installed in addition to the specified grout.

3900.4.4 Sanitary Sewer Manhole Grouting Setup

1. The CITY will measure the Sanitary Sewer Manhole Grouting Setup Bid Item as each unit that is acceptably completed.

3900.4.5 Sanitary Sewer Manhole Grouting

1. The CITY will measure the Sanitary Sewer Manhole Grouting Bid Items by the number of gallons that are acceptably installed.

3900.4.6 Sanitary Sewer Manhole Cementitious Liner Setup

1. The CITY will measure the Sanitary Sewer Manhole Cementitious Liner Setup Bid Item as each unit that is acceptably completed.

3900.4.7 Sanitary Sewer Manhole Cementitious Liner

1. The CITY will measure the Sanitary Sewer Manhole Cementitious Liner Bid Item by the vertical foot of finished wall for each prescribed thickness that is acceptably completed.

3900.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
SANITARY SEWER CURED-IN-PLACE PIPE (CIPP)		
3900	Furnish and Install 4″/6″ Sanitary Sewer Lateral CIPP	LF
3901	Furnish and Install 8″ Sanitary Sewer CIPP	LF
3902	Furnish and Install 10″ Sanitary Sewer CIPP	LF
3903	Furnish and Install 12″ Sanitary Sewer CIPP	LF
3904	Furnish and Install 15″ Sanitary Sewer CIPP	LF
3905	Furnish and Install 18″ Sanitary Sewer CIPP	LF
3906	Furnish and Install 21″ Sanitary Sewer CIPP	LF
3907	Furnish and Install 24″ Sanitary Sewer CIPP	LF
3908	Furnish and Install 27″ Sanitary Sewer CIPP	LF
3909	Furnish and Install 30″ Sanitary Sewer CIPP	LF
3910	Furnish and Install 33″ Sanitary Sewer CIPP	LF
3911	Furnish and Install 36″ Sanitary Sewer CIPP	LF
3912	Furnish and Install 42″ Sanitary Sewer CIPP	LF
3913	Furnish and Install 48″ Sanitary Sewer CIPP	LF
3914	Furnish and Install 54″ Sanitary Sewer CIPP	LF
3915	Furnish and Install 60″ Sanitary Sewer CIPP	LF
3916	Furnish and Install 66″ Sanitary Sewer CIPP	LF
3917	Furnish and Install 72″ Sanitary Sewer CIPP	LF
3918	Furnish and Install 8″ Sanitary Sewer CIPP Spot Repair	LF
3919	Furnish and Install 10″ Sanitary Sewer CIPP Spot Repair	LF
3920	Furnish and Install 12″ Sanitary Sewer CIPP Spot Repair	LF
3921	Furnish and Install 15″ Sanitary Sewer CIPP Spot Repair	LF
3922	Furnish and Install 18″ Sanitary Sewer CIPP Spot Repair	LF
3923	Furnish and Install 21″ Sanitary Sewer CIPP Spot Repair	LF
3924	Furnish and Install 24″ Sanitary Sewer CIPP Spot Repair	LF
3925	Furnish and Install 27″ Sanitary Sewer CIPP Spot Repair	LF
3926	Furnish and Install 30″ Sanitary Sewer CIPP Spot Repair	LF
3927	Furnish and Install 33″ Sanitary Sewer CIPP Spot Repair	LF
3928	Furnish and Install 36″ Sanitary Sewer CIPP Spot Repair	LF
3929	Furnish and Install 42″ Sanitary Sewer CIPP Spot Repair	LF

3930	Furnish and Install 48″ Sanitary Sewer CIPP Spot Repair	LF
3931	Furnish and Install 54″ Sanitary Sewer CIPP Spot Repair	LF
3932	Furnish and Install 60″ Sanitary Sewer CIPP Spot Repair	LF
3933	Furnish and Install 66″ Sanitary Sewer CIPP Spot Repair	LF
3934	Furnish and Install 72″ Sanitary Sewer CIPP Spot Repair	LF
SANITARY SEWER PRESSURE TESTING AND GROUTING		
3935	Furnish 8″ Sanitary Sewer Air Pressure Test	EA
3936	Furnish and Install 8″ Sanitary Sewer Grouting	EA
3937	Furnish 10″ Sanitary Sewer Air Pressure Test	EA
3938	Furnish and Install 10″ Sanitary Sewer Grouting	EA
3939	Furnish 12″ Sanitary Sewer Air Pressure Test	EA
3940	Furnish and Install 12″ Sanitary Sewer Grouting	EA
3941	Furnish 15″ Sanitary Sewer Air Pressure Test	EA
3942	Furnish and Install 15″ Sanitary Sewer Grouting	EA
3943	Furnish 18″ Sanitary Sewer Air Pressure Test	EA
3944	Furnish and Install 18″ Sanitary Sewer Grouting	EA
3945	Furnish 21″ Sanitary Sewer Air Pressure Test	EA
3946	Furnish and Install 21″ Sanitary Sewer Grouting	EA
3947	Furnish 24″ Sanitary Sewer Air Pressure Test	EA
3948	Furnish and Install 24″ Sanitary Sewer Grouting	EA
3949	Furnish 27″ Sanitary Sewer Air Pressure Test	EA
3950	Furnish and Install 27″ Sanitary Sewer Grouting	EA
3951	Furnish 30″ Sanitary Sewer Air Pressure Test	EA
3952	Furnish and Install 30″ Sanitary Sewer Grouting	EA
3953	Furnish 33″ Sanitary Sewer Air Pressure Test	EA
3954	Furnish and Install 33″ Sanitary Sewer Grouting	EA
3955	Furnish 36″ Sanitary Sewer Air Pressure Test	EA
3956	Furnish and Install 36″ Sanitary Sewer Grouting	EA
3957	Furnish 42″ Sanitary Sewer Air Pressure Test	EA
3958	Furnish and Install 42″ Sanitary Sewer Grouting	EA
3959	Furnish 48″ Sanitary Sewer Air Pressure Test	EA
3960	Furnish and Install 48″ Sanitary Sewer Grouting	EA
3961	Furnish 54″ Sanitary Sewer Air Pressure Test	EA
3962	Furnish and Install 54″ Sanitary Sewer Grouting	EA
3963	Furnish 60″ Sanitary Sewer Air Pressure Test	EA
3964	Furnish and Install 60″ Sanitary Sewer Grouting	EA
3965	Furnish 66″ Sanitary Sewer Air Pressure Test	EA
3966	Furnish and Install 66″ Sanitary Sewer Grouting	EA
3967	Furnish 72″ Sanitary Sewer Air Pressure Test	EA
3968	Furnish and Install 72″ Sanitary Sewer Grouting	EA
3969	Furnish Sanitary Sewer Lateral Connection Air Pressure Test	EA

3970	Furnish and Install Sanitary Sewer Lateral Connection Grouting	EA
3971	Furnish Sanitary Sewer Lateral Abandonment Air Pressure Test	EA
3972	Furnish and Install Sanitary Sewer Lateral Abandonment Grouting	EA
3973	Furnish and Install Additional Grout	GAL
SANITARY SEWER MANHOLE REHABILITATION		
3974	Furnish Sanitary Sewer Manhole Grouting Setup	EA
3975	Furnish and Install Sanitary Sewer Manhole Grouting	GAL
3976	Furnish Sanitary Sewer Manhole Cementitious Liner Setup	EA
3977	Furnish and Install Structural Cementitious Liner - PERMACAST® by AP/M PERMAFORM®	VF
3980	Furnish and Install CIPP Sanitary Sewer Lateral Connection Liner	EA
3981	Furnish and Install "Top Hat" Sewer Lateral Connection Liner	EA
3982	Furnish Sanitary Sewer Intruding Lateral Connection Removal	EA
SANITARY SEWER CIPP – AIR MONITORING		
3985	Furnish Air Quality Measurement Test	EA

3900.5.1 Sanitary Sewer CIPP Lining and CIPP Spot Repair

1. Payment for these Bid Items shall include all necessary labor, equipment, and materials to mobilize to site; clean the existing sanitary sewer main and laterals; televise the existing sanitary sewer main; remove roots and mineral deposits in the sanitary sewer main and laterals; determine which existing services are active; place lining material within the sanitary sewer main and laterals, including watertight seals at manhole connections and main respectively; provide flow control, including sewerage bypassing; reinstate the active sanitary sewer services; provide testing; provide post-lining televising and report; provide all other appurtenant and incidental work necessary for the CIPP lining of the existing sanitary sewer and laterals; and clean up site.

3900.5.2 Sanitary Sewer Lateral Connection and "Top Hat" Sewer Lateral Connection Liners

1. Payment for these Bid Items is full compensation for providing all necessary labor, dewatering, equipment, and materials to provide a water-tight homogenous mainline/lateral liner, with a single-point installation from the main, with O-ring gaskets at each mainline connection location and lateral stub end, capable of extending a minimum of five feet (5′) into the lateral line, free to pass forty-five degrees (45°) and ninety degrees (90°) bends with minimal impact on liner performance.

3900.5.3 Sanitary Sewer Intruding Lateral Connection Removal

1. Payment for this Bid Item shall include all necessary labor, equipment, and materials to grind or reduce the intruding lateral connection, as needed, within the main to the extent necessary to allow for proper mainline televising, cleaning, and lining and to allow normal sewer flows to be unimpeded.

3900.5.4 Air Quality Measurement Test

1. Payment for this Bid Item shall be full compensation for all necessary labor, equipment, and materials needed to perform a rapid on-site air quality test, as specified in **Section 3900.3.2.3.D** of these Specifications. Air quality tests will be measured per each test acceptably performed. As a part of this Bid Item, the CONTRACTOR shall be responsible for all labor and costs associated with taking any necessary actions associated with detection amounts exceeding specified exposure limits.

3900.5.5 Sanitary Sewer Air Pressure Testing and Grouting

1. Payment for these Bid Items shall include all necessary labor, equipment, and materials to mobilize to site, clean, and televise the existing sanitary sewer main; remove roots and mineral deposits (sanitary sewer main and at lateral connections); determine which existing services are active; provide flow control, including sewerage bypassing; provide testing; provide post-testing/grouting televising and report; provide all other appurtenant and incidental work necessary to test and grout the existing sanitary sewer main and lateral connections; and clean up site.

3900.5.6 Additional Grout

1. Payment for this Bid Item shall include all necessary labor, equipment, and materials to mobilize to site; provide flow control, including sewerage bypassing; install grout in excess of the specified grout that is installed for the Grouting Bid Items; provide all other appurtenant and incidental work necessary to install the excess grout; and clean up site.

3900.5.7 Sanitary Sewer Manhole Grouting Setup

1. Payment for the Sanitary Sewer Manhole Grouting Setup Bid Item is for full compensation to provide all necessary labor, equipment, and materials to identify and mobilize to each site; to set up the necessary equipment required to grout sanitary manhole cones, walls, and base sections; and to clean out and restore the site of the work.

3900.5.8 Sanitary Sewer Manhole Grouting

1. Payment for the Sanitary Sewer Manhole Grouting Bid Item is for full compensation to provide all necessary labor, supervision, equipment, and materials required to apply grout as specified. The CONTRACTOR shall supply all the necessary water for the cleaning of the manholes prior to grouting. The price for this water is to be included in the unit price of this Bid Item. Water is available for purchase at the City of Oshkosh's Water Distribution Division, located at 757 West 3rd Avenue. This Bid Item shall also include any necessary bypass pumping and cleaning and testing of the manholes.

3900.5.9 Sanitary Sewer Manhole Cementitious Liner Setup

1. Payment for the Sanitary Sewer Manhole Cementitious Liner Setup Bid Item is for full compensation to provide all necessary labor, equipment, and materials to identify and mobilize to each site; to set up the necessary equipment required to apply structural cementitious liner system to the manhole; and to clean out and restore the site of the work.

3900.5.10 Sanitary Sewer Manhole Cementitious Liner

1. Payment for the Sanitary Sewer Manhole Cementitious Liner Bid Item is for full compensation to provide all necessary labor, equipment, and materials required to apply the structural cementitious liner system as specified. This Bid Item shall also include any necessary bypass pumping and the plugging of active leaks and filing of voids per the Specifications prior to the application of the liner. The liner shall cover the entire sanitary manhole.

3900.6 Sanitary Manhole Chemical Protection Coating

1. Summary
   A. This section describes the application of chemical protection coating material to be applied to the inside of sanitary manhole structures for the protection of concrete and block structures from hydrogen sulfide gases and damages caused by the presences of thiobacillus bacteria and other microbial-induced corrosion (MIC) effects.

2. Materials
   A. Chemical protection coating shall not contain coal tar or any derivative thereof.
   B. Chemical protection coating shall consist of a distinct color such that application of the coating material can be easily seen and inspected upon application. If product carries multiple color options, final determination of product color shall be made by ENGINEER.
   C. Coating materials shall be a single- or two-component epoxy or urethane product free of VOC's, which has the ability to be installed by either single-coat or multi-coat applications with fast-setting cure time.

D. Coating material must be specifically designed for use of wastewater pipes and structures for protection against hydrogen sulfide gases, alkalis conditions, and other common MIC's.
E. Coating material must be able to maintain long-term performance reliability even when subjected to cyclic or continuous immersion conditions.

3. References
   A. **ASTM D-4541**: Pull-off Strength of Coatings Using a Portable Adhesion Tester.
   B. **ASTM C-882**: Standard Test Method for Bonding Strength of Epoxy Systems Used with Concrete by Slant Shear.

4. Submittal
   A. Chemical protection coating material date sheet information.
   B. Manufacturer's recommendation procedure for restoration, mixing, storing, and handling of chemical protection coating material.

5. Manhole Preparation
   A. All structures should be appropriately assessed and examined prior to any chemical protection coating material being applied to identify any structural conditions which may negatively impact the applied surface coating material. Any defects or structure condition concerns which may negatively impact the successful coating of the interior manhole surface shall be brought to the attention of the ENGINEER immediately in writing.
   B. The manhole structure shall be appropriately cleaned and prepared prior to coating application. All surface debris shall be removed, such that the structure's surface is free of all dirt, grease, oil, rust, mill scale, salts, or any other surface contaminants which would interfere with the applied coating adhesion.

6. Application
   A. All chemical coating materials must be applied to the manhole substrate material by mechanical spin casting material to maintain uniformity and consistent coating thickness. Coating material shall not be applied in excess which leads to "bleeding" or running down structure walls.

      Minimum Coating Thickness

      Wet: 250 mils (¼") build-up capability with no sag or bleeding.
      Dry: 125 mils (⅛").

7. Quality Assurance
   A. Applied coating adhesion shall meet bonding requirements per **ASTM D-4541**, and shall pass a Pull-off Strength of Coating Adhesion Tester for verification of bonding, if requested by the ENGINEER.

3900.7 Measurement

3900.7.1 Sanitary Sewer Manhole Chemical Protection Coating

1. The CITY will measure the Sanitary Sewer Manhole Chemical Protection Coating Bid Item by the vertical foot of finished wall for the full circumference of the structure acceptably completed.

3900.7.2 Sanitary Sewer Manhole Chemical Protection Coating Setup

1. The CITY will measure each Sanitary Sewer Manhole Chemical Protection Coating Setup Bid Item per each unit that is acceptably completed.

3900.8 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
SANITARY MANHOLE CHEMICAL PROTECTION COATING		
3990	Furnish and Install Sanitary Manhole Chemical Protection Coating	VF
3991	Furnish and Install Sanitary Manhole Chemical Protection Coating Setup	EA

2. Sanitary Sewer Manhole Chemical Protection Coating
   A. Payment for the Sanitary Manhole Chemical Protection Coating is for full compensation to provide all necessary labor, equipment, and materials required for properly preparing and placing the chemical coating material to the sanitary sewer manhole interior substrate surface, as specified, for the entire interior circumference of the structure. This Bid Item shall also include any necessary bypass pumping, as needed, for the full duration required for the coating material to meet full curing to withstand immersion conditions. Preparation work for the interior manhole surface shall include cleaning of the surface area to create an appropriate surface application environment to allow for appropriate bonding of the chemical coating material to the manhole structure substrate. Any infiltration identified during initial structure examination will be paid for under Bid Items #3974 and #3975 respectively.

3. Sanitary Sewer Manhole Chemical Protection Coating Setup
   A. Payment for Sanitary Sewer Manhole Chemical Protection Coating Setup is for full compensation to provide all necessary labor, equipment, traffic control, and materials to identify and mobilize to each manhole location, including setup of the necessary equipment, as needed, to supply and apply the chemical protection coating material to each manhole; and clean up and restore the work site to pre-construction conditions.

WATER MAIN SPECIFICATIONS

SECTION 4000
WATER MAIN PIPES, WATER SERVICES, CONNECTIONS, AND CORPORATION AND STOP BOXES

4000.1 Description

1. This Section describes excavating required trenches or tunnels, and laying or constructing water pipe, water services, installing corporations and stop boxes, and installing clay dams inside, then backfilling and cleaning out as necessary.

4000.2 Materials

1. Use materials conforming to the requirements for the class of the material named and specified below:

A. Ductile Iron Pipe	**AWWA C151**
B. Water Main Rubber Gaskets	**AWWA C111**
C. Polyethylene Encasement Wrap	**AWWA C105**
D. Corporation & Stop Box	**AWWA C800-01**
E. Copper Water Services	**ASTM B-88-20**
F. Compression Fittings	**ASTM B-62**
G. TR Flex Restrained Joints	**AWWA/ANSI C111/A21.11**
H. HDPE Pipe	**AWWA C906**

4000.2.1 Ductile Iron Pipe

1. Unless otherwise specified, all pipe furnished under these Specifications shall conform to **AWWA C150/ANSI A21.50** or **AWWA C151/ANSI A21.51** for Ductile Iron Pipe and with the options specified in the Contract Documents.

2. Ductile iron pipe shall consist of pipe centrifugally cast in metal or sand-lined molds having bell and spigot ends designed for a rubber gasket push-on joint.

3. Pipe wall shall be homogeneous from inside to outside and shall be completely free of laminations, blisters, or other imperfections. Defects may be removed at the factory only.

4. Minimum wall thickness shall be as follows:

Diameter of Pipe	Minimum Wall Thickness
6"	0.31" Class 52
8"	0.33" Class 52
10"	0.35" Class 52
12"	0.37" Class 52
14"	0.39" Class 52

Diameter of Pipe	Minimum Wall Thickness
16"	0.40" Class 52
18″	0.41″ Class 52
20″	0.42″ Class 52
24″	0.44″ Class 52

5. Pipe shall have a cement mortar lining and internal and external bituminous coats in accordance with **Section 51-8** of **AWWA C151**. The thickness of the standard cement lining shall be 1/16″ for sizes 3 through 12″ in diameter, inclusive, and 3/32″ for sizes 14 through 24″.

6. The bituminous coating shall be applied over the cement lining on the inside of the pipe and a bituminous seal coat shall be applied on the exterior of all pipe and fittings.

7. The coating shall be smooth, tough, and tenacious and impervious to water without any tendency to scale off, and shall not be brittle.

8. Each pipe shall have the weight, class, or nominal thickness and casting period conspicuously painted on it. The manufacturer's mark, the year in which the pipe was produced, and the letters "D.I." or the word "Ductile" shall be cast or stamped on the pipe. All cast marks and required markings shall be on or near the bell.

9. Improper or incomplete marking will be cause for rejection of the pipe.

10. Manufacturer shall furnish certification data representing each pipe length furnished. The certification report shall clearly identify the pipe furnished, and shall be furnished in triplicate to the ENGINEER. Certification shall be provided for each casting period in which a supplied pipe was cast and shall cover physical properties, identification and description of interior and exterior coatings, and results of the hydrostatic test. All certifications shall be furnished before any pipe will be accepted for installation.

11. Unless otherwise specified, all rubber gaskets shall conform to **AWWA C111** or **ANSI 21.11** for Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings.

4000.2.2 Polyethylene Encasement Wrap

1. Polyethylene encasement furnished under these specifications shall conform to **AWWA C105** or **ANSI A21.5**. Film shall be a v-bio enhanced polyethylene encasement, with a minimum nominal thickness of 0.008″ (8 mils). Tape for securing the film shall be a thermo-plastic material with a pressure-sensitive adhesive face capable of bonding to metal, bituminous coating, and polyethylene. Tape shall have a minimum thickness of 8 mils (0.008″), and a minimum width of one inch (1″).

2. The polyethylene film envelope shall be free as is commercially possible of gels, streaks, pinholes, particles of foreign matter, and undispersed raw materials. There shall be no other visible defect such as holes, tears, blisters, or thinning out at folds.

3. When required, manufacturers shall furnish certification detailing the conformance of the material to the requirements of **AWWA C105** or **ANSI A21.5**. Certifications shall be submitted in triplicate to the ENGINEER.

4. Polyethylene encasement shall be installed per **ASTM A-674**.

4000.2.3 Copper Water Tubing and Fittings

1. Tubing furnished shall be a Type "K" soft annealed seamless copper tubing and shall conform to the specifications of **ASTM B-88-20**.

2. The name or trademark of the manufacturer, and a mark indicative of the type shall be permanently and plainly marked on tubing at intervals not greater than one and one-half feet (1½').

3. Fittings for copper tubing shall be of cast brass conforming to the Reduction of Lead in the Safe Drinking Water Act. They shall have uniformity in wall thickness, and strength, and shall be free from any defect which may affect their serviceability.

4. Each fitting shall be permanently and plainly marked with the name or trademark of the manufacturer.

5. Fittings will be compression-type only. Unions shall be extra heavy 3-part unions only. All fittings must have a positive metal to metal connection.

4000.2.4 Corporation Stops

1. Corporation stops shall be Mueller H15008, A.Y. MacDonald 74701-22, or equal, from one-half inch (½") to two inches (2"), as indicated in the Contract Documents or ordered by the ENGINEER. Corporation stops and fittings must have a positive metal to metal connection.

2. All water main taps over one inch (1") must include a stainless steel sleeve.

3. Corporation stops shall be assembled with threaded compression nut only. CONTRACTOR shall not use compression ring style corporation that relies on deforming copper tubing to hold connection in place.

4000.2.5 Curb Stops

1. Curb stops shall be Mueller H-15209, Ford B 44-444, A.Y. MacDonald 76100-22, or Equal, from one-half inch (½″) to two inches (2″), as indicated in the Contract Documents or ordered by the ENGINEER. Curb stops and fittings must have a positive metal to metal connection. Curb stops shall be constructed of three-piece heavy-duty brass with threaded compression pack nut-style connections only. CONTRACTOR shall not use compression ring style curb stop that relies on deforming copper tubing to hold connection in place.

4000.2.6 Service Boxes

1. Service boxes described herein shall be cast iron and consist of an arch-patterned base section, a one-inch (1″) interior diameter (I.D.) upper section, a stationary rod and guide that fits over the curb stop, and a cast iron cover with a pentagon brass plug. The service box is to be installed over a curb stop to provide control access.

2. The lower section of the service box shall have a minimum I.D. of 2-7/8″.

3. All service boxes shall have a maximum length of seven feet (7′) when extended without the use of extension sections.

4. Service boxes shall be similar to A.Y. MacDonald 5607LR or Ford EA2-65-40.

5. For 1¼" to 2" services, a base adapter similar to Ford CB-7 should be used.

6. The rod for the service box shall be made of stainless steel for all water services and **shall be made only in the United States of America**.

4000.2.7 TR Flex Restrained Joints

1. TR Flex Restrained Joints shall be in accordance with **ANSI/AWWA C111/ANSI A21.11** as manufactured by McWane Ductile or Approved Equal.

4000.2.8 Directional Drilling HDPE Pipe

1. The installation of HDPE Pipe shall be by means of horizontal directional drilling.

2. HDPE pressure-rated pipe shall conform to the requirements of **AWWA C906** for pipe from eight inches (8″) to sixteen inches (16″). HDPE pipe shall be manufactured from materials conforming to **PE Code PE4710**.

3. HDPE pipe diameter shall conform to the O.D. of ductile iron pipe size (DIPS). The type of HDPE material, nominal pipe size, standard dimension ratio, and pressure rating shall not be less than pressure class 200 and not greater than a dimension ratio (DR) of 9.

4. Markings on the pipe shall include the following: Nominal pipe size, type of plastic material, DR number, pressure class rating, manufacturer's name, and the seal or mark of the laboratory making the evaluation of the suitability of the pipe for the transport of potable water.

5. Fittings for HDPE pipe shall conform to **AWWA C906** and shall have the same pressure rating as the pipe in which they are installed.

6. A certificate of "Compliance with Specification" shall be furnished for all materials to be supplied. Test reports prepared by an independent testing laboratory shall be provided certifying the polyethylene pipe conforms to the requirements of **ASTM D-1248** and **ASTM D-3350**.

7. Subject to compliance with the complete requirements of these Specifications, HDPE pipe products that may be incorporated into the work include Performance Pipe, Poly Pipe, or Approved Equal.

8. **Fusion Welding:** Polyethylene pipe shall be joined using butt fusion welding process. Provide a fused, flanged adaptor with ductile iron follower flange and a ductile iron flanged pipe for interconnections with ductile iron and/or PVC piping.

9. CONTRACTOR may use a drilling fluid that is completely biodegradable. Clay-based drilling fluids will also be allowed. Drilling fluid shall be subject to the CITY's review. CONTRACTOR shall provide their own clean water for drilling fluid. At no time shall drilling fluid be discharged to a surface water. This includes drilling fluid that may surface along the directionally-drilled pipe route. CONTRACTOR shall provide other drilling fluids or procedures, as needed, to prevent a discharge of drilling fluids to surface waters at no additional cost to the CITY.

10. The boring unit shall have a tracking device, which is capable of providing depth and location at all points of the boring path. Record drawings showing horizontal and vertical locations of the conduit shall be created by the CONTRACTOR based on the tracker information and submitted to the CITY.

11. **Finished Pipe:** CONTRACTOR shall submit detailed information to the CITY of the procedure and the steps to be followed for the installation of the directional drilling method selected, even if the process is named in the Specifications. All such instructions and procedures submitted shall be carefully followed during the installation. Any proposed changes in installation procedures shall require a submittal of revised procedures.

12. The installed pipe shall be continuous over the entire directionally-drilled length and shall be free from visual defects, such as foreign inclusions, concentrated ridges, discoloration, pitting, varying wall thickness, and other deformities. Pipes with gashes, nicks, abrasions, or any such physical damage which may have occurred during storage and/or handling, which are deeper than ten percent (10%) of the wall thickness, shall not be used and shall be removed from the construction site.

13. **Pipe Jointing:** Sections of polyethylene pipe shall be assembled and joined on the job site above ground. Pipe ends to be joined shall be cut square, then joined by the heating and butt fusion method in strict conformance with the manufacturer's printed instructions.

14. The butt fusion method for pipe jointing shall be carried out in the field by operators with prior experience in fusing polyethylene pipe with similar equipment using proper rigs and tools per standard procedures outlined by the pipe manufacturer. These joints shall have a smooth, uniform, double-rolled back bead made, while applying the proper melt, pressure, and alignment. It shall be the sole responsibility of the CONTRACTOR to provide an acceptable butt fusion joint. The replacement pipe shall be joined on the site in appropriate working lengths near the insertion point.

15. **Insertion or Access Pits:** The location and number of insertion or access pits shall be planned by CONTRACTOR and submitted in writing prior to excavation. The pits shall be located such that their total number shall be minimized and the length of replacement pipe installed in a single pull shall be maximized. The maximum pipe length of continuous liner shall be per the pipe bursting system manufacturer's recommendations.

16. Upon completion of the directional drilling operation by the CONTRACTOR, the CONTRACTOR shall backfill the excavation and perform cleanup and all site restoration, as indicated on the Drawings. All surfaces shall be restored in kind with thickness material removed.

17. **Process Limitations:** Though the installation process may be licensed or proprietary in nature, CONTRACTOR shall not change any material, thickness, design values, or procedures stated or approved in the submittals. CONTRACTOR shall submit, in writing, full details about component materials, their properties and installation procedures, and abide by them fully during the entire course of the project.

18. All allowable directional drilling methods are considered to be structurally equal processes as far as the end product required. The minimum required performance criteria, and/or standards, physical/structural properties, chemical resistance tests, and the replacement pipe thicknesses are given in this Specification shall be strictly complied with.

19. CONTRACTOR shall attach a 7″ by 19¼″ vinyl-coated galvanized aircraft cable pulled with the directional drilling operation as a tracer wire. Aircraft cable shall be attached to the pipe in twenty-foot (20′) intervals. Tracer wire shall be successfully tested before acceptance.

4000.2.9 Temporary Water Main

4000.2.9.1 General

1. This work shall consist of furnishing, installing, testing, protecting, maintaining, and removing a temporary water distribution system to serve homes or businesses affected by the relay of water mains, as shown in the Plan set.

2. A minimum of ten (10) days prior to the relay work, the CONTRACTOR shall submit a temporary water distribution system plan to the ENGINEER for approval. The plan shall be neatly sketched or a CADD drawing on an 11″ x 17″ size of paper. The plan shall include the minimum following requirements:
   A. Proposed system layout.
   B. Proposed procedures and schedule of pipe disinfection, testing, and activation.
   C. Proposed temporary pipe diameter.
   D. Temporary hydrant locations to ensure adequate fire flow.

3. Temporary utility services include, but are not limited to:
   A. Water services.

4. All pipe and fittings shall meet the specifications of **AWWA C906-07**, AWWA standards for Polyethylene (PE) pressure pipe and fittings, four-inch (4″) through sixty-three inch (63″), for water distribution and transmission.
   A. CONTRACTOR will submit certificate of compliance for all products that are to be used in the Temporary Water Main:
      1. Pipe.
      2. Fittings.
      3. Temporary hydrants.

5. Method of measurement:
   A. Temporary Water Main:
      1. Measure by lump sum basis for the approved and functional Temporary Water Main.
   B. Temporary Water Crossings:
      1. No measurement will be made for temporary water crossings of roadways, driveways, and sidewalks.

6. Basis of Payment:
   A. Payment for the Temporary Water Main shall be based on the entire system that is installed and shall include the cost of furnishing all labor, materials (including pipe, fittings, valves, pipe supports, ramps, couplings, gaskets, etc. for joint connections), and equipment necessary to complete the work.

7. Payment for Temporary Water Main shall also include all labor, materials, and equipment to construct or provide for temporary water crossings of roadways, driveways, and sidewalks, as shown on the CONTRACTOR-provided plan.

4000.2.9.2 Materials and Equipment

1. Provide all required materials and equipment for temporary water services and facilities.

2. Used materials and equipment may be used, if acceptable by the ENGINEER.

3. Provide only materials and equipment that are suitable for intended use and comply with the **Wisconsin State Plumbing Code**.

4. The pipe and fittings may be high density polyethylene (HDPE) in accordance with **AWWA C906-07**, or other pipe materials allowed by local building code, or otherwise approved by the ENGINEER. Piping, such as garden hoses, is not approved. Pipe joints shall be welded, fused, or joined in other methods approved by the local building code or otherwise approved by the ENGINEER.

4000.2.9.3 Execution

1. Operation of CITY valves and hydrants shall be by appropriate CITY personnel. At no times shall the CONTRACTOR operate existing valves or hydrants without prior authorization.

2. It is the CONTRACTOR's responsibility to work directly with each temporary water user to coordinate all details necessary to install and maintain the Temporary Water Main.
   A. For residential services, the CONTRACTOR shall investigate whether each house that receives temporary water has a shut-off valve upstream of the water meter. In the absence of said valve, the CONTRACTOR shall install a valve in accordance with the local building code. The CONTRACTOR then shall connect the temporary water service on the downstream side of the shut-off and bury the connection.

3. **Provide a minimum forty-eight (48) hour notice to the CITY staff, ENGINEER, and affected property owners prior to service disruption.**

4. The CONTRACTOR shall provide three (3) emergency contacts to the ENGINEER that will be available twenty-four (24) hours per day, seven (7) days per week, to address temporary water issues/concerns.

5. Provide temporary water service prior to disrupting existing service for longer than eight (8) hours.

6. All at grade temporary water pipe shall include protection provisions for vehicular traffic in driveways, roads, lawn mowing, or other related circumstances. Temporary water crossings of driveways and sidewalks will be below grade where the surface is planned to be reconstructed.

7. Each service connection must be made at the existing stop box and also include a vacuum breaker and back flow preventer, unless other means are proposed by the CONTRACTOR and approved by the ENGINEER. Any other provisions of the local building code must be adhered to. If needed, a pressure-reducing valve shall be installed at each house connection.

8. Existing hydrant locations within the Temporary Water Main shall have temporary hydrants installed for fire protection with a hydrant lead with three (3) spigots. At least one (1) spigot shall remain available for fire protection. A shut-off valve shall be placed on any spigot not in use for temporary water.

9. All hydrants used for the Temporary Water Main shall have a shut-off valve and back flow preventer at the point of connection.

10. When temporary water lines are no longer required, they shall be promptly removed by the CONTRACTOR.

4000.2.9.4 Operation, Termination, and Removal

1. Enforce strict discipline in use of temporary water services at the site.
   A. Limit availability of temporary services to essential and intended uses to minimize waste and abuse.
   B. Do not permit temporary installations to be abused or endangered.
   C. Do not allow hazardous, dangerous, or unsanitary conditions to develop or persist on site.

2. Operate temporary services in a safe and efficient manner.
   A. Do not overload temporary services.
   B. Protect from damage by freezing temperatures and similar elements.
   C. Maintain distinct markers for underground lines.
   D. Protect from damage during excavation operations.

3. Unless ENGINEER requests it be maintained for a longer period of time, remove each temporary service promptly when no longer needed, when it has been replaced by the authorized use of a permanent facility, or no later than substantial completion.

4. Materials that constitute temporary services are, and will maintain the property of the CONTRACTOR.

4000.3 Construction

4000.3.1 Excavation

4000.3.1.1 General

1. Unless otherwise specified in the Contract or the ENGINEER allows, perform water main construction in open trenches and in a manner that protects the pipelines from unusual stresses.

2. Excavate the trenches in reasonably close conformity with the Plans and as the ENGINEER laid out in the field. Begin each trench excavation at the proposed water main outlet and proceed to the upper end.

3. Keep trenches dewatered at all times.

4. If the Contract specifies or the ENGINEER allows, the CONTRACTOR may construct water mains by tunneling or jacking instead of open trenches. Adhere to the Construction Details, Construction Specifications, and ENGINEER's decisions.

5. Understand the proposed elevations for the water main as shown on the Plans are subject to revisions in order to fit field conditions, and the ENGINEER may adjust the profile grades from those the Plans shows.

6. The City of Oshkosh Water Distribution Division will make tappings when necessary for tapping valves. The CONTRACTOR shall do any excavation necessary to make the tap. CONTRACTOR shall also install the tapping valve.

7. Locating Existing Building Sewers and Services
   A. The CONTRACTOR will be furnished with available recorded measurements for the location of existing building sewers and water services. Existing service stop boxes, evidence of existing trenches, and any other pertinent evidence also shall be used in their location.
   B. The CONTRACTOR shall commence excavation for the location of the existing building sewers and water services at such point as the weight of evidence demands. In case the initial excavation for the location of existing building sewers and water services fails to

uncover same, the CONTRACTOR, at their own expense, shall explore a distance of six feet (6') in each direction, or a total of twelve feet (12'), immediately in back of and parallel to the curb, or along the water main.

C. In case the existing building sewers or water services cannot be located in these limits, and additional trenching is required, the CONTRACTOR shall make application to the ENGINEER for a written order for extra work, covering such additional exploratory trenching, and will be paid for the additional excavation and gravel backfill.

4000.3.2 Constructing Foundation

1. Construct the foundation in the trench to prevent subsequent settlement and rupture of the water main.

2. The CONTRACTOR may not lay the pipe in rock, wet conditions, or on a firm earth subgrade.

3. The CONTRACTOR shall lay the pipe on a backfilled granular foundation or bed. When placing the pipe on backfilled granular foundation, excavate the trench to at least six inches (6") below the elevation established for the bottom of the pipe. Backfill this depth with **"¾-inch clear stone"** meeting the requirements for No. 1 stone in **Section 501.2.5.4** of the STATE SPECIFICATIONS**.** Compact the material before laying the pipe on the backfilled granular material.

4. After laying the pipe, bedding material shall be placed around the sides of the pipe, except reinforced concrete pipe, up to a level six inches (6") above the top of the pipe. This material shall be placed by hand or equally careful means. When reinforced concrete pipe is installed, the bedding stone shall extend to the spring line of the pipe.

5. Excavate recesses to receive bells as necessary.

6. If the Contract details types of bedding, or required trench widths other than described above, conform to the Construction Details.

4000.3.3 Laying Water Main Pipe

1. Only proper and suitable tools and appliances for the safe and convenient handling and laying of pipes and fittings shall be used. Pipe, fittings, and valves shall be carefully handled and lowered into the trench. Under no circumstances shall any pipe or fittings be dumped or rolled into the trench or be allowed to drop against the pipe or fitting already in the trench. Great care shall be taken to prevent the pipe lining and coating from being damaged, and any lining or coating damaged in any way shall be repaired by the CONTRACTOR to the satisfaction of the Department of Public Works.

2. The bedding and cover for all water pipe shall be crusher run stone or ¾" clean stone. In all cases, both the bedding and cover material shall be of the same material.

3. The bedding material shall be placed so that after the pipe has been bedded to line and grade, there remains a four-inch (4") minimum depth under the pipe barrel in earth excavation. After the pipe has been properly laid and jointed, cover material of the same material as the bedding shall be placed around the sides of the pipe and up to a level six inches (6") above the pipe barrel. This material shall be placed by hand or equally careful means to eliminate all frozen lumps and all foreign material such as earth, clay lumps, etc.

4. Bell holes shall be properly excavated at proper intervals so joints can be properly installed. Crusher run stone shall pass a one-inch (1") mesh. Special care shall be taken to insure that the pipes are well bedded, and any defects due to settlement shall be made good by the CONTRACTOR at their own expense.

5. Whenever a pipe requires cutting, to fit in the line or bring it to the required location, the work shall be done in a satisfactory manner with an approved cutting tool or tools which will leave a smooth end at the right angles to the axis of the pipe and not otherwise damage the pipe or lining.

6. No springing of joints, to effect a change in direction will be allowed, except by permission or direction, as shown on the Drawings.

7. Pipe fittings and valves shall be secured in place by concrete foundation or thrust block or by strapping, as shown on the Drawings. The thrust blocks shall be of the shape and size as shown on the Plans. Concrete for these blocks shall be five and one-half (5½) bag mix. Thrust blocks must be installed against undisturbed soil in the trench.

8. If the bottom of the trench is of undesirable material, such as organic soil, etc. or the presence of groundwater which causes a condition which cannot adequately support the water main, an additional three inches (3") shall be excavated and filled with 1½" graded crushed stone and included as part of the standard section. In the event it becomes necessary to extend the stone fill to a greater depth, such additional amount of stone will be paid for in accordance with the prices listed in the unit bid prices. Where the distance to stable ground is excessive, the ENGINEER reserves the right to order, in writing, as an extra, such other types of foundation as they shall deem necessary.

9. Water main shall be no less than five feet (5') in depth per **NR 811.73(2)(e),** unless deemed unnecessary in specific cases by WDNR.

4000.3.4 Laying Pipe in Cold Weather

1. The ENGINEER reserves the right to order pipe-laying discontinued whenever, in their opinion, there is a danger of the quality of work being impaired because of cold weather.

2. The CONTRACTOR shall be responsible for heating the pipe and jointing material so as to prevent freezing of joints.

3. No pipe shall be laid on or in frozen ground.

4000.3.5 Relation to Sanitary Sewer and Storm Sewer

1. Water mains must be laid at least eight feet (8′) horizontally from any existing or proposed sanitary sewer. The distance is to be measured center to center. Should specific conditions prevent this separation, the CONTRACTOR shall notify the ENGINEER for specific instructions regarding the treatment of the separation.

2. Whenever a water main crosses a sanitary sewer, it should be laid at least eighteen inches (18″) above the sanitary sewer or the water main should be re-laid with fittings to cross over the sanitary sewer.

3. Water mains must be laid at least eight feet (8′) horizontally from any existing or proposed storm sewer. The distance is to be measured center to center. Should specific conditions prevent this separation, the CONTRACTOR shall notify the ENGINEER for specific instructions regarding the treatment of the separation.

4000.3.6 Joints

4000.3.6.1 Mechanical Joint Pipe

1. The mechanical joint for all bends, tees, and other fittings shall be a Megalug restraint gland.

4000.3.6.2 Push-On Pipe

1. The joint shall be effected in the following manner:
   A. Clean gasket recess in bell socket.
   B. Insert gasket into bell socket recess.
   C. Lubricate plain end with a thin film of lubricant.
   D. Push plain end home. A stripe on plain end of the pipe will serve as a guide when assembling the joint. When the stripe disappears, the joint will be complete.
   E. Attach electrical pipe thawing conductor.

4000.3.7 Backfilling

1. Backfill all water mains as described in **Section 100.61** in these Specifications.

4000.3.8 Clean Out, Chlorination, and Pressure Testing

4000.3.8.1 Cleaning of Water Main

1. Clean out all new or re-laid water mains of accumulations of silt, debris, and other foreign matter, and before acceptance, test all installations with the testing procedures as described below.
2. The CITY will allow the CONTRACTOR to chlorinate the new mater main, as presented below.

4000.3.8.2 Chlorination

1. During construction, CONTRACTOR shall use granular chlorine to obtain a safe water sample. CONTRACTOR shall place granular chlorine at each end of every pipe section prior to installation of the next pipe section.

2. When installation has been completed, the main shall be filled with water at a rate such that the water within the main will flow with a velocity no greater than one (1) fps. Precautions shall be taken to assure that air pockets are eliminated. This water shall remain in the pipe for at least twenty-four (24) hours. If the water temperature is less than 5°C (41°F), the water shall remain in the pipe for at least forty-eight (48) hours. Valves shall be positioned so that strong chlorine solution in the main being treated will not flow into the water mains in active service.

3. The price for the chlorination shall be included in the unit cost of the water main.

4. If the CONTRACTOR fails to get a safe sample, the following method will be used and included in the unit price of the water main:
   A. The City of Oshkosh Water Distribution Division has developed a standard operating procedure for chlorinating and de-chlorinating water main. This procedure is outlined below:

      Standard Operating Procedures for Chlorinating and De-Chlorinating Water Mains
      1. The CONTRACTOR must check with the City of Oshkosh Water Distribution Division before starting water main installation to determine the number of taps and location of taps needed for chlorinating water main.
      2. The CONTRACTOR is required to install a two-inch (2″) tapping saddle and a two-inch (2″) corporation within ten feet (10′) of the water main valve at the start of the Project.

3. The Water Distribution Division will make the two-inch (2″) taps.
4. The CONTRACTOR is required to install a two-inch (2″) stand pipe and a two-inch (2″) copper to iron pipe curb stop one foot (1′) to four feet (4′) above ground level.

Chlorinating Water Main

1. **AWWA C651** is the standard used for disinfecting water main.
2. The form of chlorine to be used is granular calcium hypochlorite conforming to **ANSI/AWWA B-300** or sodium hypochlorite conforming to **ANSI/AWWA B-300**.
3. The method of chlorination shall be the continuous feed or slug method. Water main is to be chlorinated to at least fifty (50) ppm.
4. Ascorbic acid is to be used to neutralize all chlorinated water flushed from the water main. Water main shall be flushed until the chlorine level reaches two (2) ppm or less before a water sample can be taken for a bacteria test.
5. When a section of water main has passed the pressure test, the Water Distribution Division will chlorinate the water main.
6. Chlorinated water main must sit for twenty-four (24) hours; **there will be no exceptions**. The CONTRACTOR shall check with the Water Distribution Division to determine if water samples can be checked on weekends or holidays. After chlorinated water main has sat for twenty-four (24) hours, the Water Distribution Division will flush the water main and take a water sample for bacteria testing. All water samples will be tested by the City of Oshkosh Water Filtration Division personnel.
7. If bacteria test is safe, the water main can be turned on. If bacteria test is unsafe, the Water Distribution Division will re-flush the main and take another sample. If there are two (2) unsafe bacteria tests, the water main has to be re-chlorinated following the same procedures. When a safe bacteria test is received, the CONTRACTOR will remove stand pipes, corporations, and tapping saddles that were used for chlorinating. Two-inch (2″) tapping holes shall be covered with a stainless steel repair sleeve, minimum eight inches (8″) wide, or preferably, a solid sleeve. If using a solid sleeve, it must be put on pipe next to tap and slid over tapping hole when the saddle and corporation are removed. Service taps and tie-ins can be made once bacteria tests are safe.

Please note the CONTRACTOR's cost to assist the City Water Distribution Division in chlorination is part of the normal unit cost for water main.

4000.3.8.3 Pressure Testing

1. Whenever a section of water main has been completed and all services connected (except in the case of relay work) and is ready to be tested, the CONTRACTOR shall flush the main to remove all sand, dirt, debris, etc. The water will be supplied by the CITY without cost, but the flushing shall be done under the direction of a representative of the Water Department.

2. When a section of main is ready for a test, static pressure of the distribution system shall be applied for a period of not less than four (4) hours. The section under test shall then be isolated from the distribution system and a pressure of 125 psi applied by means of a pump supplied and installed by the CONTRACTOR. This pressure shall be maintained for one (1) hour after which the pressure pump shall be stopped and the drop in pressure noted. Any leaks or excessive loss of pressure during this test shall be repaired by the CONTRACTOR and test repeated.

3. All equipment required for these tests shall be supplied by the CONTRACTOR.

4. The suitability of the test from the standpoint of leakage shall be based on the allowable leakage set forth in **Table 6, Section 4.1**, of **AWWA C600-87**.

4000.3.9 Corrosion Protection

1. Corrosion protection shall be provided for all ductile iron water main by use of polyethylene wrap. The polyethylene wrap shall meet the requirements of **Section 4000.2.2** of these Specifications.

4000.3.9.1 Installation

1. The polyethylene wrap shall be cut approximately two feet (2′) longer than that of the pipe section. After assembling the pipe joint, the polyethylene shall be overlapped approximately one foot (1′) and, at all joints, sealed with approved adhesive tape. Additional taping shall be used at three-foot (3') intervals along the pipe. Any rips, punctures, or other damage to the polyethylene shall be repaired immediately with adhesive tape. All copper service connections shall be wrapped for a distance of three feet (3′) from the center line of the main. Before installing the polyethylene wrap, the exterior of the pipe shall be free of foreign material.

4000.3.9.2 Wrapping of Special Fittings, Valves, Etc.

1. When valves, tees, crosses, etc., cannot be wrapped practically in a tube, a flat sheet or split tube shall be used. All seams shall be taped securely.

4000.3.9.3 Backfill around Polyethylene Wrapped Pipes

1. The bedding and cover material shall be placed with care so as to prevent damage to the polyethylene wrap. Any rips or punctures in the wrap shall be repaired immediately.

4000.3.10 Connections to Existing Water System

1. Connections which are to be made to the water system as shown on Drawings shall be made by the CONTRACTOR, except that the tapping will be made by the Water Distribution Division. All excavation, however, shall be done by the CONTRACTOR. The connections shall be made by the CONTRACTOR at such hours as shall be determined by the Water Distribution Division in order that the least disturbance of the water supply to existing consumers will be caused. The CONTRACTOR, however, shall notify the Water Distribution Division at least twenty-four (24) hours in advance of the time they desire to make the connections.

2. Before excavation of trenches is begun, the CONTRACTOR shall uncover the end of existing water main to which the new main is to be connected. This will permit adjustments in line and grade to avoid the use of extra fittings. The exposed end of an existing main must be protected and blocked by the CONTRACTOR to prevent the blowing out of the plug or cap at the end of the main.

4000.3.11 Insulation

1. Water mains shall be insulated where noted on the Plans and wherever the depth of cover is less than five feet (5').

2. The insulation shall be either polystyrene boards or insulating concrete.

4000.3.11.1 Polystyrene Boards

1. Polystyrene boards conforming to manufacturer's specifications shall be installed as follows: Prior to placement of these polystyrene boards, bedding material shall be placed to a height of six inches (6") over the top of the pipe, leveled and compacted.

2. The insulating boards shall be placed on the cover material with the long side parallel to the centerline of the water main for a minimum width of outside diameter (O.D.) +24". The boards shall be placed in a staggered arrangement so as to eliminate continuous transverse joints. If two (2) or more layers of insulation board are used, each layer should be placed so as to cover the joints of the layer immediately below

3. The first lift of backfill material shall consist of six inches (6") of bedding material, which shall be end or side dumped onto the insulation board and spread in such a manner that construction equipment does not operate directly on the insulation. This layer shall be compacted with equipment that exerts a contact stress of 70 to 80 psi. Once this layer has been compacted to the specified density, the remaining layers of backfill may be constructed utilizing conventional procedures.

4000.3.11.2 Insulating Concrete

1. Insulating concrete shall be placed around the entire main above the bedding material to a minimum thickness of six inches (6″).

4000.3.12 Portable Trench Box or Sliding Trench Shield

1. Portable trench boxes or sliding trench shields approved by OSHA may be used as long as, in the judgment of the ENGINEER, job conditions warrant such use. Use of the shield shall not relieve the CONTRACTOR of any liability for damages to persons or property occurring from or upon the work of constructing the sewer, water main, or appurtenances occasioned by negligence or otherwise, growing out of a failure on the part of the CONTRACTOR to leave in place in the trench sufficient sheathing and bracing to prevent the caving or moving of the ground, or disturbance of the completed work or any of the surface or subsurface structures.

2. Care shall be taken when a trench box or shield is moved ahead so as not to pull the already jointed pipe apart or leave voids around the pipe wall.

3. When required by the ENGINEER, the CONTRACTOR shall provide an acceptable method of rechecking line, grade, and horizontal location of the pipe after the shield has been moved ahead. If the pipe has moved, it shall be reset to the proper line and grade.

4. A suitable spacer between the concrete and the shield shall be provided. Where a concrete cradle or envelope is required, tar paper or other suitable material shall be used to prevent a bond between the spacer and the concrete, so as to permit moving of the shield without disturbing the pipe, cradle or envelope.

5. The width of the trench shield or box shall be such that a minimum six-inch (6″) horizontal clearance is maintained between the pipe and shield at all times.

6. Any voids occurring between the trench box or shield and the undisturbed trench wall within the pipe zone (bottom of trench to top of cover material) shall be filled with crushed stone, immediately after the box or shield is positioned.

4000.3.13 Water Services

4000.3.13.1 General Requirements

1. The copper lateral shall be installed from the water main to the property line. This work is to be done by the CONTRACTOR under the direct supervision of the Public Works Department. In any case, all materials shall be Water Department Standard so all valves, shut-offs, etc., throughout the City will be uniform.

2. The installation shall consist of tapping the water main, installation of a corporation stop at the main, copper pipe from the corporation to a ground key stop with service box attached extending to ground elevation (these shall be approximately six feet (6′) from the property line), and copper pipe from the ground key stop to the property line.

3. The minimum size water service shall be one inch (1″) in diameter.

4. All taps over one inch (1″) inch shall be made with the use of a tapping saddle. Said saddle shall be nylon- or epoxy-coated and supported to the main with two (2) stainless steel straps, with stainless steel bolts, nuts, and washers.

4000.3.13.2 Joints

1. All joints shall be compression-type of joint for copper tubing using only extra-heavy three part unions. The ends of the copper tubing shall be accurately sized and rounded with copper tubing sizing tools to remove any imperfections in the tubing due to coiling or handling. All ends shall be cut squarely and rough edges or burrs removed. The use of any jointing compound with copper tube flared fittings is prohibited.

4000.3.13.3 Laying Pipe

1. The water service shall be laid on a solid shelf excavated on one side of the trench. The bottom of the copper service, at all points, shall be at least twelve inches (12″) above the top of the sewer lateral.

2. Water service pipes must be at least six feet (6′) deep, where possible. If the water service becomes less than five and one-half feet (5½′) deep, or passes within two feet (2′) of an underground structure which may experience freezing temperatures, the service must be insulated with two inches (2") of an approved styrofoam insulation, placed over the pipe, four feet (4′) wide and centered over the service. If by shelving the water service, in the sewer lateral trench, the service will become less than four and one-half feet (4½′) deep, the water service must be placed in a separate trench, six feet (6′) deep, and separated from the sanitary lateral by ten feet (10′). All costs of extra excavation and insulation must be included in the unit price for laterals.

3. All copper water service 1¼″ diameter and smaller shall be installed without any coupling or joints from the corporation stop at the main to the curb stop, except with permission of the ENGINEER. Copper services 1½" and 2" shall be laid in lengths not less than twenty feet (20′).

4. The entire tap, corporation stop, the water main at the tap, and the first three (3) feet of the copper service shall be wrapped with polyethelene film.

4000.3.13.3.1 Laterals Laid across Existing Trenches

1. Where sewer laterals and/or water services are dug under existing utility lines, firm support shall be installed under the existing utility line to ensure that future settlement or breakage will not occur. Said support shall be either concrete or hardwood timbers. All supports must meet the approval of the ENGINEER.

2. Where a sewer lateral and/or water service crosses over an existing trench, hardwood plank supports shall be used to support said sewer lateral and water service. Said plank support shall be long enough to extend at least eighteen inches (18″) onto undisturbed soil on each side of the trench. The sewer lateral and/or water service shall be strapped to the plank to assure true alignment. There shall be a four-inch (4″) sand cushion placed between the plank and the pipe being crossed.

3. Where water services cross an existing pipe or conduit, there shall be at least three inches (3″) of clearance provided at the crossing point which shall be filled with bedding material.

4000.3.13.4 Slurry Backfill in Service Trenches

1. In areas where the *Construction Access Agreement* has not been signed and returned, the ENGINEER will order the CONTRACTOR to use an aggregate slurry backfill for the service trenches at the connection.

2. The unit price for this Bid Item shall include all necessary labor, equipment, and materials to slurry the service trench.

3. This Bid Item will be measured by the cubic yard for the trench backfill material that is installed.

4. The quantity in the estimate of quantities is only an estimate. The CONTRACTOR will be paid based on the actual, installed quantities only and no adjustments in unit prices will be made for any increases or decreases of quantity installed.

4000.3.13.5 Tunnel Underneath Retaining Walls for Water Services

1. In areas where the CONTRACTOR is required by the ENGINEER to install a water service to the property underneath an existing retaining wall, the CONTRACTOR shall carefully excavate on each side of the retaining wall in order to avoid damage to the existing retaining wall and push the service pipe through the excavated opening. CONTRACTOR then shall slurry the trench with an aggregate slurry backfill. The cost of the slurry will be included in the unit price of the Tunnel Underneath Retaining Walls for Services Bid Item.

2. The unit price for this Bid Item shall include all necessary labor, equipment, and materials to excavate and push the water service underneath the existing retaining wall.

3. This Bid Item will be measured by each tunnel that is acceptably completed.

4. The quantity in the estimate of quantities is only an estimate. The CONTRACTOR will be paid based on the actual, installed quantities **only** and no adjustments in unit prices will be made for any increases or decreases of quantity installed.

4000.3.14 Setting Curb Stop and Service Box

1. The curb stop shall be placed not less than six feet (6′) nor more than six and one-half feet (6½′) below the established sidewalk grade, and shall be set approximately six feet (6′) out from the right-of-way or property line.

2. The service box shall then be centered over the curb stop, supported firmly with a brick or two-inch (2") hardwood board under it, and brought to proper grade. Where the bench does not afford a firm support for the service box blocking, a 2" x 6" hardwood plank shall be placed across the entire lateral trench and supported by eighteen inches (18″) of undisturbed soil on each side.

3. Before placing backfill around the service box, the CONTRACTOR shall wrap polyethylene around the base, to prevent backfill material from entering the openings. Backfill shall then be carefully placed and compacted to assure the service box is set in a true vertical position. The CONTRACTOR shall then place a piece of four-inch (4″) Schedule 40 PVC Pipe, eighteen inches (18″) in length, over the service box and paint blue.

4000.3.15 Water Service Clay Dam

1. After installation of the water service, a clay dam will be installed at each lateral (see **Standard Detailed Drawing**).

2. The clay dam shall be placed in the terrace area, and be excavated to a depth of one foot (1′) below the bottom of the service.

3. The CONTRACTOR shall place no stone in the trench in this area, but shall backfill and compact the entire trench with clay to a depth of one foot (1′) below finished grade.

4. The clay shall extend the entire width of the trench and be a minimum length thickness of four feet (4′).

5. The CONTRACTOR cannot substitute other materials, unless approved by the ENGINEER.

4000.4 Measurement

1. The CITY will measure the Water Main Pipe Bid Items by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the pipe, from one end to the other end of the installed water main pipe.

2. The CITY will measure the Water Service Pipe Bid Items by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the pipe, from the water main to the connection of the existing water service.

3. The CITY will measure the Corporation and Stop Box Bid Items as each individual unit that is acceptably completed.

4. The CITY will measure the Water Service Clay Dam Bid Items as each individual unit that is acceptably completed**.**

5. The CITY will measure the Connection to the Existing Water Main Bid Items as each individual unit that is acceptably completed**.**

6. The CITY will measure the HDPE pipe mater main by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the pipe from one end to the other end of the acceptably installed.

4000.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
	WATER MAIN	
4000	Furnish and Install 4″ Ductile Iron Water Main Relay with Polywrap	LF
4001	Furnish and Install 4″ Ductile Iron Water Main Relay with Polywrap and TR Flex Restrained Joints	LF
4002	Furnish and Install 6″ Ductile Iron Water Main Relay with Polywrap	LF
4003	Furnish and Install 6″ Ductile Iron Water Main Relay with Polywrap and TR Flex Restrained Joints	LF
4004	Furnish and Install 8″ Ductile Iron Water Main Relay with Polywrap	LF
4005	Furnish and Install 8″ Ductile Iron Water Main Relay with Polywrap and TR Flex Restrained Joints	LF
4006	Furnish and Install 10″ Ductile Iron Water Main Relay with Polywrap	LF
4007	Furnish and Install 10″ Ductile Iron Water Main Relay with Polywrap and TR Flex Restrained Joints	LF
4008	Furnish and Install 12″ Ductile Iron Water Main Relay with Polywrap	LF

Bid Item	Description	Units
4009	Furnish and Install 12″ Ductile Iron Water Main Relay with Polywrap and TR Flex Restrained Joints	LF
4010	Furnish and Install 16″ Ductile Iron Water Main Relay with Polywrap	LF
4011	Furnish and Install 16″ Ductile Iron Water Main Relay with Polywrap and TR Flex Restrained Joints	LF
4012	Furnish and Install 18″ Ductile Iron Water Main Relay with Polywrap	LF
4013	Furnish and Install 18″ Ductile Iron Water Main Relay with Polywrap and TR Flex Restrained Joints	LF
4014	Furnish and Install 20″ Ductile Iron Water Main Relay with Polywrap	LF
4015	Furnish and Install 20″ Ductile Iron Water Main Relay with Polywrap and TR Flex Restrained Joints	LF
4016	Furnish and Install 24″ Ductile Iron Water Main Relay with Polywrap	LF
4017	Furnish and Install 24″ Ductile Iron Water Main Relay with Polywrap and TR Flex Restrained Joints	LF
4018	Furnish and Install New 4″ Ductile Iron Water Main with Polywrap	LF
4019	Furnish and Install New 4″ Ductile Iron Water Main with Polywrap and TR Flex Restrained Joints	LF
4020	Furnish and Install New 6″ Ductile Iron Water Main with Polywrap	LF
4021	Furnish and Install New 6″ Ductile Iron Water Main with Polywrap and TR Flex Restrained Joints	LF
4022	Furnish and Install New 8″ Ductile Iron Water Main with Polywrap	LF
4023	Furnish and Install New 8″ Ductile Iron Water Main with Polywrap and TR Flex Restrained Joints	LF
4024	Furnish and Install New 10″ Ductile Iron Water Main with Polywrap	LF
4025	Furnish and Install New 10″ Ductile Iron Water Main with Polywrap and TR Flex Restrained Joints	LF
4026	Furnish and Install New 12″ Ductile Iron Water Main with Polywrap	LF
4027	Furnish and Install New 12″ Ductile Iron Water Main with Polywrap and TR Flex Restrained Joints	LF
4028	Furnish and Install New 16″ Ductile Iron Water Main with Polywrap	LF
4029	Furnish and Install New 16″ Ductile Iron Water Main with Polywrap and TR Flex Restrained Joints	LF
4030	Furnish and Install New 18″ Ductile Iron Water Main with Polywrap	LF
4031	Furnish and Install New 18″ Ductile Iron Water Main with Polywrap and TR Flex Restrained Joints	LF
4032	Furnish and Install New 20″ Ductile Iron Water Main with Polywrap	LF
4033	Furnish and Install New 20″ Ductile Iron Water Main with Polywrap and TR Flex Restrained Joints	LF
4034	Furnish and Install New 24″ Ductile Iron Water Main with Polywrap	LF
4035	Furnish and Install New 24″ Ductile Iron Water Main with Polywrap and TR Flex Restrained Joints	LF

Bid Item	Description	Units
WATER SERVICE (RELAY)		
4036	Furnish and Install 1″ Water Service (Relay)	LF
4037	Furnish and Install 1¼″ Water Service (Relay)	LF
4038	Furnish and Install 1½″ Water Service (Relay)	LF
4040	Furnish and Install 2″ Water Service (Relay)	LF
WATER SERVICE (NEW)		
4042	Furnish and Install 1″ Water Service (New)	LF
4044	Furnish and Install 1½″ Water Service (New)	LF
4046	Furnish and Install 2″ Water Service (New)	LF
CORPORATION AND STOP BOX		
4048	Furnish and Install 1″ Corporation and Stop Box	EA
4049	Furnish and Install 1″ Stop Box and Rod only	EA
4050	Furnish and Install 1¼″ Corporation and Stop Box	EA
4051	Furnish and Install 1½″ Corporation and Stop Box	EA
4052	Furnish and Install 1½″ Stop Box and Rod only	EA
4053	Furnish and Install 2″ Corporation and Stop Box	EA
4054	Furnish and Install 2″ Stop Box and Rod only	EA
WATER MAIN CLAY DAMS		
4055	Furnish and Install Water Service Clay Dams	EA
WATER MAIN CONNECTIONS		
4056	Furnish and Install Connections to Existing 4″ Water Main	EA
4058	Furnish and Install Connections to Existing 6″ Water Main	EA
4060	Furnish and Install Connections to Existing 8″ Water Main	EA
4062	Furnish and Install Connections to Existing 10″ Water Main	EA
4064	Furnish and Install Connections to Existing 12″ Water Main	EA
4066	Furnish and Install Connections to Existing 16″ Water Main	EA
4068	Furnish and Install Connections to Existing 18″ Water Main	EA
4070	Furnish and Install Connections to Existing 20″ Water Main	EA
4072	Furnish and Install Connections to Existing 24″ Water Main	EA
DIRECTIONAL DRILLING HDPE PIPE		
4090	Furnish and Install Directional Drilling 8″ HDPE Pipe	LF
4092	Furnish and Install Directional Drilling 10″ HDPE Pipe	LF
4094	Furnish and Install Directional Drilling 12″ HDPE Pipe	LF
4096	Furnish and Install Directional Drilling 16″ HDPE Pipe	LF

Bid Item	Description	Units
TEMPORARY WATER MAIN		
4080	Temporary Water Main	LS
SLURRY BACKFILL		
4082	Slurry Backfill (Water Services)	CY
TUNNEL UNDERNEATH EXISTING RETAINING WALLS		
4084	Tunnel Underneath Existing Retaining Walls (Water Services)	EA

4000.5.1 Water Main (Relay)

1. Payment for the Water Main (Relay) Pipes Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for forming foundation; for laying pipe; for poly-wrapping water main; for sealing joints; for providing backfill material, including bedding material; for backfilling; for all necessary pressure testing; for chlorinating water main and obtaining a safe sample; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation, Water Main Fittings, and Connections to Existing Water Mains will be paid for under separate Bid Items.

2. Apply Contract unit prices, without adjustment, to the quantities of water main relay pipes constructed at elevations not greater than one foot (1′) above or below what the Plans show. If the ENGINEER orders the construction of the water main relay pipes or portions of the pipes at elevations greater than one foot (1′) above or below what the Plans show, then the CITY will pay for this work as specified extra work.

3. Work performed one foot (1′) or less below the pipe bottom to form a satisfactory foundation as specified is incidental to the work. The CITY will pay for work required at depths greater than one foot (1′) below the pipe bottom as extra work.

4000.5.2 Water Main (New)

1. Payment for the Water Main (New) Pipes Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for forming foundation; for laying pipe; for poly-wrapping water main; for sealing joints; for providing backfill material, including bedding material; for backfilling; for all necessary pressure testing; for chlorinating water main and obtaining a safe sample; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation, Water Main Fittings, and Connections to Existing Water Mains will be paid for under separate Bid Items.

2. Apply Contract unit prices, without adjustment, to the quantities of new water main pipes constructed at elevations not greater than one foot (1′) above or below what the Plans show. If the ENGINEER orders the construction of the new water main pipes or portions of the pipes at elevations greater than one foot (1′) above or below what the Plans show, then the CITY will pay for this work as specified extra work.

3. Work performed one foot (1′) or less below the pipe bottom to form a satisfactory foundation as specified is incidental to the work. The CITY will pay for work required at depths greater than one foot (1′) below the pipe bottom as extra work.

4000.5.3 Water Service (Relay)

1. Payment for the Water Service (Relay) Pipes Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for forming foundation; for laying pipe; for connecting to the existing service; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation will be paid for under separate Bid Item.

4000.5.4 Water Service (New)

1. Payment for the Water Service (New) Pipes Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for forming foundation; for laying pipe; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation will be paid for under separate Bid Item.

4000.5.5 Corporation and Stop Box

1. Payment for the Corporation and Stop Box Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for forming foundation; for installing corporation and stop box; for providing granular backfill material, including bedding material; for backfilling; for installing and removing a four-inch (4″) Schedule 40 PVC pipe around service box; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation will be paid for under separate Bid Item.

4000.5.6 Water Service Clay Dam

1. Payment for the Water Service Clay Dam Bid Item is for full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for providing clay backfill material; for backfilling; for compacting; for removing sheeting and

shoring; and for cleaning out and restoring the site of the work. Rock Excavation, Corporation and Stop Box, and Connections to Existing Water Services will be paid for under separate Bid Items.

4000.5.7 Connections to the Existing Water Main

1. Payment for the Connections to the Existing Water Main Bid Items is full compensation for providing all necessary labor, equipment, and materials (connection fitting shall be included in the bid price); for excavating; for sheeting and shoring; for forming foundation; for connecting to the existing water main; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work. Rock Excavation will be paid for under a separate Bid Item.

SECTION 4100
WATER MAIN FITTINGS:
TEES, CROSSES, BENDS, CAPS, REDUCERS, ENLARGERS, SLEEVES, AND PLUGS

4100.1 Description

1. This Section describes excavating required trenches, and laying and connecting water main fittings, then backfilling and cleaning out as necessary.

4100.2 Materials

1. All water main fittings shall be manufactured in accordance with American Standard Association Specifications **A.21.10** and **A21.11** for mechanical joints, Class 250.

2. Cor-Blue T-bolts and nuts shall be manufactured from the same, high-quality material as the standard T-bolts and nuts, but shall also have a ceramic-filled, baked-on fluorocarbon resin developed to handle the needs of highly corrosive conditions. Cor-Blue T-bolts and nuts shall also be in compliance with **ANSI/AWWA C111/A21.11** (current revision).

3. Fittings shall conform to **AWWA C153**.

4. The manufacturer's mark, nominal diameters of openings, and the number of degrees of fraction of the circle on all bends, shall be distinctly cast on the fittings. The pressure rating shall be distinctly marked on the fitting. Ductile iron fittings shall have the letters "DI" or "Ductile" cast on them.

5. Certification by manufacturer: Manufacturer's shall furnish certification data that represents the fittings furnished. Certifications shall be furnished to the ENGINEER. Certification shall be provided for each casting period in which a fitting was cast and shall cover the acceptance tests of **AWWA C153** and the identification and description of interior and exterior coatings. All certifications shall be furnished before any fittings will be accepted for installation.

4100.3 Construction

4100.3.1 Excavation

4100.3.1.1 General

1. Unless otherwise specified in the Contract or the ENGINEER allows, perform water main construction in open trenches and in a manner that protects the pipelines from unusual stresses.

2. Excavate the trenches in reasonably close conformity with the Plans and as the ENGINEER laid out in the field.

3. Keep trenches dewatered at all times.

4. Understand the proposed elevations for the water main fittings as shown on the Plans are subject to revisions in order to fit field conditions, and the ENGINEER may adjust the profile grades from those the Plans show.

5. Fittings shall be installed along the water mains where shown on the Plans or where designated by the ENGINEER.

6. Plugs shall be installed on all fittings at the end of water main pipes for future connections.

4100.3.2 Constructing Foundation

1. Construct the foundation in the trench to prevent subsequent settlement and rupture of the water main.

2. The CONTRACTOR may not lay the pipe in rock, wet conditions, or on a firm earth subgrade.

3. The CONTRACTOR shall lay the pipe on a backfilled granular foundation or bed. When placing the pipe on backfilled granular foundation, excavate the trench to at least six inches (6") below the elevation established for the bottom of the pipe. Backfill this depth with **"¾-inch clear stone"** meeting the requirements for No. 1 stone in **Section 501.2.5.4** of the STATE SPECIFICATIONS**.** Compact the material before laying the pipe on the backfilled granular material.

4. After laying the pipe, bedding material shall be placed around the sides of the pipe, except reinforced concrete pipe, up to a level six inches (6") above the top of the pipe. This material shall be placed by hand or equally careful means. When reinforced concrete pipe is installed, the bedding stone shall extend to the spring line of the pipe.

5. Excavate recesses to receive bells as necessary.

6. If the Contract details types of bedding, or required trench widths other than described above, conform to the Construction Details.

4100.3.3 Joints

4100.3.3.1 Mechanical Joints

1. The mechanical joint shall for all crosses, bends, reducers, enlargers, and other fittings shall be a Megalug Roma-Grip of Ebaa restraint gland.

2. All tees shall be locking tees.

4100.3.4 Backfilling

1. Backfill all water mains as described in **Section 100.61** of these Specifications.

4100.3.5 Corrosion Protection

1. Corrosion protection shall be provided for all ductile iron water main fittings by use of polyethylene wrap. The polyethylene wrap shall meet the requirements of **Section 4000.2.2** of these Specifications.

4100.3.5.1 Installation

1. The polyethylene wrap shall be cut approximately two feet (2′) longer than that of the pipe section. After assembling the pipe joint, the polyethylene shall be overlapped approximately one foot (1′) and at all joints sealed with approved adhesive tape. Additional taping shall be used at three-foot (3') intervals along the pipe. Any rips, punctures, or other damage to the polyethylene shall be repaired immediately with adhesive tape. All copper service connections shall be wrapped for a distance of three feet (3′) from the center line of the main. Before installing the polyethylene wrap, the exterior of the pipe shall be free of foreign material.

4100.3.5.2 Wrapping of Special Fittings, Valves, Etc.

1. When valves, tees, crosses, etc., cannot be wrapped practically in a tube, a flat sheet or split tube shall be used. All seams shall be taped securely.

4100.3.5.3 Backfilling Around Polyethylene-Wrapped Fittings

1. The bedding and cover material shall be placed with care so as to prevent damage to the polyethylene wrap. Any rips or punctures in the wrap shall be repaired immediately.

4100.4 Measurement

1. The CITY will measure the fittings (tees, crosses, bends, caps, reducers, enlargers, sleeves, and plugs) as each individual unit that is acceptably completed.

4100.5 Payment

1. The CITY will pay for the measured quantities at the Contract price for the following Bid Items:

Bid Item	Description	Units
	WATER MAIN TEE	
4100	Furnish and Install 6″ x 4″ Water Main Tee	EA
4101	Furnish and Install 6″ x 6″ Water Main Tee	EA
4102	Furnish and Install 6″ x 8″ Water Main Tee	EA
4103	Furnish and Install 6″ x 10″ Water Main Tee	EA
4104	Furnish and Install 6″ x 12″ Water Main Tee	EA
4105	Furnish and Install 6″ x 16″ Water Main Tee	EA
4106	Furnish and Install 6″ x 18″ Water Main Tee	EA
4107	Furnish and Install 6″ x 20″ Water Main Tee	EA
4108	Furnish and Install 6″ x 24″ Water Main Tee	EA
4109	Furnish and Install 8″ x 4″ Water Main Tee	EA
4110	Furnish and Install 8″ x 6″ Water Main Tee	EA
4111	Furnish and Install 8″ x 8″ Water Main Tee	EA
4112	Furnish and Install 8″ x 10″ Water Main Tee	EA
4113	Furnish and Install 8″ x 12″ Water Main Tee	EA
4114	Furnish and Install 8″ x 16″ Water Main Tee	EA
4115	Furnish and Install 8″ x 18″ Water Main Tee	EA
4116	Furnish and Install 8″ x 20″ Water Main Tee	EA
4117	Furnish and Install 8″ x 24″ Water Main Tee	EA
4118	Furnish and Install 10″ x 4″ Water Main Tee	EA
4119	Furnish and Install 10″ x 6″ Water Main Tee	EA
4120	Furnish and Install 10″ x 8″ Water Main Tee	EA
4121	Furnish and Install 10″ x 10″ Water Main Tee	EA
4122	Furnish and Install 10″ x 12″ Water Main Tee	EA
4123	Furnish and Install 10″ x 16″ Water Main Tee	EA
4124	Furnish and Install 10″ x 18″ Water Main Tee	EA
4125	Furnish and Install 10″ x 20″ Water Main Tee	EA
4126	Furnish and Install 10″ x 24″ Water Main Tee	EA
4127	Furnish and Install 12″ x 4″ Water Main Tee	EA
4128	Furnish and Install 12″ x 6″ Water Main Tee	EA
4129	Furnish and Install 12″ x 8″ Water Main Tee	EA

Bid Item	Description	Units
4130	Furnish and Install 12″ x 10″ Water Main Tee	EA
4131	Furnish and Install 12″ x 12″ Water Main Tee	EA
4132	Furnish and Install 12″ x 16″ Water Main Tee	EA
4133	Furnish and Install 12″ x 18″ Water Main Tee	EA
4134	Furnish and Install 12″ x 20″ Water Main Tee	EA
4135	Furnish and Install 12″ x 24″ Water Main Tee	EA
4136	Furnish and Install 16″ x 4″ Water Main Tee	EA
4137	Furnish and Install 16″ x 6″ Water Main Tee	EA
4138	Furnish and Install 16″ x 8″ Water Main Tee	EA
4139	Furnish and Install 16″ x 10″ Water Main Tee	EA
4140	Furnish and Install 16″ x 12″ Water Main Tee	EA
4141	Furnish and Install 16″ x 16″ Water Main Tee	EA
4142	Furnish and Install 16″ x 18″ Water Main Tee	EA
4143	Furnish and Install 16″ x 20″ Water Main Tee	EA
4144	Furnish and Install 16″ x 24″ Water Main Tee	EA
4145	Furnish and Install 18″ x 4″ Water Main Tee	EA
4146	Furnish and Install 18″ x 6″ Water Main Tee	EA
4147	Furnish and Install 18″ x 8″ Water Main Tee	EA
4148	Furnish and Install 18″ x 10″ Water Main Tee	EA
4149	Furnish and Install 18″ x 12″ Water Main Tee	EA
4150	Furnish and Install 18″ x 16″ Water Main Tee	EA
4151	Furnish and Install 18″ x 18″ Water Main Tee	EA
4152	Furnish and Install 18″ x 20″ Water Main Tee	EA
4153	Furnish and Install 18″ x 24″ Water Main Tee	EA
4154	Furnish and Install 20″ x 4″ Water Main Tee	EA
4155	Furnish and Install 20″ x 6″ Water Main Tee	EA
4156	Furnish and Install 20″ x 8″ Water Main Tee	EA
4157	Furnish and Install 20″ x 10″ Water Main Tee	EA
4158	Furnish and Install 20″ x 12″ Water Main Tee	EA
4159	Furnish and Install 20″ x 16″ Water Main Tee	EA
4160	Furnish and Install 20″ x 18″ Water Main Tee	EA
4161	Furnish and Install 20″ x 20″ Water Main Tee	EA
4162	Furnish and Install 20″ x 24″ Water Main Tee	EA
4163	Furnish and Install 24″ x 4″ Water Main Tee	EA
4164	Furnish and Install 24″ x 6″ Water Main Tee	EA
4165	Furnish and Install 24″ x 8″ Water Main Tee	EA
4166	Furnish and Install 24″ x 10″ Water Main Tee	EA
4167	Furnish and Install 24″ x 12″ Water Main Tee	EA
4168	Furnish and Install 24″ x 16″ Water Main Tee	EA
4169	Furnish and Install 24″ x 18″ Water Main Tee	EA
4170	Furnish and Install 24″ x 20″ Water Main Tee	EA

Bid Item	Description	Units
4171	Furnish and Install 24″ x 24″ Water Main Tee	EA
	WATER MAIN CROSS	
4172	Furnish and Install 4″ x 4″ Water Main Cross	EA
4173	Furnish and Install 4″ x 6″ Water Main Cross	EA
4174	Furnish and Install 4″ x 8″ Water Main Cross	EA
4175	Furnish and Install 4″ x 10″ Water Main Cross	EA
4176	Furnish and Install 4″ x 12″ Water Main Cross	EA
4177	Furnish and Install 4″ x 16″ Water Main Cross	EA
4178	Furnish and Install 4″ x 18″ Water Main Cross	EA
4179	Furnish and Install 4″ x 20″ Water Main Cross	EA
4180	Furnish and Install 4″ x 24″ Water Main Cross	EA
4181	Furnish and Install 6″ x 6″ Water Main Cross	EA
4182	Furnish and Install 6″ x 8″ Water Main Cross	EA
4183	Furnish and Install 6″ x 10″ Water Main Cross	EA
4184	Furnish and Install 6″ x 12″ Water Main Cross	EA
4185	Furnish and Install 6″ x 16″ Water Main Cross	EA
4186	Furnish and Install 6″ x 18″ Water Main Cross	EA
4187	Furnish and Install 6″ x 20″ Water Main Cross	EA
4188	Furnish and Install 6″ x 24″ Water Main Cross	EA
4189	Furnish and Install 8″ x 8″ Water Main Cross	EA
4190	Furnish and Install 8″ x 10″ Water Main Cross	EA
4191	Furnish and Install 8″ x 12″ Water Main Cross	EA
4192	Furnish and Install 8″ x 16″ Water Main Cross	EA
4193	Furnish and Install 8″ x 18″ Water Main Cross	EA
4194	Furnish and Install 8″ x 20″ Water Main Cross	EA
4195	Furnish and Install 8″ x 24″ Water Main Cross	EA
4196	Furnish and Install 10″ x 10″ Water Main Cross	EA
4197	Furnish and Install 10″ x 12″ Water Main Cross	EA
4198	Furnish and Install 10″ x 16″ Water Main Cross	EA
4199	Furnish and Install 10″ x 18″ Water Main Cross	EA
4200	Furnish and Install 10″ x 20″ Water Main Cross	EA
4201	Furnish and Install 10″ x 24″ Water Main Cross	EA
4202	Furnish and Install 12″ x 12″ Water Main Cross	EA
4203	Furnish and Install 12″ x 16″ Water Main Cross	EA
4204	Furnish and Install 12″ x 18″ Water Main Cross	EA
4205	Furnish and Install 12″ x 20″ Water Main Cross	EA
4206	Furnish and Install 12″ x 24″ Water Main Cross	EA
4207	Furnish and Install 16″ x 16″ Water Main Cross	EA
4208	Furnish and Install 16″ x 18″ Water Main Cross	EA
4209	Furnish and Install 16″ x 20″ Water Main Cross	EA

Bid Item	Description	Units
4210	Furnish and Install 16″ x 24″ Water Main Cross	EA
4211	Furnish and Install 18″ x 18″ Water Main Cross	EA
4212	Furnish and Install 18″ x 20″ Water Main Cross	EA
4213	Furnish and Install 18″ x 24″ Water Main Cross	EA
4214	Furnish and Install 20″ x 20″ Water Main Cross	EA
4215	Furnish and Install 20″ x 24″ Water Main Cross	EA
4216	Furnish and Install 24″ x 24″ Water Main Cross	EA
WATER MAIN BEND		
4217	Furnish and Install 4″ 11¼° Water Main Bend	EA
4218	Furnish and Install 6″ 11¼° Water Main Bend	EA
4219	Furnish and Install 8″ 11¼° Water Main Bend	EA
4220	Furnish and Install 10″ 11¼° Water Main Bend	EA
4221	Furnish and Install 12″ 11¼° Water Main Bend	EA
4222	Furnish and Install 16″ 11¼° Water Main Bend	EA
4223	Furnish and Install 18″ 11¼° Water Main Bend	EA
4224	Furnish and Install 20″ 11¼° Water Main Bend	EA
4225	Furnish and Install 24″ 11¼° Water Main Bend	EA
4226	Furnish and Install 4″ 22½° Water Main Bend	EA
4227	Furnish and Install 6″ 22½° Water Main Bend	EA
4228	Furnish and Install 8″ 22½° Water Main Bend	EA
4229	Furnish and Install 10″ 22½° Water Main Bend	EA
4230	Furnish and Install 12″ 22½° Water Main Bend	EA
4231	Furnish and Install 16″ 22½° Water Main Bend	EA
4232	Furnish and Install 18″ 22½° Water Main Bend	EA
4233	Furnish and Install 20″ 22½° Water Main Bend	EA
4234	Furnish and Install 24″ 22½° Water Main Bend	EA
4235	Furnish and Install 4″ 45° Water Main Bend	EA
4236	Furnish and Install 6″ 45° Water Main Bend	EA
4237	Furnish and Install 8″ 45° Water Main Bend	EA
4238	Furnish and Install 10″ 45° Water Main Bend	EA
4239	Furnish and Install 12″ 45° Water Main Bend	EA
4240	Furnish and Install 16″ 45° Water Main Bend	EA
4241	Furnish and Install 18″ 45° Water Main Bend	EA
4242	Furnish and Install 20″ 45° Water Main Bend	EA
4243	Furnish and Install 24″ 45° Water Main Bend	EA
4244	Furnish and Install 4″ 90° Water Main Bend	EA
4245	Furnish and Install 6″ 90° Water Main Bend	EA
4246	Furnish and Install 8″ 90° Water Main Bend	EA
4247	Furnish and Install 10″ 90° Water Main Bend	EA
4248	Furnish and Install 12″ 90° Water Main Bend	EA

Bid Item	Description	Units
4249	Furnish and Install 16″ 90° Water Main Bend	EA
4250	Furnish and Install 18″ 90° Water Main Bend	EA
4251	Furnish and Install 20″ 90° Water Main Bend	EA
4252	Furnish and Install 24″ 90° Water Main Bend	EA
WATER MAIN CAP		
4253	Furnish and Install 4″ Water Main Cap	EA
4254	Furnish and Install 6″ Water Main Cap	EA
4255	Furnish and Install 8″ Water Main Cap	EA
4256	Furnish and Install 10″ Water Main Cap	EA
4257	Furnish and Install 12″ Water Main Cap	EA
4258	Furnish and Install 16″ Water Main Cap	EA
4259	Furnish and Install 18″ Water Main Cap	EA
4260	Furnish and Install 20″ Water Main Cap	EA
4261	Furnish and Install 24″ Water Main Cap	EA
WATER MAIN REDUCER/ENLARGER		
4262	Furnish and Install 6″ x 4″ Water Main Reducer	EA
4263	Furnish and Install 8″ x 4″ Water Main Reducer	EA
4264	Furnish and Install 8″ x 6″ Water Main Reducer	EA
4265	Furnish and Install 10″ x 4″ Water Main Reducer	EA
4266	Furnish and Install 10″ x 6″ Water Main Reducer	EA
4267	Furnish and Install 10″ x 8″ Water Main Reducer	EA
4268	Furnish and Install 12″ x 4″ Water Main Reducer	EA
4269	Furnish and Install 12″ x 6″ Water Main Reducer	EA
4270	Furnish and Install 12″ x 8″ Water Main Reducer	EA
4271	Furnish and Install 12″ x 10″ Water Main Reducer	EA
4272	Furnish and Install 16″ x 4″ Water Main Reducer	EA
4273	Furnish and Install 16″ x 6″ Water Main Reducer	EA
4274	Furnish and Install 16″ x 8″ Water Main Reducer	EA
4275	Furnish and Install 16″ x 10″ Water Main Reducer	EA
4276	Furnish and Install 16″ x 12″ Water Main Reducer	EA
4277	Furnish and Install 18″ x 4″ Water Main Reducer	EA
4278	Furnish and Install 18″ x 6″ Water Main Reducer	EA
4279	Furnish and Install 18″ x 8″ Water Main Reducer	EA
4280	Furnish and Install 18″ x 10″ Water Main Reducer	EA
4281	Furnish and Install 18″ x 12″ Water Main Reducer	EA
4282	Furnish and Install 18″ x 16″ Water Main Reducer	EA
4283	Furnish and Install 20″ x 4″ Water Main Reducer	EA
4284	Furnish and Install 20″ x 6″ Water Main Reducer	EA
4285	Furnish and Install 20″ x 8″ Water Main Reducer	EA

Bid Item	Description	Units
4286	Furnish and Install 20″ x 10″ Water Main Reducer	EA
4287	Furnish and Install 20″ x 12″ Water Main Reducer	EA
4288	Furnish and Install 20″ x 16″ Water Main Reducer	EA
4289	Furnish and Install 20″ x 18″ Water Main Reducer	EA
4290	Furnish and Install 24″ x 4″ Water Main Reducer	EA
4291	Furnish and Install 24″ x 6″ Water Main Reducer	EA
4292	Furnish and Install 24″ x 8″ Water Main Reducer	EA
4293	Furnish and Install 24″ x 10″ Water Main Reducer	EA
4294	Furnish and Install 24″ x 12″ Water Main Reducer	EA
4295	Furnish and Install 24″ x 16″ Water Main Reducer	EA
4296	Furnish and Install 24″ x 18″ Water Main Reducer	EA
4297	Furnish and Install 24″ x 20″ Water Main Reducer	EA
WATER MAIN SLEEVE		
4298	Furnish and Install 4″ Water Main Sleeve	EA
4299	Furnish and Install 6″ Water Main Sleeve	EA
4300	Furnish and Install 8″ Water Main Sleeve	EA
4301	Furnish and Install 10″ Water Main Sleeve	EA
4302	Furnish and Install 12″ Water Main Sleeve	EA
4303	Furnish and Install 16″ Water Main Sleeve	EA
4304	Furnish and Install 18″ Water Main Sleeve	EA
4305	Furnish and Install 20″ Water Main Sleeve	EA
4306	Furnish and Install 24″ Water Main Sleeve	EA
WATER MAIN PLUG		
4307	Furnish and Install 4″ Water Main Plug	EA
4308	Furnish and Install 6″ Water Main Plug	EA
4309	Furnish and Install 8″ Water Main Plug	EA
4310	Furnish and Install 10″ Water Main Plug	EA
4311	Furnish and Install 12″ Water Main Plug	EA
4312	Furnish and Install 16″ Water Main Plug	EA
4313	Furnish and Install 18″ Water Main Plug	EA
4314	Furnish and Install 20″ Water Main Plug	EA
4315	Furnish and Install 24″ Water Main Plug	EA
CUT AND CAP EXISTING WATER MAIN		
4350	Cut and Cap Existing 4″ Water Main	EA
4352	Cut and Cap Existing 6″ Water Main	EA
4354	Cut and Cap Existing 8″ Water Main	EA
4356	Cut and Cap Existing 10″ Water Main	EA
4358	Cut and Cap Existing 12″ Water Main	EA

Bid Item	Description	Units
4360	Cut and Cap Existing 16″ Water Main	EA
4362	Cut and Cap Existing 18″ Water Main	EA
4364	Cut and Cap Existing 20″ Water Main	EA
4366	Cut and Cap Existing 24″ Water Main	EA

4100.5.1 Water Main Fittings

1. Payment for the Water Main Fittings Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for forming foundation; for fitting installation; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work.

4100.5.2 Cut and Cap Existing Water Main

1. Payment for the Cutting and Capping Existing Water Main Bid Items is full compensation for providing all necessary labor, equipment, and materials; for cutting and capping existing water main; for excavating; for sheeting and shoring; for forming foundation; for fitting installation; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work.

SECTION 4200
NOT USED

SECTION 4300
NOT USED

SECTION 4400
WATER MAIN GATE VALVES, CUT-IN VALVES, AND TAPPING VALVES AND SLEEVES

4400.1 Description

1. This Section describes excavating required trenches and laying and connecting water main valves, then backfilling and cleaning out as necessary.

4400.2 Materials

4400.2.1 General

1. Both valve ends shall be mechanical-joint per **AWWA C111**. Accessories (bolts, glands, and gaskets) shall be supplied by the valve manufacturer.

2. All valves must use full **AWWA C504**, Class 150B valve shaft diameter, and full Class 150B underground-service-operator torque rating throughout entire travel, to provide capability for operation in emergency service.

3. The CONTRACTOR shall install a piece of Schedule 40 – four-inch (4") PVC pipe into each valve box upon the completion of setting said valve box. The length of this PVC section shall be six inches (6") less than the length of the valve box. CONTRACTOR shall keep said PVC section inside valve throughout construction activities and remove prior to the placement of concrete pavement. The PVC section will be easily removed if the valve box remains plumb. If valve box is hit during construction activities, the PVC section will allow the valve box to remain plumb. If CONTRACTOR cannot remove PVC section prior to paving, the CONTRACTOR, at their own expense, will excavate around the valve box and straighten. The CONTRACTOR shall also place a minimum two-foot (2') x two-foot (2') piece of burlap or filter fabric inside the PVC pipe prior to the installation of the concrete pavement to prevent the concrete from falling down into the valve box and depositing on the operating nut. The cost of furnishing, installing, maintaining, and removing the PVC section and fabric shall be incidental to the cost of the valve.

4400.2.2 Gate Valves

1. Valves shall be manufactured by American Flow Control in accordance with **AWWA C515**. Valves twelve inches (12") and smaller shall be designed for 200 psi water working pressure and 150 psi for valves fourteen inches (14") – forty-eight inches (48") inclusive. Valves shall have mechanical joint ends and shall have clear water wall equal to the full nominal diameter of the valve. Valves shall be resilient wedged seated gate valves with non-rising stems, opening by turning right and provided with two-inch (2") square nut with arrow cast in metal to indicate direction of opening.

2. Water valves shall be **Waterous only open right RW**. Ductile valves shall be 2500 series.

3. Each valve shall have maker's name, pressure rating, and year in which manufactured cast on body. Prior to shipment, each valve shall be tested by hydraulic pressure equal to the AWWA test pressure.

4. Stuffing boxes shall be O-ring seal type with two (2) rings located in stem above thrust collar. All stem seals shall be replaceable with valve wide open and subjected to full rated pressure.

5. The thrust bearing recess and stem opening in the bonnet shall be bronze bushed.

6. Body and cover bolts and nuts shall meet specifications **ASTM A-304** (stainless steel). Valve body and bonnet shall be epoxy-coated outside. All interior surfaces and parts shall be protected by a corrosion resistant coating.

7. Wedge shall be constructed of ductile iron, fully encapsulated in synthetic rubber except for guide and wedge nut areas.

8. Wedge rubber shall be molded in place and banded to the ductile iron portion, and shall not be mechanically attached with screws, rivets, or similar fasteners.

9. Wedge shall seat against seating surfaces arranged symmetrically about the center line of the operating stem, so seating is equally effective regardless of direction of pressure unbalanced across the wedge.

10. Waterway shall be smooth and shall have no depressions or cavities in seat area where foreign material can lodge and prevent closure or sealing.

4400.2.3 Operator

1. Valve operator shall be of the traveling-nut type, sealed, gasketed, and lubricated for underground service. It shall be capable of withstanding an overload input torque of 450 ft. lbs. at full-open or full-closed position without damage to the valve or valve operator. It shall be designed to resist submergence in water to 25 ft. head pressure.

2. Valve shall be capable of easy closure by one (1) man using standard valve key, even under emergency line-break conditions as severe as those that would cause a valve maximum opening torque requirement of as much as two (2) times **AWWA Class 150B**.

3. Valve operator extensions shall not be used.

4400.2.4 Cast Iron Valve Boxes

1. Valve boxes shall consist of an East Jordan Iron Works 8560 Series or Tyler Union 6860 Series valve box, #6 base section, and can either be a two-piece or three-piece valve box section. All sections will be made with cast iron conforming to **ASTM A-48, Class 20**. The castings shall be free from blowholes, porosity, hard spots, shrinkage defects or cracks, or other injurious defects and shall have a normal smooth casting finish. The castings shall be thoroughly coated with asphaltum paint varnish. Valve boxes shall be five and one-quarter inches (5¼") in diameter. Valve boxes shall have a maximum length of seven feet (7') when extended without extension sections. The cost of furnishing and installing the cast iron valve boxes shall be incidental to the unit cost of the valve.

2. Valve boxes shall consist of a #6 base section, tubular mid and top sections, both with cast threads by which one can be telescoped on the other, extension sections if required, and a circular drop cover.

3. The CONTRACTOR shall install a piece of Schedule 40 – four-inch (4") PVC pipe into each valve box upon the completion of setting said valve box. The length of this PVC section shall be six inches (6") less than the length of the valve box. CONTRACTOR shall keep said PVC section inside valve throughout construction activities and remove prior to the placement of concrete pavement. The PVC section will be easily removed if the valve box remains plumb. If valve box is hit during construction activities, the PVC section will allow the valve box to remain plumb. If CONTRACTOR cannot remove PVC section prior to paving, the CONTRACTOR, at their own expense, will excavate around the valve box and straighten. The CONTRACTOR shall also place a minimum two-foot (2') x two-foot (2') piece of burlap or filter fabric inside the PVC pipe prior to the installation of the concrete pavement to prevent the concrete from falling down into the valve box and depositing on the operating nut. The cost of furnishing, installing, maintaining, and removing the PVC section and fabric shall be incidental to the cost of the valve.

4. Cast iron valve boxes shall be manufactured in the United States of America.

4400.3 Construction

4400.3.1 Excavation

4400.3.1.1 General

1. Unless otherwise specified in the Contract or the ENGINEER allows, perform water main construction in open trenches and in a manner that protects the pipelines from unusual stresses.

2. Excavate the trenches in reasonably close conformity with the Plans and as the ENGINEER laid out in the field.

3. Keep trenches dewatered at all times.

4. Understand the proposed elevations for the water main valves as shown on the Plans are subject to revisions in order to fit field conditions, and the ENGINEER may adjust the profile grades from those the Plans show.

5. Valves shall be installed along the water mains where shown on the Plans or where designated by the ENGINEER.

6. The City of Oshkosh Water Department will make taps when necessary for tapping valves. The CONTRACTOR shall do any excavation necessary to make the tap. CONTRACTOR shall also install the tapping valve.

4400.3.2 Constructing Foundation

1. Construct the foundation in the trench to prevent subsequent settlement and rupture of the water main.

2. The CONTRACTOR may not lay the pipe in rock, wet conditions, or on a firm, earth subgrade.

3. The CONTRACTOR shall lay the pipe on a backfilled granular foundation or bed. When placing the pipe on backfilled granular foundation, excavate the trench to at least six inches (6“) below the elevation established for the bottom of the pipe. Backfill this depth with **“¾-inch clear stone”** meeting the requirements for No. 1 stone in **Section 501.2.5.4** of the STATE SPECIFICATIONS**.** Compact the material before laying the pipe on the backfilled granular material.

4. After laying the pipe, bedding material shall be placed around the sides of the pipe, except reinforced concrete pipe, up to a level six inches (6“) above the top of the pipe. This material shall be placed by hand or equally careful means. When reinforced concrete pipe is installed, the bedding stone shall extend to the spring line of the pipe.

5. Excavate recesses to receive bells as necessary.

6. If the Contract details types of bedding, or required trench widths other than described above, conform to the Construction Details.

4400.3.3 Joints

4400.3.3.1 Mechanical Joints

1. The mechanical joint for valves shall be a Megalug restraint Roma-Grip gland. Fluorocarbon-coated T-head bolts shall be used on all mechanical joints.

4400.3.4 Backfilling

1. Backfill all water mains as described in **Section 100.61** of these Specifications.

4400.3.5 Corrosion Protection

1. Corrosion protection shall be provided for all ductile iron water main fittings by use of polyethylene wrap. The polyethylene wrap shall meet the requirements of **Section 4000.2.2** of these Specifications.

4400.3.5.1 Installation

1. The polyethylene wrap shall be cut approximately two feet (2') longer than that of the pipe section. After assembling the pipe joint, the polyethylene shall be overlapped approximately one foot (1') and at all joints sealed with approved adhesive tape. Additional taping shall be used at three-foot (3') intervals along the pipe. Any rips, punctures, or other damage to the polyethylene shall be repaired immediately with adhesive tape. All copper service connections shall be wrapped for a distance of three feet (3') from the center line of the main. Before installing the polyethylene wrap, the exterior of the pipe shall be free of foreign material.

4400.3.5.2 Wrapping of Special Fittings, Valves, Etc.

1. When valves, tees, crosses, etc., cannot be wrapped practically in a tube, a flat sheet or split tube shall be used. All seams shall be taped securely.

4400.3.5.3 Backfilling Around Polyethylene-Wrapped Fittings

1. The bedding and cover material shall be placed with care so as to prevent damage to the polyethylene wrap. Any rips or punctures in the wrap shall be repaired immediately.

4400.4 Measurement

1. The CITY will measure the Water Main Gate Valves, Cut-In Valves, and Tapping Valves and Sleeves Bid Items as each individual unit that is acceptably completed.

4400.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
WATER MAIN GATE VALVE		
4400	Furnish and Install 4″ Water Main Gate Valve	EA
4401	Furnish and Install 6″ Water Main Gate Valve	EA
4402	Furnish and Install 8″ Water Main Gate Valve	EA
4403	Furnish and Install 10″ Water Main Gate Valve	EA
4404	Furnish and Install 12″ Water Main Gate Valve	EA
4405	Furnish and Install 16″ Water Main Gate Valve	EA
4406	Furnish and Install 18″ Water Main Gate Valve	EA
4407	Furnish and Install 20″ Water Main Gate Valve	EA
4408	Furnish and Install 24″ Water Main Gate Valve	EA
WATER MAIN CUT-IN VALVE		
4409	Furnish and Install 4″ Water Main Cut-In Valve	EA
4410	Furnish and Install 6″ Water Main Cut-In Valve	EA
4411	Furnish and Install 8″ Water Main Cut-In Valve	EA
4412	Furnish and Install 10″ Water Main Cut-In Valve	EA
4413	Furnish and Install 12″ Water Main Cut-In Valve	EA
4414	Furnish and Install 16″ Water Main Cut-In Valve	EA
4415	Furnish and Install 18″ Water Main Cut-In Valve	EA
4416	Furnish and Install 20″ Water Main Cut-In Valve	EA
4417	Furnish and Install 24″ Water Main Cut-In Valve	EA
TAPPING VALVE AND SLEEVE		
4418	Furnish and Install 6″ x 4″ Tapping Valve and Sleeve	EA
4419	Furnish and Install 6″ x 6″ Tapping Valve and Sleeve	EA
4420	Furnish and Install 6″ x 8″ Tapping Valve and Sleeve	EA
4421	Furnish and Install 6″ x 10″ Tapping Valve and Sleeve	EA
4422	Furnish and Install 6″ x 12″ Tapping Valve and Sleeve	EA
4423	Furnish and Install 6″ x 16″ Tapping Valve and Sleeve	EA
4424	Furnish and Install 6″ x 18″ Tapping Valve and Sleeve	EA
4425	Furnish and Install 6″ x 20″ Tapping Valve and Sleeve	EA
4426	Furnish and Install 6″ x 24″ Tapping Valve and Sleeve	EA
4427	Furnish and Install 8″ x 4″ Tapping Valve and Sleeve	EA
4428	Furnish and Install 8″ x 6″ Tapping Valve and Sleeve	EA
4429	Furnish and Install 8″ x 8″ Tapping Valve and Sleeve	EA
4430	Furnish and Install 8″ x 10″ Tapping Valve and Sleeve	EA

Bid Item	Description	Units
4431	Furnish and Install 8″ x 12″ Tapping Valve and Sleeve	EA
4432	Furnish and Install 8″ x 16″ Tapping Valve and Sleeve	EA
4433	Furnish and Install 8″ x 18″ Tapping Valve and Sleeve	EA
4434	Furnish and Install 8″ x 20″ Tapping Valve and Sleeve	EA
4435	Furnish and Install 8″ x 24″ Tapping Valve and Sleeve	EA
4436	Furnish and Install 10″ x 4″ Tapping Valve and Sleeve	EA
4437	Furnish and Install 10″ x 6″ Tapping Valve and Sleeve	EA
4438	Furnish and Install 10″ x 8″ Tapping Valve and Sleeve	EA
4439	Furnish and Install 10″ x 10″ Tapping Valve and Sleeve	EA
4440	Furnish and Install 10″ x 12″ Tapping Valve and Sleeve	EA
4441	Furnish and Install 10″ x 16″ Tapping Valve and Sleeve	EA
4442	Furnish and Install 10″ x 18″ Tapping Valve and Sleeve	EA
4443	Furnish and Install 10″ x 20″ Tapping Valve and Sleeve	EA
4444	Furnish and Install 10″ x 24″ Tapping Valve and Sleeve	EA
4445	Furnish and Install 12″ x 4″ Tapping Valve and Sleeve	EA
4446	Furnish and Install 12″ x 6″ Tapping Valve and Sleeve	EA
4447	Furnish and Install 12″ x 8″ Tapping Valve and Sleeve	EA
4448	Furnish and Install 12″ x 10″ Tapping Valve and Sleeve	EA
4449	Furnish and Install 12″ x 12″ Tapping Valve and Sleeve	EA
4450	Furnish and Install 12″ x 16″ Tapping Valve and Sleeve	EA
4451	Furnish and Install 12″ x 18″ Tapping Valve and Sleeve	EA
4452	Furnish and Install 12″ x 20″ Tapping Valve and Sleeve	EA
4453	Furnish and Install 12″ x 24″ Tapping Valve and Sleeve	EA
4454	Furnish and Install 16″ x 4″ Tapping Valve and Sleeve	EA
4455	Furnish and Install 16″ x 6″ Tapping Valve and Sleeve	EA
4456	Furnish and Install 16″ x 8″ Tapping Valve and Sleeve	EA
4457	Furnish and Install 16″ x 10″ Tapping Valve and Sleeve	EA
4458	Furnish and Install 16″ x 12″ Tapping Valve and Sleeve	EA
4459	Furnish and Install 16″ x 16″ Tapping Valve and Sleeve	EA
4460	Furnish and Install 16″ x 18″ Tapping Valve and Sleeve	EA
4461	Furnish and Install 16″ x 20″ Tapping Valve and Sleeve	EA
4462	Furnish and Install 16″ x 24″ Tapping Valve and Sleeve	EA
4463	Furnish and Install 18″ x 4″ Tapping Valve and Sleeve	EA
4464	Furnish and Install 18″ x 6″ Tapping Valve and Sleeve	EA
4465	Furnish and Install 18″ x 8″ Tapping Valve and Sleeve	EA
4466	Furnish and Install 18″ x 10″ Tapping Valve and Sleeve	EA
4467	Furnish and Install 18″ x 12″ Tapping Valve and Sleeve	EA
4468	Furnish and Install 18″ x 16″ Tapping Valve and Sleeve	EA
4469	Furnish and Install 18″ x 18″ Tapping Valve and Sleeve	EA
4470	Furnish and Install 18″ x 20″ Tapping Valve and Sleeve	EA
4471	Furnish and Install 18″ x 24″ Tapping Valve and Sleeve	EA

Bid Item	Description	Units
4472	Furnish and Install 20″ x 4″ Tapping Valve and Sleeve	EA
4473	Furnish and Install 20″ x 6″ Tapping Valve and Sleeve	EA
4474	Furnish and Install 20″ x 8″ Tapping Valve and Sleeve	EA
4475	Furnish and Install 20″ x 10″ Tapping Valve and Sleeve	EA
4476	Furnish and Install 20″ x 12″ Tapping Valve and Sleeve	EA
4477	Furnish and Install 20″ x 16″ Tapping Valve and Sleeve	EA
4478	Furnish and Install 20″ x 18″ Tapping Valve and Sleeve	EA
4479	Furnish and Install 20″ x 20″ Tapping Valve and Sleeve	EA
4480	Furnish and Install 20″ x 24″ Tapping Valve and Sleeve	EA
4481	Furnish and Install 24″ x 4″ Tapping Valve and Sleeve	EA
4482	Furnish and Install 24″ x 6″ Tapping Valve and Sleeve	EA
4483	Furnish and Install 24″ x 8″ Tapping Valve and Sleeve	EA
4484	Furnish and Install 24″ x 10″ Tapping Valve and Sleeve	EA
4485	Furnish and Install 24″ x 12″ Tapping Valve and Sleeve	EA
4486	Furnish and Install 24″ x 16″ Tapping Valve and Sleeve	EA
4487	Furnish and Install 24″ x 18″ Tapping Valve and Sleeve	EA
4488	Furnish and Install 24″ x 20″ Tapping Valve and Sleeve	EA
4489	Furnish and Install 24″ x 24″ Tapping Valve and Sleeve	EA

4400.5.1 Water Main Valves

1. Payment for the Water Main Valve Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for forming foundation; for fitting installation; for furnishing and installing a cast iron valve box; for furnishing, installing, and removing a section of Schedule 40 – four-inch (4″) PVC pipe; for installing and removing either the 2′ x 2′ filter fabric or burlap; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work.

SECTION 4500
HYDRANTS

4500.1 Description

1. This Section describes excavating required trenches for relocating or installing hydrants and connecting hydrant branches to the water main.

4500.2 Materials

4500.2.1 Hydrants

1. All hydrants furnished shall meet the following requirements:
   A. Hydrants shall be manufactured in accordance with **AWWA C-502** and meet the following specifications:
      1. Hydrants shall be "**Waterous**" **Pacer WB-67** or Equal.
      2. Hydrants shall be designed for 150 pounds working pressure and tested to 300 pounds of hydrostatic pressure.
      3. Hydrants shall be of center stem type.
      4. The main valve shall open against the water pressure.
      5. Bronze stem threads are to be located below the main valve to eliminate necessity of lubrication.

2. Hydrants shall be so designed:
   A. Hydrant main valve shall close with water pressure and all operating parts, including valve seat, shall remove through barrel, without digging.
   B. Drain valve shall be all brass or bronze, and shall be positively operated by main operating rod.
   C. Hydrant operating threads shall be oil lubricated, and shall be O-ring sealed from all moisture and foreign matter.
   D. Hydrant barrel shall be centrifugally-cast ductile iron for strength and uniformity.
   E. Extensions may be added without the necessity of closing off the water or digging up the fire hydrants.
   F. Hydrants shall have a positive stop for main operating rod travel in top section (top-stop).
   G. Hydrants shall permit 360 ° rotation of nozzle section.
   H. Hydrant shall be traffic model with replaceable parts designed to break away without water loss and damage to other parts of hydrants.
   I. Hydrants shall be furnished with sixteen-inch (16") break of section.
   J. The nozzle elevation shall be twenty-four inches (24") +/- one inch (1") above grade.
   K. Hydrants shall have a minimum valve opening of five and one-quarter inches (5¼").
   L. Inlet connection shall be six-inch (6") mechanical joint.

M. Hydrants shall have two (2) - 2½" hose nozzles and one (1) pumper nozzle. Nozzle threads shall conform to present City of Oshkosh standard. Operating nuts shall be 7/8" square or conform to present City of Oshkosh standard.
N. Hydrants shall be suitable for installation in six and one-half foot (6½′) depth of trench, or as indicated on Plans.
O. Hydrants shall be designed so that the direction of the nozzles can be changed by rotating the standpipe without digging up the hydrant.
P. Hydrants will be designed so that extensions may be added without the necessity of closing off the water or digging up the fire hydrants.

4500.3 Construction

4500.3.1 Excavation

4500.3.1.1 General

1. Unless otherwise specified in the Contract or the ENGINEER allows, perform water main construction in open trenches and in a manner that protects the pipelines from unusual stresses.

2. Excavate the trenches in reasonably close conformity with the Plans and as the ENGINEER laid out in the field.

3. Keep trenches dewatered at all times.

4. Understand the proposed elevations as shown on the Plans are subject to revisions in order to fit field conditions, and the ENGINEER may adjust the profile grades from those the Plans show.

5. Valves shall be installed along the water mains where shown on the Plans or where designated by the ENGINEER.

4500.3.2 Constructing Foundation

1. Construct the foundation in the trench to prevent subsequent settlement and rupture of the water main.

2. The CONTRACTOR may not lay the pipe in rock, wet conditions, or on a firm earth subgrade.

3. The CONTRACTOR shall lay the pipe on a backfilled granular foundation or bed. When placing the pipe on backfilled granular foundation, excavate the trench to at least six inches (6″) below the elevation established for the bottom of the pipe. Backfill this depth with **“¾-**

inch clear stone" meeting the requirements for No. 1 stone in **Section 501.2.5.4** of the STATE SPECIFICATIONS**.** Compact the material before laying the pipe on the backfilled granular material.

4. After laying the pipe, bedding material shall be placed around the sides of the pipe, except reinforced concrete pipe, up to a level six inches (6") above the top of the pipe. This material shall be placed by hand or equally careful means. When reinforced concrete pipe is installed, the bedding stone shall extend to the spring line of the pipe.

5. Excavate recesses to receive bells as necessary.

6. If the Contract details types of bedding, or required trench widths other than described above, conform to the Construction Details.

4500.3.3 Mechanical Joints

1. The mechanical joint for hydrants shall be a Megalug restraint Roma-Grip gland.

2. All tees shall be locking tees.

4500.3.4 Backfilling

1. Backfill all water mains as described in **Section 100.61** of these Specifications.

4500.3.5 Corrosion Protection

1. Corrosion protection shall be provided for all ductile iron water main fittings by use of polyethylene wrap. The polyethylene wrap shall meet the requirements of **Section 4000.2.2** of these Specifications.

4500.3.5.1 Installation

1. The polyethylene wrap shall be cut approximately two feet (2') longer than that of the pipe section. After assembling the pipe joint, the polyethylene shall be overlapped approximately one foot (1') and at all joints sealed with approved adhesive tape. Additional taping shall be used at three-foot (3') intervals along the pipe. Any rips, punctures, or other damage to the polyethylene shall be repaired immediately with adhesive tape. All copper service connections shall be wrapped for a distance of three feet (3') from the center line of the main. Before installing the polyethylene wrap, the exterior of the pipe shall be free of foreign material.

4500.3.5.2 Wrapping of Special Fittings, Valves, Etc.

1. When valves, tees, crosses, etc., cannot be wrapped practically in a tube, a flat sheet or split tube shall be used. All seams shall be taped securely.

4500.3.5.3 Backfilling around Polyethylene-Wrapped Fittings

1. The bedding and cover material shall be placed with care so as to prevent damage to the polyethylene wrap. Any rips or punctures in the wrap shall be repaired immediately.

4500.3.6 Hydrants

1. Hydrants shall be placed where shown on the Drawings, or where designated by the ENGINEER. Each hydrant shall be set plumb at the grade given by the ENGINEER and shall be jointed to the fire hydrant connection at the foot of the barrel. All valves and hydrants shall be mechanical joints.

2. All hydrant branches shall start out with anchoring tees. All hydrant branch valves shall be hooked directly to anchoring tees followed by the branch and the hydrant.

3. The finished elevation of the hydrant must be set so the bolts of the break flange are a minimum of two inches (2″) and a maximum of six inches (6″) above the existing or future sidewalk elevation. This grade must be maintained no matter the depth of the water main. If extensions are required for the hydrant, they must be included in the bid, as no extra monies will be paid to the CONTRACTOR for adjustments or extensions.

4500.3.7 Relocating Hydrants

1. When a hydrant is to be relocated, the hydrant shall be excavated, removed, cleaned, and re-installed as shown in the Plans, or as the ENGINEER directs. Excavate and remove the hydrant in a manner as to prevent damage to it. The CONTRACTOR will replace hydrants damaged by its operations at no expense to the CITY.

2. The relocated hydrant will be installed as per the requirements in **Section 4500.3.6** of these Specifications.

4500.4 Measurement

1. The CITY will measure the hydrants and the relocating of hydrants as each individual unit that is acceptably completed.

4500.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
	HYDRANT	
4500	Furnish and Install Hydrant	EA
4501	Relocate Existing Hydrant	EA

4500.5.1 Hydrants

1. Payment for the Hydrants Bid Item is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for forming foundation; for setting hydrant; for blocking; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work.

4500.5.2 Relocate Existing Hydrants

1. Payment for the Relocating Existing Hydrants Bid Item is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for forming foundation; for removing existing hydrant; for setting hydrant at proposed location; for blocking; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work.

SECTION 4600
WATER VALVE MANHOLES

4600.1 Description

1. This Section describes constructing or reconstructing water valve manholes made of concrete, concrete masonry, or concrete block with necessary reinforcement, metal frames, and covers, including excavating and backfilling.

4600.2 Materials

4600.2.1 Concrete

1. Use materials conforming to the requirements for the class of the material named and specified below:
   A. Precast Concrete **ASTM C-478**
   B. Concrete Block **ASTM C-139**

2. Precast water valve manholes shall have the following requirements, which shall govern when they alter the ASTM standards: Precast water valve manhole tops shall be the eccentric cone type. Flat tops may be used only with the permission of the ENGINEER.

3. Precast reinforced concrete manhole risers and tops shall have a minimum wall thickness of four and one-half inches (4½″) for forty-two inch (42″) diameter manholes and five inches (5″) for forty-eight inch (48″) diameter manholes. All other diameter manholes must have a minimum wall thickness of six inches (6″). Reinforced integral floors shall have a minimum thickness of six inches (6″).

4. Each precast reinforced concrete manhole riser and top section shall be clearly marked with the name or trademark of the manufacturer and the date of manufacture. This marking shall be indented into the manhole section or shall be painted on with waterproof paint.

5. Precast reinforced concrete manhole risers and top sections shall be subject to rejection for failure to conform to any of the Specification requirements. In addition, individual sections of manhole risers and tops may be rejected because of any of the following reasons:
   A. Fracture cracks passing through the walls, except for a single end crack that does not exceed the depth of the joint.
   B. Defects that indicate imperfect proportioning, mixing, or molding.
   C. Surface defects indicating honey-combed or open texture.
   D. Damaged ends, where such damage would prevent making a satisfactory joint.
   E. Manhole steps out of line or improperly spaced.
   F. The interval diameter of the manhole section shall not vary more than one percent (1%) of the nominal diameter.

G. Any continuous cracking having a surface width of 0.01″ or more and extending for a length of twelve inches (12″) or more, regardless of the position in the section wall.

6. Concrete block for manholes shall be seven and three-quarter inches (7¾″) thick, curved to fit a four-foot (4′) inside diameter manhole, notched to fit manhole steps, and with corbel blocks to fit manhole ring as shown in the Detailed Drawings. Mortar shall be one (1) part Portland cement and two (2) parts mortar sand.

7. Concrete block for the entire manhole may only be used where specified or with permission of the ENGINEER. A one-half inch (½″) cement mortar back-plaster shall be used.

8. When the size or number of connections prelude the practical use of a precast bottom section, concrete block may be used up to approximately eight inches (8″) above the top of the pipe.

4600.2.2 Butyl Rubber Sealant

1. Use materials conforming to the requirements for the class of the material named and specified below:
   A. Butyl Rubber Sealant **ASTM C-990**

4600.2.3 Manhole Steps

1. Unless otherwise called for in the Plans and Specifications, **manhole steps shall NOT be installed**.

4600.2.4 Water Main Pipe to Manhole Connectors

1. Use materials conforming to the requirements for the class of material named and specified below:
   A. A-Lok Connectors **ASTM C-923**
   B. Z-Lok Connectors **ASTM C-923**
   C. Quick-Lok Connectors **ASTM C-923**

4600.2.5 Manhole Frames and Covers

1. Use materials conforming to the requirements for the class of material named and specified below:
   A. Grey Iron **ASTM A-48 Class 35B**
   B. Ductile Iron **ASTM A-536 Grade 80-55-06**

2. Manhole frames and covers shall be Neenah R-1710 frames with a solid Type B cover, with the word "WATER" cast in the cover, with locking cover and concealed pick holes. **Frames and covers are to be supplied by the City of Oshkosh.**

3. Manhole frames and covers, which are not Neenah Foundry, must be approved by the ENGINEER and meet the following requirements:
   A. All castings shall be uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion, or other effects. They shall be smooth and well-cleaned by shot-blasting. Coal tar pitch varnish shall be use for coating which shall result in a smooth, tough coating.
   B. All castings shall be manufactured true to pattern and component parts shall fit together in a satisfactory manner. Round frames shall have machine-bearing surfaces.
   C. Manhole frames shall have the following dimensions:
      1. Outside diameter - 35".
      2. Inside diameter - 24½".
      3. Diameter at cover flange - 20".
      4. Height - 9".
      5. Frame and cover shall not weigh less than 300 pounds.
      6. Cover and lid shall be twenty-two inches (22") diameter and 1½" thick at outside edge, with indented top design. The word "SANITARY" shall be cast into the cover.
      7. Both frame and cover shall be designed for heavy duty use.

4600.2.6 Water Valve Manhole Adjustment Rings

1. Use materials conforming to the requirements for the class of material named and specified below:
   A. Precast Concrete Adjustment Rings **ASTM G-478**
   B. Rubber Adjustment Rings **ASTM D-573-88**

2. Precast concrete adjustment rings shall have an outside diameter of thirty-six inches (36") and an inside diameter of twenty-four inches (24"), with a minimum allowable thickness of two inches (2").

3. Rubber adjustment rings shall have an outside diameter of thirty-six inches (36") and an inside diameter of twenty-four inches (24"), with a minimum allowable thickness of two inches (2"). The rubber adjustment rings shall be "**Infra-Riser Multi-Purpose Rubber Adjustment Riser"** or Approved Equal.

4600.3 Construction

4600.3.1 Excavation

4600.3.1.1 General

1. The excavation shall be limited to the size required for the manhole to be constructed and shall be sheathed and braced as necessary to protect the workmen and prevent loss of ground.

2. Understand that the proposed elevations for the sanitary manholes as shown on the Plans are subject to revisions in order to fit field conditions, and the ENGINEER may adjust the grades from those shown on the Plans.

3. Manholes shall be installed the end of each line; at all changes in grade, size, or alignment; and at all pipe intersections.

4. Manholes shall be located as shown on the project Plans.

4600.3.2 Constructing Foundation

1. Construct the foundation in the excavation to prevent subsequent settlement or rupture of the concrete manhole base.

2. The CONTRACTOR may not set the concrete manhole base in rock, wet conditions, or on a firm earth subgrade.

3. The CONTRACTOR shall set the concrete manhole base section on a backfilled granular foundation or bed. When placing the pipe on backfilled granular foundation, excavate the trench to at least six inches (6″) below the elevation established for the bottom of the concrete manhole base. Backfill this depth with **"¾-inch clear stone"** meeting the requirements for No. 1 stone in **Section 501.2.5.4** of the STATE SPECIFICATIONS**.** Compact the material before setting the concrete manhole base section.

4. If the Contract details types of bedding or required excavation widths others than those described above, conform to the Construction Details.

4600.3.3 Manholes Bases

4600.3.3.1 Field Poured Base for Concrete Block Manholes

1. The concrete base shall have a minimum of six inches (6″) as shown in the standard Detail Drawings. The manhole base shall substantially conform to the required shape and

dimensions; the excavation shall be back formed, if necessary, to achieve this end. If excavation in stable soil has been carried below the required depth, such excess depth shall be filled with concrete. Excess concrete shall not be deposited around the manhole in such a manner that will interfere with future connections. The pipe shall be supported on brick or solid concrete blocks for the pouring of the concrete base. The concrete of the base shall extend under the flexible pipe to where it rests in undisturbed soil. This concrete support for rigid pipe shall end in a vertical plane flush with the face of the bell.

4600.3.3.2 Field Poured Base for Precast Manholes

1. The precast manhole bottom barrel section shall be set on concrete brick or block so that the bottom section is below the spring line of the outlet pipe, set for proper location and plumbed. The manhole base of Class D concrete shall then be poured.

4600.3.3.3 Precast Manhole with Integral Base

1. The excavation shall be deep enough so after the bottom has been placed thereon, set to grade and plumbed, there remains a six-inch (6") minimum depth of bedding material below the bottom of the base. The annular space between the manhole excavation and the outside wall of the manhole section shall be backfilled with bedding material up to the spring line of the incoming pipe. The invert shall not be poured until the manhole is completely built and backfilled. The invert shall be the same diameter as the larger of the adjoining sewers and shall be shaped as shown in the Construction Details.

4600.3.3.4 Water Valve Manhole To Pipe Connections

1. A-Lok, Z-Lok, or Quick-Lok connectors shall be cast into the precast concrete manhole base section whenever possible. The connector shall be sized specifically for the type of pipe being used and shall be installed in accordance with the recommendations of the manufacturer.

2. When the A-Lok, Z-Lok, or Quick-Lok connector is made out in the field, the concrete manhole section must be cored per manufacturer's installation instructions. The connector shall be sized specifically for the type of pipe being used and shall be installed in accordance with the recommendations of the manufacturer. The seal between the connector and the pipe shall be made by compressing the connector against the outside circumference of the pipe by means of a stainless steel take down band.

4600.3.4 Concrete Walls and Chimneys

4600.3.4.1 Precast Concrete Manholes

1. Set manhole base on graded bedding material per project Specifications making sure that boots or pipe connections match design elevations. Level top of manhole base section in both directions.

2. The manhole walls shall be constructed at the specified diameter as shown on the Plans.

3. Use appropriate lifting slings that will adequately lift weight of units. The use of an approved or rate spreader bar is preferred. When lifting manhole bases and risers, make sure chain or cable lengths are long enough to prevent contact with tongue and groove area, and are kept at appropriate lifting angles. Use wooden blocks between sling and manhole wall, if necessary.

4. Clean and inspect tongue and groove surfaces. Surfaces should be clean from all dust and debris. On tongue-up manholes, place butyl material next to the vertical surface or tongue. Wrap material completely around unit overlapping ends. Knead the ends together to form a uniform splice. Make sure that all protective paper is removed. Lower bell end of the next section making sure steps are aligned into final position. If bell is up, place butyl material next to vertical surface of groove and follow above procedure. All sections, as shown on the Shop Drawings, should be completed in this manner.

5. Lifting holes shall be sealed by inserting a rubber plug or other approved material into hole, and filling with non-shrink mortar from inside and outside.

6. Backfill around manhole equally to prevent tipping. Compact fill in lifts same as the standard trench procedures, as stated in **Section 100.61** of these Specifications.

7. Testing procedures shall conform to **Section 3700** of these Specifications.

4600.3.4.2 Concrete Block Manholes

1. The manhole wall constructed of concrete block shall be constructed at the specified diameter as shown on the Plans up to the beginning of the corbel section. From this point, the manhole shall be corbelled in at approximately one-half (½") horizontal to one inch (1") vertical to the diameter of the manhole frame. The face of the manhole in which the steps are installed shall be kept vertical.

2. Backfill around manhole equally to prevent tipping. Compact fill in lifts same as the standard trench procedures, as stated in **Section 100.61** of these Specifications.

3. Testing procedures shall conform to **Section 3700** of these Specifications.

4600.3.5 Manhole Chimneys and Adjustment Rings

1. Chimneys four inches (4″) more in height shall be constructed using concrete adjustment rings. The height of the grade ring shall equal (to within an inch and not to exceed) the height of adjustment to minimize the number of joints in the chimney section. Multiple grade rings will not be allowed where one will suffice.

2. Chimneys less than three inches (3″) in height shall be constructed using rubber grade rings.

3. **Concrete grade rings three inches (3″) or less in thickness are not allowed**.

4. Grade rings shall be laid in a bead of flexible joint sealant as specified. If the top of the precast riser is uneven, the ENGINEER may require a 1¼″ diameter flexible sealant be used. Frames should be placed on 3½″ x 3/8″ bead of flexible joint sealant. On new subdivision (unimproved) streets, flexible sealant shall be omitted and the frames placed directly on the grade ring.

5. If final casting adjustment cannot be achieved using flexible sealant and/or rubber rings, the ENGINEER may allow the use of Class C concrete instead. The rubber rings and/or flexible sealant should be removed and concrete should be vibrated around the casting using a suitable spud-type vibrator. Monolithic concrete shall be vibrated into the grade ring area and finished smooth on the inside of the structure.

6. The adjustment of rings and frame shall not exceed a total height of twenty-one inches (21″).

4600.4 Measurement

1. The CITY will measure the Water Valve Manholes Bid Items by each unit that is acceptably completed.

4600.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
WATER VALVE MANHOLE		
4600	Furnish and Install Standard Water Valve Manhole (5′ Diameter)	EA
4602	Furnish and Install Standard Water Valve Manhole (6′ Diameter)	EA
4604	Furnish and Install Standard Water Valve Manhole (7′ Diameter)	EA
4606	Furnish and Install Standard Water Valve Manhole (8′ Diameter)	EA

2. Granular backfill material required for backfilling is incidental to the work.

3. Payment for the Water Valve Manholes Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for forming foundation; for sheeting and shoring; for dewatering; for providing all masonry; for backfilling; for compacting; for disposing of surplus material; and for the cleaning out and restoring the work site. Water valve manhole frames and lids are supplied by the CITY and will not be compensated for. Adjustment of the Water Valve Manhole will be paid for under a separate Bid Item.

SECTION 4700
WATER MAIN CASING PIPES
TRENCHLESS AND OPEN CUT METHODS

4700.1 Description

1. This Section describes furnishing and installing casing pipes of various sizes by the open cut or the following trenchless methods: Jack and Bore, Horizontal Drilling, Micro-Tunneling, or Hand Mining.

4700.2 Materials

1. Use materials conforming to the requirements for the class of the material named and specified below:
   A. Steel Casing Pipes **ASTM A-36**
   B. Ductile Iron Casing Pipes **ASTM A-716**
   C. Concrete Casing Pipes **ASTM C-76**
   D. Fiberglass Reinforced Polymer Mortar Pipes **ASTM D-3262**
   E. Prestressed Concrete Pipes **AWWA C300**
   F. Polyvinyl Chloride **ASTM D-1785**

2. Unless otherwise tested or approved by the CITY, only use encasement pipe or uncased carrier pipe that is new and has smooth interior and exterior walls.

4700.3 Construction

4700.3.1 General for Trenchless Installation

1. Jack and bore is a method of installing a product (often called a casing) that may serve as a direct conduit for liquids or as a duct for a carrier pipe. It is a multi-stage process consisting of constructing a temporary horizontal jacking platform and a starting alignment track in an entrance pit at a desired elevation. The product is then jacked by manual control along the starting alignment track with simultaneous excavation of the soil being accomplished by a rotating cutting head in the leading edge of the product's annular space. The ground up soil (spoil) is transported back to the entrance pit by helical wound auger flights rotating inside the product. Jack and bores typically provide limited tracking and steering as well as limited support to the excavation face.

2. Micro-tunneling is conducted similar to jack and bores with the exception that it is a remotely controlled, guided pipe jacking process that provides continuous support to the excavation face. The guidance system usually consists of a laser mounted in the tunneling drive shaft which communicates a reference line to a target mounted inside the micro-tunneling machine's articulated steering head. The micro-tunneling process provides the ability to control the excavation face stability by applying mechanical or fluid pressure to counterbalance the earth and hydrostatic pressures.

3. Removal and disposal of excess material varies, is the responsibility of the boring contractor, and is not covered under this Specification. However, the cost of the removal and final disposition is included in the cost of the trenchless operation.

4. The minimum wall thickness for steel casing pipes shall be as follows:

Nominal Casing Diameter (Inches)	Nominal Wall Thickness (Inches)
18	0.312 (5/16)
24	0.406 (13/32)
30	0.469 (15/32)
36	0.563 (9/16)
42	0.563 (9/16)

5. Casing spacers shall be designed to support the carrier pipe in the casing pipe. Standard casing spacers shall consist of 14 gauge **AISI Type 304** stainless steel and not less than four (4) - 10 Gauge **AISI Type 304** stainless steel risers. Each riser shall be equipped with a removable, ultra-high molecular weight polymer or glass reinforced plastic runner. Attachment hardware shall be **AISI Type 304** stainless steel. Spacer shall have a minimum width of two inches (2"). Standard casing spacers shall be Cascade Waterworks or Approved Equal. Spacers shall be installed at a maximum spacing of six feet (6') for the ductile iron carrier pipe.

6. No Jack and Bore conduit may be left open, without the approval of the ENGINEER, to prevent the conduit from acting as a drainage structure.

4700.3.2 Steel Pipe Casing and Welds

1. In addition to meeting or exceeding the material requirements listed above, meet the following requirements:
   A. The size of the steel casing must be at least six inches (6") larger than the largest outside diameter of the carrier pipe.
   B. The casing pipe must be straight seam pipe or seamless pipe.
   C. All steel pipe may be bare inside and out, with the manufacturer's recommended minimum nominal wall thickness to meet the greater of installation, loading, or carrier requirements.

D. All steel casing pipe must be square cut and have dead-even lengths which are compatible with the Jack and Bore equipment.

2. Use steel pipe casings and welds meeting or exceeding the thickness requirements to achieve the service life requirements. For purposes of material classification, consider steel pipe casing structural plate steel pipe. Ensure steel pipe casing of sufficient length achieves the required length through fully welded joints. Ensure joints are air-tight and continuous over the entire circumference of the pipe with a bead equal to or exceeding the minimum of either that which is required to meet the thickness criteria of pipe wall for jacking and loading or service life. A qualified welder must perform all welding.

4700.3.3 Reinforced Concrete Pipe Casing

1. In addition to meeting or exceeding the material requirements listed above, meet the following requirements:
   A. 5,000 psi concrete compressive strength.
   B. Class III, IV, or V as required by load calculations, with a C-wall.
   C. Full circular inner and outer reinforcing cage.
   D. Multiple layers of steel reinforcing cages, wire splices, laps, and spacers are permanently secured together by welding in place.
   E. Straight outside pipe wall with no bell modification.
   F. No elliptical reinforcing steel is allowed.
   G. Single cage reinforcement with a one-inch (1") minimum cover from the inside wall.
   H. Double cage reinforcement with a one-inch (1") minimum cover from each wall.
   I. Joints are gasket type.
   J. Additional joint reinforcement.

2. Upon installation, the ENGINEER may, at their discretion, require the CONTRACTOR to perform concrete wiping or injection of the joints if it is believed the joints have not maintained their water tightness during the jacking operation. No additional payment will be made for this operation.

4700.3.4 Pipe Couplings and Joints

1. In addition to meeting or exceeding the material requirements listed above, meet the following requirements:
   A. Steel Couplings and Joints
      1. Welds must comply with **Section 3400.3.2** of these Specifications when couplings are not used or when the coupling thickness is less than the casing thickness.
      2. When couplings are used, the casing joint needs only to be tack welded. Couplings must have a full bead weld such that the thickness, when measured at an angle of forty-five degrees (45°) to the casing and coupling interface, must be no less than the casing thickness.

B. Plastic Pipe Couplings and Joints
    1. Must meet or exceed all ASTM strength and composition standards established for the casing material to which they are being attached.
    2. Joints must be made sufficiently strong to withstand the pressures of jacking. All chemical welds must be completely set and cured before jacking is attempted.

4700.3.5 Groundwater Control

1. Investigate all sites for the possibility of having to manage groundwater problems that may occur due to seasonal changes or natural conditions.

4700.3.6 Quality Control

1. Take control of the operation at all times. Have a representative who is thoroughly knowledgeable of the equipment, boring, and City procedures present at the job site during the entire installation and available to address immediate concerns and emergency operations. Notify the ENGINEER forty eight (48) hours in advance of starting work. Do not begin the installation until the ENGINEER is present at the job site and agrees that the proper preparations have been made.

2. For all installations, submit sufficient information to establish the proposed strategy for providing the following:
    A. An indication where the leading edge of the casing is located with respect to line and grade and the intervals for checking line and grade. Indication may be provided by using a water gauge (Dutch level) or electronic transmitting and receiving devices. Other methods must have prior approval. Maintain a record of the progress at the job site.
    B. Equipment of adequate size and capability to install the product and including the equipment manufacturer's information for all power equipment used in the installation.
    C. A means of controlling line and grade.
    D. A means for centering the cutting head inside the borehole.
    E. Provide a means for preventing voids by assuring:
        1. The rear of the cutting head from advancing in front of the leading edge of the casing by more than one-third (1/3) times the casing diameter and in stable cohesive conditions not to exceed eight inches (8").
        2. In unstable conditions, such as granular soil, loose or flowable materials, the cutting head is retracted into the casing a distance that permits a balance between pushing pressure, pipe advancement, and soil conditions.
        3. Development of a maintaining a log of the volume of spoil material removed relative to the advancement of the casing.
    F. Adequate casing lubrication with a bentonite slurry or other approved technique.

G. An adequate band around the leading edge of the casing to provide extra strength in loose unstable materials when the cutting head has been retracted into the casing to reduce skin friction, as well as providing a method for the slurry lubricant to coat the outside of the casing.
H. At least twenty feet (20') of full diameter auger at the leading edge of the casing. Subsequent auger size may be reduced, but the reduced auger diameter must be at least seventy-five percent (75%) of the full auger diameter.
I. Water to be injected inside the casing to facilitate spoil removal. The point of injection shall be no closer than two feet (2') from the leading edge of the casing.

4700.3.7 Testing

4700.3.7.1 Product Testing

1. When there is any indication the installed product has sustained damage and may leak, stop the work, notify the ENGINEER and investigate damage. The ENGINEER may require a pressure test and reserves the right to be present at the test. Perform pressure test within twenty-four (24) hours unless otherwise approved by the ENGINEER. Furnish a copy of the test results to the ENGINEER for review and approval. The ENGINEER shall be allowed up to seventy-two (72) hours to approve or determine if the product installation is not in compliance with Specifications. The ENGINEER may require non-compliant installations to be filled with excavatable, flowable fill.

4700.3.7.2 Testing Methods

1. Testing may consist of one (1) of the following methods but always must meet or exceed City testing requirements:
   A. Follow the product manufacturer's pressure testing recommendations.
   B. Ensure the product carrier pipes installed without a casing meet the pressure requirements set by the CITY and/or ENGINEER.
      1. The CITY requires a water tight pipe and joint configuration where the product is installed beneath any pavement (including sidewalk). The ENGINEER will determine when and where water tight joint requirements shall be applied to the ultimate roadway section for future widening. When under the pavement, conduct an air pressure test for leaks in the presence of the ENGINEER at a minimum test pressure of 20 PSI by either of the following methods.
         a. Standard twenty-four (24) hour pressure test with a recording chart or
         b. A dragnet-type leak detector or equivalent device capable of detecting pressure drops of ½ PSI for a time period recommended by the manufacturer.
      2. When a product is not located under the pavement, the pipe and point configuration must meet or exceed soil tight joint requirements. The test for soil tight joint allows up to 0.10 gallons of water leakage at a sustained pressure of 5 PSI. Conduct test for joint integrity for one (1) hour.

4700.3.8 Product Locating and Tracking

1. Install all facilities such that their location can be readily determined by electronic designation after installation. For non-conductive installations, attach a minimum of two (2) separate and continuous conductive tracking (tone wire) materials, either externally or integral with the product. Use either a continuous, green-sheathed solid conductor copper wire line (minimum #12 AWG for external placement or minimum #14 AWG for internal placement in the conduit/casing) or a coated conductive tape. Ensure the conductors are located on the opposite sides when installed externally. Connect any break in the conductor line before construction with an electrical clamp or solder, and coat the connection with a rubber or plastic insulator to maintain the integrity of the connection from corrosion. Clamp connections must be made of brass or copper and the butt end type with wires secured by compression. Soldered connections must be made by tight spiral winding of each wire around the other with a finished minimum length of three-inch (3″) overlap. Tracking conductors must be extended two feet (2′) beyond bore termini. Conductors must be tested for continuity. Identify each conductor that passes by removing the last six inches (6″) of the sheath. No deductions are allowed for failed tracking conductors. Failed conductors ends must be wound into a small coil and left attached for future use.

4700.3.9 Augering Fluids

1. Use a mixture of bentonite clay or other approved stabilizing agent mixed with potable water with a minimum pH of 6.0 to create the drilling fluid for lubrication and soil stabilization. Vary the fluid viscosity to best fit the soil conditions encountered. Do not use other chemicals or polymer surfactant in the drilling fluid without written consent of the ENGINEER. Certify in writing to the ENGINEER any chemicals to be added are environmentally safe and not harmful or corrosive to the facility. Identify the source of water for mixing the drilling fluid. Approvals and permits are required for obtaining water from such sources as streams, rivers, ponds, or fire hydrants. Any water source used, other than potable water, may require a pH test.

4700.3.10 Micro-Tunneling and Micro-Tunnel Boring Machine Requirements

1. The micro-tunnel boring machine must meet the following minimum performance requirements:
   A. Capable of providing positive face support regardless of the micro-tunneling boring machine type.
   B. Articulated to enable controlled steering in both vertical and horizontal direction to a tolerance of plus or minus one inch (1″) from the designed alignment.
   C. All functions are controlled remotely from a surface control unit.
   D. Capable of controlling rotation, using a bi-directional drive on the cutter head or by using anti-roll fins or grippers. The ENGINEER must approve either method.
   E. Capable of injecting lubricant around the exterior of the pipe being jacked.

F. Indication of steering direction.
G. For slurry systems, the following is also required:
    1. Indications of the volume of slurry flow in both the supply and return side of the slurry loop
    2. Indication of slurry bypass valve position
    3. Indication of pressure of the slurry in the slurry chamber

4700.3.11 Failed Bore Path

1. If conditions warrant removal of any materials installed during a failed bore path, as determined by the ENGINEER, it will be at no cost to the CITY. Promptly fill all voids by injecting all taken out service products that have any annular space with excavatable, flowable fill.

4700.3.12 Jack and Bore and Micro-Tunneling Operations

1. Provide continuous pressure to the face of the excavation to balance groundwater and earth pressures. Ensure the shafts are of sufficient size to accommodate equipment, the pipe selected, and to allow for safe working practices. Provide entry and exit seals at the shaft walls to prevent inflows of groundwater, soil, slurry, and lubricants. Use thrust blocks designed to distribute loads in a uniform manner so that any deflection of the thrust block is uniform and does not impart excessive loads on the shaft itself or cause the jacking frame to become misaligned.

2. The jacking system must have the capability of pushing the pipe in jack and bore operations or micro-tunneling bore machines for micro-tunneling operations through the ground in a controlled manner and be compatible with the anticipated jacking loads and pipe capacity. Monitor the jacking force applied to the pipe and do not exceed the pipe manufacturer's recommendations.

3. Ensure the pipe lubrication system is functional at all times and sufficient to reduce jacking loads. Use pipe lubrication systems that include a mixing tank, holding tank, and pumps to convey lubricant from the holding tank to application points at the rear of the micro-tunneling boring machine. Maintain sufficient fluids on site to avoid loss of lubrication.

4. Power distribution system must be identified in the plans package or permit provisions, as well as identifying any noise constraints. Identify spoil removal capability and method to avoid creating hindrance to other activities which may be necessary in the area.

4700.3.13 Excess Material and Fluids

1. Monitor the pumping rate, pressures, viscosity, and density of the boring fluids to ensure adequate removal of soil cuttings and the stability of the bore hole. Contain excess drilling fluids, slurry, and soil cuttings at entry and exit points in pits until they are recycled or removed from the site. Ensure all boring fluids are disposed of or recycled in a manner acceptable to the appropriate Local, State, and Federal regulatory agencies. When jacking and boring in suspected contaminated ground, test the boring fluid for contamination and dispose of appropriately. Remove any excess material upon completion of the bore. If it becomes evident the soil is contaminated, contact the ENGINEER immediately. Do not continue boring without the ENGINEER's approval.

4700.3.14 Boring Failure

1. If any obstruction is encountered which prevents completion of the installation in accordance with the design location and Specifications; the pipe may be taken out of service and left in place at the discretion of the ENGINEER. Immediately fill the product left in place with excavatable, flowable fill. Submit a new installation procedure and revised plans to the ENGINEER for approval before resuming work at another location. If damage is observed to any property, cease all work until a plan of action to minimize further damage and restore damaged property is submitted and approved by the ENGINEER.

4700.3.15 General for Open Cut Installation

1. Unless otherwise specified in the Contract or if the ENGINEER allows, perform casing pipe installation in open trenches and in a manner that protects the casing pipe from unusual stresses.

2. Perform trenching as specified in **OSHA 29 CFR part 1926, subpart P** for excavations and trenches. Make trenches wide enough to provide working space on each side of the pipe. The required working space will depend upon the size of the casing pipe and the character of material encountered in the excavation; however, always provide sufficient space between the casing pipe and the sides of the trench to allow preparing the foundation, laying the casing pipe, and placing and compacting of backfill as specified.

3. Excavate the trenches in reasonably close conformity with the Plans and as laid out by the ENGINEER in the field.

4. Keep trenches dewatered at all times.

5. Understand the proposed elevations for the casing pipes as shown on the Plans are subject to revisions in order to fit field conditions, and the ENGINEER may adjust the profile grades from those shown on the Plans.

6. Unless noted by ENGINEER, steel casing pipe shall be used for all casing pipes.

4700.3.15.1 Constructing Foundation

1. Construct the foundation in the trench to prevent subsequent settle or rupture of the casing pipe.

2. The CONTRACTOR may not lay the casing pipe in rock, wet conditions, or on a firm earth subgrade.

3. The CONTRACTOR shall lay the casing pipe on a backfilled granular foundation or bed. When placing the casing pipe on backfilled granular foundation, excavate the trench at least six inches (6") below the elevation established for the bottom of the casing pipe. Backfill this depth with **"¾-inch clear stone"** meeting the requirements for No. 1 stone in **Section 501.2.5.4** of the STATE SPECIFICATIONS**.** Compact the material before laying the casing pipe on the backed granular material.

4. If the Contract details types of bedding, or required trench widths, other than described above, conform to the Construction Details.

4700.3.15.2 Laying Casing Pipe

1. Begin laying the casing pipe in finished trenches at the lowest point and proceed towards the upper end.

4700.3.15.3 Laying Carrier Pipe

1. Insert the carrier pipe into the casing pipe per the requirements of **Section 4000** of these Specifications.

2. All carrier pipes are to have stainless steel casing spacers installed, unless approved by the ENGINEER. The installation of the casing spacers shall be done prior to the insertion into the carrier pipe. All casing spacers shall be incidental to the construction.

4700.3.15.4 Carrier Pipe End Seals

1. Advanced Products & Systems End Seals shall be installed on each end of the carrier pipe per manufacturer's specifications. End seals shall be incidental to the Contract.

4700.3.16 Backfilling

1. Backfill all water mains as described in **Section 100.61** of these Specifications.

4700.3.17 General Rules for Casing Pipe Installation for Water Laterals

1. ENGINEER is to use discretion at all times when deciding when to use casing pipe for laterals; but in general, casing pipes for laterals are to be installed under the following conditions:
   A. Whenever the water lateral crosses under a box culvert.
   B. Whenever there is less than two feet (2′) of cover from a storm sewer with a diameter of forty-eight inches (48″) or greater.
   C. Whenever the water lateral crosses under a storm sewer with a diameter of thirty-six inches (36″) or larger and has an invert elevation of 747.00 or below.

4700.4 Measurement

1. The CITY will measure the Water Main Casing Pipe Bid Items by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the casing pipe.

4700.5 Payment

1. The CITY will pay the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
WATER MAIN CASING PIPE – TRENCHLESS		
4700	Jack and Bore 18″ Steel Water Main Casing Pipe	LF
4702	Jack and Bore 24″ Steel Water Main Casing Pipe	LF
4704	Jack and Bore 30″ Steel Water Main Casing Pipe	LF
4706	Jack and Bore 36″ Steel Water Main Casing Pipe	LF
4708	Jack and Bore 42″ Steel Water Main Casing Pipe	LF
4710	Jack and Bore 48″ Steel Water Main Casing Pipe	LF
WATER MAIN CASING PIPE – OPEN CUT		
4712	Furnish and Install 2″ Water Main Casing Pipe	LF
4714	Furnish and Install 4″ Water Main Casing Pipe	LF
4716	Furnish and Install 6″ Water Main Casing Pipe	LF
4718	Furnish and Install 8″ Water Main Casing Pipe	LF
4720	Furnish and Install 10″ Water Main Casing Pipe	LF
4722	Furnish and Install 12″ Water Main Casing Pipe	LF
4724	Furnish and Install 16″ Water Main Casing Pipe	LF
4726	Furnish and Install 18″ Water Main Casing Pipe	LF
4728	Furnish and Install 20″ Water Main Casing Pipe	LF
4730	Furnish and Install 24″ Water Main Casing Pipe	LF

Bid Item	Description	Units
4732	Furnish and Install 30″ Water Main Casing Pipe	LF
4734	Furnish and Install 36″ Water Main Casing Pipe	LF
4736	Furnish and Install 42″ Water Main Casing Pipe	LF
4738	Furnish and Install 48″ Water Main Casing Pipe	LF

4700.5.1 Trenchless Water Main Casing Pipes

1. Payment for the Trenchless Water Main Casing Pipe Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating boring pit and receiving pit; for sheeting and shoring; for de-watering; for forming foundation; for laying casing pipe; for providing backfill, including bedding material; for backfilling; for compacting; for furnishing and install stainless steel casing pipe spacers; for providing end seals; for removing sheeting and shoring, and for cleaning out and restoring the site of the work.

4700.5.2 Open Cut Water Main Casing Pipes

1. Payment for the Open Cut Water Main Casing Pipe Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for de-watering; for forming foundation; for laying casing pipe; for providing backfill, including bedding material; for backfilling; for compacting; for furnishing and installing stainless steel casing pipe spacers; for providing end seals; for removing sheeting and shoring; and for cleaning out and restoring the site of the work.

4700.6 Submittals

1. Qualifications
   A. Submit the name of the Subcontractor that will perform the horizontal auger boring or shield tunneling work and submit qualifications for the Subcontractor and Subcontractor's superintendent. In addition, submit names and training/qualifications of personnel that will perform air quality monitoring and the name of the site safety representative.

2. Horizontal Auger Boring Operations
   A. Submit for review a tunneling work plan with complete Subcontractor's construction drawings and written description identifying details of the proposed method of construction and the sequence of operations to be performed during construction, as required by the method of tunneling. The drawings and descriptions shall be sufficiently detailed to demonstrate to the ENGINEER whether the proposed materials and procedures will meet the requirements of this Section. The tunneling work plan shall be submitted to the ENGINEER for review. All submissions shall be sealed by a professional engineer licensed in the State of Wisconsin. The tunneling work plan, including drawings, shall, at a minimum, include the following items:
      1. Subcontractor shall submit arrangement drawings and technical specifications of the horizontal auger boring machine, experience record with this type of machine, and experience and training records for the equipment operator. Provide certification from the manufacturer that the proposed equipment and materials are compatible and suitable for use with the subsurface conditions defined in this Section. Include the following information concerning the horizontal auger boring machine:
         a. Dimensions.
         b. Cutters.
         c. Cutter head position relative to casing.
         d. Casing and band diameters.
         e. Torque, speed, and thrust.
         f. Auger and muck casing diameters.
      2. Method of maintaining and controlling line and grade of tunneling operation.
      3. Method and details of spoil removal, including equipment type and numbers, processing, and disposal.
      4. Electrical system.
      5. Grouting techniques to be used for contact grouting, including equipment, pumping and injection procedures, pressure grout types, and mixtures in accordance with this Section.
      6. Details of the horizontal auger boring and operation.
      7. Plans for storage and handling of casing or liner plate.
         A. Shaft Layout Drawings: Submit the layout and design of proposed access shafts for review.

3. Quality Control Methods: At least thirty (30) days prior to the start of tunneling, the Subcontractor shall submit to the ENGINEER a description of the quality control methods proposed for the tunneling operations. The Submittal shall include:
   A. Supervision: Supervisory control to ensure that the work is performed in accordance with the Plans and Specifications, and the tunneling work plan and drawings.
   B. Line and Grade: Procedures for surveying, controlling, and checking line and grade, including field forms. Procedures for resetting guidance system if its alignment shifts or is moved off design alignment and grade for any reason.

C. Movement Monitoring: Procedures for monitoring movements along the tunnel alignment as specified herein.
D. Tunneling Observation and Monitoring: Procedures for preparing and submitting daily logs of tunneling operations, including field forms.
E. Products and Materials: A plan for testing and submittal of test results to demonstrate compliance with the Specifications and Subcontractor's criteria for permanent products, materials, and installations. The plan shall identify all applicable standards and procedures for testing and acceptance.

4. Jacking Pipe: Submit detailed drawings of the jacking pipe indicating casing pipe material, including the standard to which it is manufactured, outside diameter, wall thickness, and any joint details. Indicate the ultimate and allowable jacking capacity, the required fabrication tolerances to prevent damage to the pipe during installation, and provide a certification indicating that the pipe meets these tolerances and is designed to meet all anticipated loading conditions with an adequate factor of safety.

5. Details of casing spacers, **including recommended spacing.**

6. Safety Plan: A safety plan for tunneling operations including air monitoring equipment and procedures, and provisions for lighting, ventilation, and electrical system safeguards. The plan should also include, at a minimum:
   A. Protection against soil instability and groundwater inflow.
   B. Safety for tunnel and shaft access and exit, including ladders, stairs, walkways, and hoists.
   C. Protection against mechanical and hydraulic equipment operations, and for lifting and hoisting equipment and material.
   D. Monitoring for hazardous gases.
   E. Means for emergency evacuation and self-rescue.
   F. Protection of shaft, including traffic barriers, accidental or unauthorized entry, and falling objects.

7. Calculations: Calculations shall be submitted in a neat, legible format. Assumptions used in calculations shall be consistent with information provided in this Section. All calculations shall be prepared by professional engineer licensed in the State of Wisconsin, who shall stamp and sign calculations, including:
   A. Design calculations demonstrating that the proposed jacking pipe is capable of supporting the maximum stresses to be imposed during jacking. The calculations shall take into account earth and hydrostatic loads; jacking forces; external loads, such as live loads due to traffic; and any other loads that may be reasonably anticipated during jacking. All loads shall be shown and described. Include assumed maximum drive length.

B. Calculations demonstrating that the soils behind the thrust block can transfer the maximum planned jacking forces exerted by the jacks to the ground during pipe installation with a factor of safety, without excessive deflection or displacement.

8. Schedule: Provide a schedule for all tunneling work, identifying all major construction activities as independent items. The schedule shall include, at a minimum, the following activities: mobilization; Wisconsin "One call" utility locate requests; confirmation of underground utilities, as required on the Plans and in the Specifications; groundwater control at launching and receiving shafts; shaft excavation and support; working slab construction; thrust wall construction; jacking equipment setup; entry ring installation for launch of the casing; horizontal auger boring; contact grouting; installation of the carrier pipe; shaft backfill; site restoration; cleanup and disposal; and demobilization. The schedule shall also include the work hours and workdays for each activity, and a written description of the construction activities. The schedule will be reviewed by the ENGINEER and shall be updated and resubmitted by the Subcontractor every two (2) weeks, or more frequently, if requested by the ENGINEER.

9. Before Each Drive: Submit the following to the ENGINEER at least twenty four (24) hours prior to the start of each drive:
   A. Results of line and grade survey to ensure that the thrust block, jacking frame, guide rails, entry seal, and exit seals are installed properly prior to launch of each drive.

10. Daily Records: The following daily records shall be submitted to the onsite ENGINEER by noon on the day following the shift for which the data or records were taken:
    A. Tunneling Records: The Subcontractor shall provide complete tunneling records to the ENGINEER. These records shall include, at a minimum: date, time, name of operator, tunnel crossing identification, installed ground support element/pipe number and corresponding tunnel length, rate of advance, jacking forces, spoil feed rates, changed face conditions encountered, steering jack positions, line and grade offsets, shield inclination and roll, any movement of the guidance system from the horizontal auger boring machine or other components or equipment, and durations of and reasons for delays. Computer-recorded data should be referenced to time and distance and should be recorded at time intervals of one (1) minute or less. Manually recorded observations should be made at intervals of not less than once per four feet (4'), as conditions change, and as directed by the ENGINEER. At least seven (7) days prior to the start of auguring, the Subcontractor shall submit samples of the automated and manual tunneling records. Samples shall include electronic data and any necessary programs to interpret data, and the manual logs or records to be used.
    B. Survey Measurements: Survey measurements of casing alignment, and monitoring data of all surface and subsurface settlement monitoring points as required herein.

11. Contingency Plans: The following list includes problem scenarios that may be encountered during the tunneling operations. The Subcontractor shall submit contingency plans for

dealing with each problem scenario while satisfying the Specifications. These plans shall include the observations and measurements required to clearly identify the cause of the problems:

A. Machine unable to advance:
    1. Possible obstructions (including boulders, old foundations, metallic debris, or reinforced concrete; i.e., jammed cutter head).
    2. Insufficient auger torque or jacking capacity.
    3. Shield or machine malfunction.
B. Laser distorted by heat, humidity, or physical disturbance.
C. Spoil Feed Problems: Strong hydrocarbon smell is detected in the spoils or in the shaft.
D. Jacking Forces:
    1. Jacking forces increase dramatically or suddenly.
    2. Jacking forces reach design capacity of casing, jacking frame, or thrust wall (treat these scenarios as separate incidents).
E. Settlement and Subsidence:
    1. Survey measurements indicate deformations exceed limits as defined herein.
    2. Excavated volumes significantly exceed tunnel or casing volume installed, as applicable.
    3. Rapid excess lost ground results in large voids or sinkholes.
F. Line and grade tolerances being exceeded.
G. Control is lost. Cannot monitor position, torque, thrust, steering jack position, or other performance parameters.
H. Pipe has been damaged or has been found to be out of compliance with Specifications during, or after, installation.
I. Thrust block deforms excessively under jacking loads, or provides insufficient capacity to advance casing.
J. Large volumes of water are encountered, threatening face stability.

12. Abandonment Contingency Plan: The Subcontractor shall prepare an abandonment contingency plan to handle the possibility that the Subcontractor cannot complete a tunneled crossing. The Subcontractor shall follow all provisions of the approved plan.

13. Contact Grout Work Plan and Methods:
    A. Submit work plan including contact grouting methods and details of equipment, grouting procedures and sequences, injection pressures, monitoring and recording equipment, pressure gauge calibration data, methods of controlling grout pressure, method of transporting grouting equipment and materials within the initial tunnel support, and provisions to protect interior of pipe and shaft supports.
    B. Submit details of grout mix proportions; admixtures, including manufacturers' literature; and laboratory test data verifying the strength of the proposed grout mix.

14. Contact Grout Reports and Records: Maintain and submit daily logs of grouting operations, including grouting locations, pressures, volumes, and grout mix pumped, and time of pumping. Note any problems or unusual observations on logs.

SECTION 4800
WATER MAIN ROCK EXCAVATION

4800.1 Description

1. This Section describes excavating and disposing of rock taken from within the right-of-way for water main construction.

4800.2 Materials

4800.2.1 Rock Excavation

1. Under the Rock Excavation Bid Item, excavate all hard, solid rock in ledges, bedded deposits, and unstratified masses, and all conglomerate deposits or any other material so firmly cemented they present all the characteristics of solid rock, and the ENGINEER determines it is not practical to excavate this material without first blasting, rock grinding, or using a hydraulic break hammer. The CONTRACTOR shall be required to take all practical steps to excavate existing ground conditions prior to the use of rock excavation methods for purposes of demonstrating that the existing ground cannot practically be excavated without performing rock excavation. Rock excavation also includes the removing of rock boulders having a volume of one (1) cubic yard or more.

2. The classification of Rock Excavation does not apply to crushed aggregate or asphaltic base or surface courses, or to Portland cement base or surface courses.

4800.3 Construction

4800.3.1 General

1. Remove rock, if encountered in excavation, to a depth of approximately six inches (6″) below the earth subgrade between the limits of the shoulder slopes. If the Plans show design details covering the depth of rock excavation, perform the work in accordance to the Details. If the Plans or Special Conditions do not require specific materials, then use selected material obtained from roadway and drainage excavation to backfill areas of EBS in rock excavation. If excavation methods leave undrained pockets in the rock surface, drain the depressions properly. If allowed by the ENGINEER, the CONTRACTOR may fill the depressions with ENGINEER-approved impermeable material, at no expense to the CITY.

2. Excavate rock cuts using methods and equipment so the resulting backslopes substantially conform to the slopes the Plans show or to the slopes established from stakes set for excavation. Avoid creating depressions in or substantial displacement of material outside the lines, limits, or slope planes defined by the stakes. Scale the backslopes in rock cuts to dislodge loose rock and dispose of removed material.

3. Undercut the slope of rock cuts if designated to receive topsoil, or salvage topsoil to the depth necessary to allow placing the specified amount of topsoil or salvaged topsoil, and finish to the required section.

4800.3.2 Pre-Splitting Rock

1. If the Plans show or the ENGINEER authorizes, employ the pre-splitting technique to split the face of the rock cut in a relatively smooth plane along the designated backslope, before removing the interior portion of the cut by blasting.

2. Remove all soil, loose, or decomposed rock overlying the surface of the rock to be split to the elevation the ENGINEER designates or approves before drilling the pre-splitting holes.

3. At the beginning of the pre-splitting operation or if encountering material of different geologic characteristics, drill, blast, and excavate short test sections, up to one hundred feet (100′) in length, to determine the optimum spacing, size, and loading of the holes. Do not perform testing, until the ENGINEER approves a CONTRACTOR-prepared plan of the test section. After pre-splitting the test section, expose the pre-split face to allow the ENGINEER to examine and evaluate the results. If the results are unsatisfactory, make adjustments in hole size and spacing of charges, and other aspects of the plan to produce an acceptable split face.

4. Drill holes no larger than three and one-half inches (3½″) in diameter at a spacing determined from the test section, but not less than twenty-four inches (24″) and not more forty-two inches (42″).

5. Drill holes on the required slope line and at the required slope inclination to the full depth of the cut or to a predetermined stage elevation. If the depth of cut is greater than is practical to maintain the required alignment of drilled holes, drill, blast, and excavate the cut in two (2) or more lifts. If the cut is too deep for pre-splitting to the full required depth in one (1) operation, the ENGINEER will allow a maximum offset of twelve inches (12″) at the bottom of each lift for use in drilling the next lower pre-splitting pattern. Plan the offset benches so the toe of the completed rock slope coincides with the toe of slope the Plans show.

6. Carefully charge all drill holes for pre-splitting with manufactured cartridge-type explosives, fully stem each hole, and detonate the charges simultaneously.

7. Before blasting the interior portion of the excavation area, pre-split rock slopes, either by separate operations or by time delay fuses that fracture the slope line before the charges detonate in the interior portion.

8. Position drill holes for production blasting to avoid damage to the pre-split face. Do not place the bottom of the production holes below the bottom of the pre-split holes. Do not drill portions of production drill holes within four feet (4') of a pre-split plane, except as approved by the ENGINEER.

9. Use explosive charges, detonating cord, spacing, and other items necessary for the blasting operation conforming to the explosive manufacturer's recommendations and instructions.

4800.4 Measurement

4800.4.1 Rock Excavation

1. The CITY will measure the Rock Excavation Bid Item in ledges and solid masses by the cubic yard that is acceptably completed. The CITY will perform this measurement by making vertical measurements for determining average end areas within the limits of the roadbed, as defined by the shoulder slopes. These vertical measurements will extend from the surface of the rock to an elevation six inches (6") below the subgrade or ground surface, or to the depth indicated on the plans, or to the bottom of the solid ledge or mass if the rock does not extend downward to the elevation specified, or indicated below the established grade.

2. The CITY will measure boulders and surface stone with a volume of one (1) cubic yard or more individually and compute the volume from average dimensions taken in three (3) directions.

3. The CITY will measure Utility Trench Rock Excavation Bid Items by the linear foot that is acceptably completed. Utility trench rock excavation shall be paid per **Section 4800.5.1** of these Specifications. The CITY will perform this measurement by taking the linear footage along the centerline of the pipe where rock is encountered, until a location where methods of rock excavation is no longer needed.

4800.4.2 Pre-Splitting Rock

1. The CITY will measure the Pre-Splitting Rock Bid Item by the linear foot of drilled holes, including test section holes, drilled along the face of acceptable pre-split rock slopes. The CITY will take the measurement from the top of the drilled hole at the rock surface to the elevation of the roadway ditch, to a pre-determined bench elevation or to the bottom of the rock ledge or mass where the rock does not extend to the roadway ditch or pre-determined bench elevation. The CITY will include over-break quantities in the measurement of Rock Excavation where pre-splitting is used.

4800.5 Payment

1. The CITY will pay measured quantities at the Contract unit price under the following Bid Items:

Bid Item	Description	Units
WATER MAIN ROCK EXCAVATION AND PRE-SPLITTING ROCK		
4800	Rock Excavation	CY
4801	Utility Trench Rock Excavation (Water)	LF
4802	Pre-Splitting Rock	LF

4800.5.1 Rock Excavation

1. Payment for the Rock Excavation Bid Item is full compensation for providing all necessary labor, equipment, and materials; for excavating the rock material; for disposing of surplus material; and for cleaning out and restoring the project site.

2. The CITY will not pay for the removal of hard pan rock ledges. If the ENGINEER determines that the rock ledges can be excavated with a ripper tooth from a backhoe, it shall be classified as hardpan and shall be incidental to Bid Items.

4800.5.2 Pre-Splitting Rock

1. Payment for the Pre-Splitting Rock Bid Items is full compensation for all drilling; stemming; blasting; and providing all materials, including explosives.

SECTION 4900
WATER MAIN ABANDONMENTS/REMOVALS AND MISCELLANEOUS CONSTRUCTION

4900.1 Description

1. This Section describes the abandoning of existing water structures and water main pipe, either through abandoning in place, filling, or removal of the existing water main.

4900.2 Materials

1. This Section is left vacant.

4900.3 Construction

1. The ENGINEER shall order water valve manholes and water main pipes which are no longer in use to be bulkheaded and abandoned.

2. The abandonment of water valve manholes and water main pipes shall conform to **Section 3.2.24** in the *Standard Specifications for Sewer and Water Construction in Wisconsin*, dated December 22, 2004.

4900.3.1 Abandon Water Valve Manholes

1. The abandonment of water valve manholes shall also include the following specifications:
   A. All abandoned manholes shall be removed to a depth of three feet (3′) below the proposed or established grade or existing street grade, whichever is greater.
   B. The manhole structure base shall be cracked to allow drainage.
   C. The manhole structure shall be backfilled with a granular backfill material suitable for the location of the existing water valve manhole.
   D. All castings on such abandoned structures are property of the CITY and shall be salvaged by the CONTRACTOR and delivered to the City yard as directed.

4900.3.2 Abandon Water Main Pipes

1. The abandonment of four-inch (4″) to twelve inch (12″) water main pipes shall also include the following specifications:
   A. The CONTRACTOR shall construct a bulkhead at each exposed end of the abandoned pipe consisting of a five-inch (5″) brick wall. The abandoned pipe may stay in its existing location if a proposed alignment does not coincide with the existing alignment.
   B. When the existing alignment coincides with the proposed alignment, the existing pipe shall be completely removed and considered incidental to the installation of the proposed sanitary sewer.

2. The abandonment of sixteen inch (16″) or larger water main pipe shall also include the following specifications:
   A. The CONTRACTOR shall construct a bulkhead at each exposed end of the abandoned pipe consisting of a five-inch (5″) brick wall. In addition to the bulkheads, the abandoned pipe shall be filled with either sand or cellular concrete if the proposed alignment does not coincide with the existing alignment.
   B. When the existing alignment coincides with the proposed alignment, the existing pipe shall be completely removed and considered incidental to the installation of the proposed sanitary sewer.

4900.3.3 Abandon Water Main Appurtenances

1. Valves on the section of main to be abandoned shall also be abandoned if the Contract Documents do not require their removal.

2. When valves or curb stops are to be abandoned, the CONTRACTOR shall remove only the top section of the valve or stop box and backfill the remaining hole with the required backfill material.

3. When a hydrant is to be removed and its branch is to be abandoned and it is connected to an abandoned or to be abandoned water main, the CONTRACTOR shall remove the entire hydrant and bulkhead the open end of the remaining hydrant branch and drain, if any. All Waterous hydrants shall be delivered to the City of Oshkosh Water Department, located at 757 West 3rd Avenue.

4. When a hydrant is to be removed and its branch is to be abandoned and it is connected to a water main that will remain in service, the CONTRACTOR shall, in addition to the work described above, excavate to plug the hydrant tee or cross. All Waterous hydrants shall be delivered to the City of Oshkosh Water Department, located at **757 West 3rd Avenue**.

5. Hydrant drains connected to sewer manholes shall be bulk-headed inside the manholes.

6. When a manhole is to be abandoned, the CONTRACTOR shall remove the manhole frame and lid. They shall remove the top of the manhole to at least three feet (3′) below the street grade and they shall properly backfill the remainder of the manhole. Any drains from the manhole shall be plugged.

4900.3.4 Remove Water Main Pipes

1. The removal of water main pipes also includes the following specifications:

A. All abandoned water main pipes shall be excavated and removed from the roadway as shown on the Plans or ordered by the ENGINEER. The trench will then be backfilled with a crushed aggregate base course conforming to **Section 100.61** of these Specifications. Removal of structures shall be considered incidental to the removal of the pipes.

4900.4 Measurement

4900.4.1 Water Main Abandonment by Street Segment

1. The CITY will measure the Water Main Abandonment Bid Items as a single lump sum for each individual street segment that is acceptably completed.

4900.4.2 Remove Water Main Pipes

1. The CITY will measure the Removal of the Water Main Pipe Bid Item by the linear foot that is acceptably completed. The measurement equals the distance along the centerline of the pipe that is to be removed. The CITY will make no deductions from those measured lengths for intermediate fittings.

4900.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
WATER MAIN ABANDONMENT ON STREET SEGMENT		
REMOVE WATER MAIN		
MISCELLANEOUS CONSTRUCTION		
4900	Abandon Water Main on Street A	LS
4902	Abandon Water Main on Street B	LS
4904	Abandon Water Main on Street C	LS
4906	Abandon Water Main on Street D	LS
4908	Abandon Water Main on Street E	LS
4910	Abandon Water Main on Street F	LS
4912	Abandon Water Main on Street G	LS
4914	Abandon Water Main on Street H	LS
4920	Remove Water Main	LF

4900.5.1 Abandoning Water Main

1. Payment for the Abandoning Water Main Bid Items is full compensation for providing all necessary labor, equipment, and materials to remove or break down all existing water main

appurtenances; for bricking ends; for slurrying or sand filling existing water main pipes; for filling of water valve manhole structures; and for delivering of all Waterous hydrants to the City of Oshkosh Water Department located at **757 West 3rd Avenue**.

4900.5.2 Remove Water Main Pipes

1. Payment for the Removing Water Main Pipes Bid Item is full compensation for providing all necessary labor, equipment, and materials to remove existing water main pipes. It also includes providing granular backfill material, for backfilling, for compacting; and for cleaning up and restoring the site of the work. Removal of structures shall be included in the unit price bid for removing pipe.

ELECTRICAL SPECIFICATIONS

SECTION 5000
ELECTRICAL STRUCTURES

5000.1 Description

1. This Section describes providing electrical pull boxes and electrical and communications vaults, including excavating and backfilling.

5000.2 Materials

5000.2.1 General

1. Furnish pull boxes and electrical and communications vaults as described in the Specifications and as detailed in the Drawings.

2. Manufactured vaults shall have UL Label.

3. Provide pull boxes of the types, sizes, and locations indicated on the Drawings.

5000.2.2 Pull Boxes

1. Pull boxes shall be made of corrugated steel pipe conforming to **AASHTO M36** or WDOT approved non-conductive pull box. CONTRACTOR may extend pull boxes as the Plan Details show, using the same material as the pull box.

2. Pull box castings shall be Neenah R-5900 with a Solid Lid Lettered **"ELECTRIC"**. The casting shall be sized to fit the pull box size.

3. Furnish grounding lugs and mechanical connectors that are UL or NRTL Listed and approved for copper wire. Use stainless steel for mechanical connections to the pull box.

4. The pull box covers shall have the following words stamped on the cover:
   A. Cover for traffic-signal pull boxes: TRAFFIC SIGNAL.
   B. Cover for street-light pull boxes: STREET LIGHTING.
   C. Cover for traffic-signal interconnect pull boxes: FIBER OPTIC.

5000.2.3 Communication Vaults

1. Communication vaults and lids shall be made of polymer concrete, with an open bottom. Vaults shall be UL Listed to **ANSI/SCTE 77-2010**.

2. Vaults shall be thirty inches (30″) by forty-eight inches (48″) in size. Vaults shall be a minimum of thirty-six inches (36″) in height, and shall be one (1) piece construction. Stackable multi-piece vaults are not acceptable.

3. Vault cover shall have a minimum HS-20 design load rating. Cover shall be locking. Vault cover shall be lettered **"CITY OF OSHKOSH COMMUNICATIONS"** in two-inch (2″) lettering cast into the lid.

4. All openings in the vault shall be machined at the time of fabrications, or shall be punch driven at the time of placement.

5. Vaults shall be furnished with manufactured gaskets between the lid and top of vault to resist water entry into the vault.

6. Provide grounding lugs and mechanical connections that are UL or NRTL Listed and approved for copper wire for vaults containing wiring systems over 50 volts. Use stainless steel for mechanical connections to the vault.

5000.2.4 Electrical Vaults

1. Electrical vaults and lids shall be made of polymer concrete, with an open bottom. Vaults shall be UL Listed to **ANSI / SCTE 77-2010**.

2. Vaults shall be thirty inches (30″) by forty-eight inches (48″) in size. Vaults shall be a minimum of thirty-six inches (36″) in height, and shall be one piece construction. Stackable multi-piece vaults are not acceptable.

3. Vault cover shall have a minimum HS-20 design load rating. Cover shall be locking. Vault cover shall be lettered **"CITY OF OSHKOSH ELECTRICAL"** in two-inch (2″) lettering cast into the lid.

4. All openings in the vault shall be machined at the time of fabrications, or shall be punch driven at the time of placement.

5. Vaults shall be furnished with manufactured gaskets between the lid and top of vault to resist water entry into the vault.

5000.2.5 Lighting Control Cabinets

1. Lighting control cabinets shall follow all provisions in the Detail Drawings, as well as the STATE SPECIFICATIONS.

2. Color shall be Black "RAL 9017", unless specified otherwise.

3. Lighting control cabinets shall be sixty-six inches (66″) tall, thirty-eight inches (38″) wide, and twenty-four inches (24″) deep with a back panel.

4. Fully-actuated 8-Phase traffic signal control cabinets shall be fifty-two inches (52″) tall, forty-four inches (44″) wide, and twenty-eight inches (28″) deep.

5000.2.6 Cabinet Service Installation

1. Cabinet service installation shall follow all provisions in the Detail Drawings, as well as the STATE SPECIFICATIONS, and include a meter socket with a 200-amp circuit breaker.

5000.3 Construction

5000.3.1 General

1. All work **must** be coordinated with the City Electrician. Contact City Electrician a minimum of three (3) working days prior to commencing work. **No work is allowed to commence without the approval of the City Electrician**.

2. Determine final elevation of ducts as influenced by possible adjustments in other underground and surface features.

3. Install units plumb and level with orientation and depth coordinated with arrangement of connecting conduits to minimize bends and deflections required for proper conduit entrances.

4. Under the Adjust Pull Box Bid Item, move the existing pull box to grade level. Excavate, adjust subsurface components as required, and backfill as the Plan Detail shows. Dispose of surplus or unsuitable material.

5. Under the Remove Pull Box Bid Item, excavate and remove existing pull boxes. Backfill with material similar to the material surrounding the removal or with granular material, as directed by the ENGINEER. Dispose of surplus or unsuitable excavated material. The CONTRACTOR shall salvage and return existing pull boxes to the City Electrician.

6. Under the Remove Concrete Base Bid Item, excavate, remove, haul away, and dispose of existing concrete bases. Backfill with material similar to the material surrounding the removal or with granular material, as directed by the ENGINEER. Dispose of surplus or unsuitable material.

5000.3.2 Excavation

1. The excavation shall be limited to the size required for the structure to be constructed.

2. Understand the proposed elevations for the structures, as shown on the Plans, are subject to revisions in order to fit field conditions; therefore, the ENGINEER may have to adjust the grades from those shown on the Plans.

3. Structures shall be located as shown on the Plans. The ENGINEER may have to adjust the location from those shown on the Plans based upon field conditions encountered during construction.

5000.3.3 Constructing Foundation

1. Construct the foundation to prevent subsequent settlement of the structures.

2. The CONTRACTOR may not install structures in rock, wet conditions, or on a firm earth subgrade, unless otherwise specified.

3. Unless otherwise specified, the CONTRACTOR shall place the structures on a backfilled granular foundation or bed. When placing on backfilled granular foundation, excavate to at least twelve inches (12″) below the elevation established for the bottom of the structure. Backfill this depth with **"¾-inch clear stone"** meeting the requirements for No. 1 stone in **Section 501.2.5.4** of the STATE SPECIFICATIONS. Compact the material before placing the structure on the backfilled granular material.

4. Install sand around all conduit connections to structures. Extend sand a minimum distance of three feet (3′) from outside edge of structure.

5. If the Construction Details show types of bedding, or required trench widths other than described above, conform to the Construction Details.

5000.3.4 Backfilling

1. Backfill all structures as described in **Section 100.61** of these Specifications.

5000.4 Measurement

1. The CITY will measure the Electrical Structure Bid Items that have been acceptably completed, on per each basis.

5000.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
	ELECTRICAL STRUCTURES	
5000	Pull Box – Steel, 12″ diameter x 24″	EA
5002	Pull Box – Steel, 12″ diameter x 30″	EA
5004	Pull Box – Steel, 12″ diameter x 36″	EA
5006	Pull Box – Steel, 12″ diameter x 42″	EA
5008	Pull Box – Steel, 18″ diameter x 24″	EA
5010	Pull Box – Steel, 18″ diameter x 30″	EA
5012	Pull Box – Steel, 18″ diameter x 36″	EA
5013	Pull Box – Non-Conductive, 18″ diameter x 36″	EA
5014	Pull Box – Steel, 18″ diameter x 42″	EA
5016	Pull Box – Steel, 24″ diameter x 36″	EA
5017	Pull Box – Non-Conductive, 24″ diameter x 36″	EA
5018	Pull Box – Steel, 24″ diameter x 42″	EA
5019	Pull Box – Non-Conductive, 24″ diameter x 42″	EA
5020	Pull Box – Steel, 24″ diameter x 48″	EA
5025	Adjust Pull Box	EA
5026	Remove Pull Box	EA
5027	Remove Concrete Base	EA
5032	Communication Vault, 30″ x 48″	EA
5034	Electrical Vault, 30″ x 48″	EA
5050	Furnish and Install Lighting Control Cabinet, 120/240 Volt	EA
5051	Install CITY-Supplied Lighting Control Cabinet	EA
5052	Furnish and Install Fully-Actuated 8-Phase Traffic Signal Control Cabinet	EA
5053	Install CITY-Supplied Fully-Actuated 8-Phase Traffic Signal Control Cabinet	EA
5054	Electric Service Installation	EA

2. Payment for Electrical Structures Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for providing by-pass service (if necessary); for forming foundation; for placing structures; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work.

3. Payment for Bid Items #5050 and #5052 is full compensation for providing the respective control cabinets; and for providing all necessary labor, equipment, and materials to install the control cabinets as specified.

4. Payment for Bid Items #5051 and #5053 is full compensation for providing all necessary labor, equipment, and materials to install the CITY-supplied cabinets as specified.

5. Work performed one foot (1′) or less below the structure bottom to form a satisfactory foundation as specified is incidental to the work. The CITY will pay for work required at depths greater than one foot (1′) below the structure bottom as extra work.

6. Payment for Adjust Pull Boxes is full compensation for resetting the box elevation; for all of the required materials; and for all excavating, backfilling, and disposing of surplus materials.

7. Payment for Remove Pull Boxes is full compensation for removing, and for all excavating, backfilling, and disposing of surplus materials.

SECTION 5100
ELECTRICAL CONDUIT

5100.1 Description

1. This Section describes constructing conduit for electrical and communications wiring, including excavating and backfilling.

5100.2 Materials

5100.2.1 General

1. Use materials conforming to the requirements for the class of the material named and specified below:
   A. Schedule 40 PVC (Heavy Wall Rigid Plastic) **NEMA TC-2, UL 651**
   B. Schedule 80 PVC (Extra Heavy Wall Rigid Plastic) **NEMA TC-2, UL 651**
   C. Fittings (Schedule 40 and Schedule 80) **NEMA TC-3, UL 651**

2. Conduit shall be clearly marked as follows at intervals of five feet (5') or less:
   A. Manufacturer's name or trademark.
   B. Nominal size.
   C. Temperature classification.
   D. The legend, "Schedule 40 PVC" or "Schedule 80 PVC."

3. Packaging, handling, and shipment of conduit shall be in accordance with manufacturer's instructions and specifications.

5100.2.2 PVC Conduit

1. Conduit installed direct buried in earth shall be Schedule 40, unless otherwise noted on the Drawings.

2. Conduit installed in an exposed location shall be Schedule 80.

3. Material shall be as called out on the Plans for all other locations.

4. Conduit shall be stored in the supplier's yard or on the project site in accordance with manufacturer's recommendations.

5. Cover PVC conduit with an opaque material to protect it from the sun's ultraviolet radiation. PVC conduit that has been subjected to excessive ultraviolet radiation is identified by color fading or chalking and shall not be used. The determination as to the acceptability of the conduit rests solely on the ENGINEER's decision.

6. Provide bell end fittings for conduit in pull boxes and vaults.

7. Provide non-hardening putty like conduit sealing compound. Compound shall be workable at temperatures to minus thirty-five degrees Fahrenheit (-35°F). Install at all conduit entry locations.

5100.2.3 PVC Fittings

1. Fittings shall be of the same material as the conduit they adjoin (Schedule 40 fittings on Schedule 40 conduit, Schedule 80 fittings on Schedule 80 conduit).

5100.3 Construction

5100.3.1 General

1. All work **must** be coordinated with the City Electrician. Contact City Electrician a minimum of three (3) working days prior to commencing work. **No work is allowed to commence without the approval of the City Electrician**.

2. CONTRACTOR is responsible for determining the installation method (i.e. boring, trenching, vibrating, etc.). Planned removal limits are shown on the Plans and may vary slightly based on field conditions. If additional pavement is to be removed for the installation of conduit, it will be at the CONTRACTOR's expense.

5100.3.2 Excavation

1. The excavation shall be limited to the size required for the installation of the conduit.

2. Understand the proposed elevations for the conduit, as shown on the Plans, are subject to revisions in order to fit field conditions; therefore, the ENGINEER may have to adjust the grades from those shown on the Plans.

3. Conduit shall be located as shown on the Plans. The ENGINEER may have to adjust the location from those shown on the Plans based upon field conditions encountered during construction.

4. Excavate trenches true to line and grade to provide uniform bearing.

5100.3.3 Constructing Foundation

1. Construct the foundation to prevent subsequent settlement of the conduit.

2. The CONTRACTOR may not install conduit in rock, wet conditions, or on a firm earth subgrade, unless otherwise specified.

3. Unless otherwise specified, the CONTRACTOR shall place the conduit on a backfilled granular foundation or bed. When placing on backfilled granular foundation, excavate to at least six inches (6″) below the elevation established for the bottom of the conduit. Backfill this depth with **"¾-inch clear stone"** meeting the requirements for No. 1 stone in **Section 501.2.5.4** of the STATE SPECIFICATIONS. Compact the material before laying the conduit on the backfilled granular material.

4. If the Construction Details show types of bedding, or required trench widths other than described above, conform to the Construction Details.

5100.3.4 Laying Electrical Conduit

1. Begin conduit laying in finished trenches at the lowest point and proceed towards the upper end.

2. Place conduit to avoid unnecessary handling in the trench or damage to the conduit. Provide a firm bearing beneath the entire length of each section and make it substantially true to the line and grade.

3. Pitch all conduit for drainage as indicated on the Drawings. If unable to slope conduit or drainage, provide drain by drilling one (1) one-quarter inch (¼″) diameter hole in the underside of the conduit at each end and at low points. Place a drain sump under the drainage holes, as indicated in the Details. Provide three-inch (3″) minimum separation for multiple conduits in the same trench.

4. Provide one (1) 12 AWG, XLP Insulated, Stranded Copper (see **Section 5200** of these Specifications) pull wire in each empty run of conduit installed for future use. Pull wire shall be a minimum of four feet (4′) longer than the conduit length and be "doubled over" a minimum of two feet (2′) at each access point. Pull wire shall be anchored at each access point.

5. All conduit not terminating in a pull box or vault shall be capped or plugged immediately upon installation, until wiring is installed.

6. Use UL or NRTL listed adaptor when connecting PVC conduit to rigid metallic conduit.

7. Lay all conduits with ends abutting. Take care when shoving the conduit together so that the joints are properly adjusted and not overly large. Fit conduit so they form a line with a smooth and uniform invert.

5100.3.5 Laying of Conduit in Cold Weather

1. The ENGINEER reserves the right to order conduit laying discontinued whenever, in their opinion, there is a danger of the quality of work being impaired because of cold weather.

2. The CONTRACTOR shall be responsible for heating the conduit and jointing material so as to prevent freezing of joints.

3. No conduit shall be laid on or in frozen ground.

5100.3.6 Joints

1. CONTRACTOR shall use solvent-cemented joints. The bell and spigot ends of the pipe shall be cleaned and dried prior to the application of the solvent cement with a cloth moistened with methyl-ethyl-ketone. All joints shall be primed using an approved primer compound prior to applying solvent cement. Using a brush, the solvent cement is liberally applied to the spigot a distance equal to the joint depth and lightly applied to the inside of the fitting. Immediately thereafter, the joint shall be made by inserting the conduit into the fitting and pushing it home as far as possible. The conduit then shall be rotated 30° to 90° to distribute the cement.

2. As with any solvent-cemented joints, the pipe must be cut square and cleaned. A circular blade with twenty (20) or less teeth is preferred over a finer blade that tends to heat the PVC material as it cuts, resulting in a molten PVC residue producing a rough cut.

3. After the conduit is cut to length, the outside and inside edges must be deburred. This can be easily achieved by scraping these edges with a sharp-edged piece of steel (i.e. a file).

4. Align the conduit and fittings as close to its final position as possible. Elevate both the conduit and fittings so the entire circumference is accessible.

5100.3.7 Connections to Structures

1. Connections to new structures shall conform to **Section 5000** of these Specifications.

2. Connections to existing pull boxes shall be core drilled (using an appropriately-sized core drill for electrical conduit).

3. Connections to existing electrical and communications vaults shall be core drilled (using an appropriately-sized core drill for electrical conduit), or punched in accordance with **Section 5000**.

4. Connection to existing junction boxes/vaults/manholes to be completed as directed by the City Electrician.

5100.3.8 Backfilling

1. **Do not backfill trench before it is inspected by CITY**. Backfill all conduit as described in **Section 100.61** of these Specifications. Place at least 0.7 cubic feet of No. 2 stone as specified in **Section 501.2.5.4** of the STATE SPECIFICATIONS under each drainage hole.

2. Provide four-inch (4″) wide yellow warning tape marked "ELECTRIC" in trench twelve inches (12″) below finished grade.

5100.4 Measurement

1. The CITY will measure the Electrical Conduit Bid Items that have been acceptably completed on a linear foot basis.

2. Fittings are considered incidental to the construction of the conduit, and will not be measured for payment separately.

3. Pull wire will be measured and paid under the appropriate Bid Item in **Section 5200** of these Specifications.

4. Connections of new conduit to new structures is considered incidental to the construction of the structures, and will not be measured.

5. Connection of new conduit to existing structures that have been acceptably completed will be measured on per each basis.

5100.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
ELECTRICAL CONDUIT		
5100	1″ Schedule 40 PVC	LF
5102	1″ Schedule 80 PVC	LF
5104	1.5″ Schedule 40 PVC	LF
5106	1.5″ Schedule 80 PVC	LF
5120	2″ Schedule 40 PVC	LF
5122	2″ Schedule 80 PVC	LF
5124	2.5″ Schedule 40 PVC	LF

Bid Item	Description	Units
5126	2.5″ Schedule 80 PVC	LF
5130	3″ Schedule 40 PVC	LF
5132	3″ Schedule 80 PVC	LF
5140	4″ Schedule 40 PVC	LF
5142	4″ Schedule 80 PVC	LF
5160	6″ Schedule 40 PVC	LF
5162	6″ Schedule 80 PVC	LF
5170	2″ Schedule 40 PVC Bore, including Bore Pits, Conduit, Utility Line Openings, Sawing, 6″ Sidewalk/Driveway/Ramp Removal and Replacement with 3″ CABC and Grading, Tie Bars, Curb Stop Adjustments, Turf Restoration, and Traffic Control	LF
5172	3″ Schedule 40 PVC Bore, including Bore Pits, Conduit, Utility Line Openings, Sawing, 6″ Sidewalk/Driveway/Ramp Removal and Replacement with 3″ CABC and Grading, Tie Bars, Curb Stop Adjustments, Turf Restoration, and Traffic Control	LF
CONNECTIONS		
5180	Connect to Existing Pull Box	EA
5181	Connect to Existing Conduit	EA
5182	Connect to Existing Vault	EA

2. Payment for Electrical Conduit Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for providing by-pass service (if necessary); for forming foundation; for placing conduits; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work.

3. Payment for Bid Items #5170 and #5172 is full compensation for providing all necessary labor, equipment, and materials; for saw cutting pavement, as necessary; for removing any pavement, as necessary; for excavating bore pits; for exposing any utility services through Utility Line Openings; for furnishing and installing specified conduit through directional boring operations; for furnishing and installing 6″ concrete pavement as outlined in Bid Item #1510, including sidewalk tie bars; for adjusting curb stops to surface elevation, as necessary; for restoring all turf surfaces, as necessary; for maintaining traffic and coordinating with CITY; and for cleaning up of the site.

4. Payment for Connections Bid Items is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for providing by-pass service (if necessary); for drilling or punching connection to existing structures; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work.

5. Work performed one foot (1′) or less below the structure bottom to form a satisfactory foundation as specified is incidental to the work. The CITY will pay for work required at depths greater than one foot (1′) below the structure bottom as extra work.

SECTION 5200
ELECTRICAL WIRING/FIBER

5200.1 Description

1. This Section describes providing and installing electrical and communications wiring within conduit. Conduit construction is covered in **Section 5100** of these Specifications.

5200.2 Materials

5200.2.1 General

1. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as required meeting application and NEC requirements.

2. Soft drawn copper wire with six hundred (600) volt insulation.

3. Annealed copper in accordance with **ASTM B-33**.

4. Stranding: Class B in accordance with **ASTM B-8**, except 12AWG branch circuits may be solid.

5. Rubber: Conform to the requirements of **NEMA WC 3**.

6. Cross-Linked Polyethylene: Conform to **NEMA WC 7**.

7. Ethylene Propylene Rubber: Conform to **NEMA WC 8**.

5200.2.2 Electrical Wiring for Lighting

1. All wire shall be USE rated, 600 volt XLP insulated, single-conductor stranded copper.

2. Provide wire sizes as shown in the Plans. Minimum wire size shall be 12AWG.

3. Identify insulated conductors by covering the insulation surface with a tough, strongly-adhered, color coating conforming to Method I, or by surface printing conforming to Method III of IPCEA (Insulated Power Cable Engineers Association) – **NEMA Standard S-19-81**. Do not use white coatings on ungrounded conductors.

4. On 4AWG conductor or larger; when color coding is necessary, the CONTRACTOR shall provide color coding per WSEC. On 6AWG conductor or smaller, use the insulation color per the Drawings and furnish conforming to industry standards and the WSEC.

5. Color-code both tails of all ungrounded circuit conductors at splices and fuse holders per the Drawings. Use color tape to identify circuits, half-lap the tape for a minimum of two inches (2") using ENGINEER-approved colored tape.

6. When there is more than one (1) circuit, bundle the circuit conductors with nylon cable ties, or approved electrical tape at all access points. At each hand-hole, identify the "line side" of each circuit with tape, colored per the Drawings.

5200.2.3 Data Wiring

1. Above Ground Installation: Third-party verified TIA/EIA 568-B.2, Category 5E.
   A. ANSI/TIA/EIA-568-B.2 Commercial Building Telecommunications Cabling Standard Part 2 Balanced Twisted-Pair Cabling.
   B. Ratings: CMR, CMX – Outdoor, Ethernet/IP Compliant.
   C. Cable run lengths between network devices shall not exceed one hundred (100) meters, including patch/jumper cables.

2. Underground Installation: Provide cable compliant with Fieldbus IEC 61158-2 (ISA/SP-50) with orange jacket, NEC: PLTC/ITC-ER CMG CMX-Outdoor, CEC: CMGFT4.

3. Four (4) pair conductors per network device.

4. Installation Temperature: Minus twenty-five to positive seventy-five degrees Celsius (-25°C - +75°C).

5. Operating Temperature: Minus forty degrees to positive seventy-five degrees Celsius (-40°C - +75°C).

6. Passes minus twenty-five degrees Celsius (-25°C) cold bend per **UL 1581**.

7. Provide shielding, as necessary, when network equipment requires it.

5200.2.4 Traffic Detector Wiring

1. Unshielded Wire:
   A. USE rated, XPL Insulated wire.
   B. Single conductor.
   C. Seven (7) strand copper wire.
   D. Black coated.
   E. 12AWG or 14AWG, as noted on Drawings.

2. Shielded Wire:
   A. Conform to **IMSA Specification Number 50-2**.

B. Polyethylene Insulated.
C. Dual conductor.
D. Seven (7) strand copper wire.
E. Black coated.
F. 12AWG or 14AWG (one (1) or two (2) conductor), as noted on Drawings.
G. 16AWG drain wire.

5200.2.5 Traffic Signal Wiring

1. Furnish solid copper conductor traffic signal cables conforming to **IMSA Specification Number 19-1** or **20-1**. Provide wire size and number of conductors as shown on the Drawings.

2. For wiring that extends from the terminal strip in each signal head to the mounting base, use an **IMSA 19-1** or **20-1** cable, 14 AWG 3, 5, 7, or 9 conductor, as required.

3. For signal wiring, use **IMSA 19-1** or **20-1**, 14 AWG Solid 3, 5, 7, 9, 12, 20, 21, or 25 conductors, as required.

5200.2.6 Ground Wire

1. Grounding conductor and equipment grounding conductor shall be single-conductor, stranded copper, 600 V AC, XLP Green Insulated, USE Rated, sized per NEC ART 250.

5200.2.7 GLR Fuses and Fuse Holders

1. All lighting units and festoon circuit undergrounded phase conductors shall be fused with GLR9type fuses and fuse holders, unless otherwise stated.

5200.3 Construction

5200.3.1 General

1. Do not splice underground in pull boxes, vaults, or conduit. CONTRACTOR may splice underground loop detector lead-in cable to loop wire. Do not leave wire or cable ends uncovered or submerged in water. If the ENGINEER observes a submerged condition, the ENGINEER may reject the entire length of cable or wire. Make all electrical connections and splices with a UL- or NRTL-approved mechanical-type connector.

2. Cover tape with a liberal coating of an ENGINEER-approved electrical varnish or sealant providing flexible protection from oil, moisture, and corrosion.

3. Make electrical connections in traffic signal bases with spring-wound wire nuts, insulated with a soft plastic covering, or as detailed on the Drawings. Extend wire for termination a minimum of eighteen inches (18″) beyond the pole or signal base standard access point. Provide a minimum of sixty inches (60″) of cable wire to be pulled into cabinets and left for terminations.

4. For all cables entering each pull box or vault, except loop detector lead-in cables, provide an extra loop, approximately six feet (6′) in length, to remain in each pull box or vault. This loop of cable is in addition to the amount needed to reach between each structure.

5. Install conductors in continuous lengths without splices from termination to termination. The CONTRACTOR may splice only at hand-holes in the bases of traffic signal standards or poles. At locations where no transformer bases exist, splice at the hand-holes in poles.

6. Bid Item #5310 (Pulling/Installing CITY-Supplied 12-Strand Fiber) shall conform to **Section 678** of the STATE SPECIFICATIONS, except where noted in the Measurement and Payment Sections below.

5200.3.2 Installation

1. All work **must** be coordinated with the City Electrician. Contact City Electrician a minimum of three (3) working days prior to commencing work. **No work is allowed to commence without the approval of the City Electrician**.

2. Install (“Pull”) wires with NEC-recognized wire installation equipment.

5200.3.3 Lighting Wiring

1. Install conductors in continuous lengths without splices from the cabinet terminal to pole hand-hole or transformer base. Do not splice in pull boxes or vaults.

2. Install conductors from the fixture to the fuse assembly using a continuous length of 12AWG, XLP insulated wire without splices. Provide sufficient length in the pole shaft to allow easy removal and subsequent servicing of the fuse assembly through the pole hand-hole.

3. When more than one (1) fixture is mounted on a pole, provide wiring from the fixtures to the fuses in the hand-hole for each fixture. Fixtures are to be wired separately.

4. For all wires entering each pull box or vault, provide an extra loop, approximately six feet (6′) in length, to remain in each pull box or vault. This loop is wire is in addition to the amount of wire needed to reach from structure to structure.

5200.3.4 Loop-Detector Wiring

1. Furnish and install wiring for traffic signal loop detectors.

2. Loop-detector wiring shall be installed within one-inch (1″) PVC conduit (see **Section 5100** of these Specifications). CONTRACTOR may install wiring within conduit prior to installing conduit.

3. Do not provide additional length of loop-detector wire within pull boxes or vaults.

4. Install loop-detector wire from roadside pull box or vault around the loop for the number of turns noted on Drawings, and back to the roadside pull box or vault in a single continuous (non-spliced) length.

5. Loop-detector lead-in cable shall be spliced the same day as the wire installation whenever possible. When this is not possible, the ends of the wire shall be sealed with tar or electrical sealant to prevent water from entering the insulating jacket of the wire. If water enters the insulating jacket of the wire, the entire length of wire shall be removed and replaced, at CONTRACTOR's cost.

6. Loop inductance, ground resistance, and loop-wire resistance at the pull box shall be measured immediately upon installation. Furnish a copy of the results to the ENGINEER.

7. Ground resistance shall be measured utilizing a megger. Loop wire not attaining a reading of infinity to ground shall be replaced, at CONTRACTOR's cost.

5200.3.5 Loop-Detector Lead-In Cable

1. Furnish and install loop-detector lead-in cable, splice loop, and lead-in cable together in the pull box, and connect the lead in cable to proper terminals in the control cabinet.

2. Install the loop-detector lead-in cable in electrical conduit (see **Section 5100** of these Specifications). For lead-in cable from the pull box to the control cabinet, install lead-in cable in conduit either with or without other cables. Do not provide an extra length of loop lead-in cable in pull boxes. For each loop, use a separate lead-in cable to the control cabinet. Cut the drain wire flush with the lead-in cable jacket.

3. Splice cables using cast-in-place splice kits from an approved manufacturer. Make splices as soon as possible after installing loop-detector lead-in cable.

4. If unable to splice the lead-in cable the day the wire is installed, seal the cable ends with tar or electrical sealant to keep water out of the insulating jacket of the cable. If water enters the cable-insulating jacket, remove and replace the cable at CONTRACTOR's cost.

5. Lead-in cable splices shall consist of a non-insulated butt connector, connecting one (1) loop wire to one (1) loop lead in cable wire. Crimp and solder this connection with electrical multi-flux core. Crimp-connect and solder the second two (2) wires in the same manner. Half lap tape the solder connections with an approved, rubber high-voltage tape. Half lap tape each connection with an approved, vinyl electrical tape and insulate connections from each other before placing in the splice kit. Coat each connection with an approved electrical varnish and allow the coating to dry. After drying, install the splice capsule in conformance with the manufacturer's recommendations.

6. ENGINEER may require random inspections of splice connections. ENGINEER will randomly select splices to be inspected for compliance with installation requirements. Any splices found to be non-compliant shall be replaced at CONTRACTOR's cost.

7. After splicing is complete, measure the inductance, ground resistance, and wire resistance at the cabinet end of the lead-in cable. Furnish copy of the results to ENGINEER for review.

5200.3.6 Grounded Conductor and Equipment Grounding Conductor for Traffic Signals

1. Connect the white 14AWG wires in the signal-head mounting base to the white grounded conductor in the feeder cable.

2. Terminate all grounded conductors on a bus mounted in the cabinet and isolated from the cabinet and equipment-grounding conductor. Terminate the grounded-conductor bus at the grounding lug in the electrical service meter pedestal or meter socket.

3. Terminate all equipment-grounding conductors on the equipment-grounding bus that is isolated from the grounded-conductor bus. Terminate the equipment-grounding bus at the grounded lug in the electrical service meter breaker pedestal service disconnect or the meter socket, or terminate at the grounding lug of the breaker enclosure if the service is unmetered.

4. Make the equipment-grounding connection in the signal pedestal base, or in a pole transformer base, with a pigtail and wire nut or other set screw type method approved by the CITY's Electrical Division to an equipment-grounding conductor. Extend the equipment-grounding conductor from the equipment-grounding bus in the traffic-signal cabinet, from base to base around the intersection in a complete closed circuit. Ensure the pull box is bonded to the frame and the cover is bonded to the frame with a jumper from the nearest signal base.

5. Make electrical connections in the traffic-signal base with spring-wound wire nuts, insulated with a soft flexible covering.

6. Use 10AWG, bare copper wire, or green XLP insulated, a minimum of sixteen inches (16″) in length for pigtails. Attach one (1) end of the pigtail to an approved, mechanical connector lug and place the connector inside the base, under the head of a ¼″-20 x ¾″ hex head, stainless-steel cap screw tapped into the base.

5200.3.7 Splices

1. Splices and taps in wiring shall only be permitted in hand holes in light-pole bases. Provide sufficient slack in the wiring to withdraw the splices a minimum of twenty-four inches (24″) from the pull box. The additional wire necessary to withdraw the splices is considered incidental to the installation of the wiring, and will not be added to the overall length of wiring.

2. Provide insulated black-type port and set screw connectors: Polaris, NSI, Burndy, or Approved Equal.

3. Splices shall be made in light-pole hand holes only. Do not splice in pull boxes or vaults.

5200.4 Measurement

1. The CITY will measure the Electrical Wiring Bid Items that have been acceptably completed on a linear foot basis. Measurement will be from structure to structure. Additional loops of wiring required within any structure are considered incidental to the overall length of wire installed.

2. The CITY will measure Bid Item #5310 that has been acceptably completed on a linear foot basis. Measurement will be from structure to structure. Additional loops of fiber required within any structure are considered incidental to the overall length of fiber installed. Eighty (80) linear feet of slack/loop will be required in each vault and twenty (20) linear feet of slack/loop will be required in each pull box.

3. Splices and connections are considered incidental to the construction of the wiring, and will not be measured for payment separately.

5200.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
ELECTRICAL WIRING		
5200	1 Gauge Red-Coated Wire	LF
5201	1 Gauge Black-Coated Wire	LF

Bid Item	Description	Units
5202	1 Gauge Green-Coated Wire	LF
5203	1 Gauge White-Coated Wire	LF
5204	1 Gauge Orange-Coated Wire	LF
5205	1 Gauge Yellow-Coated Wire	LF
5206	1 Gauge Brown-Coated Wire	LF
5207	1 Gauge Blue-Coated Wire	LF
5208	1 Gauge Grey-Coated Wire	LF
5209	1 Gauge Coated Wire	LF
5210	2 Gauge Red-Coated Wire	LF
5211	2 Gauge Black-Coated Wire	LF
5212	2 Gauge Green-Coated Wire	LF
5213	2 Gauge White-Coated Wire	LF
5214	2 Gauge Orange-Coated Wire	LF
5215	2 Gauge Yellow-Coated Wire	LF
5216	2 Gauge Brown-Coated Wire	LF
5217	2 Gauge Blue-Coated Wire	LF
5218	2 Gauge Grey-Coated Wire	LF
5219	2 Gauge Coated Wire	LF
5220	3 Gauge Red-Coated Wire	LF
5221	3 Gauge Black-Coated Wire	LF
5222	3 Gauge Green-Coated Wire	LF
5223	3 Gauge White-Coated Wire	LF
5224	3 Gauge Orange-Coated Wire	LF
5225	3 Gauge Yellow-Coated Wire	LF
5226	3 Gauge Brown-Coated Wire	LF
5227	3 Gauge Blue-Coated Wire	LF
5228	3 Gauge Grey-Coated Wire	LF
5229	3 Gauge Coated Wire	LF
5230	4 Gauge Red-Coated Wire	LF
5231	4 Gauge Black-Coated Wire	LF
5232	4 Gauge Green-Coated Wire	LF
5233	4 Gauge White-Coated Wire	LF
5234	4 Gauge Orange-Coated Wire	LF
5235	4 Gauge Yellow-Coated Wire	LF
5236	4 Gauge Brown-Coated Wire	LF
5237	4 Gauge Blue-Coated Wire	LF
5238	4 Gauge Grey-Coated Wire	LF
5239	4 Gauge Coated Wire	LF
5240	6 Gauge Red-Coated Wire	LF
5241	6 Gauge Black-Coated Wire	LF
5242	6 Gauge Green-Coated Wire	LF

Bid Item	Description	Units
5243	6 Gauge White-Coated Wire	LF
5244	6 Gauge Orange-Coated Wire	LF
5245	6 Gauge Yellow-Coated Wire	LF
5246	6 Gauge Brown-Coated Wire	LF
5247	6 Gauge Blue-Coated Wire	LF
5248	6 Gauge Grey-Coated Wire	LF
5249	6 Gauge Coated Wire	LF
5250	8 Gauge Red-Coated Wire	LF
5251	8 Gauge Black-Coated Wire	LF
5252	8 Gauge Green-Coated Wire	LF
5253	8 Gauge White-Coated Wire	LF
5254	8 Gauge Orange-Coated Wire	LF
5255	8 Gauge Yellow-Coated Wire	LF
5256	8 Gauge Brown-Coated Wire	LF
5257	8 Gauge Blue-Coated Wire	LF
5258	8 Gauge Grey-Coated Wire	LF
5259	8 Gauge Coated Wire	LF
5260	10 Gauge Red-Coated Wire	LF
5261	10 Gauge Black-Coated Wire	LF
5262	10 Gauge Green-Coated Wire	LF
5263	10 Gauge White-Coated Wire	LF
5264	10 Gauge Orange-Coated Wire	LF
5265	10 Gauge Yellow-Coated Wire	LF
5266	10 Gauge Brown-Coated Wire	LF
5267	10 Gauge Blue-Coated Wire	LF
5268	10 Gauge Grey-Coated Wire	LF
5269	10 Gauge Coated Wire	LF
5270	12 Gauge Red-Coated Wire	LF
5271	12 Gauge Black-Coated Wire	LF
5272	12 Gauge Green-Coated Wire	LF
5273	12 Gauge White-Coated Wire	LF
5274	12 Gauge Orange-Coated Wire	LF
5275	12 Gauge Yellow-Coated Wire	LF
5276	12 Gauge Brown-Coated Wire	LF
5277	12 Gauge Blue-Coated Wire	LF
5278	12 Gauge Grey-Coated Wire	LF
5279	12 Gauge Coated Wire	LF
5280	14 Gauge Red-Coated Wire	LF
5281	14 Gauge Black-Coated Wire	LF
5282	14 Gauge Green-Coated Wire	LF
5283	14 Gauge White-Coated Wire	LF

Bid Item	Description	Units
5284	14 Gauge Orange-Coated Wire	LF
5285	14 Gauge Yellow-Coated Wire	LF
5286	14 Gauge Brown-Coated Wire	LF
5287	14 Gauge Blue-Coated Wire	LF
5288	14 Gauge Grey-Coated Wire	LF
5289	14 Gauge Coated Wire	LF
DATA WIRING		
5300	4 Pair Shielded CAT5	LF
5302	4 Pair Shielded CAT5E	LF
5304	4 Pair Shielded Underground Data Cable	LF
5310	Pulling/Installing CITY-Supplied 12-Strand Fiber	LF
TRAFFIC DETECTOR WIRING		
5350	12 Gauge Stranded Wire	LF
5352	14 Gauge Stranded Wire	LF
5354	12 Gauge Stranded Single Pair Twisted with Shield	LF
5356	14 Gauge Stranded Single Pair Twisted with Shield	LF
SIGNAL WIRE		
5360	14 AWG Solid 3 Conductor	LF
5362	14 AWG Solid 5 Conductor	LF
5364	14 AWG Solid 7 Conductor	LF
5366	14 AWG Solid 9 Conductor	LF
5368	14 AWG Solid 12 Conductor	LF
5370	14 AWG Solid 20 Conductor	LF
5372	14 AWG Solid 21 Conductor	LF
5374	14 AWG Solid 25 Conductor	LF
FUSES AND FUSE HOLDERS		
5380	Fuse Holder	EA
5382	1 AMP Fuse	EA
5384	1.5 AMP Fuse	EA
5386	2 AMP Fuse	EA
5388	3 AMP Fuse	EA
5390	4 AMP Fuse	EA
5392	5 AMP Fuse	EA
5394	10 AMP Fuse	EA
5396	15 AMP Fuse	EA
5398	20 AMP Fuse	EA

2. Payment for Electrical Wiring Bid Items is full compensation for providing all necessary labor, equipment, and materials; for providing by-pass service (if necessary); for "pulling" wires; for connecting wires at each end; and for cleaning and restoring the site of the work.

3. Payment for Bid Item #5310 is full compensation for providing all necessary labor, equipment, and materials; for "pulling" and/or installing fiber; and for cleaning and restoring the site of the work.

SECTION 5300
NOT USED

SECTION 5400
LIGHTS

5400.1 Description

1. This Section describes installing CITY-supplied light fixtures, traffic signals, trombone arms, luminaire arms, and light poles.

5400.2 Materials

5400.2.1 General

1. CITY will supply light fixtures and light poles. Cut sheets of the poles and fixtures being supplied are included in the Special Conditions.

5400.3 Construction

5400.3.1 General

1. All work **must** be coordinated with the City Electrician. Contact City Electrician a minimum of three (3) working days prior to commencing work. **No work is allowed to commence without the approval of the City Electrician**.

2. CONTRACTOR shall assemble and install.

3. Installation shall be per manufacturer's recommendations and enclosed Detail Drawings.

4. After completing erection of poles, whether CITY-supplied or otherwise, CONTRACTOR shall ensure that the centerline of the shaft is vertical, i.e. the pole shall be installed plumb.

5400.3.2 Light Poles and Pole Top Lights

1. Install poles, luminaries, and base covers; and install pole wiring and appurtenances for lighting at the locations, as shown on the Plans, in accordance to the requirements of the Plans, the current edition of the *Standard Specifications for City of Oshkosh, Wisconsin*, and as hereinafter provided.

2. Install the pole wiring, fusing, connections, and circuit tags in accordance to the STATE SPECIFICATIONS for Non-Freeway Lighting Unit Pole Wiring.

3. Assemble and install the lighting unit in accordance to the manufacturer's instructions. Install the lighting assembly on a concrete base and provide all necessary miscellaneous materials required for a complete operating lighting unit. Connections are included in this Bid Item.

4. All connections within the pedestal base shall be made with an approved 3-port, insulated set screw connector, 14-4 gauge wire connector.

5400.3.3 Traffic Signal Poles

1. Clean each pole prior to installation. Before installing, clean the mill scale, oil, and foreign material off the transformer bases, the traffic signal pedestal bases, and all other aluminum bases.

2. Thread traffic signal standards into their pedestal bases without damaging the threads. Ensure the base is level on its concrete foundation and the standard is vertical after all connections are tight.

3. Install a grounding lug either inside the base or pole, as required, to connect equipment grounding conductors.

5400.3.4 Traffic and Pedestrian Signals and Pedestrian Push Buttons

1. The CITY will provide the traffic signals, pedestrian signals, and related pedestrian push buttons.

2. CONTRACTOR to furnish any miscellaneous tools, hardware, and components not included on the CITY's equipment list that are needed to complete the equipment installation.

3. All signal heads shall be covered or turned away from view of the traveling public until the signal is accepted for use and activated.

4. Provide three-quarter inch (¾") hole for wiring purposes in standards of poles. De-burr the holes after sawing, tap for three-quarter inch (¾") pipe thread, and install plastic bushing (Appleton BB75 or Approved Equal) before installing the wire.

5. Provide, at three-quarter inch (¾") diameter, push button mounting hole for wiring purposes in standards of poles. De-burr the holes after sawing and before installing the wire. Plug the opening in the bottom of the pedestrian push button with a threaded pipe plug. Drill a one-quarter inch (¼") diameter hole in the plug for drainage purposes. Use IMSA 50-2 loop lead in cable to wire the push button to the conductors in the base, which are included with this Bid Item.

6. Use standard poly bracket mountings.

7. Signal Mounting Hardware:
   A. Install mounting hardware necessary to attach pedestrian and traffic signal faces to standards, poles, monotube arms, and trombone arms.
   B. Seal all voids between mounting brackets and poles by using silicon or rubberized caulking or similar material, as approved by the ENGINEER.
   C. Install ENGINEER-approved sealing or closure pinnacles with neoprene/rubber washers in all topside holes of upper signal-face head-mounting brackets. Plug bottom holes on bottom-mounting brackets with ENGINEER-approved sealing or closure pinnacles.
   D. If using two (2) brackets with two (2) mounting holes in each bracket, only use the upper hole of the top bracket to bolt the bracket to a pole or standard. Band the lower end of the upper bracket and the lower bracket to the pole or standard using ¾″ wide, 0.025″ thick, stainless-steel bands. Use stainless-steel clips.
   E. Mount brackets banded to poles or standards so the traffic signal assemblies are immovable. Mount all other traffic signal and pedestrian assemblies so they are immovable.
   F. Furnish stainless-steel, hex-head, cap screw 3/8″-24 MF mounting bolts. Drill and tap the pole or standard to match. Do not extend the bolt more than one-quarter inch (¼″) through the wall, into the interior cavity of the pole or standard. Use a stainless-steel flat washer sized to properly cover the bolt hole in the bracket and a stainless-steel lock washer with each bolt.

5400.4 Measurement

1. The CITY will measure the light fixture, traffic signal, trombone arm, luminaire arm, and light pole Bid Items that have been acceptably completed on per each basis.

5400.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
	LIGHTS	
5400	Install CITY-Supplied Single Head Structure	EA
5402	Install CITY-Supplied Double Head Structure	EA
5404	Install CITY-Supplied Four (4) Section Head Structure	EA
5410	Install CITY-Supplied Pole and Pole Top Luminaire	EA
5412	Install CITY-Supplied Inverted Acorn Structure	EA
5414	Install CITY-Supplied Inverted Acorn Luminaire, Pole, Transformer Base, Drop-Over Base, and Arm; and Complete Structure	EA

Bid Item	Description	Units
5420	Install CITY-Supplied Ten-Foot (10′) Traffic Signal Pole With a Pedestal Base	EA
5421	Install CITY-Supplied Thirteen-Foot (13′) Traffic Signal Pole With a Pedestal Base	EA
5422	Install CITY-Supplied Fifteen-Foot (15′) Traffic Signal Pole With a Pedestal Base	EA
5424	Install CITY-Supplied Twenty-Foot (20′) Traffic Signal Pole With a Transformer Base	EA
5426	Install CITY-Supplied Thirty-Foot (30′) Traffic Signal Pole With a Transformer Base	EA
5428	Install CITY-Supplied Fifteen-Foot (15′) Trombone Arm	EA
5430	Install CITY-Supplied Twenty-Foot (20′) Trombone Arm	EA
5431	Install CITY-Supplied Twenty-Five Foot (25′) Trombone Arm	EA
5432	Install CITY-Supplied Thirty-Foot (30′) Trombone Arm	EA
5434	Install CITY-Supplied Three (3) Section Traffic Signal Head, Back Plate, and LED Modules	EA
5436	Install CITY-Supplied Five (5) Section Traffic Signal Head, Back Plate, and LED modules	EA
5438	Install CITY-Supplied Pedestrian Signal Head With Countdown Timer	EA
5440	Install CITY-Supplied Pedestrian Push Button	EA
5450	Install CITY-Supplied Six-Foot (6′) Luminaire Arm	EA
5452	Install CITY-Supplied Eight-Foot (8′) Luminaire Arm	EA
5454	Install CITY-Supplied Ten-Foot (10′) Truss-Type Luminaire Arm	EA
5456	Install CITY-Supplied Twelve-Foot (12′) Truss-Type Luminaire Arm	EA
5460	Install CITY-Supplied Cobra Head Luminaire	EA
5470	Install CITY-Supplied Type 9 Pole	EA
5472	Install CITY-Supplied Type 9 Special Pole	EA
5474	Install CITY-Supplied Type 10 Pole	EA
5476	Install CITY-Supplied Type 10 Special Pole	EA
5480	Install CITY-Supplied Type 9 Monotube up to and including Thirty-Foot (30′) Arm	EA
5482	Install CITY-Supplied Type 9 Monotube Thirty-Five Foot (35′) Arm	EA
5484	Install CITY-Supplied Type 9 Monotube Forty-Foot (40′) to Fifty-Foot (50′) Arm	EA
5486	Install CITY-Supplied Type 10 Monotube up to and including Thirty-Foot (30′) Arm	EA
5488	Install CITY-Supplied Type 10 Monotube Thirty-Five Foot (35′) Arm	EA

Bid Item	Description	Units
5490	Install CITY-Supplied Type 10 Monotube Forty-Foot (40′) to Fifty-Foot (50′) Arm	EA
5492	Install CITY-Supplied Type 10 Monotube Luminaire Arm; Fifteen-Foot (15′) Maximum	EA
5494	Install CITY-Supplied 20′ Tapered Pole with Transformer Base	EA
5496	Install CITY-Supplied 30′ Tapered Pole with Transformer Base	EA

2. Payment for Light Bid Items is full compensation for providing all necessary labor, equipment, and materials for delivering the CITY-supplied equipment to the site; for installing all materials, including hardware, fittings, mounting devices, shims, and attachments necessary to completely install the pole and base; and for cleaning and restoring the site of the work.

3. Payment for Traffic and Pedestrian Signal and Push Button Bid Items shall include all connections to wiring. Wiring quantities will be paid for under separate Bid Items.

SECTION 5500
BASES

5500.1 Description

1. This Section describes furnishing and installing bases for light poles and electrical control cabinets.

5500.2 Materials

5500.2.1 General

1. Use Schedule 40 PVC Conduit (see **Section 5100** of these Specifications) for all conduit penetrations.

2. Anchor Bolts: CONTRACTOR to provide anchor bolts for mounting poles to bases. All anchor bolts shall be hot-dipped zinc coated in conformance to **ASTM A-153**.

3. Steel reinforcing bars: Conform to Section **100.70.3.7** of these Specifications.

4. Concrete: Class A Concrete in accordance with **Section 100.70.4.1** of these Specifications.

5500.3 Construction

5500.3.1 General

1. All work **must** be coordinated with the City Electrician. Contact City Electrician a minimum of three (3) working days prior to commencing work. **No work is allowed to commence without the approval of the City Electrician**.

2. All bases shall be constructed plumb and level with orientation and depth coordinated with arrangement of connecting conduits to minimize bends and deflections required for proper conduit penetrations.

5500.3.2 Excavation

1. The excavation shall be limited to the size required for the base to be constructed.

2. Understand the proposed elevations, as shown on the Drawings, are subject to revisions in order to fit field conditions; therefore, the ENGINEER may have to adjust the grades from those shown on the Drawings.

3. Bases shall be located as shown on the Drawings. The ENGINEER may have to adjust the location from those shown on the Drawings based upon field conditions encountered during construction.

5500.3.3 Constructing Foundation

1. Construct the foundation to prevent subsequent settlement of the bases.

2. The CONTRACTOR may not construct bases in rock, wet conditions, or on a firm earth subgrade, unless otherwise specified.

3. Unless otherwise specified, the CONTRACTOR shall construct the bases on a backfilled granular foundation or bed. When placing on backfilled granular foundation, excavate to at least twelve inches (12") below the elevation established for the bottom of the base. Backfill this depth with **"¾-inch clear stone"** meeting the requirements for No. 1 stone in **Section 501.2.5.4** of the STATE SPECIFICATIONS. Compact the material before placing the constructing on the backfilled granular material.

4. Install sand around all conduit connections to bases.

5. If the Construction Details show types of bedding, or required trench widths other than described above, conform to the Construction Details.

5500.3.4 Backfilling

1. Backfill all bases as described in **Section 100.61** of these Specifications.

5500.4 Measurement

1. The CITY will measure the Base Bid Items that have been acceptably completed on a per each basis.

2. Embedded conduit shall be considered incidental to the Base Bid Item, and shall not be measured.

5500.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Items:

Bid Item	Description	Units
	BASES	
5500	Type 1 Base	EA

Bid Item	Description	Units
5502	Type 2 Base	EA
5503	Type 2 Leveling Nut Base; 4.5" Bolt Projection	EA
5504	Type 5 Base	EA
5505	Type 5 Leveling Nut Base; 4.5" Bolt Projection	EA
5506	Type 9 Base	EA
5508	Type 2 Modified Base	EA
5510	Type 2 Parking Lot Base, 7' Below Grade, 3' Above Grade	EA
5512	Type 10 Base	EA
5514	Type 13 Base	EA

2. Payment for Base Bid Items is full compensation for providing all necessary labor, equipment, and materials, including embedded conduit; for excavating; for sheeting and shoring; for forming foundations; for constructing bases; for providing granular backfill materials, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning and restoring the site of the work.

3. For Bid Item #5510, the Type 2 base shall follow **Standard Detail Drawing #21A** in these Specifications, Type 2 Base. It shall be installed with seven foot (7') bury depth and with three feet (3') of base exposed above ground. Total base height will be ten feet (10').

SECTION 5600
NOT USED

SECTION 5700
NOT USED

SECTION 5800
GUARD POSTS

5800.1 Description

1. This Section describes furnishing and installing of concrete-filled, ductile iron guard posts, as detailed in the Plans and hereinafter provided.

5800.2 Materials

5800.2.1 General

1. Furnish six-inch (6″) diameter ductile iron pipe, painted black (RAL Color #9017), in accordance to the current edition of **ANSI/AWWA C151.A21.51** – American National Standard for Ductile – Iron Pipe, Centrifugally Cast for Water.

2. Concrete: Class A Concrete in accordance with **Section 100.70.4.1** of these Specifications.

5800.3 Construction

5800.3.1 General

1. Construct guard posts as detailed and at the locations shown in the Plans. Apply the reflective sheeting per the manufacturer's recommendations.

5800.3.2 Excavation

1. Any excavation shall be limited to the size required for the guard post to be constructed.

2. Understand the proposed elevations, as shown on the Drawings, are subject to revisions in order to fit field conditions; therefore, the ENGINEER may have to adjust the grades from those shown on the Drawings.

3. Guard posts shall be located as shown on the Drawings. The ENGINEER may have to adjust the location from those shown on the Drawings based upon field conditions encountered during construction.

5800.3.3 Constructing Foundation

1. Construct the foundation to prevent subsequent settlement of the guard posts.

2. The CONTRACTOR may not construct guard posts in rock, wet conditions, or on a firm earth subgrade, unless otherwise specified.

5800.3.4 Backfilling

1. Backfill all guard posts as described in **Section 100.61** of these Specifications.

5800.4 Measurement

1. The CITY will measure the Guard Post Bid Item that has been acceptably completed on per each basis.

5800.5 Payment

1. The CITY will pay for the measured quantities at the Contract unit price for the following Bid Item:

Bid Item	Description	Units
	GUARD POSTS	
5800	Furnish and Install Guard Posts	EA

2. Payment for Guard Post Bid Item is full compensation for providing all necessary labor, equipment, and materials; for excavating; for sheeting and shoring; for forming foundations; for constructing guard posts; for providing granular backfill materials, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning and restoring the site of the work.

SIDEWALK ORDINANCE

SIDEWALK ORDINANCE
Section 25 Article VII
Revised through August 23, 2022

SECTION 25-42 CONSTRUCTION AND REPAIR REGULATED

No person, whether owner, builder, or contractor, shall build any new sidewalk, curb cut, or driveway approach or repair or renew, or cause to be built, repaired, or renewed any existing sidewalk, curb cut, or driveway approach contrary to the provisions of this Chapter.

The driveway approach shall be defined as the section of driveway for a property that is located between the curb or edge of pavement of a public street and the property line or street side of the public sidewalk.

SECTION 25-43 BOARD OF PUBLIC WORKS AUTHORIZED TO CONSTRUCT AND REPAIR ADVERTISING FOR BIDS

(A) The Board of Public Works is empowered and directed to proceed with the construction and repair of concrete sidewalks without advertising for bids upon such work.

(B) The Board shall advertise for bids upon all material and supplies, the estimated cost of which shall exceed One Thousand Dollars ($1,000.00). Said work shall not be done on any street until specifically ordered as required by law.

SECTION 25-44 STATE LAW APPLICABLE

In addition to the provisions of this Chapter, the provisions of Section 66.0907 of the Wisconsin Statutes, so far as applicable to this City, shall govern the construction, improvement and repair of sidewalks.

SECTION 25-45 CONCRETE SIDEWALK LAYERS / CURB CUT CONTRACTORS LICENSE

No person, firm, or corporation shall engage in or carry on the business of constructing concrete sidewalks and driveway approaches or constructing or altering curb cuts in the city without procuring an excavation license and permit therefore from the office of the Department of Public works as herein provided

SECTION 25-46 CONCRETE SIDEWALK / CURB CUT CONTRACTORS - LICENSE; APPLICATION; CONTENTS

The application for an excavation license sidewalk layers/curb cut contractor's license shall state the name and place of business of the applicant and shall contain a statement by the applicant agreeing to abide by the rules and regulations and specifications adopted by the Board of Public Works and Director of Public Works and to obey all ordinances and resolutions of the City in relation to said work.

SECTION 25-47 CONCRETE SIDEWALK/CURB CUT CONTRACTOR - CHANGE IN BUSINESS NAME OR ADDRESS

A licensee shall immediately notify the Department of Public Works of every change of place of business or of the name under which the business of such licensee is carried on.

SECTION 25-48 LICENSE FEE; PAYMENT TO TREASURER

See section 25-12. The fee for such license shall not be pro-ratable.

SECTION 25-49 LIABILITY INSURANCE REQUIRED

See section 25-13.

SECTION 25-50 BOND

See section 25-14.

SECTION 25-51 SIDEWALK CONSTRUCTION - LIGHTS AND BARRIERS

Any person who shall construct or cause to be constructed any concrete sidewalks, including all contractors performing or supervising such construction, shall cause sufficient barriers to be erected and maintained during the period of construction and sufficient lighting to be placed at each end of the sidewalk and kept operating during darkness for the period of construction in accordance with Article V. above.

SECTION 25-52 SIDEWALK/CURB CUT/DRIVEWAY APPROACH CONSTRUCTION PERMIT; APPLICATION; CONTENTS; ISSUANCE BY BOARD OF PUBLIC WORKS

No sidewalk, curb cut, or driveway approach shall be excavated, altered, or constructed by any person, firm or corporation without a Right-of-Way Excavation permit issued by the Department of Public Works to construct the same, said permit shall be signed by the party responsible for the construction, and shall state the length of said proposed walk, any openings to be left therein or thereunder and the means proposed to cover or protect the same, and designating the premises in front of which the walk is to be constructed and the nature of the principal buildings thereof. The fee charged for this permit will be established by resolution by the Common Council

SECTION 25-53 SIDEWALK LINE AND GRADE

(A) Sidewalk location.

(1) General requirements.

All sidewalks in the City shall be constructed so that the inside sidewalk line abuts the outer edge of the City owned right-of-way, with the provision that the sidewalk line may be set so as to circumvent any trees which in the opinion of the City Forester should be left standing, except as herein-after provided.

(2) Exceptions.

(a) The sidewalk on the North side of West 11th Avenue between Mason Street and Weisbrod Street shall be located one foot six inches (1'6") inside the City right-of-way, line.

(b) The sidewalk on the West side of north Main Street between Allen Avenue and Linwood Avenue shall be located one foot (1') inside the City right-of-way, line.

(c) The sidewalk on the East side of Oak Street between Cleveland Avenue and East Parkway Avenue shall be located two and eight tenths feet (2.8') inside the City right-of-way, line.

(d) The sidewalk at the Northwest corner of the inter-section of White Swan Drive and Fairview Street shall be located so the back of the sidewalk follows the line of an arc having a radius of forty-four feet (44') and commencing at the south lot line of Lot 153, third Addition to North Point Plat and ending at the East Lot line of Lot 154, Third Addition to North Point Plat.

(e) The sidewalk commencing at a point on the West line of Grand Street located eighty-eight and seven tenths (88.7) feet north of East Irving Avenue, thence Northerly along a 10-foot radius curve concave to the East having a chord length of 17.3 feet as measured along the West line of Grand Street.

(f) The sidewalk on the west side of Idaho Street, between 8th Avenue and 9th Avenue, shall be located one foot east of the west right-of-way line.

(g) The sidewalk located on the north side of West 20th Avenue commencing at Minnesota Street to 155 feet east of Minnesota Street.

(h) The sidewalk on the west side of Harrison Street, commencing 171.09 feet south of the southwest corner of Linwood Avenue and Harrison Street to 205.99 south thereof shall be located one foot six inches inside the City right-of-way line.

The sidewalk on the west side of Harrison Street, commencing 200 feet north of the northwest corner of Smith Avenue and Harrison Street to 250 feet north thereof shall be located two feet inside the City right-of-way line.

(i) Villa Park, Deerfield and Maricopa Drives.

(B) Sidewalk grade

The City Engineer shall, upon granting of the permit determine the lines and grades of said walk and cause proper stakes set to designate the same on an offset line, and until such stakes are set the construction of said walk, except the excavation therefor, shall not be commenced.

(C) Sidewalk grade stakes

No person shall, without authority in writing from the City Engineer, interfere with, alter the position or level of, remove or destroy any line or grade stakes set by the City Engineer or by his authority, before said walk is built in accordance therewith.

(D) Sidewalk slope

Unless otherwise specified by the City Engineer, the slope of all sidewalks shall be one-fourth of an inch per foot downward from the inner line to the outer line of the sidewalk, and the height of such walk at the inner line shall be determined by the City Engineer in accordance with the grade of the street or sidewalk established by the City Council. If no grade has been established, then the height shall be determined by the City Engineer in such manner as shall, in his judgment, make the same conform with the proper height of the street and adjoining sidewalks for street improvement purposes.

SECTION 25-54 SIDEWALK WIDTHS

(A) Widths - Standard

The widths of sidewalks on all streets and parts of streets, other than those for which different widths are prescribed, shall be five (5) feet.

(B) Widths - Certain streets

(1) All ordinances prescribing sidewalk widths on certain designated streets different than the standard width prescribed in Subsection (a) are incorporated into this chapter by reference thereto and shall be kept on file in the City Engineer's office. All such ordinances in force at the time of the adoption of this Code shall not be repealed by reason of adoption.

(2) The following sidewalks shall have widths as indicated:

(a) Beech Street from West Bent Avenue to Congress Avenue, both sides 4 feet.

(b) Georgia Street from West 9th Avenue to West 11th Avenue, West side - 4 feet.

(c) West South Park Avenue, North side, from Georgia Street to Berger Street, excepting those walks now presently existing - 4 feet.

(d) South Sawyer Street from West 9th Avenue to West 11th Avenue, West side - 4 feet.

(e) Kansas Street from West 9th Avenue to West 10th Avenue, East side - 4 feet.

(f) West side of North Main Street between Allen Avenue and Linwood Avenue - 4 feet.

(C) Widths - in front of public buildings
Sidewalks in front of the main entrance of all business establishments, churches, hospitals, schools, public halls, places of amusement, apartment houses, and other buildings and places of public character, shall occupy the entire space between the lot line and the curb wherever, in the judgment of the Board of Public Works, public convenience shall require it.

(D) Widths - Passage to curb
The owner of the premises may, when constructing a sidewalk in front of the premises extend a portion of the sidewalk to the curb at a place convenient for persons alighting from vehicles. Nothing contained in this Sub-section shall prevent the extension of a private driveway to the curb.

(E) Widths - Streets under 50 feet
Streets with a maximum width of fifty (50) feet shall have sidewalks with a width of four (4) feet.

(F) Widths - replacement of sidewalks with widths that vary from the standard five (5) feet. All replacement sidewalks shall be the same width as the sidewalk being replaced. The Board of Public Works may, upon request, authorize a variance in the width if it is in the best interests of the City.

SECTION 25-55 SIDEWALK THICKNESS

The thickness of all concrete sidewalks shall be four (4) inches except across existing or proposed driveways where the sidewalk shall be six (6) inches thick.

SECTION 25-56 SIDEWALK CONSTRUCTION - STANDARD SPECIFICATION

(A) Concrete construction required. All sidewalks built or rebuilt within the City street right-of-way shall be constructed of concrete as hereinafter prescribed.

(B) Material specifications

(1) All cement used in the construction of sidewalks shall be the best quality of American Portland cement and the Board of Public Works shall have the right to require a test of any cement proposed to be used in the construction of any sidewalks and to reject such cement and prohibit the same from being used if it does not conform to requirements.

(2) Portland cement shall be designation Type I or Type III, or for air entraining Portland cement Type I-A or Type III-A. Air entraining admixtures shall be added to Portland cement Type I or Type III. Air content of concrete shall be a minimum of 4% and maximum of 7%.

(3) Fine aggregate shall consist of sand having clean, hard, durable, uncoated grains, free from deleterious substances.

(4) Coarse aggregate shall consist of crushed stone, gravel or other approved inert materials with similar characteristics or combinations thereof, having clean, hard, durable, uncoated particles free from deleterious matter.

(5) The water used in mixing concrete shall be clean, free from acid, alkali, vegetable, or other organic matter.

(6) The sub-base or fill material shall be a durable material such as crushed stone, or bank-run sand or gravel.

(7) Expansion joint filler shall be half inch (l/2") preformed cork or bituminous fiber.

(8) The Board of Public Works is hereby authorized to amend these specifications at any time, provided that such amendment shall not conflict with any of the provisions of this chapter.

(C) Construction specifications

(1) Concrete shall be machine-mixed in the appropriate proportions of one (1) volume of Portland cement, two and one-quarter (2 1/4) volume of sand and three (3) volumes of coarse aggregate. There shall not be less than six (6) bags of cement per cubic yard of concrete. No more than six (6) gallons of water including that contained in the aggregate shall be used per sack of Portland cement.

(2) Excavation and subgrade preparation

(a) The subgrade shall be formed by trenching or filling to required elevation of the bottom of the concrete. Preparation of the subgrade shall include removal of all sod, loam earth, brush, shrubs, tree roots and stumps. The sub-base or fill material shall be thoroughly tamped to insure stability. Granular fill material shall be paved in layers not exceeding six (6) inches compacted thickness. In fills the sub-base shall be constructed to a width of at least eighteen (18) inches beyond both edges of the sidewalk.

(b) The licensee shall be responsible for all damage done to water shut-offs in the process of excavation or sidewalk construction and will be charged by the City for any repairs to water shut-offs. If the water shut-off falls into the sidewalk line, there shall be installed a Hudson box to protect the shut-off. Said Hudson box can be purchased from the City, however, the installation of the same will be the responsibility of the licensee.

(c) The licensee shall also be responsible for all iron property stakes. If an iron property stake is damaged or removed, the licensee shall hire a registered land surveyor to have same replaced. If this is not done, the City will hire the registered land surveyor and charge either the licensee or the abutting property on which the sidewalk was installed.

(3) Base:

There shall be installed a minimum of three (3) inches of granular base material under the sidewalk. Said base shall be leveled and thoroughly tamped to a uniform grade which is the same as that of the underside of the concrete.

(4) Forms:

Forms shall be of wood or metal and shall be straight and of sufficient strength to resist springing, tipping, or other displacement during the process of depositing and consolidating the concrete. If of wood, forms shall be surfaced plank of at least two (2) inches nominal thickness stock; if of metal, they shall be of approved section and shall have a flat surface on top. The forms shall be of a depth equal to the full depth of the sidewalk, at least six (6) inches in depth for that portion of the sidewalk abutting a driveway, or proposed driveway, and at least four (4) inches in depth for all other portions of the sidewalk. They shall be securely staked, braced, and held firmly to the required line and grade, and shall be sufficiently tight to prevent leakage of mortar. All forms shall be cleaned thoroughly and oiled before the concrete is placed against them.

(5) Placing and finishing concrete.

(a) The subgrade and forms shall be checked and approved by the City Engineer or his designee before the concrete is placed. The concrete shall be placed on a moist subgrade, deposited to the proper depth, and consolidated and spaded sufficiently to bring the mortar to the surface, after which it shall be struck off and floated with a wooden float. Before the mortar has set, the surface shall be steel troweled and given a brushed finish with a clean bristle brush. The finished surface must be uniformly smooth in appearance. Edging tools shall be used on all the joints and along the edges of the walk. Sprinkling of cement on the surface of the concrete to absorb water or to hasten hardening is prohibited. The sprinkling or adding of water to the surface of the concrete to aid in troweling or finishing the side walk shall be prohibited.

(b) No concrete shall be placed on a frozen base of subgrade.

(c) The concrete shall have a maximum slump of four (4") inches when placed.

(6) Joints:

(a) Contraction joints shall be placed at intervals of five (5') feet at right angles to the centerline of the sidewalk. Contraction joints shall be tooled or sawed to a depth of one-quarter (1/4) the total depth of the sidewalk or to a depth of one (1) inch for a four (4") thick walk and sidewalk. A one-half (1/2) inch expansion joint shall be placed at intervals of sixty (60) feet and whenever the new sidewalk abuts old walk, curb, a building or rigid structure. The joint filler shall be placed so as to completely separate the sidewalk, and the top of the filler shall be slightly below the finished surface of the sidewalk. The concrete at the faces of all joints shall be thoroughly spaded and compacted to fill the voids. The edges of the sidewalk along forms, joints, and metal slab division forms shall be rounded with an edger of one-quarter (1/4) inch radius.

(b) Joints shall not be sealed.

(7) Adjusting sidewalk to private entrance walks driveways:

Where existing concrete and asphalt entrance walks or asphalt driveways extend into the new sidewalk line, the licensee shall saw cut the concrete or asphalt on a line designated by the City Engineer or his designee and this material shall be removed to allow for construction of the new walk. After the sidewalk is constructed, the licensee shall do all patching necessary to form a satisfactory transition ramp from the entrance walk or driveway to the new sidewalk.

(8) Curing and protection:

(a) The newly placed concrete shall be cured by the Impervious Coating Method. As soon after finishing operations as the free water has disappeared, the concrete surface shall be sealed by spraying on it a uniform coating of curing material approved by the Engineer. The curing material shall be applied in such a manner as to provide a continuous water impermeable film on the entire concrete surface.

(b) The licensee shall erect and maintain suitable barricades to exclude pedestrian traffic from the newly poured sidewalks. Pedestrian traffic may be allowed to use the sidewalk any time after expiration of the curing period.

(c) The licensee shall follow construction procedures during cold weather as outlined or his designee. If the air temperature is forecast to drop below 40 degrees F., the licensee must cover all concrete poured during the previous 72 hours and shall protect the same with heavy paper and ten (10) inches to twelve inches of straw for a period of 72 hours after pouring.

(9) Restoring site of work:

At all times the licensee shall keep the working area free from an accumulation of waste material and rubbish. Periodic clean-up from work areas where construction has been completed, will be done by the licensee upon the direction of the City Engineer or his designee. Upon completion of the entire project, all work areas shall be restored to a neat and presentable condition.

SECTION 25-57 HOLLOW SIDEWALKS

(A) Plan approval by Board of Public Works. Whenever it is desired to utilize the space under the sidewalk in such a manner that the concrete sidewalk or any portion thereof shall extend over such space and constitute a hollow sidewalk, the sidewalk shall be structurally designed to carry a live load of not less than three hundred (300) pounds per square foot. The licensee must submit a detailed plan to the Board of Public Works for its approval prior to the commencement of construction, and the sidewalk shall be constructed in accordance with the approved plan and to the satisfaction of the Board of Public Works.

(B) Ventilation and access:

(1) Construction requirements.
No open or partially uncovered areas of any kind in any new or rebuilt concrete sidewalk, shall be made except when necessary for the purposes of ventilation of basements or spaces under buildings, in which case the open areas shall not extend more than five (5) inches outward from the inner line of the sidewalk and shall be securely covered by an open barred iron grating of a kind and in a manner approved by the Board of Public Works.

(2) Supporting walls.
All areas for ventilating purposes shall be properly protected by sufficient surrounding walls of brick, or concrete which shall extend upward to the sidewalk to prevent the breaking or crumbling away of the foundation of the sidewalk where it meets the ventilation area. Such walls shall be constructed in a manner satisfactory to the Board of Public Works.

(3) Exceptions.
Where the entrance to a basement now exists in any sidewalk, if properly built and guarded to the satisfaction of the Board of Public Works, it may be continued in use provided it is necessary for access to such basement from the street.

(4) Trap Doors.
Trap Doors will not be allowed except upon written approval of the Board of Public Works. If allowed, the trap door shall be designed for a live load of three hundred (300) pounds per square foot and shall close to a completely flush unit. If the trap door shall become hazardous or shall form a projection of any kind, it shall be repaired immediately. If not repaired within ten (10) days of written notice by the Board of Public Works, the Board shall cause same to be removed and the entrance or opening closed as per this ordinance.

(C) Coal holes and catch basins:

(1) Coal holes not to exceed twenty-four (24) inches in their largest dimensions may be provided in the sidewalks on any street. Coal holes shall be covered with an iron cover having a rough surface and the cover shall be flush with the surface of the sidewalk.

(2) Projections. All covers for openings of every kind in sidewalks must be adjusted to the proper grade of the sidewalk before any walk is built or rebuilt. No projection of any kind shall be allowed above the surface of any sidewalk.

SECTION 25-58 SIDEWALK CONSTRUCTION

(A) Streets shall provide a right-of-way for vehicular traffic and, where the Council so requires, a sidewalk on either or both sides thereof; the sidewalk shall be for the use of persons on foot, and no person shall be allowed to encumber the same with boxes or other material.

(B) The Council may from time to time by ordinance or resolution determine where the sidewalks shall be constructed and establish the width, determine the material and prescribe the method of construction of standard sidewalks, and the standard so fixed may be different for different streets, and may order by ordinance or resolution sidewalks to be laid as provided in this subsection.

(1) The Board of Public Works shall provide at least ten (10) days advance written notice, by regular first class mail, to property owners affected by the ordinance or resolution that determines where sidewalks shall be constructed.

SECTION 25-59 CONDEMNATION OF FAULTY CONSTRUCTION OR REPAIR; DEFECTIVE SIDEWALK; CURB CUT, OR DRIVEWAY APPROACH; NOTICE TO REBUILD; CITY MAY REPAIR; COST

(A) Faulty work; condemnation; notice.

Whenever any person, firm or corporation shall repair or cause to be repaired an existing sidewalk, curb cut, or driveway approach contrary to the terms of this Chapter, or shall construct or cause to be constructed a sidewalk, curb cut, or driveway approach that cannot be made to conform to the requirements of this Chapter or to any requirement of the Board of Public Works without

completely reconstructing such sidewalk, curb cut, or driveway approach, or some part thereof; the Board of Public Works is empowered to and shall condemn the sidewalk, curb cut, or driveway approach, or part thereof and shall give notice thereof to the licensee and owner of the abutting premises. Within twenty (20) days of receipt of said notice the sidewalk, curb cut, or driveway approach or part thereof thus condemned shall be removed and rebuilt in accordance with the provisions of this Chapter.

(B) Defective sidewalk, curb cut, or driveway approach; condemnation; notice.

When any existing sidewalk, curb cut, or driveway approach becomes defective, insufficient, or dangerous to travel, the Board of Public Works is empowered to and shall condemn the sidewalk, curb cut, or driveway approach or part thereof and shall give notice thereof to the owner of the abutting premises. Within twenty (20) days after receipt of said notice the sidewalk, curb cut, or driveway approach or part thereof thus condemned shall be removed and rebuilt in accordance with the terms of this Chapter.

(C) City may repair; cost.

If any person, firm or corporation shall fail or neglect for twenty (20) days after the service of the notice referred to in Section 25-59(a) or (b) to comply with the same, the Board of Public Works shall proceed in the manner provided by law to cause the sidewalk, curb cut, or driveway approach or part thereof to be removed and a new sidewalk, curb cut, or driveway approach built in place thereof and the cost of such work shall be charged either to the abutting property or to the licensee under the provisions of Section 25-50 or Section 25-61.

SECTION 25-60 POWERS OF THE BOARD OF PUBLIC WORKS TO GRANT VARIANCES; ARCHITECTURAL SIDEWALKS

(A) The Board of Public Works is empowered to authorize in specific cases such variance from the terms of this Article as will not be contrary to the public interest, where owing to special conditions, a literal enforcement of the provisions of this ordinance will result in practical difficulty or unnecessary hardship, so that the spirit of this ordinance shall be observed, public safety and welfare secured, and substantial justice done.

(B) Architectural sidewalks:

Architectural sidewalks may be permitted by the Board of Public Works for an entire City block when a petition is filed by all the owners of property fronting on said block and when the board is satisfied that the architectural sidewalk meets the specification for strength and durability of sidewalks contained in this Code. The architectural sidewalk with the exception of color and design is subject to all requirements of this Code.

SECTION 25-61 REPEALED (1/11/22)

SECTION 25-120 PENALTIES

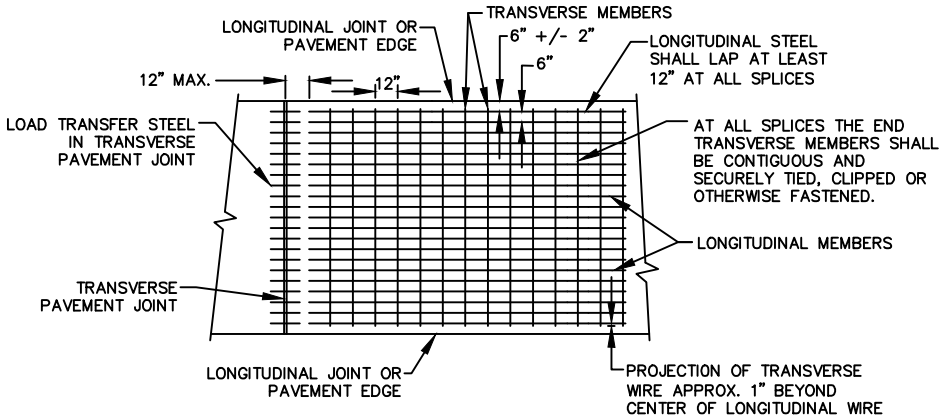
Any person who shall violate any of the provisions of this Chapter or of any Section thereof, shall, upon conviction thereof, be punished by a forfeiture of not less than $75.00 nor more than $500.00, together with costs of prosecution and in default of payment thereof, by imprisonment in the County Jail for a period not to exceed sixty (60) days. Each day of violation shall constitute a separate offense.

STANDARD DETAIL DRAWINGS

FABRIC SPECIFICATIONS

WIRE SPACING AND SIZE = 6" X 12", W 5.5 X W 4

WEIGHT PER 100 SQ. FT. = .55 POUNDS (APPROX.)

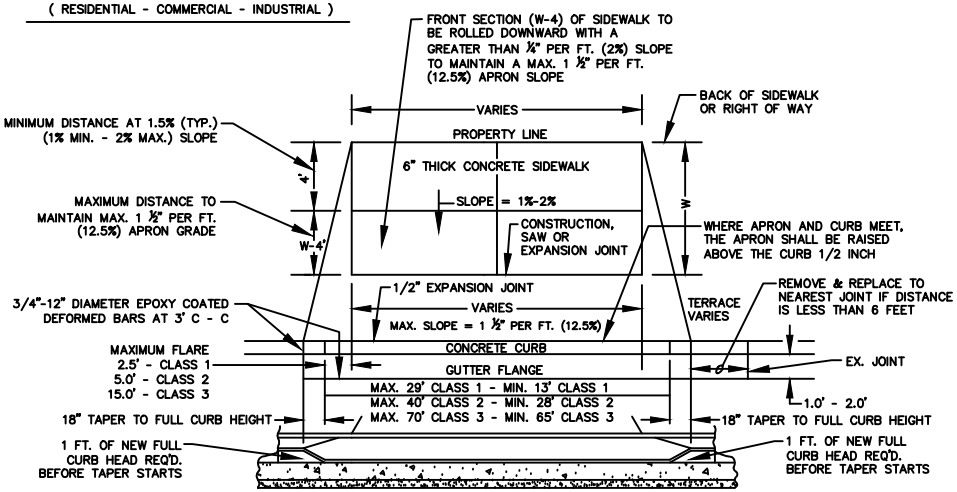


(CONCRETE REINFORCEMENT DETAIL)

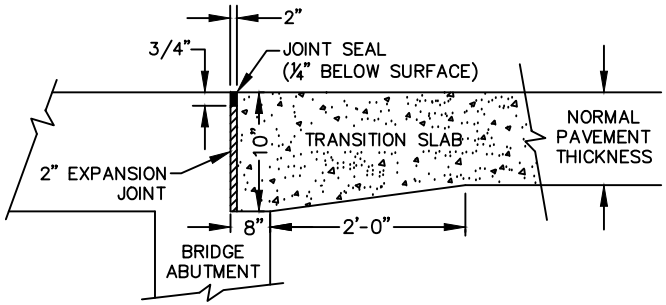
WELDED STEEL WIRE FABRIC DETAIL

(CLASS 1 - CLASS 2 - CLASS 3)

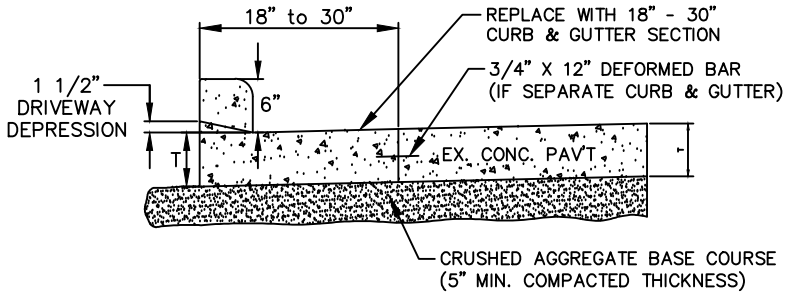
(RESIDENTIAL - COMMERCIAL - INDUSTRIAL)



TYPICAL DRIVEWAY DETAIL

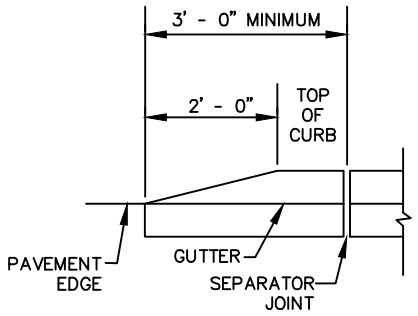


PAVEMENT TRANSITION SLAB

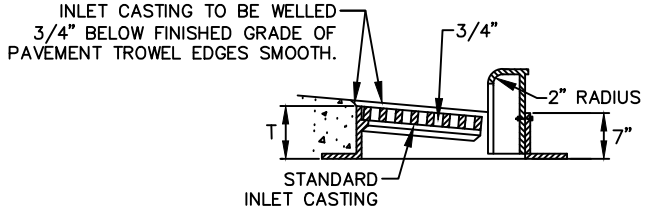


SECTION VIEW OF TYPICAL DRIVEWAY DETAIL

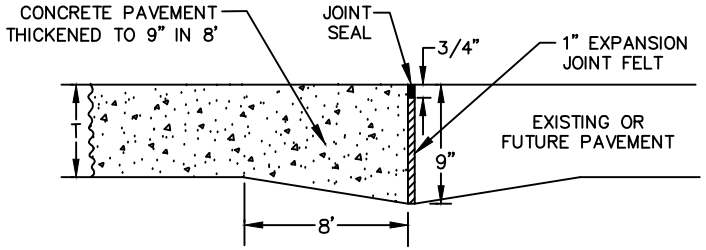
NOTE:
END SECTIONS TO BE CONSTRUCTED AND BID AS 30" CURB AND GUTTER



CURB AND GUTTER END SECTION



INLET CASTING DETAIL

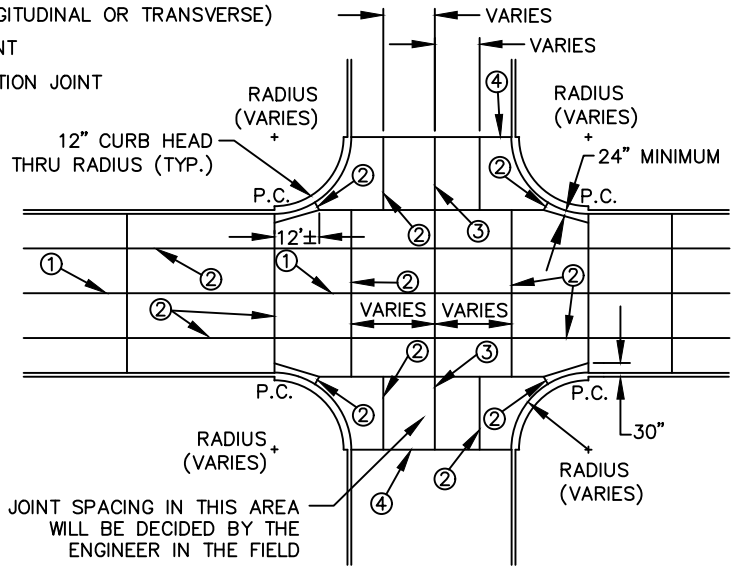


TRANSVERSE EXPANSION JOINT DETAIL

CONCRETE PAVING DETAIL
CITY OF OSHKOSH, WISCONSIN
REVISIONS 12/03/2018
STANDARD DETAIL DRAWING 01

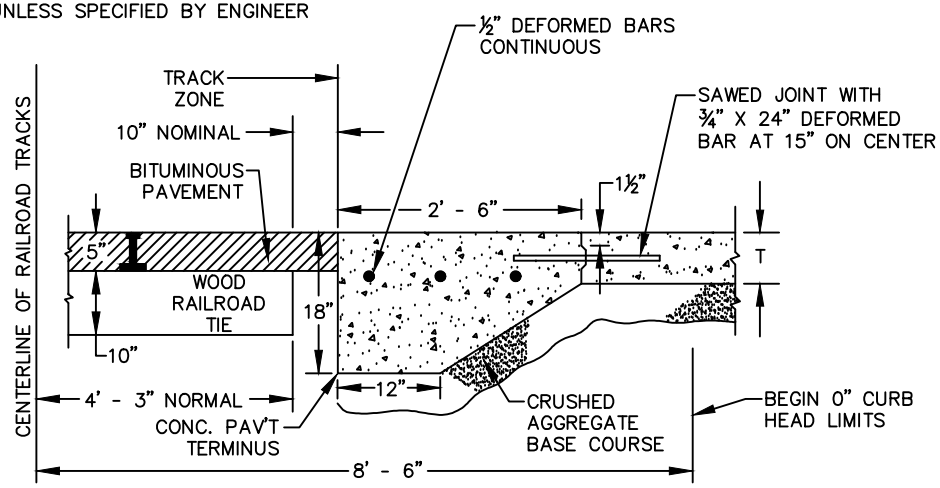
STANDARD DETAIL DRAWING 01

① LONGITUDINAL CONSTRUCTION JOINT
② SAWED JOINT (LONGITUDINAL OR TRANSVERSE)
③ CONSTRUCTION JOINT
④ FUTURE CONSTRUCTION JOINT

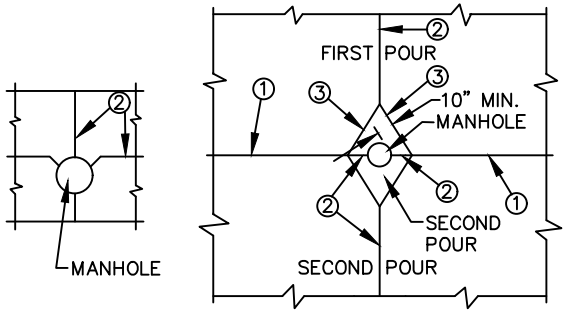


TYPICAL INTERSECTION JOINT DETAIL

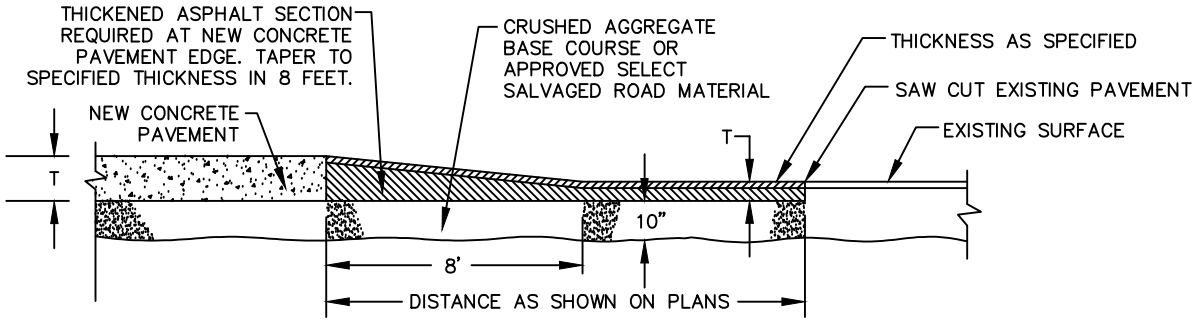
NOTE:
ALL WORK WITHIN TRACK ZONE SHALL BE DONE BY OTHERS, UNLESS SPECIFIED BY ENGINEER



RAILROAD HEADER DETAIL



TYPICAL CENTERLINE MANHOLE DETAIL



SPECIFIED THICKNESS	LAYER THICKNESS
2"	(ONE LAYER/2" UPPER)
4"	(2¼" LOWER/1¾" UPPER)
5"	(3" LOWER/2" UPPER)

TYPICAL ASPHALTIC TRANSITION DETAIL

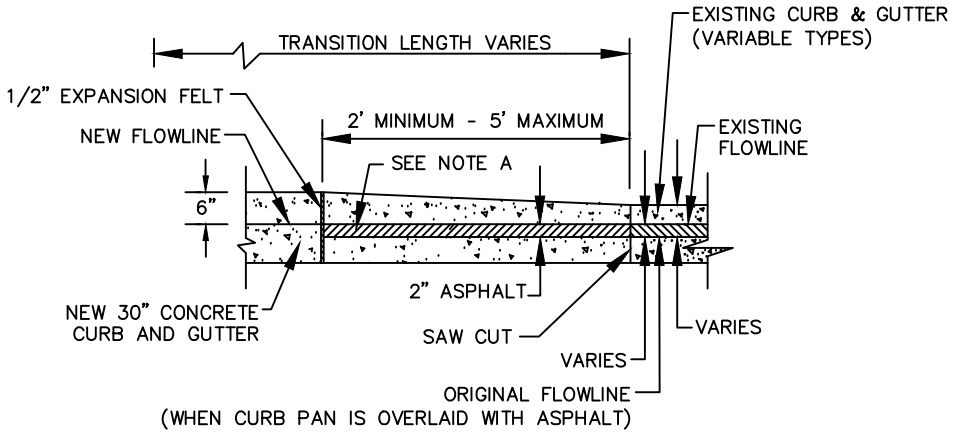
CONCRETE PAVING DETAILS
CITY OF OSHKOSH, WISCONSIN
REVISIONS 12/17/2012
STANDARD DETAIL DRAWING 02

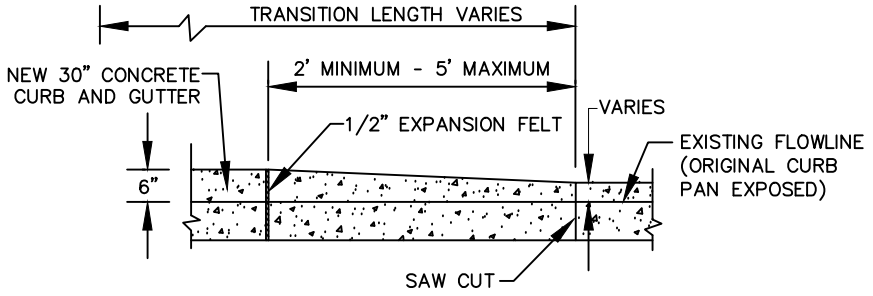
STANDARD DETAIL DRAWING 02

NOTE A:

IF THE EXISTING CURB AND GUTTER TO BE MATCHED IS OVERLAID WITH ASPHALT, THE PAN OF THE NEW CURB AND GUTTER SECTION IS TO BE KEPT DOWN 2" TO PROVIDE A BUTT JOINT FOR ASPHALT.

TRANSITION CURB AND GUTTER SECTION DETAIL

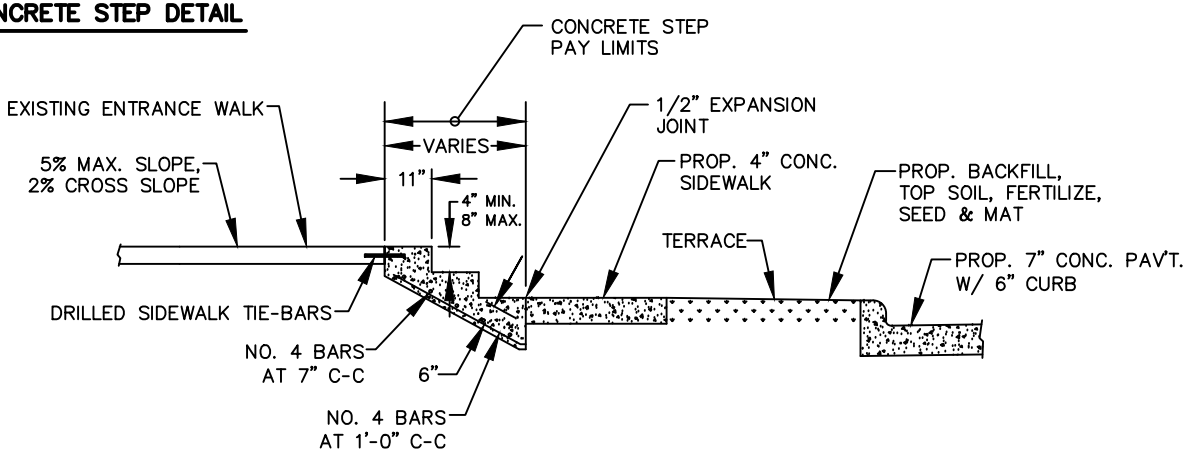




PROPOSED CONCRETE STEP DETAIL

NOTES:

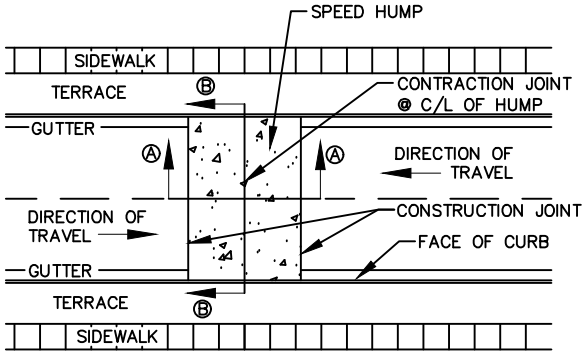
1.) ALL BAR STEEL REINFORCEMENT SHALL BE EMBEDDED 2" CLEAR
2.) ALL CONC. STEPS SHALL BE 4' IN WIDTH AND PLACED BETWEEN THE BACK EDGE OF PROPOSED SIDEWALK AND EXISTING PROPERTY SIDE ENTRANCE WALK
3.) THE EXACT LOCATION, WIDTHS, AND NUMBER OF STEPS TO BE DETERMINED IN THE FIELD BY THE ENGINEER.
4.) STEEL REINFORCEMENT NOT REQUIRED ON STEPS WITH 2 RISERS OR LESS.
5.) CITY OF OSHKOSH ORDINANCE REQUIRES A RAIL IF THERE ARE MORE THAN 3 RISERS.
6.) ALL RISERS MUST HAVE A UNIFORM HEIGHT. MAX RISER HEIGHT EQUALS 8 INCHES. MINIMUM HEIGHT EQUALS 4 INCHES.
7.) FOR SIDEWALKS ADJOINING STAIR LANDINGS, THE MAXIMUM RUNNING SLOPE (PARALLEL TO THE DIRECTION OF TRAVEL) SHALL NOT EXCEED 5% AND THE MAXIMUM CROSS SLOPE (PERPENDICULAR TO THE DIRECTION OF TRAVEL) IS 2%.



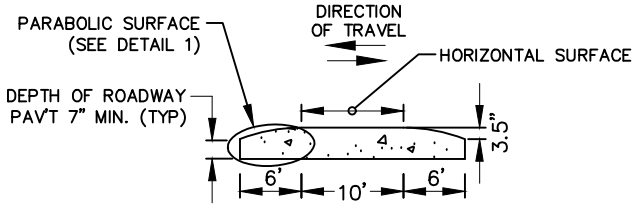
CONCRETE PAVING DETAILS	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	11/29/2016
STANDARD DETAIL DRAWING 3A	

STANDARD DETAIL DRAWING 3A

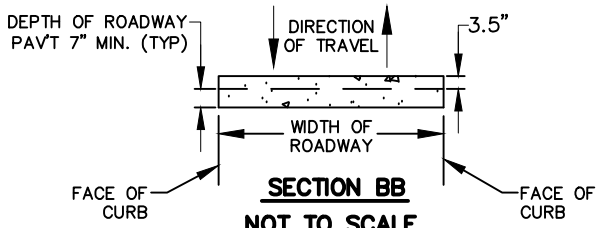
SPEED HUMP W/ RAISED GUTTER DETAIL



PLAN VIEW
SPEED HUMP ON TYPICAL URBAN STREET



SECTION AA
NOT TO SCALE
(VERTICAL SCALE IS EXAGERATED)



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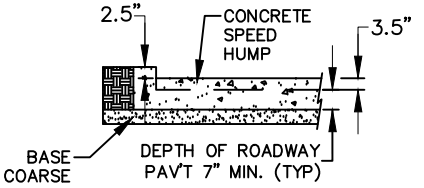
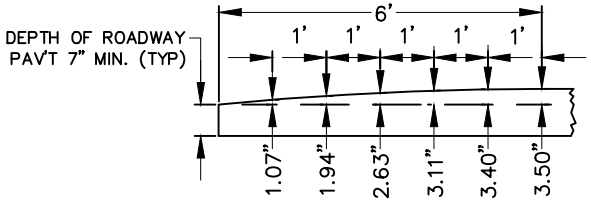
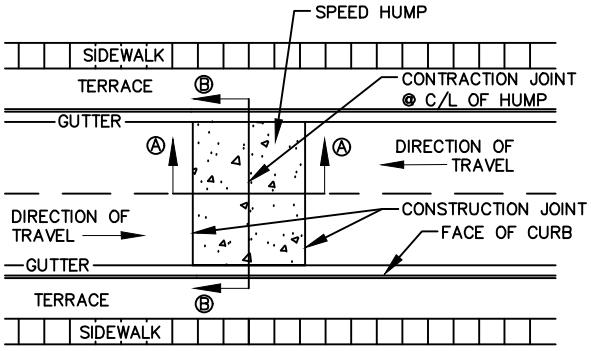


INTEGRAL CURB DETAIL
CROSS SECTION

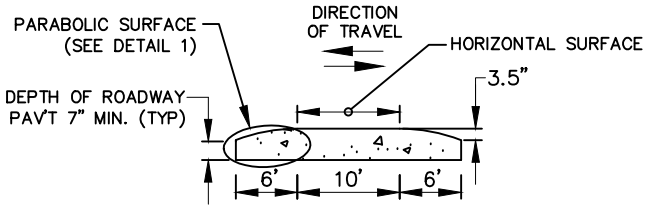


DETAIL 1
PARABOLIC SURFACE

SPEED HUMP W/ FLOW-THRU GUTTER DETAIL



PLAN VIEW
SPEED HUMP ON TYPICAL URBAN STREET



SECTION AA
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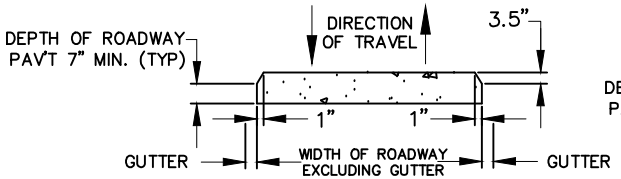

SECTION BB
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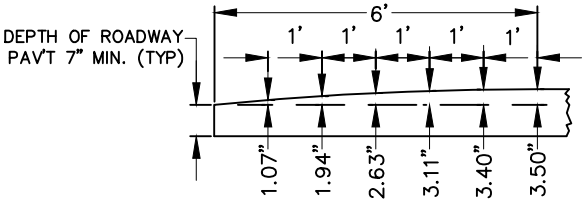
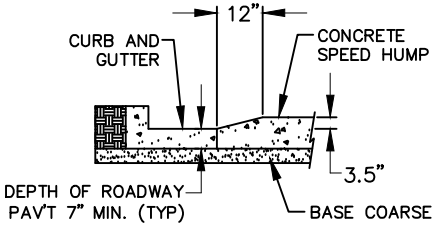


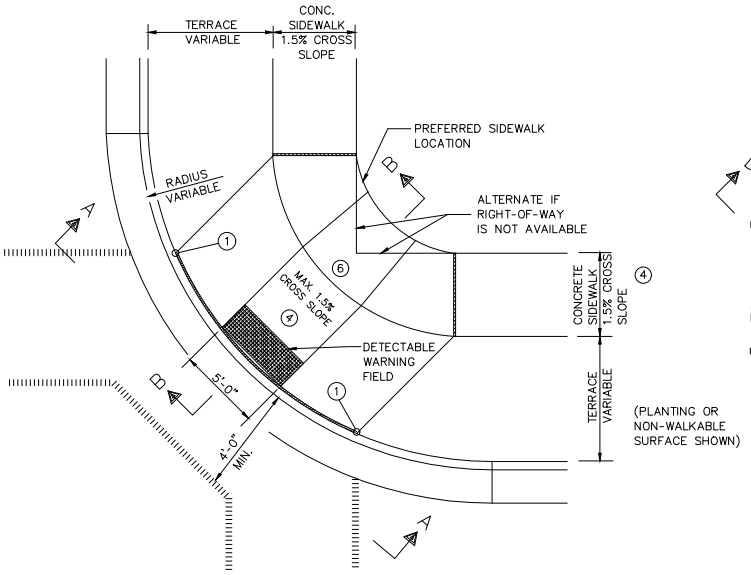
DETAIL 1
PARABOLIC SURFACE



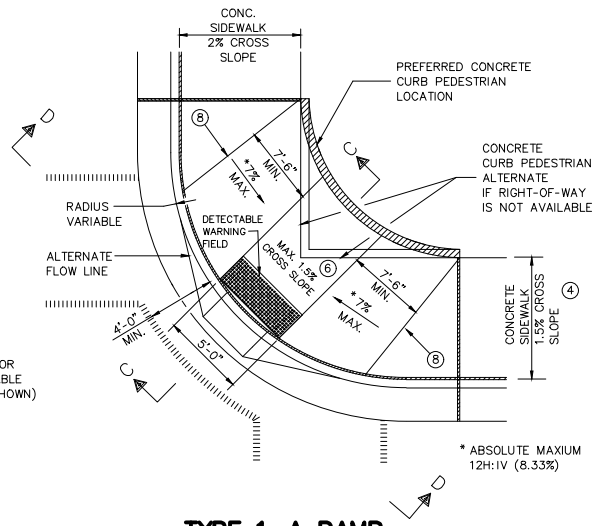
CURB DETAIL
CROSS SECTION

CONCRETE PAVING DETAILS	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	11/29/2016
STANDARD DETAIL DRAWING 3B	

STANDARD DETAIL DRAWING 3B



TYPE 1 RAMP (CENTER OF CORNER RADIUS) PLAN VIEW



TYPE 1-A RAMP (NO TERRACE) PLAN VIEW

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.

RAMPS SHALL BE BUILT AT 12H:1V OR FLATTER. WHEN NECESSARY, THE SIDEWALK ELEVATION MAY BE LOWERED TO MEET THE HIGH POINT ON THE RAMP.

TYPE 1 RAMPS SHALL HAVE A NORMAL SIDEWALK APRON AND CURB ON BOTH SIDES OF RAMP.

DETECTABLE WARNING FIELD SHALL BE MEASURED AND PAID BY THE SQUARE FOOT AS "CURB RAMP DETECTABLE WARNING FIELD". THE CONCRETE PEDESTRIAN CURB, IF NEEDED, SHALL BE MEASURED AND PAID BY THE LINEAL FOOT AS "CONCRETE CURB PEDESTRIAN". CONCRETE SIDEWALK IN THE CURB RAMP AREA SHALL BE MEASURED AND PAID BY THE SQUARE FOOT AS CONCRETE SIDEWALK, INCLUDING THE AREA UNDER THE DETECTABLE WARNING FIELD.

SELECT CURB RAMP DETECTABLE WARNING FIELD MATERIALS AND DEVICES FROM THE DEPARTMENT'S APPROVED MATERIALS LIST. THE COLOR OF THE DETECTABLE WARNING FIELD IS SPECIFIED ELSEWHERE AND IS INCIDENTAL TO THE BID ITEM OF "CURB RAMP DETECTABLE WARNING FIELD".

SURFACE TEXTURE OF THE RAMP SHALL BE OBTAINED BY COARSE BROOMING TRANSVERSE TO THE SLOPE OF THE RAMP.

(1) THIS POINT IS AN EXTENSION OF OUTSIDE EDGE OF APPROACHING SIDEWALK WHERE IT MEETS THE BACK OF CONCRETE CURB.

(2) GRADE CHANGE BETWEEN GUTTER FLAG SLOPE AND THE CURB RAMP SLOPE SHALL NOT EXCEED 11%. MAXIMUM GUTTER FLAG SLOPE IS 4%. PROVIDE LONGITUDINAL DRAINAGE AROUND CURB AND AWAY FROM CURB RAMP. NO VERTICAL LIPS OR DISCONTINUITIES GREATER THAN 1/4-INCH ARE ALLOWED. SLOPE OF CURB HEAD OPENING SHALL MATCH THE RAMP SLOPE. MINIMALLY 1.5% AND NOT EXCEED 7% WHEN ADJACENT TO 1.5% LANDING. CONSTRUCT CURB HEAD OPENING AT 1.5% IN THE DIRECTION OF PEDESTRIAN TRAVEL.

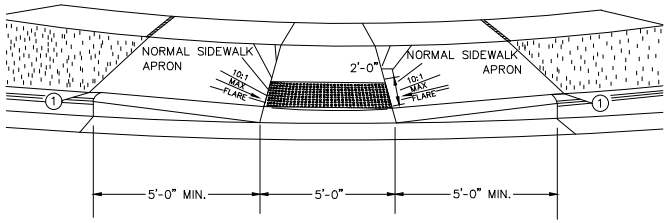
(3) ABSOLUTE MAXIMUM 12H:1V (8.33%) CURB RAMP SLOPE IS ALLOWABLE WITH FLATTENED GUTTER FLAG SLOPE AND NOT TO EXCEED 11% GRADE CHANGE.

(4) ±0.5% CONSTRUCTION TOLERANCE IN SIDEWALK CROSS SLOPE. THE SIDEWALK SHALL NOT EXCEED 2% WITHOUT PRIOR APPROVAL FROM THE ENGINEER.

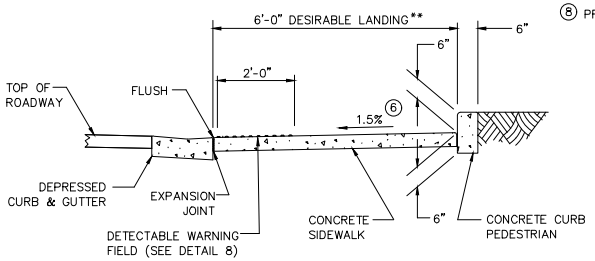
(6) PROVIDE A LEVEL LANDING (MAXIMUM 2% SLOPE) IN ANY DIRECTION OF PEDESTRIAN TRAVEL. STANDARD LANDING SIZE IS 5 FEET X 5 FEET.

(7) WHEN THIS GRADE BREAK DISTANCE EXCEEDS 5 FEET. RADIAL DETECTABLE WARNING FIELD MAY BE USED.

(8) PROVIDE GRADE BREAK PERPENDICULAR TO DIRECTION OF WHEELCHAIR TRAVEL.



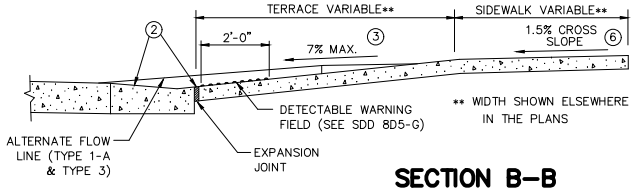
VIEW A-A



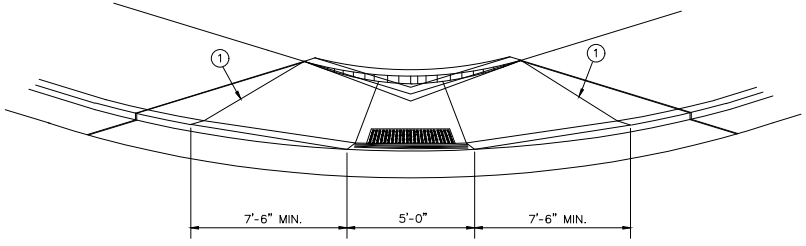
SECTION C-C

LEGEND

- 1/2" EXPANSION JOINT-SIDEWALK
- CONTRACTION JOINT FIELD LOCATED
- PAVEMENT MARKING CROSSWALK (WHITE)
- ALTERNATIVE LAYOUT



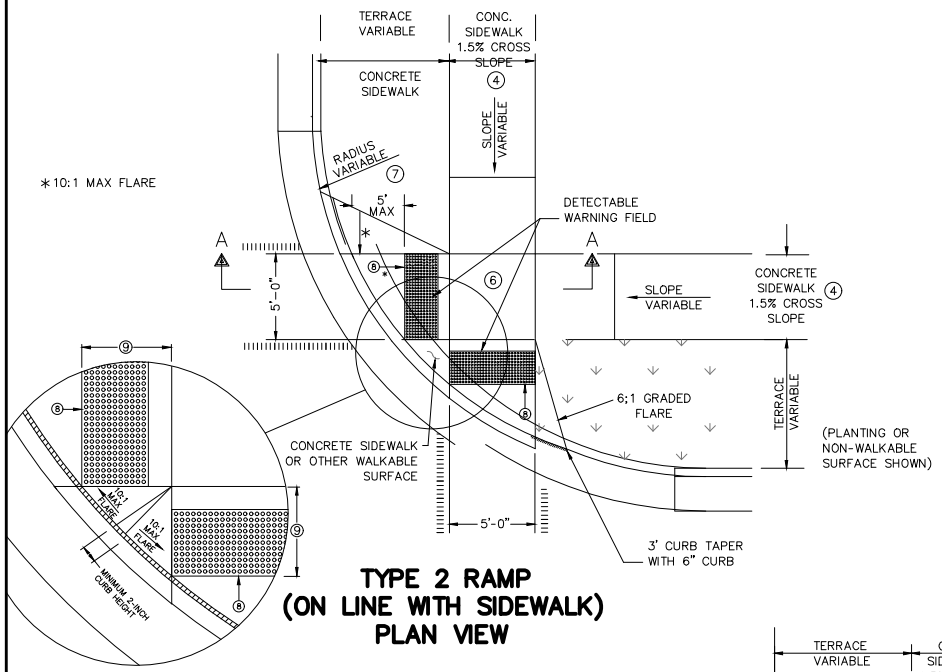
SECTION B-B



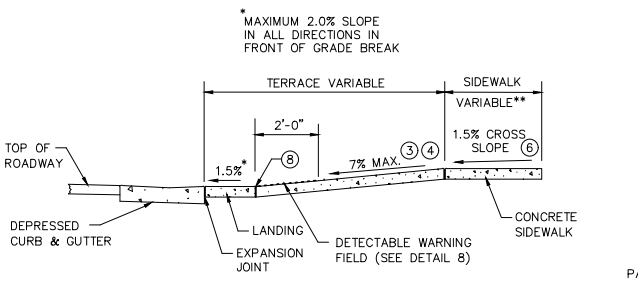
VIEW D-D

CURB RAMPS TYPES 1 AND 1-A	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	12/03/2018
STANDARD DETAIL DRAWING 04	

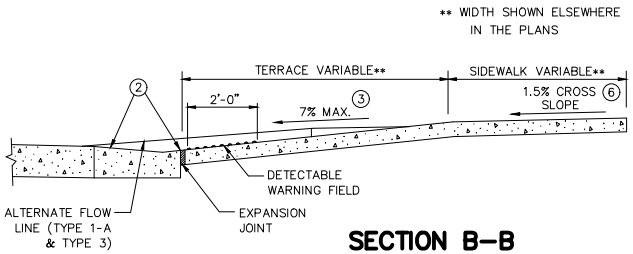
STANDARD DETAIL DRAWING 04



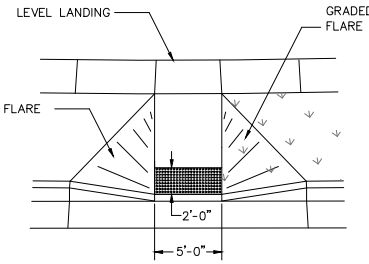
TYPE 2 RAMP (ON LINE WITH SIDEWALK) PLAN VIEW



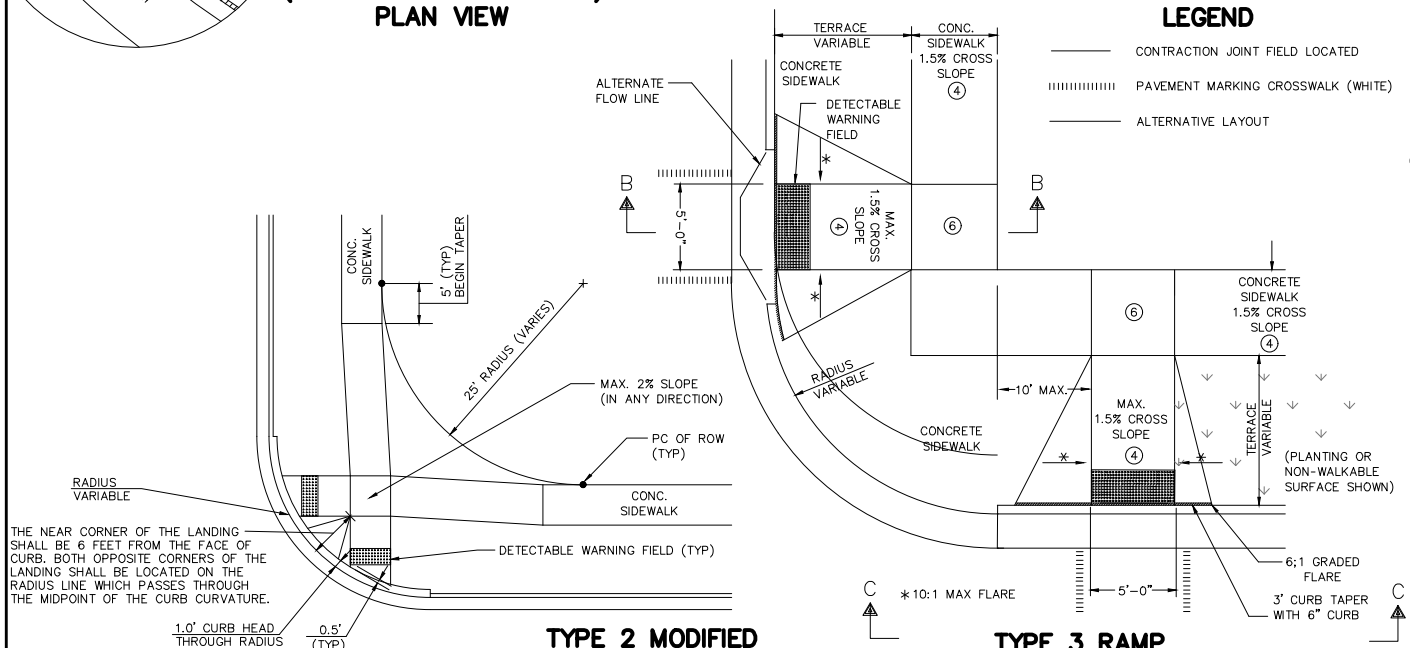
SECTION A–A



SECTION B–B



VIEW C–C FOR TYPE 3



TYPE 2 MODIFIED (CURB RAMP DETAIL) PLAN VIEW

TYPE 3 RAMP (OUTSIDE OF CROSSWALK AREA) PLAN VIEW

LEGEND

- CONTRACTION JOINT FIELD LOCATED
- PAVEMENT MARKING CROSSWALK (WHITE)
- ALTERNATIVE LAYOUT

GENERAL NOTES

USE THE TYPE 3 RAMP ONLY WHEN A TYPE 1 OR TYPE 2 CANNOT BE ACHIEVED BECAUSE FIELD CONDITIONS.

AVOID PLACING DRAINAGE STRUCTURES. JUNCTION BOXES OR OTHER OBSTRUCTIONS IN FR RAMP ACCESS AREAS.

DETECTABLE WARNING FIELDS THAT ARE INSTALLED AS A GROUP OR SIDE BY SIDE. SHALL FROM THE SAME MANUFACTURER.

(2) GRADE CHANGE BETWEEN GUTTER FLAG SLOPE AND THE CURB RAMP SLOPE SHALL NOT E 11%. MAXIMUM GUTTER FLAG SLOPE IS 4%. PROVIDE LONGITUDINAL DRAINAGE AROUND CUR AWAY FROM CURB RAMP. NO VERTICAL LIPS OR DISCONTINUITIES GREATER THAN 1/4-INCH ALLOWED. SLOPE OF CURB HEAD OPENING SHALL MATCH THE RAMP SLOPE. MINIMALLY 1.5 NOT EXCEED 7%. WHEN ADJACENT TO 1.5% LANDING. CONSTRUCT CURB HEAD OPENING AT 1.5% IN THE DIRECTION OF PEDESTRIAN TRAVEL.

(3) ABSOLUTE MAXIMUM 12H:IV (8.33%) CURB RAMP SLOPE IS ALLOWABLE WITH FLATTENED G SLOPE AND NOT TO EXCEED 11% GRADE CHANGE.

(4) ±0.5% CONSTRUCTION TOLERANCE IN SIDEWALK CROSS SLOPE. THE SIDEWALK SHALL NOT 2% WITHOUT PRIOR APPROVAL FROM THE ENGINEER.

(6) PROVIDE A LEVEL LANDING (MAXIMUM 2% SLOPE) IN ANY DIRECTION OF PEDESTRIAN TRAV STANDARD LANDING SIZE IS 5 FEET X 5 FEET.

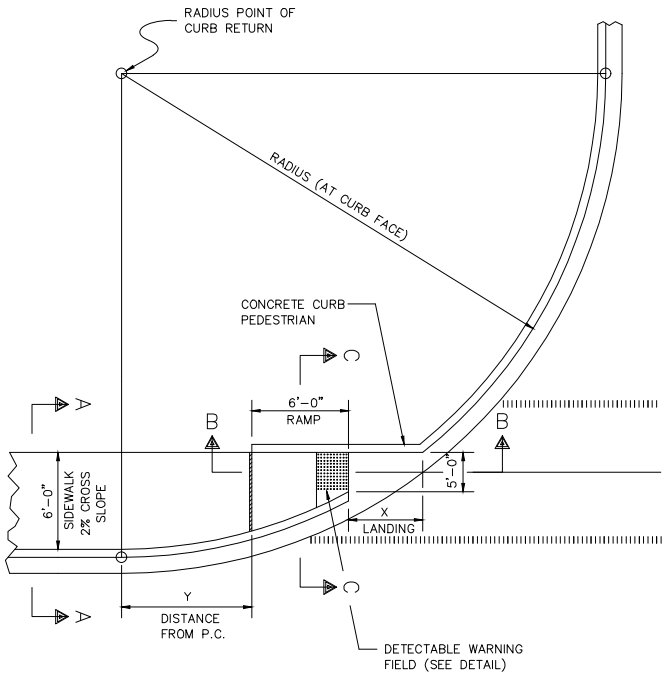
(7) WHEN THIS GRADE BREAK DISTANCE EXCEEDS 5 FEET. RADIAL DETECTABLE WARNING FIELD MAY BE USED.

(8) PROVIDE GRADE BREAK PERPENDICULAR TO DIRECTION OF WHEELCHAIR TRAVEL.

(9) WHEN THIS DISTANCE IS LESS THAN 6'-0" IT MAY BE DIFFICULT TO ACHIEVE A 7% SLOPE, OR FLATTER, ON THE RAMP. REDUCE CURB HEIGHT IN TRIANGLE AREA TO ACHIEVE 7% SLOPE, OR FLATTER, ON RAMP. 2" MINIMUM CURB HEIGHT BETWEEN 10:1 FLARES.

CURB RAMPS TYPES 2, 2 MODIFIED, 3
CITY OF OSHKOSH, WISCONSIN
REVISIONS 12/1/2020
STANDARD DETAIL DRAWING 05

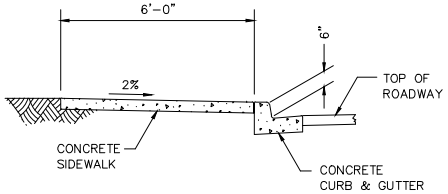
STANDARD DETAIL DRAWING 05



CURB RAMP TYPE 4A
PLAN VIEW

RADIUS (AT CURB FACE)	X	Y
20 FEET	6'-1¾"	2'-7¼"
30 FEET	7'-11¾"	4'-8¼"
40 FEET	9'-5¼"	6'-5"
50 FEET	10'-8¾"	7'-11¼"
60 FEET	11'-10¼"	9'-3½"

INTERMEDIATE RADII CAN BE INTERPOLATED



SECTION A–A

GENERAL NOTES

AVOID PLACING DRAINAGE STRUCTURES, JUNCTION BOXES OR OTHER OBSTRUCTIONS IN FRONT OF RAMP ACCESS AREAS

RAMP SLOPES SHALL NOT BE STEEPER THAN 12:1

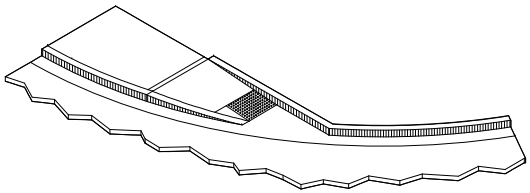
SIDEWALK CROSS SLOPE SHALL NOT EXCEED 2%

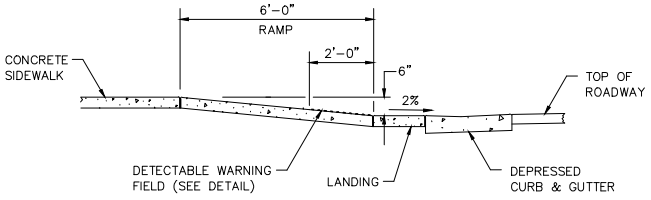
LEGEND

1/2" EXPANSION JOINT-SIDEWALK

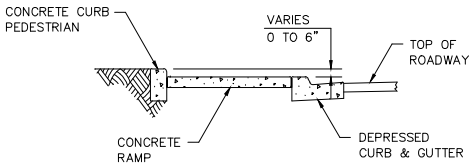
CONTRACTION JOINT FIELD LOCATED

PAVEMENT MARKING CROSSWALK (WHITE)





SECTION B–B



SECTION C–C

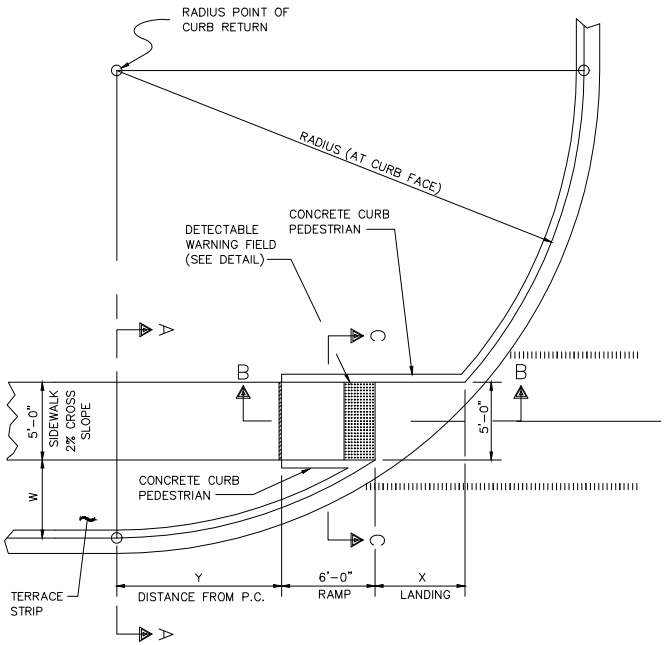
CURB RAMPS TYPE 4A

CITY OF OSHKOSH, WISCONSIN

REVISIONS 12/1/2020

STANDARD DETAIL DRAWING 06

STANDARD DETAIL DRAWING 06



CURB RAMP TYPE 4B
PLAN VIEW

RADIUS (AT CURB FACE)	W = 3'-0"		W = 4'-0"		W = 5'-0"		W = 6'-0"		W = 7'-0"	
	X	Y	X	Y	X	Y	X	Y	X	Y
20 FEET	5'-5½"	4'-6½"	4'-8½"	6'-0"	4'-1"	7'-2¾"	3'-7"	8'-3½"	3'-1½"	9'-2½"
30 FEET	7'-3¾"	7'-1"	6'-5½"	8'-11½"	5'-9¼"	10'-7"	5'-2½"	12'-0"	4'-8¾"	13'-3¼"
40 FEET	8'-9½"	9'-2½"	7'-10"	11'-5¼"	7'-1"	13'-4½"	6'-5¾"	15'-¾"	5'-11½"	16'-7¼"
50 FEET	10'-¾"	11'-¾"	9'-¼"	13'-7¼"	8'-2½"	15'-9½"	7'-6½"	17'-9"	6'-11¾"	19'-6¼"
60 FEET	11'-2½"	12'-8¾"	10'-¾"	15'-6½"	9'-2¼"	17'-11¾"	8'-5¾"	20'-1¾"	7'-10½"	22'-1½"
70 FEET	12'-2¾"	14'-3¼"	11'-¼"	17'-4"	10'-1"	19'-11¾"	9'-3¾"	22'-4¼"	8'-8¼"	24'-6¼"
80 FEET	13'-2"	15'-8½"	11'-10½"	18'-11¼"	10'-10¾"	21'-10"	10'-1"	24'-4¾"	9'-5"	26'-8¾"
90 FEET	14'-½"	17'-½"	12'-8¼"	20'-6½"	11'-7¾"	23'-7"	10'-9¾"	26'-3¾"	10'-1¼"	28'-9½"
100 FEET	14'-10½"	18'-3¾"	13'-5½"	22'-0"	12'-4¼"	25'-2¾"	11'-5¾"	28'-1½"	10'-9"	30'-9"

INTERMEDIATE RADII CAN BE INTERPOLATED

GENERAL NOTES

AVOID PLACING DRAINAGE STRUCTURES, JUNCTION BOXES OR OTHER OBSTRUCTIONS IN FRONT OF RAMP ACCESS AREAS

RAMP SLOPES SHALL NOT BE STEEPER THAN 12:1

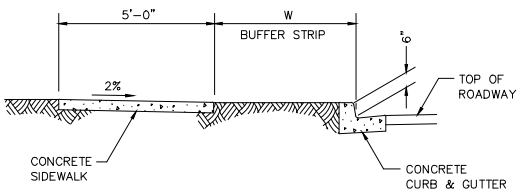
SIDEWALK CROSS SLOPE SHALL NOT EXCEED 2%

LEGEND

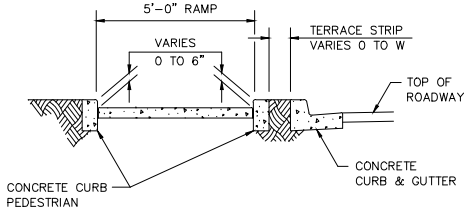
1/2" EXPANSION JOINT-SIDEWALK

CONTRACTION JOINT FIELD LOCATED

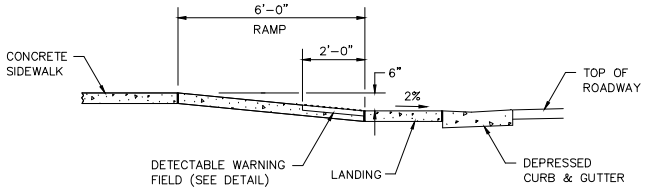
PAVEMENT MARKING CROSSWALK (WHITE)



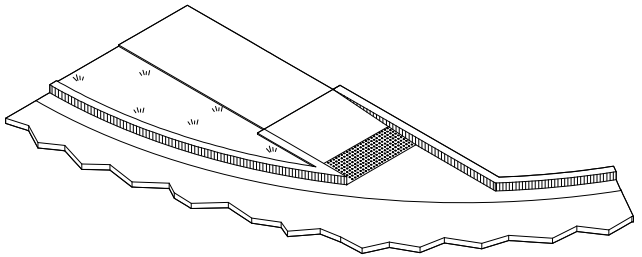
SECTION A–A



SECTION C–C



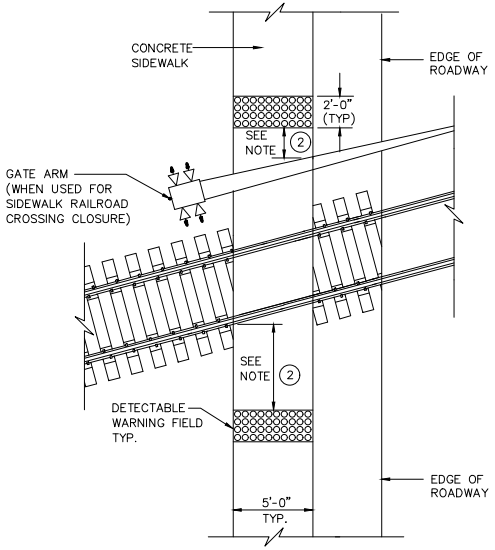
SECTION B–B



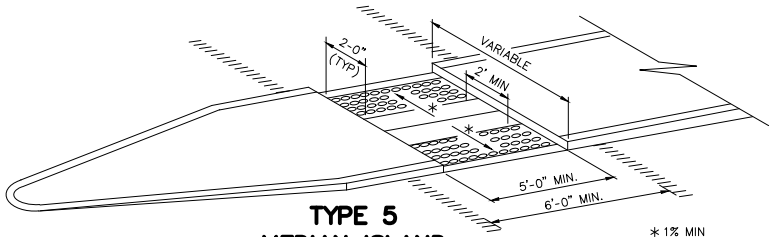
ISOMETRIC VIEW

CURB RAMPS TYPE 4B
CITY OF OSHKOSH, WISCONSIN
REVISIONS 12/1/2020
STANDARD DETAIL DRAWING 07

STANDARD DETAIL DRAWING 07



TYPE 8
DETECTABLE WARNINGS
AT RAILROAD CROSSING



TYPE 5
MEDIAN ISLAND
NON-ELEVATED CROSSING

GENERAL NOTES

SIDEWALK CROSS SLOPE SHALL NOT EXCEED 2%.

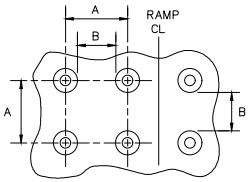
(1) SLOPE SIDEWALK TOWARD LANDING AS SHOWN WHERE THERE IS NO TERRACE OR WHERE THE TERRACE WIDTH IS LESS THAN 6 FEET WIDE.

(2) THE EDGE OF THE DETECTABLE WARNING FIELD NEAREST TO A RAILROAD CROSSING SHALL BE 1.5 FEET ± 0.1' FROM THE FACE OF THE GATE ARM IF THE GATE ARM EXTENDS ACROSS THE SIDEWALK. WHERE THERE IS NO PEDESTRIAN GATE, THE EDGE OF THE DETECTABLE WARNING FIELD NEAREST TO THE RAILROAD CROSSING SHALL BE 15 FEET FROM THE NEAREST RAIL.

LEGEND

——— CONTRACTION JOINT FIELD LOCATED

PAVEMENT MARKING CROSSWALK (WHITE)



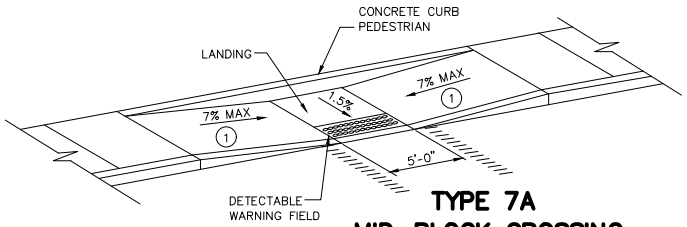
	MIN.	MAX.
A	1.6"	2.4"
B	0.65"	1.5"
C	*	*
D	0.9"	1.4"

*THE C DIMENSION IS 50% TO 65% OF THE D DIMENSION.

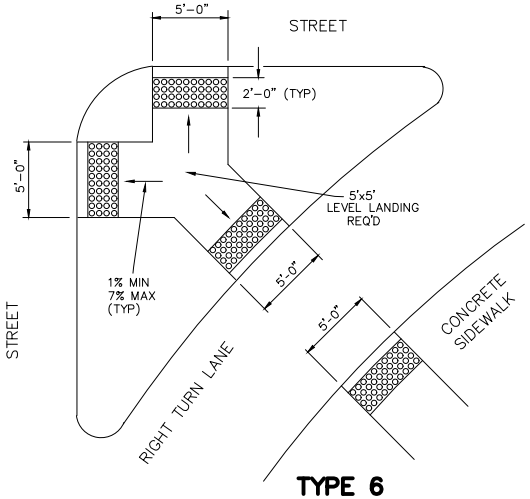
PLAN VIEW

ELEVATION VIEW

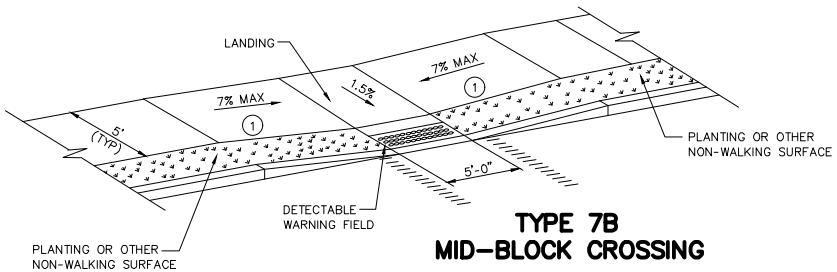
TRUNCATED DOMES
DETECTABLE WARNING
PATTERN DETAIL



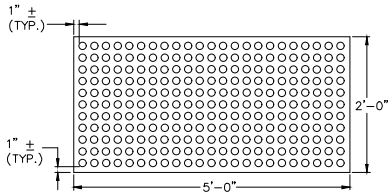
TYPE 7A
MID-BLOCK CROSSING



TYPE 6
DETECTABLE WARNING AT ISLANDS



TYPE 7B
MID-BLOCK CROSSING

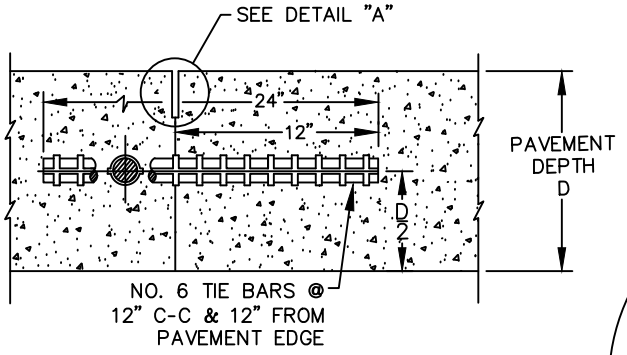


PLAN VIEW
DETECTABLE WARNING
FIELD (TYPICAL)

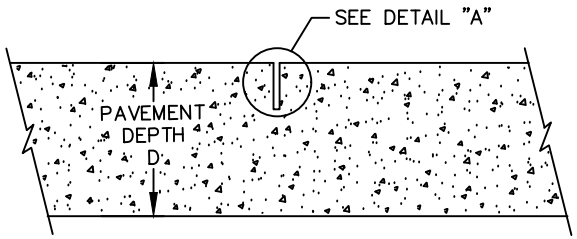
NOTE: THESE PARALLEL AND PARALLEL/PERPENDICULAR CURB RAMPS MAY BE USED AT INTERSECTIONS AND MID BLOCK LOCATIONS.

CURB RAMPS TYPES 5, 6, 7A, 7B, & 8	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	12/1/2020
STANDARD DETAIL DRAWING 08	

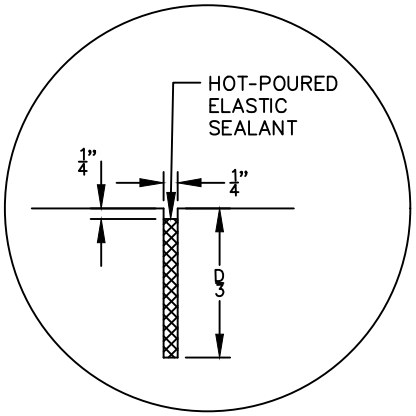
STANDARD DETAIL DRAWING 08



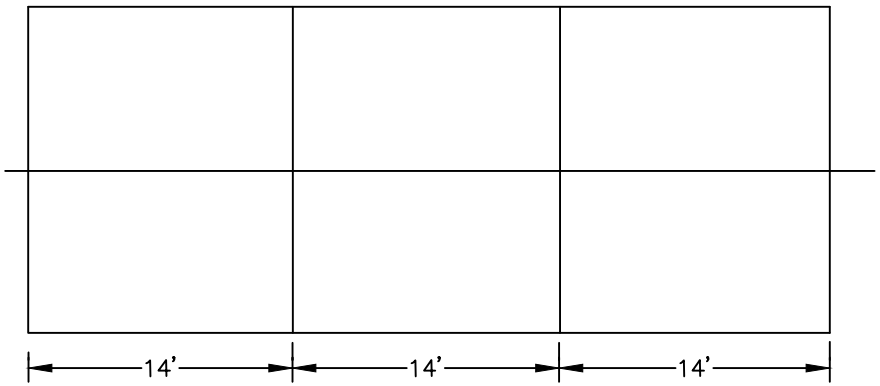
CONSTRUCTION JOINT



CONTRACTION JOINT



DETAIL "A"



CONTRACTION JOINT LOCATIONS

GENERAL NOTES

DETAILS OF CONSTRUCTION NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE STANDARD SPECIFICATIONS AND SPECIAL PROVISIONS.

CONTRACTION JOINTS

CONTRACTION JOINTS SHALL BE LOCATED AT A UNIFORM SPACING OF 14' MAX. EXCEPTIONS SHALL BE AS DIRECTED BY THE ENGINEER.

CONTRACTION JOINTS MAY BE LOCATED A MINIMUM OF 6' AND A MAXIMUM OF 10' FROM NEAREST TRANSVERSE CONSTRUCTION JOINT.

DUMMY CONTRACTION JOINTS SHALL BE LOCATED AT 80' INTERVALS AND AT MANHOLES OR INLETS WHERE POSSIBLE.

THE SAWCUT SHALL BE TO THE DEPTH OF D/3 AND THE WIDTH OF ¼ INCH.

CONTRACTION JOINTS SHALL BE SEALED AS SHOWN IN DETAIL "A".

CONSTRUCTION JOINTS

CONSTRUCTION JOINTS WILL ONLY BE ALLOWED AT EXISTING CONTRACTION JOINT LOCATIONS AND ALIGNED PERPENDICULAR TO THE CENTERLINE.

TIE BARS MAY BE INSERTED THROUGH THE HEADER BOARD AFTER THE CONCRETE HAS BEEN POURED.

TIE BARS SHALL BE EPOXY COATED IN CONFORMANCE WITH SUBSECTION 505.2.4 OF THE STATE OF WISCONSIN - STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.

CONSTRUCTION JOINTS SHALL BE SEALED AS SHOWN IN DETAIL "A".

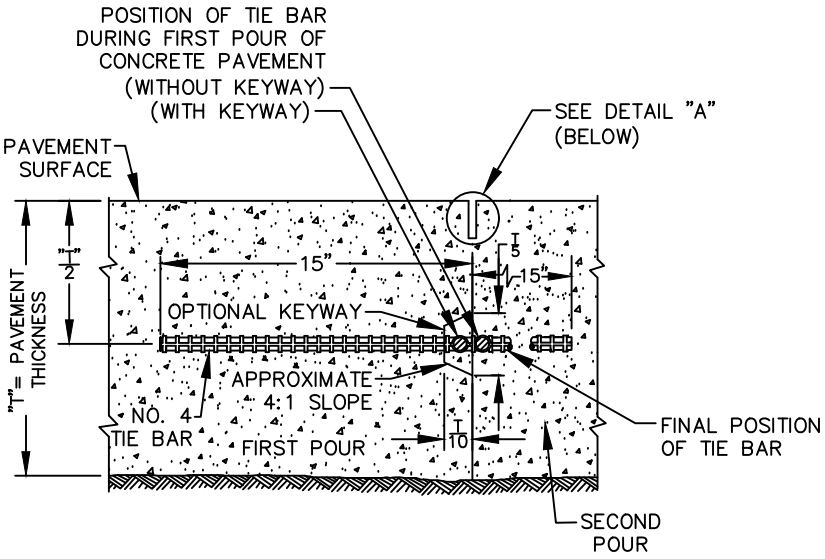
NON-REINFORCED CONCRETE PAVEMENT
(TRANSVERSE JOINTS SPACED AT 14' NORMAL)

CITY OF OSHKOSH, WISCONSIN

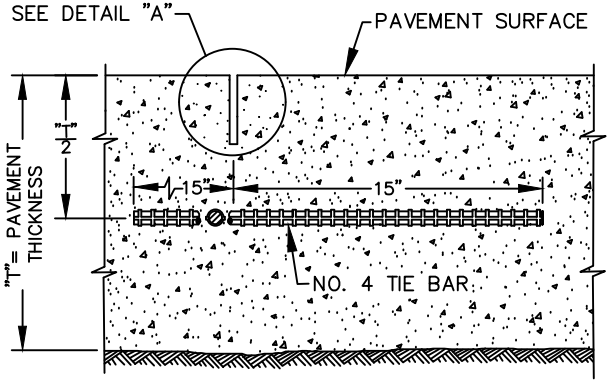
REVISIONS 12/1/2020

STANDARD DETAIL DRAWING 09

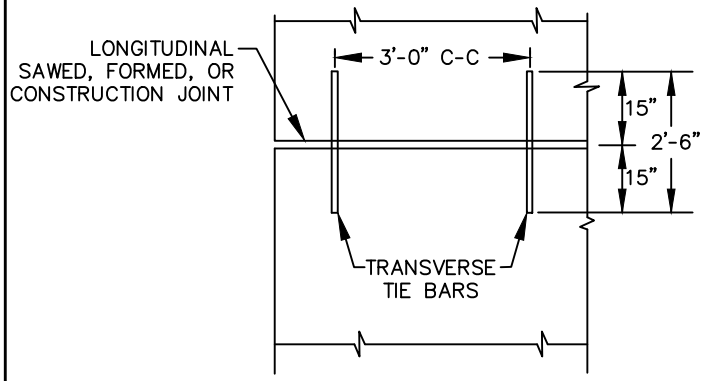
STANDARD DETAIL DRAWING 09



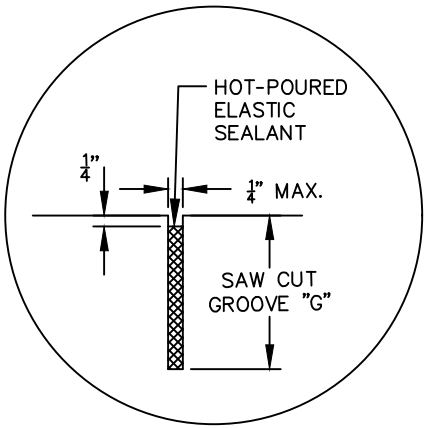
CONSTRUCTION JOINT DETAIL



SAWED JOINT DETAIL



PLAN VIEW
LOCATION OF TIE BARS DETAIL



SAW CUT
GROOVE "G"

SAWED JOINT = D/3
CONSTRUCTION JOINT = D/3

DETAIL "A"

GENERAL NOTES

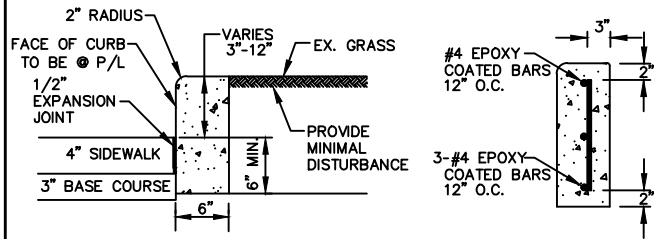
DETAILS OF CONSTRUCTION NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND THE APPLICABLE SPECIAL CONDITIONS

LONGITUDINAL JOINTS SHALL BE SHOWN IN DETAIL "A"

TIE BARS AND PAVEMENT TIES SHALL BE EPOXY COATED IN CONFORMANCE WITH SUBSECTION 505.2.4 OF THE STATE OF WISCONSIN - STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION

CONCRETE PAVEMENT LONGITUDINAL JOINTS	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	12/1/2020
STANDARD DETAIL DRAWING 10	

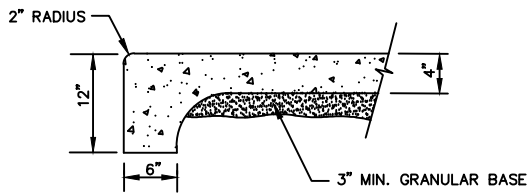
STANDARD DETAIL DRAWING 10



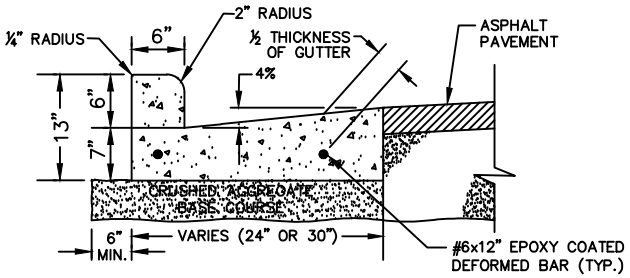
SIDEWALK CURB

FOR CURB HEIGHTS GREATER THAN 8" CURB SHALL BE REINFORCED AS SHOWN IN TYPE "B" CURB DETAIL

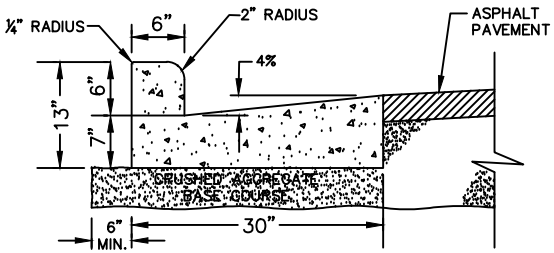
TYPE "B" CURB DETAIL



4" SIDEWALK WITH FALSE CURB DETAIL



STANDARD CURB AND GUTTER REPAIR

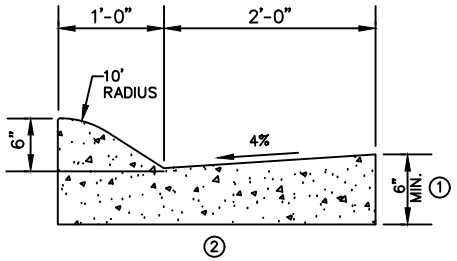


STANDARD 30" CURB AND GUTTER

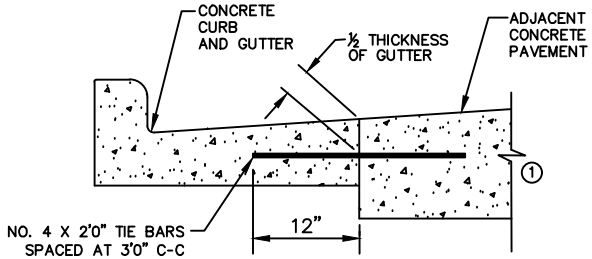
① TIE BARS ARE REQUIRED FOR CURB AND GUTTER.

② THE BOTTOM OF CURB AND GUTTER MAY BE CONSTRUCTED EITHER LEVEL OR PARALLEL TO THE SLOPE OF THE SUB-GRADE OR BASE COURSE PROVIDED A 6" MINIMUM GUTTER THICKNESS IS MAINTAINED.

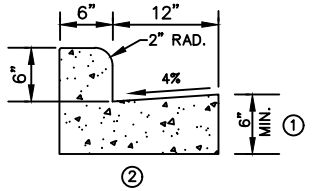
③ WHEN REVERSE SLOPE GUTTER IS REQUIRED, THE LOCATIONS WILL BE SHOWN ELSEWHERE IN THE PLAN.



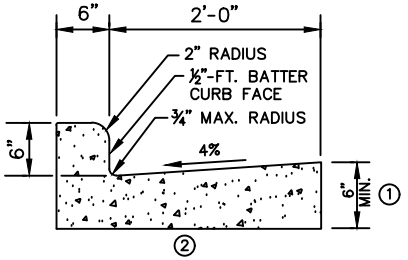
36" MOUNTABLE CONCRETE CURB & GUTTER



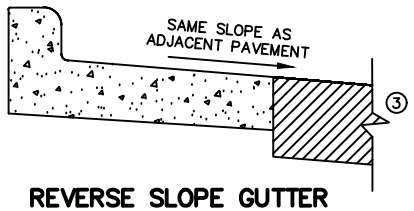
TYPICAL TIE BAR LOCATION



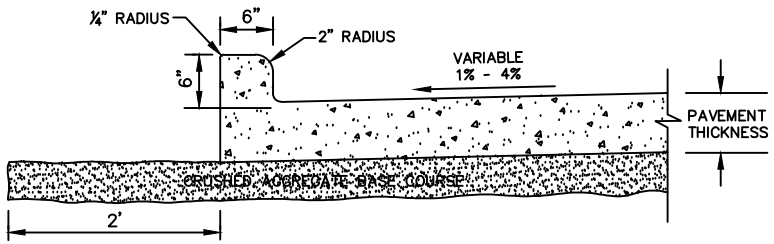
18" CONCRETE CURB & GUTTER



CONCRETE CURB & GUTTER 30"



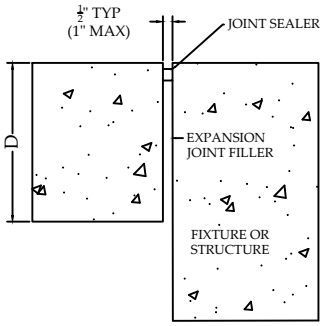
REVERSE SLOPE GUTTER (TYPICAL FOR ALL CURB & GUTTER TYPES)



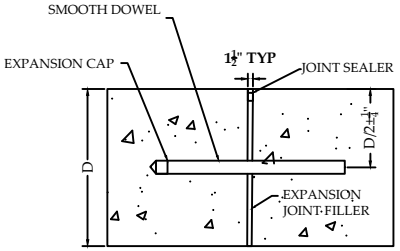
INTEGRAL CURB DETAIL

CONCRETE PAVING DETAILS	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	12/01/2020
STANDARD DETAIL DRAWING 11	

STANDARD DETAIL DRAWING 11



UNTIED - LONGITUDINAL



DOWELED TRANSVERSE ①

EXPANSION JOINTS

TIE BAR TABLE

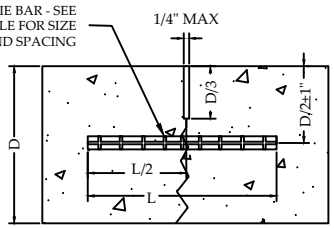
PAVEMENT DEPTH	TIE BAR SIZE	TIE BAR LENGTH (L)	MAX. TIE BAR SPACING
< 10 1/2"	NO. 4	30"	36"
≥ 10 1/2"	NO. 5	36"	36"
	NO. 4*	30"	24" **

* SUBSTITUTE BENT BARS AT LONGITUDINAL JOINTS WHEN EQUIPMENT LIMITATIONS DURING CONSTRUCTION WARRANT (e.g. AUXILIARY LANES OR TURN LANES).

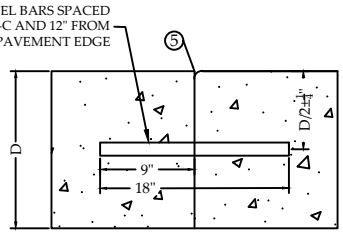
** CONFORM TO 15" MINIMUM SPACING FROM TRAVERSE JOINTS; SPACING BETWEEN TIE BARS WILL BE 30" AT TRANSVERSE JOINTS.

GENERAL NOTES

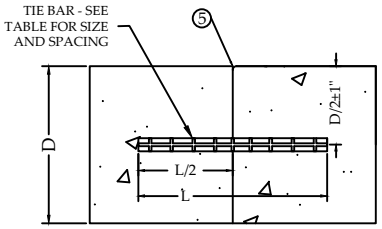
1. USE DOWELED EXPANSION JOINTS ON SIDE ROADS AT INTERSECTIONS (TO ISOLATE SIDE ROAD FROM THE THROUGH STREET) IF THE SIDE ROAD IS CONCRETE PAVEMENT AND GREATER THAN 300 FEET IN LENGTH.
2. SPACE CONTRACTION JOINTS IN ACCORDANCE WITH SDD 13C4, 13C11.
3. LOCATE CONSTRUCTION JOINTS A MINIMUM OF 6 FEET FROM THE NEAREST CONTRACTION JOINT AND ALIGN PARALLEL TO CONTRACTION JOINTS.
4. CONSTRUCTION JOINTS CAN BE FORMED OR SAWED.
5. IF JOINT IS FORMED, PROVIDE A ¼" RADIUS.
6. ANCHOR TIE BARS INTO DRILLED HOLES WITH EPOXY.



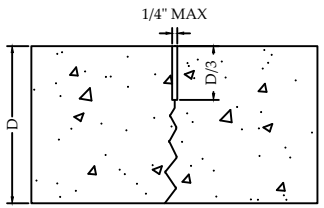
TIED LONGITUDINAL



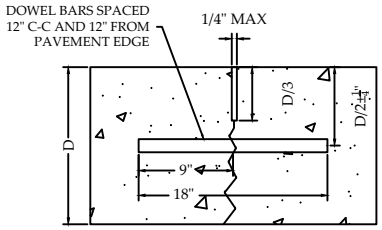
DOWELED TRANSVERSE ③



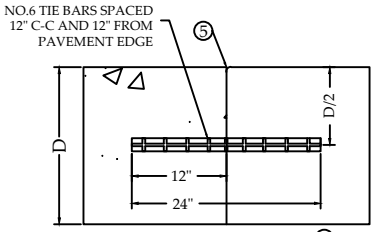
TIED LONGITUDINAL



UNDOWELED TRANSVERSE

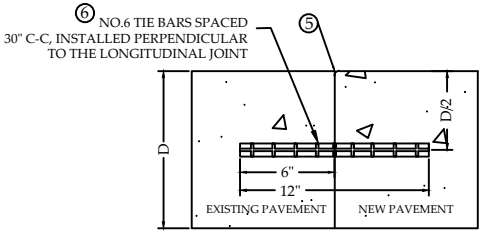


DOWELED TRANSVERSE



TIED TRANSVERSE ③

(FOR USE ON NON-DOWELED PAVEMENTS ONLY)



TIED LONGITUDINAL TO EXISTING

CONTRACTION JOINTS ②

CONSTRUCTION JOINTS ④

CONCRETE PAVEMENT JOINT TYPES

CITY OF OSHKOSH, WISCONSIN

REVISIONS 12/1/2020

STANDARD DETAIL DRAWING 12

STANDARD DETAIL DRAWING 12

CONCRETE PAVEMENT REPAIR AND REPLACEMENT
(DETAILS, NOT TO SCALE)

GENERAL NOTES:

SAW CUT, DRILL, AND LIFT OUT EXISTING CONCRETE PAVEMENT WITHIN THE BOUNDARIES OF CONCRETE REPAIR AREAS. THE CONTRACTOR MAY MAKE ADDITIONAL SAW CUTS INSIDE THE REPAIR LIMITS TO REDUCE WEIGHT AND SIZE OF CONCRETE PIECES.

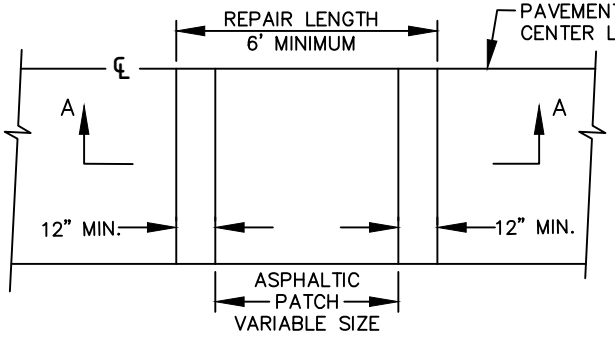
PROVIDE A 6-FOOT MINIMUM DISTANCE FROM BOUNDARIES OF CONCRETE REPAIR AREAS TO ADJACENT TRANSVERSE JOINT OR CRACK.

THE LENGTH OF REPAIRS MAY VARY FROM THE DIMENSIONS SHOWN IF THE EXISTING CONCRETE PAVEMENT IS NON-DOWELED AND THE PAVEMENT IS TO BE OVERLAID AFTER REPAIRING.

REMOVE PAVEMENT TO THE NEAREST TRANSVERSE JOINT IF CONCRETE PANEL IS LESS THAN 6 FEET. ALL SAW CUTS SHALL BE FULL DEPTH WITH NO OVERSAW. PLUNGE CUT TO END SAWCUT.

① DOWEL BARS MIGHT NOT EXIST

② 1⅝" DIAMETER SYMPATHY HOLE REQ'D AT ALL DEAD END JOINTS.

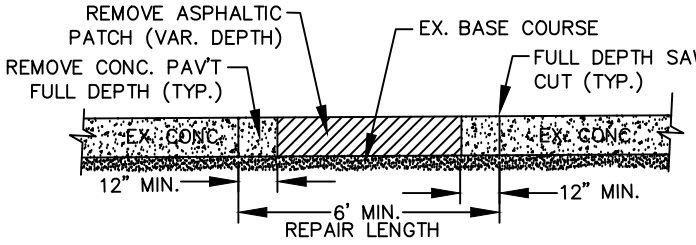


PLAN VIEW

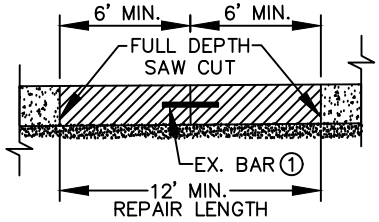
WHERE PATCH SIZES ARE DEPENDENT ON PASER RATINGS:

PASER RATING: (4-10)
6' MINIMUM JOINT SPACING MEASURED PARALLEL TO THE STREET CENTERLINE AND FULL PANEL MEASURED PERPENDICULAR TO THE STREET CENTERLINE.

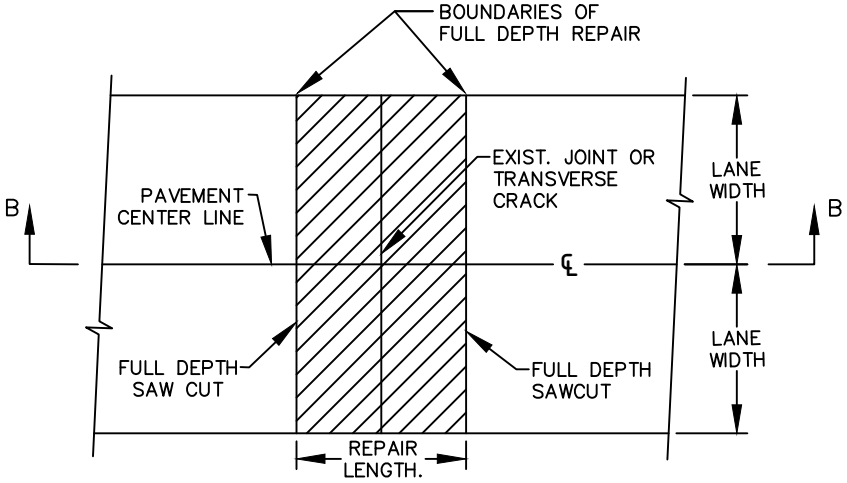
PASER RATING: (1-3)
6' MINIMUM JOINT SPACING TO REMAIN OR BE CREATED IN ALL DIRECTIONS.



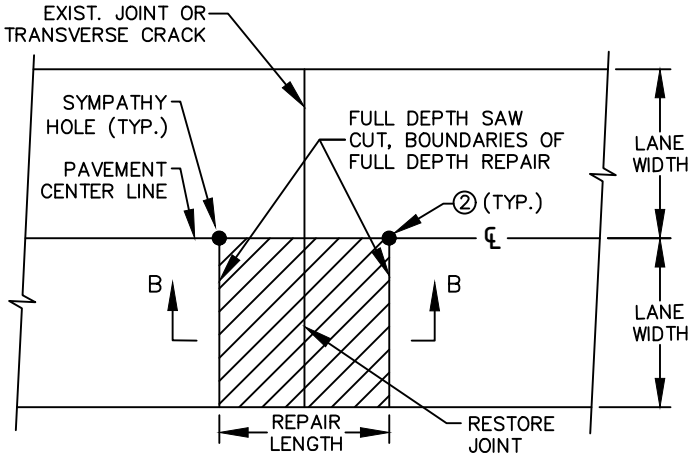
SECTION A–A
HMA PATCH REMOVAL



SECTION B–B
CONCRETE REMOVAL



PLAN VIEW (DOUBLE LANE REPAIR)



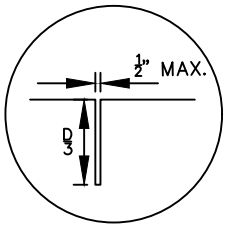
PLAN VIEW (SINGLE LANE REPAIR)

CONCRETE PAVING DETAILS
CITY OF OSHKOSH, WISCONSIN
REVISIONS 11/29/2016
STANDARD DETAIL DRAWING 13A

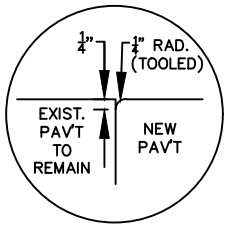
STANDARD DETAIL DRAWING 13A

CONCRETE PAVEMENT REPAIR AND REPLACEMENT

(DETAILS, NOT TO SCALE)



C1



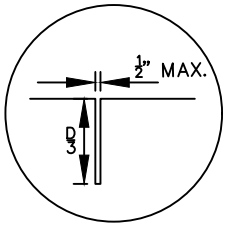
C2

TIE BAR TABLE

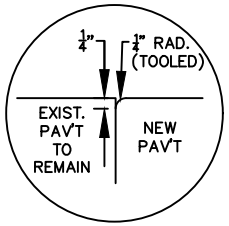
PAVEMENT DEPTH (D)	TIE BAR SIZE	TIE BAR LENGTH (L)	MAXIMUM TIE BAR SPACING
< 10 ½"	NO. 4	30"	36"
≥ 10 ½"	NO. 5	36"	36"
	NO. 4*	30"	24"

* SUBSTITUTE BENT BARS AT LONGITUDINAL JOINTS** WHEN EQUIPMENT LIMITATIONS DURING CONSTRUCTION WARRANT. (e.g. AUXILIARY LANES OR TURN LANES)

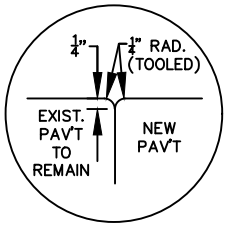
** CONFORM TO 15" MINIMUM SPACING FROM TRANSVERSE JOINTS: SPACING BETWEEN TIE BARS WILL BE 30" AT TRANSVERSE JOINTS.



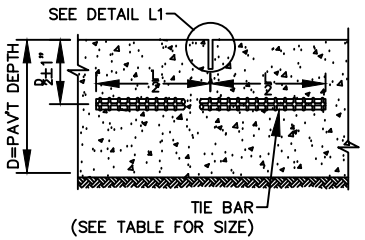
L1



L2



L3



SECTION C–C
(SAWED LONGITUDINAL JOINT)

GENERAL NOTES:

INSTALL DOWEL BARS PARALLEL TO THE PAVEMENT CENTERLINE AND PAVEMENT SURFACE.

INTERNAL JOINTS ON CONCRETE PAVEMENT REPAIRS OF EXISTING NON-DOWELED CONCRETE PAVEMENTS DO NOT NEED TO BE DOWELED.

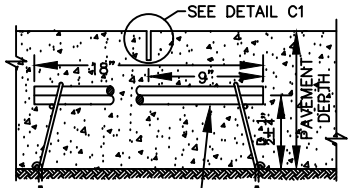
ALL JOINTS SHALL BE SEALED.

ANCHOR DOWEL BARS AND THE TIE BARS INTO DRILLED HOLES WITH AN EPOXY.

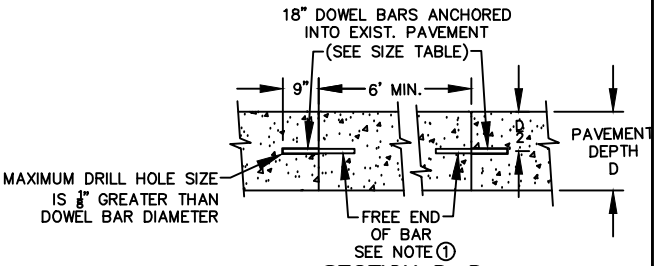
FOR MULTI-LANE CONCRETE PAVEMENT REPLACEMENTS, PROVIDE A MINIMUM DISTANCE OF 15 INCHES FROM ALL TRANSVERSE JOINTS OR EDGES OF REPLACEMENT TO THE CENTER OF THE TIE BAR NEAREST THAT JOINT OR EDGE.

NO OVER-CUT WILL BE ALLOWED AT DEAD END SAW CUTS, PLUNGE CUT AT END OF SAW CUT.

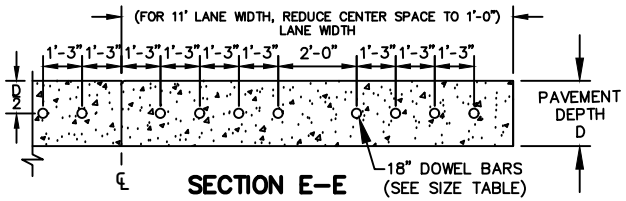
① APPLY A THIN UNIFORM COATING OF SURFACE TREATMENT TO THE FREE END OF DOWEL BARS TO PREVENT BONDING.



SECTION F–F
(CONTRACTION JOINT)



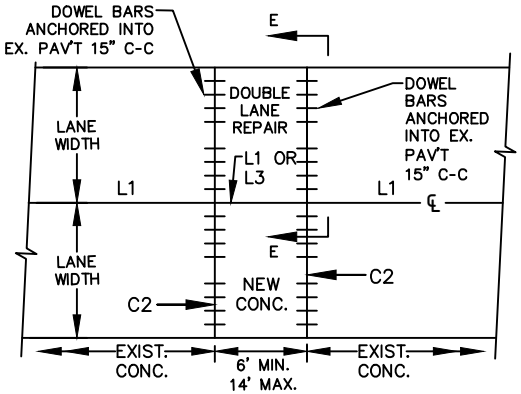
SECTION D–D



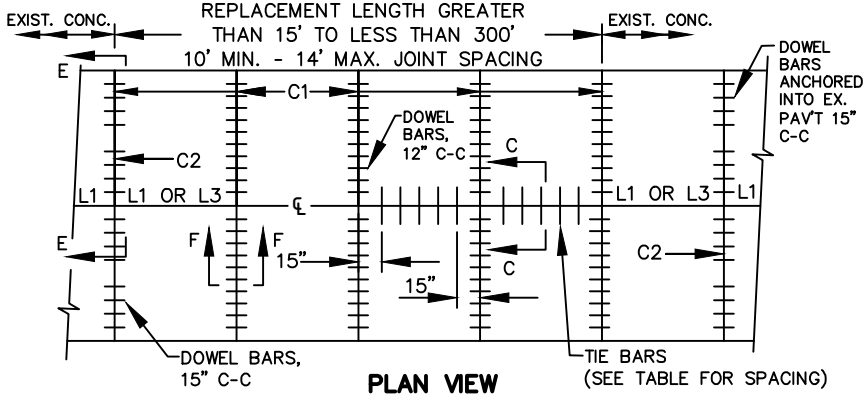
SECTION E–E

PAVEMENT DEPTH, DOWEL BAR SIZE & JOINT SPACING TABLE

PAVEMENT DEPTH (D)	DOWEL BAR DIA.	CONTRACTION JOINT SPACING
5 ½",6", 6 ½"	NONE	12'
7", 7 ½"	1"	14'
8", 8 ½"	1 ¼"	14'
9", 9 ½"	1 ¼"	14'
10" & ABOVE	1 ½"	14'



PLAN VIEW
(MULTI–LANE CONCRETE PAVEMENT REPAIR)



PLAN VIEW
(MULTI–LANE CONCRETE PAVEMENT REPLACEMENT)

CONCRETE PAVING DETAILS	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	11/29/2016
STANDARD DETAIL DRAWING 13B	

STANDARD DETAIL DRAWING 13B

CONCRETE PAVEMENT REPAIR AND REPLACEMENT
(DETAILS, NOT TO SCALE)

GENERAL NOTES

① WITH THE APPROVAL OF THE ENGINEER, FOR SINGLE LANE PAVEMENT REPLACEMENTS LESS THAN 30 FEET IN LENGTH. THE CONTRACTOR MAY INSTALL DRILLED TIE BARS ON 6:1 SKEW HORIZONTALLY. DIRECTION OF SKEW ALTERNATING WITH EACH SUCCESSIVE BAR. DRIVE SKEWED TIE BARS TO A DEPTH OF 6 INCHES IN A HOLE OF SUCH A DIAMETER AS TO PROVIDE A TIGHT DRIVEN FIT.

② USE AN ENGINEER-APPROVED BOND BREAKER ($\frac{1}{8}$" HARD PLASTIC OR 6 mm POLY IF SURFACE IS SMOOTH) FOR SINGLE LANE REPAIRS UP TO 15 FEET IN LENGTH.

③ ANCHOR TIE BARS INTO DRILLED HOLES WITH AN EPOXY.

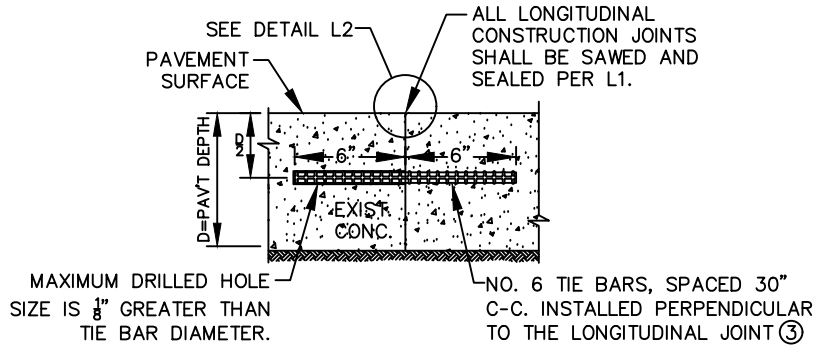
④ 1 $\frac{5}{8}$" DIAMETER SYMPATHY HOLE REQUIRED AT ALL DEAD END JOINTS.

⑤ ALL TRANSVERSE TIE IN JOINTS SHALL HAVE DRILLED DOWEL BARS, SEE TABLE ON 13 C 9 SHEET "B"

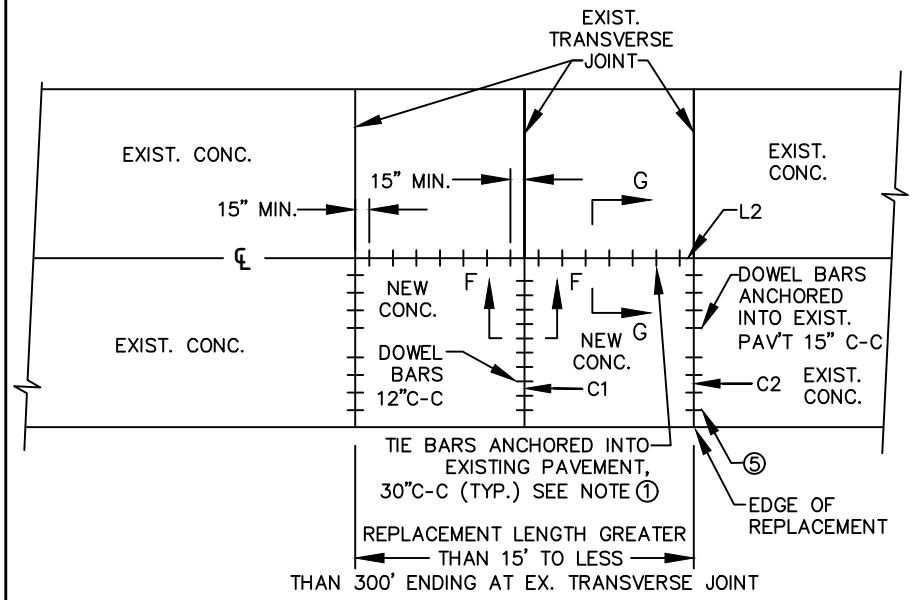
⑥ ALL TRANSVERSE JOINTS SHALL BE SAWED AND SEALED PER C1.

⑦ ALL TRANSVERSE JOINT DOWEL BARS SHALL BE DRILLED AND INSTALLED USING A HYDRAULIC GANG DRILL. HAND HELD DRILLS ARE NOT PERMITTED.

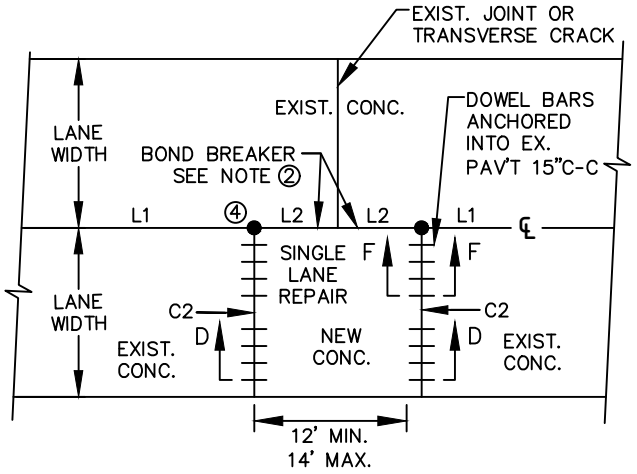
⑧ NO OVER CUT WILL BE ALLOWED. PLUNGE CUT AT END OF SAW CUT.



SECTION G–G
(TIE BARS ANCHORED INTO EXISTING PAVEMENT)
(AT LONGITUDINAL JOINTS ONLY)



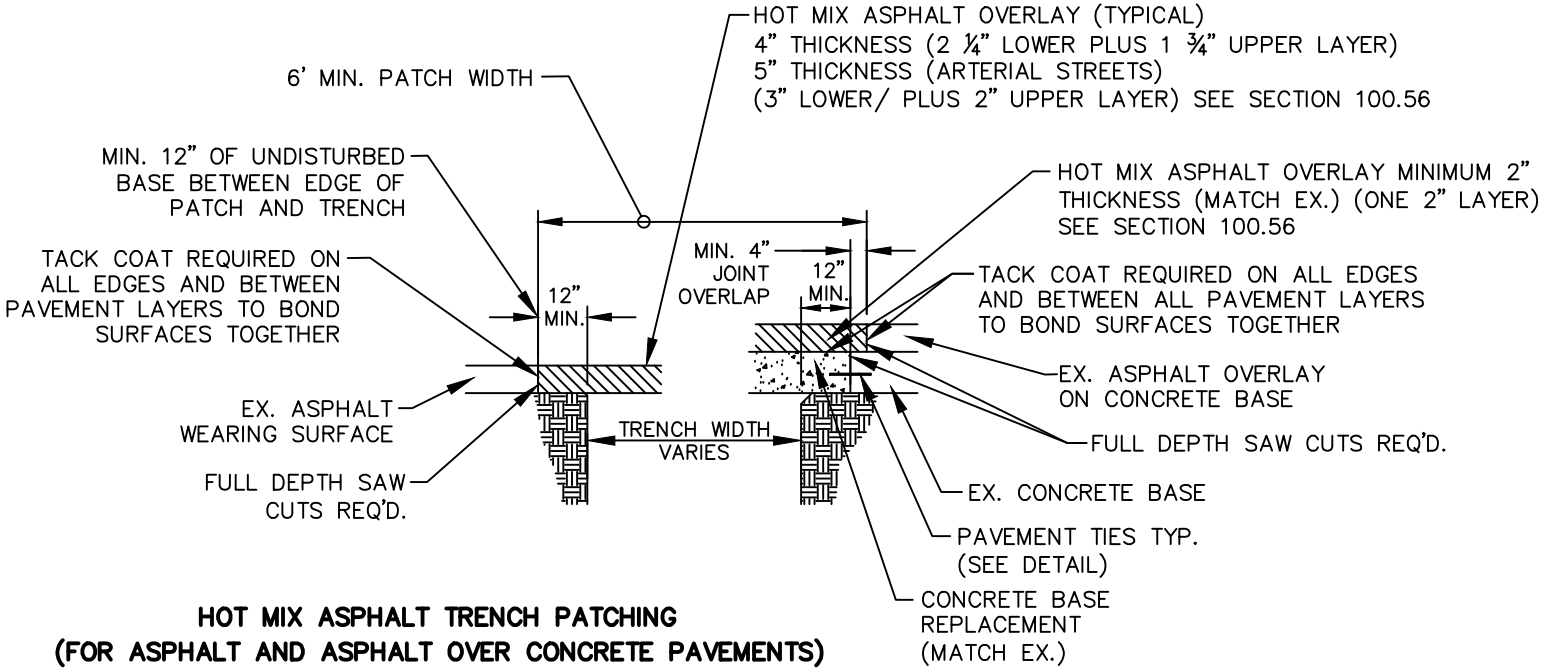
PLAN VIEW (SINGLE–LANE CONCRETE PAVEMENT REPLACEMENT)



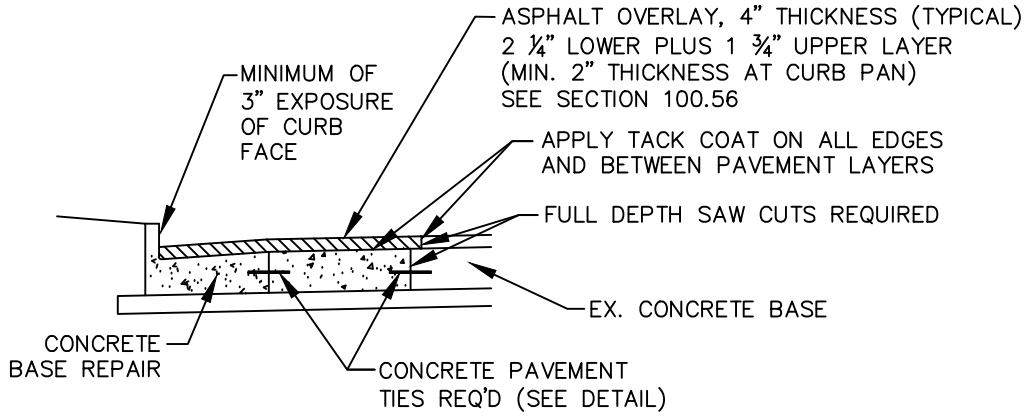
PLAN VIEW (SINGLE–LANE CONCRETE PAVEMENT REPAIR)

CONCRETE PAVING DETAILS	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	11/29/2016
STANDARD DETAIL DRAWING 13C	

STANDARD DETAIL DRAWING 13C



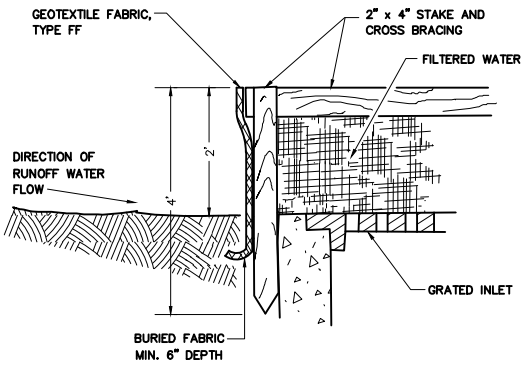
HOT MIX ASPHALT TRENCH PATCHING
(FOR ASPHALT AND ASPHALT OVER CONCRETE PAVEMENTS)

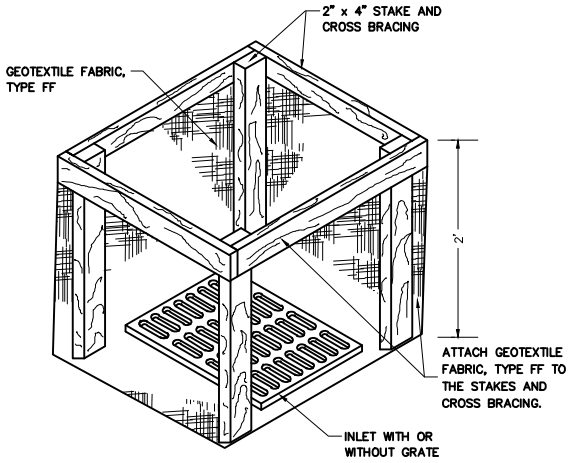


TYPICAL ASPHALT PATCH OVER CONCRETE BASE

CONCRETE PAVING DETAILS	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	11/29/2016
STANDARD DETAIL DRAWING 14	

STANDARD DETAIL DRAWING 14



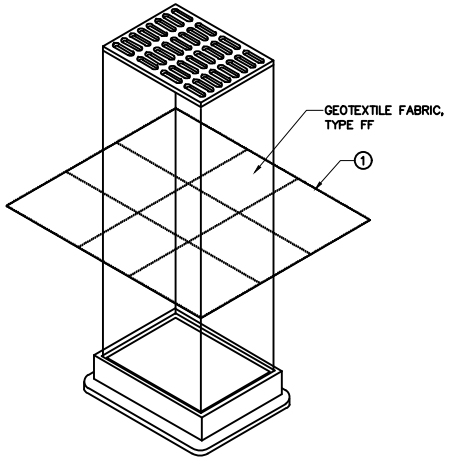


INLET PROTECTION, TYPE A

INSTALLATION NOTES
TYPE B & C

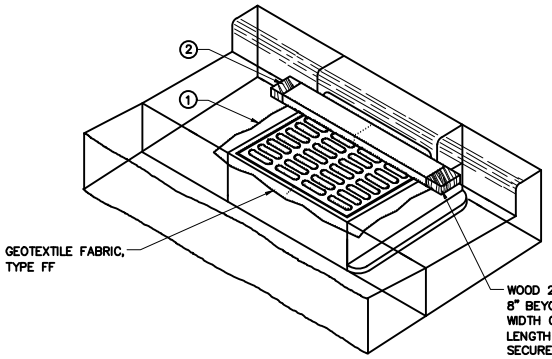
TRIM EXCESS FABRIC IN THE FLOW LINE TO WITHIN 3" OF THE GRATE.

THE CONTRACTOR SHALL DEMONSTRATE A METHOD OF MAINTENANCE, USING A SEWN FLAP, HAND HOLDS OR OTHER METHOD TO PREVENT ACCUMULATED SEDIMENT FROM ENTERING THE INLET.



INLET PROTECTION, TYPE B (WITHOUT CURB BOX)

(CAN BE INSTALLED IN ANY INLET WITHOUT A CURB BOX)



INLET PROTECTION, TYPE C (WITH CURB BOX)

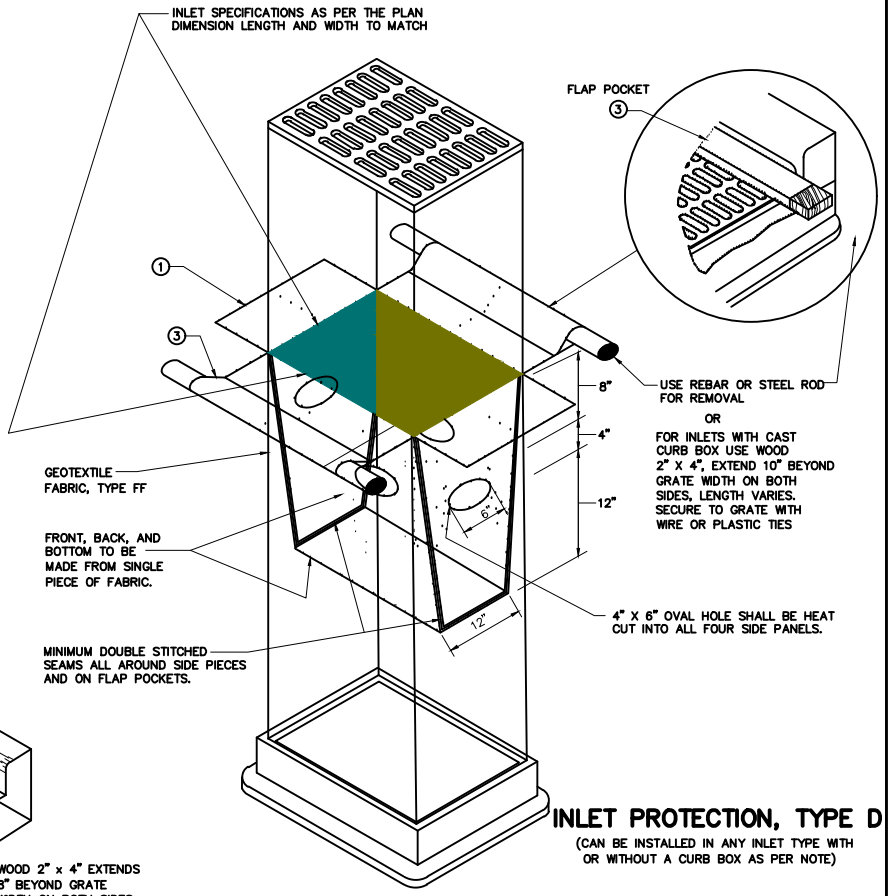
INSTALLATION NOTES
TYPE D

DO NOT INSTALL INLET PROTECTION TYPE D IN INLETS SHALLOWER THAN 30", MEASURED FROM THE BOTTOM OF THE INLET TO THE TOP OF THE GRATE.

TRIM EXCESS FABRIC IN THE FLOW LINE TO WITHIN 3" OF THE GRATE.

THE INSTALLED BAG SHALL HAVE A MINIMUM SIDE CLEARANCE, BETWEEN THE INLET WALLS AND THE BAG, MEASURED AT THE BOTTOM OF THE OVERFLOW HOLES, OF 3". WHERE NECESSARY THE CONTRACTOR SHALL

CINCH THE BAG, USING PLASTIC ZIP TIES, TO ACHIEVE THE 3" CLEARANCE. THE TIES SHALL BE PLACED AT A MAXIMUM OF 4" FROM THE BOTTOM OF THE BAG.



INLET PROTECTION, TYPE D

(CAN BE INSTALLED IN ANY INLET TYPE WITH OR WITHOUT A CURB BOX AS PER NOTE)

GENERAL NOTES

MANUFACTURED ALTERNATIVES APPROVED AND LISTED ON THE DEPARTMENT'S EROSION CONTROL PRODUCT ACCEPTABILITY LIST MAY BE SUBSTITUTED.

WHEN REMOVING OR MAINTAINING INLET PROTECTION, CARE SHALL BE TAKEN SO THAT THE SEDIMENT TRAPPED ON THE GEOTEXTILE FABRIC DOES NOT FALL INTO THE INLET. ANY MATERIAL FALLING INTO THE INLET SHALL BE REMOVED IMMEDIATELY.

① FINISHED SIZE, INCLUDING FLAP POCKETS WHERE REQUIRED, SHALL EXTEND A MINIMUM OF 10" AROUND THE PERIMETER TO FACILITATE MAINTENANCE OR REMOVAL.

② FOR INLET PROTECTION, TYPE C (WITH CURB BOX), AN ADDITIONAL 18" OF FABRIC IS WRAPPED AROUND THE WOOD AND SECURED WITH STAPLES. THE WOOD SHALL NOT BLOCK THE ENTIRE HEIGHT OF THE CURB BOX OPENING.

③ FLAP POCKETS SHALL BE LARGE ENOUGH TO ACCEPT WOOD 2X4.

This drawing based on Wisconsin Department of Transportation Standard Detail Drawing 8 E 10-2.

EROSION CONTROL DETAILS

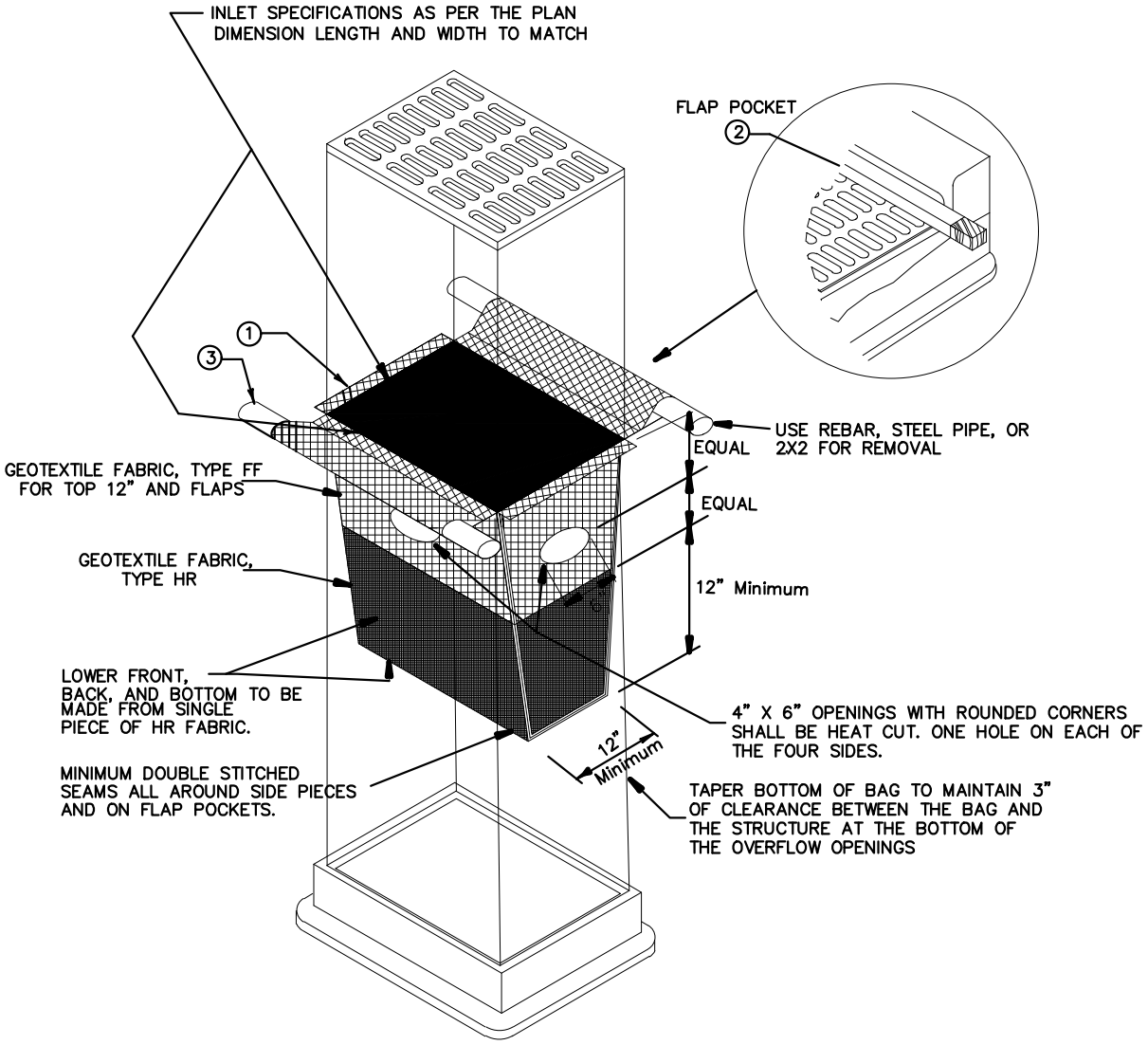
INLET PROTECTION-TYPES A, B, C, D

CITY OF OSHKOSH, WISCONSIN

REVISIONS 5/7/2009

STANDARD DETAIL DRAWING 15A

STANDARD DETAIL DRAWING 15A



CAN BE INSTALLED IN ANY INLET TYPE WITH
OR WITHOUT A CURB BOX.

GENERAL NOTES

CLEANING SHALL BE REQUIRED WHEN SEDIMENT OR STANDING WATER IS WITHIN 6" OF THE OVERFLOW HOLES OR AS DIRECTED BY THE CONSTRUCTION ENGINEER.

WHEN REMOVING OR MAINTAINING INLET PROTECTION, CARE SHALL BE TAKEN SO THAT THE SEDIMENT TRAPPED ON THE GEOTEXTILE FABRIC DOES NOT FALL INTO THE INLET. ANY MATERIAL FALLING INTO THE INLET SHALL BE REMOVED IMMEDIATELY.

THE INSTALLED BAG SHALL HAVE A MINIMUM SIDE CLEARANCE, BETWEEN THE INLET WALLS AND THE BAG,MEASURED AT THE BOTTOM OF THE OVERFLOW HOLES, OF 3".

① SIDE FLAPS SHALL BE A MAXIMUM OF 2" LONG. FOLD THE FABRIC OVER AND REINFORCE WITH MULTIPLE STICHES.

② FLAP POCKETS SHALL BE LARGE ENOUGH TO ACCEPT WOOD 2X2. THE 2X2 SHALL BE INSTALLED IN THE REAR FLAP AND SHALL NOT BLOCK THE TOP HALF OF THE CURB FACE OPENING.

③ FRONT LIFTING FLAP IS TO BE USED WHEN REMOVING AND MAINTAINING FILTER BAG.

EROSION CONTROL DETAILS

INLET PROTECTION-TYPE D "MODIFIED"

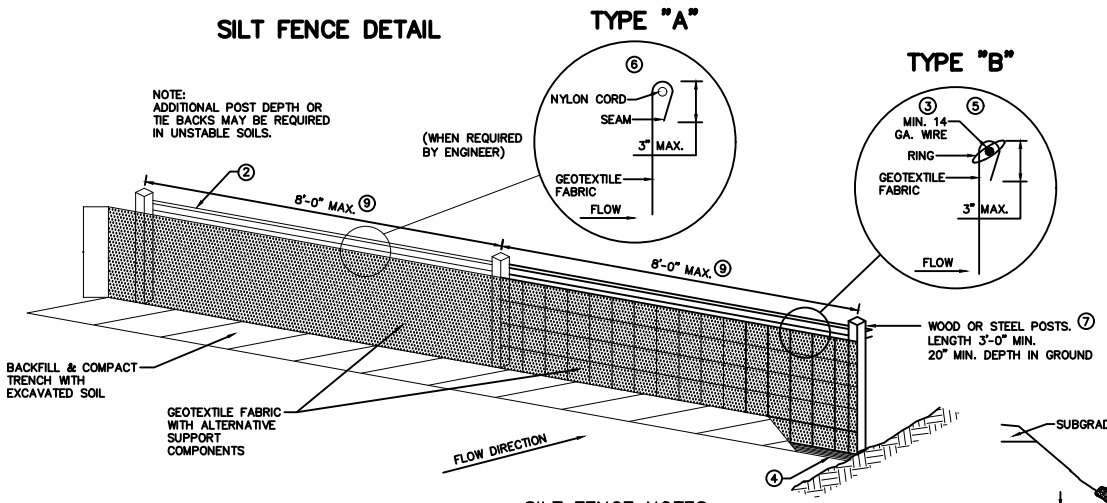
CITY OF OSHKOSH, WISCONSIN

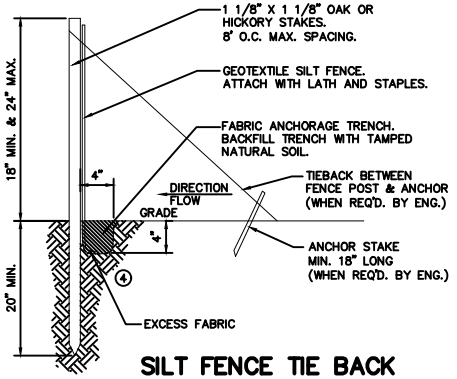
REVISIONS 2/2/2012

STANDARD DETAIL DRAWING 15B

STANDARD DETAIL DRAWING 15B

SILT FENCE DETAIL





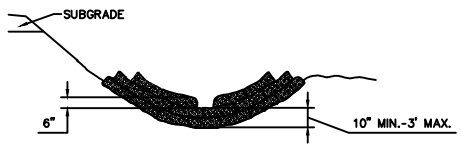
SILT FENCE TIE BACK

SILT FENCE NOTES

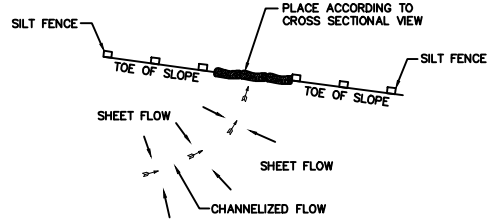
1. EROSION CONTROL SHALL BE PROVIDED IN ACCORDANCE WITH WDNR TECHNICAL STANDARD.
2. CROSS BRACE WITH 2" X 4" WOODEN FRAME OR EQUIVALENT AT TOP OF POSTS AS DIRECTED BY THE ENGINEER.
3. MINIMUM 14 GAUGE WIRE REQUIRED, FOLD FABRIC 3" OVER THE WIRE AND STAPLE OR PLACE WIRE RINGS ON 12" C.C.
4. EXCAVATE A TRENCH A MINIMUM OF 4" WIDE & 6" DEEP TO BURY AND ANCHOR THE GEOTEXTILE FABRIC. FOLD MATERIAL TO FIT TRENCH AND BACKFILL & COMPACT TRENCH WITH EXCAVATED SOIL.
5. WIRE SUPPORT FENCE SHALL BE 14 GAUGE MINIMUM WOVEN WIRE WITH A MAXIMUM MESH SPACING OF 6". SECURE TOP OF GEOTEXTILE FABRIC TO TOP OF FENCE WITH STAPLES OR WIRE RINGS AT 12" C.C. (TYPE B)
6. GEOTEXTILE FABRIC SHALL BE REINFORCED WITH AN INDUSTRIAL POLYPROPYLENE NETTING WITH A MAXIMUM MESH SPACING OF 3/4" OR EQUAL. A HEAVY DUTY NYLON TOP SUPPORT CORD OR EQUIVALENT IS REQUIRED. (TYPE A)
7. STEEL POSTS SHALL BE STUDDED "TEE" OR "U" TYPE WITH A MINIMUM WEIGHT OF 1.28 LBS./LIN. FT. (WITHOUT ANCHOR) FIN ANCHORS SUFFICIENT TO RESIST POST MOVEMENT ARE REQUIRED. WOOD POSTS SHALL BE A MINIMUM SIZE OF 1 1/8" X 1 1/8" OF OAK OR HICKORY.
8. CONSTRUCT SILT FENCE FROM A CONTINUOUS ROLL, IF POSSIBLE, BY CUTTING LENGTHS TO AVOID JOINTS. IF A JOINT IS NECESSARY, USE ONE OF THE FOLLOWING TWO METHODS: A.) TWIST METHOD -- OVERLAP THE END POSTS AND TWIST, OR ROTATE, AT LEAST 180 DEGREES, B:) HOOK METHOD -- HOOK THE END OF EACH SILT FENCE LENGTH.
9. THE MAXIMUM SPACING OF POSTS FOR WOVEN FABRIC SILT FENCE SHALL BE 8 FEET AND FOR NON-WOVEN FABRIC, 3 FEET.

EROSION CONTROL SHEET FLOW NOTES:

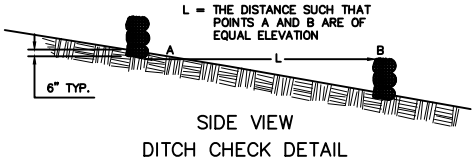
1. ANY SOIL STOCKPILED THAT REMAINS FOR MORE THAN 7 DAYS SHALL BE COVERED OR TREATED WITH STABILIZATION PRACTICES SUCH AS TEMPORARY OR PERMANENT SEEDING AND MULCHING.
2. A MINIMUM OF 4 INCHES OF TOPSOIL MUST BE APPLIED TO ALL AREAS TO BE SEEDED OR SODDED.
3. ALL WASTE AND UNUSED BUILDING MATERIALS (INCLUDING GARBAGE, DEBRIS, CLEANING WASTES, WASTEWATER, TOXIC MATERIALS, OR HAZARDOUS MATERIALS) SHALL BE PROPERLY DISPOSED OF AND NOT ALLOWED TO BE CARRIED OFF-SITE BY RUNOFF OR WIND.
4. ALL OFF-SITE SEDIMENT DEPOSITS OCCURRING AS A RESULT OF CONSTRUCTION WORK OR A STORM EVENT SHALL BE CLEANED UP BY THE END OF EACH DAY. FLUSHING SHALL NO BE ALLOWED.
5. ANY SOIL EROSION THAT OCCURS AFTER FINAL GRADING AND/OR THE APPLICATION OF STABILIZATION MEASURES MUST BE REPAIRED AND TH STABILIZATION WORK REDONE.
6. FOR ANY DISTURBED AREA THAT REMAINS INACTIVE FOR GREATER THAN 7 WORKING DAYS, OR WHERE GRADING WORK EXTENDS BEYOND THE PERMANENT SEEDING DEADLINES, THE SITE MUST BE TREATED WITH TEMPORARY STABILIZATION MEASURES SUCH AS SOIL TREATMENT, TEMPORARY SEEDING AND/OR MULCHING.
7. ALL TEMPORARY EROSION CONTROL PRACTICES SHALL BE MAINTAINED UNTIL THE SITE IS STABILIZED WITH 70% VEGETATION AND A NOTICE OF TERMINATION HAS BEEN APPROVED BY THE DNR.
8. WIND EROSION SHALL BE KEPT TO A MINIMUM DURING CONSTRUCTION. WATERING, MULCH OR A TACKING AGENT MAY NEED TO BE UTILIZED TO PROTECT NEARBY RESIDENCES/WATER RESOURCES.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL THE EROSION CONTROL MEASURES IN CONFORMANCE WITH THE WDNR CONSERVATION PRACTICE STANDARDS, LATEST EDITION.
10. UPON COMPLETION OF STORM INLET CONSTRUCTION, THE CONTRACTOR SHALL INSTALL STORM DRAIN INLET PROTECTION FOR CONSTRUCTION SITE AS SPECIFIED.
11. FINE SEDIMENT ACCUMULATIONS SHALL BE CLEANED FROM STREETS, PRIVATE DRIVES, OR PARKING AREAS BY MANUAL OR MECHANICAL SWEEPING A MINIMUM OF ONCE PER WEEK AND BEFORE ALL IMMINENT RAINS.
12. EROSION AND SEDIMENT CONTROL STRUCTURES SHALL BE INSPECTED WEEKLY AND WITHIN 24 HOURS OF RAINFALL OF 0.5 INCH OR MORE.



CROSS SECTIONAL VIEW



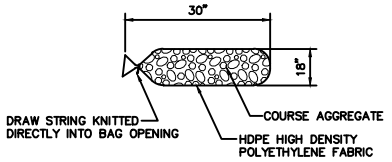
PLAN VIEW



SIDE VIEW

DITCH CHECK DETAIL

ROCK FILLED EROSION CONTROL BAGS TYPE B



COURSE AGGREGATE INFORMATION

SIEVE SIZE	SIZE NO. AASHTO No. 67 (1)
2 INCH (50 mm)	-
1 1/2 INCH (37.5mm)	-
1 INCH (25.0 mm)	100
3/4 INCH (19.0mm)	90-100
3/8 INCH (9.5mm)	20-55
No. 4 (4.75mm)	0-10
No. 8 (2.36mm)	0-5

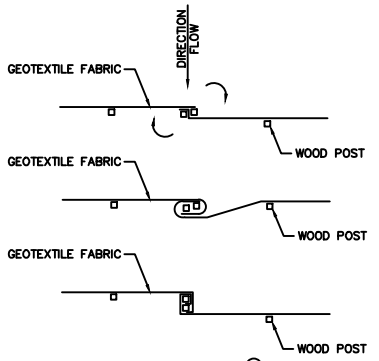
(1) SIZE No. ACCORDING TO AASHTO M 43

FILTER BAG DETAIL

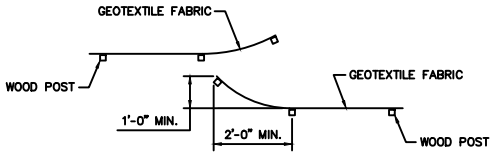
NOTES:

18" X 30" ROCK FILLED FILTER BAG SHALL BE COMPRISED OF THE FOLLOWING:
HDPE HIGH DENSITY POLYETHYLENE
HDPE HIGH DENSITY POLYETHYLENE DRAW STRING KNITTED DIRECTLY INTO BAG OPENING.
80% FABRIC CLOSURE WITH APPARENT OPENING SIZE NO LARGER THAN 1/8 " X 1/8 "
ROLLED SEAM USING A MINIMUM OF 480 DENIER POLYESTER SEWING YARN FOR STRENGTH AND DURABILITY.

USE WELL GRADED COURSE AGGREGATE CONFORMING TO THE FOLLOWING GRADATION REQUIREMENTS



TWIST METHOD ⑧

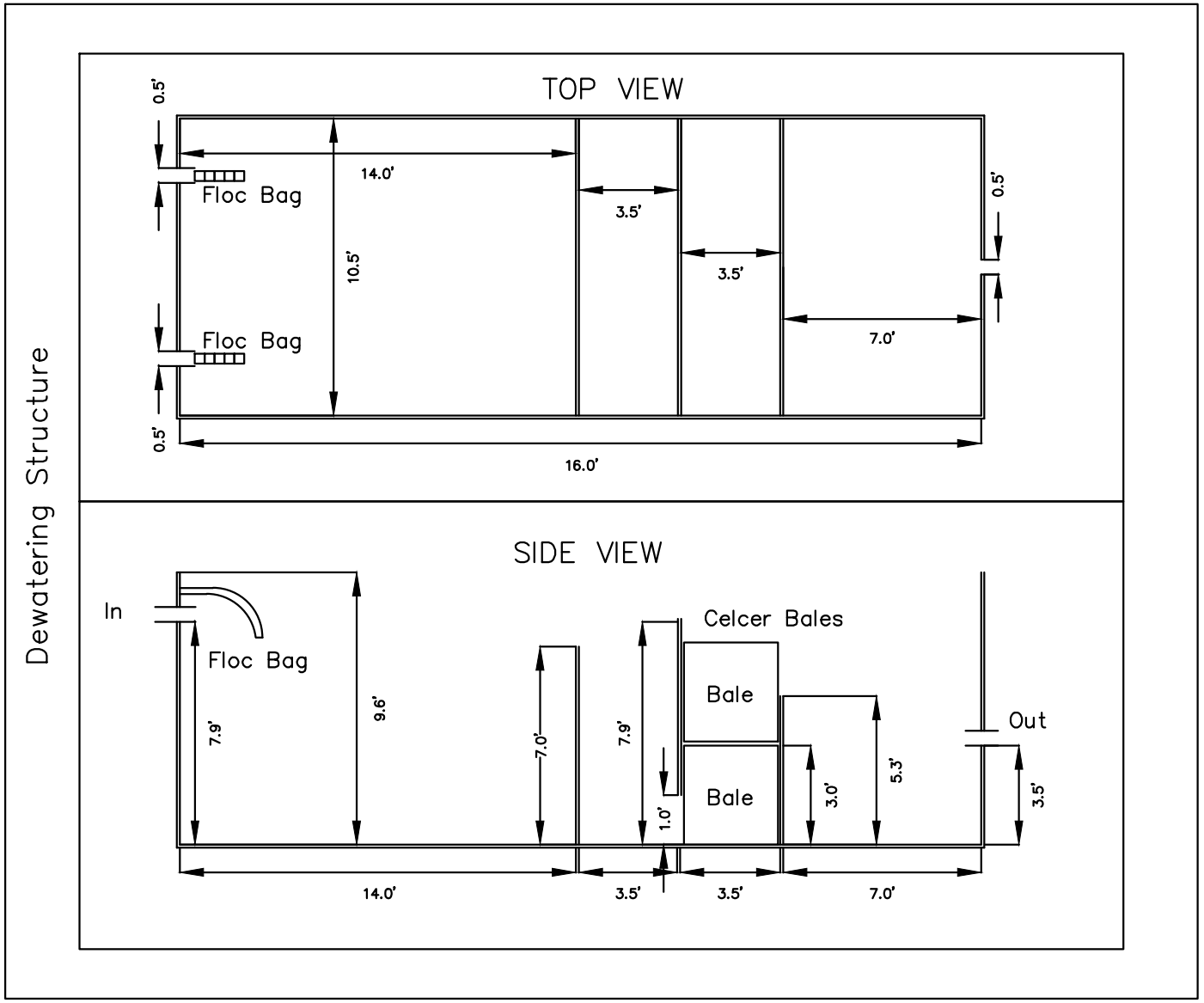


HOOK METHOD ⑧

(JOINING TWO LENGTHS OF SILT FENCE)

EROSION CONTROL DETAILS
SILT FENCING & DITCH CHECKS
CITY OF OSHKOSH, WISCONSIN
REVISIONS 5/7/2009
STANDARD DETAIL DRAWING 16

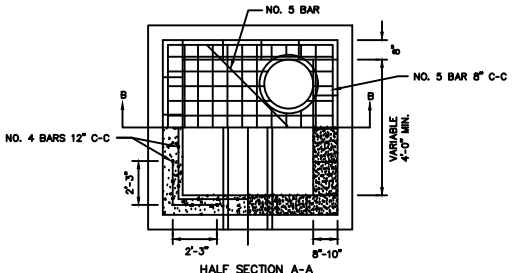
STANDARD DETAIL DRAWING 16



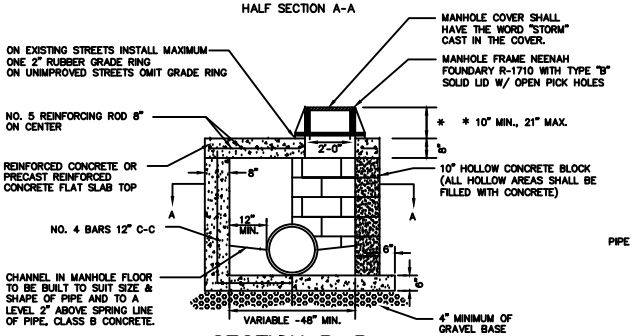
SEDIMENT CONTROL – TANK DEWATERING

DEWATERING TANK DETAIL	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	2/9/2011
STANDARD DETAIL DRAWING 17	

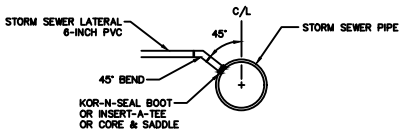
STANDARD DETAIL DRAWING 17



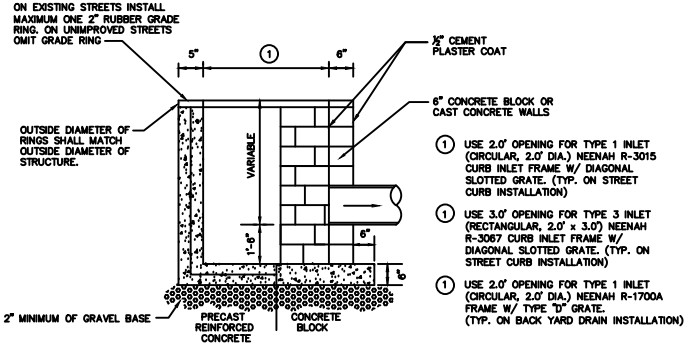
HALF SECTION A-A



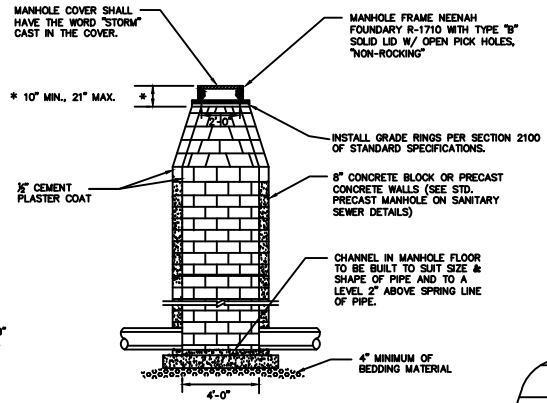
SECTION B-B
BOX MANHOLE



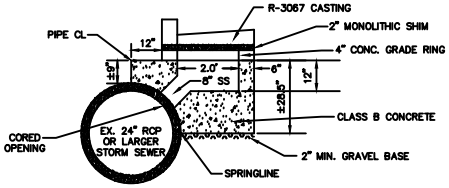
CONNECTION TO MAIN DETAIL
(STORM SEWER LATERAL)



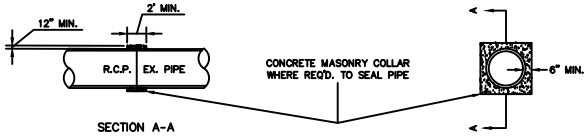
STANDARD INLET (TYPE 1 & 3) W/ 18" SUMP



STANDARD MANHOLE

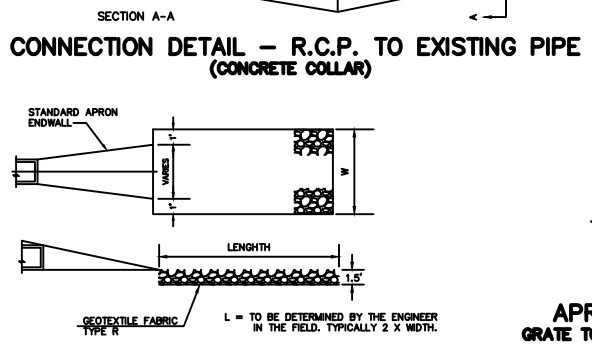


MODIFIED CAST IN PLACE
TYPE 3 INLET

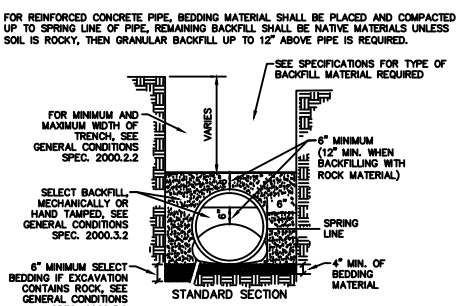


APRON ENDWALL GRATE
GRATE TO BE MADE OF GALVANIZED STEEL

APRON ENDWALL GRATE
GRATE TO BE MADE OF GALVANIZED STEEL

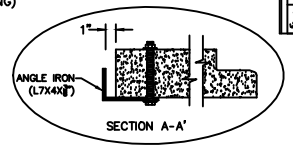


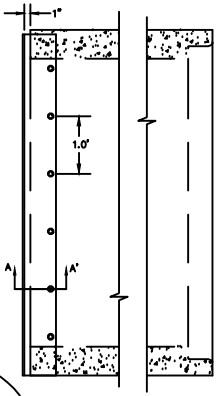
MEDIUM RANDOM RIPRAP DISCHARGE APRON



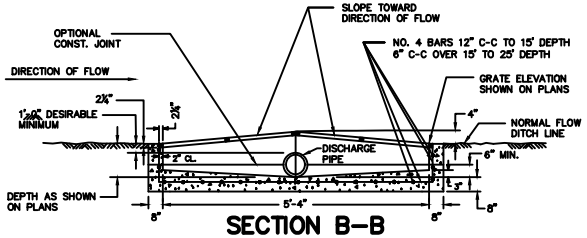
STANDARD SECTION

TRENCH DETAIL
(CLASS "B" BEDDING)





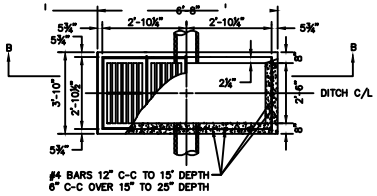
STORM SEWER BOX
CULVERT OUTFALL
PLATE DETAIL



SECTION B-B

SECTION A-A

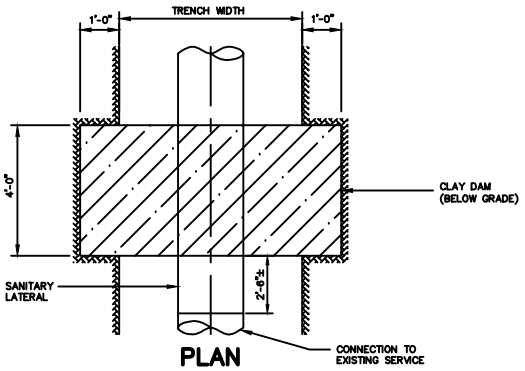
CONNECTION DETAIL – R.C.P. TO EXISTING PIPE
(CONCRETE COLLAR)



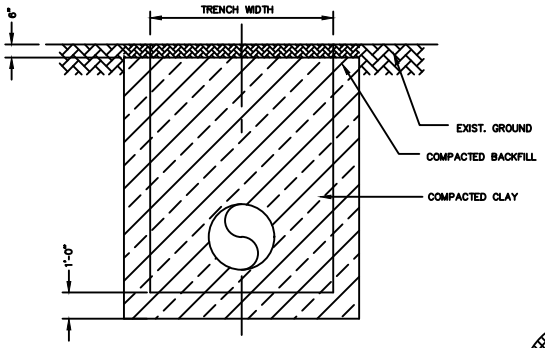
PLAN VIEW
INLET TYPE 9
(REINFORCED CONCRETE)

STORM SEWER DETAILS	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	12/21/2012
STANDARD DETAIL DRAWING 18	

STANDARD DETAIL DRAWING 18



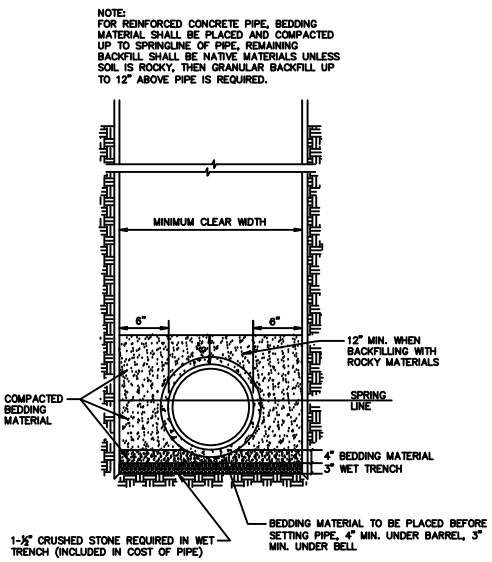
PLAN



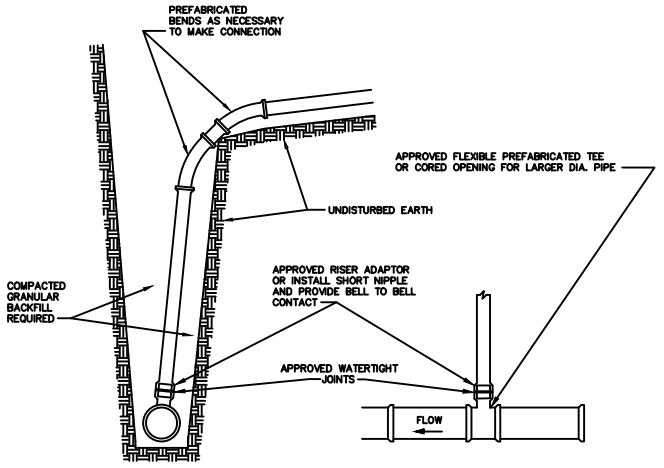
SECTION

CLAY DAM DETAIL

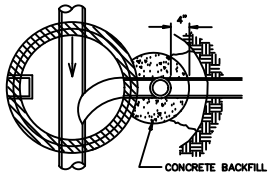
NOTE: CONTRACTOR SHALL BACKFILL AND COMPACT TRENCH WITH CLAY DAM. NO STONE SHALL BE USED IN THE BOTTOM OF TRENCH ALONG THE LENGTH OF THE DAM.

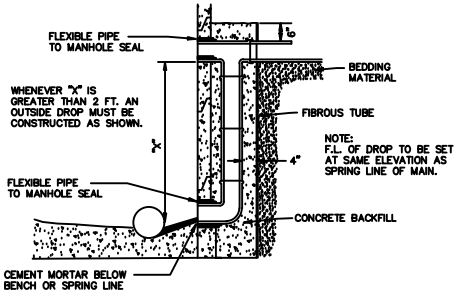


STANDARD SECTION
(CLASS "B" BEDDING)

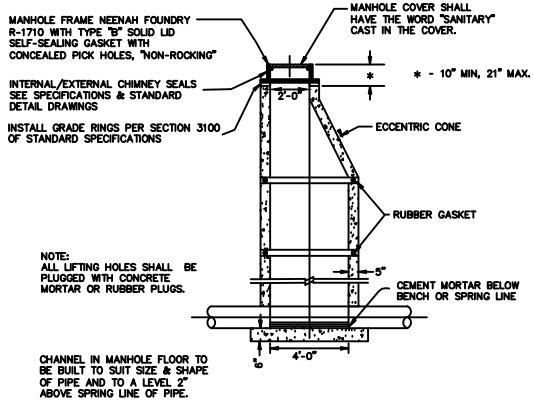


STANDARD RISER DETAIL
(FLEXIBLE RISER TO FLEXIBLE MAIN)

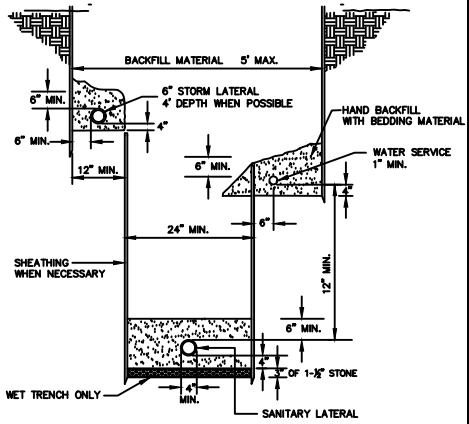




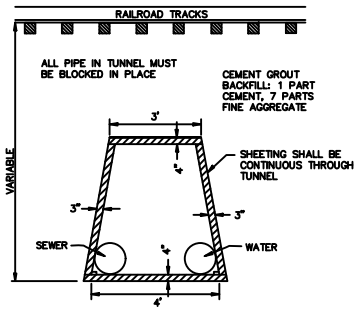
OUTSIDE DROP PRECAST MANHOLE



STANDARD PRECAST MANHOLE

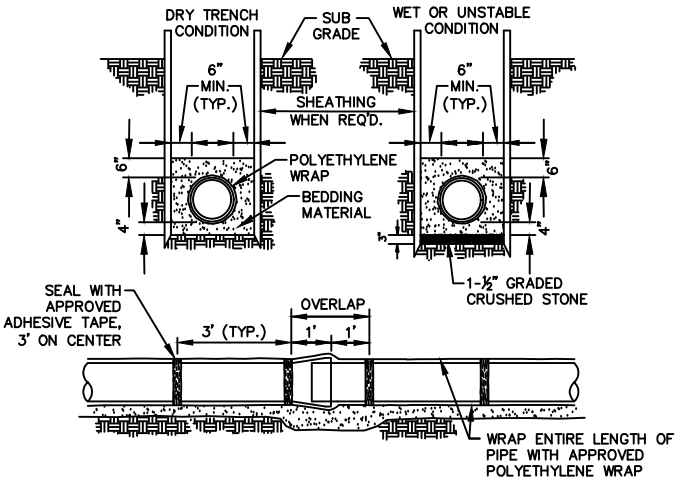


STANDARD SECTION FOR SERVICES
(STORM, SANITARY & WATER)

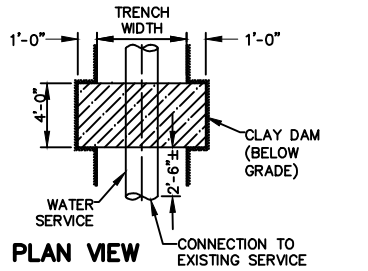


TUNNEL SECTION

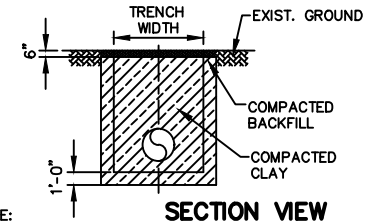
SANITARY SEWER DETAILS
CITY OF OSHKOSH, WISCONSIN
REVISIONS 5/7/2009
STANDARD DETAIL DRAWING 19



STANDARD WATER MAIN TRENCH SECTION



PLAN VIEW

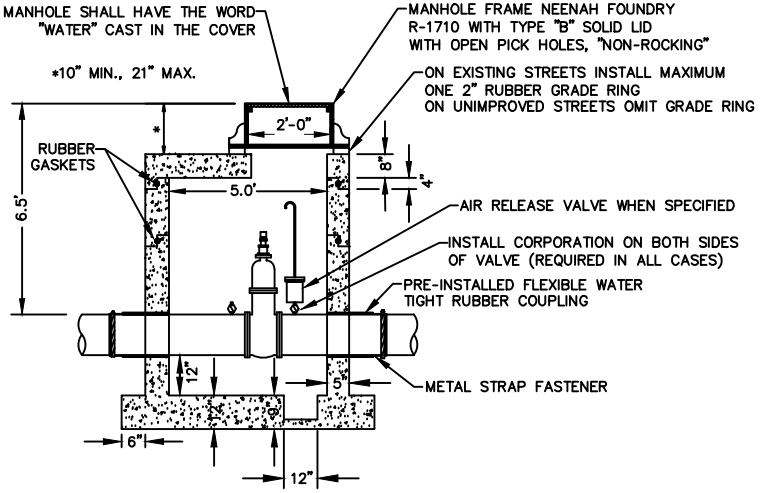


SECTION VIEW

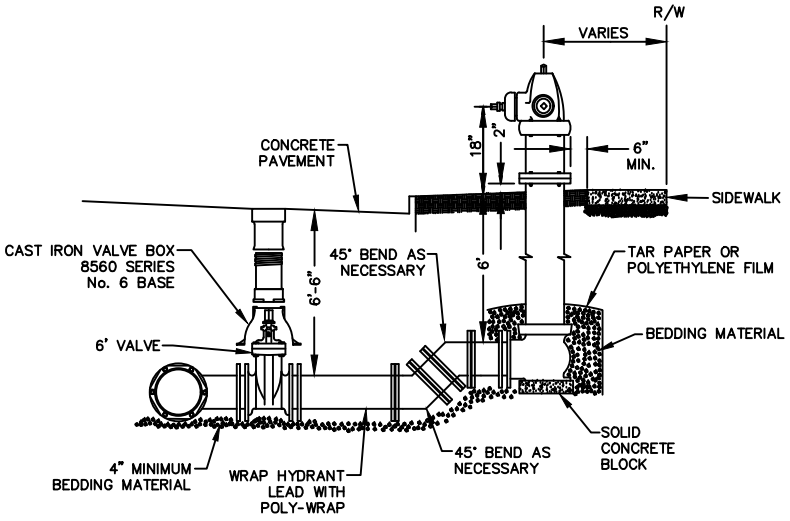
NOTE:

CONTRACTOR SHALL BACKFILL AND COMPACT TRENCH WITH CLAY DAM. NO STONE SHALL BE USED IN THE BOTTOM OF TRENCH ALONG THE LENGTH OF THE DAM.

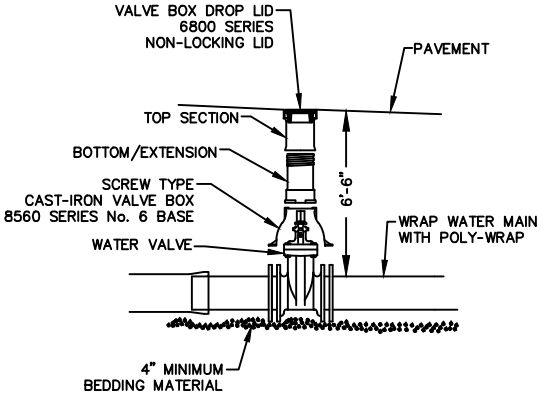
CLAY DAM DETAIL



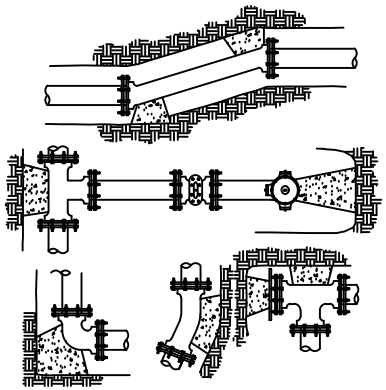
STANDARD 5' DIAMETER WATER VALVE MANHOLE



TYPICAL HYDRANT INSTALLATION MECHANICAL JOINT



WATER VALVE & VALVE BOX DETAIL



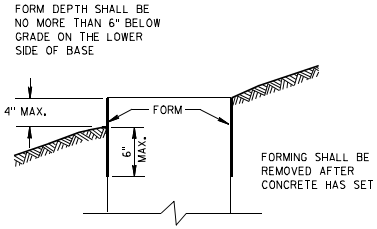
THRUST BLOCK LOCATION

NOT TO SCALE

WATER MAIN DETAILS	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	12/10/2015
STANDARD DETAIL DRAWING 20	

STANDARD DETAIL DRAWING 20

9C2: Concrete Bases Types 1, 2 and 5



FORMING DETAIL

QUANTITY REQUIREMENTS	CONCRETE BASE TYPE		
	1	2	5
APPROX. CUBIC YARDS OF CONCRETE	0.40	0.57	0.40
LBS. OF HOOP BAR STEEL	NONE	23	16
LBS. OF VERTICAL BAR STEEL	NONE	60	18

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE CONTRACT.

BASES SHALL BE EXCAVATED BY USE OF A CIRCULAR AUGER.

TOP SURFACES OF CONCRETE BASES SHALL BE TROWEL FINISHED SMOOTH AND LEVEL.

CONDUIT SIZES AND LOCATIONS SHALL BE AS SHOWN ON THE PLANS.

THE FINAL OR TERMINATING CONCRETE BASE IN A CONDUIT RUN SHALL HAVE A 6" EXIT STUB INSTALLED FOR FUTURE CABLING USE. THE EXIT STUB SHALL BE SIZED AS USED THROUGHOUT THE CONDUIT RUN AS SHOWN AT THE ENTRANCE OF THE BASE.

MINIMUM BENDING RADIUS OF CONDUIT IS EQUAL TO 6 X THE DIAMETER.

CONDUIT HEIGHT ABOVE CONCRETE BASES SHALL BE 1 INCH. ALL METALLIC CONDUIT ENDS SHALL BE REAMED AND THREADED.

ALL CONDUIT ENDS AT THE TOP OF CONCRETE BASES SHALL BE CAPPED IF METALLIC OR PLUGGED IF NONMETALLIC IMMEDIATELY AFTER PLACEMENT AND BEFORE CONCRETE IS POURED. CONDUITS IN WHICH WIRE OR CABLE IS NOT INSTALLED SHALL REMAIN CAPPED OR PLUGGED.

GENERAL NOTES (CONTINUED)

BELL ENDS SHALL BE INSTALLED ON ALL PVC CONDUIT EXPOSED AT THE TOP OF CONCRETE BASES BEFORE INSTALLATION OF CABLE OR WIRE.

ENDS OF CONDUIT INSTALLED BELOW GRADE FOR FUTURE USE SHALL BE CAPPED IF METALLIC OR PLUGGED IF NONMETALLIC.

WHEN REQUIRED TO CONNECT NONMETALLIC CONDUIT TO METALLIC CONDUIT, ONLY ADAPTER FITTINGS, U.L. LISTED FOR ELECTRICAL USE, SHALL BE USED.

IF A BASE REQUIRES A DEEP FORM BECAUSE OF LOOSE DIRT OR FILL, THE FORM SHALL BE REMOVED BEFORE BACKFILLING AROUND THE BASE. BACKFILL SHALL BE TAMPED TIGHT AGAINST THE BARE CONCRETE BASE IN LAYERS OF 1 FOOT OR LESS.

A NO. 4 AWG, STRANDED COPPER EQUIPMENT GROUNDING CONDUCTOR SHALL BE EXOTHERMICALLY WELDED TO THE EQUIPMENT GROUNDING ELECTRODE (GROUND ROD) FOR TYPE 2 AND TYPE 5 BASES.

THE EQUIPMENT GROUNDING CONDUCTOR SHALL BE FURNISHED AND INSTALLED TO ENTER THE BASE OF THE TYPE 2 AND TYPE 5 BASES THROUGH A 1 INCH CONDUIT INSTALLED FOR GROUNDING PURPOSES, LEAVING A 4 FOOT COIL OF WIRE ABOVE THE CONCRETE BASE. THE EQUIPMENT GROUNDING CONDUCTOR SHALL BE NEATLY COILED AND THE COILS TIED TOGETHER.

ANCHOR RODS SHALL BE THREADED 12" IN LENGTH ON EACH END OF THE ROD, ANCHOR RODS SHALL BE MANUFACTURED IN ACCORDANCE WITH SECTION 654.2.1 AND 641.2.2 OF THE STANDARD SPECIFICATIONS, ASTM A-449, OR ASTM A-687 (GRADE 105).

WASHERS AND LOCK WASHERS ARE REQUIRED ON ALL ANCHOR RODS.

WHEN ANCHOR RODS USING THE ALTERNATE "L" BEND ARE FURNISHED, THE 4" "L" BEND SHALL BE IN ADDITION TO THE SPECIFIED ANCHOR ROD BAR LENGTH. THE "L" BEND END SHALL NOT BE THREADED.

ANCHOR RODS SHALL BE INSTALLED WITH MISALIGNMENTS OF LESS THAN 1:40 FROM VERTICAL.

WELDING OF THE ANCHOR RODS TO THE CAGE IS UNACCEPTABLE. TIE WIRES SHALL BE USED.

BAR STEEL REINFORCEMENT SHALL BE COATED WITH POWDERED EPOXY RESIN IN ACCORDANCE WITH SECTION 505 OF THE STANDARD SPECIFICATIONS (LATEST EDITION).

(1) THE MINIMUM DEPTH OF CONDUIT EXITING THE CONCRETE BASE AND INSTALLED BELOW THE TRAVELED WAY SHALL BE 24 INCHES. THE MINIMUM DEPTH OF CONDUIT EXITING THE CONCRETE BASE THAT IS NOT INSTALLED BELOW THE TRAVELED WAY SHALL BE 18 INCHES. THE MAXIMUM DEPTH OF ALL CONDUIT SHALL BE 36 INCHES EXCEPT WITH WRITTEN APPROVAL BY THE ENGINEER.

(2) (4) 1" DIA. X 3'-6" ANCHOR RODS.

(3) (4) 1" DIA. X 5'-0" ANCHOR RODS.

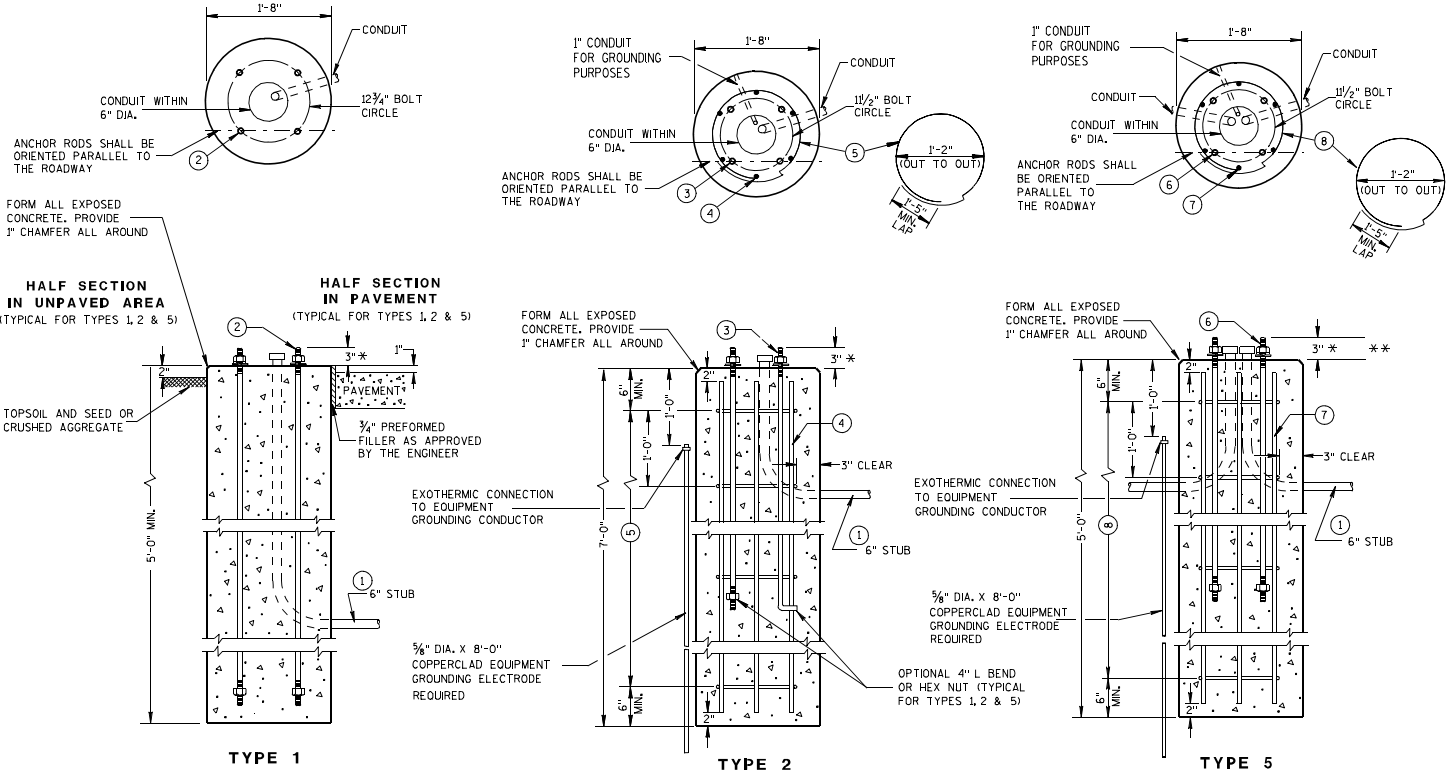
(4) (6) NO. 6 X 6'-8" BAR STEEL REINFORCEMENT.

(5) (7) NO. 4 X 5'-1" BAR STEEL REINFORCEMENT @ 1'-0" C-C.

(6) (4) 1" DIA. X 3'-6" ANCHOR RODS.

(7) (6) NO.4 X 4'-8" BAR STEEL REINFORCEMENT.

(8) (5) NO. 4 X 5'-1" BAR STEEL REINFORCEMENT @ 1'-0" C-C.



CONCRETE BASES

* ANY ANCHOR ROD PROJECTION SHORTER THAN 2¾" OR LONGER THAN 3¼" SHALL REQUIRE THE BASE TO BE REMOVED AND REPLACED AT THE CONTRACTORS EXPENSE.

** FOR NONBREAKAWAY INSTALLATIONS, 4½" ± ANCHOR ROD PROJECTION WITH THE USE OF LEVELING NUTS. RODENT SCREEN REQUIRED.

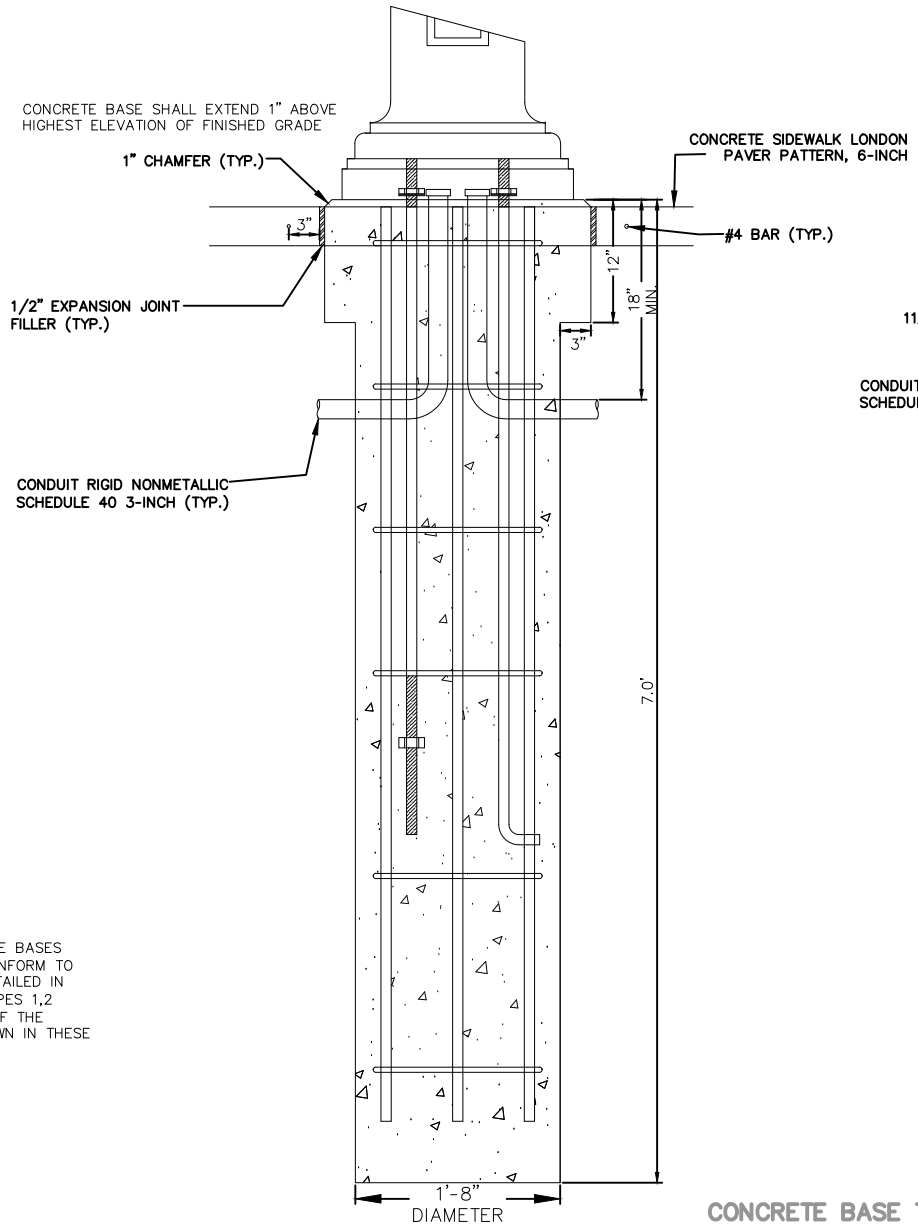
CONCRETE BASES, TYPES 1, 2 & 5

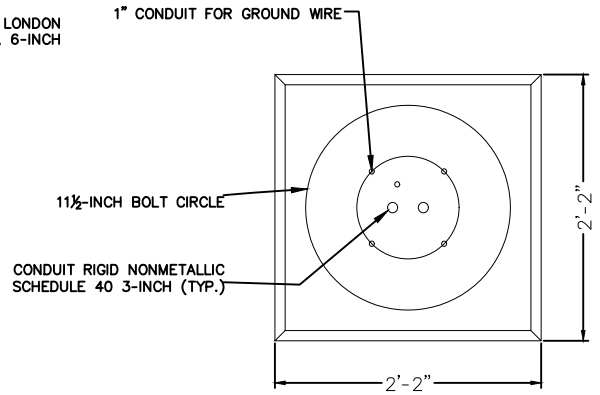
STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
3/3/10 — DATE
/S/ Joanna L. Bush — STATE ELECTRICAL ENGINEER FOR HWYS
FHWA

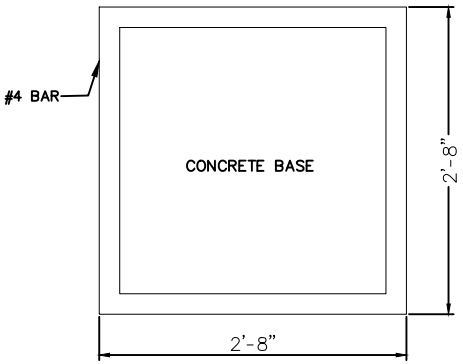
S.D.D. 9 C 2-6

STANDARD DETAIL DRAWING 21A





#4 BAR DETAIL



NOTE:

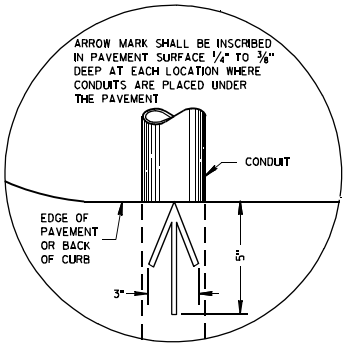
THE SPECIAL ITEM "CONCRETE BASES TYPE 2 MODIFIED" SHALL CONFORM TO CONCRETE BASE TYPE 2 DETAILED IN S.D.D "CONCRETE BASES, TYPES 1,2 & 5" WITH THE EXCEPTION OF THE SPECIAL SQUARE HEAD SHOWN IN THESE DETAILS.

CONCRETE BASE TYPE 2 MODIFIED DETAIL

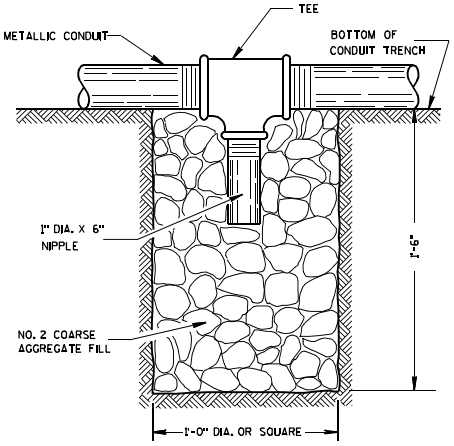
NOT TO SCALE

CONCRETE BASE DETAILS	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	12/10/2015
STANDARD DETAIL DRAWING 21B	

STANDARD DETAIL DRAWING 21B

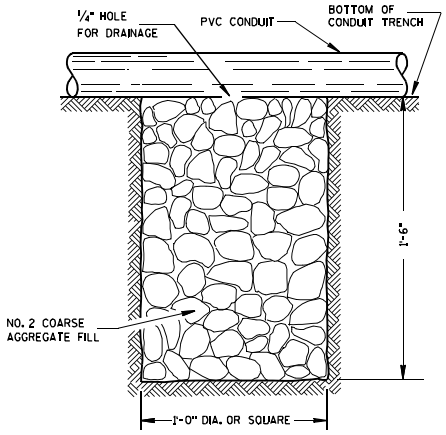


PLAN VIEW
ARROW MARK



NOTE: INSTALL AT LOCATIONS WHERE METALLIC CONDUITS CANNOT BE PITCHED TO DRAIN INTO A PULL BOX.

DRAIN SUMP FOR METALLIC CONDUIT



NOTE: INSTALL AT LOCATIONS WHERE PVC CONDUITS CANNOT BE PITCHED TO DRAIN INTO A PULL BOX.

DRAIN SUMP FOR PVC CONDUIT

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE CONTRACT.

METALLIC (STANDARD SPECIFICATION 652.2.2) OR NONMETALLIC (STANDARD SPECIFICATION 652.2.3) CONDUIT SHALL BE FURNISHED AND PLACED AS SHOWN.

DEPTH OF CONDUIT INSTALLED BELOW THE TRAVELED WAY SHALL BE 24 INCHES MINIMUM AND 36 INCHES MAXIMUM.

DEPTH OF CONDUIT INSTALLED THAT IS NOT BELOW THE TRAVELED WAY SHALL BE 18 INCHES MINIMUM AND 36 INCHES MAXIMUM.

ANY EXCEPTION TO THE MAXIMUM DEPTH SHALL BE ONLY WITH THE WRITTEN APPROVAL OF THE ENGINEER.

THE TRENCH SHALL NOT BE BACKFILLED PRIOR TO INSPECTION OF THE CONDUIT.

ALL METALLIC CONDUIT RACEWAY ENDS SHALL BE REAMED AND THREADED.

ALL METALLIC CONDUIT IN WHICH WIRE OR CABLE IS TO BE INSTALLED SHALL BE BUSHED WITH APPROVED THREADED BUSHINGS BEFORE INSTALLATION OF THE WIRE OR CABLE.

ALL METALLIC CONDUITS IN WHICH WIRE OR CABLE IS NOT TO BE INSTALLED SHALL BE CAPPED WITH THREADED PROTECTIVE CAPS, AS APPROVED BY THE ENGINEER.

ALL NONMETALLIC CONDUIT SHALL BE CAPPED OR PLUGGED IMMEDIATELY AFTER INSTALLATION AND SHALL REMAIN CAPPED OR PLUGGED UNTIL WIRE/CABLES ARE INSTALLED.

NONMETALLIC CONDUITS IN WHICH WIRE OR CABLE IS NOT BEING INSTALLED SHALL REMAIN CAPPED OR PLUGGED.

BENDING OF PVC ELECTRICAL CONDUIT SHALL BE ACCOMPLISHED BY USING A BLANKET OR EMERSION TYPE TANK DESIGNED FOR THE PURPOSE OF BENDING PVC ELECTRICAL CONDUIT.

ALL CUT ENDS SHALL BE TRIMMED INSIDE AND OUTSIDE TO REMOVE ALL ROUGH EDGES ON NONMETALLIC CONDUIT. (SEE NEC 347.5)

WHEN REQUIRED TO CONNECT NONMETALLIC CONDUIT TO METALLIC CONDUIT, ONLY U.L. LISTED ADAPTER FITTINGS SHALL BE USED.

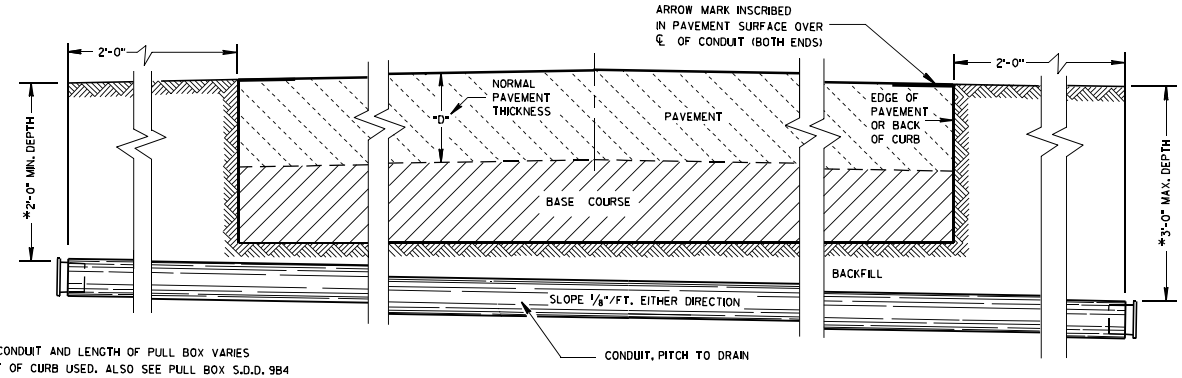
PRIOR TO CONDUIT ACCEPTANCE, CONDUIT CAPS OR PLUGS SHALL BE REMOVED, AND THE CAPS, PLUGS AND CONDUIT ENDS SHALL BE THOROUGHLY CLEANED AND THEN THE CAPS OR PLUGS REINSTALLED TO ENSURE THAT THE CAPS OR PLUGS CAN BE EASILY REMOVED IN THE FUTURE.

ALL CONDUIT BEING FURNISHED AND INSTALLED SHALL HAVE THE U.L. LABEL FIRMLY ATTACHED.

CONDUIT RUNS SHALL BE THE SAME SIZE OF CONDUIT FROM ONE END TO THE OTHER (FROM PULL BOX TO PULL BOX-OR-JUNCTION BOX TO JUNCTION BOX-OR-BASE TO BASE, ETC.).

POLY ROPE OR A PULL WIRE SHALL BE INSTALLED AS STATED IN THE STANDARD SPECIFICATION, ITEM 652.3.1.1.

ALL CONDUIT RUNS SHALL BE STRAIGHT (WITHOUT BENDS) FROM PULL BOX TO PULL BOX, PULL BOX TO BASE AND BASE TO BASE AS SHOWN ON THE PLANS.



*DEPTH OF CONDUIT AND LENGTH OF PULL BOX VARIES WITH HEIGHT OF CURB USED. ALSO SEE PULL BOX S.D.D. 9B4

SIDE ELEVATION
DETAIL FOR CONDUIT UNDER PAVED HIGHWAYS

CONDUIT

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
10/23/03 — DATE
/S/ Balu Ananthanarayanan — STATE ELECTRICAL ENGINEER FOR HWYS
FHWA

S.D.D. 9 B 2-7

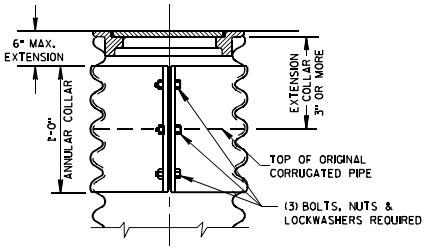
9B4: Pull Box

TABLE OF NOMINAL DIMENSIONS AND WEIGHTS

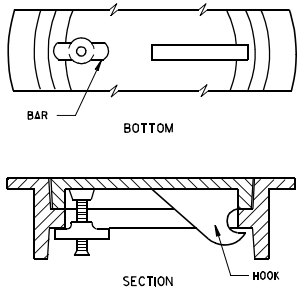
DIMENSION IN INCHES		CORRUGATED STEEL PIPE								
PIPE DIAMETER (INSIDE)	A	12	12	12	18	18	18	24	24	24
PIPE LENGTH **	B	24	30	36	24	30	36	36	42	48
WALL THICKNESS	C	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064
COVER	D	10 1/4	10 1/4	10 1/4	16 1/4	16 1/4	16 1/4	22 1/4	22 1/4	22 1/4
FRAME	E	14 1/2	14 1/2	14 1/2	20 1/2	20 1/2	20 1/2	26 1/2	26 1/2	26 1/2
FRAME	F	8 1/2	8 1/2	8 1/2	14 1/2	14 1/2	14 1/2	20 1/2	20 1/2	20 1/2
FRAME	G	11 1/2	11 1/2	11 1/2	17 1/2	17 1/2	17 1/2	23 1/2	23 1/2	23 1/2
WEIGHT IN POUNDS *										
FRAME AND COVER		60	60	60	110	110	110	155	155	155

* THE ACTUAL WEIGHT OF THE MANHOLE FRAME AND COVER MAY VARY WITHIN 5 PERCENT PLUS OR MINUS OF THE WEIGHTS SHOWN.

** NORMALLY USED LENGTHS. THE PROJECT ENGINEER SHALL DETERMINE IF PIPE LENGTHS, OTHER THAN THOSE SPECIFIED, SHALL BE USED, TO A MAXIMUM OF 48" (CONTINUOUS LENGTH, NON-SPLICED). THE ADDITIONAL LENGTH SHALL BE INCIDENTAL TO THE PULL BOX BID PRICE.

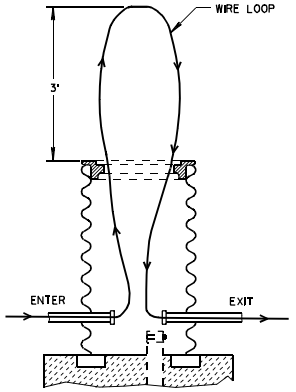


CORRUGATED PIPE EXTENDER



ALTERNATE COVER (LOCKING)

TIGHTENING BAR TYPE



MEASUREMENT DETAIL FOR WIRE/CABLE IN THE PULL BOX

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE CONTRACT.

ALL FRAMES AND COVERS SHALL BE HEAVY DUTY TYPE, SUITABLE FOR VEHICULAR TRAFFIC LOADS.

PULL BOXES LOCATED IN THE ROADWAYS SHALL HAVE LOCKING COVERS.

ENTRANCE HOLES INTO PULL BOXES SHALL BE CUT WITH A CIRCULAR HOLE SAW OR HYDRAULIC CONDUIT PUNCH. HOLE SIZE SHALL BE THE OUTSIDE DIAMETER OF THE CONDUIT THAT IS TO FIT IN THE OPENING PLUS NO MORE THAN 1/4".

THE CONTRACTOR SHALL NOT INSTALL WIRE IN ANY PULL BOX UNTIL ITS INSTALLATION HAS BEEN INSPECTED AND ACCEPTED BY THE ENGINEER.

GROUNDING LUGS (MECHANICAL CONNECTORS) SHALL BE U.L. LISTED AND APPROVED FOR USE WITH COPPER WIRE. THE MECHANICAL CONNECTION (INSIDE AND OUTSIDE) TO THE PULL BOX, SHALL BE TOTALLY AND PERMANENTLY SEALED WITH A SILICONE OR RUBBERIZED CAULKING COMPOUND AS APPROVED BY THE ENGINEER.

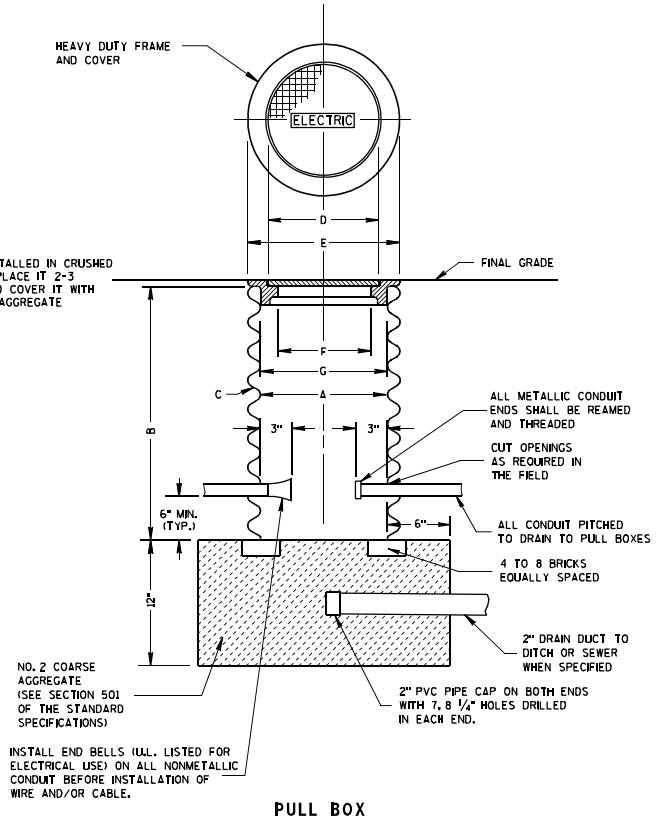
GROUNDING LUGS ARE NOT REQUIRED IN PULL BOXES WHEN VOLTAGES OF LESS THAN 50 VOLTS AC ARE THE ONLY VOLTAGES ENCOUNTERED IN THE BOXES.

ALL METALLIC CONDUIT IN WHICH WIRE AND/OR CABLE IS TO BE INSTALLED, SHALL BE BUSHED BEFORE INSTALLATION OF THE WIRE AND/OR CABLE.

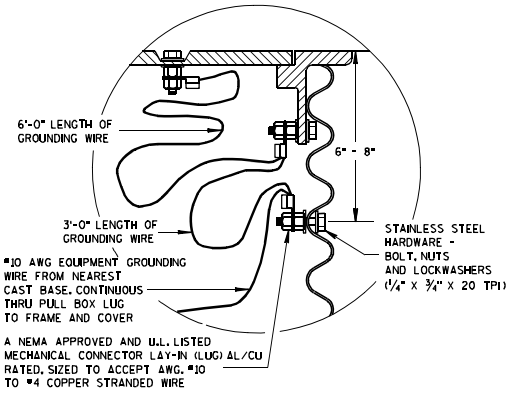
S.D.D. 9B2, "CONDUIT", APPLIES TO THIS DRAWING.

WHEN PULL BOXES ARE INSTALLED FOR FUTURE USE, DO NOT INSTALL THE EQUIPMENT GROUNDING LUG. THE EQUIPMENT GROUNDING LUG, THE EQUIPMENT GROUNDING ELECTRODE AND THE EQUIPMENT GROUNDING CONDUCTOR SHALL BE REQUIRED AND INSTALLED UNDER A FUTURE WIRING CONTRACT.

IF PULL BOX EQUIPMENT GROUNDING IS REQUIRED USING AN EQUIPMENT GROUNDING ELECTRODE IN EACH PULL BOX, THE EQUIPMENT GROUNDING ELECTRODE SHALL BE 5/8" X 8'-0", COPPERCLAD AND BE EXOTHERMICALLY WELDED TO A #4 AWG, COPPER, STRANDED WIRE (BARE OR GREEN INSULATED). THE #4 AWG WIRE SHALL BE 4 FEET IN LENGTH, NEATLY COILED, TAPED AND AVAILABLE FOR USE WHEN REQUIRED.



PULL BOX



EQUIPMENT GROUNDING LUG AND LOCATION IN STEEL PULL BOXES

PULL BOX

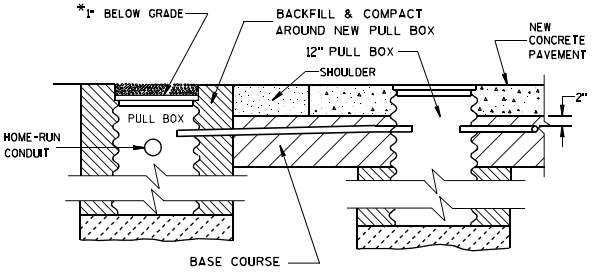
STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
9/27/06 — DATE
/S/ Balu Ananthanarayanan — STATE ELECTRICAL ENGINEER FOR HWYS
FHWA

S.D.D. 9 B 4-9

STANDARD DETAIL DRAWING 23

9F9: Loop Detector Placed in Crushed Aggregate Base (New Concrete Pavement)



SECTION A-A
NO CURB & GUTTER

LOOP DETECTOR INSTALLATION DETAILS

*RECESS PULL BOX SO THAT THE COVER IS 3" BELOW GRADE IN SHOULDER AREAS OF CRUSHED AGGREGATE. BACKFILL OVER COVER WITH THE CRUSHED AGGREGATE TO BRING THE AREA TO GRADE LEVEL.

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE CONTRACT.

LOOP SIZE, LOCATION, NUMBER OF TURNS OF WIRE AND ASSOCIATED SIGNAL PHASE SHALL BE AS SHOWN ON THE PLANS.

PITCH LEAD OUT CONDUIT TO DRAIN TO ROADSIDE PULL BOX.

SPLICES SHALL BE INSTALLED BY USING CAST IN PLACE SPLICE KITS SUCH AS 3M TYPE 82A1 OR APPROVED EQUAL. NON-INSULATED BUTT SPLICES TO FIT #12 AWG STRANDED WIRE SHALL BE USED. SPLICES SHALL BE SOLDERED AND INSULATED FROM EACH OTHER AS PER INSTRUCTIONS INCLUDED IN THE SPLICE KIT.

MEASURE GROUND RESISTANCE USING A MEGGER. REPLACE LOOP WIRE NOT ATTAINING A READING OF INFINITY TO GROUND.

AFTER SPLICING THE LOOP WIRE TO THE LOOP LEAD-IN CABLE, THE CONTRACTOR SHALL MEASURE INDUCTANCE, GROUND RESISTANCE AND WIRE RESISTANCE AT THE CABINET END OF THE LEAD-IN CABLE AND FURNISH A COPY OF THE READINGS TO THE PROJECT ENGINEER FOR EVALUATION.

ANTI-SIEZE LUBRICATING MATERIAL SHALL BE USED ON ALL THREADS OF THREADED ASSEMBLIES BEFORE INSTALLATION.

LOOP DETECTOR LEADS SHALL BE IDENTIFIED WITH THEIR ASSOCIATED LOOP BY USE OF WATERPROOF TAGS AT BOTH ENDS OF THE CABLE. A LISTING OF THE CABLE IDENTIFICATION PER INDIVIDUAL LOOP LEAD-IN SHALL BE PLACED IN THE CABINET.

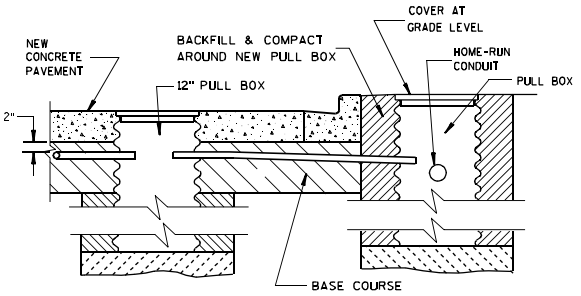
THE #12 AWG LOOP WIRE FROM THE LOOP TO THE ROADSIDE PULL BOX, SHALL BE HAND TWISTED AT LEAST 3 TWISTS PER FOOT BEFORE INSTALLATION.

SPLICES OF LOOP WIRE TO LEAD-IN CABLE SHALL BE MADE ONLY IN PULL BOXES AT THE SIDE OF THE ROAD.

THE #12 AWG LOOP WIRE SHALL BE INSTALLED FROM THE ROADSIDE PULL BOX, THROUGH THE LOOP DUCT, BACK TO THE ROADSIDE PULL BOX, AND BE INSTALLED IN ONE, NON-SPLICED, CONTINUOUS LENGTH.

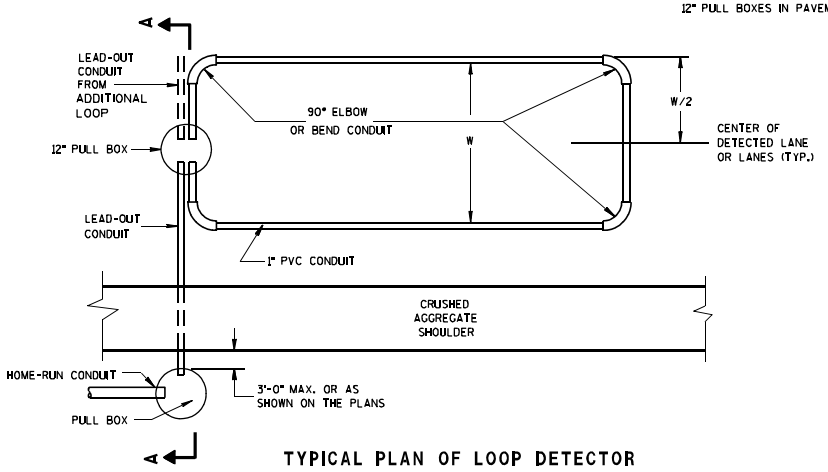
PROTECTION OF THE CONDUIT, CONDULET AND PULL BOX SHALL BE REQUIRED AFTER INSTALLATION AND BEFORE THE NEW CONCRETE PAVEMENT IS PLACED.

12" PULL BOXES IN PAVEMENT SHALL BE CORRUGATED STEEL ONLY.

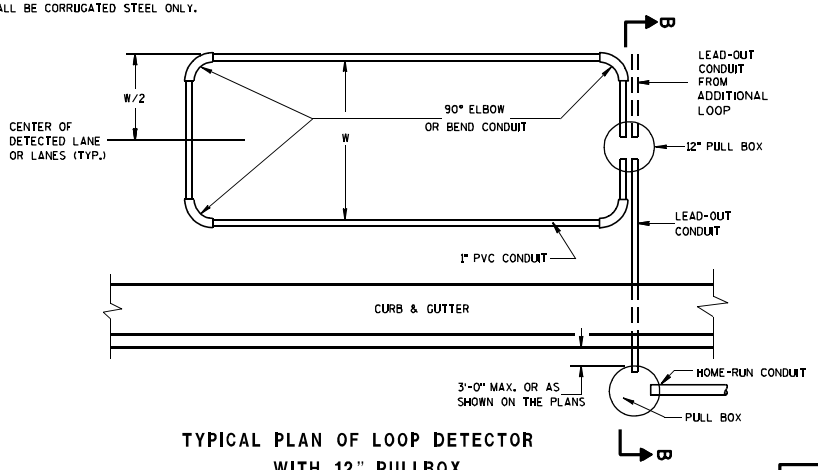


SECTION B-B
CURB & GUTTER

LOOP DETECTOR INSTALLATION DETAILS



TYPICAL PLAN OF LOOP DETECTOR
WITH 12" PULLBOX



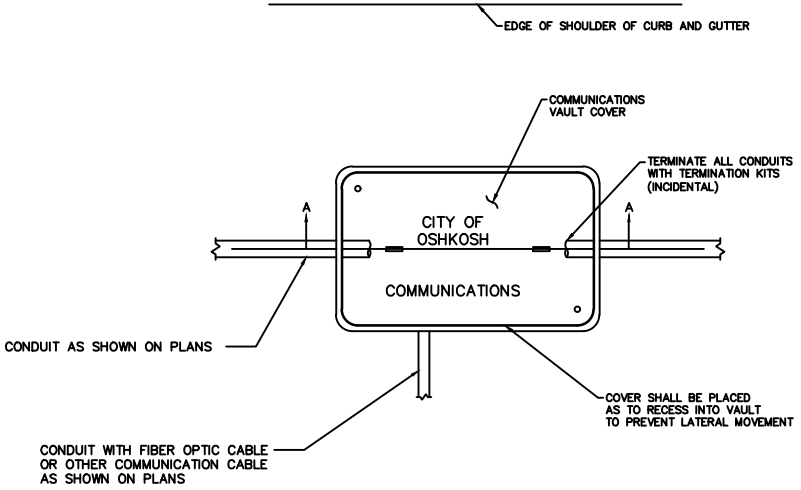
TYPICAL PLAN OF LOOP DETECTOR
WITH 12" PULLBOX

LOOP DETECTOR PLACED
IN CRUSHED AGGREGATE BASE
(NEW CONCRETE PAVEMNET)

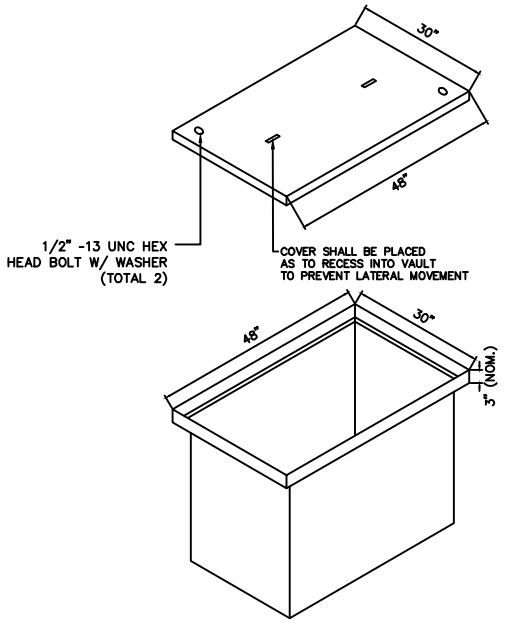
STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
6-7-06
DATE
/S/ Balu Ananthanarayanan
STATE ELECTRICAL ENGINEER FOR HWYS
FHWA

S.D. 9 F 9-3

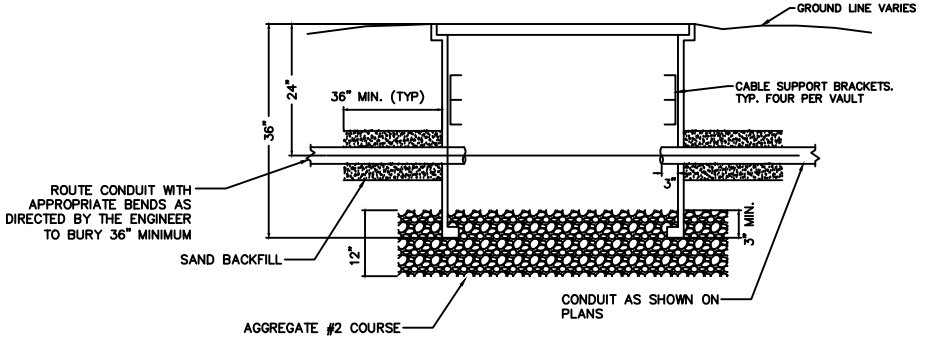


PLAN VIEW



ISOMETRIC VIEW

NOTE:
COMMUNICATIONS VAULT TYPE 1 SHOWN ON ITS PLANS AS...
V CV__



PROFILE VIEW

NOTES

BOX SHALL HAVE AN OPEN BASE

COVER SHALL HAVE A MINIMUM DESIGN LOAD OF 22,000 LBS AND SHALL LOCK

VAULT COVERS TO BE IMPRINTED WITH "CITY OF OSHKOSH COMMUNICATIONS" IN 2 INCH LETTERING

ALL OPENINGS IN STRUCTURE MUST BE MACHINED AT TIME OF FABRICATION, OR PUNCH DRIVEN AT TIME OF PLACEMENT

VAULTS SHALL BE OF ONE-PIECE CONSTRUCTION. TWO-PIECE/STACKABLE VAULTS WILL NOT BE PERMITTED

FIELD PLACEMENT OF COMMUNICATIONS VAULTS SHALL BE AS DIRECTED BY THE ENGINEER

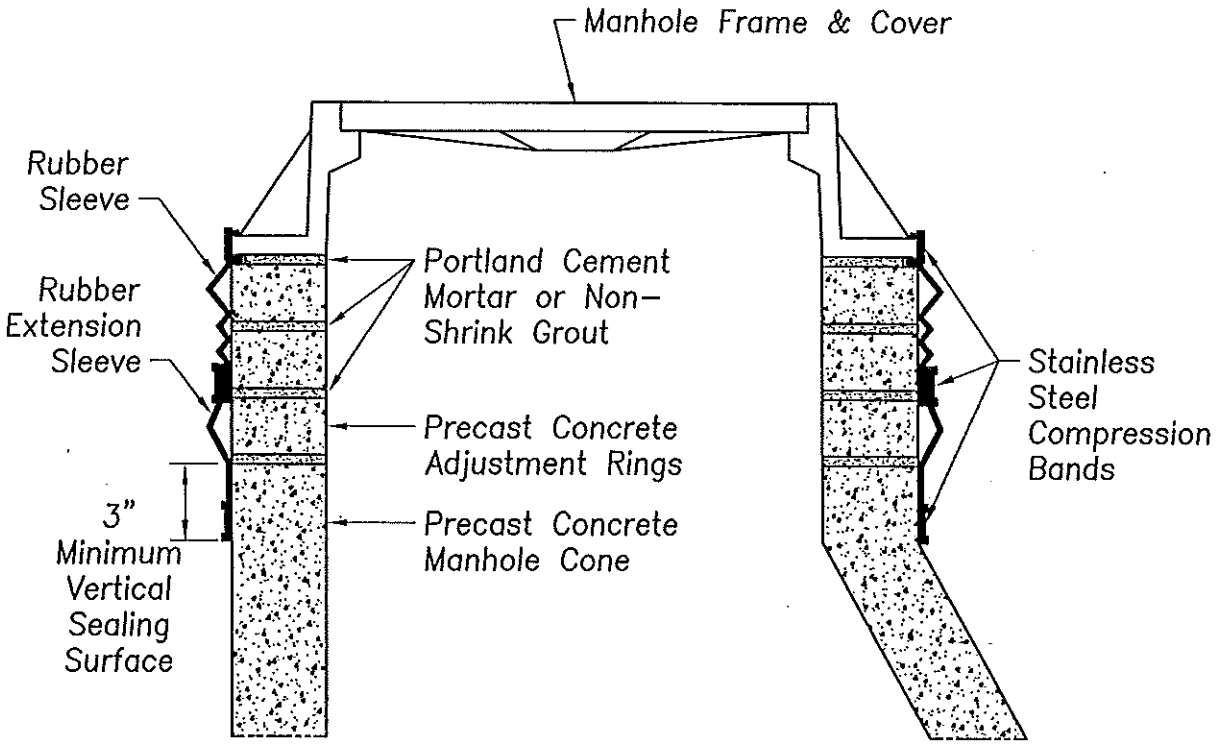
NOT TO SCALE

COMMUNICATION VAULT DETAILS	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	3/12/2012
STANDARD DETAIL DRAWING 25	

STANDARD DETAIL DRAWING 25

DRAWING: External Chimney Seal

Cretex Classic External Chimney Seal



PRECAST MANHOLE WITH EXTERNAL SEAL

1. The rubber sleeve is available in heights of 9" (Standard) and 6" (Narrow).

2. See the chimney height table below for seal and extension combinations needed to span from the frame to the top of the cone on manholes with various chimney heights. Frame offsets or diameter differentials will reduce these span heights.

3. The top of the cone shall have a minimum of 3" high vertical sealing surface that is smooth and free of any form offsets or excessive honeycomb.

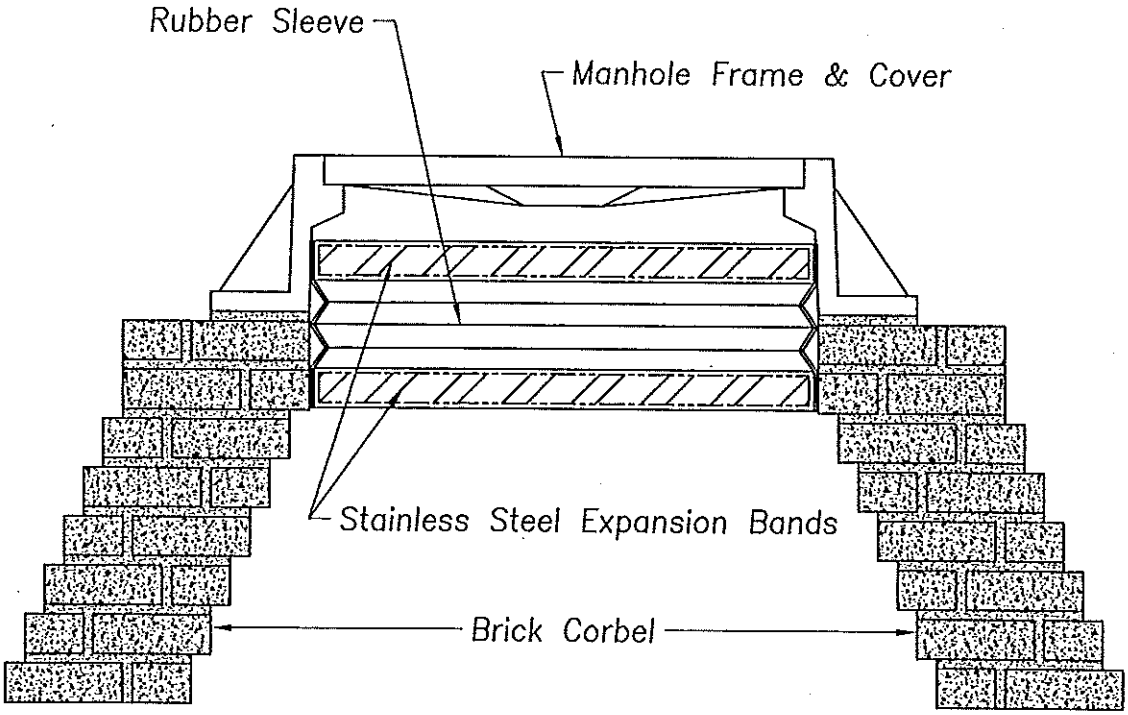
CHIMNEY HEIGHT TABLE

COMBINATIONS OF SEALS AND EXTENSIONS	TO SPAN HEIGHTS OF:
Narrow 6" Only	0" to 3"
Standard 9" Only	Over 3" – 6.5"
Standard Seal + Extension	Over 6.5" – 13.5"
Standard Seal + Multi Extensions	Over 13.5"
Add 7" of coverage for each additional Extension.	

EXTERNAL MANHOLE CHIMNEY SEAL W/EXTENSIONS PRECAST

BRICK DRAWING: Internal Chimney Seal

Cretex Classic Internal Chimney Seal



BRICK MANHOLE WITH INTERNAL SEAL

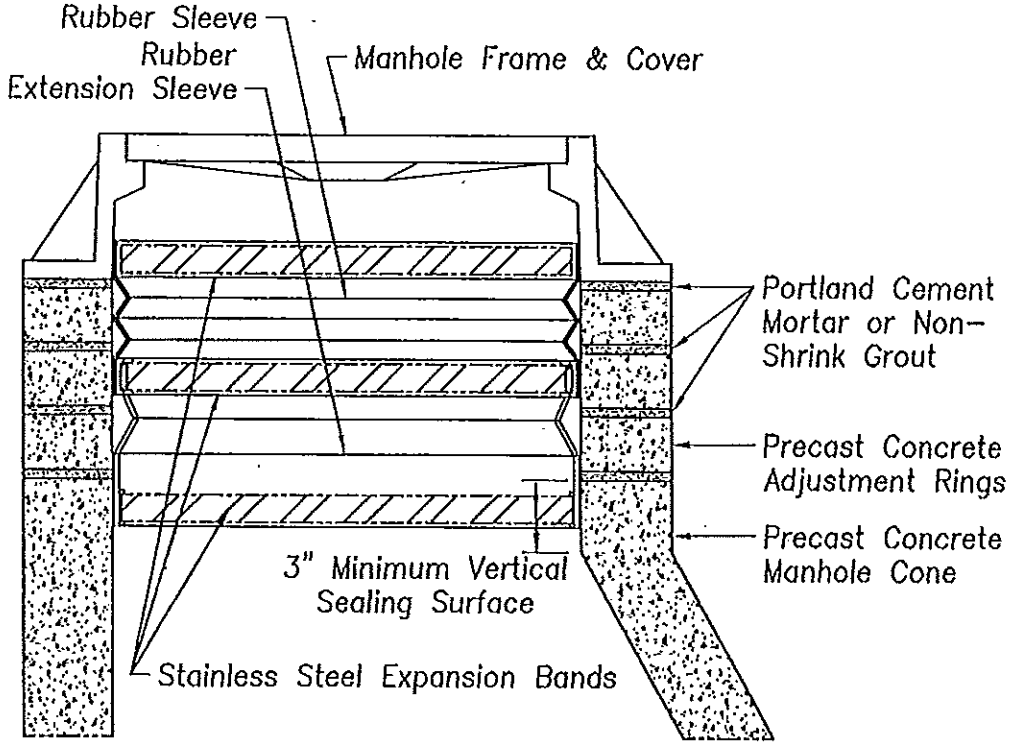
1. The rubber sleeve is available in heights of 8.5" (Standard) a 10" (Wide) & a 13" (Extra Wide). The same expansion bands are used on all three.

2. Non-shrink cementitious repair mortar shall be used to prepare a 3" – 4" wide, uniformly vertical bottom sealing surface. All sealing surfaces shall be reasonably smooth, circular, clean and free of any loose material or excessive voids.

3. If the manhole does not have a chimney and the frame sits directly on top of the corbel, a sealing surface shall be made on the second course of the corbel. The diameter of this bottom sealing surface shall not exceed that of the frame by more than 20%.

INTERNAL MANHOLE CHIMNEY SEAL
BRICK

Cretex Classic Internal Chimney Seal



PRECAST MANHOLE WITH INTERNAL SEAL

1. The rubber sleeve is available in heights of 8.5" (Standard) a 10" (Wide) & a 13" (Extra Wide). The same expansion bands are used on all three.

2. See the chimney height table below for seal and extension combinations needed to span from the frame to the top of the cone on manholes with various chimney heights. Frame offsets or diameter differentials will reduce these span heights.

3. The top of the cone shall have a minimum of 3" high vertical sealing surface that is smooth and free of any form offsets or excessive honeycomb.

CHIMNEY HEIGHT TABLE

COMBINATIONS OF SEALS AND EXTENSIONS	TO SPAN HEIGHTS OF:		
	W/ STANDARD SEAL	W/ WIDE SEAL	W/ EXTRA WIDE SEAL
Seal Only	0" to 4.5"	2" to 7.5"	6" to 12"
Seal + 7" Extension	Over 4.5" – 10.5"	Over 7.5" – 13.5"	Over 12" – 18"
Seal + 10" Extension	Over 10.5" – 13"	Over 13.5" – 16"	Over 18" – 20.5"
Seal + Multi Extensions	Over 13"	Over 16"	Over 20.5"
Add 6" of coverage for each additional 7" Extension. Add 8.5" of coverage for each additional 10" Extension.			

INTERNAL MANHOLE CHIMNEY SEAL W/EXTENSIONS PRECAST

GENERAL NOTES

CONTRACTION JOINTS

CONSTRUCT TRANSVERSE CONTRACTION JOINTS NORMAL TO THE CENTERLINE. SHOW THE LOCATION OF CONTRACTION JOINTS THROUGH INTERSECTIONS ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

INSTALL DOWEL BARS PARALLEL TO THE PAVEMENT CENTERLINE AND PAVEMENT SURFACE.

FOR PAVEMENT SLABS OF VARYING WIDTHS, LOCATE THE OUTER MOST DOWEL BAR SO THAT THE CENTER IS A MINIMUM OF 6 INCHES AND A MAXIMUM OF 18 INCHES FROM THE LONGITUDINAL JOINT AND THE FREE EDGE OF PAVEMENT.

CONSTRUCTION JOINTS

LOCATE CONSTRUCTION JOINTS AT EXISTING CONTRACTION JOINT LOCATIONS.

① OBTAIN THE ENGINEERS APPROVAL FOR THE USE OF ALTERNATIVE DESIGNS OF THE DOWEL ASSEMBLY. USE MECHANICAL DOWEL BAR INSERTERS OR DOWEL ASSEMBLIES WHEN CONSTRUCTING CONTRACTION JOINTS.

② SECURE BASKETS WITH ANCHORS TO HOLD DOWEL BARS IN THE CORRECT POSITION AND ALIGNMENT. TYPE, LOCATION, NUMBER AND LENGTH OF ANCHORS ARE DEPENDENT UPON FIELD CONDITIONS.

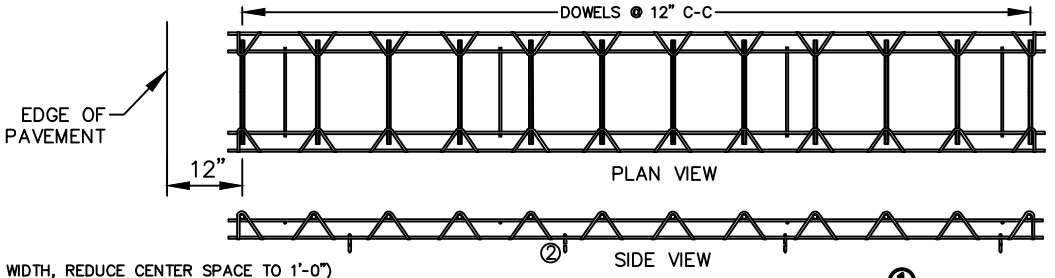
③ FORM OR SAW CONSTRUCTION JOINTS. PROVIDE A $\frac{1}{4}$-INCH RADIUS AT FORMED JOINTS.

④ PROVIDE A SMOOTH VERTICAL FACE FOR THE ENTIRE DEPTH OF THE PAVEMENT WHEN FORMING CONSTRUCTION JOINTS.

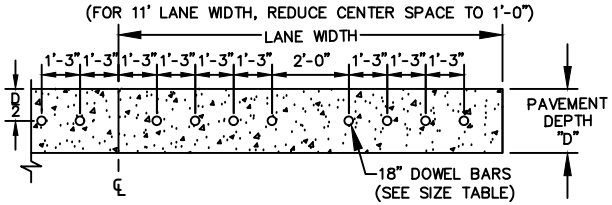
⑤ INSTALL DOWEL BARS AT CONSTRUCTION JOINTS BY FORMING OR DRILLING. INSTALL FORMED DOWEL BARS 12 INCHES C-C AND 12 INCHES FROM PAVEMENT EDGE. REMOVE EXCESS CONCRETE FROM THE FREE END OF THE DOWEL BAR IF DOWEL BARS ARE FORMED THROUGH A HEADER BOARD. INSTALL DRILLED DOWEL BARS ACCORDING TO ***DRILLED DOWEL BAR CONSTRUCTION JOINT*** DETAIL.

⑥ APPLY A THIN UNIFORM COATING OF SURFACE TREATMENT TO THE FREE END OF DOWEL BARS TO PREVENT BONDING.

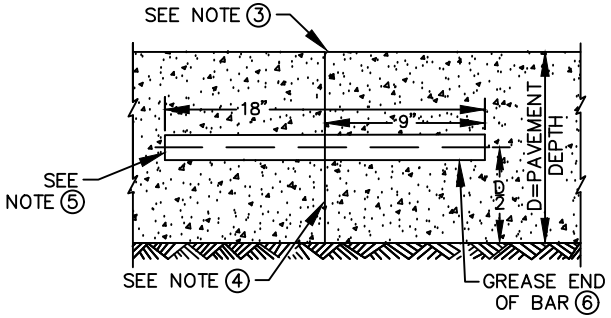
⑦ ANCHOR DOWEL BARS INTO DRILLED HOLES WITH AN EPOXY. MAXIMUM DRILLED HOLE SIZE IS $\frac{1}{8}$-INCH GREATER THAN DOWEL BAR DIAMETER, 9 INCHES IN LENGTH.



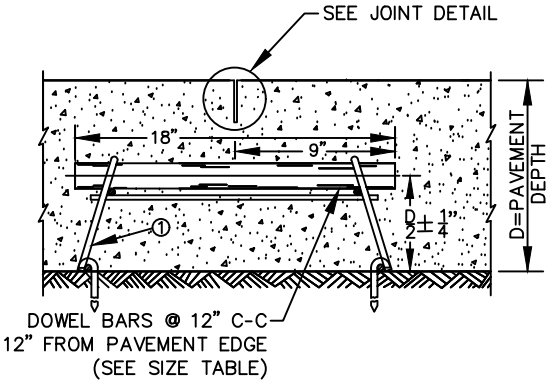
CONTRACTION JOINT DOWEL ASSEMBLY ①



DRILLED DOWEL BAR CONSTRUCTION JOINT ⑦



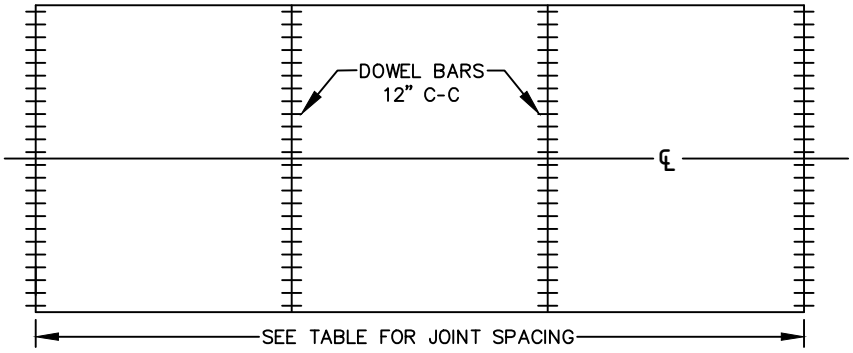
TRANSVERSE CONSTRUCTION JOINT



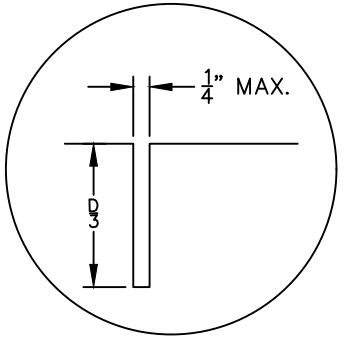
DOWELED CONTRACTION JOINT

PAVEMENT DEPTH, DOWEL BAR SIZE AND JOINT SPACING TABLE

PAVEMENT DEPTH (D)	DOWEL BAR DIA.	CONTRACTION JOINT SPACING
5 ½",6", 6 ½"	NONE	12'
7", 7 ½"	1"	14'
8", 8 ½"	1 ¼"	14'
9", 9 ½"	1 ¼"	14'
10" & ABOVE	1 ½"	14'



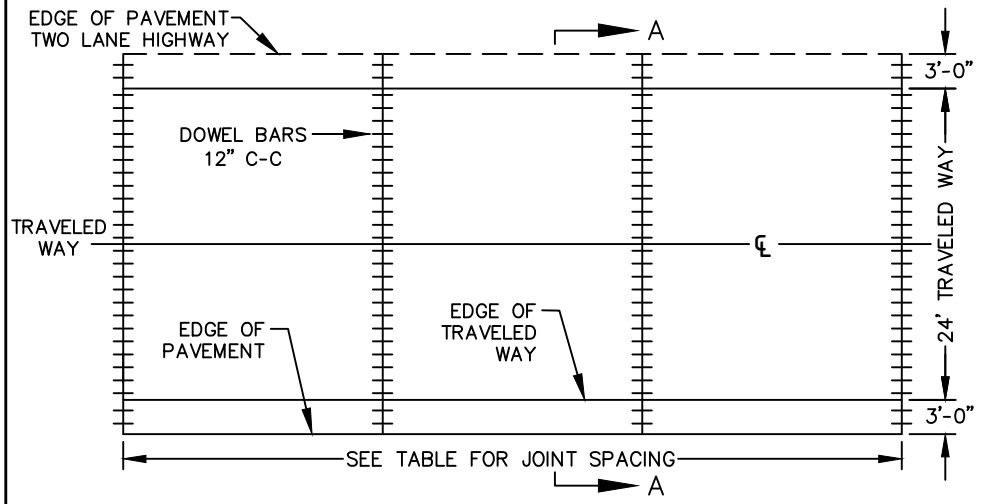
CONTRACTION JOINT LOCATIONS



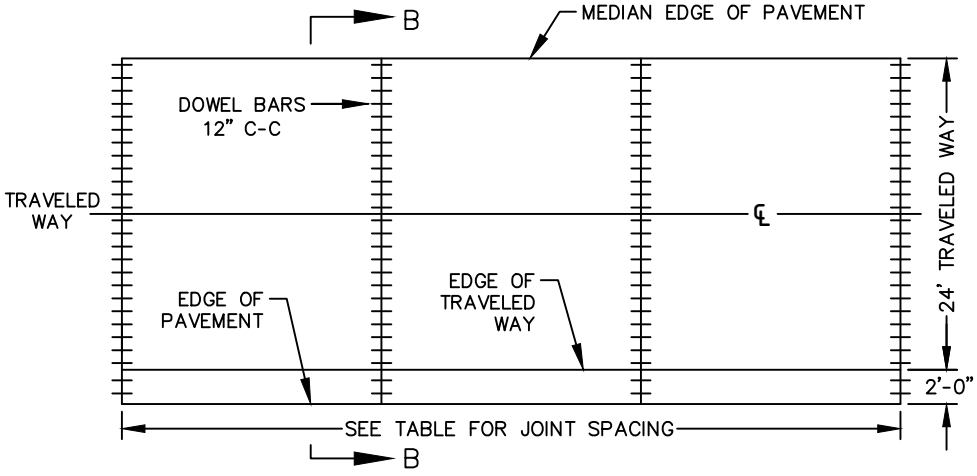
JOINT DETAIL

URBAN DOWELED CONCRETE PAVEMENT	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	12/28/2016
STANDARD DETAIL DRAWING 27A	

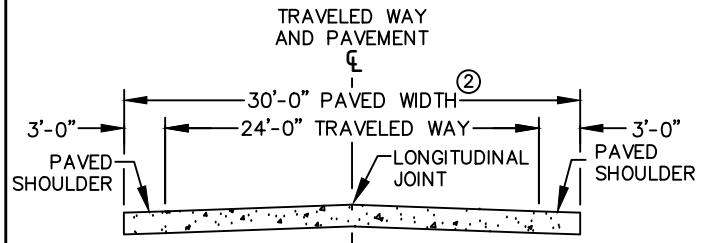
STANDARD DETAIL DRAWING 27A



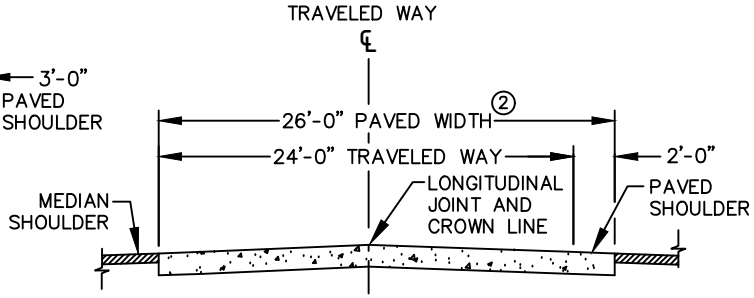
CONTRACTION JOINT LAYOUT
(TWO–LANE TWO–WAY HIGHWAY)



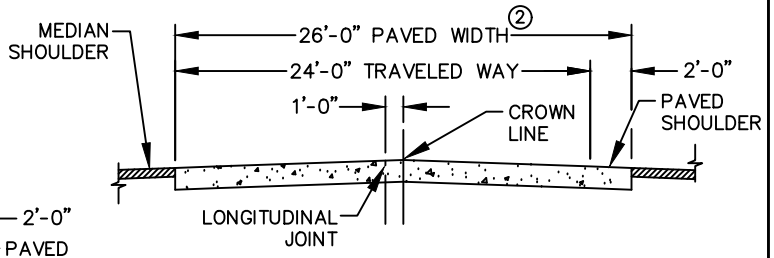
CONTRACTION JOINT LAYOUT
(DIVIDED HIGHWAY)



SECTION A–A
(TWO–LANE TWO–WAY HIGHWAY) ①



SECTION B–B



ALTERNATIVE SECTION B–B
(DIVIDED HIGHWAY) ①

GENERAL NOTES:

CONTRACTION JOINTS

CONSTRUCT TRANSVERSE CONTRACTION JOINTS NORMAL TO THE CENTERLINE. SHOW THE LOCATION OF CONTRACTION JOINTS THROUGH INTERSECTIONS ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

INSTALL DOWEL BARS PARALLEL TO THE PAVEMENT CENTERLINE AND PAVEMENT SURFACE.

FOR PAVEMENT SLABS OF VARYING WIDTHS, LOCATE THE OUTER MOST DOWEL BAR SO THAT THE CENTER OF THE BAR IS A MINIMUM OF 6 INCHES AND A MAXIMUM OF 18 INCHES FROM THE FREE EDGE OF PAVEMENT.

CONSTRUCTION JOINTS

LOCATE CONSTRUCTION JOINTS AT EXISTING CONTRACTION JOINT LOCATIONS.

① REFER TO TYPICAL CROSS SECTIONS FOR ADDITIONAL DETAILS.

② MEASURE THE ENTIRE PAVED WIDTH INCLUDING THE PORTIONS LABELED PAVED SHOULDER AS CONCRETE PAVEMENT.

PAVEMENT DEPTH (D)	DOWEL BAR DIA.	CONTRACTION JOINT SPACING
5 ½",6", 6 ½"	NONE	12'
7", 7 ½"	1"	14'
8", 8 ½"	1 ¼"	14'
9", 9 ½"	1 ¼"	14'
10" & ABOVE	1 ½"	14'

PAVEMENT DEPTH, DOWEL BAR SIZE & JOINT SPACING TABLE

RURAL DOWELED CONCRETE PAVEMENT	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	12/28/2016
STANDARD DETAIL DRAWING 27B	

STANDARD DETAIL DRAWING 27B

GENERAL NOTES

① OBTAIN THE ENGINEERS APPROVAL FOR THE USE OF ALTERNATIVE DESIGNS OF THE DOWEL ASSEMBLY. USE MECHANICAL DOWEL BAR INSERTERS OR DOWEL ASSEMBLIES WHEN CONSTRUCTING CONTRACTION JOINTS.

② SECURE BASKETS WITH ANCHORS TO HOLD DOWEL BARS IN THE CORRECT POSITION AND ALIGNMENT. TYPE, LOCATION, NUMBER AND LENGTH OF ANCHORS ARE DEPENDENT UPON FIELD CONDITIONS.

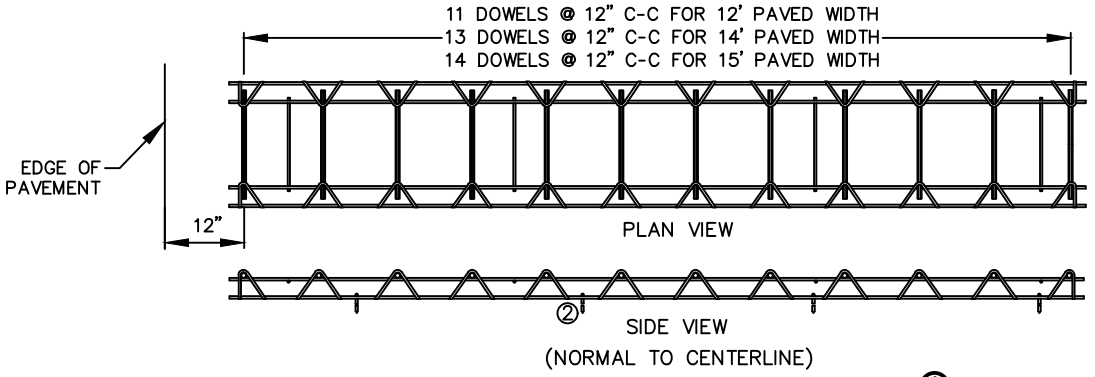
③ FORM OR SAW CONSTRUCTION JOINTS. PROVIDE A $\frac{1}{4}$-INCH RADIUS AT FORMED JOINTS.

④ PROVIDE A SMOOTH VERTICAL FACE FOR THE ENTIRE DEPTH OF THE PAVEMENT WHEN FORMING CONSTRUCTION JOINTS.

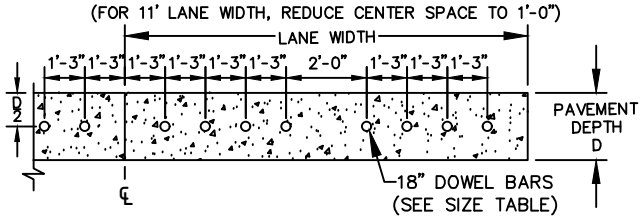
⑤ INSTALL DOWEL BARS AT CONSTRUCTION JOINTS BY FORMING OR DRILLING. INSTALL FORMED DOWEL BARS 12 INCHES C-C AND 12 INCHES FROM PAVEMENT EDGE. REMOVE EXCESS CONCRETE FROM THE FREE END OF THE DOWEL BAR IF DOWEL BARS ARE FORMED THROUGH A HEADER BOARD. INSTALL DRILLED DOWEL BARS ACCORDING TO *DRILLED DOWEL BAR CONSTRUCTION JOINT* DETAIL.

⑥ APPLY A THIN UNIFORM COATING OF SURFACE TREATMENT TO THE FREE END OF DOWEL BARS TO PREVENT BONDING.

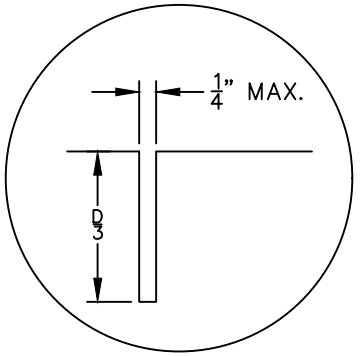
⑦ ANCHOR DOWEL BARS INTO DRILLED HOLES WITH AN EPOXY. MAXIMUM DRILLED HOLE SIZE IS $\frac{1}{8}$-INCH GREATER THAN DOWEL BAR DIAMETER, 9 INCHES IN LENGTH.



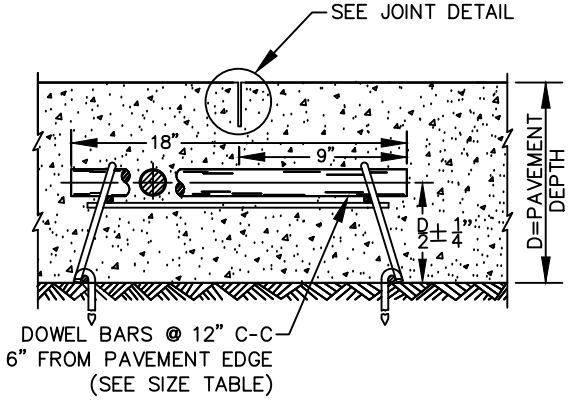
CONTRACTION JOINT DOWEL ASSEMBLY ①



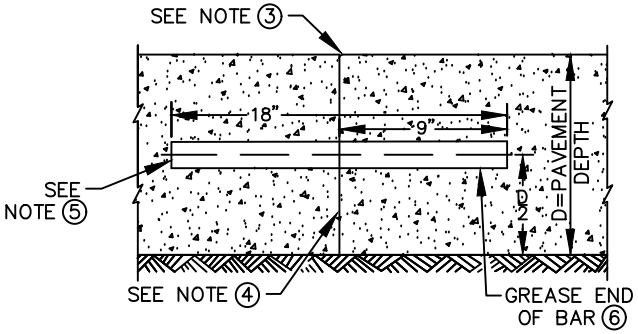
DRILLED DOWEL BAR CONSTRUCTION JOINT ⑦



JOINT DETAIL



DOWELED CONTRACTION JOINT

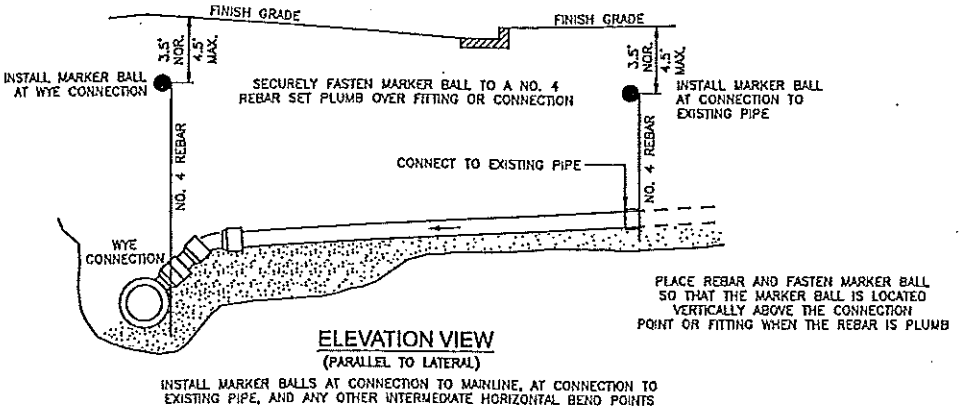


TRANSVERSE CONSTRUCTION JOINT

RURAL DOWELED CONCRETE PAVEMENT	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	12/28/2016
STANDARD DETAIL DRAWING 27C	

STANDARD DETAIL DRAWING 27C

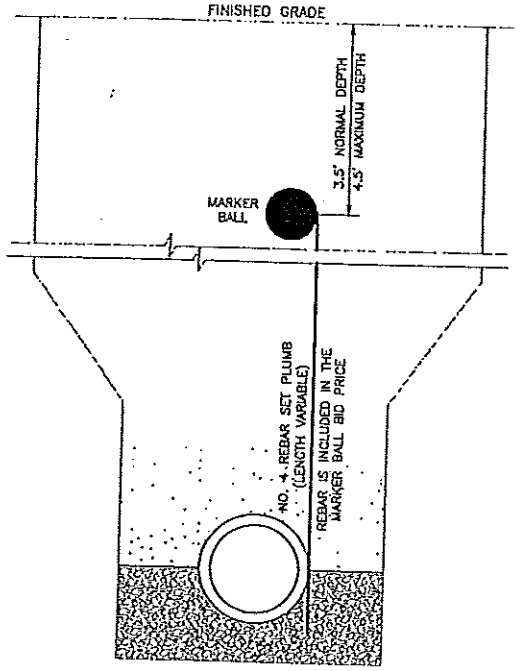
MARKER BALL DETAIL



ELEVATION VIEW
(PARALLEL TO LATERAL)

INSTALL MARKER BALLS AT CONNECTION TO MAINLINE, AT CONNECTION TO EXISTING PIPE, AND ANY OTHER INTERMEDIATE HORIZONTAL BEND POINTS

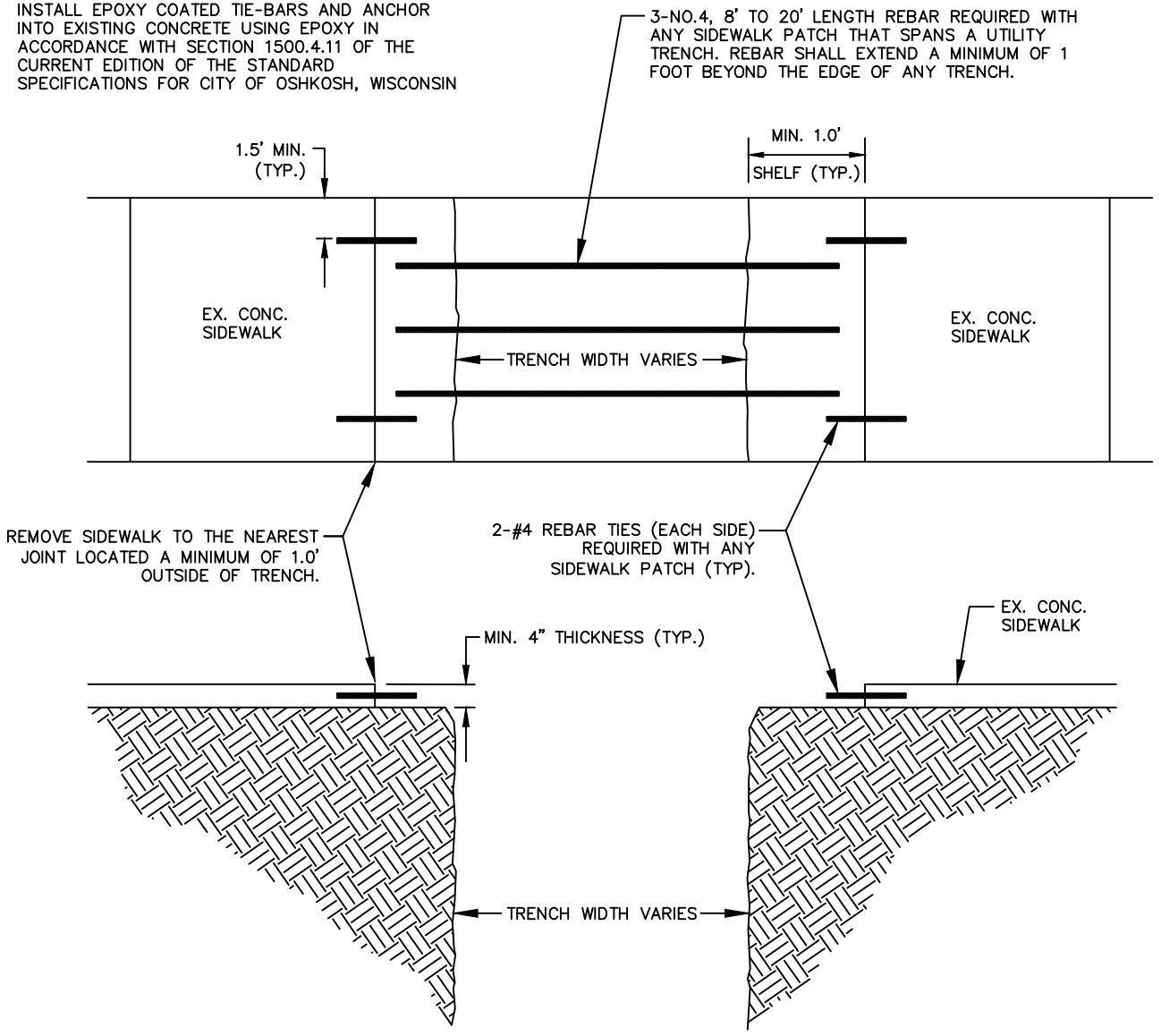
NOTE: THE CONTRACTOR SHALL VERIFY THAT THE MARKER BALLS ARE OPERATIONAL PRIOR TO FINAL PAVING, AND IF ANY MARKER BALL IS NON-OPERATIONAL, IT SHALL BE REPLACED PRIOR TO FINAL PAVING AT THE CONTRACTOR'S EXPENSE.



ELEVATION VIEW
(PERPENDICULAR TO LATERAL)

NOTE:

INSTALL EPOXY COATED TIE-BARS AND ANCHOR INTO EXISTING CONCRETE USING EPOXY IN ACCORDANCE WITH SECTION 1500.4.11 OF THE CURRENT EDITION OF THE STANDARD SPECIFICATIONS FOR CITY OF OSHKOSH, WISCONSIN

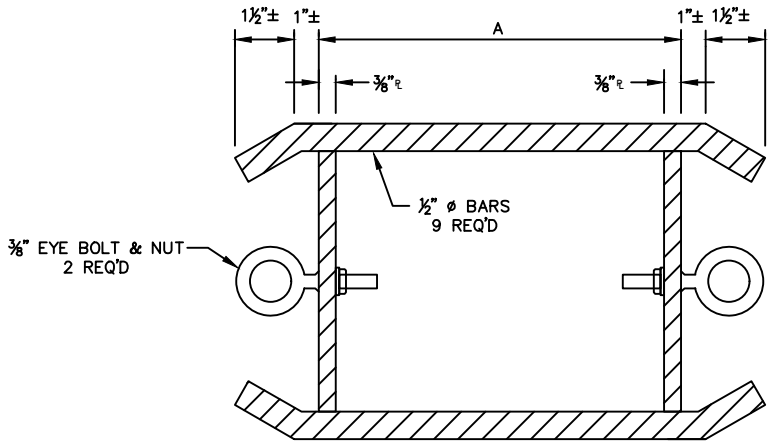


TYPICAL SIDEWALK PATCH DETAIL

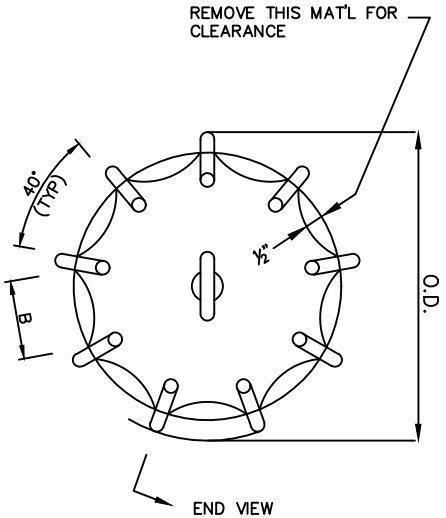
NOT TO SCALE

SIDEWALK PATCH DETAIL	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	5/7/2009
STANDARD DETAIL DRAWING 29	

STANDARD DETAIL DRAWING 29



SIDE OR TOP VIEW



END VIEW

SUGGESTED MANDREL DESIGN

NOMINAL PIPE SIZE ID	A	DIMENSIONS (FEET)														
		D - 3034, SDR - 35						F - 949 CORR. PVC						D -2680		
		5%			7.50%			5%			7.50%			5%		
		O.D.	B	B x 9	O.D.	B	B x 9	O.D.	B	B x 9	O.D.	B	B x 9	O.D.	B	B x 9
8"	0.667	0.607	0.208	1.868	0.591	0.202	1.819	0.606	0.207	1.866	0.590	0.202	1.897	0.613	0.210	1.887
10"	0.833	0.757	0.259	2.330	0.738	0.252	2.272	0.756	0.258	2.326	0.735	0.252	2.265	0.772	0.264	2.376
12"	0.833	0.899	0.307	2.768	0.876	0.300	2.696							0.930	0.318	2.863
15"	1.000	1.100	0.376	3.386	1.071	0.366	3.297							1.168	0.400	3.596
NOMINAL PIPE SIZE ID	A	D - 679, PS 46 PVC 12454C PIPE						P - 679 PVC 12364C								
		5%			7.50%			5%			7.50%					
		O.D.	B	B x 9	O.D.	B	B x 9	O.D.	B	B x 9	O.D.	B	B x 9			
18"	1.250	1.344	0.460	4.137	1.308	0.443	3.991	1.350	0.462	4.155	1.315	0.450	4.048			
21"	1.500	1.583	0.541	4.873	1.542	0.527	4.747	1.591	0.544	4.898	1.549	0.530	4.768			
24"	1.750	1.780	0.609	5.479	1.733	0.593	5.334	1.788	0.612	5.504	1.741	0.596	5.360			
27"	2.000	2.005	0.686	6.172	1.953	0.668	6.012	2.014	0.689	6.199	1.962	0.671	6.039			

NOTE:

1. TOLERANCE ON MANDREL O.D. IS ± .010 INCHES
   B x 9 IS ± .003 FEET
2. D-3034, F-679 & F-949 REFER TO ASTM DESIGNATIONS FOR PLASTIC PIPE
3. D-2680 REFERS TO ASTM DESIGNATION FOR ABS OR PVC COMPOSITE PIPE

SUGGESTED MANDREL DESIGN

NOMINAL PIPE SIZE ID	A	MINIMUM MANDREL O.D. (INCHES)				
		DEFLECTION =				
		D - 3034	SDR - 35	F-949		D - 2680
		5%	7.50%	5%	7.50%	5%
8"	8"	7.28	7.09	7.27	7.08	7.36
10"	10"	9.08	8.85	9.07	8.83	9.26
12"	10"	10.79	10.51			11.16
15"	12"	13.20	12.85			14.01
		F-679 , PS 46 PVC 12454C PIPE		F-679 , PS 46 PVC 12364C PIPE		
		DEFLECTION =				
		5%	7.50%	5%	7.50%	
18"	15"	16.13	15.70	16.20	15.78	
21"	18"	19.00	18.50	19.09	18.59	
24"	21"	21.36	20.79	21.46	20.89	
27"	24"	24.06	23.43	24.17	23.54	

NOTE, REQUIRED DIMENSIONS:

1. MANDREL DIMENSIONS ON "O.D."
2. 40° SPACING BETWEEN ANGLES
3. DIMENSIONS "A" ARE MINIMUMS

ALL OTHER DIMENSIONS ARE OPTIONAL

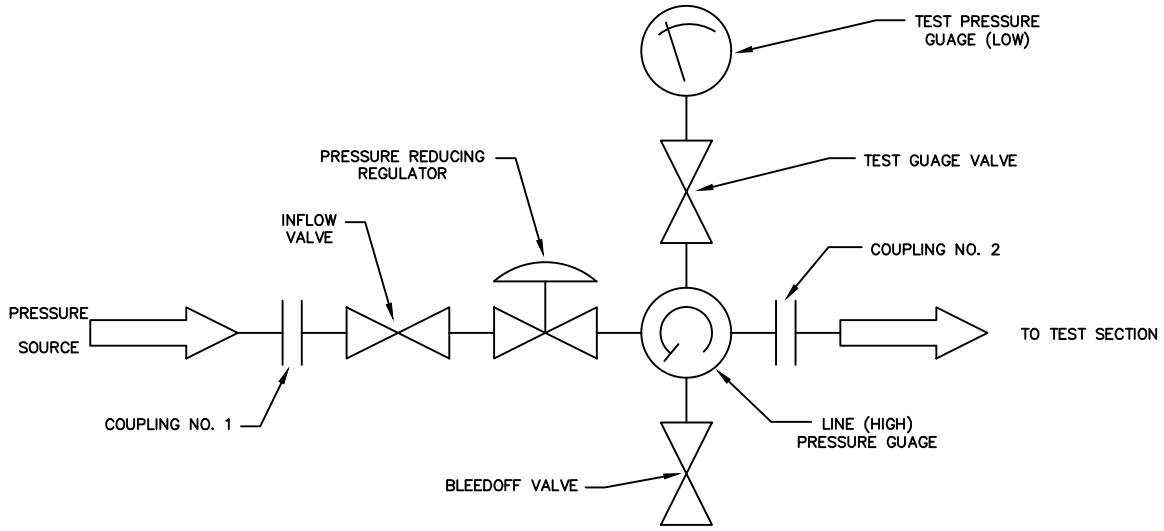
GO-NO GO MANDREL FOR PLASTIC PIPE

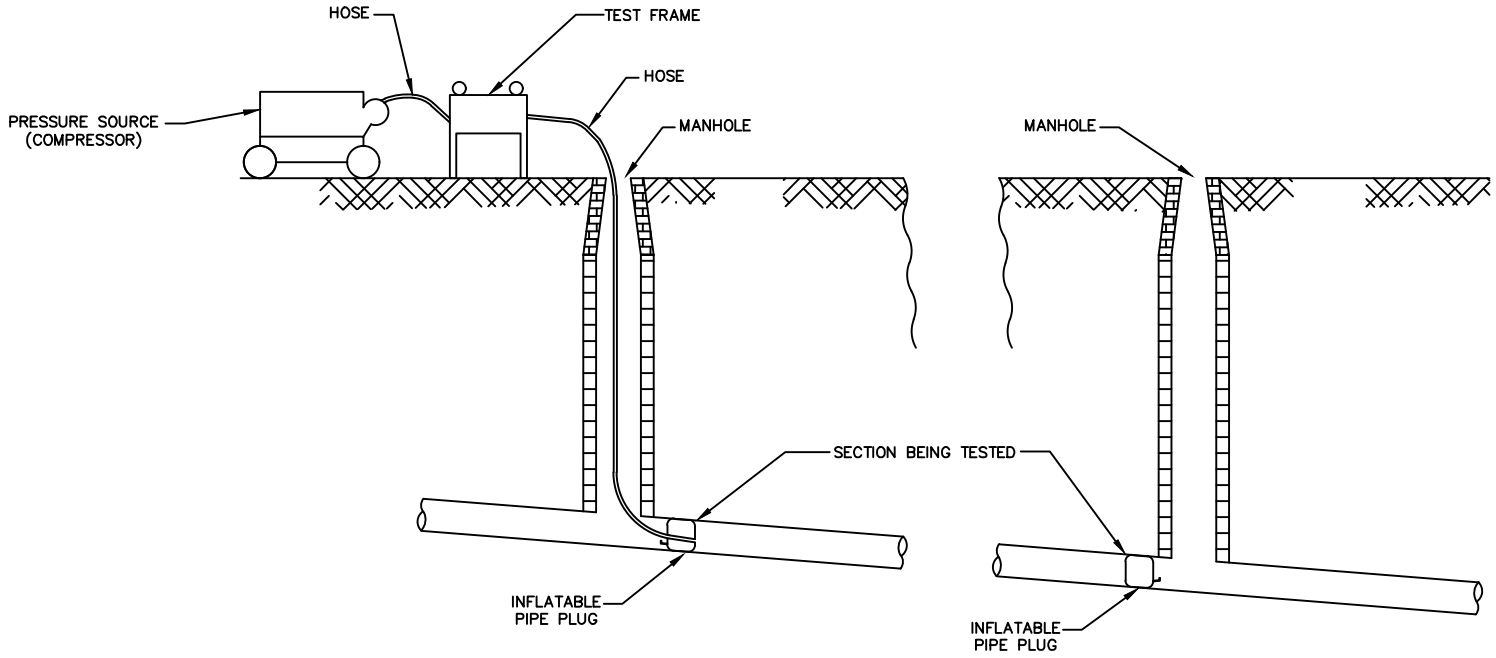
CITY OF OSHKOSH, WISCONSIN

REVISIONS 1/2/2014

STANDARD DETAIL DRAWING 30

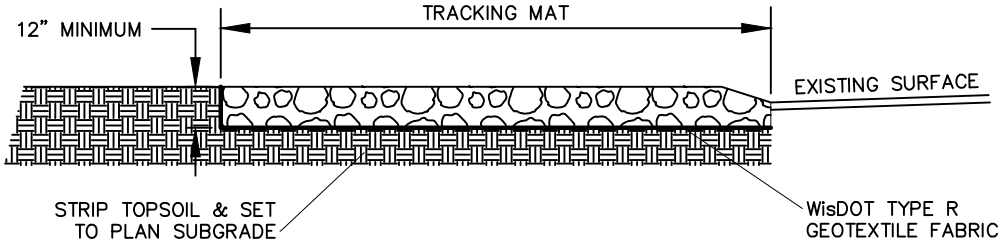
STANDARD DETAIL DRAWING 30

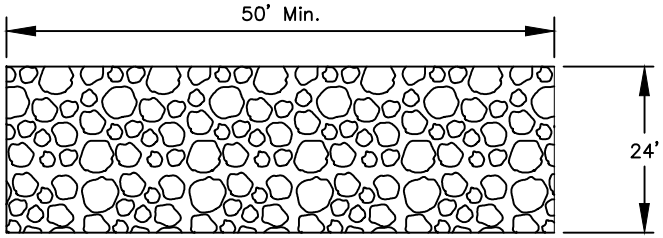




LOW PRESSURE AIR TEST DETAIL	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	1/02/2014
STANDARD DETAIL DRAWING 31	

STANDARD DETAIL DRAWING 31





STONE TRACKING PAD

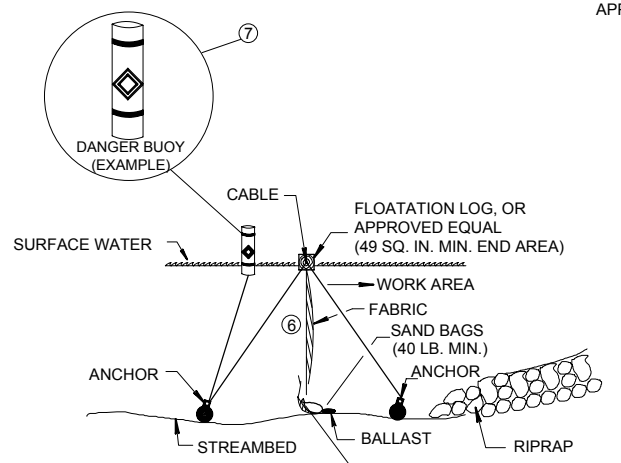
EROSION CONTROL TRACK PAD GENERAL NOTES:

1. PROVIDE THE STONE TRACKING PAD IN ACCORDANCE WITH THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES TECHNICAL STANDARD No. 1057.
2. INSTALL TRACKING PAD PRIOR TO ANY TRAFFIC LEAVING THE SITE. IF CONDITIONS ARE SUCH THAT SEDIMENT IS NOT REMOVED FROM TIRES BY THE TRACKING PAD, THEN TIRES SHALL BE WASHED IN ACCORDANCE WITH WDNR TECHNICAL STANDARD No. 1057.
3. CONSTRUCT USING 3 TO 6 INCH CLEAR OR WASHED STONE, ALL MATERIAL TO BE RETAINED ON A 3–INCH SIEVE. MINIMUM 50' LENGTH, MINIMUM 12" THICK, AND SHALL BE THE FULL WIDTH OF THE EGRESS POINT.
4. THE STONE TRACKING PAD SHALL BE UNDERLAIN WITH A WisDOT TYPE R GEOTEXTILE FABRIC TO PREVENT MIGRATION OF UNDERLYING SOIL INTO THE STONE.
5. SURFACE WATER MUST BE PREVENTED FROM PASSING THROUGH THE TRACKING PAD. FLOWS SHALL BE DIVERTED AWAY FROM TRACKING PADS OR CONVEYED UNDER AND AROUND THEM BY USING CULVERTS, WATER BARS, OR OTHER SIMILAR PRACTICES.
6. MAINTAIN THE ENTRANCE IN A CONDITION WHICH WILL PREVENT TRACKING OF SEDIMENT ONTO PUBLIC RIGHT–OF–WAYS. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND/OR CLEANING OF ANY MEASURES USED TO TRAP SEDIMENT.
7. CLEAN WHEELS TO REMOVE SEDIMENT PRIOR TO ENTERING PUBLIC RIGHT–OF–WAYS. WHEN WASHING IS DONE, IT SHALL BE DONE IN AN AREA STABILIZED WITH AND WHICH DRAINS TO AN APPROVED SEDIMENT TRAPPING DEVICE.
8. REMOVE ALL SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO A PUBLIC RIGHT–OF–WAY IMMEDIATELY.
9. OBTAIN ACCESS PERMIT TO PUBLIC ROADS PRIOR TO CONSTRUCTION.
10. EASEMENTS ARE SHOWN AT APPROXIMATE LOCATIONS.
11. REMOVE AND DISPOSE OF TRACK PAD MATERIAL AND STABILIZE THE AREA AT PROJECT COMPLETION.

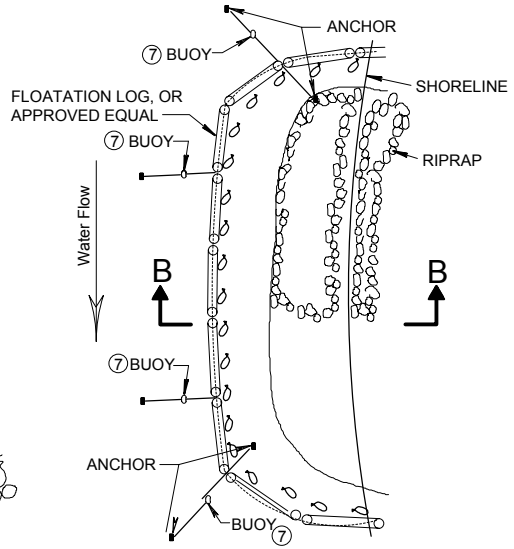
TRACKING PAD DETAIL	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	12/16/2014
STANDARD DETAIL DRAWING 32	

STANDARD DETAIL DRAWING 32

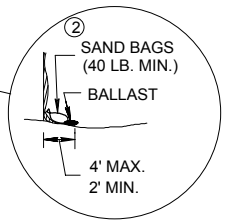
Figure 1. Turbidity Barrier Placement Details

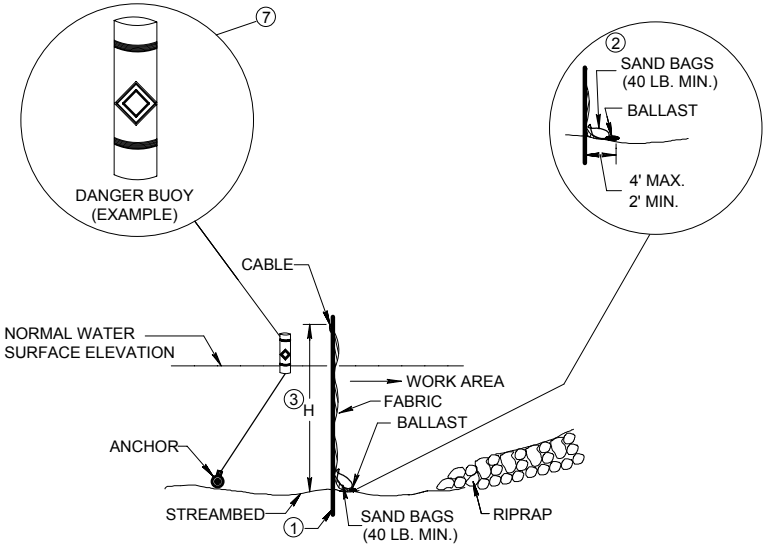


SECTION B-B

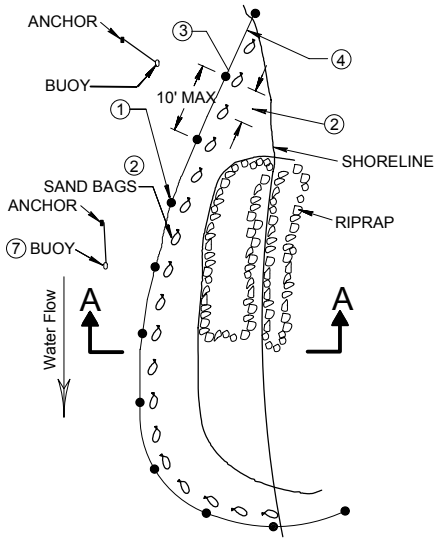


TURBIDITY BARRIER FLOAT ALTERNATIVE
CAUTION - SEE NOTE 5





SECTION A-A



PLAN VIEW

TURBIDITY BARRIER STANDARD POST INSTALLATION

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD AND THE APPLICABLE SPECIAL PROVISIONS

TURBIDITY BARRIER MAY BE REMOVED AT THE ENGINEERS OR PROJECT MANAGERS DISCRETION, WHEN PERMANENT EROSION CONTROL MEASURES HAVE BEEN ESTABLISHED.

① DRIVEN STEEL POSTS, PIPES, OR CHANNELS. LENGTH SHALL BE SUFFICIENT TO SECURELY SUPPORT BARRIER AT HIGH WATER ELEVATIONS.

② SANDBAGS TO BE USED AS ADDITIONAL BALLAST WHEN ORDERED BY THE ENGINEER OR PROJECT MANAGER TO MEET ADVERSE FIELD CONDITIONS. SPACE AS APPROPRIATE FOR SITE CONDITIONS.

③ WHEN BARRIER HEIGHT, H, EXCEEDS 8 FT., POST SPACING MAY NEED TO BE DECREASED.

④ IN WATERWAYS SUBJECT TO FLUCTUATING WATER ELEVATIONS, PROVISIONS SHOULD BE MADE TO ALLOW THE WATER TO EQUALIZE ON EACH SIDE OF THE BARRIER. THIS MAY BE ACCOMPLISHED BY LEAVING A PORTION OF THE BARRIER OPEN ON THE UPSTREAM END.

⑤ FLOAT ALTERNATIVE WILL ONLY BE ALLOWED WITH WRITTEN APPROVAL OF THE ENGINEER OR PROJECT MANAGER, AND IS MEANT FOR LOCATIONS WHERE BED ROCK PREVENTS THE INSTALLATION OF POSTS.

⑥ ALLOW SUFFICIENT SLACK VERTICALLY AND HORIZONTALLY SO THAT SEDIMENT BUILD UP WILL NOT SEPARATE OR LOWER THE TURBIDITY BARRIER.

⑦ USE AS DIRECTED BY COAST GUARD OR DNR PERMIT WHEN WORKING IN NAVIGABLE WATERWAYS.

NOT TO SCALE

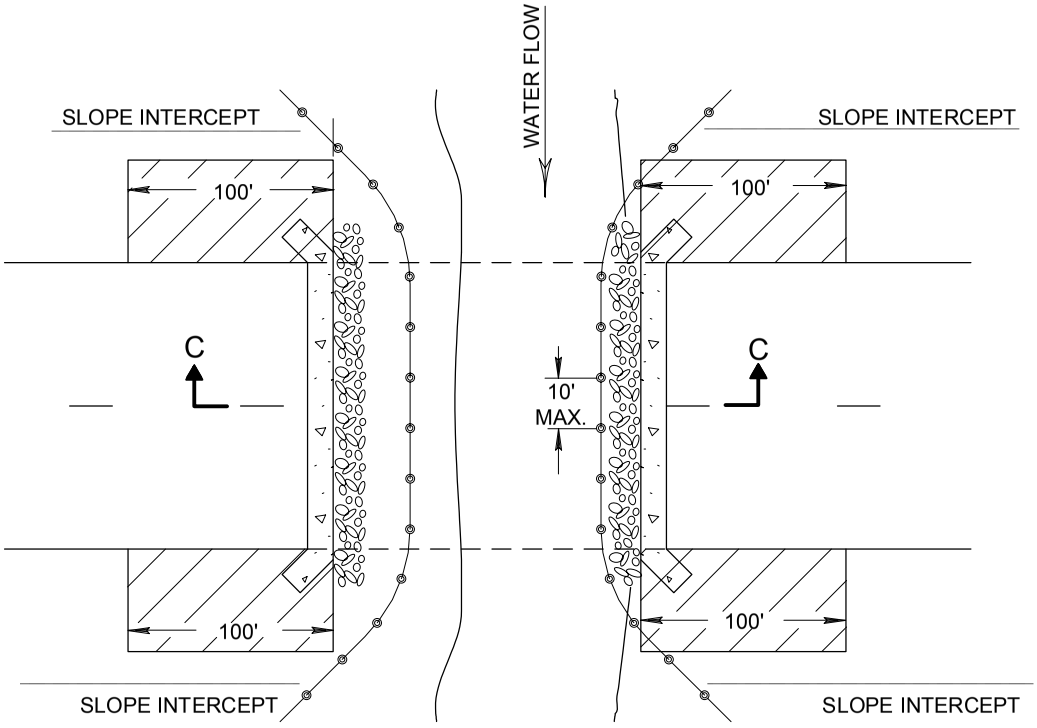
This drawing based on Wisconsin Department of Transportation Standard Detail Drawing 8 E 11-2.

STANDARD DETAIL DRAWING 33A

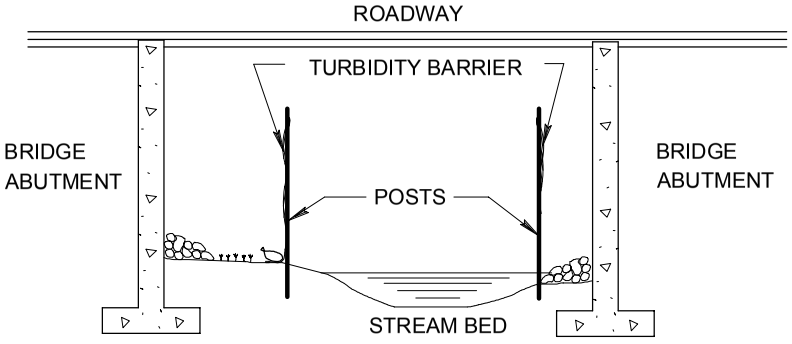
FIGURE 2. TURBIDITY BARRIER DETAIL SHOWING TYPICAL PLACEMENT AT STRUCTURES

GENERAL NOTE

FLOAT ALTERNATIVE WILL ONLY BE ALLOWED WITH WRITTEN APPROVAL OF THE ENGINEER OR PROJECT MANAGER AND IS MEANT FOR LOCATIONS WHERE BEDROCK PREVENTS THE INSTALLATION OF POSTS.



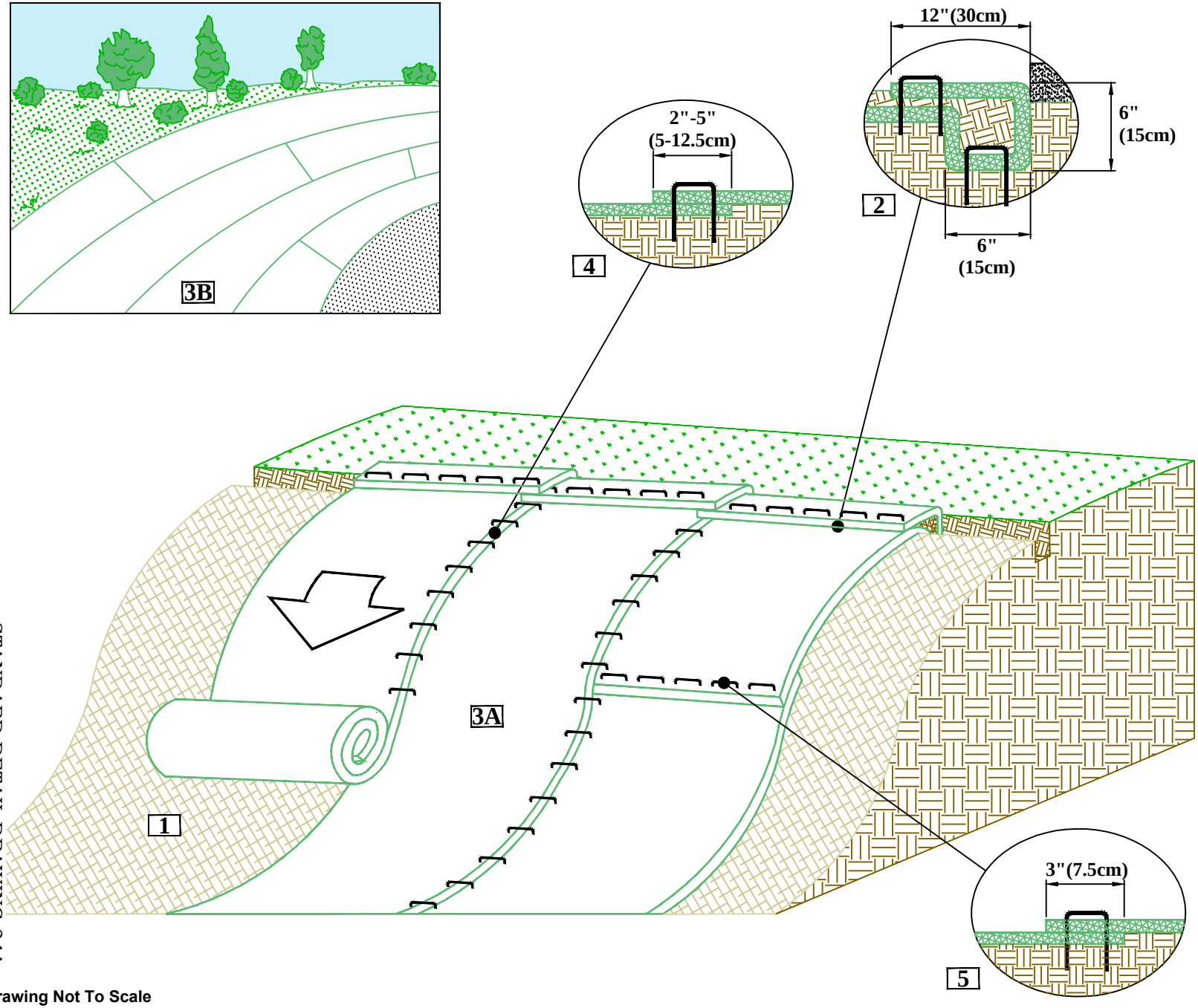
PLAN VIEW



SECTION C-C

NOT TO SCALE

This Drawing is Based on Wisconsin Department of Transportation Standard Detail Drawing 8 E 11-2.



STANDARD DETAIL DRAWING 34A

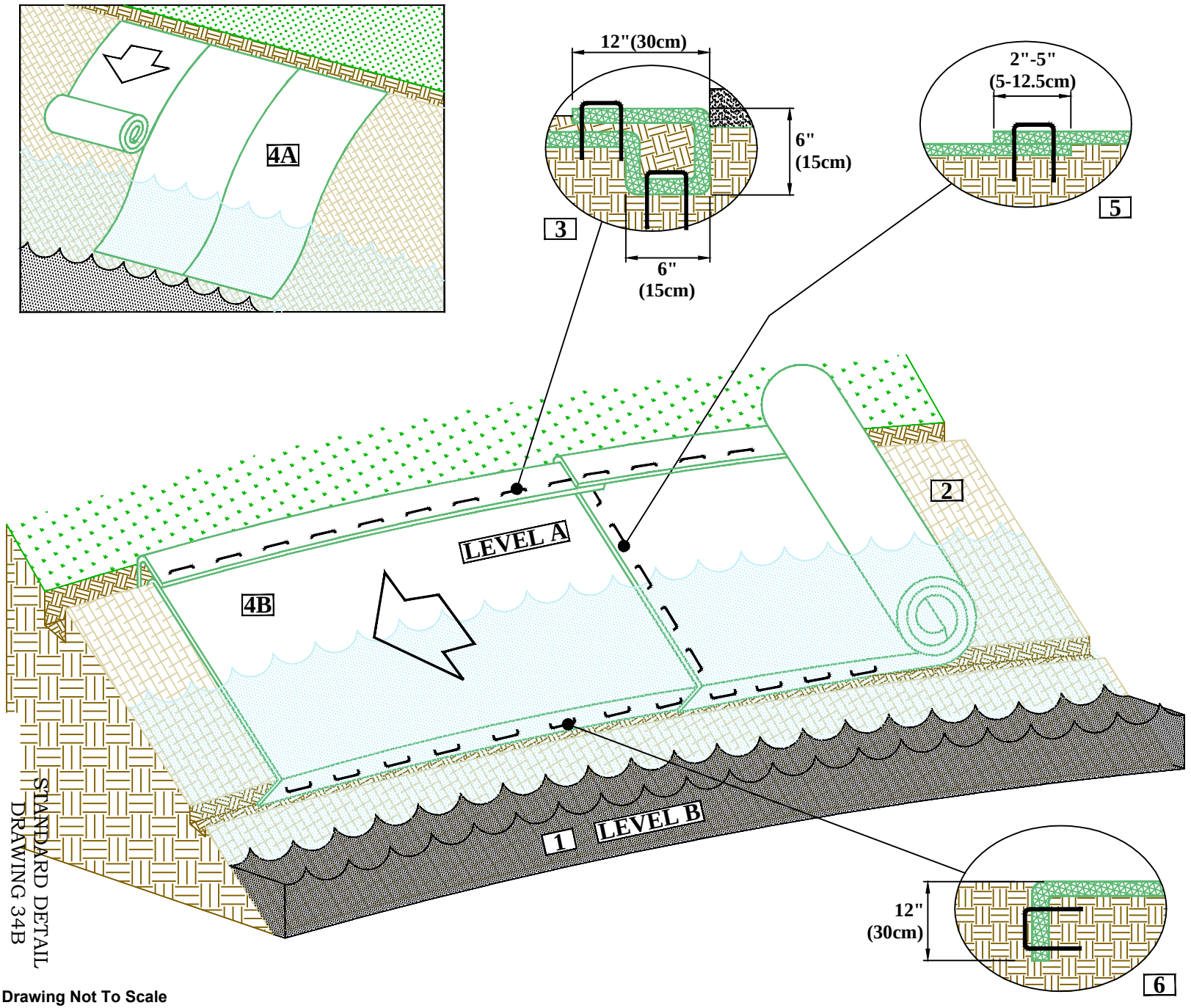
Drawing Not To Scale

EROSION MAT SLOPE INSTALLATION DETAIL

*NOTE:
In loose soil conditions, the use of staple or stake lengths greater than 6"(15cm) may be necessary to properly secure the erosion mat.

INSTALLATION DIRECTIONS

1. Prepare soil before installing erosion mat, including any necessary application of lime, fertilizer, and seed.
2. Begin at the top of the slope by anchoring the erosion mat in a 6"(15cm) deep X 6"(15cm) wide trench with approximately 12" (30cm) of erosion mat extended beyond the up-slope portion of the trench. Anchor the erosion mat with a row of staples/stakes approximately 12" (30cm) apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to the compacted soil and fold the remaining 12"(30cm) portion of erosion mat back over the seed and compacted soil. Secure erosion mat over compacted soil with a row of staples/stakes spaced approximately 12"(30cm) apart across the width of the erosion mat.
3. Roll the erosion mat (A) down or (B) horizontally across the slope. Erosion mat will unroll with appropriate side against the soil surface. All erosion mat must be securely fastened to soil surface by placing staples/stakes in appropriate locations as shown in the staple pattern guide.
4. The edges of parallel erosion mat must be stapled with approximately 2" - 5" (5-12.5cm) overlap depending on the erosion mat type.
5. Consecutive erosion mat spliced down the slope must be end over end (Shingle style) with an approximate 3"(7.5cm) overlap. Staple through overlapped area, approximately 12"(30cm) apart across entire erosion mat width.



STANDARD DETAIL
DRAWING 34B

Drawing Not To Scale

SHORELINE/ STREAMBANK INSTALLATION DETAIL

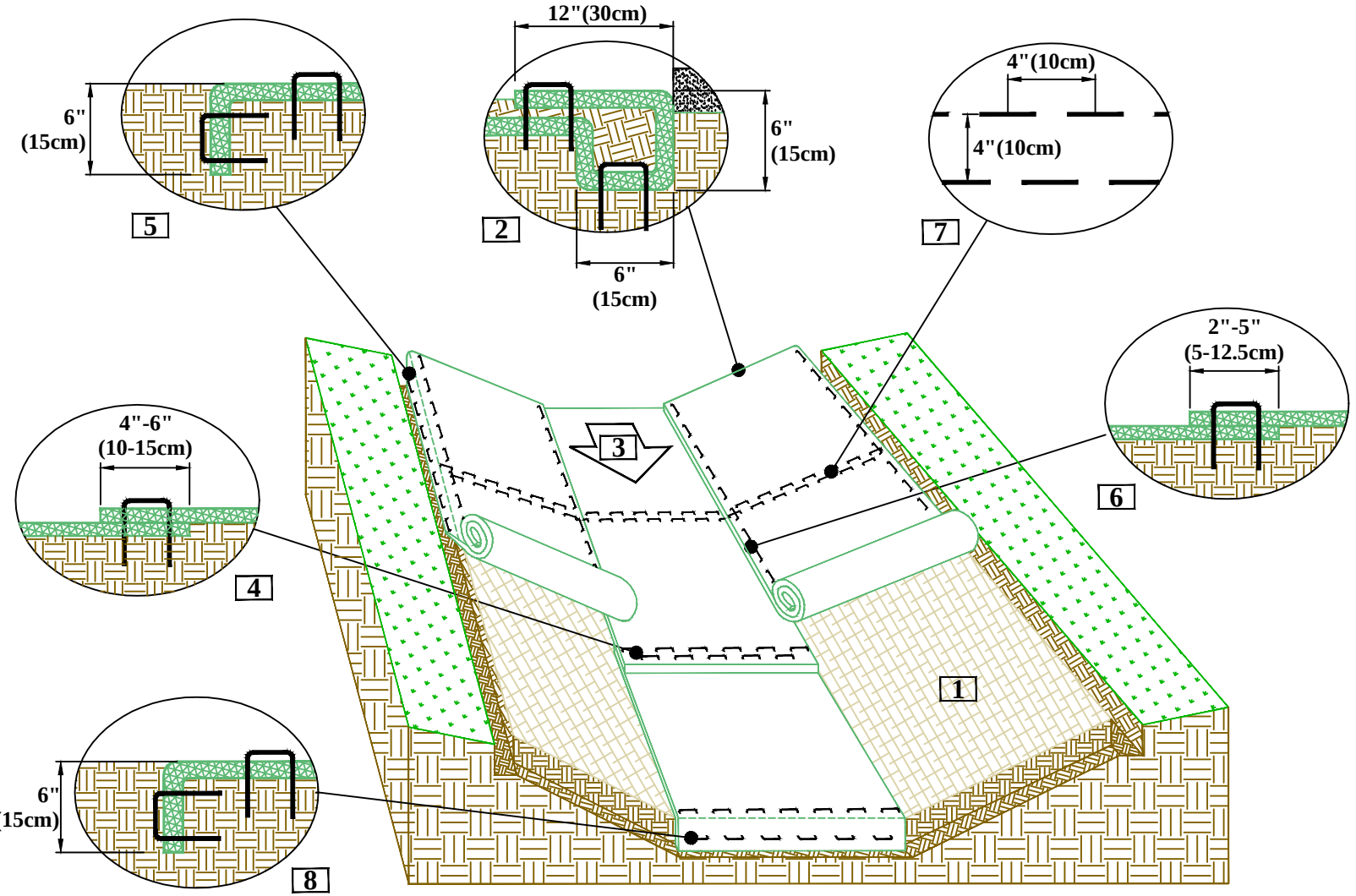
1. For easier installation, lower water level from Level A to Level B before installation.
2. Prepare soil before installing erosion mat, including any necessary application of lime, fertilizer, and seed.
3. Begin at the top of the shoreline by anchoring the erosion mat in a 6"(15cm) deep X 6"(15cm) wide trench with approximately 12"(30cm) of erosion mat extended beyond the up-slope portion of the trench. Anchor the erosion mat with a row of staples/stakes approximately 12" (30cm) apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to the compacted soil and fold the remaining 12"(30cm) portion of erosion mat back over the seed and compacted soil. Secure erosion mat over compacted soil with a row of staples/stakes spaced approximately 12"(30cm) apart across the width of the erosion mat.
4. Roll erosion mat either (A) down the shoreline for long banks (top to bottom) or (B) horizontally across the shoreline slope. Erosion mat will unroll with appropriate side against the soil surface. All erosion mat must be securely fastened to soil surface by placing staples/stakes in appropriate locations as shown in the staple pattern guide.
5. The edges of all horizontal and vertical seams must be stapled with approximately 2" - 5" (5-12.5cm) overlap. **Note**: *In streambank applications seam overlaps should be shingled in the predominant flow direction.
6. The edges of the erosion mat at or below normal water level must be anchored by placing the erosion mat in a 12"(30cm) deep X 6"(15cm) wide anchor trench. Anchor the erosion mat with a row of staples/stakes spaced approximately 12"(30cm) apart in the trench. Backfill and compact the trench after stapling (stone or soil may be used as backfill). For installation at or below normal water level, use of turf reinforcement mat on top of the erosion mat or geotextile may be recommended.

SHORELINE/ STREAMBANK INSTALLATION DETAIL

NOTES:

* In loose soil conditions, the use of staple or stake lengths greater than 6" may be necessary to properly secure the RECPs.

** Bottom anchor trench can be eliminated when using ShoreMax mat over RECP along the bottom edge.



STANDARD DETAIL
DRAWING 34C

CRITICAL POINTS

A. Overlaps and Seams
B. Projected Water Line
C. Channel Bottom/Side Slope Vertices

Drawing Not To Scale

CHANNEL INSTALLATION DETAIL

NOTES:

*Horizontal staple spacing should be altered if necessary to allow staples to secure the critical points along the channel surface.

**In loose soil conditions, the use of staple or stake lengths greater than 6"(15cm) may be necessary to properly secure the RECP's.

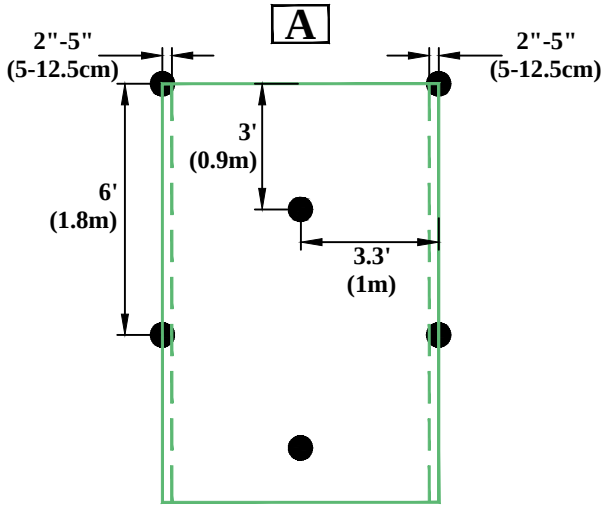
INSTALLATION DIRECTIONS

1. Prepare soil before installing erosion mat, including any necessary application of lime, fertilizer, and seed.
2. Begin at the top of the channel by anchoring the erosion mat in a 6"(15cm) deep X 6"(15cm) wide trench with approximately 12"(30cm) of erosion mat extended beyond the up-slope portion of the trench. Use a turf reinforcement mat at the channel/culvert outlet as supplemental scour protection as needed. Anchor the erosion mat with a row of staples/stakes approximately 12"(30cm) apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to the compacted soil and fold the remaining 12"(30cm) portion of erosion mat back over the seed and compacted soil. Secure erosion mat over compacted soil with a row of staples/stakes spaced approximately 12" apart across the width of the erosion mat.
3. Roll center erosion mat in direction of water flow in bottom of channel. Erosion mat will unroll with appropriate side against the soil surface. All erosion mat must be securely fastened to soil surface by placing staples/stakes in appropriate locations as shown in the staple pattern guide.
4. Place consecutive erosion mat end-over-end (Shingle style) with a 4"-6" overlap. Use a double row of staples staggered 4" apart and 4" on center to secure erosion mat.
5. Full length edge of erosion mat at top of side slopes must be anchored with a row of staples/stakes approximately 12"(30cm) apart in a 6"(15cm) deep X 6"(15cm) wide trench. Backfill and compact the trench after stapling.
6. Adjacent erosion mat must be overlapped approximately 2"-5" (5-12.5cm) (Depending on erosion mat type) and stapled.
7. In high flow channel applications a staple check slot is recommended at 30 to 40 foot (9 -12m) intervals. Use a double row of staples staggered 4"(10cm) apart and 4"(10cm) on center over entire width of the channel.
8. The terminal end of the erosion mat must be anchored with a row of staples/stakes approximately 12" (30cm) apart in a 6"(15cm) deep X 6"(15cm) wide trench. Backfill and compact the trench after stapling.

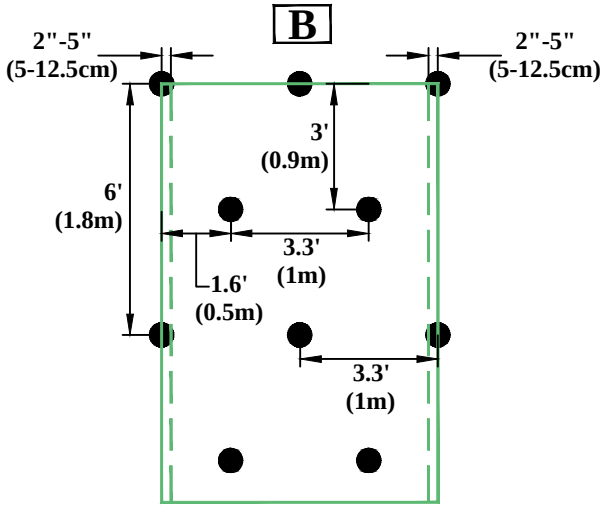
INSTALLATION PATTERN LEGEND

- 4:1 Slopes (A)
- 3:1 Slopes (B)
- 2:1 Slopes (C)
- 1:1 & Steeper Slopes (D)
- Medium/High Flow Channel (D)
- High Flow Channel And Shoreline (E)

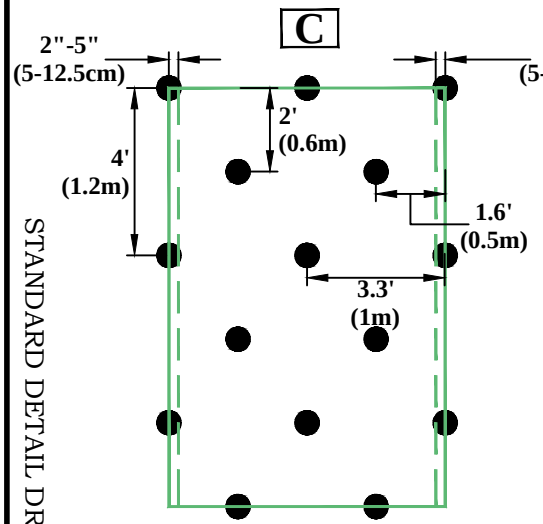
Drawing Not To Scale



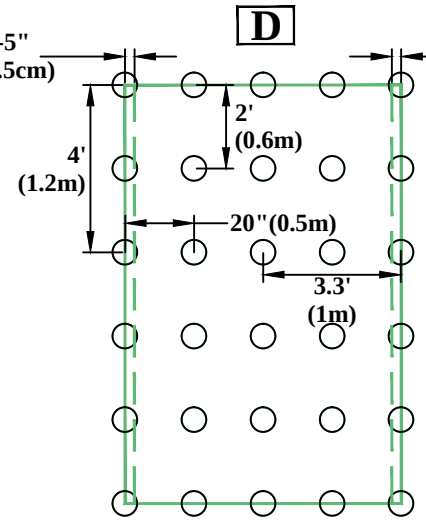
0.7 Staples per SQ.YD.



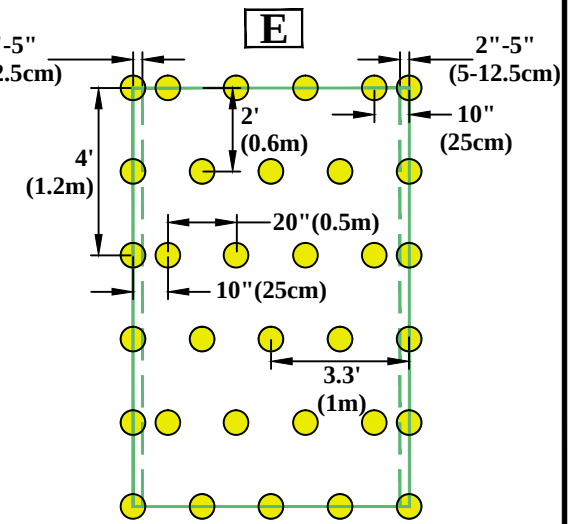
1.15 Staples per SQ.YD.



1.7 Staples per SQ.YD.



3.4 Staples per SQ.YD.



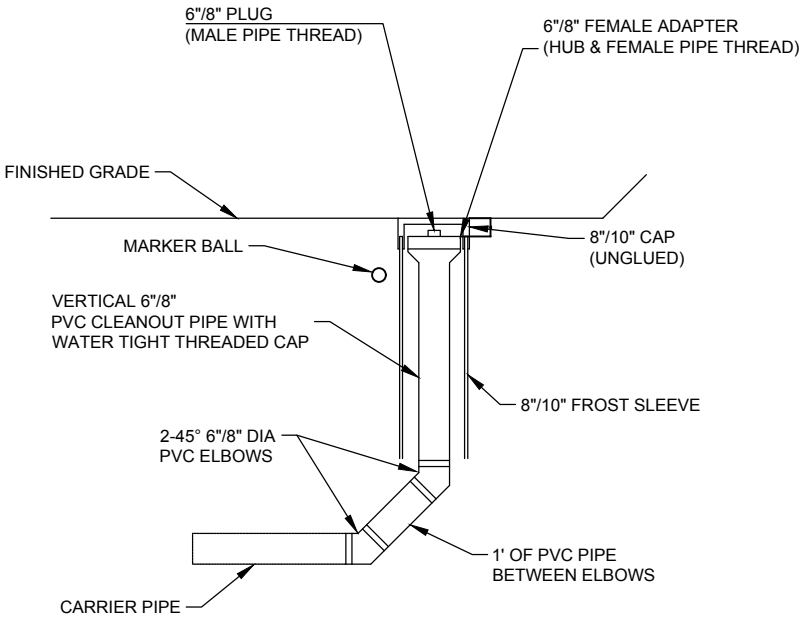
3.75 Staples per SQ.YD.

STANDARD DETAIL DRAWING 34D

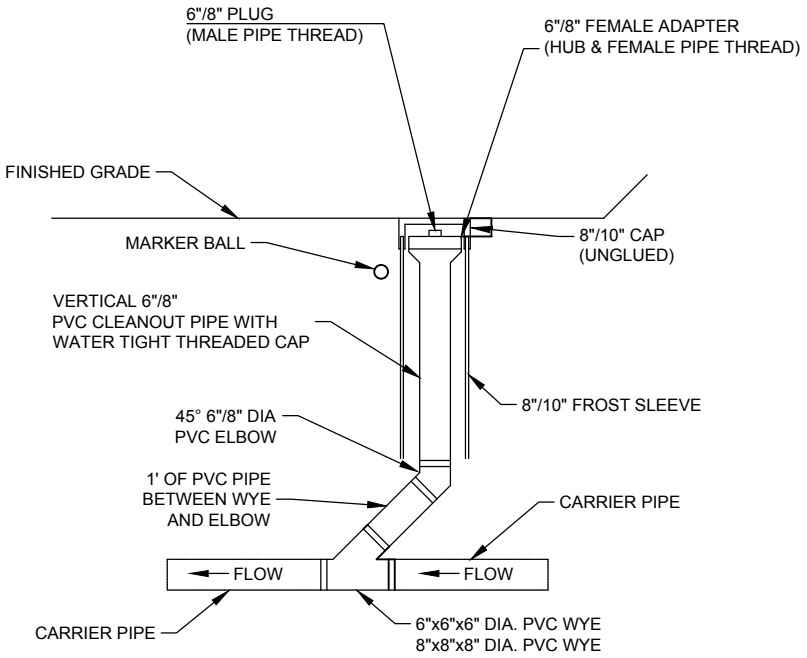
STAPLE PATTERN GUIDE

NOTES:

* Use manufactures staple pattern detail is available.



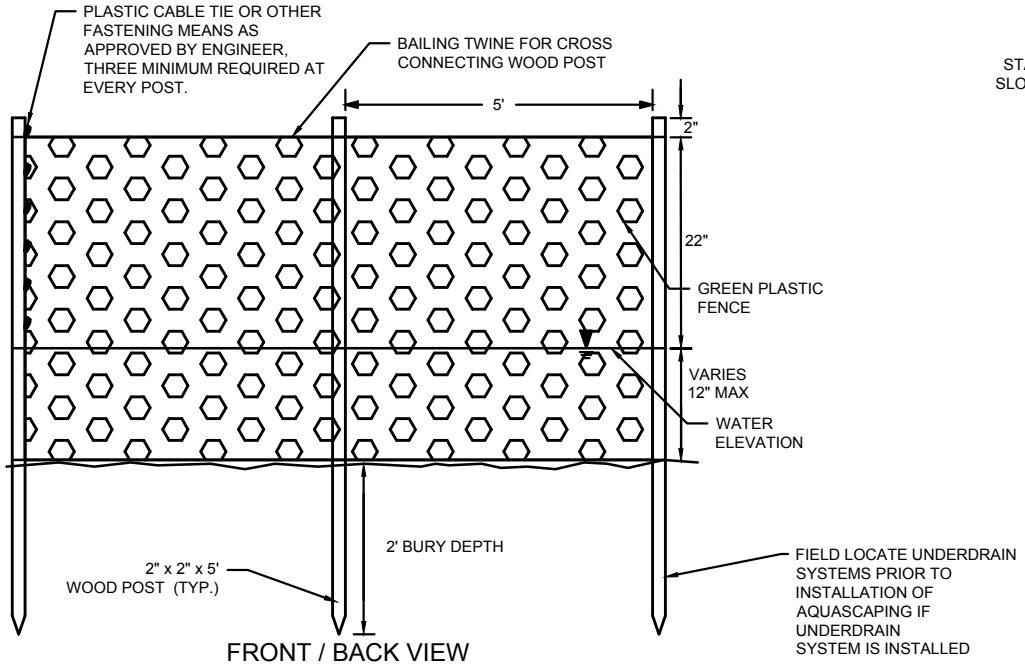
CLEANOUT, END PIPE DETAIL
(PROFILE VIEW)



CLEANOUT, CONTINOUS PIPE DETAIL
(PROFILE VIEW)

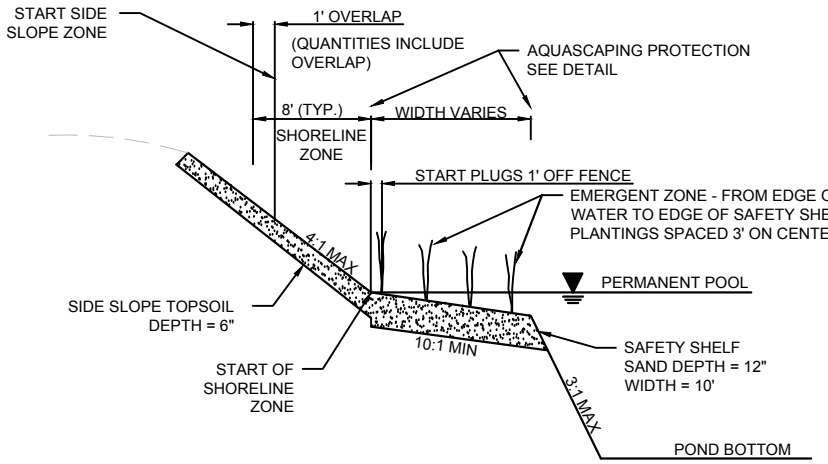
STANDARD DETAIL DRAWING 35

CLEANOUT DETAIL	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	6/01/2016
STANDARD DETAIL DRAWING 35	

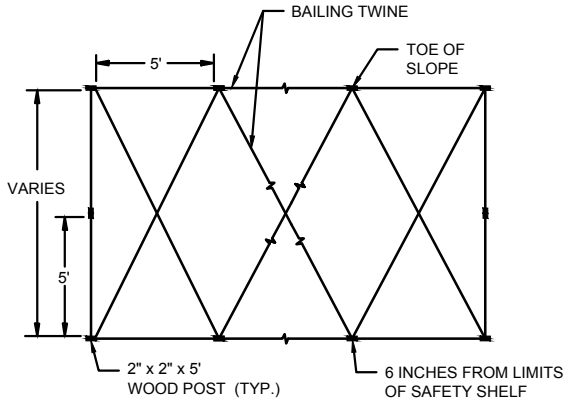


FRONT / BACK VIEW

AQUASCAPING PROTECTION DETAIL

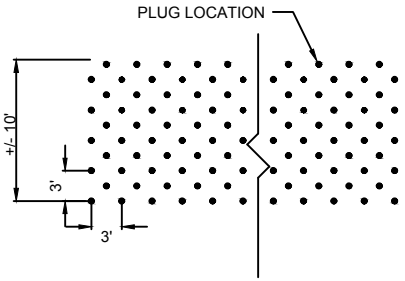


WET DETENTION BASIN TYPICAL CROSS SECTION DETAIL



PLAN VIEW

TWINING DETAIL

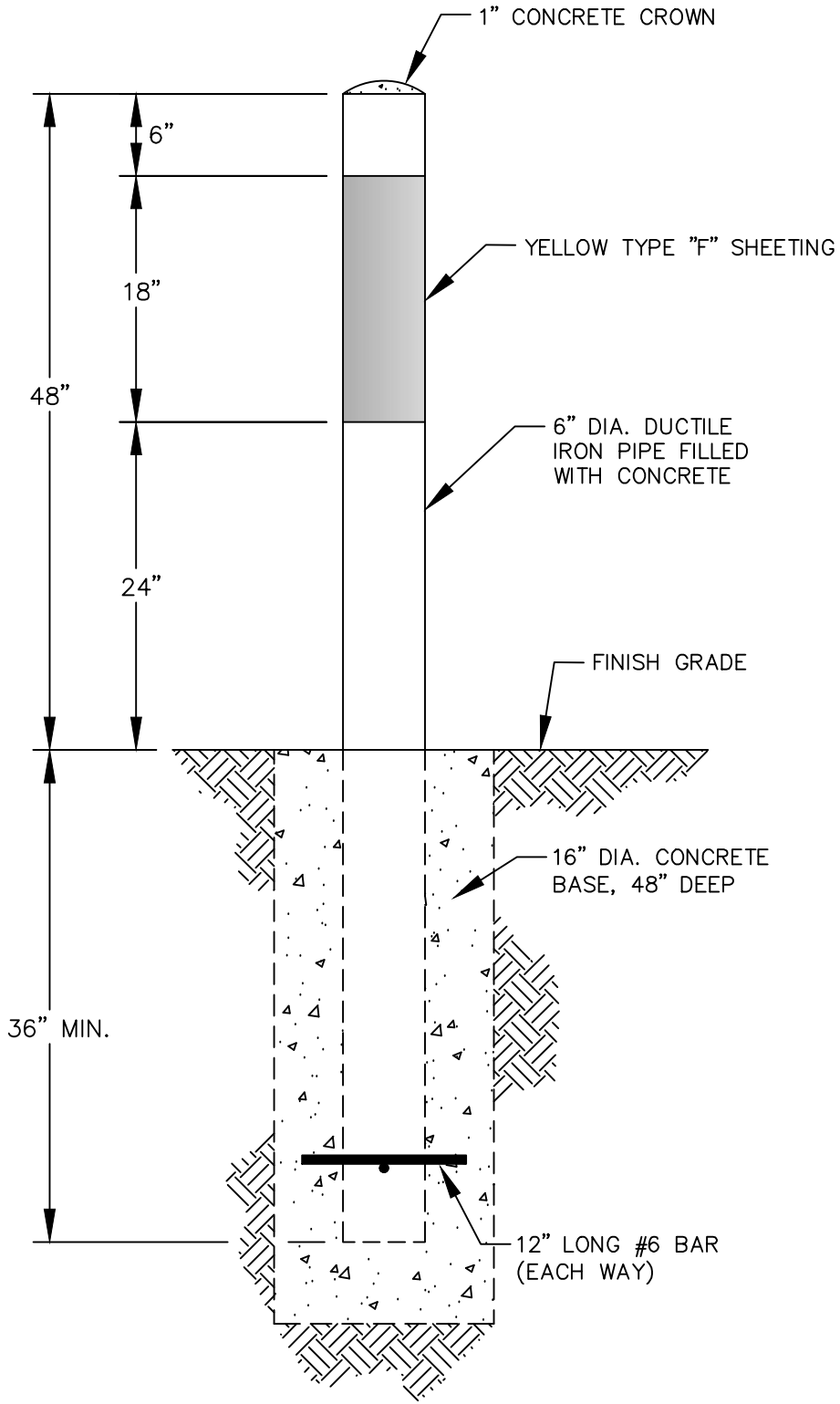


PLUGS INSTALLED HORIZONTALLY AT APPROXIMATELY 3' SPACING. SPACING MAY VARY DUE TO WIDTH OF SAFETY SHELF. (APPROXIMATELY 1.9 PLUGS PER SQ. YD.)

EMERGENT BED PLANTING DETAIL

AQUATIC PLANTING DETAILS	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	6/09/2016
STANDARD DETAIL DRAWING 36	

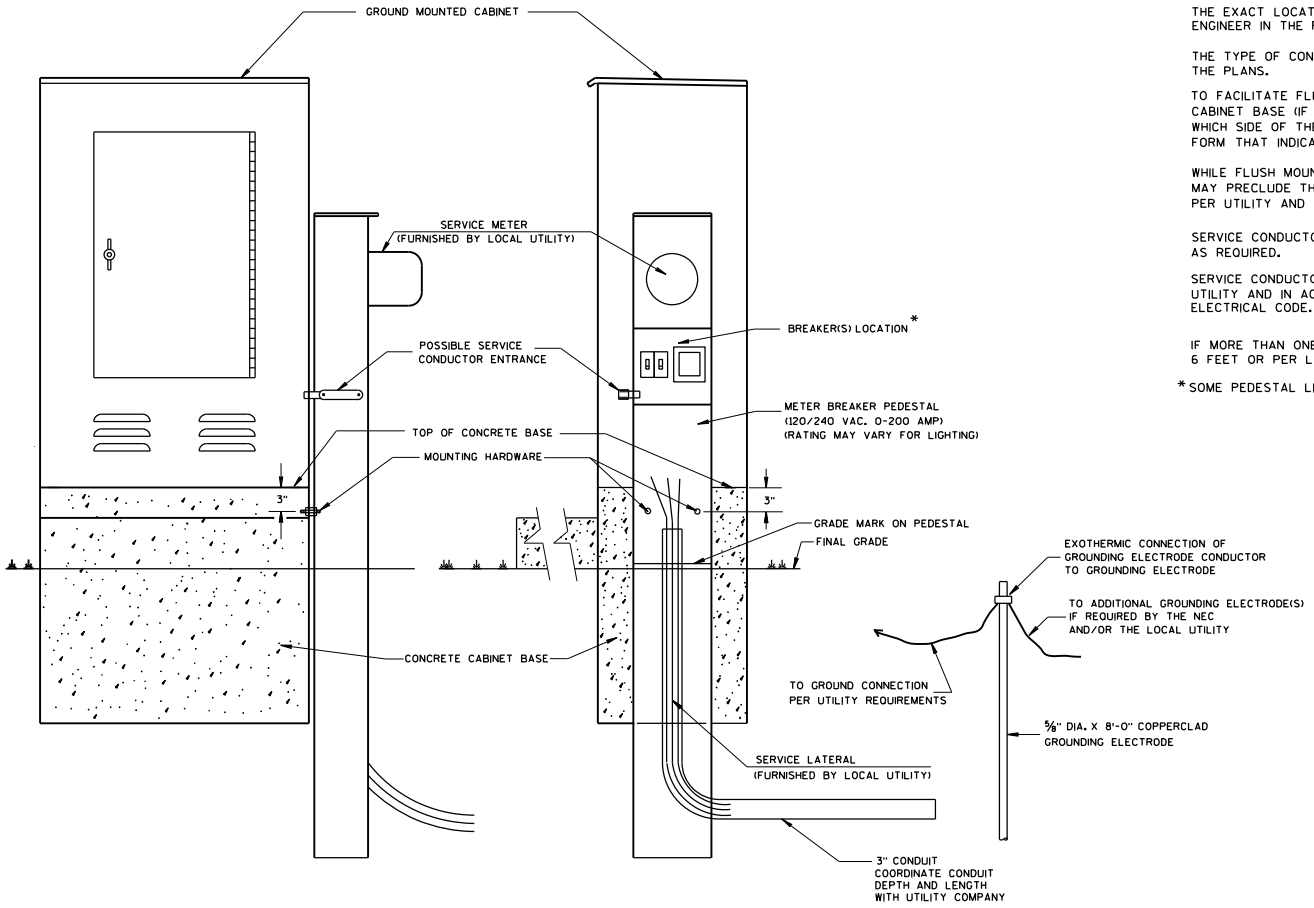
STANDARD DETAIL DRAWING 36



NOT TO SCALE

GUARD POST DETAIL
CITY OF OSHKOSH, WISCONSIN
DATE DRAWN: 2/22/2017
STANDARD DETAIL DRAWING 37

STANDARD DETAIL DRAWING 37



TYPICAL CABINET SERVICE INSTALLATION

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE CONTRACT.

THE EXACT LOCATION OF THE METER BREAKER PEDESTAL SHALL BE DETERMINED BY THE ENGINEER IN THE FIELD.

THE TYPE OF CONCRETE CABINET BASE TO BE INSTALLED SHALL BE AS CALLED FOR IN THE PLANS.

TO FACILITATE FLUSH MOUNTING OF THE METER BREAKER PEDESTAL AGAINST THE SIDE OF THE CABINET BASE (IF FLUSH MOUNTING POSSIBLE. CONFER WITH THE LOCAL UTILITY TO DETERMINE WHICH SIDE OF THE CONCRETE BASE THE ELECTRICAL SERVICE LATERAL WILL APPROACH. THEN FORM THAT INDICATED SIDE FOR FULL SIDE DEPTH.

WHILE FLUSH MOUNTING IS THE MOST DESIRABLE MOUNTING CONFIGURATION UTILITY REQUIREMENTS MAY PRECLUDE THIS OPTION. CONTRACTOR MUST PROVIDE UTILITY APPROVED PEDESTAL AND INSTALL PER UTILITY AND MANUFACTURERS REQUIREMENTS.

SERVICE CONDUCTOR ENTRANCES SHALL BE RIGID METALLIC CONDUIT, NIPPLES AND/OR CONDULETS AS REQUIRED.

SERVICE CONDUCTOR ENTRANCES SHALL BE SIZED AND LOCATED AS REQUIRED BY THE LOCAL UTILITY AND IN ACCORDANCE WITH APPROPRIATE ARTICLES OF THE LATEST ACCEPTED NATIONAL ELECTRICAL CODE.

IF MORE THAN ONE GROUNDING ELECTRODE IS REQUIRED, THE DISTANCE APART SHALL BE 6 FEET OR PER LOCAL UTILITY REGULATIONS.

* SOME PEDESTAL LIGHTING PLANS SHOW MAIN LUGS ONLY.

6

CABINET SERVICE INSTALLATION
(METER BREAKER PEDESTAL)

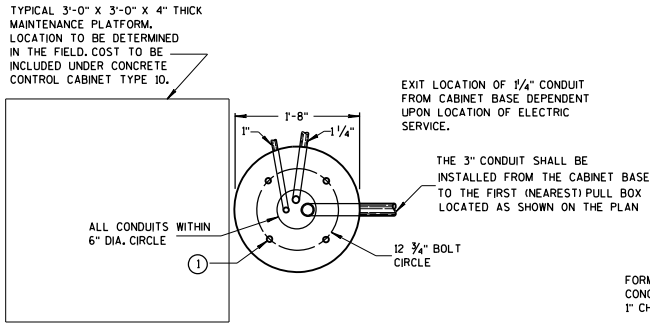
STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

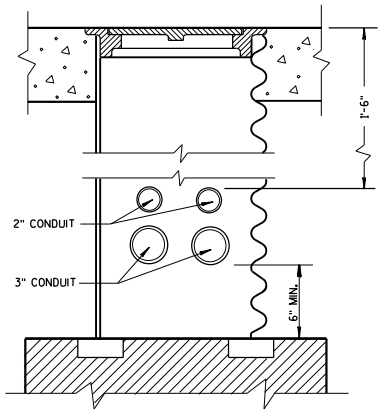
APPROVED
Sept. 2014 — DATE
/S/ Ahmet Demirbilek — STATE ELECTRICAL ENGINEER
FHWA

S.D.D. 9 D 1-5

CONTROL CABINET BASE TYPE	DIMENSIONS H	I	J	K	C.Y. CONCRETE (APPROX.)
TYPE 6 - 30" CABINET	34"	60"	10"	17"	.64
TYPE 7 - 38" CABINET	42"	60"	10"	21"	.93
TYPE 8 - 38" CABINET	42"	72"	12"	21"	1.29
TYPE 9 - VARIABLE	54"	72"	14"	27"	1.56
TYPE 10 - POST MOUNT	AS SHOWN				.65 *

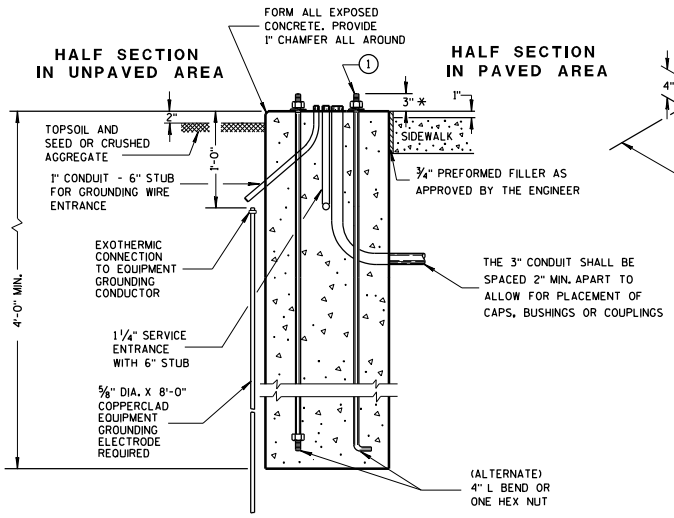
* INCLUDES MAINTENANCE PLATFORM.





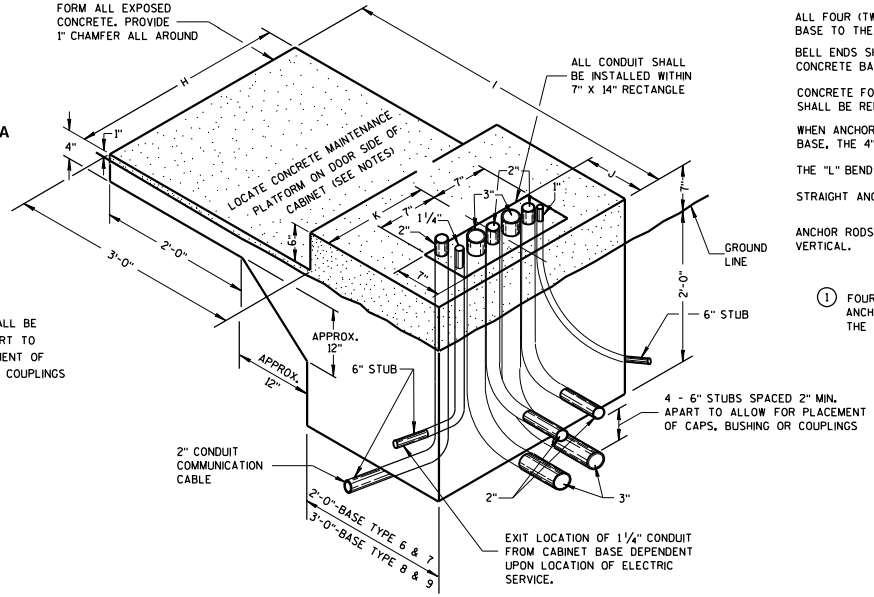
CONDUIT LOCATIONS IN 24" X 36" PULL BOX

(LEADING TO CONTROLLER CABINET BASE TYPE 6, 7, 8 AND 9)



TYPE 10

* ANY ANCHOR ROD PROJECTION SHORTER THAN 2¾" OR LONGER THAN 3¼" SHALL REQUIRE THE BASE TO BE REMOVED AND REPLACED AT THE CONTRACTORS EXPENSE.



TYPE 6,7,8 AND 9

(ISOMETRIC VIEW)

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE CONTRACT.

INSTALL FOUR ½ INCH MINIMUM DIAMETER X 4 INCH MINIMUM LENGTH APPROVED CONCRETE MASONRY ANCHORS WITH A PULLOUT STRENGTH OF 9,000 LBS. TO ANCHOR THE CABINET TO TYPE 6, 7, 8, AND 9 BASES. THE ANCHOR STUDS SHALL BE LOCATED AS DIRECTED BY THE ENGINEER TO PROPERLY ANCHOR THE CONTROL CABINET TO THE BASE.

WHEN REQUIRED TO CONNECT NONMETALLIC CONDUIT TO METALLIC CONDUIT, ONLY ADAPTER FITTINGS, U.L. LISTED FOR ELECTRICAL USE, SHALL BE USED.

CONDUIT HEIGHT ABOVE THE CONCRETE BASE SHALL BE 1 INCH.

DEPTH OF CONDUIT INSTALLED BELOW THE TRAVELED WAY SHALL BE 24 INCHES MINIMUM AND 36 INCHES MAXIMUM.

DEPTH OF CONDUIT INSTALLED THAT IS NOT BELOW THE TRAVELED WAY SHALL BE 18 INCHES MINIMUM AND 36 INCHES MAXIMUM.

ANY EXCEPTION TO THE MAXIMUM DEPTH SHALL BE ONLY WITH THE WRITTEN APPROVAL OF THE ENGINEER.

CONTROL CABINET BASE TOP SURFACES SHALL BE TROWEL FINISHED SMOOTH AND LEVEL.

WHEN A TYPE 10 CONTROL CABINET BASE IS USED TO POST MOUNT A CONTROL CABINET, A 36" SQUARE 4" THICK CONCRETE MAINTENANCE PLATFORM SHALL BE REQUIRED ON THE DOOR SIDE OF THE CABINET. THE TOP 1 INCH SHALL BE ABOVE FINISHED GRADE AND BE BROOM FINISHED AND LEVEL.

MAINTENANCE PLATFORMS ARE NOT REQUIRED WHEN THE SURROUNDING AREA IS PAVED.

MINIMUM BENDING RADIUS OF CONDUIT = 6 X THE DIAMETER.

ALL METALLIC CONDUIT ENDS SHALL BE REAMED AND THREADED.

ALL CONDUIT ENDS AT THE TOP OF CONCRETE BASES SHALL BE CAPPED IF METALLIC OR PLUGGED IF NONMETALLIC IMMEDIATELY AFTER PLACEMENT AND BEFORE CONCRETE IS POURED. CONDUITS IN WHICH WIRE OR CABLE IS NOT BEING INSTALLED SHALL REMAIN CAPPED OR PLUGGED.

ALL FOUR (TWO INCH AND THREE INCH) CONDUIT SHALL BE INSTALLED FROM THE CABINET BASE TO THE FIRST (NEAREST PULL BOX LOCATED AS SHOWN ON THE PLANS.

BELL ENDS SHALL BE INSTALLED ON ALL PVC CONDUIT EXPOSED AT THE TOP OF THE CONCRETE BASE BEFORE INSTALLATION OF CABLE OR WIRE.

CONCRETE FORM DEPTH BELOW FINISHED GRADE SHALL BE 6" MAXIMUM. CONCRETE FORMS SHALL BE REMOVED AFTER CONCRETE HAS SET.

WHEN ANCHOR RODS USING THE ALTERNATE L BEND ARE FURNISHED FOR THE TYPE 10 BASE, THE 4" L BEND SHALL BE IN ADDITION TO THE SPECIFIED ANCHOR ROD BAR LENGTH.

THE "L" BEND SHALL NOT BE THREADED.

STRAIGHT ANCHOR RODS SHALL BE THREADED 12" IN LENGTH ON EACH END OF THE ROD.

ANCHOR RODS SHALL BE INSTALLED WITH MISALIGNMENTS OF LESS THAN 1:40 FROM VERTICAL.

(1) FOUR (4) ANCHOR RODS, 1" DIA. X 3'-6". ANCHOR RODS SHALL BE MANUFACTURED IN ACCORDANCE WITH SECTION 654.2.1 OF THE STANDARD SPECIFICATIONS.

CONCRETE CONTROL CABINET BASES

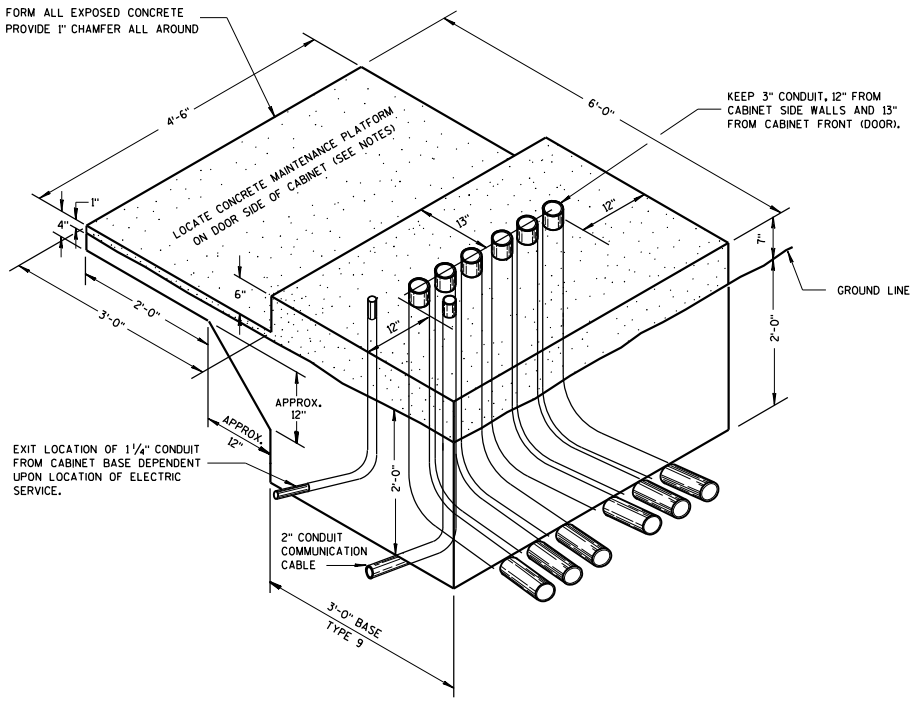
CONCRETE CONTROL CABINET BASES

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
Sept. 2016 — DATE
/S/ Ahmet Demirbilek — STATE ELECTRICAL ENGINEER
FHWA

S.D.D. 9 C 5-10

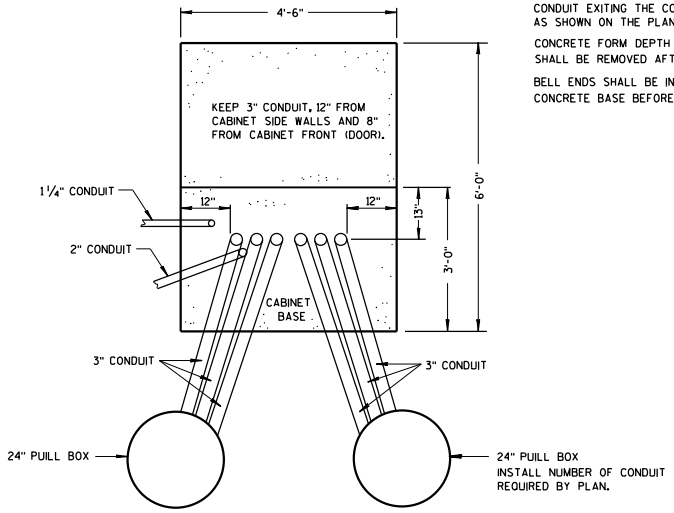
6



ISOMETRIC VIEW

TYPE 9, SPECIAL

(C.Y. CONCRETE = APPROX. 1.56)



PLAN VIEW

CONCRETE CONTROL CABINET BASE, TYPE 9, SPECIAL

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE CONTRACT.

INSTALL FOUR ½ INCH MINIMUM DIAMETER X 4 INCH MINIMUM LENGTH STAINLESS STEEL APPROVED CONCRETE MASONRY ANCHORS WITH A PULLOUT STRENGTH OF 9,000 LBS. TO ANCHOR THE CABINET TO TYPE 6, 7, 8, AND 9 BASES. THE ANCHOR STUDS SHALL BE LOCATED AS DIRECTED BY THE ENGINEER TO PROPERLY ANCHOR THE CONTROL CABINET TO THE BASE.

WHEN REQUIRED TO CONNECT NONMETALLIC CONDUIT TO METALLIC CONDUIT, ONLY ADAPTER FITTINGS, U.L. LISTED FOR ELECTRICAL USE, SHALL BE USED.

CONDUIT HEIGHT ABOVE THE CONCRETE BASE SHALL BE 1 INCH.

DEPTH OF CONDUIT INSTALLED BELOW THE TRAVELED WAY SHALL BE 24 INCHES MINIMUM AND 36 INCHES MAXIMUM.

DEPTH OF CONDUIT INSTALLED THAT IS NOT BELOW THE TRAVELED WAY SHALL BE 18 INCHES MINIMUM AND 36 INCHES MAXIMUM.

ANY EXCEPTION TO THE MAXIMUM DEPTH SHALL BE ONLY WITH THE WRITTEN APPROVAL OF THE ENGINEER.

CONTROL CABINET BASE TOP SURFACE SHALL BE TROWEL FINISHED SMOOTH AND LEVEL.

MAINTENANCE PLATFORM SHALL BE FLOAT OR BROOM FINISHED AND BE LEVEL.

MAINTENANCE PLATFORMS ARE NOT REQUIRED WHEN THE SURROUNDING AREA IS PAVED.

MINIMUM BENDING RADIUS OF CONDUIT = 6 X THE DIAMETER.

ALL METALLIC CONDUIT ENDS SHALL BE REAMED AND THREADED.

CAP ALL BELOW GRADE METALLIC CONDUIT ENDS IN WHICH WIRE OR CABLE IS NOT BEING INSTALLED.

PLUG ALL BELOW GRADE NONMETALLIC CONDUIT ENDS IN WHICH WIRE OR CABLE IS NOT BEING INSTALLED.

ALL CONDUIT ENDS AT THE TOP OF CONCRETE BASES SHALL BE CAPPED IF METALLIC OR PLUGGED IF NONMETALLIC IMMEDIATELY AFTER PLACEMENT AND BEFORE CONCRETE IS POURED. CONDUITS IN WHICH WIRE OR CABLE IS NOT BEING INSTALLED SHALL REMAIN CAPPED OR PLUGGED.

CONDUIT EXITING THE CONCRETE BASE (SIX THREE INCH) SHALL TERMINATE IN PULL BOXES AS SHOWN ON THE PLANS.

CONCRETE FORM DEPTH BELOW FINISHED GRADE SHALL BE 6" MAXIMUM. CONCRETE FORMS SHALL BE REMOVED AFTER CONCRETE HAS SET.

BELL ENDS SHALL BE INSTALLED ON ALL PVC CONDUIT EXPOSED AT THE TOP OF THE CONCRETE BASE BEFORE INSTALLATION OF CABLE OR WIRE.

CONCRETE CONTROL CABINET BASE, TYPE 9, SPECIAL	
STATE OF WISCONSIN DEPARTMENT OF TRANSPORTATION	
APPROVED	
Sept. 2014 (DATE)	/S/ Ahmet Demirbilek (STATE ELECTRICAL ENGINEER)
FHWA	

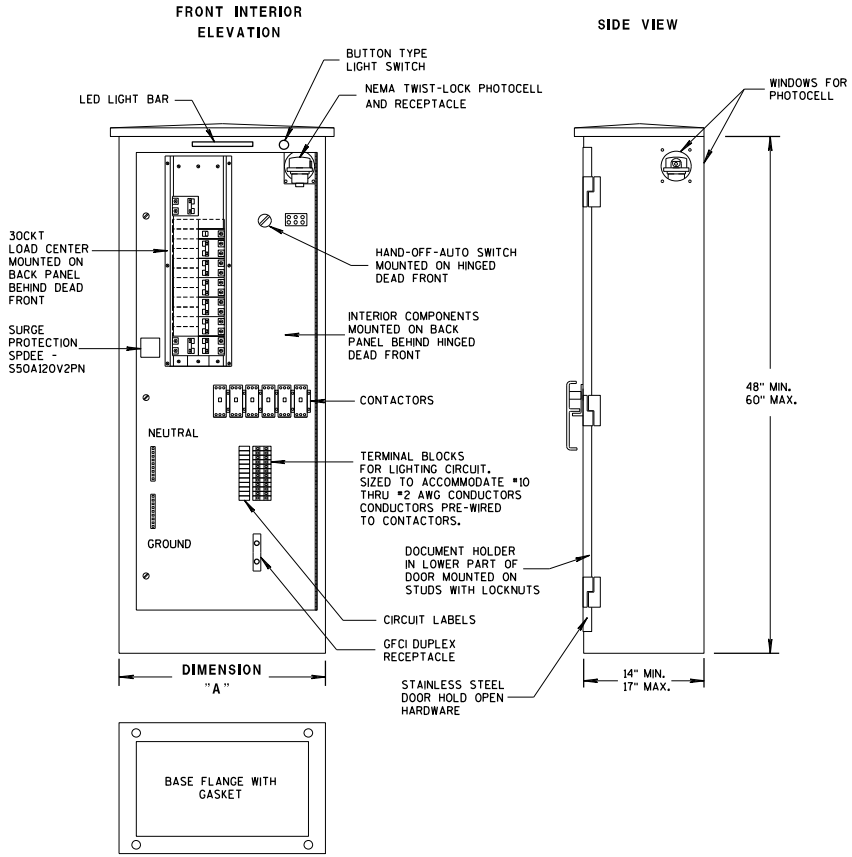
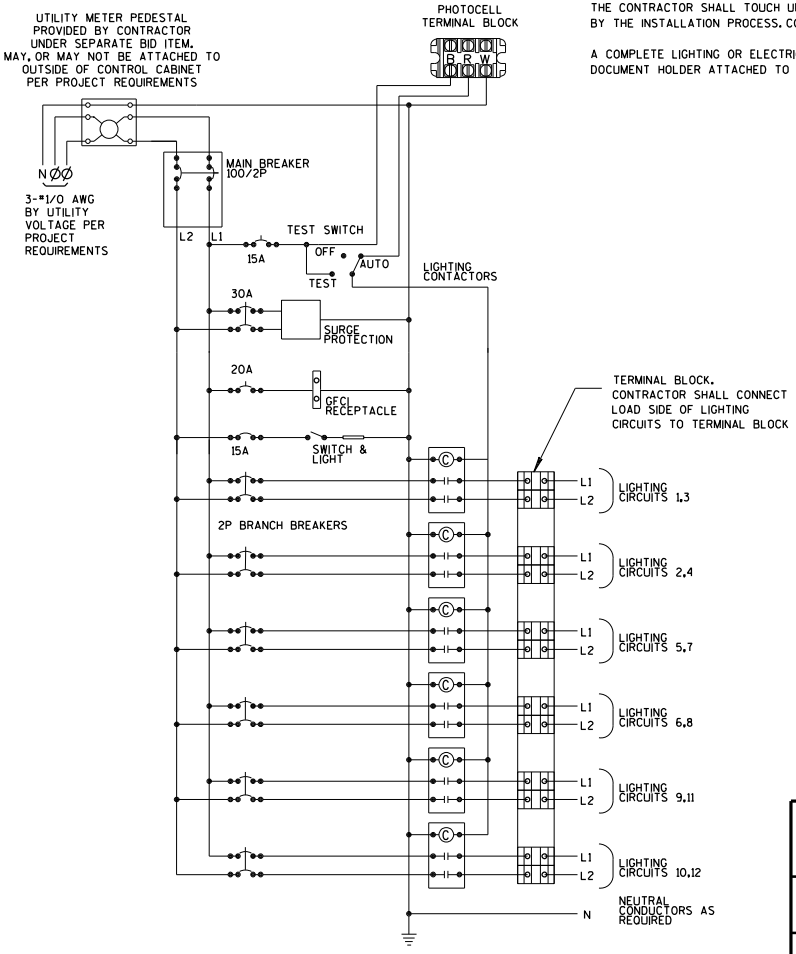


TABLE OF DIMENSIONS (INCHES)

CONCRETE BASE TYPE	CABINET WIDTH	DIMENSION "A"
L24	24"	24"
L30	30"	30"

LIGHTING CONTROL CABINET



CONTROL CABINET SCHEMATIC

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND APPLICABLE SPECIAL PROVISIONS.

ALL INTERNAL ELECTRICAL COMPONENTS WILL BE PRE-WIRED BY THE CABINET FABRICATOR.

ALL CONDUIT ENTRIES SHALL BE SEALED WITH AN APPROPRIATE DUCT SEALING COMPOUND.

ORIENT PHOTOCELL AWAY FROM AMBIENT LIGHT SOURCES AND ONCOMING TRAFFIC HEADLIGHTS.

THE CONTRACTOR SHALL TOUCH UP ANY DAMAGE TO THE ANODIZED FINISH CAUSED BY THE INSTALLATION PROCESS. COLOR MATCH PAINT SHALL BE USED.

A COMPLETE LIGHTING OR ELECTRICAL PLAN SHALL BE SECURELY PLACED IN THE DOCUMENT HOLDER ATTACHED TO THE DOOR.

LIGHTING CONTROL CABINET
120/240 VOLT

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
Sept. 2014 — DATE
/S/ Thomas Gonring — STATE LIGHTING ENGINEER FOR HWYS.
FHWA

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S.D. 9 D 4-2

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE CONTRACT.

FOUR (4) BOLTS SHALL BE FURNISHED WITH EACH TRANSFORMER BASE. BOLTS SHALL BE 1" DIAMETER, 4" IN LENGTH, WITH WASHERS, LOCK WASHERS AND NUTS. BOLTS, NUTS AND WASHERS SHALL BE MANUFACTURED IN ACCORDANCE WITH SECTION 641.2.2 OF THE STANDARD SPECIFICATIONS.

LEVELING SHIMS, IF NEEDED, SHALL BE DESIGNED FOR THE PURPOSE AND USED UNDER CAST BASES WHEN PLUMBING POLES OR STANDARDS DURING INSTALLATION. THE USE OF WASHERS IN LIEU OF PROPER LEVELING SHIMS IS NOT ACCEPTABLE.

SHIM LENGTH SHALL BE LONG ENOUGH TO COMPLETELY COVER THE AREA UNDER THE LENGTH AND WIDTH OF THE BASE MOUNTING FLANGE.

DOUBLE NUTTING IS NOT ACCEPTABLE FOR LEVELING OR MOUNTING PURPOSES.

A NEMA APPROVED, U.L. LISTED, COPPER WITH BRASS OR STAINLESS STEEL SET SCREW, DIRECT BURY RATED, MECHANICAL CONNECTOR (LUG), SIZED TO ACCEPT AWG. #10 TO #4 COPPER STRANDED WIRE SHALL BE FURNISHED AND INSTALLED IN THE PEDESTAL AND TRANSFORMER BASES.

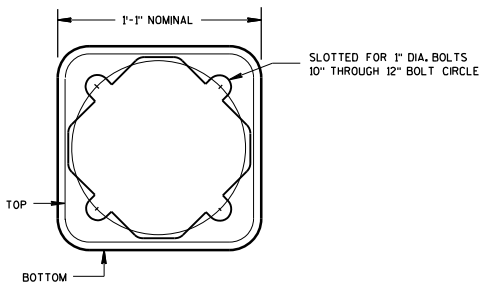
THE MECHANICAL CONNECTOR SHALL BE INSTALLED USING A 1/4" - 20 (TPI) STAINLESS STEEL HEX HEAD BOLT OF SUFFICIENT LENGTH TO FIRMLY ATTACH THE LUG TO THE BASE.

SHOULD THE MANNER OF ATTACHMENT OF THE LUG REQUIRE WASHERS, HEX NUTS, LOCK WASHER - THEY SHALL BE STAINLESS STEEL AS IS THE BOLT. THE MANNER OF ATTACHMENT SHALL NOT BLOCK ACCESSIBILITY TO WIRE PLACEMENT IN THE CONNECTOR.

PEDESTAL BASE COLLAR THREADING SHALL BE TAPERED AND IN ACCORDANCE WITH NATIONAL PIPE THREADING DIMENSIONS.

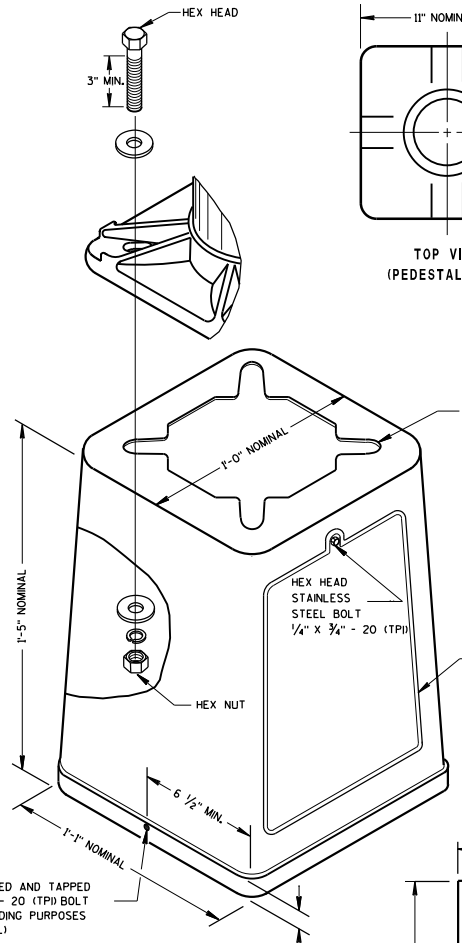
BASE COLLAR THREADING SHALL EXTEND INTO THE BASE COLLAR WITH SUFFICIENT DEPTH TO ACCEPT THE INSTALLATION OF TRAFFIC SIGNAL STANDARDS TO A DEPTH OF 1½", THEN TIGHTENING TO A POINT OF BEING IMMOVABLE.

THE ACCESS DOOR SHALL BE OF THE SAME MATERIAL AS THE BASE.

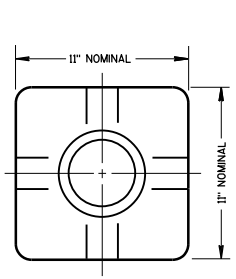


BOTTOM VIEW
(TRANSFORMER BASE)

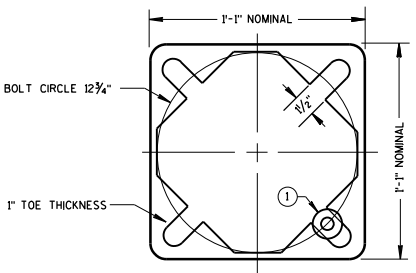
TYPICAL MECHANICAL
CONNECTOR LUG
TO BE FURNISHED WITH EACH BASE



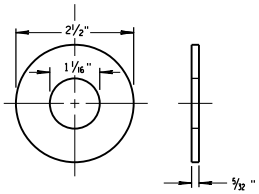
ISOMETRIC VIEW



TOP VIEW
(PEDESTAL BASE)

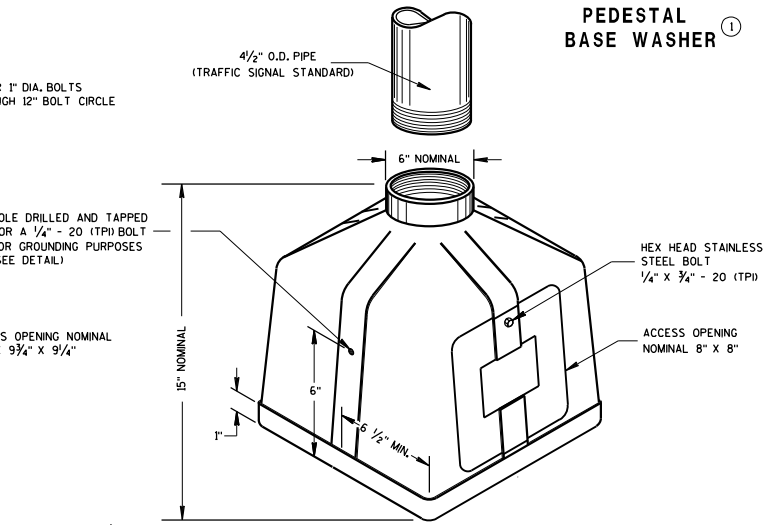


BOTTOM VIEW
(PEDESTAL BASE)

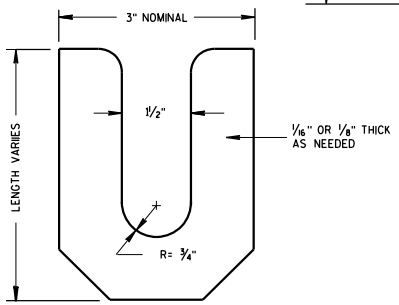


ZINC COATED STEEL WASHER
TO BE PROVIDED BY THE CONTRACTOR

PEDESTAL
BASE WASHER (1)



ISOMETRIC VIEW
PEDESTAL BASE



LEVELING SHIM

TRANSFORMER BASE

INTENDED FOR USE WITH TYPE 2, 3, 4, 5 & 6 POLES

TRANSFORMER/PEDESTAL BASES	
STATE OF WISCONSIN DEPARTMENT OF TRANSPORTATION	
APPROVED Sept. 2014 DATE FHWA	/S/ Ahmet Demirbilek STATE ELECTRICAL ENGINEER

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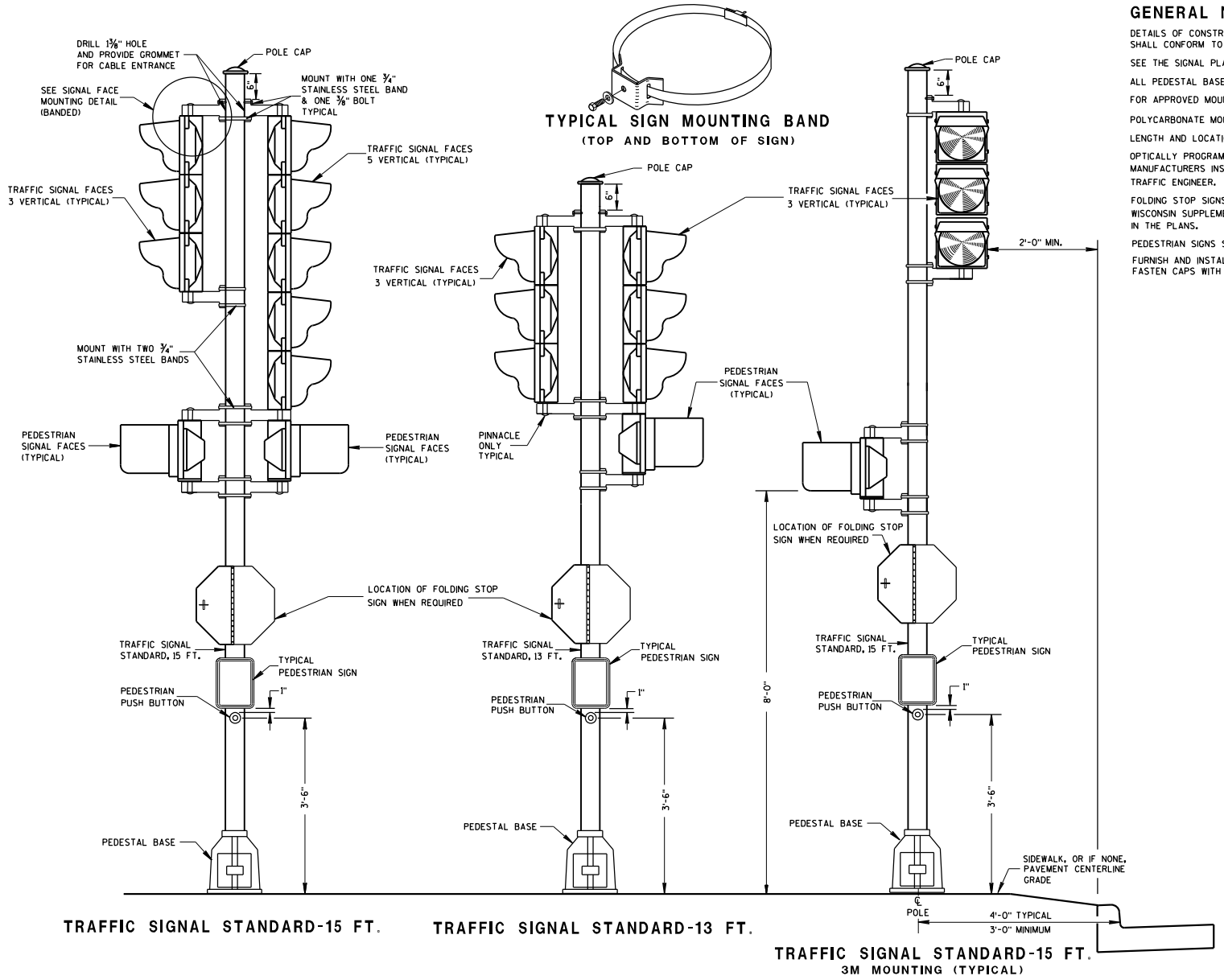
S.D. 9 C 3-4

9E6: Traffic Signal Standard Poly Bracket Mountings (Typical) 13 ft. or 15 ft.



GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE CONTRACT.

SEE THE SIGNAL PLAN FOR REQUIRED SIGNAL FACE SIZES.

ALL PEDESTAL BASES SHALL BE MOUNTED ON CONCRETE BASE - TYPE 1.

FOR APPROVED MOUNTING HARDWARE, SEE THE CONTRACT SPECIAL PROVISIONS.

POLYCARBONATE MOUNTING BRACKETS SHALL BE USED.

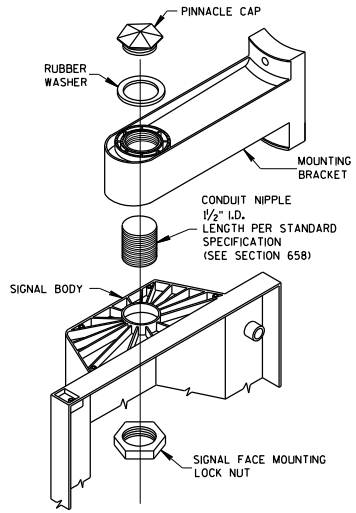
LENGTH AND LOCATION OF TRAFFIC SIGNAL STANDARDS SHALL BE AS SHOWN ON THE PLANS.

OPTICALLY PROGRAMMED SIGNAL FACES SHALL BE MASKED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS, AND UNDER THE DIRECTIONS OF THE REGION TRAFFIC ENGINEER.

FOLDING STOP SIGNS SHALL BE IN ACCORDANCE WITH THE MUTCD AND/OR THE LATEST WISCONSIN SUPPLEMENT. THE SIGNS SHALL BE SIZED AND LOCATED AS CALLED FOR IN IN THE PLANS.

PEDESTRIAN SIGNS SHALL BE AS DESIGNATED IN THE PLANS.

FURNISH AND INSTALL VENTILATED, CAST, METALLIC (ALUMINUM ALLOY) CAPS. FASTEN CAPS WITH ONE (1) ¼" X ¾" - 20 TPI STAINLESS STEEL, HEX HEAD BOLT.



SIGNAL FACE MOUNTING DETAIL
(BANDED)

TRAFFIC SIGNAL STANDARD POLY BRACKET MOUNTINGS (TYPICAL) 13 FT. OR 15 FT.

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
2/28/2013 — DATE
/S/ Ahmet Demirbilek — STATE ELECTRICAL ENGINEER
FHWA

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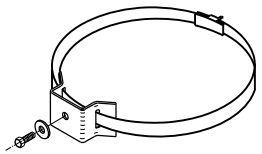
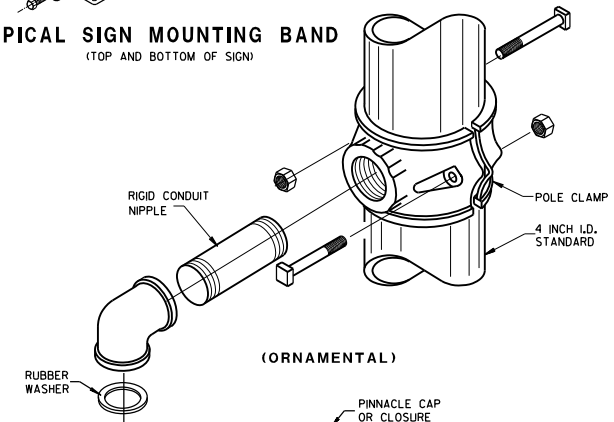
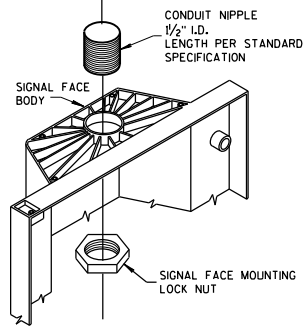
STANDARD DETAIL DRAWING 43

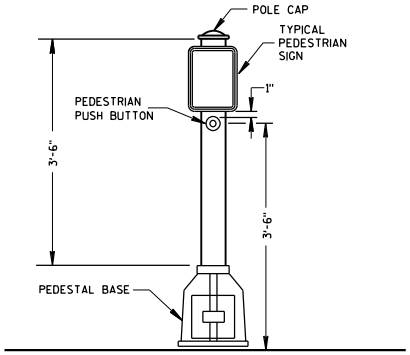


TYPICAL SIGN MOUNTING BAND
(TOP AND BOTTOM OF SIGN)





SIGNAL FACE MOUNTING DETAILS



PEDESTRIAN PUSH BUTTON TYPICAL MOUNTING

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE CONTRACT.

SEE THE SIGNAL PLAN FOR REQUIRED SIGNAL FACE SIZES.

LOCATIONS SHALL BE AS SHOWN ON THE PLANS.

ALL PEDESTAL BASES SHALL BE MOUNTED ON CONCRETE BASE - TYPE 1.

FOR APPROVED MOUNTING HARDWARE, SEE THE CONTRACT SPECIFICATIONS.

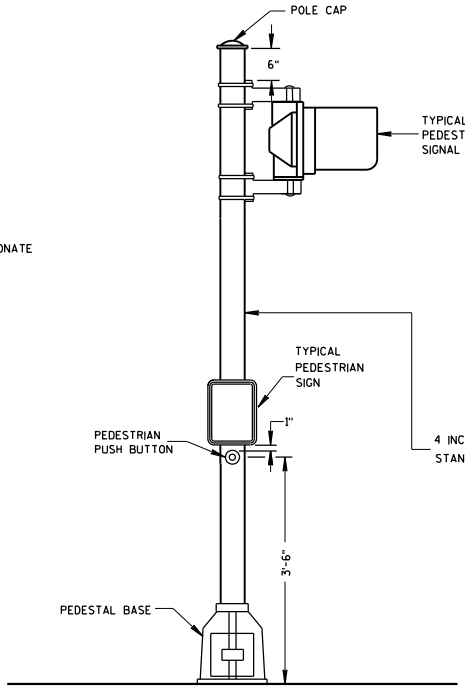
POLYCARBONATE SIGNAL FACE MOUNTING BRACKETS SHALL BE USED UNLESS ORNAMENTAL POLE CLAMPS ARE SPECIFIED.

LENGTH OF TRAFFIC STANDARDS SHALL BE AS SHOWN ON THE PLANS.

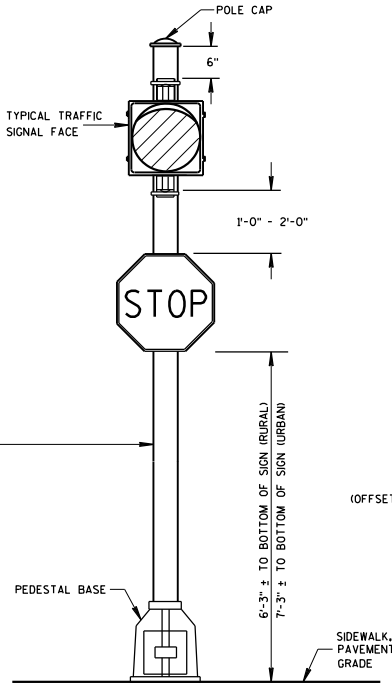
MOUNTINGS AND BRACKETS SHALL BE AS SHOWN ON THE PLANS OR DESCRIBED IN THE SPECIAL PROVISIONS (BY THE DISTRICT TRAFFIC ENGINEER).

PEDESTRIAN SIGNS SHALL BE AS DESIGNATED IN THE PLANS.

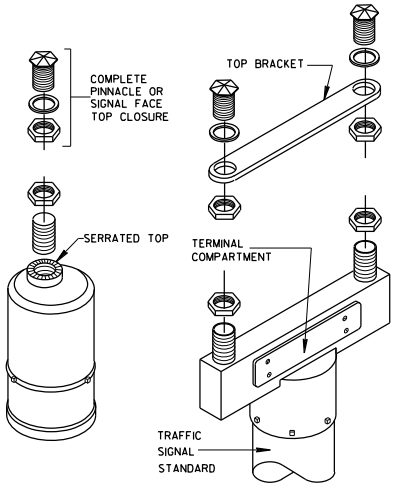
FURNISH AND INSTALL VENTILATED, CAST, METALLIC (ALUMINUM ALLOY) CAPS. FASTEN CAPS WITH ONE (1) 1/4" X 3/4" - 20 TPI STAINLESS STEEL, HEX HEAD BOLT.



PEDESTRIAN FACE STANDARD-10 FT.
(WALK-DON'T WALK)



STANDARD FLASHER.
10 FOOT, 13 FOOT OR 15 FOOT AS REQUIRED



SINGLE
(OFFSET-SERRATED MOUNTING)

DOUBLE
(SERRATED MOUNTING)

SLIPFITTERS

TRAFFIC SIGNAL STANDARD PEDESTRIAN AND FLASHER TYPICAL MOUNTING DETAILS

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
5/11/10 DATE
/S/ John Corbin
STATE ELECTRICAL ENGINEER FOR HWYS
FHWA

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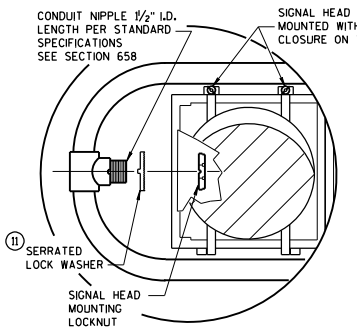
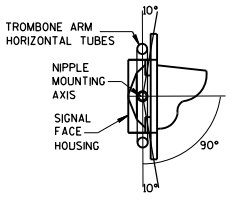
S.D.D. 9 E 7-5



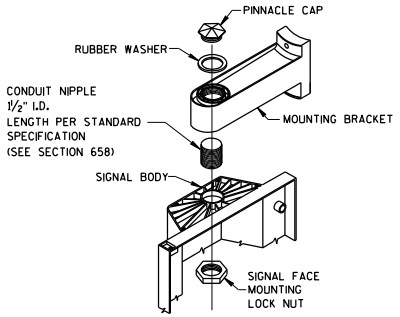
HORIZONTAL SIGNAL HEAD MOUNTING DETAIL *

* SIGNAL HEAD ATTACHMENT ALSO APPLYS TO MOUNTING AT CROSS BAR



SECTION A-A

(10 DEGREES TILT REQUIREMENT OF FACE(S) IN THE TROMBONE MOUNTING)



SIGNAL FACE MOUNTING DETAIL

(BANDED)

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE CONTRACT.

POLES SHALL BE EITHER ALUMINUM OR GALVANIZED STEEL AS CALLED FOR IN THE CONTRACT.

SECTION 657, POLES, OF THE STANDARD SPECIFICATIONS SHALL APPLY TO THIS DRAWING.

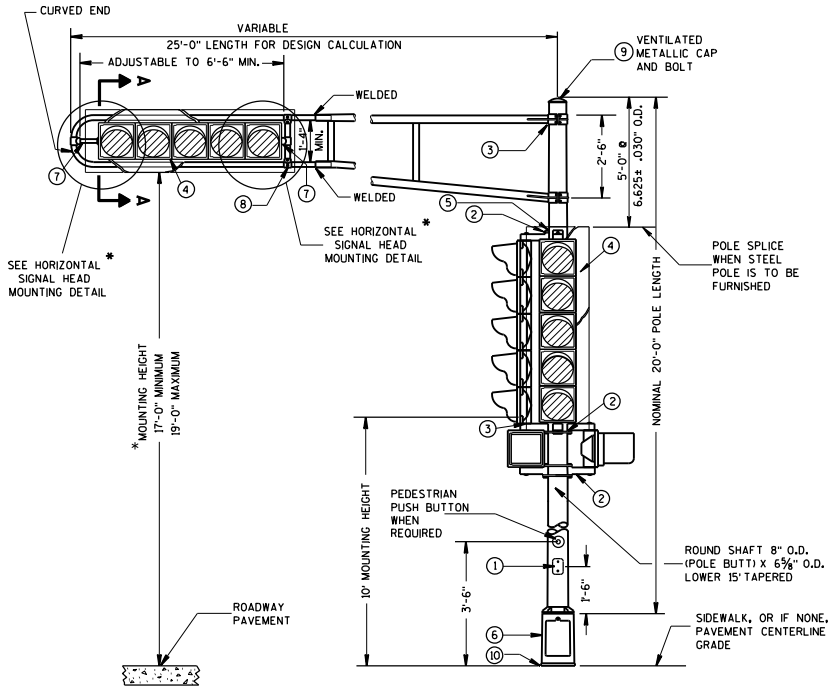
A PULL WIRE/ROPE IN ACCORDANCE WITH STANDARD SPECIFICATION 652 SHALL BE INSTALLED IN EACH TROMBONE ARM RACEWAY DURING THE MANUFACTURING PROCESS.

TYPE 2 ALUMINUM POLES SHALL BE CONSTRUCTED OF 6063-T6 ALUMINUM ALLOY. SLEEVING INSIDE THE POLE IS NOT ACCEPTABLE.

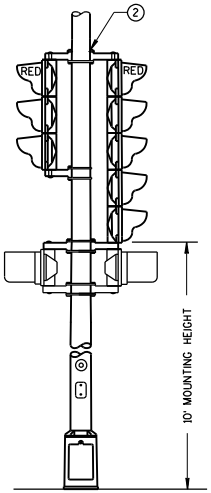
WHEN TRANSFORMER BASES ARE USED, WIRE CONNECTIONS SHALL BE MADE IN THE TRANSFORMER BASE.

1. 4" X 6" REINFORCED HANDHOLE & COVER ASSEMBLY WITH 2 (TWO) ¼" X ¾" - 20 TPI HEX HEAD STAINLESS STEEL BOLTS.
2. SIGNAL FACE MOUNTING BRACKETS. MOUNT WITH CAP SCREWS AND BANDING. (SEE STANDARD SPECIFICATIONS - SEC. 658)
3. GROMMETS, 1" CHASE NIPPLES OR 1" CLOSE CONDUIT NIPPLES WITH BUSHINGS SHALL BE PROVIDED FOR 1⅜" HOLE IN POLE SHAFT FOR WIRING.
4. SECURELY MOUNT DULL BLACK POLYCARBONATE BACKPLATES, PROJECTING 5" BEYOND ALL SIDES OF THE SIGNAL FACE HOUSING, PER MANUFACTURER'S RECOMMENDATIONS.
5. POLE MOUNTED SIGNAL FACES SHALL REQUIRE 1 OR MORE MOUNTING SPACERS UNDER THE TOP MOUNTING BRACKET(S) AS REQUIRED, TO PLUMB THE SIGNAL FACES.
6. CAST ALUMINUM TRANSFORMER BASE, WHEN REQUIRED.
7. MOUNTING BRACKET NIPPLES FOR THE SIGNAL FACE(S) SHALL BE 2 INCHES IN LENGTH AND 1½ INCHES IN DIAMETER. (SEE STANDARD SPECIFICATION - SECTION 658).
8. VERTICAL STRUT (ADJUSTABLE). ONE (1) SET SCREW (¼" X ¾" LONG- 20 TPI, STAINLESS STEEL, HEX HEAD) INTO EACH ARM MEMBER IF STRUT IS THE SLIDING TYPE.
9. FURNISH AND INSTALL VENTILATED, CAST, METALLIC (ALUMINUM ALLOY) CAPS. FASTEN CAPS WITH ONE (1) ¼" X ¾" - 20 TPI STAINLESS STEEL, HEX HEAD BOLT.
10. SHIMMING, IF NEEDED, SHALL BE LOCATED BETWEEN THE CONCRETE FOUNDATION AND THE TRANSFORMER BASE.
11. USE SERRATED LOCK WASHERS WITH NOTCHES BETWEEN END TEE AND SIGNAL HEAD.

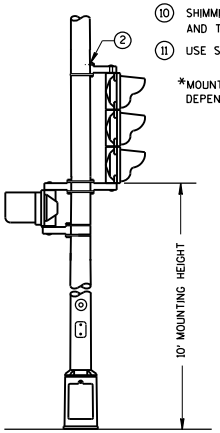
*MOUNTING HEIGHT LIMITATION DIMENSIONS OF THE TROMBONE MAST ARM WILL BE DEPENDENT UPON THE USE/NON-USE OF A TRANSFORMER BASE.



(MAXIMUM LOAD)



TYPICAL MOUNTING OF BACK TO BACK 3 AND 5 SECTION SIGNAL FACES

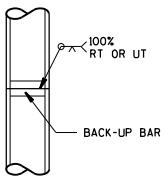


TYPICAL MOUNTING OF 3 SECTION SIGNAL FACE

TYPE 2 POLE MOUNTING CONFIGURATION

FOR MANUFACTURERS USE ONLY

WELD TO BE 100% R.T. OR U.T. TESTED AS PER THE REQUIREMENTS OF AWS D 1.5-88. RECORDS OF COMPLIANCE OF SUCH TESTING SHALL BE FURNISHED TO THE OFFICE OF DESIGN/BRIDGE FOR VERIFICATION AND APPROVAL.



POLE SPLICE DETAIL

POLE MOUNTINGS FOR TRAFFIC SIGNALS TYPE 2

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

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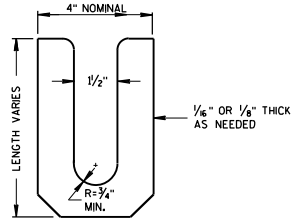
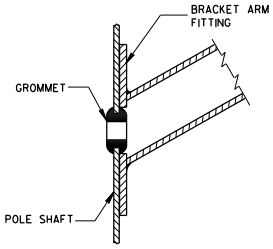
S.D. 9 E 1-14a

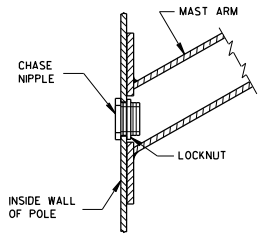
STANDARD DETAIL DRAWING 45



LEVELING SHIM (13)
SHALL BE ALUMINUM



TYPICAL APPLICATION OF GROMMET IN POLE SHAFT



TYPICAL APPLICATION OF CHASE NIPPLE IN POLE SHAFT

GENERAL NOTES

CLAMP BOLT-NUT TIGHTENING TORQUE SHALL BE INDICATED BY INDENT STAMPING (1/2 INCH NUMERALS AND LETTERS) OR WEATHERPROOF PRINTING ON THE INSIDE OF THE CLAMP THAT IS WELDED TO THE ARM MEMBER.

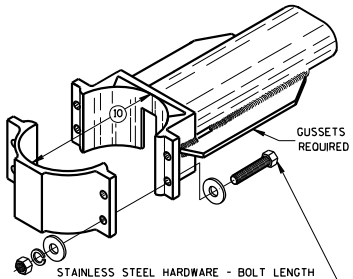
(10) 4.5" I.D. FOR LUMINAIRE MAST ARM CLAMP.
6.625" I.D. FOR TROMBONE MAST ARM CLAMP.

(11) INDIVIDUAL BASE PLATE ANCHOR ROD COVERS. (4 REQUIRED)

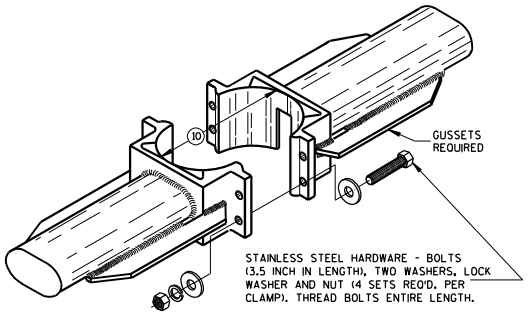
(12) BASE PLATE SLOTTED TO ACCEPT 11" THROUGH 12" BOLT CIRCLE USING 1" DIAMETER ANCHOR RODS.

(13) LEVELING SHIMS, DESIGNED FOR THE PURPOSE, SHALL BE USED WHEN PLUMBING POLES. THE USE OF WASHERS IN LIEU OF PROPER LEVELING SHIMS IS NOT ACCEPTABLE. LEVELING SHIMS SHALL BE USED ONLY BETWEEN THE TOP OF THE CONCRETE BASE AND A METALLIC BASE PLATE.

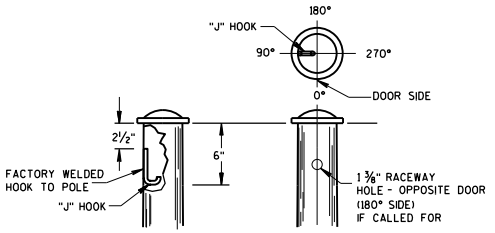
SHIMS SHALL BE LONG ENOUGH AND WIDE ENOUGH TO COMPLETELY COVER THE AREA UNDER THE LENGTH AND WIDTH OF THE BASE MOUNTING FLANGE.



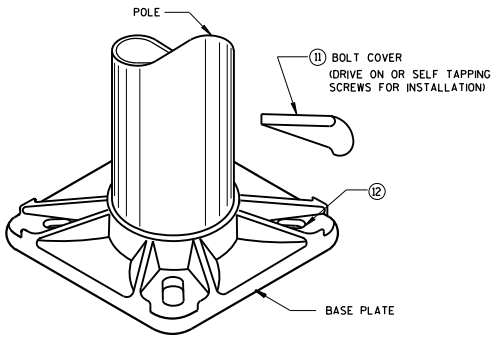
TYPICAL TROMBONE MAST ARM AND SINGLE LUMINAIRE MAST ARM MOUNTING CLAMP



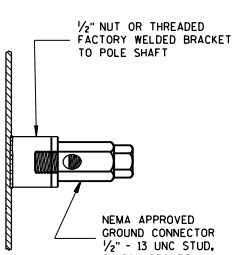
TYPICAL LUMINAIRE MAST ARM (DOUBLE) MOUNTING BRACKETS

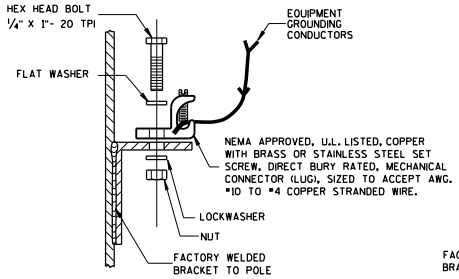


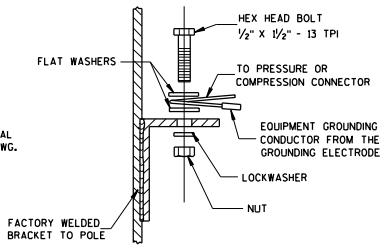
TYPICAL "J" HOOK LOCATION



BASE PLATE







TYPICAL GROUNDING CONNECTIONS
NUT, BOLT AND WASHERS SHALL BE STAINLESS STEEL

HARDWARE DETAILS FOR POLE MOUNTINGS

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
Feb. 2015 — DATE
/S/ Ahmet Demirbilek — STATE ELECTRICAL ENGINEER
FHWA

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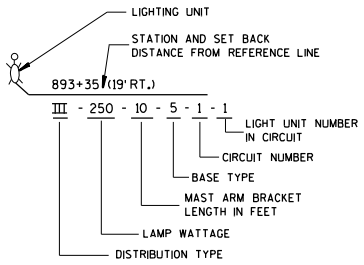
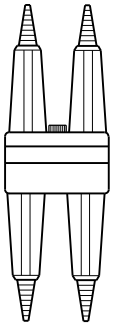
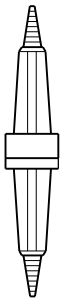
S.D. 9 E 1-14g



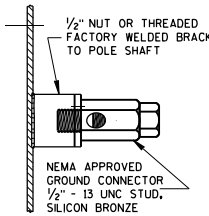
LIGHTING UNIT CODE
(TYPICAL)

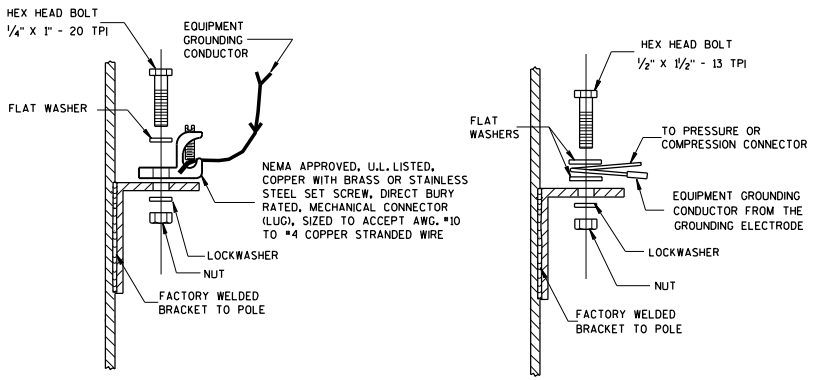


DETAIL "A"
BREAKAWAY DOUBLE POLE WITH WATERPROOF INSULATING BOOT



DETAIL "B"
BREAKAWAY SINGLE POLE WITH WATERPROOF INSULATING BOOT





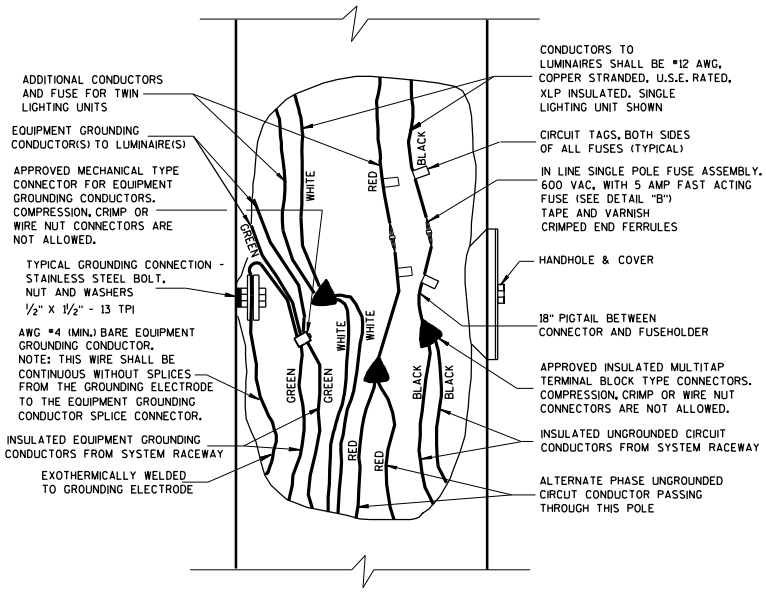
TYPICAL GROUNDING CONNECTIONS
NUT, BOLT, WASHERS AND LOCKWASHERS SHALL BE STAINLESS STEEL

GENERAL NOTES

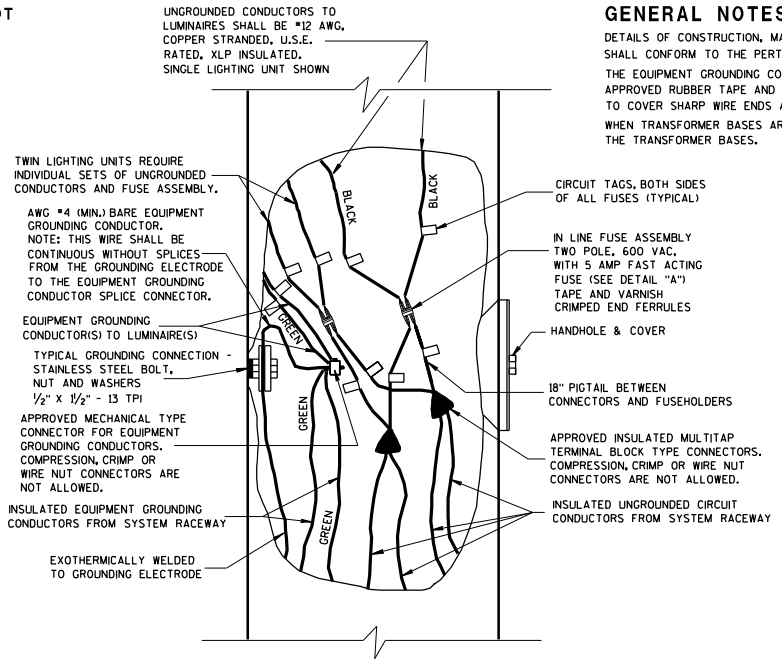
DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE CONTRACT.

THE EQUIPMENT GROUNDING CONNECTOR SHALL BE TAPED WITH 3 WRAPS (MINIMUM) OF APPROVED RUBBER TAPE AND THEN 3 WRAPS (MINIMUM) OF APPROVED VINYL TAPE TO COVER SHARP WIRE ENDS AFTER THE CONNECTION IS COMPLETED.

WHEN TRANSFORMER BASES ARE USED, ALL WIRING CONNECTIONS SHALL OCCUR WITHIN THE TRANSFORMER BASES.



3 WIRE - 120, 240 OR 480 VAC (UNGROUNDED CONDUCTOR) WITH GROUNDED CONDUCTOR AND WITH EQUIPMENT GROUNDING CONDUCTOR



2 WIRE - 240 OR 480 VAC (UNGROUNDED CONDUCTORS) WITH EQUIPMENT GROUNDING CONDUCTOR

NON-FREEWAY LIGHTING UNIT POLE WIRING

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
Sept. 2014 — DATE
/S/ Ahmet Demirbilek — STATE ELECTRICAL ENGINEER
FHWA

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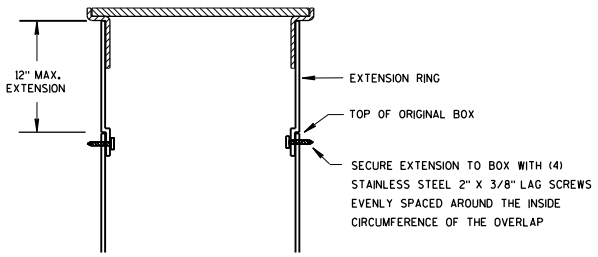
S.D. 9 E 3-5

TABLE OF NOMINAL DIMENSIONS AND WEIGHTS

DIMENSION IN INCHES		NON-CONDUCTIVE PULL BOX	
BOX DIAMETER ** (INSIDE)	A	24	24
BOX OVERALL OUTSIDE DIAMETER	B	27	27
BOX LENGTH	C	36	42
FRAME OPENING	D	22 1/2	22 1/2
WEIGHT IN POUNDS *			
COVER		50	50
BOX ONLY		75	85

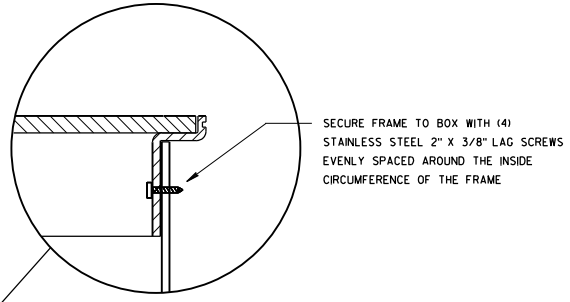
* THE ACTUAL WEIGHT OF THE COVER OR BOX ONLY MAY VARY NOT TO EXCEED 100 LBS INDIVIDUALLY.

** DIAMETER VARIES FROM TOP TO BOTTOM WITH THE DIAMETER LARGER AT THE BOTTOM TO PREVENT FROST HEAVE

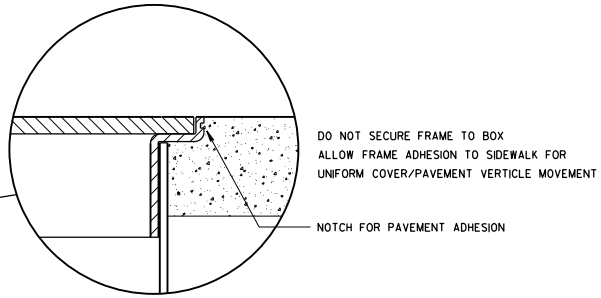


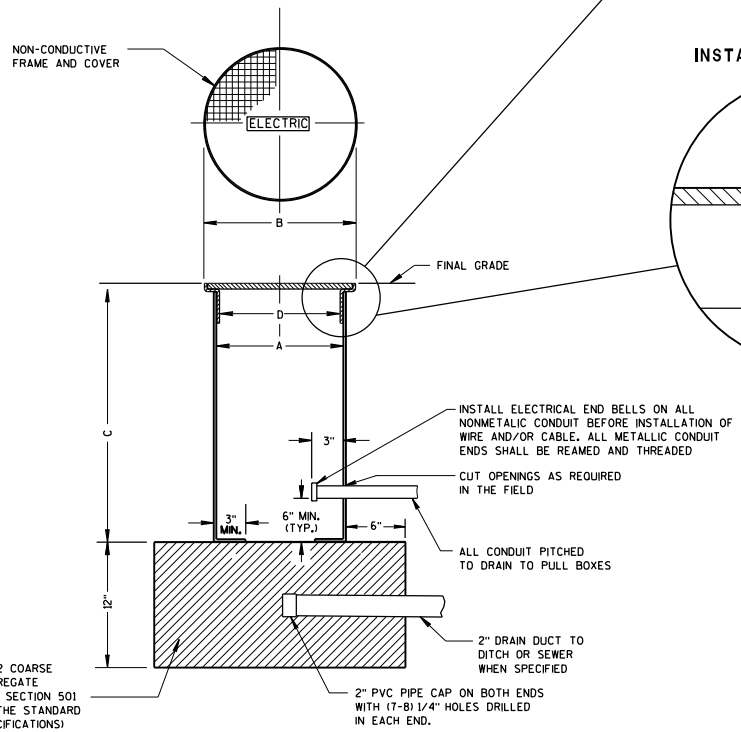
BOX EXTENSION

INSTALLED IN SOD OR CRUSHED AGGREGATE



INSTALLED IN SIDEWALK





NON-CONDUCTIVE PULL BOX

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE CONTRACT.

ALL BOXES, FRAMES AND COVERS SHALL BE SUITABLE FOR TIER 15 LOADING AS SPECIFIED IN ANSI/SCTE 77.

PROVIDE AN OPENING FOR TOOL ASSISTED COVER REMOVAL NOT LARGE ENOUGH TO PERMIT PASSAGE OF A SPHERE MORE THAN 1/2" DIAMETER

ENSURE COVER SURFACE IS SKID RESISTANT WITH A COEFFICIENT OF FRICTION OF AT LEAST 0.5 AND VERTICAL SURFACE DICONTINUITIES LESS THAN 1/4".

COVER SHALL BE MAGNETICALLY LOCATABLE.

BOXES AND EXTENSIONS ARE TRIMMABLE FOR CUSTOM LENGTHS. TRIMMED PIECES SHALL MAINTAIN A UNIFORM LENGTH.

ENTRANCE HOLES INTO PULL BOXES SHALL BE CUT WITH A CIRCULAR HOLE SAW OR HYDRAULIC CONDUIT PUNCH. HOLE SIZE SHALL BE THE OUTSIDE DIAMETER OF THE CONDUIT THAT IS TO FIT IN THE OPENING PLUS NO MORE THAN 1/4".

THE CONTRACTOR SHALL NOT INSTALL WIRE IN ANY PULL BOX UNTIL ITS INSTALLATION HAS BEEN INSPECTED AND ACCEPTED BY THE ENGINEER.

ALL METALLIC CONDUIT IN WHICH WIRE AND/OR CABLE IS TO BE INSTALLED, SHALL BE BUSHED BEFORE INSTALLATION OF THE WIRE AND/OR CABLE.

ENTIRE BOX MUST BE CONSTRUCTED OF NON-CONDUCTIVE MATERIALS WITH THE EXCEPTION OF STAINLESS STEEL FASTENERS AND MAGNETIC LOCATABLE DEVICE.

WHEN A PULL BOX IS INSTALLED IN CRUSHED AGGREGATE SHOULDERS, PLACE IT 2-3 INCHES BELOW GRADE AND COVER IT WITH 2-3 INCHES OF CRUSHED AGGREGATE

LABEL ON COVER SHALL READ "ELECTRIC" FOR SIGNAL AND LIGHTING SYSTEMS, "WISDOT ITS" FOR COMMUNICATIONS AND ITS EQUIPMENT SYSTEMS.

PULL BOX
NON-CONDUCTIVE

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
May 2017
DATE

/S/ Ahmet Demirbilek
STATE ELECTRICAL ENGINEER

FHWA

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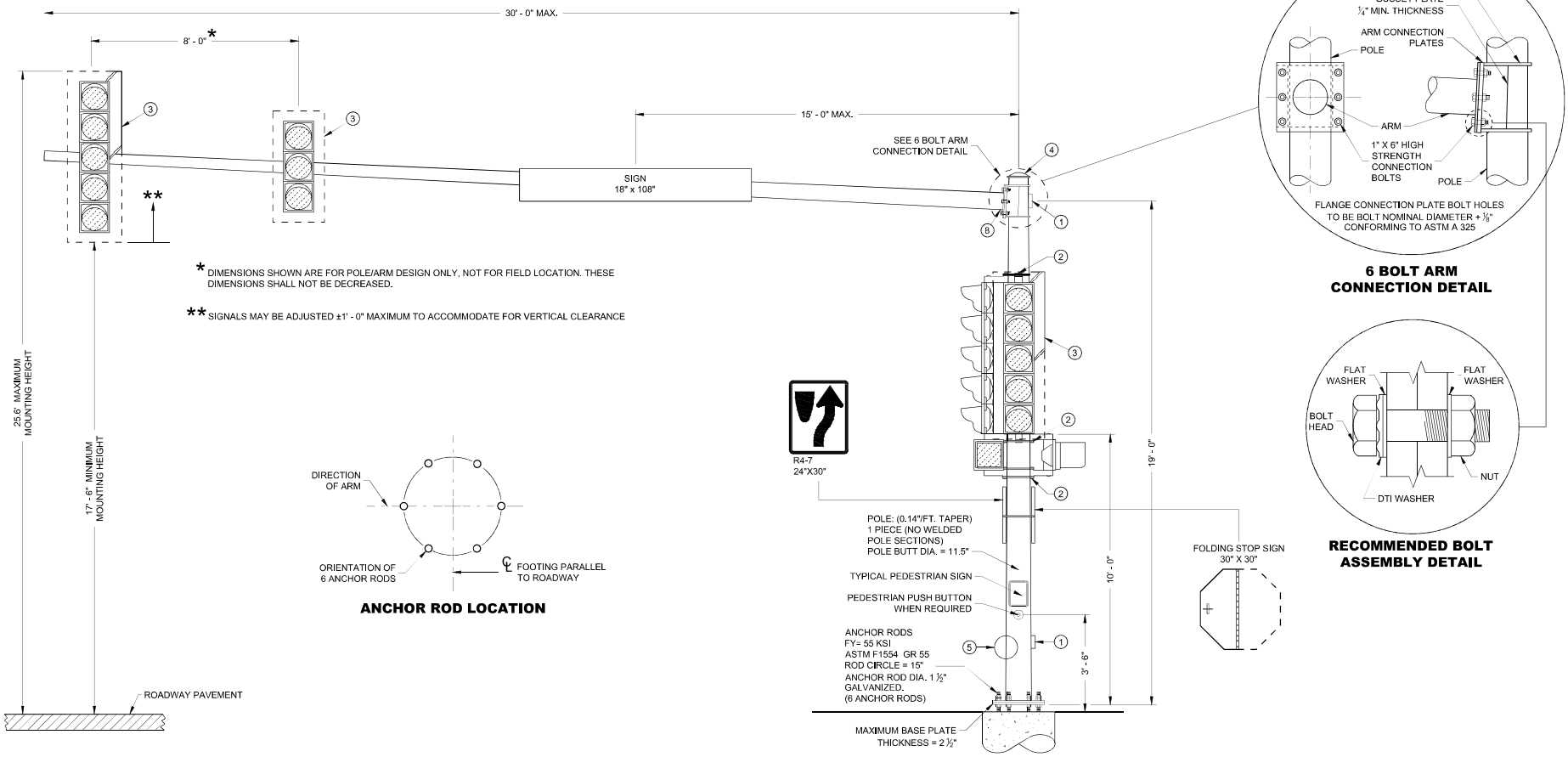
S.D.D. 9 B 16-1

SDD 09E08-a Type 9 Pole, 15' - 30' Monotube Arm



TYPE 9 POLE
15' - 30' MONOTUBE ARM
(MAXIMUM LOAD)

TYPE 9 POLE 15' - 30' MONOTUBE ARM	
STATE OF WISCONSIN DEPARTMENT OF TRANSPORTATION	
APPROVED August 2020 DATE	/S/ Ahmet Demirbilek STATE ELECTRICAL ENGINEER
FHWA	

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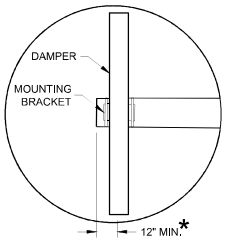
SDD 09E08 - 09a

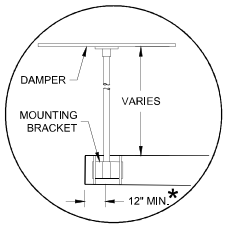
SDD 09E08 - 09a

STANDARD DETAIL DRAWING 49A

SDD 09E08-b Type 9 Special Pole, 35' Monotube Arm

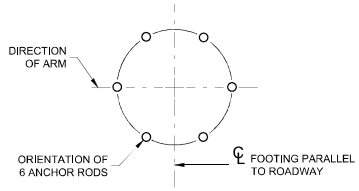


DUMBBELL VIBRATION DAMPER

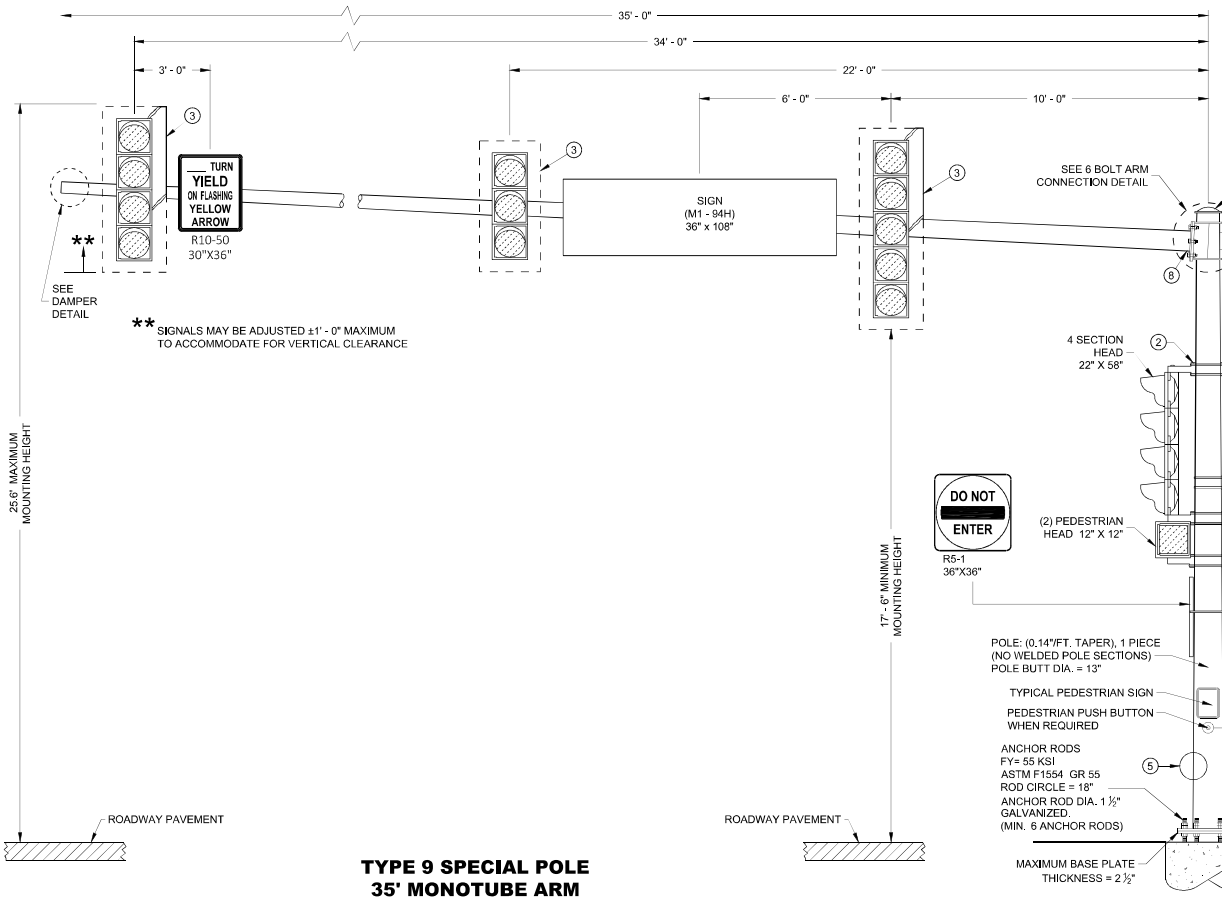


FLAT VIBRATION DAMPER

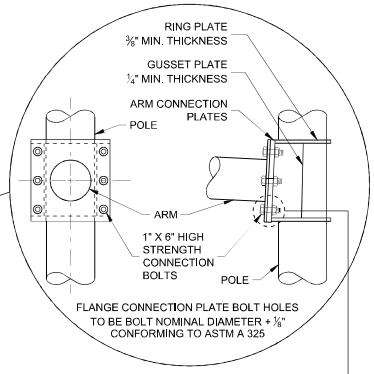
* MOUNT AS CLOSE TO END OF MAST ARM FOR MAXIMUM DAMPING PER MANUFACTURER'S RECOMMENDATIONS.



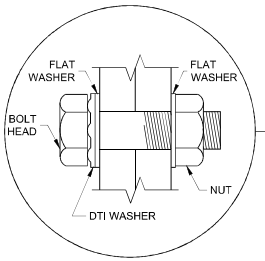
ANCHOR ROD LOCATION



TYPE 9 SPECIAL POLE
35' MONOTUBE ARM
(MAXIMUM LOAD)



6 BOLT ARM CONNECTION DETAIL



RECOMMENDED BOLT ASSEMBLY DETAIL

TYPE 9 SPECIAL POLE
35' MONOTUBE ARM

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
August 2020 — DATE
/S/ Ahmet Demirbilek — STATE ELECTRICAL ENGINEER

FHWA

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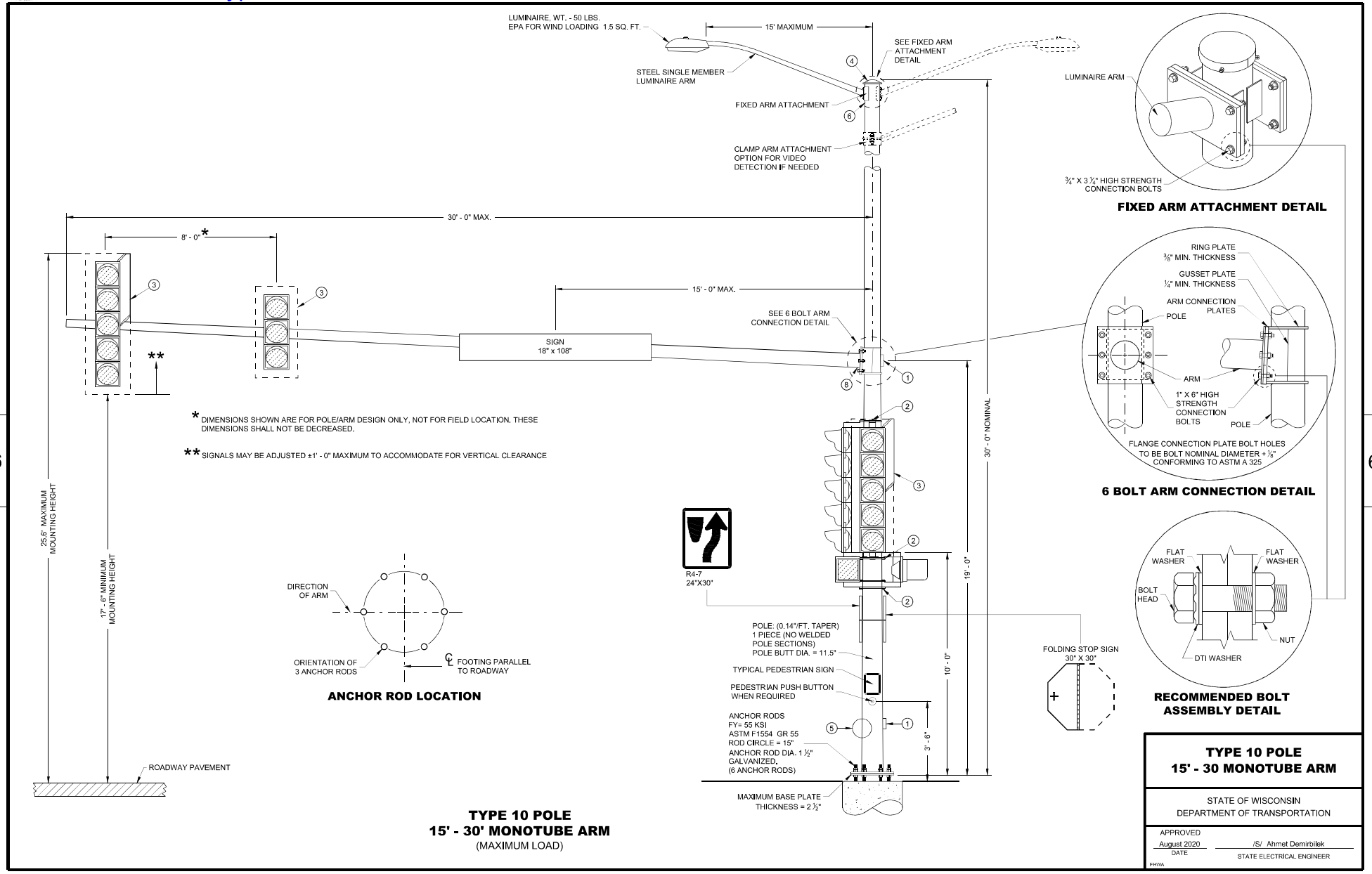
6

STANDARD DETAIL DRAWING 49B

SDD 09E08 - 09b

SDD 09E08 - 09b

SDD 09E08-e Type 10 Pole, 15' - 30' Monotube Arm



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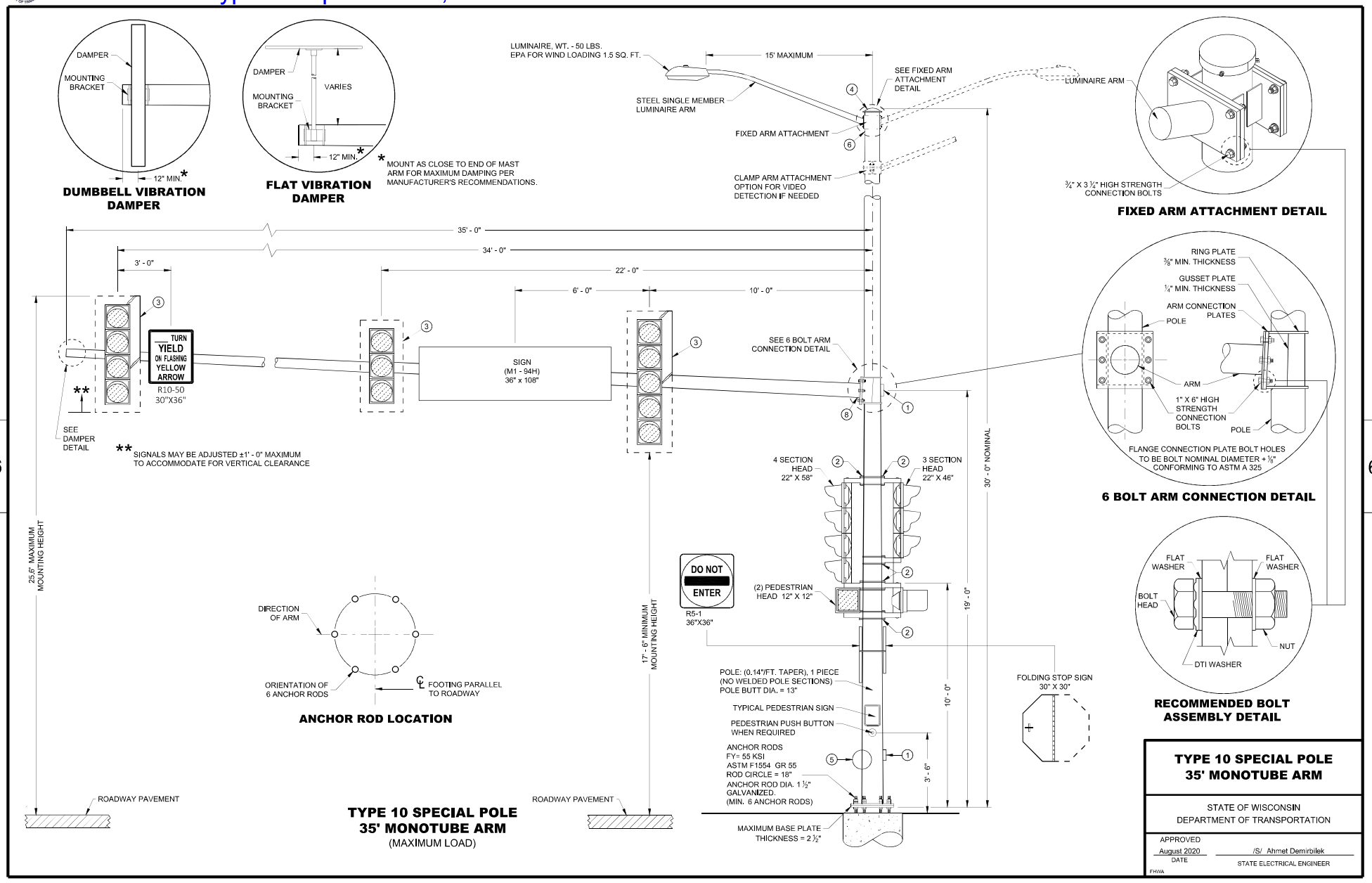
SDD 09E08 - 09e

SDD 09E08 - 09e

STANDARD DETAIL DRAWING 49C

SDD 09E08-f Type 10 Special Pole, 35' Monotube Arm



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STANDARD DETAIL DRAWING 49D

SDD 09E08 - 09f

SDD 09E08 - 09f

SDD 9C11 Concrete Base Type 10

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE CONTRACT.

BASES SHALL BE EXCAVATED BY USE OF A CIRCULAR AUGER.

TOP SURFACES OF CONCRETE BASES SHALL BE TROWEL FINISHED AND LEVEL.

CONDUIT SIZES AND LOCATIONS SHALL BE AS SHOWN ON THE PLANS.

THE FINAL OR TERMINATING CONCRETE BASE IN A CONDUIT RUN SHALL HAVE A 6" EXIT STUB INSTALLED FOR FUTURE CABLING USE. THE EXIT STUB SHALL BE SIZED AS USED THROUGHOUT THE CONDUIT RUN AS SHOWN AT THE ENTRANCE OF THE BASE.

MINIMUM BENDING RADIUS OF CONDUIT IS EQUAL TO 6 X THE DIAMETER.

CONDUIT HEIGHT ABOVE CONCRETE BASES SHALL BE 4 INCHES. ALL METALLIC CONDUIT ENDS SHALL BE REAMED AND THREADED. NONMETALLIC CONDUIT SHALL HAVE BELL END INSTALLED. ALL CONDUIT SHALL BE SLOPED TO PULL BOX.

ALL CONDUIT ENDS AT THE TOP OF CONCRETE BASES SHALL BE CAPPED IF METALLIC OR PLUGGED IF NONMETALLIC IMMEDIATELY AFTER PLACEMENT AND BEFORE CONCRETE IS POURED. CONDUIT IN WHICH WIRE OR CABLE IS NOT INSTALLED SHALL REMAIN CAPPED OR PLUGGED.

BELL ENDS SHALL BE INSTALLED ON ALL PVC CONDUIT EXPOSED AT THE TOP OF CONCRETE BASES BEFORE INSTALLATION OF CABLE OR WIRE.

ENDS OF CONDUIT INSTALLED BELOW GRADE FOR FUTURE USE SHALL BE CAPPED IF METALLIC OR PLUGGED IF NONMETALLIC.

WHEN REQUIRED TO CONNECT NONMETALLIC CONDUIT TO METALLIC CONDUIT, ONLY ADAPTER FITTINGS, U.L. LISTED FOR ELECTRICAL USE, SHALL BE USED.

IF A BASE REQUIRES A DEEP FORM BECAUSE OF LOOSE DIRT OR FILL, THE FORM SHALL BE REMOVED BEFORE BACKFILLING AROUND THE BASE. BACKFILL SHALL BE TAMPED TIGHT AGAINST THE BARE CONCRETE BASE IN LAYERS OF 1 FOOT OR LESS.

A NO. 4 AWG, STRANDED COPPER EQUIPMENT GROUNDING CONDUCTOR SHALL BE EXOTHERMICALLY WELDED TO THE EQUIPMENT GROUNDING ELECTRODE (GROUND ROD).

THE EQUIPMENT GROUNDING CONDUCTOR SHALL ENTER THE BASE THROUGH A 1 INCH CONDUIT INSTALLED FOR GROUNDING PURPOSES, LEAVING A 4 FOOT COIL OF WIRE ABOVE THE CONCRETE BASE. THE EQUIPMENT GROUNDING CONDUCTOR SHALL BE NEATLY COILED AND THE COILS TIED TOGETHER.

WELDING OF THE ANCHOR RODS TO THE CAGE IS UNACCEPTABLE. TEMPLATES SHALL BE USED.

BAR STEEL REINFORCEMENT SHALL BE COATED WITH POWDERED EPOXY RESIN IN ACCORDANCE WITH SECTION 505 OF THE STANDARD SPECIFICATIONS (LATEST EDITION).

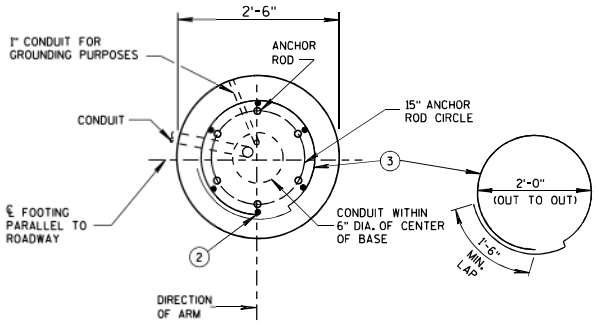
ANCHOR RODS SHALL BE INSTALLED WITH MISALIGNMENTS OF LESS THAN 1:40 FROM VERTICAL.

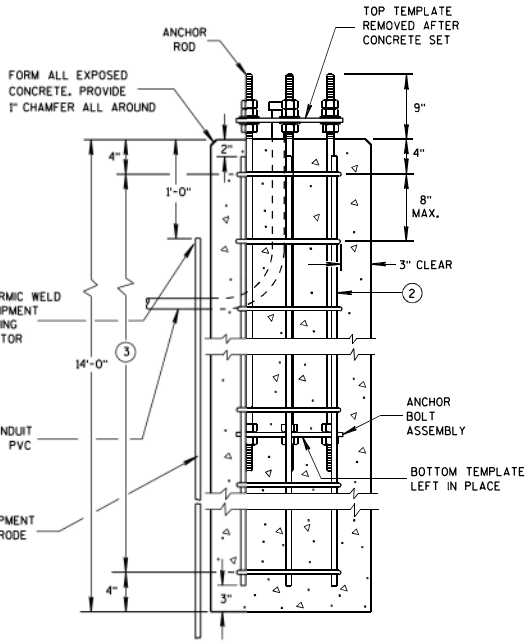
(1) THE MINIMUM DEPTH OF CONDUIT EXITING THE CONCRETE BASE AND INSTALLED BELOW THE TRAVELED WAY SHALL BE 24 INCHES. THE MINIMUM DEPTH OF CONDUIT EXITING THE CONCRETE BASE THAT IS NOT INSTALLED BELOW THE TRAVELED WAY SHALL BE 18 INCHES. THE MAXIMUM DEPTH OF ALL CONDUIT SHALL BE 36 INCHES, (GREATER THAN 36 INCHES IF INSTALLED IN BREAKER-RUN), EXCEPT WITH WRITTEN APPROVAL BY THE ENGINEER.

(2) (6) NO. 6 X 13'-7" BAR STEEL REINFORCEMENT.

(3) (21) NO. 5 X 7'-10" BAR STEEL REINFORCEMENT @ 8" MAX. C-C.

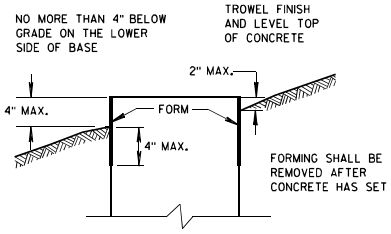
CONCRETE MASONRY	fc=3,500 p.s.i.
HIGH STRENGTH BAR STEEL REINFORCEMENT, GRADE 60	fy=60,000 p.s.i.
ANCHOR RODS, ASTM F1554 GRADE 55 (IN ACCORDANCE WITH SECTION 531.2.2 OF THE STANDARD SPECIFICATION)	fy=55,000 p.s.i.
TEMPLATES, ASTM, A709 GRADE 36	fy=36,000 p.s.i.



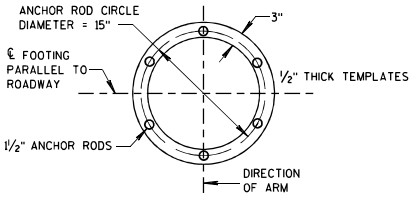


CONCRETE BASE TYPE 10
(FOR TYPE 9 & 10 & OVER HEIGHT (OH) POLES)

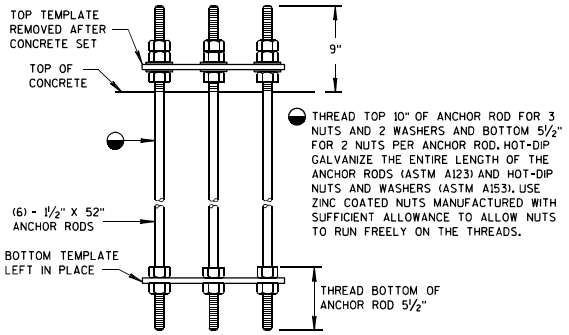
TO BE USED WHEN GROUND ELEVATION AT BASE EQUALS OR IS GREATER THAN HIGH POINT OF ROADWAY ELEVATION. SEE S.D.D. 9C13-2 WHEN GROUND ELEVATION AT BASE IS LOWER THAN HIGH POINT OF ROADWAY ELEVATION.



FORMING DETAIL



TOP AND BOTTOM TEMPLATES



ANCHOR BOLT ASSEMBLY DETAIL

CONCRETE BASE TYPE 10 ANCHOR ASSEMBLY

QUANTITY REQUIREMENTS	
APPROX. CUBIC YARDS OF CONCRETE	2.5
LBS. OF HOOP BAR STEEL	172
LBS. OF VERTICAL BAR STEEL	122

CONCRETE BASE TYPE 10

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
May 2017 — DATE
/S/ Ahmet Demirbilek — STATE ELECTRICAL ENGINEER
FHWA

6

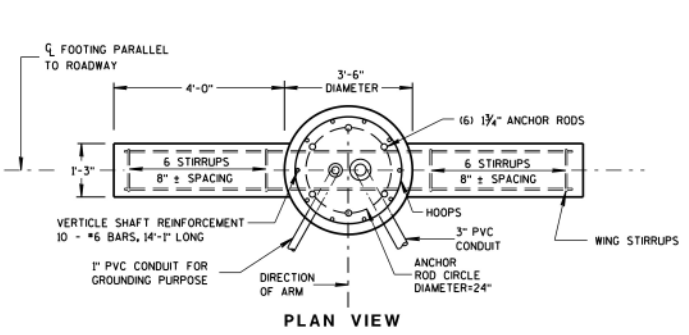
6

S.D.D. 9 C 11-10

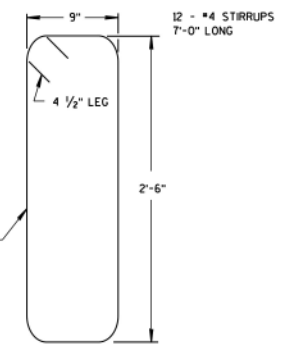
STANDARD DETAIL DRAWING 50

S.D.D. 9 C 11-10

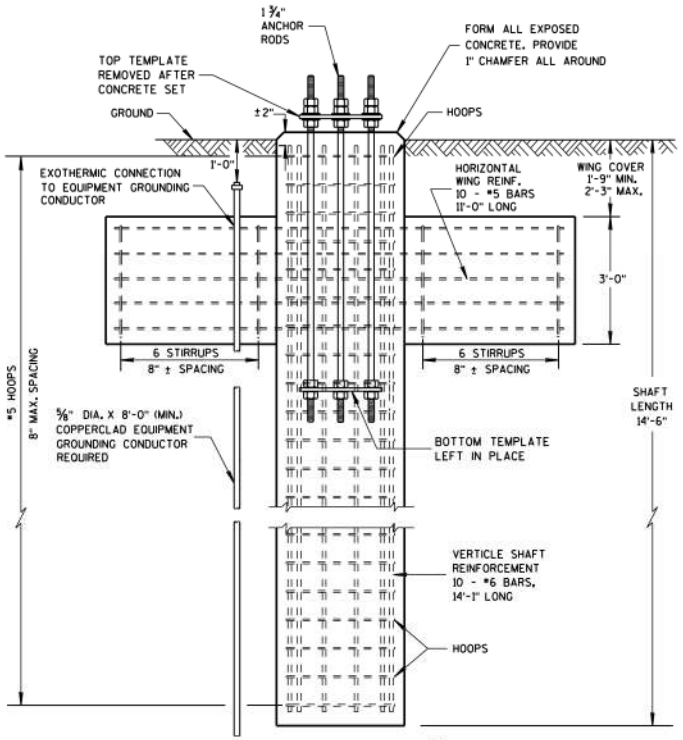
SDD 9C12-a Concrete Base Type 13



PLAN VIEW

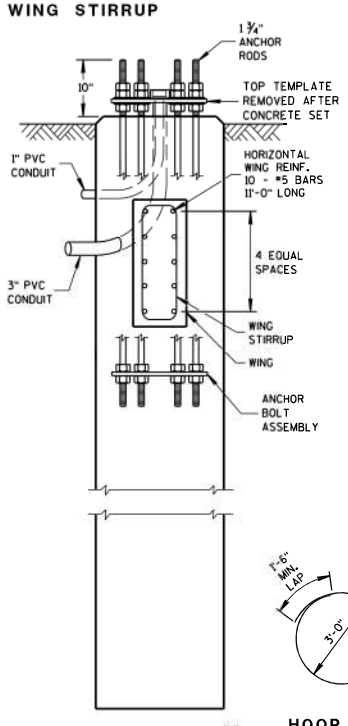


WING STIRRUP



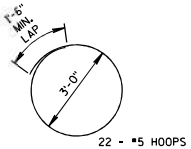
ELEVATION VIEW*

* CONDUITS ARE NOT SHOWN ON THIS VIEW FOR CLARITY



SIDE VIEW**

** HOOPS AND VERTICAL SHAFT REINFORCEMENT NOT SHOWN ON THIS VIEW FOR CLARITY



HOOP DETAIL

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE CONTRACT.

ORIENT ANCHOR RODS IN FOOTING AND PROVIDE ANCHOR ROD PROJECTION ABOVE TOP OF CONCRETE FOOTING BASE PER THIS SHEET.

BENDING DIMENSIONS FOR REINFORCING BARS ARE OUT TO OUT.

USE 3" CLEAR FOR ALL REINFORCEMENT UNLESS NOTED OTHERWISE.

THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATION AS TO THE TYPE AND LOCATION OF THE UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO.

WELDING OF ANCHOR RODS TO THE CAGE IS UNACCEPTABLE. TEMPLATES SHALL BE USED.

BASES (SHAFT), BELOW THE WING, SHALL BE EXCAVATED BY THE USE OF A CIRCULAR AUGER. IF A BASE REQUIRES A DEEP FORM BECAUSE OF LOOSE SOIL, THE FORM SHALL BE REMOVED BEFORE BACKFILLING AROUNG THE BASE. BACKFILL SHALL BE TAMPED TIGHT AGAINST THE BARE CONCRETE BASE IN LAYERS OF 1 FOOT OR LESS.

TOP SURFACE OF THE CONCRETE BASE SHALL BE TROWEL FINISHED AND LEVEL.

CONDUIT SIZE AND LOCATIONS SHALL BE AS SHOWN ON THE PLANS.

MINIMUM BENDING RADIUS OF CONDUIT IS EQUAL TO 6 X THE DIAMETER.

CONDUIT HEIGHT ABOVE CONCRETE BASE SHALL BE 4½" INCHES. ALL METALLIC CONDUIT ENDS SHALL BE REAMED AND THREADED. NONMETALLIC CONDUIT SHALL HAVE BELL ENDS INSTALLED. ALL CONDUIT SHALL SLOPE TO PULL BOX.

ALL CONDUIT ENDS AT THE TOP OF THE BASES SHALL BE CAPPED IF METALLIC OR PLUGGED IF NONMETALLIC IMMEDIATELY AFTER PLACEMENT AND BEFORE CONCRETE IS POURED. CONDUITS IN WHICH WIRE OR CABLE IS NOT INSTALLED SHALL REMAIN CAPPED OR PLUGGED.

BELL ENDS SHALL BE INSTALLED ON ALL PVC CONDUIT EXPOSED AT THE TOP OF CONCRETE BASES BEFORE INSTALLATION OF CABLE OR WIRE.

WHEN REQUIRED TO CONNECT NONMETALLIC CONDUIT TO METALLIC CONDUIT, ONLY ADAPTOR FITTINGS, UL LISTED FOR ELECTRICAL USE, SHALL BE USED.

A NO. 4 AWG, STRANDED COPPER EQUIPMENT GROUNDING CONDUCTOR SHALL BE EXOTHERMICALLY WELDED TO THE EQUIPMENT GROUNDING ELECTRODE (GROUND ROD).

THE EQUIPMENT GROUNDING CONDUCTOR SHALL BE FURNISHED AND INSTALLED TO ENTER THE BASE THROUGH A 1-INCH CONDUIT INSTALLED FOR GROUNDING PURPOSES, LEAVING A 4-FOOT COIL OF WIRE ABOVE THE CONCRETE BASE, THE EQUIPMENT GROUNDING CONDUCTOR SHALL BE NEATLY COILED AND THE COILS TIED TOGETHER.

BAR STEEL REINFORCEMENT SHALL BE COATED WITH POWDERED EPOXY RESIN IN ACCORDANCE WITH SECTION 505 OF THE STANDARD SPECIFICATIONS.

THE MINIMUM DEPTH OF CONDUIT EXITING THE CONCRETE BASE AND INSTALLED BELOW THE TRAVEL WAY SHALL BE 24-INCHES. THE MINIMUM DEPTH OF CONDUIT EXITING THE CONCRETE BASE THAT IS NOT INSTALLED BELOW THE TRAVELED WAY SHALL BE 18-INCHES. THE MAXIMUM DEPTH OF ALL CONDUIT SHALL BE 36-INCHES, (GREATER THAN 36-INCHES IF INSTALLED IN BREAKER-RUN), EXCEPT WITH THE WRITTEN APPROVAL OF THE ENGINEER.

ANCHOR RODS SHALL BE INSTALLED WITH MISALIGNMENTS OF LESS THAN 1:40 FROM VERTICAL.

CONCRETE MASONRY	fc=3,500 p.s.i.
HIGH STRENGTH BAR STEEL REINFORCEMENT, GRADE 60	fy=60,000 p.s.i.
ANCHOR RODS, ASTM F1554 GRADE 55 (IN ACCORDANCE WITH SECTION 531.2.2 OF THE STANDARD SPECIFICATIONS	fy=55,000 p.s.i.
TEMPLATES, ASTM A709 GRADE 36	fy=36,000 p.s.i.

(FOR TYPE 12 & 13 & OVER HEIGHT (OH) POLES)

CONCRETE = 6.3 C.Y.
H.S. REINFORCEMENT = 635 LBS.

TO BE USED WHEN GROUND ELEVATION AT BASE EQUALS OR IS GREATER THAN HIGH POINT OF ROADWAY ELEVATION.
SEE S.D.D. 9C13-2 WHEN GROUND ELEVATION AT BASE IS LOWER THAN HIGH POINT OF ROADWAY ELEVATION.

CONCRETE BASE TYPE 13

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

6

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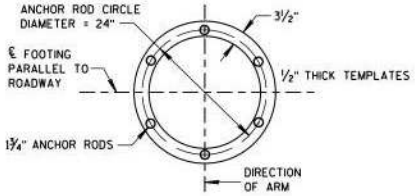
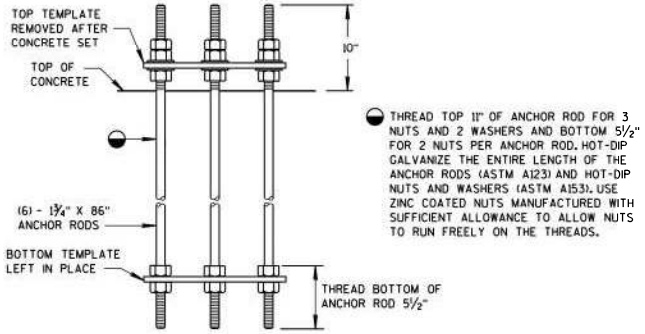
S.D.D. 9 C 12-9a

S.D.D. 9 C 12-9a

STANDARD DETAIL DRAWING 51

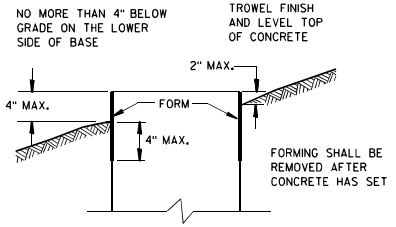


TOP AND BOTTOM TEMPLATES



ANCHOR BOLT ASSEMBLY DETAIL

CONCRETE BASE TYPE 13 ANCHOR ASSEMBLY



FORMING DETAIL

CONCRETE BASE TYPE 13

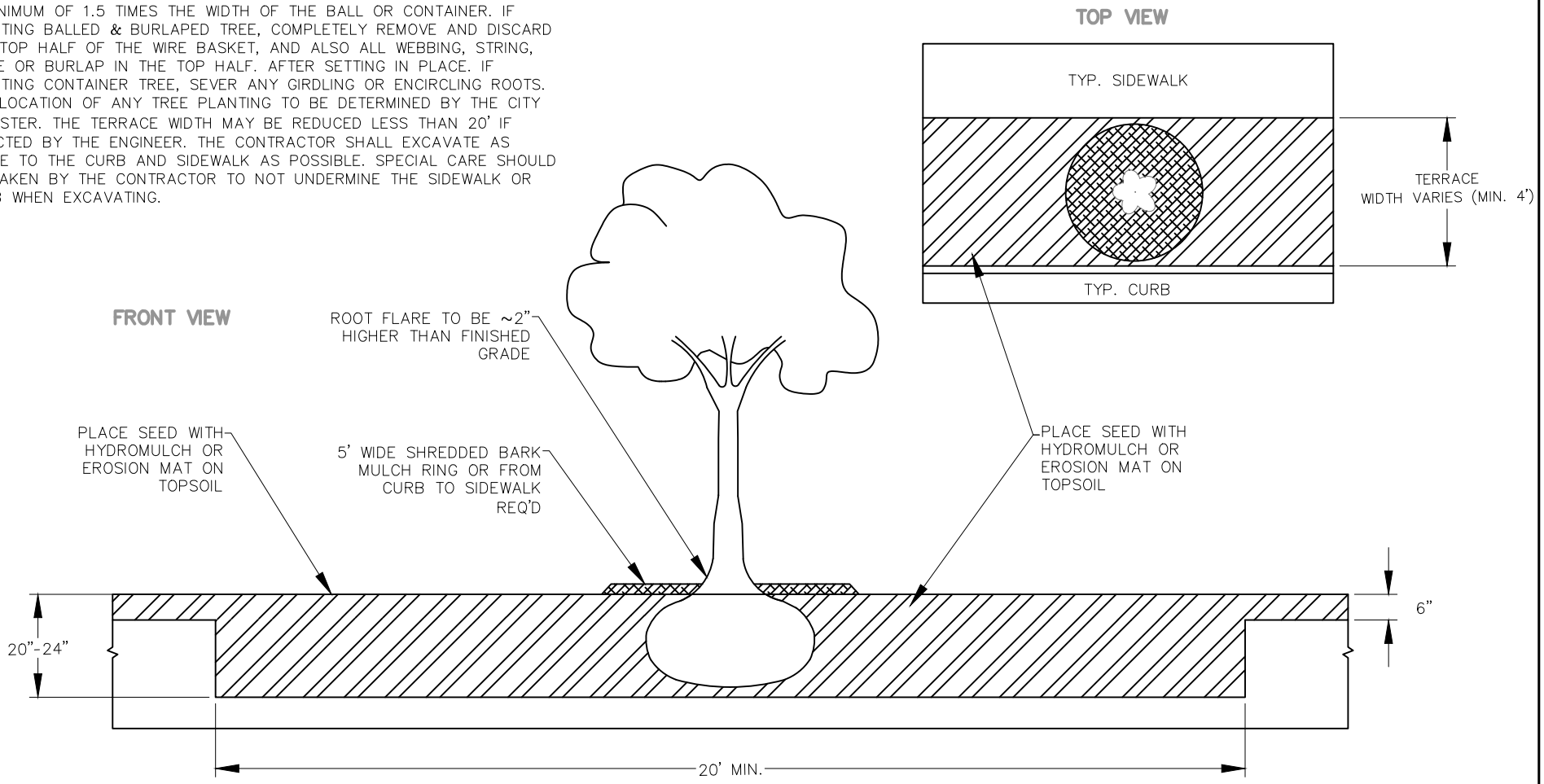
STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
May 2017 — DATE
/S/ Ahmet Demirbilek — STATE ELECTRICAL ENGINEER
FHWA

TERRACE TREE PLANTING
(DETAILS, NOT TO SCALE)

NOTES:

IF PLANTING A BALLED & BURLAPED OR CONTAINER TREE, EXCAVATE TO A MINIMUM OF 1.5 TIMES THE WIDTH OF THE BALL OR CONTAINER. IF PLANTING BALLED & BURLAPED TREE, COMPLETELY REMOVE AND DISCARD THE TOP HALF OF THE WIRE BASKET, AND ALSO ALL WEBBING, STRING, TWINE OR BURLAP IN THE TOP HALF. AFTER SETTING IN PLACE. IF PLANTING CONTAINER TREE, SEVER ANY GIRDLING OR ENCIRCLING ROOTS. THE LOCATION OF ANY TREE PLANTING TO BE DETERMINED BY THE CITY FORESTER. THE TERRACE WIDTH MAY BE REDUCED LESS THAN 20' IF DIRECTED BY THE ENGINEER. THE CONTRACTOR SHALL EXCAVATE AS CLOSE TO THE CURB AND SIDEWALK AS POSSIBLE. SPECIAL CARE SHOULD BE TAKEN BY THE CONTRACTOR TO NOT UNDERMINE THE SIDEWALK OR CURB WHEN EXCAVATING.

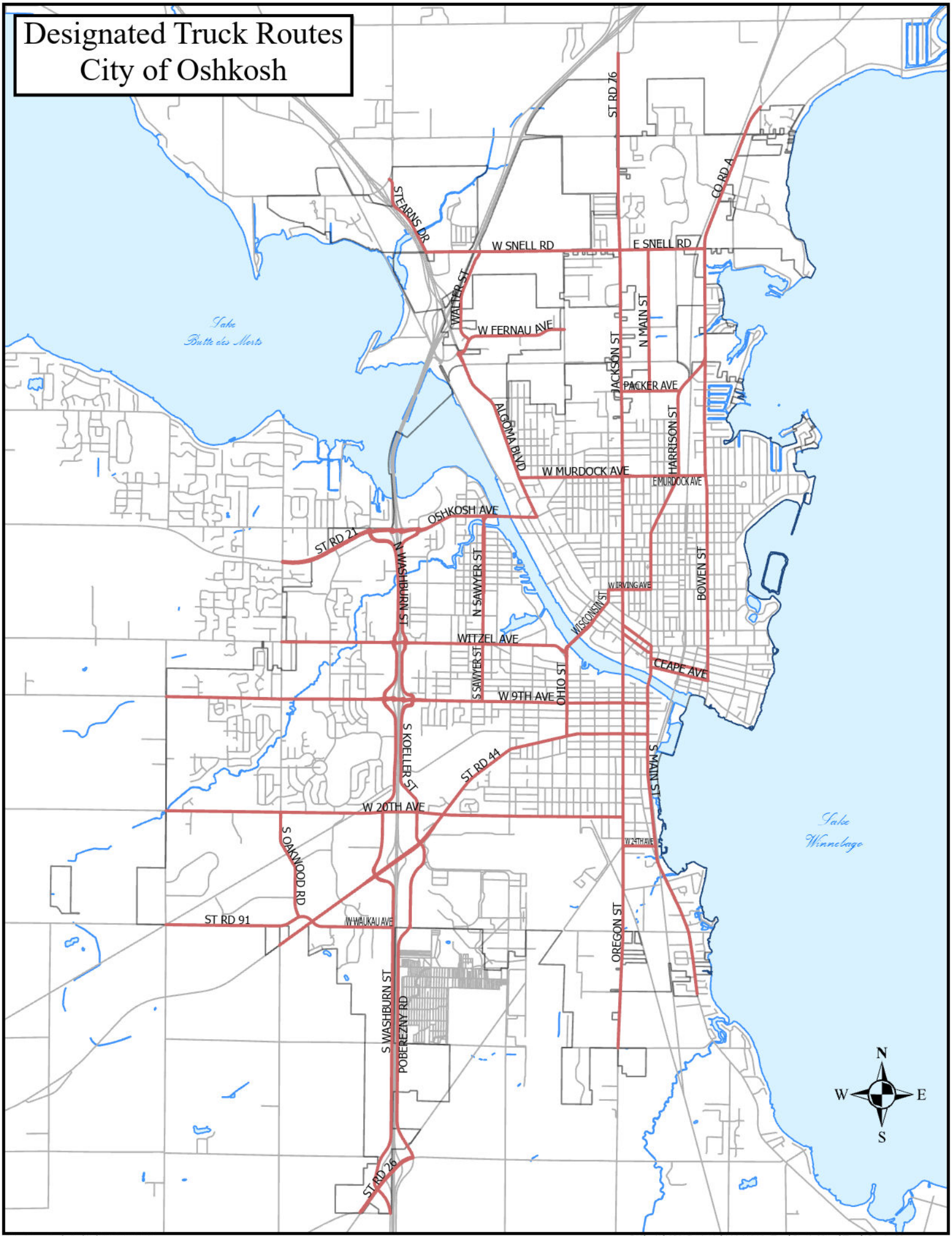


TERRACE TREE PLANTING DETAILS	
CITY OF OSHKOSH, WISCONSIN	
REVISIONS	08/05/2025
STANDARD DETAIL DRAWING 53	

STANDARD DETAIL DRAWING 53

DESIGNATED TRUCK ROUTES

Designated Truck Routes
City of Oshkosh



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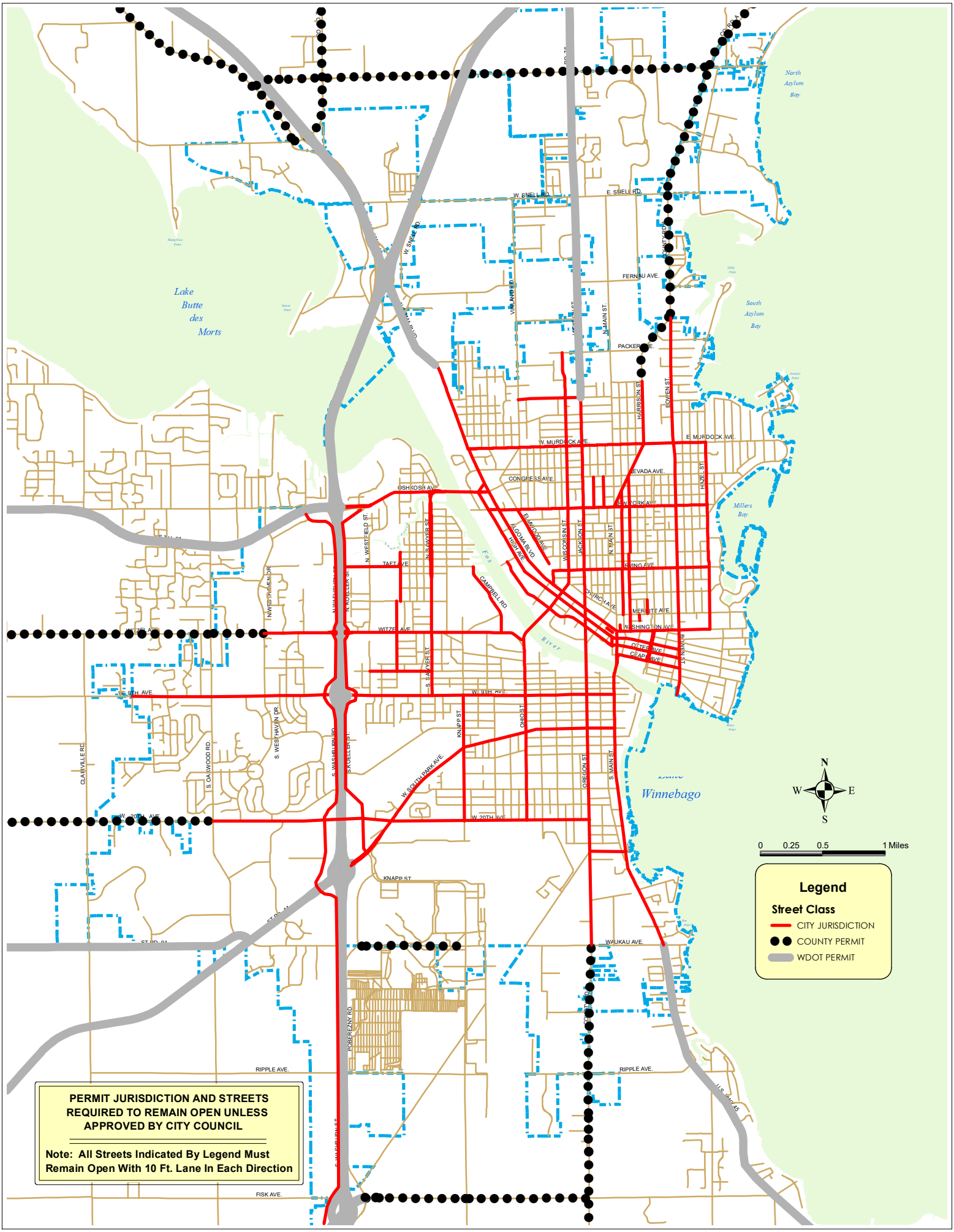
PERMIT JURISDICTION AND STREETS REQUIRED TO REMAIN OPEN


Lake Butte des Morts
North Asylum Bay
South Asylum Bay
Millers Bay
Lake Winnebago
Fox River
W. SNELL RD.
E. SNELL RD.
FERNAU AVE.
PACKER DR.
W. MURDOCK AVE.
E. MURDOCK AVE.
CONGRESS AVE.
NEVADA AVE.
E. NEW YORK AVE.
OSHKOSH AVE.
TAFT AVE.
WITZEL AVE.
W. 9TH AVE.
W. 20TH AVE.
KNAPP ST.
W. SOUTH PARK AVE.
WAUKAU AVE.
RIPPLE AVE.
FISK AVE.
CAMPBELL RD.
BUNDY RD.
POBEREZNY RD.
N. WESTFIELD ST.
N. SAWYER ST.
S. SAWYER ST.
WISCONSIN ST.
JACKSON ST.
N. MAIN ST.
S. MAIN ST.
HARRISON ST.
BOWEN ST.
HYDE ST.
ALGOMA BLVD
RIVER AVE.
IRVING AVE.
CHURCH AVE.
MERRITT AVE.
W. WASHINGTON AVE.
OTTER AVE.
CEAPA AVE.
OHIO ST.
OREGON ST.
CLAYTON AVE.
S. WESTHAVEN DR.
S. OAKWOOD RD.
OAKVILLE RD.
S. WASHBURN BLVD
S. OBEL LN.
N. WESTHAVEN DR.
N. OBEL LN.
S. WASHBURN ST.
COUNTY RD. A
COUNTY RD. G
COUNTY RD. II
COUNTY RD. Y
VINLAND RD.
W. SNELL RD.
ST RD. 21
ST RD. 44
U.S. HWY 45
N
S
E
W
0
0.25
0.5
1 Miles
Legend
Street Class
CITY JURISDICTION
COUNTY PERMIT
WDOT PERMIT
PERMIT JURISDICTION AND STREETS REQUIRED TO REMAIN OPEN UNLESS APPROVED BY CITY COUNCIL
Note: All Streets Indicated By Legend Must Remain Open With 10 Ft. Lane In Each Direction