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1000. GOVERNING SPECIFICATIONS (1504)

Use of the term “Plans, Specifications and Special Provisions” within this specification shall be construed to mean those documents which compliment, modify, or clarify these specifications and are accepted as an enforceable component of the Contract or Contract Documents.

In the following Specifications all references to “Mn/DOT Specifications” shall mean the “Standard Specifications for Construction” of the Department of Transportation of the State of Minnesota, current edition including all supplemental specifications and other updates. All materials and methods shall comply with that Specification and Supplemental Specifications unless modified in these documents.

All reference to other Specifications of AASHTO, ASTM, ANSI, AWWA, etc. shall mean the latest published edition available on the date of advertisement for bids.

The City of Inver Grove Heights’ General Specifications; the Standard Specifications for Trench Excavation and Backfill/Surface Restoration, the Standard Specifications for Sanitary Sewer and Storm Sewer Installation, and the Standard Specifications for Water Main and Service Line Installation as prepared by the City Engineer’s Association of Minnesota; (current editions) shall apply to all work and material to be furnished under this project except as modified by these Supplemental Specifications and the Special Provisions.

Copies of the Standard Specifications as prepared by the City Engineer’s Association of Minnesota are available at the CEAM website at www.CEAM.org.

Numbers following the various specification sections refer to Mn/DOT and *CEAM* specification numbers. Mn/DOT numbers are in shown in standard text and *CEAM numbers are shown in italic text.*

1001. GAS SERVICE (1507)

In the event it is necessary to cut any gas line or remove a section to perform the necessary street grading, such cutting shall be performed by the gas company at no expense to the contractor provided this work is not for the convenience of the contractor. The cost of repairing any accidental breakage or damage to gas lines caused by the Contractor's operation shall be the responsibility of the Contractor. The gas company shall perform all repair work, no matter how slight.

The Contractor shall call the gas company immediately upon causing any damage to the integrity of the coating on any gas line.

1002. EXISTING UNDERGROUND UTILITIES (1507)

Construction operations adjacent to utility property shall be performed in accordance with the provisions of 1507 and the following:

See the Plans for the list of utility owners that have existing facilities affected by the work under this Contract, some of which may be relocated or adjusted in advance of, or concurrently with, the Contractor's operations under this Contract.

The City shall not be responsible for any delay that the Contractor may encounter because of the utility companies involved failing to carry out their necessary work in a timely manner. The Contractor should meet with the affected utility companies as soon as possible to coordinate timely relocations. The Contractor's only recourse against the City for delays caused by failure of the utility companies to adjust or relocate their facilities shall be limited to requesting time extensions for completion of the Contract.

The Contractor shall report to the Engineer, in writing, any undesirable conditions: such as, but not limited to, debris in manholes or pipes, damaged valve boxes, broken castings, etc. prior to commencing work on any street. Once excavation or utility work has commenced it will be assumed that all damage to underground installations, except that reported as noted above, has been caused by the Contractor's operations, and it shall be the responsibility of such Contractor to make the necessary repairs.

Location of Underground Utilities

The Plan will indicate the quality level of the subsurface utility information according to the guidelines of CI/ASCE 38-2 entitled “Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data.” If no quality level is indicated the Contractor shall assume it is quality level D. Every effort has been made to position and dimension all existing underground utilities on the Plans. This information was obtained from the respective utility companies and the City record plans. The City of Inver Grove Heights does not guarantee the locations as shown on the Plans. It is the Contractor’s responsibility to ascertain the final location of these utilities (including municipal water and sewer lines and appurtenances) and to notify the utility companies when construction commences in each area. The Contractor shall contact Gopher State One-Call (651-454-0002) at least 48 hours (excluding Saturdays, Sundays, and holidays) prior to any excavation.

All work and time delays associated with the locating, uncovering, and backfilling of existing utilities shall be considered incidental work to the project with no additional compensation allowed therefore.

Prospective bidders are encouraged to contact the utility companies prior to submitting proposals for this project to help plan coordination of the construction with the utility relocations and adjustments.

Interference of Underground Structures (2600.3A4)

The Contractor is responsible for the protection of all underground utilities, which are located in the field or are shown on the plans.

When any underground structure interferes with the planned placement of the pipeline or appurtenances to such an extent that alterations in the work are necessary to eliminate the conflict or avoid endangering effects on either the existing or proposed facilities, the Contractor shall immediately notify the Engineer and the Owner of the affected structure. When any existing facilities are endangered by the Contractor’s operations, the Contractor shall cease work at the site and take such precautions as may be necessary to protect the in-place structures until a decision is made as to how the conflict will be resolved.

Without specific authorization from the Engineer, no utility service shall be disrupted, nor shall any change be made in either the existing structures or the planned installations to overcome the interference. Alterations in existing facilities will be allowed only to the extent that service will not be curtailed unavoidably and then only when the encroachment or relocation will satisfy all applicable regulations and conditions.

Wherever alterations are required as a result of unforeseen underground interferences not due to any fault or negligence of the Contractor, the Engineer will issue a written order covering any additional or extra work involved and specifying the revised basis of payment, if any. Any alterations made strictly for the convenience of the Contractor, shall be subject to prior approval and shall be at the Contractor's expense.

No extra compensation will be allowed for delays caused by the interference of underground structures. It is the Contractor's responsibility to review plans, proposed construction, existing field conditions, and coordinate with utilities to identify potential conflicts ahead of the Contractor's work schedule. Lack of planning and foresight by the Contractor shall not be construed as reason for claim or reimbursement for lost expenses in labor, equipment or materials.

1003. CONSTRUCTION LIMITS

The Contractor shall confine the operations to the limits of the construction area. Prior to beginning work, the City will have obtained the necessary rights-of-way and easements. Any work completed outside of the construction limits shown on the plan, even if it is still within the City ROW, shall be approved by the Engineer. The Contractor shall contact the Engineer and obtain Engineer's permission before storing, stockpiling, building haul roads, excavation, etc., outside of the right-of-way.

1004. TEMPORARY SANITARY FACILITIES

The Contractor shall furnish and maintain a temporary closet or privy of a type at a location approved by the Engineer. Any person working on the project shall be allowed to use the facility. The facility shall be removed when directed by the Engineer.

Any incidence of a person working either for the Contractor or his subcontractors who defecates or urinates in the open, failing to use the sanitary facilities, shall result in a \$1000 deduction from payment owed to the Contractor by the City. In addition, the person shall no longer be allowed to work on the project under any circumstances.

1005. EMPLOYEE HEALTH AND WELFARE (1706)

The Contractor shall be required to abide by 29 CFR 1910 Occupational Safety & Health Administration (OSHA) and Minnesota Rules 5207.

The Contractor shall not use any motor vehicle equipment on this Project having an obstructed view to the rear unless:

- (A) The vehicle has a reverse signal alarm which is audible above the surrounding noise level; or
- (B) The vehicle is backed up only when an observer signals that it is safe to do so.
- (C) A \$50.00 penalty (per incident) will be assessed against the Contractor each time failure to comply with these backup requirements is observed on the Project site.
- (D) None of the penalties listed above shall be considered by the Contractor as allowance of noncompliance incidents of these backup requirements on this Project. The Contractor is advised that at any time the Contractor is not in compliance, the Engineer may take additional remedial measures which may include, but not be limited to, contacting the Contractor's insurance company and/or MN/OSHA.

1006. TIME OF WORK

Unless otherwise specified, the Contractor shall notify the Engineer in advance of all times when and in which phases of the project employees and equipment are to work on this construction. In accordance with ordinances of the City of Inver Grove Heights, no work, to include running equipment, on this project shall take place between the hours of 7:00 p.m. and 7:00 a.m. and any time on Sundays, unless permission has been granted by the Engineer.

1007. NIGHT WORK

On occasion, the City may require the Contractor to perform certain work at night to minimize utility or business disturbances or other such circumstances as might arise. Where a bid item is provided in the Contract, "Night Work" will be measured and paid for at the Contract unit price of Each. Payment shall be compensation in full for all additional costs associated with performance of the related work to be performed at night, including, but not limited to, overtime or other extra labor costs, lighting, and any barriers or barricades as required to safely perform the work over one night per Each. If no pay item is provided in the Contract, Night Work shall be considered incidental, for which no direct compensation shall be made.

1008. SCOPE OF WORK

The Work to be carried out under these General Requirements shall include furnishing all labor, material, tools and equipment necessary for the construction of the proposed improvements, complete in place as described in the Plans and Specifications herein.

Minor appurtenances not specifically listed as bid items, but which are necessary to complete the project, as shown in the Plans, in a satisfactory manner shall be considered incidental items and no direct compensation will be made therefore.

1009. WORK SCHEDULE AND PRECONSTRUCTION CONFERENCE

Prior to the start of the work, there will be a preconstruction conference arranged by the Engineer. Representatives of the Engineer and the Contractor (including the Contractor's project superintendent) shall be present at this meeting.

At this meeting, the Contractor shall designate a competent project superintendent who shall be familiar with all phases of the work to be executed and who shall oversee the work during the progress. The project superintendent shall represent the Contractor in the Contractor's absence, and communications and directions given by the project superintendent shall be as binding as if given by the Contractor.

Also, at this meeting, the Contractor shall submit in writing to the Engineer for approval, a schedule of procedure indicating the order in which the Contractor proposes to perform the various stages of the work, the dates on which he will start the several salient features thereof (including procurement of materials, plant and equipment), and the contemplated dates for completing the same. The schedule of procedure shall indicate the number of crews and employees to be employed, and locations of work for each crew. This schedule shall be in the form of a bar chart of a suitable scale to indicate appropriately the percentage of work scheduled and completed by weekly intervals. The Contractor shall not deviate from said schedule after it has been approved without the permission of the Engineer.

1010. TRAFFIC PROVISIONS AND SITE MAINTENANCE (1404 & 1710, 2600.3A1)

1010.1 Construction Requirements

1010.1.1 Overview

Whenever work interferes with the flow of traffic along a roadway, the Contractor shall provide for traffic control and signing and public safety in accordance with the provisions of the field manual of Temporary Control Zone Layouts of the Minnesota Manual of Uniform Traffic Control Devices (MMUTCD) and Mn/DOT Specifications 1404 and 1710, and the Special Provisions.

The Contractor shall submit the proposed traffic control layout to the Engineer, for approval, at least fourteen (14) days prior to the start of construction. At least 24 hours prior to placement, all traffic control devices shall be available on the Project for inspection by the Engineer. The Contractor shall modify his/her proposed traffic control layout and/or devices as deemed necessary by the Engineer.

The Contractor shall be required to respond to calls from the Engineer concerning traffic control. If the Contractor is negligent in correcting the deficiency within one hour of notification the Contractor shall be subject to a daily charge of \$200 per day for every day that the deficiency is not corrected.

The Contractor shall keep the required agencies informed of changing traffic patterns and detour situations.

All Contractor's personnel, except operators who will remain in their vehicles at all times, shall wear reflectively striped, highly visible, short sleeved one or two-piece coveralls (color and striping pattern to be determined by the District/Division Traffic Engineer), at all times while working on the Project. These coveralls shall be considered an incidental expense for which no direct compensation will be made. Any Contractor's employee found on the Project not wearing the prescribed reflective coveralls will be immediately ordered off the Project by the Engineer.

The Contractor shall furnish names, addresses and phone numbers of at least two (2) individuals responsible for the placement and maintenance of traffic control devices. At least one of the individuals shall be "on call" 24 hours per day, seven days per week, during the times any traffic control devices, furnished and installed by the Contractor, are in place or when areas are under construction.

1010.1.2 Maintenance of Streets Under Construction and Haul Roads

Maintenance of the streets and areas under construction, detours, by-passes and equipment yards, used in conjunction with the project, shall be the responsibility of the Contractor. Said maintenance shall include keeping the streets free of obstacles, parked equipment, barricades that are not in use, blading the traveled ways and controlling the dust in the construction area; and replacing signs and barricades during and after storms, high winds, and damage caused by traffic. Streets in the area, not under construction, shall be kept free of construction materials, dirt and other undesirable materials.

While any open excavations are maintained, the Contractor shall have available a supply of steel plates suitable for temporary bridging of open trench sections where either vehicular or pedestrian traffic must be maintained. Use of the plates shall be as directed or approved by the Engineer and where installed they shall be secured against possible displacement and be replaced with the permanent structure as soon as possible.

The Contractor shall be responsible for construction of all necessary temporary haul roads required to complete the required excavation and disposal. Construction of temporary haul roads shall also include placement of necessary granular material over existing bituminous roadway surfaces. This material shall be of sufficient depth to allow for protection of existing bituminous surfaces. Construction of necessary haul roads shall be considered an incidental item to other construction items and no direct compensation will be made therefore.

Mn/DOT Specification 2130 is hereby amended to provide that the Contractor shall furnish and apply all water necessary on the project, including water used as dust palliative, washing of equipment, etc., and that such water shall be considered as an incidental item to the Contract and no direct payment will be made therefore. If the Contractor elects, he may purchase water from the City's water distribution system. See Section "WATER USAGE ALLOWANCE" in the City Standard Specifications.

When dust becomes or appears to be becoming a nuisance or problem to the area, or nearby residents, it shall be the responsibility of the Contractor to immediately alleviate the undesirable conditions. The maintenance responsibility, herein described, shall be inherent to the Contractor and shall be applicable at all times, including weekends, throughout the construction period. The Contractor shall provide periodic inspection of the project, particularly during and after storms, to maintain blinkers and barricades, provide dust and erosion control and general maintenance. If the Contractor is negligent in this respect, the City reserves the right to perform this work with its own forces at overtime rates. The cost of such work shall be charged to the contractor.

The disregarding of this provision shall be cause for suspension of the project until the Contractor can show evidence that employees have been hired specifically to perform the above work and will be available at all times.

1010.1.3 Traffic Control Devices and Maintenance

Traffic control devices include, but are not limited to, temporary signs, barricades, warning signs, trailers, flashers, cones, drums, pavement markings and flagmen as required and sufficient barricade weights to maintain barricade stability.

All traffic control devices shall conform and be installed in accordance to the “Minnesota Manual on Uniform Traffic Control Devices” (MNMUTCD) and Part VI, “Field Manual for Temporary Traffic Control Zone Layouts”, the “Guide to Establishing Speed Limits in Highway Work Zones”, the Minnesota Flagging Handbook, the provisions of Mn/DOT 1404 and 1710, the Minnesota Standard Signs Manuals Parts I and II, the Traffic Engineering Manual Chapter 8 Appendixes 8-8.02 and 8-8.03, the Traffic Control Layouts/Typical Traffic Control Layouts in the Plans, these specifications, and the Special Provisions.

The Contractor shall furnish, install, maintain, and remove all traffic control devices required to provide safe movement of pedestrian and vehicular traffic through the Project during the life of the Contract from the start of Contract operations to the final completion thereof. The Engineer will have the right to modify the requirements for traffic control as deemed necessary due to existing field conditions. The roadways shall be kept open to traffic at all times, except as modified in these specifications or the Special Provisions.

The Contractor shall be responsible for the immediate repair or replacement of all traffic control devices that become damaged, moved or destroyed, of all lights that cease to function properly, and of all barricade weights that are damaged, destroyed, or otherwise fail to stabilize the barricades. The Contractor shall further provide sufficient surveillance of all traffic control devices at least once every 24 hours.

When signs will remain in the same location for more than 14 consecutive days the signs shall be post mounted. This would not include portable signs which are set up and taken down at the beginning and end of each work shift.

When signs are installed, they shall be mounted on posts driven into the ground at the proper height and lateral offset as detailed in the MNMUTCD. When signs are removed, the sign posts and stub posts shall also be removed from the Right of Way within two (2) weeks.

1010.1.4 Traffic Flow and Access

All work under this Contract which may affect traffic shall be coordinated with the Engineer so as to provide reasonable traffic access to the area under construction.

The Contractor shall furnish, install, and maintain 1 “ROAD WORK AHEAD” and 1 “END ROAD WORK” signs in advance of and beyond each end of the construction limits as directed by the Engineer. The Contractor shall also furnish, install, and maintain 1 “ROAD WORK AHEAD” signs in advance of the construction limits on all intersecting roads and streets as directed by the Engineer. The signs shall conform to the standards shown in the MNMUTCD. No direct compensation will be made to the Contractor for furnishing and erecting these signs. The signs shall remain the property of the Contractor.

Street signage shall be maintained at all times by temporary installations. Temporary signage shall be considered incidental to the Lump Sum “Traffic Control” item.

The Contractor shall be required to cover or remove all traffic control devices which may be inconsistent with traffic patterns during all traffic switches. See “Traffic Control Devices and Maintenance”.

Open excavation adjacent to the existing pavement will not be permitted on opposite sides of the roadway at the same time. The Contractor shall provide protective devices necessary to protect traffic from excavations, drop-offs, falling objects, splatter or other hazards that may exist during construction. This work shall be an incidental cost to the Contractor.

The Contractor will not be permitted to park vehicles or construction equipment so as to obstruct any traffic control device. The parking of workers’ private vehicles will not be allowed within the Project limits unless so approved by the Engineer.

The Contractor will not be allowed to store materials or equipment within 100 ft of through traffic unless approved by the Engineer. If materials or equipment must be stored within 100 ft of through traffic, the Contractor shall provide barricades or barriers, as directed by the Engineer, to warn and protect traffic.

Local access to abutting property must be maintained at all times. The Contractor is required to maintain road surfaces so that any necessary local traffic can safely travel within the project. Gravel material needed for this maintenance shall be incidental and no direct compensation will be made. At all times throughout this project, the Contractor shall keep all directly affected property owners informed as to the appropriate access route being provided and maintained for them.

The Contractor shall at all times maintain a lane width of not less 11 feet in each direction.

Flag persons may be required and shall conform to the requirements set forth in the MMUTCD. Flag persons, while on duty, shall wear approved safety hats and vests and be equipped with two-way radios and a “Stop-Slow” paddle while directing traffic.

During milling, reclaiming, or pavement removal operations proper lane closures shall be set up well in advance of the operation. “Uneven pavement” signing shall be in place, in addition to all other traffic control as specified in the MMUTCD, until paving of the wear course takes place.

1010.1.5 Temporary Lane Closures

Neither road closures nor detours shall be permitted unless specified in the Special Provisions or authorized by the Engineer. Where road closures or detours are permitted by the Engineer, the Engineer shall determine the appropriate agencies, boards, or departments the Contractor must notify prior to taking the action and the proper advance notice to be provided to each body.

Compliance with this requirement shall not be construed to relieve the Contractor from the responsibility of notifying agencies or institutions whose services may be predicated upon a roadway being opened to traffic or whose services would be hindered if a roadway is closed to traffic. Such agencies or institutions shall include, but not be limited to, the police department, the fire department, Metro Transit bus service, school bus service, and ambulance service.

- Any temporary lane closure extending to or beyond 1000 ft. shall have a minimum of one Type III barricade placed in the closed lane for every 1000 ft. of extension.
- All temporary lane closures used at night shall have plastic drum-like channelizers (or Type I barricades with steady burn lights) in the lane closure taper and also in any shifts in traffic alignment.
- Temporary lane closures will not be permitted during inclement weather, nor any other time when, in the opinion of the Engineer, the lane closure will be a greater than normal hazard to traffic.
- Temporary lane closures or other restrictions by the Contractor, during work hours and consistent with the time restrictions, will be permitted during those hours and at those locations approved by the Engineer. Requests for temporary lane closures shall be made at least 24 hours prior to such closures. When a temporary lane closure is used by the Contractor, the closure shall be incidental work and no direct compensation will be made therefore.

- Temporary lane restrictions will not be permitted between the hours of 7:00 A.M. and 9:00 A.M. and between the hours of 4:00 P.M. and 7:00 P.M. **Work which will restrict or interfere with traffic shall not be performed between 12:00 noon on the day preceding and 9:00 A.M. on the day following any consecutive combination of a Saturday, Sunday and legal holiday.** The Engineer will have the right to lengthen, shorten, or otherwise modify the foregoing periods of restrictions as actual traffic conditions may warrant.

1010.1.6 Vehicle Warning Lights

All Contractors', subcontractors' and suppliers' mobile equipment, which are working in the lane closure or within 15 feet of the lane closure, shall be equipped with operable warning lights which meet the appropriate requirements of the SAE specifications. This would include any vehicle which enters the traveled roadway at any time. The SAE specification requirements are as follows:

360 Degree Rotating Lights - SAE Specification J845

Flashing Lights - SAE Specification J595

Flashing Strobe Lights - SAE Specification J1318

Lights shall be mounted so that at least one light is visible at all times when at eye level from a 60 foot radius about the equipment. This specification is to be used for both day and night time operations. All costs incurred to provide warning lights shall be at no cost to the City. These warning lights shall be operating and visible when a vehicle decelerates to enter a construction work zone and again when a vehicle leaves the work zone and enters the traveled traffic lane. Any warning lights shall be on the list of approved lights which may be obtained by contacting:

Vehicle Warning Lights

Office of Construction MS650

Transportation Bldg.

395 John Ireland Blvd.

St. Paul, MN 55155

OR by calling: (651) 296-3126

This list is updated periodically. Warning light suppliers and manufactures may contact the above for information on adding new products to the list.

1010.1.7 Traffic Control and Inspection Log and Maintenance

The Contractor shall be required to respond to any call from the Engineer or his designated representative concerning any request for improving or correcting traffic control devices within one (1) hour.

The Contractor shall inspect, on a daily basis, all traffic control devices, which the Contractor has furnished and installed, and verify that the devices are placed in accordance with these specifications, the Special Provisions, and/or the MMUTCD. Any discrepancy between the placement and the required placement shall be immediately corrected. The person performing this inspection shall be required to make a daily log. This log shall also include the date and time any changes in the stages, phases, or portions thereof go into effect. The log shall identify the location and verify that the devices are placed as directed or corrected in accordance with the Plan. All entries in the log shall include the date and time of the entry and be signed by the person making the inspection. The Engineer reserves the right to request copies of the logs as he deems necessary.

1010.2 Method of Measurement and Payment

“Traffic Control” will be measured and paid for at the Contract unit price of lump sum. Payment shall be compensation in full for all costs of furnishing, installing, maintaining, relocating, and removing the individual traffic control as specified in these specifications and the Special Provisions.

1011. PROTECTION OF THE PUBLIC

The Contractor shall provide all necessary barricades, fences and other protection as required for the proper execution of the work, protection of Contractor’s work, protection of the public, and for the protection of Contractor’s employees, employees of the Owner, and other personnel according to all Federal, State, and Local regulations. This provision shall be incidental to the construction and no direct compensation will be paid therefore.

The Contractor shall take whatever steps are necessary to protect adjoining properties and structures from hazards in connection with the Contractor’s performance of the work. The Contractor shall be responsible for all damages to properties and structures that occur as a result of the Contractor’s operations.

1012. PROTECTION OF EXISTING FACILITIES

- A. Every effort has been made to position and dimension all existing City utilities on the plans. The information was obtained from the City's Engineering Department. The Owner does not guarantee the locations as shown on the plans. It is the Contractor's responsibility to ascertain the final location of these utilities by field verification (including municipal water and sewer lines and appurtenances), and to notify the utility companies, or affected agency, a minimum of 72 hours prior to the commencement of work in each area.
 - 1. The Contractor shall notify the Engineer of any conflict between the existing utilities and the proposed construction. The Engineer, in cooperation with utilities companies, shall determine the necessity for any relocation of these utilities.

- B. The Contractor shall protect all existing utilities and facilities so that they will continue to function in the Contractor's proper manner, both during construction and in the future. Any supporting structure that may be required because of the Contractor's operations shall be provided by the Contractor.
 - 1. The Contractor shall bring to the attention of the Engineer any conditions such as sand in manholes or valve boxes existing prior to the Contractor's excavation. Once excavation has commenced, it will be assumed that all damage to underground utilities has been caused by the Contractor's operations and it will be the Contractor's responsibility to make the necessary repairs.

- C. The Contractor shall provide and use only rubber-tired dozers, front-end loaders and other necessary equipment, other than the paving machine, on all work where street pavement or portions of pavement are undisturbed. All such pavements shall be protected as the Engineer may direct. No compensation will be allowed the Contractor for replacement of damaged street pavements or utilities not scheduled for replacement.

1013. LITTERING

Littering by anyone working either for the Contractor or one of his subcontractors shall result in a \$250 deduction for each incidence from monies owed to the Contractor by the City. This shall include littering in private property, boulevards, streets, excavations, or trenches.

1014. FINAL CLEANUP (1407)

- A. The Contractor shall remove all debris associated with the items of work included under this Contract. This debris shall be removed upon completion of the work, or at such other times as may be necessary for coordination of the work of the Owner or others, the safety of employees, and the public or as required by applicable codes and regulations.
- B. Should the Contractor not remove rubbish or debris, or not cleanup the site as specified above, the Owner reserves the right to have this work done by others and charge the Contractor for the expense of said work.
- C. The Contractor shall remove, from the site, all equipment and excess materials associated with the work after the work is completed.

1015. PROTECTION & RESTORATION OF PROPERTY (1712, 2600.3A3)

The Contractor shall provide and use only rubber-tired dozers, front-end loaders and other necessary equipment, other than the paving machine, on all work where street pavement or portions of pavement are undisturbed. All such pavements shall be protected as the Engineer may direct.

No compensation will be allowed the Contractor for replacement of damaged street pavements or utilities not scheduled for replacement.

The Contractor shall shore up, brace, underpin, secure and protect, as may be necessary, all foundations and other parts of in-place structures adjacent to, adjoining, and in the vicinity of the project, which may be in any way affected by the excavations or other operations connected with the construction of the improvements required under this contract. The Contractor shall indemnify and hold harmless the City and its Engineer from any damages for which the City and or its Engineer may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.

Within the construction limits, as required, the removal of improvements such as paving, curbing, walks, turf, etc., shall be subject to acceptable replacement after completion of underground work, with all expense of removal and replacement being borne by the Contractor to the extent that separate compensation is not specifically provided for in the Contract.

Obstructions such as street signs, guard posts, small culverts, mailboxes, and other items of prefabricated construction may be temporarily removed during construction provided that essential service is maintained in a relocated setting as approved by the Engineer and that nonessential items are properly stored for the duration of construction. Upon completion of the underground work, all such items shall be replaced in their proper setting at the sole expense of the Contractor.

The Contractor shall be responsible for protection of existing overhead utilities and poles. This shall include arranging with the utility and paying the utility for holding poles that will be close to the edge of any trench. Holding of poles and repair of any damage to these facilities shall be considered incidental to the project with no additional compensation allowed. If relocation or removal of these facilities is required, the Owner will contact the concerned utility and pay for the relocation or removal at no additional expense to the Contractor.

In the event of damage to any surface improvements, either privately or publicly owned, in the absence of construction necessity, the Contractor will be required to replace or repair the damaged property to the satisfaction of the Engineer and without cost to the Owner.

1016. NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT

Pollution of natural resources of air, land, and water by operations under this Contract shall be prevented, controlled, and abated in accordance with the rules, regulations, and standards adopted and established by the Minnesota Pollution Control Agency (MPCA), and in accordance with the provisions of Mn/DOT 1717 and the following:

(A) By signing the Proposal and completing the permit, the Contractor is a co-permittee with the City to ensure compliance with the terms and conditions of the General Storm Water Permit (MN R110001) and is responsible for those portions of the permit where the Contractor is referenced. This Permit establishes conditions for discharging storm water to waters of the State from construction activities that disturb 0.4 hectares [1 acre] or more of total land area. A copy of the "General Permit Authorization to Discharge Storm Water Associated with a Construction Activity Under the National Pollutant Discharge Elimination System (NPDES)/State Disposal System Permit Program" is available at <http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/construction-stormwater/index.html> or by calling 651-296-3890.

The Contractor shall apply and pay for the NPDES Permit on this Project. Payment for the application shall be incidental to the Contract and no direct compensation will be made. The City will provide the Contractor with the application form with Sections 1 thru 14 completed, as part of the Contract document package. The Contractor shall fill out the Contractor's portion (Section 15), complete the application process, and post the Permit onsite. The Storm Water Pollution Prevention Plan, a requirement of the NPDES Permit, is included in Appendix E.

A NPDES Permit Declaration form will be sent to the Contractor with the Contract award packet. A copy of the signed permit application and a signed Permit Declaration form must be returned with the Contract and Bond. Submittal of the copy of the signed permit application and Permit Declaration is mandatory for Contract approval. No work which disturbs soil and/or work in waters of the state will be allowed on this Project until the NPDES Permit is in effect and the City has received the required documentation.

(B) The Contractor shall be solely responsible for complying with the requirements of General Permit where Contractor is referenced including Paragraphs IV.B and IC.C covering Erosion and Sediment Control during Construction.

The Contractor shall be responsible for providing all inspections, documentation, record keeping, maintenance, remedial actions, repairs required by the permit. All inspections, maintenance, and records required in the General Permit Paragraphs IV.E, shall be the sole responsibility of the Contractor. The word "Permittee" in these referenced paragraphs shall mean "Contractor". Standard forms for logging all required inspection and maintenance activities shall be used by the Contractor. All inspection and maintenance forms used on this Project shall be turned over to the Engineer every two weeks for retention in accordance with the permit.

The Contractor shall have all logs, documentation, inspection reports on site for Engineer's review and shall post the permit on site. The Contractor shall immediately rectify any shortcomings noted by the Engineer. All meetings with the MPCA, Watershed District, WMO, or any local authority shall be attended by both the Engineer and the Contractor or their representatives. No work required by said entities, and for which the Contractor would request additional compensation from the City, shall be started without approval from the Engineer. No work required by said entities and for which the changes will impact the design or requirements of the Contract documents or impact traffic shall be started without approval from the Engineer.

The Contractor shall immediately notify the Engineer of any site visits by Local Permitting Authorities performed in accordance with Paragraph V.H.

(C) If the Contractor fails to perform the requirements as listed herein, the Engineer will issue a Work Order detailing the required action. The Contractor shall start the required action within twenty-four (24) hour of receipt of the Work Order and continue the required action until the Project is brought into compliance with the permit. Failure to perform the required action as specified, shall subject the Contractor to a \$1,000/calendar day deduction until that time that the Contractor brings the Project in compliance with the NPDES Permit.

The Contractor shall review and abide by the instructions contained in the permit package. The Contractor shall hold the City harmless for any fines or sanctions caused by the Contractor's actions or inactions regarding compliance with the permit or erosion control provisions of the Contract Documents.

1017. EROSION CONTROL AND STORM WATER MANAGEMENT (1717, 2573)

The Contractor shall exercise care to provide erosion protection on slopes disturbed by construction particularly adjacent to ponds, marshes and waterways before construction begins. These areas shall be protected by properly installed silt fence or other means as approved by the Engineer. Erosion protection facilities, in place when work is started, shall be maintained unless the Engineer approves removal.

The Contractor shall prevent sediment from leaving the disturbed area. Should the Contractor fail in preventing sediment leaving the disturbed are, such sediment that becomes deposited elsewhere in the streets, storm sewers, ponds, or marshes downstream shall be removed at the Contractor's expense. All work that may result from the ineffectual maintenance of erosion control shall be at the Contractor's expense. This may include, but is not limited to storm sewer cleaning, sod replacement, street cleaning, curb and gutter replacement and sedimentation removal.

The Contractor will be required to install such temporary erosion and sediment control measures as may be needed at the direction of the Engineer to correct conditions developing during construction. The erosion and sediment control types and methods of installation specified in the "MPCA Protecting Water Quality in Urban Areas" manual include, but are not limited to, filter fence, fiber blanket, storm sewer inlet protection, rock construction entrances, diversion ditches, temporary seeding, tackifier, sprayed mulch, rock dams, street sweeping, dust control watering, temporary sedimentation ponds, and concrete washout areas as per City Standard Details or as directed by the Engineer. All stockpiled excavation material shall be shaped and covered in a manner so as to minimize erosion and control sediment runoff from this material. Erosion and sediment control items shall be as shown on the Plans or as directed by the Engineer. The contractor shall be responsible to remove erosion control devices upon turf establishment or prior to final completion.

Unless pay items are included for erosion control measures, such costs shall be incidental to the project.

Where a bid item is provided for erosion and or sediment control components the unit bid price for erosion and sediment control measures shall include all labor and materials to install, maintain, and remove erosion control measures. Payment will not be made for replacing damaged, stolen, or otherwise non-functional erosion and sediment control measures. Once installed, the Contractor shall maintain the erosion and sediment control system and keep the upstream settlement areas clean. The erosion and sediment control measures shall be checked and repaired after each rain in accordance with NPDES and MPCA regulations as they apply.

All erosion and sediment control measures shall be installed by the Contractor and Checked by the Engineer before any construction activities can start on a site.

1017.1 Item 2573.550 Erosion Control Supervisor

The Contractor shall provide an Erosion Control Supervisor, who shall meet all requirements of Mn/DOT Specification 2573.3A1.

Where a bid item is provided in the Contract, “Erosion Control Supervisor” will be measured and paid for at the Contract unit price of lump sum. Payment shall be compensation in full for all costs associated with the responsibilities of the Erosion Control Supervisor as specified. If no pay item is provided in the Contract, the Erosion Control Supervisor shall be considered incidental, for which no direct compensation shall be made.

1018. COORDINATION OF PLANS AND SPECIFICATIONS (1504)

Coordination of Plans and Specifications shall be done in accordance with Mn/DOT Specification 1504 with the following modification:

A requirement appearing in one of the Contract documents is as binding as though the requirement appears in all. If discrepancies exist between the Contract documents, the following order of precedence applies:

1. Addenda
2. Special Provisions
3. Plans
4. Standard Plates
5. City of Inver Grove Heights Standard Specifications
6. City of Inver Grove Heights Supplementary Conditions of the Standard General Conditions of the Construction Contract
7. Standard General Conditions of the of the Construction Contract
8. Mn/DOT Supplemental Specifications
9. Mn/DOT General Specifications

If discrepancies exist between dimensions in the Contract documents, the following order of precedence applies:

1. Plan dimensions
2. Calculated dimensions
3. Scaled dimensions

Should the Contract Documents conflict with any regulations and standards of a governing authority in which compliance is mandatory, the regulations and standards shall take precedence. This shall not, however, be construed to relieve the Contractor from complying with the requirements of the Contract Documents which are in excess of, but not contrary to, the regulations and standards.

1019. CONSTRUCTION STAKES- ALIGNMENT AND GRADES (1508)

The primary line and grade will be established by the Engineer. For trench installation, line and grade stakes will be set parallel to the proposed pipeline at an appropriate offset that will best serve the Contractor's operations wherever practical. For tunnel installation, line and grade stakes will be set directly above the proposed pipeline setting.

The Contractor shall arrange operations to avoid unnecessary interference with the establishment of the primary line and grade stakes and shall render whatever assistance may be required by the Engineer in accomplishing the staking. The Contractor shall be responsible for preservation of the primary stakes and, if negligent in providing necessary protection, shall bear the full cost of any re-staking. It is the Contractor's responsibility to notify the City of destroyed or missing stakes.

The Contractor shall be solely responsible for the correct transfer of the primary line and grade to all working points and for construction of the work to the prescribed lines and grades as established by the Engineer.

No deviation shall be made from the required line or grade except with the consent of the Engineer.

Any costs for re-staking requested by the Contractor due to the negligence, lack of protection, or destruction of such staking by the Contractor (including others under planning, guidance, supervision or direction of the contractor to include, but not limited to, subcontractors, private utility companies, public works, surveyors, testing companies, etc.) shall be paid for by the Contractor in cash, prior to final payment being approved, in the amount of the invoice provided by the Surveyor and agreed to by the Engineer.

At weekly intervals the Contractor shall provide a written priority list of project segments for construction staking by the Engineer. The Engineer will schedule staking in accordance with the priority list. If any changes in the priority list are requested by the Contractor, at least 72 hours prior notice (excluding non-work days) shall be given to the Engineer for remobilization of a survey crew to perform the revised priority staking.

No additional compensation shall be allowed the Contractor for any claims of crews being held up because of lack of line and grade stakes unless the Contractor has submitted a written priority list to the Engineer at least 72 hours in advance and is following a previously approved schedule of work.

The Contractor shall, at their own expense, correct any mistakes caused by the disturbance or removal of construction stakes. The Engineer may require that work be suspended at any time when, for any reason, such marks cannot be properly followed.

1020. INSPECTION OF WORK (1511)

The Owner shall have the right to inspect the work at the job and storage site(s). The Contractor shall facilitate access to the work for the purpose of said inspection.

Defects or departures from the Contract Documents uncovered during inspections shall be corrected by the Contractor at the Contractor's expense.

1021. ACCEPTANCE (1516)

Upon written notice from the Contractor that the project is completed, the Engineer will make a preliminary inspection with the Contractor present. Upon completion of this preliminary inspection, the Engineer will notify the Contractor, in writing, of any particulars in which this inspection reveals that the work is defective or incomplete.

Upon receiving the written notice from the Engineer, the Contractor shall immediately under-take the work required to remedy defects and complete the project to the satisfaction of the Engineer.

When the Contractor has corrected or completed the items as listed in the Engineer's Written Notice, he shall inform the Engineer, in writing, that the required work has been completed. Upon receipt of this notice the Engineer, in the presence of the Contractor, shall make final inspection of the project.

Should the Engineer find all work satisfactory at the time of this inspection, the Contractor will be allowed to make application for final payment in accordance with the provisions of the Contract Documents. Should the Engineer still find dissatisfaction with the work, the Engineer will inform the Contractor of the deficiencies and will deny the Contractor's request for final payment until such time as the Contractor has satisfactorily completed the work.

1022. TESTING (1603)

The testing of materials, called for hereinafter, shall be conducted by an independent testing laboratory approved by the Engineer, except as otherwise specified. Bituminous pavement testing shall be completed by the Contractor in accordance with Mn/DOT specifications and shall be considered incidental to the Contract without any additional compensation thereof. All other tests required by the Engineer shall be ordered and paid for by the Owner at all specified locations. All tests on material to be placed shall be completed prior to the placing of any material. All retests due to failure of original tests shall be paid for by the Contractor until satisfactorily passing in accordance with the minimum requirements identified or referenced in Contract documents.

Signed copies of all reports on tests shall be sent at once to the Engineer and the Contractor. These copies shall be received by the Engineer prior to the placing of any of the tested items. Tests shall be made in accordance with the placing of any of the tested items. Tests shall be made in accordance with the American Society of Testing and Materials (ASTM) Standard and Tentative Specifications that apply, except as otherwise specified. Rejected materials shall immediately be removed from the site and shall not be used in the work. Inspections and testing shall in no way

relieve the Contractor or Supplier from responsibility in furnishing materials and workmanship in accordance with the Plans and specifications.

1023. MOBILIZATION (2021)

Mobilization, not to exceed 5% of the total bid, shall be performed in accordance with the provisions of Mn/DOT Specification 2021, amended as such:

Method of Measurement: Mobilization will be measured on the basis of a single lump sum unit.
Basis of Payment: The Contractor will be paid a lump sum price for mobilization. The lump sum price shall be payment in full for the costs of all supervision, labor, materials, equipment, overhead and profit, and performing all operations as are necessary for mobilization, all complete as specified. This item shall include the Contractor 's premium for performance and payment bonds and/or any special insurance obtained for this project; furnishing, installing and maintaining Contractor 's facilities; providing work area security; development, implementation, and maintenance of appropriate health and safety plan; providing all electrical, water, and telephone services required or needed by the Contractor to perform the work; equipment mobilization and demobilization; furnishing and installing erosion and sediment control measures not specifically paid for elsewhere in these Specifications, including dust control, street sweeping, and traffic control; temporarily relocating and replacing any signage, landscaping, or fencing necessary to complete the Work; site cleanup during and upon completion of the work; preparing and transmitting the required submittals; obtaining all permits required of the Contractor; identifying and locating utilities as necessary for the work; and all incidentals and other items not specifically paid for but included in the total scope of the Work.

1024. CLEARING AND GRUBBING (2101)

Clearing and grubbing shall be defined as removing and disposing of trees, shrubs, brush, stumps, roots, windfalls, and other plant life, including dead and decayed matter, that exists within the construction areas which are not specifically designated to remain. This work shall be done in accordance with MN/DOT Specification 2101.

The Engineer will establish the ROW lines and construction limits within which the clearing and grubbing operations are to be confined. The Contractor shall protect that which is to remain in accordance with Mn/DOT Specification 1712, and shall conduct all clearing and grubbing operations in a manner that will not damage or jeopardize the surrounding plant life and property.

1024.1 Construction Requirements

The clearing operations should consist of cutting and removing the trees, shrubs, bushes, windfalls and other vegetation in the designated areas. At the same time the Contractor should prune off, as directed, any low hanging, unsound, or unsightly branches on the trees and shrubs designated to remain. Brush should be defined as all bushes, shrubs and other vegetation that can be cut with a brush scythe or mowing machine, together with isolated trees less than the size defined as significant as defined in the method of measurement and payment section. All brush should be cut off within 6 inches of the ground surface.

The grubbing operations shall consist of removing and disposing of the stumps, roots and other remains in the designated areas. Unless otherwise permitted, stumps shall be removed completely. Except in areas to be excavated, all depressions resulting from the grubbing operations shall be backfilled with suitable material and compacted to the satisfaction of the Engineer. This work item is considered incidental to the grubbing operations. It shall be determined that the clearing and grubbing has been satisfactorily completed before permitting grading operations in a given area to start.

Any trees or shrubs within a clearing area that are designated to be preserved are to be identified and marked by the Engineer.

When so indicated on the plans or when directed by the Engineer, the Contractor shall install temporary fencing at the construction limits prior to any construction activities in order to protect vegetation or further delineate the work areas. When the proposal does not contain an estimated quantity for temporary fencing it shall be considered incidental to the Contract.

1024.2 Method of Measurement and Payment

Payment for clearing and grubbing shall be on an area, or lump sum basis, as identified on the plans or bid tab for significant trees. A significant tree is defined as a healthy deciduous tree measuring ***eight (8) inches in diameter***, or greater, at a point 4-1/2 feet above the ground surface; or a healthy coniferous tree measuring ***ten (10) feet in height***, or greater. Payment for clearing and grubbing for other than significant trees — insignificant trees, shrubs, brush, stumps, windfall, and other plant life shall be incidental. If a specific line item for area clearing and grubbing is not included in the Bid Proposal Form, the work shall be considered incidental to the Contract.

1025. EMERALD ASH BORER COMPLIANCE

The City of Inver Grove Heights is in Dakota County, which the Minnesota Department of Agriculture has placed under an Emerald Ash Borer Quarantine. Any work for any City contract is subject to the following:

The Contractor shall not market to wood industries or individuals any part of an ash (*Fraxinus* spp) tree from within the City without an Emerald Ash Borer Compliance Agreement with the Minnesota Department of Agriculture.

The Contractor shall not make ash or any hardwood species with bark attached from within the City available to the public for use as firewood. The Contractor shall not transport entire ash trees, limbs, branches, logs, chips, ash lumber with bark, stumps and roots outside of Dakota County without fulfilling the requirements of an Emerald Ash Borer Compliance Agreement with the Minnesota Department of Agriculture. The Contractor shall not transport the ash material outside of the State of Minnesota without obtaining United States Department of Agriculture Joint Emerald Ash Borer Compliance Agreement approval with the Minnesota Department of Agriculture.

The Contractor shall dispose of ash trees either in accordance with an Emerald Ash Borer Compliance Agreement or by utilizing the ash wood chips within the construction limits for erosion control, Stabilized Construction Exit pads, or landscaping purposes.

No direct compensation will be made for compliance with these requirements.

1026. LOCATION TIES FOR SEWER AND WATER COMPONENTS

The Contractor shall be required to measure a minimum of two ties to each gate valve and sewer casting within the street section. The Contractor shall make a record of all ties to in-place structures and be ready to supply them to the Engineer on request. The Contractor shall also keep one copy in the construction foreman's truck and the construction trailer at all times.

1027. MARKING FOR REMOVALS

The City will clearly mark all removals using white paint.

All ties shall be marked with white paint. The Contractor shall not mark any ties or cut lines with pink or any other color paint besides white. Pink paint will not be allowed for any marking for removals or ties.

The Contractor shall make all **scoring lines for cutting driveways** using a **chalk line**. Paint shall not be used to mark the cut line for any driveways.

1028. REMOVAL OF MISCELLANEOUS STRUCTURES AND EXCESS MATERIALS (2104, 2600.3A5)

This work shall consist of removing structures, such as pipe culverts, payments, curbs, gutters, sidewalks, guard rails, fences, mailboxes, sewer and drain tile lines, manholes, catch basins, and other miscellaneous structures.

Removal operations shall be coordinated effectively with the excavation and installation operations as will cause the least practical disruption of traffic or inconvenience to the public. The debris resulting from removals shall become the property of the Contractor and shall be disposed of by the Contractor in accordance with Mn/DOT Specification 2104. Removal debris shall not be deposited at locations that will block access to fire hydrants, private driveways, or other essential service areas, nor obstruct surface drainage. Removal and final disposal of debris shall be accomplished as a single operation wherever possible and, in any event, the debris shall be removed from the site before starting excavating operations.

The cost of removal and disposal of all miscellaneous structures and excess materials and all costs connected therewith shall be considered incidental to the contract for payment purposes unless specifically noted as a pay item in the Plans or Special Provisions, in which case there will be a pay item and a unit measure listed in the Bid Proposal.

1028.1 Construction Requirements

1028.1.1 Concrete and Bituminous Structures

Removal of concrete or bituminous structures shall be by methods producing clean-cut breakage to pre-scored lines as will preserve the remaining structure without damage. Removal equipment shall not be operated in a manner that will cause damage to the remaining structure or adjoining property.

The use of drop weight equipment for breaking pavement shall not be permitted.

1028.1.2 Concrete Pavement, Concrete Walk, and Curb and Gutter

In removing concrete pavement, concrete walk, curb, curb and gutter and other similar structures, the removal shall be to an existing joint unless otherwise shown on the plans or directed by the Engineer. If the removal is to a point where no joint exists, the structure shall be sawed along the removal lines with a concrete saw to the full depth of the concrete before breaking of the concrete. All necessary fracturing of the concrete pavement prior to removal shall be accomplished with self-propelled hydraulic or air-ram demolition hammers, the design and operation of which will be subject to the approval of the Engineer.

When breaking or removing concrete pavement adjacent to pavement that is to remain, the Contractor shall utilize extra caution so as to prevent damage to the remaining pavement. The presence of steel dowel bars or deformed tie bars may require some hand labor or special equipment to facilitate proper removal of concrete adjacent to existing pavement joints.

Existing tie bars or dowels protruding from the pavement to remain and which are to be incorporated into the new work as shown on the drawings shall be cleaned of all bonded concrete and protected from damage during the removal operations. Those tie bars and dowels which are not required in the new work shall be cut off flush with the edge of the existing pavement.

Existing electrical circuits, if any, embedded in the pavement, shall be cut clean at the removal line.

1028.1.3 Bituminous Pavement and Bituminous Curb and Gutter

When removing bituminous pavement where the cut will be exposed in the finished work, the pavement shall be sawed along the removal lines to a minimum depth of two inches prior to removal operations. The edge of the pavement to remain shall be vertical and on a true line at the time the adjoining pavement is constructed.

The removal of bituminous curb shall be incidental to the removal of bituminous pavement.

If the proposal includes an item for bituminous pavement removal, measurement will be by area in square yards regardless of thickness. If no bid item for bituminous removal is on the bid form, the removal of bituminous or asphaltic concrete pavements will not be measured for separate payment, but will be included in the common excavation quantity.

1028.1.4 Mailboxes

Mailboxes, which must be disturbed by construction, shall be relocated immediately in a temporary position as directed by the Engineer and as per United States Postal requirements. It is the Contractor's responsibility to coordinate with the local postal authority as to where the temporary location(s) shall be and to notify the postal patrons of the locations. All relocation operations shall be done in such a manner so as to cause no interruption of mail delivery. In no case shall the owner or resident be without a mailbox installation for more than 24 hours. All mailbox salvage, temporary installation and permanent reinstallation shall be incidental to the project construction with no separate compensation given. Any damaged supports or mailboxes as a result of the salvaging operation shall be replaced with new mailboxes or supports of similar style at no cost to the City.

1028.1.5 Fences

The Contractor shall remove and replace any fence within the construction limits of this Contract. This may involve, but is not limited to, relocating an existing fence and footings to a new alignment to accommodate existing right-of-way or easements. All fences shall be replaced in a condition at least equal to that which existed before construction.

1028.2 Method of Measurement and Payment

1028.2.1 Bituminous Pavement

Bituminous pavement removal shall be paid for at the Contract unit price per square yard regardless of thickness. This shall be compensation for all labor and equipment required for pavement removal. **Sawing** shall be considered **incidental** to this item unless otherwise stated in the Plans or Special Provisions.

1028.2.2 Concrete Pavement

Concrete pavement removal shall be paid for at the Contract unit price per square yard regardless of thickness. This shall be compensation for all labor and equipment required for pavement removal. **Sawing** shall be considered **incidental** to this item unless otherwise stated in the Plans or Special Provisions.

1028.2.3 Remove Concrete Walk

Concrete walk removal shall be paid for at the Contract unit price per square foot regardless of thickness. This shall be compensation for all labor and equipment required for pavement removal. **Sawing** shall be considered **incidental** to this item unless otherwise stated in the Plans or Special Provisions.

1028.2.4 Concrete Curb and Gutter

Concrete curb and gutter shall be paid for at the Contract unit price per lineal foot of curb measured along the face of curb. **Sawing** shall be considered **incidental** to this item unless otherwise stated in the Plans or Special Provisions.

1028.2.5 Sawing

- Where a bid item is included bituminous sawing shall be paid for at the Contract unit price per lineal foot regardless of thickness.
- Where a bid item is included concrete sawing shall be paid for at the Contract unit price per lineal foot regardless of thickness.

1029. STREET SWEEPER WITH PICKUP BROOM (2123)

“Street Sweeper with Pickup Broom” shall consist of promptly cleaning the streets of debris deposited or tracked by trucks hauling and construction activities. **Tracked sediments shall be swept at the end of each working day unless otherwise directed by the Engineer.** The contract unit price for “Street Sweeper with Pickup Broom” shall be compensation for all labor, equipment and materials required to complete this work and shall include disposal of all material collected by the sweeping operations. Measurement will be made at the contract unit price per hour (HR), and shall only include hours billed (not including travel time) **and** noted in the log book kept by the Erosion Control Supervisor.

1030. WATER USAGE ALLOWANCE (2130)

The Contractor may purchase water from the City and be reimbursed through the contract up to, but not exceeding, the amount provided in the lump sum amount on the bid form. In the event that no bid item is present, water used on the project is considered incidental and there will be no direct compensation thereof.

1030.1 Materials

Water used for on the project for construction related activities, such as but not limited to, dust control, watering turf, and construction equipment water needs or as approved by Engineer. Water from sources other than The City of Inver Grove Heights Utility Department will not be accepted for reimbursement.

1030.2 Construction Requirement

The Contractor shall obtain the required Hydrant Usage Permit from the City before utilizing water for construction use. The Contractor requesting the permit for water usage will be supplied a meter and hydrant location for withdrawing the metered water.

1030.3 Method and Measurement of Payment

There will be a Lump Sum WATER USAGE ALLOWANCE bid item in the amount shown in the unit bid price on the bid form. The Utility Department will invoice the permitted Contractor the current Water Usage Charge per 1,000 gallons as itemized on the Hydrant Permit in the Appendix. The Contractor shall pay the invoices and submit receipts from the Utility Department for payment to be included on subsequent pay estimates. The Contractor will be

paid ONLY for the amount of water used, up to the unit bid price shown on the bid form. Only the City's Water Usage Charge will be reimbursed by the WATER USAGE ALLOWANCE. The Contractor is responsible for the Permit Deposit amount, daily Hydrant/Meter Rental fee, and any charges for damages with no compensation or reimbursement thereof.

1031. TRENCH EXCAVATION AND BACKFILL

This work shall consist of the excavation and backfilling for the purposes of installing new and or relocating or adjusting existing underground utilities.

1031.1 Materials (2600.2)

1031.1.1 Granular Material (3149, 2600.2A)

Granular materials furnished for foundation, bedding, encasement, backfill, or other purposes as may be specified shall consist of any natural or synthetic mineral aggregate such as sand, gravel, crushed rock, crushed stone, or slag, that shall be so graded as to meet the gradation requirements specified herein for each particular use by the material manufacturer or as indicated in the Plans, Specifications, or Special Provisions.

A. Granular Material Use Designations (2600.2A2)

Granular materials provided for Foundation, Bedding, Encasement, or Backfill use as required by the Plans, Specifications, and Special Provisions, either as part of the pipe item work unit or as a separate contract item, shall be classified as to use in accordance with the following:

Material Use Designation

Zone Designation

Granular Foundation-----	Placed below the bottom of pipe grade as replacement for unsuitable or unstable soils, to achieve better foundation support.
Granular Bedding-----	Placed below the pipe midpoint, prior to pipe installation, to facilitate proper shaping and to achieve uniform pipe support.
Granular Encasement-----	Placed below an elevation one foot above the top of pipe, after pipe installation, for protection of the pipe and to assure proper filling of voids or thorough consolidation of backfill.

Granular Backfill----- Placed below the surface base course, if any, as the second stage of backfill, to minimize trench settlement and provide support for surface improvements.

In each case above, unless otherwise indicated, the lower limits of any particular zone shall be the top surface of the next lower course as constructed. The upper limits of each zone are established to define variable needs for material gradation and compaction or void content, taking into consideration the sequence of construction and other conditions. The material use and zone designations described above shall only serve to fulfill the objectives and shall not be construed to restrict the use of any particular material in other zones where the gradation requirements are met.

B. Granular Material Gradation Classification (3149.2, 2600.2A1)

Granular materials furnished for use in Foundation, Bedding, Encasement, or Backfill construction shall conform to the following requirements:

“Foundation material” (Coarse Filter Aggregate) shall meet Mn/DOT Specification 3149.H with the following modification: material shall have 100 percent by weight passing the 1-1/2 inch versus 100 percent by weight passing the 1 inch sieve. “Coarse Filter Aggregate” and “Foundation Material” shall hereby be used interchangeably and shall conform to these specifications.

Bedding and encasement materials for flexible pipe, where improved pipe foundation is not required, shall meet the requirements of Mn/DOT Specification 3149.2.B.1, Granular Borrow, with the following addition: 100 percent by weight shall pass the one-inch sieve.

Backfill materials shall consist of existing trench materials, except as otherwise specified in this specification or in the Special Provisions.

A gradation report from an approved Independent Testing laboratory of the proposed granular materials shall be furnished to the Engineer before any of the granular materials are delivered to the project.

1031.1.2 Piling (2452, 2600.2B)

Piling shall be constructed in accordance with the provisions of Mn/DOT Specification 2452 and special plan details relating to piling.

1031.1.3 Insulation (3760, 2600.2C)

Main Insulation shall be extruded rigid board material having a thermal conductivity of 0.23 BTU/hour/square foot/degree Fahrenheit/inch thickness, maximum, at 40 degrees F mean, a comprehensive strength of 35 psi minimum, and water absorption of 0.25 percent by volume minimum. Unless otherwise specified in the Plans, Specifications, or Special Provisions, board dimensions shall measure 8 feet long, 2 or 4 feet wide, and 1, 1-1/2, 2, or 3 inches thick.

1031.1.4 Geotextile Fabric (3733, 2600.2D)

Geotextile fabric shall meet the requirements of Mn/DOT Specification 3733 and be used as required by the Plans, Specifications, and Special Provisions.

1031.2 Construction Requirements

1031.2.1 Establishing Line and Grade (2600.3A2)

For trench installation, line and grade stakes will be set parallel to the proposed pipeline at an appropriate offset that will best serve the Contractor's operations wherever practical. For tunnel installation, line and grade stakes will be set directly above the proposed pipeline setting. Grade and line stakes will be set at 25-foot intervals along the pipeline; at each change in line or grade; and as needed for pipeline appurtenances and service lines.

The Contractor shall be solely responsible for the verification and correct transfer of the primary line and grade to all working points and for construction of the work to the prescribed lines and grades as established by the Engineer. If a discrepancy is found in any of the construction stakes, it shall be reported to the Engineer immediately, and work shall not proceed until the discrepancy has been corrected. Following construction of a work shaft on tunnel installations, the line and grade shall be transferred down the shaft and be projected into and throughout the length of each tunnel heading.

Unless otherwise specified in the Plans, Specifications, and Special Provisions, the water main shall generally be placed with the minimum specified cover. However, a greater depth may be required to clear existing storm and sanitary sewers and sewer services, and no additional compensation shall be provided for such adjustments.

In locations where sewer is in direct conflict with existing water main and water services the water main and water services shall be lowered to provide at least 18 inches of vertical distance between the top of the water main or service and the bottom of the sanitary or relocated in accordance with the Plans.

Water mains crossing above storm or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer. When local conditions prevent a vertical separation as described, the following construction shall be used:

- Sewers passing over or under water mains shall be constructed of materials equal to water main standards of construction for a distance of at least 9 feet on either side of the water main.
- Water main passing under sewers shall, in addition, be protected by providing:
 - A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main.
 - Adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking of the water mains.
 - A length of water pipe shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.

Water mains shall be laid at least 10 feet horizontally from any sanitary sewer or storm sewer, whenever possible. When local conditions prevent a horizontal separation of 10 feet, a water main may be laid closer to a storm or sanitary sewer provided that:

- The bottom of the water main is at least 18 inches above the top of the sewer.
- Where this vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure water tightness prior to backfilling.

1031.2.2 Excavation and Preparation of Trench (2105, 2600.3B)

All excavation shall be accomplished in a careful and workmanlike manner as to limit the area of surface disturbance to a minimum. Excessive surface disturbance due to poor workmanship or carelessness shall be replaced by the Contractor at no cost to the City.

A. Operational Limitations and Requirements (2600.3B1)

Excavating operations shall proceed only so far in advance of pipe laying as will satisfy the needs for coordination of work and permit advance verification of unobstructed line and grade as planned. Utility conflicts which may occur shall be dealt with according to the requirements of Section 1011.2.1 of this Specification (“Establishing Line and Grade”).

All installations shall be accomplished by open trench construction except for short tunnel sections approved by the Engineer and with the exception that boring and jacking or tunnel construction methods shall be employed where so specifically required by the Plans, Specifications, or Special Provisions.

Installation of pipe through tunnel excavations shall be allowed only where the surface structure can be properly supported and the backfill restored to the satisfaction of the Engineer.

Wherever the excavation extends under or approaches so close to an existing structure as to endanger it in any way, precautions and protective measures shall be taken as necessary to preserve the structure and provide temporary support. Hand methods of excavating shall be utilized to probe for and expose such critical or hazardous installations as gas pipe and power or communication cables.

The Engineer shall be notified of any need for blasting to remove materials which cannot be broken up mechanically, and there shall be no blasting operations conducted until the Engineer’s approval has been secured. Blasting will be allowed only when proper precautions are taken to protect life and property, and then shall be restricted as the Engineer directs. The hours of blasting operations shall be set by the Owner. The Contractor shall assume full responsibility for any damages caused by blasting, regardless of the requirements for notification and approval. The Contractor shall secure any required permits for blasting and shall conduct blasting operations in conformance with all applicable local, state and federal laws, regulations, and ordinances.

B. Classification and Disposition of Materials (2600.3B2)

Excavated materials will be classified for payment only to the extent that the removal of materials classified by the Engineer as rock will be paid for as provided in the Special Provisions or shown in the Proposal. All other materials encountered in the excavations, with the exception of items classified for payment as structure removals, will be considered as Unclassified Excavation and unless otherwise specified in the Plans, Specifications, and Special Provisions, no additional compensation shall be provided for their removal.

Unclassified materials shall include muck, rubble, wood debris, and boulder stone, masonry or concrete fragments less than one cubic yard in volume, together with other miscellaneous matter that can be removed effectively with power operated excavators without resorting to drilling and blasting.

Rock excavation shall be as defined in Mn/DOT Specification 2105.2A2.

Excavated materials will be classified for reuse as being either suitable or unsuitable for backfill or other specified use, subject to selective controls. All suitable materials shall be reserved for backfill to the extent needed, and any surplus remaining shall be utilized for other construction on the project as may be specified or ordered by the Engineer.

Material handling and stockpiling of reusable materials shall be considered incidental with no additional compensation provided. All materials considered unsuitable by the Engineer, for any use on the project, shall be immediately removed from the project and be disposed of as arranged for by the Contractor at no extra cost to the City.

C. Excavation Limitations and Requirements (2600.3B3)

Trench excavating shall be to a depth that will permit preparation of the foundations as specified and installation of the pipeline and appurtenances at the prescribed line and grade, except where alterations are specifically authorized. Trench widths shall be sufficient to permit the pipe to be laid and joined properly and the backfill to be placed and compacted as specified. Extra width shall be provided as necessary to permit convenient placement of sheeting and shoring and to accommodate placement of appurtenances.

Excavations shall be extended below the bottom of structure as necessary to accommodate any required Granular Foundation material. When rock or unstable foundation materials are encountered at the established grade, additional materials shall be removed as specified or ordered by the Engineer to produce an acceptable foundation. Unless otherwise indicated or directed, rock shall be removed to an elevation at least six inches below the bottom surface of the pipe barrel and below the lowest projection of joint hubs. All excavations below grade shall be to a minimum width equal to the outside pipe diameter plus two feet. Rock shall be removed to such additional horizontal dimensions as will provide a minimum clearance of one foot on all sides of appurtenant structures such as valves, housings, access structures, etc.

Where no other grade controls are indicated or established for the pipeline, the excavating and foundation preparations shall be such as to provide a minimum cover over the top of the pipe as specified. Trench widths shall allow for at least six inches of clearance on each side of the joint hubs. The maximum allowable width of the trench at the top of pipe level shall be the outside diameter of the pipe plus two feet, subject to the considerations for alternate pipe loading set forth below. The width of the trench at the ground surface shall be held to a minimum to prevent unnecessary destruction of the surface structures.

The maximum allowable trench width at the level of the top of pipe may be exceeded only by approval of the Engineer, after consideration of pipe strength and loading relationships. Any alternate proposals made by the Contractor shall be in writing, giving the pertinent soil weight data and proposed pipe strength alternate, at least seven days prior to the desired date of decision.

If the trench is excavated to a greater width than that authorized, the Engineer may direct the Contractor to provide a higher class of bedding and/or a higher strength pipe than that required by the Plans, Specifications, and Special Provisions in order to satisfy design requirements, without additional compensation.

D. Sheet piling and Bracing Excavations (2600.3B4)

All excavations shall be sheeted, shored, and braced as will meet all requirements of the applicable safety codes and regulations; comply with any specific requirements of the Contract; and prevent disturbance or settlement of adjacent surfaces, foundations, structures, utilities, and other properties. Any damage to the work under contract or to adjacent structures or property caused by settlement, water or earth pressures, slides, cave-ins, or other causes due to failure or lack of sheet piling, shoring, or bracing or through negligence or fault of the Contractor in any manner shall be repaired at the Contractor's expense and without delay.

The Contractor shall assume full responsibility for proper and adequate placement of sheet piling, shoring, and bracing, wherever and to such depths that soil stability may dictate the need for support to prevent displacement. Bracing shall be so arranged as to provide ample working space and so as not to place stress or strain on the in-place structures to any extent that may cause damage.

Sheet piling, shoring and bracing materials shall be removed only when and in such manner as will assure adequate protection of the in-place structures and prevent displacement of supported grounds. Sheet piling and bracing shall be left in place only as required by the Plans, Specifications, and Special Provisions or ordered by the Engineer. Otherwise, sheet piling and bracing may be

removed as the backfilling reaches the level of respective support. Wherever sheeting and bracing is left in place, the upper portions shall be cut and removed to an elevation of three feet or more below the established surface grade as the Engineer may direct.

All costs of furnishing, placing and removing sheeting, shoring, and bracing materials, including the value of materials left in place as required by the Contract, shall be included in the prices bid for pipe installation and will not be compensated separately. When any sheeting, shoring, or bracing materials are left in place by written order of the Engineer, in the absence of specific requirements of the Contract to do so, payment will be made for those materials as an Extra Work item, including waste material resulting from upper cut-off requirements.

E. Preparation and Maintenance of Foundations (2600.3B5)

Foundation preparations shall be conducted as necessary to produce a stable foundation and provide continuous and uniform pipe bearing between bell holds. The initial excavating or backfilling operations shall produce a subgrade level slightly above finished grade as will permit hand shaping to finished grade by trimming of high spots and without the need for filling of low spots to grade. Final subgrade preparations shall be such as to produce a finished grade at the centerline of the pipe that is within 0.03 foot of a straight line between pipe joints and to provide bell hold excavation at each joint as will permit proper joining of pipes and fittings.

In excavations made below grade to remove rock or unstable materials, the backfilling to grade shall be made with available suitable materials unless placement of Granular Foundation or Bedding material is specified and provided for or is ordered by the Engineer. Placement of the backfill shall be in relatively uniform layers not exceeding 8 inches in loose thickness. Each layer of backfill shall be compacted thoroughly, by means of approved mechanical compaction equipment, as will produce uniform pipe support throughout the full pipe length and facilitate proper shaping of the pipe bed.

Where placement of foundation materials will not provide an adequate foundation for laying pipe due to the instability of the existing materials and where ordered by the Engineer, the Contractor shall place Geotextile Type I fabric on top of the unstable materials prior to placing foundation materials. Sufficient geotextile fabric shall be used to completely enclose the foundation materials and pipe.

It shall be the Contractor's responsibility to notify the Engineer of changing soil conditions which may be of poor bearing capacity and when organic soils are encountered. Where utilities are placed on unstable soils without notification of the Engineer, the Contractor shall be responsible for all repairs and correction of the installation without further compensation.

Where the foundation soil is found to consist of materials that the Engineer considers to be so unstable as to preclude removal and replacement to a reasonable depth to achieve solid support, a suitable foundation shall be constructed as the Engineer directs in the absence of special requirements in the Plans, Specifications, and Special Provisions. The Contractor may be required to furnish and drive piling and construct concrete or timber bearing supports or other work as may be ordered by the Engineer.

Care shall be taken during final subgrade shaping to prevent any over-excavation. Should any low spots develop, they shall only be filled with approved material, which shall have optimum moisture content and be compacted thoroughly without additional compensation to the Contractor. The finished subgrade shall be maintained free of water and shall not be disturbed during pipe lowering operations except as necessary to remove pipe slings.

The discharge of trench dewatering pumps shall be directed to natural drainage channels or storm water drains. Draining trench water into sanitary sewers or combined sewers will not be permitted.

The Contractor shall install and operate a dewatering system of wells or points to maintain pipe trenches free of water wherever necessary or as directed by the Engineer to meet the intent of these specifications. Unless otherwise specified in the Plans, Specifications, and Special Provisions, such work shall be considered incidental.

All costs of excavating below grade and placing foundation or bedding aggregates as required shall be included in the bid prices for pipe items to the extent that the need for such work is indicated in the Contract provisions and the Proposal does not provide for payment under separate Contract Items. Any excavation below grade and any foundation or bedding aggregates required by order of the Engineer in the absence of Contract requirements will be compensated for separately.

If examination by the Engineer reveals that the need for placement of foundation aggregate was caused by the Contractor's manipulation of the soils in the presence of excessive moisture or lack of proper dewatering, the cost of the corrective measures shall be borne by the Contractor.

1031.2.3 Placement of Insulation (2600.3D)

Rigid insulation board shall be placed within the pipe encasement zone, 6 inches above the pipe. Prior to placement of the insulation, Granular Borrow (Mn/DOT 3149) shall be leveled and compacted until there is no further visual evidence of increased consolidation or the density of the compacted layer conforms to the density requirements specified in the Special Provisions, then leveled and lightly scarified to a depth of 1/2 inch. Borrow material placed above and below the insulation shall be free of rock or stone fragments measuring 1-1/2 inches or greater.

Insulation boards shall be placed on the scarified material with the long dimension parallel to the centerline of the pipe. Boards shall be placed in a single layer with tight joints. No continuous joints or seams shall be placed directly over the pipe. If two or more layers of insulation boards are used, each layer shall be placed to cover the joints of the layer immediately below.

The Contractor shall exercise precaution to ensure that all joints between boards are tight during placement and backfilling with only extruded ends placed end to end or edge to edge.

The first layer of material placed over the insulation shall be 6 inches in depth, free of rock or stone fragments measuring 1-1/2 inches or greater. The material shall be placed in such a manner that construction equipment does not operate directly on the insulation and shall be compacted with equipment which exerts a contract pressure of less than 80 psi. The first layer shall be compacted to conform to the density requirements specified in the Special Provisions.

1031.2.4 Pipeline Backfilling Operations (2451.3.D, 2600.3E)

All backfill shall be compacted as required by Mn/DOT Specification 2105.3.F.1 "Specified Density Method". All trenches shall be compacted in maximum two (2) foot lifts. The required density of trench backfill shall be 95% of maximum density except that the top three (3) feet shall be compacted to 100% of maximum density.

Until expiration of the warranty period, the Contractor shall assume full responsibility and expense for all backfill settlement and shall refill and restore the work as directed to maintain an acceptable surface condition, regardless of location.

The backfilling operations shall be started as soon as conditions will permit on each section of pipeline, so as to provide continuity in subsequent operations and restore normal public service as soon as practicable on a section-by-section basis. All operations shall be pursued diligently, with proper and adequate equipment, as will assure acceptable results.

The backfilling shall be accomplished with the use of Suitable Materials from the excavated materials to the extent available and practical. Should the materials available within the trench section be unsuitable or insufficient, without loading and hauling or the employment of unreasonable measures, the required additional materials shall be furnished from outside sources as an Extra Work item in the absence of any Special Provision requirements.

Suitable Material shall be defined as a mineral soil free of foreign materials (rubbish, debris, etc.), frozen clumps, oversize stone, rock, concrete or bituminous chunks, and other unsuitable materials, that may damage the pipe installation, prevent thorough compaction, or increase the risks of after settlement unnecessarily.

Material selection shall be such as to make the best and fullest utilization of what is available, taking into consideration particular needs of different backfill zones. Material containing stone, rock, or chunks of any sort shall only be utilized where and to the extent there will be no detrimental effects.

Within the pipe bedding and encasement zones described as that portion of the trench which is below an elevation one foot above the top of the pipe, the materials placed shall be limited in particle size to 1-1/2 inches maximum in the case of pipe of 12 inches in diameter or less and to 2 inches maximum in the case of larger pipe. Above these zones, the placement of material containing stones, boulders, chunks, etc. greater than 8 inches in any dimension shall not be allowed.

All flexible pipes shall be bedded in accordance with ASTM Specification D2321, "Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe". This shall include placement of granular bedding and encasement materials from a point six inches below the bottom of pipe to a point twelve inches above the top of the pipe.

Placement and compaction of bedding and encasement materials around the pipe shall be considered incidental to the installation of the pipe. Where existing soils do not meet the requirements of bedding and encasement materials, the Contractor shall furnish the required granular materials.

Compaction of materials placed within the pipe bedding and encasement zones shall be accomplished with portable or hand equipment methods, so as to achieve thorough consolidation under and around the pipe and avoid damage to the pipe. Above the cover zone material, the use of heavy roller type compaction equipment shall be limited to safe pipe loading.

Backfill materials shall be carefully placed in uniform loose thickness layers up to 12 inches thick spread over the full width and length of the trench section to provide simultaneous support on both sides of the pipeline. Granular backfill may be placed in 12-inch layers above an elevation one foot above the top of the pipe, and with the provision that, by authority and at the discretion of the Engineer in consideration of the demonstrated capability of special type vibrating compactors, the stated maximums may be increased.

All surplus or waste materials remaining after completion of the backfilling operations shall be disposed of in an acceptable manner within 24 hours after completing the backfill work on each particular pipeline section. Disposal at any location within the project limits shall be as specified, or as approved by the Engineer; otherwise, disposal shall be accomplished outside the project limits at the Contractor's discretion. The backfilling and surplus or waste disposal operations shall be a part of the work required under the pipeline installation items, not as work that may be delayed until final cleanup.

1031.3 Method of Measurement and Payment

All items will be measured separately according to design designation as indicated in the Pay Item name and as may be detailed and defined in the Plans, Specifications, or Special Provisions. Complete-in-Place items shall include all component parts described or required to complete the unit, but excluding any excesses covered by separate Pay Items.

1031.3.1 Special Backfill Materials

When special aggregate backfill materials are required to be furnished and placed to comply with the indicated laying conditions, the costs shall be included for payment as part of the pipe items without any direct compensation. Otherwise, the furnishing of aggregate materials for backfill by order of the Engineer in the absence of such requirements will be compensated for as an extra work item.

1031.3.2 Granular Materials

Granular materials furnished for foundation, bedding, cover, or backfill placement as specified in connection with pipe or structure items will only be paid for as separate Contract Items to the extent that the Proposal contains specific Pay Items. Otherwise the furnishing and placing of granular materials as specified shall be incidental to the pipe or structure item without any direct compensation being made.

1031.3.3 Geotextile Fabric

Where geotextile fabric is used for improving pipe foundation, it shall be measured and paid by the square yard of material installed.

1031.3.4 Piling

Piling shall be measured according to the provisions of Mn/DOT Specification 2452.

1031.3.5 Insulation

Rigid board insulation shall be measured and paid on a square yard basis installed to the specified thickness noted on the Plans, Specifications, and Special Provisions and shall include all materials, equipment, and labor required for placement.

1032. NON-OPEN CUT PIPE INSTALLATION (2600.3C)

Pneuma Gopher pipe installation shall **not** be allowed within City right of way.

The terms “auger”, “boring”, “jack”, “jacking”, and “tunneling” refer only to non-open cut construction. The Contractor shall inspect and verify soil conditions to his own satisfaction in order to determine the type of construction to employ. During the construction, the Contractor shall be responsible for protecting all existing utilities above the pipe invert.

1032.1 Materials

Steel casing pipe for jacking-boring shall conform to ASTM Designation A252, Grade 2 or ASTM Designation A139, Grade B. The casing pipe shall have minimum thickness as follows:

<u>Nominal Casing Size</u>	<u>Outside Diameter (inches)</u>	<u>Minimum Shell Thickness (inches)</u>
12	12-3/4	0.250
14	14	0.282
16	16	0.282
18	18	0.312
20	20	0.343
22	22	0.375
24	24	0.403
26	26	0.438
28	28	0.469
30	30	0.469
32	32	0.500
34	34	0.532
36	36	0.532
38	38	0.532
40	40	0.563
42	42	0.563

Where shown on the Plans, the Contractor shall be required to install an augured in-place casing to the type, material, and diameter as specified.

1032.2 Construction Requirements

1032.2.1 Jacking/ Boring (2600.3C1)

The minimum diameter of the casing pipe shall be four (4) inches greater than the outside diameter of the bell of the carrier pipe. For any installation beneath a railroad, the top of the casing pipe shall not be closer than the specified dimensions indicated in the permit.

If the Contractor elects to install steel casing, the minimum wall thickness shall be as stated in this Specification. Where required by the Engineer, two 17-pound anode packs shall be attached to the casing for corrosion protection.

A 1-1/2-inch pipe shall be forced along the top of the casing pipe. The front end of this pipe shall be 18 inches behind the front end of the casing pipe. A mixture of water and bentonite clay shall be forced through this pipe at all times during the casing installation to fill any voids that may be present above the casing pipe. Upon completion of the casing installation, this pipe shall be slowly withdrawn while bentonite is forced through the pipe to fill any remaining voids.

The Contractor shall prevent excavated materials from flowing back into the excavation during the non-open cut construction. This shall include the use of a shield conforming to the size and shape of the casing that will prevent materials from flowing into the leading edge of the casing. The machine used shall be capable of controlling line and grade and shall conform to the size and shape of the casing pipe.

No jacking/auguring of pipe will be allowed below the water tables unless the water table has been lowered sufficiently to keep the water below the pipe being installed. The use of water under pressure (jetting) or puddling will not be permitted to facilitate jacking/auguring operations.

If any installation is augured, the head shall be approved by the Engineer and the auger shall be located six (6) inches behind the lead edge of the casing or carrier pipe.

If a void develops, the jacking/auguring shall be stopped immediately, and the void shall be filled by pressure grouting. The grout material shall consist of sand-cement slurry of at least two sacks of cement per cubic yard and a minimum of water to assure satisfactory placement.

Ranger II casing spacers or an approved equivalent shall be used as necessary to install the carrier pipe to the proper line and grade inside the casing pipe. The casing pipe shall be sealed at both ends with a suitable material to prevent water or debris from entering the casing pipe.

1032.2.2 Directional Boring (2600.3C2)

Direction boring installation shall be accomplished where required on the Plans or in the Special Provisions to minimize disturbance of existing surface improvements. The installer shall have a minimum of three years of experience in this method of construction and have installed at least 1,000 feet of 8-inch or larger diameter pipe to specified grades. The field supervisor employed by the Contractor shall have at least three years of experience and shall be at the site at all times during the boring/drilling installation, and be responsible for all of the work.

The Contractor shall submit boring/drilling pit locations to the Engineer before beginning construction.

The drilling equipment shall be capable of placing the pipe as shown on the plans. The installation shall be by a steerable drilling tool capable of installing continuous runs of pipe, without intermediate pits, a minimum distance of 200 feet. The guidance system shall be capable of installing pipe within 1-1/2 inch of the plan vertical dimensions and 2 inches of the plan horizontal dimensions. The Contractor shall be required to remove and reinstall pipes which vary in depth and alignment from these tolerances.

Pull back forces shall not exceed the allowable pulling forces for the pipe being installed. Drilling fluid shall be a mixture of water and bentonite clay. Disposal of excess fluid and spoils shall be the responsibility of the Contractor.

1032.3 Method of Measurement and Payment.

Jacking/ boring and directional boring shall be measured and paid for at the Contract unit price per lineal foot. Payment shall be full compensation for provision of the casing complete and installed to the grade and in the location as shown on the Plans.

1033. EXCAVATION (2105)

In general, excavation shall be performed in accordance with MN/DOT Specification 2105.

Excavation shall consist of removing, to the designated elevation or profile as shown on the Plans or directed by the Engineer, existing materials including soil, gravel, previously constructed surface including bituminous and concrete, trees not paid as “Clearing and Grubbing”, shrubbery, and any other material not specifically noted as a pay item in the Bid Proposal.

1033.1 Construction Requirements

1033.1.1 Common Excavation (P)

“Common Excavation” shall be measured from the top of the existing surface down to the bottom of proposed plan excavation for the purpose preparing the subgrade for: the planned roadway grades, elevation, and section (granular material, aggregate material, curb, shoulders, ditches and/or pavement); the proposed turf grades, elevation and section (borrow material,

topsoil, and/or sod or seed) ; and the proposed driveway, path, and walk grades, elevation and section (granular material, aggregate material, and/or pavement). Existing curb, pavement, aggregate material, rock, topsoil, soils, turf, and vegetation are included in the plan (P) quantity for Common Excavation when such materials are within above the top of subgrade elevation as shown on the plan. Removal and stockpiling of existing organic material, topsoil and vegetation is considered incidental to common excavation. Unless otherwise provided for in the Plans or Special Provisions, existing topsoil and organic material shall be disposed of by the Contractor and shall not be reused within the project limits.

Any other reusable materials generated during the work, such as aggregate and granular materials shall be segregated from other waste materials and be stockpiled so as to maintain suitability and permit proper reuse. Stockpile locations are to be provided by the Contractor with the approval of the Engineer. Bituminous materials, concrete, sod, and other materials not suitable for trench backfilling shall be disposed of by the Contractor at no additional cost to the City unless specified on the plans or in the specifications as a pay item and shall include all costs involved in removing and disposing of material. All other excavated materials found suitable for reuse on the Project, shall be replaced in the trench and compacted by mechanical means as approved by the Engineer.

Excavated material shall not be deposited so close to the edges of the excavations so as to create hazardous conditions, nor shall any material be placed so as to block the access to emergency services. Excavated materials shall be placed in areas that will not block existing pedestrian or vehicle traffic when possible.

Slopes shall be cut as shown on the Plans and shall be neatly bladed and raked.

Private driveways shall be graded as directed by the Engineer. Before fine grading for curb and gutter, all existing driveways shall be excavated or filled to the proposed subgrade elevation and opened for access at all times. Driveways shall be constructed with material as similar as possible to that existing prior to the start of construction.

During construction, all excavations shall be maintained in such condition that they will be well drained and properly protected from erosion at all times. Temporary ditches or gutters shall be constructed when necessary to maintain drainage and avoid damage to the roadway or adjacent property. No excavated material shall be placed or stockpiled in a manner as to restrict free surface drainage of the subgrade, base course, or adjacent property.

1033.1.2 Subgrade Excavation

Subgrade excavation shall be defined as the volume of material excavated below the common excavation. The subgrade excavation shall start at the beneath the aggregate base or common excavation depths shown on the plans, whichever is greater. Subgrade excavation is additional excavation required to remove unsuitable material as designated by the Engineer.

1033.2 Method of Measurement and Payment

1033.2.1 Common Excavation (2105.2A1)

“Common Excavation” will be paid for at the Contract unit price per cubic yard, and shall include all excavation, compacting, disposal of excess materials including excess soil from utility installation, and maintenance work. Excavation will be measured in its original position by cross-section method, and the volume computed by the method of average end areas, unless the Common Excavation item in the Contract is given a (P) designation, in which case, measurement will be by Plan quantity only.

1033.2.2 Subgrade Excavation (2105.2A4)

Subgrade excavation shall be measured by cross-section volume in its original position (excavated volume, EV).

“Subgrade Excavation” shall be paid for at the Contract unit price per cubic yard excavated volume. Payment will be for all items incidental to construction including, but not limited to, labor and equipment required for excavation and proper disposal of unsuitable material.

1034. BASE PREPARATION AND TEST ROLLING (2105, 2111)

Base preparation and test rolling shall be done prior to curb and gutter construction, placing of gravel base, sand-gravel sub-base, plant mixed bituminous base, or as directed by the Engineer on all streets unless otherwise noted on the plans.

Test rolling shall be performed in accordance with Mn/DOT Specification 2111. In lieu of the rolling equipment specified in 2111, a tandem truck, loaded with a minimum of 14 tons, may be used upon approval of the Engineer. This truck will be driven near the curb and gutter locations on both sides of the roadway and in other locations the Engineer may direct. The furnishing of a fully loaded tandem with driver is considered incidental to the contract and no direct compensation will

be made therefore.

1035. AGGREGATE BASE (2211)

1035.1 Materials

Aggregate base for street construction shall meet the appropriate material and gradation requirements of Mn/DOT Specification 3138 for Class 5, depending on the type of aggregate used, but in no case shall the aggregate contain more than 25% recycled concrete.

The Contractor shall furnish the Engineer with a written statement as to the source of the material and at the request of the Engineer shall deliver a 30- pound representative sample of the intended furnished material, not less than five working days in advance of placement of said material. Change of source shall not be made without approval of the Engineer.

1035.2 Construction Requirements

The subgrade shall be prepared in accordance with Section 1013 of these Specifications (“Excavation”). Aggregate base shall only be placed on subgrade which is at optimum moisture content.

Aggregate base shall be constructed in lifts not to exceed six inches in compacted thickness. Each lift shall be shaped and compacted separately. The Contractor shall take care to avoid segregation of aggregate due to excess movement during shaping operations.

After the material is placed on the roadway, it shall be shaped approximately to the grade and cross-section as shown on the Plans. No aggregate shall be placed on the roadway that cannot be compacted within 24 hours.

Compaction shall be done with approved vibratory compactor capable of imparting a compactive force of at least 15 tons, and shall continue until there is no evidence of further compaction. Water shall be added, as approved by the Engineer, to obtain maximum compaction. Water used for the purpose of compaction shall be incidental to this item.

The entire surface shall be compacted as specified in Mn/DOT 2211.3C.

After compaction, the surface of the base shall be smooth and true to crown and grade as shown on the Plans. The thickness shall not vary more than one-half inch from that shown on the Plans.

Any settlement of road surfaces that are either placed under this Contract or by others under either public or private contract; that are in excess of one inch, as measured by a ten-foot straight edge; and that are within the guarantee period shall be considered failure of the mechanical compaction. The Contractor shall be required to repair such settlement including all items placed by others.

1035.3 Method of Measurement and Payment

“Aggregate Base” (of each class specified) shall be paid for at the Contract unit price per ton delivered and compacted in place. Aggregate material shall be weighed on an approved scale and the weights recorded on a weighted ticket approved by the Engineer. A copy of the scale weight tickets for the day’s run shall be furnished to the Engineer at the end of each working day and shall indicate if the material has been placed on a state aid or a non-state aid street or streets, the class of material, and the date. No payment for Aggregate Base shall be made unless these tickets have been received and approved by the Engineer within two working days of placement of the material within the Work. Weight of trucks shall be controlled so that no damage will be inflicted on the Work, adjacent streets or any haul road. The Contractor shall be responsible for the damage due to hauling material.

1036. AGGREGATE DRIVEWAYS (2211)

Where noted on the plans, it shall be necessary to restore disturbed gravel driveways with in-kind driveway aggregate material.

1036.1 Materials

Driveway Rock shall conform to one of the following classifications, and the Contractor shall furnish and install the type of "Driveway Rock" most closely matched texture and color to the existing driveway as determined by the Engineer:

- Three-Quarter Inch (3/4") Minus shall be 100 percent crushed quarry stone conforming to the Modified Class 5 gradation except that 100 percent shall pass the one-inch sieve.
- Three-Quarter Inch (3/4") Clear shall be 100 percent crushed quarry stone with 100 percent passing the one-inch (1") sieve and zero (0) percent passing the one-half inch sieve.
- Ornamental Rock shall be a broad classification for a unique driveway rock encountered in a project and the Contractor shall furnish an identical rock to match the existing material insofar as is available.

1036.2 Construction Requirements

Aggregate materials shall be placed and compacted on an Engineer-approved subgrade at the optimum moisture content. The subgrade shall be prepared in accordance with Section the Excavation Specifications section. The subgrade aggregate depth shall be 6-inches compacted or match the existing aggregate depth, whichever is greater.

Aggregate shall be constructed in lifts not to exceed six inches in compacted thickness. Each lift shall be shaped and compacted separately. The Contractor shall take care to avoid segregation of aggregate due to excess movement during shaping operations. The driveway shall be shaped approximately to the grade and cross-section as shown on the Plans. No aggregate shall be placed that cannot be compacted prior to the end of the same working day.

Compaction shall be done with approved vibratory compactor capable of imparting a compactive force of at least 15 tons, and shall continue until there is no evidence of further compaction. Water shall be added, as approved by the Engineer, to obtain maximum compaction.

The entire surface shall be compacted as specified in Mn/DOT 2211.3.C.

The thickness shall not vary more than one-half inch from what was approved. The thickness of the rock may be increased at the discretion of the Engineer in areas of unstable subgrade conditions. The same requirements for haul slips submitted as stated elsewhere in this specification shall apply.

1036.3 Method of Measurement and Payment

Excavation of materials and preparation of subgrade is incidental to common excavation.

Driveway restoration will be paid for at the contract unit bid price per ton for Class 5 Aggregate Base. Payment shall be compensation for labor, materials and equipment for excavation, disposing of excess excavation material, subgrade shaping, and furnishing, placing, and compacting material.

1037. DRIVEWAY PAVMENT (2301, 2531, 2360)

Bituminous and Concrete Driveways shall be replaced according to the following provisions

1037.1 Materials

1037.1.1 Bituminous Driveway Pavement

Residential driveway pavement shall be gyratory mix design SPWEA230E. **No** recycled asphalt pavement (**RAP**) shall be used in the bituminous mixture for driveways.

1037.1.2 Commercial Driveway Asphalt Pavement

Materials for commercial driveway asphalt pavement shall be the same materials specified for adjacent bituminous roadway construction.

1037.1.3 Concrete Driveway Pavement

Material for concrete driveway pavement shall be Mn/DOT Concrete Mix 3F52.

1037.2 Construction Requirements

Bituminous driveways shall **not** be paved until: the **base course** of bituminous street pavement is installed; the General Contractor has verified the driveway aggregate base material has been placed, graded, and compacted to specifications; the General Contractor has verified the average driveway matching thickness, to the nearest ¼ inch, for each driveway; the General Contractor has notified the Engineer 24-hours in advance of paving, that the specified conditions have been met and provided measured driveways depths in writing (listed by street address).

Bituminous Driveway edges shall be tamped, and care should be taken to minimize surface segregation. Excess surface segregation shall be cause for the Engineer to reject the driveway pavement and require the Contractor to remove and replace the driveway pavement. **Heating of the driveway to make repairs is not allowed.**

1037.2.1 Bituminous Driveway Pavement

Pavement shall be constructed in accordance with Mn/DOT Specification 2360.

Where existing bituminous driveways or paths are disturbed by construction or must be graded to allow for adjusted street grades, driveway surfaces shall be replaced with six inches (6") 100% Crushed Class 5 aggregate base and bituminous wearing course equal to the existing bituminous mat except that a minimum of two and a half inches (2.5") shall be required.

1037.2.2 Commercial Driveway Asphalt Pavement

Construction requirements for Commercial Driveway Asphalt Pavement shall be the same as specified for adjacent roadway bituminous pavements.

1037.2.3 6" Concrete Driveway Pavement

Where existing concrete driveways are disturbed by construction or must be graded to allow for adjusted street grades, driveway surfaces shall be replaced with six inches (6") select granular borrow, six inches (6") Class 5 (100% Crushed Limestone) aggregate base and concrete equal in thickness to that of the existing concrete panels (if less than 8"), except that a minimum of six inches (6") shall be required.

1037.2.4 8" Concrete Driveway Pavement

Where existing concrete driveways or concrete driveway aprons are disturbed by construction, indicated on the Plans to be replaced, or must be graded to allow for adjusted street grades, driveway surfaces shall be replaced with six inches (6") select granular borrow, six inches (6") Class 5 aggregate base and concrete equal in thickness to that of the existing concrete panels, except that a minimum of eight inches (8") shall be required.

1037.3 Method of Measurement and Payment

Where existing concrete driveways with reinforcement (mesh, rebar or other) were removed the Contractor shall be required to construct the new driveway section with equivalent reinforcement. All costs associated with reinforcement and rebar/dowel ties shall be considered incidental to the concrete driveway bid items. In the event that a special aggregate or concrete mix is specified by a property owner, the Contractor will be paid for only the additional material costs with allowed markup per the Supplementary Conditions. Invoices for additional material

costs shall be submitted to the Engineer upon completion of the work.

1037.3.1 Bituminous Driveway Pavement

Bituminous Driveway Pavement shall be paid for at the Contract unit price per ton and shall include all costs incidental to construction, including but not limited to, fine grading of aggregate base, compaction of aggregate base, labor, materials (to include tack coat) and equipment required for construction of the driveway pavement.

1037.3.2 Commercial Driveway Asphalt Pavement

Bituminous pavement for commercial driveways shall be paid for by the unit bid price per ton shown in the plans and specifications for roadway bituminous paving, to include all labor, materials and equipment. Certified weight tickets must be submitted for approval and payment. There will be no separate pay item for Commercial Driveway Asphalt Pavement.

1037.3.3 6" Concrete Driveway Pavement

"6" Concrete Driveway Pavement" shall be paid for at the Contract unit price per square yard and includes all costs incidental to construction, including but not limited to, fine grading of aggregate base, concrete mixture, reinforcement, reinforcement bars, labor, materials and equipment required for construction of the driveway pavement. If pavement thickness is greater than 6-inches, than the square yard quantity will be prorated by percentage of volume increased without any additional compensation thereof.

1037.3.4 8" Concrete Driveway Pavement

"8" Concrete Driveway Pavement" shall be paid for at the Contract unit price per square yard and includes all costs incidental to construction, including but not limited to, fine grading of aggregate base, concrete mixture, reinforcement, reinforcement bars, labor, materials and equipment required for construction of the driveway pavement. If pavement thickness is greater than 8-inches, than the square yard quantity will be prorated by percentage of volume increased without any additional compensation thereof.

1038. PLANT-MIXED ASPHALT PAVEMENT (2360)

This work shall conform to the requirements of Mn/DOT Specification 2360 except as modified or clarified herein. All municipal state aid roadways shall follow state aid requirements in materials, construction, and testing or as modified herein, whichever is more stringent. Small quantity HMA paving shall require a Mix Design Report unless otherwise approved by the Engineer. A test summary sheet of the gyratory design must be submitted by 9:00 a.m. the day following HMA placement and must have the Quality Control Actions section filled out in order to receive payment for quantity placed. Each truck load of HMA shall ticket with date, time, mix designation, Mix Design Report number, plant location, certified plant, truck number, City and/or State job number, truck tare weight, and HMA weight. The Contractor shall be responsible for arranging paving operations to minimize hauling over freshly laid pavement. Weight of the trucks shall be controlled so that no damage will be inflicted upon the base or any haul road.

1038.1 Materials

The allowable percentages of Recycled Asphaltic Pavement Materials (RAP) are as follows: The maximum percentage of recycled asphaltic pavement allowed is a maximum of 20 percent in all WEARING courses. The maximum percentage of recycled asphaltic pavement allowed is a maximum of 30 percent in all NON-WEARING courses.

The Bituminous Material for Tack Coat shall be CSS-1H as provided in Specification 2357.2A.

The Mix Designation Numbers (2360.1A) for the bituminous mixtures on City Projects will be 2360 (Gyratory) as specified in the Bid Form and Details are as follows unless otherwise specified:

New Construction/Reconstruction

- Gyratory Type SP Wearing Course on very high-volume collector streets or streets with a high volume of commercial truck traffic (ex. Upper 55th St. or Cahill Ave.) – **SPWEA440C**
- Gyratory Type SP Wearing Course on collector streets – **SPWEA330C**
- Gyratory Type SP Wearing Course on residential streets – **SPWEA330C**
- Gyratory Type SP Non-Wearing Course on very high-volume collector streets or streets with a high volume of commercial truck traffic (ex. Upper 55th St. or Cahill Ave.) – **SPNWB440C**
- Gyratory Type SP Non-Wearing Course on collector streets – **SPNWB330C**
- Gyratory Type SP Wearing Course on residential streets – **SPNWB330C**

Overlays

Follow appropriate Gyrotory Type SP Wearing Course above except that B grade binder shall be used.

1038.2 Construction Requirements

1038.2.1 Restrictions

Bituminous mixtures shall not be placed when, in the opinion of the Engineer, the weather or roadway conditions are unfavorable.

Unless otherwise approved by the Engineer, bituminous surface shall be placed only during the hours of daylight and when the surface is at proper moisture content. Mixtures may be placed when the air temperature is at and will remain greater than 36 degrees F **and** the base (aggregate base or bituminous base course) is not frozen. Mixtures shall not be placed on frozen base regardless of air temperature. Paving at temperatures below 36 degrees F shall be subject to the approval of the Engineer.

Transverse joints in adjacent strips shall be separated a minimum of five feet. Longitudinal joints shall conform to the requirements of Mn/DOT Specification 2360.3.C.3. Traffic shall not be permitted over an unmatched longitudinal joint except at locations directed by the Engineer.

1038.2.2 Preparation of the Bituminous Base

When sweeping streets is required prior to any stage of paving, the sweeping shall be performed with a pickup sweeper or in a manner, which precludes dust and debris being deposited on the boulevard or lawn. This sweeping shall be incidental to pavement placement regardless of whether there is a street sweeping bid item provided.

1038.2.3 Pavement Density (2360.3D)

Unless otherwise specified, all courses or layers of plant mix asphalt mixtures shall use the Maximum Density Method specification 2360.3.D.1 to include shoulders.

Trail and driveway pavements shall be compacted by the ordinary compaction method (2360.3.D.2).

1038.2.4 Thickness and Surface Smoothness (2360.3.E)

The Contractor shall comply with thickness and smoothness requirements of 2360.3.E.

1038.2.5 Tack Coat (2357)

Bituminous tack coat shall be constructed in accordance with the provisions of Mn/DOT Specification 2357, except as modified below:

- Tack will not be put down more than 1500 feet ahead of paving operations and on the same day unless otherwise approved by the Engineer.
- Contractor is responsible for protecting the tack coat from traffic, dirt and debris.
- Tack coat that does not meet application rate thickness due to traffic will be required to be re-applied at the expense of the Contractor. Re-application shall allow for proper break-down of tack material prior to paving.
- Tack coat shall be applied to the inside edge of curb and gutter, between all bituminous layers, and prior to placing any bituminous mixtures on existing pavement.
- The unit price bid for tack coat shall include cleaning of all debris and dirt from existing bituminous courses prior to placement of tack coat.
- Tack coat shall be applied all existing pavement, even when the existing pavement has been placed on the same day.

Equipment and labor costs associated with applying the bituminous tack coat to the inside edge of curb and gutter, at the ends of construction and on the vertical face of transverse joints shall be incidental to paving.

1038.3 Method of Measurement and Payment

1038.3.1 Plant Mixed Bituminous Pavement

The plant-mixed bituminous pavement shall be paid for at the Contract unit price per ton in place, which shall be compensation in full for all costs incidental to the construction including materials used in the mixture. The pay item in the Bid Proposal may be Base Course, Binder Course Wearing Course Mixture at the depth specified. Payment shall be in accordance with Mn/DOT Specification 2360.5 except that payment shall not exceed 100% of the total tonnage as indicated on the scale weight tickets provided to the Engineer by the Contractor. Incentive payments shall not be made.

Bituminous material shall be weighed on an approved scale at the plant and the weights recorded on an original weight ticket approved by the Engineer. A copy of the scale weight tickets for the day's run shall be furnished to the Engineer at the end of each working day and shall indicate if the material has been placed on a state aid or a non-state aid street or streets, the type of material, and the date. A running total for each day's run shall be recorded on the weight tickets. No payment for the bituminous material will be made until these tickets have been received and approved by the Engineer.

1038.3.2 Tack Coat

Bituminous material for tack coat shall be considered incidental to the construction of the bituminous wearing course as specified.

1039. MODULAR BLOCK RETAINING WALL (2411)

This work shall consist of furnishing and installing a precast concrete wall in accordance with Mn/DOT Specification 2411, and the following:

The precast walls shall be constructed in the location and configuration as shown on the Plans. The Engineer reserves the right to alter alignment to improve constructability and aesthetics.

1039.1 Materials

The precast walls shall be segmented block walls similar to those manufactured by:

- Keystone Retaining Wall Systems
- Versa-Lok Retaining Wall Systems
- Rockwood Retaining Wall Systems
- Anchor Wall System
- Or an approved equal

The wall system shall be gray or tan colored with a split face textured surface. Product information shall be supplied to the Engineer to approve the color and texture.

1039.2 Construction Requirements

The pre-cast wall system shall be constructed in accordance with the manufacturer's recommendations upon approval of the design methodology by the Engineer.

The wall shall conform to the following specifications and typical section requirements:

- The wall shall be designed, and the detailed drawings prepared by a Professional Engineer experienced in retaining wall design that is registered in the State of Minnesota. The design computations and the plans shall be certified by the Engineer and submitted to the wall Owner for their permanent record.
- The detailed drawings shall contain all the necessary information for the construction of the wall. Included shall be a typical section detailing excavation limits, geotextile locations, block embedments, leveling pad dimensions, backfill, etc. Include as many sections and other views necessary for the construction and inspection of the wall. The information on embedment, geotextile locations, and geotextile lengths as they relate to wall heights may be shown in tabular form. Also included shall be the pertinent information on the individual blocks and the geotextile material.
- All plan sheets shall clearly identify the name of the responsible engineering firm and the name of the person certifying the plan. Each sheet shall be certified.

NOTES FOR TYPICAL SECTION:

- The minimum depth of block embedment shall be as determined by the retaining wall Engineer.
- The minimum reinforcement length shall be as determined by the retaining wall Engineer.
- Geotextile vertical spacing shall be determined by detailed analysis.
- A 4-inch drainage pipe conforming to Mn/DOT Specification 3278 wrapped in a Type 1 geotextile conforming to Mn/DOT Specification 3733 is recommended.
- The Project Engineer has the option of having additional drains placed to intercept any water-bearing soil strata discovered during construction.
- Pay limits of structure excavation.
- Backfill to meet Mn/DOT Specification 3149.2B modified to 10 percent or less passing the #200 sieve. In addition, 10 percent must pass the 4-inch sieve. Compaction shall be in accordance with Mn/DOT Specification 2451.3.D.
- Any suitable backfill shall be compacted in accordance with Mn/DOT Specification 2105.3.F.2 "Quality Compaction Method".

- Slopes shall be determined by in-situ soils and or OSHA regulations. Any excavation beyond “Limits of Excavation” shall be at the Contractor’s expense.
- The Leveling Pad shall be either un-reinforced concrete or compacted aggregate. The thickness shall be determined by analysis, but in no case shall be less than 6 inches.
- Slopes and or surcharge loading shall be shown on fill being retained.

The chart below will indicate which sections to use per Mn/DOT Technical Memorandum No. 95-SA-05, dated March 13, 1995.

SECTION	WALL HEIGHT	WALL HEIGHT	WALL HEIGHT
	< 2'	2' TO < 6.5'	≥ 6.5'
I	X	X	X
II	X		
III		X	
IV			X
V			X
VI	X	X	X
VII			X
VIII	X	X	X

If the wall is supporting a live load, building, or other structure, or an unusually high dead load, the sections for wall height greater than or equal to 6.5 feet shall apply.

If a fence is required along the top of the wall, the wall shall be designed to include the additional loading. When the longitudinal slope of the footing is greater than 10:1, the footing may be stepped.

Utilities shall be located outside the construction limits of the retaining wall. Any utilities needing to be located within this area shall be installed as the wall is being constructed. Once the geotextile layers are installed, neither the geotextile nor the utility shall be disturbed at any time. Any future maintenance on the utility will require dismantling the wall.

1039.3 Method of Measurement and Payment

The measurement for the precast concrete wall shall be the area in square feet of the entire wall face furnished and installed as specified. This includes wall face above and below ground. Payment shall be at the Contract price per square foot and shall be compensation in full for all costs to construct the wall complete in place.

1040. SEWER SYSTEM (2503, 2621)

This work shall consist of the construction of pipe sewers utilizing plant fabricated pipe and other appurtenant materials, installed for conveyance of sewage, industrial wastes, or storm water. The work includes construction of manhole and catch basin structures and other related items as specified.

1040.1 Materials (2621.2)

All materials required for this work shall be new material conforming to requirements of the referenced specifications for the class, kind, type, size, grade, and other details indicated in the Contract. Unless otherwise indicated, all required materials shall be furnished by the Contractor. If any options are provided for, as to type, grade, or design of the material, the choice shall be limited as may be stipulated in the Plans, Specifications, or Special Provisions.

All manufactured products shall conform in detail to such standard design drawings as may be referenced or furnished in the Plans. Otherwise, the Engineer may require advance approval of material suppliers, product design, or other unspecified details as it deems desirable for maintaining adopted standards.

At the request of the Engineer, the Contractor shall submit in writing a list of materials and suppliers for approval. Suppliers shall submit a Certificate of Compliance that the materials furnished have been tested and are in compliance with the specifications.

All pipe furnished for main sewer and service line installations shall be of the type, kind, size, and class indicated for each particular line segment as shown in the Plans and designated in the Contract Items. Wherever connection of dissimilar materials or designs is required, the method of joining and any special fittings employed shall be products specifically manufactured for this purpose and subject to approval by the Engineer.

1040.1.1 Sewer Pipe and Service Line Materials (2625.2A)

A. Ductile Iron Pipe and Fittings (2621.2A2)

Ductile Iron pipe shall be used where shown on the Plans. Cast Iron pipe may not be used in lieu of ductile iron pipe.

DIP for Gravity Sewers

All Ductile Iron Pipe for gravity sewers shall be Class 52, DIP. Ductile Iron fittings shall be used for each particular installation of Ductile Iron pipe. Ductile iron pipe shall conform to the requirements of AWWA C115 or C151 for water and thickness design shall conform to AWWA C150. In addition, the pipe shall comply with the following supplementary provisions:

- Fittings shall conform to the requirements of AWWA C110 or 153 (Gray Ductile Iron Fittings or Ductile Iron Compact Fittings) for the joint type specified.
- All DIP Sanitary Sewer Mains and services shall be constructed with Protecto 401 Ceramic epoxy Lined Ductile Iron Pipe and fittings as manufactured by U.S. Pipe, or approved equal. All exterior surfaces of the pipe and fittings shall have an asphaltic coating at least one mil thick. Spotty or thin seal coating, or poor coating adhesion, shall be cause for rejection.
- Rubber gasket joints for Ductile Iron Pressure Pipe and fittings shall conform to AWWA C111. If used as a pressure line, an electrical contact must be provided through every joint.
- **Smith-Blair 413 Steel Transition Couplings**, or approved equal, shall be used to connect pipes of different outside diameters when the maximum O.D. variation does not exceed the listed coupling O.D. range. The outside drop D.I. pipe connection to PVC pipe shall use this specified coupler unless otherwise approved by the Engineer.

DIP for Force Mains

The ductile iron pipe covered by this specification shall be of the push on joint type or the mechanical joint type, centrifugally cast to conform to all requirements of AWWA Specification C151, latest revision.

To prevent cracking of the lining, the maximum allowable deflection of the pipe shall not exceed 2% of the pipe diameter.

Minimum thickness of ductile iron pipe shall be as follows:

3" Ductile Iron Pipe	0.25"	Class 51
4" Ductile Iron Pipe	0.26"	Class 51
6" Ductile Iron Pipe	0.25"	Class 50
8" Ductile Iron Pipe	0.27"	Class 50
10" Ductile Iron Pipe	0.29"	Class 50
12" Ductile Iron Pipe	0.31"	Class 50
14" Ductile Iron Pipe	0.33"	Class 50
16" Ductile Iron Pipe	0.34"	Class 50
18" Ductile Iron Pipe	0.35"	Class 50
20" Ductile Iron Pipe	0.36"	Class 50
24" Ductile Iron Pipe	0.38"	Class 50
30" Ductile Iron Pipe	0.39"	Class 50
36" Ductile Iron Pipe	0.43"	Class 50
42" Ductile Iron Pipe	0.47"	Class 50
48" Ductile Iron Pipe	0.51"	Class 50
54" Ductile Iron Pipe	0.57"	Class 50

All pipes shall have a Ceramic Epoxy Liner.

All ductile iron pipes shall be marked "DUCTILE IRON" in large letters. The nominal wall thickness shall be plainly marked on each piece of pipe.

- Rubber Gasket Joints. All rubber gasket joints are to be in accordance with AWWA Specification C111 latest revision. Adequate means for electrical conductivity shall be provided for the gasket joint.
- Fittings. All fittings are to be in accordance with AWWA Specification C110, latest revision. All fittings are to have short body laying dimensions.

B. Reinforced Concrete Pipe and Fittings (3236, 2621.2A3)

Reinforced concrete pipe and fittings including bends, tee sections and specials shall conform to the requirements of the Standard Specifications for Reinforced Concrete Sewer Pipe, ASTM Designation C76 Wall B with circular reinforcing for the class of pipe specified with rubber O-ring or profile joints for the type, size, and strength class specified, subject to the following supplementary provisions:

- Reinforced concrete pipe less than 15” will not be allowed.
- All branch fittings such as tees, wyes, etc. shall be cast as integral parts of the pipe. All fittings and specials shall be of the same strength class as the pipe to which they are attached.
- Concrete pipe bends called for on the plans shall be 7 1/2° pipe bends with a 4’-0” center line laying length with a 30.5’ radius of curve, and with wall thicknesses and steel reinforcing in accordance with ASTM Specifications C76. The bends shall be of the same pipe class as the pipe on either side of the bend.
- Reinforced concrete pipe joints shall be Type R-4, and the gasket shall be circular in cross section. The joint shall be constructed in accordance with ASTM C-361.
- Pipe required for piling shall be reinforced concrete pipe furnished in eight-foot (8’) lengths and shall be of special design in accordance with Section 10, ASTM Designation C76, latest revision.
- Concrete pipe to be jacked shall be Class V or greater.
- Lift holes will not be permitted unless specifically authorized in the Plans, Specifications, and Special Provisions.

C. Corrugated Steel Pipe and Fittings (3226, 2621.2A4)

Corrugated metal pipe may only be used for storm sewers where specifically indicated on the Plans or in the Special Provisions. Corrugated steel pipe and fittings shall conform to the requirements of Mn/DOT Specification 3226 “Corrugated Steel Pipe” for the type, size and sheet thickness specified. When specifically provided for in the Plans, Specifications, and Special Provisions, the galvanized steel pipe and fittings shall be furnished with special aramid fiber bonded, bituminous, or plastic coating or concrete lining as required.

D. Polyvinyl Chloride Pipe and Fittings (3245, 2621.2A5)

PVC for Gravity Sewers

All mainline PVC sanitary sewer shall be 8” or larger, and as a minimum be SDR 35, ASTM 3034, clearly marked on the outside wall of the pipe. Mainline joint connections shall be pushed on with elastomeric gasket joints which are bonded to the inner wall of the gasket recess of the bell socket.

Pipe classification by burial depth from finish grade to pipe invert shall conform to the following:

<u>Burial Depth</u>	<u>Pipe Class</u>
0 - 14 feet	SDR 35
14 - 24 feet	SDR 26
> 24 feet	DIP, Class 52

All fittings and wye branches shall be of extra strength construction and conform to ASTM D-3034-73. Service wyes shall have concrete placed around the wye joint in accordance with the standard detail plate. All joints shall conform to ASTM D-3212. Typical sanitary house services shall be solvent weld joints. Rubber gasket push-on type joints are permitted only on mainline (lateral) sewer lines.

PVC for Force Mains

The polyvinyl chloride pressure pipe (PVC pressure pipe) covered by this specification shall conform to ASTM-D1784, Type I, Grade I, and ASTM D-2241 SDR-PR 41, 100 psi latest revision and shall have a minimum working pressure of 100 psi.

All pipes shall be marked PVC ASTM D-1120 and ASTM D-2241. The class pressure rating or SDR shall be plainly marked on the pipe.

- Rubber Gasket Joints. All PVC pressure pipe shall have rubber gasket joints in accordance with ASTM D-1869. Joints shall be kept clean and properly lubricated prior to installation.
- Fittings. All fittings shall be compatible with the pipe supplied and shall have a minimum working pressure of 200 psi (SDR-21).

E. High Density Polyethylene (HDPE)

HDPE smooth interior, dual-walled pipe may be used for storm sewer sizes up to and including 24 inches in diameter **for culverts in rural sections only or as directed by the Engineer.** Pipe to be N-12 as manufactured by Advanced Drainage Systems or approved equal.

1040.1.2 Air and Vacuum Valves for Force Mains

Sewage air and vacuum valves shall be Crispen sewage valves, Model Number S20B and S20AB, as manufactured by Multiplex Manufacturing Co., or approved equal.

The valve shall be furnished with a two-inch (2") inlet, a two-inch (2") shut off valve and all other accessories needed for back flushing such as a one-inch (1") blow off valve, a one-half inch (1/2") shut off valve and a quick disconnect coupling with back flushing hose.

An operating and maintenance instruction manual shall be included with the valve.

1040.1.3 Metal Sewer Castings (2621.2B)

Manhole frames and covers of the type, size and weight specified shall be Class 30 or better gray iron castings conforming to ASTM Designation A48, Gray Iron Castings. The frame and cover shall be sandblasted prior to coal tar pitch varnish finish. Bearing surfaces shall be machined to fit and shall be non-rocking. All references on the drawings to catalog numbers denote the design, size and weight of castings required. Casting assemblies of other manufacturers may be approved for use by the Engineer if, in his opinion, they are of equal quality and suitability.

A. Sanitary Sewer Castings (2621.2B1)

Type Sanitary

Standard manhole frame and cover shall be Neenah Foundry Company, R-1642 or approved equal. The lid shall be solid type C with two (2) type F concealed pick holes and the following lettering "SANITARY SEWER". Full bearing surfaces of frame and cover shall be machine milled to provide true bearing around the entire circumference.

B. Storm Sewer Castings (2621.2B2)

Type Storm

Standard manhole frame and cover shall be Neenah Foundry Company, R-1642 or approved equal. The lid shall be solid type C with two (2) type F concealed pick holes and the following lettering "STORM SEWER". Full bearing surfaces of frame and cover shall be machine milled to provide true bearing around the entire circumference.

Type Curb

Catch Basin, Type A shall be constructed with Neenah Frame and Box No. R-3067 with Type VL Grate or approved equal. Where constructed in areas of surmountable curb and gutter, a smooth transition to B-618 curb and gutter shall be constructed approaching and leaving the catch basin, as shown in the Standard Detail.

Type Grate

Standard manhole frame and cover shall be Neenah Foundry Company, R-1642 or approved equal. The lid shall be a Type 'G' standard flat grate. Full bearing surfaces of frame and cover shall be machine milled to provide true bearing around the entire circumference.

Type Ditch

Standard manhole frame and cover shall be Neenah R-4342 Ditch Grate, Stool Type or approved equal.

1040.1.4 Precast Concrete Manhole and Catch Basin Sections (2506, 2621.2C)

Manholes and catch basins shall be constructed using precast sections conforming to ASTM Specification C-478 and Mn/DOT Specification 2506. Manhole section joints shall be Type R-4.

Sanitary sewer manholes shall be supplied with pre-formed inverts and flexible sleeve connections for all lateral lines 15" in diameter or less unless otherwise noted on the construction plans. The flexible connection shall be an interface boot as manufactured by Elk River Concrete, or Kore-N-Seal Boot as manufactured by North Star Concrete or equal.

Manhole or Catch Basin steps shall conform to the requirements of Mn/DOT Standard Plate 4180. Neenah Foundry step No. R-1981 or equal shall be provided and spaced 16" on center on the downstream face of the manhole, unless otherwise specified. Aluminum manhole steps may be used and shall be made of Apex Ternalloy No. 5 aluminum alloy. Copolymer Polypropylene plastic steps (PSI-PF) may also be used.

Manholes shall be as follows:

Sanitary Sewer

Design F Design F Manholes shall conform to the requirements of Mn/DOT Standard Plate 4007.

Storm Sewer

Design 4020 Design 4020 manholes shall conform to the requirements of Mn/DOT Standard Plate 4020. Top slabs shall conform to Mn/DOT Standard Plate 4022 for 48-inch diameter CBs and CB MHs.

Design F Design F manholes shall conform to the requirements of Mn/DOT Standard Plate 4005, Design F, Type B Cone.

Design J Design J Manholes shall conform to the requirements of Mn/DOT Standard Plate 4009, Design J.

Sewer manholes shall be built with such additional adjusting rings and short manhole sections as necessary to allow for adjustment of the manhole to the proposed grade as shown on the Plans and Details. Manhole and catch basin casting tops shall be ¼” to ½” (0.03’ to .04’) and 0.1’ respectively, below the finished grade.

Manholes shall have a minimum of two two-inch (2”) adjusting rings and a maximum of six two-inch (2”) adjusting rings to finished grade. The barrel sections shall be cast in such a manner that the manhole builds will meet the aforementioned requirements.

1040.1.5 Trash Guard

Where shown on the Plans, a trash guard shall be installed in accordance with the Standard Detail Sheet. The trash guard shall have a minimum of ¾” vertical galvanized steel rods placed at a maximum spacing of 6” center-to-center unless otherwise specified. The guard shall be securely attached to the end section. The Contractor may submit other methods of constructing the trash guard subject to the approval of the Engineer.

1040.1.6 Riprap (2511)

Where shown on the Plans, riprap shall be constructed in accordance with Mn/DOT Specification 2511 for Random Riprap Class III unless otherwise specified.

Riprap required for the various pipe sizes shall be as shown on the Standard Detail sheet, unless otherwise specified.

Filter material for riprap shall be 180N Marafi or an approved equivalent in conformance with the requirements of Mn/DOT Specification 3601 for granular filter or the requirements of Mn/DOT Specification 3733 for a Type III geotextile fabric.

1040.1.7 Concrete (2461, 2621.2D)

Concrete shall conform to Section 1022.1.1 of this Specification (“Concrete and Concrete Mix Components”). Type 3 (air-entrained) concrete shall be furnished and used in all structures having weather exposure.

1040.1.8 Mortar (2621.2E)

Mortar shall consist of a mixture of one part Portland Hydraulic Cement and two parts of clean washed sand by volume. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar, but in no case shall exceed five-and-one-half (5 ½) gallons of water per sack of cement.

Sand shall conform to ASTM C-144. Portland cement shall conform to ASTM C-150.

1040.2 Construction Requirements

1040.2.1 Installation of Pipe and Fittings (2621.3A)

A. Inspection and Handling (2621.3A1)

Proper and adequate implements, tools, and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. During the process of unloading, all pipe and accessories shall be inspected by the Contractor for damage. The Contractor shall notify the Engineer of all material found to have cracks, flaws or other defects. The Engineer shall inspect the damaged materials and have the right to reject any

materials found to be unsatisfactory. The Contractor shall promptly remove all rejected material from the site. All materials shall be handled carefully, as will prevent damage to protective coatings, linings, and joint fillings; preclude contamination of interior areas; and avoid jolting contact, dropping, or dumping.

All work and materials are subject to tests by the Owner at such frequency as may be determined by the Engineer.

While suspended and before being lowered into laying position, each pipe section and appurtenance unit shall be inspected by the Contractor to detect damage or unsound conditions that may need corrective action or be cause for rejection. The Contractor shall inform the Engineer of any defects discovered and the Engineer will prescribe the required corrective actions or order rejection.

Immediately before placement, the joint surfaces of each pipe section and fitting shall be inspected for the presence of foreign matter, coating blisters, rough edges or projections, and any imperfections so detected shall be corrected by cleaning, trimming, or repair as needed.

B. Pipe Laying Operations (2621.3A2)

Trench excavation shall conform to the requirements of Section 1011 of this Specification (“Trench Excavation and Backfill”).

All foreign matter or dirt shall be removed from the inside of the pipe and fittings before they are lowered into position in the trench and they shall be kept clean by approved means during and after laying. The sewer materials shall be carefully lowered into laying position by the use of suitable restraining devices. Under no circumstances shall the pipe be dropped into the trench.

At the time of pipe placement, the bedding conditions shall be such as to provide uniform and continuous support for the pipe between bell holds. Bell holds shall be excavated as necessary to make the joint connections, but they shall be no larger than would be adequate to support the pipe throughout its length. No pipe material shall be laid in water or when the trench or bedding conditions are otherwise unsuitable or improper.

When placement or handling precautions prove inadequate, in the Engineer’s opinion, the Contractor shall provide and install suitable plugs or a cap effectively closing the open ends of each pipe section before it is lowered into laying position, and they shall remain so covered until removal is necessary for connection of an adjoining unit.

Unless otherwise permitted by the Engineer, bell and spigot pipe shall be laid with the bell ends facing upgrade and the laying shall start on the downgrade end and proceed upgrade. As each length of bell and spigot pipe is placed in laying position, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with approved backfill material, which shall be thoroughly compacted by tamping around the pipe to a height of at least 12 inches above the top with hand operated mechanical tamping devices or by hand. The joint areas shall remain exposed and precautions shall be taken to prevent the soil from entering the joint space, until the joint seal is affected. Backfill in the bell area shall be left loose.

Connection of pipe to existing lines or previously constructed manholes or catch basins shall be accomplished as shown in the Plan or as otherwise approved by the Engineer. Where necessary to make satisfactory closure or produce the required curvature, grade or alignment deflections at joints shall not exceed that which will assure tight joints and comply with any limitations recommended by the pipe manufacturer.

Entrance of foreign matter into pipeline openings shall be prevented at all times to the extent that suitable plugs or covering can be kept in place over the openings without interfering with the installation operations.

Installation of thermoplastic pipe shall conform to ASTM D-2321.

C. Connection and Assembly of Joints (2621.3A3)

All pipe and fitting joints shall fit tightly and be fully closed. Spigot ends shall be marked as necessary to indicate the point of complete closure. All joints shall be soil tight, as the minimum requirement, and shall be watertight in all sanitary sewer pipe lines and in all storm sewer pipe lines installed within the limits of a paved street or highway traffic lanes. Where specified, the joints in certain assemblies shall be made structurally integral by being completely encased in concrete to form a rigid watertight unit as indicated in the standard drawings.

All joints shall be sealed as follows, subject to such other approved method as the Engineer may authorize as being an acceptable alternative:

- Concrete pipe and fitting joints – compression type rubber gasket seals conforming to the requirements of ASTM C-443, ASTM C-361 or AASHTO M-198 for circular pipe, or as otherwise approved by the Engineer in the case of non-circular pipe sections.
- PVC pipe and fittings assembled gasket seal joints.

- Corrugated-double wall HDPE pipe and fittings – assembled push-on gasket joints shall pass performance tests as listed in ASTM D-3212. Solvent welds shall not be permitted.
- Corrugated steel pipe and fittings – sealed with approved type compression seals.

D. Bulkheading Open Pipe Ends (2621.3A4)

All pipe and fitting ends left open for future connection shall be bulkheaded by approved methods prior to backfilling. Unless otherwise specified or approved, all openings of 24 inches in diameter or less shall be closed off with prefabricated plugs or caps and all openings larger than 24 inches in diameter shall be closed off with masonry bulkheads.

Prefabricated plugs and caps shall be of the same material as the pipe material, or an approved alternate material, and they shall be installed with watertight seal as required for the pipeline joints. Masonry bulkheads shall be constructed with clay or concrete brick to a wall thickness of eight inches.

Bulkheads installed for temporary service during construction may be constructed with two-inch timber planking securely fastened together and adequately braced, as an alternate to the masonry construction.

1040.2.2 Appurtenance Installations (2621.3B)

Appurtenance items such as aprons, trash guards, gates and castings shall be installed where and as required by the Plans and in accordance with such Standard Detail drawings or supplementary requirements as may be specified.

Casting assemblies installed on manhole or catch basins structures shall be set in a full mortar bed and be adjusted to the specified elevation without the use of shims or blocking.

Sewer aprons shall be subject to all applicable requirements for installation of pipe. All aprons and outfall end sections shall have the last three sections tied. Two tie bolt fasteners shall be placed in each of the last three joints, one on each side of top center at the 60 degree point (from vertical). Tie bolt diameter shall be: 1/2 inch for 12” to and including 21” pipe; 5/8 inch for 24” to and including 36” pipe; 3/4 inch for 42” to and including 54” pipe; and 1” for 60” and larger pipe. The tie bolts shall be of a design approved by the Engineer.

1040.2.3 Force Main Installation

Air relief manholes shall be constructed of precast concrete sections with R-4 joints as designated on the plans and shown on the detail plate in accordance with ASTM designation C-139.

All pipes shall be laid to the depth shown on the contract drawings. The contractor shall satisfactorily maintain the specified cover by the use of grade boards. If additional bends are required, where not shown on the drawings to maintain alignment around curves, the contractor shall provide the required number and be compensated at the unit price as proposed on the bid form.

The following is the maximum allowable joint deflection for the ductile iron pipe.

<u>Ductile Iron Pipe</u>	<u>Mechanical Joints</u>	<u>Slip Joints</u>
4 inch	4°25'	5°
6 inch	4°25'	5°
8 inch	3°51'	5°
10 inch	3°42'	5°
12 inch	3°08'	5°
14 inch	2°39'	3°
16 inch	2°21'	3°
18 inch	2°07'	3°

- Handling of Force Main Material into Trench. Proper tools and facilities satisfactory to the engineer shall be provided and used by the contractor for the safe and convenient prosecution of the work. All pipe, fittings and valves shall be carefully lowered into the trench in such a manner as to prevent damage to force main materials and protective coatings and linings. Under no circumstances shall force main materials be dropped or dumped into the trench.
- Jointing. All types of joints shall be made in strict accordance with manufacturer's specifications. All pipe ends shall be wire brushed, wiped clean, and kept clean until joints are made.
- Cutting Pipe. Un-tapered spigot ends may be encountered when pipes are cut in the field. Before assembly, the cut end should be beveled with a heavy file or other suitable apparatus, removing any sharp or rough edges to protect the gasket from injury and ensure ease of assembly.

- Blocking. All fittings, at points of bends in the line, shall be solidly braced against the end or sides of the trench. All fittings shall be blocked with concrete. The concrete is to have a minimum compressive strength of 2000 psi and the block to be of sufficient size so as not to exert more than 2000 lbs. per square foot pressure against the soil.

Testing Requirements

- Hydrostatic Tests Required. A pressure test shall be required for all installations of force main and all appurtenances.
- Pressure Test. The pressure test shall be held at a hydrostatic pressure equal to twice the maximum design pressure or a minimum hydrostatic pressure of 70 psi for a period of one hour in the presence of the engineer. At the end of the one hour period, the pressure drop shall be read. Next, the contractor shall add water to the system through a water meter capable of measuring increments to a tenth of a gallon until the water system has been restored to the original hydrostatic pressure as stated above. The quantity of water added to the system shall be read to the nearest tenth of a gallon. The maximum allowable quantity of water which may be added to the water system is one pint per hour for each section of force main tested between consecutive valves or plugs. A suitable container graduated in increments of one pint shall be used as the source of water.
- Procedure. Each valved section of pipe shall be slowly filled with water from a safe source, and the specified test pressure, measured at the lowest point of elevation, shall be applied by means of a water pump connected to the pipe in a manner satisfactory to the engineer. Where valves do not exist the contractor shall plug the end of the line in a manner satisfactory to the engineer. The pump, pipe connections, gauge and all necessary apparatus shall be furnished by the contractor and shall be approved by the engineer before any test is made. All necessary pipe taps shall be made by the contractor as may be directed by the engineer.
- Expelling Air before Test. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this in those instances where air relief manholes exist, the pipe shall be filled with water until all air has been expelled through the air relief valve. Then the shut off valve between the force main and air relief valve shall be closed and the air relief valve disconnected from the system. The pressure test on the force main can then proceed as outlined above.
- Examination under Pressure. Any cracked or defective pipes, valves and fittings discovered in consequence of the pressure test shall be removed and replaced by the contractor with sound material and the test shall be repeated until satisfactory to the engineer. The pressure test shall be performed in a manner approved by the engineer. The contractor shall correct all faulty materials or workmanship discovered during the

tests and all such corrections shall be made to the satisfaction of the engineer at the contractor's expense.

1040.2.4 Sewer Service Installations (2621.3C)

The Engineer, with the assistance of the Contractor, shall keep accurate records of all service installations as to type, location, elevation, point of connection and termination, etc. This service record shall be maintained jointly by the Contractor and Engineer on forms provided by the Engineer. Property line ends of sanitary services shall be left uncovered until the Engineer approves the installation and records the location by station and elevation. Services shall be installed to the minimum grade in good workmanlike manner. Services covered prior to acceptance and location by the Engineer shall be re-excavated, or shall not be paid for.

The main sewer service connection shall consist of installing a Branch Tee or Wye section in the main sewer line at designated locations or providing an insert type Saddle Tee in a pipe cutout where and as permitted or required in lieu of the built-in fitting. Orientation of service connection fitting shall be as shown in the standard drawings unless otherwise directed by the Engineer.

Where the depth of cover over the main sewer invert is greater than 15 feet (or such other maximum as may be indicated), the service connection shall be extended upward by means of a Service Riser Section in accordance with the details shown in the standard drawings. Depth of the service line at the lot shall be a minimum of ten (10) feet below finished boulevard grade and no deeper than thirteen (13).

Unless otherwise specified, service pipe shall be installed at right angles to the main sewer and at a straight line grade to the property line. The standard and minimum grades shall be a uniform rise of one inch in four feet for sanitary service lines and one inch in eight feet for storm sewer service lines. These minimum grades may be reduced (by not more than one-half pitch) where the Engineer so approves in the case of restrictive elevation differences.

Building service pipe lines shall generally be kept as deep as required to serve the building elevation and maintain the specified minimum pipe grades. Pipe bends shall be provided as necessary to bring the service lines to proper location and grade. Pipe bends shall not exceed 22-1/2 degrees without approval of the Engineer.

Unless otherwise indicated, service pipe installation shall terminate at property line or as designated on the Plans, with a gasket plug placed in the end, at which point the Contractor shall furnish and set a 4 x 4 inch wooden timber 6 feet to 8 feet in length embedded 4 feet below grade, or approved steel post to mark the exact end of pipe. The timber or post shall be set vertically, with the top 2 feet painted green.

Wherever service line connections to the main sewer are permitted or required to be made by the open cut-out method in the absence of a built-in Tee or Wye fitting, the connection shall be made by using an approved type of Saddle Tee fitting. Saddle type sanitary service connections shall be allowed only with prior approval from the City Engineer. The pipe cut-out shall be made with an approved type coring machine or by other approved methods producing a uniform, smooth circular cut-out as required for proper fit. The cut-out discs shall be retrieved and shall not be allowed to remain within the main sewer pipe. Only aluminum alloy saddles securely fastened to the main sewer pipe by means of epoxy resin or other approved adhesive, in accordance with the manufacturer's recommendation shall be used. The entire connection fitting shall be encased in concrete to a minimum thickness of six inches.

Wherever service line connections to the main sewer are required to be made by means of built-in Branch Tee or Wye fittings, the Contractor shall, in the absence of such fitting, remove a section of the main sewer pipe and replace it with the required Branch Tee or Wye section connected by means of an approved sleeve coupling.

Sanitary sewer service lines shall not be connected to a manhole.

All pipe and fitting openings at temporary terminal points shall be fitted with suitable plugs or shall be bulkheaded as required for the main sewer pipe.

1040.2.5 Manhole and Catch Basin Structures (2621.3D)

Manholes, catch basins, and other special access structures shall be constructed at designated locations as required by the Plans and in accordance with any Standard Detail drawings or special design requirements given therefore.

Unless otherwise specified or approved, manholes and catch basins shall be constructed on a pre-cast or cast-in-place concrete base and the barrel riser sections, cone section and top adjusting rings shall all be of pre-cast concrete. All units shall be properly fitted and sealed to form a completely watertight structure.

Unless otherwise specified or approved, manholes and catch basins shall have an inside barrel diameter at the bottom of 48 inches minimum and the inside diameter at the top of the cone section and all adjusting rings shall be of the same size and shape as the casting frame. Casting assemblies shall be as specified in the Plans.

Concrete cast-in-place base shall be poured on undisturbed or firmly compacted foundation material which shall be trimmed to proper elevation. The bottom riser section shall be set in fresh concrete or mortar and all other riser section joints of the tongue and groove design shall be sealed with rubber gaskets. The concrete base under an outside drop connection shall be monolithic with the manhole base.

Wherever special designs so require or permit a precast concrete base may be used or the structure may be constructed with solid sewer brick or block units or with cast-in-place concrete. Any combination of cast-in-place concrete and brick or block mortar may be required where it is impossible to complete the construction with standard precast manhole sections. Cast in place and block structures will be subject to the approval by the Engineer.

All annular wall space surrounding the in-place storm sewer pipes shall be completely filled with mortar or concrete, and the inside bottom of each manhole and catch basin shall be shaped with fresh concrete to form free flow through invert troughs as directed.

1040.2.6 Reconnecting Existing Facilities (2621.3E)

Disposition of abandoned facilities and reconnection of existing facilities shall be as provided for in the Plans, Specifications, and Special Provisions.

1040.2.7 Sanitary Sewer Leakage Testing (2621.3F)

All sanitary sewer lines, including service connections, shall be substantially watertight and shall be tested for excessive leakage upon completion and before connections are made to the service by others. Each test section of the sewer shall be subjected to exfiltration testing, either by hydrostatic or air test method as described below and at the Contractor's option. The requirements set forth for maximum leakage shall be met as a condition for acceptance of the sewer section represented by the test.

If the ground water level is greater than three feet above the invert elevation of the upper manhole and the Engineer so approves, infiltration testing may be allowed in lieu of the exfiltration testing, in which case the allowable leakage shall be the same as would be allowed for the Hydrostatic Test.

All testing shall be performed by the Contractor without any direct compensation being made therefore, and the Contractor shall furnish all necessary equipment and materials, including plugs and standpipes as required.

A. Air Test Method (2013 CEAM)

The sewer pipe section under test shall be clean at the time of testing but the pipe may be wetted. Pneumatic balls shall be used to plug the pipe ends at the manholes. Low pressure air shall be introduced into the plugged line until the internal air pressure reaches 4.0 psi greater than the average back pressure of any groundwater pressure that may submerge the pipe. At least two minutes shall be allowed for the air temperature to stabilize before readings are taken and the timing started. During this time the Contractor shall check all plugs with soap solution to detect plug leakage. If plugs are found to leak, air shall be bled off, the plugs shall be retightened, and the air shall be reintroduced into the line.

The sewer pipe section under test will be accepted as having passed the air leakage test if it does not lose air at a rate to cause the pressure to drop from 3.6 to 3.0 psi in less time than one-half minute per inch in diameter of the pipe tested.

B. Hydrostatic Test Method (2621.3F2)

After bulkheading the test section, the pipe shall be subjected to a hydrostatic pressure produced by a head of water at a depth of three feet above the invert elevation of the sewer at the manhole of the test section. In areas where ground water exists, this head of water shall be three feet above the existing water table.

The water head shall be maintained for a period of one hour during which time it will be presumed that full absorption of the pipe body has taken place, and thereafter for an extended period of one hour the water head shall be maintained as the test period. During the one hour test period, the measured water loss within the test section, including service stubs, shall not exceed the Maximum Allowable Loss (in Gallons Per Hour per 100 Feet of Pipe) given below for the applicable Main Sewer Diameter.

Main Sewer Diameter (inches)	Maximum Allowable Loss* (Gallons per hour per 100 feet)
6	0.5
8	0.6
10	0.8
12	1.0
15	1.2
18	1.4
21	1.7
24 & Larger	1.9
*Based on 100 Gallons per Day per Pipe Diameter Inch Per Mile	

If measurements indicate exfiltration within a test action is not greater than the allowable maximum, the section will be accepted as passing the test.

C. Test Failure and Remedy (2621.3F3)

In the event of test failure on any test section, testing shall be continued until all leakage has been detected and corrected to meet the requirements. All repair work shall be subject to approval of the Engineer. Introduction of sealant substances by means of the test water will not be permitted.

Unsatisfactory repairs or test results may result in an order to remove and replace pipe as the Engineer considers necessary for test conformance. All repair and replacement work shall be at the Contractor's expense.

1040.2.8 Deflection Test (2621.3G)

Installed PVC pipe shall be tested for deflection using a "go-no-go" mandrel at least thirty (30) days following installation. An additional deflection test shall be provided by the contractor within 30 days of the expiration of the two-year warranty period (the Contractor may televise at his option).

The deflection test shall be performed by pulling a rigid ball or none-point mandrel (Mn/DOT Technical Memorandum 98-24-B-01 or latest revision) through the pipe without the aid of mechanical pulling devices. The ball or mandrel shall have a minimum diameter equal to 95% of the actual inside diameter of the pipe. The maximum allowable deflection shall not exceed

5% of the pipe's internal diameter. The line will be considered acceptable if the mandrel can progress through the line without binding. The time of the test, method of testing, and the equipment to be used for the test shall be subject to the approval of the Engineer.

All testing shall be performed by the Contractor at his expense without any direct compensation being made therefore, and he shall furnish all necessary equipment and materials required.

In the event of test failure on any test section, the section shall be replaced, with all repair work subject to approval of the Engineer. The replaced section shall be retested for leakage and deflection in conformance with the specifications contained herein. All repairs, replacement, and retesting shall be at the Contractor's expense.

1040.2.9 Televising (2621.3H)

Within 30 days of the expiration of the two-year warranty period, the Contractor shall televise sanitary sewer sections for all gravity sanitary sewer construction.

The televising camera shall be mounted on a skid so that it is centered in the pipe. The camera shall be equipped with sufficient lights to completely illuminate the interior of the pipe within the range of the camera.

A recording and a report shall be made of the entire footage of pipe televised. The linear footage of pipe televised shall be integrated into the recording for ease of identification of pipe being viewed. A diagram of the project with all televising indexed on it shall be provided in triplicate within five working days following the last day of televising on the project. If televising is interrupted for more than five days, an intern index diagram shall be furnished. The original recording of the entire footage shall be provided to the City, after recording is completed. Each recording shall be clearly labeled on the outside indicating the project, location and number. Recording shall be in DVD format.

1040.3 Method of Measurement and Payment

1040.3.1 Sewer Pipe

Sewer pipe of each design designation will be measured by length in linear feet along the line of pipe. Terminal points of measurement will be the pipe end at free outlets; the point of connection with in-place pipe; the center of manholes or catch basins; the point of centerline intersections at branch fittings; or the point of juncture with other appurtenances or units.

Separation of quantities according to “depth zone classification”, when so designated in the Pay Item, will be determined by depth of pipe invert below the ground surface profile. Pay depth for sewer construction will be based on the proposed street subgrade elevations or the existing ground, whichever is less, at the time of construction.

Sewer pipe will be paid for at the Contract unit price per lineal foot for each type, for each diameter of pipe furnished and installed, and according to the depth zone classification, if applicable. Increases and reducers will be paid for at the Contract unit price per linear foot for the larger size pipe.

Unit prices bid shall be compensation in full for all costs incidental to construction, including, but not limited to, excavation, dewatering, sheeting, pipe completely installed, backfilling, removal of excess fill material, necessary bends, wyes, and tee sections, unless otherwise indicated as a pay item.

1040.3.2 Manholes and Catch Basins

Manholes and catch basins will not be paid for until the manhole construction is completed including inverts poured, rings grouted, castings placed and pipe within the structure neatly cut with no ragged edges unless otherwise specified. Payment shall include rings, inverts and castings unless otherwise specified. Extra depth manholes and or catch basins will not be paid unless specifically stated in the Special Provisions.

1040.3.3 Reinforced Concrete Pipe Aprons and Rip Rap

Reinforced concrete pipe aprons of each size shall be paid for at the Contract unit price per each. Unit prices bid shall be compensation in full for all costs incidental to construction, including, but not limited to, excavation and backfilling, compaction, tie rods, trash guards, and end sections.

Where rip rap is installed, the rip rap and filter material will be paid for at the contract unit prices bid per cubic yard furnished and placed as specified. Cubic yards will be based on loose volume (LV) determined by the truckloads of riprap delivered to and incorporated into the work. Volumes will be determined to the nearest whole cubic yard based on average load size, as determined by the Engineer, multiplied by the actual number of loads. The Contractor shall provide the Engineer with daily load records. The load record shall supplement, but not take precedence over the volume calculations conducted by the Engineer.

1040.3.4 Outside Drop Connection

All outside drop connections shall be paid for on vertical drop. This measurement will be from the invert of the high pipe to the invert of the low pipe. This measurement shall be full compensation for all necessary materials and labor required for complete installation of each drop section, including granular encasement, fittings, and any special piping required, including coring two holes into existing manholes for the drop connection.

The the lineal foot unit bid price for installation of D.I. pipe section extended to connect to the main (PVC or other sewer pipe) shall include the cost for labor, equipment and materials to supply and install the specified Smith-Blair 413 Steel Transition Couplings, or approved equal.

1040.3.5 Service Connection

Service risers shall be paid for on lineal feet installed. This measurement shall be full compensation for all fittings, bends and labor required for installation.

1040.3.6 Service Pipe

Service pipe of each design will be measured separately by length in linear feet, horizontally along the line of installation, between the service end and the point of juncture with the main pipe connection fitting.

1040.3.7 Sanitary Sewer Pipe Cleanout

Payment for sanitary sewer cleanouts will be for each number constructed complete in-place. Clean outs of the size specified shall include: sanitary wye, elbows, riser pipe, threaded PVC cap, and an 18" – 36" cast iron box and cover.

1040.3.8 Special Pipe Fittings

Special pipe fittings (wyes, tees, bends, etc.) of each design designation will be measured by number of each installed complete-in-place as specified, but excluding any such fittings required to be installed as a component part of any other Work Unit.

1040.3.9 Cut-In Connection to Existing System

Connecting sewers to existing pipes or manholes, or constructing manholes on existing pipe shall be paid for at the Contract unit price per each connection. This shall be full compensation for all labor, equipment, and supplies required for cutting in the new connection.

1041. WATER SYSTEM (2504, 2611)

This work shall consist of the construction of water main and building service pipelines utilizing plant fabricated pipe and other appurtenant materials, installed for conveyance of potable water. The work includes the relocation or adjustment of existing facilities as may be specified in the Plans, Specifications, and Special Provisions.

Tapped Service installations shall include all water service lines less than three inches nominal inside diameter pipe. The component parts of a tap service installation shall include a corporation stop coupling complete with water main tap and saddle where required; a curb stop coupling complete with service box; and copper piping extending from the corporation stop to the curb stop coupling or to the limits as established by the Engineer. Tapped Service lines shall be installed at the size specified in the Plans, Specifications, and Special Provisions.

Branch Service installations shall include all water service lines of three inches nominal inside diameter pipe and larger. The component parts of a branch service installation shall include a tapping sleeve and valve or a tee connection and valve complete with valve box, and piping extending from the water main connection, to the property line or to the limits as specified by the Engineer.

All references to Gray Iron material shall be construed to include both Gray Iron and Ductile Iron products, except where one or the other is specified. All references to “structure” shall include any man-made object that is not otherwise exempted by special terminology or definition.

1041.1 Materials (2611.2)

All materials required for this work shall be new material conforming to requirements of the reference specifications for the class, kind, type, size, grade, and other details indicated in the Contract. Unless otherwise indicated, all required materials shall be furnished by the Contractor. If any options are provided for, as to type, grade, or design of the material, the choice shall be limited as may be stipulated in the Plans, Specifications, or Special Provisions.

All manufactured products shall conform in detail to such standard design drawings as may be referenced or furnished in the plan. Otherwise, the Owner may require advance approval of material suppliers, product design, or other unspecified details as it deems desirable for maintaining adopted standards.

Contractor shall submit, in writing, a list of materials and suppliers for approval.

A Certificate of Compliance shall be furnished stating that the materials furnished have been tested and are in compliance with the specification requirements.

1041.1.1 Water Pipe (2611.2A)

Polyvinyl chloride pipe shall **not** be permitted for any water main installation in the City.

All water main shall be designed for a working pressure of 350 psi, laying condition Type 2, cement mortar lined. Other lining may be used if approved by the Engineer in advance of the bid opening. All other materials for water main including water main fittings and appurtenances shall also meet similar specifications. All water main shall be installed with 7.5 feet of cover (to top of pipe) unless otherwise direct from the Engineer.

Ductile iron pipe shall conform to the requirements of AWWA C115 or C151 for water and thickness design shall conform to AWWA C 150. In addition, the pipe shall comply with the following supplementary provisions:

- All water main, 8" or larger, shall be Ductile Iron Pipe – Class 52.
- All 6" water main shall be Ductile Iron Pipe – Class 54.
- All hydrant leads shall be 6" Ductile Iron Pipe – Class 52.
- Fittings shall be Ductile Iron and conform to the requirements for AWWA C110 OR 153 (Gray Iron and Ductile Iron Fittings) (Ductile Iron Compact Fittings) for the joint type specified.
- Unless otherwise specified all pipe shall be furnished with cement mortar lining meeting the requirements of AWWA C104 for standard thickness lining. All exterior surfaces of the pipe shall have an asphaltic coating at least one mil thick. Spotty or thin seal coating, or poor coating adhesion, shall be cause for rejection.
- Unless otherwise specified all fittings shall be furnished with an epoxy coating. Spotty or thin epoxy coating, or poor coating adhesion, shall be cause for rejection.
- Rubber gasket joints for Ductile Iron Pressure Pipe and fittings shall conform to AWWA C111.

Water main pipe walls shall be of a thickness to support 2 ½ full threads for the size of service necessary of Standard Corporation stop threads as specified by AWWA C800. A service saddle shall be used when the corporation stop exceeds the size listed in the following for each diameter of water main:

<u>Water Main Size</u>	<u>Maximum Corp Size without Saddle</u>
8"	1 ¼"
10"	1 ½"
12"	2"
14" & larger	2"

1041.1.2 Fire Hydrants (2611.2B)

Hydrants shall be Waterous Pacer No. WB-67-250, or approved equal and shall conform to the applicable requirements of AWWA C-502. All hydrants shall have a 6" gate valve installed on hydrant lead as directed by the City Engineering Department. No service taps are allowed off hydrant leads.

Unless otherwise specified in the Plans, Specifications, and Special Provisions, hydrants shall be furnished in conformance with the following supplementary requirements:

- Hydrants shall have a five-inch (nominal diameter) main valve opening of the type that opens against water pressure.
- Hydrant barrels shall be two pieces, non-jacket type, with flanged joint above finished grade line and with mechanical joint connection at the hub end for joining a six-inch ductile iron branch pipe.
- Hydrants shall be provided with a 16" break off section.
- Hydrant bury length, measured from the bottom of the branch pipe connection to the finished ground line at the hydrant, shall be 8'-0".
- Hydrants shall have two outlet nozzles for 2-1/2 inch (I.D.) hose connection and one outlet nozzle for 4.5 inch (I.D.) steamer connection. All outlet nozzle threads shall be National Standard Fire-Hose Coupling Screw Threads (NFPA 1963).
- Hydrant operating mechanisms shall be provided with "O" ring seals preventing entrance of moisture and shall be lubricated through an opening in the operating nut or bonnet.
- Hydrants shall be provided with outlets for drainage in the base or barrel, or between the base and barrel, unless the Special Provisions require that drain outlets be omitted or plugged.

- The hydrant operating nut shall be rotated counterclockwise to open.
- Hydrants shall be tied to their corresponding valve with **tie rods**.
- Detailed drawings, catalog information, and maintenance data shall be furnished as requested by the Engineer.
- All hydrant installations shall be furnished with a standard hydrant marker, rod - white with red tape, such as Hydra-finder by Rod-on Corp. The contractor shall attach the marker after installation of the hydrant.

1041.1.3 Valves and Valve Boxes (2611.2C)

A. Valve Boxes (2611.2C1)

Installation shall include a Flexstake marking post when the valve is outside the traveled roadway.

Valve boxes shall be cast iron of the three piece screw type suitable for a depth of 7 ½ feet of cover over the top of the pipe or to a depth as shown on the plans. For valves buried to a depth greater than 14 feet from the top of operating nut to the top of the finished grade, the valve box shall be equipped with a riser rod in a length when connected to the operating nut is 6” below the top of the finished grade. Boxes shall be of a 5 ¼” diameter. Valve boxes shall be Tyler 6860 G, Mueller H10361 or Bibby-Ste.-Croix or approved equal as shown on the Standard Detail.

Drop covers on valve boxes shall bear the word “water” on the top.

Valve Box Adapters. Valve box adapters shall be installed on all gate valves and butterfly valves as manufactured by Adapter, Inc. or approved equal. Payment for said adapters shall be considered incidental to the price of gate valves or butterfly valves.

B. Resilient Wedge Gate Valves (4” to 24” Diameter) (2611.2C2)

- Gate valves shall be resilient wedge type, manufactured to meet all applicable requirements of A.W.W.A. Standard for Resilient Sealed Gate Valves C509-80. Valves shall have non-rising stems, opening in a counterclockwise direction. Valves shall be furnished with all exterior solid stainless steel nuts and bolts and spray-coated with a bituminous coal tar supplied by the manufacturer.
- Valves shall be provided with a two-inch (2”) square operating nut and shall open in a counterclockwise direction.
- All gate valves shall be non-rising stem type furnished with O-Ring stem seals.

- All gate valves 16 inches or larger in size shall be arranged for operation in the horizontal position.
- All gate valves 12 inches or larger in size shall be equipped with approved barrel type rugged gate position.
- All gears on gate valves shall be cut tooth steel gears, housed in heavy ductile or cast iron extended type grease cases of approved design.
- All gate valves shall have an open indicating arrow, the manufacturer's name, pressure rating and year of manufacture cast on the valve bodies.

C. Butterfly Valves (2611.2C3)

Butterfly valves shall be located as shown on the plans positioned as shown on the Standard Detail and be constructed for buried service. Bodies shall be of cast iron with mechanical joint to fit ductile iron pipe and be furnished with all solid stainless steel nuts and bolts. Valve bearings shall be of nylon or permanently lubricated bronze. The rubber seat shall be permanently bonded to the body.

The shaft shall be 304 stainless steel with a disc Ni-resist Type 1 with polished edge. The operator shall be constructed and sealed for buried or submerged service. This unit shall be equipped with an A.W.W.A. two-inch (2") square operating nut, and open in a counterclockwise direction. The valve and operator assembly and all components shall be equal or exceed all recognized standards and shall be Henry Pratt "Groundhog", or approved equal. Minimum requirements for butterfly valves shall conform to A.W.W.A. C504, latest revision. Valves shall be furnished with all exterior stainless steel nuts and bolts and spray-coated with a bituminous coal tar supplied by the manufacturer.

1041.1.4 Water Service Pipes and Fittings (2611.2D)

Water service pipe of 3 inches or larger inside diameter shall conform to the requirement for Ductile Iron Pipe and Ductile Iron Fittings as set forth under the provisions of 2611.2A1.

Water service pipe of less than 3 inches in inside diameter shall conform to the requirements of ASTM B 88 for Seamless Copper Water Tube, Type K, Soft Annealed temper Pipe and fittings as per ASTM D1785, D2241, D2466, D2467 and D2740 as specified on the Proposal or in the Special Provisions.

Corporation stops, saddles, curb stops, and curb stop service boxes shall conform to the requirements of AWWA C800 as detailed in the Plans, Specifications, and Special Provisions or approved designations. All fittings for copper tubing shall be cast brass, having uniformity in wall thickness and strength, and shall be free of defects affecting serviceability. All copper pipe fittings shall be flared. Use of compression fittings shall be subject to the approval of the Engineer. All threads for underground service line fittings shall conform to the requirements of AWWA C-800. Each fitting shall be permanently and plainly marked with the name or trademark of the manufacturer.

Curb stop service boxes shall be gray iron castings conforming to the requirements of ASTM A 48 for Class 20 or higher tensile strength and shall have 18 inches of vertical adjustment for the cover depth specified in the Plans, Specifications, and Special Provisions.

A. Corporation Stops

Corporation stops shall be equal to Mueller H-15000 with Mueller thread inlet and copper service pipe outlet.

B. Curb Stops and Boxes

Curb stops shall be equal to Ford B-22-333, provided with riser keys. Curb stops shall have copper service pipe inlet and outlet. Curb boxes shall be equal to Mueller H-10300, Minneapolis Pattern, and shall be adjustable up and down for 7.5 feet of cover. Any curb stop boxes that will be within a paved surface shall have a cover equal to Ford A-1 installed prior to pavement placement. The furnishing and installation of the cover shall be considered incidental, for which no direct compensation will be made.

Service lines shall be terminated and marked at the curb stop box in accordance with the City's standard plate, which is to be located at the street right-of-way. No "pig tails" will be allowed and no "dry" taps will be allowed.

1041.1.5 Polyethylene Encasement Material (2611.2E)

Polyethylene encasement material shall conform to the requirements of AWWA C-105 for tube type installation and 8 mil nominal film thickness and shall be installed in areas noted in the plans or otherwise directed by the Engineer.

1041.1.6 Restrained Joint Retainer Glands (2611.2F)

Retainer glands shall **not** be used. Where water main joint restraint is required, use tie rods or Mega-Lug type in accordance with Standard Detail plates and manufacturer's recommendations.

All nuts, bolts, and tie rod type restraints shall be core blue.

1041.2 Construction Requirements (2611.3)

1041.2.1 Installation of Pipe and Fittings (2611.3A)

Installation of ductile iron water mains and their appurtenances shall conform to the requirements of AWWA C-600 Specifications, the Plans, Specifications and Special Provisions.

Installation of pipe and fittings shall also conform to the following general guidelines:

A. Inspection and Handling (2611.3A1)

Inspection and handling shall conform to the requirements of Section 1019.2.1A of this Specification ("Inspection and Handling").

B. Pipe Laying Operations (2611.3A2)

Trench excavation shall conform to the requirements of Section 1011 of this Specification ("Trench Excavation and Backfill").

Bedding conditions and pipe cleanliness shall conform to the requirements of the second through fourth paragraphs of Section 1019.2.1B of this Specification ("Pipe Laying Operation")

As each length of bell and spigot pipe is placed in laying position, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with approved backfill material, which shall be thoroughly compacted by tamping around the pipe to a height of at least 12 inches above its top. Acceptable tamping techniques include hand tamping and use of hand operated mechanical tamping devices.

At all times when pipe laying is not in progress, including noon hour and overnight periods, all open ends of the pipe line shall be closed by watertight plugs or other means approved by the Engineer. If water is present in the trench, the seals shall remain in place until the trench is pumped completely dry.

When connecting to existing stubs, the Contractor shall take every precaution necessary to prevent dirt or debris from entering the existing lines. All necessary work to make the connection shall be done at no additional compensation, except where noted otherwise.

C. Aligning and Fitting of Pipe (2611.3A3)

The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe and so as to leave a smooth square-cut end. Pipe shall be cut with approved mechanical cutters. The electric-arc cutting method, using carbon or steel rod, will be approved for use on larger size ductile or gray pipe where mechanical cutters are not available. Flame cutting will not be allowed under any conditions. All rough edges shall be removed from the cut ends of pipe and, where rubber gasket joints are used; the outer edge shall be rounded or beveled by grinding or filing to produce a smooth fit.

Wherever it is necessary to deflect ductile iron pipe from a straight line either in the vertical or horizontal plane, to avoid obstructions, plumb stems, or produce a long radius curve when permitted, the amount of deflection allowed at each joint shall not exceed the allowable limits for maintaining a satisfactory joint seal as given in AWWA C-600 for mechanical joints and push-on joints. The maximum angular deflection at any joint for other pipe materials and joints shall not exceed the manufacturer's recommendations. If the specified alignment requires angular deflections greater than recommended or allowed, the Contractor shall provide appropriate bends or shorter pipes such that the maximum angular deflection is not exceeded.

Connection and assembly of joints shall be accomplished during the setting, aligning, and fitting operations, in accordance with the provisions of Section 1020.1.4 of this Specification, to the extent that the jointing requirements will permit ("Water Service Pipes and Fittings").

D. Blocking and Anchoring of Pipe (2611.3A4)

Where valves are located on dead-ends, the valves shall be tied or lugged across the valve with tie rods on ductile iron pipe. Dead ends 6 inches through 12 inches shall be tied commencing with branch fittings by installing mechanical joint pipe with ductile iron pipe retainer glands or other pipe fasteners as approved by the Engineer.

In addition,

- All horizontal bends exceeding 20 degrees deflection, and all caps, plugs, branch tees, and gate valves shall be provided with concrete buttress blocking.
- All vertical bends exceeding 20 degrees deflection shall be provided with concrete buttress blocking at the low points and with metal tie rod or strapping restraints at the high points.
- Offset bends made with standard offset fittings need not be strapped or buttressed.

Hardwood blocking shall not be allowed at any time. All blocking shall be new precast (manhole block or approved equal) or poured in place concrete.

Concrete buttresses shall be poured against firm, undisturbed ground and shall be formed in such a way that the joints will be kept free of concrete and remain accessible for repairs. The concrete mix used in buttress construction shall meet the requirements for Grade B concrete in conformance with Mn/DOT Specification 2461. Buttress dimensions shall be a minimum of 12 inches in thickness, and the minimum area, in square feet shall be as follows:

PIPE SIZE	TEE OR PLUG	1/4 BEND	1/8 BEND	1/16 BEND
6"	2.9	3.1	1.6	0.8
8"	3.7	5.3	2.9	1.4
10"	5.7	8.1	4.4	2.2
12"	8.1	13.4	6.6	3.2
16"	15.1	21.4	11.6	5.9
20"	23.2	30.2	18.1	9.3
24"	33.6	48.5	26.1	13.3

Contractors are instructed to size concrete buttress blocking on fittings and dead ends where the blocking must withstand the pressure of larger main line fittings equipped with reducers, for the larger sized main line thrust and not for smaller fitting size only. This is of particular importance on tees and crosses where the main size is reduced on the run from large to small size by use of reducers.

All metal parts of tie rod or strap type restraints shall be galvanized or coated with other approved asphaltic type rust proofing.

All necessary fittings, bands, tie rods, nuts, and washers, and all labor and excavation required for installation of reaction restraints shall be furnished at the Contractor's expense with no direct compensation provided therefore.

E. Polyethylene Encasement of Pipeline (2611.3A5)

Wherever so required by the Plans, Specifications, or Special Provisions, or otherwise required by the Engineer, the pipeline, including valves, fittings, and appurtenances, shall be fully encased in polyethylene film meeting the requirements of these Specifications. The film shall be furnished in tube form for installation on pipe and all pipe-shaped appurtenances such as bends, reducers, off-sets, etc. Sheet film shall be provided and used for encasing all odd-shaped appurtenances such as valves, tees, crosses, etc.

The polyethylene tubing shall be installed on the pipe prior to being lowered into the trench. Tubing length shall be sufficient to provide a minimum overlap at all joints of one foot or more. Overlap may be accomplished with a separate sleeve tube placed over one end of the pipe prior to connecting another section of pipe, or by bunching extra overlap material at the pipe ends in accordion fashion. After completing the pipe jointing and positioning the overlap material, the overlap shall be secured in place with PVC or polyethylene tape wrapped circumferentially around the pipe not less than three turns.

After encasement, the circumferential slack in the tubing film shall be folded over at the top of the pipe to provide a snug fit along the barrel of the pipe. The fold shall be held in place with plastic adhesive tape applied at intervals of approximately three feet along the pipe length. Also, any rips, punctures, or other damage to the tubing shall be repaired as they are detected. These repairs shall be made with PVC or polyethylene tape. Under no circumstance shall duct tape be used to repair polyethylene encasement.

At odd-shaped appurtenances such as gate valves, the tubing shall overlap the joint and be secured with tape, after which the appurtenance piece shall be wrapped with a flat film sheet or split length of tubing by passing the sheet under the appurtenance and bringing it up around the body. Seams shall be made by bringing the edges together, folding over twice, and taping down. Wherever encasement is terminated, it shall extend for at least two feet beyond the joint area.

Openings in the tubing for branches, service taps, air valves and similar appurtenances shall be made by cutting an X-shaped slit and temporarily folding back the film. After installing the appurtenance, the cut tabs shall be secured with tape and the encasement shall be completed as necessary for an odd-shaped appurtenance.

Unless otherwise specified in the Plan, Specifications, and Special Provisions, hydrants encased in polyethylene tubing shall have plugged drain outlets.

1041.2.2 Connection and Assembly of Joints (2611.3B)

Where rubber gasket joints are specified, care shall be taken during the laying and setting of piping materials to ensure that the units being joined have the same nominal dimension of the spigot outside diameter and the socket inside diameter. A special adaptor shall be provided to make the connection when variations in nominal dimension might cause unsatisfactory joint sealing.

Immediately before making the connection, the inside of the bell or socket and the outer surface of the spigot ends shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter. Insertion of spigot ends into the socket or bell ends shall be accomplished in a manner that will assure proper centering and insertion to full depth. The joint seal and securing requirements shall be as prescribed below for the applicable pipe and joint type.

A. Ductile Iron Pressure Pipe and Fitting Joints (2611.3B1)

Ductile iron pressure pipe and fitting joints shall conform to AWWA C-111.

Push-On Joints (2611.3B1a)

The circular rubber gasket shall be kept in a warm, flexible condition at all times, and for purposes of placement shall be flexed inward and inserted in the gasket recess of the bell socket. A thin film of approved gasket lubricant shall be applied to either the inside surface of the gasket or the outside surface of the spigot end, or to both. Care shall be taken while inserting the spigot end to prevent introduction of contaminants. The joint shall be completed by forcing the spigot end to the bottom of the socket using suitable pry-bar or jack type equipment. Spigot ends which do not have depth marks shall be marked before assembly to insure full insertion.

Field cut pipe shall be filed or ground at the spigot edge to resemble the manufacturer's fabricated detailing. The use of the bucket on the excavation equipment to force the pipe into the socket shall not be permitted

Mechanical Joints (2611.3B1b)

The last eight inches of the outside spigot surface and the inside bell surface of each pipe and appurtenance joint shall be painted with a soap solution, after being thoroughly cleaned. The gland shall then be slipped on the spigot end with the lip extension toward the socket or bell end. The rubber gasket shall be kept in a warm, flexible condition at all times, and for purposes of placement shall be painted with soap solution and be placed on the spigot end with the thick edge toward the gland. An approved lubricant provided by the pipe manufacturer may be used in lieu of the soap solution.

After the spigot end is inserted into the socket to full depth and centered, the gasket shall be pressed into place within the bell evenly around the entire joint. After the gland is positioned behind the gasket, all bolts shall be installed, and the nuts tightened alternately to the specified torque, such as to produce equal pressure on all parts of the gland.

Unless otherwise specified, the bolts shall be tightened by means of a suitable torque-limiting wrench to within a foot-pound range of: 45 to 60 for 5/8-inch bolts; 75 to 90 for 3/4-inch bolts; 85 to 100 for 1-inch bolts; and 105 to 120 for 1-1/4-inch bolts. After tightening, all exposed parts of the bolts and nuts shall be completely coated with an approved asphaltic type rust preventive material.

Flanged Joints (2611.3B1c)

Flanged joints shall be installed only in above grade or exposed locations and shall conform to the requirements of AWWA C115 Specifications, the Plans, Specifications and Special Provisions. Flanged joints shall have full face gaskets.

1041.2.3 Water Service Installations

Water service facilities consisting of Tap Service Lines and Branch Service Lines, complete with all required appurtenances, shall be installed as required by in the Plans, Specifications, and Special Provisions, in accordance with all pertinent requirements for main line installations together with the provisions hereof.

It shall be the responsibility of the Contractor to keep an accurate record of the location, depth and size of each service connection and other pertinent data such as the location of curb stops and pipe endings. Tap locations shall be recorded in reference to survey line stationing. Curb stops shall be tied to definable land marks such as building corners, lot corner markers, etc. Pipe

terminals at the property line shall be marked to the ground surface with a suitable wood timber 4 by 4 inch, 8 feet long set vertically into the ground with the top 2 feet painted blue. Approved record keeping forms will be furnished by the Engineer and the completed records shall be submitted by the Contractor upon completion of the work.

Water service lines shall normally be installed by trenching and be subject to the same requirements as prescribed for the main pipeline installation, except for those which may not be pertinent or applicable. Where water service lines are installed alongside of sanitary service lines, installation shall be such as to maintain the minimum specified clearances between pipelines and provide proper and adequate bearing for all pipes and appurtenances. For separate installation, the trench width shall be not less than two feet. Subject to minimum clearances, the water lines may be laid in a common trench excavated principally for sewer installation, either by widening the trench as necessary or by providing a shelf in the trench wall where ground stability will permit. When water service pipe is placed in a common trench with sewer service pipe, the sewer service pipe shall be constructed of materials and with joints equivalent to water main standards.

Water service lines shall be installed to provide for the specified cover over the top of the pipe and with not less than 18 inches of clearance between pipelines. A minimum 3 inches of clearance shall be maintained in crossing over or under other structures. Where the service pipe may be exposed to freezing due to insufficient cover or exposure from other underground structures, the water pipe shall be insulated as directed by the Engineer.

A. Tee Branch Service Lines (2611.3C1)

Tee branch service piping shall be of the type, size, and wall thickness specified. The pipe and appurtenances shall have rubber gasket push-on or mechanical joints. Tee branch service lines shall be provided as required by the Plans.

Installation of tee branch service facilities shall be in accordance with all applicable requirements of these specifications as pertain to the mainline installations.

B. Tapped Service Lines (2611.3C2)

Service piping shall be of the size and type specified. Unless otherwise specified, minimum pipe size for tap service installations shall be one-inch nominal inside diameter. Larger size pipe may be specified for commercial and industrial uses or for some domestic services as specifically identified. Installation of service facilities shall be in accordance with all applicable requirements of these specifications as pertain to the mainline installations, subject to the exceptions and supplementary provisions set forth hereinafter.

Unless otherwise indicated, service piping may be laid directly on any solid foundation soil that is free of stones and hard lumps. However, when specified or ordered, aggregate materials shall be furnished and placed as necessary to secure proper foundation drainage, pipe covering, or backfill support.

Tapped service piping of 1-inch in diameter shall be installed in one piece without intermediate joint couplings between the corporation stop and the curb stop. Service pipe of 1-1/2-inches in diameter and larger shall be furnished in standard roll lengths to eliminate any intermediate joints. When full roll lengths are less than the service length the rolls may be joined with approved couplings. One-inch (1") tap service lines shall require one-inch taps. Corporations shall not be 3/4" on the tap side and 1" on the service side.

Unless otherwise specified, connection of tapped service lines to the water main shall be made at an angle of not more than 22 degrees from the horizontal. A double wrap of Teflon tape shall be placed on the corporation stop threads prior to installation in the main. Expansion loops shall be directed downward or horizontal from the tap.

Unless otherwise indicated, tap service lines shall be installed on a straight line at right angles to the water main or property line as directed by the Engineer. In the absence of specific requirements, the service line shall be terminated at the property line, where it shall be connected to an existing line or, in the case of undeveloped property; it shall terminate at the curb stop and box.

The flaring of copper tubing ends shall be accomplished only with the use of the proper size and type of tools as designed for the purpose. Tubing shall be cut squarely, and all edge roughness shall be removed prior to flaring. All couplings shall be tightened securely, so the flared end fits snugly against the bevel of the fitting without leakage. The flared joint couplings shall be made up without the use of jointing compounds.

The service pipe and curb stop coupling depth shall be such as to maintain not less than the specified minimum cover. The service box shall be connected to or centered over the curb stop and be firmly supported on concrete blocking as required by the Plans, Specifications, and Special Provisions. Clearance shall be provided so the service box does not rest on the water pipe. Service boxes shall be installed plumb. Service boxes shall be installed at half-extensions. The service boxes shall be brought to proper surface grade when the final ground surface has been established.

Contractor shall keep on hand all available connection fittings in order to connect to an existing water service line of varying sizes. Additional labor, materials and equipment cost for copper connections to existing lines shall be considered incidental to construction unless otherwise specified.

1041.2.4 Setting Valves, Hydrants, Fittings and Specials (2611.3D)

Valves, hydrants, fittings, and specials shall be provided and installed as required by the Plans, Specifications, and Special Provisions, with the exact locations and setting as directed by the Engineer, and with each installation accomplished in accordance with the requirements for installation of mainline pipe to the extent applicable. Support blocking, reaction backing, and anchorage devices shall be provided as required by the Plans, Specifications, and Special Provisions, or as otherwise ordered by the Engineer.

Hydrants shall be installed plumb, with the height and orientation of nozzles as shown in the Plans or as directed by the Engineer. Unless otherwise specified, the hydrants shall be connected to the mainline pipe with 6-inch diameter ductile iron pipe, controlled by an independent valve.

When a hydrant with an open drain outlet is set in clay or other impervious soil, a drainage pit of at least one cubic yard shall be excavated below and around the hydrant base and the pit shall be filled with Foundation Material to a level six inches above the drain outlet. Poly or other material approved by the Engineer shall be carefully placed over the rock to prevent backfill material from entering voids in the rock drain. Hydrants located where the groundwater table is above the drain outlet shall have the outlet drain hole plugged or the drain tube cut off to prevent draining, and shall be equipped with a tag stating, "Pump After Use".

Valve boxes shall be centered with a valve box adapter over the valve wrench nut and be installed plumb, with the box cover flush with the surface of the finished pavement or at such other level as may be directed. All gate valve boxes shall be installed with appropriate riser sections such that there will be a minimum of 6" of adjustment in each direction (up or down) after the top section is set to grade.

Masonry valve pit structures, for valves with exposed gearing or operating mechanisms, shall be constructed in accordance with the details shown in the Plans and with the applicable provisions of these Specifications.

Drainage blow-offs, air vents, conductivity access boxes, and other special appurtenances shall be provided and installed as required by the Plans, Specifications, and Special Provisions.

All dead ends shall be closed with approved plugs or caps and shall be equipped with suitable blow-off facilities.

1041.2.5 Water Service Testing and Maintenance Line

Water service testing and maintenance connections described herein are considered incidental to water main construction to include all labor, materials, and equipment costs with no additional compensation thereof.

Where there is **not** a hydrant within 50 feet of the **high point** a 1-inch corporation stop and temporary copper line and shut off stop shall be placed for air release and testing purposes before the lines are charged.

Where a newly constructed segment of water main has no hydrant for charging or testing the line, a 1-inch corporation stop and temporary copper line with shut off stop shall be placed for charging, testing, and flushing the pipe.

At the direction of the Engineer, temporary pipe and shut-off shall be removed and corporation stop turn off at the main.

1041.2.6 Disinfection of Water Main (2611.3E)

Before being placed in service, the completed water main shall be disinfected. Disinfection materials and procedures, and the collection and testing of water samples, shall be in accordance with the provisions of AWWA C-651. After the final flushing the water shall be tested for bacteriologic quality and must be found to meet the standards prescribed by the Minnesota Department of Health.

Where an existing water main is cut for the installation of any fitting, the pipe and fittings proposed to be installed shall be disinfected prior to installation as follows:

- The interior of the pipe and fittings shall be cleaned of all dirt and foreign material.
- The interior of the pipe and fittings shall be thoroughly swabbed or sprayed with a 1 percent minimum hypochlorite solution.

Unless otherwise indicated in the Plans, Specifications, and Special Provisions, the Contractor shall furnish all materials and perform the disinfecting, flushing, and testing as necessary for meeting the water quality requirements. The flushing operations and the form of chlorine and method of application to be used shall be subject to approval by the Engineer.

Water main disinfection shall be coordinated with the City’s Utility Department consisting of:

High-test calcium hypochlorite or bleaching powder must be prepared as a water mixture for introduction into the water mains. The powder should first be made into a paste and then thinned to approximately a one percent (1%) chlorine solution (10,000 PPM). The preparation of a one percent (1%) chlorine solution requires the following proportions of powder to water:

<u>PRODUCT</u>	<u>AMOUNT OF COMPOUND</u>	<u>QUANTITY OF WATER (GALLONS)</u>
High-Test Calcium Hypochlorite (65 – 70% CL)	1 LB	7.50
Chlorinated Lime (32 – 35% CL)	2 LB	7.50

The Contractor shall install, at his expense, corporations at the beginning and end of each project main to facilitate chlorination testing. These corporations are incidental to water main installation. **Only City personnel will be allowed to charge lines.**

Points of Application. The preferred point of application of the chlorinating agent shall be at the beginning of the pipeline extension, or any valved section of it, and through a corporation stop inserted by the contractor in the top of the newly placed pipe. The water injector for delivering the chlorine bearing water into the pipe should be supplied from a tap on the pressure side of the gate valve controlling the flow into a pipeline extension. In a new system, application of chlorine may be advantageously at the pumping station, wells, or storage reservoirs. When properly cleaned first, these units are thus chlorinated adequately.

Water from the existing distribution system or other sources of supply shall be controlled so as to flow into the newly laid pipeline during the application of the chlorine. The rate of chlorine mixture flow shall be in such proportion to the rate of water entering the pipe that the chlorine dose applied to the water entering the newly laid pipe shall be sufficient to produce 5.0 PPM after 24 hours standing. A convenient method of determining the rate of flow of water into the line to be treated is to start with the line full of water and measure the rate of discharge at a hydrant with a pilot gage. Great flexibility is made possible by providing a series of orifices to give good gage readings at high and low flows.

The Contractor may elect to use the Tablet Method which is generally described as follows:

- The Contractor shall place hypochlorite tablets in each section of pipe and also in hydrants, hydrant branches and other appurtenances during construction. The tablets shall be attached to the upper portion of the pipe with a harmless adhesive, such as “Permatex No. 1,” hard setting gasket cement, or other approved material.
- When the installation has been completed, the main shall be filled with water at a very low rate to ensure the tablets dissolve in the same locations as installed. Filling velocity shall not exceed one (1) foot per second. Chlorine residual tests shall be run by the Engineer at the beginning and end of the 24-hour retention period. Chlorine concentrations at the beginning of the period shall not be less than 50 PPM.
- A minimum of 10 days prior to allowing private connections to the new main, the heavily chlorinated or stagnant water shall be thoroughly flushed from the main until the chlorine concentration in the water being flushed is the same as the chlorine residual in the existing water main serving the area. Twenty-four hours after flushing has been completed, another chlorine residual test will be performed and the concentration in the new water main shall be no less than the existing water main in the area.

1041.2.7 Testing (2611.3F & 2611.3G)

A. Electrical Conductivity Test (2611.3F)

The Contractor shall perform a conductivity test within one week after completion of pressure testing of the main on all iron pipe water mains to establish that electrical thawing may be carried out in the future. The system (pipeline, valves, fittings and hydrants) shall be tested for electrical continuity and current capacity. The electrical test shall be made after the hydrostatic

pressure test and while the line is at normal operating pressure. Backfilling shall have been completed. The line may be tested in sections of convenient length as approved by the Engineer. Direct current of 350 amperes + 10% shall be passed through the pipeline for 5 minutes. Current flow through the pipe shall be measured continuously on a suitable ammeter and shall remain steady without interruption or excessive fluctuation throughout the 5-minute test period.

Insufficient current or intermittent current or arcing, indicated by large fluctuation of the ammeter needle, shall be evidence of defective contact in the pipeline. The cause shall be isolated and corrected. Thereafter, the section in which the defective test occurred shall be retested as a unit and shall meet the requirements.

Sources of Direct Current for these tests may be motor generators, batteries, arc welding machines, etc. Direct Current arc welding machines will probably be the usual source. These machines are available in adequate capacity for these tests and are equipped with controls for regulating the current output. All such equipment shall be furnished by the Contractor, subject to the approval of the Engineer.

Cables from the power source to the section of system under test should be of sufficient size to carry the test current without overheating or excessive voltage drop. Usable sizes will probably be in the range of 2/0 to 4/0 A.W.G.

Connections for the test shall be made at hydrants. The hydrants shall be in the open position with the caps on during the test. The cable shall be clamped to the body of the hydrant.

Note: After the test, the hydrant shall be shut off and a cap loosened to allow hydrant drainage or the hydrant shall be pumped dry. Tighten cap after drainage.

In using arc welding machines, the current control should be set at minimum before starting. After starting the machines, advance the control until the current indicated on the ammeter is at the desired test value. Caution: In case of open circuits at joints or connections, the voltage across the defective joint or connection will be in order of 50-100 volts.

B. Hydrostatic Test (2611.3G)

After the pipe has been laid, including fittings and valves and blocking, all newly-laid pipe or any valved section thereof, unless directed otherwise by the Engineer, shall be subject to hydrostatic pressure of 150 pounds per square inch. The duration of each such test shall be at least two hours.

Each section of pipe to be tested shall be filled with water and all air expelled at the highest point. The required taps to expel air or to fill the water main shall be supplied and installed by the Contractor and shall be 1 inch and shall include an approved service saddle when required.

The test apparatus shall be applied at the lowest elevation on the section to be tested. The apparatus shall be connected to the main at a service tap or special tap location.

The pressure gauge shall be a standard pressure gauge. The dial shall register from 0 -200 psi and have a dial size of 4 1/2 inches with 1 psi increments.

The specified pressure shall be held for a minimum duration of 2 hours, no drop in pressure will be allowed.

If this test requirement cannot be met, the Contractor shall investigate the cause, make corrections, and retest until the pressure drop requirement can be met.

Only if several consecutive tests indicate a consistent pressure drop and only after the Contractor has made numerous attempts to resolve the problem, acceptable to the Engineer, the Contractor make a written request for the Engineer to consider the magnitude of the leak, however, meeting the leakage allowance shall not automatically be considered acceptance, in lieu of the pressure test, for the section being tested. Allowing a leakage test and final acceptance thereof shall be at the discretion of the Engineer.

When allowed, the leakage test shall be performed as follows (2013 CEAM):

After satisfactory completion of the pressure test, a leakage test shall be performed on each valved section of water main to determine the quantity of water that must be supplied into the section to maintain a test pressure of 150 pounds per square inch, after the air in the pipeline has been expelled and the pipe has been filled with water.

After filling the pipe with water and expelling all air in the line, the specified pressure shall be applied in the same manner as prescribed for the pressure test, and sufficient water shall be measured and supplied into the pipe section to maintain the pressure for a test duration of 2 hours.

Each pipe section tested will be accepted if the leakage does not exceed the quantity determined by the formula given below.

$$L = \frac{SD\sqrt{P}}{133,200}$$

L = Maximum permissible leakage in gallons per hour

S = Length of pipe tested in feet

D = Nominal diameter of pipe in inches

P = Average test pressure during the test, in pounds per square inch, gauge pressure

If the pipe section under test contains pipe of various diameters, the allowable leakage will be the sum of the computed leakage for each size of pipe.

When requested, the Contractor shall furnish a written report of the results of leakage tests, which shall identify the specific test section, the average pressure, the duration of the test, and the amount of leakage.

1041.2.8 Operational Inspection (2611.3H)

At the completion of the project and in the presence of the Engineer and the Contractor, representatives of the City shall operate all valves, hydrants, and water services to ascertain that the entire facility is in good working order; that all valve boxes are centered and valves are opened; that all hydrants operate and drain properly; that all curb boxes are plumb and centered; and that water is available at all curb stops.

1041.2.9 Continuation of Water Services

It shall be the responsibility of the Contractor to provide and coordinate continuous water service at no additional compensation. All such coordinated efforts shall be through the Engineer and Inver Grove Heights Utilities Division. No other than City authorized personnel shall operate, connect to, or make use of the in-place system without permission from and then only when a representative of the City is present. Once the portion being constructed is physically connected to and placed into operation as an integral part of the total in-place system, that section shall be under the same control conditions as stated above.

1041.3 Method of Measurement and Payment (2611.4 & 2611.5)

1041.3.1 Water Pipe (2611.4A)

Mainline pipe and service pipe of each kind and size will be measured separately by the overall length along the axis of the pipeline, from beginning to end of each installation and without regard to intervening valves or specials. Terminal points of measure will be the spigot or cut end, base of hub or bell end, center of valves or hydrants, intersecting centers of tee or wye branch service connections, and center of corporation stop or curb stop couplings.

1041.3.2 Valves (2611.4B)

Valves of each size and type will be measured separately as complete units, including the required manhole or valve box setting.

1041.3.3 Corporation Stops (2611.4C)

Corporation stops of each size and type will be measured separately by the number of units installed, including the water main tap and saddle.

1041.3.4 Curb Stops (2611.4D)

Curb stops of each size and type will be measured separately by the number of units installed, including the required curb box and cover if needed.

1041.3.5 Hydrants (2611.4E)

Hydrants will be measured by the number of units installed.

1041.3.6 Relocate Hydrant and Valve (2611.4F)

Hydrant relocation shall include full compensation for all costs of hydrant and valve disassembly and relocation including excavation, blocking, rodding, backfilling, compaction, disinfection, leakage testing, final clean-up, and such other work as may be specified. Extension of six inch hydrant branch pipe shall be paid for on a lineal foot basis per bid item.

1041.3.7 Hydrant Adjustment (2611.4G)

Hydrant adjustment shall include full compensation for all costs of hydrant disassembly and adjustment (+ or -) including excavation, hydrant cutting, extension kit, and backfilling and other such work as may be specified. Hydrant extension shall be paid for on a lineal foot basis per bid item.

1041.3.8 Air Vents (2611.4H)

Air vents of each type and size will be measured separately by the number of complete units installed, including the required manhole or valve box setting.

1041.3.9 Rearrangement of In-place Facilities (2611.4I)

The removal, relocation, extension, or adjustment of existing in-place facilities will be measured, as indicated in the Proposal.

1041.3.10 Polyethylene Encasement (2611.4J)

Polyethylene encasement of pipe will be measured by the linear foot of pipe encased of each specified size.

1041.3.11 Ductile Iron Fittings (2611.4K)

Ductile Iron fittings shall be measured by the pound without joint accessories or on an each basis as specified on the Proposal or in the Special Provisions.

The standard weight of Ductile Iron fittings, for payment basis, shall be as published in AWWA C-110. Table is provided on below:

AWWA STANDARD WEIGHTS FOR C110 D.I.P.

TYPE	SIZE	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
11 1/4 MJ BEND		30	50	75	110	160	220	275	345	430	540	770
22 1/2 MJ BEND		30	50	75	110	160	220	275	345	430	535	765
45 MJ BEND		30	50	75	110	155	215	270	340	420	530	755
90 MJ BEND		35	55	85	125	190	255	340	430	545	680	1025
MJ PLUG		10	15	25	45	65	85	120	150	190	215	350
MJ CAP		12	15	25	45	60	80	115	155	215	250	370
MJ TEE	3"	35										
	4"	75	80									
	6"	110	115	125								
	8"	155	165	175	185							
	10"		235	250	260	310						
	12"		315	325	340	390	410					
	14"			435	450	465	540	585				
	16"			540	550	570	590		740			
	18"			590	605	620	640	755	905	945		
	20"			725	735	755	775	795	945	1140	1185	
	24"			985	1000	1020	1030		1075	1400	1720	1815
MJ CROSS	4"		105									
	6"	125	140	160								
	8"		185	205	235							
	10"		260	285	310	380						
	12"		340	360	385	460	495					
	14"			475	500	540	630	710				
	16"			575	605	645	685	830	895			
	18"			652	655	685	725	870	1060	1130		
	20"			760	790	820	860	905	1085	1330	1415	
	24"			1025	1045	1085	1110	1155	1200	1590	1965	2155
MJ REDUCER	4"	40										
	6"	55	60									
	8"		80	95								
	10"		105	115	135							
	12"		135	150	165	190						
	14"			190	210	230	255					
	16"			230	250	280	305	335				
	18"				295	325	350	380	415			
	20"					375	405	430	470	510		
	24"						550	575	615	660	705	

1041.3.12 Access Structures (2611.4M)

Access structures, such as valve boxes, services boxes, manholes and vaults, will be measured for payment only when and to the extent that the Proposal contains specific items therefore.

Otherwise, the required structures are included for payment as part of the pipe appurtenance (Gate Valve, Curb Stop, Air Vent, Conductivity Access, etc.) item which is served. When applicable, measurement will be by the number of individual units installed of each type and design.

1042. ADJUSTMENT OF EXISTING STRUCTURES

1042.1 Materials

Mortar shall consist of one-part Portland cement, three-parts clean mortar sand, and sufficient water for proper consistency.

Adjusting rings shall conform to the requirements of Mn/DOT Specification 3616, 3621, and 3622.

Pre-cast adjusting rings shall conform to the size and shape of the frame base.

Any concrete used for structure adjustment shall have a 28-day compressive strength of at least 4000 pounds per square inch.

1042.2 Construction Requirements

Existing manholes and catch basins shall be adjusted to meet the grades as established on the Plans by either removing or adding concrete adjusting rings. Castings shall be set on a full bed of mortar.

All sanitary manhole inverts shall be protected from nicks or other damage that may inhibit flow and cause backups. If damage does occur to the invert the Contractor will be responsible for pouring a new invert. The Engineer may require that the Contractor install a mechanism to protect the invert such as a catchment umbrella, temporary PVC invert or other approved device in sensitive flow areas to ensure that damage to the invert does not occur while maintaining flow through the sewer. Protection and any necessary repairs to the invert will be incidental to the adjustment of the existing structure unit price.

The Contractor shall not raise manhole castings or gate valve boxes until after the base course has been paved.

Manhole adjustment rings and frames shall be set in a full bed of mortar: wood shims shall not be permitted. All manholes shall have a minimum of two two-inch (2") adjusting rings and a maximum of six two-inch (2") adjusting rings. Thicker adjusting rings (i.e. 6" or 12") shall be required if more than six 2" adjusting rings would be required to adjust the casting to final grade. Extra payment shall not be made for thicker rings or for adjustment ring depth in excess of 12"

Unless otherwise approved by the Engineer, when adjusting manholes, all material removed shall be replaced with base material, placed and compacted in two-inch (2") lifts to the bottom of the surfacing. Sawing for adjusting or raising manholes and or gate valves shall be done in a diamond pattern such that no cut line is perpendicular to the direction of travel on the road. Bituminous base shall be replaced with bituminous base. Backfilling with surfacing materials shall be included in the bid price for adjustment of existing structures.

When the frame and ring casting cannot be adjusted as indicated above or the casting requires more than 12" (total) of adjusting rings, at the discretion of the Engineer, the entire top section of the manhole (top slab or cone section) shall be removed and the manhole reconstructed to plan elevation prior to the paving of the base course. The backfill material shall be granular and thoroughly compacted in two-inch (2") lifts.

After completion of the adjustment, any mortar, earth, or other debris in the manhole or catch basin must be removed immediately, and the sewer invert left in clean condition.

The Contractor shall be fully liable for any damages incurred by the public as a result of sewer stoppages due to construction operations. Upon notification of a sewer stoppage caused by the Contractor's operation, the Contractor shall be required to remove obstructions and effect repairs when notified by the City. Should the Contractor fail to respond immediately to such notification, the City will act as necessary to restore service. The Contractor shall be charged for work performed by the City on an overtime basis.

All structures within the roadway shall be adjusted to final grade prior to constructing the bituminous wearing course. Final grade for structures shall be 1/2" to 3/4" below, and parallel to, the wearing surface. When a base course is excavated in order that a structure may be raised, the horizontal limits of said excavation shall be cut in a diamond pattern so that the saw lines are not perpendicular to the traveled roadway, and not extend more than two feet beyond the edge of the structure. The bituminous base course shall be patched within 24 hours of the excavation and

structure adjustment. The Contractor shall make location ties for all structures, so they can be easily located and provide a copy to the Engineer.

Proper barricading and signing must be done during this operation to protect the public and to divert traffic. Signing and barricading shall be done at the Contractor's expense and with the approval of the Engineer.

1042.2.1 Reconstruct Manhole (2506.503)

“Reconstruct Manhole” shall include the following:

- Salvage the existing cover/ lid and frame/ ring casting.
- Removing or adding barrel sections, top slab (27” opening), or top cone (27” opening) to fit the manhole's new height.
- Furnishing and installing a new casting assembly and adjusting rings to establish the casting to finish grade.
- Furnishing and installing concrete mortar at the invert if it needs repair. Repair of the invert will be incidental to this item.

The thickness of pavement patching of the area around the excavation shall be shown on the specific typical section for each street. The pavement must be cut and removed 2' beyond the casting to ensure proper compaction of the subgrade and pavement structure. The contractor shall note that the removals, sawing, aggregate base, bituminous patching, etc. around adjusted facilities is incidental to this item.

Payment will be at the Contract unit price per each. This shall be compensation in full for all labor, equipment and materials (including the new frame and ring casting assembly, rings, and mortar) required to rebuild the manhole as approved by the Engineer.

1042.2.2 Reconstruct Catch Basin (2506.503)

“Reconstruct Catch Basin” shall include the following:

- Removing all existing adjusting rings. If a block structure exists, block may need to be removed (or sawed off) to be able to install the required 4”- 12” of adjusting rings.
- Furnishing and installing a precast adjusting section for a 2' X 3' rectangular catch basin.
- Furnishing and installing adjusting rings and mortar to set the casting at the specified grade.

- Furnishing and installing concrete mortar at the invert if it needs repair. Repair of the invert will be incidental to this item.

No concrete shall be installed in front of the catch basin other than mortar for grade rings. Catch basin castings shall be adjusted during the construction of curb and gutter, providing a depression in the gutter flow line of 0.10' at the catch basin.

1042.2.3 Adjust Frame and Ring Casting (2506.522)

Slip-in metal adjusting rings shall not be allowed unless otherwise stated in the Plans or Special Provisions.

“Adjust Frame and Ring Casting” shall include removing and replacing all existing adjusting rings down to the pre-cast or concrete block structure of the manhole or catch basin. This work shall be done as described in Mn/DOT Specification 2506. Castings shall be replaced as noted in the Plans.

Adjustment of casting shall be as follows:

Manholes: All sanitary sewer and storm sewer manhole castings shall be left in place during the wear course paving operation. The castings shall be adjusted before the mat is laid and shall be left ½” to ¾” below finished grade. Adjustment shall be incidental to the contract unit price for each new structure.

Catch Basins: Storm sewer catch basin castings shall be adjusted where necessary to be 0.1’ below finished gutter line. Adjustment shall be incidental to the contract unit price bid for each new structure.

1042.2.4 Adjust Gate Valve (2504.602)

Gate Valve inserts shall not be allowed unless otherwise stated in the Plans or Special Provisions.

“Adjust Gate Valve” shall include adjusting a gate valve box to plan grade by turning or by replacing the riser section with a different length riser section. It shall also include the replacement of a damaged riser section as directed by the Engineer. The riser section length shall be such that a minimum of 6” of adjustment in each direction (up or down) still remains after the valve box is adjusted to grade.

The thickness of pavement patching of the area around the adjusted casting shall be as shown on the specific typical section for each street. The pavement must be sawcut and removed 2' beyond the casting to ensure proper compaction of the subgrade and pavement structure. The Contractor shall note that the removals, sawing, aggregate base, bituminous patching, etc. around adjusted facilities are incidental to this pay item.

1042.2.5 Adjust Curb Stop Box (2504.602)

It may be determined in the field that curb stop boxes may need to be adjusted to final grade.

“Adjust Curb Stop Box” shall include adjusting a curb stop box to final grade by adjusting or by replacing the riser section with a different length riser section, and shall also include the installation of a new Ford Type A1 cover, or equal, if the curb stop box is within a paved surface. It shall also include the replacement of a damaged riser section or box as directed by the Engineer.

1042.3 Method of Measurement and Payment

Payment for adjustment of existing structures will be made on the basis of the following schedule:

<u>Item</u>	<u>Unit</u>
Reconstruct Manhole	Each
Reconstruct Catch Basin	Each
Adjust Frame and Ring Casting	Each
Adjust Gate Valve	Each
Adjust Curb Stop	Each

The Contract unit price shall include all labor, materials (including backfill materials), and equipment necessary to perform the Work. Extra payment shall not be made for concrete

**1043. CONCRETE WORK: CURB AND GUTTER, SIDEWALK AND SIDEWALK
RAMPS (2521 & 2531)**

This section describes requirements for concrete and related work including but not limited to curbs, gutters, sidewalks and flatwork. Concrete curb and gutter and sidewalks shall be installed in all locations as shown on the contract plans. Concrete work shall be broom finished. All concrete work shall be done in accordance with MN/DOT 2521 and 2531. Under this section, the Contractor shall furnish all labor, material, accessories, equipment, and services necessary to furnish, place, finish and cure all concrete as indicated on the drawings or as specified herein.

1043.1 Materials

1043.1.1 Concrete and Concrete Mix Components (2461)

Ready-mixed concrete may be used provided that the concrete produced conforms to these specifications as a minimum, and that the equipment, materials, and methods used conform to Mn/DOT Specification 2461.2. The Contractor shall furnish the Engineer with a copy of the ready-mix manufacturers design and specifications for the concrete to be used. The concrete shall conform to ASTM C-94. The Contractor will be held responsible for the proper disposal of ready-mix truck washing residue. The concrete drum shall be washed into the project's designated and approved concrete washout area (See IGH Standard Plate MISC-05), an approved portable concrete waste container, or within the concrete truck itself using equipment that enables proper disposal of concrete residue.

Concrete shall meet the requirements of Mn/DOT Specification 2461, subject to the following specific requirements and limitations:

- Concrete mix design for sidewalk, pedestrian ramps, or other exterior flatwork shall be Mn/DOT Mix 3F52
- Concrete mix design for hand-placed curb and gutter shall be Mn/DOT Mix 3F52.
- Concrete mix design for machine-placed curb and gutter shall be Mn/DOT Mix 3F32.
- Concrete shall have an air content of 6.5%, with occasional deviations between 5.0 and 8.0%.
- For High Early Strength concrete use the specified mix with 30% additional cement.
- Concrete failing to meet these requirements shall be removed and replaced at no cost to the City.

A batch ticket signifying the concrete mix design and the presence of any admixtures shall accompany each load of ready-mixed concrete. The ticket shall be available on the site to the Engineer. The Engineer shall take the ticket of any concrete not in compliance with IGH Specification 1022.1.1 and the concrete load shall be rejected. If the concrete was placed before discovery of its non-compliance, the concrete shall be removed and replaced with no cost to the City.

The maximum amount of water added to a load shall be the amount allowed on the batch ticket accompanying the load of concrete **if no concrete has been discharged from the truck**. If concrete has been discharged from the truck, the amount of water shown on the ticket is no longer valid; therefore, no water may be added without permission of the Engineer. If water is added without the permission of the Engineer, or if the amount of water added exceeds that allowed on the batch ticket, the load of concrete will be rejected and if concrete was discharged from the truck, the concrete will be removed and replaced at no cost to the City.

1043.1.2 Reinforcing Steel

All reinforcing steel shall be of the size and shape shown on the plans. It shall meet the requirements of new billet steel, intermediate grade, ASTM Designation A 305.

1043.2 Construction Requirements

Any concrete placed in variance with these instructions and any concrete showing evidence of having been frozen before attaining initial “set” shall be removed and replaced by the Contractor at no cost to the City.

1043.2.1 Forms

A. General

Forms shall conform to shape, lines and dimensions of the members as shown on the plans. They shall be properly braced or tied to maintain position and shape and to withstand the pressures to which they will be subjected. Forms shall be made sufficiently tight to prevent leakage of mortar.

B. Form Ties

Form ties approved by the Engineer shall be used. They shall have a minimum working strength when fully assembled of at least 3000 lbs. Ties shall be so adjustable in length as to permit tightening of forms and of such type as to leave no metal closer than 1-1/2 inch of the surface, and they shall not be fitted with any lugs, cones, washers or other device to act as a spreader within the form or for any other purpose which will leave a hole larger than 7/8" in diameter or a depression back of the exposed surface of the concrete. Wire ties will not be permitted.

Ties that are to be pulled from the wall shall be coated with cup grease or other approved material to facilitate removal.

C. Wetting and Oiling Forms

The entire inside surface of all forms shall be oiled with approved form oil or thoroughly wetted immediately before placing concrete.

D. Inspection of Forms

The Contractor shall notify the Engineer after forms have been set so that a form inspection can be made. Concrete shall not be placed in any forms until they have been inspected by the Engineer and/or **permission is given** to start placing. Such inspection shall not relieve the Contractor of responsibility for the adequacy of the forms or of remedying any defects from use of the forms. The Contractor shall be held liable for any cost of repair or replacement for concrete that was poured without giving advanced notice to the Engineer **and** without receiving permission to begin.

1043.2.2 Reinforcement

A. Cleaning

Metal reinforcement before being placed shall be thoroughly cleaned of silt and rust scale and of coating that will destroy or reduce the bond. Reinforcement appreciably reduced in section shall be rejected. When there is delay in depositing concrete, reinforcement shall be re-inspected and, when necessary, cleaned.

B. Bending and Straightening

Reinforcement shall be carefully formed. Cold bends shall be made around a pin having a diameter of six or more times the least dimension of the reinforcement bars.

Metal reinforcement shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the plans shall not be used. Heating of reinforcement will be permitted only when the entire operation is approved by the Engineer.

C. Placing

Metal reinforcement shall be accurately positioned and secured against displacement by using annealed wire of not less than No. 16 gauge or suitable clips at intersections and shall be supported in a manner that will keep all metal away from the exposed surface of the wall. Nails shall not be driven into the outside forms to support reinforcement nor shall any other device for this purpose come in contact with the outside form except that wood strips shall be inserted between the reinforcement and the forms at intervals to maintain the required clear distance between the reinforcement and the inside and outside surfaces of the concrete. The strips shall be pulled up and removed from the wall and the weather side of all exterior walls shall not be less than 2".

D. Splicing

All bars shall be lapped at least forty diameters at all splices, corners and at abrupt changes in directions of walls.

1043.2.3 Deposited Concrete

A. Cleaning Equipment

Before beginning a run of concrete, hardened concrete and foreign materials shall be removed from the inner surfaces of the mixing and conveying equipment. All conveyances, buggies, or barrows shall be kept clean during the placing of the concrete.

B. Transporting

Concrete shall be handled from the mixer or mixing truck to the place of final deposit in carts, buggies, concrete buckets or conveyors. The concrete shall not be spouted nor delivered by spout or trough from the hoists, nor dumped into carts with a free fall from the mixer of more than three feet. Every possible precaution shall be taken to prevent segregation or loss of the ingredients while transporting the concrete. Delivery carts or buggies shall be kept on temporary runways built over the floor system and runway supports shall not bear upon reinforcing steel or fresh concrete.

C. Time of Placing

Concrete shall not be placed until all reinforcement is securely and properly fastened in its correct position, nor until the forms have been inspected and approved by the Engineer and form ties at construction joints have been retightened, nor until all sleeves, hangers, pipes, conduits, bolts, wires and any other fixtures required to be embedded therein have been placed and anchored by the Contractor, nor until the forms and reinforcement have been cleaned and the forms oiled or wetted as specified.

D. Placing

Special care must be exercised to prevent segregation of the concrete and to prevent splashing the forms or reinforcement with concrete and any such splashes or accumulation of hardened or partially hardened concrete on the forms or reinforcement above the general level of the concrete already in place must be removed before the work proceeds. Concrete shall be placed through canvas "elephant trunks" or galvanized iron chutes equipped with suitable hopper heads. Chutes or trunks shall be of variable lengths, so that the free fall shall not exceed three feet and a sufficient number shall be placed in the forms to insure the concrete being kept level at all times. Sufficient illumination shall be provided in the interior of the forms so that the concrete at places of deposit is visible from the deck and runways. Concrete shall be placed in lifts not greater than 12" and shall be spaded to thoroughly embed all reinforcement and fixtures. Spading shall be supplemented by the use of vibrators or by rapping the forms with rubber hammers or wooden mallets. When forms are removed, surfaces shall be even and dense, free from aggregate pockets or honeycomb.

E. Depositing Against Other Concrete

Before depositing new concrete on or against concrete that has hardened, the forms shall be retightened, the surface of the hardened concrete shall be roughened, as required, thoroughly cleaned of foreign matter, and moistened with water.

F. Protecting and Curing

All exposed surfaces of concrete shall be protected from premature drying and freshly placed concrete shall be protected against wash by rain. Curing compound shall be placed within 30 minutes of placement. Failure to place curing compound within 30 minutes shall be cause for the Engineer to reject the Work and require removal and replacement at no cost to the City. All concrete shall be cured for a period of seven days after placing. The method of curing shall be approved by the Engineer.

G. Depositing In Cold Weather

Concrete shall be placed only during the hours of daylight and when the surface is dry. Concrete may be placed when the air temperature is a minimum of 36 degrees Fahrenheit and rising, **and** the subgrade is not frozen. Concrete shall not be placed on frozen subgrade regardless of air temperature. Placing of Concrete at temperatures below 36 degrees Fahrenheit shall be subject to the approval of the Engineer.

Concrete when deposited shall have a temperature not below 50 degrees Fahrenheit and not above 90 degrees Fahrenheit. In freezing weather, suitable means shall be provided for maintaining the concrete at a temperature not lower than 70 degrees Fahrenheit for three days, or 50 degrees for five days after placing, except when high early strength Portland cement concrete is used the temperature must be maintained at not less than 70 degrees Fahrenheit for two days or 50 degrees for three days. Cooling of the concrete to outside temperature shall not be at a rate faster than one degree each hour for the first day or two degrees each hour thereafter until the outside temperature is reached. The methods of heating the materials and protecting the concrete shall be approved by the Engineer. Salt, chemicals or other foreign materials shall not be mixed with the concrete for the purpose of preventing freezing.

H. Patching

Any concrete which is not formed as shown on the plans or for any reason out of alignment or level or shows a defective surface shall be considered as not conforming with the intent of these specifications and shall be removed from the job by the Contractor at his expense unless the Engineer grants permission to patch the defective area. Permission to patch any such area shall not be considered as a waiver of the Engineer's right to require complete removal of the defective work if the patching does not, in his opinion satisfactorily restore the quality of the surface.

Immediately after removing forms all concrete shall be inspected, and any poor joints, voids, stone pockets or other defective areas permitted by the Engineer to be patched and all tie holes shall at once be patched before the concrete is thoroughly dry. Defective areas shall be chipped away to a depth of not less than one inch (1") with the edges perpendicular to the surface. The area to be patched and a space at least six inches (6") wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar. The patch shall be made of the same material and of the same proportions as used for the concrete except that the coarse aggregate shall be omitted. The amount of mixing water shall be as little as consistent with the requirements of handling and placing. The mortar shall be re-tempered without the addition of water by allowing it to be mixed with a trowel to prevent setting.

1043.2.4 Joints

A. Expansion Joints

The Contractor shall be required to install 1/2-inch expansion joints in the following locations:

Sidewalk or other flatwork:

- At 60' intervals
- Along the foundation of any building or abutting masonry
- At the intersection of two public walks (one joint only across one walk and adjacent to the other)
- Around any structure within the flatwork (i.e. gate valves, light poles, etc)
- Along one side of abutting concrete driveways
- As shown on project drawings or as directed by the Engineer

Curb and gutter:

- At the beginning and end of all radii including radii at intersections, cul-de-sacs, driveways, and high capacity curb opening catch basins
- At 10' each side of all catch basins
- As shown on project drawings or as directed by the Engineer

This work shall be incidental to construction of the concrete walks or curb and gutter and no direct compensation will be paid therefore.

B. Contraction Joints

Contraction joints shall be formed every 10 feet for curb as well as at every radius and every catch basin. Contraction joints shall be formed every 5 feet for sidewalks. When concrete is placed against existing work, contraction joints shall be formed to align with the like joints in the existing work.

1043.2.5 Testing

A. Strength (Test Cylinders)

All concrete shall have a 7-day compressive strength of at least 2000 psi and a 28-day compressive strength of 4500 psi.

Concrete test cylinders shall be cast in sets of 4 cylinders. Cylinder sets shall be made with the following minimum frequencies:

- One set per 100 cubic yards of each concrete mix used per day.
- One set for each type of work done per day regardless of the mix used.
- Pours of less than 5 cubic yards of concrete need not be tested unless requested by the Engineer.

The four cylinders in each set will be tested with the following frequency:

- One cylinder will be tested at 7 days.
- Two cylinders will be tested at 28 days.
- If the cylinders tested at 28 days do not indicate an average minimum compressive strength of 4500 psi, the fourth cylinder will be tested at 56 days.

The average strength of all the cylinders shall be equal to or greater than the strengths specified. In cases where the strength of the test cylinders for any portion of the structure falls below the requirements specified herein, the Engineer may order a change in the mix or water content for the remaining portion of the work, and may require the Contractor to secure test specimens of the hardened concrete represented by these cylinders.

The number of test specimens required to be taken shall be the same as the number of test cylinders made during the pour. Specimens shall be secured and tested in accordance with ASTM Designation C-42. If the specimen tests further substantiate that the concrete represented by the cylinders and specimens is below the strength requirements specified herein, the Engineer may order such concrete removed and rebuilt at the expense of the Contractor. The foregoing tests shall be made by an established independent laboratory approved by the Engineer. The cost of these tests shall be paid for by the Contractor. The Contractor shall use laboratories approved by the Engineer. Other laboratories may also be approved upon submittal of evidence.

Unless otherwise specified on the Plans or Special Provisions, the concrete testing shall be conducted by an independent testing laboratory hired by the Engineer.

Test cylinders shall be made and stored in accordance with ASTM Designation C-31 and tested in accordance with ASTM Designation C-39.

B. Air Content

Air content shall be 6.5%, with an occasional deviation between 5% and 8%.

Testing of air content shall be conducted with the following minimum frequencies:

- One test per 100 cubic yards of each concrete mix placed per day.
- One test for each type of work done per day regardless of the mix used.
- Pours of less than 5 cubic yards of concrete need not be tested unless requested by the Engineer.

In addition to the minimum testing frequencies, additional testing may be ordered by the Engineer based on field conditions, changes in the concrete mix as shown on the batch tickets, results of testing done at the plant, field test results of previous loads, or any other reason that indicates additional testing may be necessary.

Concrete that does not meet the specifications for air content may be corrected in the field if allowed by the Engineer and if time is available to correct and place the load within 90 minutes from initial mixing as per Mn/DOT Specification 2461.3.G.3. If the Engineer will not allow the load to be corrected in the field or if the load cannot be corrected and placed within 90 minutes from initial mixing, the load shall be rejected at no cost to the City. In addition, subsequent loads of concrete delivered to the site shall be tested and shown to be in compliance with the specifications before any additional concrete can be placed in the Work. Once testing indicates that the concrete being delivered to the site is within compliance, the normal minimum testing frequencies shall resume. If concrete from a non-compliant load was placed in the Work, the concrete shall be removed and replaced at no cost to the City.

C. Workability (Slump Test)

The slump of the concrete shall be in accordance with Mn/DOT Specification 2461.3.G.6. As per this specification the maximum allowable slump range for Mn/DOT Mix 3A32 is 1 inch to 3 inches. The maximum allowable slump range for Mn/DOT Mix 3A22 is 1 inch to 2 inches.

Slump testing shall be conducted with the following minimum frequencies:

- One test per 100 cubic yards of each concrete mix used per day.
- One test for each type of work done per day regardless of the mix used.
- Pours of less than 5 cubic yards of concrete need not be tested unless requested by the Engineer.

In addition to the minimum testing frequencies, additional testing may be ordered by the Engineer based on field conditions, changes in the concrete mix as shown on the batch tickets, results of testing done at the plant, field test results of previous loads, or any other reason that indicates additional testing may be necessary.

Concrete that does not meet the specifications for slump may be corrected in the field if allowed by the Engineer and if time is available to correct the load within 60 minutes from initial mixing as per Mn/DOT Specification 2461.3.G.4. If the Engineer will not allow the load to be corrected in the field or if the load cannot be corrected within 60 minutes from initial mixing, the load shall be

rejected at no cost to the City. In addition, subsequent loads of concrete delivered to the site shall be tested and shown to be in compliance with the specifications before any additional concrete can be placed in the work. Once testing indicates that the concrete being delivered to the site is within compliance, the normal minimum testing frequencies shall resume. If concrete from a non-compliant load was placed in the Work, the concrete shall be removed and replaced at no cost to the City.

These tests in no way alleviate the Contractor's responsibility for material, quality and workmanship.

1043.2.6 Pedestrian Curb Ramps (2531)

This work consists of constructing pedestrian curb ramps with Truncated Dome Systems (detectable warning surfaces) in compliance with the ADA Accessibility Guidelines (ADAAG). This work shall be performed in accordance with Mn/DOT Specification 2531, the details in the Plan, the City Standard Detail, and the following:

- The Contractor shall select a truncated dome product from the approved products list at <http://www.mrr.dot.state.mn.us/materials/ApprovedProducts/appchart.asp#trdomes>. Only approved products are allowed. Stamped concrete is not allowed.
- All truncated dome systems shall be installed in strict accordance with the recommendations of the manufacturer.
- The entire dome area shall be unpainted cast iron.
- At the time of construction, all Truncated Dome Systems are specified to be in dimensional and alignment compliance with the requirements of the ADAAG as detailed in the Plan.

1043.2.7 Curb and Gutter (2531)

All concrete curb and gutter shall be constructed in accordance with Mn/DOT Specification 2531, except as modified or altered below:

- Driveway openings in the curb shall be constructed as shown on the plans, standard plates, or as directed by the engineer in the field.
- The contractor shall construct concrete gutters and/or aprons as detailed on the standard plates, at locations indicated on plan.
- Delete that portion of 2531 which requires that the concrete curb and gutter joints be sealed with joint sealer.

- The contractor shall furnish without charge all concrete samples needed for testing ordered by the engineer.
- For surmountable curb installations, all radii at intersections shall be B-618 concrete curb and gutter with a 10-foot taper section, on each side of the radius.
- Contraction joints shall be formed or sawed at 10-foot intervals to a depth of 2 inches from all exposed surfaces.
- Provide full depth expansion joints where indicated on detail plates, against fixed objects, at 10' either side of all catch basins, and at the beginning and end of all radii including radii at intersections, cul-de-sacs, driveways, and high capacity curb opening catch basins.
- After the concrete is finished and broomed the contractor shall spray the surface with a spray membrane curing compound conforming to Mn/DOT Specification 3754. Curing compound shall be placed within 30 minutes of placement.
- After placement, no work shall take place on the roadway for 72 hours, after which work can resume and the driveways shall be ramped over the curb with reclaimed aggregate to allow resident access.

1043.3 Method of Measurement and Payment

1043.3.1 Concrete Curb and Gutter

Concrete curb and gutter will be paid for at the Contract unit price bid per lineal foot measured along the face of the curb at the gutter line. Payment shall be compensation in full for all costs incidental to construction, including (but not limited to) excavation not included in roadway excavation quantities, granular backfill when required, final adjustment of catch basin castings, expansion fillers and application of curing compound. No additional compensation will be allowed for curb which is curved, or for driveway and ramp openings which are constructed. Curved curb and driveway openings and ramps will be paid for as concrete curb and gutter.

1043.3.2 Concrete Valley Gutter

Concrete valley gutter shall be paid for with two separate items.

The flatwork in the radii shall be measured by area from the edge of concrete (back of curb for integral curb) and paid for at the Contract unit price per square yard for 6" concrete flatwork. Payment shall be compensation in full for all costs incidental to construction, including (but not limited to) excavation not included in roadway excavation quantities, reinforcement, granular backfill when required, expansion fillers, integral curb, and application of curing compound.

The valley gutter shall be measured by area and paid for at the Contract unit price per square foot for 8" concrete valley gutter. The valley gutter length shall be measured as the toe-to-toe distance of the incoming street and the width shall be as specified in the Standard Detail.

The flatwork in the radii shall be paid as Item 2531.618 "Concrete Wing Apron" at the Contract unit price per square foot.

Payment shall be compensation in full for all costs incidental to construction, including (but not limited to) excavation not included in roadway excavation quantities, reinforcement, granular backfill when required, expansion fillers and application of curing compound.

1043.3.3 Concrete Sidewalk

Concrete sidewalk of each thickness will be measured by area and paid for at the Contract unit price per square foot which shall be compensation in full for all costs incidental to construction, including (but not limited to) excavation not included in roadway excavation quantities, granular base when required, expansion fillers, and application of curing compound.

1043.3.4 Pedestrian Curb Ramps

Pedestrian curb ramps shall be paid for at the Contract unit price per each. The ramp and truncated dome area will be included in the per each cost. The area included for payment of the pedestrian curb ramp is the entire area of the ramp (6' back from the curb) and includes both the truncated dome portion and regular concrete flatwork in the pay area. Any landing area behind the pedestrian ramp will be paid for as concrete walk. Truncated dome shall be cast iron natural finish Neenah R-4984 or East Jordan Iron Works detectable warning plate or approved equal.

1044. TURF ESTABLISHMENT (2571, 2575, 3876, 3877 & 3878)

This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to turf restoration as indicated on the drawings or as specified herein. A variety of different turf establishment methods may be utilized. The Contractor shall refer to the plan for the locations of the different turf establishment areas. Temporary seeding may be necessary during construction in erosion sensitive areas. The Contractor shall do temporary seeding work as specified herein or as directed by the Engineer.

1044.1 Materials

1044.1.1 Topsoil (3877)

Unless specified, topsoil shall meet the requirements of Mn/DOT Specification 3877 for Boulevard Topsoil Borrow.

1044.1.2 Fertilizer (3881)

Fertilizer use shall comply with Minnesota Statutes 2004, 18C.60 *Phosphorous turf fertilizer use restrictions* or local ordinances, if more restrictive.

1044.1.3 Plant Material (2571)

All plant material shall conform to Mn/DOT Specification 2571.

1044.1.4 Seed (3876)

Temporary seeding, if required, shall use Mn/DOT Seed Mixture 21-111 May 1 to August 1 or Mixture 21-112 August 1 to October 1, unless otherwise specified.

1044.1.5 Sod (3878)

Sod shall meet the requirements of Mn/DOT Specification 3878.2A “Lawn Sod” unless otherwise specified.

1044.2 Construction Requirements (2105, 2575)

1044.2.1 Subgrade Preparation

The subgrade shall be shaped to approximate the contour of the finished surface. Subgrade areas prepared for topsoil shall be free of construction debris, rocks, and clumps of soil with only the native soils or approved fill material in place. The subgrade shall be loosened to a depth of six-inches and raked prior to application of the topsoil. The Contractor shall remove all rocks and debris from the surface prior to mulching, seeding or sod placement. The subgrade surface shall be graded uniformly and raked free of chunks and rocks exceeding $\frac{3}{4}$ inch (three-quarters of an inch) in diameter.

1044.2.2 Topsoil

Unless specified, topsoil shall meet the requirements of Mn/DOT Specification 3877 for Boulevard Topsoil Borrow. Any topsoil placed, or subsequent work shall not be done without: (1) having the subgrade approved by the Engineer and (2) having the topsoil tested and (3) topsoil amendments and recommendation for meeting select topsoil borrow specifications approved by the Engineer. The Contractor shall bear the burden, risks and costs of removing the materials placed without prior approval of the subgrade preparation, topsoil borrow material, or soil amendment.

Grading of boulevards and placement of topsoil shall not occur prior to paving of the base course bituminous pavement unless otherwise approved by Engineer. At all times during grading, preparation and sod laying or seeding, it shall be the contractor's responsibility to see that all catch basins in the construction area are kept clean. Gutters shall be cleaned and free of dirt and other materials at the end of each working day to ensure proper drainage and sediment control.

The Contractor shall not dump topsoil on the street unless specifically approved by the Engineer in the field. Topsoil dumped on the street shall not be allowed to remain overnight unless proper safety flashers are installed and approved by the Engineer in the field.

When placed, the topsoil shall be shaped uniformly and to approximate the contour of the finished surface (minus hold down), with a minimum depth of four (4) inches, unless otherwise shown on the plan. All construction debris shall be removed from the area prior to seeding or sodding. The topsoil shall be loosened with a disc or harrow to its full depth prior to seeding.

Prior to placing any topsoil, the slopes shall be cut uniformly such that the finished slope shall conform to the designated section. The topsoil shall be raked, and all lumps and irregularities removed prior to placing the sod or seed. All sod and seed shall be placed on a minimum of four (4) inches of Boulevard Topsoil Borrow regardless of the previous conditions of the lawn.

1044.2.3 Seeding

Seeding shall meet the requirements of Mn/DOT Specification 2575. Seed of the specified mixture shall be raked into the topsoil at the required PLS rate listed in Table 3876-1 of the Mn/DOT Standard Specifications. Unless otherwise specified, the same rate of application shall then be applied in conjunction with hydraulic soil stabilizer, resulting in a total application of double the required PLS rate. Final acceptance of seeding shall be based on an established growth of 6-inches with a uniform density to provide full coverage of the soils, free of weeds and bare spots.

Any re-seeding necessary shall be performed at the Contractor's expense.

The Contractor shall furnish weight tickets documenting pounds of hydraulic soil stabilizer, fertilizer placed seed placed. The seed tickets shall show individual plant species along with the percent purity and percent germination. The fertilizer tickets shall show mix proportions.

1044.2.4 Sodding

2575.3.A.2b shall be deleted and replaced with the following: Sod shall not be placed between September 11 and April 14 unless otherwise specified or approved by the Engineer.

The Contractor shall, during the course of laying the sod or immediately after completing placement of each area (within 8 hours), water and compress the sod into the underlying soil by rolling or tamping. The initial watering and rolling or tamping shall be sufficient to provide firm contact and bond between underlying soil and the sod and provide a smooth, even surface free of humps and depressions. The Engineer may require additional rolling if an acceptable result is not obtained. In dry periods the Engineer may require the watering of areas to be sodded prior to sod placement. The left-over sod and topsoil material shall be removed from the street as soon as possible after installation.

New sod shall be level with existing adjacent sod and the thatch or base soil shall be approximately one inch below the top of adjacent curb, gravel shoulder, or sidewalk. The Engineer reserves the right to have sod re-laid in areas where this specification is not met without any cost to the City. Where required, sod shall be pegged such that it remains in the position it was originally placed. The Contractor shall be responsible for regular maintenance, watering and fertilizing of sod during the maintenance period. The Contractor shall be responsible for keeping a log of watering hours and notifying the Engineer when they are on the project maintaining and watering the sod.

The duration of the sod maintenance period responsibilities shall be 30 days or until August 21, whichever comes later, unless otherwise specified (i.e. sod placed in June must be maintained by the Contractor until August 21 of the same year). Sod that is not accepted by the Engineer after the expiration of the maintenance period shall be replaced by the Contractor with no additional compensation provided, and the maintenance period shall be extended for another 30 days for the entire affected lot. If a portion of the sod is not accepted by the Engineer by October 15, then all sod placed on the respective lot will continue under the sod maintenance period until May 30th of the following year. 30-day extensions and sod replacement criteria shall continue for the following year until all sod on a lot is fully accepted.

Additional Seeding Requirements:

- 1) Areas prepared for seeding shall be free of rocks, debris and clumps of soil. The areas shall be graded uniformly and lawn areas shall be raked free of chunks exceeding ½ inches in diameter.
- 2) The Contractor shall furnish weight tickets documenting pounds of hydraulic soil stabilizer placed, pounds of fertilizer placed and pounds of seed placed. The seed tickets shall show individual plant species along with the percent purity and percent germination. The fertilizer tickets shall show mix proportions.
- 3) Dormant seeding may be utilized in accordance with the referenced specifications and technical memorandum, provided the final acceptance standards are met.
- 4) Final acceptance of seeding shall be based on an established growth of 6-inches with a uniform density to provide full coverage of the soils, free of weeds and bare spots. Any re-seeding necessary shall be performed at the Contractor's expense.

1044.3 Method of Measurement and Payment

1044.3.1 Topsoil

Top soil will be paid for at the Contract unit price per cubic yard loose volume. This will be compensation in full for all labor, equipment, and other materials required for placement and grading of topsoil. Loose volume will be calculated as compacted volume in place multiplied by a factor of 1.5. Placement of stripped topsoil will be incidental to project costs and no additional compensation will be made for this work.

1044.3.2 Seeding

Seeding shall be paid for as specified in the Special Provisions.

1044.3.3 Sodding

Sodding will be paid for at the Contract unit price per square yard as measured in place. This will be compensation in full for all labor, equipment, sod and water, maintenance, and other materials (excluding top soil).

Upon satisfactory placement of the original sod, the Engineer may authorize partial payment of moneys as are due for sodding, in an amount up to but not exceeding 60 percent of the contract bid price. The remaining percentage shall not become due and payable until expiration of the sod maintenance period, and acceptance of the sod by the Engineer. No payment will be made

for sod which is not in acceptable condition at the time of final inspection. In addition, an amount equal to 100 percent of the contract unit price will be deducted from any payment due or which may become due the Contractor for each square yard of unacceptable sod.

1045. MONUMENTS (3667)

Mutually agreed upon terms for removal and replacement of property and control monuments shall be established prior to construction. Without these terms in writing, the Contractor shall have full responsibility for the replacement of the monuments by a land surveyor registered in the State of Minnesota. This work shall be completed at no cost to the City of Inver Grove Heights unless a prior agreement states otherwise.