City of Portage

Contract Conditions and Specifications

Part One

GENERAL CONDITIONS

CITY OF PORTAGE
A PLACE FOR OPPORTUNITIES TO GROW

Transportation & Utilities Department

TO: CITY OF PORTAGE
CONTRACT CONDITIONS & SPECIFICATIONS BOOKLET HOLDERS

DATE: March 15, 2005

FROM: W. Christopher Barnes, P.E. WCB
City Engineer

SUBJECT: CONTRACT CONDITIONS AND SPECIFICATIONS
Revision Dated March 15, 2005 – *EFFECTIVE March 15, 2005*

Enclosed for inclusion in your CITY OF PORTAGE CONTRACT CONDITIONS AND SPECIFICATIONS BOOKLET are the following additions:

Indemnification: Replace Articles 6.31 and 6.32 on page 36 with the attached indemnification clauses.

Non-Discrimination: Add new Article 6.35 to page 37 (attached).

If you need additional copies, you may contact the Transportation & Utilities Department at 269-329-4422.

Indemnification

6.31 To the fullest extent permitted by Laws and Regulations, the Contractor shall indemnify and hold harmless the City and its officers, directors, employees, agents and consultants from and against all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of or resulting from the performance of the Work or from the failure to comply with any covenant or term of the contract, provided that any such claim, cost, loss or damage: (i) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself), including the loss of use resulting therefrom and (ii) is caused in whole or in part by any act or omission of the Contractor, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any act or omission of a person or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such person or entity.

6.32 In any and all claims against the CITY or any respective consultants, agents, officers, directors or employees by any employee (or the survivor or personal representative of such employee) of the Contractor, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation above shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor of any such Subcontractor, Supplier or other person or organization under workers' compensation acts, disability benefit acts or other employee benefit acts.

Insurance coverage required by the contractor constitutes the minimum requirements and those requirements shall in no way lessen or limit the liability of the contractor under the terms of the contract. The contractor shall procure and maintain at contractor's own cost and expense any additional claims or amounts of insurance that, in the City's judgment, may be necessary for contractor's proper protection in the prosecution of the work.

Non-Discrimination

6.35 The Contractor agrees to comply with the Federal Civil Rights Act of 1964 as amended; the Federal Civil Rights Act of 1991 as amended; the Americans With Disabilities Act of 1990 as amended; the Elliott-Larsen Civil Rights Act, Article 2, Act No. 453, Public Act of 1976 as amended; the Michigan Handicapper's Civil Rights Act, Article 2, Act. No. 220; Public Act of 1976, as amended and all other applicable Federal, State and Local laws and regulations. Specifically, contractors and subcontractors are required not to discriminate against any employee or applicant for employment with respect to such person's hire, tenure, terms, conditions, or privileges of employment, or any matter directly or indirectly related to employment because of such person's height, weight, race, color, religion, national origin, ancestry, age, marital status, sex or disability, as defined by law. Breach of this covenant may be regarded as a material breach of the contract.

The City of Portage in accordance with Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 USC 2000d to 2000d-4 and Title 49, Code of Federal Regulations, Department of Federally-assisted programs of the Department of Transportation issued pursuant to such Act, hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, minority business enterprises will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of gender, disability, race, color or national origin in consideration for an award.

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GENERAL CONDITIONS

ARTICLE 1 -- DEFINITIONS

1.1 Addenda -- Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the Bidding Requirements or the Contract Documents.

1.2 Agreement -- The written contract between the CITY and the CONTRACTOR covering the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

1.3 Application for Payment -- The form accepted by the ENGINEER which is to be used by the CONTRACTOR in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

1.4 Asbestos -- Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

1.5 Bid -- The offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

1.6 Bidding Documents -- The advertisement or invitation to Bid, Instruction to Bidders, the Bid form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

1.7 Bidding Requirements -- The advertisement or invitation to Bid, Instructions to Bidders, and the Bid form.

1.8 Bonds -- Performance and payment bonds and other instruments of security.

1.9 Change Order -- A document recommended by the ENGINEER, which is signed by the CONTRACTOR and the CITY and authorizes an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract times, issued on or after the Effective Date of the Agreement.

1.10 CITY -- The City of Portage, Michigan with whom the CONTRACTOR has entered into the Agreement and for whom the Work is to be provided.

1.11 Contract Documents -- The Agreement, Addenda (which pertain to the Contract Documents) the bid submitted by the CONTRACTOR (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice

of Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications by the ENGINEER issued pursuant to paragraphs 3.5, 3.6.1, and 3.6.3 on or after the Effective Date of the Agreement. Shop Drawing submittals approved pursuant to paragraphs 6.26 and 6.27 and the reports and drawings referred to in paragraphs 4.2.1.1 and 4.2.2.2 are not Contract Documents.

1.12 Contract Price -- The moneys payable by the CITY to the CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.9.1 in the case of Unit Price Work).

1.13 Contract Times -- The numbers of days or the dates stated in the Agreement; (i) to achieve Substantial Completion, and (ii) to complete the Work so that it is ready for final payment as evidenced by the written recommendation of final payment by the ENGINEER in accordance with paragraph 14.13.

1.14 Contractor -- The person, firm or corporation with whom the CITY has entered into the Agreement.

1.15 Defective -- An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty, or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to the recommendation of final payment of the ENGINEER (unless responsibility for the protection thereof has been assumed by the CITY at Substantial Completion in accordance with paragraph 14.8 or 14.10).

1.16 Drawings -- The drawings which show the scope, extent and character of the Work to be furnished and performed by the CONTRACTOR and which have been prepared or approved by the ENGINEER and are referred to in the Contract Documents. Shop drawings are not Drawings as so defined.

1.17 Effective Date of the Agreement -- The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

1.18 ENGINEER -- The person, firm or corporation named as such in the Agreement.

1.19 Consultant of the Engineer -- A person, firm or corporation having a contract with the ENGINEER to furnish services as independent professional associate or consultant of the ENGINEER with respect to the Project

1.20 Facility -- Any building, structure, utility or land that is built, constructed, installed or used in conjunction with municipal/governmental services.

1.21 Field Order -- A written order issued by the ENGINEER which orders minor changes in the Work in accordance with paragraph 9.5 but which does not involve a change in the Contract Price or the Contract Times.

1.22 General Requirements -- Sections of Division 1 of the Specifications.

1.23 Hazardous Waste -- The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

1.24 Laws and Regulations; Laws or Regulations -- Any and all applicable laws, rules, regulations, ordinances, codes and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

1.25 Liens -- Liens, charges, security interests or encumbrances upon real property or personal property.

1.26 Milestone -- A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

1.27 Notice of Award -- The written notice by the CITY to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the conditions precedent enumerated therein, within the time specified, the CITY will sign and deliver the Agreement.

1.28 Notice to Proceed -- A written notice given by the CITY to the CONTRACTOR (with a copy to the ENGINEER) fixing the date on which the Contract Times will commence to run and on which the CONTRACTOR shall start to perform the obligations of the CONTRACTOR under the Contract Documents.

1.29 Partial Utilization -- Use by the CITY of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

1.30 PCB's - Polychlorinated biphenyls

1.31 Petroleum - Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-hazardous wastes and crude oils.

1.32 Project -- The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

1.33 Radioactive Material -- Source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (42 USC Section 2001 et seq.) as amended from time to time.

1.34 Resident Project Representative -- The authorized representative of the ENGINEER who may be assigned to the site or any part thereof.

1.35 Samples -- Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

1.36 Shop Drawings -- All drawings, diagrams illustrations, schedules and other data or information which are specifically prepared or assembled by or for the CONTRACTOR and submitted by the CONTRACTOR to illustrate some portion of the Work.

1.37 Specifications -- Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

1.38 Subcontractor -- An individual, firm or corporation having a direct contract with the CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the site.

1.39 Substantial Completion -- The Work (or a specified part thereof) has progressed to the point where, in the opinion of the ENGINEER as evidenced by a definitive certificate of Substantial Completion by the ENGINEER, it is sufficiently complete, in accordance with the Contract Documents, so that the Work, (or specified part) can be utilized for the purposes for which it is intended; or if no such certificate is issued, when the Work is complete and ready for final payment as evidenced by a recommendation by the ENGINEER for final payment in accordance with paragraph 14.13. The terms "substantially complete" and substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

1.40 Supplementary Conditions -- The part of the Contract Documents which amends or supplements these General Conditions.

1.41 Supplier -- A manufacturer, fabricator, supplier, distributor, materialman or vendor having a direct contract with the CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by the CONTRACTOR or any Subcontractor.

1.42 Underground Facilities -- All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials; electricity, gases, steam, liquid petroleum products, telephone or

other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

1.43 Unit Price Work -- Work to be paid for on the basis of unit prices.

1.44 Work -- The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction and performing or furnishing services and furnishing documents, all as required by the Contract Documents.

1.45 Work Change Directive -- A written directive to the CONTRACTOR, issued on or after the Effective Date of the Agreement and signed by the CITY and recommended by the ENGINEER, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed as provided in paragraph 4.2 or 4.3 or to emergencies under paragraph 6.23. A Work Change Directive will not change the Contract Price or the contract Times, but is evidence that the parties expect that the change directed or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times as provided in Paragraph 10.2.

1.46 Written Amendment -- A written amendment of the Contract Documents, signed by the CITY and the CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the nonengineering or nontechnical rather than strictly construction-related aspects of the Contract Documents.

Delivery of Bonds:

2.1 When the CONTRACTOR delivers the executed Agreements to the CITY, the CONTRACTOR shall also deliver to the CITY such Bonds as the CONTRACTOR may be required to furnish in accordance with paragraph 5.1

Copies of Documents

2.2 The CITY shall furnish to the CONTRACTOR one copy (unless otherwise specified in the Supplementary Conditions) of the Contract Documents. Additional copies will be furnished, upon request, at the cost of reproduction.

Commence of Contract Times; Notice to Proceed

2.3 The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement, or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A notice to Proceed may be given at any time within thirty days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day of the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

Starting the Work

2.4 The CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run, but no Work shall be done at the site prior to the date on which the Contract Times commence to run.

Before Starting Construction

2.5 Before undertaking each part of the Work, the CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. The CONTRACTOR shall promptly report in writing to the ENGINEER any conflict, error, ambiguity or discrepancy which the CONTRACTOR may discover and shall obtain a written interpretation of clarification from the ENGINEER before proceeding with any Work affected thereby; however, the CONTRACTOR shall not be liable to the CITY or the ENGINEER for failure to report any conflict, error, ambiguity or discrepancy in the Contract Documents, unless the CONTRACTOR knew or reasonably should have known thereof.

2.6 Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), the CONTRACTOR shall submit to the ENGINEER for review:

2.6.1 a preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2.6.2 a preliminary schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing and processing such submittals;

2.6.3 a preliminary schedule of values for all of the Work which will include quantities and prices of items aggregating the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.7 Before any Work at the site is started, the CONTRACTOR and the CITY shall deliver to the City certificates of insurance which the CONTRACTOR is required to purchase and maintain in accordance with paragraphs 5.4, 5.6, and 5.7.

Preconstruction Conference:

2.8 Within twenty days after the Contract Time starts to run, but before any Work at the site is started, a conference attended by the CONTRACTOR, the ENGINEER, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.6, procedures for handling Shop Drawings and other submittals, processing Applications for Payment and maintaining required records.

Initially Acceptable Schedules:

2.9 Unless otherwise provided in the Contract Documents, at least ten days before submission of the first Application for Payment a conference attended by the CONTRACTOR, the ENGINEER and others as appropriate will be held to review for acceptability to the ENGINEER as provided below the schedules submitted in accordance with paragraph 2.6. The CONTRACTOR shall have an additional ten days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to the CONTRACTOR until the schedules are submitted to and acceptable to the ENGINEER as provided below. The progress schedule will be acceptable to the ENGINEER as providing an orderly progression of the Work to completion within any specified Milestones and the Contract Times, but such acceptance will neither impose on the ENGINEER responsibility for the sequencing, scheduling or progress of the Work nor interfere with the relieve the CONTRACTOR from the full responsibility of the CONTRACTOR therefor. The schedule of the Shop Drawing and Sample submissions by the CONTRACTOR will be

acceptable to the ENGINEER as providing a workable arrangement for reviewing and processing the required submittals, the schedule of values of the CONTRACTOR will be acceptable to the ENGINEER as to form and substance.

ARTICLE 3 -- CONTRACT DOCUMENTS; INTENT, AMENDING, REUSE

Intent

3.1 The Contract Documents comprise the entire agreement between the CITY and the CONTRACTOR concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of the State of Michigan.

3.2 It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be furnished and performed whether or not specifically called for. When words or phrases which have a well-known technical or construction industry or trade meaning are used to describe Work, materials or equipment, such words or phrases shall be interpreted in accordance with that meaning. Clarifications and interpretations of the Contract Documents shall be issued by the ENGINEER as provided in paragraph 9.4.

3.3 Reference to Standards and Specifications of Technical Societies: Reporting and Resolving Discrepancies.

3.3.1 Reference to standards, specifications, manuals or codes of any technical society, organization or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, code or Laws or Regulations in effect at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

3.3.2 If, during the performance of the Work, the CONTRACTOR discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any such Law or Regulation applicable to the performance of the Work or of any such standard, specification, manual or code or of any instruction of any Supplier referred to in paragraph 6.5, the CONTRACTOR shall report it to the ENGINEER in writing at once, and the CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as authorized by paragraph 6.23) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.5 or 3.6; provided, however, that the CONTRACTOR shall not be liable to the CITY or the ENGINEER for failure to report any such conflict, error,

ambiguity or discrepancy unless the CONTRACTOR knew or reasonably should have known thereof.

3.3.3 Except as otherwise specifically stated in the Contract Documents or as may be provided by amendment or supplement thereto issued by one of the methods indicated in paragraph 3.5 or 3.6, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity or discrepancy between the provisions of the contract Documents and:

3.3.3.1 the provisions of any such standard, specification, manual, code or instruction (whether or not specifically incorporated by reference in the contract documents); or

3.3.3.2 The provisions of any such Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation.

No provision of any such standards, specification, manual, code or instruction shall be effective to change the duties and responsibilities of the CITY, the CONTRACTOR, or the ENGINEER, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract documents, nor shall it be effective to assign the CITY, the ENGINEER, or any of the Consultants, agents, or employees of the ENGINEER of any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of paragraph 9.13 or any other provision of the Contract Documents.

3.4 Whenever in the Contract Documents the terms “as ordered,” “as directed,” “as required,” “as allowed,” “as approved”, or terms of like effect or import are used, or the adjectives “reasonable,” “suitable,” “acceptable,” “proper” or “satisfactory”, or adjectives of like effect or import are used to describe a requirement, direction, review of judgment of the ENGINEER as to the Work, it is intended that such requirement, direction, review of judgment will be solely to evaluate, in general, the completed Work for compliance with the requirements of an d information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to the ENGINEER any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.13 or any other provision of the Contract Documents.

Amending and Supplementing Contract Documents:

3.5 The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:

3.5.1 a formal Written Amendment,

3.5.2 a Change Order (pursuant to paragraph 10.4), or

3.5.3 a Work Change Directive (pursuant to paragraph 10.1).

3.6 In addition, the requirements of the Contract Documents may be supplemented and minor variations and deviations in the Work may be authorized, on one or more of the following ways.

3.6.1 a Field order (pursuant to paragraph 9.5),

3.6.2 the approval of the ENGINEER of a Shop Drawing or Sample (pursuant to paragraphs 6.26 and 6.27), or

3.63 the written interpretation or clarification of the ENGINEER (pursuant to paragraph 9.4).

Reuse of Documents:

3.7 The CONTRACTOR, and any Subcontractor or Supplier or other person or organization performing or furnishing any of the Work under a direct or indirect contract with the CITY (i) shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications or other documents (or copies of any thereof) prepared by or bearing the seal of the ENGINEER or the Consultant of the ENGINEER, and (ii) shall not reuse any of such Drawings, Specifications, other documents or copies on extensions of the Project or any other project without written consent of the CITY and the ENGINEER and specific written verification or adoption by the ENGINEER.

ARTICLE 4 -- AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

4.1 The CITY shall furnish, as indicated in the Contract Documents, the lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for the use of the CONTRACTOR. Upon reasonable written request, the CITY shall furnish the CONTRACTOR with a correct statement of record legal title and legal description of the lands upon which the Work is to be performed and the interest of the CITY therein as necessary for giving notice of or filing a mechanic's lien against such lands in accordance with applicable Laws and Regulations. The CITY shall identify any encumbrances of restrictions not of general application but specifically related to use of lands so furnished with which the CONTRACTOR will have to comply in performing the Work. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by the CITY unless otherwise provided in the Contract Documents. If the CONTRACTOR and the CITY are unable to agree on entitlement or the amount or extent of any adjustments in the Contract Price or the Contract Times as a result of any delay in furnishing these lands, rights-of-way or easements of the CITY, the CONTRACTOR may make claim therefor as provided in Articles 11 and 12. The CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.2 Subsurface and Physical Conditions:

4.2.1 Reports and Drawings: Reference is made to the Supplementary Conditions for identification of:

4.2.1.1 Subsurface Conditions: Those reports of explorations and tests of subsurface conditions at or contiguous to the site that have been utilized by the ENGINEER in preparing the Contract Documents; and

4.2.1.2 Physical Conditions: Those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) that have been utilized by the ENGINEER in preparing the Contract Documents.

4.2.2 Limited Reliance by the CONTRACTOR Authorized; Technical data. The CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data,

the CONTRACTOR may not rely upon or make any claim against the CITY, the ENGINEER, or any of the Consultants of the ENGINEER with respect to:

4.2.2.1 the completeness of such reports and drawings for the purposes of the CONTRACTOR, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by the CONTRACTOR and safety precautions and programs incident thereto, or

4.2.2.2 other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings, or

4.2.2.3 any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such data, interpretations, opinions or information.

4.2.3 Notice of Differing Subsurface of Physical Conditions: If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the site that is uncovered or revealed either:

4.2.3.1 is of such a nature as to establish that any "technical data" on which the CONTRACTOR is entitled to rely as provided in paragraphs 4.2.1 and 4.2.2 is materially inaccurate or

4.2.3.2 is of such a nature as to require a change in the Contract Documents, or

4.2.3.3 differs materially from that shown or indicated in the Contract Documents, or

4.2.3.4 is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then

The CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing contains affected thereby or performing any Work in connection therewith (except in an emergency as permitted by paragraph 6.23), notify the CITY and the ENGINEER in writing about such condition. The CONTRACTOR shall not further disturb such conditions or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

4.2.4 The Review of the ENGINEER: The ENGINEER will promptly review the pertinent conditions, determine the necessity of the CITY in obtaining additional exploration or tests with respect thereto and advise the CITY in

writing (with a copy to the CONTRACTOR) of the finding and conclusions of the ENGINEER.

4.2.5 Possible Contract Documents Change: If the ENGINEER concludes that a change in the Contract Documents is required as a result of a condition that meets one or more of the categories in paragraph 4.2.3, a Work Change Directive or a Change Order will be issued as provided in Article 10 to reflect and document the consequences of such change.

4.2.6 Possible Price and Times Adjustments: An equitable adjustment in the Contract Price or in the Contract Times, or both, will be allowed to the extent that the existence of such uncovered or revealed condition causes an increase or decrease in the cost of the CONTRACTOR, or time required for performance of the Work; subject, however to the following:

4.2.6.1 such condition must meet any one or more of the categories described in paragraphs 4.2.3.1 through 4.2.3.4, inclusive;

4.2.6.2 a change in the Contract Documents pursuant to paragraph 4.2.5 will not be an automatic authorization of nor a condition precedent to entitlement to any such adjustment;

4.2.6.3 with respect to Work that is paid for on a Unit Price Basis, any adjustment on Contract Price will be subject to the provisions of paragraphs 9.2 and 11.9; and

4.2.6.4 the CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Time if:

4.2.6.4.1 The CONTRACTOR knew of the existence of such conditions at the time the CONTRACTOR made a final commitment to the CITY in respect of Contract Price and Contract Times by the submission of a bid or becoming bound under a negotiated contract; or

4.2.6.4.2 the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test or study of the site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for the CONTRACTOR prior to the making of such final commitment by the CONTRACTOR; or

4.2.6.4.3 The CONTRACTOR failed to give the written notice within the time and as required by paragraph 4.2.3.

If the CITY and the CONTRACTOR are unable to agree on entitlement to or as to the amount or length of any such equitable adjustment in the Contract Price or Contract Times, a claim may be made therefor as provided in Articles 11 and 12. However, the CITY, the ENGINEER, and the Consultants of the ENGINEER shall not be liable to the CONTRACTOR for any claims, cost, losses or damages sustained by the CONTRACTOR on or in connection with any other project or anticipated project.

4.3 Physical Conditions--Underground Facilities:

4.3.1 Shown or Indicated The information and data shown or indicated in the Contract Documents with respect to existing Underground facilities at or contiguous to the site is based on information and data furnished to the CITY or the ENGINEER by the owners of such Underground Facilities or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

4.3.1.1 The CITY and the ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and

4.3.1.2 The cost of all of the following will be included in the Contract Price and the CONTRACTOR shall have full responsibility for: (i) reviewing and checking all such information and data, (ii) locating all Underground Facilities shown or indicated in the Contract Documents, (iii) coordination of the Work with the owners of such Underground Facilities during construction, and (iv) the safety and protection of all such Underground Facilities as provided in paragraph 6.20 and repairing any damage thereto resulting from the Work.

4.3.2 Not Shown or Indicated: If an Underground Facility is uncovered or revealed at or contiguous to the site which was not shown or indicated in the Contract Documents, the CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing contains affected thereby of performing any Work in connection therewith (excepting an emergency as required by paragraph 6.23), identify the Owner of such Underground Facility and give written notice to that Owner and to the CITY and the ENGINEER. The ENGINEER will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence of the Underground Facility. If the ENGINEER concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued as provided in Article 10 to reflect and document such consequences. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility as provided in paragraph 6.20. The CONTRACTOR shall be allowed an increase in the Contract Price or an

extension of the Contract Times, or both, to the extent that they are attributable to the existence of any Underground Facility that was not shown or indicated in the Contract Documents and that the CONTRACTOR did not know of and could not reasonably have been expected to be aware of or to have anticipated. If the CITY and the CONTRACTOR are unable to agree on entitlement or the amount or length of any such adjustment in the Contract Price or Contract Times, the CONTRACTOR may make a claim therefor as provided in Articles 11 and 12. However, the CITY, the ENGINEER, and the Consultants of the ENGINEER shall not be liable to the CONTRACTOR for any claims, costs, losses or damages incurred or sustained by the CONTRACTOR on or in connection with any other project or anticipated project.

Reference Points:

4.4 The CITY shall provide engineering surveys to establish reference points for construction which in the judgment of the ENGINEER are necessary to enable the CONTRACTOR to proceed with the Work. The CONTRACTOR shall be responsible for laying out the Work, shall protect and preserve the established reference points and shall make no changes or relocation without the prior written approval of the CITY. The CONTRACTOR shall report to the ENGINEER whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points by professionally qualified personnel.

4.5 Asbestos, PCB's, Petroleum, Hazardous Waste or Radioactive Material:

4.5.1 The CITY shall be responsible for any Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material uncovered or revealed at the site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the site. The CITY shall not be responsible for any such materials brought to the site by the CONTRACTOR, Subcontractor, Suppliers or anyone else for whom the CONTRACTOR is responsible.

4.5.2 The CONTRACTOR shall immediately: (i) stop all Work in connection with such hazardous condition and in any area affected thereby (except in an emergency as required by paragraph 6.23), and (ii) notify the CITY and the ENGINEER (and thereafter confirm such notice in writing). The CITY shall promptly consult with the ENGINEER concerning the necessity for the CITY to retain a qualified expert to evaluate such hazardous condition or take corrective action, if any. The CONTRACTOR shall not be required to resume Work in connection with such hazardous condition or in any such affected area until after the CITY has obtained any required permits related thereto

and delivered to the CONTRACTOR special written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (ii) specifying any special conditions under which such Work may be resumed safely. If the CITY and the CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of such Work stoppage or such special conditions under which Work is agreed by the CONTRACTOR to be resumed, either party may make claim therefor as provided in Articles 11 and 12.

4.3.5 If after receipt of such special written notice the CONTRACTOR does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then the CITY may order such portion of the Work that is in connection with such hazardous condition or in such affected area to be deleted from the Work. If the CITY and the CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price of Contract Times as a result of deleting such portion of the Work, then either party may make a claim therefor as provided in Articles 11 and 12. The CITY may have such deleted portion of the Work performed by own forces of the CITY or others in accordance with Article 7.

4.5.4 To the fullest extent permitted by Laws and Regulations, the CITY shall indemnify and hold harmless the CONTRACTOR, Subcontractors, the ENGINEER, the Consultants of the ENGINEER and the officers, directors, employees, agents, other consultants and subcontractors of each and any of them from and against all claims, costs, losses and damages arising out of or resulting from such hazardous condition provided that: (i) any such claim, cost, loss or damage is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, and (ii) nothing in this subparagraph 4.5.4 shall obligate the CITY to indemnify any person or entity from and against the consequences of the negligence of that person or entity.

4.5.5 The provisions of paragraphs 4.2 and 4.3 are not intended to apply to Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material uncovered or revealed at the site.

ARTICLE 5 -- BONDS AND INSURANCE

Performance, Payment and Other Bonds:

5.1 The CONTRACTOR shall furnish Performance and Payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all the obligations of the CONTRACTOR under the Contract Documents. The CONTRACTOR shall also furnish a maintenance bond in an amount equal to twenty-five (25%) percent of the contract price. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Government Financial Operations, US Treasury department. All Bonds signed by an agent must be accompanied by a certified copy of sure authority of the agent to act.

5.2 If the surety on any Bond furnished by the CONTRACTOR is declared as bankrupt or becomes insolvent or its right to do business is terminated in the State of Michigan or it ceases to meet the requirements of paragraph 5.1, the CONTRACTOR shall within ten days thereafter substitute another Bond and surety, both of which must be acceptable to the City.

5.3 LICENSED SURETIES AND INSURERS; CERTIFICATES OF INSURANCE:

5.3.1 All Bonds and insurance required by the Contract Documents to be purchased and maintained by the CITY or the CONTRACTOR shall be obtained from surety or insurance companies that are duly licensed or authorized in the State of Michigan to issue Bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.3.2 The CONTRACTOR shall deliver to the CITY, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by the CITY or any other additional insured) which the CONTRACTOR is required to purchase and maintain in accordance with paragraph 5.4.

Liability Insurance of the CONTRACTOR

5.4 The CONTRACTOR shall purchase and maintain such liability and other insurance

as is appropriate for the Work being performed and furnished and as well provide protection from claims set forth below which may arise out of or result from the performance and furnishing of the Work of the CONTRACTOR, and other obligations under the Contract Documents of the CONTRACTOR, whether it is to be performed or furnished by the CONTRACTOR, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform or furnish any of the Work, or by anyone for whose acts any of them may be liable:

5.4.1 claims under workers' compensation, disability benefits and other similar employee benefit acts;

5.4.2 claims for damages because of bodily injury, occupational sickness or disease, or death of employees of the CONTRACTOR;

5.4.3 claims for damages because of bodily injury, sickness or disease, or death of any person other than the employees of the CONTRACTOR;

5.4.4 claims for damages insured by customary personal injury liability coverage which are sustained: (i) by any person as a result of an offense directly or indirectly related to the employment of such person by the CONTRACTOR, or (ii) by any other person for any other reason;

5.4.5 claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

5.4.6 claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

The policies of insurance so required by this paragraph 5.4 to be purchased and maintained shall:

5.4.7 with respect to insurance required by paragraphs 5.4.3 through 5.4.7 inclusive, include as additional insureds (subject to any customary exclusion in respect of professional liability) the CITY, the ENGINEER, the Consultants of the ENGINEER and any other persons or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers and employees of all such additional insured;

5.4.8 include the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

5.4.9 include completed operations insurance;

5.4.10 include contractual liability insurance covering the indemnity obligations of the CONTRACTOR under paragraphs 6.12, 6.16 and 6.31 through 6.33;

5.4.11 contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least thirty days prior written notice has been given to the CITY and the CONTRACTOR and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the CONTRACTOR pursuant to paragraph 5.3.2 will so provide);

5.4.12 remain in effect at least until final payment and at all times thereafter when the Contractor may be correcting, removing or replacing defective Work in accordance with paragraph 13.12; and

5.4.13 with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment (and the CONTRACTOR shall furnish the CITY and each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued evidence satisfactory to the CITY and any such additional insured of continuation of such insurance at final payment and one year thereafter).

Liability Insurance of the CITY

5.5 In addition to the insurance required to be provided by the CONTRACTOR under paragraph 5.4, the CITY, at the option of the CITY, may purchase and maintain at the expense of the CITY, liability insurance of the CITY as will protect the CITY against claims which may arise from operations under the Contract Documents.

Property Insurance (Builders Risk):

5.6 Unless otherwise excluded in the Supplementary Conditions, the CONTRACTOR shall purchase and maintain property insurance upon the Work at the site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

5.6.1 include the interests of the City, the CONTRACTOR, Subcontractors, the ENGINEER, Consultants of the ENGINEER and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

5.6.2 be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work and Work in transit and shall insure against at least the following perils fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris, removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils as may be specifically required by the Supplementary Conditions.

5.6.3 include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

5.6.4 cover materials and equipment stored at the site or at another location that was agreed to in writing by the CITY prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by the ENGINEER; and

5.6.5 be maintained in effect until final payment is made unless otherwise agreed to in writing by the CITY, the CONTRACTOR, and the ENGINEER with thirty days written notice to each other additional insured to whom a certificate of insurance has been issued.

5.7 The CONTRACTOR shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of the CITY, the CONTRACTOR, Subcontractors, the ENGINEER, the Consultants of the ENGINEER, and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

5.8 All of the policies of insurance (and the certificates or other evidence thereof required to be purchased and maintained by the CONTRACTOR in accordance with paragraphs 5.6 and 5.7 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least thirty days prior written notice has been given to the CITY and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.11.

5.9 The CITY shall not be responsible for purchasing and maintaining any property insurance to protect the interests of the CONTRACTOR, Subcontractors or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount, will be borne by the CONTRACTOR Subcontractor or others suffering any such loss

and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the expense of the purchaser.

5.10 If the CITY requests in writing that other special insurance be included in the property insurance policies provided under paragraphs 5.6 or 5.7, the CONTRACTOR shall, if possible, include such insurance, and the cost thereof will be charged to the CITY by appropriate Change Order or Written Amendment. Prior to commencement of the Work at the site, the CONTRACTOR shall in writing advise the CITY whether or not such other insurance has been procured by the CONTRACTOR.

5.11 Waiver of Rights

5.11.1 The CITY and the CONTRACTOR intend that all policies purchased in accordance with paragraphs 5.6 and 5.7 will protect the CITY, the CONTRACTOR, Subcontractors, ENGINEER, Consultants of the ENGINEER and all other persons or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds in such policies and will provide primary coverage for all losses and damages caused by the perils covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. The CONTRACTOR waive all rights against the CITY, its officers, directors, employees and agents for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, the ENGINEER, the Consultants of the ENGINEER and all other persons or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds under such policies for losses and damage so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by the CITY as trustee or otherwise payable under any policy so issued.

Receipt and Application of Insurance Proceeds

5.12 Any insured loss under the policies of insurance required by paragraphs 5.6 and 5.7 will be adjusted with the City and made payable to the CITY as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 5.13. The CITY shall deposit in a separate account any money so received, and shall distribute it is accordance with such agreement as the parties in interest may reach. If no other special agreement is reached the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

5.13 The City as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within fifteen days after the occurrence of loss to exercise of this power to the CITY. If such objection be made, the CITY as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, the CITY, as fiduciary, shall adjust and settle the loss with the insurers and if required in writing by any party in interest, the CITY as fiduciary shall give bond for the proper performance of such duties.

Acceptance of Bonds and Insurance; Option to Replace

5.14 If the CITY has any objection to the coverage afforded by the provisions of the Bonds or insurance required to be purchased and maintained under this Contract, the City shall notify the CONTRACTOR in writing as soon as possible after receipt of the certificates (or other evidence requested) required by paragraph 2.7. The CONTRACTOR shall provide to the CITY such additional information with respect of insurance provided as the CITY may reasonably request. If the CONTRACTOR does not purchase or maintain all of the Bonds and insurance required of such party by the Contract Documents, the CITY shall notify the CONTRACTOR in writing of such failure to purchase and maintain, and if not corrected, the CITY may elect to obtain equivalent bonds or other insurance to protect such interests of the CITY at the expense of the CONTRACTOR and a Change Order shall be issued to adjust the contract price accordingly. As an alternative, the CITY may treat failure of the CONTRACTOR to provide or maintain such bonds or insurance as a termination pursuant to paragraph 15.2 of this contract.

Partial Utilization--Property Insurance

5.15 If the CITY finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, such use or occupancy may be accomplished in accordance with paragraph 14.10; provided that no such use or occupancy shall commence before the insurers providing the property insurance have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6--RESPONSIBILITY OF THE CONTRACTOR

Supervision and Superintendence

6.1 The CONTRACTOR shall supervise, inspect and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. The CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, but the CONTRACTOR shall not be responsible for the negligence of others in the design or specification of a specific means, method, technique, sequence or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. The CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

6.2 The CONTRACTOR shall keep on the Work at all times during its progress a competent resident superintendent, who shall not be replaced without written notice of the CITY and the ENGINEER except under the extraordinary circumstances. The superintendent will have the representative of the CONTRACTOR at the site and shall have authority to act on behalf of the CONTRACTOR. All communications to the superintendent shall be as binding as if given to the CONTRACTOR.

Labor, Materials and Equipment

6.3 The CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out and construct the Work as required by the Contract Documents. The CONTRACTOR shall at all times maintain good discipline and order at the site. Except as otherwise required for the safety or protection of persons or the Work or property at the site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the site shall be performed during regular working hours.

6.4 Unless otherwise specified in the General Requirements, the CONTRACTOR shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

6.5 All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of the CITY. If required by the ENGINEER, the CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and qualify of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and

conditioned in accordance with instructions of the applicable Supplier, except as otherwise provided in the Contract Documents.

Progress Schedule:

6.6 The CONTRACTOR shall adhere to the progress schedule established in accordance with paragraph 2.9 as it may be adjusted from time to time as provided below:

6.6.1 The CONTRACTOR shall submit to the ENGINEER for acceptance (to the extent indicated in paragraph 2.9) proposed adjustments in the progress schedule that will not change the Contract Times (or Milestones). Such adjustments will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

6.6.2 Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of paragraph 12.1. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

6.7 Substitutes and "Or-Equal" Items:

6.7.1 Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function and quality required. Unless the specification or description contains or is followed by words reading that no like equivalent or "Or-Equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be accepted by the ENGINEER under the following circumstances:

6.7.1.1 "Or-Equal": If in the sole discretion of the ENGINEER an item of material or equipment proposed by the CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by the ENGINEER as an "or-equal" item, in which case review and approval of the proposed item may, in the sole discretion of the ENGINEER be accomplished without compliance with some or all of the requirements for acceptance of proposed substitute items.

6.7.1.2 Substitute Items: If in the sole discretion of the ENGINEER an item of material or equipment proposed by the CONTRACTOR does not qualify as an "or-equal" item under subparagraph 6.7.1.1, it will be considered a proposed substitute item. The

CONTRACTOR shall submit sufficient information as provided below to allow the ENGINEER to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. The procedure for review by the ENGINEER will include the following as supplemented in the General Requirements and as the ENGINEER may decide is appropriate under the circumstances. Requests for review of proposed substitute items of material or equipment will not be accepted by the ENGINEER from anyone other than the CONTRACTOR. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment, the CONTRACTOR shall first make written application to the ENGINEER for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified and be suited to the same use as that specified. The application will state the extent, if any, to which the evaluation and acceptance of the proposed substitute will prejudice the achievement of Substantial Completion of the CONTRACTOR on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with the CITY for work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which will be considered by the ENGINEER in evaluating the proposed substitute. The ENGINEER may require the CONTRACTOR to furnish additional data about the proposed substitute.

6.3.1.3 Expense of the CONTRACTOR: All data to be provided by the CONTRACTOR in support of any proposed “or-equal” or substitute item will be at the expense of the CONTRACTOR.

6.7.2 Substitute Construction Methods or procedures: If a specific means, method, technique, sequence or procedure of construction is shown or indicated in and expressly required by the Contract Documents, the CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence or procedure of construction acceptable to the ENGINEER. The

CONTRACTOR shall submit sufficient information to allow the ENGINEER, in the sole discretion of the ENGINEER, to determine that the substitute proposed is equivalent to that expressly called for by the CONTRACT Documents. The procedure for review by the ENGINEER will be similar to that provided in subparagraph 6.7.1.2.

6.7.3 Evaluation of the ENGINEER The ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.7.1.2 and 6.7.2. The ENGINEER will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized without the prior written acceptance of the ENGINEER which will be evidenced by either a Change Order or an approved Shop Drawing. The CITY may require the CONTRACTOR to furnish at the expense of the CONTRACTOR a special performance guarantee or other surety with respect to any "or-equal" or substitute. The ENGINEER will record time required by the ENGINEER and the Consultants of the ENGINEER in evaluating substitutes proposed or submitted by the CONTRACTOR pursuant to paragraphs 6.7.1.2 and 6.7.2 and in making changes in the Contract Documents (or in the provisions of any other direct contract with the CITY for work on the Project) occasioned thereby. Whether or not the ENGINEER accepts a substitute item so proposed or submitted by the CONTRACTOR, the CONTRACTOR shall reimburse the CITY for the charges of the ENGINEER and the Consultants of the ENGINEER for evaluating each such proposed substitute item.

6.8 Concerning Subcontractors, Suppliers and Others:

6.8.1 The CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization (including those acceptable to the CITY and the ENGINEER as indicated in paragraph 6.8.1), whether initially or as a substitute, against whom the CITY or the ENGINEER may have reasonable objection. The CONTRACTOR shall not be required to employ any Subcontractor, Supplier or other person or organization to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

6.8.2 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers or other persons or organizations (including those who are to furnish the principal items of materials or equipment) to be submitted to the CITY in advance of the specified date prior to the Effective Date of the Agreement for acceptance by the CITY and the ENGINEER, and if the CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, the acceptance of the CITY or the ENGINEER (either in writing or by failing to make written objection thereto by the date indicated for acceptance of objection in the bidding documents or the Contract Documents) of any such Subcontractor, Supplier or other person or

organization so identified may be revoked on the basis of reasonable objection after due investigation, in which case the CONTRACTOR shall submit an acceptable substitute, the Contract Price will be adjusted by the difference in the cost occasioned by such substitution and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by CITY or ENGINEER of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of the CITY or the ENGINEER of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of the CITY or ENGINEER to reject defective Work.

6.9.1 The CONTRACTOR shall be fully responsible for the CITY and the ENGINEER for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with the CONTRACTOR just as the CONTRACTOR is responsible for acts and omissions of the CONTRACTOR. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier, or other person or organization any contractual relationship between the CITY or the ENGINEER and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of the CITY or the ENGINEER to pay or to see to the payment of any moneys due any such Subcontractor, Supplier or other person or organization except as may otherwise be required by Laws and Regulations.

6.9.2 The CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with the CONTRACTOR. The CONTRACTOR shall require all Subcontractors, Suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with the ENGINEER through the CONTRACTOR.

6.10 The divisions and sections of the Specifications and the identifications of any Drawings shall not control the CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

6.11 All Work performed by the CONTRACTOR by a Subcontractor or Supplier will be pursuant to an appropriate agreement between the CONTRACTOR and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of the CITY and the ENGINEER. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in paragraph 5.6 or 5.7, the agreement between the CONTRACTOR and the

Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against the CITY, the CONTRACTOR, the ENGINEER, the Consultants of the ENGINEER and all other additional insureds for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, the CONTRACTOR will obtain the same.

Patent Fees and Royalties:

6.12 The CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of the CITY or the ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by the CITY in the Contract Documents. To the fullest extent permitted by Laws and Regulations, the CONTRACTOR shall indemnify and hold harmless the CITY, the ENGINEER, the Consultants of the ENGINEER and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages arising out of or resulting from any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product or device not specified in the Contract Documents.

Permits:

6.13 Unless otherwise provided in the Supplementary Conditions, the CONTRACTOR shall obtain and pay for all construction permits and licenses. The CITY shall assist the CONTRACTOR, when necessary, in obtaining such permits and licenses. The CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. The CONTRACTOR shall pay all charges of utility owners for connections to the Work, and the CITY shall pay all charges of such utility owners for capital costs related thereto such as plant investment fees.

6.14 Laws and Regulations:

6.14.1 The CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to furnishing and performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations,

neither the CITY nor the ENGINEER shall be responsible for monitoring the compliance of the CONTRACTOR with any Laws or Regulations.

6.14.2 If the CONTRACTOR performs any Work knowing or having reason to know that is contrary to Laws or Regulations, the CONTRACTOR shall bear all claims, costs, losses and damages caused by, arising out of or resulting therefrom; however, it shall not be the primary responsibility of the CONTRACTOR to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve the CONTRACTOR of the obligation of the CONTRACTOR under paragraph 3.2.2.

Taxes:

6.15 The CONTRACTOR shall pay all sales, consumer, use and other similar taxes required to be paid by the CONTRACTOR in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

Use of Premises:

6.16 The CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workers to the site and land and areas identified in and permitted by the Contract Documents and other land and areas permitted by Laws and Regulations, rights-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. The Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any adjacent land or areas, resulting from the performance of the Work. Should any claim be made by any such owner or occupant because of the performance of the Work, the CONTRACTOR shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law. The CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless the CITY, the ENGINEER, the Consultant of the ENGINEER and anyone directly or indirectly employed by any of them from and against all claims, costs, losses and damages arising out of or resulting from any claim or action, illegal or equitable, brought by any such owner or occupant against the CITY, the ENGINEER, or any other party indemnified hereunder to the extent caused by or based upon the performance of the Work of the CONTRACTOR.

6.17 During the progress of the Work, the CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work the CONTRACTOR shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery and surplus materials. The

CONTRACTOR shall leave the site clean and ready for occupancy by the CITY at Substantial Completion of the Work. The CONTRACTOR shall restore to original condition all property not designated for alteration by the Contract Documents.

Record Documents

6.19 The CONTRACTOR shall maintain in a safe place at the site one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Change Directives, Field Orders and written interpretations and clarifications (issued pursuant to paragraph 9.4) in good order and annotated to show all changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to the ENGINEER for reference. Upon completion of the Work, those record documents, Samples and Shop Drawings will be delivered to the ENGINEER for the CITY.

Safety and Protection:

6.20 The CONTRACTOR shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

6.20.1 all persons on the Work site or who may be affected by the Work;

6.20.2 all the Work and materials and equipment to be incorporated therein whether in storage on or off the site; and

6.20.3 other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and Underground Facilities not designated for removal, relocation or replacement in the course of construction.

The CONTRACTOR shall comply with all applicable Laws and Regulations of any public body having jurisdiction for safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. The CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property referred to in paragraph 6.20.2 or 6.20.3 caused, directly or indirectly , in whole or in part, by the CONTRACTOR, any Subcontractor, supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts to any of them may be liable, shall be remedied by the CONTRACTOR (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of the CITY or the ENGINEER or the

Consultant of the ENGINEER or anyone employed by any of them or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the CONTRACTOR or any Subcontractor, Supplier or other person or organization directly or indirectly employed by any of them). The Duties and responsibilities of the CONTRACTOR for safety and for protection of the Work shall continue until such time as all the Work is completed and the ENGINEER has issued a notice to the CITY and the CONTRACTOR in accordance with paragraph 14.13 that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

Safety Representative:

6.21 The CONTRACTOR shall designate a qualified and experienced safety representative at the site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

Hazard Communication Programs:

6.22 The CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the site in accordance with Laws or Regulations.

Emergencies:

6.23 In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, the CONTRACTOR, without special instruction or authorization from the CITY or the ENGINEER is obligated to act to prevent threatened damage, injury or loss. The CONTRACTOR shall give the ENGINEER prompt written notice if the CONTRACTOR believes that any significant changes in the WORK or variations from the CONTRACT DOCUMENTS have been caused thereby. If the ENGINEER determines that a change in the Contract Documents is required because of the action taken by the CONTRACTOR in response to such an emergency, a Work Change Directive or Change Order will be issued to document the consequences of such action.

6.24 Shop Drawings and Samples

6.24.1 The CONTRACTOR shall submit Shop Drawings to the ENGINEER for review and approval in accordance with the accepted schedule of Shop Drawings and Sample submittals (see paragraph 2.9). All submittals will be identified as the ENGINEER may require and in the number of copies specified in the General Requirements. The data shown on the Shop Drawings will be completed with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to show the ENGINEER the materials and equipment the CONTRACTOR proposes to provide and to enable the ENGINEER to review the information for the limited purposes required by paragraph 6.26.

6.24.2 The CONTRACTOR shall also submit Samples to the ENGINEER for review and approval in accordance with said accepted schedule of Shop Drawings and Sample submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended and otherwise as the ENGINEER may require to enable the ENGINEER to review the submittal for the limited purposes required by paragraph 6.26. The numbers of each Sample to be submitted will be as specified in the Specifications.

6.25 Submittal Procedures:

6.25.1 Before submitting each Shop Drawing or Sample, the CONTRACTOR shall have determined and verified:

6.25.1.1 all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar information with respect thereto,

6.25.1.2 all materials with respect to intended use, fabrication, shipping,

handling, storage, assembly and installation pertaining to the performance of the Work, and the CONTRACTOR shall also have reviewed and coordinated each shop drawing for Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

6.25.2 Each submittal will bear a stamp or specific written indication that the CONTRACTOR has satisfied the obligations of the CONTRACTOR under the Contract Documents with respect to review and approval of the CONTRACTOR of that submittal.

6.25.3 At the time of each submission, the CONTRACTOR shall give the ENGINEER specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication separate from the submittal; and, in addition, shall cause a specific notations to be made on each Shop Drawing and Sample submitted to the ENGINEER for review and approval of each such variation.

6.26 The ENGINEER will review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals accepted by the ENGINEER as required by paragraph 2.9. Review and approval of the Engineer will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. The review and approval of the ENGINEER will not extend to means, methods, techniques, sequences or procedures of construction (except where a particular means, method, technique, sequence or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions. The CONTRACTOR shall make corrections required by the ENGINEER, and shall return the required number of corrected copies of Shop Drawings and submit as required new samples for review and approval. The CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by the ENGINEER on previous submittals.

6.27 ENGINEER'S REVIEW AND APPROVAL OF Shop Drawings or Samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER'S attention to each such variation at the time of submission as required by paragraph 6.25.3 and ENGINEER has given written approval of each such

variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for complying with the requirements of paragraph 6.25.1.

6.28 Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submissions accepted by ENGINEER as required by paragraph 2.9, any related Work performed prior to ENGINEER'S review and approval of the pertinent submittal will be at the sole expense and responsibility of CONTRACTOR.

Continuing the work:

6.29 CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by paragraph 15.5 or as CITY and CONTRACTOR may otherwise agree in writing.

6.30 CONTRACTOR'S General Warranty and Guarantee:

6.30.1 CONTRACTOR warrants and guarantees to CITY, ENGINEER and ENGINEER'S Consultants that all Work will be in accordance with the Contract Documents and will not be *defective.* CONTRACTOR'S warranty and guarantee hereunder excludes defects or damage caused by:

6.30.1.1 abuse, modification or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors or suppliers; or

6.30.1.2 CONTRACTOR'S obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR'S obligation to perform the Work in accordance with the Contract Documents.

6.30.2 CONTRACTOR'S obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR'S obligation to perform the Work in accordance with the Contract Documents:

6.30.2.1 Observations by ENGINEER;

6.30.2.2 recommendation of any progress of or final payment by ENGINEER;

6.30.2.3 the issuance of a certificate of Substantial Completion or any payment by the CITY to the CONTRACTOR under the Contract Documents;

6.30.2.4 use or occupancy of the Work or any part thereof by the CITY;

6.30.2.5 any acceptance by the CITY or any failure to do so;

6.30.2.6 any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by the ENGINEER pursuant to paragraph 14.13;

6.30.2.6 any inspection, test or approval by others; or

6.30.2.8 any correction of defective Work by the CITY.

Indemnification:

6.31 To the fullest extent permitted by Laws and Regulations, the CONTRACTOR shall indemnify and hold harmless the CITY, the ENGINEER, the Consultants of the ENGINEER and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of or resulting from the performance of the Work, provided that any such claim, cost, loss or damage: (i) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself), including the loss of use resulting therefrom and (ii) is caused in whole or in part by any negligent act or omission of the CONTRACTOR, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of a person or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such person or entity.

6.32 In any and all claims against the CITY or the ENGINEER or any of their respective consultants, agents, officers, directors or employees by any employee (or the survivor or personal representative of such employee) of the CONTRACTOR, any

Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under paragraph 6.31 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the CONTRACTOR of any such Subcontractor, Supplier or other person or organization under workers' compensation acts, disability benefit acts or other employee benefit acts.

6.33 The indemnification obligations of the CONTRACTOR under paragraph 6.31 shall not extend to the liability of the ENGINEER and the Consultants of the ENGINEER, officers, directors, employees or agents caused by the professional negligence, errors or omissions of any of them.

Survival of Obligations:

6.34 All representations, indemnifications, warranties and guarantees made in, required by or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the Work and termination or completion of the Agreement.

ARTICLE 7--OTHER WORK

Related Work at Site:

7.1 The CITY may perform other work related to the Project at the site by the own forces of the CITY, or let other direct contracts therefor which shall contain General Conditions similar to these, or have other work performed by utility owners. If the fact that such other work is to be performed was not noted in the Contract Documents, then: (i) written notice thereof will be given to the CONTRACTOR prior to starting any such other work, and (ii) the CONTRACTOR may make a claim therefor as provided in Articles 11 and 12 if the CONTRACTOR believes that such performance will involve additional expense to the CONTRACTOR or requires additional time and the parties are unable to agree as to the amount or extent thereof.

7.2 The CONTRACTOR shall afford each other contractor who is a party to such a direct contract and each utility owner (and CITY, if the CITY is performing the additional work with employees of the CITY) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly connect and coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, the CONTRACTOR shall do all cutting, fitting, and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. The CONTRACTOR shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of the ENGINEER and the others whose work will be affected. The duties and responsibilities of the CONTRACTOR under this paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of the CONTRACTOR in said direct contracts between the CITY and such utility owners and other contractors.

7.3 If the proper execution or results of any part of the Work of the CONTRACTOR depends upon work performed by others under this Article 7, the CONTRACTOR shall inspect such other work and promptly report to the ENGINEER in writing any delays, defects or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of the Work Contractor. Failure of the CONTRACTOR to report will constitute an acceptance of such other work as fit and proper for integration with the Work of the CONTRACTOR except for latent or non-apparent defects and deficiencies in such other work.

Coordination

7.4 If the CITY contracts with others for the performance of other work on the Project at the site, the following will be set forth in Supplementary Conditions

7.4.1 the person, firm or corporation who will have authority and responsibility for coordination of the activities among the various prime contractors will be identified;

7.4.2 the specific matters to be covered by such authority and responsibility will be itemized; and

7.4.3 the extent of such authority and responsibilities will be provided.

Unless otherwise provided in the Supplementary Conditions, the CITY shall have sole authority and responsibility in respect of such coordination.

ARTICLE 8--RESPONSIBILITIES OF THE CITY

8.1 Except as otherwise provided in these General Conditions, the CITY shall issue all communications to the CONTRACTOR through the ENGINEER.

8.2 In case of termination of the employment of the ENGINEER, the CITY shall appoint an engineer against whom the CONTRACTOR makes no reasonable objection, whose status under the Contract Documents shall be that of the former ENGINEER.

8.3 The CITY shall furnish the data required of the CITY under the Contract Documents promptly and shall make payments to the CONTRACTOR promptly when they are due as provided in paragraphs 14.4 and 14.13.

8.4 The duties of the CITY in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.1 and 4.4 Paragraph 4.2 refers to City identifying and making available to the CONTRACTOR copies of reports of explorations and tests of subsurface conditions at the site and drawings of physical conditions in existing structures at or contiguous to the site that have been utilized by the ENGINEER in preparing the Contract Documents.

8.5 The responsibilities of the CITY in respect of purchasing and maintaining liability and property insurance are set forth in paragraphs 5.5 through 5.10.

8.6 The City is obligated to execute Change Orders as indicated in paragraph 10.4

8.8 In connection with the right to stop Work or suspend Work of the City (see paragraphs 13.10 and 15.1), paragraph 15.2 deals with the right of the CITY to terminate services of the CONTRACTOR under certain circumstances.

8.9 The CITY shall not supervise, direct or have control or authority over, nor be responsible for, the means, methods, techniques, sequences or procedures of the CONTRACTOR for construction or the safety precautions and programs incident thereto, or for any failure of the CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work. The CITY will not be responsible for the failure of the CONTRACTOR to perform or furnish the Work in accordance with the Contract Documents.

8.10 The responsibility of the CITY in respect of undisclosed Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Materials uncovered or revealed at the site is set forth in paragraph 4.5.

8.11 If and to the extent the CITY has agreed to furnish the CONTRACTOR reasonable

evidence that financial arrangements have been made to satisfy the obligations of the CITY under the Contract Documents, the responsibility of the CITY in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9--STATUS OF THE ENGINEER DURING CONSTRUCTION

Representative of the CITY:

9.1 The ENGINEER will be the representative of the CITY during the construction period. The duties and responsibilities and the limitations of authority of the ENGINEER as the representative of the CITY during construction are set forth in the Contract Documents and shall not be extended without written consent of the CITY and the ENGINEER.

Visits to Site:

9.2 The ENGINEER will make visits to the site at intervals appropriate to the various stages of construction as the ENGINEER deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of the executed Work of the CONTRACTOR. Based on information obtained during such visits and observations, the ENGINEER will endeavor for the benefit of the CITY to determine, in general, if the Work is proceeding in accordance with the Contract Documents. The ENGINEER will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The efforts of the ENGINEER will be directed toward providing for the CITY a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and on-site observations, the ENGINEER will keep the CITY informed of the progress of the Work and will endeavor to guard the CITY against defective Work. The visits of the ENGINEER and on-site observations are subject to all the limitations on the authority and responsibility of the ENGINEER set forth in paragraph 9.13, and particularly, but without limitation, during or as a result of the on-site visits or observations by the ENGINEER of the Work of the CONTRACTOR the ENGINEER will not supervise, direct, control or have authority over or be responsible for the means, methods, techniques, sequences or procedures of construction of the Contractor, or the safety precautions and programs incident thereto, or for any failure of the CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work.

Project Representative:

9.3 If the CITY and the ENGINEER agree, the ENGINEER will furnish a Resident Project Representative to assist the ENGINEER in providing more continuous observation of the Work. The responsibilities and authority and limitations thereon of any such Resident Project Representative and assistants will be as provided in paragraph 9.13 and in the Supplementary Conditions. If the CITY designates another representative or agent to represent the CITY at the site who is not a Consultant, agent or employee of the ENGINEER, the responsibilities and authority and limitations thereon of such other person will be as provided in the Supplementary Conditions.

Clarifications and Interpretations:

9.4 The ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as the ENGINEER may determine necessary, which shall be consistent with the intent of and reasonably inferable from Contract Documents. Such written clarifications and interpretations will be binding on the CITY and the CONTRACTOR. If the CITY or CONTRACTOR believes that a written clarification or interpretation justifies an adjustment in the Contract Price or the Contract Times and the parties are unable to agree to the amount or extent thereof, if any, the CITY of the CONTRACTOR may make a written claim therefor as provided in Article 11 or Article 12.

Authorized Variations in Work:

9.5 The ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on the CITY and also on the CONTRACTOR who shall perform the Work involved promptly. If the CITY or the CONTRACTOR believes that a Field Order justifies an adjustment in the Contract Price or the Contract Times and the parties are unable to agree as to the amount or extent thereof, the CITY or the CONTRACTOR may make a written claim therefor as provided in Article 11 or 12.

Reflecting Defective Work:

9.6 The ENGINEER will have authority to disapprove or reject Work which the ENGINEER believes to be defective, or that the ENGINEER believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. The ENGINEER will also have authority to require special inspection or testing of the Work as provided in paragraph 13.9, whether or not the Work is fabricated, installed or completed.

Shop Drawings, Change Orders and Payments:

9.7 In connection with the authority of the ENGINEER as to Shop Drawings and Samples, see paragraphs 6.25 through 6.28 inclusive.

9.8 In connection with the authority of the ENGINEER as to Change Orders, see articles 10, 11, and 12.

9.9 In connection with the authority of the ENGINEER as to Applications for Payment,

see Article 14.

Determinations for Unit Prices:

9.10 The ENGINEER will determine the actual quantities and classifications of Unit Price Work performed by the CONTRACTOR. The ENGINEER will review with the CONTRACTOR the preliminary determinations of the ENGINEER on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). The written decision of the ENGINEER thereon will be final and binding upon the CITY and the CONTRACTOR, unless within ten days after the date of any such decision either the CITY or the CONTRACTOR delivers to the other and to the ENGINEER written notice of intention of appeal from the decision of the ENGINEER and: (a) an appeal from the decision of the ENGINEER is taken within the time limits and in accordance with the procedures set forth in a "Dispute Resolution Agreement," entered into between the CITY and the CONTRACTOR pursuant to Article 16, or (b) if no such Dispute Resolution Agreement has been entered into, a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect to the decision of the ENGINEER, unless otherwise agreed in writing by the CITY and the CONTRACTOR. Such appeal will not be subject to the procedures of paragraph 9.11.

Decisions on Disputes:

9.11 The ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and other matters relating to the acceptability of the Work or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work and Claims under Articles 11 and 12 in respect of changes in the Contract Price or Contract Times will be referred initially to the ENGINEER in writing with a request for a formal decision in accordance with this paragraph. Written notice of each such claim, dispute or other matter will be delivered by the claimant to the ENGINEER and the other party to the Agreement promptly (but in no event later than thirty days) after the start of the occurrence of event giving rise thereto, and written supporting data will be submitted to the ENGINEER and the other party within sixty days after the start of such occurrence or event unless the ENGINEER allows an additional period of time for the submission of additional or more accurate data in support of such claim, dispute or other matter. The opposing party shall submit any response to the ENGINEER and the claimant within thirty days after receipt of the last submittal of the claimant unless the ENGINEER allows additional time). The ENGINEER will render a formal decision in writing within thirty days after receipt of the opposing submittal of the party, if any, in accordance with this paragraph. The written decision of the ENGINEER on such claim, dispute or other matter will be final and binding upon the CITY and the CONTRACTOR unless: (a) an appeal from the decision of the ENGINEER is taken within the time limits and in accordance with the procedures set forth in a "Dispute Resolution Agreement," entered into between the CITY and the

CONTRACTOR pursuant to Article 16, or (b) if no such Dispute Resolution Agreement has been entered into, a written notice of intention to appeal from the written decision of the ENGINEER is delivered by the CITY or the CONTRACTOR to the other and to the ENGINEER within thirty days after the date of such decision and a formal proceeding is instituted by the appealing party in a a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect to such claim, dispute or other matter in accordance with applicable Laws and Regulations within sixty days of the date of such decision, unless otherwise agreed in writing by the CITY and the CONTRACTOR.

9.12 When functioning as interpreter and judge under paragraphs 9.10 and 9.11, the ENGINEER will not show partiality to the CITY or the CONTRACTOR and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by the ENGINEER pursuant to paragraphs 9.10 or 9.11 with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.15) will be a condition precedent to any exercise by the CITY or the CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such claim, dispute or other matter pursuant to Article 16.

9.13 Limitations on the Authority and Responsibilities of the ENGINEER

9.13.1 Neither authority or responsibility of the ENGINEER under this Article 9 or under any other provision of the Contract Documents nor any decision made by the ENGINEER in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise or performance of any authority or responsibility by the ENGINEER shall create, impose or give rise to any duty owed by the ENGINEER to the CONTRACTOR, any Subcontractor, any Supplier, and other person or organization, or to any surety for or employee or agent of any of them.

9.13.2 The ENGINEER will not supervise, direct, control or have authority over or be responsible for the means, methods, techniques, sequences or procedures of the CONTRACTOR of construction, or the safety precautions and programs incident thereto, or for any failure of the CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work. The ENGINEER will not be responsible for failure to perform or furnish the Work of the CONTRACTOR in accordance with the Contract Documents.

9.13.3 The ENGINEER will not be responsible for the acts or omissions of the CONTRACTOR or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

9.13.4 The review of the ENGINEER of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, and certificates of inspection, tests and approvals and Other documentation required to be delivered by paragraph 14.12 will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests and approvals that the results certified indicate compliance with, the Contract Documents.

9.13.5 The limitations upon authority and responsibility set forth in the paragraph 9.13 shall also apply to the Consultants of the ENGINEER, Resident Project Representative and assistants.

ARTICLE 10--CHANGES IN THE WORK

10.1 Without invalidating the Agreement and without notice to any surety, the CITY may, at any time or from time to time, order additions, deletions or revisions in the Work. Such additions, deletions or revisions will be authorized by a Written Amendment, a Change Order or a Work Change Directive. Upon receipt of any such document, the CONTRACTOR shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

10.2 If the CITY and the CONTRACTOR are unable to agree as to the extent, if any, of an adjustment in the Contract Price or an adjustment of the Contract Times that should be allowed as a result of a Work Change Directive, a claim may be made therefor as provided in Article 11 or Article 12.

10.3 The CONTRACTOR shall not be entitled to an increase in the Contract price or an extension of the Contract Times with respect to any Work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in paragraphs 3.5 and 3.6 except in the case of an emergency as provided in paragraph 6.23 or in the case of uncovering Work as provided in paragraph 13.9.

10.4 The CONTRACTOR shall execute appropriate Change Orders recommended by the ENGINEER (or Written Amendments) covering:

10.4.1 changes in the Work which are (i) ordered by the CITY pursuant to paragraph 10.1, (ii) required because of acceptance of defective Work under paragraph 13.13 or correcting defective Work under paragraph 13.4, or (iii) agreed to by the parties;

10.4.2 changes in the Contract Price or Contract Times which are agreed to by the parties; and

10.4.3 changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by the ENGINEER pursuant to paragraph 9.11;

provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, the CONTRACTOR shall carry on the Work and adhere to the progress schedule as provided in paragraph 6.29.

10.5 If notice of any change affecting the general scope of the Work or the provisions

of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be the responsibility of the CONTRACTOR, and the amount of each applicable Bond will be adjusted accordingly.

11.1 The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to the CONTRACTOR for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by the CONTRACTOR shall be at the expense of the CONTRACT without change in the Contract Price.

11.2 The Contract Price may only be changed by a Change Order or by a Written Amendment. Any claim for an adjustment in the Contract Price shall be based on written notice delivered by the party making the claim to the other party and to the ENGINEER promptly (but in no event later than thirty days) after the start of the occurrence of event giving rise to the claim and stating the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered within sixty days after the start of such occurrence of event (unless the ENGINEER allows additional time for claimant to submit additional or more accurate data in support of the claim) and shall be accompanied by written statement of the claimant that the adjustment claimed covers all known amounts to which the claimant is entitled as a result of said occurrence or event. All claims for adjustment in the Contract Price shall be determined by the ENGINEER in accordance with paragraph 9.11 if the CITY and the CONTRACTOR cannot otherwise agree on the amount involved. No claim for an adjustment in the Contract Price will be valid if not submitted in accordance with this paragraph 11.2.

11.3 The value of any Work covered by a Change Order or of any claim for an adjustment in the Contract Price will be determined as follows:

11.3.1 where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of paragraphs 11.9.1 through 11.9.3, inclusive);

11.3.2 where the Work involved is not covered by unit prices contained in the contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 11.6.2);

11.3.3 where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under paragraph 11.3.2, on the basis of the Cost of the Work (determined as provided in paragraphs 11.4 and 11.5) plus a CONTRACTOR fee for overhead and profit (determined as provided in paragraph 11.6).

Cost of the Work:

11.4 The term Cost of the Work means the sum of all costs necessarily incurred and paid by the CONTRACTOR in the proper performance of the Work. Except as otherwise may be agreed to in writing by the CITY, such costs shall be in amounts no higher than those prevailing in the locality of the project, shall include only the following items and shall not include any of the costs itemized in paragraph 11.5

11.4.1 Payroll costs for employees in the direct employ of the CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by the CITY and the CONTRACTOR. Such employees shall include without limitation superintendents, foremen and other personnel employed full-time at the site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work after regular working hours, on Saturday, Sunday or legal holidays, shall be included in the above to the extent authorized by the CITY.

11.4.2 Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to the CONTRACTOR unless the CITY deposits funds with the CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to the CITY. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to the CITY, and the CONTRACTOR shall make provisions to that they may be obtained.

11.4.3 Payments made by the CONTRACTOR to the Subcontractors for Work performed or furnished by Subcontractors. If required by the CITY, the CONTRACTOR shall obtain competitive bids from subcontractors acceptable to the CITY and the CONTRACTOR shall deliver such bids to the CITY who will then determine, with the advice of the ENGINEER, which bids, if any, will be accepted. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work Plus a fee, the Cost of the Work and fee of the Subcontractor shall be determined in the same manner as the Cost of the Work and fee of the CONTRACTOR as provided in paragraphs 11.4, 11.5, 11.6, and 11.7. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

11.4.4 Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys and accountants) employed for services specifically related to the Work.

11.4.5 Supplemental costs including the following:

11.4.5.1 The proportion of necessary transportation, travel and subsistence expenses of employees of the CONTRACTOR incurred in discharge of duties connected with the Work.

11.4.5.2 Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost less market value of such items used but not consumed which remain the property of the CONTRACTOR.

11.4.5.3 Rentals of all construction equipment and machinery and the parts thereof whether rented from the CONTRACTOR or others in accordance with rental agreements approved by the CITY with the advice of the ENGINEER, and the costs of transportation loading, unloading, installation, dismantling and removal thereof--all in accordance with the terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

11.4.5.4 Sales, consumer, use or similar taxes related to the Work, and for which the CONTRACTOR is liable, imposed by Laws and Regulations.

11.4.5.5 Deposits lost for causes other than negligence of the CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

11.4.5.6 Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by the CONTRACTOR in connection with the performance and furnishing of the Work (except losses and damages within the deductible amounts of property insurance established by the CITY in accordance with paragraph 5.9), provided they have resulted from causes other than the negligence of the CONTRACTOR, and Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of the CITY. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining the fee of the CONTRACTOR. If,

however, any such loss or damage requires reconstruction and the CONTRACTOR is placed in charge thereof, the CONTRACTOR shall be paid for services a fee proportionate to that stated in paragraph 11.6.2.

11.4.5.7 The cost of utilities, fuel and sanitary facilities at the site.

11.4.5.8 Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.

11.4.5.9 Cost of premiums for additional Bonds and insurance required because of changes in the Work

11.5 The term Cost of the Work shall not include any of the following:

11.5.1 Payroll costs and other compensation of the officers, executives, principals (of partnership and sole proprietorships) general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks and other personnel employed by the CONTRACTOR whether at the site or in principal or a branch office for general administration of the Work of the CONTRACTOR and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 11.4.1 or specifically covered by paragraph 14.4.4--all of which are to be considered administrative costs covered by the fee of the CONTRACTOR.

11.5.2 Expenses of principal and branch officers of the CONTRACTOR other than the office of the CONTRACTOR at the site.

11.5.3 Any part of capital expenses of the CONTRACTOR, including interest on capital employed for the Work of the CONTRACTOR and charges against the CONTRACTOR for delinquent payments.

11.5.4 Cost of premiums for all Bonds and for all insurance whether or not the CONTRACTOR is required by the CONTRACT Documents to purchase and maintain the same (except for the cost of premiums covered by subparagraph 11.4.5.9 above).

11.5.5 Costs due to the negligence of the CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied and making good any damage to property.

Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 11.4.

11.6 The fee of the CONTRACTOR allowed to CONTRACTOR for overhead and profit shall be determined as follows:

11.6.1 a mutually acceptable fixed fee; or

11.6.2 if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

11.6.2.1 for costs incurred under paragraphs 11.4.1 and 11.4.2, the fee of the CONTRACTOR shall be fifteen percent;

11.6.2.2 for costs incurred under paragraph 11.4.3, the fee of the CONTRACTOR shall be five percent;

11.6.2.3 where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of paragraphs 11.4.1, 11.4.2, 11.4.3, and 11.6.2 is that the Subcontractor who actually performs or furnishes the Work, at whatever tier, will be paid a fee of fifteen percent of the costs incurred by such Subcontractor under paragraphs 11.4.1 and 11.4.2 and that any higher tier Subcontractor and the CONTRACTOR will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor.

11.6.2.4 no fee shall be payable on the basis of costs itemized under paragraphs 11.4.4, 11.4.5 and 11.5;

11.6.2.5 the amount of credit to be allowed by the CONTRACTOR to the CITY for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in the fee of the CONTRACTOR by an amount equal to five percent of such net decrease; and

11.6.2.6 when both additions and credits are involved in any one change, the adjustment in the fee of the CONTRACTOR shall be computed on the basis of the net change in accordance with paragraphs 11.6.2.1 through 11.6.2.5, inclusive.

11.7 Whenever the cost of any Work is to be determined pursuant to paragraphs 11.4 and 11.5, the CONTRACTOR will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in form

acceptable to the ENGINEER an itemized cost breakdown together with supporting data.

11.8 It is understood that the CONTRACTOR ahs included in the Contract Price allowances so named in the Contract Documents and shall cause the Work so covered to be furnished and performed for such sums as may be acceptable to the CITY and the ENGINEER. The CONTRACTOR agrees that:

11.8.1 the allowances include the cost to CONTRACTOR (less any aplicable trade discounts) of materials and equipment required by the allowances to be delivereda t the site, and all applicable taxes; and

11.8.2 Costs of the CONTRACTOR for unloading and hanlding on the site, labor, installation costs, overhead, profit and other expenses contemplated for the allowances have been icnluded in the Contract Price and not in the allowances and no demand for additional payment on account of any of the foregoing will be valid.

Prior to final payment, an appropriate Chagne Order will be issued as recommended by the ENGINEER to reflect actual amounts dude the CONTRAACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.9 Unit price Work:

11.9.1 Where the Contract Documens provide that all or part of the Work is to be Unit Price Work, initiallky the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Sgreement. The estimated quantities of items of Unit Price Work are not guaranteed and are soely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit price Work performed by the CONTRACTOR will be made by the ENGINEER in accordance with paragraph 9.10.

11.9.2 Each unit price will be deemed to include an amount considered by the CONTRACTOR to be adequate to cover the overhead and profit of the CONTRACTOR for each separately identified item.

11.9.3 The City or the CONTRACTOR may make a claim for an adjustment in the Contract Price in accordance with Article 11 if:

11.9.3.1 the quantity of any item of Unit Price Work performed by the

CONTRACTOR differs materially and significantly from theestimated quantity of such item indicated in the Agreement; and

11.9.3.2 there is no corresponding adjustment with respect to any other item of Work; and

11.9.3.3 if the CONTRACTOR believes that the CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or the CITY believes that the CITY is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

11.9.3.4 The term materially and significantly shall be construed to apply only to the following circumstances:

11.9.3.4.1 When a major item of work, as defined in paragraph 1.43 is increased in excess of 125 percent or decreased below 75 percent of the original contract quantity. Any allowance for an increase in quantity shall apply only to that portion in excess of 125 percent of original contract item quantity, or in case of a decrease below 75 percent of original contract item quantity, or in case of a decrease below 75 percent, to the actual amount of work performed or

11.9.3.4.2 When such changes or alterations are sufficient in magnitude to affect the unit cost by 10 percent or more, considering all of the estimated quantity used for bidding purposes.

ARTICLE 12--CHANGE OF CONTRACT TIMES

12.1 The Contract Times (or Milestones) may only be changed by a Change Order or a written Amendment. Any claim for an adjustment of the Contract Times (or Milestones) shall be based on written notice delivered by the party making the claim to the other party and to the ENGINEER promptly (but in no event later than thirty days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within sixty days after such occurrence (unless the ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the written statement of the claimant that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Times (or Milestones) shall be determined by the ENGINEER in accordance with paragraph 9.11 if the CITY and the CONTRACTOR cannot otherwise agree. No claim for an adjustment in the Contract Times (or Milestones) will be valid if not submitted in accordance with the requirements of this paragraph 12.1.

12.2 All time limits stated in the Contract Documents are of the essence of the Agreement.

12.3 Where the CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of the CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost due to such delay if a claim is made therefor as provided in paragraph 12.1 Delays beyond the control of the CONTRACTOR shall include, but not be limited to, acts or neglect by the CITY, acts or neglect of utility limited to, acts or neglect by the CITY, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions or acts of God. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of the CONTRACTOR.

12.4 Where the CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both the City and the CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be the sole and exclusive remedy of the CONTRACTOR for such delay. In no event shall the CITY be liable to the CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent or of any item, for damages arising out of or resulting from (i) delays caused by or within the control of the CONTRACTOR, or (ii) delays beyond the control of both parties including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God or acts of neglect by utility owners or other contractors performing other work as contemplated by Article 7.

ARTICLE 13--TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

13.1 Notice of Defects: Prompt notice of all defective Work of which the CITY or the ENGINEER have actual knowledge will be given to the CONTRACTOR. All defective Work may be rejected, corrected or accepted as provided in this Article 13.

Access to Work:

13.2 CITY, ENGINEER, Consultants of the ENGINEER, other representatives and personnel of the CITY, independent testing laboratories and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspecting and testing. The CONTRACTOR shall provide them proper and safe conditions for such access and advise them of the site safety procedures and programs of the CONTRACTOR so that they may comply therewith as applicable.

Tests and Inspections

13.3 The CONTRACTOR shall give the ENGINEER timely notice of readiness of the Work for all required inspections, tests or approval, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

13.4 The CITY shall perform, or employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

13.4.1 for inspections, tests or approvals covered by paragraph 13.5 below;

13.4.2 that costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.9 below shall be paid as provided in said paragraph 13.9; and

13.4.3 as otherwise specifically provided in the Contract Documents.

13.5 If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested or approved by an employee or other representative of such public body, the CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests or approval, pay all costs in connection therewith, and furnish the ENGINEER the required certificates of inspection, or approval. The CONTRACTOR shall also be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests or approvals required for the acceptance by the CITY and the ENGINEER of materials or equipment to be incorporated in the Work, or of materials, mix designs, or equipment

submitted for approval prior to purchase by the CONTRACTOR thereof for incorporation in the Work.

13.6 If any Work (or the work of others) that is to be inspected, tested or approved is covered by the CONTRACTOR without written concurrence of the ENGINEER, it must, if requested by the ENGINEER, be uncovered for observation.

13.7 Uncovering Work as provided in paragraph 13.6 shall be at the expense of the CONTRACTOR unless the CONTRACTOR has given the ENGINEER timely notice of the intention of the CONTRACTOR to cover the same and the ENGINEER has not acted with reasonable promptness in response to such notice.

Uncovering Work:

13.8 If any Work is covered contrary to the written request of the ENGINEER, it must, if requested by the ENGINEER, be uncovered for the observation of the ENGINEER and replaced at the expense of the CONTRACTOR.

13.9 If the ENGINEER considers it necessary or advisable that covered Work be observed by the ENGINEER or inspected or tested by others, the CONTRACTOR, at the request of the ENGINEER, shall uncover, expose or otherwise make available for observation, inspection or testing as the ENGINEER may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, the CONTRACTOR shall pay all claims, costs, losses and damages caused by, arising out of or resulting from such uncovering, exposure, observation, inspection and testing and of satisfactory replacement or reconstruction (including testing and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and the CITY shall be entitled to an appropriate decrease in the Contract Price, and if the parties are unable to agree as to the amount thereof, may make a claim therefor as provided in Article 11. If, however, such Work is not found to be defective the CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement and reconstruction; and, if the parties are unable to agree as to the amount or extent thereof, the CONTRACTOR may make a claim therefor as provided in Articles 11 and 12.

CITY May Stop the Work:

13.10 If the Work is defective, or the CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, the CITY may order the CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the CITY to stop the Work

shall not give rise to any duty on the part of the CITY to exercise its right for the benefit of the CONTRACTOR or any surety or other party.

Correction or Removal of Defective Work:

13.11 If required by the ENGINEER, the CONTRACTOR shall promptly, as directed, either correct all defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by the ENGINEER, remove it from the site and replace it with Work that is not defective. The CONTRACTOR shall pay all claims, costs, losses and damages caused by or resulting from such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.12 Correction Period:

13.12.1 If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be defective, the CONTRACTOR shall promptly, without cost to the CITY and in accordance with the written instructions of the CITY: (i) correct such defective Work, or, if it has been rejected by the CITY, remove it from the site and replace it with Work that is not defective and (ii) satisfactorily correct or remove and replace any damage to other Work or the work of others resulting therefrom. If the CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, the CITY may have the defective Work corrected or the rejected Work removed and replaced, and all claims, costs, losses and damages caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by the CONTRACTOR.

13.12.2 In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

13.12.3 Where defective Work (and damage to other Work resulting therefrom) has been corrected, removed or replaced under this paragraph 13.12, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

Acceptance of Defective Work

13.3 If, instead of requiring correction or removal and replacement of defective Work,

the City (and, prior to the recommendation of the ENGINEER of final payment, also ENGINEER) prefers to accept it, the CITY may do so. The CONTRACTOR shall pay all claims, costs, losses and damages attributable to the evaluation of and determination of the CITY to accept such defective Work (such costs to be approved by the ENGINEER as to reasonableness). If any such acceptance occurs prior to the recommendation of the ENGINEER of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and the CITY shall be entitled to an appropriate decrease in the Contract Price, and if the parties are unable to agree as to the amount thereof, the CITY may make a claim therefor as provided in Article 11. If the acceptance occurs after such recommendation, an appropriate amount will be paid by the CONTRACTOR to the City.

CITY May Correct Defective Work:

13.14 If the CONTRACTOR fails within a reasonable time after written notice from the ENGINEER to correct defective Work or to remove and replace rejected Work as required by the ENGINEER in accordance with paragraph 13.11, or if the CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if the CONTRACTOR fails to comply with any other provision of the Contract Documents, the CITY may, after seven days written notice to the CONTRACTOR, correct and remedy any such deficiency. In exercising the rights and remedies under this paragraph the CITY shall proceed expeditiously. In connection with such corrective and remedial action, the CITY may exclude the CONTRACTOR from all or part of the site, take possession of all or part of the Work, and suspend services of the CONTRACTOR related thereto, take possession of the tools, appliances, construction equipment and machinery of the CONTRACTOR at the site and incorporate in the Work all materials and equipment stored at the site or for which the CITY has paid the CONTRACTOR but which are stored elsewhere. The CONTRACTOR shall allow the CITY, the representatives, agents and employees of the CITY, other contractors of the CITY, and the ENGINEER and Consultants of the ENGINEER access to the site to enable the CITY to exercise the rights and remedies under this paragraph. All claims, costs, losses and damages incurred or sustained by the CITY in exercising such rights and remedies will be charged against the CONTRACTOR and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and the City shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, the CITY may make a claim therefor as provided in Article 11. Such claims, costs, losses and damages will include but not be limited to all costs of repair or replacement of work of others destroyed or damaged by correction, removal or replacement of defective Work of the CONTRACTOR. The CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by the CITY of the rights and remedies of the CITY hereunder.

Schedule of Values:

14.1 The schedule of values established as provided in paragraph 2.9 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to the ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units completed.

Application for Progress Payment:

14.2 At least twenty days before the date established for each progress payment (but not more often than once a month), the CONTRACTOR shall submit to the ENGINEER for review an Application for Payment filled out and signed by the CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice or other documentation warranting that the CITY has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect the interest of the CITY therein, all of which will be satisfactory to the CITY. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

Warranty of Title by CONTRACTOR:

14.3 The CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to the CITY no later than the time of payment free and clear of all Liens.

Review of Applications for Progress Payment:

14.4 The ENGINEER will, within ten days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to the CITY, or return the Application to the CONTRACTOR indicating in writing the reasons of the ENGINEER for refusing to recommend payment. In the latter case, the CONTRACTOR may make the necessary corrections and resubmit the Application. Ten days after presentation of the Application for Payment to the CITY with the recommendation of the ENGINEER, the amount recommended will (subject to the provisions of the last sentence of paragraph 14.7) become due and when due will be paid by the CITY to the CONTRACTOR.

14.5 Recommendation of the ENGINEER of any payment requested in an Application for Payment will constitute a representation by the ENGINEER to the CITY, based on on-site observations of the ENGINEER of the executed Work as an experienced and qualified design professional and on review of the Application for Payment by the ENGINEER and the accompanying data and schedules, that to the best of knowledge, information and belief of the ENGINEER:

14.5.1 the Work has progressed to the point indicated.

14.5.2 the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.10, and to any other qualifications stated in the recommendation), and

14.5.3 the conditions precedent to the CONTRACTOR being entitled to such payment appear to have been fulfilled insofar as it is the responsibility of the ENGINEER to observe the Work.

However, by recommending any such payment the ENGINEER will not thereby be deemed to have represented that (i) exhaustive or continuous on-site inspections have been made to check the quality or the quantity of the Work beyond the responsibilities specifically assigned to the ENGINEER in the Contract Documents of (ii) that there may not be other matters or issues between the parties that might entitle the CONTRACTOR to be paid additionally by the CITY or entitle the CITY to withhold payment to the CONTRACTOR.

14.6 Recommendation of the ENGINEER of any payment, including final payment, shall not mean that the ENGINEER is responsible for the means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs of the CONTRACTOR incident thereto, or for any failure of the CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work, or for any failure of the CONTRACTOR to perform or furnish Work in accordance with the Contract Documents.

14.7 The ENGINEER may refuse to recommend the whole or any part of any payment if, in the opinion of the ENGINEER, it would be incorrect to make the representations to the CITY referred to in paragraph 14.5. The ENGINEER may also refuse to recommend any such payment, or because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in the opinion of the ENGINEER to protect the CITY from loss because:

14.7.1 the Work is defective or completed Work has been damaged requiring

correction or replacement.

14.7.2 the Contract Price has been reduced by Written Amendment or Change Order,

14.7.3 The CITY has been required to correct defective Work or complete Work in accordance with paragraph 13.14, or

14.7.4 The ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 15.2.1 through 15.2.4 inclusive.

The CITY may refuse to make payment of the full amount recommended by the ENGINEER because:

14.7.5 claims have been made against the CITY on account of performance of furnishing of the Work of the CONTRACTOR.

14.7.6 Liens have been filed in connection with the Work, except where the CONTRACTOR has delivered a specific Bond satisfactory to the CITY to secure the satisfaction and discharge of such Liens.

14.7.7 there are other items entitling the CITY to a set-off against the amount recommended, or

14.7.8 the CITY has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.7.1 through 14.7.3 or paragraphs 15.2.1 through 15.2.4 inclusive:

but the CITY must give the CONTRACTOR immediate written notice (with a copy to the ENGINEER) stating the reasons for such action and promptly pay the CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by the CITY and the CONTRACTOR, when the CONTRACTOR corrects to the satisfaction of the CITY the reasons for such action.

Substantial Completion:

14.8 When the CONTRACTOR considers the entire Work ready for its intended use the CONTRACTOR shall notify the CITY and the ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by the CONTRACTOR as incomplete) and request that the ENGINEER issue a certificate of Substantial Completion. Within a reasonable time thereafter, the CITY, the CONTRACTOR, and the ENGINEER shall make an inspection of the Work to determine the status of completion. If the ENGINEER does not consider the Work substantially complete, the ENGINEER will notify the CONTRACTOR in writing giving the reasons therefor. If the ENGINEER considers the Work substantially complete, the ENGINEER will prepare

and deliver to the CITY a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative lift off items to be completed or corrected before final payment. The CITY shall have seven days after receipt of the tentative certificate during which to make written objection to the ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, the ENGINEER concludes that the Work is not substantially complete, the ENGINEER will within fourteen days after submission of the tentative certificate to the CITY notify the CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as the ENGINEER believes justified after consideration of any objections from the CITY. At the time of delivery of the tentative certificate of Substantial Completion the ENGINEER will deliver to the CITY and the CONTRACTOR a written recommendation as to division of responsibilities pending final payment between the CITY and the CONTRACTOR with respect to security, operation, safety, maintenance, heat, utilities, insurance and warranties and guarantees. Unless the CITY and the CONTRACTOR agree otherwise in writing and so inform the ENGINEER in writing prior to the ENGINEER issuing the definitive certificate of Substantial Completion, the aforesaid recommendation of the ENGINEER will be binding on the CITY and the CONTRACTOR until final payment.

14.9 The CITY shall have the right to exclude the CONTRACTOR from the Work after the date of Substantial Completion but the CITY shall allow the CONTRACTOR reasonable access to complete or correct items on the tentative list.

Partial Utilization:

14.10 Use by the CITY at the option of the CITY of any substantially completed part of the Work which: (i) has specifically been identified in the Contract Documents, or (ii) the CITY, the ENGINEER, and the CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by the CITY for its intended purpose without significant interference with the performance of the CONTRACTOR of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following:

14.10.1 The CITY at any time may request the CONTRACTOR in writing to permit the CITY to use any such part of the Work which the CITY believes to be ready for its intended use and substantially complete. If the CONTRACTOR agrees that such part of the Work is substantially complete, the CONTRACTOR will certify to the CITY and the ENGINEER that such part of the Work is substantially complete and request the ENGINEER to issue a certificate of Substantial Completion for that part of the Work. The CONTRACTOR at any time may notify the CITY and the ENGINEER in writing that the CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request the ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within

a reasonable time after either such request, the CITY, the CONTRACTOR, and the ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If the ENGINEER does not consider that part of the Work to be substantially complete, the ENGINEER will notify the CITY and the CONTRACTOR in writing giving the reasons therefor. If the ENGINEER considers that part of the Work to be substantially complete, the provisions of paragraphs 14.8 and 14.9 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

Final Inspection:

14.11 Upon written notice from the CONTRACTOR that the entire Work or an agreed portion thereof is complete, the ENGINEER will make a final inspection with the CITY and the CONTRACTOR will notify the CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. The CONTRACTOR shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

Final Application for Payment:

14.12 After the CONTRACTOR has completed all such corrections to the satisfaction of the ENGINEER and delivered in accordance with the Contract Documents all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance required by paragraph 5.4, certificates of inspection, marked-up record documents (as provided in paragraph 6.19) and other documents, the CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied (except as previously delivered) by: (i) all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by subparagraph 5.4.13, (ii) consent of the surety, if any, to final payment, and (iii) complete and legally effective releases or waivers (satisfactory to the CITY) of all Liens arising out of or filed in connection with the Work. In lieu of such releases or waivers of Liens and as approved by the CITY, the CONTRACTOR may furnish receipts or releases in full and an affidavit of the CONTRACTOR that: (i) the releases and receipts include all labor, services, material and equipment for which a Lien could be filed, and (ii) all payrolls, material and equipment bills and other indebtedness connected with the Work for which the CITY or the property of the CITY might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, the CONTRACTOR may furnish a Bond or other collateral satisfactory to the CITY to indemnify the CITY against any Lien.

Final Payment and Acceptance:

14.13 If, on the basis of the observation of the ENGINEER of the Work during

construction and final inspection, and the review and final Application for Payment and accompanying documentation by the ENGINEER as required by the Contract Documents, the ENGINEER is satisfied that the Work has been completed and other obligations of the CONTRACTOR under the Contract Documents have been fulfilled, the ENGINEER will, within ten days after receipt of the final Application for Payment, indicate in writing the recommendation of payment of the ENGINEER and present the Application to the CITY for payment. At the same time the ENGINEER will also give written notice to the CITY and the CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 4.15. Otherwise, the ENGINEER will return the Application to the CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case the CONTRACTOR shall make the necessary corrections and resubmit the Application. Thirty days after the presentation to the CITY of the Application and accompanying documentation, in appropriate form and substance with the recommendation and notice of acceptability of the ENGINEER, the amount recommended by the ENGINEER will become due and will be paid by the CITY to the CONTRACTOR.

14.14 If, through no fault of the CONTRACTOR, final completion of the Work is significantly delayed and if the ENGINEER so confirms, the CITY shall, upon receipt of the final Application for Payment of the CONTRACTOR and recommendation of the ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by the CITY for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.1, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the CONTRACTOR to the ENGINEER with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

Waiver of Claim:

14.15 The making and acceptance of final payment will constitute:

14.15.1 A waiver of all claims by the CITY against the CONTRACTOR, except claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to paragraph 14.11, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from continuing obligations of the CONTRACTOR under the Contract Documents; and

14.15.2 a waiver of all claims by the CONTRACTOR against the CITY other than those previously made in writing and still unsettled.

ARTICLE 15--SUSPENSION OF WORK AND TERMINATION

15.1 At any time and without cause, the CITY may suspend the Work or any portion thereof for a period of not more than ninety days by notice in writing to the CONTRACTOR and ENGINEER which will fix the date on which Work will be resumed. The CONTRACTOR shall resume the Work on the date so fixed. The CONTRACTOR shall be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if the CONTRACTOR makes an approved claim therefor as provided in Articles 11 and 12.

CITY May Terminate

15.2 Upon the occurrence of any one or more of the following events:

15.2.1 If the CONTRACTOR persistently fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 2.9 as adjusted from time to time pursuant to paragraph 6.6);

15.2.2 If CONTRACTOR disregards Laws or Regulations of any public body having jurisdiction;

15.2.3 If CONTRACTOR disregards the authority of the ENGINEER; or

15.2.4 If CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents;

The CITY may, after giving the CONTRACTOR (and the surety, if any,) seven days written notice and to the extent permitted by Laws and Regulations, terminate the services of the CONTRACTOR, exclude the CONTRACTOR from the site and take possession of the Work and of all tools, appliances, construction equipment and machinery of the CONTRACTOR at the site and use the same to the full extent they could be used by the CONTRACTOR (with liability to the CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the site or for which the CITY has paid the CONTRACTOR but which are stored elsewhere, and finish the Work as the CITY may deem expedient. In such case the CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the CONTRACT Price exceeds all claims, costs, losses and damages sustained by the CITY arising out of or resulting from completing the Work such excess will be paid to the CONTRACTOR. If such claims, costs, losses and damages exceed such unpaid balance, the CONTRACTOR shall pay the difference to the CITY. Such claims, costs, losses and damages exceed such unpaid balance, the CONTRACTOR shall pay the difference to the CITY. Such claims, costs,

losses, and damages incurred by the CITY will be reviewed by the ENGINEER as to their reasonableness and when so approved by the ENGINEER incorporated in a Change Order, provided that when exercising any rights or remedies under this paragraph the CITY shall not be required to obtain the lowest price for the Work performed.

15.3 Where the services of the CONTRACTOR have been so terminated by the CITY, the termination will not affect any rights or remedies of the CITY against the CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due the CONTRACTOR by the CITY will not release the CONTRACTOR from liability.

15.4 Upon seven days written notice to the CONTRACTOR and ENGINEER, the CITY may, without cause and without prejudice to any other right or remedy of the CITY, elect to terminate the Agreement. In such case, the CONTRACTOR shall be paid (without duplication of any items):

15.4.1 For completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

15.4.2 For expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

15.4.3 For all claims, costs, losses and damages incurred in settlement of terminated contracts with Subcontractors, Suppliers and others; and

15.4.4 For reasonable expenses directly attributable to termination.

The CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

CONTRACTOR May Stop Work or Terminate:

15.5 If, through no act or fault of the CONTRACTOR, the Work is suspended for a period of more than ninety days by the CITY or under an order of court or other public authority, or the ENGINEER fails to act on any Application for Payment within thirty days after it is submitted or the CITY fails for thirty days to pay the CONTRACTOR any sum finally determined to be due, then the CONTRACTOR may, upon seven days written notice to the CITY and the ENGINEER, and provided the CITY or the ENGINEER do not remedy such suspension or failure within that time, terminate the Agreement and recover from the CITY payment on the same terms as provided in paragraph 15.4. In lieu of terminating the Agreement and without prejudice to any

other right or remedy, if the ENGINEER has failed to act on an Application for Payment within thirty days after it is submitted, or the CITY has failed for thirty days to pay the CONTRACTOR any sum finally determined to be due, the CONTRACTOR may upon seven days written notice to the CITY and the ENGINEER stop the Work until payment of all such amounts due the CONTRACTOR, including interest thereon. The provisions of this paragraph 15.5 are not intended to preclude the CONTRACTOR from making claim under Articles 11 and 12 for an increase in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to the stopping Work of the CONTRACTOR as permitted by this paragraph.

ARTICLE 16--DISPUTE RESOLUTION

If and to the extent that the CITY and the CONTRACTOR have agreed on the method and procedure for resolving the disputes between them that may arise under this Agreement, such dispute resolution method and procedure, if any, shall be as set forth in a “Dispute Resolution Agreement,” exhibit to be attached hereto and made a part hereof. If no such agreement on the method and procedure for resolving such disputes has been reached, and subject to the provisions of the paragraphs 9.10, 9.11, and 9.12, the CITY and the CONTRACTOR may exercise such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any dispute.

ARTICLE 17--MISCELLANEOUS

Giving Notice

17.1 Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.2 Computation of Times:

17.2.1 When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law applicable to the CITY, such day will be omitted from the computation.

17.2.2 A calendar day of twenty-four hours measured from midnight to the next midnight will constitute a day.

Notice of Claim:

17.3 Should the CITY or the CONTRACTOR suffer injury or damage to person or property because of any error, omission or act of the other party or of any of the other employees or agents or others of the party for whose acts the other party is legally liable, claim will be made in writing to the other party within a reasonable time of the first observance of such injury or damage. The provisions of this paragraph 17.3 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or repose.

Cumulative Remedies:

17.4 The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto and, in particular but without limitation, the warranties, guarantees and obligations imposed upon the CONTRACTOR by paragraphs 6.12, 6.16, 6.30, 6.31, 6.32, 13.1, 13.12, 13.14, 14.3, and 15.2 and all of the rights and remedies available to the CITY and the ENGINEER thereunder, are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

Professional Fees and Court Costs Included:

17.5 Whenever reference is made to “claims, cost, losses and damages,” it shall include in each case, but not be limited to, all fees and charges of engineer, architects, attorneys and other professional and all court or arbitration or other dispute resolution costs.

ARTICLE 18 -- INSURANCE REQUIREMENTS

18.1 General

Prior to commencement of the Work, the Contractor shall purchase and maintain during the entire term of the project such insurance as will protect the Contractor, the City, and the Engineer(s) from claims arising out of the Work described in this contract and performed by the Contractor, Subcontractor(s), or Sub-subcontractor(s). The certificate of insurance must contain the following statement: The City of Portage, its agents, elected officials, and employees, is included as an additionally insured party. This insurance must consist of:

18.2 Workers Compensation

Workers Compensation insurance, including Employer's Liability to cover employee injuries or disease compensable under the Workers Compensation statues of the states in which work is conducted under this contract.

18.3 Comprehensive General Liability

A Comprehensive General Liability policy to cover bodily injury to persons other than employees and for damage to tangible property, including loss of use thereof, including the following exposures.

a. All premises and operations.

b. Explosion, collapse and underground damage.

c. Protective coverage for Independent Contractors or Subcontractors employed by the Contractor.

d. Contractual Liability for the obligation assumed in the Indemnification or Hold Harmless agreement found in the contract.

e. Personal Injury Liability endorsement with no exclusions pertaining to employment.

f. Products and Completed Operations coverage. This coverage shall extend through the contract guarantee period.

18.4 Comprehensive Automobile Liability

A Comprehensive Automobile Liability policy to cover bodily injury and property damage arising out of the ownership, maintenance or use of any motor vehicle, including owned, non-owned, and hired vehicles. In the light of standard policy provisions concerning (a) loading and unloading and (b) definitions pertaining to motor vehicles licensed for road use vs. unlicensed or self-propelled construction equipment, it is strongly recommended that the Comprehensive General Liability and the Comprehensive Auto Liability be written by the same insurance carrier, though not necessarily in one policy.

18.5 Builder's Risk - Installation Floater

When required, the Contractor shall purchase a Builder's Risk-Installation Floater in a form acceptable to the City covering property of the project for the full cost of replacement as of the time of any loss which shall include, as named insureds, (a) the Contractor, (b) all Subcontractors, (c) all Sub-subcontractors, (d) the City, the Engineer(s) or Architect(s), as their respective interests may prove to be at the time of loss, covering insurable property which is the subject of this contract, whether in place, stored at the job site, stored elsewhere, or in transit at the risk of the insured(s). Coverage shall be effected on "all risk" form including, but not limited to, the perils of fire, wind, vandalism, collapse, theft and earthquake, with exclusions normal to the cover. The Contractor may arrange for such deductibles as is deemed to be within the ability of the Contractor of self-assume, but the Contractor will be held solely responsible for the amount of such deductible and for any coinsurance penalties. Any insured loss shall be adjusted with the City and the Contractor and paid to the City and Contractor as Trustee for the other insureds.

18.6 Umbrella or Excess Liability

The City, or representatives of the City, may for certain projects, require limits higher than those stated in paragraph 18.8 which follows. The Contractor is granted the option of arranging coverage under a single policy for the full limit required or by a combination of underlying policies with the balance provided by an Excess or Umbrella Liability policy equal to the total limit(s) requested. Umbrella or Excess policy wording shall be at least as broad as the primary or underlying policy(ies) and shall apply to both the general liability, and to the automobile liability insurance of the Contractor.

18.7 Railroad Protective Liability

Where such an exposure exists, the Contractor will provide coverage in the name of each railroad company having jurisdiction over rights-of-way across which work under the Contract is to be performed. The form of policy and the limits of liability shall be

determined by the railroad company(ies) involved. See supplemental specifications for limits and coverage requested.

18.8 Limits of Liability

The required limits of liability for insurance coverages shall not be less than the following:

Workers Compensation	Statutory
Comprehensive General Liability Combined Single Limit (including sub-contractors)	$1,000,000
Comprehensive Automobile Liability Combined Single Limit (Injury and Property Damage)	$1,000,000
Builders Risk-Installation Floater	Cost to Replace
Umbrella or Excess Liability	$2,000,000

18.9 Notice of Cancellation or Intent not to Renew

Policies will be endorsed to provide that at of least 30 days written notice shall be given to the City and to the Engineer of cancellation or of intent not to renew.

18.10 Evidence of Coverage

The Insurance Certificates referenced in Paragraph 1 above shall be submitted within ten (10) working days of notification of award and prior to the execution of any Work under this contract.

It shall be the responsibility of the Contractor to provide similar insurance for each Subcontractor, or to provide evidence that each Subcontractor carries insurance in like amounts, prior to the time such Subcontractor proceeds to perform under the contract.

18.11 Other Insurance Provisions

The term “other insurance provisions” in a policy in which the City of Portage is named as an insured, shall not apply to the City.

18.12 Right of Recovery or Subrogation

Insurers shall have no right of recovery or subrogation against the City (including its agents and employees as aforesaid), it being the intention of the parties that the insurance policies so affected shall protect both parties and be primary coverage for any and all losses covered by the above described insurance.

18.13 Qualifications of Insurers

In order to determine financial strength and reputation of insurance carriers, all companies providing the coverages required shall be licensed or approved by the Insurance Bureau of the State of Michigan and shall have a financial rating not lower than XI and a policyholder's service rating no lower than B+ as listed in A.M. Best's Key Rating Guide, current edition. Companies with ratings lower than B+:XI will be acceptable only upon written consent of the City.

Part Two

General Specifications

101.1a

DEFINITIONS *

AASHTO = American Association of State Highway and Transportation Officials

ACI = American Concrete Institute

ANSI = American National Standards Institute

ASTM = American Society for Testing and Materials

AWWA = American Water Works Association

CITY = City of Portage, MI

DPS = Department of Public Services

GLUMRB = Great Lakes Upper Mississippi River Board of State Public Health and Environmental Managers (Ten State Standards)

gph = Gallons per hour

HMA = Hot Mix Asphalt

MDD = Maximum Dry Density as determined by the Modified Proctor Method

MDEQ = Michigan Department of Environmental Quality

MDOT = Michigan Department of Transportation

MMUTCD = Michigan Manual of Uniform Traffic Control Devices

NEMA = National Electrical Manufacturer Association

PLC = Programmable Logic Controller

psi = Pounds per square inch

RPR = Resident Project Representative

SD = Standard Detail

* See City General Conditions for additional Definitions.

101.0 SUMMARY

101.1 Summary These General Specifications are intended to cover those items of work which are general and can be used to complete typical types of construction.

102.0 SPECIFICATIONS BY REFERENCE

102.1 Specifications by Reference Whenever reference is made to specifications other than those contained herein, said specifications shall apply and be binding as if fully repeated herein; e.g., Sewer Pipe, MDOT Specifications 8.08. References to MDOT Specifications are to the MDOT's 2012 Standard Specifications for Construction.

103.0 FUNDAMENTAL REQUIREMENTS

103.1 As-Built Drawings During construction, the CONTRACTOR, with assistance from the RPR shall make all measurements necessary for the preparations of a complete set of "As Built" drawings showing the exact location and elevation of all sewers, house leads or Y's, valves locations, fitting locations, leaching basins, and other appurtenances in a manner acceptable to the ENGINEER. It shall be the ENGINEER's responsibility to prepare final record "as built" drawings.

103.2 Traffic Flow All work shall be carried on in an orderly and satisfactory manner and interference with normal flow of traffic shall be kept to a minimum. Driveways and streets disturbed by construction shall be replaced as soon as possible and no street may be closed without permission of the ENGINEER.

103.3 Line and Grade Line and grade shall be established by the ENGINEER as specified in the General Conditions Article 4.4.

103.4 Testing All testing shall be witnessed by the RPR or ENGINEER. Any unwitnessed testing shall be re-tested in the presence of the RPR or ENGINEER.

104.0 ROAD, RAILROAD, AND UTILITY CROSSINGS

104.1 Road Crossings Road crossings shall be in accordance with the requirements of the governmental body having jurisdiction over the road to be crossed. Notice as required shall be given to said governmental body before work starts. In the case of the City of Portage, the notice shall be in writing received a minimum of 72 hours prior to commencing the crossing. If the contract contains a separate item for "Road Crossing" the unit price will be payment in full for removing the existing surfacing, backfilling in a manner approved by the ENGINEER and replacing surfacing as shown on the Drawings. Otherwise the road crossings will be incidental to the installation of the utility.

104.2 Railroad Crossings

104.2.1 Where a facility crosses a railroad, the construction shall be in strict accordance with current railroad specifications and supplementary conditions as specified in the permit.

104.2.2 The CONTRACTOR shall be responsible for the installation of the casement (if required) and the facility, across/under railroads as bid. The CITY shall bear the cost of railroad inspector, flagmen, underground markers, permits, etc., required by the Railroad Company.

104.2.3 Such notice as required by the Railroad Permit shall be given to the railroad superintendent before any work is performed within railroad right-of-way.

104.3 Utility Crossings Where the sanitary sewer crosses under or over a utility, that utility shall be protected from damage. Back filling and restoration shall be in accordance with these specifications or as directed by the ENGINEER.

104.3.1 Whenever the clearance between the crossed utility and the new facility is one foot (1' or less) both utilities shall be backfilled to twelve inches (12") above the higher utility as per specification 205.4.

104.4 Water Crossings Water crossing shall be constructed in accordance with the requirements of the governmental body having jurisdiction over the water way to be crossed. If the Contract contains a separate item for "Water Crossing" the price per linear foot shall be payment in full for furnishing materials, laying and properly anchoring the pipe. Otherwise, the cost of the water crossing will be incidental to the Contract Price for laying the facility.

105 SIGN REMOVAL AND REPLACEMENT

105.1 Sign Removal and Replacement Street signs, mail boxes, private drives, culverts and other improvements shall be restored in a manner acceptable to the ENGINEER. Any street sign proposed to be removed during construction shall be removed from the project site and delivered to the Department of Public Services garage located at 7719 South Westnedge Avenue. Any street signs, mailboxes etc. not scheduled to be removed shall be temporarily supported during construction and properly replaced as soon as practical. In no case shall mailboxes be inaccessible for a period of more than 24 hours.

106.0 MAINTENANCE OF TRAFFIC AND DRAINAGE

106.1 Vehicular and Foot Traffic During the progress of the work, the CONTRACTOR shall accommodate vehicular and foot traffic except as otherwise specified herein and shall provide access to fire hydrants, water, gas valves, and driveways and walkways as directed by the CONTRACTOR'S Safety Representative.

106.2 Street Closing Streets or roads shall not be closed or partially barricaded without prior approval from the City Engineer.

106.3 Cost of Detours, Barricades, Signs Unless otherwise specified, the cost of detours, barricades, signs, etc., shall be incidental to the work being performed. All signage and barricading shall conform to the current issue of the MMUTCD, MDOT standards, and these specifications.

107.0 PUBLIC AND PRIVATE UTILITY LOCATIONS

107.1 Public Utility Locations Public utilities of all types, insofar as possible, have been shown on the drawings. The location of these utilities are shown using the best information available, but no guarantee is given that the locations are accurate or that utilities other than those shown are not present. The CONTRACTOR prior to construction shall notify MISS DIG (Phone: 1-800-842-7171 or 811) for proper notification and staking of utilities.

If the CONTRACTOR neglects to restore or make good damage or injuries to utilities or structures, the CITY or its contract operator may, upon forty-eight (48) hours notice, proceed to restore or make good such damage or injury and to order the cost thereof deducted from any monies that are or may become due the CONTRACTOR for the work under this Contract.

107.2 Public Utility Work Public utility work, such as the maintenance, removal, relocation, replacement, chlorination, opening and closing valves, etc., of water and/or sewer lines necessary to complete the contractual work shall be the responsibility of the CONTRACTOR and cost thereof shall be included in his bid price for related items. Such work on water and sewer lines shall be done only with the proper CITY department or its contract operator in charge of the utility being fully informed of the work and having a representative on the site during the work period.

107.3 Maintenance of Public Utility Whenever, in the opinion of the ENGINEER, such utilities need not be removed or relocated, but can be maintained or secured without interfering with the proper execution of the work, such maintenance shall be performed or paid for by the CONTRACTOR. All work shall be carried out so as to secure the safety of the utility involved and the work under construction.

107.4 Time Extension - Public Utility Work The CONTRACTOR will not be entitled to an extension of time on account of delay in the movement of utilities, unless in the opinion of the ENGINEER and CITY, the CONTRACTOR is unreasonably delayed through the fault of others. Any change of Contract Times shall be addressed as per Article 12 of the CITY's General Conditions.

108.0 SIGNS

108.1 Project Signs

108.1.1 The CONTRACTOR, at the beginning of work on the site, shall furnish, erect and maintain on the site where directed by the ENGINEER, a minimum of one sign for each project site as detailed in SD-127.

108.1.3 The lettering shall be done by a skilled sign painter and shall be properly proportioned, spaced and centered, and shall be of contrasting colors as indicated on SD-127 or approved by the ENGINEER.

108.1.4 The sign(s) shall be removed at the completion of the work as directed by the ENGINEER.

108.2 Advertising No advertising signs of any kind shall be erected or displayed on the site without the authorization of the City Engineer.

108.3 Job Instruction Job instruction signs such as “Danger,” Keep Off,” etc., shall be furnished, erected and maintained by the CONTRACTOR as may be required to safely conduct the work. Such signs shall be maintained in accordance with the MMUTCD and shall be neat in appearance, kept in good condition and promptly removed when their usefulness has expired.

109.0 OTHER JURISDICTIONAL REQUIREMENTS

109.1 Other Jurisdictional Requirements If any of the municipal requirements identified herein should conflict with any other governmental, professional or manufacturing specifications or codes, the conflict shall be immediately brought, in writing, to the attention of the ENGINEER. The ENGINEER and CITY shall at that time determine which specification shall govern.

110.0 REJECTED MATERIALS

110.1 Rejected Materials All materials rejected by the CITY or its representative shall be removed from the site of the work immediately.

111 SAMPLES FOR TESTING

111.1 Samples For Testing The CONTRACTOR shall furnish without cost to the CITY certification from a reputable testing agency that all materials meet the requirements set forth in the Contract Documents. Samples shall be of the precise material proposed to be furnished as per General Condition 6.24.2. The number of samples and sample size shall be as directed by the Independent Testing Laboratory unless otherwise directed by the ENGINEER.

112.0 MEASUREMENT AND PAYMENT

112.1 Method of Measurement All facilities specified will be measured in place, in accordance with the appropriate units identified in the Bid Proposal.

112.2 Basis of Payment Facilities of the type specified will be paid for at the contract unit price, which shall constitute payment in full for excavation, backfilling, removal of excess excavation, furnishing all materials, labor, and equipment necessary to install the facility and appurtenances completely. All work necessary for a complete project shall be incorporated into the Unit Prices given for Bid Items in the Bid Proposal.

112.3 Materials Testing and Inspection

112.3.1 When a pay item is shown in the Bid Proposal for material testing and inspection costs, an independent testing laboratory will be selected and directed by the ENGINEER. The CONTRACTOR shall pay the laboratory upon the receipt of invoices, certified as correct by the ENGINEER.

112.3.2 The CONTRACTOR will be reimbursed for actual inspection and testing costs as approved by the ENGINEER and set forth in General Conditions Article 13, and the Contract Documents. If the actual cost of laboratory services amounts to more or less than the sum set up in the Bid Proposal, the difference between actual amount paid and the amount bid will be added or deducted from the contract price.

113.0 STATE OF MICHIGAN APPROVAL

113.1 State Of Michigan Approval The ENGINEER will submit plans and specifications to the appropriate agency of the State of Michigan for approval.

114.0 SITE TV SURVEY

114.1 Scope of Work Prior to placement of materials or construction equipment in the construction area, the CONTRACTOR shall make a digital record and backup copy of the construction area.

114.2 Materials The type of digital record required shall be digital video disc (DVD) capable of playback on any brand of DVD player.

114.3 Resolution The DVD shall be of high grade quality, approved by the CITY.

114.4 Information Recorded

114.4.1 General All video recording shall be by electronic means and shall display continuously and simultaneously by generated transparent digital information as shown below:

114.4.2 Time information: Hours, minutes and seconds (e.g. 11:22:39 AM) appearing in upper left hand corner of screen.

114.4.3 Date information: Month, Day and Year (e.g. 10/12/05) appearing immediately below the time information.

114.4.4 Engineering stationing: Continuous, accurate, and corresponding to the project stationing, in standard engineering symbols (e.g. 108+32) appearing in the lower left hand corner of the screen.

114.4.5 Description line: Name of area being viewed and the specific direction being viewed, appearing immediately above the engineering stationing.

114.5 Coverage

114.5.1 General Include all surface features located within the zone of influence of construction supported by appropriate audio description.

114.5.2 Omissions and Additions The CITY reserves the right to add or omit areas to the digital recording.

114.5.3 Audio/Video Description Audio description shall be made simultaneously with the video coverage and shall include, but not necessarily be limited to, existing driveways, sidewalks, curbs, ditches, roadways, landscaping, trees, culverts, headwalls, retaining walls, and buildings. Audio description shall include any irregularities being noted (e.g. driveway cracked) with special video attention (close ups, etc.) being made of the irregularity.

114.5.4 House Number Identification Houses and other buildings shall be identified visually by house number (if visible) in such a way that manholes, hydrants, and the like can be located by reference thereto. In all instances, however, location shall be identified by audio and/or visual means at intervals not exceeding 100 feet in the direction of travel.

114.6 Rate of Speed and Panning

114.6.1 Speed The rate of speed in the general direction of travel shall not exceed and average of 48 feet per minute.

114.6.2 Panning Panning rates and zoom in/zoom out rates shall be controlled sufficiently in order that during playback the object can be viewed clearly.

114.7 Weather Limitations Recording shall be done during periods of good visibility. No recording shall be done during periods of precipitation or when more than 10 percent of the ground area is covered with snow unless specific written approval of the ENGINEER is obtained.

114.8 Camera Height When conventional wheeled vehicles are used, the distance from the camera lens to the ground shall be not more than 12 feet.

114.9 Limits Separate recordings shall be made on each side of the right-of-way, easement or street, unless otherwise specified.

114.10 Accessibility When areas to be recorded are not accessible by conventional wheeled vehicles, the CONTRACTOR shall provide special conveyances approved by the ENGINEER or record the information by hand carried apparatus.

114.11 Delivery Deliver one original of the completed recording to the CITY before any construction work commences. Unless specifically identified in the Bid Proposal, this work shall be incidental to the cost of construction.

115.0 Access Management Guidelines

115.1 The access management policy manual presents standards and guidelines for the following items:

- Intersection spacing
- Traffic signal spacing
- Intersection corner clearance
- Driveway spacing and density
- Sight distance
- Driveway geometrics
- Median opening spacing
- Two way left tum lanes
- Frontage and backage roads
- Left turn and right turn lanes
- Auxiliary acceleration lane
- Parking

Some of these guidelines can be used to prevent potential traffic problems. Others can be used to alleviate an existing problem. Usually, a combination of two or more of the guidelines will apply to a particular condition.

It is not practical to apply all of these guidelines to an existing street with existing access points. However, as opportunities arise, implementing as many of them as possible is desirable.

The application of access management guidelines will result in the following benefits for the City of Portage:

- Improved traffic safety and fewer crashes
- Shorter travel times and reduced motorist costs
- Extended function and capacity of roadways
- Improved access to property while enhancing the value of private land development

115.1.1 Intersection Spacing

Intersections should be properly spaced in order to avoid additional conflict points and to prevent vehicle backups. In some cases, an intersection can be eliminated, especially where a residential street intersects an arterial too close to a major intersection. Closing off the residential street and installing a cul-de-sac is an effective way to do this (Figure-1).

Spacing of unsignalized intersections should be treated as driveway spacing criteria. No street will be allowed within an intersection influence area. (See driveway spacing (Table 2) and functional area of intersections (Figure 1)).

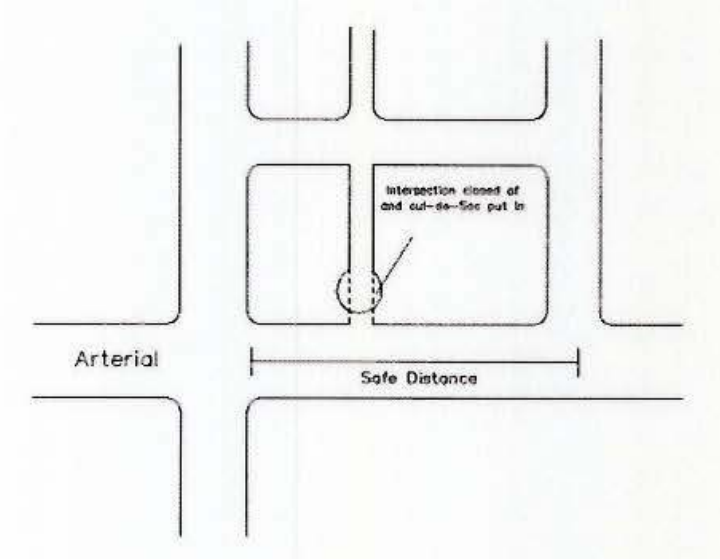


Figure 1. Eliminating Intersections

115.1.2 Traffic Signal Spacing

Improper signal spacing adversely affects traffic progression. Traffic signals spaced too closely result in traffic congestion and traffic queues that extend back through adjacent upstream signals. The variables involved in the planning, design and operation of signalized roadways are reflected in the relationship between speeds, cycle lengths and signal spacing to yield maximum bi-directional progressions. Table 1 presents the optimum spacing of signalized intersections at various speeds and cycle lengths.

Cycle Length (sec)	Speed (mph)						
	25	30	35	40	45	50	55
	Distance (ft)						
60	1100	1320	1540	1760	1980	2200	2430
70	1280	1540	1800	2050	2310	2500	2820
80	1470	1740	2050	2350	2640	2930	3220
90	1630	1980	2310	2640	2970	3300	3630
120	2200	2640	3080	3520	3960	4400	4840

Table 1. Optimal Spacing of Signalized Intersections

115.1.3 Intersection Corner Clearance

This guideline defines the minimum distance allowed between an intersection and the first adjacent driveway. Figure 3 illustrates the corner clearance standards for signalized and unsignalized intersections.

Driveways should also be separated from freeway entrances and exits and railroad crossings. The following guidelines are suggested:

- At least 100 ft from a bridge rail to the edge of a driveway
- At least 600 ft from the edge of a driveway to a freeway entrance or exit ramp, or railroad crossings.

115.1.4 Driveway Spacing and Density

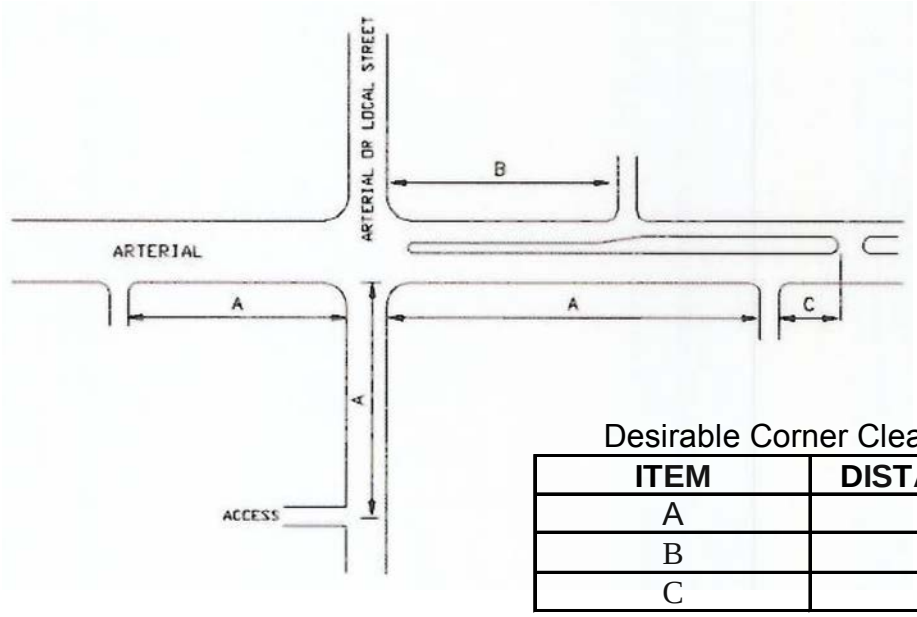
This guideline establishes standards for the separation distance between driveways and the number of driveways per lot. The standards vary with the roadway classification and with the speed limit of the roadway.

Number of driveways per lot:
No more than one driveway per parcel shall be provided. One additional driveway may be allowed for properties with a continuous frontage of more than 300 ft and one additional driveway may be allowed for each additional 300 ft of frontage.

Driveways should be consolidated where possible in order to reduce the number of driveways. Two or more adjacent properties can share driveways. Similarly, connections between adjacent parcels should be developed using internal driveways and aisles.

Driveway spacing:
Driveway spacing standards are based on the speed limit of the roadway. The higher the speed, the longer the spacing between driveways. The minimum spacing is measured from centerline of a driveway to the centerline of the adjacent driveway. Table 2 shows standards for the minimum recommended driveway spacing.

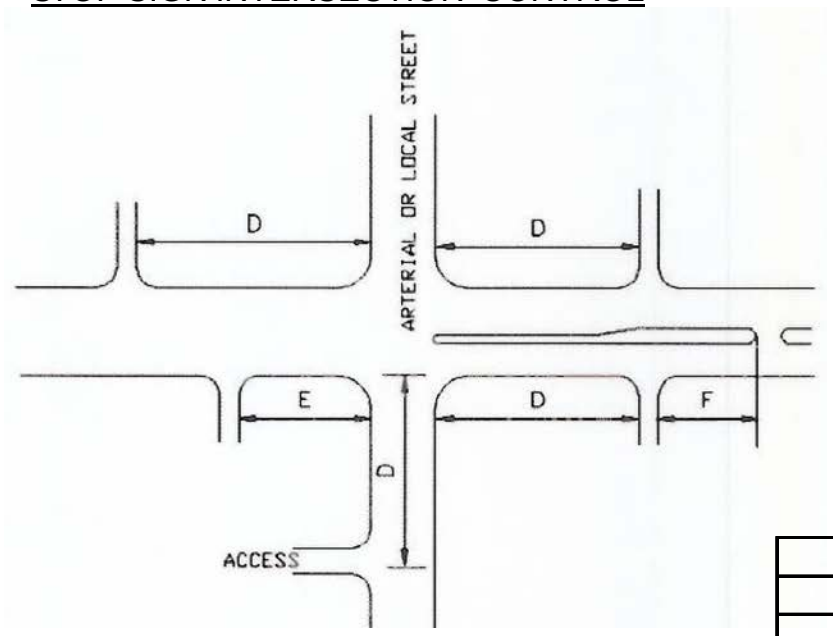
SIGNALIZED INTERSECTION CONTROL



Desirable Corner Clearance

ITEM	DISTANCE (ft)
A	230
B	115
C	75

STOP SIGN INTERSECTION CONTROL



Desirable Corner Clearance

ITEM	DISTANCE (ft)
D	115
E	85
F	75

The above dimensions assume a 30 to 35 mph posted speed. For a posted speed of 40 to 55 mph, these values should be doubled.

Figure 2. Corner Clearance Guidelines

Speed on Roadway (mph)	Spacing Guidelines (ft)
25	130
30	185
35	245
40	300
45	350
50	455
55	455+

Table 2. Guidelines for Driveway Spacing

In the event that a particular parcel lacks sufficient frontage to maintain adequate spacing, the following options can be considered:

- Choose the next lowest spacing from Table 2. For example on a 30 mph roadway, the distance may be reduced to 130 ft which is the spacing for 25 mph roadway.
- Encourage a shared driveway with the adjacent owners.
- Provide access from a side street if possible
- In areas where frontage roads or service drives exist or can be constructed, individual properties shall provide access to these drives rather than directly to the main street.

Different standards apply when driveways are offset, i.e. at the opposite side of a street. Table 3 presents desirable distances between two driveways on the opposite side of an undivided roadway.

Speed on Roadway (mph)	Spacing Guidelines (ft)
25	255
30	325
35	425
40	525
45	630
50	750

Table 3. Guidelines for Spacing Between Driveways on Opposite Side of the Street

115.1.5 Sight Distance

Sight distance is the length of roadway ahead visible to the driver. Stopping sight distance is the minimum distance required for a vehicle to stop safely based on speeds. Table 4 shows the guidelines for stopping sight distances.

Design Speed of Highway (mph)	Stopping Sight Distance (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730

Table 4. Stopping Sight Distance

Drivers should be able to enter and leave the driveway safely. Figure 3 demonstrates what is meant by safe sight distance. Safe sight distance should be provided for every intersection and driveway.

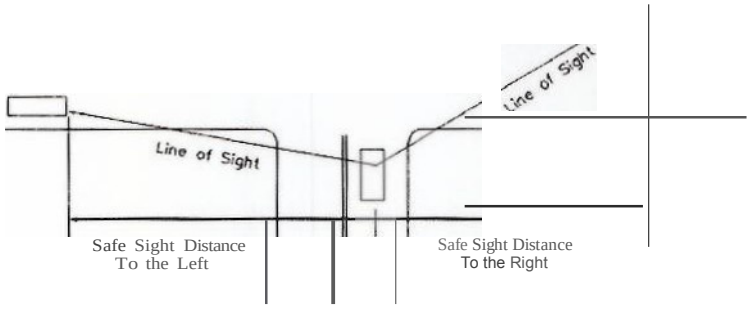


Figure 3. Safe Sight Distance

Generally, 7 seconds of travel time is used to determine intersection sight distances in urban areas. Based on this 7-second criterion, Table 5 shows the intersection sight distances for varying speed limits.

Speed on Roadway (mph)	Intersection Sight Distance (ft)
30	310
35	360
40	410
45	460
50	510
55	570
60	620
65	670

Table 5. Intersection Sight Distance

115.1.6 Driveway Geometries

This section contains guidelines regarding width, turning radius, throat length, approach angle, grade, pedestrian and bicycle crossings and surfacing requirements of driveways.

Throat Width and Length:
The typical driveway design shall include one ingress lane and one egress lane with a combined maximum throat width of 26 ft, measured from face to face of the curb. An additional ingress and egress within the same driveway may be allowed to ensure safe and efficient driveway movement.

A driveway lane shall be a maximum of 13 ft wide.

Throat length is the distance between the street and the end of the driveway within the development. Following are the standards to be used regarding throat length:

- For low volume driveways (below 150 peak hour vehicles in both directions), the minimum throat length shall be 20 ft.
- For medium volume driveways (150-400 peak hour vehicles in both directions), the minimum throat length shall be 60 ft.
- For high volume driveways (over 400 peak hour vehicles in both directions), the throat length should be determined by a traffic study.

Turning Radius:
The turning radius of a commercial driveway shall be a minimum of 25 ft. Radius can be reduced in areas with heavy pedestrian traffic so that vehicles will slow down to tum. Radius can also be reduced where acceleration/deceleration lanes are used. In any case, the design radius should not be less than 15 ft.

Industrial driveways shall have a 50-ft turning radius in order to accommodate large turning trucks.

Approach Angle:
Driveways on two-way public roads shall have angles of 90-degree angles of intersection with the road. The minimum acceptable angle is 70 degree.

Driveways on one-way public roads can have a minimum angle of 60 degrees with the roadway.

Grade:
The grade of a driveway should be minimal in order to prevent large speed differentials between turning and through traffic. There should be a smooth transition to and from the roadway. Desirable grades and maximum allowable grades are shown in Table 6.

Roadway Type	Desirable Grade	Maximum Grade
Principal Arterial	2-3 %	3-4 %
Minor Arterial	4%	5%
Collector	5%	6%

Table 6. Desirable Grades and Maximum Allowable Grades

Driveways should always have a minimum grade change of ½% to 1% to provide for adequate drainage.

Pedestrian and Bicycle Crossings:
Driveways should be designed to accommodate pedestrian and bicycle traffic expected to cross it. Alternative crosswalks or signalized crosswalks should be considered where necessary. Where there are four or more lanes, they should be designed so that pedestrians have refuge from entering and exiting traffic. When a driveway crosses a bicycle facility, the driveway should be designed to accommodate the safe crossing of bicyclists.

Driveway Surfacing:
All driveways should be paved to eliminate the tracking of granular material onto the through lanes.

115.1.7 Median Opening Spacing

This guideline provides standards for median opening spacing. Median openings should be provided at driveways only when they would have minimal effect on traffic flow and where it can safely be accomplished.

Median openings should not be allowed within the functional area of an intersection or interchange under any condition. Also they should not be allowed where inadequate sight distances exist.

Full opening means that turns can be made in both directions. Directional opening means turns can be made only in one direction. Table 7 presents the standards for median opening spacing for both directional and full openings.

Roadway Type	Full Median	Directional Median
Principal Arterial	1320-2640 ft	660-1320 ft
Minor Arterial	1320 ft	660 ft

Table 7. Median Opening Spacing

115.1.8 Two Way Left Turn Lanes

Two-way-left-turn lanes can be used where traffic volume and density of the driveways is relatively low and the proportion of left turning vehicles is relatively high. It is recommended for the following situations:

- Where left turning vehicle percentage is at least 20 percent during the peak hour
- 4-lane roadways with projected average daily traffic of less than 28,000 vehicles.
- 2-lane roadways with projected average daily traffic of less than 17,500 vehicles.

115.1.9 Frontage and Backage Roads

A frontage or backage road (service drives) provides alternative access to property. Frontage and backage roads improve safety and increase the capacity of the main roadway. Following are the standards for the design of frontage and backage roads:

- Minimum width measured from curb to curb shall be 25 ft.
- Minimum setback from right of way shall be 10 ft.
- Intersections of frontage and backage roads with the main roadway shall be designed as described for the driveway standards.
- Intersections for frontage roads shall be located at least 300 ft from the main street for which they are intended to provide alternative access.

115.1.10 Left Turn and Right Turn Lanes

Left turn and right turn lanes are the most effective means of reducing the speed differential between a turning vehicle and through traffic.

Table 8 shows the conditions under which left turn lanes should be provided.

35mph		45 mph		55mph	
Left Tum Volume per hour	Directional Volume per hour per lane (Heaviest Direction of Volume)	Left Tum Volume per hour	Directional Volume per hour perlane (Heaviest Direction of Volume)	Left Tum Volume per hour	Directional Volume per hour per ane (Heaviest Direction of Volume)
10	400	10	350	10	300
20	300	20	225	20	150
30	225	30	150	30	100
40	175	40	100	40	100
50	150	50	100	50	100
60	100	60	100	60	100

Table 8. Left Turn Lane Warrant

Right turn lanes should be provided when the speed limit is more than 35 mph and the average daily traffic of the main street is more than 10,000 vehicles per day and the number of right turning vehicles meets the criteria listed in Table 9.

Posted Speed>45 mph		Posted Speed<45 mph	
Number of Lanes	Right Turn Vehicles per hour	Number of Lanes	Right Turn Vehicles per hour
2	30	2	80
4	40	4	110

Table 9. Right Turn Lane Warrant

Right turn lanes should also be provided for the following situations:

- Poor internal site design such that circulation leads to back up onto the main street. Businesses with short drive-thru lanes are typical examples of this.
- The driveway or minor public road is difficult to sec.
- Operating speeds on the main street are very high (greater than 60 mph).
- The driveway entrance is gated.
- Right turning traffic consists of an unusually high percentage of trailers or other large vehicles.
- The intersection or driveway angle is highly skewed.
- Rear end collision experience is unusually high.

The length of right turn and left turn lanes will vary depending on traffic volumes, type of traffic control, and traffic signal timing and phasing (if the intersection is signalized). Required turning lane lengths should be determined by a traffic analysis on a case-by-case basis.

115.1.11 Auxiliary Acceleration Lane

A right turn acceleration lane allows the right turn egress vehicles to accelerate before entering the through traffic flow. Right turn acceleration lanes can be provided if:

- Posted speed limit of the major road is 35 mph and,
- Average daily traffic of the major road is more than 10,000 vehicles and,
- There are at least 75 right turn egress movements from the driveway onto the major road during the peak hour.

Right turn lanes can also be provided if there is an identifiable crash experience regarding right turn egress movements. The right tum acceleration lane should be of sufficient length to ensure safe merging maneuvers between the driveway vehicle and vehicles on the main street. The length should be determined by a traffic study.

115.1.12 Parking

Parking should not be allowed on highways that are primarily intended to serve through traffic movements. Parking should also be prohibited on high volume roadways to ensure safety.

Following are the guidelines regarding on street parking:

- Parking shall be prohibited on major streets.
- Parking may be allowed on local and collector streets if an engineering study indicates that it is safe to do so and it does not have an adverse impact on traffic flow.

201.0 SITE PREPARATION

201.1 Site Preparation This work shall consist of cutting, removing from the ground and disposing of trees, stumps, brush, shrubs, roots, logs and other vegetation occurring within the construction area which interfere with excavation or installation of the proposed facility. All vegetation which is not designated on the plans or by the ENGINEER to be removed shall be carefully protected from damage or injury during all construction operations. Unless otherwise called for in the Bid Proposal or the specifications, site preparation shall be incidental to the cost of construction.

201.2 Clearing and Grubbing Clearing and grubbing shall consist of the removal of ALL trees, shrubs, bushes, and undergrowth that occurs in such quantities that, in the opinion of the ENGINEER, it is impractical to identify as individual items. This work shall consist of the removal and proper disposal of all items, including the root structures, necessary to install the proposed facility. Unless specifically identified in the Bid Proposal, this work shall be incidental to the cost of construction.

201.3 Removal of Existing Materials

201.3.1 Excavation This work shall consist of the removal and replacement of all materials necessary for the proper installation of the facilities called for on the plans. All excess materials shall be properly disposed of at the CONTRACTOR's expense.

201.3.2 Rotomilling This work shall consist of furnishing all equipment, manpower, and materials necessary for removal and storage of asphalt in such a manner that it can be used as a gravel material. The finished materials shall substantially meet the grading requirements of MDOT 22A gravel. Unless called for separately, all costs for this work shall be considered as incidental to the cost of construction. If this material is to be re-used as a gravel material, it shall be in accordance with Section 206.2.5.2.

201.3.3 Diamond Grinding Surface grinding of existing materials shall consist of a self propelled device meeting the current MDOT specifications for diamond grinding. All excess material shall be properly disposed of at the CONTRACTOR's expense.

202.0 REMOVAL OF WATER

202.1 Suitable Means The CONTRACTOR shall provide suitable means to promptly remove and properly dispose of water entering the excavation at all times during the construction of the work.

202.2 Excavation The excavation shall be kept dry until backfill has been completed above the pipe. In water-bearing sand or quicksand, special precautions shall be taken, such as well-points, tight sheeting or drains. All costs of water removal shall be paid for by the CONTRACTOR and shall be incidental to the cost of the pipe or other facility being installed. Unless specifically identified in the Bid Proposal, this work shall be incidental to the cost of construction.

202.3 Dewatering As part of the various pay items, the CONTRACTOR shall design, furnish, install, test, operate, monitor and maintain a dewatering system of sufficient scope, size and capacity to control groundwater flow into excavations and to permit construction to proceed on dry, stable subgrades.

The CONTRACTOR shall protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, ponding and other hazards created by dewatering operations.

The dewatering system shall be installed to ensure minimum interference with roads, streets, walks and other adjacent facilities. Streets, walks or other adjacent facilities shall not be closed without permission from the CITY and authorities having jurisdiction.

The CONTRACTOR shall install the dewatering system utilizing wells, well points or similar methods complete with pump equipment, valves, appurtenances, water disposal and surface-water controls. Generators that are used to supply electrical power to the dewatering system pumps shall be properly muffled so as to not cause a nuisance to adjacent private residences.

Before excavating below the ground water level, place the dewatering system into operation to lower the water table as required. Operate the system continuously until drains, sewers and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

Provide an adequate system to lower and control ground water to permit excavations, construction of structures and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata to below bottom of foundations, drains, sewers and other excavations.

Dispose of water removed by dewatering in a manner that avoids endangering public health, property and portions of the work under construction or completed. Provide sumps, sedimentation tanks and other flow-control devises to remove the sediment from the water

prior to discharge. Discharge of water removed by dewatering into a lake or stream other than through an existing storm sewer outlet will require a MDEQ permit. The CONTRACTOR shall be responsible for obtaining the appropriate MDEQ permits unless otherwise noted in the project Specifications.

Treatment of dewatering effluent shall be provided where the groundwater being lowered is contaminated. All treatment shall be permitted and in accordance with MDEQ and EPA requirements. The CONTRACTOR shall submit shop drawings and the proposed treatment process for approval prior to dewatering contaminated areas.

Dewatering shall be maintained on a continuous basis. If dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system, restore damaged structures and foundations soils at no additional expense to the CITY.

The CONTRACTOR shall be responsible for all damage to and interruption of private water systems resulting from the dewatering operations. The CONTRACTOR shall provide temporary water service for affected private wells.

The dewatering system shall be removed from the project site upon completion of dewatering. All well holes shall be plugged and abandoned per the requirements of the MDEQ. Damage to adjacent facilities caused by dewatering operations shall be promptly repaired to an equal to or better condition than existed prior to installing the dewatering system.

203.0 EXCAVATION SUPPORT SYSTEMS

203.1 Sheeting and Bracing

203.1.1 The CONTRACTOR shall furnish and put in place at his own expense, bracing, shoring or sheeting, as may be necessary for the protection of the Work, public property or adjacent private property.

203.1.2 Unless otherwise noted in the Contract Documents or directed by the ENGINEER, the sheeting, bracing or shoring shall be removed as the Work progresses in such a manner as to prevent the caving of the excavation or any damage to the sewer or structure. Any voids left by removal of said materials must be filled with sand and compacted. Unless specifically identified in the Bid Proposal, this work shall be incidental to the cost of construction.

203.2 Support in Unstable Soil Where the bottom of the trench at sub-grade is found to consist of material which is unstable to such a degree that, in the opinion of the ENGINEER, it cannot be removed and replaced with an approved material thoroughly compacted in place to support the pipe properly, the CONTRACTOR shall construct supports as directed by the ENGINEER. If such conditions are encountered, they shall be paid for according to Article 11.00 of the General Conditions or as bid.

204 EARTH WORK

204.1 Excavation to Grade

204.1.1 The ENGINEER will establish control points, reference lines, and bench marks. Also, the ENGINEER will set construction stakes establishing lines, slopes and continuous profile-grade and will furnish the CONTRACTOR with all necessary information relating to lines, slopes and grades. These stakes and marks shall constitute the field control by and in accordance with which the CONTRACTOR shall establish other necessary controls to perform the work. The CONTRACTOR shall carefully compare all levels given on the drawings with existing levels and shall notify the ENGINEER of any discrepancies before proceeding with the work. When stakes are set by the ENGINEER, the CONTRACTOR shall request the staking 48 hours in advance.

The CONTRACTOR shall carefully preserve bench marks, reference points and stakes, and in the case of willful or careless destruction of the same, the CONTRACTOR shall be charged with the resulting replacement expense and shall be responsible for delays and errors caused by their unnecessary loss or disturbance.

204.1.2 Any excavation below specified grade shall be corrected with approved material, thoroughly compacted as directed by the ENGINEER. Any extra cost incurred shall be borne by the CONTRACTOR.

204.2 Pipe Construction in Fill Sections Where it is necessary to lay pipe in a fill area, unstable or unsuitable material shall be removed and slopes steeper than 1 to 2 shall be stepped before fill material is placed. The embankment shall be of suitable materials and shall be placed in layers not to exceed one foot and shall be compacted to 95% MDD to the top of the pipe. The embankment shall be not less than three diameters wide at the invert of the pipe and shall be continued up to provide not less than one foot of cover over the pipe.

204.3 Roadway Excavation Roadway excavation shall consist of the removal and proper disposal of all materials necessary for construction of a prepared sub-grade to the elevations and cross-section indicated on the Drawings and/or called for in the specifications. It shall include clearing, grubbing, and the removal of trees or stumps encountered within the limits of the grading area. Roadway excavation may be further designated as borrow excavation, peat excavation, frost heave excavation or earth stripping, if so provided in the Bid Proposal supplementary conditions or required by the ENGINEER. Excavation shall at all times be performed in a manner and sequence that will provide drainage. Suitable materials shall be used to construct embankments on the project as required by the Contract and at the direction of the ENGINEER.

204.4 Preparing Roadway Foundation

204.4.1 Any material within lines two feet (2') outside the proposed surfacing that cannot be compacted to 95% MDD shall, at the request of the ENGINEER and upon approval

from the CITY, be excavated to a depth determined by the ENGINEER. If such conditions are encountered, they shall be paid for in accordance with Article 11 of the General Conditions.

204.4.2 Embankments shall not be constructed on frozen earth, ice, snow, topsoil, mulch, or other unstable material. Where embankments are to be constructed on existing slopes steeper than one (1) vertical to six (6) horizontal, steps shall be formed in the slope before fill is placed.

204.4.3 Excavation of Unstable Material

204.4.3.1 After unsuitable material has been excavated at the direction of the ENGINEER, sufficient time shall be allowed to cross-section the excavated area for the purpose of determining quantities, unless a lump sum amount or other method of payment satisfactory to the CITY and CONTRACTOR is agreed upon.

204.4.3.2 Where it is possible, a six-inch (6") drainage pipe shall be placed from the low point of the excavated area to a natural drainage course, ditch, or storm sewer structure. The excavated area shall be backfilled with approved porous material. Where an outlet for drainage is not available and the surrounding earth is impervious, the backfill shall be made with materials free from silt or topsoil. All areas shall be compacted to not less than 95% MDD.

204.5 Excavation and Preparation of Trenches

204.5.1 Excavation of Trench The trench shall be excavated so that the pipe can be laid to the alignment and grade required and shall consist of the removal and stock piling or hauling of all materials of whatever nature encountered. Excavation shall proceed only as far in advance of pipe laying as permitted by the ENGINEER. Trench excavation shall include all clearing, grubbing and tree removal within and adjacent to the excavated area, supporting of all adjacent structures whether above or below ground.

204.5.2 Width of Trench

204.5.2.1 The width of the trench shall be as per SD-122 .

204.5.2.2 If the above width is exceeded, the CONTRACTOR shall install a concrete cradle as directed by the ENGINEER to support the added load on the pipe. The use of additional labor and material shall be at the expense of the CONTRACTOR.

204.5.2.3 Trenches shall be of such extra width as necessary to permit the placement of timber supports, sheeting, and bracing, where required.

204.5.3 Pipe Clearance in Rocks Large rocks, boulders and stones over four inches (4") in diameter shall not be placed in bedding, haunching or backfill as defined in SD-122.

205.0 BACKFILLING

205.1 General

205.1.1 Unless otherwise directed, all excavations shall be initially backfilled as noted in SD-122 to a point of one (1) foot above the pipe immediately after installation.

205.1.2 If it is apparent that the CONTRACTOR is not backfilling around the pipe in accordance with the specifications, the ENGINEER may request that the trench be left open above the pipe until compaction testing has been completed.

205.2 Backfill Material All backfill material shall be free from cinders, ashes, refuse, vegetable or organic matter, boulders, rocks or stones, or other materials which, in the opinion of the ENGINEER, is unsuitable.

205.3 Around Pipe In earth other than free draining sand or gravel, all pipe shall be laid with Class B bedding unless otherwise specified. The pipe shall be bedded in compacted granular material and placed on a flat bottom trench. Class B Bedding: The granular material shall be MDOT 17A stone. The granular bedding shall be placed as shown in SD-122.

Where Class B bedding as noted does not apply, all trenches shall be backfilled by hand, from the bottom of the trench to a horizontal plane passing through the center of the pipe, with approved sand placed in layers of four inches (4") and compacted. Backfill material shall be deposited uniformly in the trench for its full width on each side of the pipe and compacted in place to 95% MDD. Cost of furnishing, placing and compacting bedding shall be included in the price for installation.

205.4 Grade From a horizontal plane passing through the center of the pipe to a point one foot (1') above the top of the pipe, the trench shall be backfilled with material approved by the ENGINEER, placed in six inch (6") layers and compacted to 95% MDD. The trench may be backfilled from one foot above the pipe to the surface by means of a bulldozer and vibrator which shall compact the backfill by being operated longitudinally along the pipe line. Pushing material into the trench from the side without the above noted longitudinal compaction will not be permitted.

205.5 Drives, Parking Areas and Streets The trench backfill under drives, parking areas and in streets including an area 3' (three feet) from edge of pavement or back of curb, shall be MDOT Class II or ENGINEER approved native granular material, placed in layers not to exceed one foot (1') in thickness and compacted to 95% MDD. This fill shall be constructed to the proposed elevation. A road base of six inches (6") shall be filled with MDOT 22A aggregate compacted to 95% MDD and maintained until the replacement surfacing can be properly placed.

205.6 In Freezing Weather Backfilling shall not be done in freezing weather except by written permission of the ENGINEER. No frozen material shall be buried below final elevation of ground.

205.7 Around Hydrants and Valve Boxes Backfilling around hydrants shall be MDOT Class II or native material as approved by the ENGINEER placed in 4" to 6" lifts from a horizontal plane passing through the center of the lead main to one foot (1') below the top grade. The drain outlet shall be backfilled with 2 cubic feet of 6A washed stone to provide adequate drainage as shown in SD-144.

205.8 Around Manholes After the structure and/or mortar have set up sufficiently to avoid damage, backfilling shall be done in a manner that will not cause unequal pressure on the structure. No material except MDOT Class II or native material, approved by the ENGINEER, shall be placed within three feet (3') of the structure.

206.0 PAVING AND SURFACING

206.1 Sub-base Preparation This shall consist of the CONTRACTOR furnishing all equipment, manpower, and materials necessary to prepare the subbase to the line and grade called for on the drawings or in the specifications. This shall be incidental to the cost of installation of the roadway surface.

206.2 Gravel Aggregate Base

206.2.1 Description This work shall consist of an aggregate base constructed on a prepared subgrade.

206.2.2 Materials The materials shall meet the requirements specified in the MDOT Specifications, for 22A unless otherwise specified in the Contract Documents.

206.2.3 Deleted

206.2.4 Placing and Compacting Materials Base material shall not be placed until the sub-grade has been approved by the ENGINEER. The Aggregate Base shall be placed by means of a mechanical spreader in such a depth that, when compacted, the thickness will equal the thickness shown on the Drawings. The depth of any layer shall not be more than six inches (6”), or less than three inches (3”), compacted. Each layer shall be floated with an approved maintainer or patrol grader until the mix is uniform and the surface smooth. This work shall be performed in conjunction with a vibrating type compactor, pneumatic tired roller, or other approved compaction method until 95% of MDD has been obtained. Water may be added as needed to obtain optimum moisture content.

206.2.5 Payment - Gravel

206.2.5.1 Aggregate Base Aggregate Base shall be paid for at the contract unit price per square yard, which price shall constitute payment in full for furnishing and placing the materials specified and compacting to the grade and profile shown on the Drawings. This item shall be measured by receipt of a duplicate ticket for materials showing the weight of the material received by the RPR.

206.2.5.2 Rotomilled Material Rotomilled gravel shall be paid for at the contract unit price per syd, which shall constitute payment in full for rotomilling, storing, measuring, and calculating the quantity used, furnishing and placing the material as specified in Section 201.3.2 and compacting to the grade and profile shown on the Drawings. This item shall be measured by calculating the cubic yards of stockpiled material as described in Section 201.3.2. If the quantities are measured by weight, a figure of 3200 pounds per cubic yard will be used for converting to cubic yards.

206.3 Bituminous Materials and Preparation

206.3.1 Preparation of Subbase This work shall be done in strict accordance with current MDOT Specifications.

206.3.1.1 Payment - Bituminous Materials The bituminous materials shall be paid for at the contract unit price which shall constitute payment in full for furnishing HMA as specified to the job site, placing and compacting the mixture, maintaining traffic and any other necessary operations for constructing the hot mix asphalt base.

206.3.1.2 Bituminous Bond Coat

206.3.1.2.1 The bond coat shall be SS-1h. The rate of application shall be 0.10 to 0.15 gallons per square yard unless otherwise noted on the Drawings or approved by the ENGINEER.

206.3.1.2.2 The SS-1h asphalt emulsion shall be applied to a properly swept and cleaned base or leveling course prior to placing the next asphalt course.

206.3.1.2.3 The bituminous material shall be uniformly applied by means of a pressure distributor, except in such areas that are inaccessible to the regular distributor, in which case, hand spraying application will be permitted.

206.3.1.2.4 The foundation shall be free from moisture or frost and the surface temperature shall not be lower than 50°F when the treatment is applied, unless approved by the ENGINEER. SS-1h shall be applied immediately ahead of the laying operation an adequate distance to allow it to cure before placing the HMA.

206.3.2 HMA Base Course

206.3.2.1 Scope of Work The work to be done under these specifications shall consist of construction of an HMA course applied to a prepared sub-grade.

206.3.2.2 Preparation of Sub-Grade The sub-grade will be compacted and graded and ready to accept the HMA base course.

206.3.2.3 Materials The HMA base shall consist of one or more courses constructed on a prepared sub-grade. It shall be applied at a rate and in a manner that conforms to the requirements of the current MDOT Specification. HMA classification and type shall be shown in the contract documents.

206.3.3 HMA Leveling Course

206.3.3.1 Description This work shall consist of conditioning the existing road surface, grading to the plan grade and profile, treating with a bonding material, unless otherwise provided, and constructing thereon an HMA leveling course composed of materials and mixed in accordance with the current MDOT Specification. Where an existing pavement is to be widened, the existing shoulder shall be excavated sufficiently to allow for inclusion of a compacted aggregate base in accordance with the Contract Documents and the HMA leveling course.

206.3.3.2 Placement The HMA shall be placed by an approved self-propelled mechanical spreader, or other means as approved by the ENGINEER, to such a depth that when compacted, it will have the thickness specified or ordered by the ENGINEER.

The mixture shall be placed and compacted in accordance with the current MDOT Specifications and traffic shall not be allowed on the surface being placed until rolling has been completed. HMA level course classification and type shall be shown in the contract documents.

206.3.3.3 Rolling After the mixture is placed, each layer shall be compacted in accordance with the current MDOT Specifications. Any area that is defective shall be removed and replaced at the expense of the CONTRACTOR.

206.3.3.4 Weather Limitations Bond Coat shall not be applied when weather is threatening, or when the air temperature of the surface the coat is to be applied to in the shade is less than 50°F, or as authorized by the ENGINEER.

Bituminous mixture shall not be placed during rainy or threatening weather or when moisture on the surface to be treated would prevent satisfactory bond or when the air temperature in the shade is less than 40°F, unless authorized by the ENGINEER.

206.3.3.5 Testing The CONTRACTOR shall be required to furnish a certified analysis of the contents of the asphalt. The CONTRACTOR shall arrange to have samples collected and an extraction and mechanical analysis made by an independent laboratory for each 400 tons of material, but in no case less than one sample per project. The cost of testing shall be incidental to the unit cost of asphalt paving unless otherwise noted in the Bid Proposal.

206.3.4 HMA Surface Course

206.3.4.1 Description This work shall consist of conditioning the existing road surface, grading to the plan grade and profile, treating with a bonding material unless otherwise provided for, and constructing thereon an HMA Surface Course composed of materials and mixed in accordance with the current MDOT Specifications and as called for in the Contract Documents. HMA surface course classification and type shall be shown in the contract documents.

206.3.4.2 Other Requirements All other work in connection with the above operation shall be as specified under HMA Leveling Course specifications.

206.3.5 Bituminous Valley Gutter Bituminous valley gutter shall be installed in accordance with the current MDOT specifications and SD-131.

206.3.5.1 Description Where bituminous valley gutter is called for, it shall be placed integrally with the HMA surface Course with a self-propelled paving machine in accordance with the current MDOT Specifications for Construction.

Unless conditions warrant otherwise, the valley gutter construction operation shall be continuous from end to end of the street and in one direction so as to eliminate joints. Valley gutters shall be measured continuously through driveway openings. "Bituminous Valley Gutter" shall be paid for at the contract unit price per lineal foot and shall be payment in full for all materials and labor.

206.4 Concrete

206.4.1 Concrete Pavement

206.4.1.1 Materials The materials shall meet the requirements specified in the current MDOT Specifications for the following items:

Portland Cement Concrete	Steel Reinforcement
Cement	Water
Coarse Aggregate, 6A	Joint Material
Fine Aggregate, 2NS	Concrete Admixture and Curing Agents

Course aggregate shall consist of limestone or slag material.

206.4.1.2 Construction

206.4.1.2.1 Equipment The equipment shall be as currently being used by the construction industry and in accordance with the current MDOT Standard Specifications for Construction.

206.4.1.2.2 Construction Procedures

206.4.1.2.2.1 Preparation of Sub-Grade The sub-grade shall be graded and thoroughly compacted to a point at least one foot outside of the proposed concrete facility. Forms shall then be placed to provide adequate time for the ENGINEER to check them in advance of placing concrete. The compacted sub-grade shall be moist and free from mud or frost at the time of concrete placement. Any areas disturbed by equipment shall be smoothed out and tamped.

206.4.1.2.2.2 Placing Forms Forms shall be placed on thoroughly compacted material and checked for line and grade by the ENGINEER in advance of placing concrete.

206.4.1.2.2.3 Aggregates Aggregates shall be handled in a manner that will provide uniformity of grading and moisture content at the time of batching. All aggregates shall be limestone or slag material.

206.4.1.2.2.4 Concrete Design The concrete mix shall be designed by an approved independent laboratory at the expense of the CONTRACTOR. Evidence of actual tests shall be furnished indicating that the proposed design will result in concrete meeting the requirements for MDOT P1-517: 6.5% entrained air with a tolerance of plus or minus 1.5%; compressive strength at 28 days of 3500 psi; modulus of rupture at 28 days of 650 psi; minimum content of cement 5.50 sacks per cubic yard.

206.4.1.2. 2.5 Proportioning Aggregates shall be proportioned by weight. The equipment shall be an approved weighing device as specified by the current MDOT Specifications. The weighing device shall be accurate with a tolerance of 1% plus or minus. Water shall be discharged into the mixer by an approved device that will provide the amount required with a maximum variation of 1%.

206.4.1.2.2.6 Consistency Where machine methods are used for striking off and consolidating the concrete, the slump shall be between 1-1/2 and 2-1/2 inches. Where hand finishing is permitted, the slump may be increased to 3-1/2 inches. Concrete shall reach its place in the finished work without segregation. Moving the concrete with rakes or by use of a vibrator will not be permitted.

206.4.1.2.2.7 Strength of Concrete If the average results from the test beams or cylinders are below the required 28 day strength, it will be sufficient reason for rejecting for further use the materials being used. If said average results are more than 10% below the required strength, the CITY may elect to permit such curbing or sidewalk to remain in place and receive as compensation therefore a 50% reduction of the contract unit price, or to require the CONTRACTOR, at his own expense, to

remove the deficient concrete and replace it with concrete of satisfactory quality.

206.4.1.2.2.8 Mixing The mixing time for concrete shall be for a period of not less than one (1) minute in a drum that shall revolve at the rate of not less than 14, nor more than 20, revolutions per minute. The volume of mixed material in each batch shall not exceed the Associated General Contractors of America rated capacity of the mixer.

The CITY reserves the right to require the CONTRACTOR to discontinue the use of ready-mixed concrete if, in the opinion of the ENGINEER, the use of such concrete does not produce satisfactory work and no claim will be considered due to such change.

206.4.1.2.2.9 Transportation of Materials Transportation of materials shall be as specified under the current MDOT Requirements.

206.4.1.2.2.10 Placing Concrete Concrete shall be placed in accordance with the current MDOT Specification, except commercial vehicles will not be permitted on non-reinforced pavement until tests indicate a modulus of rupture of not less than 500 psi.

206.4.1.2.3 Joints All longitudinal and transverse joints shall confirm to the details and position shown on the Drawings. Transverse joints shall be constructed at right angles to the center line of the pavement and shall not vary more than 1/4 inch from a true line. The surface of the pavement adjacent to all joints shall be finished to a true surface and properly aged. The surface across the joints shall be tested with a ten foot (10') straight edge and any irregularities shall be corrected before the concrete has hardened.

206.4.1.2.3.1 Longitudinal Joints Longitudinal joints shall be sawed plane-of-weakness joints with bars, or bulkhead construction joints with hook bolts, as detailed in the current MDOT Standard Details and in accordance with the current MDOT specifications.

206.4.1.2.3.2 Tranverse Joints Transverse joints shall be contraction joints, expansion joints or construction joints and shall be strictly as indicated in the current MDOT Standard Details and in accordance with the current MDOT specifications.

206.4.1.2.4 Consolidating and Finishing The sequence of operations after the placing of the concrete shall be: striking off and consolidation, floating, scraping, and testing surface with straight edge, and edging and final finishing with burlap drag.

206.4.2 Concrete Sidewalk

206.4.2.1 Summary This work shall consist of a single course of concrete constructed on a prepared and approved sub-grade to the width and thickness noted on the drawings.

206.4.2.2 Materials The materials shall meet the requirements as specified in the current MDOT specifications for the following items:

Concrete, Grade, S2, P1	Granular Material Class II
Water	
Joint-Fillers	

The concrete mix shall meet the requirements for MDOT P1-517: 6.5% air entrained with a tolerance of plus or minus 1.5%, compressive strength of 3,500 psi at 28 days and a slump within the range of 1-1/2 to 3 inches. Modulus of rupture at 28 days of 650 psi, minimum cement content of 5.50 sacks per cubic yard. The aggregate shall consist of a limestone or slag material.

206.4.2.3 Forming The sub-grade shall be thoroughly compacted to insure its stability. Straight forms of wood or metal shall be placed to the plan grade and staked in a manner that will prevent deflection or settlement. They shall be set to an elevation that will provide 1/4 inch per foot slope toward the center of the street, or as otherwise detailed in the Contract Documents, or approved by the ENGINEER.

206.4.2.4 Consolidating and Finishing The sub-grade shall be thoroughly wetted and the concrete deposited thereon to the proper depth. It shall be spaded along the forms, compacted and struck off flush with the top of the forms. The surface shall be floated with a suitable float, edges and joints properly tooled and then finished with a wood float or brush as required by the CITY to provide a non-slip surface.

206.4.2.5 Joints One inch (1") transverse expansion joints shall be placed every 50 ft. for the full depth of the sidewalk and contraction joints formed with spacing equal to the width of the sidewalk or as directed by the ENGINEER. All joints shall be constructed at right angles to the centerline of the sidewalk.

206.4.2.6 ADA Detectable Warning Devices ADA ramps shall be installed at all public street intersections or as directed by the ENGINEER in accordance with current MDOT standards and SD-119.

206.4.3 Concrete Curb and Gutter

206.4.3.1 Summary Where concrete curb or curb and gutter is specified, it shall be as detailed in the SD-113 or as indicated in the Contract Documents. The trenching, forming, placing, finishing and curing shall take place before the HMA base or leveling surface is placed and conform to the specifications for concrete sidewalk section

206.4.2.2 through 206.4.2.5 of these specifications. The forms shall be metal and extend to the full depth of the structure. The concrete shall be spaded to prevent honey-combing.

Expansion joints shall be placed through the curb at the spring points of the street returns and uniform intervals of not more than one hundred feet (100') between intersections. Expansion joint material shall also be placed five feet (5') on each side of all drainage structure castings. Plane of weakness joints shall be placed to divide the structure into uniform sections ten feet (10') in length. Irregular sections shall not be less than eight feet (8') in length. The concrete shall be cured in accordance with the current MDOT Specifications for Construction.

Concrete curbs shall be measured continuously through driveway openings which shall be left as required by the CITY. "Concrete Curb" or "Concrete Curb and Gutter" shall be paid for at the contract unit price per linear foot which shall constitute payment in full for all materials and labor. The aggregate shall consist of a limestone or slag material.

206.4.3 Stamped Concrete

206.4.3.1 Materials The concrete shall meet the requirements of 6 inch concrete sidewalk and shall include an integral color texture and release agent. The release agent shall be dry-shake powder or liquid to facilitate the release of imprinted tools. The CONTRACTOR shall furnish the owner with the manufacturer's standard colors for selection prior to placement of the stamped concrete.

The imprinting tool shall be the standard brick paver pattern "Running Bond – New Brick" and shop drawings of the available stamping patterns shall be submitted to the ENGINEER for approval.

A reactive color shall be applied during finishing operations. The color system is intended to be a combination of water solutions of metallic salts designed to penetrate and react with concrete to produce insoluble, abrasion-resistant color deposits in concrete pores. The colors also shall contain dilute acid to etch the concrete surface lightly to permit color to penetrate and react with the concrete. The surface colors shall be approved colors suitable for the purpose intended and applied in accordance with the manufacturer's instructions. The color admixture shall be Scofield C-32 or approved equal. The form release shall be Scofield Lithochrome antiquing release, charcoal gray or approved equal. Concrete sealer shall be Scofield Cureseal or approved equal.

All materials shall be furnished, prepared, applied, cured, and stored according to the manufacturer's directions specified for the use intended as specified.

206.4.3.2 Construction Methods The CONTRACTOR shall prepare the surface and place the concrete in accordance with MDOT's latest Standard Specifications for Construction for sidewalk. After the concrete is placed and screeded to the proper

grade, the color hardener shall be applied as necessary to achieve a uniform finish. An even thin coat of the release agent shall then be applied. While the concrete is still in the plastic stage, the forming tools shall be applied to make the desired patterned surface. The CONTRACTOR shall hand-tool in areas where imprinting tools are not practical. The areas shall be laid out for proper alignment and the concrete shall be imprinted to a consistent depth while it is still plastic. Control joints shall be placed in accordance with the plans and shall be cut to ¼ of the thickness of the slab. A joint filler of a matching color shall be installed as recommended by the manufacturer. The concrete shall be protected from premature drying, excessive hot or cold temperatures, and any other damages. Upon completion, the CONTRACTOR, shall chip away any concrete “squeeze” left from tool placement. The surface shall be pressure washed and allowed to dry after which the clear sealant for masonry surfaces shall be applied.

The CONTRACTOR shall provide a representative mockup of all etched graphic elements 72 hours prior to actual etching. The city shall review the mockup and reserves the right to make adjustments in the position of the graphic based on the outline of the mockup.

207.0 UTILITY INSTALLATION

207.1 Water Mains

207.1.1 Materials Mains: four inch (4") to ten inch (10") diameter pipe shall be Class 52 Ductile Iron and twelve inch (12") diameter and larger pipe shall be Class 53 Ductile Iron, conforming to ANSI A21.51/AWWA C151. All piping inside structures shall have flanged joints. Pipe twelve inches (12") and less in diameter shall be rated for 250 psi internal working pressure (IWP), sizes exceeding twelve inches (12") in diameter shall be rated for 150 psi I.W.P.

207.1.2 All Buried Fittings and Joints Mechanical joints, flange joints, and push-on joints shall conform to ANSI 21.10/AWWA C110 specifications.

207.1.2.1 Bolts and Nuts Bolts and nuts used with mechanical joints shall be high strength cast iron NI-Resist or approved equal.

207.1.2.2 Gaskets Rubber gaskets shall be vulcanized styrene butadiene rubber (SBR) or approved equal conforming to ANSI A21.11/AWWA C111 as approved by the ENGINEER. The joints shall be assembled in strict accordance with the manufacturer's recommendations.

207.1.2.3 Flanged Joints Cast iron flanged fittings shall meet ANSI A21.10/AWWA C-110 and shall be assembled in accordance with the manufacturer's recommendations. Bolts and nuts shall be of steel, cadmium plated with a minimum yield strength of 45ksi and shall meet ANSI A21.11/AWWA C-111. Gaskets shall be as described in Section 207.1.2.2.

207.1.2.4 Gate Valves & Wells Valves shall be furnished and installed at the locations shown on the Drawings. Valves shall be mechanical joint with mechanical joint gaskets. All valves shall be gate valves.

207.1.2.4.1 Gate Valves All gate valves shall be EJ FlowMaster of the resilient wedge type for seating and operating characteristics meeting the requirements of AWWA C515 specifications. The valves are to be mechanical joint opening clock-wise, non-rising stem and fully bronze mounted.

207.1.2.5 Valve Boxes Valve boxes shall be EJ 8560 (for 3 piece boxes) or 8550 (for 2 piece boxes) or approved equal). Non-ferrous models are not allowed.

207.1.2.6 Hydrant, Valve, & Valve Box Assembly Hydrants shall be of dry barrel design, Underwriters Laboratory listed, and conforming to AWWA C502 standards. The hydrant mechanism shall be of a non -rising stem, opening clockwise, with a 5-1/4 inch valve that closes with the system pressure. The hydrant shall be a "traffic model" provided with a safety coupling and flange design that will permit a full 360 degree facing of the nozzles. Hydrants shall

be EJ WaterMaster 5CD250, EJ WaterMaster 5BR250 or Clow Valve Company Medallion Model F-2545 equivalent. All hydrants shall be installed in accordance with SD-144.

207.1.2.6.1 The inside diameter of the hydrant barrels shall not be less than 7-1/4".

207.1.2.6.2 Hydrants shall be manufactured with a main valve set ring of bronze and bronze upper valve plate.

207.1.2.6.3 Each hydrant shall be supplied with a 6" gate valve, mechanical by mechanical joint complete with a 2 piece cast iron valve box having a 5-1/4" screw shaft opening.

207.1.2.6.4 The inlet at the hydrant shoe shall be mechanical joint ANSI A21.11 standard 6".

207.1.2.6.5 The hydrant bonnet shall have two 2-1/2" National Standard Hose Connections (7-1/2" threads per inch with a 3-1/16" O.D.) and one 4" Pumper Nozzle with a #5 Storz Connection.

207.1.2.6.6 The hydrant shall have a bury length of 5-1/2 feet from the invert of the inlet to the ground line, unless otherwise specified.

207.1.2.6.7 Each nozzle cap shall have a suitable rubber-like gasket. Nozzles shall have rubber-like "O" ring gaskets.

207.1.2.6.8 Each hydrant shall have all chains removed prior to activation for public use.

207.1.2.6.9 Each hydrant assembly shall have factory-applied yellow paint above the ground line with caps painted John Deere Green (54416D).

207.1.2.6.10 The hydrant operating nut and nozzle caps shall have 7/8" square operating lugs.

207.1.2.6.11 The stem packing in the hydrant bonnet shall be of the double "O" ring type.

207.1.2.6.12 All hydrant operating stems shall have a steel coupling attached with stainless steel coupling pins to the upper and lower stems.

207.1.2.6.13 All hydrant extensions shall be made at the ground line or above, without the necessity of digging.

207.1.2.6.14 The outlet nozzles shall be mechanically attached into the bonnet.

207.1.2.6.15 The hydrant bonnet shall be able to be positioned 360°by loosening the bonnet flange bolts.

207.1.2.6.16 All hydrant drains or drips shall be open unless these are lying in the water table, in which case, they shall be plugged.

207.1.2.6.17 All hydrants and hydrant valves shall be restrained as detailed in SD-144 or as recommended by the manufacturer or other means acceptable to the ENGINEER.

207.1.2.6.18 All hydrants shall be installed in a manner such that the center of the pumper connection is a minimum of 21" and a maximum of 36" above the adjacent finished grade. The hydrant shall have an area of 36" clear of obstructions surrounding the outlet nozzles and operating nut.

207.1.2.6.19 All hydrants shall have signs installed in accordance with SD-145 unless otherwise specified in the Bid Proposal. The cost of the signs and installation shall be considered included with the cost of the fire hydrant assembly.

207.1.2.7 Joint Restraints The following methods of restraining the joints are acceptable: 1) U.S. Pipe Field Lock Gasket, 2) Retainer Glands, 3) Threaded Rods, 4) Meg-a-Lug Glands. Any other method of restraint must be appr oved by the ENGINEER. The ENGINEER shall indicate on the construction drawings which Tees and Bends are to be restrained. **Thrust blocks shall not be allowed.**

207.1.2.7.1 Restraint All pipe deflections over twenty (20) degrees, all tees, and valves at the dead ends of lines shall be restrained, tied or harnessed in a manner acceptable to the ENGINEER. The restraint shall be applied to joints each direction from the deflection or fitting an adequate distance to resist the axial thrust of the test pressure. Minimum acceptable distance shall be seventy (70') feet each way from said deflections.

207.1.2.8 External Conductors All pipe placement shall provide for electrical conductivity across each joint. The electrical conductivity connections shall be of the external conductor type. The conducting medium shall be adequately sized and designed to carry 400 amperes for an extended period of time. The conductor shall be fastened to each side of each joint in a permanent manner. External conductors shall be U. S. Pipe and Foundry Co., "Electro-Bond" strips; Erico Products, Inc., "Cadwell" connectors; Clow Corporation, "Cable-Bond Connectors"; conductivity gaskets approved by the ENGINEER or equal. All connection areas shall be coated as per manufacturer's requirements. **Bronze wedges shall not be allowed.**

207.1.3 Installation

207.1.3.1 Installation of Service No valve or other control on the existing system shall be operated for any purpose by the CONTRACTOR without prior permission of the CITY. It shall be the responsibility of the CONTRACTOR to notify all persons to be affected by any shut off 48 hours prior to the operation of any valves.

207.1.3.2 Bedding In earth other than free draining sand or gravel, all pipe shall be bedded with MDOT Class II or IIA unless otherwise specified.

207.1.3.3 Handling Material Proper and suitable tools and appliances for the safe and careful handling, conveying and laying of the pipe shall be used. Care shall be taken to prevent the coating of ductile iron pipe from being damaged, particularly on the inside of the pipe. Pipe, valves, hydrants and fittings strung along the route shall be placed in such a manner that they will not be submerged or collect water. All pipes and castings shall be carefully examined and tested for defects. If any materials are found to be defective, they shall be removed from the site and replaced with acceptable materials.

207.1.3.4 Cleaning Pipe & Fittings All lumps, blisters and excess coal-tar coating shall be removed from the bell and spigot end of each pipe and fitting and the outside of the spigot and the inside of the bell shall be wire-brushed and wiped clean, dry and free from oil or grease prior to laying.

207.1.3.5 Laying Pipe Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed. The ENGINEER may require that a heavy tightly woven bag be placed over each end and left there until the connection is to be made. After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home to correct line and grade. At any time when pipe laying is not in progress, the open end(s) of pipe shall be closed by a watertight plug or other means approved by the ENGINEER. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the plug shall remain in place until the trench is pumped completely dry. Watermain shall be placed a maximum of 6'-0" and a minimum of 5'0" depth as measured from finished grade to the top of the pipe unless existing water table conditions warrant the ENGINEER to direct otherwise.

Whenever a main is installed under any existing utility line such as gas, sewer, water, etc., provisions shall be made to prevent the weight of such utility line from straining and possibly breaking the main. Such provisions shall consist of concrete bedding of the main, complete concrete encasement, or some other method approved by the ENGINEER. If it is a sanitary sewer line, the CONTRACTOR will be required to encase the water main with a minimum of nine inches (9") of five (5) sack concrete a distance of ten feet (10') each way from the sewer line. Separation of watermain and sewer shall be in accordance with the current version of the GLUMRB - "10 State Standards".

207.1.3.6 Direction of Laying Pipe shall be laid with bell ends facing in the direction of laying, unless directed otherwise by the ENGINEER. Where pipe is laid on a grade

of 10% or greater, the laying shall start at the bottom and shall proceed upward with the bell ends of the pipe up grade.

207.1.3.7 Cutting of Pipe 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 or cement lining and so as to leave a smooth end at right angles to the axis of the pipe. Flame cutting of pipe by means of an Oxyacetylene torch shall not be allowed. Where the pipe joint is such that it employs a single gasket to effect the joint seal, the outside of the cut end will be tapered back 1/8 inch at an angle of approximately 30 degrees so as to remove any sharp, rough edges which might damage the gasket.

207.1.3.8 Tapping Sleeves Tapping sleeves shall only be ductile iron or epoxy coated steel. The tapping sleeve shall be Rockwell 622, U.S. Pipe T-28 or equal. Where a "size on size" tap is required, a mechanical joint ductile iron tapping sleeve shall be used. The tapping sleeve shall be U.S. Pipe T-9, Mueller H-615 or approved equal.

207.1.3.9 Cutting in Tees Cutting in tees shall only be allowed by written permission of the City Engineer.

207.1.3.10 Poly Wrap When the water main is to be located in potentially corrosive soil, it may, at the ENGINEER's discretion, be poly wrapped. The poly wrap shall conform to AWWA Standard C104. The unit price bid for the poly wrap shall include all labor, material, and equipment necessary to install the poly wrap.

207.1.4 Water Service Materials

207.1.4.1 Corporation Stop 3/4 inch and 1 x 1-1/4 inch shall be Mueller H-15000 or Ford F600 or approved equal. 2 inch shall be Mueller B20285 or Ford B81-777 or approved equal.

207.1.4.2 Curb Stop 3/4 inch and 1-1/4 inch shall be Mueller B-25204 or Ford B22-333 or B22-555 or approved equal. 2 inch services shall be Ford B-44-777 or approved equal.

207.1.4.3 Curb Box 3/4 inch and 1-1/4 inch services shall be Mueller H10308, Ford EA2-60-40-54R Buffalo style Armor Access Boxes or approved equal. Non metal curb boxes shall have a metal lid suitable for metal detection. 2 inch services shall be standard main gate valve box as per 207.1.2.5.

207.1.4.4 Service Saddle 2 inch service saddle shall be double strapped, ductile iron saddle with iron pipe threads and galvanized or cadmium plated straps, Ford F202, Rockwell 311, or approved equal.

207.1.4.5 2 inch Adapter 2 inch Adapter to connect copper pipe to ball valve shall be Ford C-84-77 or approved equal.

207.1.4.6 Copper Pipe Copper pipe for water services shall be in accordance with ASTM B88, Type "K" annealed, seamless copper.

207.1.4.7 Copper Pipe Fittings Fittings for copper pipe shall have flared type connection with the exception that 2 inch copper pipe fittings may have compression type connections with locking devices.

207.1.4.8 Meter Box Fittings

Meter Box Cover – The meter box cover shall be a Ford Meter Box Monitor cover Model MC-24-T or approved equal.

Meter Box – The meter box shall be a Hancor HDPE Model MP NL 1 24 0008 or approved equal.

Meter Yolks – The meter yolks used for setting meters in meter boxes shall be:

- 3/4" service w/ 5/8" meter – Ford Meter Box Co. Model VB82W-22-33 or approved equal.
- 3/4" service w/ 3/4" meter – Ford Meter Box Co. Model VB83W-22-23 or approved equal.
- 1-1/4" service w/1" meter – Ford Meter Box Co. Model VB84W-22-55 or approved equal.

207.2 Sewers

207.2.1 Materials

207.2.1.1 Pipe All sewers installed shall be of the type (storm or sanitary) and size indicated on the drawings.

207.2.1.1.1 The following approved materials shall conform to the applicable ASTM, AASHTO, and other applicable specifications. All other types must meet with the approval of the City Engineer.

Sanitary Sewers
Extra Strength Clay Pipe (ASTM C700)
Concrete Sewer Pipe (ASTM C76/AASHTO M170)
Plastic (PVC) Pipe SDR 26 ≤ 15" Diameter (ASTM D3033 or D3034)
18-24" Diameter, T-1 wall thickness (ASTM F679)
Asbestos-Cement Pipe (ASTM C428)
Ultra Rib Pipe (ASTM F794)
Armco A-2000 Pipe (ASTM F949, F794)
ADS N-12 SaniTite Pipe (ASTM F2648/AASHTO M294)

Storm Sewers
Reinforced Concrete Pipe (ASTM C76/AASHTO M170)
ADS N-12 SaniTite Pipe (ASTM F2648/AASHTO M294)

207.2.1.1.2 Corrugated metal pipe shall conform with current MDOT specifications and table. Pipe shall be Zinc or Bituminous coated in accordance with AASHTO specifications.

207.2.1.2 Joints Joints shall be one of the following unless otherwise called for on the Drawings or Special Specifications.

207.2.1.2.1 Rubber Rubber joints shall be "tylox", "Press-Seal", "Rubber Pressure Joint", "Ring-Tite", or approved equal, and installed according to the manufacturer's recommendations.

207.2.1.2.2 Corrugated Metal (on corrugated metal pipe only). Corrugated metal two (2) piece coupling bands or Contech's "Hugger" with rubber "O" Ring shall be used and installed according to the manufacturer's recommendations.

207.2.1.2.3 Bituminous Mastic Bituminous mastic joints shall be made when the joint surfaces are clean and dry, using "DeWitt #10", "Sewertite" by Philip Carey Company, or approved equal.

207.2.1.2.4 Slip Seal Bituminous precast rings of tapered design around the spigot and inside of the bell shall be cast on the pipe at the foundry. They must be kept clean and coated with a softening agent prior to using.

207.2.1.2.5 Sanitary Sewer Joints Joints shall be one of the following unless otherwise called for on the Drawings or Special Specifications:
Clay: ASTM C425
Concrete: ASTM C443
Asbestos-Cement: ASTM C1869
Plastic (ABS): ASTM D2680
Plastic (PVC): ASTM D3212 or D2855, ASTM F477

207.2.1.2.6 HDPE HDPE pipe is permitted only for 24" diameter pipe and under. Minimum cover shall be 3 feet measured from top of pipe to finished grade.

207.2.1.3 Laying of Pipe

207.2.1.3.1 Pipe shall be laid from the lower end of sewer upwards. The use of brick, lumps of clay, wood, etc. to level the pipe will not be permitted. Pipe joints shall be properly seated in accordance with the manufacturer's guidelines.

207.2.1.3.2 Each pipe shall be inspected for possible defects before being placed in the trench. Joint surfaces shall be free of earth or frozen matter.

207.2.1.3.3 All pipe shall be laid with bell ends up-grade to line and grade as called for on the plans and each pipe as laid shall be checked by the CONTRACTOR. After laying of pipe, care in backfilling and other operations shall be taken so as not to disturb its line or grade.

207.2.1.3.4 Pipe joints on sewer 36" diameter and larger shall be pointed up on inside with ASTM F100 grout by Sauereisen, Five Star Grout or equal after backfilling has been completed.

207.2.1.3.5 The CONTRACTOR shall excavate to the required grade for the type of bedding specified. Bell holes for bell and spigot pipe shall be dug at each joint. As work progresses, the interior of the sewer shall be cleaned of all dirt, jointing material and foreign material of every description. On small sewers, where cleaning after laying may be difficult, a swab or drag shall be kept in the pipe lines and pulled forward past each joint immediately after its completion.

207.2.1.4 Concrete Cradle Where required, a concrete cradle shall be constructed of 1500 psi concrete, having a minimum thickness of 4" under the pipe and extending up the sides of the pipe equal to one-fourth its outside diameter. Concrete cradle shall have no slump and shall be mechanically mixed. Payment for concrete cradle shall be as provided in the Bid Proposal.

207.2.1.5 Pipe Bedding

207.2.1.5.1 Storm Sewer In earth other than free draining sand or gravel, all pipe shall be laid with Class B bedding unless otherwise specified. Class B bedding: The pipe shall be bedded in compacted granular material placed on a flat bottom trench. The granular material shall be MDOT IIA. The granular bedding shall have a minimum thickness of 6 inches below the pipe and shall extend to the spring line of the pipe as per SD-122. Cost of furnishing and placing bedding shall be included in the price for sewer installation.

207.2.1.5.2 Sanitary Sewers

207.2.1.5.2.1 Bedding Classes A, B, or C, as described in the latest ASTM C12 Standard (ANSI A106.2) or WPCF MOP No. 9 (ASCE MOP No. 37) shall be used for all rigid pipe provided the proper strength pipe is used with the specified bedding to support the anticipated load.

207.2.1.5.2.2 Bedding Classes I, II, or III as described in ASTM D2321 (ANSI K65-171) shall be used for all flexible pipe provided the proper strength pipe is used with the specified bedding to support the anticipated load.

207.2.1.6 Clearance to Water Main Minimum clearance to a public supply water main shall be as follows: eighteen inches (18") vertically and ten feet (10') horizontally in accordance with GLUMRB "10 States Standards".

207.2.1.7 Sewer Saddles Sewer saddles for new connections on existing pipe shall be Romac Style "CB" Sewer Saddle, Fernco "Quikseal" Connector or approved equal.

207.2.1.8 Bore and Jack Construction All bore and jack materials shall be in accordance with MDOT Specification 401.03.I. Casing spacers shall be Uni-Flange Series 1300 Casing Spacers or approved equal.

207.2.1.9 Horizontal Directional Drilling The work generally consists of three phases, beginning with drilling a pilot hole from the surface or pit at a starting point to an exit pit at the surface beyond the obstacle or area that is to be avoided. The second phase consists of reaming the pilot hole to make it large enough for the pipeline to be installed. Finally, the pipeline is pulled into place. During the pipe pulling operation, drilling fluid (a bentonite, water, and polymer solution) is injected to stabilize the hole, remove cuttings, and lubricate the pipe.

207.2.1.9.1 Directional drilling CONTRACTORS or subcontractors and their field supervisory personnel shall have actively engaged in the installation of pipe using directional drilling for a minimum of five years.

207.2.1.9.2 Submittals shall be in accordance with the requirements of the City of Portage Specifications. The CONTRACTOR shall submit to the ENGINEER for review and comment, prior to commencing any work, a detailed statement of the drilling equipment, with a pulling gauge monitor, and tracking transmitter/devices selected and procedures to be used in performance of the work. A drilling fluid disposal plan shall also be submitted.

207.2.1.9.3 During the construction, a data sheet or drilling log for each pilot hole shall be prepared to document the location and depth of the drill head in relation to the found elevation and centerline of the drilling path at a minimum of ten (10) foot intervals. Locating and guidance can be completed by the walkover system or by wireless steering tool system.

207.2.1.9.4 Construction in other agencies rights of way or properties shall conform to the requirements of the regulating agency and the City of Portage Specifications.

207.2.1.9.5 Polyethylene pipe shall conform to the material designations of Plastic Pipe Institute (PPI) and ASTM, PE3408, ASTM F714 and AWWA C906. The pipe shall be made from a high density, molecular weight resin that is classified as TR-4 by the PPI in

accordance with ASTM D1248. The resin shall contain antioxidants and be stabilized for protection against ultra-violet degradation. Pipe shall have a cell classification of PE 345464C and meet or exceed all requirements of ASTM D3350. Pipe shall have a designated use color stripe applied during production. Pipe shall meet ANSI/NSF Standard 60 or 61 as applicable and be permanently identified as meeting all required standards.

207.2.1.9.6 Pipe size shall be DIPS nominal diameters. The minimum wall thickness for the directional drilling installation process shall be DR-11 with a minimum working pressure of 160 psi.

207.2.1.9.7 PVC pipe for horizontal directional drill installation method shall have fused joints and meet AWWA C900 or C905 as specified or noted, DR-18 test requirements. The pipe shall be extruded with plain ends suitable for fusing. The pipe shall be Fusible C900 or C905 as specified or noted and will be blue for potable water applications, purple for recycled or reclaimed water, green for sanitary sewer or force main applications and white for irrigation or storm sewer application.

207.2.1.9.8 Two Number 6 braided wires for tracing with a tensile strength equal to or greater than the pipe being pulled shall be utilized. Wires shall be secured to the pipe with tape at intervals not to exceed 10 feet. Wires shall be XHHW type with heat shrink encasement at all splices. Tracer wires shall terminate inside air relief structures or at valve box assemblies. Tracer wires shall extend 4' above the opening on structures.

207.2.1.9.9 The CONTRACTOR shall familiarize himself with the geologic characterization of the soil stratum at the proposed drilling path.

207.2.1.9.10 The CONTRACTOR shall be responsible for informing the ENGINEER of any changes that are required in the directional drilling procedure due to geologic conditions.

207.2.1.9.11 If any obstruction is encountered that stops the forward progress of the drilling operation or the pull back process, the CONTRACTOR and ENGINEER shall review the situation and jointly determine the feasibility of continuing drilling operations, making adjustments or switching to an alternative construction method.

207.2.1.9.12 Launching and recovery pits shall be as small as practicable. Dewatering of pits and excavations shall be done in accordance with the General Provisions and the City of Portage Specifications. When water is encountered, the CONTRACTOR shall provide a dewatering system of sufficient capacity to keep any

excavation free of water until the backfill operation is in progress. Dewatering shall be performed in a manner such that removal of soil particles is held to a minimum. Water from the dewatering system shall be desilted before discharge. Methods of dewatering and desilting, including all costs, shall be the CONTRACTOR's responsibility.

207.2.1.9.13 Drilling path shall be walked in the presence of the ENGINEER, RPR, CONTRACTOR, CONTRACTOR'S Superintendent, and subcontractor, if applicable, with the guidance system that shall be used for each segment of drill path. The CONTRACTOR shall locate and record any surface and subsurface magnetic variations or abnormalities and all points of interference, as well as verifying all utilities location and corresponding utility maps. Should any discrepancy arise between utility maps, field locations, and guidance system findings the CONTRACTOR shall clarify all discrepancies prior to beginning drilling operations. The drill path survey shall be performed no earlier then two (2) days prior to commencing drilling operations. Provide ENGINEER 48-hour notice of drill path survey.

207.2.1.9.14 The drilling equipment shall be capable of placing the pipe within the planned line and grade. The drilling equipment shall be capable of pulling product pipe from either the downstream or upstream location. The equipment must be adequately sized for the application. The guide system shall have the capability of measuring inclination, roll and azimuth. The guidance system shall have an independent means to ensure the accuracy of the installation. The CONTRACTOR shall demonstrate a viable method to eliminate accumulated error due to the inclinometer (pitch or accelerometer). The guidance system shall be capable of generating a plot of the borehole survey for the purpose of a record drawing.

207.2.1.9.15 The guidance system shall meet the following specifications:

Inclination:	Accuracy	+ 0.05
	Range	+ 90
	Repeatability	+ 0.02
Roll:	Accuracy	+ 0.05
	Range	+ 90
Azimuth:	Accuracy	+ 0.05
	Range	+ 90

Equipment set-up requirements at the launch and recover locations shall be determined by the CONTRACTOR in accordance with the Contract

Drawings and submitted to the ENGINEER per the requirements of the City Standard Specifications.

207.2.1.9.16 Pilot Hole Drilling: The entry angle of the pilot hole and the boring process shall maintain a curvature that does not exceed the allowable bending radii of the product pipe. The CONTRACTOR shall follow the pipeline alignment as shown on the Drawings, within the specification requirements. The location and depth of the drill head in relation to the profile and centerline of the alignment shall be determined at a maximum of ten foot intervals.

207.2.1.9.17 In the event of difficulties at any time during drilling operations requiring the complete withdrawal from the tunnel, the CONTRACTOR shall either be allowed to withdraw and abandon the tunnel and begin a second attempt at a different location; or excavate at the point of the difficulty and install the product pipe by an alternate method of installation. Either alternative shall be approved by the ENGINEER before the CONTRACTOR withdraws.

207.2.1.9.18 Access pits shall be at the beginning and end of the segments shown on the Drawings. Intermittent pits shall be approved by the ENGINEER prior to proceeding with drilling operations. No intermittent access pits shall be allowed in wetland areas.

207.2.1.9.19 Installing Product Pipe: After the pilot hole is completed, the CONTRACTOR shall install a swivel to the reamer and commence pullback operations. Reaming diameter shall not exceed 1.5 times the outside diameter of the product pipe being installed. The product pipe being pulled into the tunnel shall be protected and supported so that it moves freely and is not damaged by stones and debris on the ground during installation. Tracer wire shall be attached to product pipe before pullback operations begin. Pullback forces shall not exceed the allowable forces for the product pipe.

207.2.1.9.20 The CONTRACTOR shall allow sufficient lengths of product pipe to extend past the termination point to allow connections to adjacent pipe sections, manholes, or tees. Pulled HDPE pipe shall be allowed 24 hours for stabilization prior to making tie-ins. Any required length of extra product pipe shall be at the CONTRACTOR's discretion. Restrained connections to conventional water main or appurtenances shall be made using a mechanical-joint adapter with stainless steel stiffener or approved equal.

207.2.1.9.21 All pipe sections, specials, and jointing materials shall be carefully examined for defects and no piece shall be laid that is known to be defective. Any defective piece discovered installed shall be removed and replaced with a sound one in a manner satisfactory to the Resident

Project Representative at the CONTRACTOR's expense. Defective material shall be marked with lumber crayon and removed from the job site before the end of the following day. Pressure and leakage testing shall be in conformance with the City of Portage Standard Specifications.

207.3 Sewer Structures

207.3.1 General

207.3.1.1 Structures shall be hard-burned common-brick, concrete radial block, reinforced concrete or precast concrete unless a specific type is called for in the Supplementary Specifications or on the Drawings. Brick shall be thoroughly wetted and laid in a full bed of mortar. The laying of the brick shall never be more than three (3) courses ahead of the exterior plaster. Brick and precast concrete block shall only be allowed if approved by the ENGINEER.

207.3.1.2 Floors shall be at least eight inches (8") thick and shall extend six inches (6") outside the wall of the structure. Precast floor slabs may be used if a uniform bearing can be obtained.

207.3.1.3 The wall thickness of manholes constructed of various materials and set at various depths shall be as follows:

Depth	Brick	Poured Concrete	Precast	Concrete Block
0-8'	8"	6"	5"	6"
8'-15'	8"	8"	5"	8"
15'+	12"	12"	5"	12"

Minimum inside diameter shall be 48". Sanitary sewer manholes shall be either poured concrete or precast.

207.3.1.4 All precast sanitary manholes shall conform to ASTM C478 with O-ring rubber gasket type joints, ASTM C443 and Butyl Rubber Joint Sealant Conforming to SS-S-210A. All pipe openings in precast sanitary manholes shall be fitted with a resilient rubber boot, utilizing stainless steel bands as per SD-105.

207.3.1.5 All brick and concrete work shall be properly cured and protected from freezing for a minimum of 72 hours. When the temperature is expected to be below 40° F during placing or within 24 hours thereafter, cold weather concreting in accordance with ACI 306R shall apply, mortar and concrete shall be heated to a minimum temperature of 70°.

207.3.1.6 Brick and block manholes shall be plastered on the outside with at least 1/2" of mortar in a manner that will seal the structure completely.

207.3.1.7 A minimum of three (3) courses and a maximum of six (6) courses of brick shall be placed above the top of the cone section of all poured, precast or block manholes and inlets when the structures are installed in non-curb and gutter areas. When in curb and gutter areas, only the maximum adjustment shall apply. When specified by the ENGINEER, recycled rubber adjustment rings shall be used for the final adjustment between pavement and the cone section. Rubber adjustment rings shall be EJ Infra-riser or American Highway Products Flex O Ring or approved equal.

207.3.2 Materials

207.3.2.1 Concrete Concrete for bases and poured structures shall have a compressive strength of 3,000 psi and a minimum of five (5) sacks of cement per cubic yard. Slump shall not exceed three inches (3"). Aggregates shall meet current MDOT requirements.

207.3.2.2 Brick Brick shall be Grade MS conforming to the requirements of the Standard Specifications for Sewer Brick. American Society for Testing Materials, Designation C-32.

207.3.2.3 Mortar Block Mortar block shall meet ASTM requirements for load bearing Concrete Masonry Units C-90, Grade N-II (MDOT).

207.3.2.4 Water Water for concrete or mortar shall be clean and fresh, free from oil, acids or organic matter.

207.3.2.5 Mortar for laying brick or block and plastering outside of structure shall be C-270, Type S composed of one (1) part portland cement and two (2) parts fine aggregate MDOT 2NS - Specifications. The mortar cement shall be of the "non-shrinking" characteristic.

207.3.2.6 Frame and Cover The manhole frame and cover shall be of gray iron conforming to ASTM A48, Class 35 in a solid cover of design conforming to the Standard Details. All frames and covers shall be dipped in coal tar varnish. Castings shall be free from pouring faults, sponginess, cracks, blowholes, blisters, shrinkage strains, and other defects. Plugging of defective castings is not permitted. Castings shall be true to pattern in form and dimension. Weight of castings shall not vary by more than 5 percent from published weight. CONTRACTOR shall submit invoices showing actual weight of casting as certified by manufacturer. Castings shall have machined bearing surfaces. All castings shall be coated with non-toxic, nonflammable, water-based, asphalt paint. Lettering shall be cast on covers. Unless indicated otherwise, the manufacturer's name shall be cast in cover. Covers for sanitary sewer manholes shall be solid lids and labeled "Sanitary Sewer". Castings for Storm Sewer Structures shall include the phrases "DUMP NO WASTE" and "DRAINS TO WATERWAYS" with the "eco-fish" symbol. All storm sewer manhole covers shall be vented.

207.3.2.7 Manhole Steps Manhole steps shall be one inch (1") high-grade aluminum or cast iron with foot recess and suitably scored so as to provide a non-slip surface, or as approved by the ENGINEER. The step shall be placed fifteen inches (15") apart (center to center) with the top step no more than twenty-four inches (24") from the top of casting and the bottom step no farther than twenty-four (24") inches from the bench of the manhole.

207.3.3 Installation

207.3.3.1 Backfilling After the structure and mortar have set up sufficiently to avoid damage, backfilling shall be done in a manner that will not cause unequal pressure on the structure. No material except MDOT Class II or native material if approved by the ENGINEER shall be placed within three feet (3') of the structure.

207.3.3.2 Drop Manholes Drop manholes shall be constructed in accordance with SD-105 unless otherwise stated in the Contract Documents.

207.3.3.3 Covers "Covers", as specified, will be included in the contract unit price for manholes, which shall constitute furnishing new castings and other materials and placing and adjusting the castings.

207.3.3.4 Reconstruction "Reconstructing Manholes", "Reconstructing Catch Basins", and "Reconstructing Inlets" will be paid for at the contract unit price each, which shall constitute payment in full for furnishing the labor and materials and fittings, and for all necessary excavation, backfilling, and proper disposal of surplus material necessary to complete the reconstruction.

207.4 Oil/Sediment In-Line Separators Storm water treatment devices shall be in accordance with the current City Storm Water Design Criteria Manual.

207.5 Chain-Link Fence Install chain-link fence, as manufactured by American Steel and Wire Company, Continental Steel Corporation, or approved equal.

Fabric shall be 9-gage wire (before vinyl coating) woven in a 2-in mesh with knuckled top and bottom salvage. Fence fabric shall have a brown vinyl coating.

Corner posts and gate posts shall be 3-inch outside-diameter round vinyl coated and shall be braced and trussed. Corner posts shall conform to ASTM A120 (Schedule 40). Line posts shall be 2-1/2 inch outside diameter round vinyl coated 10 feet on center, with a minimal weight of 1.33 pounds per lineal foot.

Footings for corner and gate posts shall be 12 inches in diameter and shall be 40 inches deep with posts set 36 inches deep.

Footings for line posts shall be 12 inches in diameter and shall be 36 inches deep with posts set 32 inches deep.

Top and bottom rail shall be 1-5/8 inches outside-diameter round vinyl coated pipe.

Fence shall be 6 feet high above grade, using 6 foot vinyl coated fence fabric.

The gate frames shall be made of 2 inch vinyl coated tubing and joined at the corners to form a rigid panel. The frame shall be filled with the same vinyl coated fence fabric as used for the fence. The fabric shall be fastened to the frame on all four sides, by means of adjustable hook bolts and tension rods.

The gate shall be 12 feet wide and capable of being opened and closed easily by one person.

Gate latches shall be a “Fence Loc” latch manufactured by Cargo Protectors, Inc. or an approved equal.

207.5 Retaining Wall, Block The work under this item shall be preformed in accordance with Section 706 of the 2012 MDOT Standard Specifications for Construction and manufacturer specifications, with exceptions noted below.

This work shall consist of all labor, material, and equipment necessary to furnish and install the block retaining wall as shown on the plans and herein described.

The masonry wall shall be built of classic units in antique red color, manufactured by Rockwood Retaining Walls, Inc., phone number (800) 536-2376.

The CONTRACTOR shall prepare the new embankment grade, place geotextile liner identical to that required for heavy rip rap, and place the block retaining wall units.

The block retaining wall will be measured by length and multiplied by the average height, measured from the bottom of the first course to the top of the top course, to obtain the face area of block retaining wall actually installed. The CONTRACTOR shall be paid this unit price bid per square foot of block retaining wall actually built.

208.0 QUALITY CONTROL

208.1 Water Mains

208.1.1 Pressure Tests

208.1.1.1 General Preliminary testing of mains shall be done by the CONTRACTOR to ascertain if there are any major leaks. Final pressure tests shall be made in the presence of the ENGINEER who shall receive 24 hour notice prior to testing. If it is necessary for the ENGINEER to supervise more than one test, the CONTRACTOR will be liable for the additional cost involved. Operation of system valves shall only be done by the CITY or the CITY's contract operator. **The CONTRACTOR shall not operate valves on an active system.**

208.1.1.2 Test Restrictions Test pressure shall not be less than 1.25 times the working pressure at the highest point along the test section. Test pressure shall not exceed pipe or thrust-restraint design pressures. The hydrostatic test shall be of at least a 2 hour duration. The pressure shall not vary by more than 5 psi (35 Mpa or 0.35 bar) for the duration of the tests.

Valves shall not be operated in either direction at differential pressure exceeding the rated valve working pressure. Use of a test pressure greater than the rated valve pressure can result in trapped test pressure between the gates of a double-disc gate valve. For tests at these pressures, the test setup should include provision, independent of the valve, to reduce the line pressure to the rated valve pressure on completion of the test. The valve can then be opened enough to equalize the trapped pressure with the line pressure, or fully opened if desired.

208.1.1.3 Pressurization After the new pipe has been placed, it shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the lowest point along the test section. Each valved section of pipe shall be slowly filled with water, and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the CITY. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. The system shall be allowed to stabilize at the test pressure before beginning the leakage test.

208.1.1.4 Air Removal Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the CONTRACTOR shall install additional corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the unneeded corporation cocks shall be removed and plugged at the CONTRACTOR's expense.

208.1.1.5 Examination Any exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until it is satisfactory to the ENGINEER.

208.1.1.6 Leakage Defined Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi (35 Mpa or 0.35 bar) of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

208.1.1.7 Testing Allowance Testing allowance shall be defined as the maximum quantity of makeup water that is added in to a pipeline undergoing hydrostatic testing, or any valved section, thereof, in order to maintain pressure within +/- 5 psi (34.5 kPa) of the specified test pressure (after the pipeline has been filled with water and the air has been expelled). No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = SD\sqrt{P} \div 148{,}000$$

Where: L = Testing allowance, in gallons per hour
S = Length of Pipe Tested, in feet
D = Nominal Diameter of the Pipe, in inches
P = Average test pressure during the hydrostatic test, in pounds per square inch

This formula is based on an allowable leakage of 10.49 gpd/mi/inch of nominal diameter at a pressure of 150 psi. The allowable leakage for the various sizes of pipe is shown in the following table:

Hydrostatic Testing Allowance per 1,000 Feet of Pipeline *

Avg. Test Pressure psi	(bar)	4	6	8	10	12	14	16	18	20	24	30	36	42	48	54
450	(31)	0.57	0.86	1.15	1.43	1.72	2.01	2.29	2.58	2.87	3.44	4.30	5.16	6.02	6.88	7.74
400	(28)	0.54	0.81	1.08	1.35	1.62	1.89	2.16	2.43	2.70	3.24	4.05	4.86	5.68	6.49	7.3
350	(24)	0.51	0.76	1.01	1.26	1.52	1.77	2.02	2.28	2.53	3.03	3.79	4.55	5.31	6.07	6.83
300	(21)	0.47	0.70	0.94	1.17	1.40	1.64	1.87	2.11	2.34	2.81	3.51	4.21	4.92	5.62	6.32
275	(19)	0.45	0.67	0.90	1.12	1.34	1.57	1.79	2.02	2.24	2.69	3.36	4.03	4.71	5.38	6.05
250	(17)	0.43	0.64	0.85	1.07	1.28	1.50	1.71	1.92	2.14	2.56	3.21	3.85	4.49	5.13	5.77
225	(16)	0.41	0.61	0.81	1.01	1.22	1.42	1.62	1.82	2.03	2.43	3.04	3.65	4.26	4.86	5.47
200	(14)	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29	2.87	3.44	4.01	4.59	5.16

175	(12)	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15	2.68	3.22	3.75	4.29	4.83
150	(10)	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99	2.48	2.98	3.48	3.97	4.47
125	(9)	0.30	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81	2.27	2.72	3.17	3.63	4.08
100	(7)	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62	2.03	2.43	2.84	3.24	3.65

*If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

208.1.1.8 Water Water for making tests will be furnished by the CITY if it is available under pressure; otherwise by the CONTRACTOR at his expense.

208.1.1.9 Valves When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gph/in. of nominal valve size shall be allowed.

208.1.1.10 Hydrants Acceptance shall be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than that specified in Section 208.1.1.7, the CONTRACTOR shall, at his own expense, locate and make approved repairs as necessary until the leakage is within the specified allowance.

208.1.1.11 Visible Leaks All visible leaks shall be repaired, regardless of the amount of leakage. All piping shall be “Bottle Tight” at system pressure prior to acceptance.

208.1.2 Disinfection

208.1.2.1 General The CONTRACTOR shall disinfect all new water mains in accordance with AWWA Standard C651, in a manner acceptable to the MDEQ. The use of chlorine tablets and/or powder is not acceptable when placed in the pipe during construction.

208.1.2.2 Flushing Flush out the new pipe lines until the water runs clear. This shall be done after the pressure test and before disinfection. Each valved section of the newly laid pipe shall be flushed separately with potable water from the public supply. The CONTRACTOR shall notify the water utility responsible for maintenance of the existing system prior to any scheduled flushing. Flushing shall provide a minimum of 2.5 feet per second of water velocity. The following table lists the flow in gallons per minute required to obtain the minimum flow rate of 2.5 feet per second:

Pipe Size	Minimum Flow in Gallons Per Minute
4-Inch	100
6-Inch	225
8-Inch	400
10-Inch	625
12-Inch	900
16-Inch	1,600
20-Inch	2,500

208.1.2.3 Disinfection Disinfect the pipe lines in accordance with AWWA C651 with chlorine applied either as a gas from cylinders through a portable solution feed chlorinator or by the introduction of a hypochlorite solution. Calcium hypochlorite in commercial grades contains about 65% to 70% of free chlorine. Hypochlorite powder shall first be made into a paste and then thinned to 1% chlorine solution.

208.1.2.4 Application The point of application of the chlorinating agent shall be at the beginning of the pipe line extensions, any valved section of it, or through a corporation cock inserted in the newly laid pipe. Water from the existing distribution system shall be controlled to flow very slowly into the newly laid pipe during the application of chlorine. Partially open the end-most hydrant or valve on the section of pipe line under treatment to permit the flow of water through the pipe line and to prevent the building up of water pressure in excess of twenty (20) psi. Continue treatment until the flow of water from the far end of the main contains sufficient residual chlorine, 40 to 50 parts per million, as determined by the drop dilution test as per Michigan Department of Health Instructions.

The treated water shall remain in the pipe line for a minimum of twenty-four hours, following which period the main shall be thoroughly flushed until all of the heavily chlorinated water is removed. Test water samples with orthotolidine reagent to see that the replacement water is chemically and bacteriologically acceptable.

208.1.2.5 Samples Bacteriological water samples shall be collected by the ENGINEER or his duly authorized representative from the end of the main being tested. Analysis of the sample shall be made by a State approved laboratory. If the results are unsafe, the disinfection process shall be repeated. The responsibility for the test rests with the CONTRACTOR who shall also be liable for any costs to the ENGINEER when more than two treatments or tests are necessary. Two samples will be required with the second sample taken 24 hours after the first sample in accordance with AWWA Standard C651.

208.1.2.6 Sampling Distances Bacteriological water samples shall be collected in accordance with current AWWA, MDEQ and Michigan Department of Public Health guidelines. Sampling points shall be located between the beginning of the new main and the chlorination point and also at the end of the newly installed water main or every 1,000 lineal feet whichever is the smaller distance. In no case shall the distance between sampling points exceed 1,200 lineal feet.

Upon completion of the sampling, any corporation fitting(s) used shall be removed and permanent brass plug(s) installed as approved by the ENGINEER.

208.1.3 Electrical Conductivity

208.1.3.1 General All cast iron, ductile iron pipe and fittings furnished and installed under this contract shall be provided with electrical conductivity connections as described in Sections 208.1.3.2 and 207.1.2.8 of these specifications.

208.1.3.2 Testing If requested by the ENGINEER, after installation of the mains and before backfilling of the joints, the CONTRACTOR shall verify to the ENGINEER's satisfaction, that the system (pipeline and mechanical joint fittings) provide for electrical continuity across each joint and fitting.

This test can be accomplished by attaching one lead of a simple volt/ammeter tester to one side of the joint or fitting and the other lead to the opposite side of the joint or fitting and observing that a current is being conducted. If the CONTRACTOR wishes to employ other means of testing, the CONTRACTOR must first outline the procedure for the approval of the ENGINEER.

208.2 Sanitary and Storm Sewers

208.2.1 General All tests shall be performed under the observation of the ENGINEER or RPR. Prior to connecting any active sewer services or extending services beyond the property line, the new sewers and services shall be tested for alignment and leakage. The sewer shall be thoroughly cleaned before the ENGINEER is requested to witness or perform any tests.

208.2.2 Alignment Sewers must be straight between manholes and will be tested for straightness by lamping between manholes or by other means acceptable to the ENGINEER.

208.2.3 Minimum Slopes All sewers shall be designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet per second (0.6 m/s), based on Manning's formula using an "n" value of 0.013. The following are the recommended minimum slopes which should be provided; however, slopes greater than these are desirable.

Nominal Sewer Pipe Size	Minimum Slope in Feet Per 100 Feet (m/100 m)
8 inch (200 mm)	0.04
10 inch (250 mm)	0.28
12 inch (300 mm)	0.22
14 inch (350 mm	0.17
15 inch (375 mm)	0.15
16 inch (400 mm	0.14
18 inch (450 mm	0.12
21 inch (525 mm	0.10
24 inch (600 mm)	0.08
27 inch (675 mm	0.067
30 inch (750 mm)	0.058
33 inch (825 mm)	0.052
36 inch (900 mm)	0.046
39 inch (975 mm)	0.041
42 inch (1050 mm)	0.037

208.2.4 Deflection

208.2.4.1 Deflection tests shall be performed on all flexible pipe. The test shall be conducted after the final backfill has been placed and prior to installing any asphalt or concrete surface, unless otherwise approved by the ENGINEER. The ENGINEER may require that a second deflection test be performed 30 days or more after the initial test.

208.2.4.2 Maximum deflection under full load shall not exceed 5% of the ASTM designated average inside diameter as determined by the laboratory for the specified piping. Should a pipe exceed the allowable deflection, the CONTRACTOR shall, at his expense, replace those pipes and retest the section.

208.2.5 Leakage (sanitary only)

Leakage tests shall be specified. This may include appropriate water or low pressure air testing. The testing methods selected should take into consideration the range in groundwater elevations during the test and anticipated during the design life of the sewer.

208.2.5.1 Water (Hydrostatic) Testing The leakage exfiltration or infiltration shall not exceed 100 gallons per inch of pipe diameter per mile per day [9L/(mm of pipe diameter/ km/day] for any section of the system. An exfiltration or infiltration test shall be performed with a minimum positive head of 2 feet (0.6m).

208.2.5.1.1 General Unless otherwise called for in the Special Specifications, the maximum allowable infiltration or exfiltration shall be 100 gallons per day per inch of diameter per mile of pipe. The joints shall be tight and any visible leakage in the joints and leakage in excess of that specified shall be repaired.

Branch fittings and ends of house service stubs shall be securely plugged to withstand test pressure. The section of line being tested shall also be securely plugged as required. All plugs shall be adequately braced.

No section tested may show a leakage over the allowable limit and the average leakage for the project shall not exceed the allowable limit. All manholes will be inspected for visible leakage and the CONTRACTOR shall make all necessary repairs.

208.2.5.1.2 Infiltration Where the ground water level is above the top of the pipe, the sewer shall be tested for infiltration. The CONTRACTOR shall furnish, install and maintain a “V” notch weir, tightly secured to the low end of each section of sewer, so that the infiltration may be checked. The weir shall be direct reading of an approved design calibrated to read gallons per day. When the infiltration is demonstrated to be within the allowable limits, the CONTRACTOR shall remove

the weirs and all framing, leaving the sewers and manholes clean and free of any debris.

208.2.5.1.3 Exfiltration Exfiltration tests will be required only when the natural or induced ground water table is less than 2 feet over highest point in pipeline under test, including house services. Exfiltration tests shall be made by filling the line to minimum depth of 2 feet above the high point of the line under test, with allowance for ground water level, and measuring the water required to maintain this level.

208.2.5.2 Low Pressure Air Where approved by the ENGINEER, the CONTRACTOR may perform low pressure air acceptance tests in lieu of infiltration and exfiltration tests. The CONTRACTOR shall furnish all equipment and personnel to conduct an acceptance test using low pressure air in accordance with ASTM F1417.

Air shall be slowly supplied to the plugged pipe line until the internal air pressure reaches 4.0 pounds per square inch greater than the average back pressure of any ground water that may submerge the pipe. At least two minutes shall be allowed for temperature stabilization before proceeding further.

The rate of air loss shall then be determined by measuring the time interval required for the internal pressure to decrease from 3.5 to 2.5 psi.

The pipe line shall be considered acceptable if the time interval for the 1.0 psi pressure drop is not less than the holding time listed in 208.2.5.2.2.

208.2.5.2.1 Water Table Conditions In areas where ground water is known to exist, the CONTRACTOR shall determine the extent of ground water over the invert of the pipe and apply additional pressure to the test pressure as follows:

Extent of Ground Over Invert of Pipe	Pounds of pressure to be Added to Test Pressure
1 foot	0.5
2 feet	0.8
3 feet	1.3
4 feet	1.7
5 feet	2.1
6 feet	2.6
8 feet	3.4
10 feet	4.3
12 feet	5.2
14 feet	6.1
16 feet	6.9

208.2.5.2.2 Table for Loss Time required for loss of pressure from 3.5 PSIG to 2.5 PSIG for size and length of pipe indicated for Q = 0.003 (cu. ft./min/sq. ft. of internal surface area).

Pipe Diam-eter (in.)	Mini-mum Time (min: sec.)	Length for Mini-mum Time (ft.)	Time for Longer Length (sec.)	Specification Time for Length (L) Shown (min:sec)										
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft	500 ft	550 ft	600 ft
4	1:53	597	.190L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:54
6	2:50	398	.427L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12	3:34	3:55	4:16
8	3:45	298	.760L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42	6:20	6:58	7:36
10	4:43	239	1.187L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54	9:54	10:53	11:52
12	5:40	199	1.709L	5:40	5:40	5:42	7:08	8:33	9:48	11:24	12:50	14:15	15:40	17:06
15	7:05	154	2.671L	7:05	7:05	8:54	11:08	12:21	15:35	17:48	20:02	22:16	24:29	26:43
18	8:30	133	3:846L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51	32:03	35:16	38:28
21	9:55	144	5:235L	9:55	13:05	17:27	21:11	30:11	30:32	34:54	39:16	43:37	47:59	52:21
24	11:20	99	6:837L	11:24	17:57	22:48	28:30	34:11	39:11	45:35	51:17	56:59	62:41	68:23
27	12:45	88	8:653L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54	72:07	79:20	86:33
30	14:10	80	10:683L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07	89:02	97:56	106:51
33	15:35	72	12:926L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57	107:44	118:31	129:17
36	17:00	66	15.384L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23	128:13	141:02	153:51
39	18:25	61	18.054L	30:57	45:09	60:11	75:14	90:16	105:19	120:22	135:24	150:32	165:31	180:34
42	19:50	57	20.939L	34:54	52:21	69:48	87:15	104:42	122:09	139:36	157:03	174:31	191:58	209:25

NOTE: When 2 sizes of pipe are involved, the time shall be computed by the ratio of lengths involved.

Example: 400 feet of 10 inch pipe and 200 feet of 6 inch pipe.

$$\text{Time} = \frac{\text{Length}_1 \times \text{Time}_1 + \text{Length}_2 \times \text{Time}_2}{\text{Length}_1 + \text{Length}_2} =$$

$$= \frac{400 \times 7{:}54 + 200 \times 2{:}50}{400 + 200} = \frac{400 \times 474 + 200 \times 170}{400 + 200}$$

= 373 seconds = 6.13 (min:sec)

208.2.6 Televising This item shall consist of televising the sewer to check for misalignment, infiltration, defective pipe or joints, debris and the location of wyes. The digital video disc must have a screen record of date, project name and number and stationing to assist in locating physical features such as joints, wyes and other items listed above. The disc, along with written log and backup copy, shall be furnished to and become the property of the CITY prior to acceptance.

208.3 Roadways

208.3.1 Subgrade

208.3.1.1 Compaction All roadway subgrades shall have the proper compaction tests performed on it to verify that all materials have been compacted to within 95% MDD.

Compaction tests shall be performed on each 500 feet of roadway or as otherwise directed by the ENGINEER.

208.3.1.2 Grade Control All roadway subgrades shall be checked by means of stretching a string line across the entire roadway and verifying that the proper cross slope in relation to the center line of the roadway has been provided.

This testing will be done for a maximum of every 200 lineal feet of roadway with measurements taken at the center line, 1/4 points and edge of pavement.

208.3.2 Gravel Finish gravel grades shall be checked in accordance with the specifications in section 208.3.1. In addition, a certified sieve analysis of the gravel shall be provided for the material from its source site. If the material is obtained from more than one site, then such analysis must be provided for each site.

208.3.3 HMA (Bituminous Pavement)

208.3.3.1 Mix Design Prior to laying of any bituminous materials for a roadway, the CONTRACTOR must submit for approval a "mix design" from his supplier.

203.3.3.2 Extraction Testing Sufficient materials will be supplied from the job site by the CONTRACTOR to an approved independent laboratory for the purpose of performing an extraction test. One sample shall be taken for every 400 tons of material, or fraction thereof, delivered to the site.

An extraction test (AASHTO T164-70) and a mechanical analysis (AASHTO T30-70) shall be performed on the mix samples. It shall be the responsibility of the CONTRACTOR to have the samples tested by the approved laboratory which shall furnish to the ENGINEER two (2) copies of the results.

208.3.3.3 Material Yield During the paving operations, "yield" calculations shall be performed on each 300 lineal feet of paving to show the average thickness of pavement being installed. This "yield" shall agree with designed pavement thickness shown on the construction drawings when unit weight is calculated at 110 lb/syd./in.

208.3.4 Concrete

208.3.4.1 Paving Before the CONTRACTOR starts work he will be required to submit and have approved a design mix with evidence that said mix will meet all the requirements of the Specifications. This information shall be furnished by an approved laboratory which shall also check slump, entrained air content and make two (2) test beams for each pour of 250 cubic yards of concrete or less and a set for each additional 250 cubic yards or fraction thereof. It shall be the responsibility of the CONTRACTOR to have the beams delivered to the laboratory, properly cured, and tests performed by an approved laboratory which shall furnish the ENGINEER with

two (2) copies of the results. If the test beams are lost or mishandled, the CONTRACTOR shall have cores taken from the pavement affected and furnish two copies of reports of their strength to the ENGINEER.

Unless otherwise provided for in the Special Specifications and/or Bid Proposal, the cost of laboratory and tests shall be incidental to the unit price for Concrete Pavement.

208.3.4.2 Curb and Gutter The CONTRACTOR shall provide a minimum of three test cylinders per every 500 lineal feet of curb and gutter installed to be tested by a certified laboratory. These cylinders will be tested to show the level of the flexure or compression strength of the cylinders at 7 days and 28 days.

208.3.4.3 Side Walk The CONTRACTOR shall provide a minimum of 3 test cylinders per each daily pour of concrete to be tested by a certified laboratory. These cylinders will be tested to show the level of compressive strength of the cylinders at 7 days and 28 days.

209.0 RESTORATION

209.1 Sodding

209.1.1 General This work shall consist of furnishing and placing approved sod on the earth bed or approved soil and shall include preparation of earth bed and proper disposal of surplus material. No sod shall be placed when the temperature is below 32°F (0°C). No frozen sod shall be placed nor shall any sod be placed upon frozen soil.

209.1.2 Materials The sod shall be a minimum of four inches (4") in thickness and shall consist of a dense, well rooted growth of desirable perennial grasses free from noxious weeds.

209.1.2.1 Submittals Submittals shall be in accordance with the requirements of the City Specifications and shall include:

209.1.2.1.1 Shop Drawings for Review:

a. The CONTRACTOR shall indicate all variances from the requirements of the Contract Documents.

b. Manufacturer's material certification.

209.1.2.1.2. Information for the Record:

a. Submit to Resident Project Representative:

1) Invoices indicating the weight, brand, and composite analysis of fertilizer used on the project.

2) Bag tickets indicating weight and composition of all seed used on the project.

209.1.3 Payment Trees in easements shall be included in this Section, except as otherwise stated in the easement agreement. "Sodding" shall be paid for at the contract unit price per square yard and shall be payment in full for all materials and labor.

209.2 Seeding & Mulching Seed shall be sown only between the dates of May 1st and October 15th, unless otherwise permitted by the ENGINEER. The operation of finish grading and sowing shall not be performed when the ground is frozen or muddy.

209.2.1 General Where grass areas maintained as a lawn are disturbed, the fill shall be compacted, seeded and mulched as follows:

209.2.2 Work This work shall consist of placing four inches (4") of top soil compacted, preparing the soil, application of fertilizer, sowing seeds of the mixture specified and placing mulch over the area seeded. The top soil shall be obtained from a source approved by the ENGINEER prior to material placement.

209.2.3 Topsoil Topsoil obtained from off-site shall consist of loose, friable, loamy topsoil without admixture of subsoil or refuse. It shall be reasonably free from peat, muck, roots, hard clay, coarse gravel, stones, weeds, tall grass, brush, sticks, or other litter. Each load of topsoil shall be subject to the approval of the ENGINEER. The fraction of topsoil passing a No. 10 sieve shall contain not more than 40% clay. Topsoil shall contain not less than 5% or more than 20% organic matter as determined by loss on ignition of oven-dried samples to constant weight at 212 deg F.

209.2.3.1 Class "A" Mixture Class "A" seed mixture shall be used for lawn areas that have been disturbed or for adjacent backslopes and shall be as follows:

	Percentages
Manhattan Rye	40%
Creeping Red Fescue	20%
Red Top	20%
Common Bluegrass	20%

209.2.3.2 Class "B" Mixture All other areas that have been disturbed shall be as follows:

	Percentages
Perennial Rye	30%
Kentucky Blue	20%
Creeping Red Fescue	30%
Alsike Clover	20%

209.2.3.3 Preparation of Area After the areas to be seeded have been brought to the required grade, the soil shall be loosened and mixed to a depth of four inches (4") until it is in a friable condition. (Chemical fertilizer of the 12-12-12 grade and worked into the soil 48 hours prior to seeding.)

209.2.4 Fertilizer The area to be seeded shall be disked and harrowed and all depressions filled in accordance with MDOT Item 621.03. Fertilizer shall be applied at a rate which will provide 240 lbs/acre of chemical fertilizer nutrients in equal proportions of Nitrogen, Phosphoric Acid, and Potash. Either dry or liquid fertilizer may be used and shall be distributed in an even pattern over the specified area, then thoroughly disked, harrowed, or raked into the soil to a depth of not less than 1 in.

All clods, rubbish, and stones greater than 1 in. in any dimension shall be removed and the area graded to a smooth surface. Hand raking will be required in areas

inaccessible to machines and will be required in areas of urban character and in front of residences where machines do not provide results equivalent to hand raking.

209.2.4.1 Rate Seed as specified above shall be sown at a rate of 6 pounds per 1,000 square foot for lawns. After seeding, the area shall be rolled.

209.2.5 Mulching Mulching consisting of clean straw or hay shall be spread over the surface of the seeded area at a uniform thickness at the rate of 100 pounds per 1,000 square feet. Within 48 hours after an area has been seeded, it shall be mulched in conformance with one of the following specified methods as designated in the Special Provisions or the Contract Item for Seeding:

Hay or Straw Mulch:

a. Mulching with hay or straw shall be in conformance with mulching requirements of MDOT Sections 816.03E and 816.03G, except that in front of residences the mulching material shall be kept in place by an approved non-tracking adhesive or other approved method in lieu of the specified asphalt emulsion.

b. Matting used for mulching shall be placed in conformance with MDOT Section 816.03F. Matting shall be used on all slopes greater than 10:1.

209.2.6 Hydro-Mulch Hydro-mulching shall meet or exceed specifications for conventional seeding. Weight tickets for seed (with proper mixture identified), fertilizer and mulch shall be required for payment according to the unit price bid per square yard.

209.3 Watering and Maintenance Seeded and sodded areas shall be watered and maintained as specified below until they are established.

1. The seed bed shall be thoroughly watered as soon as the seed is covered.

2. Water shall be applied by a hydro-seeder or water tank under pressure with a nozzle producing a spray that will not dislodge the mulching material.

3. Water applications shall be made at least once a week, provided significant rainfall has not occurred within the weekly period.

4. The rate of application shall be 120 gal/1,000 sf.

5. The CONTRACTOR shall keep all sodded areas, including the subgrade, thoroughly moist for two weeks after sodding. After the two-week period, the CONTRACTOR shall water the sod as specified for seeded areas.

6. Matting areas shall be maintained until all work on the Contract has been completed and accepted.

7. The seeded areas shall be mowed once at an approximate height of 6-in. as directed by the ENGINEER to control excess growth, including weeds.

8. Maintenance shall consist of the repair of areas damaged by erosion, wind, fire, or other causes. The soil in these damaged seeded areas shall be restored to the condition of grade existing prior to application of matting, and restored areas shall be relined, refertilized, and reseeded. Where necessary, the matting shall be completely replaced. Damaged sod shall be replaced with new sod.

209.4 Driveway Replacement

209.4.1 Gravel Drives All disturbed gravel driveway surfaces shall be replaced with six inches of MDOT 22A gravel compacted to 95% MDD. This shall be paid for and measured under MDOT 22A Gravel.

209.4.2 Crushed Stone Drives All disturbed driveways which had crushed stone or pea gravel surfaces shall be replaced with like material to a depth required by the ENGINEER. This shall be paid for according to the number of cubic yards delivered.

209.4.3 Bituminous Drives All disturbed bituminous driveway surfaces shall be replaced with 6 inches of compacted MDOT 22A gravel and surfaced with 3 inches of compacted MDOT bituminous top course material. This shall be paid for under bituminous driveway replacement and includes gravel and bituminous. The bituminous material may be laid in one layer.

209.4.4 Concrete Drives All disturbed concrete driveway surfaces shall be replaced with 6 inches of Portland cement concrete placed over 2 inches of compacted sand or suitable base material. Concrete mixture shall be P1 or S2 with limestone or slag aggregate.

209.5 Concrete Curb and Gutter Concrete curb and gutter removed to facilitate construction shall be replaced in kind to the line, grade and limits as established by the ENGINEER. Replacement shall be in accordance with the Standard Specifications, Section 207.4.3.

Removal and replacement of concrete curb and gutter shall be measured according to the number of lineal feet replaced. This payment shall be payment in full for all necessary labor, equipment and materials necessary for this removal and replacement.

209.6 Sprinkler Heads The CONTRACTOR shall remove all sprinkler heads, water lines, and appurtenances necessary, and take such precautions necessary to prevent damage to the same. As soon as possible after the construction of the improvement, the CONTRACTOR shall replace the sprinkler heads, water lines, and appurtenances in good condition. Removal and replacement of the sprinkler heads, water lines, and appurtenances shall be paid for as specified in the Bid Proposal.

209.7 Tree & Stump Removal

209.7.1 General This work shall consist of removing trees where called for on the plans or directed by the ENGINEER, and shall include cutting such trees, removing their stumps and roots from the ground and properly disposing of the material.

209.7.2 Chipping The trees, stumps, roots and debris shall be removed and properly disposed of by the CONTRACTOR. Where removal of a stump may result in damage to existing utilities, the stump shall be removed by chipping to a depth of at least one foot below the finished ground surface. Other stumps may be removed by chipping when approved by the ENGINEER.

209.7.3 Payment The complete work as measured for REMOVE TREE will be paid for at the contract unit prices as set forth in the Bid Proposal.

The size of the trees will be determined by the average diameter of the tree trunk, measured to the nearest full inch, at a point 4-1/2 feet above the base of the tree at the ground line. Trees having major limbs lower than 4-1/4 feet from the ground shall be measured at the smallest diameter below such limbs.

Removing trees less than 8 inches in diameter shall be considered incidental to Clearing and Grubbing.

209.7.4 Multiple Trees Where more than one tree has grown from a common stump, each tree will be measured as a separate tree or stump.

209.8 Tree Replacement

209.8.1 General Unless otherwise specified, each tree removed shall be replaced with nursery grown tree. The replacement tree shall be at least 2-1/2 inches in diameter. The replacement tree shall either be of the variety indicated on the drawings, of the same variety as the tree removed, or of the variety listed below. It is the CITY's intent to have the replacement tree be of the same variety as the tree removed unless the property OWNER requests otherwise or the tree removed is of an undesirable variety. If the tree's variety is not indicated on the drawings, the replacement tree shall be of a variety listed below. Final selection of the replacement tree's variety shall be made by the ENGINEER.

209.8.2 Payment The replacement shall be paid for at the contract unit price as specified under section Nursery Grown Plants. Tree replacement shall be planted at the location staked out by the ENGINEER.

209.8.3 Tree Type
Ginko (Ginkgo Biloba) - male trees only
Norway Maple (Acer Platanoides)

Crimson King Maple (Acer Platanoides “Crimson King”)
Sugar Maple (Acer Asaccharum)
Seedless Ash (Fraximum Pennsylvanicum)
Little Leaf Linden (Tilia Cordata)
Silver Linden (Tilia Tomentosa)
Crimeam Linden (Tilia Euchlora)
Honey Locust (Gledistsia Traicanthos)
Red Oak (Quercus Levelia)
English Oak (Wuercus Robur)
Bradford Pear (Pyrus Calleryana)

209.9 Shrubs and Plantings

209.9.1 General Shrubs and other plantings which may be damaged during any phase of the construction shall, with the permission of the OWNER, be replanted as directed or removed to an area provided by the CONTRACTOR and “heeled” in until such time as they can be replanted in their original location. The work shall be done in the acceptable manner and the CONTRACTOR shall be required to replace any shrubs or trees that fail to survive.

209.9.2 Nursery Grown Plants

209.9.2.1 Materials

209.9.2.1.1 All plants shall be nursery grown in accordance with modern horticultural practice under climatic conditions similar to those in the locality of the job. They shall have been root pruned or transplanted several times.

Plants shall be freshly dug. No cold storage or healed in plants will be acceptable. Plants shall be typical of their species or varieties. Plants shall have normal, well-developed branches and vigorous fibrous root system. They shall be healthy, vigorous plants free from defects, decay, disfiguring roots, sun-scald injuries, abrasion of the bark, plant diseases, insect pest eggs, bores and all forms of infestations of objectionable disfigurements.
Trees shall have straight trunks with the leader intact, undamaged and uncut. Any old cuts and abrasions shall be completely callused over.

209.9.2.1.2 Sizing All trees and shrubs shall be measured when their branches are in normal position. Height and spread refer to main body of the plant.

The determining measurement for trees shall be the caliper 12” above the ground for trees greater than 4” in caliper and 6” above ground for trees less than 4” in caliper.

All plant sizes shall be in accordance with those called for on the plans or in the specifications. Larger plants shall not increase contract price, unless prior approval has been granted.

Small plants shall be used only by prior approval and must adjust contract prices accordingly.

209.9.2.1.3 Pruning No pruning will be done prior to delivery.

209.9.3 Installation

209.9.3.1 Final planting shall be staked out by the ENGINEER.

209.9.3.2 Planting shall be performed by personnel familiar with planting procedure and under the supervision of a qualified foreman.

209.9.3.3 All trees and shrubs shall be planted plumb.

209.9.4 Inspection of Materials Plants will be subject to inspection on quality, size and color. Plants lacking compactness or proper proportion, plants which are weak or thin, or plants injured by too close planting in nursery rows will not be accepted. Plant material which has been cut back from larger grades to meet certain specified requirements will be rejected. Right is reserved to reject plants considered as unsatisfactory. Rejected plants shall be removed from site.

209.9.5 Guarantee and Replacement

209.9.5.1 General Any planting failing to grow within two year guarantee period shall be replaced and replanted with materials of like size, quality, and variety by the end of the first transplanting season following termination of the guarantee period.

209.9.5.2 Guarantees All guarantees shall be limited to one replacement of each plant, unless the cause of plant mortality is a direct result of CONTRACTOR negligence. The guarantee will not apply where plants die because of animal damage, vandalism, injury by fire, drowning, storm, hail, drought, insect's disease, exceptional or untimely freeze, or act of nature. Guarantee period will not begin until completion of project.

209.9.5.3 Payment Plantings will only be paid for on a unit price basis when agreed upon by the ENGINEER. This price shall include the initial material, installation and replacement of dead plantings. All other plantings shall be incidental.

209.10 Roadway

209.10.1 Ditch Cleanout The CONTRACTOR shall clean and reshape existing ditches to the grades and cross sections as shown on the drawings. Excess excavation shall be

properly disposed of in a manner satisfactory to the ENGINEER. "Ditch Cleanout" shall be paid for at the unit price per lineal foot of ditch cleaned.

209.10.2 Relaying Existing Culverts This work shall consist of removing existing culverts, cleaning and relaying to the new grade established under ditch cleanout. Deformed ends of CMP shall be straightened out so they do not impede the flow of water. Backfill shall be as per 207.2.1.5.1. "Relay Existing Culverts" shall be paid for at the contract unit price per foot and shall be payment in full for all Work listed above.

209.10.3 Adjustment of Utility Covers On any project that is resurfaced, the CONTRACTOR shall be required to adjust the covers on all utility structures or monument boxes to the elevation of the new cross section. The cost of such adjustments shall be as set forth in the Bid Proposal.

209.10.4 Flush and Clean Existing Culverts This Work shall consist of cleaning all dirt and debris from existing culverts where called for on the Drawings. The contract unit price per lineal foot shall be payment in full for equipment and labor necessary to complete the Work.

209.10.5 Deformed Culverts Deformed ends of culverts not covered under other items shall be straightened out to the satisfaction of the ENGINEER.

209.11 Erosion Controls

209.11.1 Erosion Control Blanket Areas indicated on the drawings and areas directed by the ENGINEER shall be stabilized with "Curlex II doublenet" Excelsior Blanket by American Excelsior Company, S150 Hi Velocity Erosion Control Blanket by North American Green, or approved equal following application of the specified restoration materials. This material shall be installed in accordance with the manufacturer's guidelines.

209.11.2 Plain Rip Rap This work shall consist of construction of a protective covering of approved stone on an earth bed covered with a filter fabric and shall include excavation and proper disposal of excavated material. The rip-rap shall be a minimum of four inches (4") thick and shall commence to a foot above the ditch bottom on the inside slope and continue to the top of the back slope. Rip Rap shall be native stone, broken concrete is not allowed. Each stone shall be laid by hand and firmly embedded into the slope. "Plain Rip-Rap" shall be paid for at the unit price per square yard, and shall be payment in full for all material and labor.

209.11.3 Grouted Rip Rap The stone shall be laid as specified for plain rip-rap and the spaces shall be filled with mortar as specified in Section 7.02 MDOT Specifications. "Grouted Rip-Rap" shall be paid for at the unit price per square yard and shall be payment in full for all material and labor.

2.09.12 Steel Beam Guard Rail

209.12.1 Materials All materials, methods of construction and basis of payment shall be in accordance with the applicable portion of current MDOT Specification and Standard Details.

209.12.2 Use Steel beam guard rail (12 gauge galvanized) shall be used in sections of the required lengths where called for on the drawings.

210.0 LIFT STATIONS

210.1 General The CONTRACTOR shall supply to the CITY one complete below ground submersible pump station with all necessary equipment and material needed for its operation. Main items of work include the valve and pump chambers, submersible pumps, valves, piping, force main, electrical wiring and controls, and control panel.

210.2 Discrepancies Before starting the fabrication and installation of the lift station, the CONTRACTOR shall examine the proposed plans and these specifications. If any discrepancies occur, he shall report them to the ENGINEER in writing and obtain written instructions for changes in the work.

210.3 Submittals

210.3.1 Shop Drawings The CONTRACTOR shall submit to the ENGINEER all shop or setting drawings and schedules required for the work. The CONTRACTOR shall make any corrections in the drawings required by the ENGINEER and resubmit the same without delay.

210.3.1.1 Required Shop Drawings The CONTRACTOR shall furnish shop drawings for the below listed equipment:

a) Pump, Motor and Seals
b) Guide Bars or Rails
c) Discharge Connection
d) Check Valves
e) Plug Valves
f) Gate Valves
g) Trash Basket and Rake
h) Sump Pump
i) Access Doors, including dimensions and locations
j) Grating and Supports
k) Control Panel(s)
l) Transformers
m) Motor Starters
n) Wiring Devices
o) Sewer Power Lightning Arresters
p) Electrical Receptacles

210.3.1.2 Pump Curves The CONTRACTOR shall furnish to the ENGINEER with the shop drawings, performance curves and tables showing flow in gallons, total head in feet, efficiency in percent, and brake horsepower. Also, within sixty (60) days after lift station start-up the CONTRACTOR shall furnish certified performance curves for each pump showing flow in gallons, total head in feet, efficiency in percent, and brake horsepower.

210.3.1.3 Controls and Enclosures Shop drawings shall be required for all pump controls, for all equipment, and electrical enclosures. Schematic drawings and wiring diagrams showing all components shall be submitted for the pump controls, equipment enclosures, lift station control circuitry and alarms.

210.3.2 Manuals

210.3.2.1 Installation Instructions The CONTRACTOR shall furnish to the ENGINEER at the time of the delivery of the equipment one copy of installation instructions for such equipment.

210.3.2.2 Operating and Maintenance Manuals The CONTRACTOR shall deliver to the ENGINEER four (4) copies, each containing "as-Built" data on lift station equipment, instructions on operation and maintenance, list of spare parts and sources from which they may be obtained and a list of spare parts recommended to be maintained on the site. These manuals shall be delivered within sixty (60) days after lift station start-up. Each copy shall be submitted in separate three-ring binders, properly indexed, and identified with Table of Contents, including pump curve data.

210.4 Structures

210.4.1 Installation The installation of the chambers and appurtenances shall be as per the manufacturer's recommendations, approved shop drawings, the drawings and these contract documents. All precast concrete bases shall be set on a bed of pea gravel, with a minimum thickness of four inches or as approved by the ENGINEER.

210.4.2 Pump Chamber The pump chamber shall be the diameter and wall thickness as specified on the drawings. The chamber shall be precast reinforced concrete ASTM C478 (manhole sections) with O-ring joints. The base and top shall be precast and as detailed on the drawings. The top slab shall have a 5 to 7 percent air entrainment in the concrete. The joints between the precast sections shall be of the O-ring seal type ASTM C443, with the joints between the base and sections sealed with RAM-NEK, Cadilloc or an approved equal material. All connections into the structure shall be Kor-N Seal or approved equal.

The CONTRACTOR shall paint the exterior of the pumping chamber with two coats of self-priming coal tar water proofing at 7.0 mils per coat. The exterior shall be wire brushed prior to painting. All other metallic surfaces (not aluminum), supports and fasteners, shall be painted and wire brushed prior to being painted. All submerged surfaces shall be painted with two coats coal tar epoxy (8 mils per coat); and all not-submerged surfaces shall have one coat epoxy primer (1-1/2 mils) and two coats polyamide cured epoxy gloss enamel (8 mils per coat). All aluminum surfaces in contact with concrete or steel shall be coated with a bitumastic material.

210.4.3 Valve Chamber The valve chamber shall be of the diameter as specified on the drawings. The material method of installation, and painting shall be as specified in Section 210.4.2. The CONTRACTOR shall provide a sump in the valve chamber as detailed on the drawings. The sump shall have a galvanized bar-grating cover capable of supporting a 300 psf loading. Suggested manufacturers of the sump are Reliance, Borden Blaw-Knox or an approved equal. A sump pump will be required.

210.5 Equipment and Materials

210.5.1 Ladder and Grating The CONTRACTOR shall provide within the pump chamber an aluminum, removable ladder. The rails of the ladder shall be approximately 3 inches wide by 3/4 inches deep, and the rungs shall be at least 1-1/4 inches in diameter of non-slip design and on 12 inch centers. All grating provided shall be aluminum and designed for a 150 psf loading.

The ladder shall be bolted to aluminum brackets with aluminum bolts and nuts of sufficient number and size to safely accommodate the designed loading of the ladder. The brackets shall be anchored to the pump chamber wall in a manner acceptable to the ENGINEER.

210.5.2 Submersible Pumps Two Class I, Division 1, Group D intrinsically safety explosion proof sewage pumps shall be furnished. The cast iron stator casting shall be oil filled with stainless steel fasteners. Seals on the pumps shall have double mechanical seal running in oil. The pump impellers shall be single or double vane of non-clog design capable of passing a 3 inch spherical solid. The material for the pump impeller shall be either cast iron or bronze.

All submersible pumps shall have motor seal chambers fitting with electrode moisture probes. Signal lights shall be provided to indicate water in the seal chambers. Thermal sensors in the motor windings shall deactivate starter when temperature exceeds safe level. Motor insulation will be the minimum of NEMA code F.

Guide bars for the pump removal shall be 2 inch diameter Schedule 40-304 non-sparking stainless steel with intermediate supports. Also provide a stainless steel chain for raising and lowering the pumps. It should be capable of lifting/lowering a minimum of 1,000 pounds. In addition, the pump discharge shall be sealed to the cast iron discharge connection bolted to the floor. The motors shall be capable of driving the pump over the full range of the characteristic curve within service factor of 1.15. The housing shall be an air or oil filled water tight casing and the Insulation shall be Class F. The motor shaft shall be stainless steel and the motor shall be capable of operating either fully or partially submerged. The CONTRACTOR shall provide a seal leakage water sensor probe. The motor starting requirements are not to exceed NEMA Code G. The specified operating conditions for the pumps and motors shall be as listed in the supplementary specifications.

210.5.3 Piping All force main and lift station piping shall be cement lined ductile iron pipe of the size as specified on the drawings. The pipe shall be as specified in Section 207.1.1 of these Standard Specifications. The joints within the station shall be flanged ANSI A21.10 with composition gaskets and shall be secured by stainless steel nuts and bolts as required within AWWA Standards. The joints on the force main and outside of the pump chamber shall be mechanical or push on joint capable of withstanding 150 psi pressure. All joints shall conform to Section 207.1.2 and Section 207.1.2.7.1 of these Standard Specifications. All force main shall be tested in accordance with these

Standard Specifications. The piping for the sump pump discharge shall be sized as shown on the drawings and be Schedule 80 PVC with treaded joints.

210.5.4 Valving All Eccentric plug valves shall be rated at 150 psi, lever operated with 2 inch operating nut and position indicator and be permanently lubricated. Also, all plugs shall be eccentric seated with a drip-tight shut-off and the port area being a minimum of 80% of the pipe size. The body of the valve shall be either cast iron or stainless steel with class 125 flanged end connections. All bushings will be stainless steel and the seating surface shall be 90% nickel, 300 series stainless steel or bronze; mechanically retained; or brazed to body and be machined or ground. The rotating element seating surface shall be a neoprene capacity stuffing box and spring loaded or with an adjustable bolted gland packing the follower.

All gate valves shall conform to the standard specifications 207.1.2.4.1 as detailed herein.

All check valves shall be fully opening, iron body, bronze mounted swing checks with outside lever. The lever shall be weighted or spring loaded. A check valve shall be located on each discharge line and as shown on the plans.

210.5.5 Access Doors All access doors shall be heavy duty, aluminum hatches with extruded aluminum channel frame and 1/4 inch thick diamond plate cover. Each cover shall be designed to withstand a 300 psf live load and be watertight. The operations shall be tubular spring, securing bottom of lifting mechanism housing to bottom shoe. Provide holes in shoe for water drainage. The hinges for the access doors shall be forged brass with stainless steel pins.

Each door shall have a holding arm to engage when door is fully open. The door shall open to 90 degrees and lock automatically in that position. Also provide a vinyl grip handle to release door for closing.

The CONTRACTOR shall reinforce the hatches over the trash basket as necessary with aluminum stiffeners to support the trash basket with 200 pounds load in the full open position. Also provide a flush, spring loaded locking device, capable of unlocking from the interior. The CONTRACTOR shall place a bituminous coat on the underside of the frame where it will come in contact with the concrete slab.

210.5.6 Sump Pumps The CONTRACTOR shall furnish one sump pump in the sump in the valve chamber. It shall be a submersible pump with 120 volt hermetically sealed heavy duty motor, to be permanently lubricated and with sealed bearings. The pump shall be portable with a connection for sump pump piping in the valve chamber. It shall be rated at 20 gpm at 10 foot discharge head equipped with an automatic level control system.

210.5.7 Trash Basket The CONTRACTOR shall furnish a trash basket as detailed on the drawings. It shall have 2 inch by 1 inch rollers made from either hard rubber, nylon, hard plastic or of similar material.

The CONTRACTOR shall furnish as accessories one aluminum rake, 12 inches wide with a six foot handle, with slots to fit the bar spacing of the trash basket, and one shovel, flat and at least 16 inches wide.

210.5.8 Spare Parts The CONTRACTOR shall furnish with the station the following spare parts:

a) One Impeller
b) One Key, Lockwasher and Nut
c) One Set of Mechanical Seals for the Pumps
d) One Set of Relays

210.5.9 Controls for Submersible Station Each pump shall be equipped with overload protection, circuit breaker, 6 digit elapsed time meters (minutes and 0.1 minutes) starting relays, run lights, H-O-A switches - Pump alternation shall be automatic with operator override to allow manual operation. Motor electric service cable shall be of sufficient length to reach control panel without splices. Also provide 2-1/2 inch ammeters on each leg of the wastewater pump circuits. The ampere meter shall be sized for the pump provided, with a meter accuracy of ±2% full scale.

The wiring in the chamber shall permit 20 feet submergence without affecting operation. Controls shall be mounted in a NEMA 12 enclosure with drip shield, lockable control panel with disconnect as detailed. Provide seal-off fittings where conduit exists from the pump chamber. Each door shall have a holding arm to engage when the door is fully open. The door shall open to 90 degrees and lock automatically in that position. The control panel should be similar to Standard Detail #160.

All construction shall be Class 1 construction type B wiring. The Equipment is as shown in the details following these specifications.

210.5.10 Motor Starters All motor starters shall be either combination, circuit breaker type or magnetic with the following accessories:

a) 120 Volt Control
b) Name Plate
c) Bi-metallic Overloads
d) Run Pilot Light
e) Selector Switches - 3 position

The overload shall be capable of being reset from the front of the starter enclosure. Each starter shall be padlockable in the “off” position and all wiring shall be type B.

210.5.11 Grounding All grounding materials shall be #2/0 bare copper wire and 5/8 inch by 10 feet copperweld ground rods. All connections between the grounding elements shall be thermoweld where concealed or mechanical where exposed to view.

Any grounding conductor penetrating a concrete surface shall be 5/8 inch solid copperweld. The grounding resistance shall be 25 ohms or less.

210.5.12 Conduit Systems All exposed conduit shall be PVC piping or PVC coated galvanized rigid steel. In all explosive areas all seals shall be Class 1, Division 1, Grade D. All wiring shall be in conduit with an external junction box, except in the pump chamber where cables go to floats and pump motors.

210.5.13 Motor Efficiencies All motors less than 5 hp shall have a minimum motor efficiency of 75%. All 5 hp and above shall be 80%.

210.6 Gate Valves All gate valves shall conform to those as specified in Section 207.1.2.4.1 of these specifications.

210.7 Joint Restraints All joint restraints shall conform to that specified in Section 207.1.2.7 of these specifications.

210.8 Electrical Work

210.8.1 Description of Work Included The work included in this section shall be furnishing and installation of electric power. The main items of work include electric service to the stations, branch circuits, conduit, wiring devices, connection to motors, float switches and the like.

210.8.2 Installation All installation shall be as suggested by the manufacturer, as indicated on the shop drawings or as specified in the contract documents or on the drawings.

210.8.3 Permits The CONTRACTOR will be required to secure an electrical permit from the City of Portage Community Development Department. All work must be inspected and approved by the CITY's Electrical Inspector prior to Consumers Energy setting the meter.

210.8.4 Electrical Service The power requirements shall be 3 phase, 480 volts, 60 amperes unless otherwise specified in the Supplementary Conditions. The CONTRACTOR shall make all necessary arrangements with Consumers Energy for the installation of the power service from the meter to the nearest available line source. The CONTRACTOR shall, as part of the contract, pay all costs incurred in the installation of the electrical service. The CONTRACTOR shall take out all necessary permits with Consumers Energy on behalf of the CITY.

210.8.5 Power Service Lightning Arrestor The Lightning Arrestor shall be 600 volt, 3-phase with conduit connection for attaching to the meter enclosure. Suggested manufacturers are General Electric and Westinghouse.

210.8.6 Instrumentation and Controls To control the operation of the pumps with variation in sewage level in the pump chamber, a solid state submersible differential pressure transducer and circuit board as manufactured by Magnova, Inc. shall be provided.

The submersible pressure transducer shall be enclosed in a watertight PVC housing with 1/2" pipe thread at the top and shall be suitable for wastewater applications. It is to be mounted at the end of a 1/2" non-corrosive pipe below the low water level set point. The cable shall be continuous without splicing from the transducer to the control unit. Transducer housing and cable shall be supplied by the manufacturer.
Set points shall be LWA (Low Water Alarm), Off, Lead, Lag, HWA (High Water Alarm).

PVC transducer bellows shall be of phosphor bronze. The cable affixed to the transducer will consist of one shielded pair, one unshielded pair, shield drain wire and a vent tube that are all enclosed in a high density waterproof polyethylene jacket. Normal power input of 120 VAC/60Hz. Line voltage variations of plus or minus 15 volts shall affect output less than 1% of the range.

Provide 4-20 ma D.C. output signal proportional to level.

The lift station shall have a PLC with a built-in flash-PROM which will automatically control the two lift station pumps based on the pump chamber level. The pump chamber level signal will be generated by the above described submersible 4-20 ma level transmitter. In case of failure by the level transmitted or PLC, the lift station shall also be designed to turn the pumps on and off by the two intrinsic mercury float switches in the pump chamber.

The PLC shall radio the station signals back to the Master PLC (central location). The CONTRACTOR shall make all necessary arrangements with the SCADA Consultant for the installation of PLC, radio and required programming. The CONTRACTOR shall as part of the contract pay all costs incurred in the installation of the SCADA equipment and programming.

The lift station shall include the following:

1 - NEMA 12 enclosure size approximately 24" high x 20" wide x 8" deep with the following equipment mounted and wired inside the station's main control panel

2 - EAO Entry alarm door switch part number 01 151 025 and required accessories

210.8.7 Reprogramming Master PLC The reprogramming of the master PLC and the revising of the existing graphics display panel, SCADA Alarm Program and Reporter Software at the central location shall be done by the SCADA Consultant.

210.8.8 Sequence of Operation As the water level in the pump chamber rises to the elevation shown for "Lead Pump On" on the drawings, the pump shall be activated. The

lead pump shall pump the water down to the elevation shown for “Lead Pump Off”, and the lead pump shall shut off.

If the water level in the pump chamber rises to the elevation shown for “Lag Pump On”, the lag pump shall be activated. As the water level in the pump chamber decreases to the elevation shown for the “Lag Pump Off”, the lag pump shall shut off and the lead pump shall continue to operate as specified above.

The CONTRACTOR shall provide for manual alternation of the pumps.

When the water level in the pump chamber rises to the level of the high water level float switch, an alarm shall be activated and start both pumps. This function will be independent of the operation of the PLC. Both pumps shall shut off if the water level decreases to the elevation shown for “Both Pumps Off - Alarm”.

210.8.9 Alarm Conditions System shall be programmed for the following alarm conditions:

1. Data Failure
2. Power Failure
3. High Water
4. Low Water
5. Entry Alarm
6. Entry Alarm Disabled
7. Pump Seal Failure
8. Pump #1 Run (Green)
9. Pump #1 Failure (Red)
10. Pump #2 Run (Green)
11. Pump #2 Failure (Red)

All alarms shall remain on until manually reset after correction of alarm system.

210.8.10 Control Panel

210.8.10.1 General The control panel shall be as specified in Section 210.5.9. All connections to this panel shall be made at terminal strips. All wiring shall be copper, do not use aluminum wire. All wiring shall be numbered for identification.

A complete “As Built” wiring diagram and terminal strip diagram complete with numbered identification shall be furnished to the City of Portage (4 copies).

All wiring shall be in strict accordance with local, state, and National Electric Codes.

Power and control terminals shall be located at the bottom of the panel. Locate conduit stubs accordingly.

The control panel shall be equipped with a Crouse-Hinds AR2042-522, or approved equal, emergency generator receptacle.

Conduits shall be installed to prevent moisture or water from entering and accumulating within the enclosure. All conduits shall be sealed.

Conductors shall be located so that they will be free from physical damage and to avoid overheating. The conductors shall be supported properly.

All incoming and outgoing control and power connections shall be numbered for identification and installed as per manufacturer's wiring diagram.

210.8.10.2 Control Panel Accessories The below listed accessories shall be furnished with the control panel:

a) Name Plates
b) Pilot and Alarm Lights
c) Selector Switches
d) Control Circuits

All name plates shall be a minimum 1 inch by 3 inch white plastic with engraved black lettering. Provide name plates for all switches and circuit breakers, motor starters and push buttons.

All pilot and alarm lights shall be 120 volt, 60 Hertz with plastic lens and color matched rings. The CONTRACTOR shall furnish special tools for lamp replacement, if required. All lights shall be of the "push to test" type.

All selector switches shall be rated at not less than 120 volts, 10 amperes, 60 Hertz with maintained or momentary contacts as required and oil tight. All switches shall be "Off-On", "Off-Auto", "On-Off-Auto", or "Open-Close" as shown on the drawings.

All control circuits shall be rated at not less than 120 volts, 10 amperes. The relays shall be of the plug-in type with octal socket.

210.8.10.3 Piping and Supports All non-submerged piping and supports shall be coated with 1 coat of epoxy primer (1-1/2 mils) and 2 coats polyamide cured epoxy enamel (2 mils per coat). All submerged piping and supports shall be painted with 2 coats of coal tar epoxy (8 mils per coat). All surfaces prior to painting shall be wire brushed to remove all rust and loose scale.

210.8.11 Testing

210.8.11.1 Factory Testing of Pumps Each pump shall be tested at the factory prior to shipment. At the time of shipment, furnish certified performance curves for each pump based on these test results.

210.8.11.2 Motor Rotation After completion of the electrical service connections to the pump, the direction of rotation of pump will be checked by the CONTRACTOR.

210.8.11.3 Current Unbalance Upon ascertaining that the pump is rotating in the proper direction, the CONTRACTOR will check for current unbalance between phases. Current unbalance shall not exceed 4% between phases.

210.8.11.4 Pressure Testing Force Main The CONTRACTOR shall provide the ENGINEER 48 hour notice prior to testing. If it is necessary for the ENGINEER to supervise more than one test, the CONTRACTOR will be liable for the additional cost involved.

Before applying the specified test pressure, all air shall be expelled from the pipe. At high points, the CITY shall make the necessary taps at the expense of the CONTRACTOR to release the air and insert plugs after the tests have been completed.

The CONTRACTOR shall furnish proper appliances and facilities for testing and draining the main without injury to the work, and surrounding territory. The CONTRACTOR shall test by filling the main with clean water under a minimum hydrostatic pressure on one hundred fifty (150) pounds per square inch based on the elevation of the lowest point in the line to be tested and corrected to the elevation of the test gauge. Pressure shall be maintained for two (2) hours.

No pipe installation will be accepted if the leakage per 1,000 feet of pipeline is greater than that shown below.

Diameter	Gal/Hour
4-inch	0.33
6-inch	0.50
8-inch	0.66
10-inch	0.83
12-inch	0.99
16-inch	1.32
20-inch	1.66

Water for making tests will be furnished by the CITY if it is available under pressure; otherwise, by the CONTRACTOR at the expense of the CONTRACTOR.

210.8.11.5 Station Performance Test Before connecting station to the sanitary sewer system, it shall be inspected and performance tested with the ENGINEER. The CONTRACTOR shall notify the ENGINEER at least 48 hours prior to the time of test. The ENGINEER, CONTRACTOR, appropriate CITY personnel and a factory representative for instrumentation shall be present at the time of the performance test. All components shall be tested and inspected for compliance and operational correctness. Any components not functioning correctly shall be repaired/corrected by the CONTRACTOR and the test shall be repeated until accepted by the ENGINEER.

210.8.12 Rotary Converter

210.8.12.1 General A variable frequency system shall be installed to provide 3 phase power to the pump motors.

1. Variable Frequency Drive 1 Phase to 3 Phase:

   a. Circuit Breakers:
      (1) NEMA 3R enclosures suitable for outdoor use.
      (2) Sized to match rotary converter or as shown.

   b. Variable Frequency Drive Phase Conversion System
      (1) 1 phase to 3 phase
      (2) 480 V 1 Phase to 480 VAC 3 Phase
      (3) Install inside control cabinet

210.8.13 Lift Station Cost Breakdown The successful bidder will be required to submit a cost breakdown for the major lift station components such that the ENGINEER can prepare partial pay estimates based upon the amount of work completed. This cost breakdown will be subject to review and approval by the ENGINEER.

Part Three

STANDARD DETAILS

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STANDARD DETAILS

Standard Detail Number	Description
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SD-125J	Sedimentation Controls Silt Fence
SD-125K	Sedimentation Controls Temporary Inlet Protection
SD-125L	Sedimentation Controls Temporary Curb Inlet Protection
SD-126	Reserved for future use
SD-127	Project Sign
SD-128	Reserved for future use
SD-129	Reserved for future use
SD-130	Storm Sewer Heavy-Duty Casting
SD-131	Integral Valley Gutter Section
SD-132	Reserved for future use
SD-133	Standard 48" Drainage Structure (Perforated)
SD-134	Inside Drop Manhole (4" or 6")
SD-135	Force Main Drop Connection
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SD-153A	Curb Stop Connection & Final Setting of Curb Box
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Standard Detail Number	Description
SD-157	Meter Setting Arrangement for 3", 4" or 6" Turbine Meter with 1" Bypass Meter and Typical Pit Layout
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SD-160	Typical Low Profile Lift Station Control Panel
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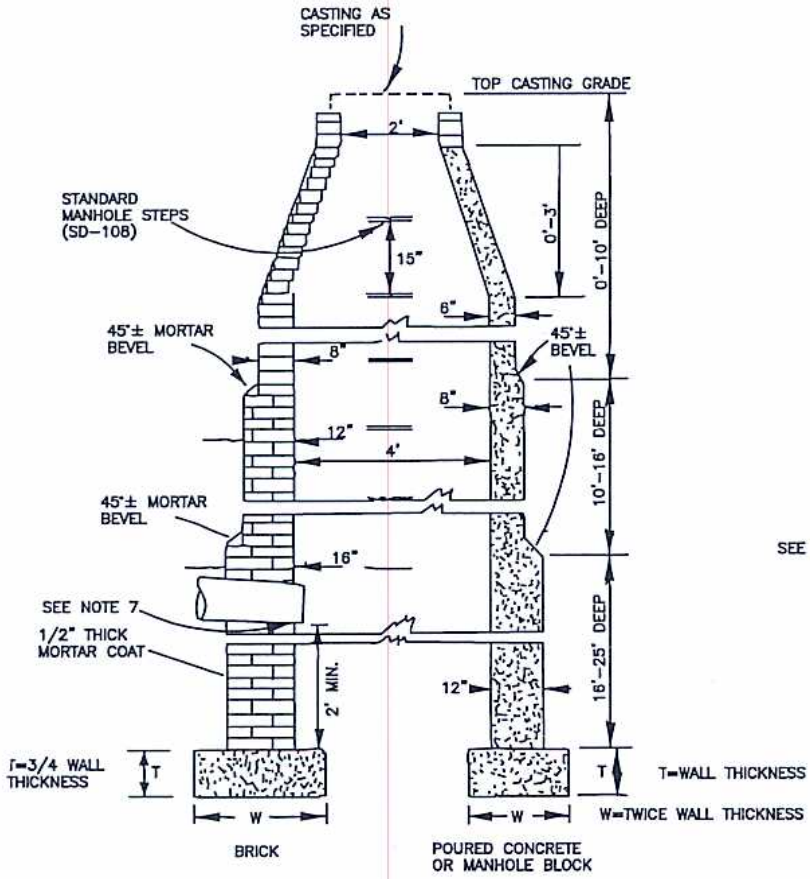
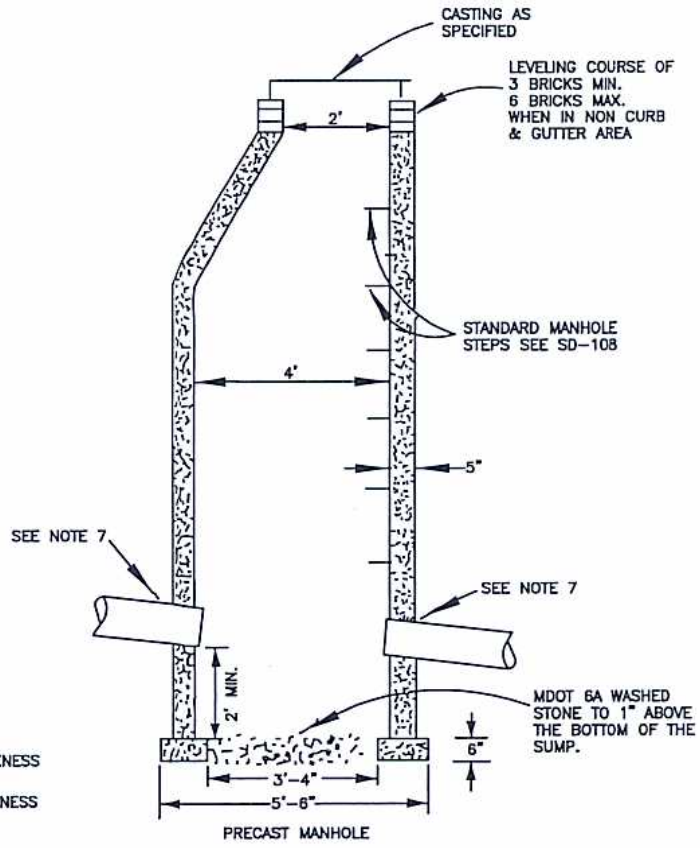
SD-163	Reserved for future use
SD-164	Valve Extension Stem (Variable)
SD-165	Pavement Replacement Detail
SD-166	Typical Intersection Marking Detail
SD-167	Reserved for future use
SD-168	Standard Trench Detail for Ductile Iron Water Main
SD-169	Welcome to Portage City Sign
SD-170	Local Roadway Standard Section





1. CONCRETE FOR BASES AND POURED STRUCTURES SHALL HAVE A COMPRESSIVE STRENGTH OF 3500 P.S.I. IN 28 DAYS AND A MINIMUM OF 5.5 SACKS OF CEMENT PER CYD, SLUMP SHALL NOT EXCEED FOUR INCHES (4").

2. BRICK SHALL BE GRADE MA. CONFORMING TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR SEWER BRICK, A.S.T.M. C-32.

3. MORTAR BLOCK SHALL MEET A.S.T.M. REQUIREMENTS FOR LOAD BEARING CONCRETE MASONRY UNITS C-90-52.

4. MORTAR FOR LAYING BRICK OR BLOCK AND PLASTERING OUTSIDE OF STRUCTURES SHALL BE COMPOSED OF 1 PART PATENTED MORTAR AND 2-1/2 PARTS OF MASONRY SAND (M.D.O.T. SPECIFICATIONS).

5. PRECAST MANHOLES SHALL BE OF THE ECCENTRIC CONE TYPE CONFORMING TO ASTM C-478.

6. MANHOLE STEPS SHALL BE SPACED 15" APART. STEPS REQUIRED IF DEPTH IS OVER FIVE FEET (5'). STEPS SHALL BE EJIW 8501 (PRECAST) OR EJIW 8503 (BLOCK) OR APPROVED EQUAL.

7. RESILIENT CONNECTIONS (ASTM C-923) WILL BE REQUIRED FOR PIPE INSERTIONS.

NOTE: CATCH BASINS SHALL HAVE SOLID BOTTOMS, LEACHING BASINS SHALL HAVE AN OPEN BOTTOM AS DETAILED ABOVE.

STORM SEWER LESS THAN 24" SHALL HAVE A RESILIENT CONNECTION

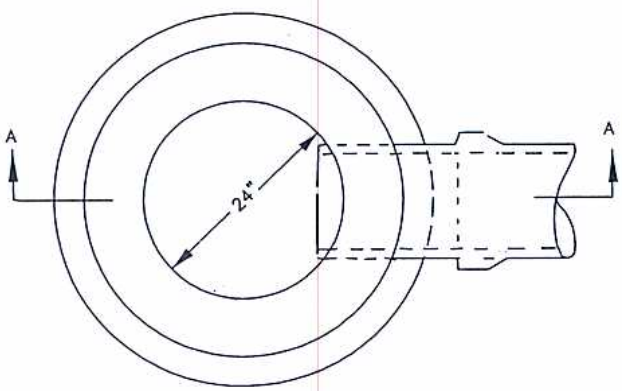
CITY OF PORTAGE

STANDARD 48" DRAINAGE STRUCTURE

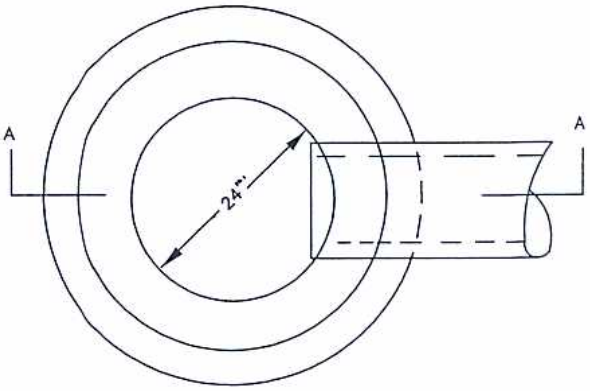
STANDARD DESIGN SD-101

APPROVED BY WCB

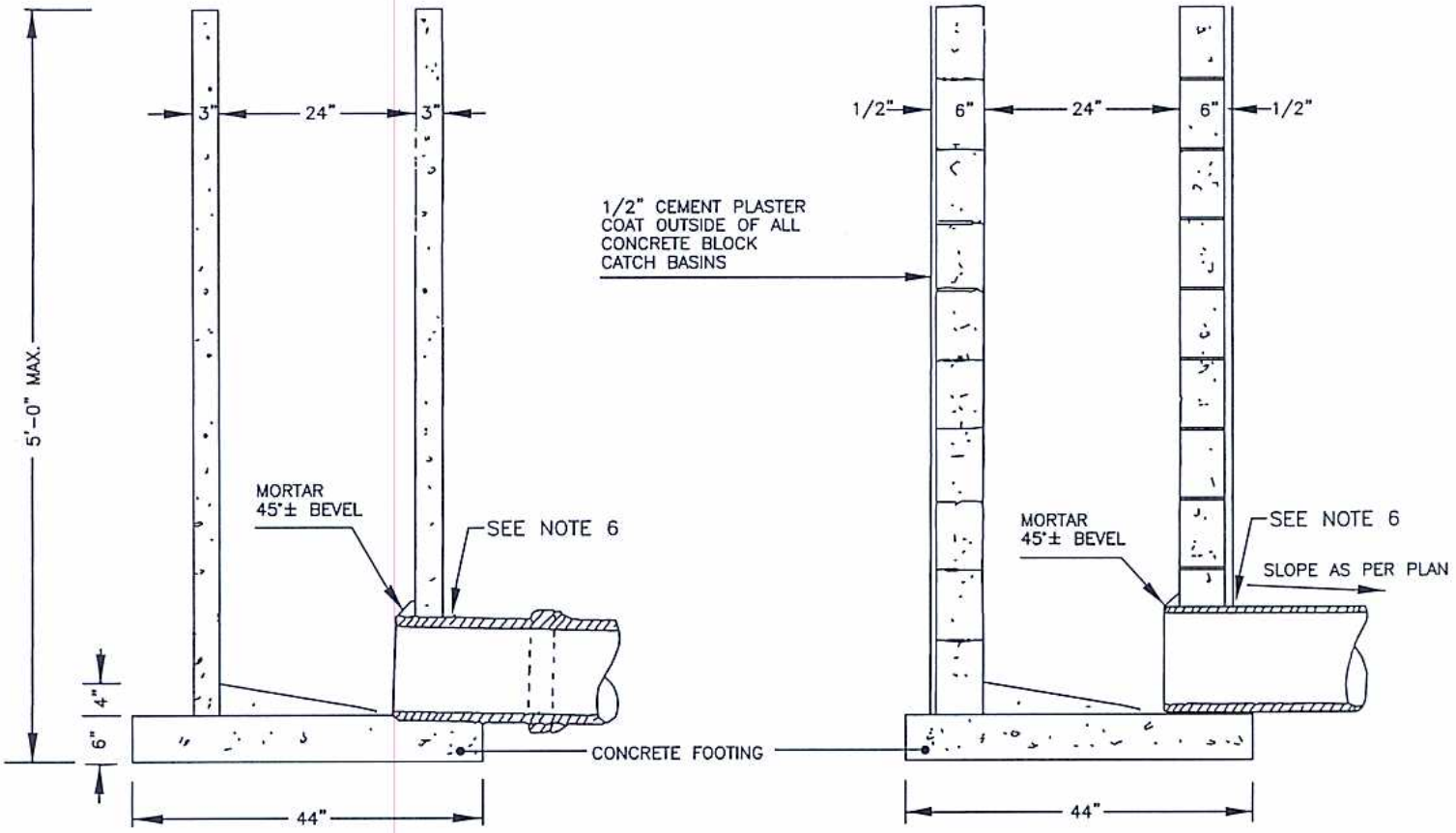
AUG.17,93 L.G.N.
AUG.07,95 drw(cad)
NOV. 97 drw(cad)
NOV.24,97 drw(cad)
MARCH,1999 drw(cad)
AUG'05 J&H



PAVED INVERT



PLAN VIEW



PRE-CAST CONCRETE

SECTION A-A

CONCRETE BLOCK

1. CONCRETE FOR BASES AND POURED STRUCTURES SHALL HAVE A COMPRESSIVE STRENGTH OF 3500 P.S.I. IN 28 DAYS AND A MINIMUM OF 5.5 SACKS OF CEMENT PER CYD SLUMP NOT TO EXCEED 4".

2. CEMENT BLOCK SHALL MEET A.S.T.M. REQUIREMENTS FOR LOAD BEARING CEMENT MASONRY UNITS C-90-52.

3. MORTAR FOR LAYING BRICK OR BLOCK AND PLASTERING OUTSIDE OF STRUCTURES SHALL BE COMPOSED OF 1 PART PATENTED MORTAR AND 2.5 PARTS MASONRY SAND (2MS, MDOT SPECIFICATIONS).

4. PRECAST MANHOLES SHALL BE OF THE ECCENTRIC CONE TYPE CONFORMING TO ASTM C-478.

5. MANHOLE STEPS SHALL BE SPACED 15" APART. STEPS REQUIRED IF DEPTH IS OVER FIVE FEET (5'). STEPS SHALL BE EJIW 8501 (PRECAST) OR EJIW 8503 (BLOCK) OR APPROVED EQUAL.

6. RESILIENT CONNECTORS SHALL BE REQUIRED FOR ALL PIPE INSERTIONS AS PER ASTM C-923.

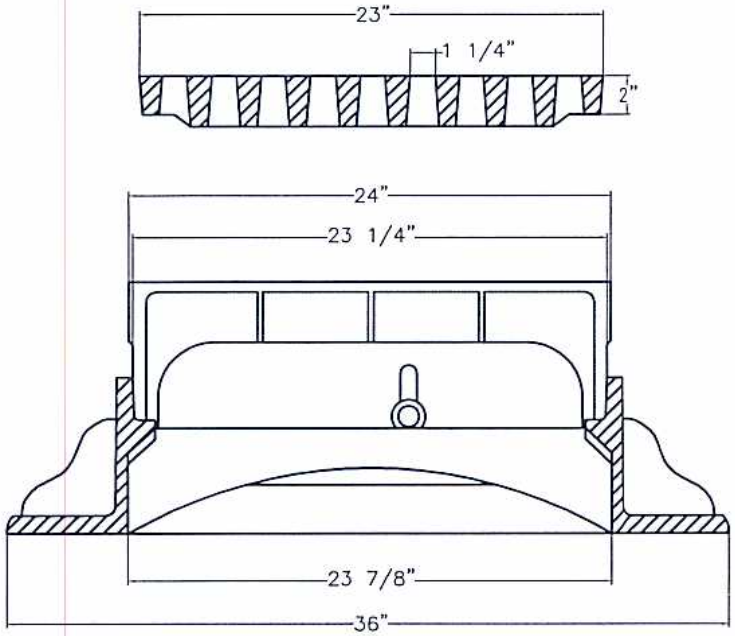
CITY OF PORTAGE

24" CATCH BASIN

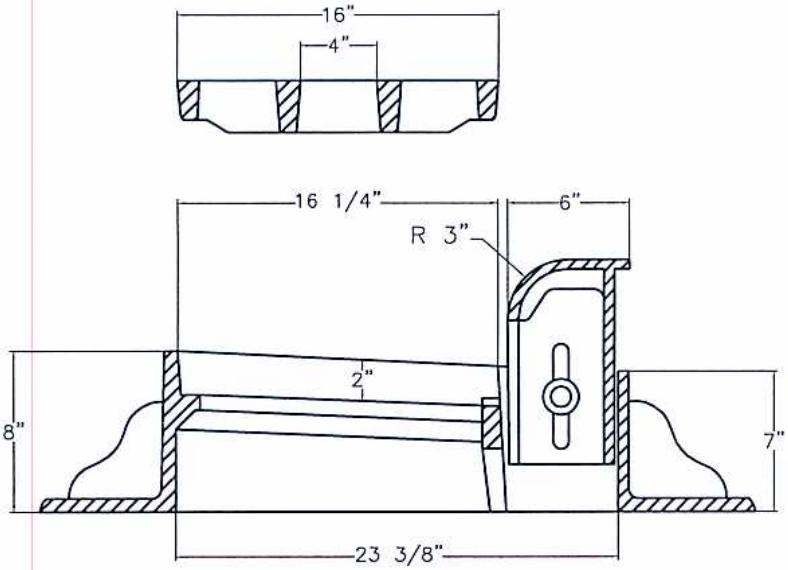
STANDARD DESIGN SD-102

APPROVED BY WCB

AUG. 17,93 L.G.N.
NOV. 97 D.R.W.
NOV. 24,97 D.R.W.
DEC. 2,97 D.R.W.
MARCH,99 D.R.W.
JULY'05 J&H



SIDE VIEW



CROSS SECTION

NOTES:

THE SEATING FACE OF THE GRATE AND THE SEAT FOR SAME ON THE FRAME SHALL BE GROUND SO THAT THE GRATE SHALL HAVE AN EVEN BEARING ON ITS SEAT TO PREVENT ROCKING OR TILTING.

THE CASTINGS SHALL BE FREE OF POURING FAULTS, BLOWHOLES, CRACKS, AND OTHER IMPERFECTIONS.

THEY SHALL BE SOUND, TRUE TO FORM AND THICKNESS, CLEAN AND NEATLY FINISHED, AND SHALL BE COATED WITH COAL TAR PITCH VARNISH.

CASTING:

EAST JORDAN "7010 WITH M4 GRATE & T1 BACK"
OR APPROVED EQUIVALENT
HAVING A TOTAL WEIGHT OF 325 LBS.

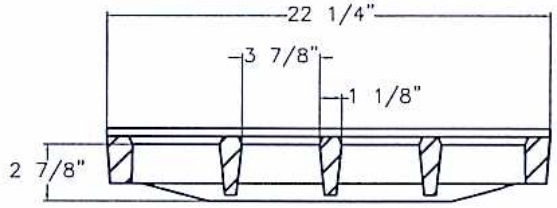
CITY OF PORTAGE

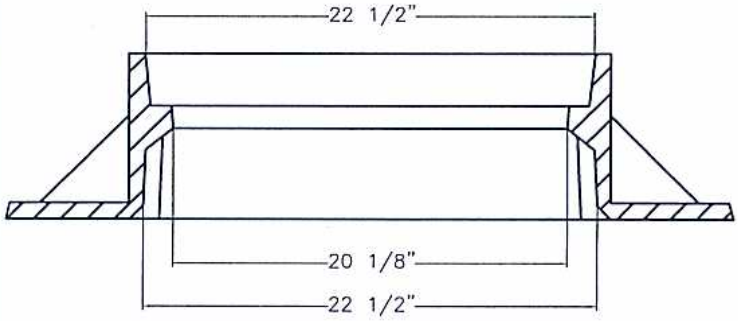
STANDARD CURB INLET CASTING

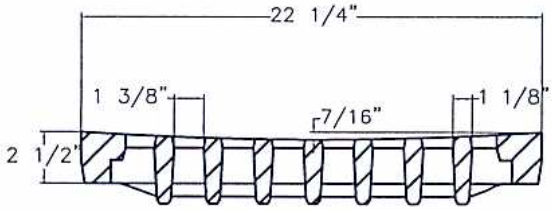
AUG.17,93	L.G.N.
AUG.07,95	drw(cad)
NOV. 97	drw(cad)
JULY'05	J&H
DEC'06	jma (cad)

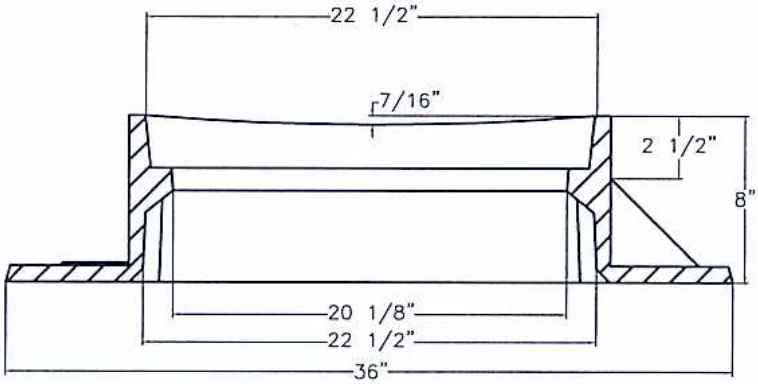
STANDARD DESIGN SD-103

APPROVED BY WCB









NOTES:

THE SEATING FACE OF THE GRATE AND THE SEAT FOR SAME ON THE FRAME SHALL BE GROUND SO THAT THE GRATE SHALL HAVE AN EVEN BEARING ON ITS SEAT TO PREVENT ROCKING OR TILTING

THE CASTING SHALL BE FREE OF POURING FAULTS, BLOWHOLES, CRACKS, AND OTHER IMPERFECTIONS. THEY SHALL BE SOUND, TRUE TO FORM AND THICKNESS, CLEAN AND NEATLY FINISHED, AND SHALL BE COATED WITH COAL TAR PITCH VARNISH.

CASTING:

EAST JORDAN "5100 CASTING WITH M1 GRATE"
HAVING A TOTAL WEIGHT OF 490 LBS.

CITY OF PORTAGE

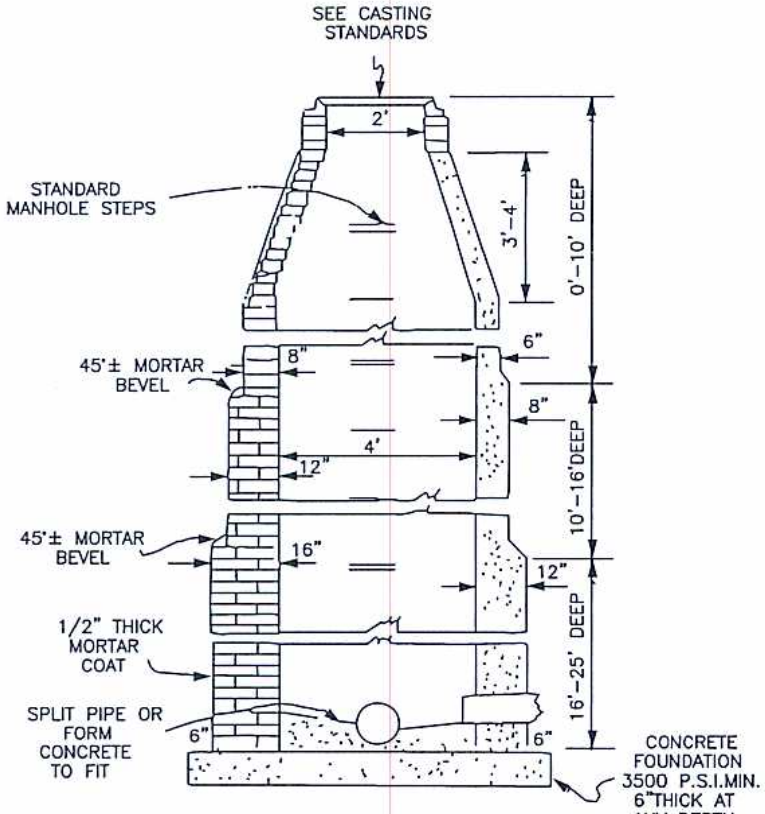
STANDARD DROP CURB INLET CASTING

AUG.17,93 L.G.N.	
AUG.07,95 drw(cad)	
NOV. '97 drw(cad)	
JULY'05 J&H	
DEC'06 jma (cad)	

STANDARD DESIGN SD-104

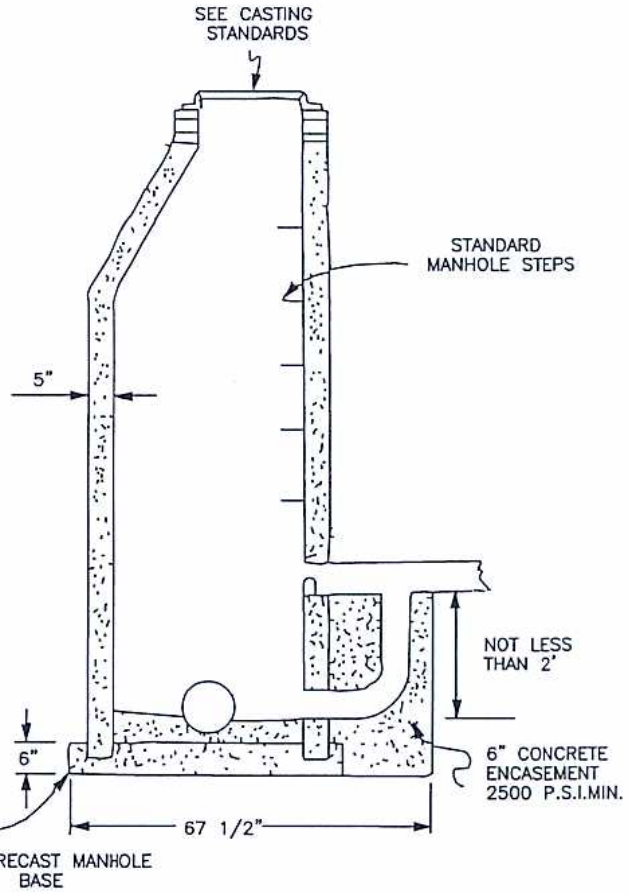
APPROVED WCB

MANHOLE



BRICK

DROP MANHOLE



PRECAST MANHOLE

POURED CONCRETE OR MANHOLE BLOCK

1. BRICK SHALL BE GRADE MA. CONFORMING TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR SEWER BRICK, A.S.T.M. C-32
2. MORTAR BLOCK SHALL MEET A.S.T.M. REQUIREMENTS FOR LOAD BEARING CONCRETE MASONARY UNITS C-90-52
3. MORTAR FOR LAYING BRICK OR BLOCK AND PLASTERING OUTSIDE OF STRUCTURES SHALL BE COMPOSED OF ONE PART PATENTED MORTAR AND 2-1/2 PARTS MDOT 2NS.
4. PRECAST MANHOLES SHALL BE OF THE ECCENTRIC CONE TYPE CONFORMING TO ASTM C-478 WITH GASKETS CONFORMING TO ASTM C-443 AND BUTYL RUBBER JOINT SEALANT CONFORMING TO FEDERAL SPECIFICATION SS-S-210A.

F RESILIENT CONNECTIONS (ASTM C-923) WILL BE REQUIRED FOR PIPE INSERTIONS.

TABLE "A"

SEWER SIZE INCOMING	DROP SIZE
8"THRU 12"	8"
15"THRU 18"	10"
21"THRU 27"	12"
30"THRU 36"	15"

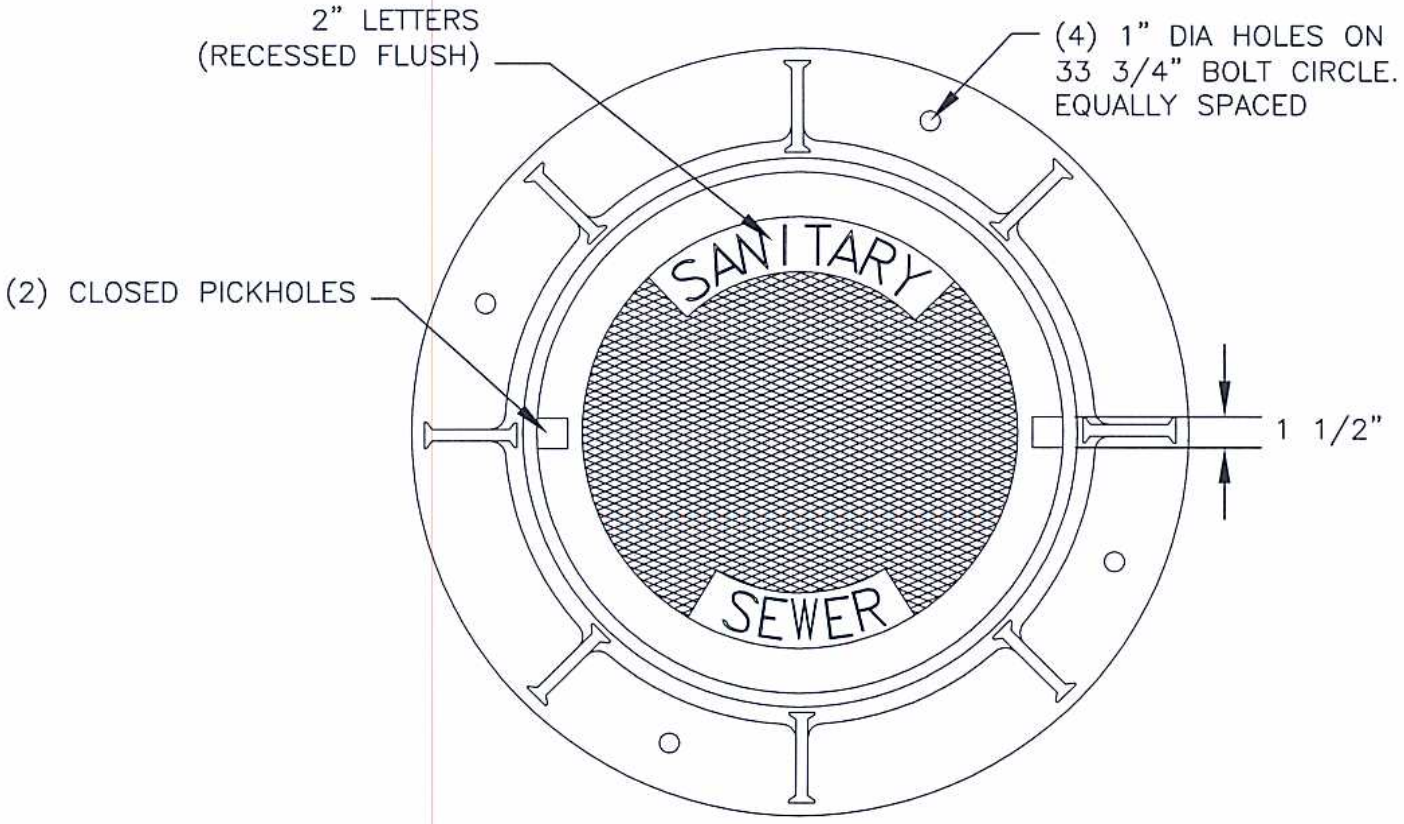
CITY OF PORTAGE

STANDARD MANHOLE

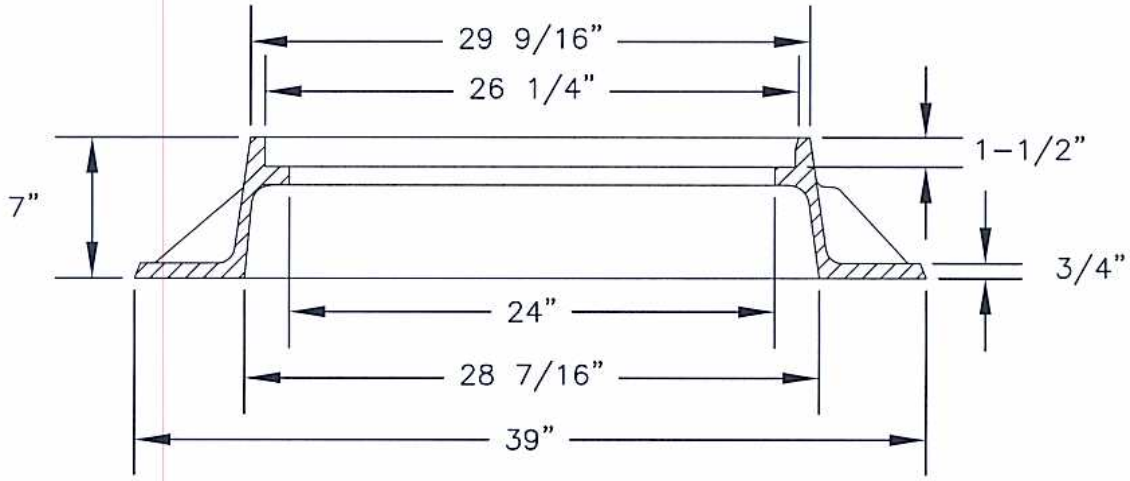
AUG.17,93 L.G.N.
AUG.07,95 drw(cad)
NOV. '97 drw(cad)
JULY'05 J&H

STANDARD DESIGN SD-105

APPROVED WCB



TOP VIEW OF FRAME



CROSS SECTION OF FRAME

EAST JORDAN FRAME CASTING "1040Z" OR EQUIVALENT

NOTES:

THE SEATING FACE OF THE LID AND THE SEAT FOR SAME ON THE FRAME SHALL BE GROUND OR MACHINED SO THAT THE LID SHALL HAVE AN EVEN BEARING ON ITS SEAT TO PREVENT ROCKING OR TILTING.

THE CASTING SHALLL BE FREE OF POURING FAULTS, BLOWHOLES, CRACKS AND OTHER IMPERFECTIONS. THEY SHALL BE SOUND, TRUE TO FORM AND THICKNESS, CLEAN, AND NEATLY FINISHED, AND SHALL BE COATED WITH COAL TAR PITCH VARNISH.

MANHOLE COVER:

EAST JORDAN TYPE "A" 1040A
W/ 2" "SANITARY SEWER" LETTERING
HEAVY DUTY SOLID COVER OR APPROVED EQUIVALENT

TOTAL WEIGHT
350 LB.

CITY OF PORTAGE

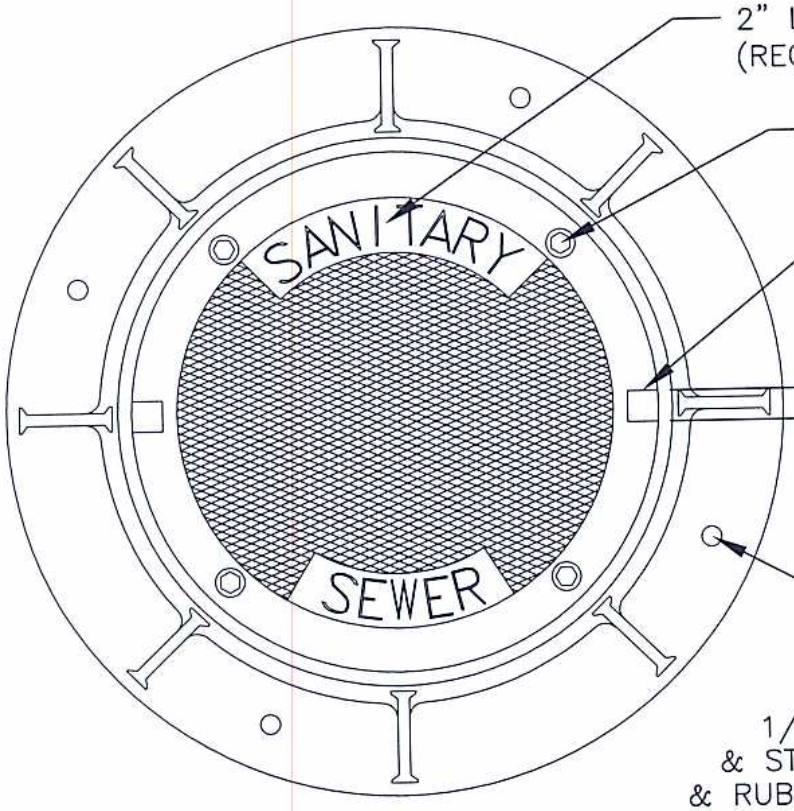
SANITARY SEWER STANDARD MANHOLE CASTING

AUG. 17, 93 L.G.N.
NOV. '97 D.R.W.
JULY'05 J&H
JAN'07 JMA

STANDARD DESIGN SD-106

APPROVED WCB

TOP VIEW OF FRAME



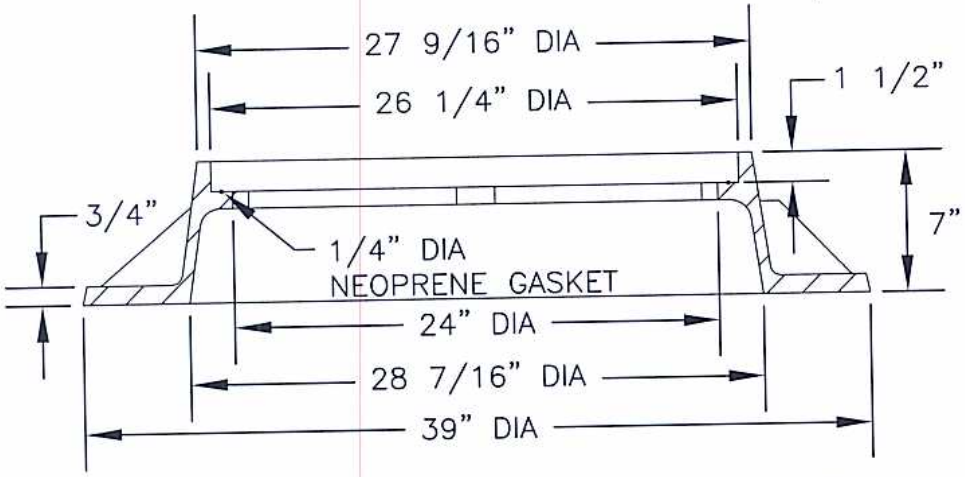
2" LETTERS
(RECESSED FLUSH)

(4) 1/2"–13
HEX BOLTS & WASHERS

(2) CLOSED PICKHOLES

1 1/2"

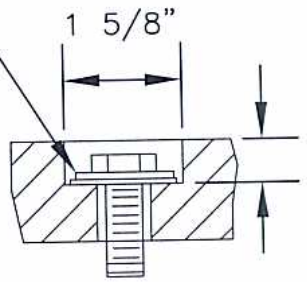
(4) 1" DIA HOLES ON 33 3/4"
BOLT CIRCLE EQALLY SPACED



CROSS SECTION OF FRAME

EAST JORDAN FRAME CASTING "1040 ZPT" OR EQUIVALENT

1/2"–13 BOLT
& STEEL WASHER
& RUBBER WASHER
(TYP 4 PLACES)



BOLT DETAIL

NOTES:

THE SEATING FACE OF THE LID SHALL BE GROUND OR MACHINED TO FORM A TIGHT SEAL WITH THE NEOPRENE GASKET IN THE MACHINED GROOVE IN THE BASE.

THE CASTING SHALL BE FREE OF POURING FAULTS, BLOW HOLES, CRACKS AND ANY OTHER IMPERFECTIONS. THEY SHALL BE SOUND, TRUE TO FORM AND THICKNESS, CLEAN AND NEATLY FINISHED, AND SHALL BE COATED WITH COAL TAR PITCH VARNISH.

MANHOLE COVER:

EAST JORDAN TYPE "APT". HEAVY DUTY SOLID COVER OR APPROVED EQUIVALENT, EQUIPPED WITH 1/2" BRONZE CAP SCREWS AND 2" "SANITARY SEWER" LETTERING.

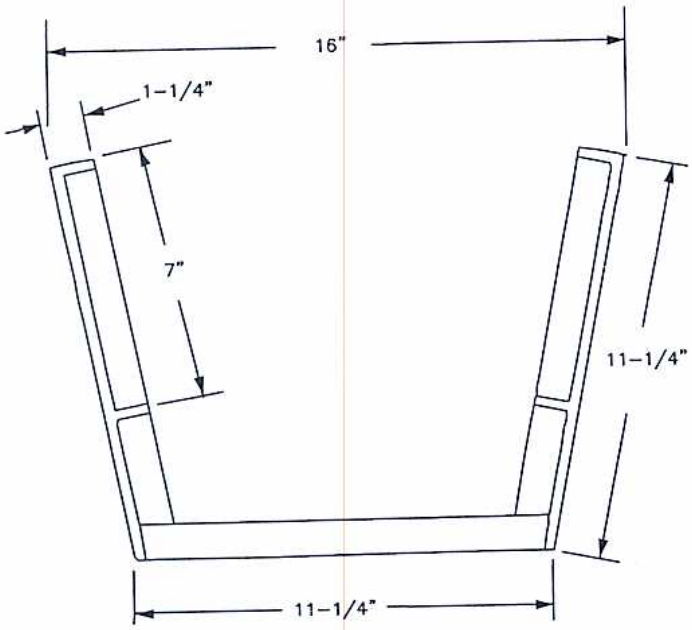
TOTAL WEIGHT
380 LBS.

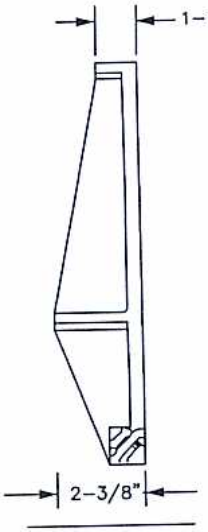
CITY OF PORTAGE

SANITARY SEWER
PRESSURE–TIGHT
MANHOLE CASTING

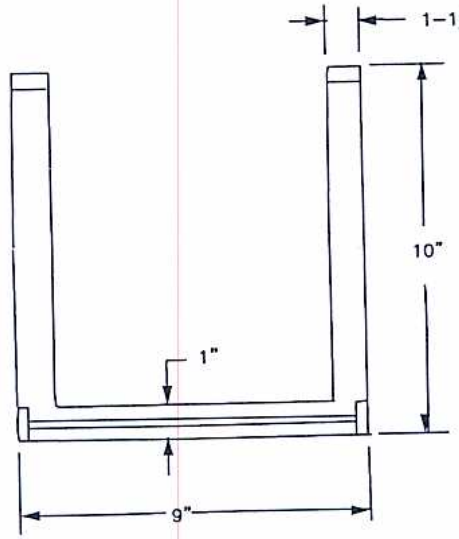
STANDARD DESIGN	SD–107
APPROVED	WCB

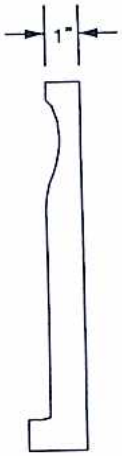
AUG.17,9
L.G.N.
AUG.07,9
drw(cad
NOV. '9
drw(cad
JULY'0
J&H
JAN '0
JMA





TYPICAL STEP
FOR BLOCK CONSTRUCTION





TYPICAL STEP
FOR PRECAST CONSTRUCTION

NOTES:

MANHOLE STEPS SHALL BE ONE INCH (1") CAST IRON OR HIGH GRADE ALUMINUM WITH FOOT RECESS AND SUITABLY SCORED SO AS TO PROVIDE A NON-SLIP SURFACE.

EAST JORDAN MANHOLE STEP "8501"
FOR PRECAST CONSTRUCTION, OR APPROVED EQUIVALENT

EAST JORDAN MANHOLE STEP "8503"
FOR BLOCK CONSTRUCTION, OR APPROVED EQUIVALENT

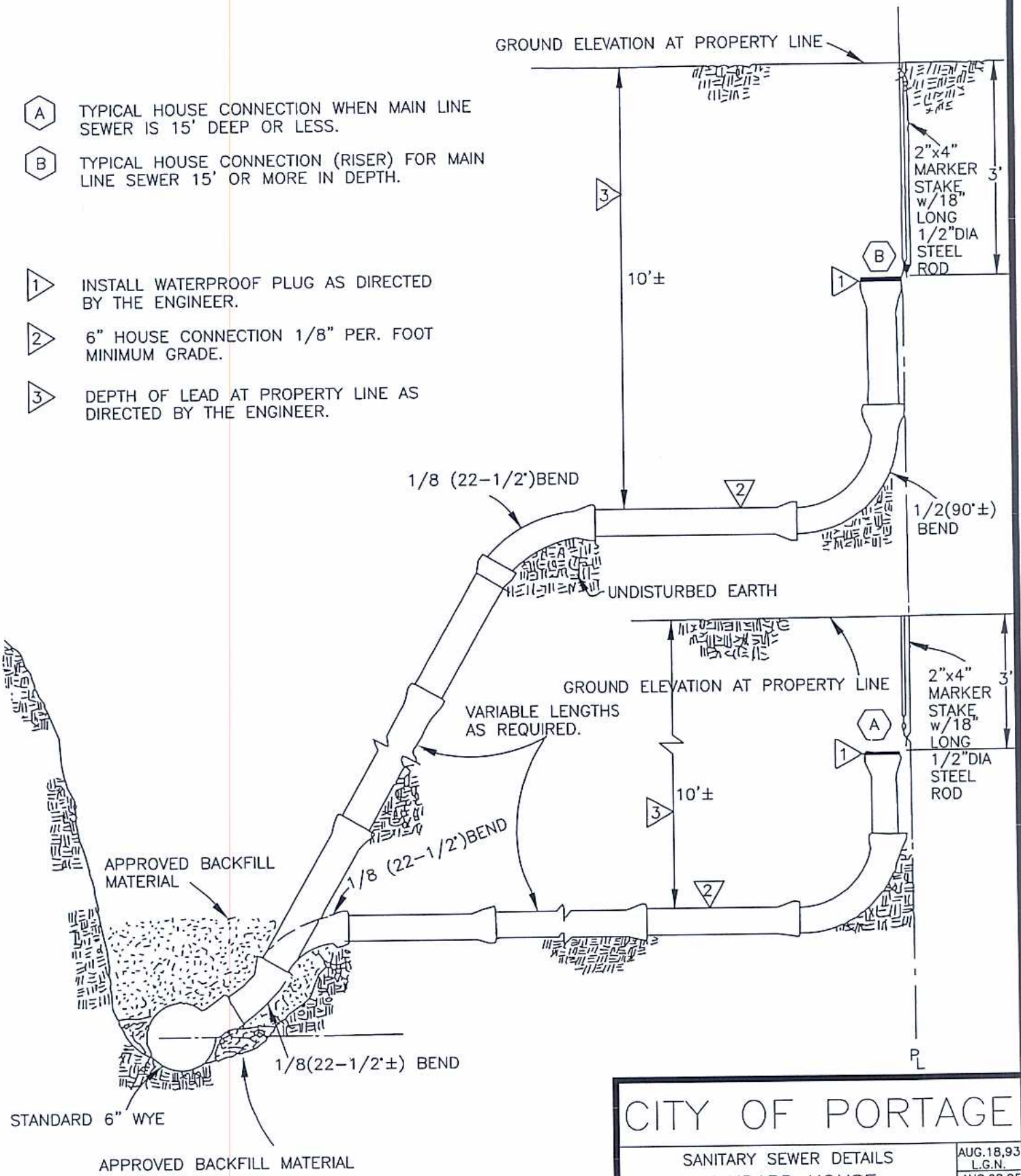
CITY OF PORTAGE

STANDARD MANHOLE STEP

AUG.17,9
L.G.N.
AUG.07,9
drw(cad)
NOV. '97
drw(cad)
JULY'05
J&H

STANDARD DESIGN SD-108

APPROVED WCB



CITY OF PORTAGE

SANITARY SEWER DETAILS

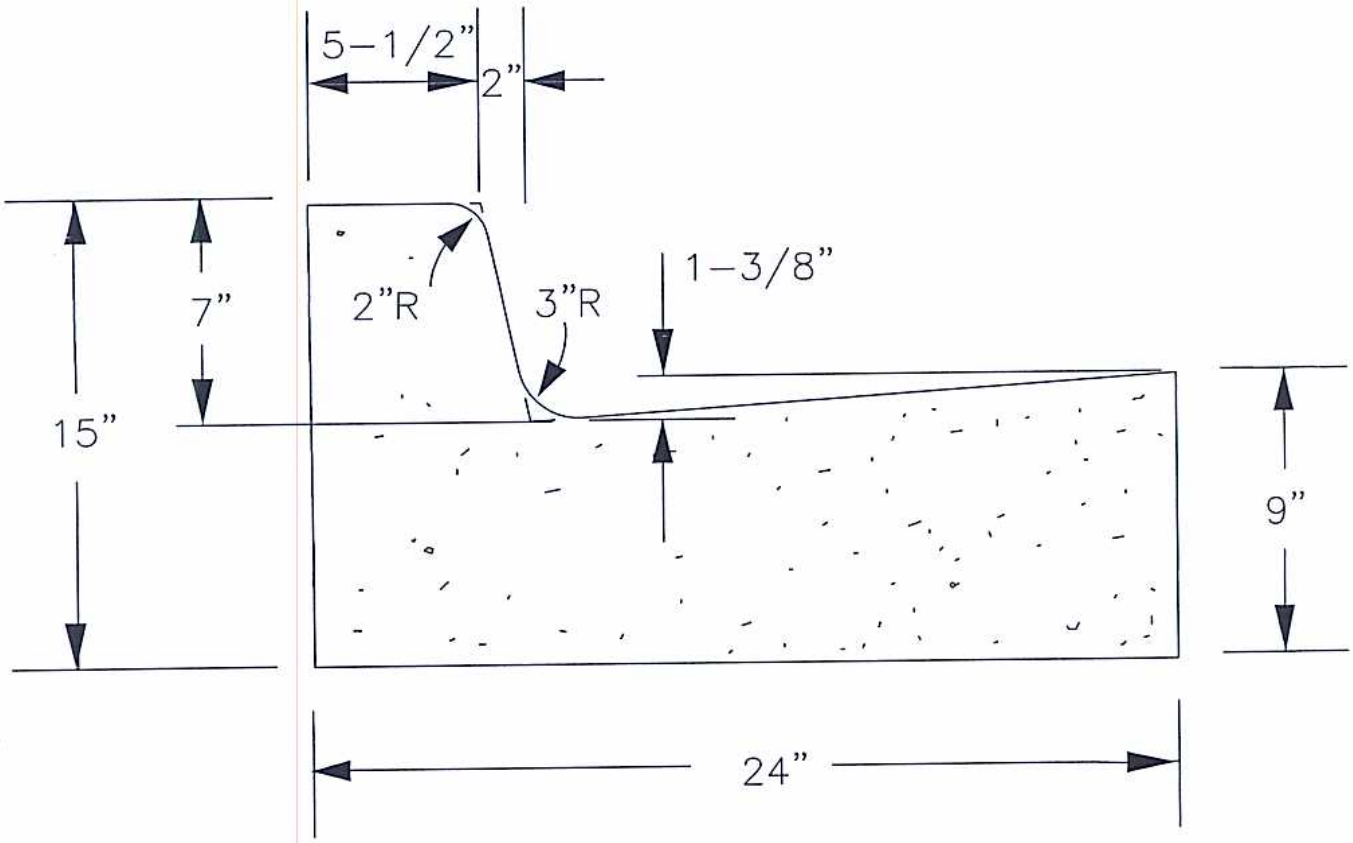
STANDARD HOUSE CONNECTIONS

(PROPERTY LINE RISER)

STANDARD DESIGN SD-110

APPROVED WCB

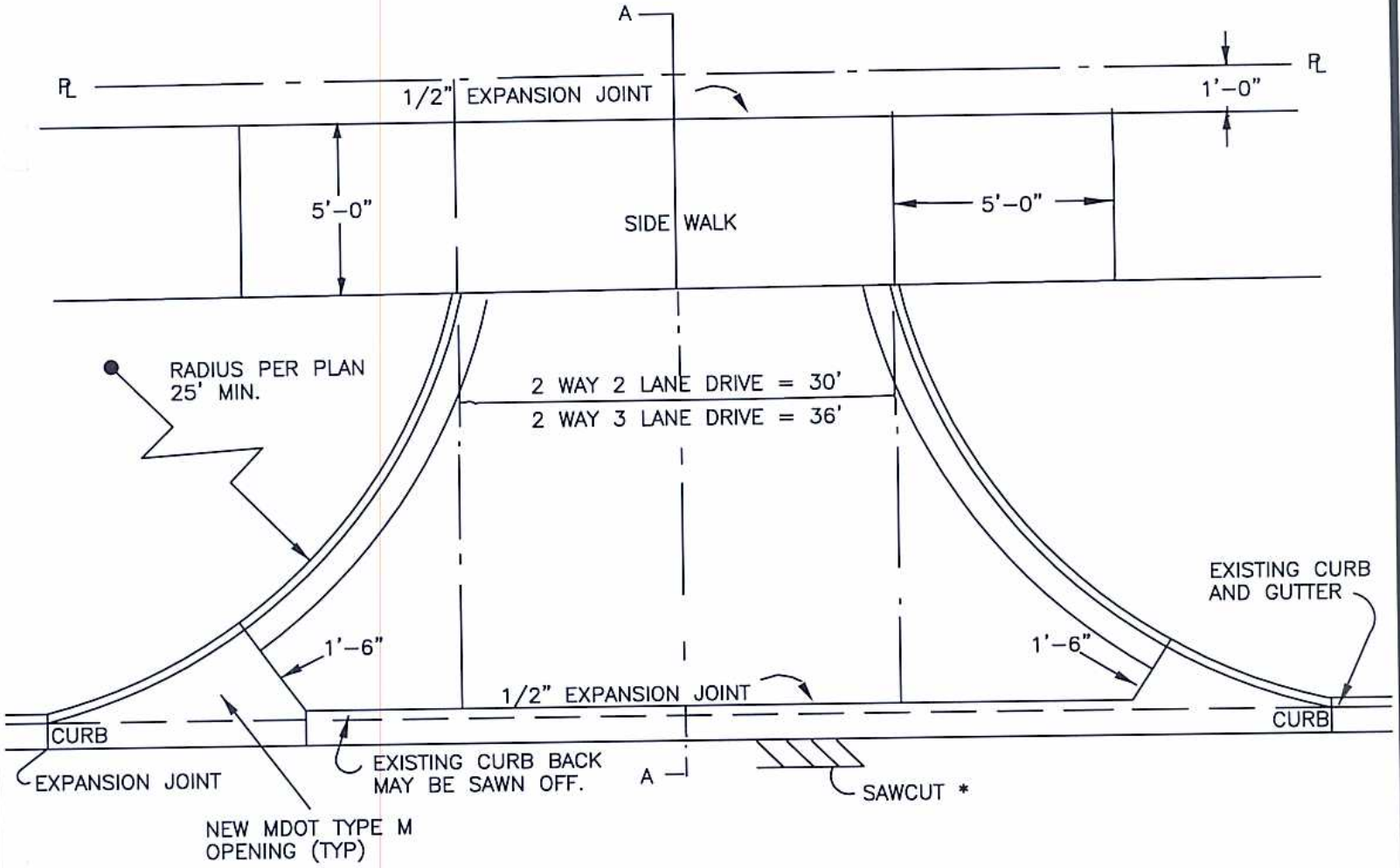
AUG.18,93 L.G.N.
AUG.08,95 drw(cad)
NOV.25,97 drw(cad)
DEC.'97 drw(cad)
FEB.'98 drw(cad)
JULY'05 J&H



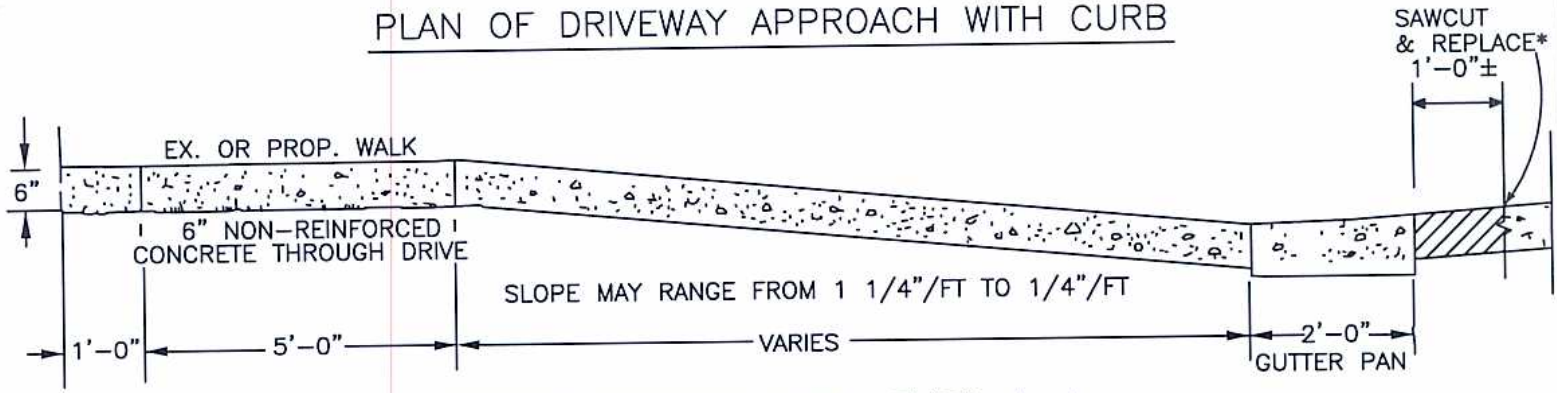
CURB DETAIL

STANDARD MDOT C–4 CURB WITHOUT REBAR

CITY OF PORTAGE	
STANDARD CURB	AUG.17,93 L.G.N. JULY'05 J&H
STANDARD DESIGN SD–113 APPROVED WCB	



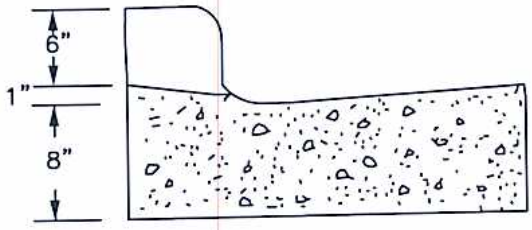
PLAN OF DRIVEWAY APPROACH WITH CURB



CROSS–SECTION DRIVE THRU A–A

1. IF BITUMINOUS PAV'T IS USED FOR APPROACH, MIN. THICKNESS SHALL BE 4" BIT. & 8" 22A AGGREGATE.

* SAWCUT AND REPLACE WITH EQUAL DEPTH OF PAVEMENT. ANNULUS SHALL NOT BE FILLED WITH CONCRETE.



IF CURB INLET IS PRESENT, REPLACE CASTING PER SD–104 AND ADJUST CURB FLOWLINE ACCORDINGLY

CURB DETAIL

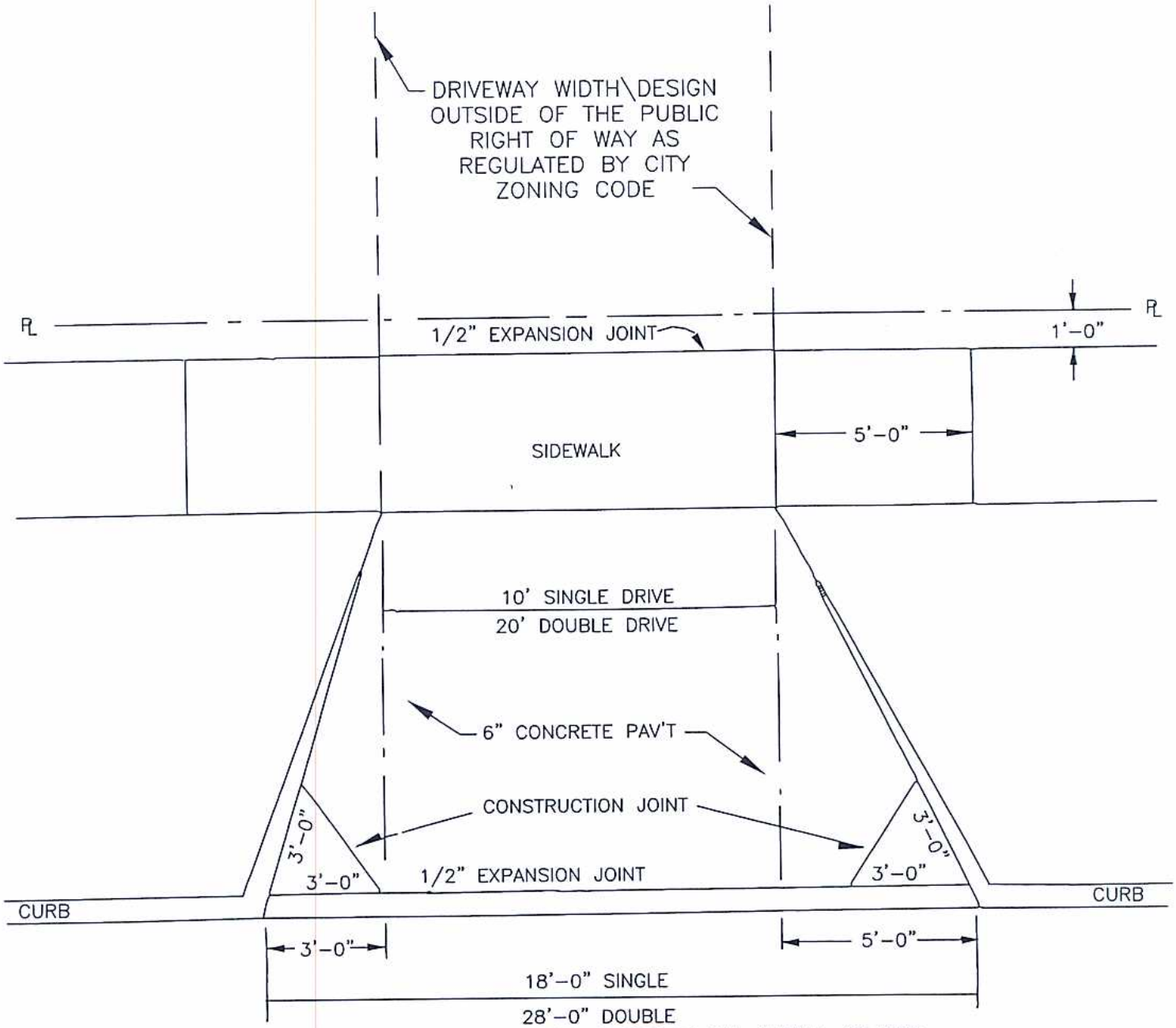
CITY OF PORTAGE

COMMERCIAL & INDUSTRIAL DRIVEWAY APPROACH WITH CURBED STREET

FEB.,'99 D.R.W.
MARCH,'99 D.R.W.
JULY'05 J&H

STANDARD DESIGN SD–116

APPROVED WCB



PLAN OF DRIVEWAY APPROACH WITH CURB

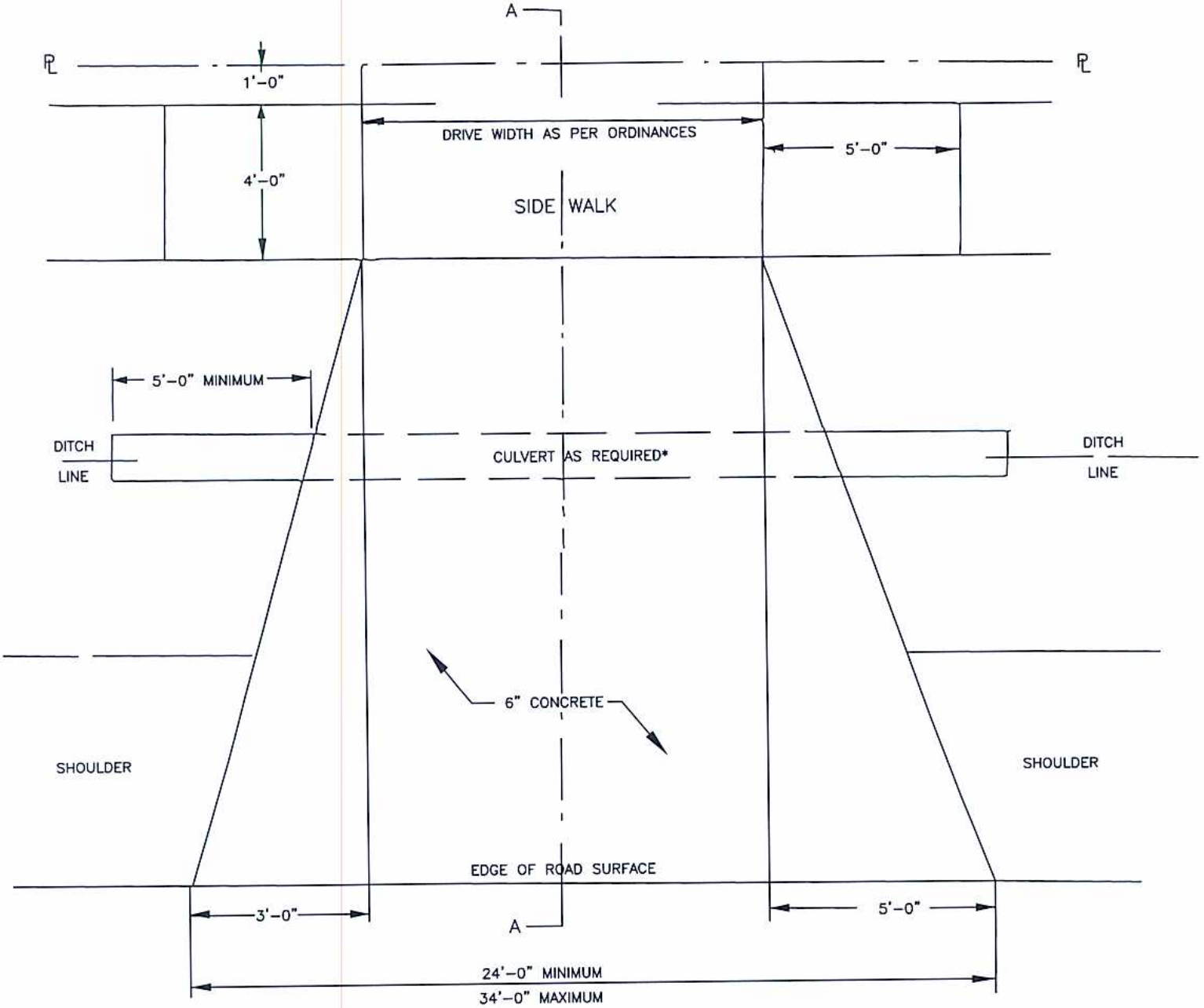
CITY OF PORTAGE

RESIDENTIAL DRIVEWAY APPROACH WITH CURBED STREET

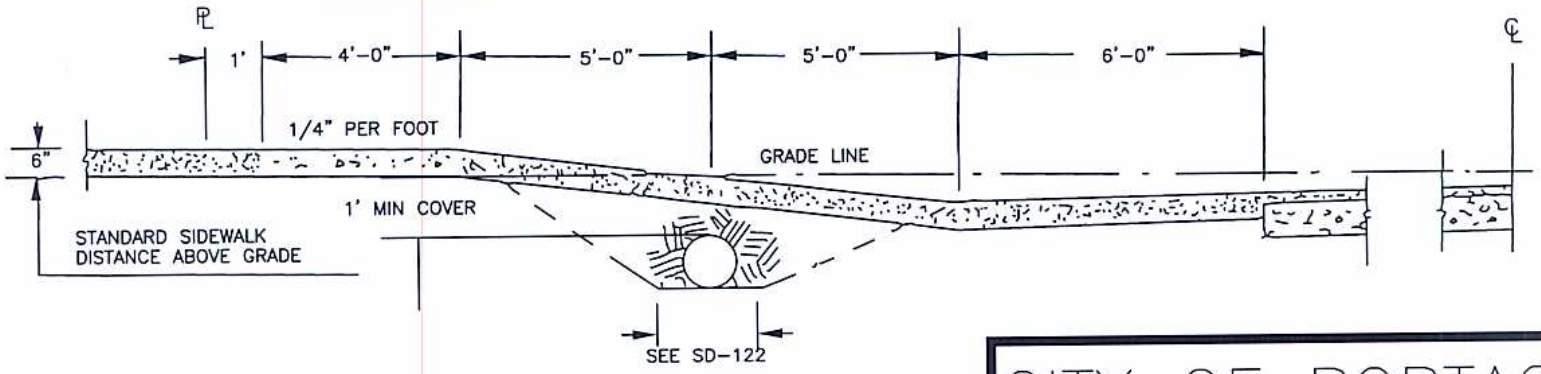
STANDARD DESIGN SD-117

APPROVED WCB

AUG.17,93	L.G.N.
NOV. '97	D.R.W.
NOV.25,97	D.R.W.
JULY'05	J&H
FEB '07	JMA



PLAN OF DRIVEWAY APPROACH WITHOUT CURB



CROSS SECTION DRIVE THRU A–A

* SIZE AND NECCESSITY OF CULVERT TO BE DETERMINED BY THE ENGINEER
* IF BITUMINOUS PVMT IS USED MIN THICKNESS SHALL BE 3" BIT & 6" 22A AGGREGATE

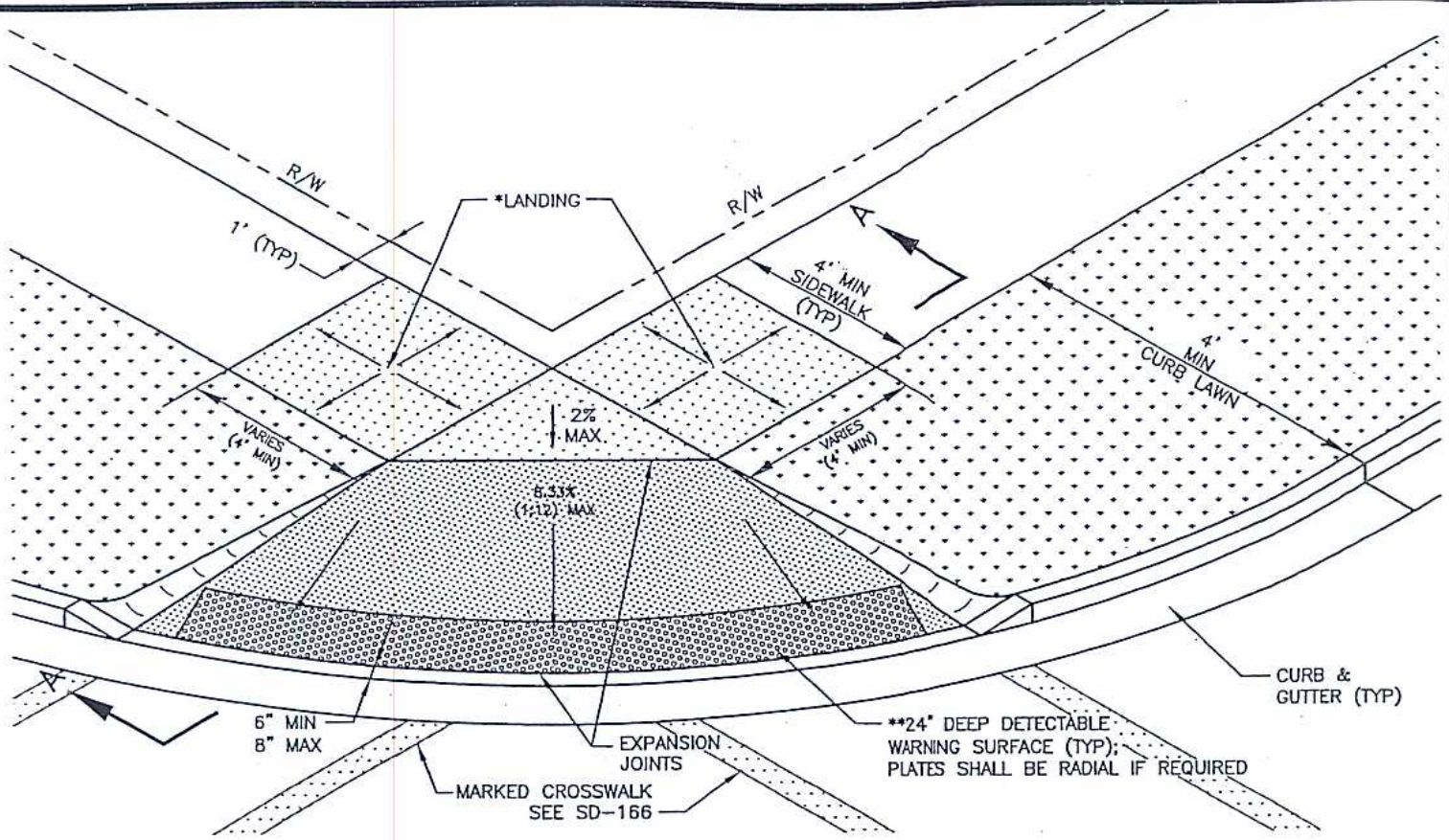
CITY OF PORTAGE

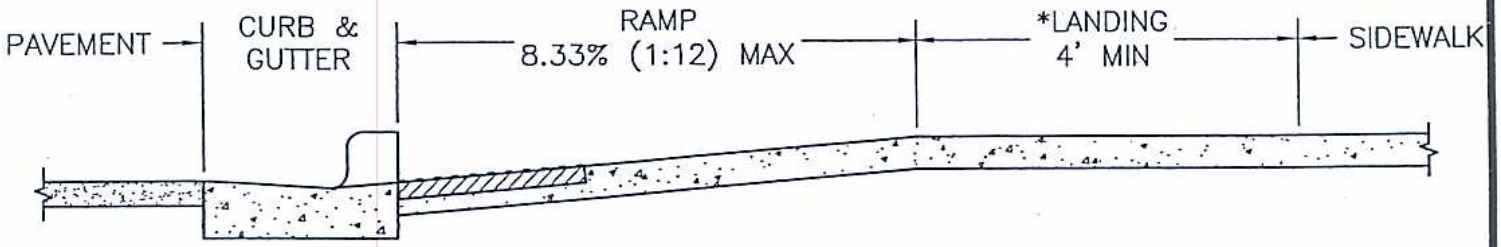
RESIDENTIAL DRIVEWAY APPROACH WITHOUT CURBED STREET

AUG.17,9. L.G.N.
AUG.07,9 drw(cad)
NOV. '97 drw(cad)
JULY'05 J&H
FEB '0 JMA

STANDARD DESIGN SD–118

APPROVED WCB





SECTION A-A

NTS

* MAXIMUM LANDING SLOPE IN ANY DIRECTION IS 2% (1:50). LANDING SHALL BE A MINIMUM OF 4'-0" IN ALL DIRECTIONS.

** DETECTABLE WARNING SURFACE SHALL EXTEND THE FULL WIDTH OF THE CURB RAMP. THEY SHALL BE LOCATED SO THAT THE EDGE NEAREST THE CURB LINE IS A MINIMUM OF 6" AND A MAXIMUM OF 8" FROM THE FACE OF THE CURB.
DETECTABLE WARNING PLATES SHALL HAVE A BLACK ASPHALT COATING AND SHALL BE CAST IRON. PLATES SHALL BE EJIW 7005 OR NEENAH FOUNDRY SERIES 4213.

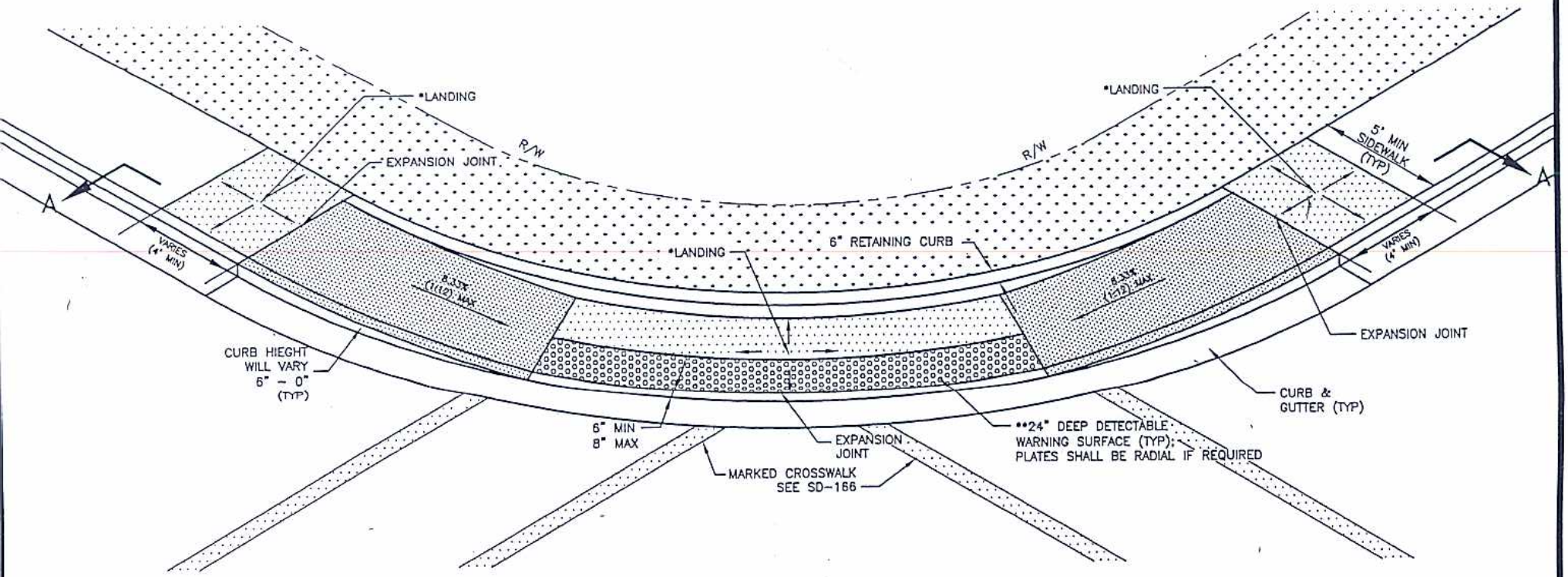
CITY OF PORTAGE

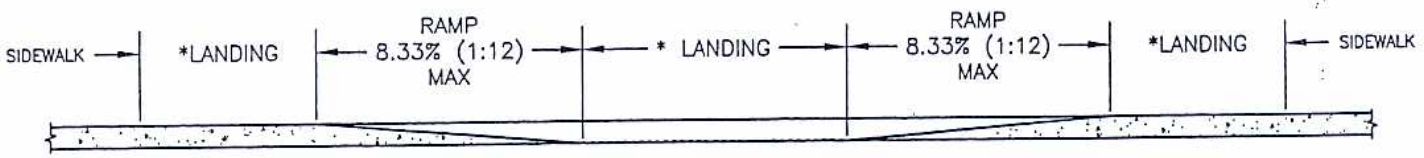
RAMPED SIDEWALK DETAIL

AUG.17,93 L.G.N.	
AUG.07,95 drw(cad)	
NOV.07,97 drw(cad)	
NOV.25,97 drw(cad)	
JAN'07 JMA	

STANDARD DESIGN SD-119A

APPROVED WCB





SECTION A-A

NTS

* MAXIMUM LANDING SLOPE IN ANY DIRECTION IS 2% (1:50). LANDING SHALL BE A MINIMUM OF 4'-0" IN ALL DIRECTIONS.

** DETECTABLE WARNING SURFACE SHALL EXTEND THE FULL WIDTH OF THE CURB RAMP. THEY SHALL BE LOCATED SO THAT THE EDGE NEAREST THE CURB LINE IS A MINIMUM OF 6" AND A MAXIMUM OF 8" FROM THE FACE OF THE CURB.
DETECTABLE WARNING PLATES SHALL HAVE A BLACK ASPHALT COATING AND SHALL BE CAST IRON. PLATES SHALL BE EJIW 7005 OR NEENAH FOUNDRY SERIES 4213.

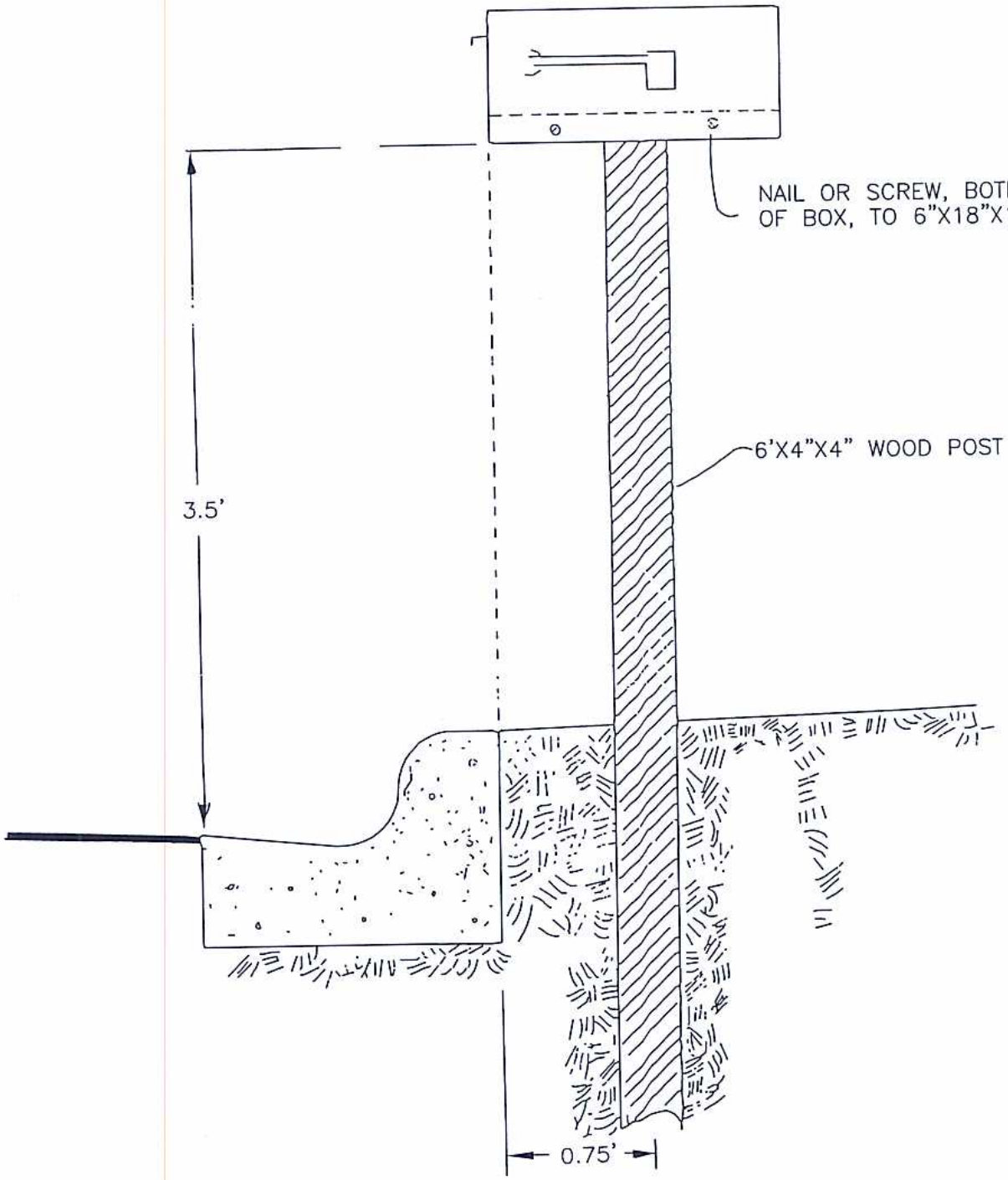
CITY OF PORTAGE

RAMPED SIDEWALK ADJACENT TO CURB & GUTTER DETAIL

STANDARD DESIGN SD-119B

APPROVED WCB

AUG.17,93	
L.G.N.	
AUG.07,95	
drw(cad)	
NOV.07,97	
drw(cad)	
NOV.25,97	
drw(cad)	
JAN'07	
JMA	



NOTES:

MAIL BOX TO BE POSTMASTER APPROVED
POST TO BE 6'X4"X4" WOOD WITH 6"X18"X1" WOOD BASE BOARD FIRMLY ATTACHED
POST TO BE PLACED SO AS TO STAND STRAIGHT
IN AREAS WITHOUT CURB AND GUTTER, PLACE CENTER OF POST 1.75' OFF EXISTING SHOULDER

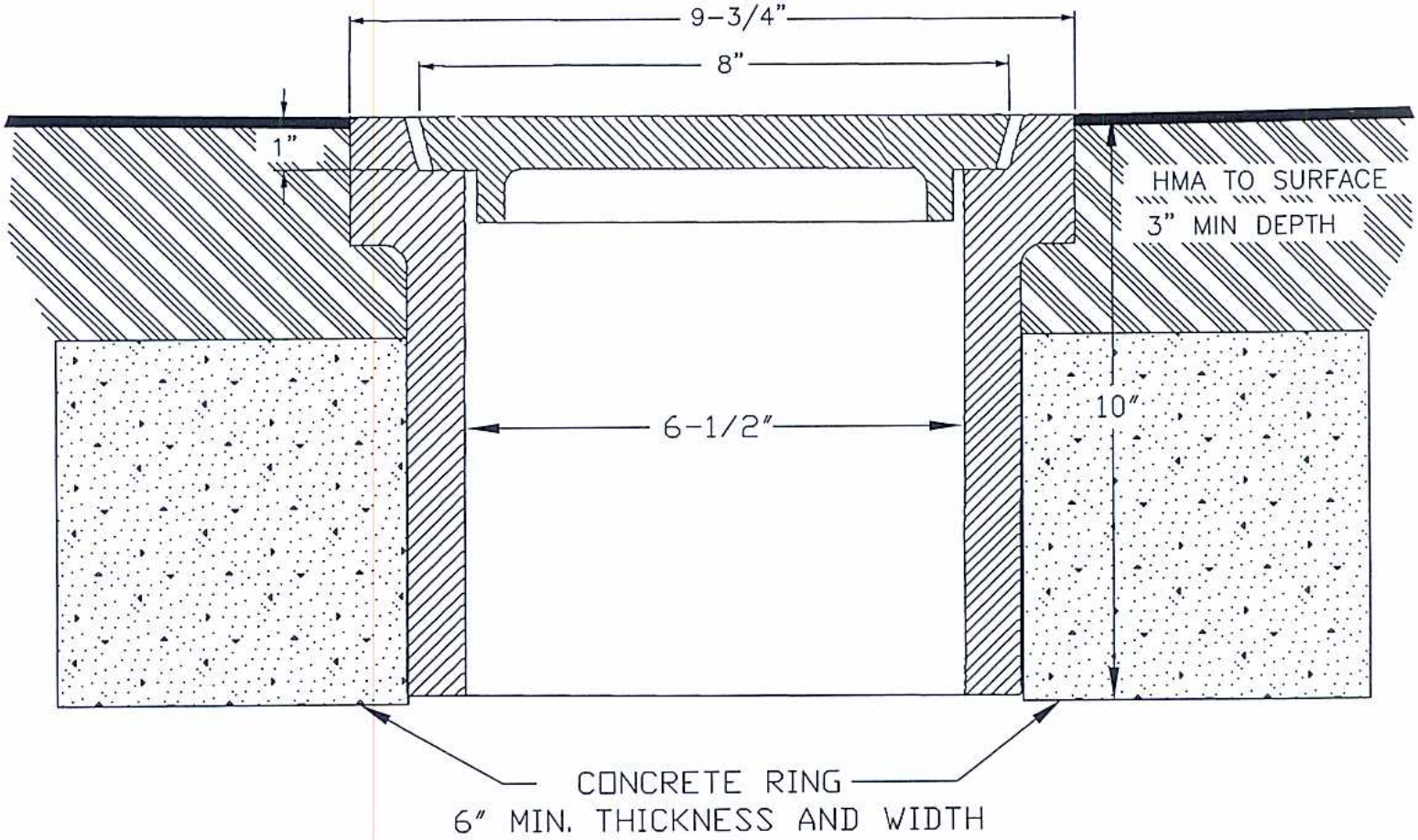
CITY OF PORTAGE

TYPICAL MAIL BOX

AUG.17,9 L.G.N.
AUG.07,95 drw(cad)
NOV. '97 drw(cad)
JULY'05 J&H

STANDARD DESIGN SD-120

APPROVED WCB



CROSS SECTION OF MONUMENT BOX AND COVER

NOTES:

THE SEATING FACE OF THE LID AND THE SEAT FOR SAME ON FRAME SHALL BE GROUND OR MACHINED SO THAT THE LID SHALL HAVE AN EVEN BEARING ON ITS SEAT TO PREVENT ROCKING OR TILTING.

THE CASTING SHALL BE FREE OF POURING FAULTS, BLOW HOLES, CRACKS AND OTHER IMPERFECTIONS, THEY SHALL BE SOUND, TRUE TO FORM AND THICKNESS, CLEAN AND NEATLY FINISHED, AND SHALL BE COATED WITH TAR PITCH VARNISH.

CASTING:

EAST JORDAN FLANGE TYPE "2965"
OR APPROVED EQUIVALENT

TOTAL WEIGHT 60 LB.

CITY OF PORTAGE

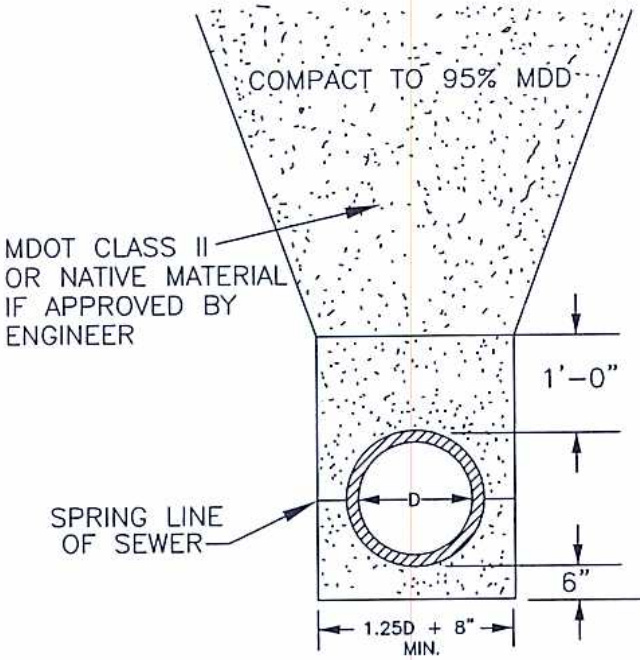
STANDARD MONUMENT BOX

AUG.17,93 L.G.N.
AUG.07,95 drw(cad)
NOV. '97 drw(cad)
JULY'05 J&H

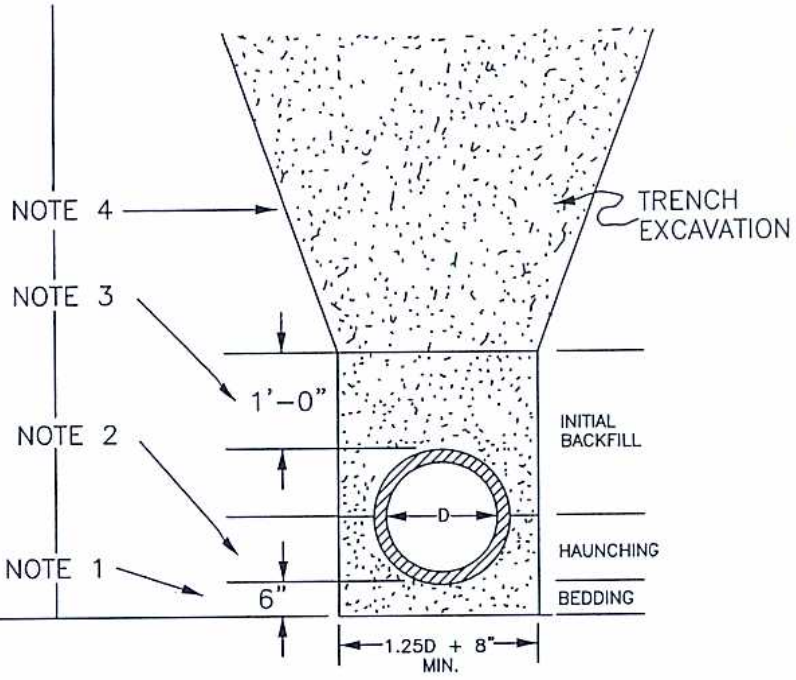
STANDARD DESIGN SD-121

APPROVED WCB

TYPICAL SECTION OF SEWER IN OPEN CUT UNDER ROADBED



TYPICAL SECTION OF SEWER IN OPEN CUT NOT UNDER ROADBED



GRADING REQUIREMENTS FOR GRANULAR MATERIALS AND MDOT 17A

MATERIAL	TOTAL PERCENT PASSING (SIEVE SIZE – U.S. STANDARD SIEVE SERIES)										LOSS BY WASHING PERCENT
	6"	3"	2"	1"	3/4"	1/2"	3/8"	No. 4	No. 30	No. 100	
CLASS I			100			40–85		20–85	5–30		0–5
CLASS II		100		60–100						0–30	0–7
CLASS III	100	95–100									0–15
17A				100	90–100	50–75		0–8			1.0 MAX

PER MDOT 2003 STANDARD SPECIFICATIONS FOR CONSTRUCTION, FOR ADDITIONAL INFORMATION, SEE TABLES 902–2 AND 902–3

NOTES:

(1). BEDDING: CLASS "A" BEDDING SHALL CONSIST OF A CONTINUOUS CONCRETE CRADLE CONFORMING TO PLAN DETAIL.
CLASS "B" BEDDING SHALL CONSIST OF A BED OF GRANULAR MATERIAL HAVING A THICKNESS OF AT LEAST SIX INCHES (6") BELOW THE BOTTOM OF THE PIPE TO THE SPRINGLINE OF THE PIPE, AND SHALL HAVE RECESSES SHAPED TO RECEIVE THE BELL.
CLASS "C" BEDDING SHALL CONSIST OF BEDDING THE CONDUIT IN ITS NATURAL FOUNDATION TO A DEPTH OF THE SPRING LINE OF THE CONDUIT. THE BED SHALL BE SHAPED TO RECEIVE THE BELL.

(2). HAUNCHING: FROM THE BOTTOM OF THE PIPE TO THE SPRING LINE, HAUNCHING OF THE PIPE BEDDING MATERIAL CLASS B OR C SHALL BE PERFORMED. HAUNCHING SHALL CONSIST OF PLACING LIFTS OF CLASS B OR C MATERIAL IN FOUR INCH (4") TO SIX INCH (6") LIFTS ON EITHER SIDE OF THE PIPE, AND COMPACTING IN PLACE.

(3). INITIAL BACKFILL: FROM THE SPRING LINE OF THE PIPE TO ONE FOOT (1') ABOVE THE PIPE, THE PIPE SHALL BE BACKFILLED WITH GRANULAR MATERIAL, CLASS B OR C, IN SIX INCH (6") LIFTS AND COMPACTED TO 95% OF MAXIMUM DRY DENSITY (MDD), AS DETERMINED BY THE MODIFIED PROCTOR METHOD.

4). FINAL BACKFILL: WHERE EXCAVATION IS MADE THROUGH PAVEMENT AREAS OR WHERE STRUCTURES ARE UNDERCUT BY THE EXCAVATION, THE BACKFILL FROM ONE FOOT (1') ABOVE THE PIPE TO THE SUBGRADE SHALL BE MADE WITH GRANULAR MATERIAL COMPACTED TO 95% OF MAXIMUM DRY DENSITY, AS DETERMINED BY THE MODIFIED PROCTOR METHOD.
WHERE EXCAVATION IS NOT MADE THROUGH PAVEMENT AREAS OR OTHERWISE SPECIFIED, THE BACKFILL SHALL BE COMPACTED IN FOUR FOOT (4') MAXIMUM LIFTS BY MACHINE METHODS.

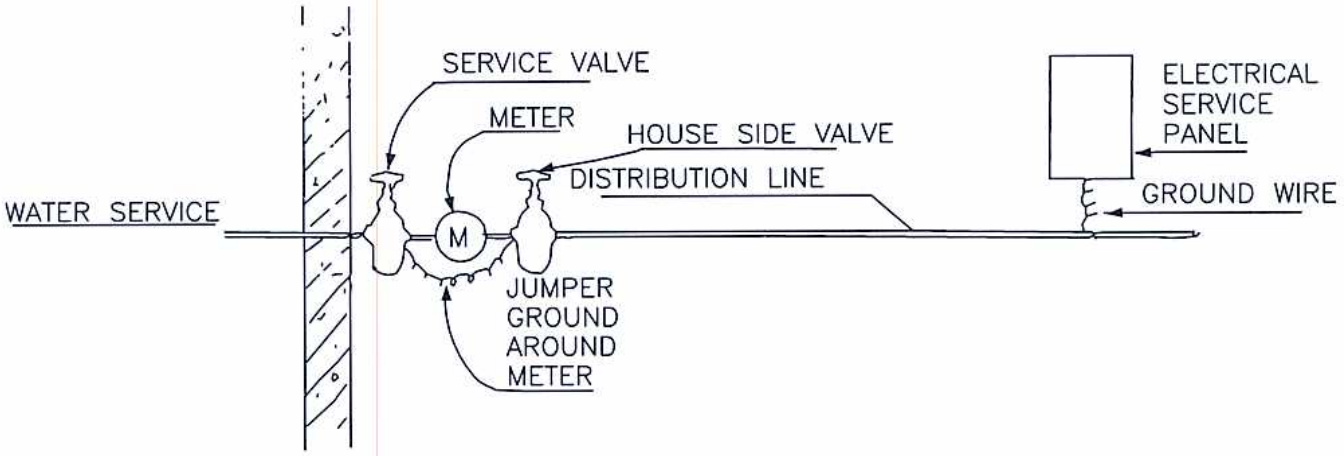
CITY OF PORTAGE

STANDARD TRENCH DETAIL

AUG.17,93	L.G.N.
AUG.07,95	drw(cad)
NOV. 7,97	drw(cad)
JULY 99	drw(cad)
JULY'05	J&H

STANDARD DESIGN SD–122

APPROVED WCB



1. PERMIT REQUIRED EITHER BY PLUMBER OR HOMEOWNER, FOR CONNECTION FROM METER DISCHARGE TO DISTRIBUTION PIPING IN BUILDING.
2. OLD PUMP AND WELL MUST BE COMPLETELY DISCONNECTED FROM POTABLE WATER SUPPLY (GROUNDING MAY BE DISRUPTED.)
3. APPROVED METALLIC PIPE (COPPER or GALVINIZED IRON) MUST BE USED TO ASSURE PROPER GROUNDING CONTINUITY.
4. FULL SIZE GATE VALVE MUST BE USED ON HOUSE SIDE.
5. MINIMUM SIZE GROUND WIRE AUTHORIZED No.6 BRAIDED COPPER.
6. APPROVED GROUND CLAMP MUST BE USED.
7. AN INSPECTION FOR CROSS CONNECTIONS SHALL BE MADE PRIOR COMPLETING THE CONNECTION TO THE SERVICE.
8. CALL 329–4477 COMMUNITY DEV. DEPT. FOR INSPECTION OF INSTALLATION.
9. THE WATER METER SHALL BE INSTALLED IMMEDIATELY ADJACENT TO THE INTERIOR WALL.

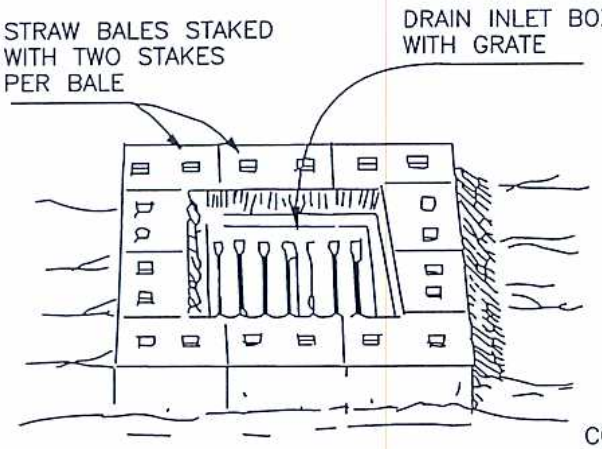
CITY OF PORTAGE

TYPICAL CITY WATER CONNECTION

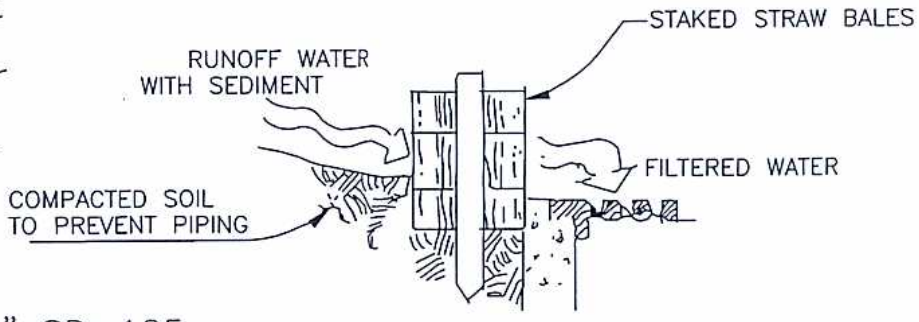
AUG. 18, 93 L.G.N.
NOV. '97 D.R.W.
JULY '99 D.R.W.
FEB '07 JMA

STANDARD DESIGN SD–124

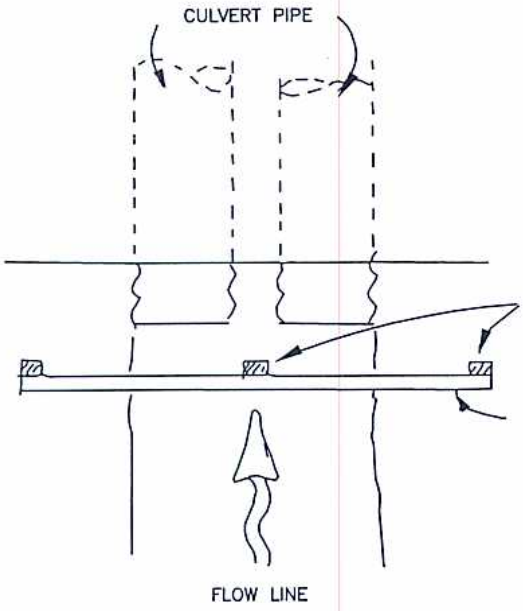
APPROVED BY J.B.

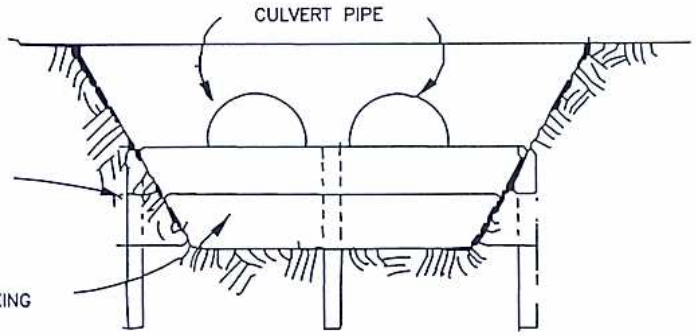


DETAIL "A" SD-125
STRAW BALE/DRAIN INLET SEDIMENT FILTER

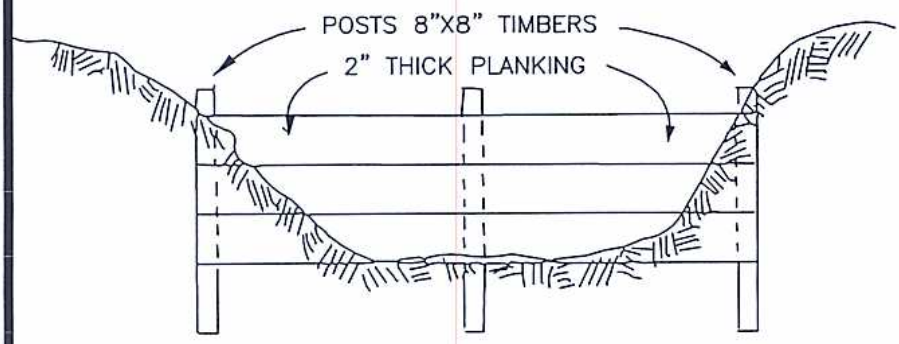


CROSS SECTION





DETAIL "B" SD-125
CULVERT SEDIMENT TRAP



DETAIL "C" SD-125
STREAM SEDIMENT TRAP

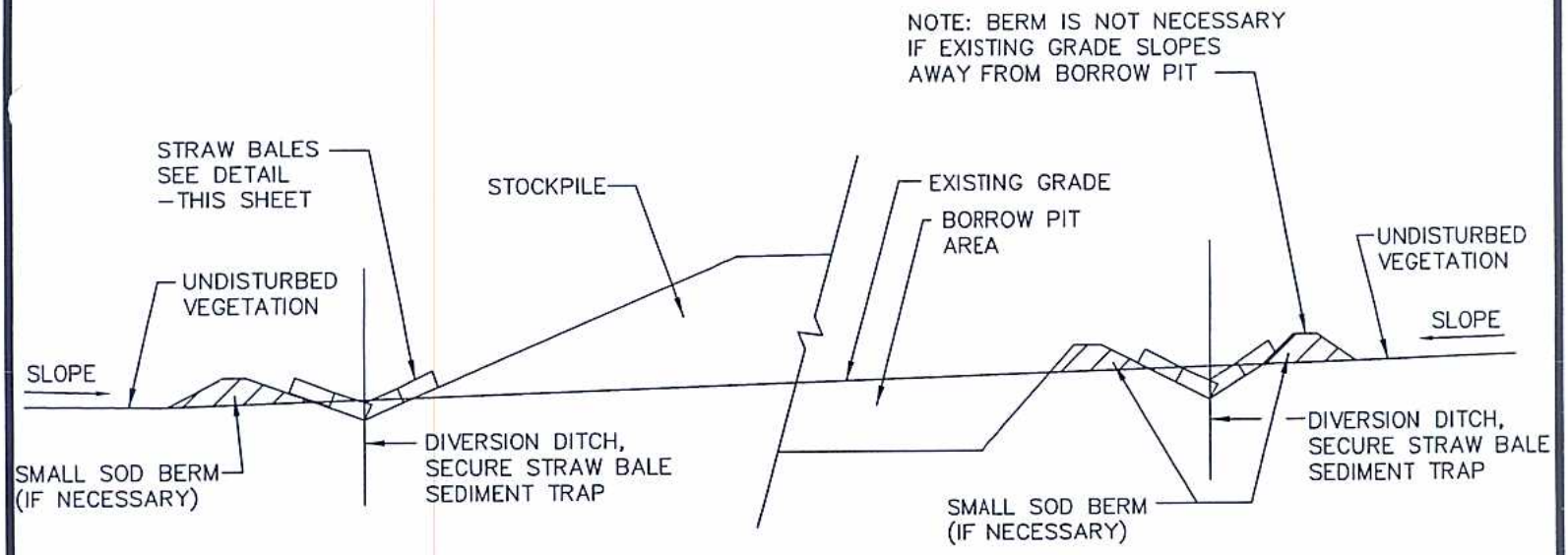
CITY OF PORTAGE

SEDIMENT TRAPS

AUG.18,93 L.G.N.
AUG.08,95 drw(cad)
NOV. '97 drw(cad)
AUG'05 J&H

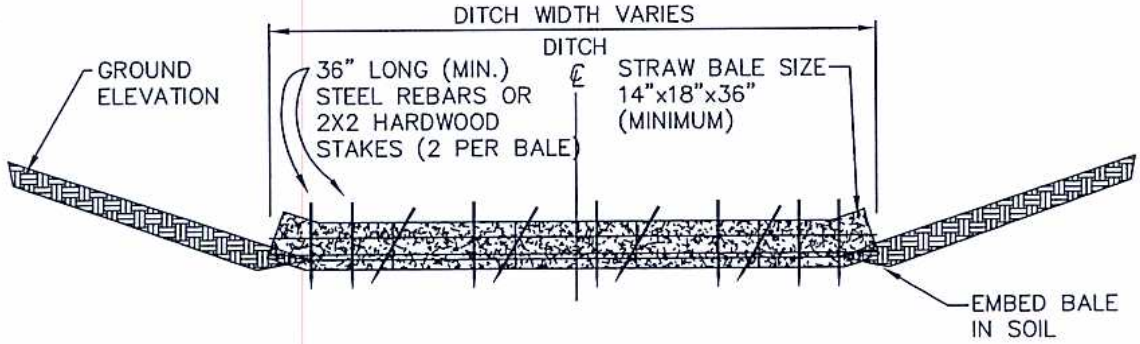
STANDARD DESIGN SD-125

APPROVED WdB



TEMPORARY DIVERSION DITCH DETAIL

N.T.S.



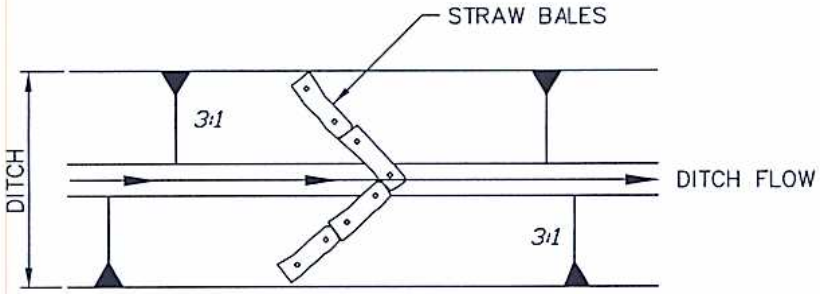
SEDIMENT TRAP DITCH DETAIL

NTS

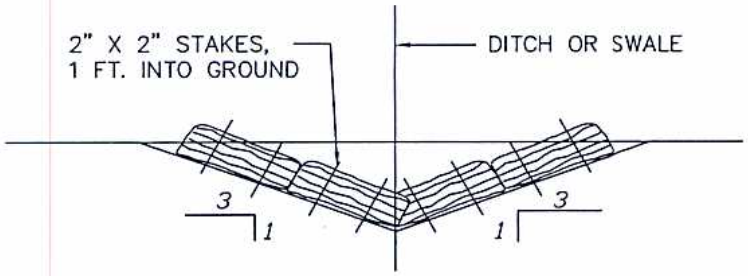
NOTES:

1. EXACT NUMBER OF BALES TO BE DETERMINED.
2. STRAW BALES SHOULD BE EMBEDDED 4" INTO THE DITCH.
3. END BALES SHOULD BE SLIGHTLY SLOPED UPHILL.
4. DETAIL TYPICAL OF BOTH TRAP LOCATIONS.
5. OTHER SEDIMENT TRAP LOCATIONS TO BE DETERMINED AS NEEDED.
6. DRIVE FIRST STAKE AT AN ANGLE TOWARDS PREVIOUS BALE TO FORCE BALES TOGETHER.

CITY OF PORTAGE	
SEDIMENTATION CONTROLS DIVERSION DITCH AND SEDIMENT TRAP	AUG'05 J&H
STANDARD DESIGN SD-125A	
APPROVED BY WCB	



PLAN VIEW



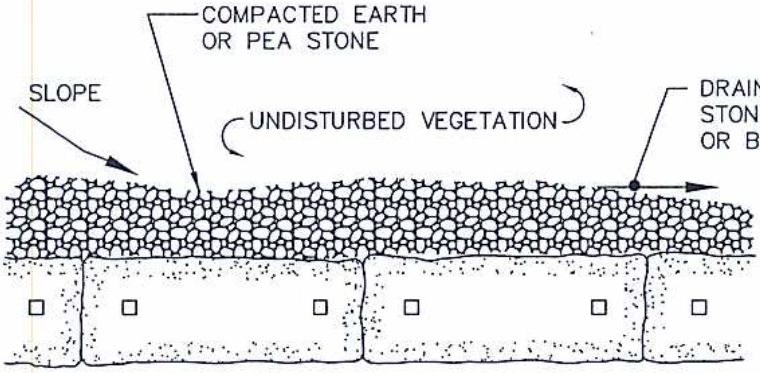
NOTE: INSTALL STRAW BALES EVERY 200 FT. IN DITCHES AROUND BORROW AREAS, STOCKPILES, OR OTHER AREAS WHERE SEDIMENT TRAP IS NEEDED DURING CONSTRUCTION.

SECTION

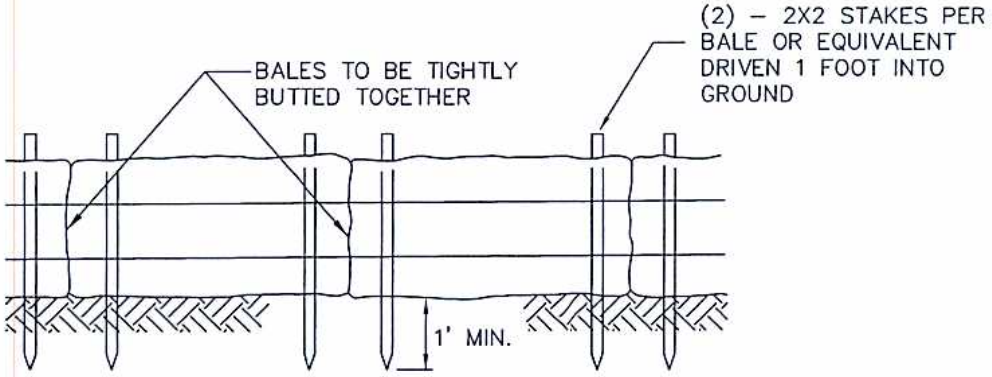
STRAW BALE SEDIMENT TRAP DETAIL

N.T.S.

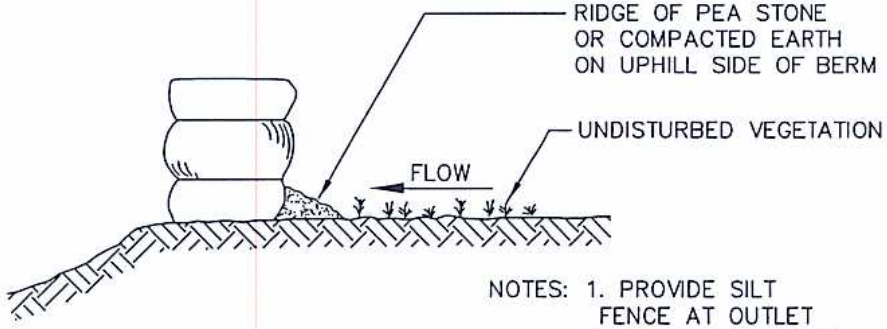
CITY OF PORTAGE	
SEDIMENTATION CONTROLS STRAW BALE SEDIMENT TRAP	AUG'05 J&H
STANDARD DESIGN SD-125B	
APPROVED BY WOB	



PLAN



ELEVATION



NOTES: 1. PROVIDE SILT FENCE AT OUTLET
2. SMALL EARTH BERM MAY BE CONSTRUCTED INSTEAD.

SECTION

STRAW BALE DIVERSION BERM

N.T.S.

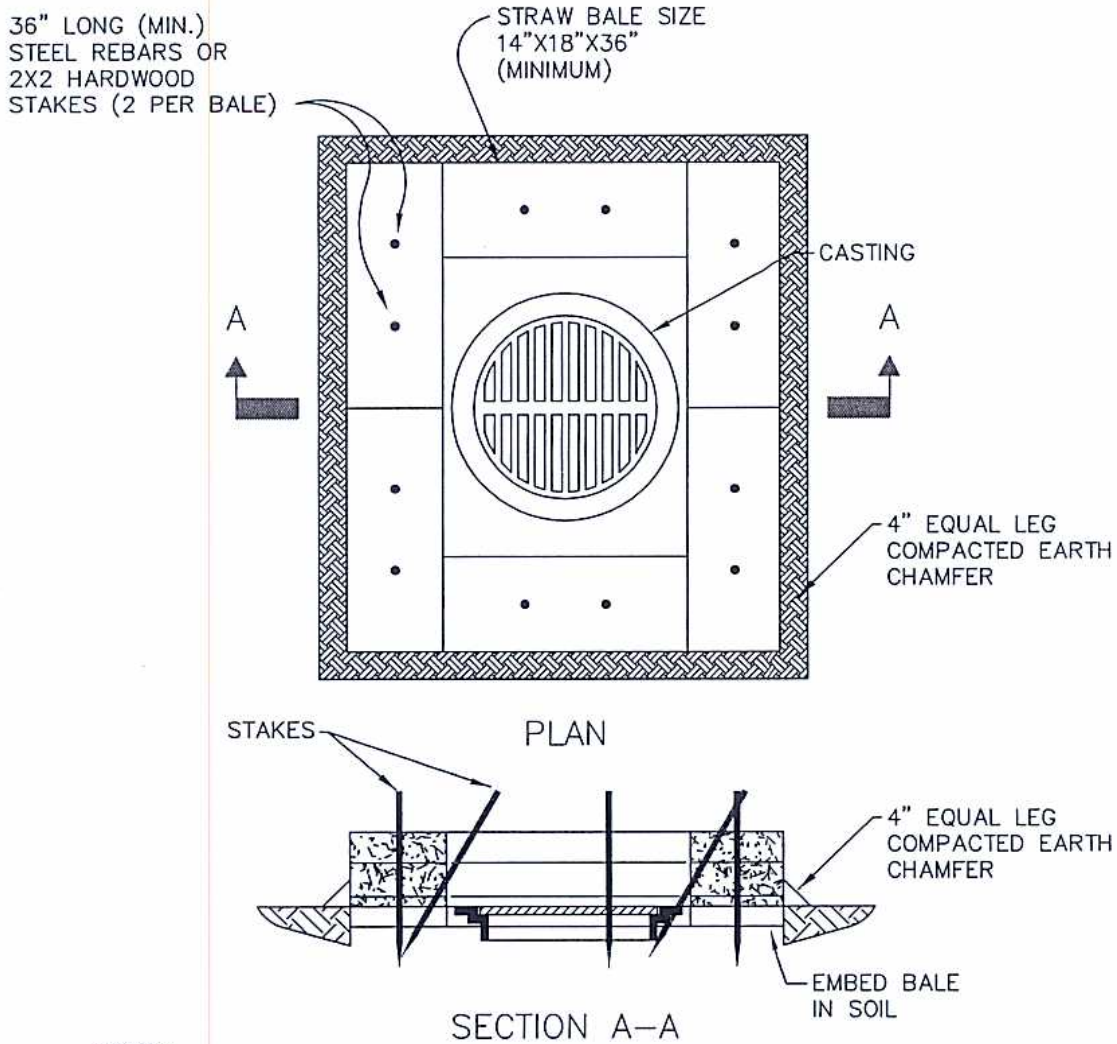
CITY OF PORTAGE

SEDIMENTATION CONTROLS
STRAW BALE
DIVERSION BERM

AUG'05
J&H

STANDARD DESIGN SD–125C

APPROVED BY WCB



NOTES:

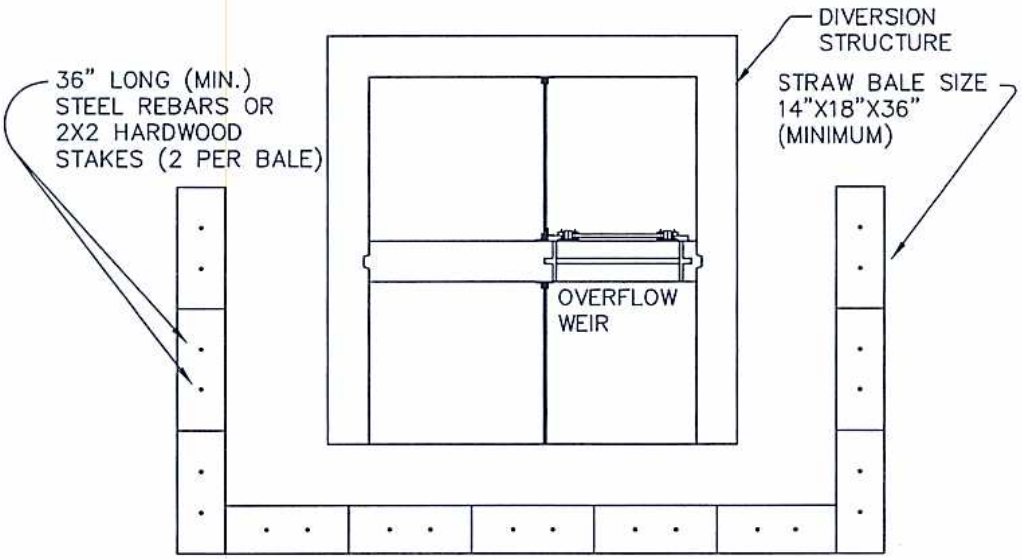
1. BUILD INLET UP TO GROUND ELEVATION.
2. STRAW BALES SHOULD BE EMBEDDED 4" INTO THE DITCH.
3. TOPS OF BALES SHOULD BE 14" ABOVE INLET, EMBEDDED AS IN NOTE 2.
4. DRIVE FIRST STAKE AT AN ANGLE TOWARDS PREVIOUS BALE TO FORCE BALES TOGETHER.

SEDIMENT TRAP
AROUND CATCH BASINS, MANHOLES, & INLETS

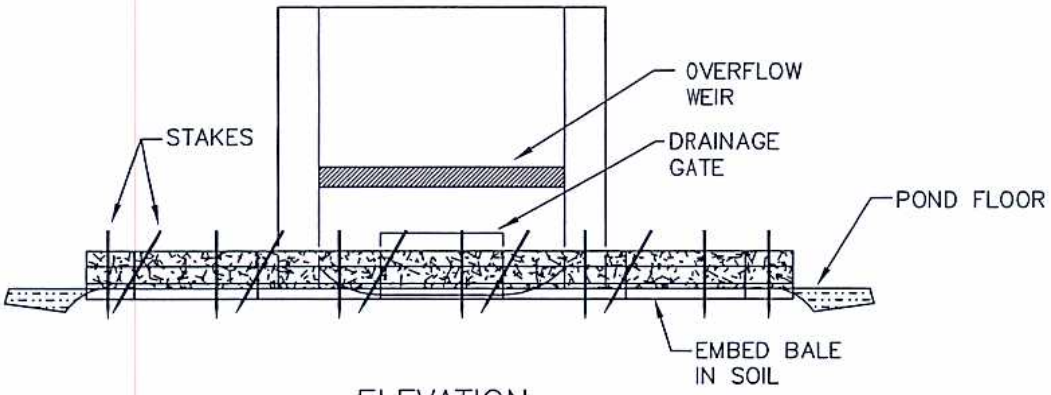
(TO BE PLACED WHERE SHOWN ON THE DRAWINGS AND AS THE CONTRACTOR'S WORK REQUIRES TO FILTER SEDIMENT FROM THE STORM WATER RUN OFF).

NTS

CITY OF PORTAGE	
SEDIMENTATION CONTROLS SEDIMENT TRAP AROUND INLETS	AUG'05 J&H
STANDARD DESIGN SD–125D	
APPROVED BY WCB	



PLAN

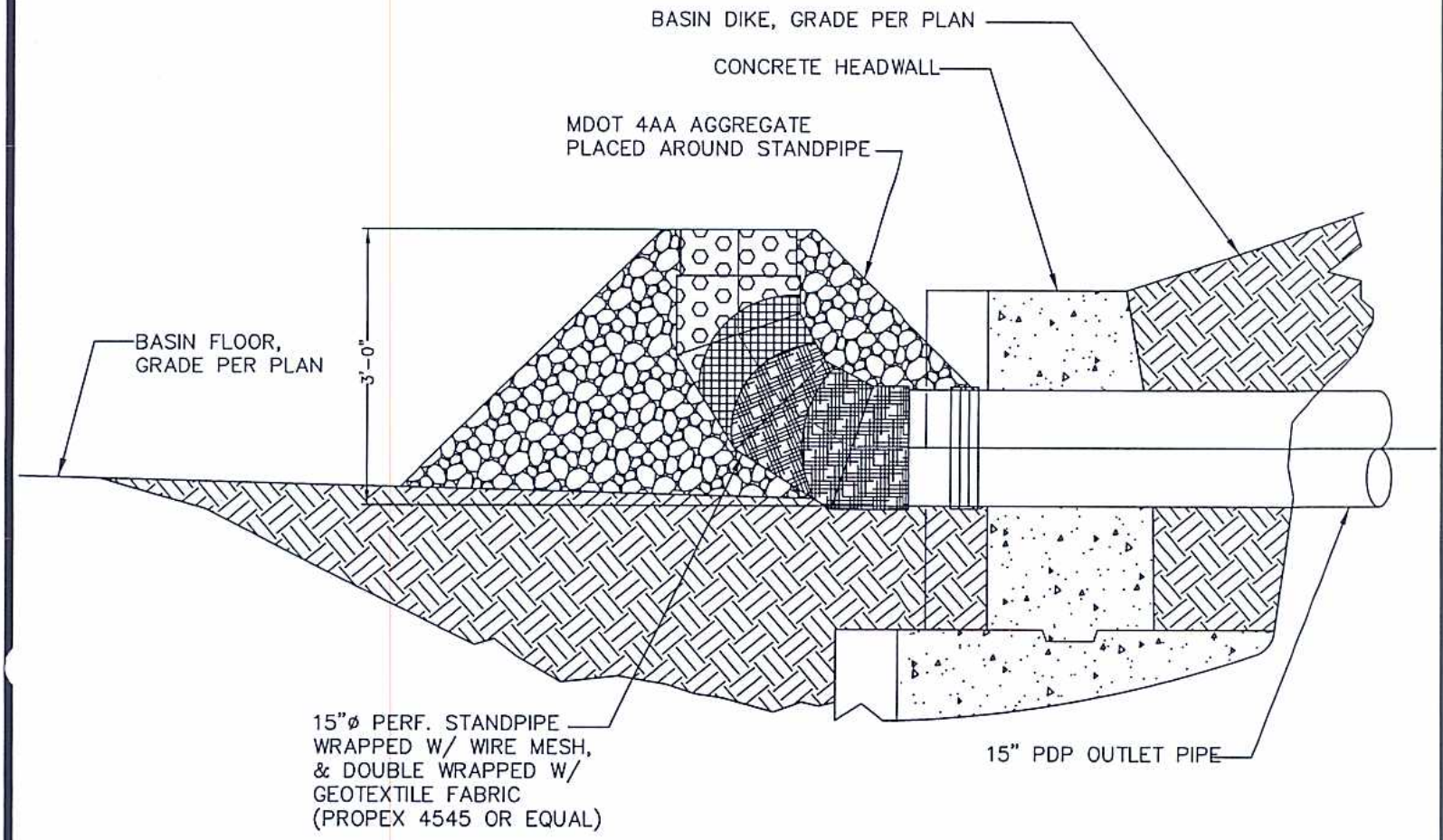


ELEVATION

SEDIMENT TRAP AT DIVERSION STRUCTURE

NTS

CITY OF PORTAGE	
SEDIMENTATION CONTROLS SEDIMENT TRAP AT DIVERSION STRUCTURE	AUG'05 J&H
STANDARD DESIGN SD-125E	
APPROVED BY WCB	

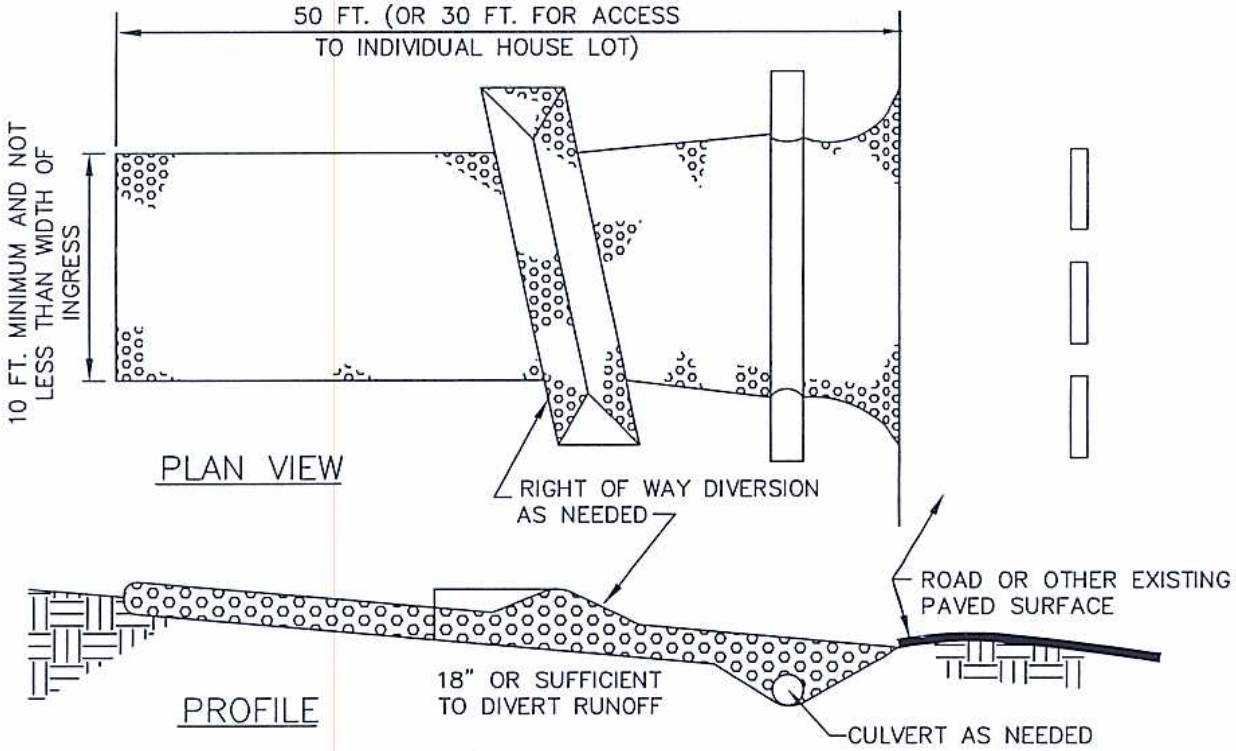


TEMPORARY SEDIMENT BASIN OUTLET STRUCTURE DETAIL

NTS

CITY OF PORTAGE

SEDIMENTATION CONTROLS TEMPORARY SEDIMENT BASIN OUTLET STRUCTURE	AUG'05 J&H
STANDARD DESIGN SD-125F	
APPROVED BY WCB	



1. STONE – MDOT 4AA STONE OR RECYCLED CONCRETE OF EQUIVALENT GRADATION SHALL BE USED.

2. LENGTH – THE CONSTRUCTION ENTRANCE SHALL BE AS LONG AS REQUIRED TO STABILIZE HIGH TRAFFIC AREAS BUT NOT LESS THAN 50 FT. (EXCEPT ON SINGLE RESIDENCE LOT WHERE A 30–FT. MINIMUM LENGTH APPLIES.

3. THICKNESS – THE STONE LAYER SHALL BE AT LEAST 6 IN. THICK.

4. WIDTH – THE ENTRANCE SHALL BE AT LEAST 10 FT. WIDE, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.

5. BEDDING – A GEOTEXTILE SHALL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING STONE. IT SHALL HAVE A GRAB TENSILE STRENGTH OF AT LEAST 200 LB. AND A MULLEN BURST STRENGTH OF AT LEAST 190 LB (PROPEX 4553 OR EQUAL).

6. CULVERT – A CULVERT SHALL BE CONSTRUCTED UNDER THE ENTRANCE IF NEEDED TO PREVENT SURFACE WATER FLOWING ACROSS THE ENTRANCE FROM BEING DIRECTED OUT ONTO PAVED SURFACES.

7. TEMPORARY DIVERSION – A TEMPORARY DIVERSION (SD–125I) SHALL BE CONSTRUCTED AS PART OF THE CONSTRUCTION ENTRANCE IF NEEDED TO PREVENT SURFACE RUNOFF FROM FLOWING THE LENGTH OF THE CONSTRUCTION ENTRANCE AND OUT ONTO PAVED SURFACES.

8. MAINTENANCE – TOP DRESSING OF ADDITIONAL STONE WALL SHALL BE APPLIED AS CONDITIONS DEMAND. MUD SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC ROADS, OR ANY SURFACE WHERE RUNOFF IS NOT CHECKED BY SEDIMENT CONTROLS, SHALL BE REMOVED IMMEDIATELY. REMOVAL SHALL BE ACCOMPLISHED BY SCRAPING OR SWEEPING.

9. CONSTRUCTION ENTRANCES SHALL NOT BE RELIED UPON TO REMOVE MUD FROM VEHICLES AND PREVENT OFF SITE TRACKING. VEHICLES THAT ENTER AND LEAVE THE CONSTRUCTION SITE SHALL BE RESTRICTED FROM MUDDY AREAS.

CONSTRUCTION ENTRANCE

NTS

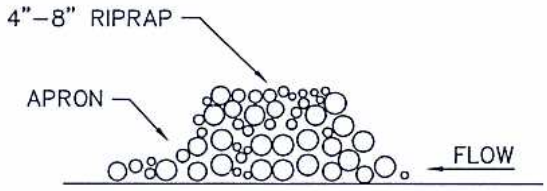
CITY OF PORTAGE

SEDIMENTATION CONTROLS
CONSTRUCTION
ENTRANCE

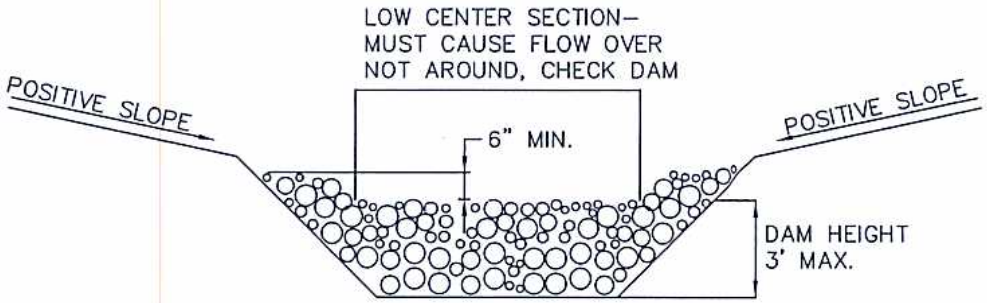
AUG'05
J&H

STANDARD
DESIGN SD–125G

APPROVED BY WCB



PROFILE



CROSS SECTION

1. THE CHECK DAM SHALL BE CONSTRUCTED OF 4 IN. TO 8 IN. DIAMETER RIPRAP, PLACED SO THAT IT COMPLETELY COVERS THE WIDTH OF THE CHANNEL.

2. THE TOP OF THE CHECK DAM SHALL BE CONSTRUCTED SO THAT THE CENTER IS APPROXIMATELY 6 IN. LOWER THAN THE OUTER EDGES, SO WATER WILL FLOW ACROSS THE CENTER AND NOT AROUND THE ENDS.

3. THE MAXIMUM HEIGHT OF THE CHECK DAM AT THE CENTER OF THE WEIR SHALL NOT EXCEED 3 FT.

4. SPACING BETWEEN DAMS SHALL BE AS SHOWN IN THE PLANS OR BY THE FOLLOWING TABLE:

CHECK DAM SPACING				
DAM HEIGHT (FT.)	CHANNEL SLOPE			
	< 5%	5–10%	10–15%	15–20%
1	65 FT.	30 FT.	20 FT.	15 FT.
2	130 FT.	65 FT.	40 FT.	30 FT.
3	200 FT.	100 FT.	65 FT.	50 FT.

CHECK DAM

CITY OF PORTAGE

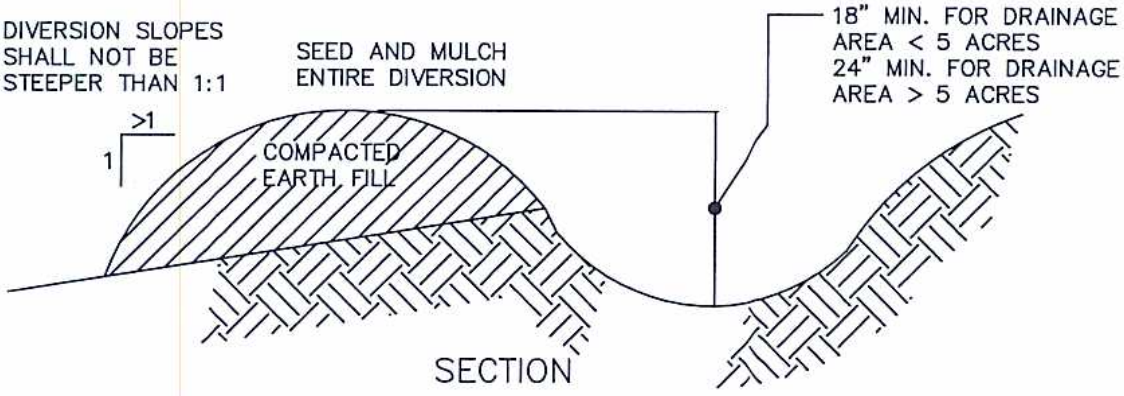
SEDIMENTATION CONTROLS

AUG'05 J&H

CHECK DAM

STANDARD DESIGN SD–125H

APPROVED BY WCB



1. DIVERSION SHALL BE COMPACTED BY TRAVERSING WITH TRACKED EARTH MOVING EQUIPMENT.

2. DIVERSIONS SHALL NOT BE BREACHED OR LOWERED TO ALLOW CONSTRUCTION TRAFFIC TO CROSS; INSTEAD THE TOP WIDTH MAY BE MADE WIDER AND SIDE SLOPES MADE FLATTER THAN SPECIFIED ABOVE.

3. DIVERSIONS SHALL BE STABILIZED WITH VEGETATION AND CHECK DAMS OR THE FOLLOWING TREATMENTS.

TEMPORARY DIVERSION STABILIZATION TREATMENT			
DIVERSION SLOPE	< 2 ACRES	2–5 ACRES	5–10 ACRES
0–3%	SEED AND STRAW	SEED AND STRAW	SEED AND STRAW
3–5%	SEED AND STRAW	SEED AND STRAW	MATTING
5–8%	SEED AND STRAW	MATTING	MATTING
8–20%	SEED AND STRAW	MATTING	ENGINEERED

NOTE: DIVERSIONS WITH STEEPER SLOPES OR GREATER DRAINAGE AREAS ARE BEYOND THE SCOPE OF THIS STANDARD AND MUST BE DESIGNED FOR STABILITY, SEED, STRAW AND MATTING USED SHALL MEET THE MDOT SPECIFICATIONS FOR TEMPORARY SEEDING (TSM 24+), MULCHING AND MATTING.

TEMPORARY DIVERSION

N.T.S.

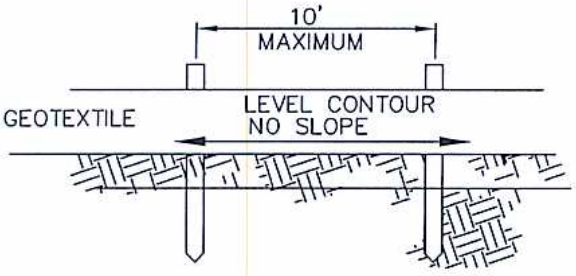
CITY OF PORTAGE

SEDIMENTATION CONTROLS
TEMPORARY
DIVERSION

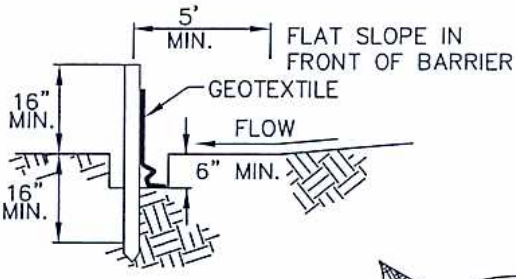
AUG'05
J&H

STANDARD DESIGN SD–125I

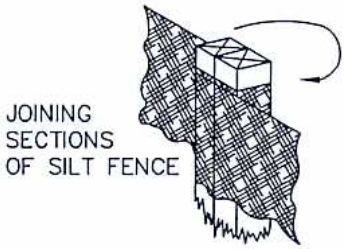
APPROVED BY WCB



ELEVATION



DETAILS:



NOTES:

1. SILT FENCE SHALL BE CONSTRUCTED BEFORE UPSLOPE LAND DISTURBANCE BEGINS.
2. ALL SILT FENCE SHALL BE PLACED AS CLOSE TO THE CONTOUR AS POSSIBLE SO THAT WATER WILL NOT CONCENTRATE AT LOW POINTS IN THE FENCE AND SO THAT SMALL SWALES OR DEPRESSIONS WHICH MAY CARRY SMALL CONCENTRATED FLOWS TO THE SILT FENCE ARE DISSIPATED ALONG ITS LENGTH.
3. TO PREVENT WATER PONDED BY THE SILT FENCE FROM FLOWING AROUND THE ENDS, EACH END SHALL BE CONSTRUCTED UPSLOPE SO THAT THE ENDS ARE AT A HIGHER ELEVATION.
4. WHERE POSSIBLE, SILT FENCE SHALL BE PLACED ON THE FLATTEST AREA AVAILABLE.
5. WHERE POSSIBLE, VEGETATION SHALL BE PRESERVED FOR 5 FT. (OR AS MUCH AS POSSIBLE) UPSLOPE FROM THE SILT FENCE. IF VEGETATION IS REMOVED, IT SHALL BE REESTABLISHED WITHIN 7 DAYS FROM THE INSTALLATION OF THE FENCE.
6. SOIL STOCKPILES OR OTHER SOURCES OF SEDIMENT SHALL HAVE SILT FENCE PROTECTION.
7. THE SILT FENCE SHALL BE PLACED IN A TRENCH CUT A MINIMUM OF 6" DEEP. THE TRENCH SHALL BE CUT WITH A TRENCHER, CABLE LAYING MACHINE, OR OTHER SUITABLE DEVICE WHICH WILL ENSURE AN ADEQUATELY UNIFORM TRENCH DEPTH.
8. THE SILT FENCE SHALL BE PLACED WITH THE STAKES ON THE DOWN SLOPE SIDE OF THE GEOTEXTILE AND SO THAT 8" OF CLOTH ARE BELOW THE GROUND SURFACE. EXCESS MATERIAL SHALL LAY ON THE BOTTOM OF THE 6" DEEP TRENCH. THE TRENCH SHALL BE BACK FILLED AND COMPACTED.
9. SEAMS BETWEEN SECTION OF SILT FENCE SHALL BE OVERLAPPED WITH THE END STAKES OF EACH SECTION WRAPPED TOGETHER BEFORE DRIVING INTO THE GROUND.
10. MAINTENANCE – SILT FENCE SHALL ALLOW RUNOFF TO PASS ONLY AS DIFFUSED FLOW THROUGH THE GEOTEXTILE. IF RUNOFF OVER TOPS THE SILT FENCE, FLOWS UNDER OR AROUND THE ENDS, OR IN ANY OTHER WAY BECOMES A CONCENTRATED FLOW, ONE OF THE FOLLOWING SHALL BE PERFORMED, AS APPROPRIATE:
    1) THE LAYOUT OF THE SILT FENCE SHALL BE CHANGED,
    2) ACCUMULATED SEDIMENT SHALL BE REMOVED,
    3) OTHER PRACTICES SHALL BE INSTALLED.

CRITERIA FOR SILT FENCE MATERIALS:

1. FENCE POSTS – THE LENGTH SHALL BE A MINIMUM OF 32" LONG. WOOD POST WILL BE 2" X 2" HARDWOOD OF SOUND QUALITY. THE MAXIMUM SPACING BETWEEN POSTS SHALL BE 10 FT.
2. SILT FENCE FABRIC ECOLOFENCE 24/11 OR EQUAL (SEE TABLE BELOW):

SILT FENCE

N.T.S.

FABRIC PROPERTIES	VALUES	TEST METHOD
GRAB TENSILE STRENGTH	100 LB. MINIMUM	ASTM D 4632
TRAPEZOID TEAR STRENGTH	65 LB. MINIMUM	ASTM D 4533
PERMITTIVITY	0.1/SEC MINIMUM	ASTM D 4491
APPARENT OPENING SIZE (MAX)	0.60 MILLIMETERS	ASTM D 4751

CITY OF PORTAGE

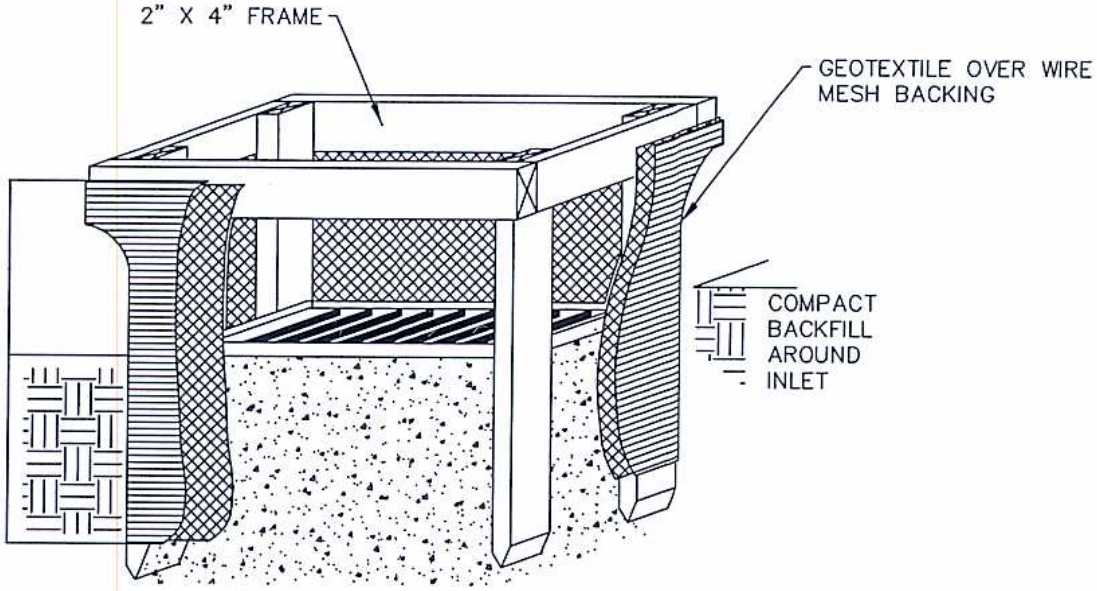
SEDIMENTATION CONTROLS

SILT FENCE

AUG'05
J&H

STANDARD DESIGN SD–125J

APPROVED BY WCB



NOTES:

1. INLET PROTECTION SHALL BE CONSTRUCTED EITHER BEFORE UPSLOPE LAND DISTURBANCE BEGINS OR BEFORE THE STORM DRAIN BECOMES OPERATIONAL.

2. THE EARTH AROUND THE INLET SHALL BE EXCAVATED COMPLETELY TO A DEPTH AT LEAST 18 IN.

3. THE WOODEN FRAME SHALL BE CONSTRUCTED OF 2 IN BY 4 IN. CONSTRUCTION GRADE LUMBER. THE 2 IN. BY 4 IN. POSTS SHALL BE DRIVEN 18 IN. INTO THE GROUND AT FOUR CORNERS OF THE INLET AND THE TOP PORTION OF 2 IN. BY 4 IN. FRAME ASSEMBLED USING THE OVERLAP JOINT SHOWN. THE TOP OF THE FRAME SHALL BE AT LEAST 6 IN. BELOW ADJACENT ROADS IF PONDED WATER WOULD POSE A SAFETY HAZARD TO TRAFFIC.

4. WIRE MESH SHALL BE OF SUFFICIENT STRENGTH TO SUPPORT FABRIC WITH WATER FULLY IMPOUNDED AGAINST IT. IT SHALL BE STRETCHED TIGHTLY AROUND THE FRAME AND FASTENED SECURELY TO THE FRAME.

5. GEOTEXTILE SHALL HAVE A PERMITTIVITY OF 0.1 PER SECOND (ASTM D 4491) AND BE RESISTANT TO SUNLIGHT. IT SHALL BE STRETCHED TIGHTLY AROUND THE FRAME AND FASTENED SECURELY. IT SHALL EXTEND FROM THE TOP OF THE FRAME TO 18 IN. BELOW THE INLET NOTCH ELEVATION. THE GEOTEXTILE SHALL OVERLAP ACROSS ON THE SIDE OF THE INLET SO THE ENDS OF THE CLOTH ARE NOT FASTENED TO THE SAME POST.

6. BACKFILL SHALL BE PLACED AROUND THE INLET IN COMPACTED 6 IN. LAYERS UNTIL THE EARTH IS EVEN WITH NOTCH ELEVATION ON ENDS AND TOP ELEVATION ON SIDES.

7. A COMPACTED EARTH DIKE OR A CHECK DAM SHALL BE CONSTRUCTED IN THE DITCH LINE BELOW THE INLET IF THE INLET IS NOT IN A DEPRESSION AND IF RUNOFF BYPASSING THE INLET WILL NOT FLOW TO A SETTLING POND. THE TOP OF EARTH DIKES SHALL BE AT LEAST 6 IN. HIGHER THAN THE TOP OF THE FRAME.

INLET PROTECTION IN SWALES, DITCH LINES OR YARD INLETS

N.T.S.

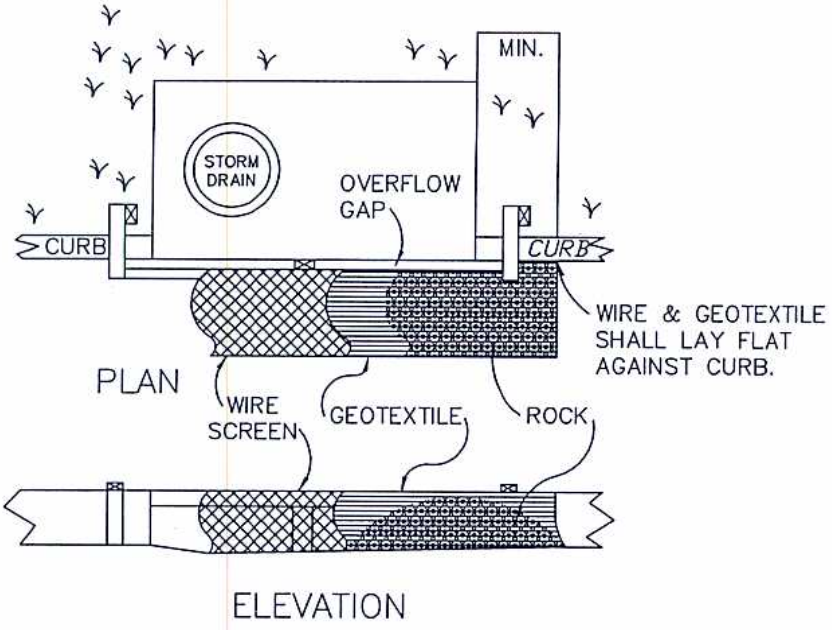
CITY OF PORTAGE

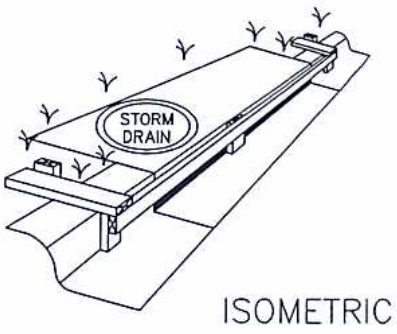
SEDIMENTATION CONTROLS
TEMPORARY
INLET PROTECTION

AUG'05
J&H

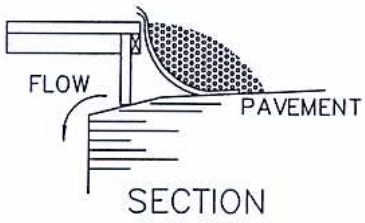
STANDARD DESIGN SD-125K

APPROVED BY WCB





ISOMETRIC



SECTION

DETAILS:

NOTES:

1. INLET PROTECTION SHALL BE CONSTRUCTED EITHER BEFORE UPSLOPE LAND DISTURBANCE BEGINS OR BEFORE THE STORM DRAIN BECOMES OPERATIONAL.

2. THE WOODEN FRAME IS TO BE CONSTRUCTED OF 2–BY–4 IN. CONSTRUCTION–GRADE LUMBER. THE END SPACERS SHALL BE A MINIMUM OF 1 FT. BEYOND BOTH ENDS OF THE THROAT OPENING. THE ANCHORS SHALL BE NAILED TO 2–BY–4 IN. STAKES DRIVEN ON THE OPPOSITE SIDE OF THE CURB.

3. THE WIRE MESH SHALL BE OF SUFFICIENT STRENGTH TO SUPPORT FABRIC AND STONE. IT SHALL BE A CONTINUOUS PIECE WITH A MINIMUM WIDTH OF 30 IN. AND 4 FT. LONGER THAN THE THROAT LENGTH OF THE INLET, 2 FT. ON EACH SIDE.

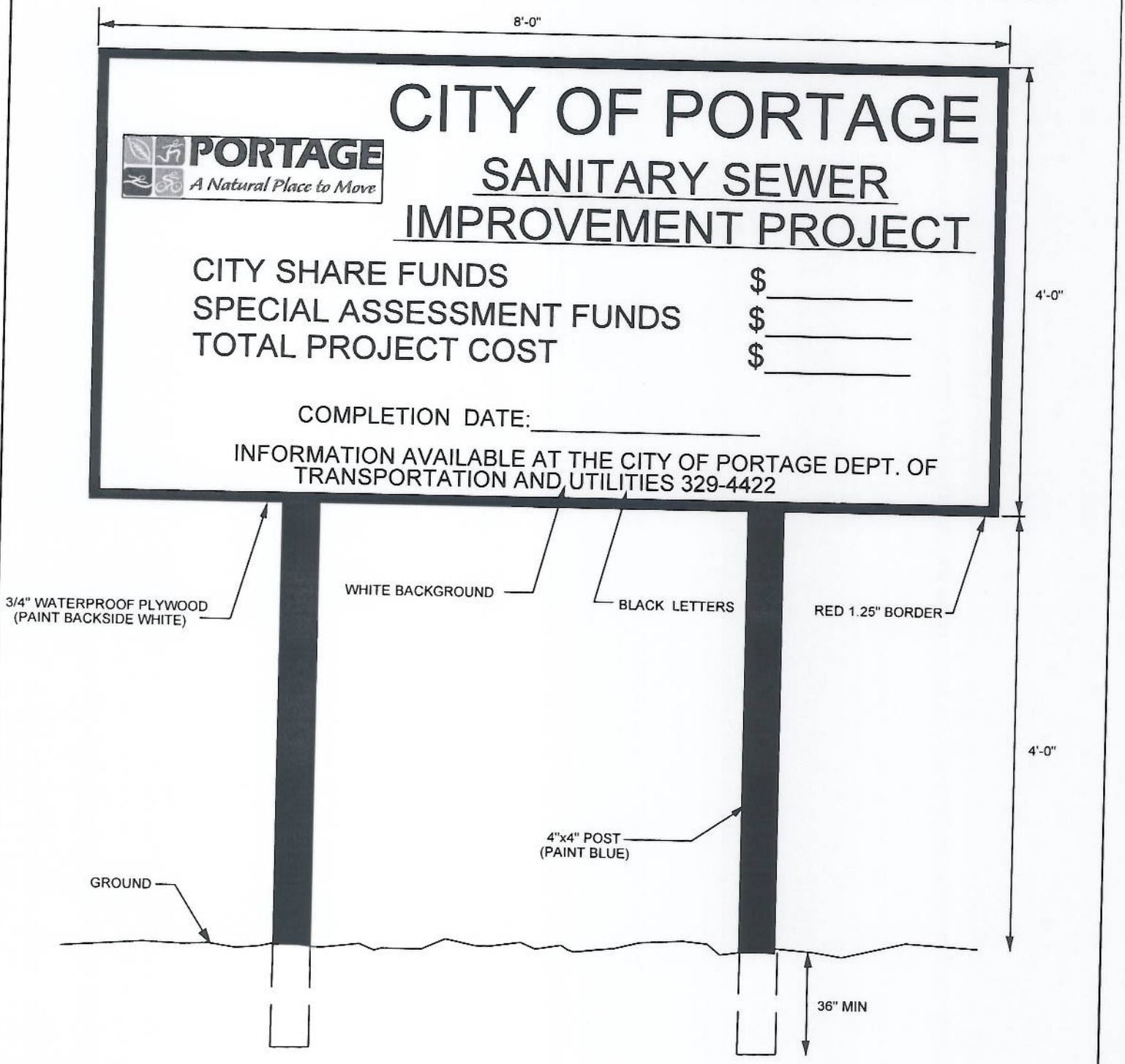
4. GEOTEXTILE SHALL HAVE A PERMITTIVITY OF 0.1 PER SECOND (ASTM D 4491) AND BE RESISTANT TO SUNLIGHT.

5. THE WIRE MESH AND GEOTEXTILE CLOTH SHALL BE FORMED TO THE CONCRETE GUTTER AND AGAINST THE FACE OF THE CURB ON BOTH SIDES OF THE INLET AND SECURELY FASTENED TO THE 2–BY–4 IN. FRAME.

6. MDOT 4AA STONE SHALL BE PLACED OVER THE WIRE MESH AND GEOTEXTILE IN SUCH A MANNER AS TO PREVENT WATER FROM ENTERING THE INLET UNDER OR AROUND THE GEOTEXTILE CLOTH.

CURB INLET PROTECTION

CITY OF PORTAGE	
SEDIMENTATION CONTROLS TEMPORARY CURB INLET PROTECTION	AUG'05 J&H
STANDARD DESIGN SD–125L	
APPROVED BY WCB	



NOTE: IF SPACE OR PROJECT TIME IS LIMITED FOR DRIVING POSTS INTO THE GROUND (SUCH AS THE STRIP PAVING PROJECT) , THE PROJECT MANAGER MAY USE METAL POSTS AND A BASE SO THAT SIGNS CAN BE MOVED.

NOTE :

LETTER SIZE	TEXT FONT :
5"	ARIAL
3.5"	ARIAL
2.5"	ARIAL
1.75"	ARIAL

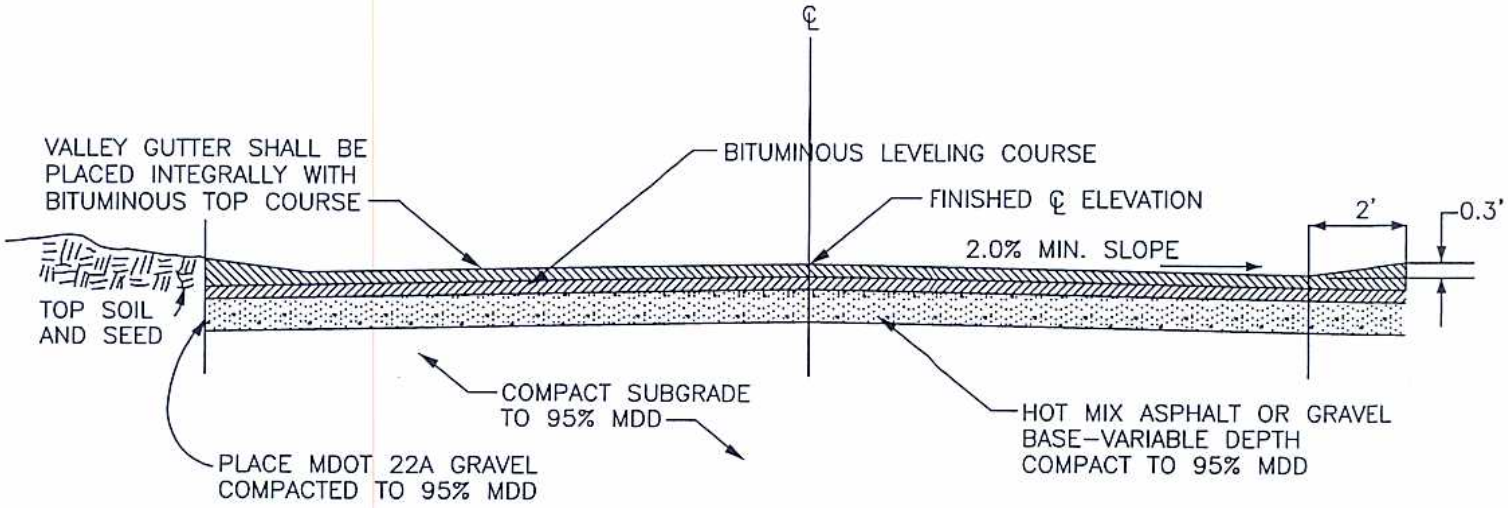
CITY OF PORTAGE

PROJECT SIGN

LATEST REVISION 03/04/16 JLH

STANDARD DESIGN SD-127

APPROVED BY WB



CITY OF PORTAGE

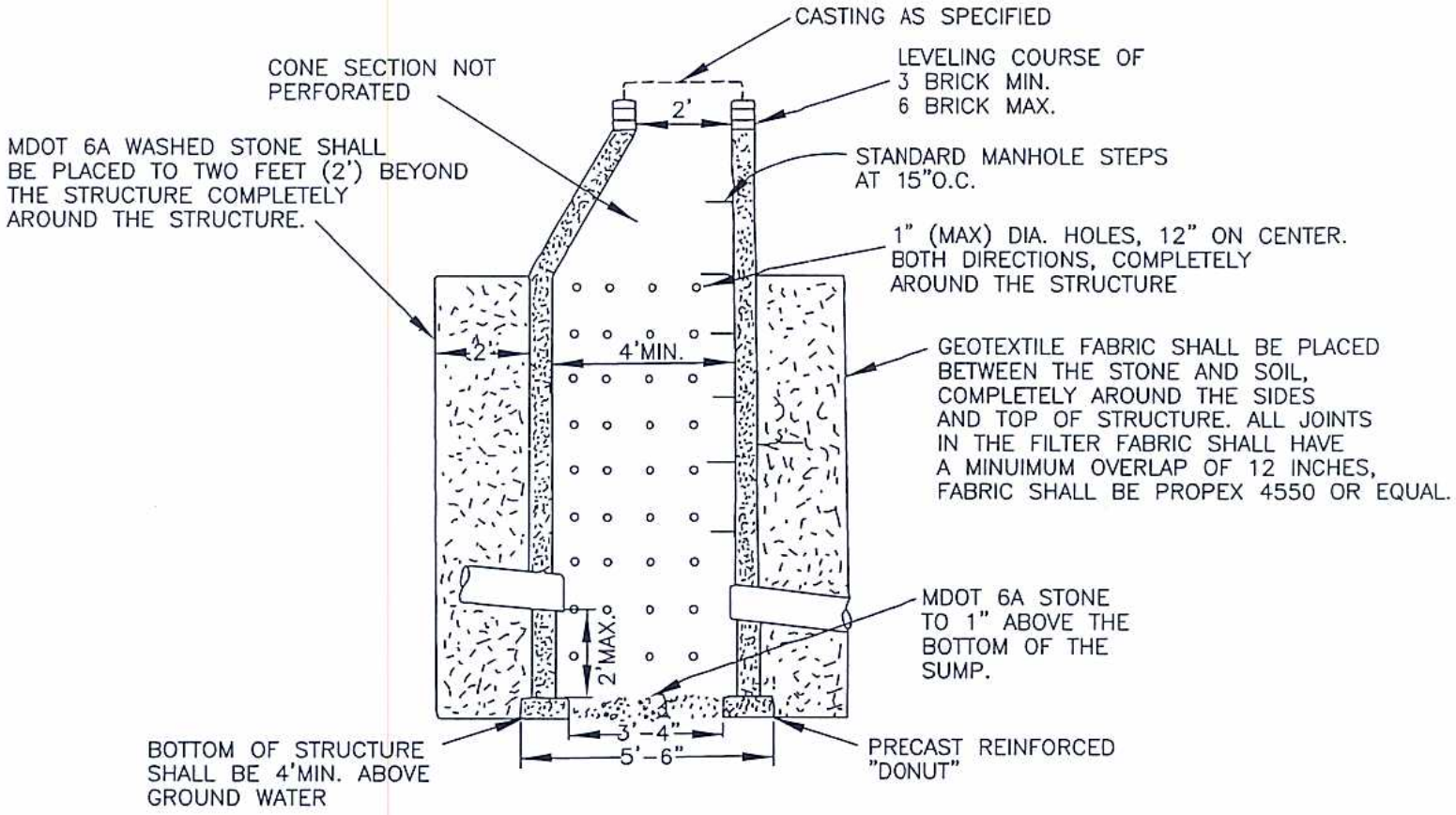
INTEGRAL VALLEY GUTTER SECTION

TYPICAL CROSS–SECTIONAL VIEW
NOT TO SCALE

AUG.18,93 L.G.N.
AUG.08,95 drw(cad)
AUG'05 J&H

STANDARD DESIGN SD–131

APPROVED WCB



PRECAST LEACHING BASIN

1. CONCRETE FOR BASES AND POURED STRUCTURES SHALL HAVE A COMPRESSIVE STRENGTH OF 3500 P.S.I. IN 28 DAYS AND A MINIMUM OF 5.5 SACKS OF CEMENT PER. CU. YD. SLUMP SHALL NOT EXCEED (4").

2. PRECAST MANHOLES SHALL BE OF THE ECCENTRIC CONE TYPE WITH STEEL REINFORCEMENT CONFORMING TO THE ASTM SPECIFICATIONS FOR C-478.

3. STEPS SHALL NOT BE INSTALLED UNTIL AFTER ALIGNMENT OF CASTING IS APPROVED

NOTE: CATCH BASINS SHALL HAVE SOLID BOTTOM AND SIDES, LEACHING BASINS SHALL HAVE AN OPEN BOTTOM AS DETAILED ABOVE.

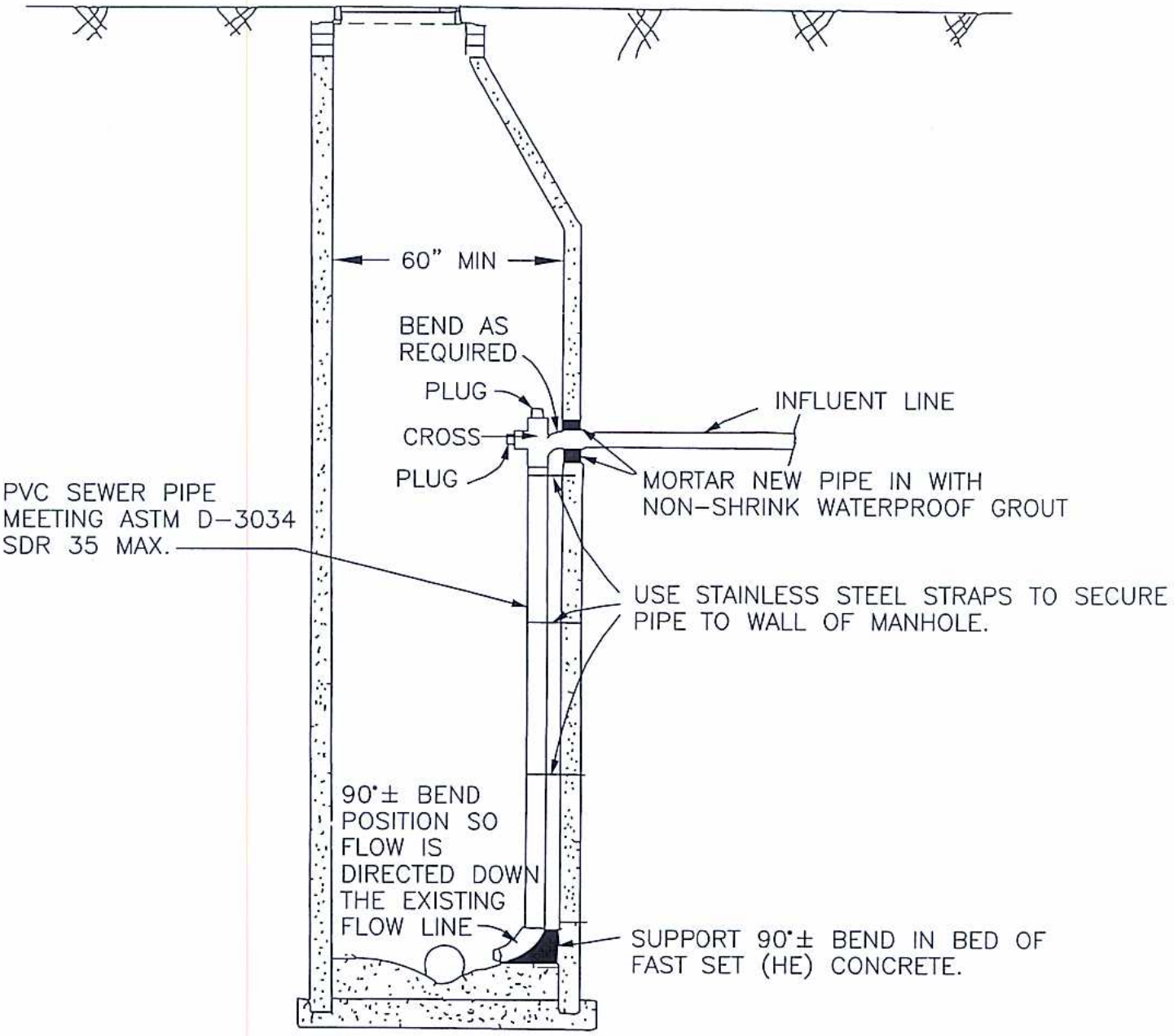
CITY OF PORTAGE

STANDARD
48" DRAINAGE STRUCTURE
(PERFORATED)

AUG.18,93 L.G.N.
AUG.08,95 drw(cad)
AUG'05 J&H

STANDARD DESIGN SD-133

APPROVED BY WCB



NOTE: FOR MANHOLE DIMENSIONS SEE SD-105
THIS CONNETION WILL ONLY BE ALLOWED FOR MANHOLES 60" DIA. OR GREATER

CITY OF PORTAGE

SANITARY SERVICE DROP CONNECTION 4" or 6" ONLY

AUG.18,93 L.G.N.
MAR.3,94 J.B.
AUG.08,95 drw(cad)
NOV.25,97 drw(cad)
AUG'05 J&H

STANDARD DESIGN SD-134

APPROVED BY WCB

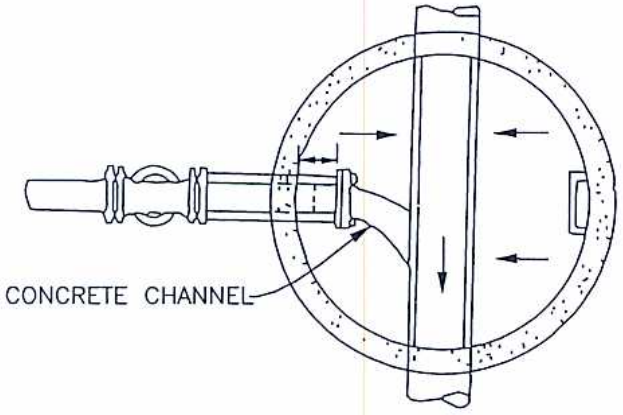
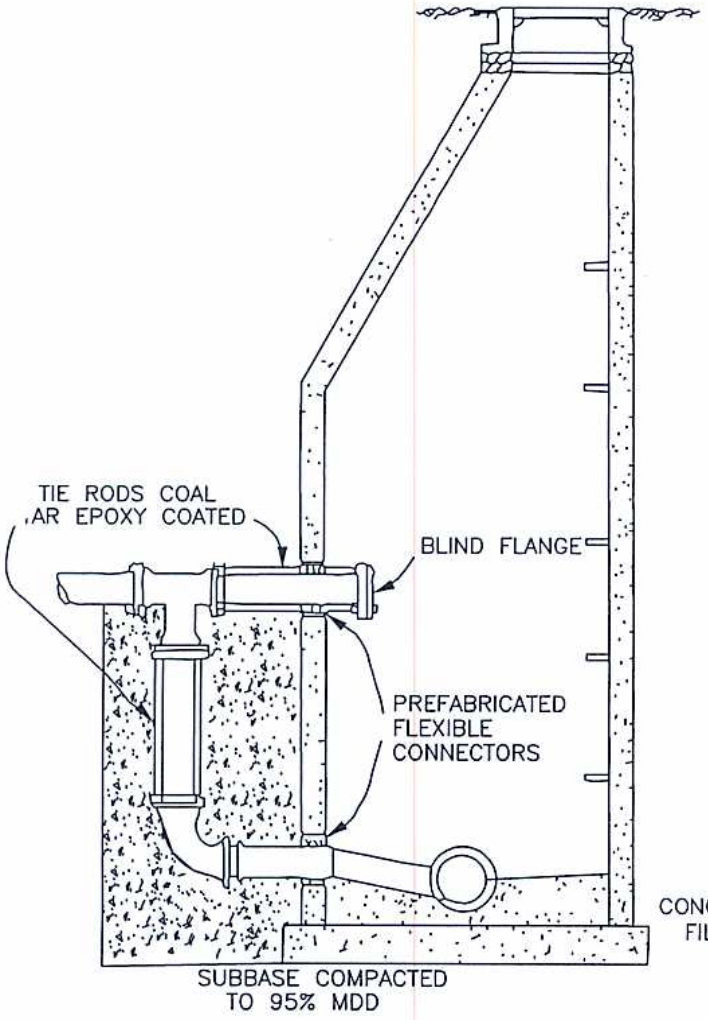
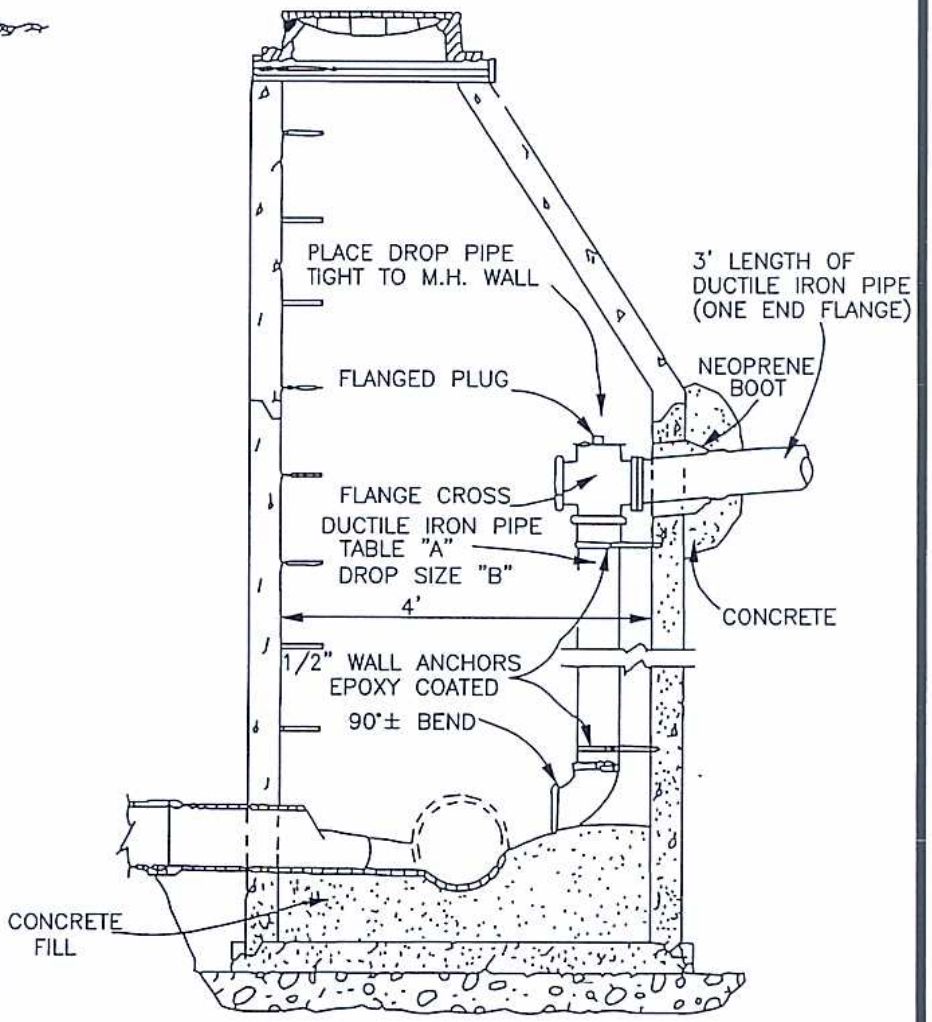


TABLE "A"

PIPE SIZE (INCOMING)	DROP "B"
2"	2"
4"	4"
6"	6"
8"THRU 12"	8"
15"THRU 18"	10"
21"THRU 24"	12"



OUTSIDE DROP



INSIDE DROP

NOTES:

FITTINGS SHALL BE MECHANICAL JOINT

PIPE SHALL BE DUCTILE IRON CLASS 52 INCLUDING FIRST LENGTH OF PIPE OUTSIDE OF MANHOLE DROP CONNECTION.

CONCRETE AROUND OUTSIDE DROP SHALL BE TYPE 1 PORTLAND CEMENT WITH A MINIMUM COMPRESSIVE STRENGTH OF 2000 PSI AT 28 DAYS.

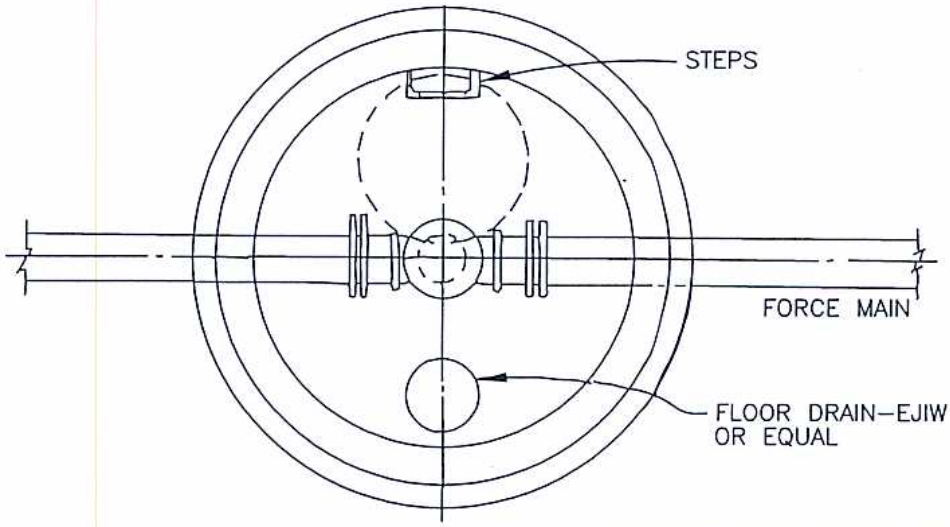
CITY OF PORTAGE

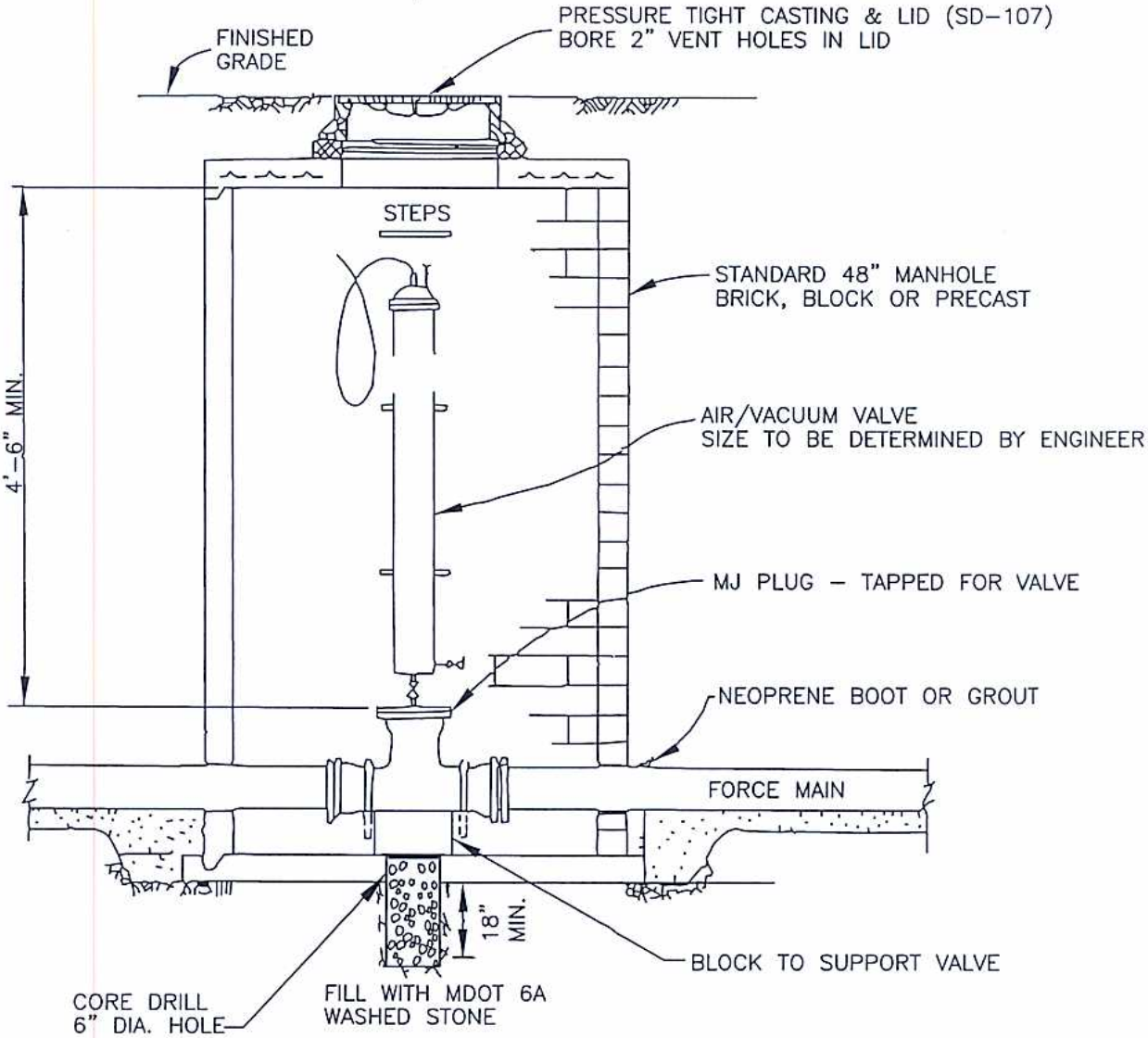
FORCE MAIN DROP CONNECTION

AUG.18,93 L.G.N
AUG.08,95 drw(cad)
NOV.25,87 drw(cad)
AUG'05 J&H

STANDARD DESIGN SD-135

APPROVED BY WCB





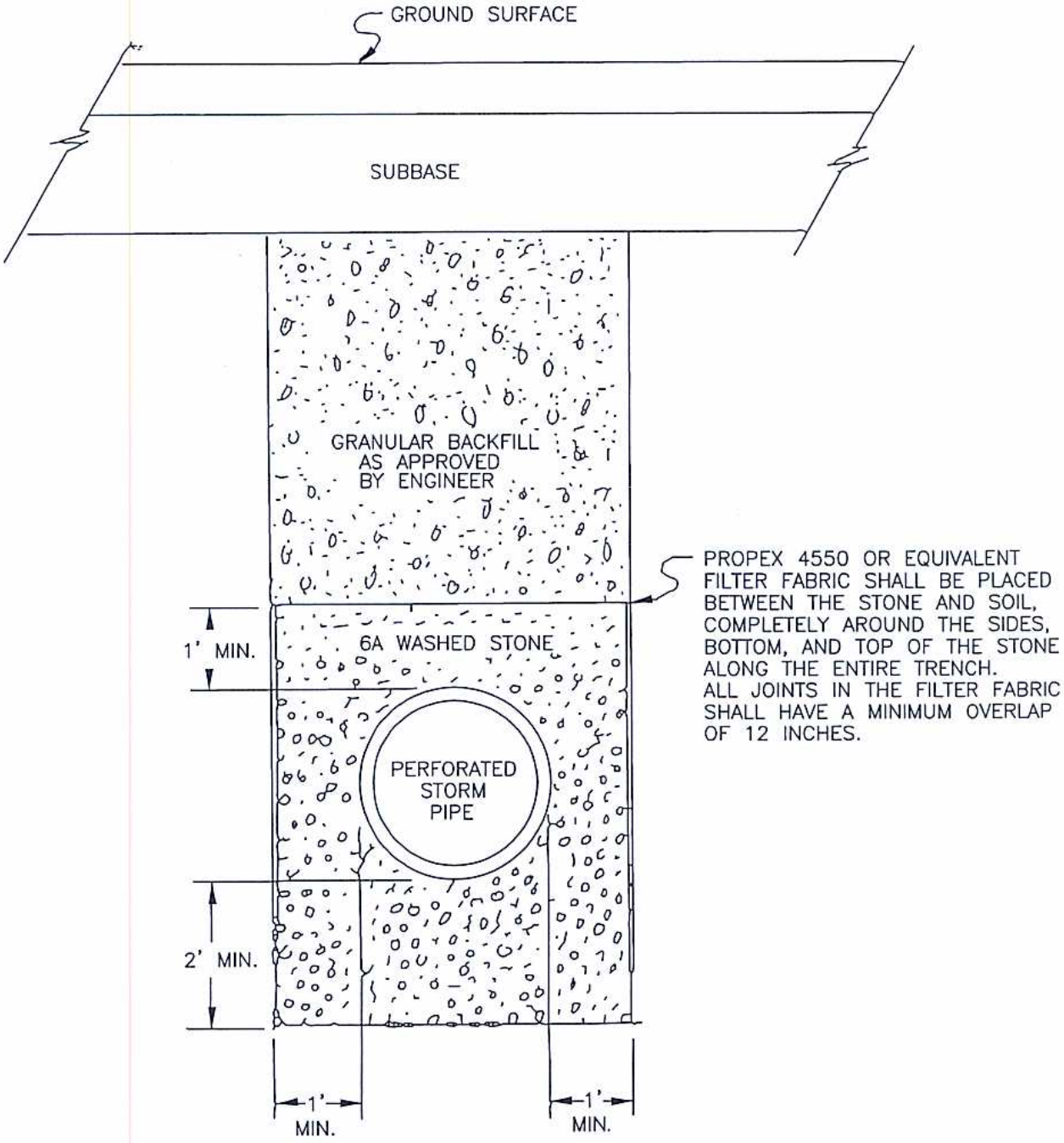
CITY OF PORTAGE

SAN. SEWER FORCE MAIN AIR RELEASE VALVE AND CHAMBER

AUG.18,93 L.G.N.
SEPT 7,95 drw (CAD)
NOV.25,97 drw (CAD)
AUG'05 J&H

STANDARD DESIGN SD–136

APPROVED BY WCB



CITY OF PORTAGE

STORM WATER TRENCH DETAIL

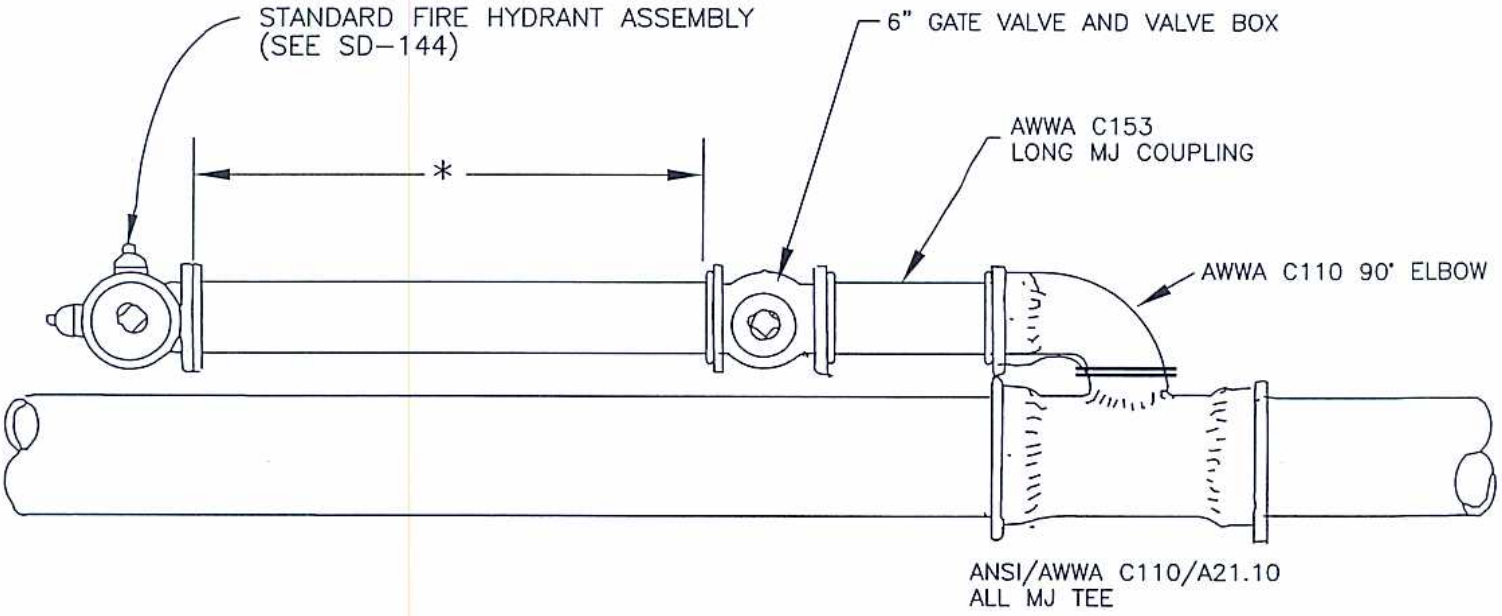
AUG.18,93
L.G.N

SEPT 7,95
drw (CAD)

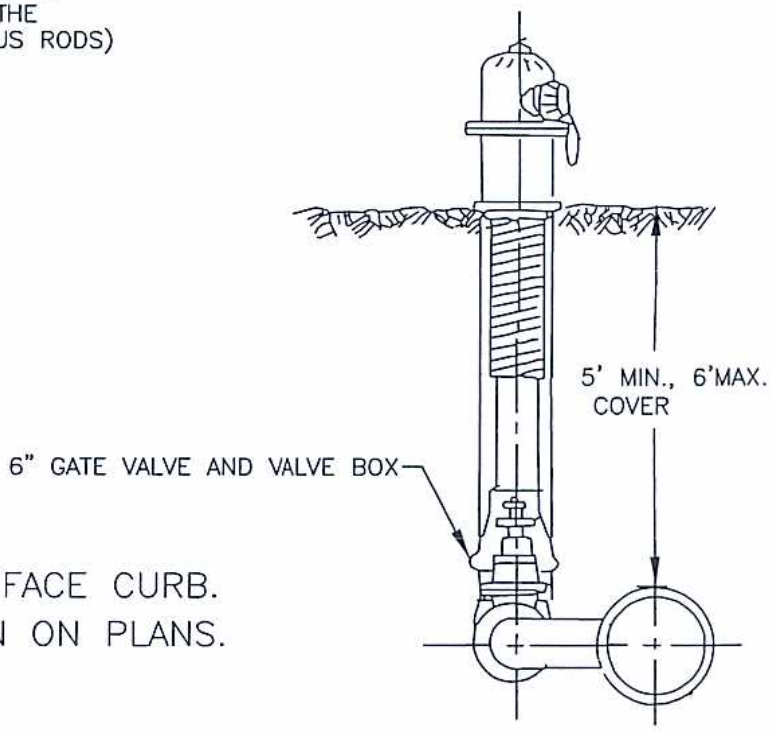
AUG'05
J&H

STANDARD DESIGN SD-137

APPROVED BY WCB



*DISTANCE MAY VARY. HYDRANT SHALL HAVE A MECHANICAL JOINT INLET AND BE RESTRAINED, TIED OR HARNESSED TO THE AUXILIARY VALVE IN A MANNER ACCEPTABLE TO THE ENGINEER (E.G. TWO 3/4-INCH THREADED CONTINUOUS RODS) MECHANICAL JOINT RETAINER GLAND, CLOW F-1216 ANCHORING PIPE WITH ROTO-RING GLAND, ETC.



4" PUMPER CONNECTION TO FACE CURB.
DIRECTION OF TEE AS SHOWN ON PLANS.

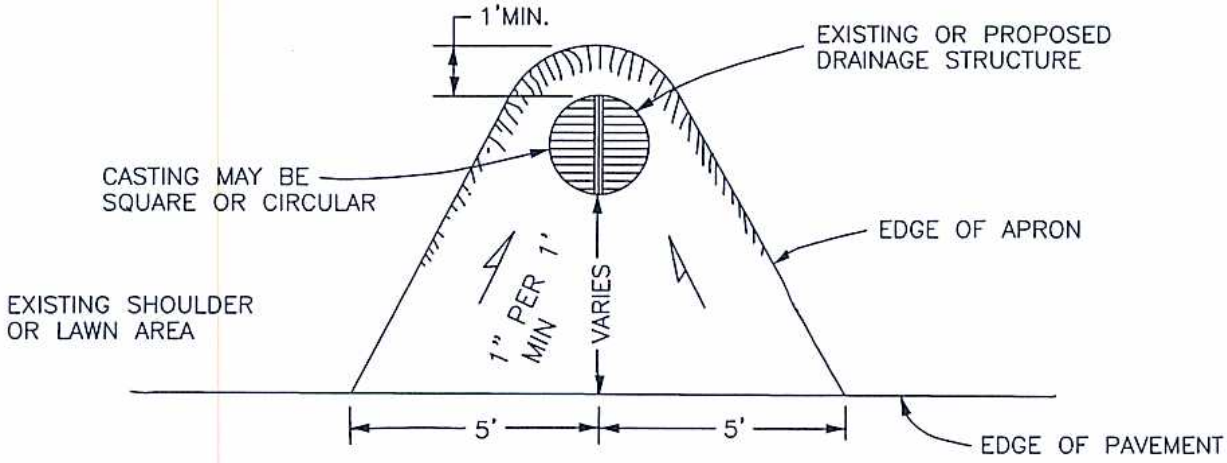
CITY OF PORTAGE

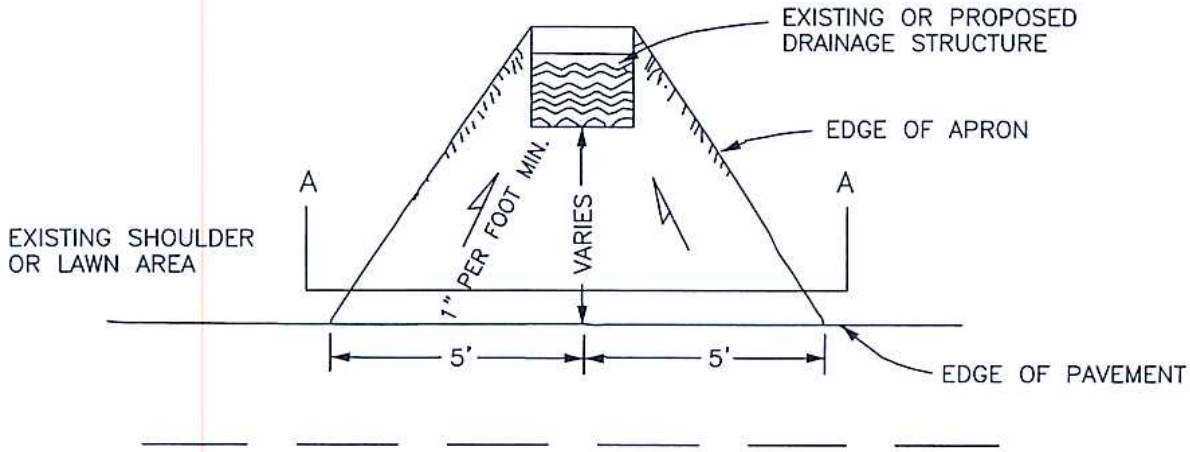
CLOSE COUPLE HYDRANT ASSEMBLY

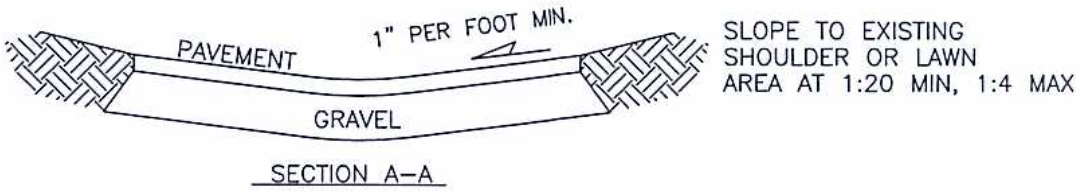
AUG. 18, 93 L.G.N.
JULY '99 d.r.w.
AUG. '99 d.r.w.
AUG'05 J&H

STANDARD DESIGN SD-138

APPROVED BY WCB







SECTION A–A

THE BITUMINOUS APRON SHALL BE CONSTRUCTED OVER 6" MIN. (CIP) OF MDOT 22A. PAVEMENT SHALL BE 2" MIN. OF TOP COURSE MATERIAL

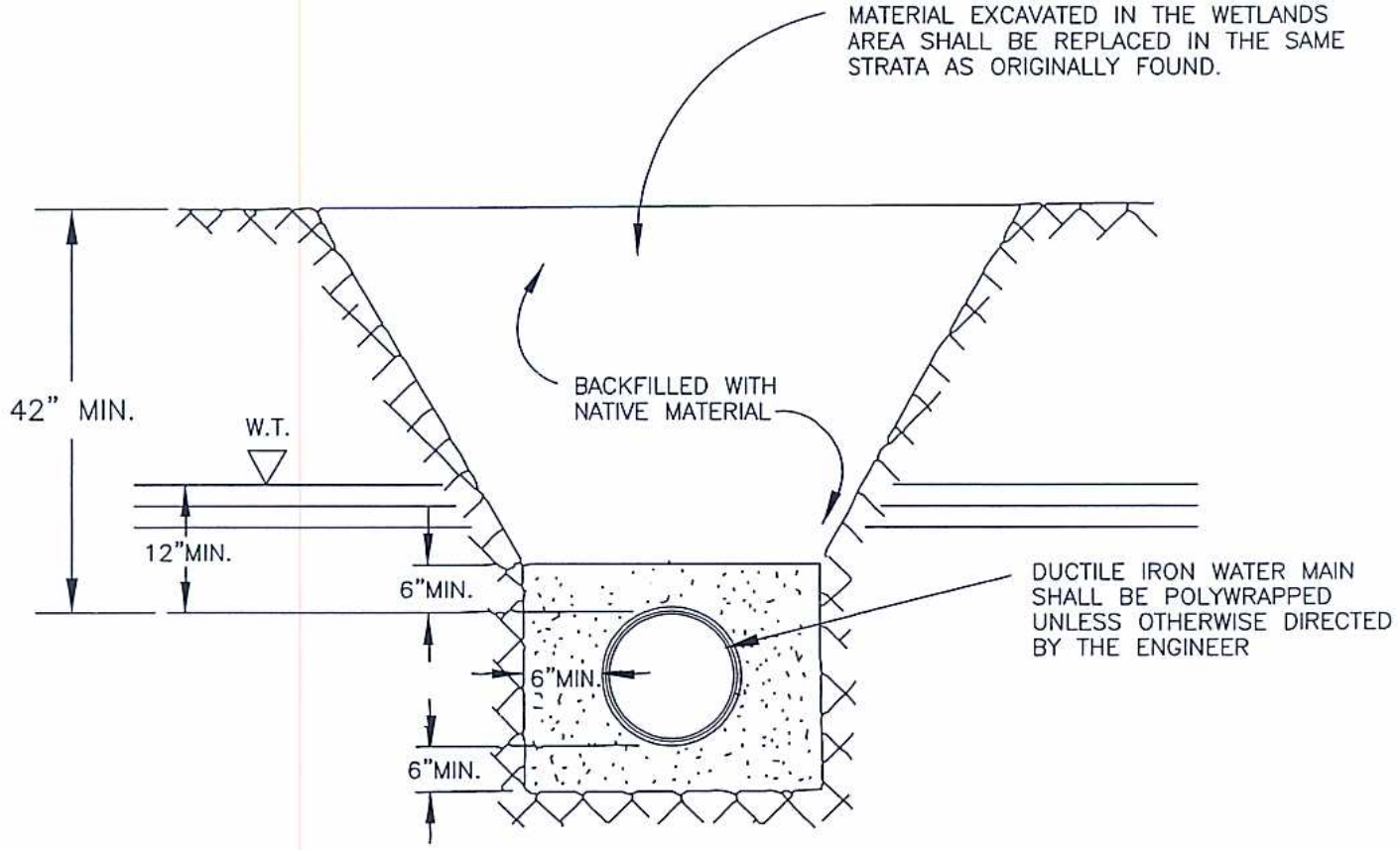
CITY OF PORTAGE

BITUMINOUS SPILLWAY AT STORM BASIN

AUG.18,93 L.G.N.
AUG.09,95 drw(cad)
AUG'05 J&H

STANDARD DESIGN SD–139

APPROVED BY WCB



TRENCH SHALL BE EXCAVATED TO STABLE MATERIAL AND BACKFILLED TO GRADE WITH COMPACTED MDOT CLASS II OR NATIVE GRANULAR MATERIAL IF APPROVED BY THE ENGINEER.

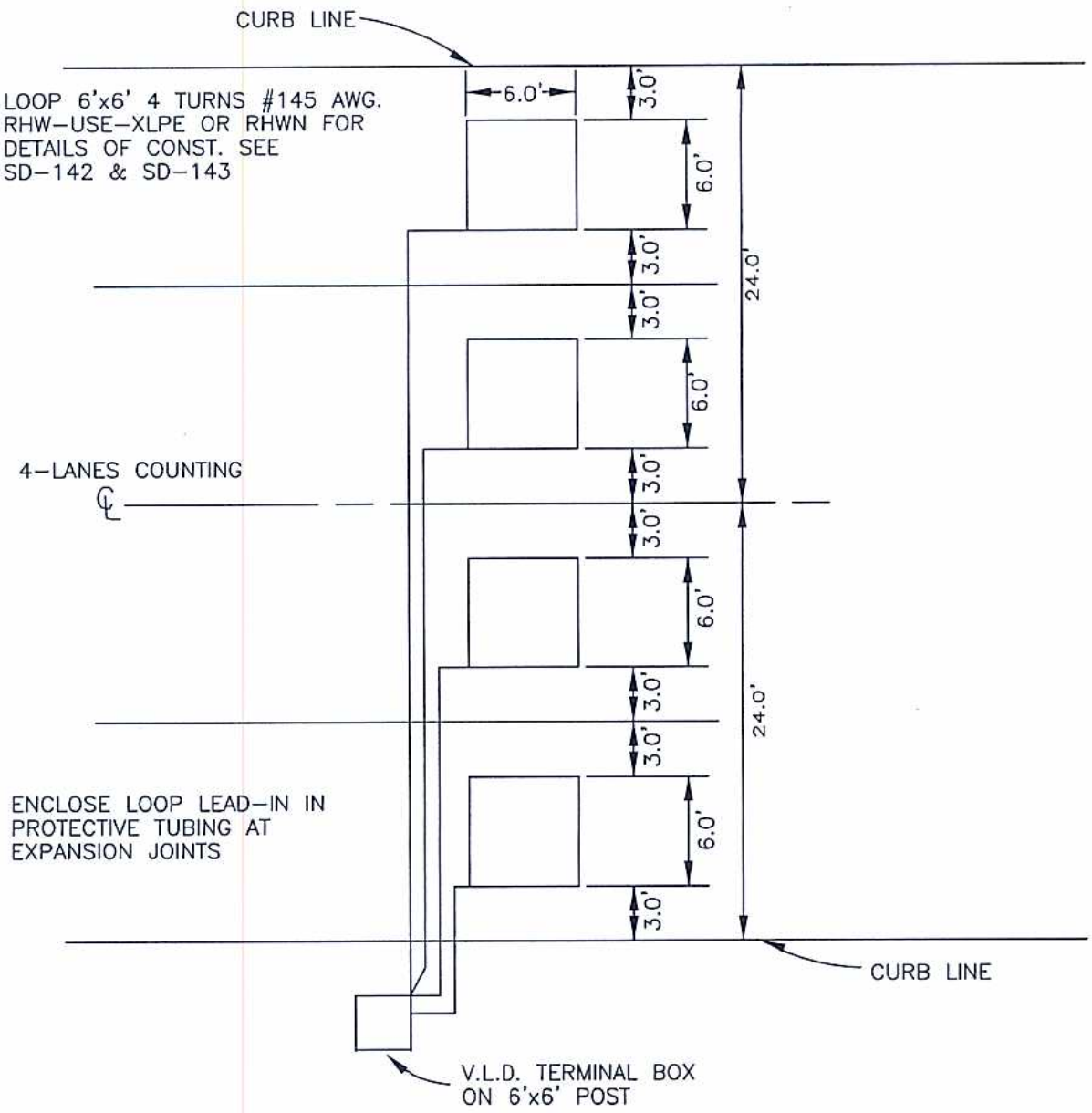
CITY OF PORTAGE

WETLAND TRENCH DETAIL FOR WATER MAIN

AUG.18,93 L.G.N.
AUG.09,95 drw(cad)
JULY '99 drw(cad)
AUG'05 J&H

STANDARD DESIGN SD-140

APPROVED BY WCB



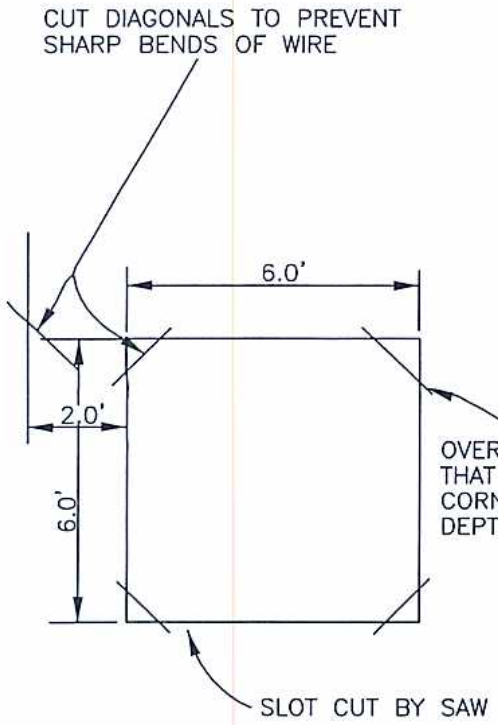
CITY OF PORTAGE

MULTI-LANE LOOP LAYOUT

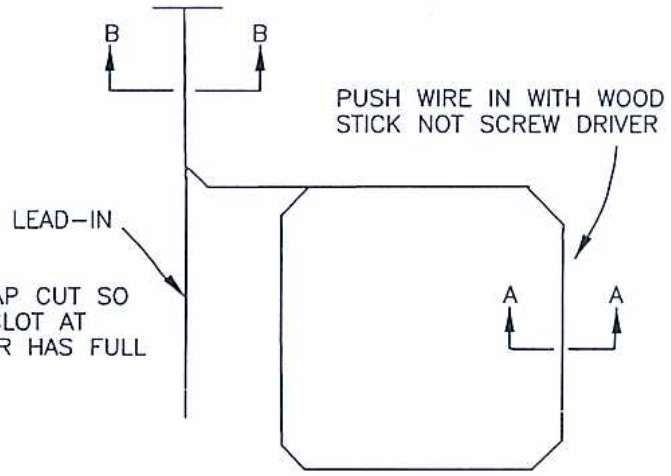
AUG.18,93 L.G.N.
AUG.09,95 drw(cad)
NOV.07,97 drw(cad)
AUG'05 J&H

STANDARD DESIGN SD-141

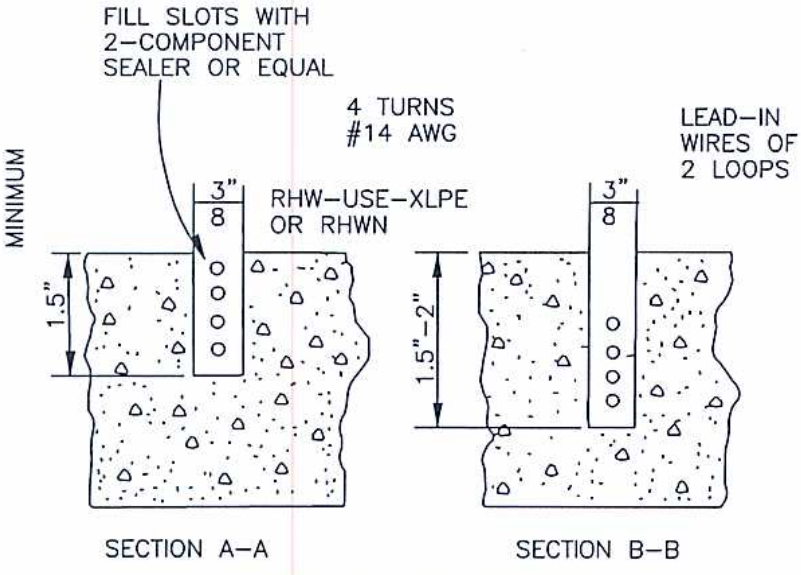
APPROVED BY WCB



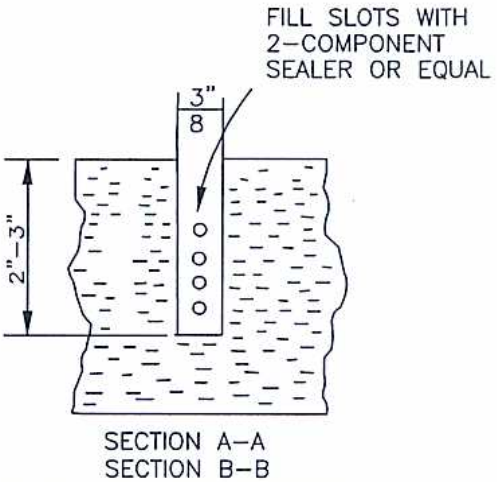
SLOT PLAN



LOOP IN SLOT PLAN



LOOP IN CONCRETE



LOOP IN CONCRETE

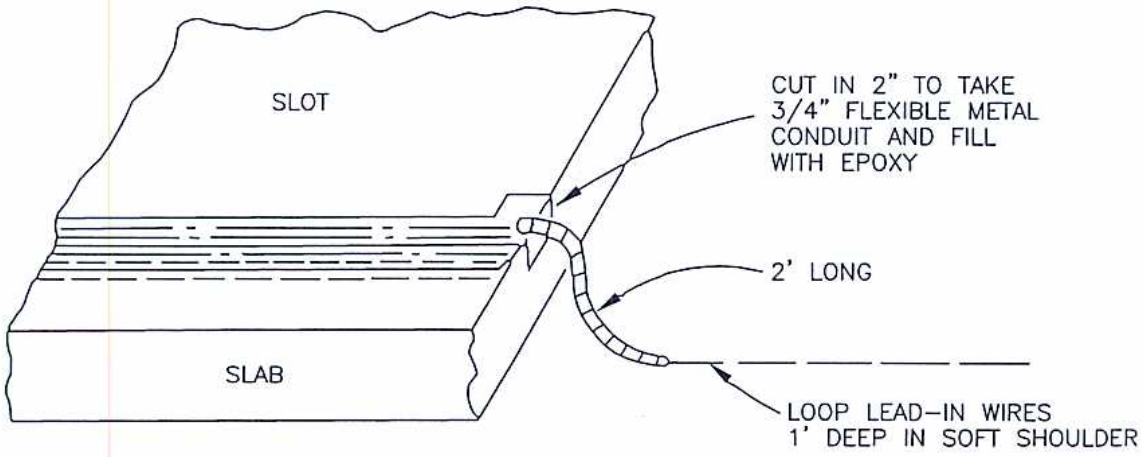
CITY OF PORTAGE

DETECTION LOOP CONSTRUCTION DETAIL

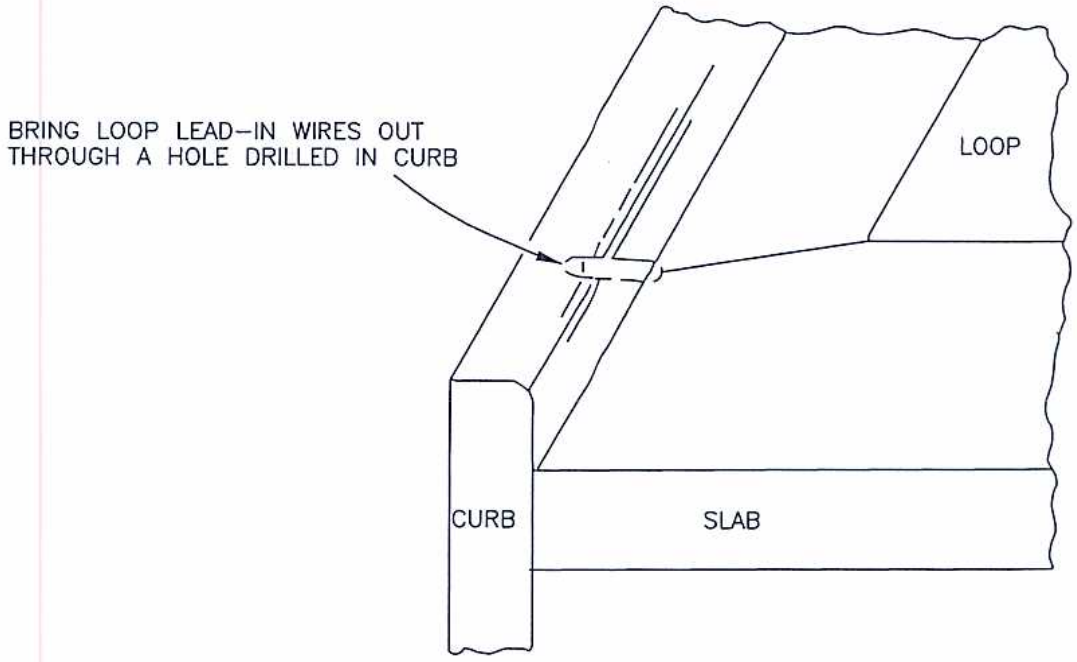
AUG.18,93 L.G.N.
AUG.09,95 drw(cad)
NOV.07,97 drw(cad)

STANDARD DESIGN SD-142

APPROVED BY WCB



LOOP LEAD-IN WIRES IN SOFT SHOULDER



LOOP LEAD-IN WIRES IN CURB

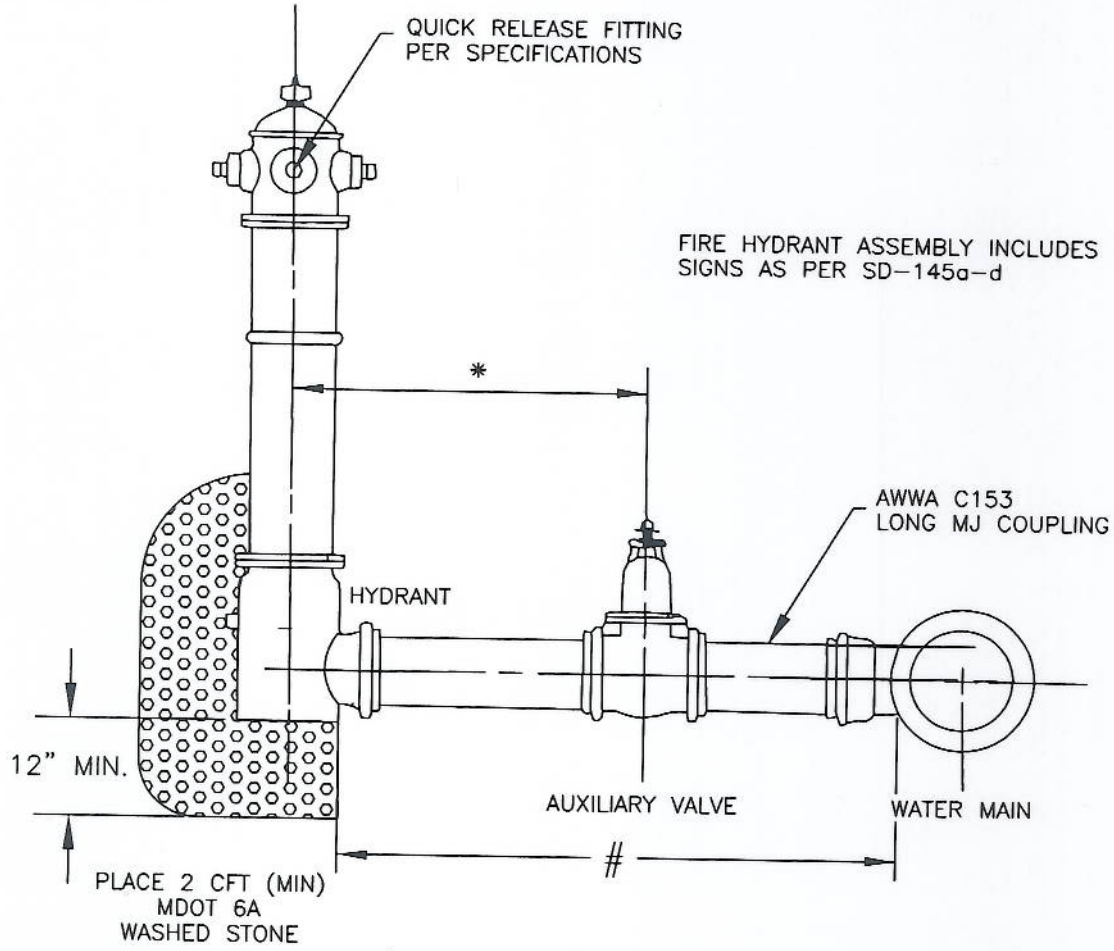
CITY OF PORTAGE

DETECTION LOOP LEAD-IN CONSTRUCTION DETAIL

AUG.18,93 L.G.N.
NOV.07,97 D.R.W.

STANDARD DESIGN SD-143

APPROVE4D BY JB



*DISTANCE MAY VARY. HYDRANT SHALL HAVE A MECHANICAL JOINT INLET AND BE RESTRAINED, TIED OR HARNESSED TO THE AUXILIARY VALVE IN A MANNER ACCEPTABLE TO THE ENGINEER (E.G. TWO 3/4-INCH THREADED CONTINUOUS RODS) MECHANICAL JOINT RETAINER GLAND, CLOW F-1216 ANCHORING PIPE WITH ROTO-RING GLAND, ETC. CONCRETE THRUST BLOCKS WILL NOT BE PERMITTED.

IF DISTANCE BETWEEN WM AND FH IS GREATER THAN 20LFT, 8" DIWM SHALL BE USED.

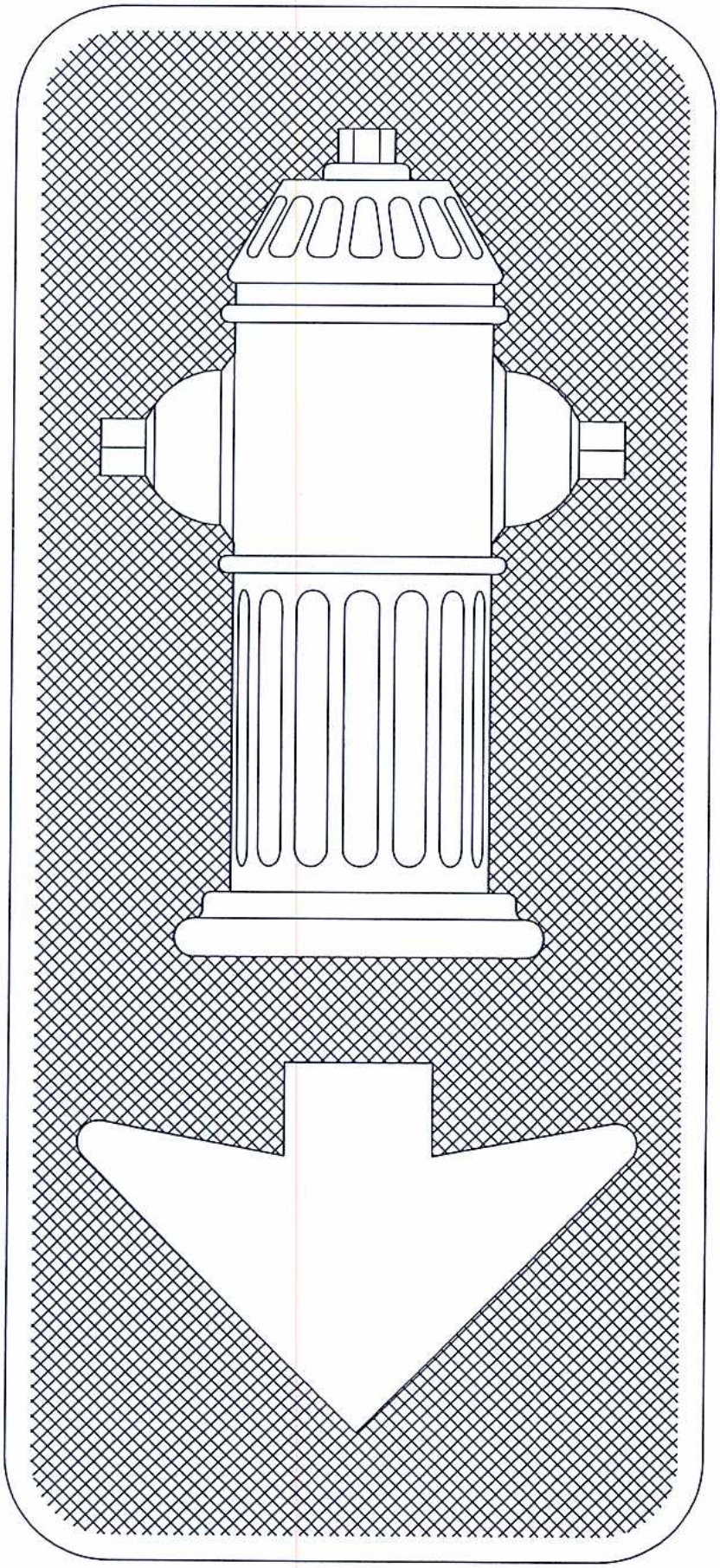
CITY OF PORTAGE

TYPICAL FIRE HYDRANT ASSEMBLY

LATEST REVISION 03/04/16 J.L.H

STANDARD DETAIL SD-144

APPROVED BY WCB

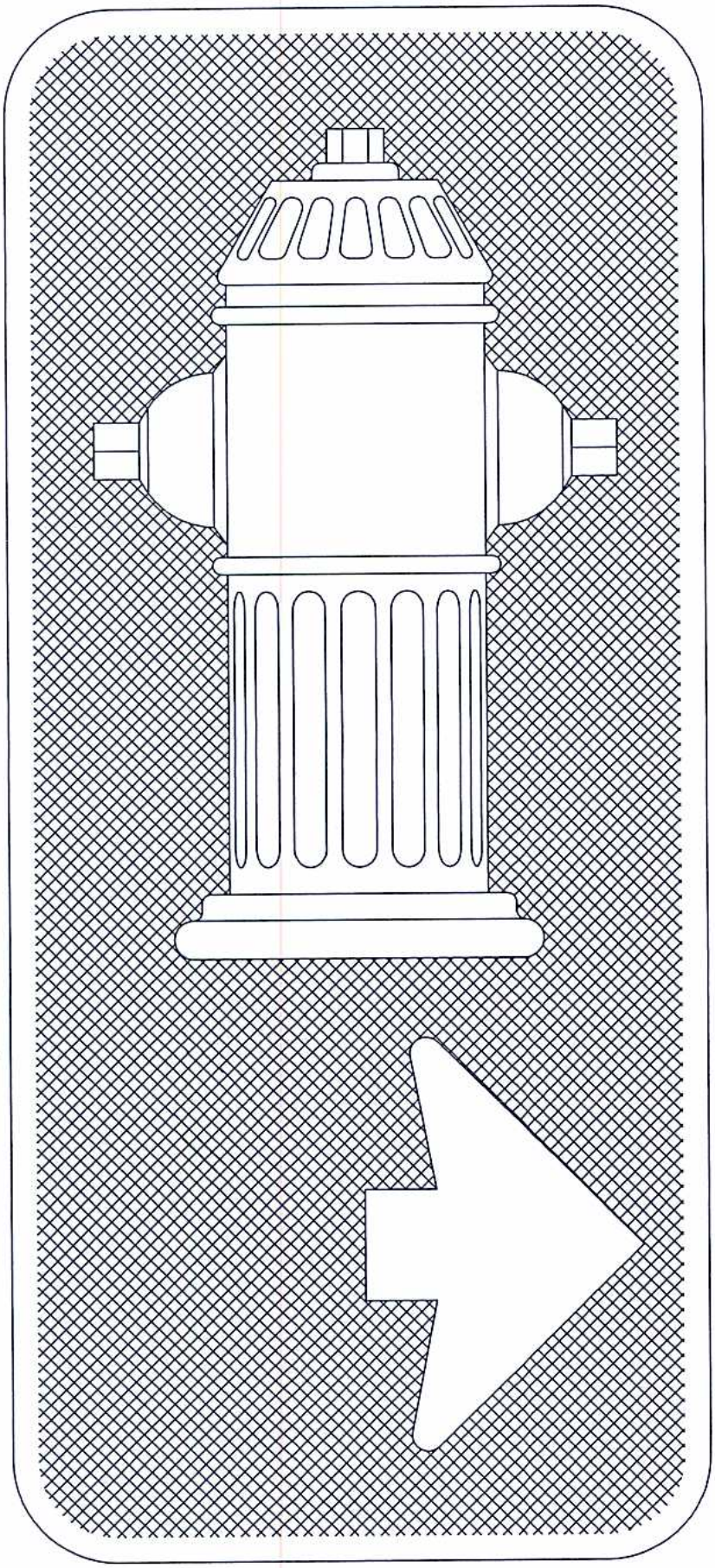


FIRE HYDRANT SIGN

SIZE: 18"x8"
COLOR: RED w/WHITE SYMBOLS
SPECIFICATIONS:
M.D.O.T. TYPE 3A
BOTTOM HEIGHT OF SIGN: 5 FEET
POST: 2 lb U-CHANNEL, 9 FEET IN LENGTH

TWO REQUIRED ON EACH POST

CITY OF PORTAGE	
STANDARD HYDRANT SIGN	AUG.18,93 L.G.N. AUG.09,95 drw(cad)
STANDARD DESIGN SD-145A	
APPROVED J.B.	



CITY OF PORTAGE

STANDARD HYDRANT SIGN

AUG.18,93
L.G.N.
AUG.09,95
drw(cad)

STANDARD DESIGN SD-145B

APPROVED J.B.

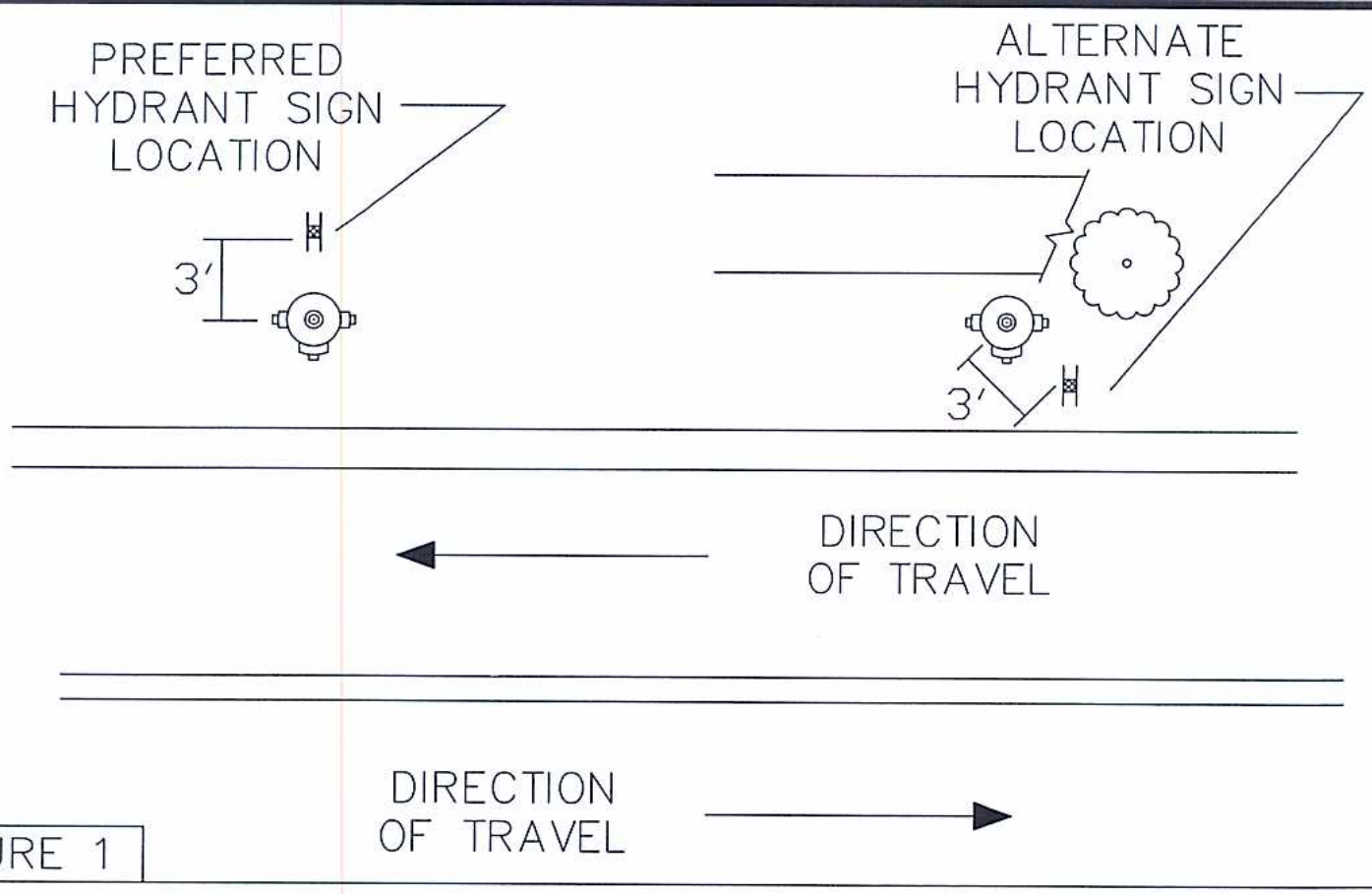
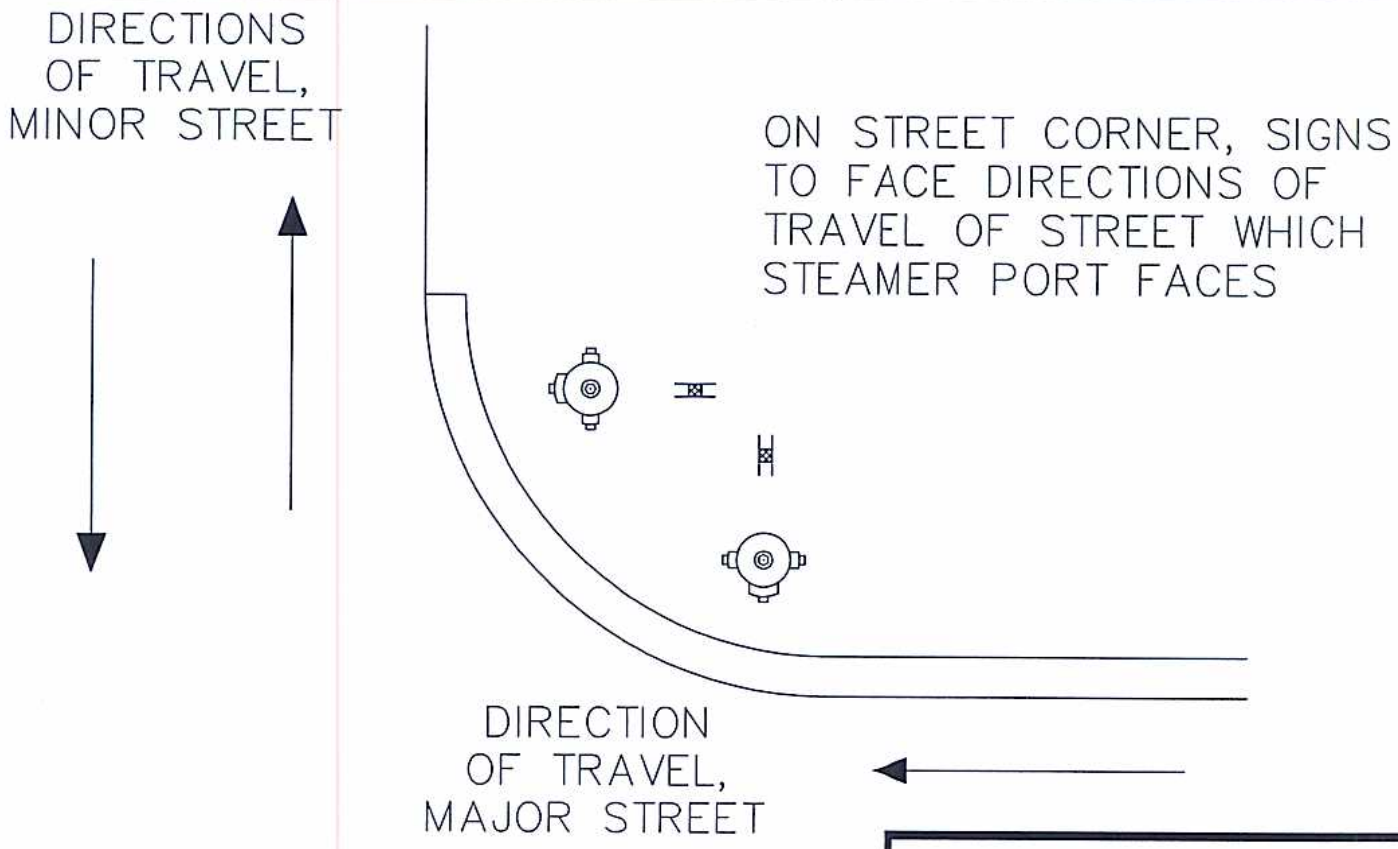
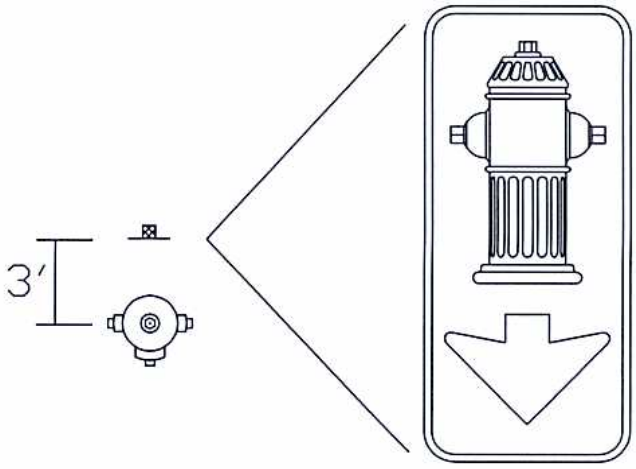


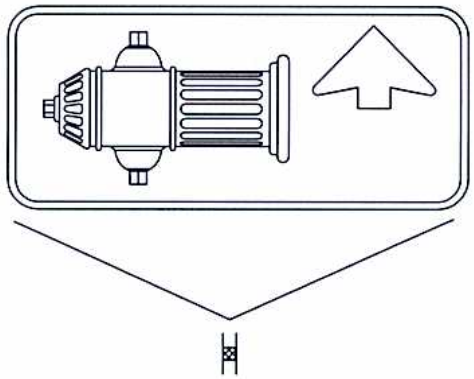
FIGURE 1



CITY OF PORTAGE	
STANDARD HYDRANT SIGN	AUG.19,93 L.G.N. AUG.09,95 drw(cad)
STANDARD DESIGN SD-145C	
APPROVED J.B.	

ARRANGEMENT OF SIGNS FOR HYDRANTS NOT CLEARLY VISIBLE FROM ROAD





SIGN GIVES DIRECTION TO HYDRANT

DIRECTION OF TRAVEL

DIRECTION OF TRAVEL

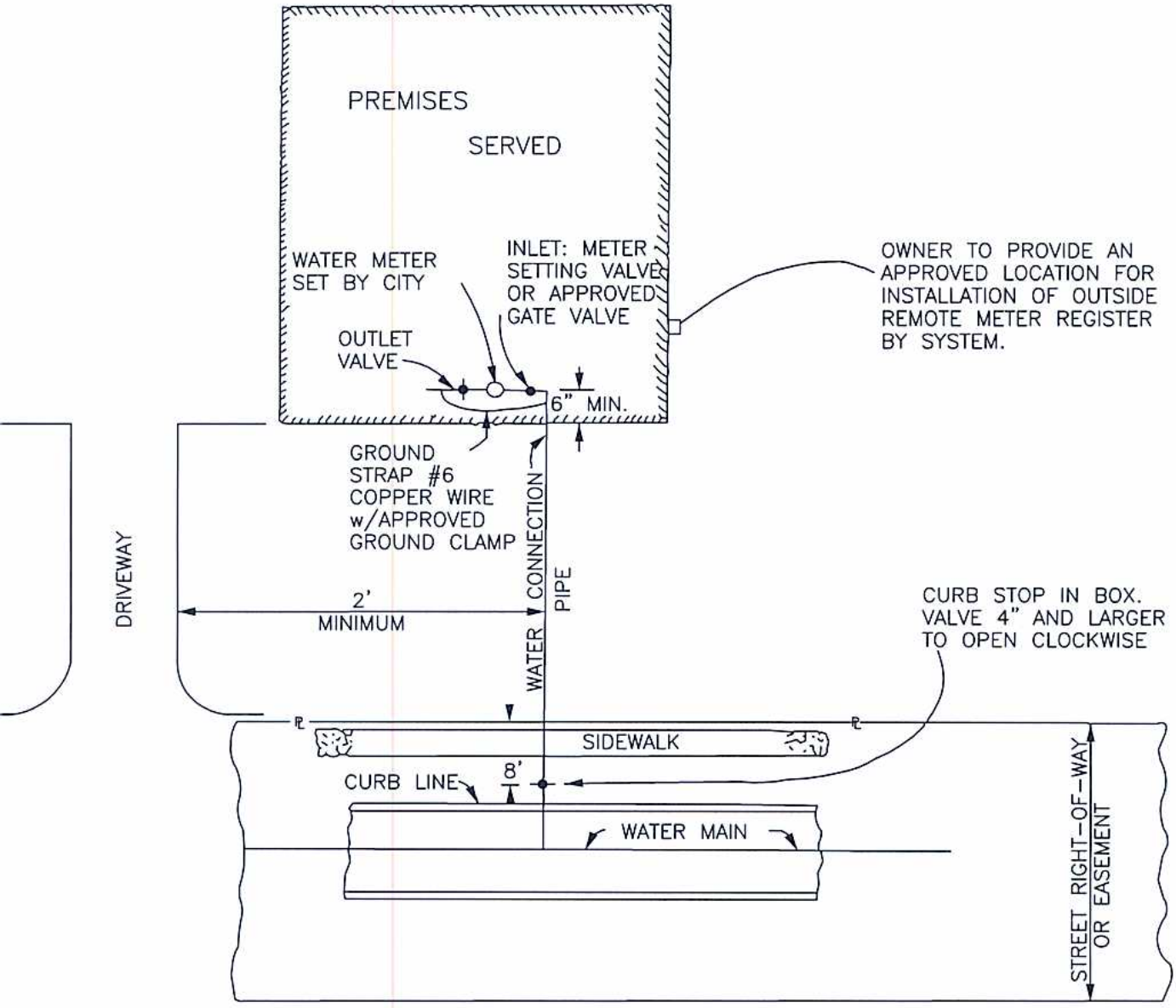
CITY OF PORTAGE

STANDARD HYDRANT SIGN

AUG.19,93 L.G.N.
AUG.09,95 drw(cad)

STANDARD DESIGN SD-145D

APPROVED J.B.



NOTE:

1) FOR 2" OR LARGER WATER CONNECTION PIPE, SEE OTHER DRAWINGS FOR METER SETTING.

2) ALL WATER SERVICE PIPE, VALVES & APPRUTENANCES, SHALL BE THE SAME SIZE FROM THE WATER MAIN TO THE METER INLET VALVE.

3) WHEN A TAPPING SLEEVE AND VALVE IS INSTALLED NO ADDITIONAL CURB STOP IS REQUIRED.

4) THE WATER SERVICE SHALL BE A MINIMUM OF 2' FROM THE EDGE OF THE DRIVEWAY.

5) WHERE A BASEMENT METER SETTING IS NOT FEASIBLE, A METER PIT INSTALLATION WILL BE REQUIRED.

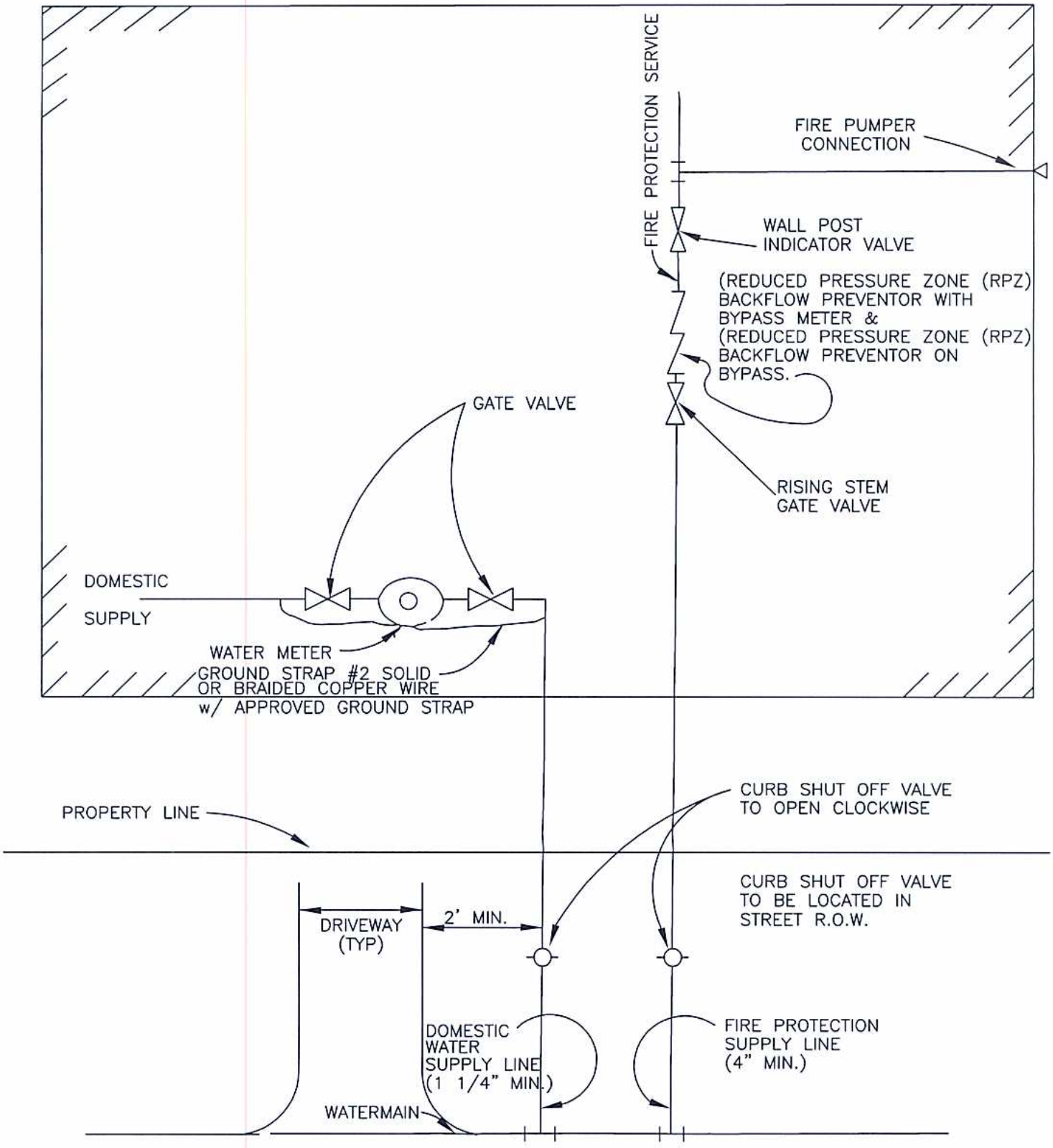
CITY OF PORTAGE

TYPICAL WATER CONNECTION PIPE

AUG.19,93 L.G.N.
APR. 1995 drw
4-25-95 drw
4-26-95 drw
FEB '07 JMA

STANDARD DESIGN SD-146

APPROVED BY J.B.



NOTE:

1. WATER SERVICE LOCATION. THE WATER SERVICE LINES ARE NOT TO BE LOCATED OVER OTHER UNDERGROUND UTILITIES, TOWARD LARGE TREES, IN LINE WITH SANITARY SEWER LINES, SEPTIC TANKS, DRAIN FIELDS, DRY WELLS, OR UNDER DRIVEWAYS. WATER SERVICES ARE TO BE A MINIMUM OF 2' FROM THE EDGE OF THE DRIVEWAY.
2. ALL POST INDICATOR VALVES (WALL &/or YARD) SHALL BE LOCATED DOWN STREAM OF THE BACKFLOW PREVENTION DEVICE. THE CURB SHUTOFF VALVE CANNOT BE USED FOR A POST INDICATOR VALVE.

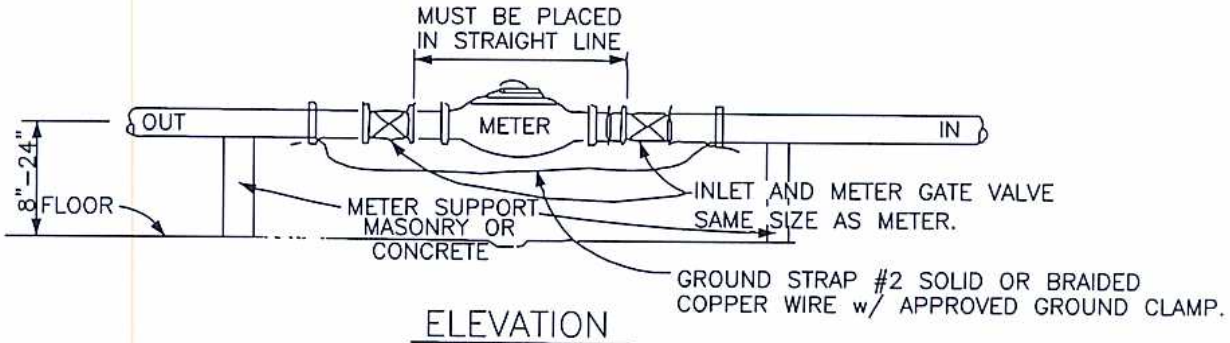
CITY OF PORTAGE

STANDARD WATER SERVICE LOCATION

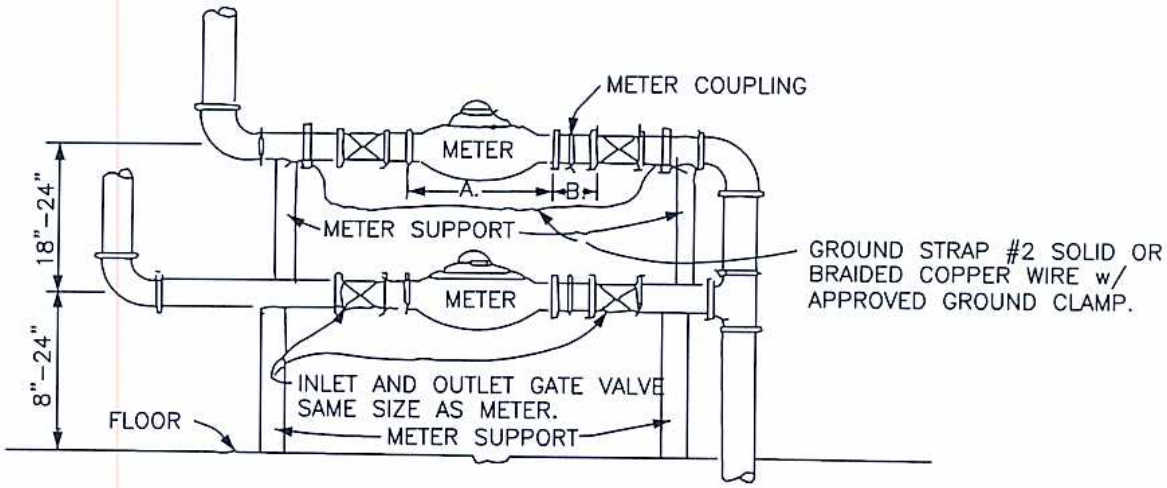
STANDARD DESIGN SD-148

APPROVED BY WCB

AUG.30,94 L.G.N.
APR. 1995 drw
4-25-95 drw
NOV. 1997 drw
DEC. 1997 drw
FEB. '07 JMA



ELEVATION
SINGLE METER
1 1/2", 2", or 3"



ELEVATION
METER BATTERY
1 1/2", 2", or 3"

NOTE:
ALL PIPE IN THE METER SETTING MUST BE BRASS WITH THREADED ENDS OR CAST IRON.

METER SIZE	A.	B.
1 1/2	13"	6"
2" SR	17"	8"
2" COMPOUND	15 1/4"	8"
3" COMPOUND	17"	12"

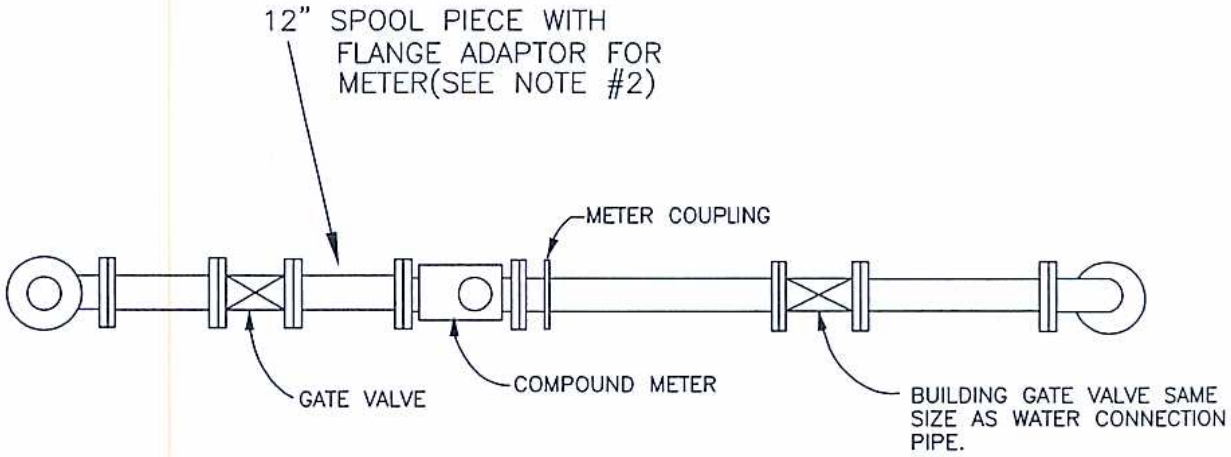
CITY OF PORTAGE

METER SETTING
1 1/2" or 3"
WATER CONNECTION
PIPE

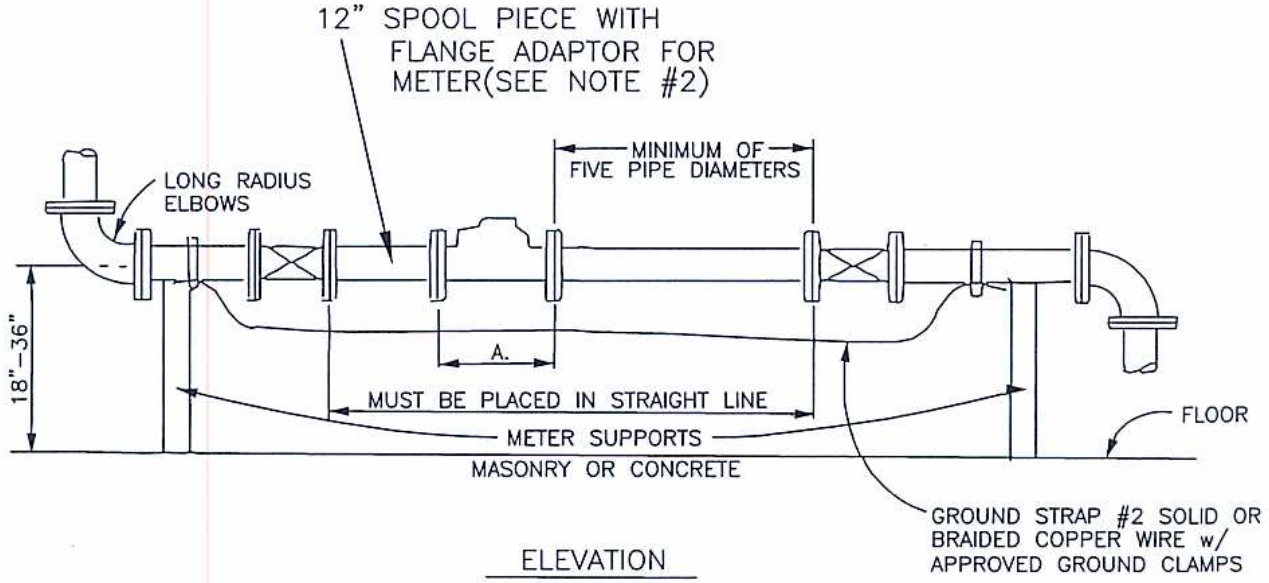
AUG. 19,93
L.G.N.
AUG'05
J&H

STANDARD DESIGN SD-149

APPROVED BY J.B.



PLAN VIEW



ELEVATION

.NOTE:

#1 METER DIMENSIONS

	A.
3"	17"
4"	20 3/8"
6"	27 3/8"

#2

METER SIZE	FLANGE ADAPTOR MODEL #
3"	SMITH BLAIR 912
4"	SMITH BLAIR 912
6"	SMITH BLAIR 912

ALL PIPE AND VALVES IN THE METER SETTING MUST BE THE SAME SIZE AS THE METER. BLACK IRON PIPE MAY NOT BE USED.

CITY OF PORTAGE

METER SETTING FOR 3", 4" or 6" METERS

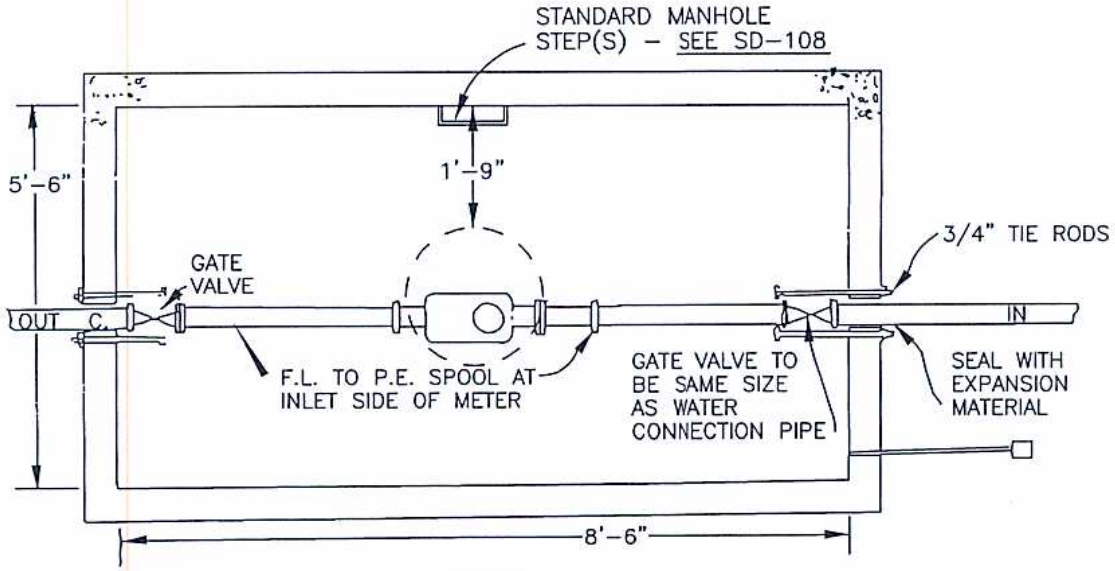
AUG.19,93 L.G.N.

APR. 1995 drw

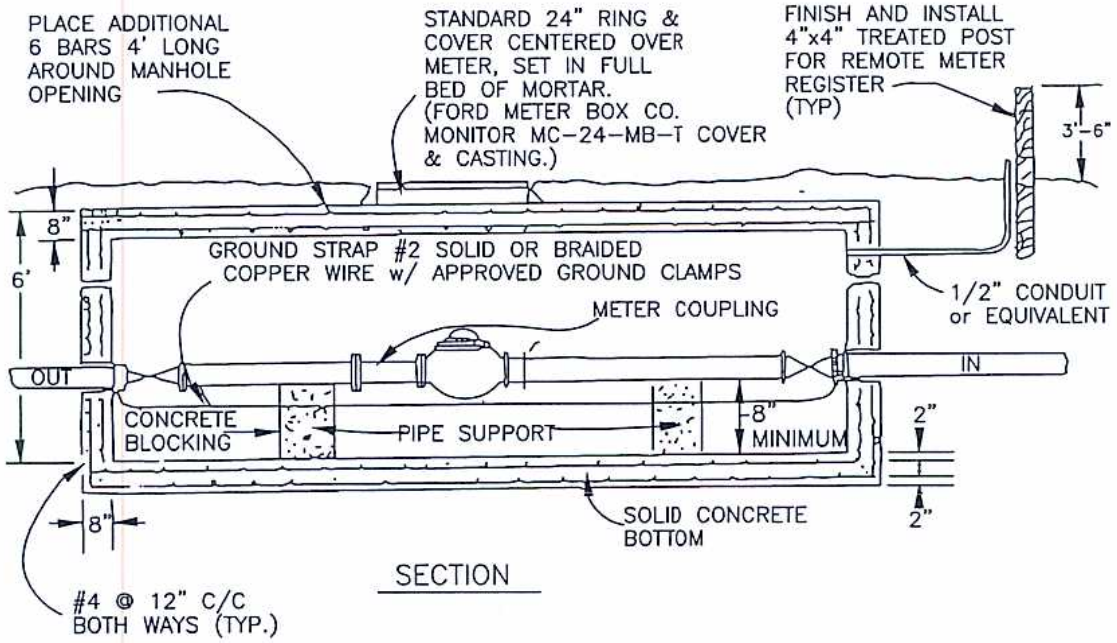
4-25-95 drw

STANDARD DESIGN SD-150

APPROVED BY J.B.



PLAN



SECTION

NOTE:

3" METER LENGTH 17"
4" METER LENGTH 20 5/8"
6" METER LENGTH 24 3/4"

METER SIZE	FLANGE ADAPTOR MODEL #
3"	SMITH BLAIR 912
4"	SMITH BLAIR 912
6"	SMITH BLAIR 912

NOTE:

ALIGN STEPS WITH ACCESS OPENING TO FACILITATE EASY INGRESS & EGRESS SEE SD–108

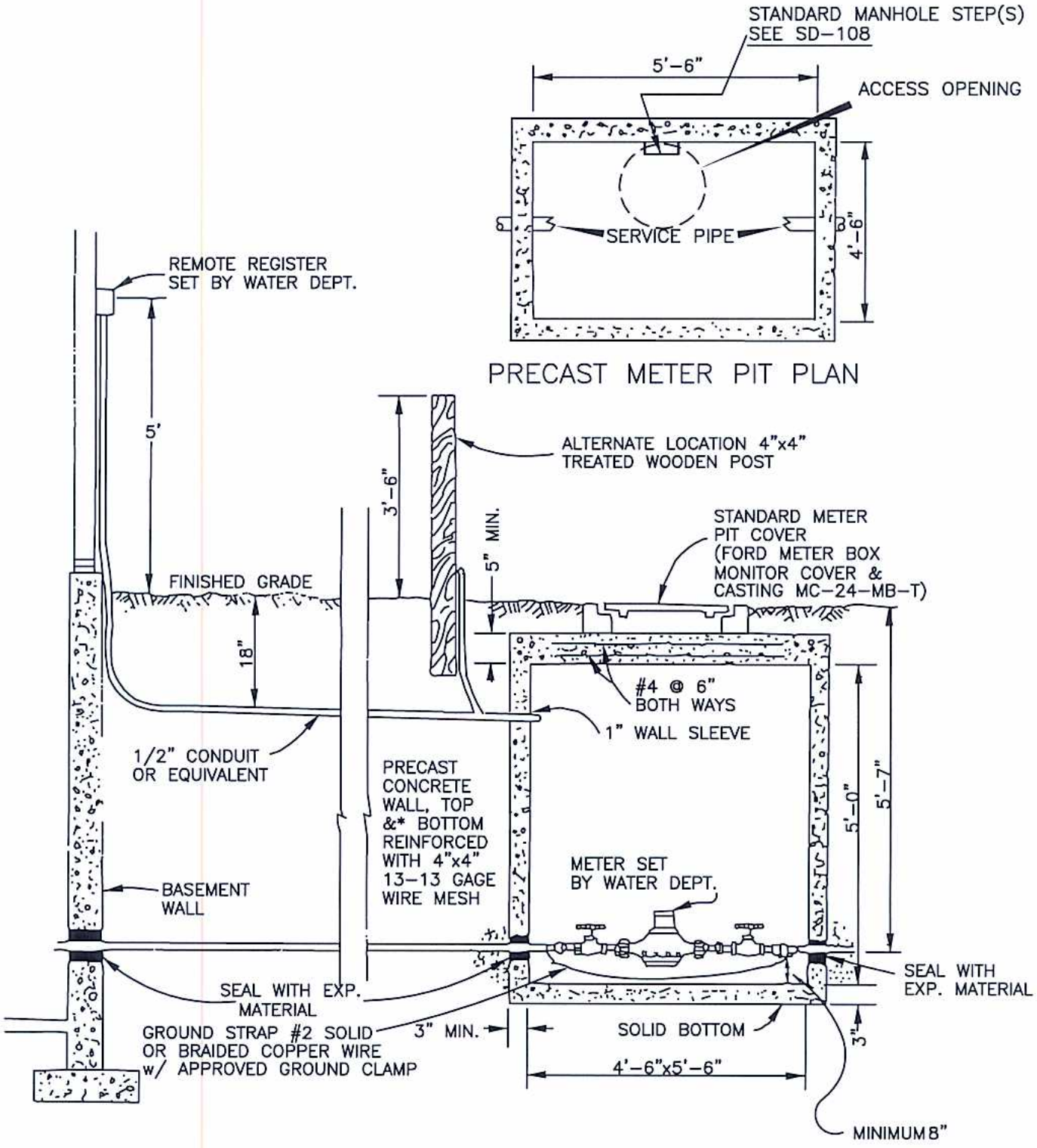
CITY OF PORTAGE

PRECAST METER PIT AND METER SETTING ARRANGEMENT FOR 3",4"or 6" COMPOUND METER AND TYPICAL PIT LAYOUT

STANDARD DESIGN SD–151

APPROVED BY WCB

AUG.19,93 L.G.N.
APR. 1995 d.r.w.
4–25–95 d.r.w.
DEC.'97 d.r.w.
JULY '99 d.r.w.
AUG'05 J&H



NOTE:

CONTRACTOR MUST FURNISH AND INSTALL A 1/2" CONDUIT FROM THE METER PIT TO THE APPROVED LOCATION EITHER ON A BUILDING WALL OR MOUNTED ON A POST NEAR THE PIT.

ALIGN STEPS WITH ACCESS OPENING.

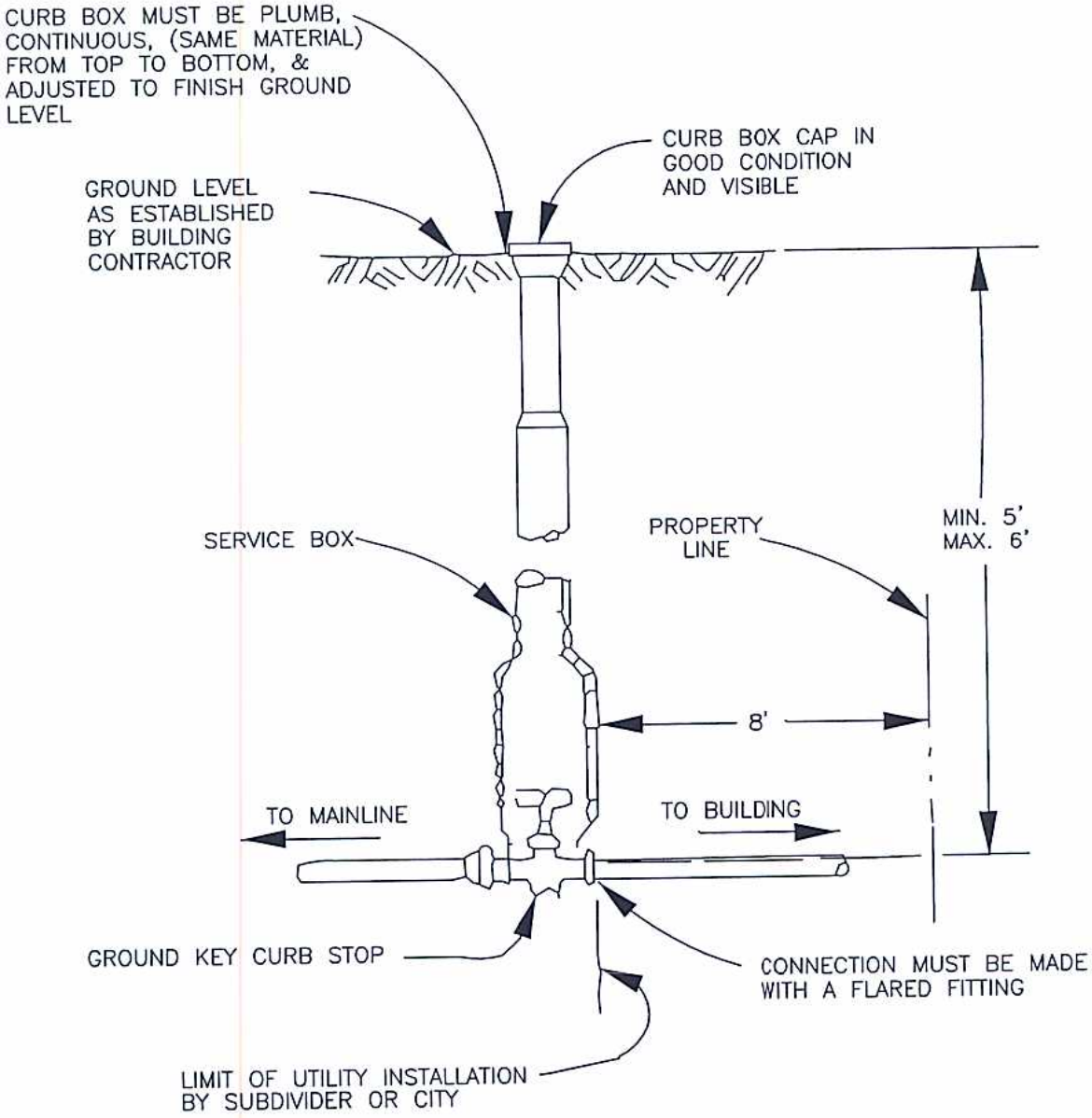
CITY OF PORTAGE

PRECAST METER PIT FOR 1 1/2"or 2" METER

AUG.19,93 L.G.N.	
APR. 1995 d.r.w.	
4-25-95 d.r.w.	
DEC.2,97 d.r.w.	

STANDARD DESIGN SD-152

APPROVED BY WCB



NOTE:
FAILURE TO COMPLY WITH THIS DETAIL SHALL BE SUFFCIENT CAUSE TO REJECT SETTING OF WATER METER

CITY OF PORTAGE
ENGINEERING DEPARTMENT

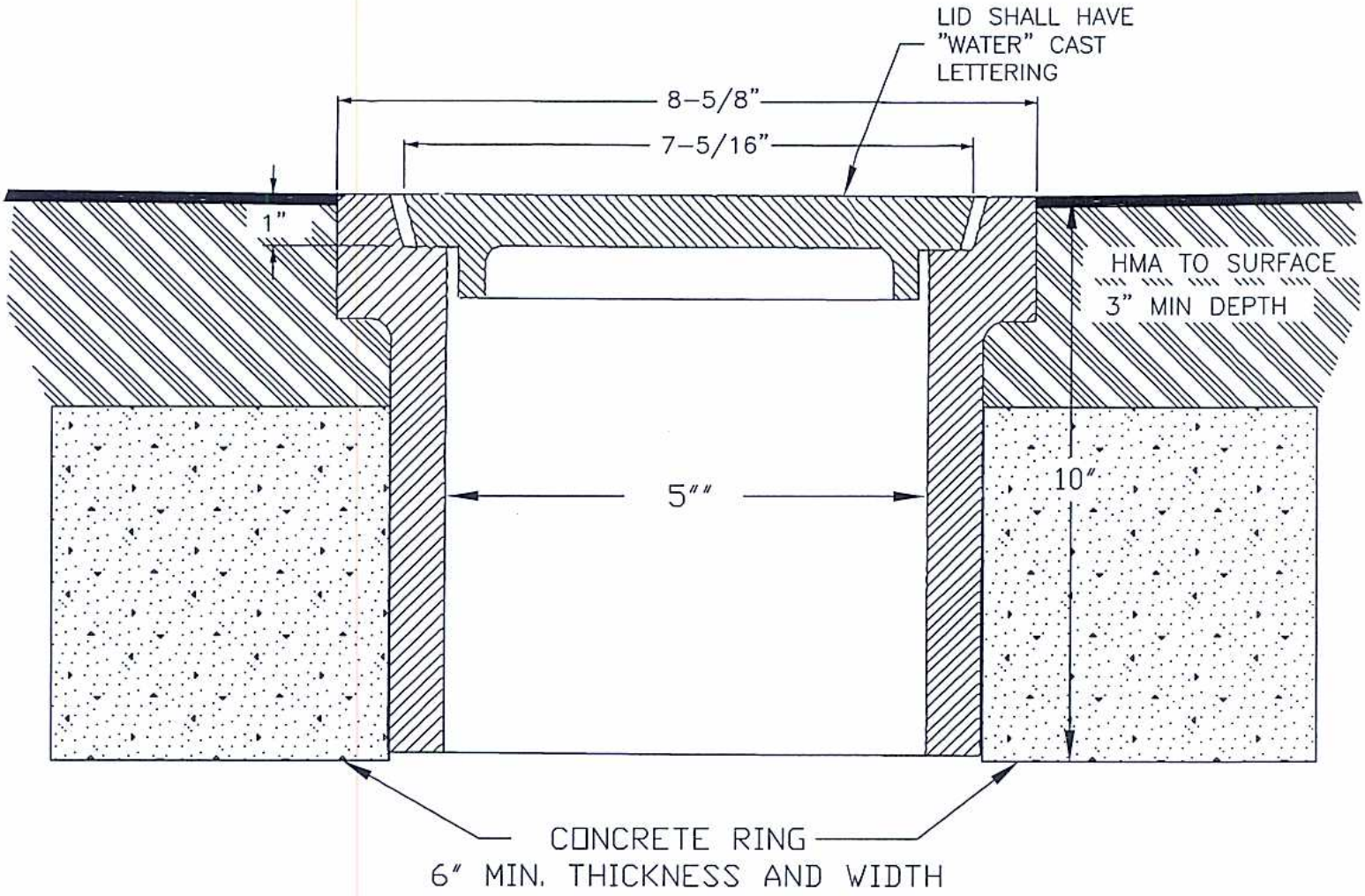
APR.13,94
L.G.N.

CURB STOP CONNECTION & FINAL SETTING OF CURB BOX

STANDARD DESIGN SD-153A

APPROVED BY J.B.

WS-7A



CROSS SECTION OF VALVE BOX AND COVER

NOTES:

THE SEATING FACE OF THE LID AND THE SEAT FOR SAME ON FRAME SHALL BE GROUND OR MACHINED SO THAT THE LID SHALL HAVE AN EVEN BEARING ON ITS SEAT TO PREVENT ROCKING OR TILTING.

THE CASTING SHALL BE FREE OF POURING FAULTS, BLOW HOLES, CRACKS AND OTHER IMPERFECTIONS, THEY SHALL BE SOUND, TRUE TO FORM AND THICKNESS, CLEAN AND NEATLY FINISHED, AND SHALL BE COATED WITH TAR PITCH VARNISH.

LID SHALL BE NON LOCKING TYPE EJIW 6800

CASTING:

EAST JORDAN SCREW TYPE "8550"
OR APPROVED EQUIVALENT

TOTAL WEIGHT 148 LB.

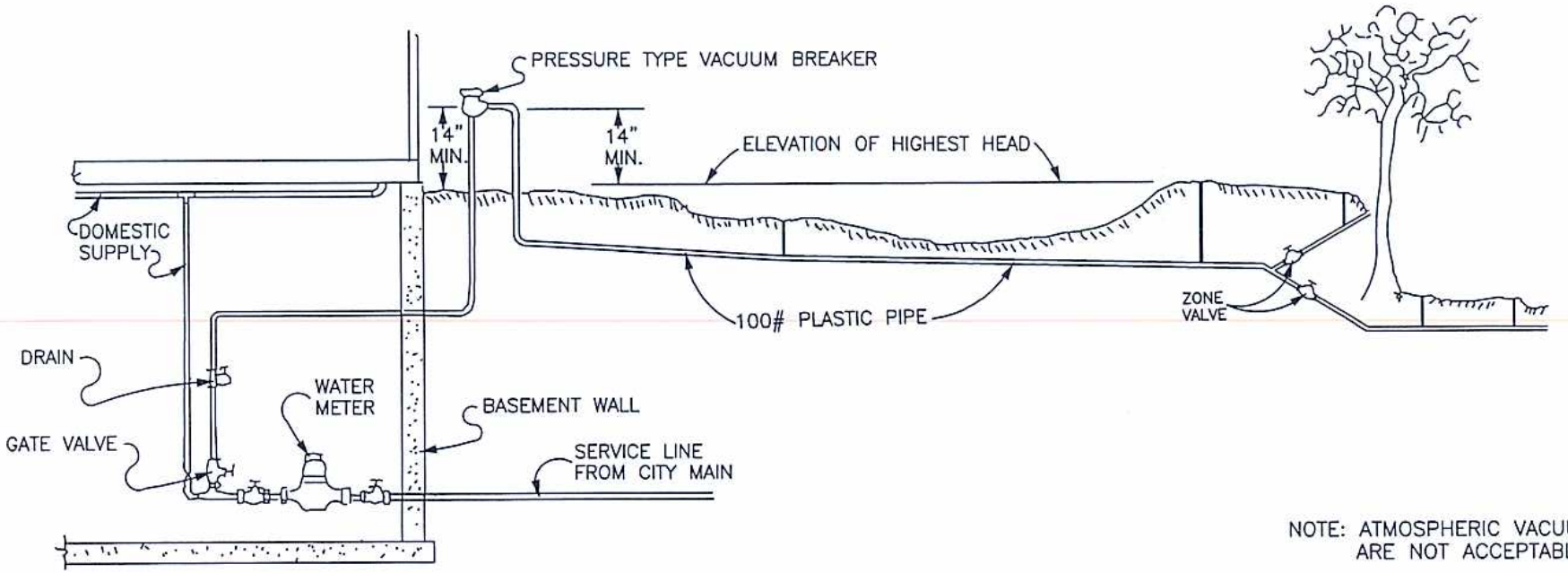
CITY OF PORTAGE

STANDARD
VALVE BOX

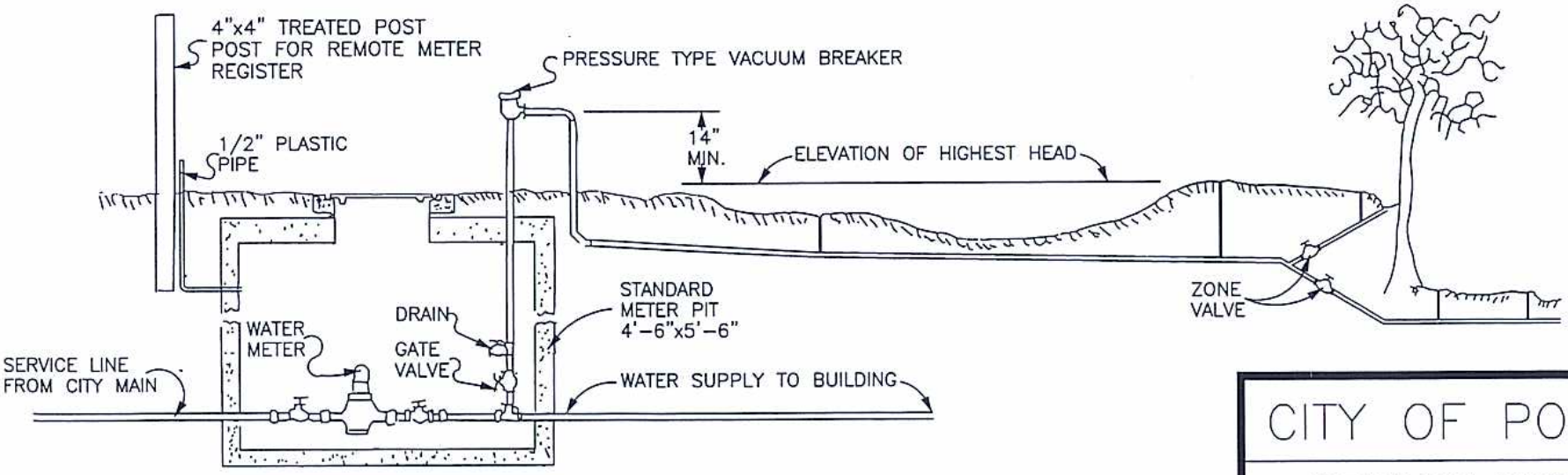
DEC 2006
JMA

STANDARD DESIGN SD-154

APPROVED WCB



NOTE: ATMOSPHERIC VACUUM BREAKERS ARE NOT ACCEPTABLE



NOTE:
SEE METER PIT DETAIL FOR DIMENSIONS.

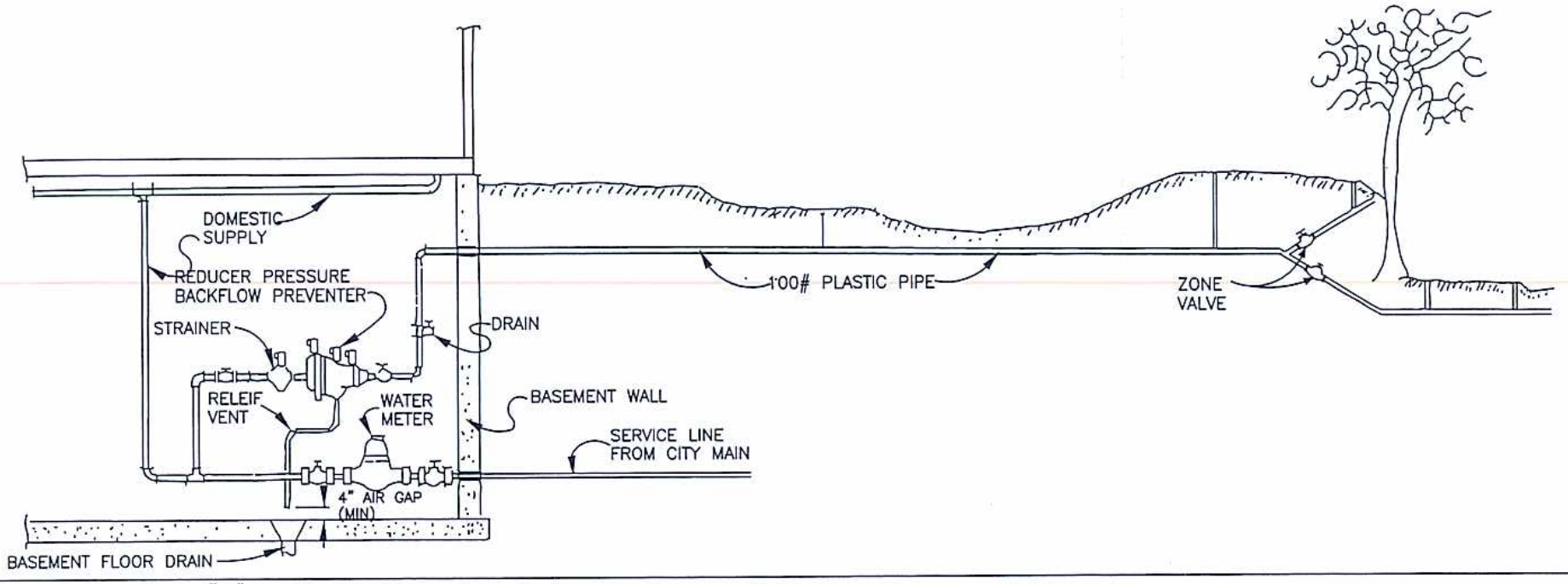
CITY OF PORTAGE

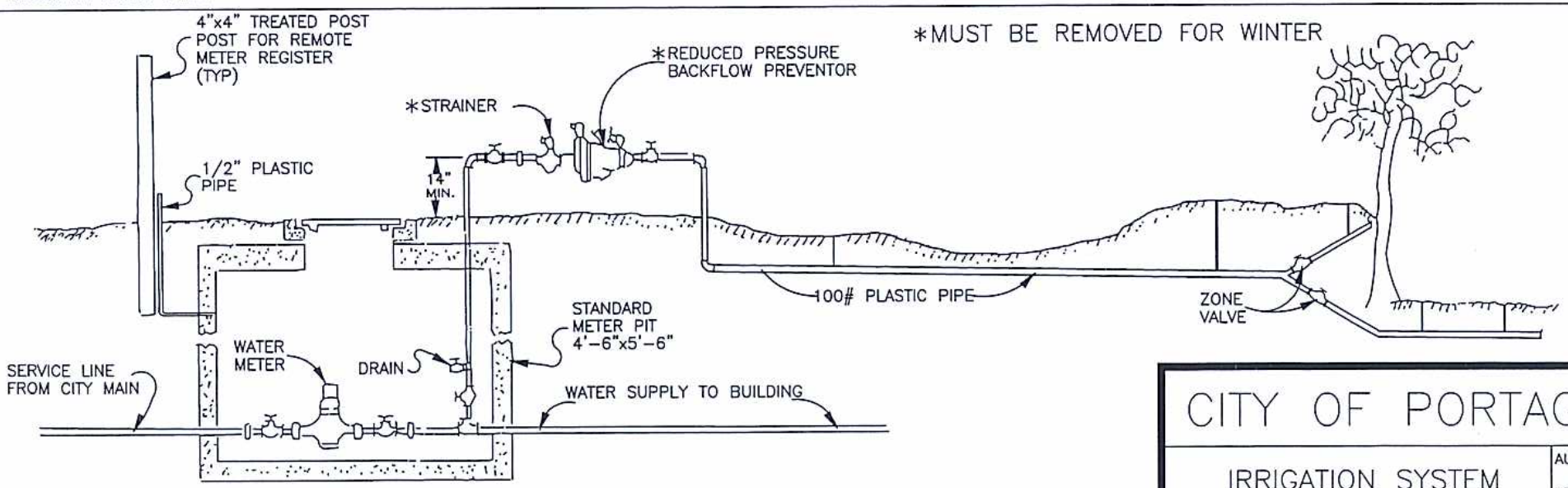
IRRIGATION SYSTEM PRESSURE TYPE VACUUM BREAKER

AUG. 19, 93 LGN
APR. 1995 d.r.w.
4-25-95 d.r.w.

STANDARD DESIGN SD-155

APPROVED BY J.B.





NOTE:
SEE METER PIT DETAIL FOR DIMENSIONS

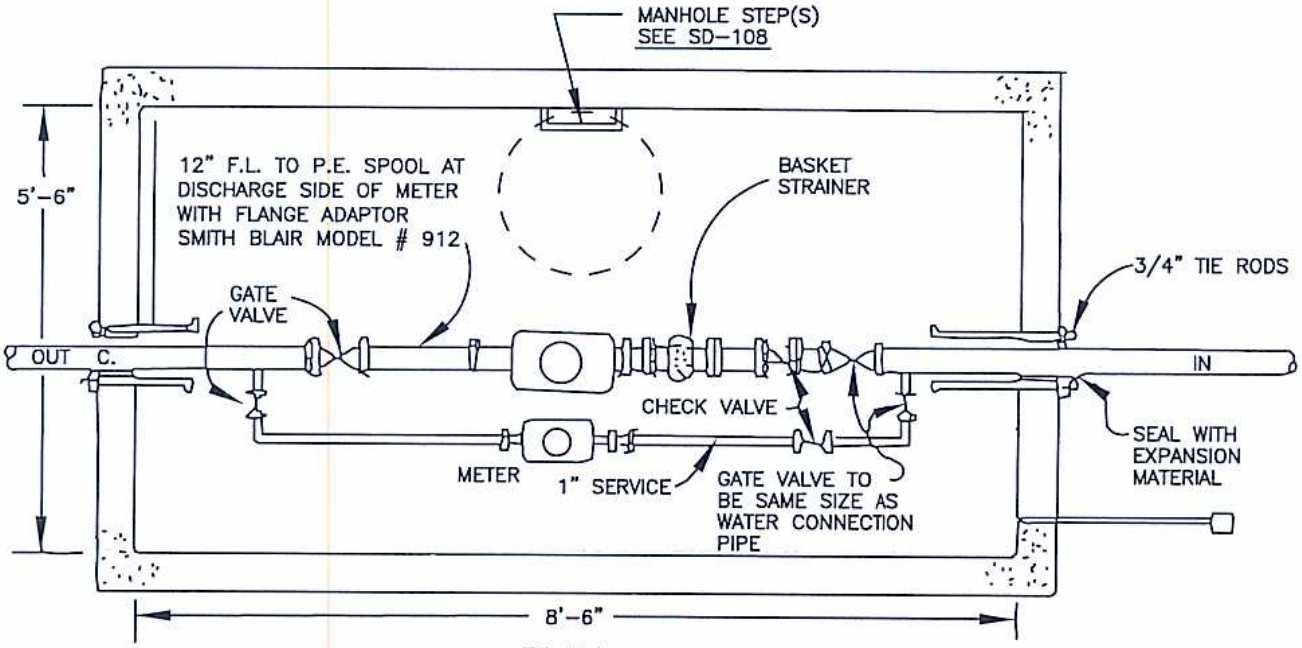
CITY OF PORTAGE

IRRIGATION SYSTEM REDUCED PRESSURE BACKFLOW PREVENTOR

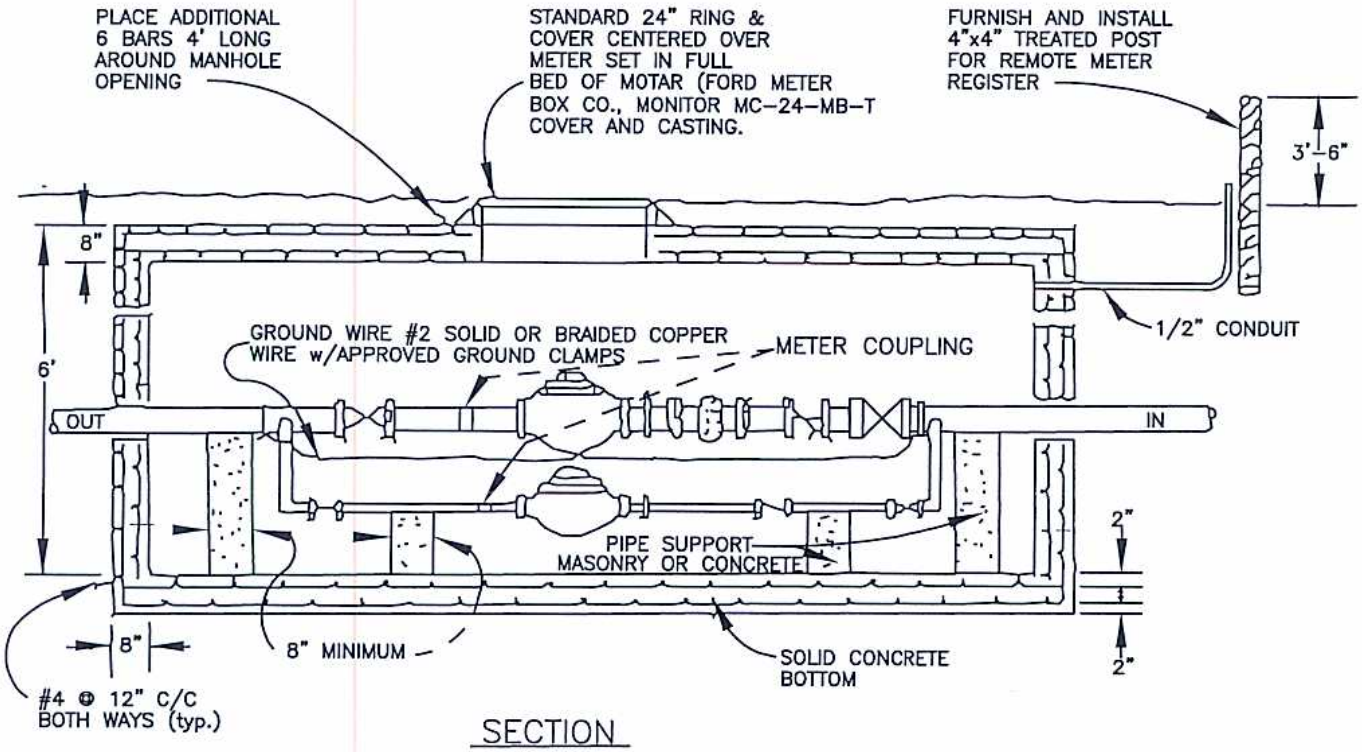
AUG.19,93 L.G.N.
APR. 1995 d.r.w.
4-25-95 d.r.w.

STANDARD DESIGN SD-156

APPROVED BY J.B.



PLAN



SECTION

NOTE: ALIGN STEPS WITH ACCESS OPENING TO FACILITATE EASY INGRESS & EGRESS

#1 METER DIMENSIONS

	A.	B.
3"	17"	12
4"	20-3/8"	20
6"	27-3/8"	36

#2

METER SIZE	FLANGE ADAPTOR MODEL #
3"	SMITH BLAIR 912
4"	SMITH BLAIR 912
6"	SMITH BLAIR 912

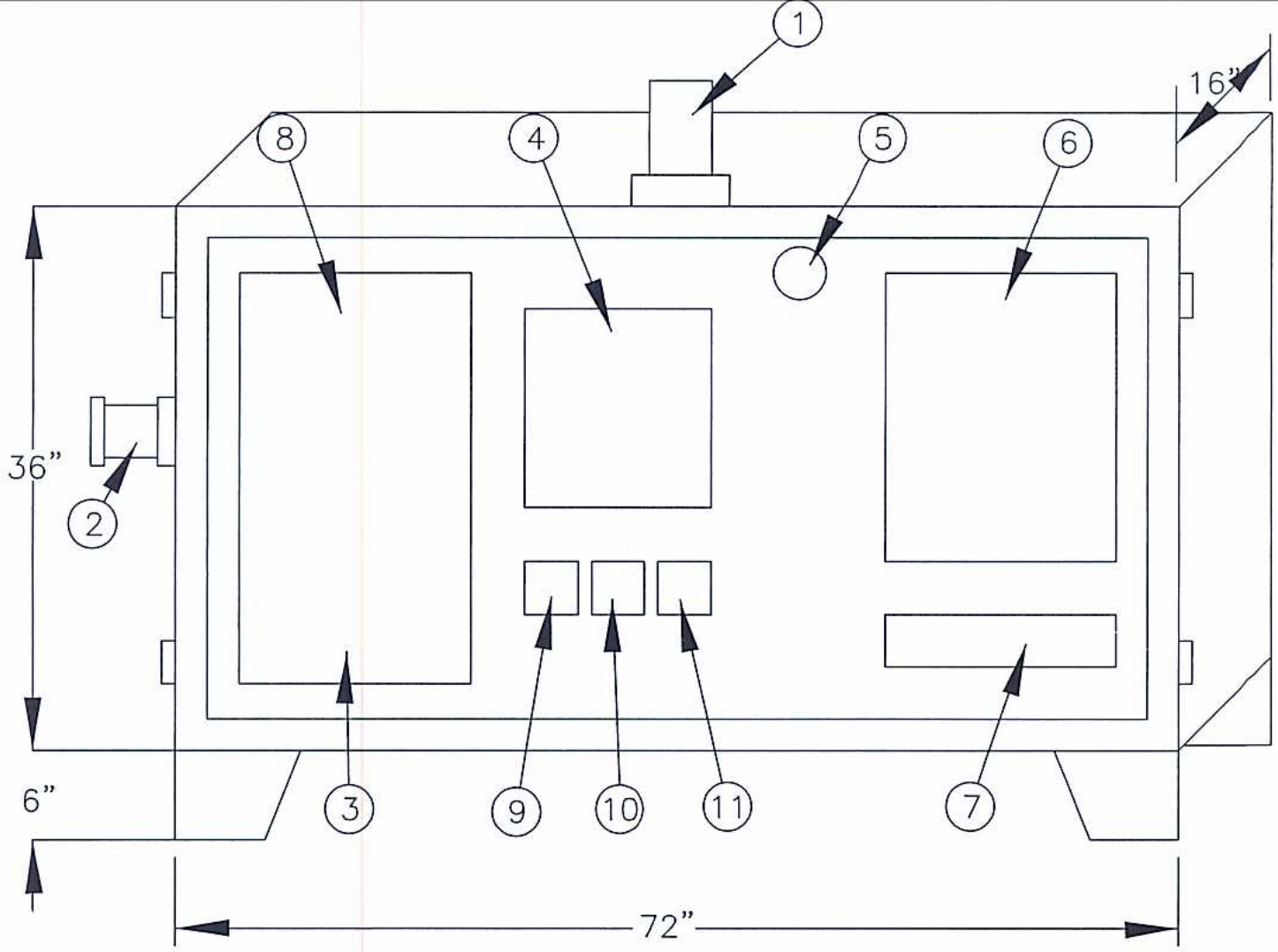
CITY OF PORTAGE

METER SETTING ARRANGEMENT FOR 3", 4" OR 6" TURBINE METER WITH 1" BYPASS METER AND TYPICAL PIT LAYOUT

STANDARD DESIGN SD-157

APPROVED BY WCB

AUG.19,93 L.G.N.
APR. 1995 d.r.w.
4-25-95 d.r.w.
4-26-95 d.r.w.
DEC. '97 d.r.w.
JULY '99 d.r.w.



1. ALARM LIGHT
2. EMERGENCY GENERATOR RECEPTACLE
3. PUMP PANEL
4. CIRCUIT BREAKER PANEL
5. LIGHT
6. REMOTE TERMINAL
7. WIREWAY
8. ENCLOSURE
9. DUPLEX OUTLET
10. WET WELL LIGHT SWITCH
11. PANEL LIGHT SWITCH

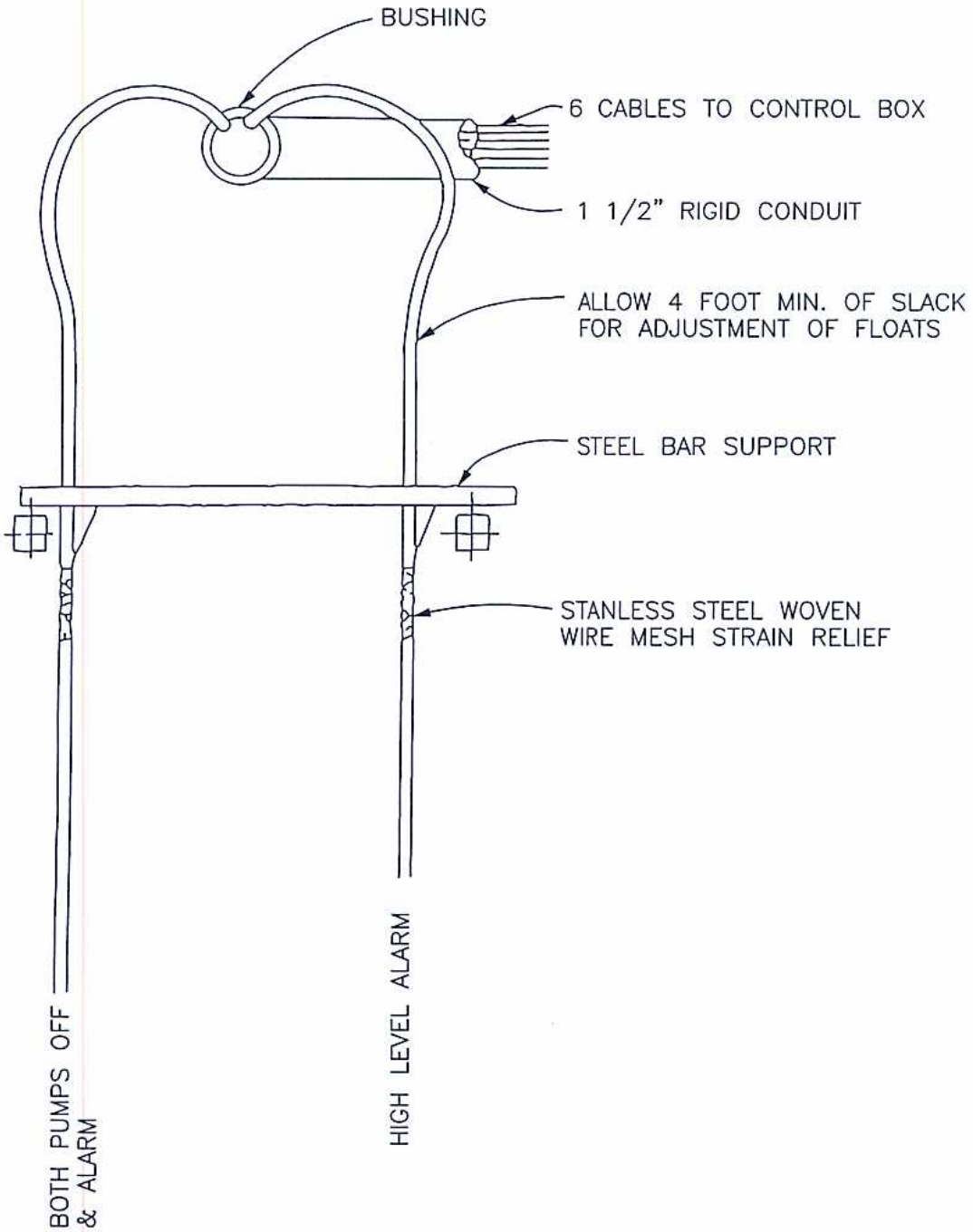
CITY OF PORTAGE

TYPICAL
LOW PROFILE
LIFT STATION
CONTROL PANEL

AUG.20,93 L.G.N.
AUG.10,95 drw(cad)
DEC.'97 drw(cad)

STANDARD DESIGN SD-160

APPROVED BY WCB



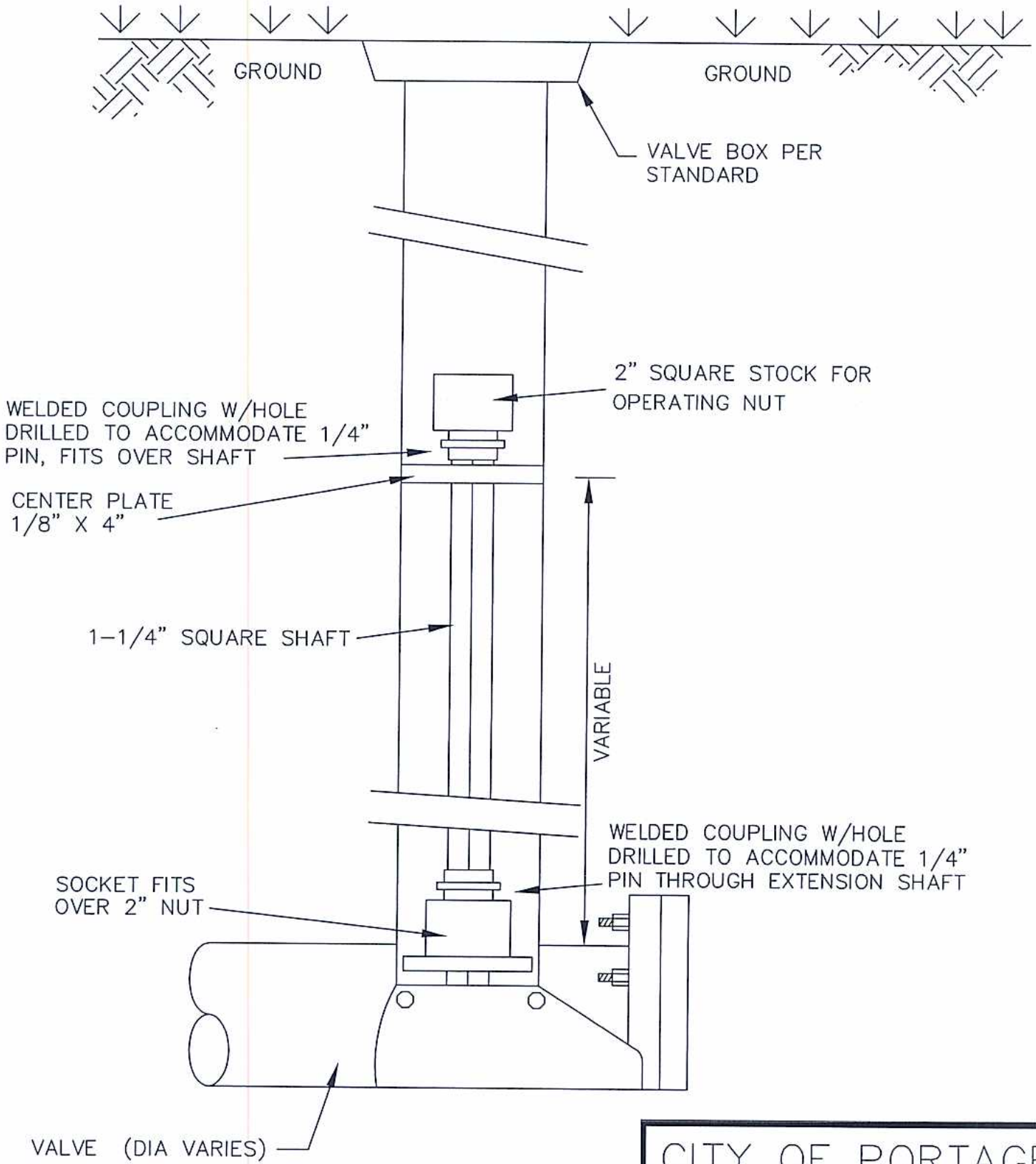
CITY OF PORTAGE

FLOAT TERMINATION DETAIL FOR SUBMERSIBLE LIFT STATION

AUG.20,93 L.G.N.
AUG.10,95 drw(cad)

STANDARD DESIGN SD-161

APPROVED BY J.B.



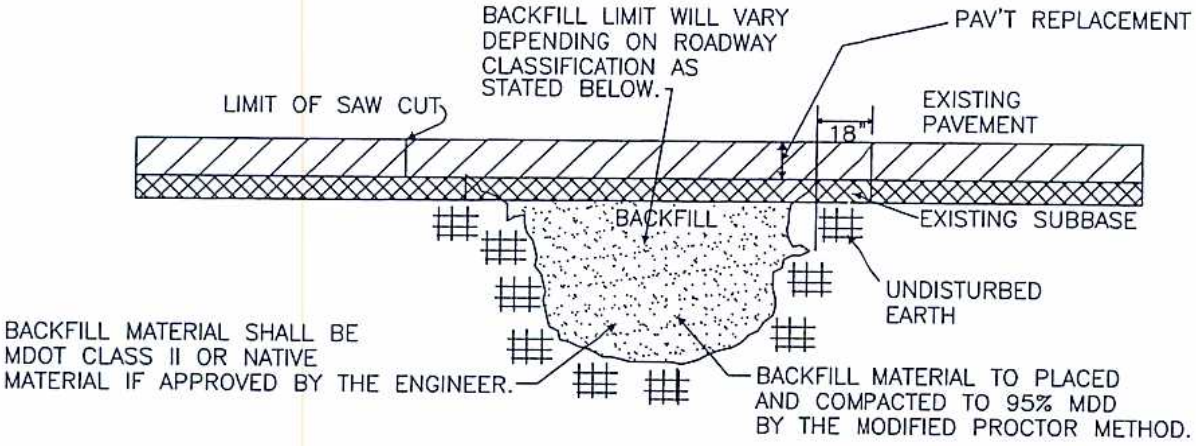
CITY OF PORTAGE

VALVE EXTENSION STEM (VARIABLE)

4-13-94 D.W.
NOV. 97 d.r.w.
DEC. 06 JMA

STANDARD DESIGN SD-164

APPROVED BY J.B.



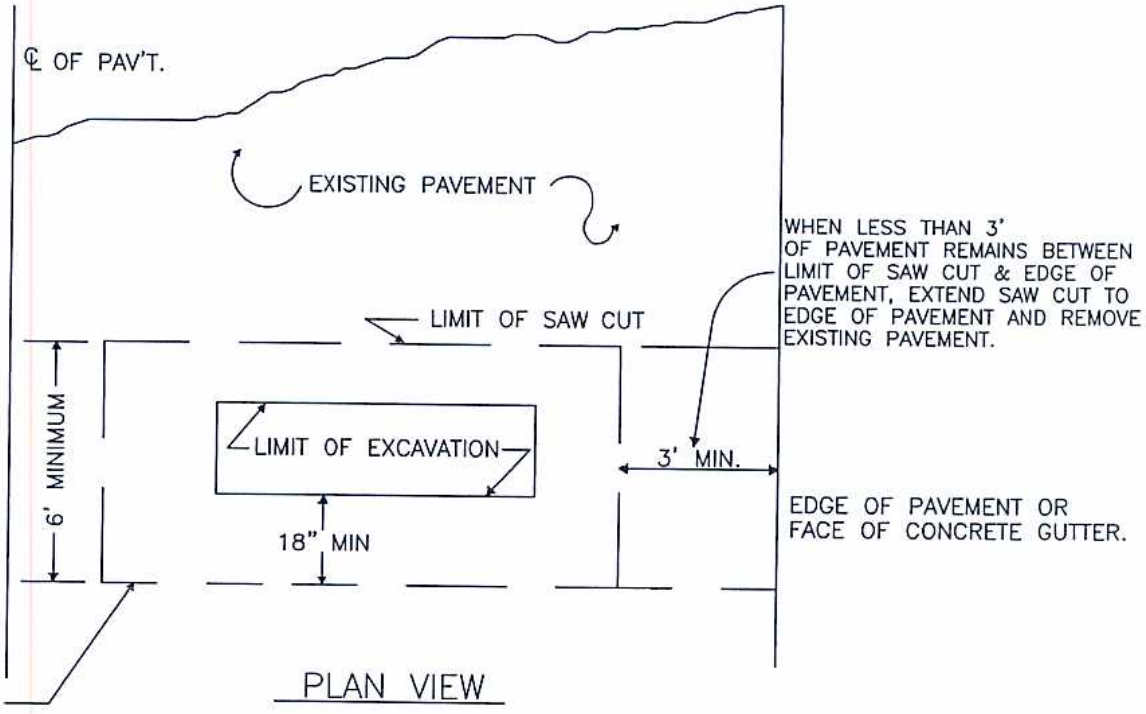
CROSS SECTION
NO SCALE

- PAVEMENT REPLACEMENT:

MAJOR ROAD(ADT>2000): 4"(COMPACTED) MDOT 22A, 5" MDOT 13A HMA BASE COURSE (TWO LIFTS MIN.) AND 3" OF MDOT 13A HMA – LEVELING AND TOP COURSES.

LOCAL ROAD(ADT<2000): 6"(COMPACTED) MDOT 22A, 2" MDOT 13A HMA & 1–1/2" OF MDOT 36A HMA.

NOTE: LENGTH AND WIDTH OF THE PATCH VARY DEPENDING ON THE DEPTH OF THE EXCAVATION.



FINISH NEAT SAWCUT AS DETAILED HEREIN ONLY WHEN EXCAVATION IS COMPLETE AND PREPARATION FOR FINISH REPAIR IS BEING IMPLEMENTED.

PLAN VIEW

NO SCALE

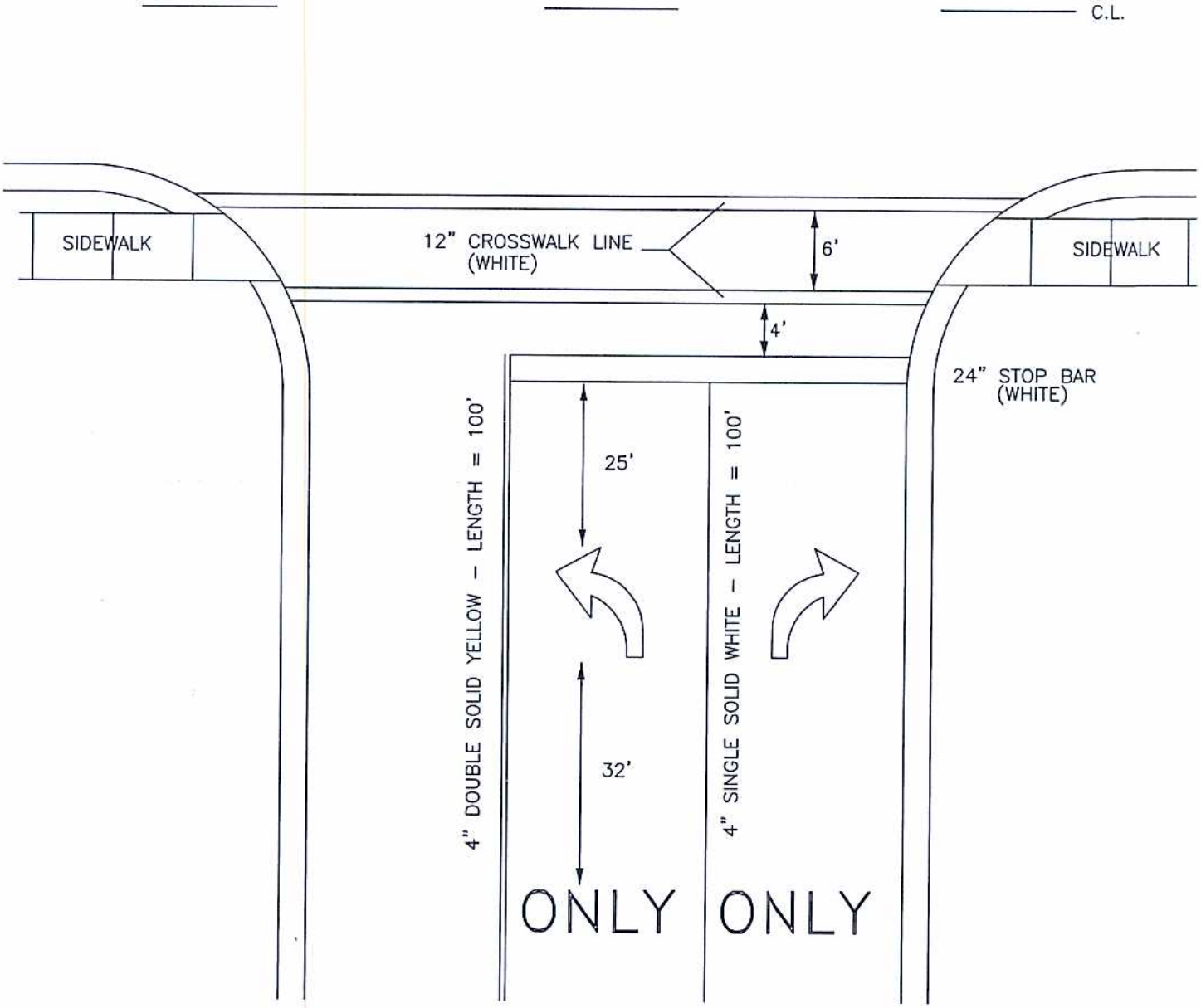
1. ALL NON UTILITY PAVEMENT REPLACEMENT REQUESTS WILL REQUIRE A PERMIT ISSUED BY THE TRANSPORTATION AND UTILITIES DEPARTMENT.
2. 48 HOURS NOTICE IS TO BE GIVEN TO THE CITY OF PORTAGE TRANSPORTATION & UTILITIES DEPT. PRIOR TO ANY LANE RESTRICTION, CLOSURE OR DETOUR IMPLEMENTATION.
3. EXISTING PAVEMENT SHALL BE SAW CUT A MINIMUM OF 18" FROM THE EDGE OF THE EXCAVATION.
4. A MIN. PATCH WIDTH OF 6' IS REQUIRED SO AS TO FACILITATE A STEEL WHEELED ROLLER WHEN RUNNING PERPENDICULAR TO CENTERLINE OF ROADWAY.
5. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF PORTAGE CONTRACT CONDITIONS AND SPECIFICATIONS.

CITY OF PORTAGE

PAVEMENT REPLACEMENT DETAIL

STANDARD DESIGN	SD–165
APPROVED BY	WCB

4–96 D.R.W.
12–97 D.R.W.
JAN'98 DRW
FEB'98 DRW
AUG'05 J&H



NOTE:

1) ALL STOP BARS, CROSSWALK LINES, ARROWS, & "ONLY" SYMBOLS SHALL BE WHITE.

2) INLAY OR OVERLAY PLASTIC OR THERMOPLASTIC MATERIALS SHALL BE USED FOR ALL STOP BARS, CROSSWALK LINES, ARROWS, AND "ONLY" SYMBOLS.

3) THERMOPLASTIC MATERIALS SHALL BE USED FOR ALL 4" CENTERLINE AND LANE LINE MARKINGS.

4) ARROWS AND "ONLY" SYMBOL DIMENSIONS SHALL BE PER THE MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES, CURRENT ED.

5) THE STOP BAR SHALL BE PLACED A MINIMUM OF 4 FEET IN ADVANCE OF THE NEAREST CROSSWALK LINE.

6) IF NO CROSSWALK EXISTS, THE STOP BAR SHALL BE PLACED AT THE DESIRED STOPPING POINT, BUT NO MORE THAN 30 FEET OR LESS THAN FEET FROM THE NEAREST EDGE OF THE INTERSECTING ROADWAY.

7) ARROWS AND "ONLY" SYMBOLS SHALL BE USED AT ALL MAJOR STREET INTERSECTIONS, OR AS DIRECTED BY THE ENGINEER.

NO SCALE

CITY OF PORTAGE

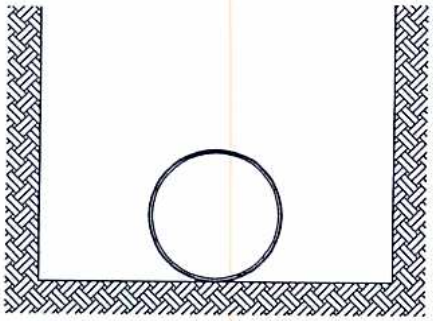
TYPICAL INTERSECTION MARKING DETAIL

MAR. 1999
T.R.D.

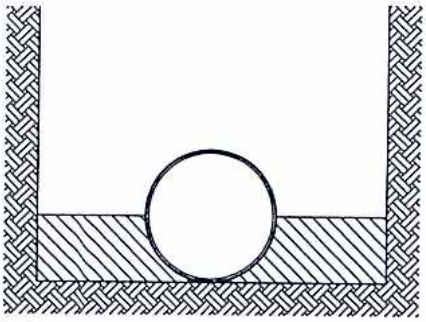
STANDARD DESIGN SD-166

APPROVED BY WCB

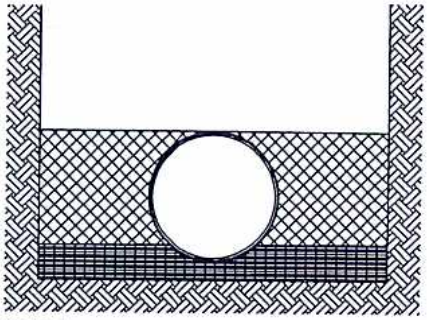
LAYING CONDITIONS FOR DUCTILE IRON PIPE.



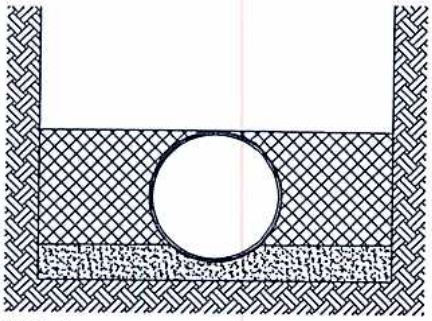
TYPE 1:*
FLAT BOTTOM TRENCH.** LOOSE BACKFILL



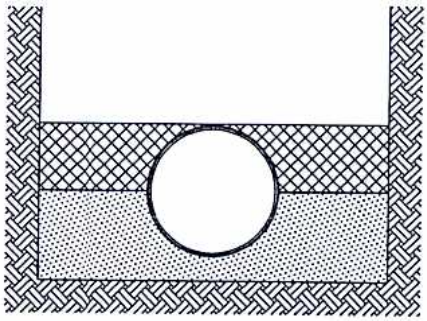
TYPE 2:
FLAT BOTTOM TRENCH.** BACKFILL LIGHTLY CONSOLIDATED TO CENTERLINE OF PIPE.



TYPE 3:
PIPE BEDDED IN 4 IN. MINIMUM OF LOOSE SOIL.***
BACKFILL LIGHTLY CONSOLIDATED TO TOP OF PIPE.



TYPE 4:
PIPE BEDDED IN SAND, GRAVEL OF CRUSHED STONE TO DEPTH OF 1/8 PIPE DIAMETER, 4IN. MINIMUM.
BACKFILL COMPACTED TO TOP OF PIPE.
(APPROXIMATELY 80% STANDARD PROCTOR, AASHTO T-99.)



TYPE 5:
PIPE BEDDED IN COMPACTED GRANULAR MATERIAL TO CENTERLINE OF PIPE. COMPACTED GRANULAR OR SELECT MATERIAL++ TO TOP OF PIPE. (APPROXIMATELY 90% STANDARD PROCTOR, AASHTO T-99.)

NOTES:
1. MINIMUM DEPTH 5'
2. MAXIMUM DEPTH 6'
3. *FOR 14 IN. AND LARGER PIPE, CONSIDERATION SHOULD BE GIVEN TO THE USE OF LAYING CONDITIONS OTHER THAN TYPE 1.
4. **"FLAT BOTTOM" IS DEFINED AS UNDISTURBED EARTH.
5. ++ "LOOSE SOIL" OR "SELECT MATERIAL" IS DEFINED AS NATIVE SOIL EXCAVATED FROM THE TRENCH, FREE OF ROCKS, FOREIGN MATERIALS AND FROZEN EARTH.

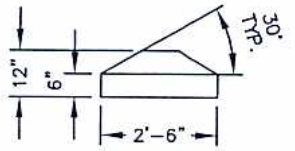
CITY OF PORTAGE

STANDARD TRENCH DETAIL FOR DUCTILE IRON WATER MAIN

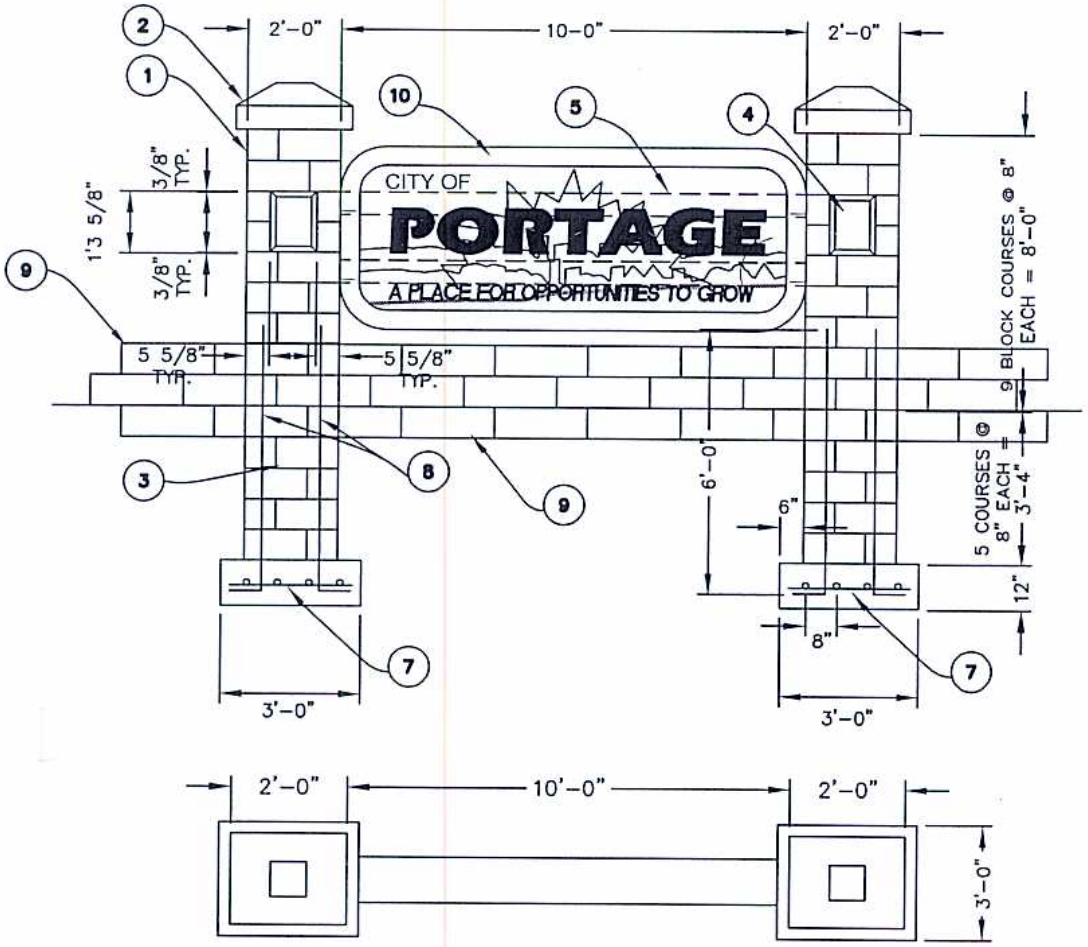
AUG'05 J&H

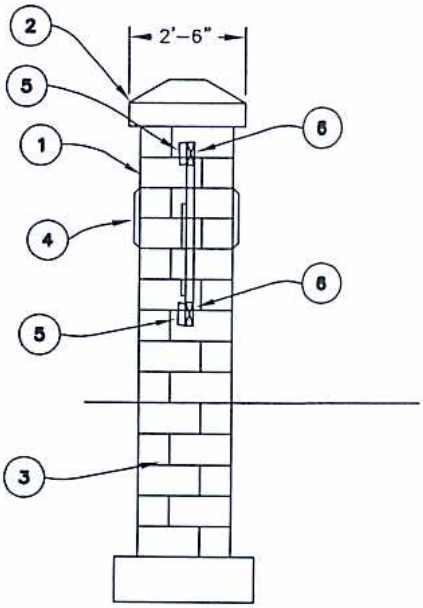
STANDARD DESIGN SD-168

APPROVED BY WCB



TYP. COLUMN CAP
SCALE: 1/4" = 1'-0"





SIGN KEYNOTES

1. SPLIT FACE CONCRETE BLOCK, COLOR BLEND TO BE MIXTURE OF COLOR NO. 1 NATURAL AND COLOR NO W10 (LIGHT GREY). BLOCK AS MANUFACTURED BY 4D INC. MIDLAND, MICHIGAN, OR APPROVED EQUIVALENT.
2. CUT SMOOTH FINISH MANUFACTURED STONE.
3. STANDARD WEIGHT CONCRETE BLOCK.
4. MANUFACTURED STONE INSERTS – FRONT & REAR ONLY (TOTAL THICKNESS 5 1/8")
5. 2"X6"X10' PRESSURE TREATED WOOD MEMBER
6. 4"x4"x1/4" STEEL ANGLE 1 1/2" LENGTH. BOLT TO WOOD NAILER WITH 2 LAG SCREWS AND TO STONE END WALLS WITH (2) 1/2" BOLTS.
7. #5 RODS 8" O.C. EACH WAY.
8. (4) – #5 DOWEL RODS.
9. NEW CONCRETE BLOCK LANDSCAPE WALL INSTALL AS PER MANUFACTURERS RECOMMENDATIONS. (2 COURSES SHOWING ABOVE GRADE, 1 COURSE BURIED). COLOR TO BE SELECTED BY OWNER.
10. HIGH DENSITY CLEAR CEDAR (2" THICKNESS) W/WOOD SANDBLAST.
    COLORS TO BE PANTONE AS FOLLOWS:
    PORTAGE = RED 186
    SUN = PROCESS YELLOW
    BORDER = BLUE 300
    STREAM = BLUE 300 (50% SCREENED DOWN)
    BACKGROUND STRUCTURES = LIGHT GREEN 3252
    FOREGROUND STRUCTURES = DARK GREEN 329

CITY OF PORTAGE	
WELCOME TO PORTAGE CITY SIGN	AUG'05 J&H
STANDARD DETAIL SD-169	
APPROVED BY WCB	

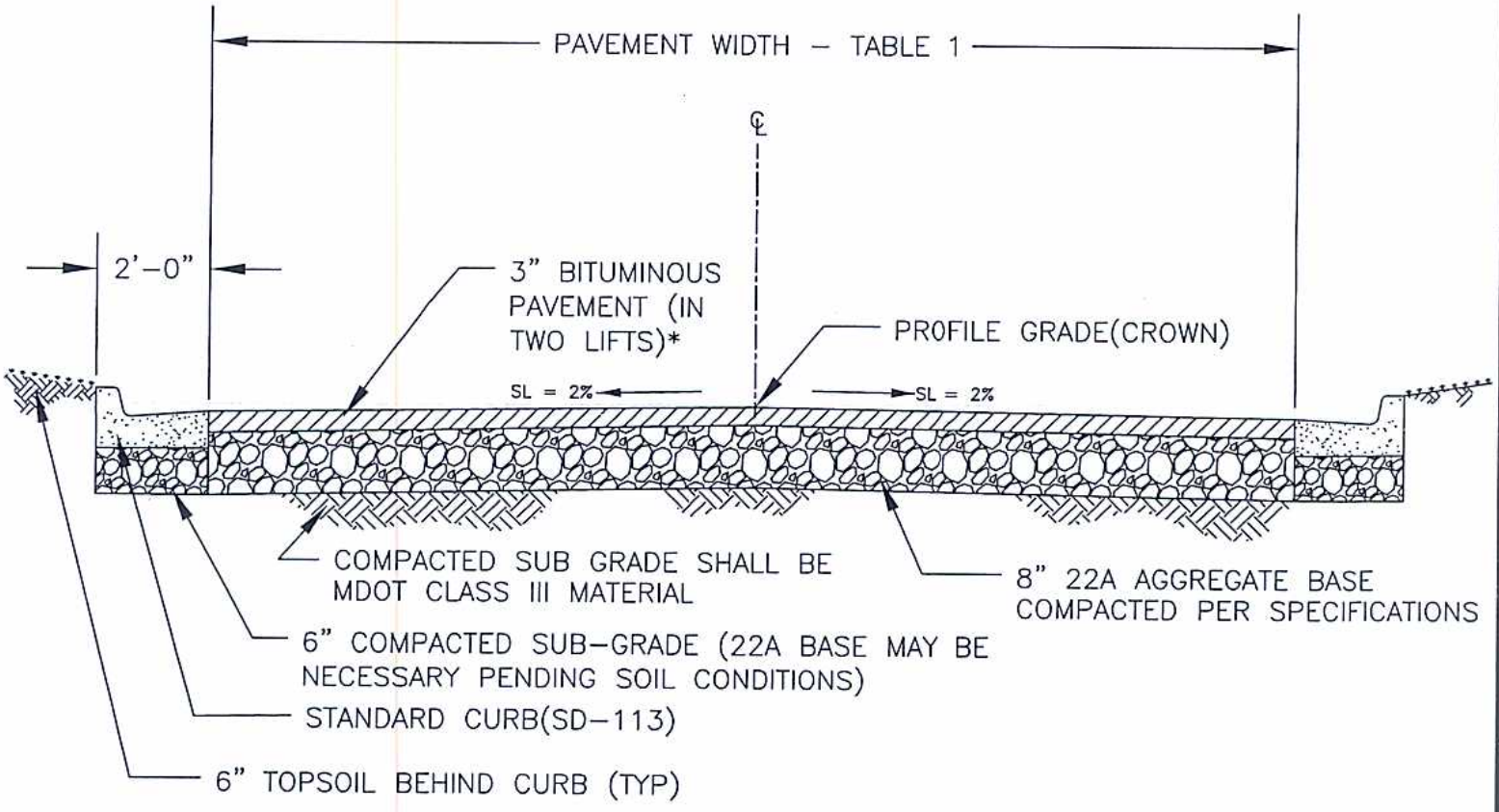


TABLE 1	
LOT WIDTH (FRONTAGE ON A PUBLIC STREET)	PAVEMENT WIDTH
79' OR LESS	32'–0"
80' TO 99'	26'–0"
100' OR MORE	24'–0"

* BITUMINOUS PAVEMENT SHALL BE MDOT 36AA SURFACE COURSE AND MDOT 13A LEVELING COURSE

CITY OF PORTAGE

LOCAL ROADWAY STANDARD SECTION

AUG.17,93	L.G.N.
AUG.07,95	drw(cad)
NOV. '97	drw(cad)
JULY'05	J&H
JAN'07	JMA

STANDARD DESIGN SD–170

APPROVED WCB