City of Canton

Engineering Design Standards
For
Public Improvements

City of Canton
210 N. Dakota St.
Canton, SD 57013

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May 2012

City of Canton Engineering Design Standards for Public Improvements

Here for your easy reference is a manual setting forth the engineering design standards for public improvements within the city of Canton. Attention and compliance to these standards will result in less confusion and uncertainty in planning, designing, and constructing these improvements within the city. These standards are also developed to reduce the maintenance costs and minimize operational problems associated with public improvements for the City, its citizens and taxpayers. These standards are by no means all-inclusive. However, they do provide the basic design principles and standards to be used in developing public improvements.

SUMMARY OF REVISIONS

Line Item	Date	Revision/Addition
11.1	8/2012	Added allowable drainage discharge rates
1.1	12/2014	Added Definition of Terms
1.9	12/2014	Revised who considers variances to Standards
1.11	12/2014	Added Interpretation of Standards
9.4.9.2.5	12/2014	Added typical location for sanitary sewer services
9.4.9.3	12/2014	Added backwater valve option by Sioux Chief
10.2.7	12/2014	Increased clear space around fire hydrants
10.2.10	12/2014	Added standard color for fire hydrants
10.4	12/2014	Added Remote Terminal Units to meters
10.7.4	12/2014	Added typical installation and location information for water services
10.7.8	12/2014	Changed allowable water service line materials
13.2.3	12/2014	Clarified information required on title sheet of construction plans
14.1.1	12/2014	Revised Acceptance Limitation verbiage with the addition of City Engineer.
14.2	12/2014	Added City Inspection Requirements
14.3	12/2014	Added Minimum Testing Requirements

Chapter 1 General Provisions

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General Provisions

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Chapter 1 General Provisions

1.1 Definition of Terms

CITY. The term THE CITY or THIS CITY shall mean the City of Canton in the County of Lincoln, and the State of South Dakota, as represented by its proper officers.

CITY ENGINEER. The term CITY ENGINEER shall mean the current City Engineer duly appointed by the City.

CITY MANAGER. The Term CITY MANAGER shall mean the current City Manager duly appointed by the City.

DESIGN ENGINEER. The term DESIGN ENGINEER shall mean the registered professional engineer representing the Owner and/or Developer.

1.2 Short Title

These regulations, together with all future amendments, shall be known as the City of Canton Engineering Design Standards for Public Improvements (hereinafter called Design Standards).

1.3 Jurisdiction

These Design Standards, along with the City of Canton Standard Specifications (hereinafter referred to as Standard Specifications) and the City of Canton Standard Plates (hereinafter referred to as Standard Plates), shall apply to all public improvements within the incorporated area of the City of Canton except where superseded by Federal or State requirements.

1.4 Amendments and Revisions

These standards and criteria may be amended as new technology is developed or experience gained in the use of these Design Standards. The City Manager, following the recommendations of the City Engineer, shall consider revisions and/or amendments to these Design Standards.

1.5 Enforcement Responsibility

It shall be the duty of the City to enforce the provisions of these Design Standards.

1.6 Review Process

The City will review all submittals for compliance with the specific Design Standards. Acceptance by the City does not relieve the Owner, Design Professional, or Contractor from responsibility for insuring that the calculations, plans, specifications, construction, and record drawings are in compliance with the Design Standards.

1.7 Prior Approval

These Design Standards shall not abrogate or annul: (a) any permits issued before the effective date of these Design Standards; (b) any construction plans approved before the effective date of these Design Standards; (c) any final plat documents that have been recommended for

approval by the City of Canton Planning Commission prior to the effective date of these standards; or (d) any easements or covenants already in effect.

1.8 Relationship to Other Standards

If special districts impose more stringent standards or if standards within these engineering design standards conflict, this difference is not considered a conflict and the more stringent standard shall apply. If State or Federal Government imposes more stringent standards, criteria, or requirements, these shall be incorporated into these Design Standards in accordance with Section 1.4 of this Manual.

1.9 Variances

Variances from these Design Standards will be considered and either approved or denied on a case-by-case basis by the City Manager or by the City Engineer.

1.10 Private Facilities

If an owner of private street or utility facilities wishes to dedicate these facilities for public use and maintenance, the facilities must meet the standards set forth herein prior to being accepted by the City.

1.11 Interpretation of Standards

The City is responsible for interpretation of all standards and requirements within these engineering design standards.

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Submittal Procedures

2.1 Submittal of Reports and Plans

2.1.1 Number of Copies. Design Professionals or Owners seeking approval and/or acceptance of reports, plans, and related documents shall submit a minimum of three (3) copies to the City Manager or designee. The City Manager shall promptly forward the documents to the City Engineer for review. Where the project is complex in nature and will require review by several departments, additional copies may be required to reduce the review time. Electronic copies of reports, plans and related documents for review purposes may be submitted in PDF or similar format upon City approval.

2.1.2 Conformance. Plans submitted shall be in conformance with Chapter 13-Construction Plans. The plans shall include any special provisions. Reports submitted shall be in a typed, bound form in conformance with the requirements of the applicable chapters of these standards. If a report is required which is not provided for in these standards the report shall include all data, references, and calculations as applicable.

2.1.3 Dating, Signing, and Stamping of Drawings and Documents. All final drawings, plans, specifications, reports, plats or other architectural, engineering or land surveying documents, papers, or diagrams involved in the practice of architecture, professional engineering, or land surveying prepared for the use of others by any corporation for delivery by it to any person to be made a part of any public record within the City shall be dated and bear the signature, stamp, or seal of the architect, professional engineer, or land surveyor who was responsible for the preparation thereof.

2.2 Acceptance of Reports and Plans

2.2.1 Review Process. The City will attempt to review submitted plans within approximately ten (10) working days. This time will vary due to the complexity of the project and/or workload of the City. After review is completed, comments will be compiled and forwarded to the Design Professional/owner. If necessary a review conference will be scheduled. The report and/or plans will be accepted or returned for revisions as noted.

2.2.2 Resubmittals. Where the report and/or plans are returned for revisions, all revisions shall be made prior to resubmittal.

2.3 Revisions to Accepted Plans

2.3.1 Initial Acceptance. Plans, specifications, and reports are accepted initially for eighteen (18) months. If not constructed during this time period, such reports automatically become void and must be updated to current criteria before any further permits can be issued. The City or its designee may grant a one-year extension to the construction plans, specifications, and/or drainage report, provided a) the development plans, construction plans, and specifications have not substantially changed and, b) that other conditions affecting the development site have not substantially changed or do not require a modification to accepted plans or specifications.

2.3.2 Updates to Prior Submittals.

2.3.2.1 Whenever updates or revisions to previously accepted construction plans, specifications, or reports are necessary, the design professional will submit updates or revisions through the normal document submittal process. This submittal shall meet the requirements of Section 2.1 of these Design Standards.

2.3.2.2 Requests for updates and revisions will be considered only if there are NO revisions to the original development plan(s) or report(s). The City will review the original development plan(s) or report(s) for compliance with current standards under normal review procedures.

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Chapter 3 Permit Procedures and Requirements

3.1 Application Requirements and Procedures

3.1.1 Permit Application. A permit shall be required for any construction or installation within the public right-of-way or public easement for any substantial modification of existing construction or use. Application for such permits shall be made at City Hall.

3.1.1.1 No permit will be required for publicly bid contracts approved by the City of Canton.

3.1.2 Types of Permits.

3.1.2.1 Sidewalk and Driveway Permit, which governs construction of new and repair or replacement of existing sidewalks and driveways within public right-of-way.

3.1.2.2 Private Utility Permit, which governs the installation, removal, repair, or maintenance of private utilities other than sanitary sewer, water and storm sewer services in public right-of-way or public easements.

3.1.2.3 Sewer and Water Service Permit, which governs the installation, removal, repair, or maintenance of sanitary sewer services, water services and storm sewer services.

3.1.2.4 Construction Permit, which governs the installation of public improvements within the public right-of-way and grading outside the street right-of-way in proposed subdivisions. This includes street grading, curb and gutter, roadway subbase, base and wearing surface, drainage and flood control facilities, water main and sanitary sewer installation, and grading outside the street right-of-way.

3.1.2.5 Excavation and Grading Permit, which governs grading in excess of 300 cubic yards outside the street right-of-way as defined by the Uniform Building Code (Chapter 7-Grading). An Excavation and Grading Permit is not required if a Construction Permit has been issued.

3.1.2.6 Occupancy Permit, which governs the right and timing of occupancy to buildings.

3.1.2.7 Building Permit, which governs the construction of the following items (including but not limited to): new buildings, additions, replacement of decks and portches, etc., garages (detached garages require Conditional Use Permit), gazebos, storage buildings and sheds, kennels, signs, fences, pools and structures moved within a lot or onto a lot.

3.1.3 Letters of Responsibility. Those agencies set forth in Section 3.4.4 may obtain a permit under their Letter of Responsibility, Figure 3.1, or at their option, require the Contractor performing the work to obtain a permit in which event the Contractor would be required to furnish a performance bond as set forth in Section 3.4.1 thereby assuming

full responsibility for the work performed. Except as set forth herein, the Contractor performing the work shall be the permittee.

3.1.4 Reserved.

3.1.5 Emergency Repairs. Permits shall apply to emergency repairs. However, a delay of 24 hours is granted, excluding weekends and holidays, following the beginning of such repair.

3.1.6 Reserved.

3.1.7 Issuance of Permits.

3.1.7.1 Sidewalk and Driveway Permits and Sewer and Water Service Permits will be issued only to those qualified persons or corporations experienced in the type of work to be performed. Exceptions to this requirement are Driveway and Sidewalk Permits issued for sidewalk installation where the property owner acquires the permit and does the construction.

3.1.8 Time Limits.

3.1.8.1 All permits requiring excavation within the paved portion of a city street will become void on November 1. Extensions to existing permits may be made on a case-by-case basis by the City. Permits requiring excavation within the paved portion of the street will be issued on an emergency basis only between November 1 and April 1 of the following year.

3.1.8.2 Unless otherwise provided for in the special provisions, the Sidewalk and Driveway Permit shall be valid for an indefinite period from the date issued, unless revoked by mutual consent, for failure of the applicant to abide by the terms and conditions of the permit, or by operation of the law.

3.1.9 Cancellation.

3.1.9.1 Failure of the applicant to comply with any of the terms and conditions of the permit shall be sufficient cause for cancellation of the permit and may result in removal of the utilities, approaches or other facility by the City at the applicant's expense.

3.1.9.2 The permit, the privileges granted herein, and the obligations of the applicant created thereby shall be binding upon the successors and assigns of the applicant.

3.2 Permit Standards and Conditions

This Section describes the requirements for plans and other information necessary for approval of a permit application.

3.2.1 Permit Approval. Permits are issued subject to the approval of City, County, State or other governmental agencies having either joint supervision over the section of road, or authority to regulate land use by means of zoning and/or building regulations. It shall

be the applicant's responsibility to determine the necessity of and to obtain any such easements and approvals which may be required.

3.2.2 Street Restoration. Granting of a permit is based upon replacement or restoration of the street and right-of-way to its original condition or to a satisfactory condition by the applicant.

3.2.3 Landscaping. The permit holder shall be responsible for the restoration of landscaped areas between the property line and adjacent public roadways.

3.2.4 Relocating Utilities. The applicant shall be responsible for relocating or adjusting any utility facilities located on the street right-of-way as required to accommodate the approach or other facility applied for. Construction of the utility, road approach or other facility by the applicant, his agent or Contractor, will be permitted only after the applicant has furnished the City evidence that satisfactory arrangements for said relocation or adjustment has been made with the Owner of the affected utility facility.

3.2.5 Permit Release. Applicant must pay required fees and provide insurance and bonding, as required, prior to release of the permit.

3.3 Refunds

Refunds may be made on any permit fee at the discretion of the City.

3.4 Bonds and Insurance

3.4.1 Bonds. Bonds are required for work as listed in the Revised Ordinances of Canton, South Dakota.

3.4.2 Inadequate Bond. Any permit determined to be without an adequate bond as required, shall be subject to immediate revocation by the City.

3.4.3 Reserved.

3.4.4 Letters of Responsibility. Governmental agencies, other than the City of Canton, special districts, cooperative utilities, and investor-owned electric, gas and communications utilities, may provide a Letter of Responsibility in lieu of posting the required performance bond. Subject Letter of Responsibility shall be in the format of Figure 3.1.

3.4.5 Other Forms of Security. It shall be acceptable to the City to receive cash deposits, certified checks or similar security in lieu of a performance bond. Bonds shall be filed at City Hall.

3.4.6 Liability Insurance. The applicant shall obtain and carry, for the period of time required for the complete installation of facilities authorized by the permit, including the repair and restoration of the road facilities, and also during such future periods of time when operations are performed involving the repair, relocation or removal of said facilities authorized by the permit, a liability and property damage insurance policy or policies. Coverage shall be provided against any claim, demand, suit, or action for property damage, personal injury, or death resulting from any activities of the applicant, his officers, employees, agents or contractors in connection with the construction,

installation, repair or removal of the said facilities authorized by the permit. The said policy or policies shall include as named insured: the City of Canton, its City Commission, its officers, agents and employees, except as to claims against the applicant, for personal injury to any members of the City Commission or its officers, agents and employees, or damage to any of its or their property. The said insurance policy or policies shall be in any insurance company duly authorized and licensed to do business in the State of South Dakota. The applicant and/or its Contractor's insurer shall endeavor to give the City ten (10) days' written notice in advance of any cancellation of insurance required in the terms of these general provisions.

3.4.7 Certificate of Self-Insurance. Government agencies other than the City of Canton, and public utilities, may provide a Certificate of Self-Insurance as shown in Figure 3.2 in lieu of any insurance policy or policies required under Section 3.4.6. Such Certificate shall be approved by the City Attorney and filed at City Hall prior to the issuance of any permit.

3.5 Construction Specifications

All backfill material, compaction, and resurfacing of any excavation made in the City right-of-way will be done in accordance with the Standard Specifications and Standard Plates on file at City Hall.

3.6 Traffic Control

3.6.1 Street Closure. Traffic must be provided with a minimum lane width of ten (10) feet in the construction area. Any plan for traffic control during construction that indicates a complete closure of an arterial or collector street must show detour routes and must be approved by the City prior to issuance of a permit. Normally, only one side of the local street may be blocked at any given time. When a local street is closed to traffic, the City must be notified 24 hours in advance.

3.6.2 Signing. Construction signing must be used and shall be maintained by the responsible Contractor. All traffic control devices must be in accordance with the Manual on Uniform Traffic Control Devices, latest edition.

3.7 Restoring Pavements

All persons, corporations, governmental agencies, special districts, utility companies who having obtained a permit and made a cut in a public right-of-way shall repair such pavements or surfacing to the original condition. If such pavements or surfacing are not restored and maintained as to the original condition, notice thereof in writing by first class mail shall be given the permittee, who shall put the same in good condition within a maximum of three (3) days. If the permittee fails after notice given to restore and maintain such pavements or the surface thereof, the City may make the necessary repairs and such permittee shall pay the costs thereof, and until paid no other permit shall be issued.

3.8 Utility Installations

3.8.1 Underground. All utility lines shall be installed at depths as illustrated in Chapter 4, Figures 4.1-4.6 of these Design Standards. Exceptions may be granted by the City where warranted and upon prior written request and approval.

3.8.2 Overhead. Minimum ground clearances shall conform to the National Electric Safety Code Standards, latest edition.

3.9 Fees

Fees shall be assessed for permits and inspection at the time of issuance of the permit in accordance with the schedule in force. The current fee schedule is on file with the Finance Officer of the City.

Figure 3.1 Letter of Responsibility

City Hall
City of Canton
210 N. Dakota Ave.
Canton, SD 57013

THIS IS TO CERTIFY THAT _____
(Name of Agency)

does agree that, in lieu of posting the required performance bond, the following practices will be adhered to:

1. That no street cuts, in any Canton street, highway or other right-of-way, for any purposes, will be made without having secured the proper permit.

2. That any street cut made by the above will be backfilled and compacted in accordance with the current requirements of Canton, and the surface restored to a condition equal to or better than that condition which existed prior to the making of the cut.

3. The responsibility for the maintenance of the restored cuts shall rest with the above for a period of one year after the cut has been filled and resurfaced.

4. That, in the event repairs are not made or maintained to the satisfaction of the City or a designated representative, necessary repairs shall be made by the City at the expense of the above-named organization.

Subscribed to this _____ day of _____, _____.

_____

By: _____
Signature of Authorized Agent

_____
Title

NOTE: This document is to be filed at City Hall.

Figure 3.2 Certificate of Self-Insurance

City Hall
City of Canton
210 N. Dakota Ave.
Canton, SD 57013

THIS IS TO CERTIFY THAT _____
(Name of Agency)

a _____, in lieu of providing the insurance policy required under Section 3.4.6 of the Engineering Design Standards for Public Improvements of the City of Canton, South Dakota, is wholly self-insured or is self-insured to cover the deductible limit of _____ as expressed by Policy No. _____ issued by _____ for combined bodily injury and property damage liability. It is further certified that reserves in support of the self-insurance program are adequate to provide coverage at the levels required of insurance policies in Section 3.4.6.

Subscribed to this _____ day of _____, _____.

_____

By: _____
Signature of Authorized Agent

_____
Title

NOTE: This document is to be filed at City Hall.

Chapter 4 Utility Locations and City Utility Easements

Chapter 4
Utility Locations and City Utility Easements

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Chapter 4 Utility Locations and City Utility Easements

4.1 Purpose of Standard Locations

4.1.1 Conflicts. It is necessary to provide adequate space for utilities in a manner that will minimize conflicts between using the public right-of-way for transportation purposes and utility purposes. When street grades, alignments, or widths are changed, utilities are usually required to relocate. Oftentimes standard locations are inapplicable and unobtainable in street areas where existing utilities are seriously crowded and where it would not be feasible to expect major or dramatic reorientation of the underground. The location criteria must be practical and applicable in new developments, in urban relocation work, and in cases where overhead facilities are being converted into underground structures and plans.

4.1.2 Relocations. Utilities are not expected to revise existing facilities as to location or depth solely or primarily for the purpose of creating uniformity. However, when new or relocation work is undertaken, uniformity should be sought. It is acknowledged that the present may be locked in because of the past, but there should be consideration for uniform utility locations for the future.

4.2 Plans Required

4.2.1 Construction Approval. Any utility or other facility constructed in City right-of-way shall have construction plans submitted and approved in accordance with requirements in these Design Standards. No construction permit shall be issued for construction of new utilities or extension of existing facilities (except service taps or laterals to individual properties) without prior construction plan approval by the City.

4.2.2 Conformance. The applicant's completed facility shall be in conformance with the drawings or sketches referred to above, unless a special variance has been requested and approved by the City.

4.3 Location Requirements

All utilities located within the public right-of-way shall be in accordance with drawings based on width of right-of-way and pavement width. (See Figures 4.1 through 4.6.)

(1) Utilities already existing in non-standard locations may be replaced in the same location when permitted by the City.

(2) Gravity lines shall take preference as to horizontal and vertical alignment over non-gravity systems and pressure systems.

(3) Consideration will be given to the use of utility easements adjacent to the public right-of-way and to the use of alleys and medians.

(4) In the event of a conflict, or if a particular utility requires more than one system be installed in the right-of-way, the alternate location may be used when permitted by the City.

(5) Utilities shown are primarily for local distribution and collection. Large diameter lines may make it necessary to modify utility locations.

(6) Storm sewer shall normally be located on the south or east side of the street. Any storm sewer 48 inches or larger in diameter shall be reviewed on a case-by-case basis.

(7) Street trees placed between the curb and street side of sidewalk must not interfere with underground or overhead utilities.

(8) Normally street lights will be placed on the same side of the street as the electric utility.

(9) Street lights shall not be located closer than five (5) feet horizontally to fire hydrants.

4.4 Reserved

4.5 City Utility Easements

Easements for sanitary sewer, storm sewer, drainage, water main, and power shall be obtained when the utilities are to be constructed outside of the typical street right-of-way (ROW) on private property. Sanitary sewer, storm sewer, drainage and water main easements shall have a minimum width of twenty (20) feet. Additional width may be required by the City to ensure proper access for City maintenance equipment. When City utilities are to be located adjacent to one another, the minimum separation distance between the utilities shall be ten (10) feet. All other utility easements shall have a minimum easement width of ten (10) feet.

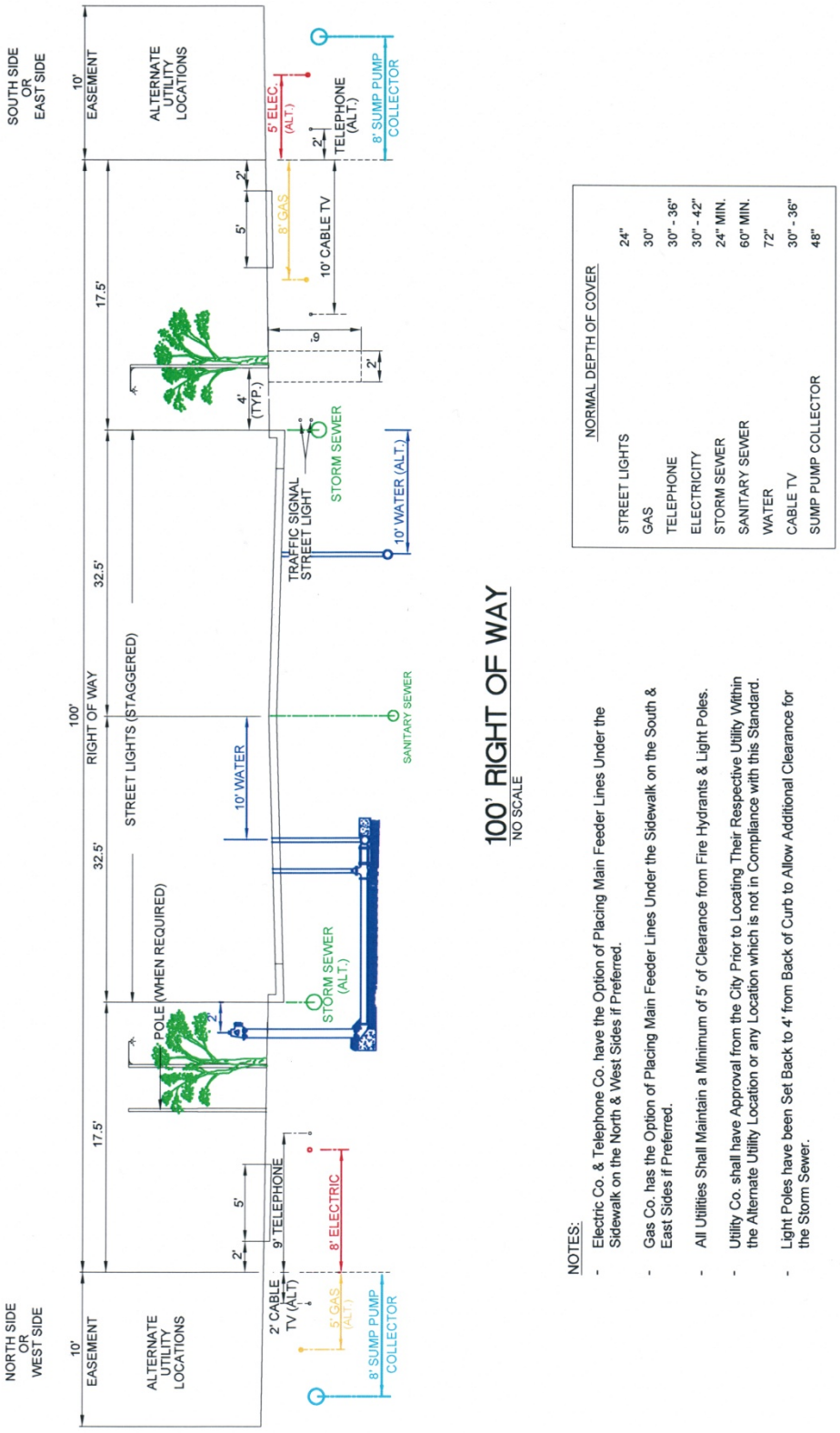
Easements shall be labeled specifically for the utility in which it is describing, for example:

Sanitary Sewer Easement
Storm Sewer Easement
Drainage Easement
Water Main Easement
Utility Easement

4.5.1 Easement for Sanitary Sewer, Storm Sewer, Drainage, Water Main, and/or Power. An easement exhibit showing the location and width of the easement is to be provided to the City Attorney. The City Attorney shall use the City's typical easement form where the City utility is to be constructed on private property. The City shall record the easement at the Lincoln County Courthouse Register of Deeds.

4.5.2 Construction Easement for Sanitary Sewer, Storm Sewer, Drainage, Water Main, and/or Power. An easement exhibit showing the location and width of the temporary construction easement is to be provided to the City Attorney. The City Attorney shall use the City's typical easement form where the City utility is to be constructed on private property.

Figure 4.1 100' Right of Way



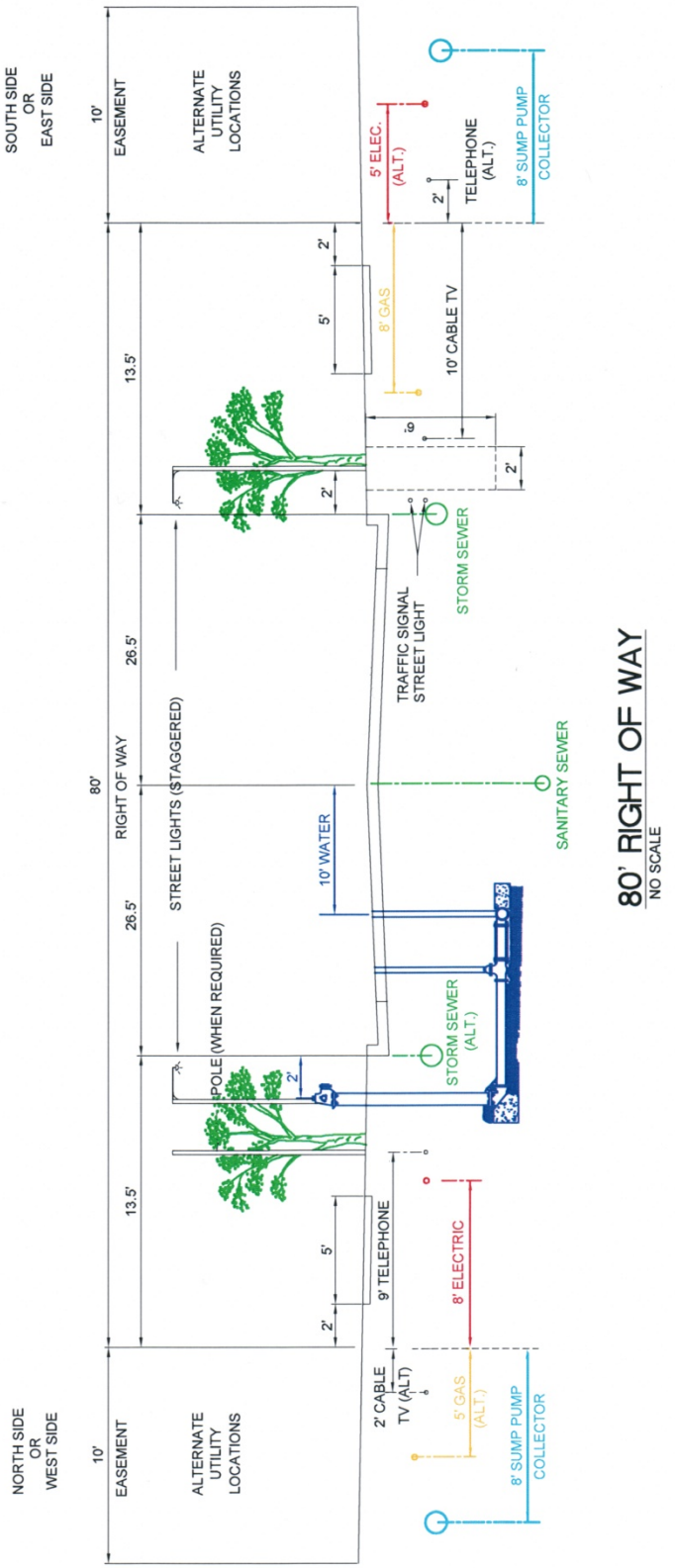
100' RIGHT OF WAY
NO SCALE

NOTES:

- Electric Co. & Telephone Co. have the Option of Placing Main Feeder Lines Under the Sidewalk on the North & West Sides if Preferred.
- Gas Co. has the Option of Placing Main Feeder Lines Under the Sidewalk on the South & East Sides if Preferred.
- All Utilities Shall Maintain a Minimum of 5' of Clearance from Fire Hydrants & Light Poles.
- Utility Co. shall have Approval from the City Prior to Locating Their Respective Utility Within the Alternate Utility Location or any Location which is not in Compliance with this Standard.
- Light Poles have been Set Back to 4' from Back of Curb to Allow Additional Clearance for the Storm Sewer.

NORMAL DEPTH OF COVER	
STREET LIGHTS	24"
GAS	30"
TELEPHONE	30" - 36"
ELECTRICITY	30" - 42"
STORM SEWER	24" MIN.
SANITARY SEWER	60" MIN.
WATER	72"
CABLE TV	30" - 36"
SUMP PUMP COLLECTOR	48"

Figure 4.2 80' Right of Way



80' RIGHT OF WAY
NO SCALE

NORMAL DEPTH OF COVER

STREET LIGHTS	24"
GAS	30"
TELEPHONE	30" - 36"
ELECTRICITY	30" - 42"
STORM SEWER	24" MIN.
SANITARY SEWER	60" MIN.
WATER	72"
CABLE TV	30" - 36"
SUMP PUMP COLLECTOR	48"

NOTES:

- Electric Co. & Telephone Co. have the Option of Placing Main Feeder Lines Under the Sidewalk on the North & West Sides if Preferred.
- Gas Co. has the Option of Placing Main Feeder Lines Under the Sidewalk on the South & East Sides if Preferred.
- All Utilities Shall Maintain a Minimum of 5' of Clearance from Fire Hydrants & Light Poles.
- Utility Co. shall have Approval from the City Prior to Locating Their Respective Utility Within the Alternate Utility Location or any Location which is not in Compliance with this Standard.
- Light Poles have been Set Back to 4' from Back of Curb to Allow Additional Clearance for the Storm Sewer.

Figure 4.3 66' Right of Way

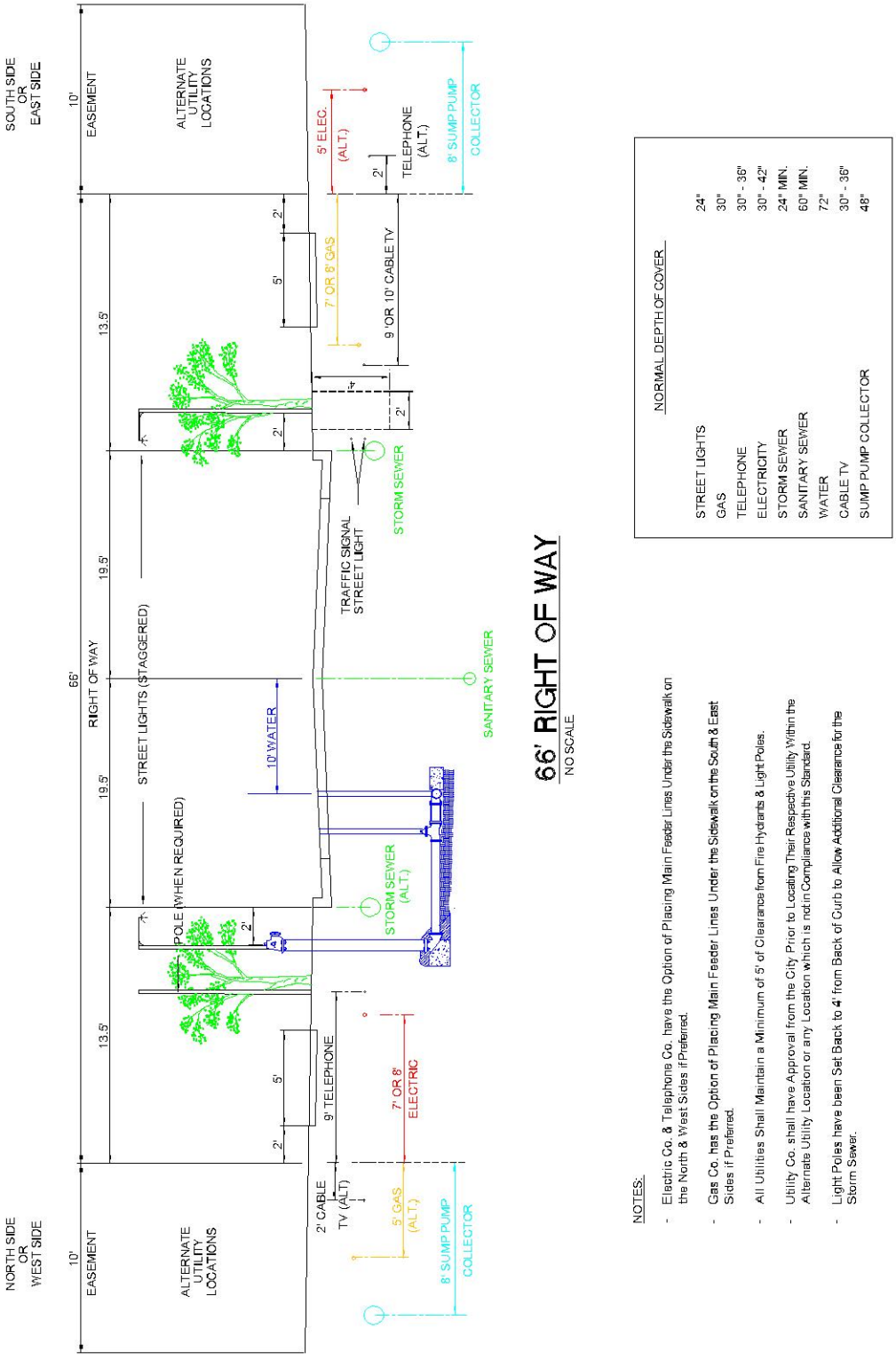
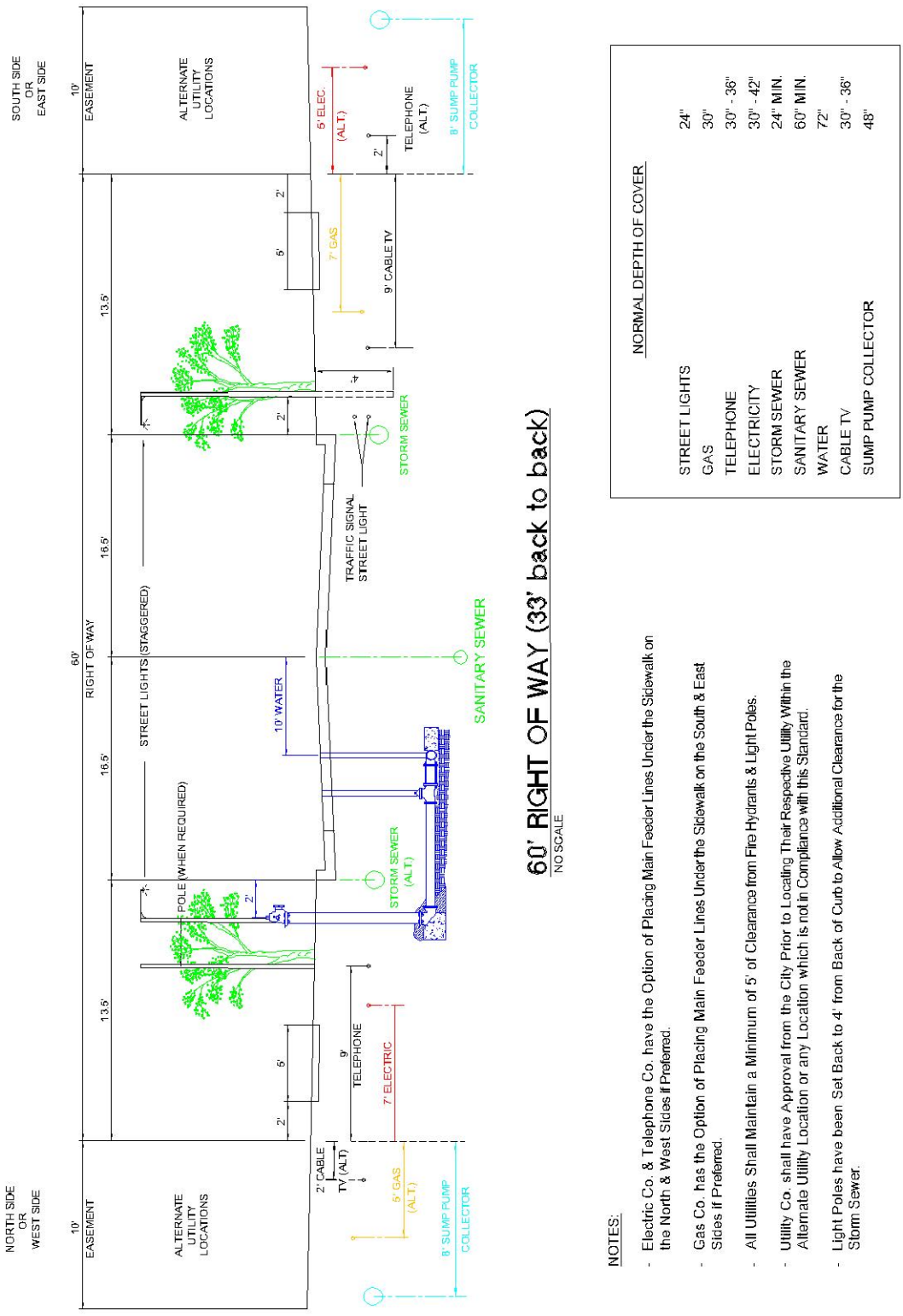


Figure 4.4 60' Right of Way (33' back to back)



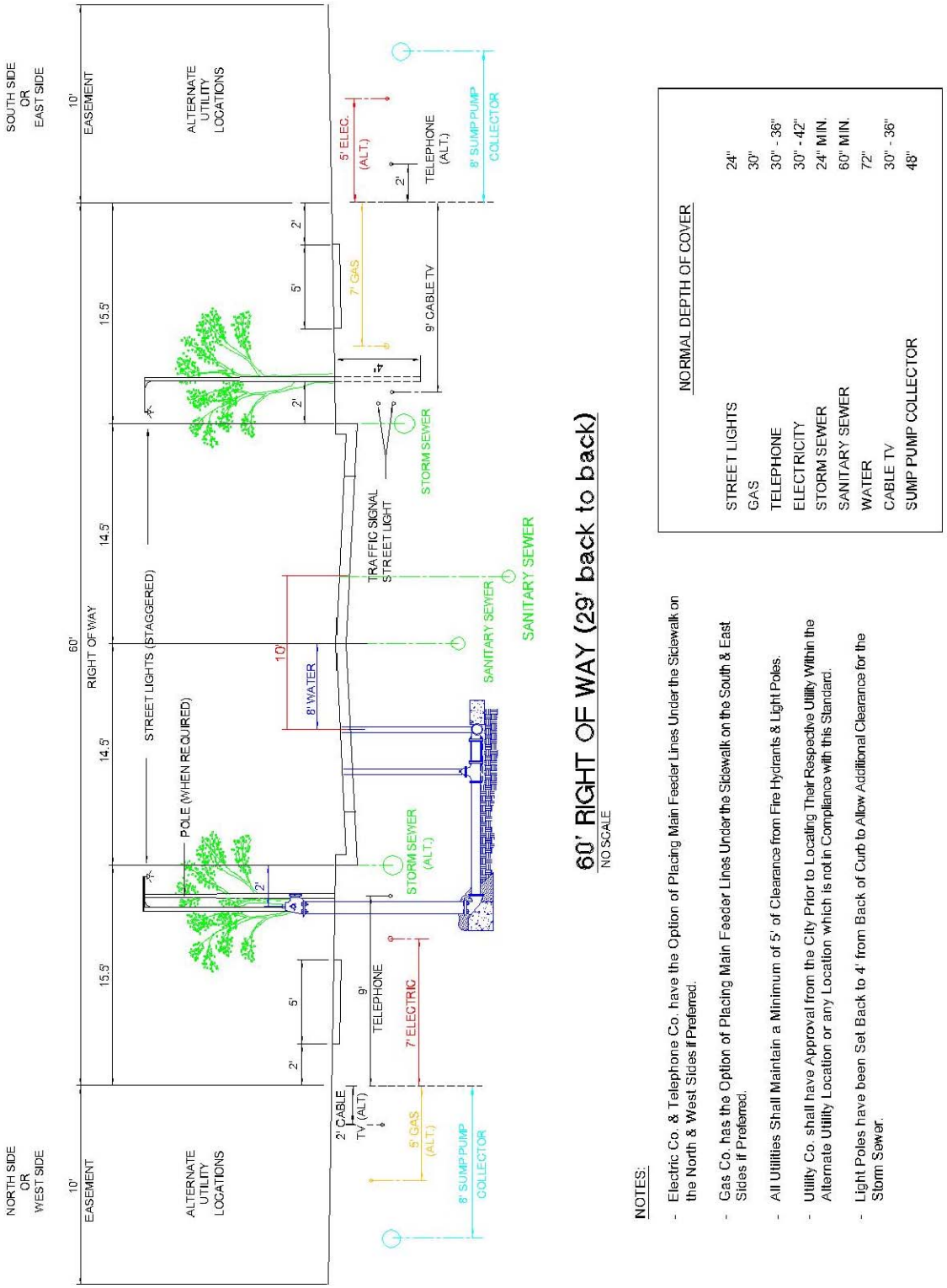
60' RIGHT OF WAY (33' back to back)
NO SCALE

NOTES:

- Electric Co. & Telephone Co. have the Option of Placing Main Feeder Lines Under the Sidewalk on the North & West Sides if Preferred.
- Gas Co. has the Option of Placing Main Feeder Lines Under the Sidewalk on the South & East Sides if Preferred.
- All Utilities Shall Maintain a Minimum of 5' of Clearance from Fire Hydrants & Light Poles.
- Utility Co. shall have Approval from the City Prior to Locating Their Respective Utility Within the Alternate Utility Location or any Location which is not in Compliance with this Standard.
- Light Poles have been Set Back to 4' from Back of Curb to Allow Additional Clearance for the Storm Sewer.

NORMAL DEPTH OF COVER	
STREET LIGHTS	24"
GAS	30"
TELEPHONE	30" - 36"
ELECTRICITY	30" - 42"
STORM SEWER	24" MIN.
SANITARY SEWER	60" MIN.
WATER	72"
CABLE TV	30" - 36"
SUMP PUMP COLLECTOR	48"

Figure 4.5 60' Right of Way (29' back to back)



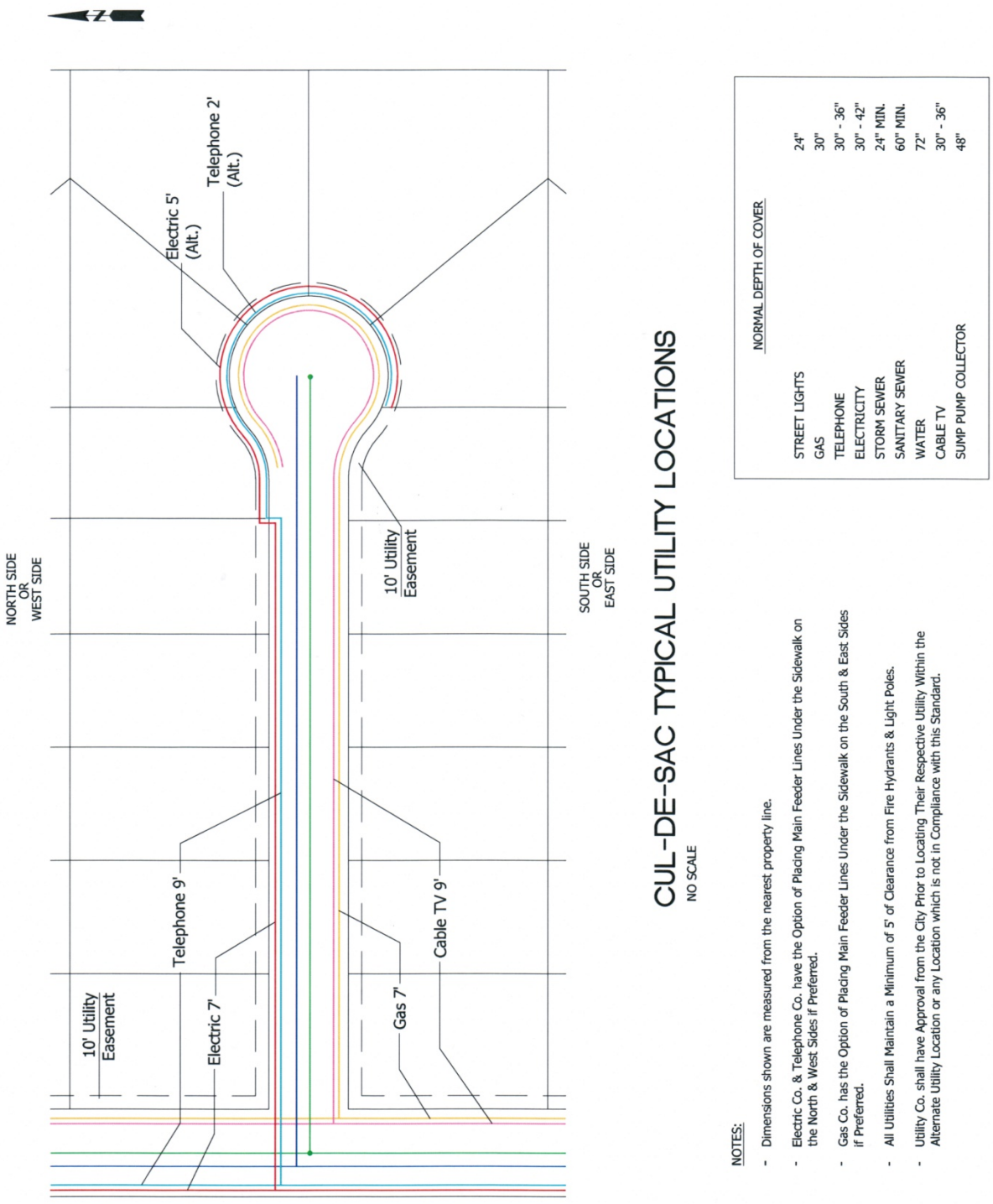
60' RIGHT OF WAY (29' back to back)
NO SCALE

NOTES:

- Electric Co. & Telephone Co. have the Option of Placing Main Feeder Lines Under the Sidewalk on the North & West Sides if Preferred.
- Gas Co. has the Option of Placing Main Feeder Lines Under the Sidewalk on the South & East Sides if Preferred.
- All Utilities Shall Maintain a Minimum of 5' of Clearance from Fire Hydrants & Light Poles.
- Utility Co. shall have Approval from the City Prior to Locating Their Respective Utility Within the Alternate Utility Location or any Location which is not in Compliance with this Standard.
- Light Poles have been Set Back to 4' from Back of Curb to Allow Additional Clearance for the Storm Sewer.

NORMAL DEPTH OF COVER	
STREET LIGHTS	24"
GAS	30"
TELEPHONE	30" - 36"
ELECTRICITY	30" - 42"
STORM SEWER	24" MIN.
SANITARY SEWER	60" MIN.
WATER	72"
CABLE TV	30" - 36"
SUMP PUMP COLLECTOR	48"

Figure 4.6 Cul-De-Sac Typical Utility Locations



Chapter 5 Street Access and Parking Lot Criteria

Chapter 5
Street Access and Parking Lot Criteria

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Chapter 5 Street Access and Parking Lot Criteria

5.1 Traffic Studies

5.1.1 Responsibilities for Traffic Report

5.1.1.1 Traffic impact reports may be required by the City in order to adequately assess the impact of a proposal on the existing and/or planned street system. The primary responsibility for assessing the traffic impacts associated with a proposed development will rest with the developer, with the City serving in a review capacity.

5.1.1.2 Unless waived by the City, a written report meeting the City guidelines will be required for a nonresidential development proposal when trip generation during the peak hour is expected to exceed 100 vehicles, or any multi-family residential development with 150 or more dwelling units.

5.1.1.3 Preparation of the report shall be the responsibility of the developer and must be prepared by a licensed design professional with experience in transportation planning. Upon submission of a draft traffic report, the City will review the study data sources, methods, and findings. Comments will be provided in a written form. The developer and his engineer will then have an opportunity to incorporate necessary revisions prior to submitting a final report. All reports must be reviewed by the City before acceptance.

5.1.1.4 All previous traffic reports relating to the development that are more than two years old must be updated, unless it is determined that conditions have not changed enough to warrant an update.

5.1.1.5 Traffic reports will be required if the trip generation/dwelling unit criteria as noted in Section 5.1.1.2 are exceeded for the following submittals:

a. For a rezoning application or Conditional Use Permit.

b. For a development engineering plan or final development plan if the property has already been rezoned for the proposed use and no traffic report was required for the rezoning.

c. Prior to issuance of a building permit, if the property has already been zoned/platted, and no previous traffic report less than two years old exists.

d. Additional access off an arterial street to an existing use is being requested.

e. The developer will be required to submit a new traffic report if, after submitting the original traffic report, the land use intensity and traffic generation area increased by more than 15 percent.

5.1.1.6 Where access points are not defined or a site plan is not available at the time the traffic report is prepared, additional traffic work may be required when a site plan becomes available or the access points are defined.

5.1.1.7 The developer will be notified at the pre-planning stage if a traffic report will be required, provided sufficient information is available for the City to determine whether the trip generation/dwelling unit criteria have been met. If insufficient information is available but the property appears to involve a sufficiently intense land use, the applicant will be informed that a traffic report is required.

5.1.2 Traffic Report Format

Traffic consultants are encouraged to discuss projects with the City prior to starting the study. Topics for possible discussion at such meetings might include directional distribution of traffic, definition of the study area, intersections requiring critical lane analysis, and methods for projecting build-out volume. This should provide a firm base of cooperation and communication between the City, the owner or developer, and his consultant in creating traffic characteristics that are in the best interest of the total community. Specific requirements will vary depending on the site location. However, all traffic reports shall contain, as a minimum, the following information:

5.1.2.1 Introduction.

5.1.2.1.1 Land Use, Site, and Study Area Boundaries. A brief description of the size of the land parcel, general terrain features, the location within the jurisdiction and the region should be included in this section. In addition, the roadways that afford access to the site, and are included in the study area, should be identified.

The exact limits of the study area should be based on engineering judgment, and an understanding of existing traffic conditions at the site. In all instances, however, the study area limits shall be mutually agreed upon by the developer, his design professional, and City staff. These limits will usually result from initial discussion with staff. A vicinity map that shows the site, in relation to the surrounding transportation system, should be included.

5.1.2.1.2 Existing and Proposed Site Uses. The existing and proposed uses of the site should be identified in terms of the various zoning categories of the City. In addition, the specific use for which the request is made should be identified if known, since a number of uses may be permitted under the existing ordinances.

5.1.2.1.3 Existing and Proposed Uses in Vicinity of the Site. A complete description of the existing land uses in the vicinity of the site, as well as their current zoning and use should be included.

The developer should also state the proposed uses for vacant adjacent land in order that any proposed transition in uses is identified. This latter item is especially important where large tracts of undeveloped and/or underdeveloped land are in the vicinity of the site, and within the

prescribed study area. Generally much of this information can be obtained from the initial meetings with the City's Planning and Zoning Board.

5.1.2.1.4 Existing and Proposed Roadways and Intersections. Within the study area, the developer must describe existing roadways and intersections (geometrics and traffic signal control) as well as improvements contemplated by government agencies. This would include the nature of the improvement project, its extent, implementation schedule, and the agency or funding source responsible.

5.1.2.2 Trip Generation and Design Hour Volumes.

5.1.2.2.1 A summary table listing each type of land use, the size involved, the average trip generation rates used (total daily traffic and a.m./p.m. peaks), and the resultant total trips generated shall be provided.

5.1.2.2.2 Trip generation will be calculated from the latest data contained within the Institute of Transportation Engineers' Trip Generation Guide (latest edition) or NCHRP Report No. 187. In the event that data is not available for the proposed land use, the City must approve estimated rates prior to acceptance.

5.1.2.2.3 Site design hour volumes approximating the peak hour volume used to determine public improvements will be estimated by one of the following methods which are listed in order of preference:

A. Traffic volume counts for existing uses.

B. Peak hour trip generation rates as published in the ITE Trip Generation Guide (latest edition).

C. NCHRP Report No. 187 where justified.

5.1.2.3 Trip Distribution. The direction of approach for site-generated traffic will be presented in this section. The technical analysis steps, basic methods, and assumptions used in this work must be clearly stated.

5.1.2.4 Trip Assignment. This section will describe the utilization of study area roadways by site-generated traffic. The anticipated site traffic volumes must be combined with existing and projected area traffic volumes in Section 5.1.2.5 to describe mainline and turning movement volumes for future conditions with the site developed as proposed. Internal trips in excess of 10 percent will require analytical support to demonstrate how the higher figures were derived. Nongenerated passerby traffic reductions in generation volumes may be considered if applicable. All estimates of trip distribution, assignment, and modal split are subject to review and approval by the City.

5.1.2.5 Existing and Projected Traffic Volumes.

5.1.2.5.1 Graphics should show:

a. AM peak hour site traffic (in and out) including turning movements.

b. PM peak hour site traffic (in and out) including turning movements.

c. AM peak hour total including site (in and out) and through traffic including turning movements for current conditions and 20-year projections or build-out.

d. PM peak hour total including site (in and out) and through traffic including turning movements for current conditions and 20-year projections or build-out.

5.1.2.5.2 All raw traffic count data (including hourly ADT and peak hour turning movements) and analysis worksheets shall be provided in the appendices. Computer techniques, and the associated printouts, can be used as part of the report.

5.1.2.5.3 Build out projections shall include major vacant properties around the proposed development as defined by the City. Volume projections for background traffic growth will be provided by the City, or a method for determining their volume will be recommended by the City.

5.1.2.5.4 All total daily traffic counts should be actual machine counts and not based on factored peak hour sampling. Latest available machine counts from SDDOT, the City, and other agencies may be acceptable if not more than two years old.

5.1.2.5.5 All traffic will be assigned to existing and planned facilities in a manner consistent with existing traffic patterns and approved by the City.

5.1.2.6 Capacity Analysis. A capacity analysis will be conducted for the street intersections at driveways for the proposed development. Within the limits of the previously defined study area, capacity analyses will also be conducted for street intersections. The a.m., p.m., and any other possible peak period will be tested to determine which will be analyzed. Pedestrian movements should also be considered in the evaluation. Capacity calculations should also include an analysis for 20th year projections or build-out conditions. Capacity analysis will be calculated in accordance with the procedures outlined in The Highway Capacity Manual, TRB Special Report No. 209.

5.1.2.7 Traffic Signals.

5.1.2.7.1 The need for new traffic signals shall be checked using the warrants in the Manual on Uniform Traffic Control Devices, latest edition. Traffic progression is of paramount importance. Generally a spacing of one-half mile for all signal-controlled intersections should be maintained.

This spacing is usually desirable to achieve good speed, capacity, and optimum signal progression.

5.1.2.7.2 To provide flexibility for existing conditions and ensure optimum two-way signal progression, an approved traffic engineering analysis will

be made to properly locate all proposed connecting access approaches that may require signalization. An optimum two-way progression pattern will be established between two public intersections that bracket the proposed approach as chosen by the City. These bracketing intersections should be about one mile apart, and be existing, or possible future signal locations.

5.1.2.7.3 The progression pattern calculation must use a cycle length of between 50 and 120 seconds, and a travel speed of 40 mph, unless existing signal systems and speed limits govern usable cycle lengths and travel speeds. A desirable bandwidth of 50 percent must be used where existing conditions allow. Where intersections have no signals presently, but are expected to have signals, a 60 percent mainline, 40 percent cross street cycle split should be assumed. The green time allowed to the cross street will be considered no less than the time which is required for a pedestrian to cross the mainline at four feet per second. Those intersections which would reduce the optimum bandwidth if a traffic signal were installed will remain unsignalized and have turning movements limited by driveway design or median islands.

5.1.2.8 Level of Service. Level of Service C during the peak hour will be the design objective. The design year will be approximately 20 years following construction or at build-out of the area. Levels of service are defined in The Highway Capacity Manual.

5.1.2.9 Traffic Accidents. Traffic accident data for affected street corridors may be required for the study. Where this is necessary, estimates of increased or decreased accident potential shall be evaluated for the development.

5.1.2.10 Recommendations. In the event that analysis indicates unsatisfactory levels of service on study area roadways, a description of proposed improvements to remedy deficiencies shall be included. These proposals would not include committed projects by the City or the SDDOT. In general, the recommendation section should include:

5.1.2.10.1 Proposed Recommended Improvements. This section shall describe the location, nature, and extent of proposed improvements to assure sufficient roadway capacity.

5.1.2.10.2 Volume/Capacity Analysis at Critical Points. Another iteration of the volume/capacity analysis will be described, which demonstrates the anticipated results of making these improvements.

5.1.2.10.3 Levels of Service at Critical Points. As a result of the revised volume/capacity analysis presented in the previous section, levels of service for the highway system with improvements will be presented.

5.1.2.11 Conclusion. The last chapter of the report must be a clear, concise description of the study findings. It is anticipated that this concluding chapter will serve as an executive summary.

5.1.2.12 Revisions to Traffic Report. Revisions to the traffic report must be provided as required by the City. The need to require revisions will be based on the completeness of the traffic report, the thoroughness of the impact evaluation, and the compatibility of the study with the proposed access and development plan.

5.2 Access Control

5.2.1 General Access

Access in newly developing areas will follow these provisions. In areas being redeveloped, access will be determined as to the best fit based on traffic safety, existing conditions, future street improvements, and property development along with other considerations as appropriate.

A Sidewalk and Driveway Permit must be obtained from the City for any public or private access constructed to a public street. Access to streets or highways within the city limits under the jurisdiction of the South Dakota Department of Transportation (SDDOT) are also governed by requirements of the SDDOT. In addition to obtaining a permit from the City, a permit from the Area Engineer of the SDDOT must be obtained.

5.2.2 Basic Principles for Curb Openings and Driveways

5.2.2.1 Arterial Street Access

5.2.2.1.1 Private residential access directly to arterial streets and any access to a principal arterial street shall be permitted only when the property in question has no other reasonable access to the general street system, or when denial of direct access to the arterial and alternative access to another roadway would cause traffic operation and safety problems as shown in a Traffic Report.

5.2.2.1.2 Offsets. On any arterial street where access is permitted, driveways on opposite sides of the street shall align or shall be offset along their centerlines not less than 150 feet.

5.2.2.1.3 Minor Arterial Streets-Only one access will be allowed for up to 300 feet of frontage on minor arterial streets.

5.2.2.2 General Access

5.2.2.2.1 High Volume Access. In general, when trip generation served by the driveway exceeds 100 vehicles per hour during the peak hour, returns using a standard street return radius as set forth in Table 5.1 and Figure 5.1 will be required.

5.2.2.2.2 Access Points. Access will not be approved for parking or loading areas that require backing maneuvers onto a public street right-of-way except for single family or duplex residential uses on local and minor collector streets.

Table 5.1
Driveway Dimensions (All Dimensions in Feet)

Arterial	Dimension Reference (See Figure 5.1)	Local			Collector			Arterial		
		Resi-dential	Com-mercial	Indus-trial	Resi-dential	Com-mercial	Indus-trial	Resi-dential	Com-mercial	Indus-trial
Width[1]	W									
Minimum		12	15	20	12	15	20	15	15	20
Maximum		36[2,3]	36	40	30	36	40	36	36	40
Right-turn Radius	R									
Minimum		5	10	15	10	15	25	25	25	30
Maximum[4]		15	20	30	25	50	50	30	50	50
Minimum Spacing[5]										
From Property Line	P	0	R	R	0	R	R	R	R	R
From Street Corner	C	10	40	40	50	50	50	50	50	50
Between Driveways	D	10[6]	25	25	35	50	50	50	50	50
Angle[7]	A	45°	70°	70°	45°	70°	70°	70°	70°	70°

1. The minimum width of commercial driveways is intended to apply to 1-way operation. In high pedestrian activity areas, such as in a central business district or in the same block with auditorium, school, or library, the maximum basic width should be 30 feet. The width shown applies to rural routes and most City streets including neighborhood business, residential, and industrial streets. The width is intended to be measured along the right-of-way line, in most instances, at the inner limit of a curbed radius or between the line of the radius and the near edge of a curbed island at least 50 square feet in area.

2. The maximum width on bulb of cul-de-sac shall be 24 feet.

3. The maximum driveway width cannot exceed the width of the garage structure.

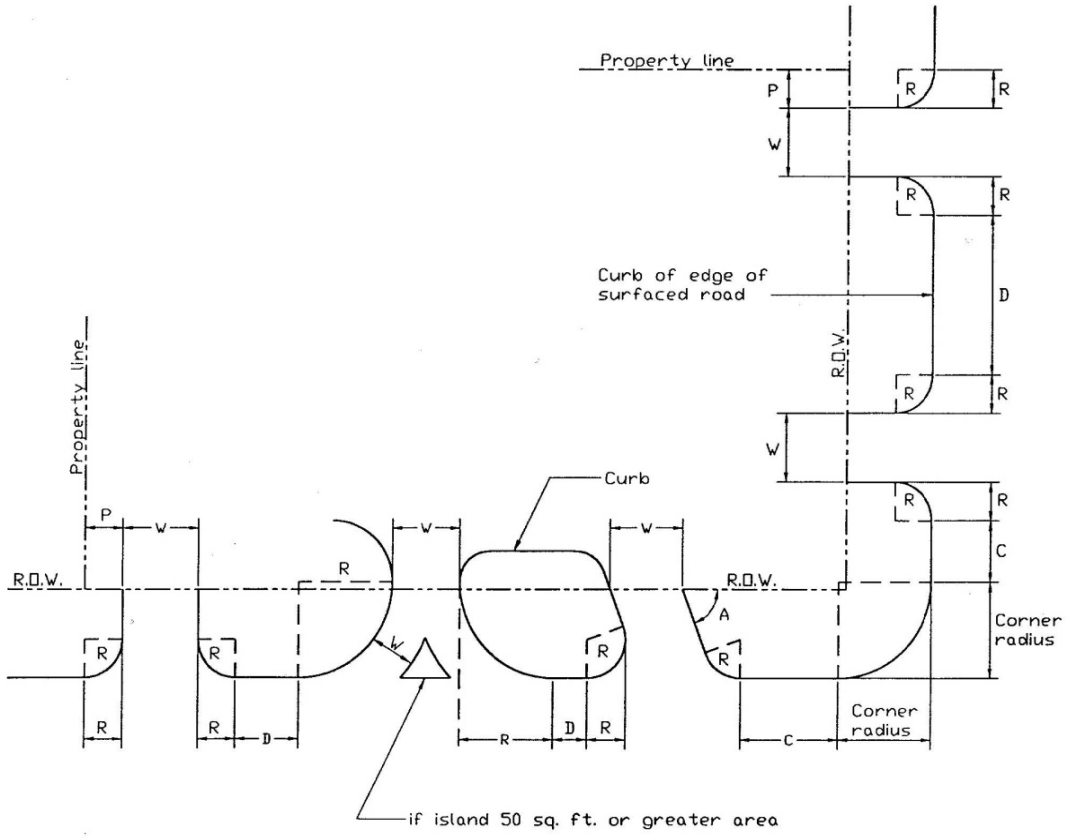
4. On the side of a driveway exposed to entry or exit by right-turning vehicles. In high pedestrian activity areas, the radii should be half the values shown. The maximum radii for major generator driveways shall be designed in accordance with A Policy on Geometric Design of Highways and Streets, published by AASHTO latest edition.

5. Measured along the curb or edge of pavement from the roadway end of the curb radius. In high pedestrian activity areas, the minimum spacing between driveways should be 5 feet.

6. Minimum space between driveways may be reduced to 3 feet on one side on local streets only at the discretion of the City.

7. Minimum acute angle measured from edge of pavement, and generally based on 1-way operation. For 2-way driveways, and in high pedestrian activity areas, the minimum angle should be 80 degrees.

Figure 5.1 Driveway Dimensions



5.2.2.2.3 Standards. Every property that accesses the street shall have a driveway. Driveways shall be constructed in accordance with the City of Canton Standard Plates.

5.2.2.2.4 Existing and Future Demands. The opening or driveway width shall be adequate to handle properly the anticipated traffic volume and character of traffic, as well as being within the limits specified for the type of property development. The controls established for curb openings and driveways shall apply to existing streets as well as new streets that may be developed in the future.

5.2.2.2.5 Utility Conflicts. Any adjustments which must be made to utility poles, street light standards, fire hydrants, catch basins or inlets, traffic signs and signals, or other public improvements or installations which are necessary as the result of the curb openings or driveways shall be accomplished without any cost to the City.

5.2.2.2.6 Access Signs. Driveway approaches, whereby the driveway is to serve as an entrance only or as an exit only, shall be appropriately signed by, and at the expense of, the property owner subject to approval of the City Zoning Board. Sign location, height, and legend must be in

accordance with the Manual on Uniform Traffic Control Devices (MUTCD).

5.2.2.2.7 Abandoned Driveways. Any curb opening or driveway which has been abandoned shall be removed and the street restored by the property owner.

5.2.3 General Requirements

5.2.3.1 Number of Openings.

5.2.3.1.1 Single-Family Residential - In general, each single-family residential property shall be limited to one access point. However, where houses are located on corner lots or have extra wide frontage, more than one access point may be permitted. Applicable zoning setback requirements must be followed.

5.2.3.1.2 Multi-Family Residential - In general, access shall be determined by information provided by the Owner/Developer in a Traffic Impact Report and/or by comments generated during the City's review and acceptance of that report.

5.2.3.1.3 Commercial - In general, commercial property having less than 150 feet of frontage and located mid-block shall be limited to one access point to the street. A second access point may be allowed for commercial property having more than 150 feet of frontage. For commercial property located on a corner, one access to each street may be permitted; if one of the streets is an arterial street, then access may be restricted to the side street only. Access may also be restricted if use of such access would be precluded by existing left turn lanes or other traffic control devices.

5.2.3.1.4 Industrial - Access shall be determined on a case-by-case basis. The City will consider good traffic engineering practice and may require information to be provided by the applicant in a Traffic Report. Where a Traffic Report is not required, the maximum number of openings will be dictated primarily by the size and spacing between openings.

5.2.3.2 Access to Roadways with No Curb and Gutter. Private drive access to local, collector or arterial streets that have no curb and/or gutter improvements shall be constructed to meet the following requirements:

5.2.3.2.1 The private drive shall extend from right-of-way line to the edge of the existing driving surface and shall be constructed of: (a) an eight (8) inch thick compacted aggregate base material, or if paved, (b) a minimum four (4) inch thick asphalt pavement over six (6) inch thick aggregate base material; i.e. minimum acceptable roadway pavement design.

5.2.3.2.2 Access shall be governed by the driveway criteria.

5.2.3.2.3 A culvert properly sized for the ditch flow shall be installed at the established roadside ditch flowline beneath the private drive access. Minimum size for the culvert shall be 18 inches. Culverts shall have a

precast concrete-sloped end section or cast in place concrete headwall. If a cast in place headwall is built, it shall have a maximum slope of 4:1 on any exposed face. No vertical headwalls will be allowed.

5.2.3.2.4 A sketch plan of the installation must be submitted with the access permit application. No construction permit will be issued until the access and its construction plan or sketch are approved by the City.

5.2.3.3 Amount of Curb Opening Permitted. Driveway width shall comply with Table 5.1.

5.2.3.4 Mutual Access. On commercial, industrial, and multi-family developments, mutual use of access to streets is encouraged and may be necessary to meet driveway spacing requirements. Where used, mutual access will comply with City Ordinance and will be shown on plans for approval prior to construction or change of use.

5.2.4 Definition of Terms for Access Control

Several terms are used herein which have a somewhat distinct meaning. For the purpose of clarity, the definition of some of these terms are listed below.

5.2.4.1 Width of Curb Opening (W)-The width of curb opening measured at the throat of the driveway from the edge of pavement to the edge of pavement.

5.2.4.2 Property Line (P)-The distance measured along the property line from the nearest edge of the driveway to the property line.

5.2.4.3 Corner Clearance (C)-At an intersecting street the distance measured along the curb line from the end of the corner radius to the nearest edge of the curb opening.

5.2.4.4 Distance Between Double Drives (D)-The distance measured along the curb line between the radii.

5.2.4.5 Frontage-The distance along the street right-of-way line of a single property or development within the property lines. Corner property at an intersection would have a separate frontage along each street.

5.2.4.6 Residential-Property used primarily for residential purposes such as single family, two family and multi-family units.

5.2.4.6.1 Single-Family (SF) Residential-Single, detached family dwelling units or double bungalows or duplexes.

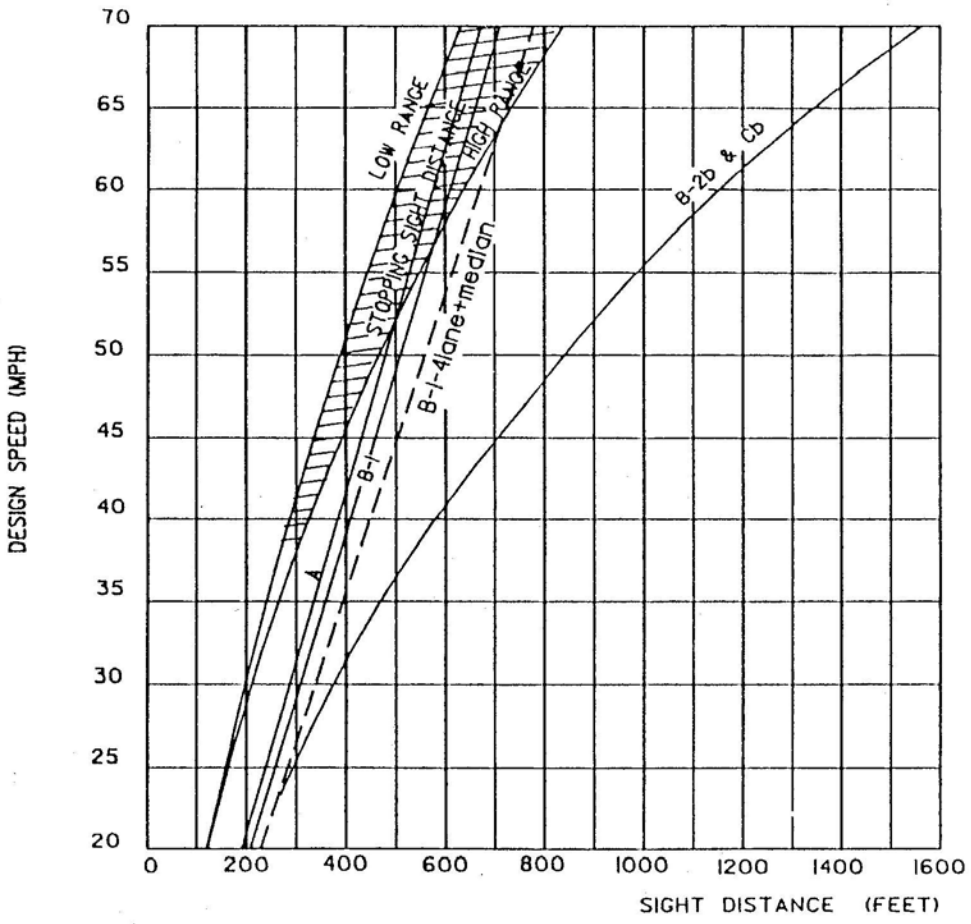
5.2.4.6.2 Multi-Family (MF) Residential-Three or more attached dwelling units including townhouses, condominiums and apartments.

5.3 Access Design

5.3.1 Driveway Spacing

Where lots are large enough, the center of driveways not in alignment will normally be offset a minimum of 150' for all commercial/multi-family properties. Greater distances may be required if left-turn storage lanes require such on arterial streets. Minimum sight distance shall be provided at all access points as shown in Figure 5.2, which applies to both city street and driveway intersections.

Figure 5.2: Intersection Distance at At-Grade Intersection



A Sight Distance For P Vehicle Crossing 2-Lane Highway From Stop. (See Diagram)

B-I Sight Distance For P Vehicle Turning Left Into 2-Lane Highway Across P Vehicle Approaching From Left. (See Diagram)

B-I-4 Lane+Median Sight Distance For P Vehicle Turning Left Into 4lane Highway Across P Vehicle Approaching From Left. (See Diagram)

B-2b Sight Distance For P Vehicle To Turn Left Into 2-Lane Highway And Attain 85% Of Design Speed Without Being Overtaken By A Vehicle Approaching From The Right Reducing Speed From Design Speed To 85% Of Design Speed. (See Diagram)

Cb Sight Distance For P Vehicle To Turn Right Into 2-Lane Highway And Attain 85% Of Design Speed Without Being Overtaken By A Vehicle Approaching From The Left And Reducing From Design Speed To 85% Of Design Speed.

5.3.2 Driveway Design

Driveway sectional details are shown in Figure 5.3 with design requirements listed in Table 5.2.

Figure 5.3 Driveway Grades

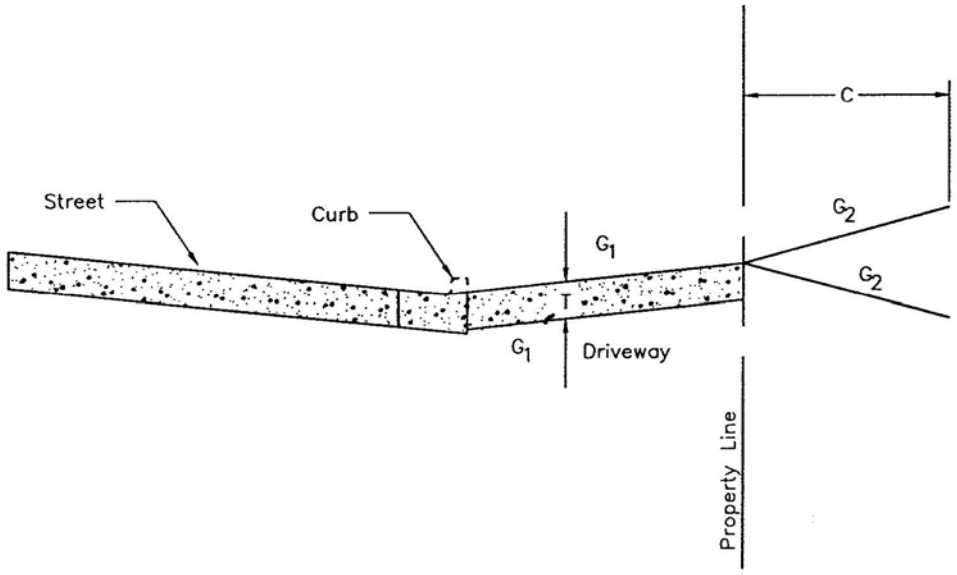


Table 5.2

Type of Driveway	Minimum Thickness	Grade (G1)		Grade (G2)		Control Distance (C)
		Min.	Max.	Min.	Max.	
Low Volume Residential	6”	+5.0%	+8.0%	±0. 5%	±13%	20’
Low Volume Commercial/ Industrial	7”	±0.5%	±6%	±0. 5%	± 6%	40’
High Volume	7”	±0.5%	±3%	±0. 5%	± 3%	40’

The following sketches are the recommended minimum design for limited movement driveways. Acceleration and deceleration lanes may be required to be incorporated into the designs. The islands are raised with vertical curb. The ends of the islands should typically be provided with 2' radii.

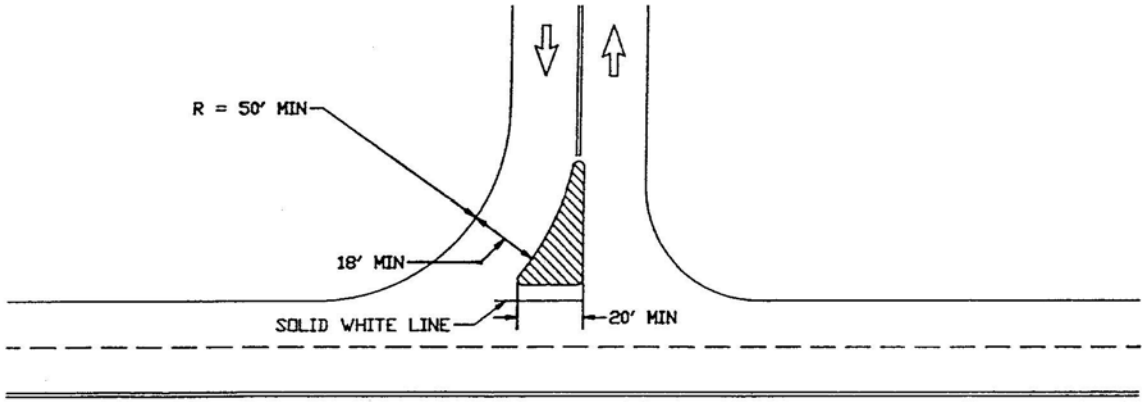


Figure 5.4: Right-In, Right-Out, Left-In Driveway Design

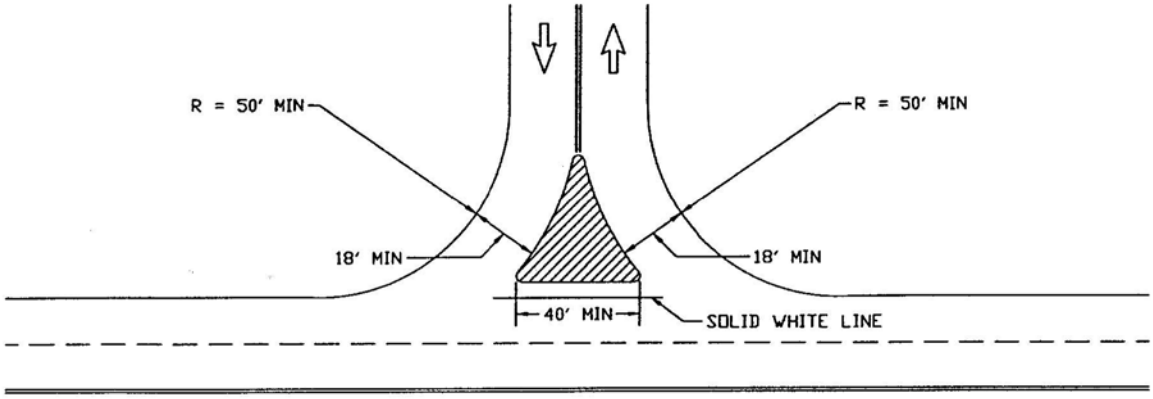


Figure 5.5: Right-In, Right-Out Driveway Design

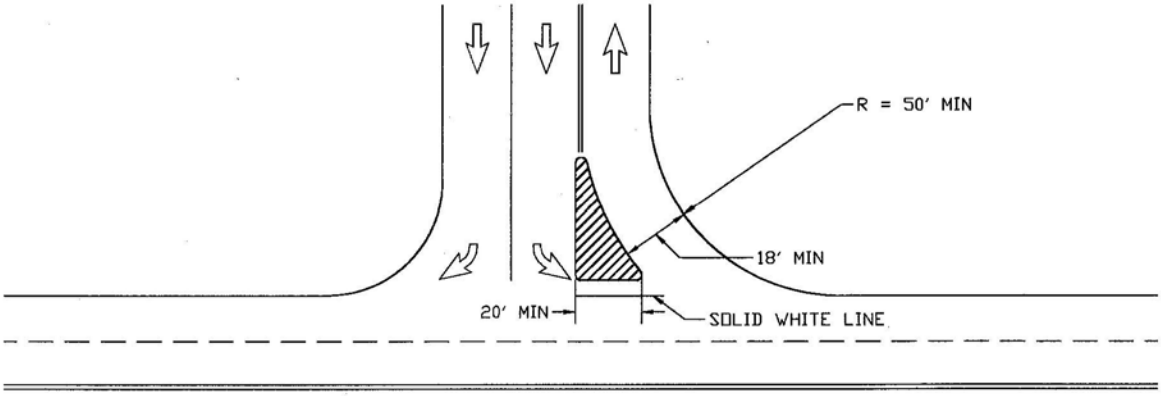


Figure 5.6: Right-In, Right-Out, Left-Out Driveway Design

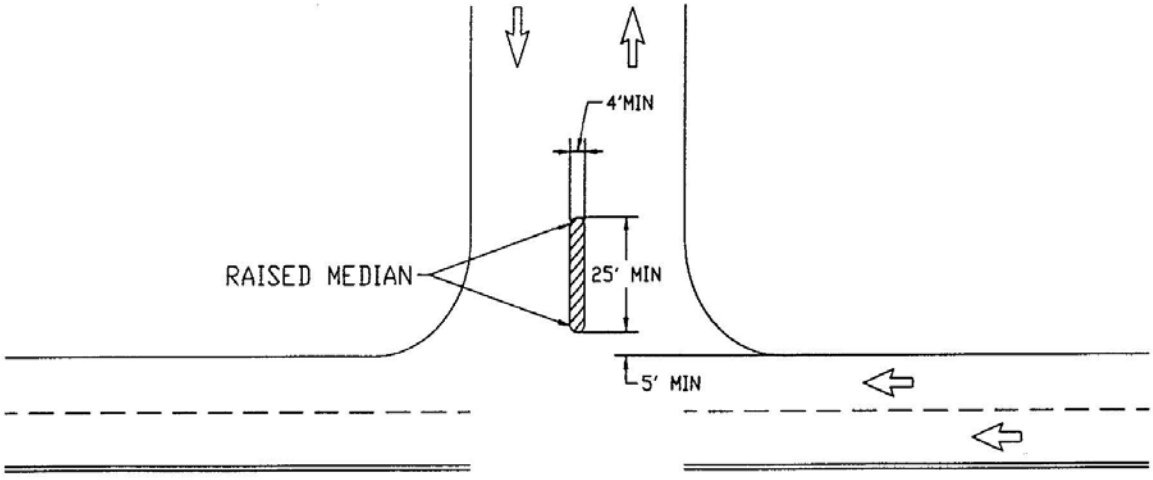


Figure 5.7: Driveway Design with Median Divider

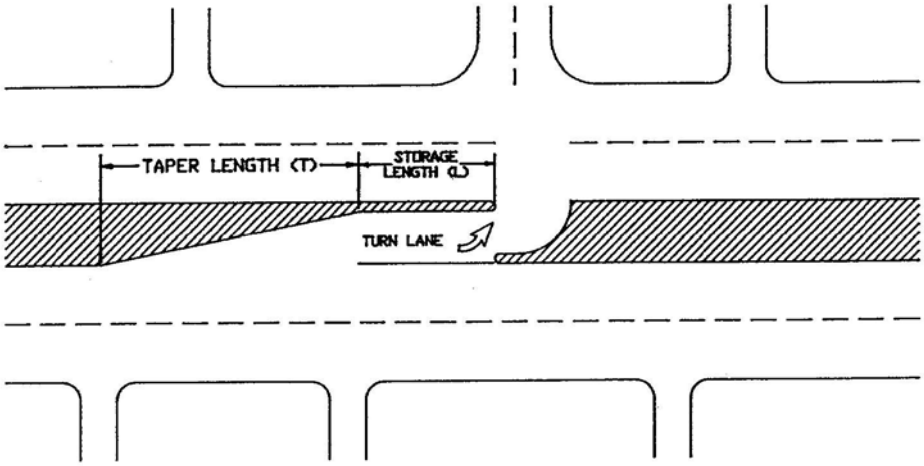


Figure 5.8: Median Design to Restrict Existing Left Turns

5.4 Off-Street Parking Area

5.4.1 General. In accordance with City Zoning Ordinances 11.04, the following guidelines regarding the design of off-street parking areas shall be followed.

5.4.2 Minimum Stall Width. The minimum stall width shall be eight and one-half feet, except compact vehicles. Compact vehicle minimum stall width shall be seven and one-half feet.

5.4.3 Compact Vehicles. A maximum of 33% of total required parking stalls may be designated specifically for compact vehicles. When an area is designed for compact vehicles only, the area shall be adequately signed to inform drivers of the exclusion.

5.4.4 Parking Dimensions. Minimum module depths shall be as shown on Figure 5.9 and in Table 5.3.

5.4.5 Backing Into Street Not Allowed. The spaces shall be so arranged so that no vehicle will be required to be backed into the street in order to exit the lot except for single-family or duplex dwelling units.

5.4.6 Backing Over Sidewalk Not Allowed. The spaces shall be so arranged so that no vehicle will be required to be backed over a public sidewalk in order to exit the stall.

Figure 5.9 Parking Area Layout

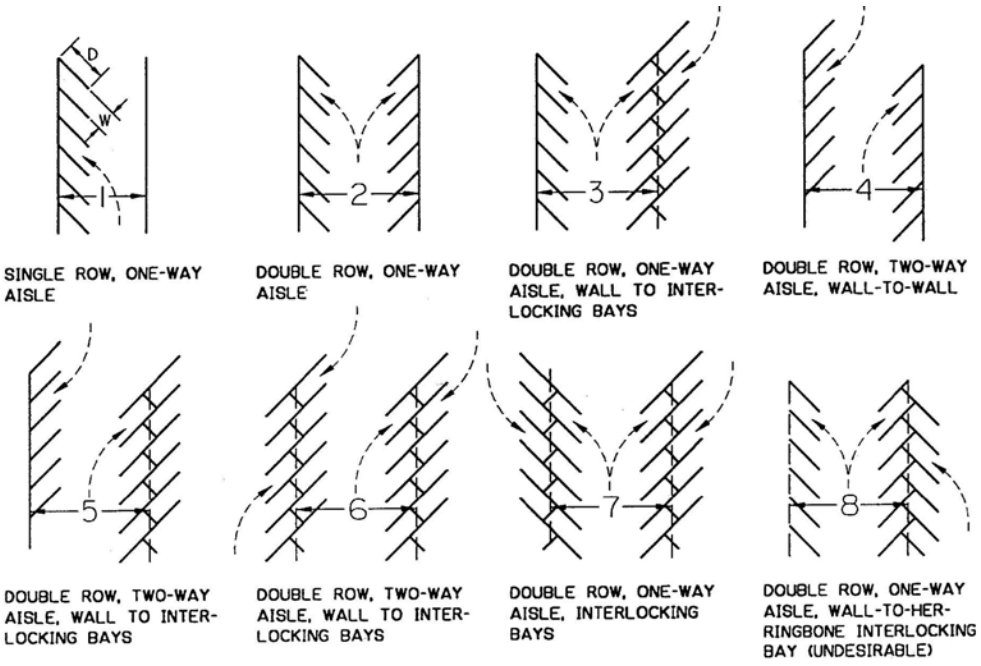


Table 5.3
Minimum Parking Lot Design Requirements
(All Dimensions in Feet)

PARKING ANGLE (DEGREES)	STALL DEPTH "D" (FEET)	STALL WIDTH "W" (FEET)	MODULE DEPTH (FEET)							
			1	2	3	4	5	6	7	8
45	16*	7.5*	26	41	40	52	50	50	39	39
45	18	8.50	30	48	45	58	54	51	42	42
45	18	9.00	30	48	45	58	54	51	42	42
45	18	9.50	30	48	45	58	54	51	42	42
45	18	10.00	30	48	45	58	54	51	42	42
60	17*	7.5*	29	46	45	57	55	53	43	43
60	20	8.50	37	57	55	60	58	56	53	53
60	20	9.00	36	56	54	60	58	56	52	52
60	20	9.50	34	54	52	60	58	56	50	50
60	20	10.00	33	53	51	60	58	56	50	50
75	17*	7.5*	33	49	49	50	49	49	49	49
75	20	8.50	41	61	60	61	60	59	59	59
75	20	9.00	40	60	59	60	59	58	58	58
75	20	9.50	39	59	58	59	58	57	57	57
75	20	10.00	38	58	57	58	57	57	57	57
90	16*	7.5*	35	50	49	50	50	50	50	50
90	19	8.50	45	64	64	64	64	64	64	64
90	19	9.00	43	62	62	62	62	62	62	62
90	19	9.50	42	61	61	61	61	61	61	61
90	19	10.00	41	60	60	60	60	60	60	60
* = COMPACT CARS ONLY										

5.5 Accessible Parking Spaces and Signs

5.5.1 General. The following policy regarding the number, location, design, and signing requirements for accessible parking spaces shall be followed.

5.5.2 Accessible Spaces. Accessible parking spaces shall be 8 feet wide minimum. One in every eight accessible spaces, but not less than one, shall be served by an access aisle 8 feet wide minimum and shall be designated "Van Accessible." All other access aisles adjacent to accessible spaces shall be 5 feet wide minimum (see Figure 5.10). The minimum number of accessible spaces is shown in Table 5.4.

Table 5.4 Required Accessible Parking Spaces

Total Parking in Lot	Standard Accessible Parking Spaces	Van Accessible Parking Spaces	Required Minimum Number of Accessible Parking Spaces
1 to 25	0	1	1
26 to 50	1	1	2
51 to 75	2	1	3
76 to 100	3	1	4
101 to 150	4	1	5
151 to 200	5	1	6
201 to 300	6	1	7
301 to 400	7	1	8
401 to 500	7	2	9
501 to 1000			2% of total
1001 and over			20 plus 1 for each 100 over 1000

5.5.3 Location of Accessible Spaces. Accessible parking spaces serving a particular building shall be located on the shortest accessible route of travel from the adjacent parking to an accessible entrance.

5.5.4 Number of Signs Required. There shall be sufficient signs to inform the driver as to which parking spaces are reserved for the disabled. A sign will also be required in the 8-foot wide, striped-out area.

5.5.5 Location of Signs. Signs are to be located at the head of each space and centered on the space. No sign shall be more than 6 feet from the head of the space. The bottom of the primary sign shall be at least 7 feet above the pavement. In the case of supplemental signs, the bottom of the lowest sign shall be at least 6 feet above the pavement.

5.5.6 Legend on Signs. The primary sign shall be as indicated in the Manual on Uniform Traffic Control Devices (MUTCD) for an R7-8 as shown in Figure 5.11. In addition, a supplementary plaque (or incorporated in the primary sign) containing the legend "STATE PERMIT OR LICENSE REQUIRED" shall be part of the assembly. An additional plaque (or incorporated in the primary sign) indicating "VAN ACCESSIBLE" shall be included in the assembly for those spaces required to be designed for van accessibility.

5.5.7 Pavement Markings. All accessible spaces shall be marked (by painted lines or other) in conformance with the examples shown in Figure 5.10. Accessible spaces need not be indicated by pavement markings such as a legend or the international symbol, but it is recommended that this be done as a supplemental message to the sign.

Figure 5.10

Typical Layout of Accessible Parking Spaces and Sign Placement

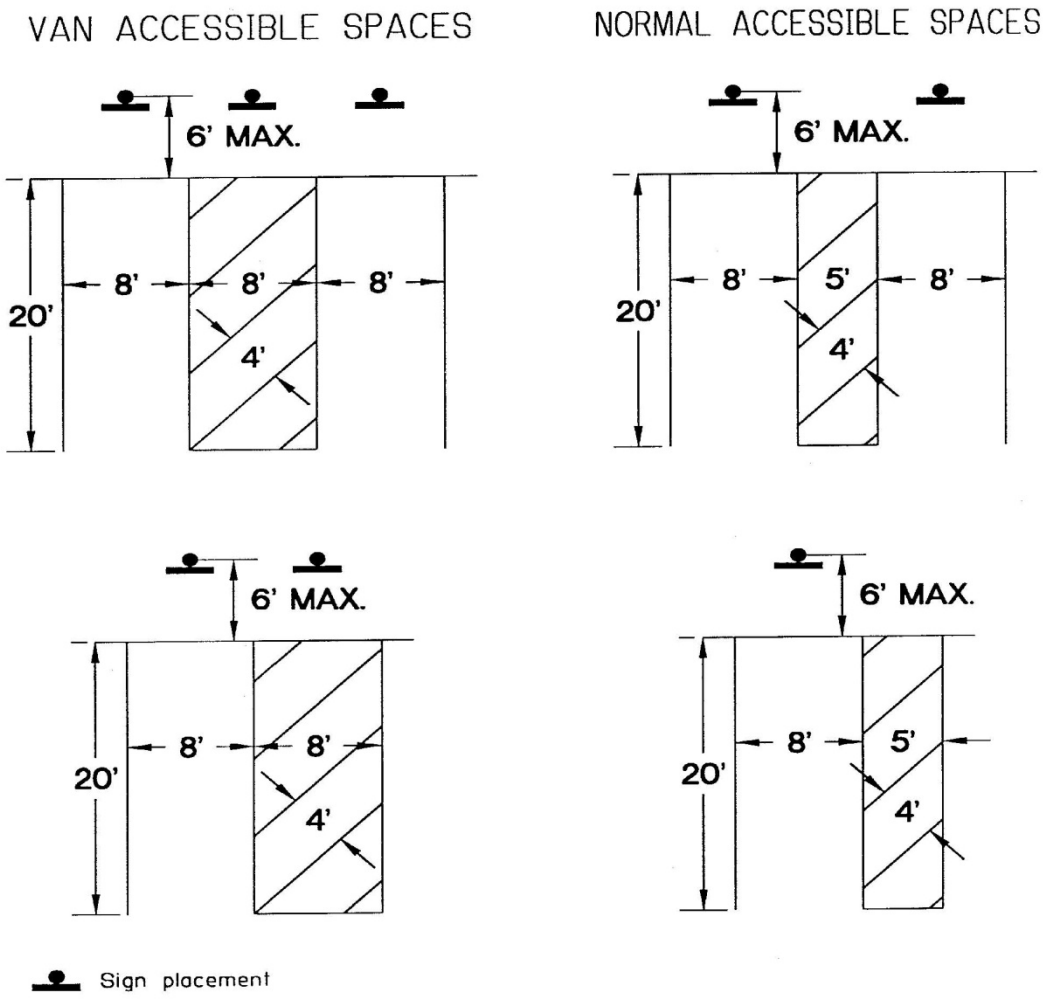
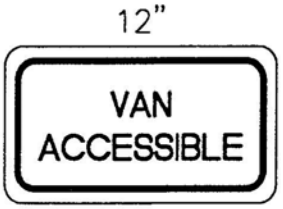


Figure 5.11 Signs

PRIMARY SIGN

COLOR: legend and border are green on a white background - white symbol on a blue background



SUPPLEMENTARY PLAQUE (IF NEEDED)

HEIGHT: Bottom of primary sign a minimum of 7 ft. If supplementary signs are used, minimum is 6 ft.

SIZE: Primary sign is 12"x 18". Supplementary signs are 8"x 12" and 6"x 12" for Van Accessible signs.

Supplementary messages may be incorporated on the primary sign, this requires sign size of 12 inch by 30 inch

SUPPLEMENTARY PLAQUE

Chapter 6 Geotechnical Exploration and Report

Chapter 6
Geotechnical Exploration and Report

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6.2 When Required 1

6.3 Soil Exploration 1

6.4 Report 2

Chapter 6 Geotechnical Exploration and Report

6.1 General

The geotechnical exploration and report shall determine any special geotechnical conditions and make recommendations regarding the special conditions, grading, foundations and pavement.

6.2 When Required

For public improvement projects, the determination as to when soils reports will be required will be determined on an individual, case-by-case basis by the City.

6.3 Soil Exploration

6.3.1 General. When geotechnical explorations are required, all sampling and testing of the soil shall be performed in accordance with the appropriate AASHTO (American Association of State Highway and Transportation Officials) and ASTM (American Society for Testing and Materials) designations.

6.3.2 Sampling. Representative samples of the soils shall be obtained by drilling shallow penetration soil borings along the route of the existing or proposed public right-of-way.

6.3.2.1 Borings shall extend to a minimum depth of 5.0 feet below the proposed subgrade foundation, or 2.0 feet below the flow line elevation of any pipe or conduit. Every third boring, or a minimum of one boring, shall be of sufficient depth, or a minimum of ten (10) feet, for monitoring of the ground water elevation.

6.3.2.2 Borings will be performed at close enough intervals to determine the boundaries of each significant soil type present.

6.3.2.3 A random technique shall be used to select sampling locations.

6.3.2.4 Spacing of the borings will vary with the uniformity of the soil profile and the topography. The maximum interval between soil borings may not exceed 400 feet.

6.3.2.5 Where the original ground line is to be covered with fill material, five (5)-foot depth borings are necessary to determine the character of the support.

6.3.2.6 Where drainage areas are crossed or boggy areas are encountered, the spacing of the borings shall be at closer intervals in order to determine the boundaries of the "soft" area. At these "weak" areas, the depth of the borings may also have to be increased in order to determine if and to what depth improved subgrade material will be required to provide uniform support for the construction.

6.3.2.7 Representative samples from the borings shall be collected for submittal to a soils testing laboratory for evaluation.

6.3.2.8 A boring log shall be maintained for each soils boring performed. The boring log shall contain a complete record of the soil material observed.

6.3.3 Testing.

6.3.3.1 The tests required are those for identification and classification purposes. These tests include a standard sieve and hydrometer analysis (ASTM D422 of AASHTO T-88) and Atterburg Limits (ASTM D423 and 424 or AASHTO T-89 and 90). The test results are used to give a soil a descriptive name and letter symbol (in accordance with the Unified Soils Classification System) indicating its principle characteristics. Based on the test results, similar soil types can be placed into several major groups.

6.3.3.2 These major groups shall be plotted on a profile sheet to determine their limits. The profile sheet is used with the laboratory data in selecting what soil types further testing should be performed on. Additional testing includes the moisture-density relationship (AASHTO T-99 or T-180) and California Bearing Ratio (MIL STD 621 Method 101 or ASTM D1883). The moisture-density relationship determines the maximum dry density and optimum moisture content for that particular soil. The CBR test is performed at 95 percent of the maximum dry density and at the optimum moisture content. The results of the CBR test determine the relative bearing value of the subgrade and is used in the pavement thickness design. A minimum of a three (3) point curve will be utilized for the CBR testing with a five (5) point curve preferred. If the various soil type areas are not large enough to justify separate pavement designs, a single design shall be made on the worst soil type.

6.4 Report

6.4.1 General. The report shall identify any geotechnical special conditions found in the exploration and recommendations to ameliorate the special conditions along with grading, foundations, and subgrade and pavement requirements. The recommendations may be divided into three parts; geotechnical special conditions, grading and foundation, and subgrade and pavement.

6.4.2 Special Geotechnical Conditions. The special conditions portion of the report shall consider ground water, frost susceptibility, erosion potential, soils creep, landsliding, expansive soils, soil corrositivity, and any other special geotechnical conditions the Geotechnical Engineer becomes aware of.

6.4.3 Grading and Foundation. The grading and foundation portion shall include data regarding the distribution and engineering characteristics of the various soil materials, data about groundwater levels, recommendations about the need for mitigation measures for special geotechnical conditions, grading criteria, foundation design criteria, and any other information the Geotechnical Engineer considers pertinent.

6.4.4 Subgrade and Pavement. The subgrade and pavement portion shall include data regarding the distribution of various subgrade materials and design tests (such as CBR, R-value, and/or plate bearing) to be made. Where soils are susceptible to erosion,

recommendations shall be made for preventing the undermining of pavements. The pavement design may be included in this report or prepared and submitted separately by the Engineer responsible for preparation of the construction plans and contract documents.

Chapter 7 Grading

Chapter 7 Grading

Section and Topic **Page**

7.1 General 1

7.2 Grading Requirements for Subdivisions 1

Chapter 7 Grading

7.1 General

7.1.1 All proposed developments shall be graded such that storm water runoff is conducted away from proposed building sites to swales constructed in drainage easements along lot lines, to public rights-of-way, or to another approved drainage course.

7.1.2 Reserved.

7.1.3 Reserved.

7.1.4 Reserved.

7.1.5 No filling will be allowed in any areas of land within a proposed subdivision or other type of development which lies either wholly or in part within the flood plain of a river, stream, creek, or lake unless under the terms of a permit granted by the U.S. Corps of Engineers and/or the City of Canton where applicable.

7.2 Grading Requirements for Subdivisions

7.2.1 Reserved.

7.2.2 The longitudinal slope along a rear yard drainage easement shall be not less than 1.0 percent but not so great as to cause erosion.

7.2.3 All grade point elevations shall be shown for each lot at the property corners and at the low and high points along the property lines.

7.2.4 The general direction of overland drainage in the rear yard shall be indicated on each lot by an arrow.

7.2.5 High and low street grade points, slope direction (by arrow) and the location of all inlets and drainage ditches shall be shown on the grading plan.

7.2.6 A maximum slope of three (3) feet horizontal to one (1) foot vertical shall not be exceeded for all terracing. The toe of the slope shall be located outside of drainage easements and natural drainage ways unless adequate drainage is provided.

7.2.7 Grading plans shall be drawn to a scale of one inch = 100 feet (1" = 100') or larger.

7.2.8 Grading plans shall include details of typical lot grading and drainage patterns intended to be used.

7.2.9 The grading plans shall show the contours with intervals of one (1) foot for land with a slope of one (1) percent or less, intervals of two (2) feet for a slope between one and one-tenth (1.1) and nine and nine-tenths (9.9) percent and contours of five (5) feet for land with a slope exceeding ten (10) percent.

7.2.10 All elevations shall be on the NAVD 1988 vertical control datum.

7.2.11 Drainage patterns other than those shown in standard details may be used and will be acceptable for review. Details of the typical lot drainage pattern shall be shown on the grading plan with all grade control points identified.

7.2.12 In general, for streets with ditches and no curbs, elevation of the front lot line shall be at least six (6) inches above the centerline of the road.

7.2.13 All non-conforming lots with drainage patterns other than those in standard details shall be noted on the grading plan.

7.2.14 Storm sewers and inlets shall be placed in rear yard swales at low (sump) points where front to rear grading is used.

7.2.15 Reserved.

7.2.16 Drainage swales shall be constructed entirely within the easements.

7.2.17 The grading plan shall show the minimum ground elevation adjacent to buildings for each lot.

Chapter 8 Street Design and Pavement Thickness

Chapter 8
Street Design and Pavement Thickness

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Chapter 8 Street Design and Pavement Thickness

8.1 General

8.1.1 This Chapter sets forth the design and technical criteria to be used in the preparation of all roadway plans. Where design information is not provided herein, "A Policy on Geometric Design of Highways and Streets" (AASHTO Standards) as published by AASHTO's most current edition (English units) shall be used.

8.1.2 Functional Street Classification.

8.1.2.1 Major Street Plan. The functional street classification of the City's street network is shown in the most current Canton Comprehensive Plan. The right-of-way requirements are noted in Article 7 of the Subdivision Ordinances of the City of Canton. The functional classification is a system used to group public roadways into classes according to their purpose in moving vehicles and providing access to the public.

8.1.2.2 Major Collector. A major collector street is a general term denoting a roadway designed or operating with the following characteristics:

A. Posted speed limit of greater than or equal to 35 miles per hour.

B. Anticipated traffic volume generally greater than 7,000 vehicles per day.

C. Continuous for two or more miles.

D. Designed to handle traffic volumes loading from and onto local, other collector, and arterial roadways.

E. Traffic control is provided generally by signs.

F. No on-street parking will be allowed.

8.1.2.5 Minor Collector. A minor collector street is a general term denoting a roadway designed or operating with the following characteristics:

A. Posted speed limits of greater than or equal to 30 miles per hour.

B. Anticipated traffic volume generally less than 7,000 vehicles per day.

C. Continuous for less than two miles.

D. Designed to handle traffic volumes loading from and onto local, other collector, and arterial roadways.

E. Traffic control is provided generally by signs.

F. On-street parking may be permitted.

8.1.2.6 Local Street. A local street is a general term denoting a roadway designed or operating with the following characteristics:

A. Posted speed limit not in excess of 25 miles per hour.

B. No criteria for traffic volumes.

C. Limited continuity.

D. Designed for ease of access to adjacent developments.

E. Traffic control is by signage or rules for uncontrolled intersections.

F. On-street parking permitted.

G. Does not intersect with an arterial street.

8.2 Roadway Design and Technical Criteria

8.2.1 Traffic Lane Widths.

8.2.1.1 The minimum traffic lane width shall be 11 feet. For arterial streets and streets with anticipated truck traffic count in excess of 3% of the total traffic count, the lane width shall be 12 feet.

8.2.1.2 In the design of local streets, the number of lanes for moving traffic will be a secondary consideration.

Table 8.1
Minimum Street Design Criteria

	Local			Collector		Arterial	
Design Elements	Cul-de-sac (3)	Single Family	Commercial, Industrial Multi-Family	Minor	Major	Minor	Regional or Primary
24-hour Volumes (vpd)	500 or less	2000 or less	2500 or less	<5000	>5000	10,000	15,000
Design Speed (mph)	-	-	-	35	40	45	50
Driving Lanes	-	-	2	2	2-4	4	4 or more
Right-of-Way (ft.)	60	66	66	66	80	100	100 or more
Roadway Width (ft.) (1)	29	33	39	39	41 or 49	41-53	65 or more
Lane Width (ft.)	-	-	11	11	11	12	12
Sidewalk (2)	5' detached	5' detached	5' detached	5' detached		5' detached	
Curb & Gutter	6" vertical	6" vertical	6" vertical	6" vertical		6" vertical	
Min: Max. Grade (%)	0.5-8.0	0.5-8.0	0.5-8.0	0.5-7.0		0.5-6.0	
Curb Return Radii (ft.)							
- intersect local	13.5	13.5	13.5	20		-	
- intersect collector	20	20	20	25		30	
- intersect arterial				30		35	
Horizontal Curve Radius (ft.)	150	150	300			AASHTO Standards	
Vertical Alignment Control	---------- AASHTO Standards ----------						
Grade at Intersection (%)							
- intersect local	3	3	3	-	-	-	
- intersect collector	2	2	2	2		-	
- intersect arterial				2		2	

(1) All dimensions are measured to back of curb.
(2) Where sidewalk is attached to curb, sidewalk shall be one foot wider.
(3) Non-residential cul-de-sac dimensions will differ

8.2.2 Separate Turning Lanes.

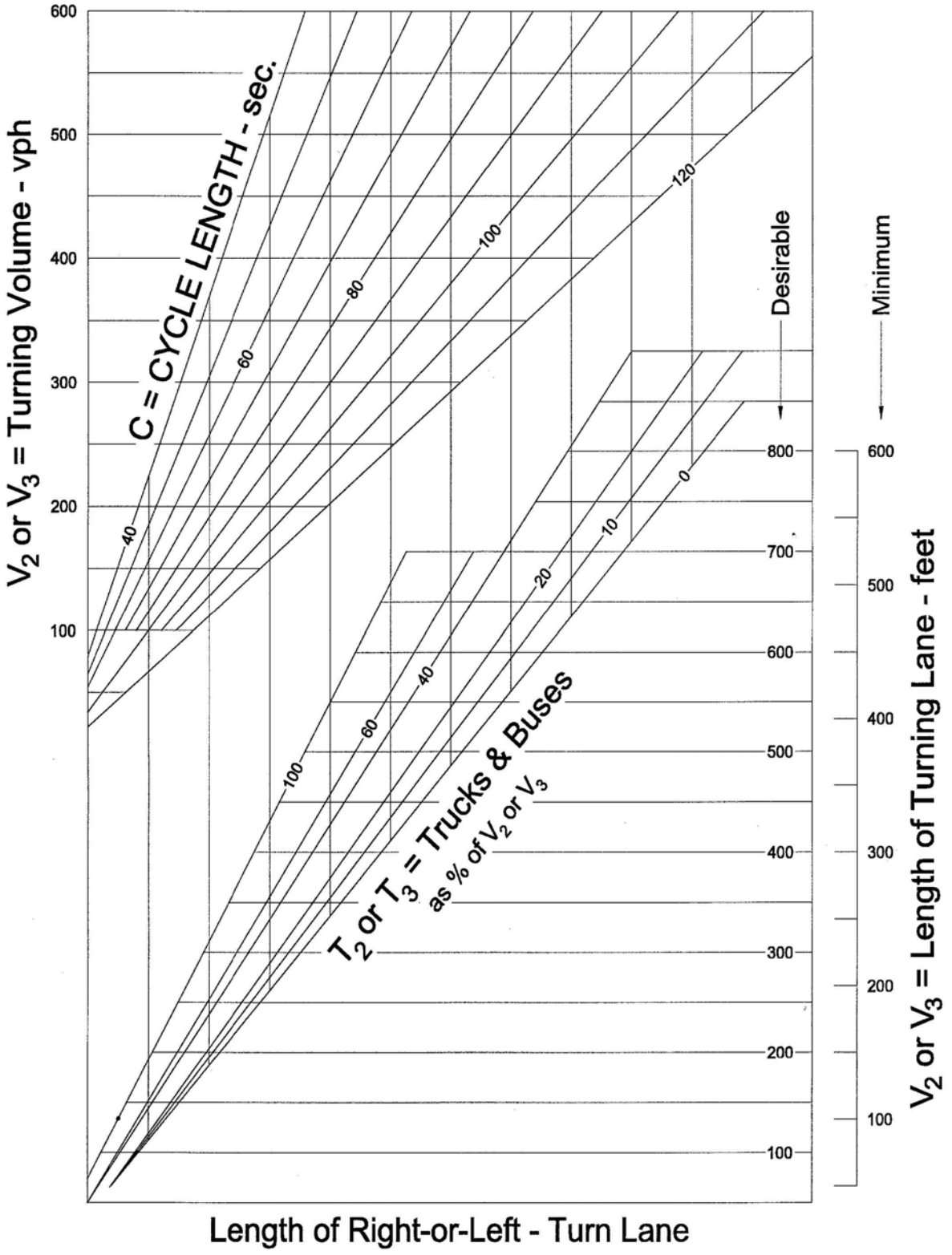
8.2.2.1 Separate turning lanes may be constructed on arterial and collector streets but will, as a rule, not be found on local streets.

8.2.2.2 Where separate turning lanes are constructed on the basis of a capacity analysis at the intersection, a width of 12 feet will be used for arterial streets where truck traffic is involved and 11 feet in width for other streets.

8.2.2.3 Left-turn Lane Storage Lengths for New Facilities.

8.2.2.3.1 Left-turn lane storage design at both signalized and unsignalized intersections for proposed street design plans may be determined from Figure 8.1. New streets will use the desirable lengths. Minimum design lengths will only be permitted under constraints imposed by geometrics of existing streets. Lengths of dual left-turn lanes shall be independently designed.

Figure 8.1: Design of Left-Turn Storage Length Volume-Based Nomograph For At-Grade Signalized Intersections



8.2.3 Parking.

8.2.3.1 Parking lanes will not be provided on arterial or major collector streets.

8.2.3.2 No diagonal or perpendicular parking will be allowed on any City street unless approved by the City Council.

8.2.3.3 Where on-street parking is provided on collector streets, the parallel lane width shall be a minimum of eight (8) feet, which would include the gutter pan.

8.2.4 Medians.

8.2.4.1 Generally, medians will be built only on arterial streets. The width may vary anywhere from a minimum of 16 feet to a maximum of 50 feet. At intersections, medians may be used to provide for separate left-turn storage lanes.

8.2.4.2 Medians and boulevards are not desired on local and collector streets. However, when permitted, the median or boulevard shall conform to the same design standards as set forth for arterial streets. No bushes or shrubbery may be placed in any median.

8.2.5 Design Speed. The highway design speed shall be used to establish features such as superelevation rate, critical length of grade, vertical and horizontal curves, intersections, etc. See Table 8.1 for design speeds.

8.3 Sidewalks

8.3.1 Location. Sidewalks shall be constructed on both sides of all roadways unless specifically waived by the City. Generally, the sidewalks shall be located two (2) feet from the property line within the street right-of-way.

8.3.2 Sidewalk Curb Ramps. State law requires that curb ramps be installed at all intersections and at certain mid-block locations for all new construction or reconstruction of curb and sidewalk. Curb ramps shall be constructed in accordance with the City of Canton Standard Plates. Curb ramps may be shown at all curb returns or called out by a general note on the development plans, but must be shown (located) at all "T" intersections. Whenever referencing a curb ramp, specify the City of Canton Standard Plates to be used to construct that ramp.

8.4 Bicycle Paths

The most current AASHTO Guide for the Development of Bicycle Facilities shall be used as a design guide for the design of bicycle paths. A bicycle path, also referred to as a shared use path, is defined as a bikeway physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way. Bike paths may also be used by pedestrians, skaters, wheelchair users, runners, and other non-motorized users.

8.5 Drainage

Drainage systems shall be designed in accordance with Chapter 11-Drainage Improvements. Development plans, including the drainage report, shall be considered as part of the street design and will be required for concurrent review with the street construction plans. Safe conveyance of traffic is the major function of streets; the storm drainage function of the street must therefore be designed to the limits set forth in Chapter 11-Drainage Improvements.

8.5.1 Valley Gutters. Valley gutters shall be constructed in accordance with the City of Canton Standard Plates. Valley gutters are not permitted across collector or arterial streets, nor are they allowed on streets with storm sewer systems.

8.5.2 Inlets. Inlets shall be located to intercept the curb flow at the point curb flow capacity is exceeded by the storm runoff. Refer to Chapter 11-Drainage Improvements for curb capacity. Inlets shall also be installed to intercept crosspavement flows at points of transition in superelevation. Due to the presence of curb ramps, inlets are not allowed in the curb return, but will be located at the tangent points of the curb returns. In general, inlets shall be placed on the upstream side of the intersection so as to intercept the water before it reaches the pedestrian crosswalk.

8.5.3 Cross-slope. Except at intersections, or where superelevation is required, streets, in general, shall be level from top of curb to top of curb (or flowline to flowline) and shall have a one and one-half (1.5) percent to three (3) percent crown as measured from centerline to lip of gutter, or lip of median gutter to lip of outside curb on roadways with medians. Where the crownpoint is not centered in the street, the crownpoint can be no further out than the quarter point of the street.

8.5.4 Temporary Erosion Control. Temporary erosion control is required at the ends of all roadways that are not completed due to project phasing, subdivision boundaries, etc., in accordance with Chapter 12-Erosion Control.

8.5.5 Sidewalk. Storm water from concentrated points of discharge shall not be allowed to flow over sidewalks, but shall drain to the roadway by use of storm sewers. Sidewalk chases will not be allowed unless specifically approved by the City. If permitted, sidewalk chase sections shall not be located within the driveway.

8.6 Horizontal Alignment

8.6.1 Horizontal Curves. Any angular break in horizontal alignment of more than two (2) degrees shall require a horizontal curve (Table 8.1).

8.6.2 Curb Return Radius. Minimum curb return radius shall be as shown in Table 8.1. Where truck traffic is significant, curb return radii shall be provided in accordance with AASHTO standards.

8.6.3 Construction Signs and Barricades. Design and construction shall comply with the requirements of the Manual on Uniform Traffic Control Devices, latest edition. Details shall be shown on the construction drawings, and installation shall be provided by the Contractor and/or Owner.

8.6.4 Superelevation. The use of superelevation is discouraged for all streets. However, where superelevation is required for curves, arterial streets and collector streets,

horizontal curve radius and superelevation shall be in accordance with the recommendations of the AASHTO standards. Superelevation shall not be used on local roadways. All roadway designs utilizing superelevation are subject to review and acceptance by the City.

8.6.5 Spiral Curves. Spiral curves shall not be used on streets within the City (State Highways excluded) except upon written acceptance of the City.

8.6.6 Cul-de-sacs. The following criteria shall be used for the horizontal geometry of cul-de-sac turnarounds.

(1) Minimum property line radius 55.0 feet for residential and 65 feet for non-residentail.

(2) Minimum back of curb radius 40.5 feet for residential and 50.5 feet for non-residential.

(3) Maximum length of cul-de-sac 500.0 feet measured along centerline, between the radius point of the turnaround and the R.O.W. line of the abutting street

8.6.7 Spacing and Offsets. Four-legged intersections will normally be spaced at least 300 feet apart. Where tee (T) intersections are used, the centerlines of streets not in alignment must be offset a minimum of 150 feet.

8.6.8 Transition Length. If lanes are added, deleted, or adjusted, it will be necessary to construct a transition section for the safe conveyance of traffic. The following formula shall be applied to the taper or lane change necessary for this transition:

$$L=WS^2/60$$

where:

L = Length of transition in feet
W = Width of offset in feet
S = Speed limit or 85th percentile speed

8.7 Vertical Alignment

8.7.1 Changing Grades. The use of grade breaks, in lieu of vertical curves, is not encouraged. However, if a grade break is necessary and the algebraic difference in grade does not exceed eight tenths (0.008 ft/ft) of a percent, the grade break will be permitted.

8.7.2 Vertical Curves. Design controls for vertical alignment must be in accordance with AASHTO standards. When the algebraic difference in grade (A) is at or exceeds eight-tenths (0.008 ft/ft) of a percent, a vertical curve is to be used. All vertical curves shall be labeled, in the profile, with length of curve (L) and K (defined as L/A).

8.7.3 Intersections. The following criteria shall apply at intersections.

8.7.3.1 The grade of the "through" street shall take precedence at intersections. At intersections of roadways with the same classification, the more important roadway, as determined by the City, shall have this precedence.

8.7.3.2 The elevation at the end of curb return on the through street is always set by the grade of the through street in conjunction with normal pavement cross-slope.

8.7.3.3 Carrying the crown of the side street into the through street is not permitted.

8.7.3.4 Dipping the flowline to the extent that the lip of gutter is dipped is not permitted, except as specified by Standard Plates concerning curb opening inlets. Tipping an inlet for the benefit of drainage is also not permitted.

8.7.3.5 A more detailed review shall be performed for arterial-arterial intersection to maximize driveability.

8.7.3.6 Flowline profiles and pavement cross-slopes shall be shown through an intersection until a normal cross-section is obtained. Elevations on a 15foot grid shall be shown on a plan view drawing. This information shall be submitted using a scale of 1" = 20' horizontally and 1" = 2' vertically.

8.7.3.7 Parabolic or curved crowns are not allowed. In no case shall the pavement cross-slope at intersections exceed the grade of the through street.

8.7.3.8 The rate of change in pavement cross-slope, when warping side streets at intersections, shall not exceed one (1) percent every twenty-five (25) feet horizontally on a local roadway, one (1) percent every thirty-seven and one-half (37.5) feet horizontally on a collector roadway, or one (1) percent every fifty-six and one-half (56.5) feet horizontally on arterial roadways.

8.7.4 Curb Returns. Minimum fall around curb returns shall be one-half of one (0.5) percent.

8.7.5 Connection with Existing Roadways

8.7.5.1 Existing grade(s) shall be shown for a sufficient distance to assure that horizontal and vertical curve requirements are being or can be met with field verified as-builts showing stations and elevations at twenty-five (25) foot intervals. In the case of connection with an existing intersection, these as-builts are to be shown within a one hundred (100) foot radius of the intersection. This information shall be included in the plan and profile that shows that proposed roadway. Limits and characteristics of the existing improvement are the primary concern in the plan view. Such characteristics include horizontal alignment, offset intersections, limits of the improvements, etc.

8.7.5.2 Previously approved designs for the existing improvement are not an acceptable means of establishing existing grades, however, they are to be referenced on the construction plan where they occur.

8.7.5.3 The basis of the as-built elevations shall be the same as the design elevations (both flowline or both top of curb, etc.) when possible.

8.8 Off-Site Design

The design grade, and existing ground at that design grade, of all roadways that dead end due to project phasing, subdivision boundaries, etc., shall be continued, in the same plan and profile as the proposed design, for at least three-hundred (300) feet or to its intersection with another roadway. This limit shall be extended to six-hundred (600) feet when arterial roadways are being designed.

8.9 Construction Traffic Control

8.9.1 Pedestrian Traffic

8.9.1.1 Every precaution shall be taken to ensure that construction work does not interfere with the movement of pedestrian traffic, which shall be maintained on the sidewalk at all times and flagmen provided for guidance as necessary.

8.9.1.2 Where an excavation interrupts the continuity of the sidewalk, the Contractor shall provide suitable bridge or deck facilities, to be supplemented by the use of such proper devices and measures as prescribed in the Manual on Uniform Traffic Control Devices, latest edition, for the safe and uninterrupted movement of pedestrian traffic. The edges or ends of the pedestrian bridge or decking shall be beveled or chamfered to a thin edge to prevent tripping.

8.9.1.3 Temporary diversion walkways shall be hard surfaced and electric lighting shall be provided and kept continuously burning during hours of darkness, when required by the City.

8.9.1.4 Unless otherwise authorized by the City, pedestrians shall not be channeled to walk on the traveled portion of a roadway.

8.9.1.5 Under certain conditions, it may be necessary to divert pedestrians to the sidewalk on the opposite side of the street. Such crossings shall only be made at intersections or marked pedestrian crossovers.

8.9.1.6 Facilities satisfactory to the City shall be provided for pedestrians crossing at corners, pedestrian crossovers, and public transportation stops.

8.9.2 Vehicular Traffic.

8.9.2.1 Construction work zone traffic shall be controlled by signs, barricades, detours, etc. which are designed and installed in accordance with the Manual on Uniform Traffic Control Devices, latest edition. A traffic control plan shall be submitted to and approved by the City, or designated agent, prior to start of any construction.

8.9.2.2 For construction of new facilities, traffic control should strive to keep the motorist from entering the facility. The primary means to accomplish this are by use of temporary barricades, located in advance of the construction area and

with appropriate signing. New construction shall not be opened to traffic, and the construction traffic control removed, without the approval of the City.

8.9.2.3 The details of the traffic control plan must be shown on a map. For minor projects or local roadways, a neat sketch of the roadways and the proposed control devices will suffice. For major projects or major roadways, the traffic control plan shall be superimposed on as-builts, construction plan drawings, or other detailed map.

8.9.2.4 The Manual on Uniform Traffic Control Devices, latest edition, shall be the basis upon which the traffic control plan is designed, in concert with proper prudent and safe engineering practice. All necessary signing, striping, coning, barricading, flagging, etc., shall be shown on the plan.

8.9.2.5 Any plan for traffic control during construction that indicates a complete closure of an arterial or collector street must show detour routes and must be approved by the City. Requirements as to rerouting of traffic, signing, time of closure, and length of closure will be determined on a case-by-case basis. When a local street is to be closed to traffic, the City must be notified, preferably 24 hours in advance.

8.9.2.6 Directional access on roadways may be restricted (minimum travel lane width in construction area is ten [10] feet), but proper controls including flagging must be indicated. Removal of on-street parking shall be considered, and noted where applicable.

8.10 Speed Change Lanes

The design of the arterial street system depends upon the proper control of access to developments. The location and design of access points must minimize traffic hazards and interference to through-traffic movements. In order to ensure proper access control, the following standards for deceleration lanes have been established.

8.10.1 Where Required. Speed change lanes may be required along segments of arterial or collector streets if the proposed development constitutes a potential for creating a traffic hazard or unnecessarily impedes through-traffic movements as determined by the Traffic Impact Report or the City. A high volume access must be provided with a turning or speed change lane to allow the driver to maneuver out of the main travel lanes before slowing down. Speed change lanes and left-turn lanes must be provided in the center or median of the road for left-turning traffic at a high volume access. If such lanes cannot be provided, left turns will be restricted.

8.10.1.1 Speed change lane for right-turning movements will be required according to Table 8.2:

Table 8.2: Volume Warrants For Speed Change Lanes For Right-Turning Movements

POSTED SPEED OF STREET IN MPH					
	Less than 25	26 to 40	41 to 50	51 or greater	For
If the design hour volume of the highway lanes will exceed	500 1400	400 1200	200 800	150 600	2-lane streets 4 or more lanes
and the designated volume of the access approach will exceed	50 70	40 60	20 40	15 25	2-lane streets 4 or more lanes

For streets with four or more through travel lanes, design hour volumes shall be measured only in the direction of the access approach.

8.10.1.2 For left-turning movements, speed change lanes will be required according to Table 8.3:

Table 8.3: Volume Warrants For Speed Change Lanes For Left-Turning Movements

POSTED SPEED OF STREET IN MPH					
	Less than 25	26 to 40	41 to 50	51 or greater	For
If the design hour volume of the highway lanes will exceed	500 1000	400 900	200 600	150 400	2-lane streets 4 or more lanes
and the left-turning design hour volume into the access approach will exceed	50 70	40 60	20 40	15 25	2-lane streets 4 or more lanes

For streets with four or more through travel lanes, design hour volumes shall be measured only in the direction of the median speed change lane.

8.10.1.3 For both tables, where the existing street design hour volume is below the values in the tables, a 20th year prediction shall be made and compared to the table.

8.10.1.4 Where public safety so requires, due to specific site conditions, such as sight distance, a turn lane may be required even though the warrants in Tables 8.2 and 8.3 are not met. Where the design hour volume of the street is twice the street design hour volume in Tables 8.2 and 8.3, the City may require a minimum speed change lane for any access approach.

8.10.2 Speed Change Lane Design

8.10.2.1 On highway arterial and collector streets in the City, the design of acceleration/deceleration lanes shall meet the minimum requirements as shown in Tables 8.4 and 8.5, providing sufficient off-site right-of-way is available. These

absolute minimum requirements were developed recognizing the severe limitations that currently exist on right-of-way availability for most of the urban street network. Where grades are significant, modifications to these lengths will be required by the City. If off-site right-of-way is insufficient, lanes will be designed to maximize the use of available right-of-way at the time that construction plans receive final approval.

Table 8.4: Acceleration Lane and Taper Lengths

(1)SPEED (MPH)	LANE LENGTH		TAPER LENGTH
	Stop Condition	From 15 mph (2)	
30	150’	125’	120’
35	175’	150’	150’
40	250’	200’	180’
45	300’	250’	180’

(1) 85th percentile speed.
(2) Assumes vehicles start at 15 miles per hour.

Table 8.5: Deceleration Lane and Taper Lengths

SPEED (MPH)	LANE LENGTH		TAPER LENGTH
	15 mph Turn*	Stop Condition	
30	100’	125’	120’
35	125’	150’	150’
40	175’	225’	180’
45	200’	250’	180’

* Assumes vehicle turns at speed of 15 mph at the end of the deceleration lane.

8.10.3 Exemptions. Requests for exemption from the requirements for a deceleration lane shall be based upon a traffic engineering study that presents trip generation data for the proposed development in terms of impacts upon through-traffic flows. Such requests shall be reviewed by the City and may be approved, except that such an approval cannot be granted if through-traffic would be impeded more than three (3) percent of the total time or more than five (5) percent of the time during peak traffic flow periods or if other unique circumstances warrant special design considerations.

8.11 Pavement Thickness

Design of pavement thickness for collector and arterial streets and local streets in industrial and commercial zoned areas shall be based on AASHTO Guide for Design of Pavement Structures, latest edition. Pavement design shall be based on an inherent reliability of 75 percent. For traffic conditions where the equivalent 18 kip/single axle loading is less than 1,000,000, the low-volume road design method may be used. Recommendations and subgrade properties developed by the Geotechnical Exploration Report shall be used in the design of the pavement structure.

8.11.1 Industrial and Arterial Streets must be designed for pavement thickness on an individual street-by-street basis. However, in no event may the pavement thickness be less than that specified in Table 8.6. Local Residential Streets need not be designed on

an individual basis, but must meet the minimum pavement thickness as set forth in Table 8.6.

8.11.2 Minimum compressive strength for Portland Cement concrete paving shall be 4000 psi at 28 days.

8.11.3 Traffic Data. Where traffic data is available, actual counts shall be used along with projections of traffic growth in determining the pavement design. If traffic data is not available, Table 8.7 may be used to provide data for the pavement design. Traffic data for all arterial streets will be determined by the City.

Table 8.6 Minimum Pavement Thickness Requirements

	Local Residential Streets	Commercial, Industrial & Collector Streets	Arterial Streets
Portland Cement Concrete (Requires Aggregate Cushion)	6”	8”	8”
Asphaltic Concrete With Aggregate Base	4”AC 6” Aggregate	5” AC 9” Aggregate	6” AC 12” Aggregate

Table 8.7 Traffic Volumes

Street Classification	ADT (2 way)	No. of Lots	18-kip ESAL Traffic	AASHTO Traffic Level
Cul-de-sacs and Local Residential	200	20-30	10,000-50,000	Low
Local, Local Multi-Family, or Commercial	300-700	60-140	50,000-300,000	Low
Local Industrial	200-700		400,000-600,000	Medium
Collector	7,000		400,000-1,000,000	High
Arterial	To be determined by the City			

8.12 Angle of Intersection and Offsets

8.12.1 Proposed streets and driveways must intersect one another at 90° angles or as close to 90° as topography permits (no less than 80°).

8.12.2 When "tee" intersections are used, the center lines of the streets not in alignment must normally be offset a minimum of 150 feet on local streets, and 300 feet on nonresidential local, and collector streets. On arterial streets, the minimum spacing must be increased to accommodate the storage lanes and tapers or 300 feet, whichever is greater.

8.13 Rural Subdivision Road Standards

8.13.1 Subdivisions outside of the City limits and within the extraterritorial platting jurisdiction shall comply with these requirements.

8.13.2 Access shall be determined by street classification. Roadway servicing the subdivision must be hard surfaced as approved by the City.

8.13.3 Driveways shall be hard surfaced and comply with Figure 5.3 of the Engineering Design Standards.

8.13.4 Minimum width of the driving surface shall be 24 feet with two foot shoulders. Ditches and driveways shall have a maximum side slope of 4:1.

8.13.5 If access to the subdivision is not on a paved road, the subdivision roads may have a gravel driving surface. If access to the subdivision is paved surface or planned for paved surfacing, or if the size of development creates a significant traffic impact, the subdivision roads shall be paved.

8.13.6 Gravel roads shall have an initial 3 inch lift of gravel covering the road bed, and a second lift of 3 inches of gravel within one year following the completion of construction. Asphalt roads shall be constructed in accordance with Table 8.6.

8.13.7 Culverts in the street right-of-way shall comply with county requirements. Flared end sections or slope concrete headwalls are required on all culverts within the road right-of-way.

8.13.8 The size of culverts shall be determined by a drainage study for the entire subdivision.

8.13.9 The City will be responsible for accepting final street and drainage plans and coordination of road access and approach permits with County, Township, and SDDOT officials.

8.13.10 Traffic control signs and street name signs shall be furnished and properly posted. Street names shall be approved by the City and County.

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Chapter 9 Sanitary Sewers

9.1 General Requirements

9.1.1 Design. The design for sanitary facilities shall be in conformance with the following.

1. "Recommended Standards for Wastewater Facilities Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers." 1990 Edition (Ten State Standards)

2. Requirements and Standards of the South Dakota Department of Environment and Natural Resources.

3. City of Canton Engineering Design Standards and Standard Specifications

4. City of Canton Standard Plates (hereafter referred to as Standard Plates).

5. South Dakota State Plumbing Code.

6. Uniform Plumbing Code and the International Association of Plumbing and Mechanical Officials.

7. Conflict - In case of a conflict between the above design standards, the most restrictive requirement shall apply.

9.1.2 Construction Standards. Construction standards shall be the most recent revision of the Standard Specifications and Standard Plates. All details, materials, and sewer appurtenances shall conform to these standards.

9.2 Preliminary Submittals

9.2.1 General. A preliminary report and plan shall be reviewed and accepted by the City prior to preparation of final construction drawings. Acceptance of these preliminary submittals shall constitute only a conceptual acceptance and shall not be construed as acceptance of specific design details. For developments with valid approved preliminary plans, this requirement will be omitted.

Information for sanitary sewer systems must be submitted as required by Chapter 10, Recommended Standards for Wastewater Facilities, 1990 Edition. The amount of detail required will vary with the complexity of the project.

9.2.2 Report. The report shall include, as a minimum, the following information:

1. Name of subdivision and developers and property owners.

2. Location and boundaries of development.

3. Area (in acres).

4. Type of development-Commercial, Residential, Industrial (or proportion of each).

5. Major individual commercial or industrial occupants (if any).

6. Type of sewage produced by major contributors identified above.

7. Volume of sewage produced by major contributors.

8. Estimated population density.

*9. Can developments adjacent to the development under study be served by the existing sewer (from the standpoint of geography, gradient and capacity)?

10. Does the planned sewer have adequate capacity to serve adjacent developments?

11. Estimated flow in planned sewer (cfs, mgd or other unit).

12. Proposed pipe size for planned sewer.

13. Proposed pipe size for force main, if applicable.

14. Information regarding proposed pumping station, if any.

a. Type.

b. Capacity.

15. Adequacy of receiving sewer system.

16. Estimated cost of planned facilities.

17. Time schedule for proposed development.

18. Method of financing proposed sewer system.

19. Proposed basement locations.

*Note: The City will furnish the design engineer with existing flow information within thirty (30) working days of receipt of a written request.

9.2.3 Preliminary Plan.

1. The plan shall be in accordance with the Subdivision Ordinance. Notations shall be made on the plan regarding the location of the nearest available sewer, the direction of the proposed sanitary sewer flow, and the necessity for any lift stations.

9.3 Determination of Flow

9.3.1 Lateral Sewers.

1. Discharge (QA) Average Daily Flow

   Equation 1: Area x Area Density x Rate = Average Daily Flow

   Equation 2: Number of Units x Unit Density x Rate = Average Daily Flow. Density for multiple dwelling units shall be not less than 2.5 persons/unit. Density for single family dwelling units shall be not less than 3.5 persons per unit.

2. Discharge (QP) Peak Lateral Sewer Flow

   Average Daily Flow x 400%-Peak Lateral Sewer Flow

3. Design Density and Rate-(See Paragraph 9.3.5)

9.3.2 Trunk Sewers.

1. Discharge (QA) Average Daily Flow

   Equation 1: Area x Area Density x Rate = Average Daily Flow

   Equation 2: Number of Units x Unit Density x Rate = Average Daily Flow

2. Discharge (QP) Peak Trunk Flow

   Average Daily Flow x 250% = Peak Trunk Sewer Flow

3. Design Density and Rate-(See Paragraph 9.3.5)

9.3.3 Area. Gross area shall be used in determining design flows and shall include streets and alleys but exclude parks, school grounds, and similar dedicated open space.

9.3.4 Special Design Densities. Special design densities shall be subject to approval by the City based on methodology provided by the design professional.

9.3.5 Density Design Table.

Land Use	Area Density	Unit Density	Rate*
Low Density Residential	6 units/acre	3 people/unit	100 gpcd
Med. Density Residential	12 units/acre	2 people/unit	100 gpcd
High Density Residential	25 units/acre	2 people/unit	100 gpcd
Office & Institutional	Special Design Density-dependent on water use		
Commercial	Special Design Density-dependent on water use		
Industrial	Special Design Density-dependent on water use		

*gpcd-gallons per capita per day

9.4 Facility Design

9.4.1 Capacity of Pipe. The Manning Equation shall be used to determine pipe capacities. The design Manning's (n) for all Pipe Materials:

"n" = 0.013

9.4.2 Velocity within Pipe.

Min. at peak flow = 2 feet per second (fps)

Max. at peak flow = 14 feet per second (fps)

9.4.3 Approved Pipe Materials. Refer to Standard Specifications.

9.4.4 Force Main Minimum and Maximum Velocity.

The minimum force main velocity shall be 2 feet per second.

Suction and discharging piping for lift stations shall be sized so that the maximum velocities do not exceed 5 feet per second and 8 feet per second, respectively.

9.4.5 Size of Sewer Pipe. No gravity sanitary sewer to be maintained by the City shall be less than 8" diameter. Minimum size of building sanitary sewer stubouts shall be 4" diameter. All sanitary sewer services other than single-family residential units (example: commercial, industrial, office, multi-family, etc.) shall be a minimum of 6" diameter. No private lateral sewer shall be less than six inches in diameter, however, eight-inch diameter sewers are recommended. Six-inch diameter pipe may be used as private laterals where there are relatively low flows, a small number of people to be served, future extensions are not anticipated, and the sewer is capable of handling the design

flows. The justification for using the six-inch pipe shall be provided by the design professional in writing. The possibility of cleaning problems shall be identified by the design professional and accepted by the development.

9.4.6 Depth of Sewer. Gravity sewers shall have a minimum depth of 7 feet where practical. They shall be deep enough to serve all basements, designed with a 2 percent grade on building sewers (absolute minimum of 1 percent). They should be well below the frost line at all points and lower than any water lines placed in the same street. Insulation shall be required above the sanitary sewer where the dimension from the finished grade elevation to the top of the pipe is 5 feet or less. (See the Standard Plates for pipe insulation details.) Risers on service stubouts shall be provided for sewers greater than 12 feet deep as measured at the building line. Maximum depth of sewer shall not exceed the depth recommended by the pipe manufacturer.

9.4.7 Alignment of Sewers. Sewers less than 24" diameter shall be straight between manholes with the following one exception: In subdivisions where street layouts are such that a straight alignment is not practical, sewers may be curved. The curvature must be concentric with the curvature of the street. The radius of curvature shall not be less than 200 feet for 8 inch diameter pipe. The pipe manufacturer's recommended maximum deflection may not be exceeded. All sanitary sewers on curved streets shall be located in the center of the street. Where it is not possible to maintain the centerline location on a curved street (ex: road centerline radius of curvature less than 200 feet), the sanitary sewer shall be located as close to the centerline as possible and at a distance of at least 10 feet from the back of curb.

9.4.8 Physical Requirements.

1. Minimum Manhole Diameter-48 inches

2. Maximum Manhole Spacing

Diameter of Sewer	Distance
15” or less	400 feet
Greater than 15”	500 feet

Note: Exceptions will be permitted within a development; however, said exceptions shall not be for more than 5 percent of the manholes in the development. Said exceptions shall not exceed 6 percent of the above distances.

3. Minimum Grade. Sewers shall have minimum grade sufficient to maintain 2 fps at peak flow. For low flow lines where feasible, a minimum grade of one percent shall be used. Minimum grade on building sanitary sewer stubouts shall be one percent.

4. Minimum Manhole Drop

Same pipe size-0.10 feet

Change in pipe size-match 0.8 depth point of all lines as a minimum, and match tops of pipes whenever possible.

5. Maximum Manhole Drop

Without drop connection - 1.5 feet as measured from invert to invert.

6. Manhole Covers, External Frame Seals and Markers. For approved types of manhole covers, refer to Standard Specifications. If the possibility of surface runoff cannot be avoided, a solid manhole cover, having an integral self sealing type gasket that can be bolted closed, must be used.

All manholes located outside dedicated street rights-of-way shall be designed and constructed with a bolt down-type cover, having an integral self sealing type gasket, and the manhole ring shall be bolted to the manhole cone unless otherwise directed by the City. Bolt down type covers may be required in other locations as directed by the City. A note shall be added to the construction plans indicating where the bolt down covers are required. Manhole markers shall also be used for all manholes outside dedicated street right-of-way. (See Standard Plates.)

Manhole external frame seals shall be required on all concrete street areas and unpaved surface areas (see supplemental standard specifications for types). A note shall be added to the construction plans to indicate where and what type is to be installed.

Plastic/fiberglass type manhole markers shall be used in areas outside of the dedicated street right-of-way, except for interstate areas, roadway right-of-way areas, and areas designated by the City. Steel delineator posts and markers shall be used in interstate areas, roadway right-of-way areas, and areas designated by the City (see the supplemental standard specifications and standard plates for types).

7. Access to Manholes. Manholes outside the street right-of-way shall be subject to the acceptance of the City. Manholes located outside of the street rights-of-way must be located in areas which allow direct access by maintenance vehicles.

8. Industrial Sewer Monitoring Facility. Any new building constructed or proposed to be constructed in an industrially zoned area with a floor space of greater than 5,000 square feet, and with a water meter size of greater than 3/4 inch and projected process wastewater flow greater than 5,000 gallons per day, or if otherwise required by the City, shall install a sewer monitoring facility prior to final building inspection approval. The monitoring facility shall normally be situated outside of the building on the user's premises. If the industrial user's service line ties into an existing city manhole and such manhole allows for safe sampling and isolation of the industrial user's discharge, the City may allow said manhole to serve as the industrial user's monitoring facility.

9. Crossings. Sanitary sewer crossings of storm sewers shall have no less than 6 inches of clearance. Special structural support and insulation will be required if there is less than 18 inches clearance. (See the Standard Plates for details.) The minimum horizontal clearance shall be 2feet. Clearance refers to the distance from the outside of the sewer pipe to the outside of the storm sewer pipe.

Sanitary sewer crossings of other utilities shall be done in accordance with Ten States Standards, State of South Dakota standards, and Standard Specifications and Standard Plates.

10. Standard Plates. See Supplemental Standard Specifications and Standard Plates for such details as manholes, drop connections, risers and other appurtenances.

11. "Dead end" manholes on line segments shall be extended beyond the midpoint of the last serviced lot.

12. Sanitary sewer lines ending at development phase boundaries that do not terminate with a manhole shall be ended with a bell end section of pipe and watertight plug. A one foot or less section of pipe with a glued on cap inserted into the bell end of the pipe will be allowable as a watertight plug. Couplings will not be allowed for this type of connection unless there is a change in pipe material.

13. Private sewer service clean-outs will not be allowed in the public right-of-way unless minimum spacing requirements dictate the need for cleanout(s) in the right-of-way. All clean-outs shall be protected with approved cover protection (see Standard Plates).

14. Manholes located at the end of cul-de-sacs shall be located 5 to 10 feet from the back of curb and gutter.

9.4.9 Sewer Services.

9.4.9.1 Connections to Manholes. Individual services may not be connected into manholes.

9.4.9.2 Regular Services.

1. Each structure shall be served by a separate service line connected to a public or private sanitary lateral sewer.
    - The service should be perpendicular to the lateral sewer line in the public right-of-way.
    - Single-family attached housing (twin homes, duplexes, etc.) will be required to have separate services for each living unit.
    - The service for each living unit shall not be located under the property of the adjacent living unit.
    - If a floor drain is installed in a garage or an unattached building, an approved oil and grease separator shall be installed to intercept oils and greases before entry into the City's collection system. There shall be no direct discharge from a floor drain in a garage or unattached building to the City's collection system.
    - For new construction, there shall be a minimum of 10 feet of horizontal separation between the sanitary sewer service and the water service from the main to the structure.

2. Sewer services must meet all the requirements of the Supplemental Standard Specifications and Standard Plates.

3. All platted lots of a proposed subdivision are to front on and have a separate sewer service to a sanitary sewer main without crossing any adjacent properties. Additional sewer services will be required for each additional principal structure on a given lot.

4. Sewer services across one lot to provide service to an adjacent lot in a proposed subdivision, may be approved, provided that all of the following conditions are met:

a. Proposed subdivision does not exceed two lots.

b. A private utility easement 20 feet in width is provided across the burdened lot (to be occupied by sewer service only).

c. The City determines that a sewer main extension will not be necessary to perpetuate the system and in all likelihood no future development of abutting properties will benefit from a main extension.

5. Sewer services shall typically be located 10 feet from the downstream lot corner.

9.4.9.3 Backflow Preventer

1. All new residential and non-residential structures with a sanitary service line shall have a backflow preventer installed in the service line.

2. The backflow preventer shall be installed: (1) in a concrete manhole within ten feet of an exterior wall of the structure, or (2) in a PVC riser in conjunction with a Series 869 DWV Backwater Valve as manufactured by Sioux Chief within ten feet of an exterior wall of the structure, or (3) within an accessible space inside the structure.

9.4.9.4 Sanitary Sewer Service Cleanouts. A sanitary sewer cleanout shall be installed on each new sanitary sewer service installed for all residential and non-residential structures. The sanitary sewer service cleanout shall be installed within five feet of an exterior wall of the structure or immediately downstream of a backflow preventer installed outside the structure. Cleanouts will not be allowed in the public right-of-way unless minimum spacing requirements dictate the need for cleanout(s) in the right-of-way.

9.4.10 Sewage Lift Stations. The Supplemental Standard Specifications and Standard Plates for sewage lift stations shall be used for all stations unless a separate design is determined necessary by the City. Each pumping station shall be provided with a minimum of two pumps, each having a capacity sufficient to pump the peak design flow.

Temporary lift stations with reduced design requirements may be considered by the City where future trunk sewers are planned to eliminate the need for the station within five years from the installation date of the lift station.

No sanitary sewage shall be allowed to be discharged into a newly constructed lift station wet well until final completion is made and notification is made by the City assuring operation responsibilities.

9.4.10.1 Specific Equipment Required. The sewage lift station shall be supplied with, but not be limited to, the following specific items:

1. Separate Dry Well and Wet Well (Wet Well may have submergible pumps)

2. Flow Meter

3. Secondary Power Supply-Engine Generator System

4. Automatic Transfer Switch for the Secondary Power Supply

5. Variable Frequency Drive (VFD) for All Motors - The requirement for VFDs may be deleted if it is determined unnecessary by the City.

9.4.10.2 Wet Well Design. The wet well design shall be coordinated with pump sizing in order to avoid frequent on/off cycling of the pumps. To prevent septicity, inflow into the wet well without pumping should not exceed approximately 30 minutes.

Cycle time is the total time between starts of an individual pump and can be determined by comparing the volume between the "on" and "off" levels in the wet well with the pump capacity. Cycle time is computed as follows:

Where:

CT = Cycle Time (minutes),

V = Wet Well Volume between On and Off Levels (gallons),

D = Rated Pump Capacity (gallons per minute), and

Q = Wet Well Inflow (gallons per minute),

$CT = V/(D-Q) + V/Q$

With a given wet well volume and pumps of uniform pumping rate, minimum cycle time will occur when the rate of inflow is equal to one-half of the discharge rate of the individual pump under consideration and the formula for cycle time simplifies to $CT = 2V/Q = 4V/D$. An effective wet well volume of at least 2.5 times the discharge rate of the pump is required.

The operating volume of the wet well shall be designed to provide the following maximum motor starting times at the design pumping rates.

Motor Size, hp	Maximum Motor Starting Times
0 - 25	6 starts per hour

26 - 35	5 starts per hour
36 - 60	4 starts per hour

9.4.10.3 Pump Design. The operating speed of the pumps shall not exceed 1800 rpm. The test sphere minimum diameter shall be no less than three inches in diameter. The minimum suction and discharge diameter shall be no less than four inches in diameter.

9.4.10.4 Engine Generator Design. The engine generator shall be designed to operate each pump simultaneously but start each pump separately. If more than two pumps are used, the engine generator shall be designed to start the pumps necessary for the firm pumping capacity of the station simultaneously. It shall be at the City's discretion to change the generator sizing requirements when the size of the lift station warrants it. The engine generator system shall be a 4-cycle water-cooled type. The generator shall be supplied with an automatic transfer switch. An enclosure for the automatic transfer switch shall be supplied and sized large enough to contain the station on/off switches, telephone termination boxes and other necessary controls. The generator shall be supplied with all accessories which make it a complete operating system.

9.4.10.5 Power Supply. The power supply shall be 240 volt, 60 Hz, 3 phase unless 480 volt power supply is required and/or available. However, where supply is not available power supply may be 1 phase with written approval from the City.

9.4.10.6 Access Road to the Lift Station. An access into the lift station will be required and shall be shown on the construction drawings. The access road shall meet minimum thickness and materials standards for streets. The surfacing used shall be asphalt or concrete.

9.4.10.7 Lift Station Site Fencing. A fence shall be required and constructed around the perimeter of the lift station generator or the lift station site. The City shall determine if a fence is required. The fence shall be as detailed and specified in the Standard Plates.

9.4.10.8 Site Landscaping. The Contractor shall provide a 2-foot wide rocked area around the electrical box, wetwell, drywell, and generator (if applicable). The rock shall be landscaping rock or quartzite. Remaining area shall be grassed. The Contractor shall maintain the grass areas by watering, fertilizing, reseeding, mulching, and mowing until the grass has established a 2-inch catch of grass. The Contractor shall immediately reseed and mulch areas that show bare spots at no additional cost.

9.4.10.9 Odor Control. Odor control shall be provided at the lift station and/or the force main discharge where it is determined to be a detectable problem or shown through a design analysis. The design engineer shall perform an analysis showing the modeled results of the odor control analysis. Odor control will be required at the lift station and force main discharge point if it is found to be a detectable problem in the analysis or in the field as determined by the City within the two-year warranty period.

9.5 Sanitary Sewer Easements

Sanitary sewer easements shall be obtained for all sanitary sewers located on private and public property. Sanitary sewer easements shall have a minimum width of thirty (30) feet. In addition, temporary easements may be required for construction.

Sanitary sewer easements shall be accessible for City maintenance vehicles to drive on to maintain the sanitary sewer. All manholes shall be accessible to City maintenance vehicles. If determined necessary by the City, the area over the sanitary sewer shall be benched to provide an access trail along the line and/or to the manholes.

The following Table 9.5 lists the minimum easement widths for sanitary sewer with a pipe diameter of 30 inches or less. The minimum easement widths shall be used when preparing plans. The easement widths may be required to be wider depending upon specific site conditions.

Table 9.5
Minimum Required Easement Width for Sanitary Sewer
(for 30-inch pipe and smaller)

Pipe Depth (feet)	Minimum Easement Width Required (feet)
8	30
9	30
10	30
11	30
12	30
13	30
14	30
15	34
16	36
17	40
18	42
19	46
20	48
21	52
22	54
23	58
24	60
25	64
26	66
27	70
28	72
29	76
30	78

Chapter 10 Water Mains

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Chapter 10 Water Mains

10.1 General

10.1.1 This Chapter sets forth the design and technical criteria to be used in the preparation of all water main plans. Where design information is not provided herein, the following standards (most current edition) shall be used:

1. "Recommended Standards for Water Works Great Lakes-Upper Mississippi River Board of State Sanitary Engineers." (Ten State Standards)

2. Requirements and Standards of the South Dakota Department of Environment and Natural Resources.

3. American Water Works Association Standards.

4. South Dakota Plumbing Code.

5. Uniform Plumbing Code of International Association of Plumbing and Mechanical Officials.

6. National Fire Protection Association (NFPA)

7. Conflict - In case of a conflict between the above design standards, the most restrictive requirement shall apply.

10.1.2 Construction Standards. Construction standards shall be the most recent revision of the City of Canton Standard Specifications and the City of Canton Standard Plates. All details, materials, and water appurtenances shall conform to these standards.

10.1.3 Where a conflict occurs between the above standards, the most restrictive requirement shall apply.

10.1.4 An average daily water flow rate of 1,500 gallons per minute with a residual pressure of 20 psi at the most remote hydrant shall be maintained for all residential developments. Multifamily, commercial, and industrial developments shall be designed according to acceptable methods to determine their water flow demands. The Insurance Services Office (ISO) fire flow guidelines may be used as an acceptable method of calculating water flow rates.

10.1.5 Arterial or feeder mains, 12-inch diameter or larger, will be located on mile roads. Wherever possible, they shall also be located on half-mile roads, but never more than 3000 feet apart.

10.1.6 Minimum size water main shall be 8-inch diameter, except that dead end water mains less than 500 feet in length may be 6-inch diameter. Dead-end mains longer than 500 feet shall be 8-inch diameter.

10.1.7 Water mains on cul-de-sacs must terminate with a fire hydrant.

10.1.8 Depth of cover shall be 6-feet minimum. Where a dip must be placed in a main in order to pass under another utility, the length of the deeper main shall be kept to a minimum, and bends shall be used to achieve the desired offset. The existing main may be lowered in place, if this method is practical and acceptable to the City.

10.1.9 Disinfection, bacteriological and hydrostatic tests shall be required in accordance with the Canton Standard Specifications before acceptance.

10.1.10 Mains shall be located so as to best conform with the layout of existing facilities. In streets where no pattern has been established, mains shall generally be located ten (10) feet to the north or west of the center line. A minimum horizontal separation of ten (10) feet shall be provided between water mains and sanitary mains and storm sewer mains except as allowed in the Ten States Standards and as noted in Chapter 4 of the City of Canton Engineering Design Standards.

Water mains shall be at least twenty (20) feet away from buildings and under paved areas whenever possible. Water mains will not be allowed under buildings and must be encased under enclosed walkways and tunnels.

10.1.11 Finish grades for all hydrants shall be shown on the plans.

10.2 Fire Hydrant Location

10.2.1 For arterial streets, fire hydrants shall be staggered on both sides of the street such that they are spaced not more than 500 feet along the centerline of the street. Fire hydrants on each street side shall be spaced at not more than 1000 feet measured along the centerline of the street. For collector and local streets, fire hydrants shall be spaced at not more than 500 feet on along the centerline of the street. Private fire hydrants shall be provided to meet the fire code when distance to the nearest hydrant is greater than those prescribed by the fire code.

10.2.2 Spacing of hydrants around multiple family, commercial, or manufacturing establishments shall be considered as individual cases and shall be determined by consultation with the City.

10.2.2.1 Fire hydrant systems on Private Property.

Where fire hydrants including associated water mains and appurtenant items are installed on private property a minimum of a twenty-foot water main easement shall be granted to the City for maintenance and operation. **No Private Fire Hydrand system shall be allowed.**

10.2.3 Hydrants shall be located on the road right-of-way, 3 feet from the back of curb for sidewalk adjacent to boulevards and on a lot line whenever possible. Fire hydrants installed within curbside sidewalk shall be located 2 feet behind the back of curb and on a lot line whenever possible.

10.2.4 Fire hydrants shall be installed on the end of all dead-end mains. If the main terminates in a cul-de-sac, the fire hydrant shall be installed to meet clear space requirements as outlined in 10.2.7.

10.2.5 For commercial construction, fire hydrants shall be located at least 25 feet from the exterior wall of any masonry building and at least 50 feet from any exterior wall of frame or equivalent construction, including brick and stone veneer.

10.2.6 Flushing hydrants installed for testing purposes shall be removed once testing has been completed. If the flushing hydrants will remain in place for the duration of a winter season, they shall be installed behind the proposed curb and gutter.

10.2.7 A minimum of five (5) foot clear space shall be maintained around the circumference (outside) of fire hydrants, except as otherwise required or approved by the City Engineer. Light poles, posts, fences, vehicles, vegetative growth, trash, storage, mailboxes and other materials or things shall not be placed or kept near fire hydrants in a manner that would prevent such fire hydrants from being immediately discernable and/or usable. The fire department shall not be detoured or hindered from gaining immediate access to a hydrant.

10.2.8 When fire hydrants are located outside City ROW and are subject to impact by motor vehicles, guard posts, curb and gutter or other approved means shall be provided for hydrant protection.

10.2.9 Fire hydrant(s) shall be installed not more than 100 feet from fire department connection(s) serving any buildings equipped with a standpipe system.

10.2.10 Fire hydrant(s) shall open counterclockwise and shall be red in color.

10.3 Gate Valves

10.3.1 In general, gate valves on cross connecting mains shall be located so that no single break requires more than 800 feet to be out of service, and on feeders 12 inches or larger, gate valves shall be spaced not more than 1/4 mile apart. Gate valves shall be arranged so that any section can be isolated by closing not more than four gate valves, with a maximum of 30 residential lots out of service.

10.3.2 Gate valves shall generally be located such that they will not be in the sidewalk line or in driveways.

10.3.3 All gate valves shall be installed with a valve nut centering device and valve box.

10.3.4 Valves shall be placed on all dead-end mains for future extension, unless no services are planned and chlorination can be redone without interruption to anyone.

10.3.5 Perpendicular connections of new mains to existing mains shall be by a smith tap or by a cut and tie to the existing main.

10.3.6 Gate valves and curb stops for fire lines and domestic services shall be installed at least 20 feet away from the building. If the domestic service comes off of the fire line, both lines must have a shut off valve after they separate.

10.3.7 Valves shall open counterclockwise.

10.4 Meters

10.4.1 One 5/8” meter with Remote Terminal Unit (RTU) shall be supplied by the City of Canton for installation by the property owner. Additional 5/8” meter(s) with RTU or any meter larger than 5/8” with RTU shall be furnished and installed by the property owner. All meters and appurtenant items shall be approved by the City of Canton prior to installation.

10.4.2 Master meters and Remote Terminal Units for main line metering of industrial and commercial complexes shall be subject to the approval of the City of Canton. Authorization must be obtained from the City of Canton Water Department to allow the use of a master meter in lieu of individual meters. The meter shall be installed in an approved vault or an approved heated and ventilated above-grade enclosure.

10.4.3 Water meters shall be installed as close as practical to the point where the water service enters the building and **must** be located upstream of any valves (except air valves), tees, take-offs, diversions or branches of any type. Location of the remote terminal unit shall be approved by the City of Canton Water Department.

10.5 Backflow Prevention

All lawn sprinkler and irrigation systems shall be equipped with suitable backflow preventer in compliance with the Uniform Plumbing Code, where they are connected to the Municipal Water Supply System.

10.6 Special Requirements for Automatic Sprinkler Fire Protection Systems

Sprinkler systems directly connected to public water supply shall be isolated from the public water main by an approved double check valve assembly or backflow preventer such as those manufactured by Watts or Beco or equal.

10.7 Service Lines

10.7.1 Not more than one consumer shall be supplied from each service line. Each separate account requiring a separate meter shall also require a separate service line.

10.7.2 Side by side duplexes, triplexes and town houses shall have a separate account and a separate service line for each unit. The service lines shall be located on the individual consumer's property whenever possible. Easements shall be obtained where this is not possible.

10.7.3 Apartments and over/under duplexes, triplexes, etc. do not need to be individually metered and do not need separate service lines.

10.7.4 Residential service lines shall either be constructed to the property line or to a point 3 feet behind the curb as a part of the street construction project. Service lines shall typically be installed twenty feet from the downstream lot corner.

10.7.5 Commercial and industrial service lines may be constructed to the property line if the service line size is known.

10.7.6 All service lines shall be marked by a steel fence post or an approved marker. The steel fence post should be painted blue on the top one-foot portion of the marker. The marker should be placed near the curb stop or at the termination point of the service stub-in. The service line marker shall remain in place and maintained by the property owner until the service line is extended into the property to serve a house, building, or other structure. The property owner will be responsible for replacing damaged markers.

10.7.7 If newly developing separate platted properties are replatted to a single unit, any additional water services that were previously installed shall be removed to the corporation stop on the City main at the expense of the owner provided the final lift of asphalt or final surfacing has not been installed.

10.7.8 Material Requirements:

10.7.8.1 Service lines 2 inches in diameter and smaller within street right-of-way or within utility easements shall be soft copper tubing with flared ends.

10.7.8.2 Service lines 2 inches in diameter and smaller outside the street right-of-way and outside utility easements shall be soft copper tubing with flared ends, restrained joint PVC (Yelomine) or high density polyethylene (HDPE) pressure pipe.

10.7.8.3 Water service lines 4 inches in diameter and greater shall be ductile iron pipe or C900 PVC pipe.

10.7.8.4 All other service line materials not listed above will not be allowed unless specifically approved by the City.

10.7.9 For new construction, there shall be a minimum of 10 feet of horizontal separation between the sanitary sewer service and the water service from the respective mains to the structure being serviced.

10.8 Material Specifications

10.8.1 Material specifications are included in the Canton Standard Specifications.

10.8.2 Ductile iron pipe is required to be used in all sites known to have soil contaminated by volatile organic compounds such as fuel and petroleum products or as directed by the City. All ductile iron pipe and fittings shall be encased in polyethylene regardless of soil conditions.

10.9 Manufactured Home Parks

10.9.1 New manufactured home parks shall have individually metered services and the distribution system within the park shall be built to meet the Supplemental Standard Specifications, the Standard Plates and the Design Standards. Maintenance and access easements granted to the city for the water main and the service lines to the curb stop are also required.

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Drainage Improvements

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Chapter 11 Drainage Improvements

11.1 Allowable Drainage Discharge Rates

For developments that are either two acres in size or larger or there is more than one acre of impervious area within the development, the allowable storm water discharge rates shall be as follows:

For all storm events the post-developed discharge rate shall be less than or equal to the discharge rate from the site prior to development unless City-Owned conveyance structures of adequate size are contiguous and downstream of the proposed discharge points.

11.2 Requirements for Storm Drainage Plans

11.2.1 General.

The following criteria shall be utilized in the analysis of the drainage system.

a. Runoff analysis shall be based upon proposed land use, and shall take into consideration all contributing runoff from areas outside of the study areas.

   The analysis of storm runoff from existing developed areas lying outside of the study area shall be based upon present land use and topographic features.

   All undeveloped land lying outside of the study area shall be considered as fully developed based upon the Canton Comprehensive Plan. Whenever the future land use of a specific undeveloped area cannot be accurately predicted, the average runoff coefficient to be used in said area shall not be less than 0.50 for the Rational Method runoff coefficient or an approved equivalent value for any other method, Table 11.1 (Appendix).

b. The probable future flow pattern in undeveloped areas shall be based on existing natural topographic features (existing slopes, drainage ways, etc.).

c. Average land slopes in both developed and undeveloped areas may be used in computing runoff. However, for areas in which drainage patterns and slopes are established, actual slopes and patterns shall be utilized.

d. Flows and velocities which may occur at a design point when the upstream area is fully developed shall be considered. Drainage facilities shall be designed to assure flows and velocities will not cause erosion damage.

e. The primary use of streets shall be for the conveyance of traffic. The computed amount of runoff in streets shall not exceed the requirements set forth in these Design Standards.

f. The use of onsite detention, detention within the development or detention in a drainage basin of which the development is part may be required.

g. The changing of natural drainageway locations will not be approved unless such change is shown to protect against unreasonable hazard and liability, substantiated by thorough analysis.

h. The planning and design of drainage systems shall be such that problems are not transferred from one location to another. Outfall points shall be designed in such a manner that will not create flooding hazards.

i. Localized flooding information shall include the area inundated by the major storm runoff.

j. The flow routing for both the minor and major storm runoff shall be approved by the City. Drainage easements will be required and shall be designated on all drainage drawings and subdivision plats.

k. Approval will not be made for any proposed building or construction of any type of structure including retaining walls, fences, etc., or the placement of any type of fill material, which will encroach on any utility or drainage easement or which will impair surface or subsurface drainage from surrounding areas.

11.2.2 Minor and Major Design Storms.

Urban areas generally have two separate and distinct drainage systems. One is the minor system corresponding to the minor (or ordinary) storm recurring at regular intervals. The other is the major system corresponding to the major (or extraordinary storm) which has a one percent probability of occurring in any one year, called the 100-year storm event. Since the effects and routing of storm waters for the major storm may not be the same for the minor storm, all storm drainage plans submitted for approval shall be submitted in detail identifying the effects of both the minor storm and the major storm.

a. Minor Storm Provisions.
The minor storm drainage system shall be designed to provide protection against regularly recurring damage, to reduce street maintenance costs, to provide an orderly urban drainage system and to provide convenience to the urban residents. Storm sewer systems consisting of underground piping, natural drainageways, and other required appurtenances shall be considered as part of the minor storm drainage system.

b. Major Storm Provisions.
The major storm drainage system shall be designed to prevent major property damage or loss of life. The effects of the major storm on the minor drainage system shall be noted. The route of the major storm shall be noted to assure an outlet to a designated major drainageway is available.

11.2.3 Design Storm Calculations

1. Introduction

Presented in this section are the criteria and methodology for determining the storm runoff design peaks and volumes to be used in the City of Canton for the preparation of storm drainage studies, plans, and facility design.

2. Design Frequencies

The residential and commercial design storm return frequency shall not be less than 5 years for the minor storm and 100 years for the major storm. The industrial design return frequency shall not be less than 5 years for the minor storm and 100 years for the major storm.

3. Design Rainfall

The design rainfall data to be used for the Canton area was obtained from the National Weather Bureau. The intensity-duration-frequency curves are presented in Figure 11.1 (Appendix).

4. Rational Method

The Rational Method may be used in both the minor and major storm runoff computations for basins that are not complex and generally have less than 100 acres.

The Rational Method is based upon the following formula:

$$Q = CIA \qquad \text{(Equation 1)}$$

Where:

Q = Peak Discharge (cfs),
C = Runoff Coefficient,
I = Rainfall Intensity (inches/hour), and
A = Drainage Area (acres).

When using the Rational formula, an assumption is made that the maximum rate of flow is produced by a constant rainfall which is maintained for a time equal to the period of concentration of flow at the point under consideration. Theoretically, this is the time of concentration, which is the time required for the surface runoff from the most remote part of the drainage basin to reach the point being considered.

However in practice, the concentration time, Tc, is an empirical value that results in acceptable peak flow estimates.

For basins that are larger than 100 acres, for smaller basins that are more complex and for storm sewer modeling, it is recommended that the design storm runoff and modeling be analyzed by other methods approved by the City. Design

parameters used in the model shall be submitted with the drainage calculations.

5. Time of Concentration and Travel Time

As discussed in this Section, Tc, the time of concentration, is the time it requires for runoff to travel from the hydraulically most distant point of the watershed to the point of interest within the watershed.

Travel time is the time it takes water to travel from one location to another in a watershed.

In the application of the Rational Method, the time of concentration must be estimated so that the average rainfall rate of a corresponding duration can be determined from the intensity-duration-frequency chart in Figure 11.1 (Appendix).

Water travels across a watershed as sheet flow, shallow concentrated flow, open channel flow, or some combination of these. The type that occurs is a function of the conveyance system and is best determined by field inspection. The minimum time of concentration shall be 15 minutes unless otherwise approved by the City.

a. Sheet Flow

Sheet flow is flow over plane surfaces. It usually occurs in the headwater of streams. With sheet flow, the friction value (Manning's n) is an effective roughness coefficient that includes the effect of raindrop impact; drag over the plane surface; obstacles such as litter, crop ridges, and rocks; and erosion and transportation of sediment. These n values are for very shallow flow depths of about 0.1 foot or so. Table 11.2 (Appendix) provides Manning's n values for sheet flow for various surface conditions.

For sheet flow of less than 300 feet, use Manning's kinematic solution (Overton and Meadows 1976) to compute Tt:

$$Tt = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5} s^{0.4}} \qquad \text{(Equation 2)}$$

Where:

Tt = travel time (hr),
n = Manning's roughness coefficient, Table 11.2 (Appendix),
L = flow length (ft),
P_2 = Two-year, 24-hour rainfall (in) = 2.7 inch for our area, and
s = slope of hydraulic grade line (land slope, ft/ft).

This simplified form of the Manning's kinematic solution is based on the following: (1) shallow steady uniform flow, (2) constant intensity of rainfall excess (that part of a rain available for runoff), (3) rainfall duration of 24 hours, and (4) minor effect of infiltration on travel time.

i. Limitations

- Manning's kinematic solution should not be used for sheet flow longer than 300 feet. Equation 2 was developed for use with the four standard rainfall intensity-duration relationships.

- South Dakota is a Type II intensity-duration relationship, as defined by the Soil Conservation Service (SCS).

- In watersheds with storm sewers, carefully identify the appropriate hydraulic flow path to estimate TC. Storm sewers generally handle only a small portion of a large event. The rest of the peak flow travels by streets, lawns, and so on, to the outlet. Consult a standard hydraulics textbook to determine average velocity in pipes for either pressure or nonpressure flow.

- The minimum Tt used in Technical Release-55 (TR-55) Urban Hydrology for Small Watersheds is 0.1 hr (6 minutes).

b. Shallow Concentrated Flow

After a maximum of 300 feet, sheet flow usually becomes shallow concentrated flow. The average velocity for this flow can be determined from Figure 11.2 (Appendix) in which average velocity is a function of watercourse slope and type of channel. Tillage can affect the direction of shallow concentrated flow.

After determining average velocity from Figure 11.2 (Appendix), use the following equation to estimate travel time for the shallow concentrated flow segment:

$$Tt = \frac{L}{3600\ V} \qquad \text{(Equation 3)}$$

Where:

Tt = travel time (hr),
L = flow length (ft),
V = average velocity (ft./sec.), and
3600 = conversion factor from seconds to hours.

c. Open Channel Flow

Open channels are assumed to begin where surveyed cross section information has been obtained, where channels are visible on aerial photographs, or where blue lines (indicating streams) appear on United

States Geological Survey (USGS) quadrangle sheets. Manning's equation or water surface profile information can be used to estimate average flow velocity. Average flow velocity is usually determined for bank-full elevation. Manning's equation is:

$$V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n} \qquad \text{(Equation 4)}$$

Where:

V = average velocity (ft/s),
r = hydraulic radius (ft) and is equal to a/pw,
a = cross sectional flow area (ft^2),
p_w = wetted perimeter (ft),
s = slope of the hydraulic grade line (channel slope, ft/ft), and
n = Manning's roughness coefficient for open channel flow.

Manning's n values for open channel flow can be obtained from standard hydraulic textbooks. After average velocity is computed using Equation 4, Tt for the channel segment can be estimated using Equation 3.

6. Rainfall Intensity (I)

The intensity (I), is the average rainfall rate in inches per hour for the period of maximum rainfall of a given frequency having a duration equal to the time of concentration. After the design storm frequency has been selected, the rainfall intensity shall be obtained from the intensityduration-frequency chart in Figure 11.1 (Appendix) using the time of concentration calculated above.

7. Runoff Coefficient (C)

The runoff coefficient (C) represents the integrated effects of infiltration, evaporation, retention, flow routing, and interception, all of which effect the time distribution and peak rate of runoff. Table 11.1 (Appendix) presents the recommended values of C for the various recurrence frequency storms. The values are presented for different surface characteristics as well as for different aggregate land uses. The coefficient for various surface areas can be used to develop a composite value for a different land use.

11.2.4 Concept Drainage Plan.

The Concept Drainage Plan shall be submitted as part of the Concept Plan.

The purpose of the Concept Drainage Plan is to identify any proposed drainage concerns regarding the development. Approximate flow paths and existing conditions will be provided.

11.2.5 Developers Preliminary Drainage and Grading Plan

1. The developer shall submit a drainage plan that identifies the entire drainage basin(s) of which the development is included. Scales as small

as 1 inch equals 500 may be used to show the entire development.

2. The following information shall be included in the submittal:

   a. A route outlet map will be required. This map shall show how the drainage from the proposed development will be transmitted to the nearest major drainageway. The map shall show any existing structure(s) which may limit the flow en route to the major drainageway. The route outlet map shall show the drainage area upstream of the proposed development and the estimate of flow under current conditions presently draining onto and through the development.

   b. Data for minor and major storm flows within the proposed development for all drainage basins and sub-basins.

   c. Identification of drainage problems with proposed solutions to deal with the problems within the development.

   d. Identification of downstream and upstream facilities as shown on the route outlet map.

   e. Locations and size of proposed detention ponds as required by this Chapter.

   f. General locations and size of potential wetlands shall be identified. Include copy of correspondence with United States Army Corps of Engineers (USACOE) requesting wetland determination and any responses. Also note if any mitigated wetlands will be created.

   g. Any and all existing 100-year floodplains must be identified, as shown by FEMA maps.

   h. Existing contours.

   i. Location and size of existing open channels, bridges, culverts, storm sewers, and ponding areas within the development.

   j. Location of streets.

   k. Identification of all drainage basins tributary to the development.

   l. Drainage patterns within the proposed development.

   m. Provide adequate information as to the effect of the drainage pattern on adjacent property. Provide survey data as required for adequate information. Identify the storm water path to the major drainageway.

11.2.6 Development Engineering Final Drainage Plan

1. The Final Drainage Plan shall be a detailed plan of the proposed development phase. It shall include detailed data for all runoff within the proposed development phase, and detailed data for the design of all drainage structures within the development phase.

2. Drawings and data (actual calculations may be required with submittal) comprising of the Final Drainage Plan shall include, but not be limited to the following information. Scale will be 1 inch equals 100 feet maximum.

    a. Proposed contours, and arrows indicating drainage paths.

    b. Location and elevations of Bench Marks.

    c. Property lines.

    d. Streets, names, and grades.

    e. Existing drainage facilities and structures, including existing roadside ditches, drainage ways, gutter flow directions, culverts, etc. All pertinent information such as size, shape, slope, location, etc., shall also be included to facilitate review and approval of drainage plans. Flow areas will be delineated.

    f. Proposed storm sewers and open drainage ways, easement, and right-of-way requirements, including proposed inlets, manholes, and culverts. General notes concerning erosion control and energy dissipation shall be provided.

    g. Proposed outfall point for runoff from the development phase.

    h. Routing and accumulative flows at various critical points for the minor and major storm runoff.

    i. 100-year flood level in all streets in which the curb is overtopped during the 100-year storm for sump condition or other critical points.

    j. Identify 100-year flood elevations for major and lateral drainageways.

    k. Inlet flow data.

    l. Pipe flow data.

    m. All flood plains, identified by FEMA maps, within the proposed development phase.

    n. Location and size of potential wetlands.

1. Provide copy of correspondence with state and federal agencies related to the potential impact to wetlands or other cultural resources. This includes:

    a. Wetland determination for USACOE

    b. Wetland mitigation plan

    c. Any restrictive covenants that would prevent the City from performing maintenance activities such as excavating within the wetlands.

o. Hydrological data for each drainage area.

1. Areas

2. Watershed lengths, elevations, time of concentration

3. Rainfall intensity

4. Runoff coefficients

5. Projected land uses and existing physical features of areas contributing runoff

6. Storm duration

7. Runoff (Q) (Note: This list of criteria assumes use of Rational Formula. If a different method is used, all relevant factors are to be enumerated.)

8. See this Chapter 11 of the engineering design standards for allowable storm water discharge rates.

p. Major drainageways.

1. Alignments

2. Profiles including existing and proposed

3. “n” values (Manning)

4. Velocities

5. Soils analysis with a discussion of the proposed channel erosion potential

6. Froude number

q. Design recommendations

1. Dikes

2. Filling low areas

3. Provision of easements

4. Recommendations against building in certain areas

5. Provisions for onsite retention and detention

6. Other as appropriate for conditions

11.2.7 Existing Floodplain Map—Revisions

All submittals for floodplain revision must be reviewed and approved by FEMA or their authorized agent. The City will not take responsibility for time, scheduling, or cost involved in floodplain map revisions or letters of map amendments.

The developer is responsible for submitting all information to FEMA. Copies of all information sent to, and correspondence with FEMA must also be sent to the City.

11.1.8 Review by Other Agencies

All open channel construction and existing drainageway modifications will be reviewed by the City and other appropriate county, state, or federal agencies.

11.3 Storm Sewers

11.3.1 Design Flow

For areas smaller than 100 acres, the Rational formula is acceptable to compute runoff. For areas larger than 100 acres, the Soil Conservation Service method or other acceptable computer applications shall be used. Computations for storm sewer design and storm inlet designs shall be submitted.

11.3.2 Installation

All construction shall be in accordance with the approved local and State requirements for drainage improvements.

11.3.3 Location of Storm Sewers

1. All public storm sewers shall be installed in the public easement or right-of-way. If storm sewer pipe is placed on back lot lines or otherwise placed across private property, a drainage easement is required provided the pipe is utilized to drain public storm water. If the storm sewer pipe is to be used for private storm water runoff, no easement is required.

    a. Placement

        Storm sewer must be extended to the far edge of the

platted subdivision to be serviced, regardless of where the inlets are placed.

b. Easements

1. All easements must be mutually exclusive for the City of Canton. Easements shall be identified as public utility and drainage easements. Final Drainage Plans shall identify the type of easement.

2. All drainage easements must be a minimum of 20 feet wide, additional width for access may be required. The pipe shall be placed only along the center of the easement, unless approved by the City.

3. No landscaping except grass may be placed in the easement.

4. No permanent structure may be placed in the easement.

11.3.4 Size

No public storm sewer shall be less than 18 inches in diameter. Trunk storm sewers must be a minimum of 18 inches in diameter. All changes in pipe size must occur at a manhole, inlet, or junction box.

11.3.5 Depth

The minimum allowable sewer depth of cover shall be 18 inches.

11.3.6 Pipe

Residential, commercial and industrial pipes shall be sized to carry a five-year flow. Hydraulics of the sewer shall be analyzed. The hydraulic gradient shall remain below the gutter or ground surface elevation to prevent overflow.

Storm sewer pipe within street right-of-way or drainage easements shall be reinforced concrete pipe unless otherwise approved by the City. In certain cases the designer may wish to specify one type of pipe for a certain purpose, in which case no alternate should be given. The “class” of reinforced concrete pipe shall be Class III minimum unless a higher class of pipe is warranted due to site conditions or application. Any class of pipe that is not Class III shall be identified on the plans.

Storm sewer pipe made of other materials such as polyethylene may be approved by the City for private development storm sewer or storm sewer to be installed outside the public right-of-way.

Coefficients of roughness, “n,” for use in the Manning formula as listed below shall normally be used:

Type of Pipe Concrete	"n"
Concrete	0.013
Polyethylene	0.010

11.3.7 Velocity

The minimum allowable velocity in a storm sewer shall be 3 feet per second (fps). The maximum velocity shall be 15 fps.

11.3.8 Pipe Strength

Pipe specified shall meet AASHTO HS-20 loadings.

11.3.9 Alignment

Sewer shall be installed with a straight alignment between structures with the following two exceptions: In locations where layouts are such that a straight alignment is not practical, sewers may be curved. The curvature must be concentric with the curvature of the street. The pipe manufacturer's recommended maximum deflection angle shall not be exceeded. Storm sewer bends will be shown as required. The City may require a structure instead of a bend.

11.3.10 Separation

1. Storm sewer crossings of the water main will be performed in accordance with the South Dakota Department of Environment and Natural Resources design guidelines. Water main will be installed at least ten 10 horizontally from any storm sewer, measured edge to edge. Exceptions may be allowed by the City. Crossings of water main and storm sewer will have a minimum of 18 inches clearance between the outside surface of the pipes.

2. Storm sewer crossings of sanitary sewer shall be performed in accordance with these Design Standards. Sanitary sewer shall be installed at least 2 feet horizontally from any storm sewer.

   Crossings of sanitary sewer and storm sewer will have a minimum of 6 inches clearance between the outside surface of the pipe. Crossings that have less than 18 inches of clearance will be structurally supported.

11.3.11 Ground Water Barriers

When there exists a possibility that ground water may be diverted and follow the path of the new sewer, ground water barriers shall be constructed in adequate numbers to prevent ground water migration along sewer trenches.

11.4 Storm Sewer Appurtenances

11.4.1 Junction Boxes

1. Location

Trunk storm sewer is defined as any storm sewer 18 inches in diameter or larger that is used to convey storm water from two or more inlets.

Lateral storm sewer is defined as the storm sewer that connects to the trunk sewer system. Minimum lateral storm sewer pipe shall be 12 inches in diameter.

Structures shall be required when trunk line storm sewers intersect.

Pipe Tee-Sections may be used to connect a lateral storm sewer to the trunk storm sewer when the lateral length between the Tee-Section and a structure is 75 feet or less.

Field connections to connect a lateral system to the existing trunk storm sewer system, as described in the previous paragraph, will only be permitted if conditions prohibit the installation of a structure, as determined by the City.

Bends may be used along the trunk system between structures when curvature alignment requires the bend and the maximum spacing between structures has not been exceeded. The City may require a structure instead of a bend.

For 18-inch-diameter storm sewer, the maximum total bend or curvature allowed is 22.5 degrees. For 24-inch-diameter storm sewer and larger, the maximum single bend allowed is 45 degrees. If more than one bend is required due to alignment curvature, the maximum angle per bend is 7.5 degrees. Maximum total curvature is 90 degrees for 24-inch RCP and larger.

Structures shall be installed at the upper end of each line, at changes in grade, size, curvature or alignment, and at distances not greater than: 400 feet for sewers 15 inches in diameter or less; 450 feet for sewers 18 inches and 21 inches in diameter; and 500 feet for sewers 24 inches in diameter and larger.

Structures must be located in areas which allow direct access by maintenance vehicles.

2. Flow Channels

When there is an increase in sewer size of a smaller sewer connected with a larger one, the invert of the smaller sewer must be raised to maintain the same energy gradient. An approximate method of doing this is to place the 0.8 depth point of both sewers at the same elevation or to match the crown of the pipe. Structures that have a direction change of flow shall have a minimum 0.1-foot drop between the inverts.

Drop manholes shall be avoided whenever possible.

11.4.2 Outlets

1. Where a storm sewer discharges into a natural channel or irrigation ditch, an outlet structure shall be provided that will blend the storm sewer discharge into the natural channel flow in such a way as to prevent erosion of the bed or banks of the channel.

2. When the discharge velocity is low, or subcritical, the outlet structure may be one of the following:

    a. Flared end section

    b. Head wall

    c. Wing walls

3. If the discharge velocity is high, or supercritical, prevention of erosion of the natural channel bed or banks in the vicinity of the outlet may require an energy dissipating structure.

4. All outlets shall have an apron consisting of one of the following:

    a. Rip rap with geotextile fabric base

    b. Concrete anchor mat

    c. Concrete slab

    d. Scour stop, or approved equal

    e. Other approved methods

11.4.3 Inlets

1. Introduction

A storm inlet is an opening into a storm sewer system for the entrance of surface storm runoff. There are three types of inlets: curb opening, grated, and combination. In addition, inlets may be further classified as being on a continuous grade or in a sump. The term “continuous grade” refers to an inlet so located that the grade of the street has a continuous slope past the inlet and therefore ponding does not occur at the inlet. The sump condition exists whenever water is restricted to the inlet area because the inlet is located at a low point. A sump condition can occur at a change in grade of the street from positive to negative or due to the crown slope of a cross street when the inlet is located at an intersection.

2. Inlet Standards

Acceptable inlets for public streets shall be Type I curb opening or Type II combination. Curb opening inlets shall be used at true sumps or at sumps formed by crown slope of cross section at the intersection. Either curb opening type or combination inlets may be used on continuous grade. Grated inlets may be used for parking areas and open fields or other applications subject to approval by the City.

Reduction factors shall be applied to the theoretical calculated capacity of inlets based upon their type and function. The reduction factors compensate for effects which decrease the capacity of the inlet such as debris plugging, pavement overlaying, and in variations of design assumptions.

The allowable capacity of an inlet shall be determined by applying the applicable reduction factor from Table 11.3 (Appendix) to the theoretical capacity as presented in the following sections.

The size of outlet pipes from storm water inlets shall be based upon the theoretical capacity of the inlet, but shall not be less than 12 inches in diameter.

3. Curb Opening Inlet Hydraulics

A curb opening inlet may operate under two different conditions of flow: (1) free flow conditions under which a free water surface is continuous into the inlet, or (2) submerged conditions, in which the inlet functions as an orifice. The continuous grade design procedures described herein assume that the inlets will be designed to operate under the free flow condition, since the gutter flow depth required to submerge the inlet is greater than the allowable street capacity.

The inlet dimensions evaluated herein are the standards used for Type I and II inlets.

4. Sump Condition

Presented in Figure 11.3 (Appendix) is a capacity nomograph for sump condition with a gutter depression at the inlet. This chart is an adaptation of a Bureau of Public Roads chart and is applicable to both the free flow and the submerged cases.

5. Continuous Grade

For the “continuous grade” condition, the capacity of the inlet is dependent upon many factors including gutter slope, depth of flow in the gutter, height and length of curb opening, street cross slope, and the amount of depression at the inlet. In addition, all of the gutter flow will not be intercepted and some flow will continue past the inlet area (“bypass”). The amount of bypass must be included in the downstream drainage facility evaluation as well as in the design of the inlet.

Inlet size and spacing is dependent upon the allowable use of streets for

handling storm runoff. Section 11.6 of this chapter will address pavement encroachment and provide criteria for the maximum width of spread (W) as addressed below.

When the allowable pavement encroachment has been determined, the theoretical gutter capacity for a particular encroachment can be determined by the use of Figure 11.4 (Appendix). To further simplify computations, Figure 11.5 (Appendix) is provided to enable direct determinations for various street sections. Figure 11.4 (Appendix) as well as the charts for inlet capacity provided in the Appendix of these standards will assist the designer in solving for the capacity of an inlet on a continuous grade. The procedure for properly sizing and determining inlet spacing is as follows:

a. After the design has determined a total runoff discharge (Q) flowing upstream of the inlet, enter Figure 11.5 (Appendix) for design Q and extend a vertical line down to intersect with the longitudinal gutter slope (So). Extend a horizontal line from the point to the cross slope (Sx) of the street being studied and extend a vertical line down from this point to the width of spread (W). The depth of flow (D) at the curb may also be determined if the vertical line intersecting the cross slope (Sx) on the lower portion of the graph is extended horizontally to intercept the depth at the curb.

b. Select the appropriate capacity chart from the Appendix for the type of inlet (Type I or II), street cross slope (Sx) and longitudinal gutter slope (So).

c. Type I inlets: Enter the chart for the inlet length selected. Extend a vertical line up to intersect the curve for the width of spread (W) determined in Step 1 and extend a horizontal line from this point to the inlet intercept ratio (Qi/Q).

   Type II inlets: Enter the chart for the width of spread (W) determined in Step 1. Extend a horizontal line across to intersect the line for the longitudinal gutter slope (So) and extend a vertical line from this point to the inlet intercept ratios (Qi/Q).

d. Multiply the inlet intercept ratio (Qi/Q) determined in Step 3 times the total discharge (Q) carried by the gutter, yields the quantity of water being intercepted by the inlet (Qi). For Type I inlets, the designer may want to repeat Steps 3 and 4 for other lengths of inlets.

   After the theoretical capacity has been determined as outlined above, capacity reduction factors must be applied as listed in Table 11.3 (Appendix). The designer will need to choose which type of inlet is most effective based upon both hydraulic and economic considerations.

6. Capacity of Grated Inlets in Sump

As previously noted, grated inlets may be used for parking areas and open fields or other areas subject to approval by the City. The design procedure presented in the following section is based upon the assumption that the grated inlet is clear from debris and is operating at its maximum efficiency.

For a grated inlet operating under sump conditions, the reduction factors of Table 11.3 (Appendix) shall be applied.

Under sump conditions a grated inlet acts essentially as a series of orifices. Design charts indicate that the application of the orifice formula to the clear opening of the inlets gives satisfactory capacities for a clean inlet. Figure 11.6 (Appendix) shows the results of the tests. The head used shall be determined by the allowable depth of ponding for the installation at the design storm frequency.

11.5 Culverts

11.5.1 General

Culverts may be of any shape and construction as required by existing topographic features; provided, however, the size, location and type of construction of culverts shall be subject to acceptance by the City.

Culverts within the major drainageways, as determined by the City, that are under arterials or railroads shall have sufficient capacity to pass all of the runoff from the 100-year storm considering 20 percent of the inlet plugged, for pipes under 48-inch diameter.

For all other streets, culverts must be designed to convey a minimum of 10-year flow with no street overtopping and must be large enough so that the 100-year flow over the top of the road does not exceed 18 inches in depth above the invert of the gutter.

11.5.2 Design Criteria

1. The following design criteria shall be utilized for all culvert design:

    a. The culvert including inlet and outlet structures shall properly take care of storm water flow, bed-load, and debris at all stages of flow.

    b. **Inlets**. Culvert inlets shall be designed to minimize entrance and friction losses. Inlets shall be provided with either flared-end sections or head walls with wing walls. Projecting ends will not be acceptable. For large structures, provisions shall be made to resist possible structural failure due to hydrostatic uplift forces.

    c. **Outlets**. Culvert outlets shall be designed to avoid sedimentation, undermining of the culvert, or erosion of the

downstream channel. Outlets shall be provided with either flared-end sections or headwalls, with wingwalls. Projecting outlets will not be acceptable. Additional outlet control in the form of rip rap, channel shaping, dissipation structure, etc., may be required where excessively high discharge velocities occur. All structural outlet velocity dissipaters shall be underlain with a suitable filter fabric to protect against scour.

d. Slopes. Culvert slopes shall be such that neither silting nor excessive velocities and scour occur. Generally, the minimum slope of culverts shall be limited to 0.50 percent.

e. Hydraulic Design. Culverts shall be analyzed to determine whether discharge is controlled by inlet or outlet conditions for both the initial storm discharge and the major storm discharge. The value of the roughness coefficient (n) used shall not be less than those specified by documentation of the culvert manufacturer. Computations for selected culvert sizes shall be submitted for review.

f. Minimum Allowable Size. The required size of the culvert shall be based upon adequate hydraulic design analysis. Approval will not be granted for round culverts with less than 18 inches inside diameter, or for arched or oval-shaped culverts with span-rise dimensions less than 24 inches x 18 inches nominal. The minimum height of a reinforced box culvert should be 3 feet to facilitate cleanout and allow removal of forms during construction.

g. Multiple Culvert Installation. Where physical conditions dictate, multiple culvert installations will be acceptable, provided the minimum size of any culvert to be used shall not be less than the requirements set forth above.

h. Structural Design. The structural design of culverts shall conform to those methods and criteria recommended by the manufacturer of a specific type of culvert dependent upon the type of bedding, the method of installation, and the load.

i. Trash and Debris Deflector. When, in the opinion of the City, debris accumulation for a particular drainageway appears to pose a significant probability of culvert plugging, trash racks or debris deflectors will be required.

11.6 Open Channel Flow, Major Drainageway

11.6.1 General

See Figure 11.7 (Appendices) for design standards for channel construction.

All channels will be designed with the five-year storm frequency and the 100-year

storm frequency considered.

The property corner elevation of properties abutting a major drainageway shall be 1 foot above the 100-year design storm.

Recommended minimum ground elevations for homes abutting or affected by the major drainageway shall be 2 feet above the overflow elevation. Recommended minimum ground elevation for homes abutting or affected by major drainageways, where an overflow system is not available, will be either a minimum of 4 feet above the 100-year high water elevation or at an elevation that provides for 150 percent of the 100-year flow capacity.

Channels shall be designed in such a manner that flows at the critical depth and supercritical flows are avoided.

If increased flows are proposed for any channel, protection as required shall be provided for a natural channel. Channel protection will be designed to withstand forces that attempt to overtop the channel banks, deteriorate the channel lining, erode soils beneath the channel lining and erode unlined areas of the channel.

Concrete-lined channels with Froude number (Equation 5) greater than 0.8 shall be reinforced with mesh or reinforcement steel. Subdrains to relieve hydraulic groundwater pressure shall be installed in the concrete-lined channels. The concrete channel shall be installed on a stable subgrade.

$$Fr = \frac{V}{(gyh)^{1/2}} \qquad \text{(Equation 5)}$$

Where:

FR = Froude number
V = velocity
g = acceleration due to gravity, 32.2 ft/sec^2
yh = depth, (area/surface width)

If the natural channel is disturbed, cannot remain in its original state, or design computations indicate erosion potential, channel protection will consist of fabric and rip rap or other accepted protection practice when concrete lining is not desirable.

All channels shall be designed with proper and adequate erosion control features. When required, drops or check dams shall be installed to control water surface profile slope.

Grass-lined channels or side slopes of concrete-lined channels will be seeded with a mixture as set forth in these Design Standards.

Lateral drainageways without a low flow storm sewer will only be permitted with the acceptance of the City.

11.7 Street Flow Capacity

11.7.1 General

The criteria set forth herein will be used in analyzing and approving the adequacy of streets as a function of the drainage system. Both the minor and 100-year storm runoff must be considered and calculations showing such runoff at critical sections shall be submitted. Street, curb and gutter, valley gutters, and curb cuts shall conform to the City standards.

11.7.2 Street Capacity for Minor Storms

Pavement encroachment for the minor design storm shall not exceed the limitations set forth in the following table:

Allowable Pavement Encroachment and Depth of Flow for Minor Storm Runoff

Street Classification	Maximum Encroachment*
Local	No curb overtopping. Flow may spread to crown of street.
Collector	No curb overtopping. Flow spread must leave the equivalent of one 10-foot driving lane clear of water (one lane for two-lane street, two lanes for four-lane street).
Arterials	No curb overtopping. Flow spread must leave the equivalent of two 10-foot driving lanes clear of water; one lane in each direction.

*Where no curbing exists, encroachment shall not extend past property lines.

The storm sewer system shall commence at the point where the maximum allowable encroachment occurs. All residential and commercial storm sewers systems shall be designed for the five-year storm event. All industrial storm sewer systems shall be designed for the five-year storm event.

When the allowable pavement encroachment has been determined, the theoretical gutter carrying capacity for a particular encroachment shall be computed using the modified Mannings formula for flow in a triangular channel as shown in Figure 11.4 (Appendix). To simplify computations, graphs for particular street shapes may be used as shown on Figure 11.5 (Appendix). An “n” value of 0.015 shall be used unless special considerations exist.

11.7.3 Street Capacity for Major Storms

The allowable depth of flow and inundated area for the major design storm shall not exceed the limitations set forth in the following table:

Allowable Depth of Flow and Inundated Area for 100-Year Storm Runoff

Street Classification	Allowable Depth and Inundated Areas
Local and Collector	Residential dwellings, public, commercial, and industrial buildings shall not be inundated at the ground line unless buildings are flood proofed. The depth of water over the gutter flow line shall not exceed 18 inches.
Arterial	Residential dwellings, public, commercial, and industrial buildings shall not be inundated at the ground line unless buildings are flood proofed. Depth of water at the street crown shall not exceed 6 inches to allow operation of emergency vehicles. The depth of water over the gutter flow line shall not exceed 18 inches.

11.7.4 Cross Street Flow

Cross street flow can occur by two separate means. One is runoff which has been flowing in a gutter and then flows across the street to the opposite gutter or inlet. The second case is flow from some external source, such as a drainageway or conduit, which will flow across the crown of the street when the conduit capacity beneath the street is exceeded. The maximum allowable cross street flow depth based on the worst condition shall not exceed the limitation stipulated in the following table.

Allowable Cross Street Flow

Street Classification	Minor Storm Runoff	100-Year Design Storm Runoff
Local	6-inch depth at crown or in the valley gutter	18 inches of depth above gutter flowline
Collector	Depth of flow shall not exceed 6 inches above gutter flow line	18 inches of depth above gutter flowline
Arterial	None	6 inches or less over crown*
Freeway	None	6 inches or less over crown*

* Only in gutter flow crossing the street. External flows may not cross street.

11.7.5 Capacity Calculations

All theoretical flow capacities shall be reduced by the appropriate reduction factors as shown in Figure 11.8 (Appendix) to obtain allowable flow capacities.

11.7.6 Drainage Tract Requirements

All backward draining cul-de-sacs and sump streets are required to have a minimum 20-foot-wide drainage easement shown on the plat for the purpose of conveying drainage.

The easement shall meet the applicable requirements for storm sewer easements.

11.8 Detention Storage

11.8.1 General

Detention ponds shall be designed and constructed at those locations identified by the City. The use of onsite detention is permitted at those locations where the onsite drainage system cannot be tied into an existing drainage system.

Onsite detention may be used if the development cannot provide adequate storm sewer systems to achieve the required storm sewer standards.

Onsite detention may be required by the City if any part of the downstream storm sewer conveyance system is inadequate to convey the development runoff.

11.8.2 Design Storm

Detention ponds along major drainageways as identified by the City shall be designed for a 100-year design flow.

Other detention ponds shall be designed such that the 5-year return storm is conveyed through the principal outlet assembly and the 100-year return storm is conveyed through the overflow assembly.

11.8.3 Release Methods

Intermittent ponds shall drain completely.

Careful consideration must be given to the discharge of the surface release as to the elimination of erosion potential, and the capacity of the downstream surface water course. The release structure shall be designed to withstand the forces caused by the structure being overtopped during a larger than design storm.

A stage (foot) versus release rate (CFS) curve must be provided for the release structure.

11.8.4 Maximum Release Rate

The detention pond volumes and release rate shall be designed to accommodate runoff generated by the development and post-developed upstream properties.

The release rate from the detention pond cannot exceed predevelopment rates for the 5-year and 100-year return storm unless City-owned conveyance structures of adequate size are contiguous and downstream of the proposed discharge points.

11.8.5 Maintenance Requirements

Detention ponds and similar areas not required as a necessary part of the major drainage system as determined by the City may be accepted by the City for maintenance only if such land provides another useful public service such as a public

park or wildlife area.

All detention areas shall have a 30-foot-wide access to a public right-of-way if they are not located adjacent to a public right-of-way.

11.8.6 Adjacent Property Elevations

The property corner elevation of properties abutting a detention pond shall be 1 foot above the 100-year design storm.

Recommended minimum ground elevations for homes abutting or affected by the detention pond shall be 2 feet above the overflow elevation. Recommended minimum ground elevation for homes abutting or affected by detention ponds will be a minimum of 4 feet above the 100-year pond high water elevation if an overflow system is not available or at an elevation that provides an additional 50 percent storage.

11.9 Reference Material

Hastead Quick TR-55.

CHAPTER 11
DRAINAGE IMPROVEMNTS

TABLES AND FIGURES

Table 11.1
Runoff Coefficients for Rational Method

Land Use or Surface Characteristics	Percent Impervious	Storm Frequency, years 5	10	100
Business:				
Commercial Areas	95	.88	.90	.93
Neighborhood Areas	65	.65	.70	.80
Residential:				
Single-Family	40	.45	.50	.70
Multi-Unit (detached)	50	.55	.60	.75
Multi-Unit (attached)	70	.70	.70	.80
1/2 Acre Lot or Larger	30	.40	.45	.65
Apartments	70	.70	.70	.80
Industrial:				
Light Areas	80	.80	.80	.85
Heavy Areas	90	.80	.85	.90
Parks, Cemeteries:	7	.25	.35	.60
Playgrounds:	13	.30	.40	.70
Schools:	50	.55	.60	.75
Railroad Yard Areas:	40	.45	.50	.70
Undeveloped Areas:				
Historic Flow Analysis Greenbelts, Agricultural	2	.20	.30	.60
Offsite Flow Analysis (when land use not defined)	45	.50	.55	.72
Streets:				
Paved	100	.88	.90	.93
Gravel	7	.25	.35	.65
Drives and Walks:	96	.87	.90	.92
Roofs:	90	.85	.90	.90
Lawns, Sandy Soil:	0	.10	.20	.50
Lawns, Clay Soil:	0	.20	.30	.60

NOTE: These Rational Formula coefficients do not apply for larger basins where the time-of-concentration exceeds 60 minutes.

REFERENCE: Urban Drainage and Flood Control District Rational Formula Procedure, Hydrology Research Program, August 1979.

Table 11.2

Roughness Coefficients (Manning's n) for Sheet Flow

Surface Description	n[1]
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤ 20%	0.06
Residue cover > 20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses[2]	0.24
Range (natural)	0.13
Woods:[3]	
Light underbrush	0.40
Dense underbrush	0.80

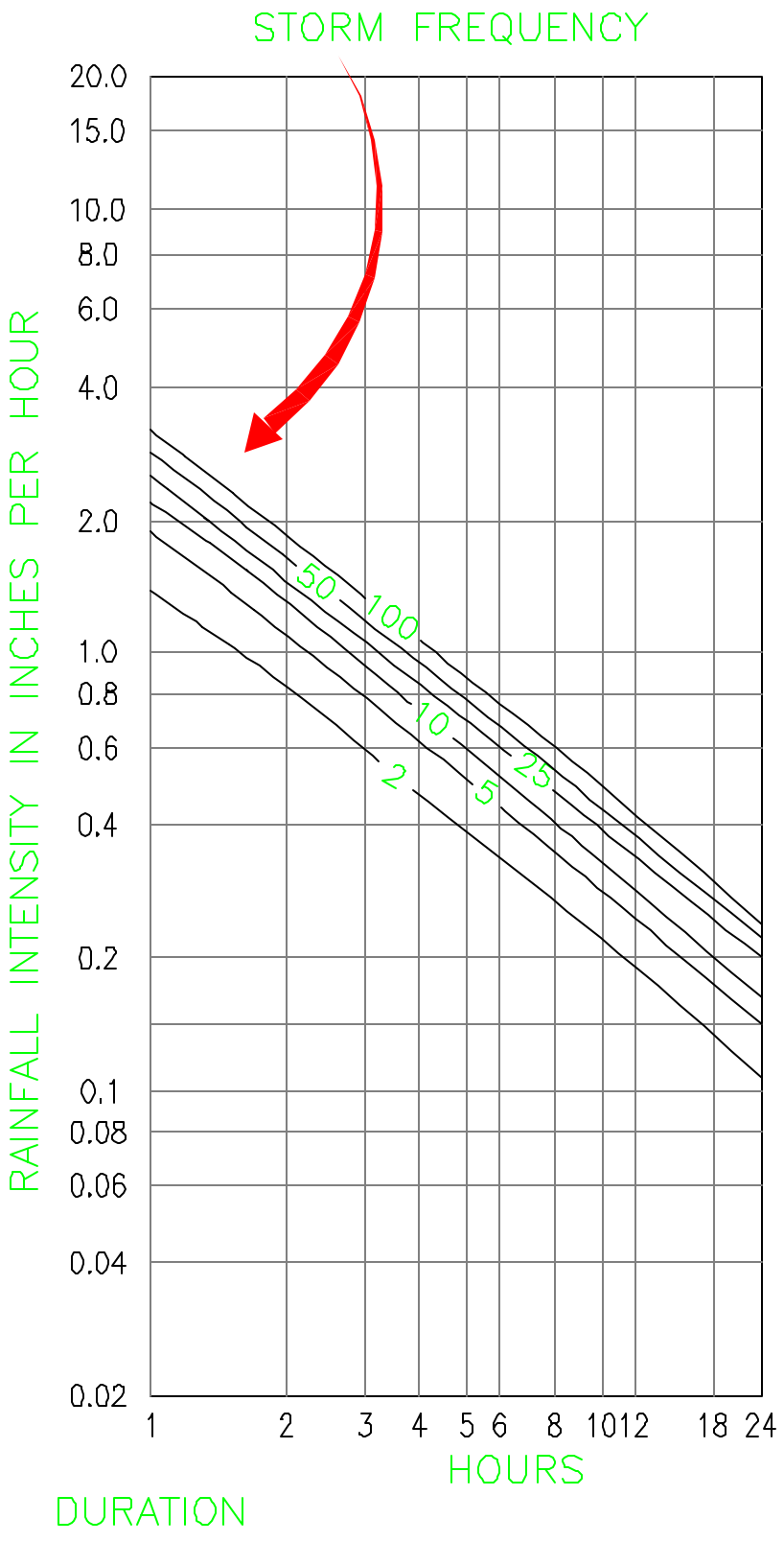
[1]The n values are a composite of information compiled by Engman (1986).

[2]Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.

[3]When selecting n, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

Table 11.3
Reduction Factors to Apply to Inlets

Condition	Inlet Type	% of Theoretical Capacity Allowed
Sump	Grated	50%
Sump	Combination	65%
Continuous Grade	Deflector	75%
Continuous Grade	Longitudinal Bar Grate incorporating recessed transverse bars	60%
Continuous Grade	Combination	110% of that listed for type of grate utilized
Sump or Continuous Grade	Curb Opening	
	L = 3'	80%
	L = 6'	88%
	L = 8'	90%
	L = 10'	92%
	L = 15'	95%



Sources; U.S. Weather Bureau, Technical Paper No. 40, 1963.
NOAA Central Weather Service, Technical Memorandum NWS HYDRO-35, 1977.

DRAWN BY:_____

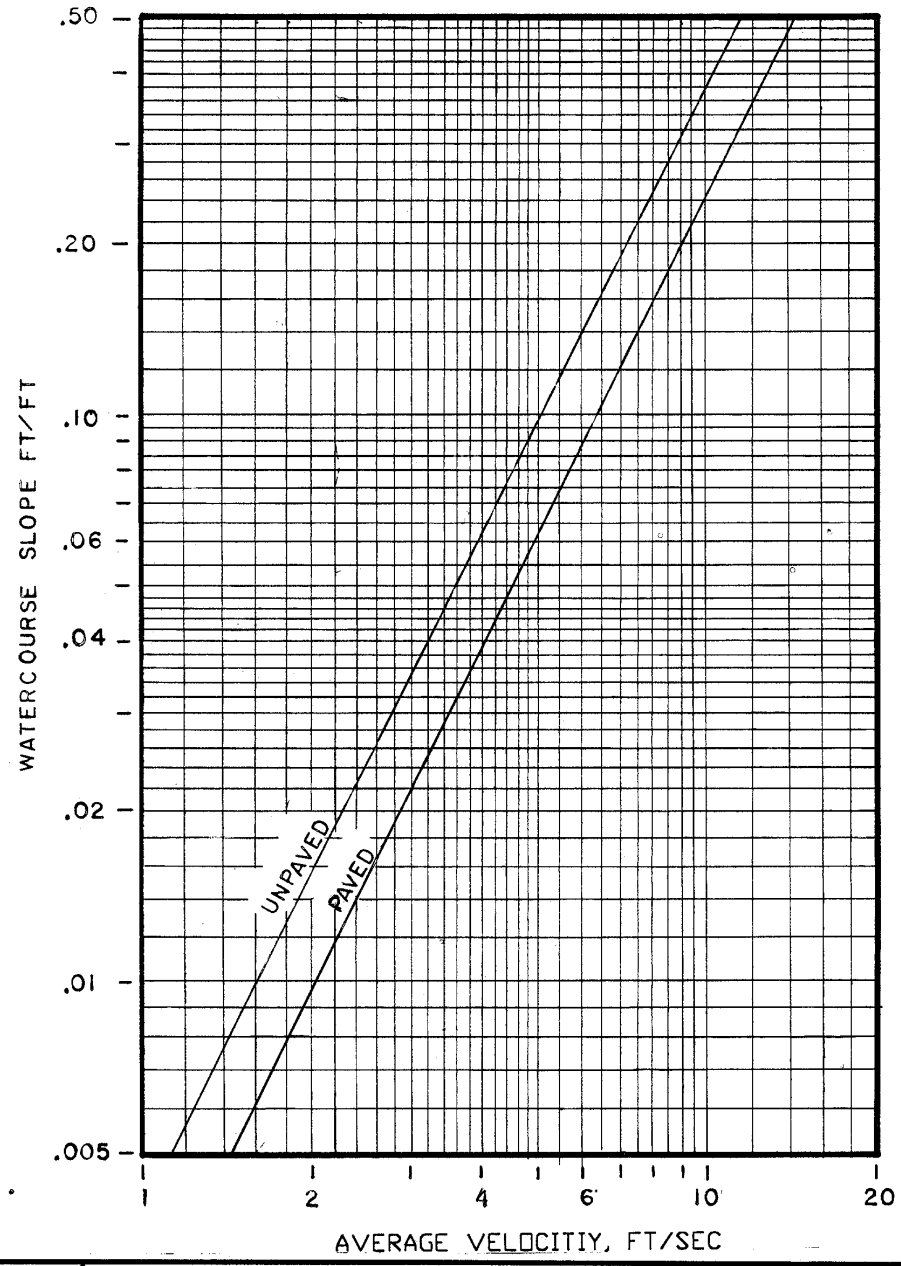
CHECKED BY:_____

APPROVED BY: J.D.____

INTENSITY-
DURATION-
FREQUENCY

ISSUED: JULY 9, 1999
REVISED: JUNE 03

FIGURE NO.
11.1



DRAWN BY: RRH

CHECKED BY:

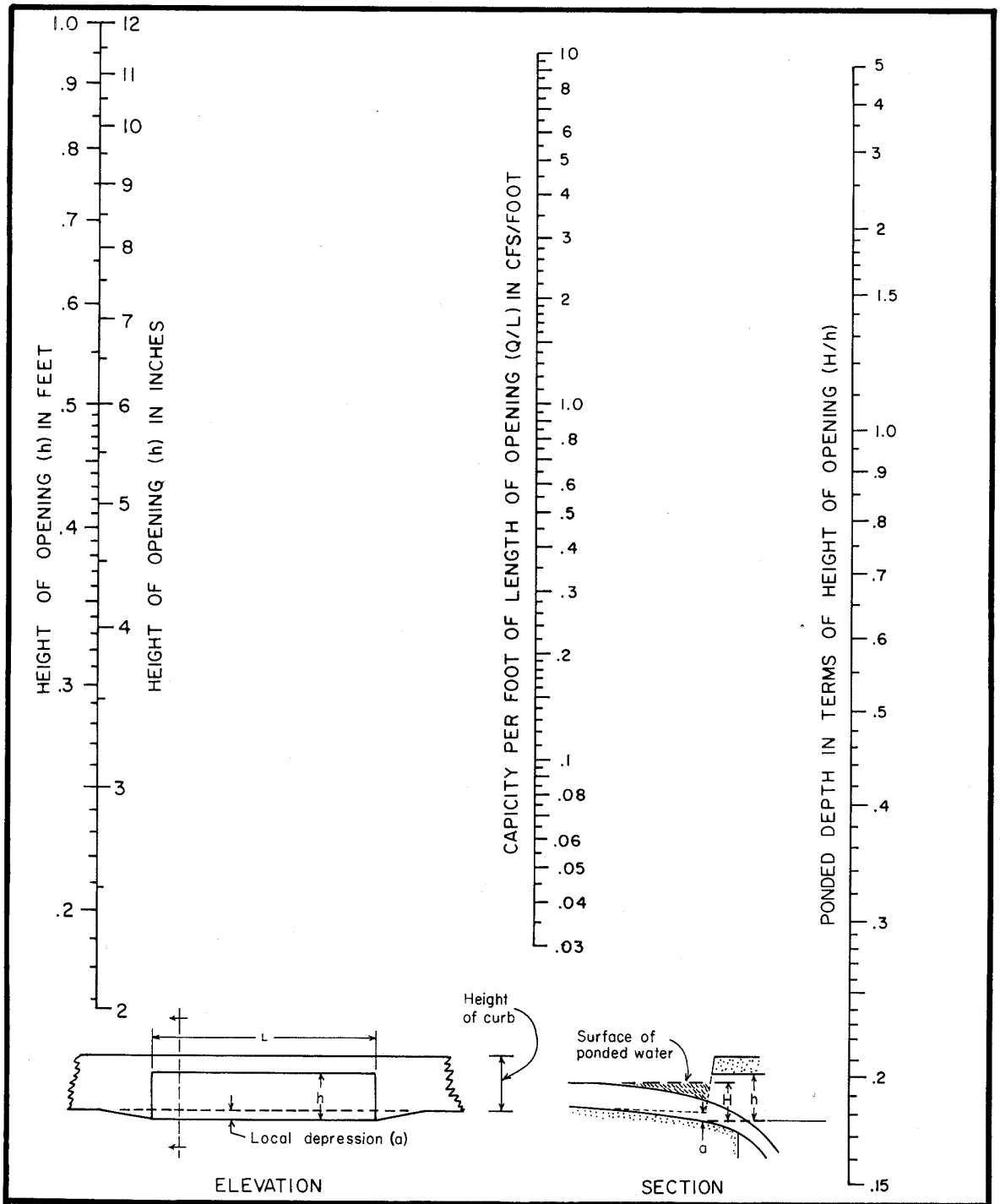
APPROVED BY: J.O.

AVERAGE VELOCITIES FOR ESTIMATING TRAVEL TIME FOR SHALLOW CONCENTRATED FLOW

ISSUED: JULY 9, 1999

REVISED:

FIGURE NO. 11.2



DRAWN BY: RLN

CHECKED BY:

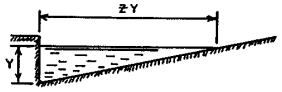
APPROVED BY:

CAPACITY OF CURB OPENING INLET AT LOW POINT IN GRADE

ISSUED: JULY 9, 1999

REVISED:

FIGURE NO. 11.3



EQUATION: $Q = 0.56\left(\frac{Z}{n}\right) S^{1/2}\ Y^{8/3}$

n is roughness coefficient in manning formula appropriate to material in bottom of channel.

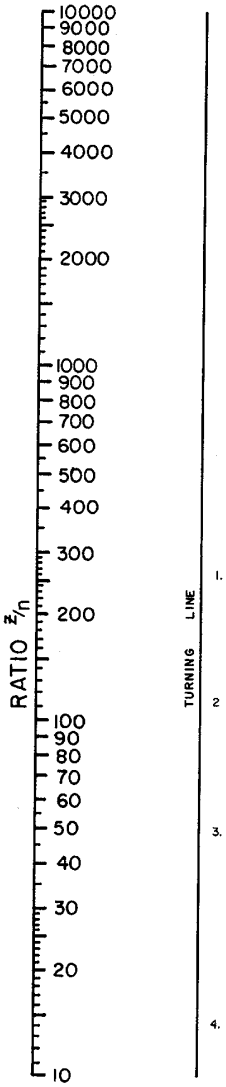
Z is reciprocal of cross slope

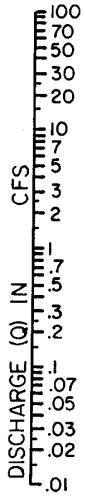
REFERENCE: H.R.B. Proceedings 1946 page 150, equation (14)

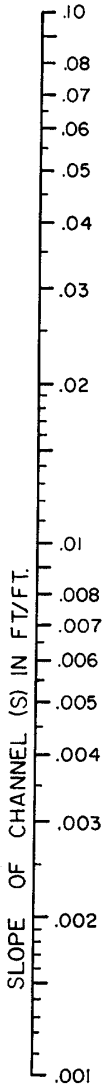
EXAMPLE: (see dashed lines)

GIVEN: S = 0.03
Z = 24
n = .02
Z/n = 1200
Y = 0.22

FIND: Q = 20 cfs



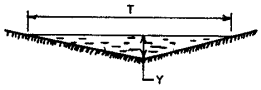




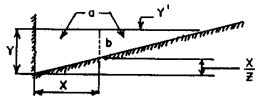
INSTRUCTIONS

1. Connect Z/n ratio with slope (S) and connect discharge (Q) with depth (Y). These two lines must intersect at turning line for complete solution.

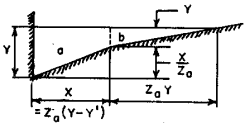
2. For shallow V-shaped channel as shown use nomograph with $Z = \frac{T}{Y}$



3. To determine discharge Q_x in portion of channel having width X: determine depth Y for total discharge in entire section a. Then use nomograph to determine Q_b in section b for depth $Y' = Y - \left(\frac{X}{Z}\right)$



4. To determine discharge in composite section: - follow instruction 3 to obtain discharge in section a at assumed depth Y, obtain Q_b for slope ratio Z_b and depth Y then $Q_T = Q_a + Q_b$



DRAWN BY: RLN

CHECKED BY:

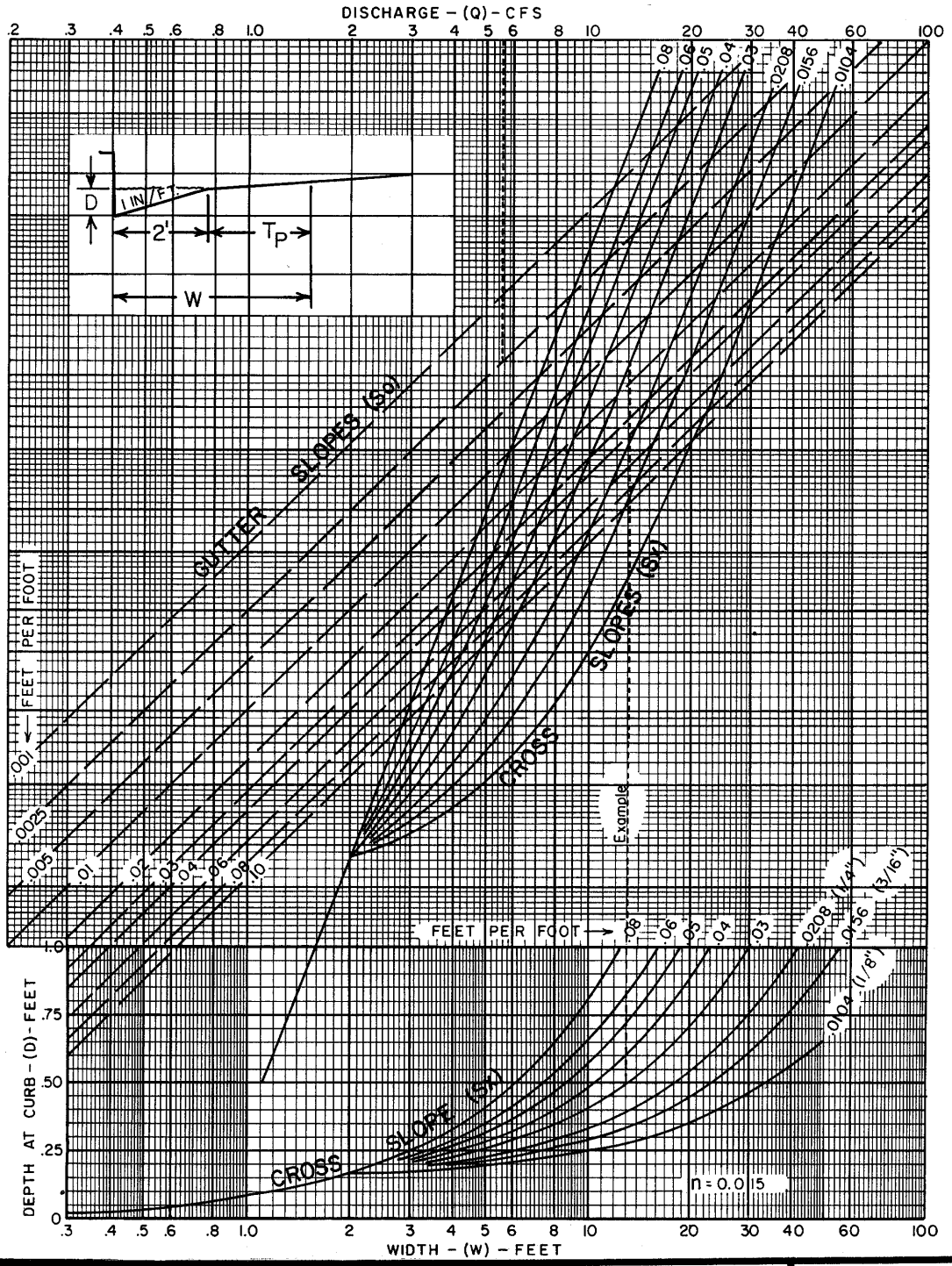
APPROVED BY:

NOMOGRAPH FOR FLOW IN TRIANGULAR CHANNELS

ISSUED: JULY 9, 1999

REVISED:

FIGURE NO. 11.4



DRAWN BY: RLN

CHECKED BY: _____

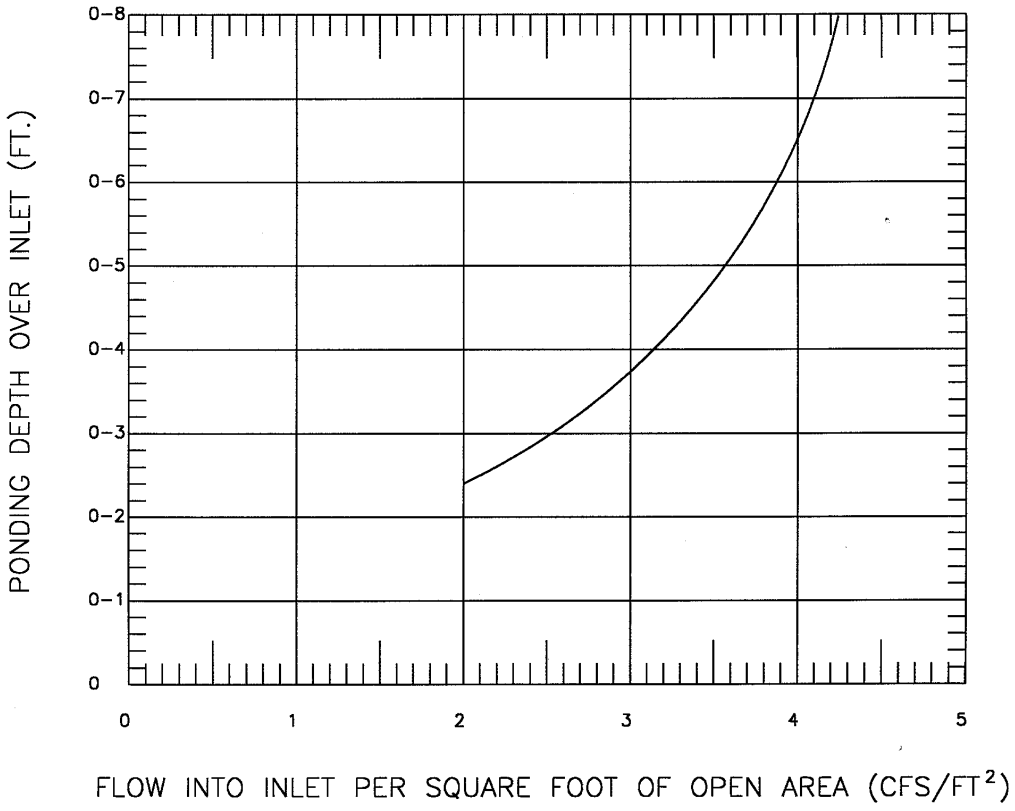
APPROVED BY: _____

FLOW CHARACTERISTIC CURVES

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO. 11.5



DRAWN BY: RRH CHECKED BY: APPROVED BY: J.O.	CAPACITY OF A GRATED INLET IN SUMP	ISSUED: JULY 9, 1999 REVISED: FIGURE NO. 11.6

DESIGN CRITERIA	RESIDENTIAL LATERAL WITH PIPE	NON-RESIDENTIAL LATERAL / CONCRETE CHANNEL	MAJOR DRAINWAY
GRASS SIDE SLOPES	4:1 OR FLATTER	4:1 OR FLATTER	4:1 OR FLATTER
FREE BOARD (100 YEAR STORM)	0.5 FOOT	0.5 FOOT	$H = 0.5+V^2/2g$ MIN. 1 FOOT
BOTTOM WIDTH MINIMUM	4 FOOT	6 FOOT	6 X DEPTH OF 100 Yr. FLOW
DEPTH (100 YEAR STORM)	MAX. 2 FOOT	MAX. 2 FOOT	PER MASTER DRAINAGE PLAN
SLOPE MINIMUM	1%	0.5%	0.2% - 0.6% (NATURAL)
LOW FLOW PIPE / CHANNEL	18" MIN. RESIDENTIAL & COMMERCIAL 2 YEAR INDUSTRIAL	2 YEAR CAPACITY CROSS-SLOPE 1/4" PER FOOT	N/A
RADIUS	N/A	N/A	2 X TOP WIDTH AND > 100 FEET CENTERLINE
VELOCITY	N/A	MIN. 2 FOOT/SEC. 5 YEAR	MIN. 2 FOOT/SEC. 5 YEAR

DRAWN BY: RRH

CHECKED BY:

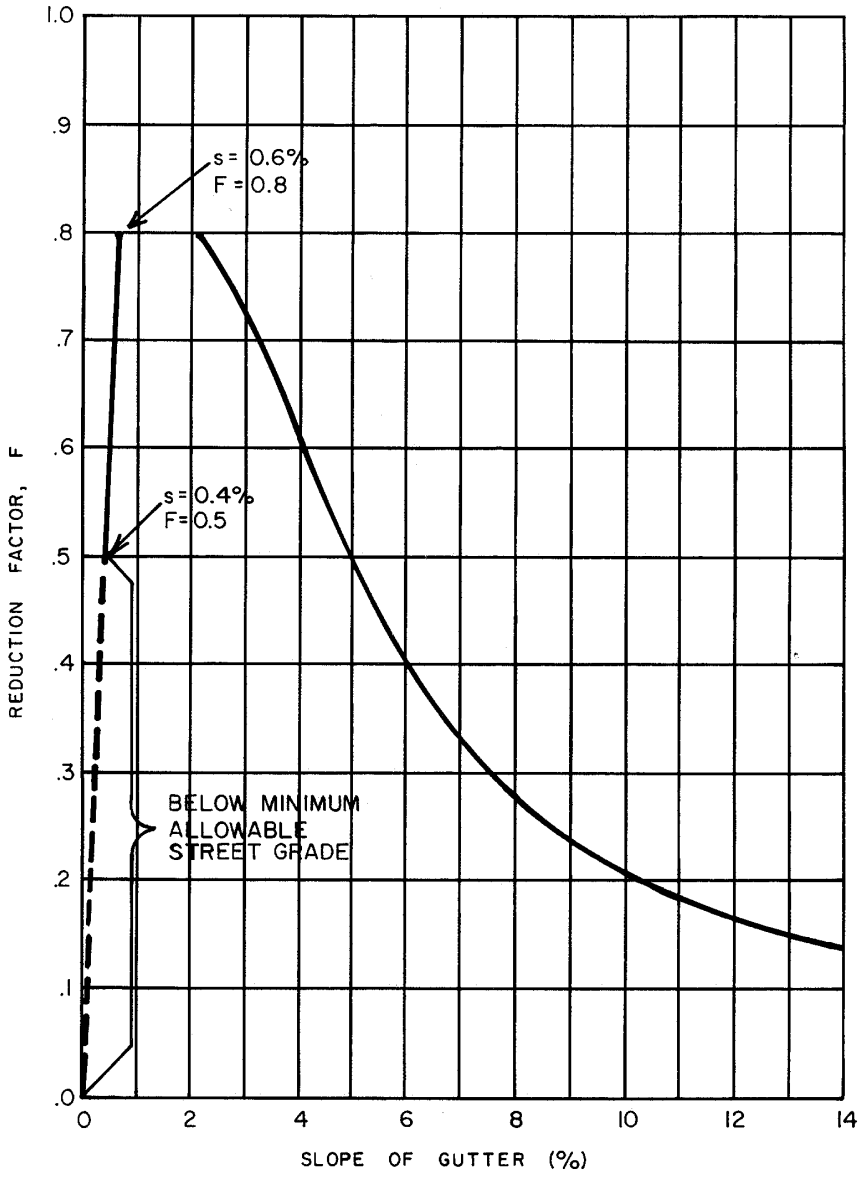
APPROVED BY: J.D.

CHANNEL DESIGN CRITERIA

ISSUED: JULY 1999

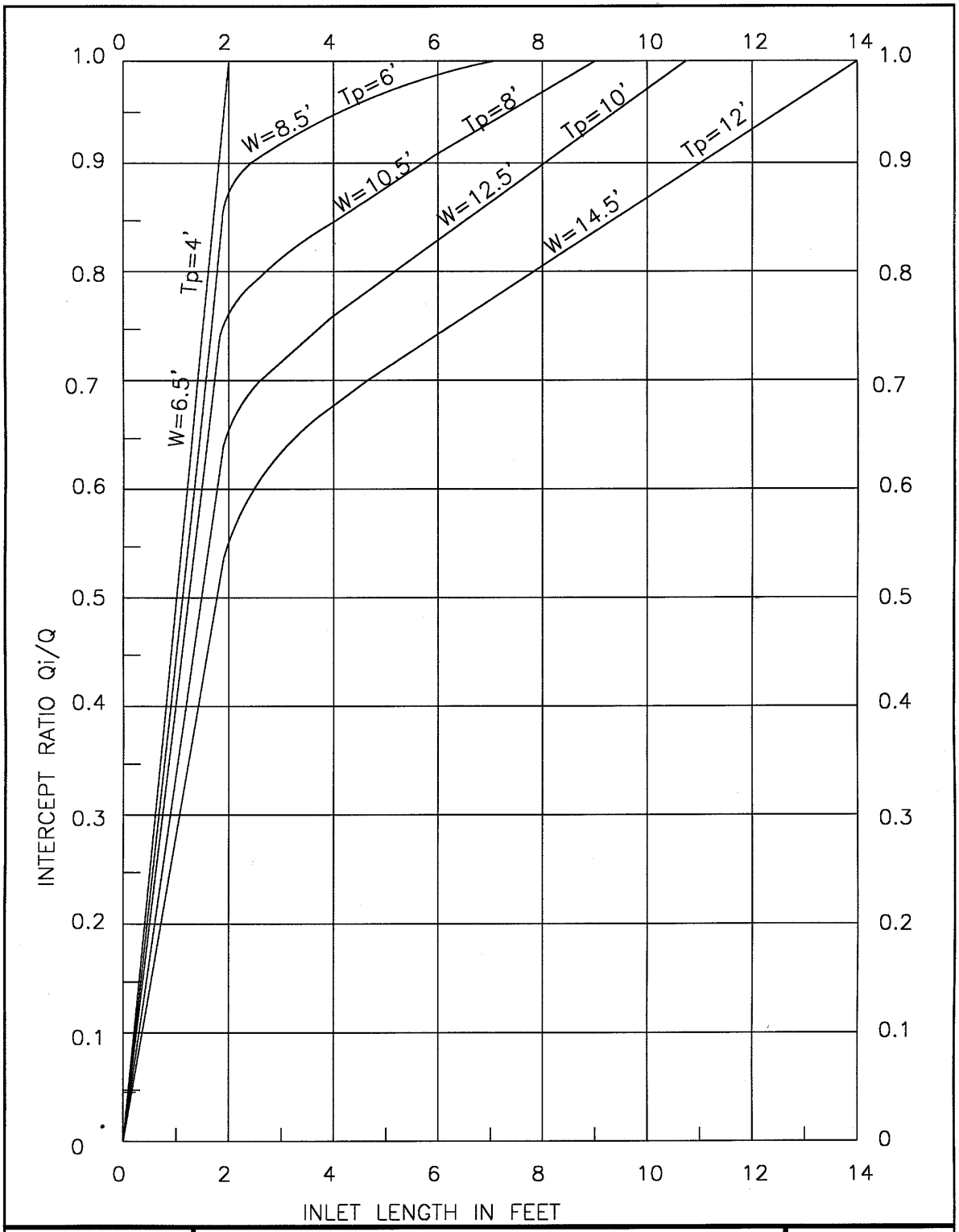
REVISED: 12-17-03

FIGURE NO. 11.7



Apply reduction factor for applicable slope to the theoretical gutter capacity to obtain allowable gutter capacity.

DRAWN BY: RLN CHECKED BY: APPROVED BY:	REDUCTION FACTOR FOR ALLOWABLE GUTTER CAPACITY	ISSUED: JULY 9, 1999 REVISED: FIGURE NO. 11.8



DRAWN BY: RRH

CHECKED BY:

APPROVED BY: J.O.

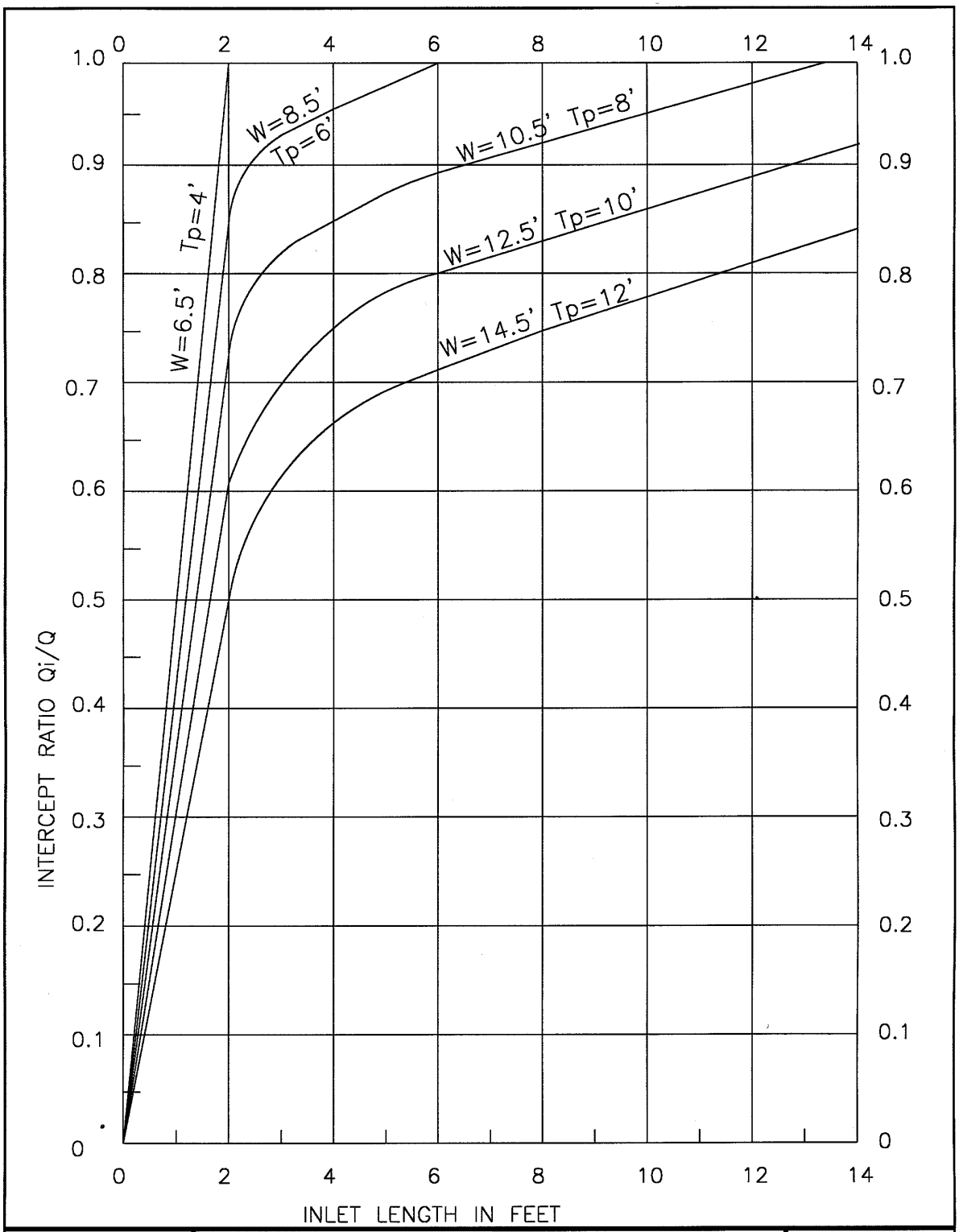
INLET CAPACITY TYPE I

So= 0.002, Sx=3/16"/ft.

ISSUED: JULY 9, 1999

REVISED:

FIGURE NO. 11.9



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

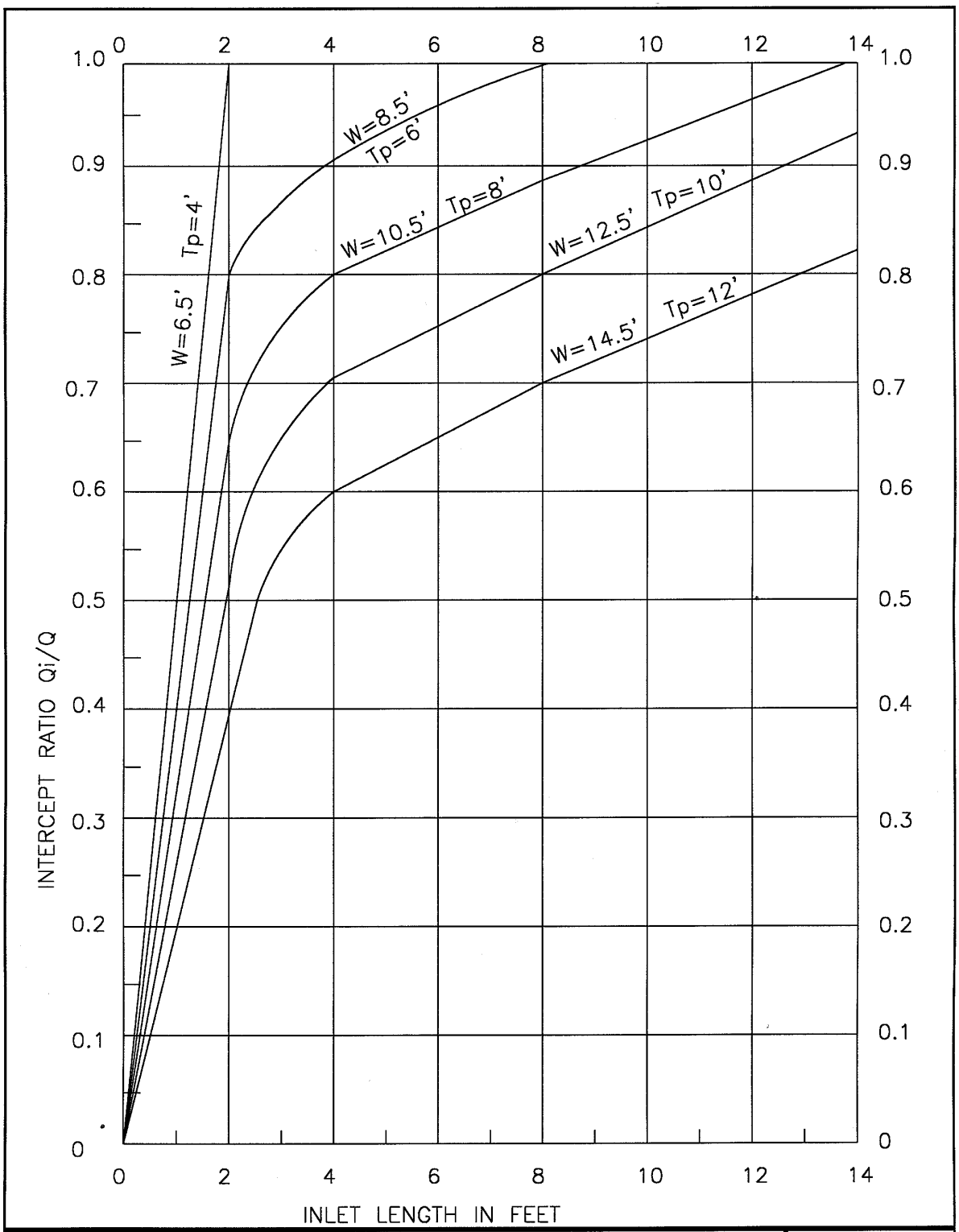
INLET CAPACITY TYPE I

So= 0.004, Sx=3/16"/ft.

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO. 11.10



DRAWN BY: RRH

CHECKED BY:

APPROVED BY: J.O.

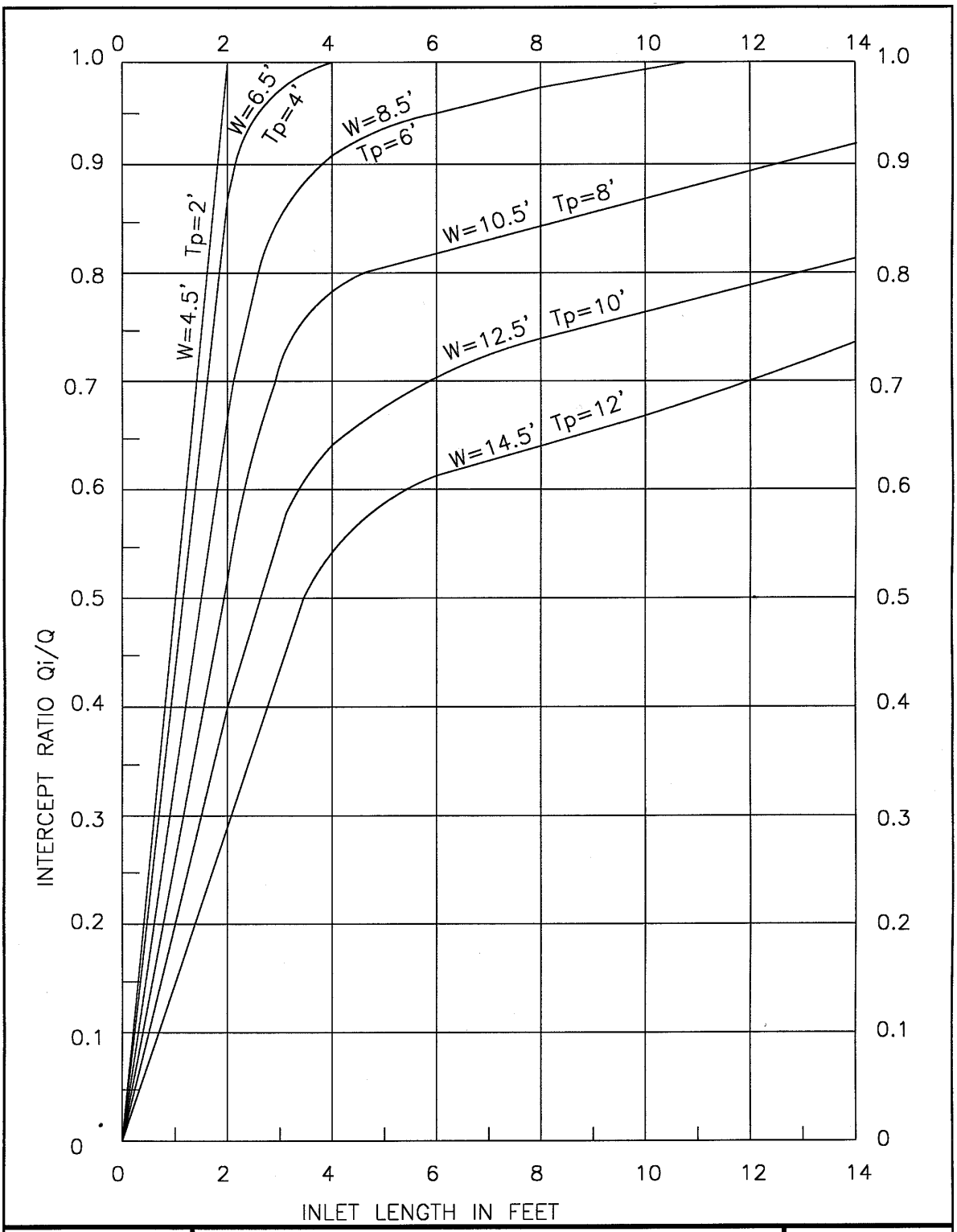
INLET
CAPACITY
TYPE I

So= 0.006, Sx=3/16"/ft.

ISSUED: JULY 9, 1999

REVISED:

FIGURE NO.
11.11



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

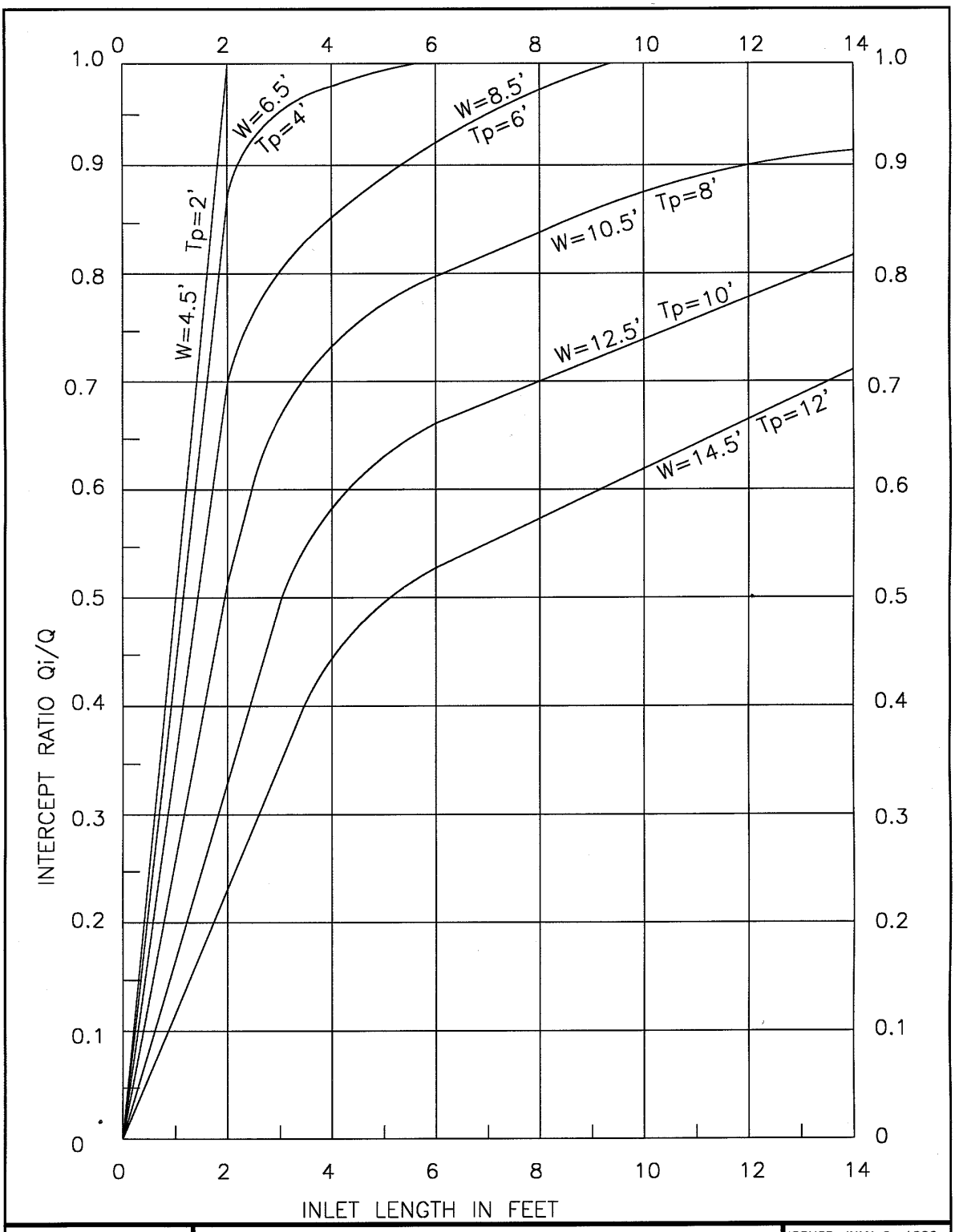
INLET
CAPACITY
TYPE I

So= 0.008, Sx=3/16"/ft.

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO.
11.12



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

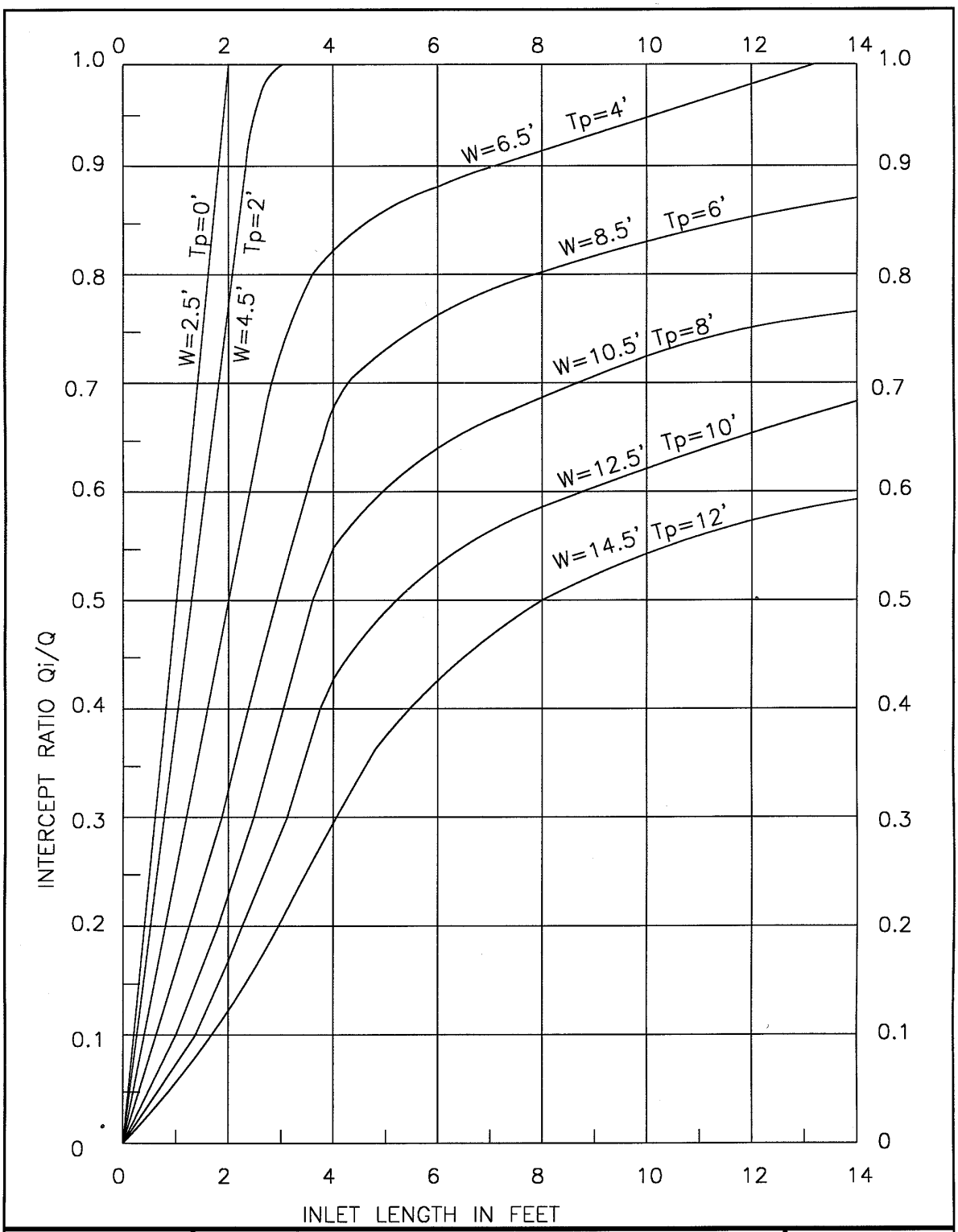
INLET CAPACITY TYPE I

So= 0.01, Sx=3/16"/ft.

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO. 11.13



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

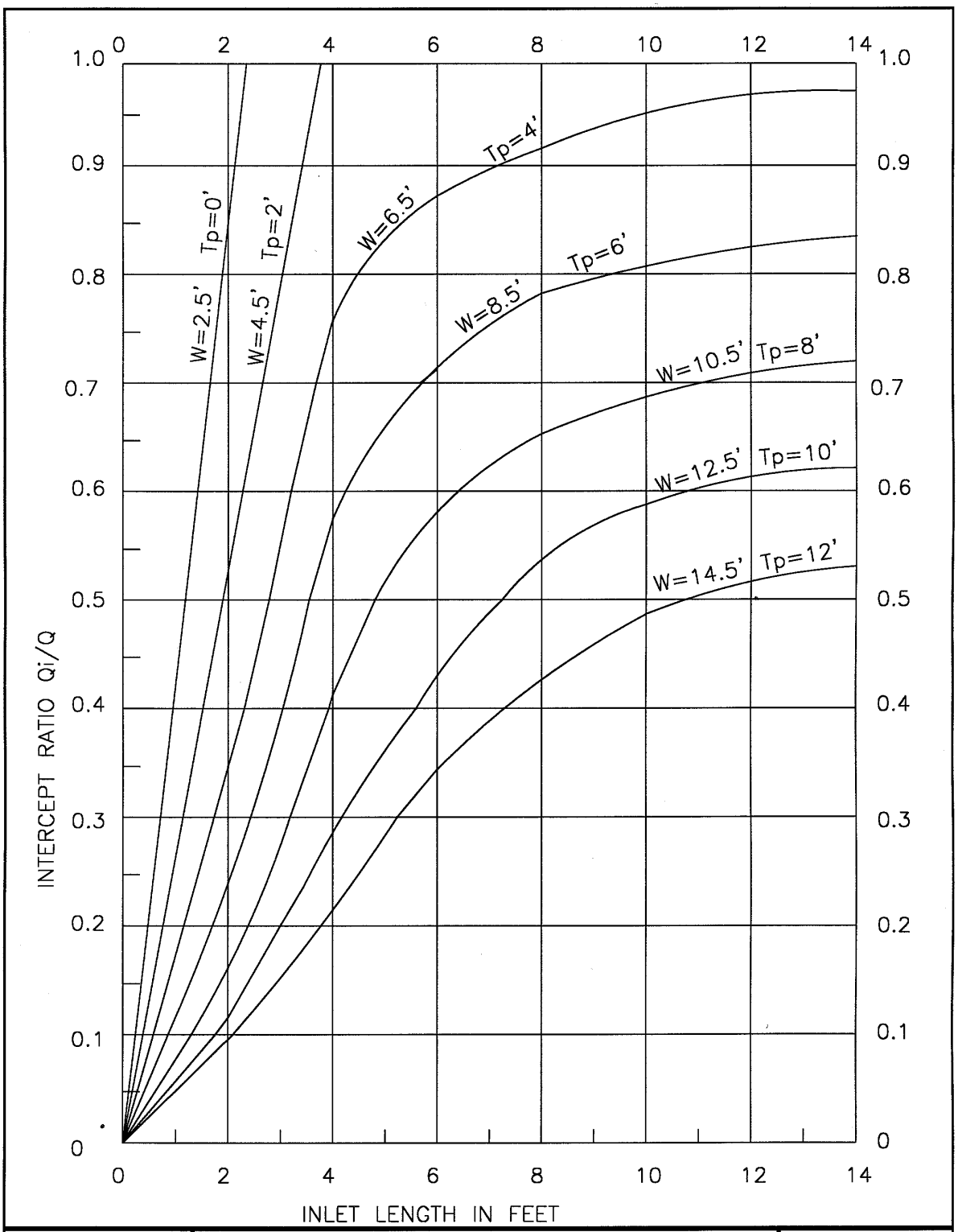
INLET CAPACITY TYPE I

So= 0.02, Sx=3/16"/ft.

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO. 11.14



DRAWN BY: RRH

CHECKED BY:

APPROVED BY: J.O.

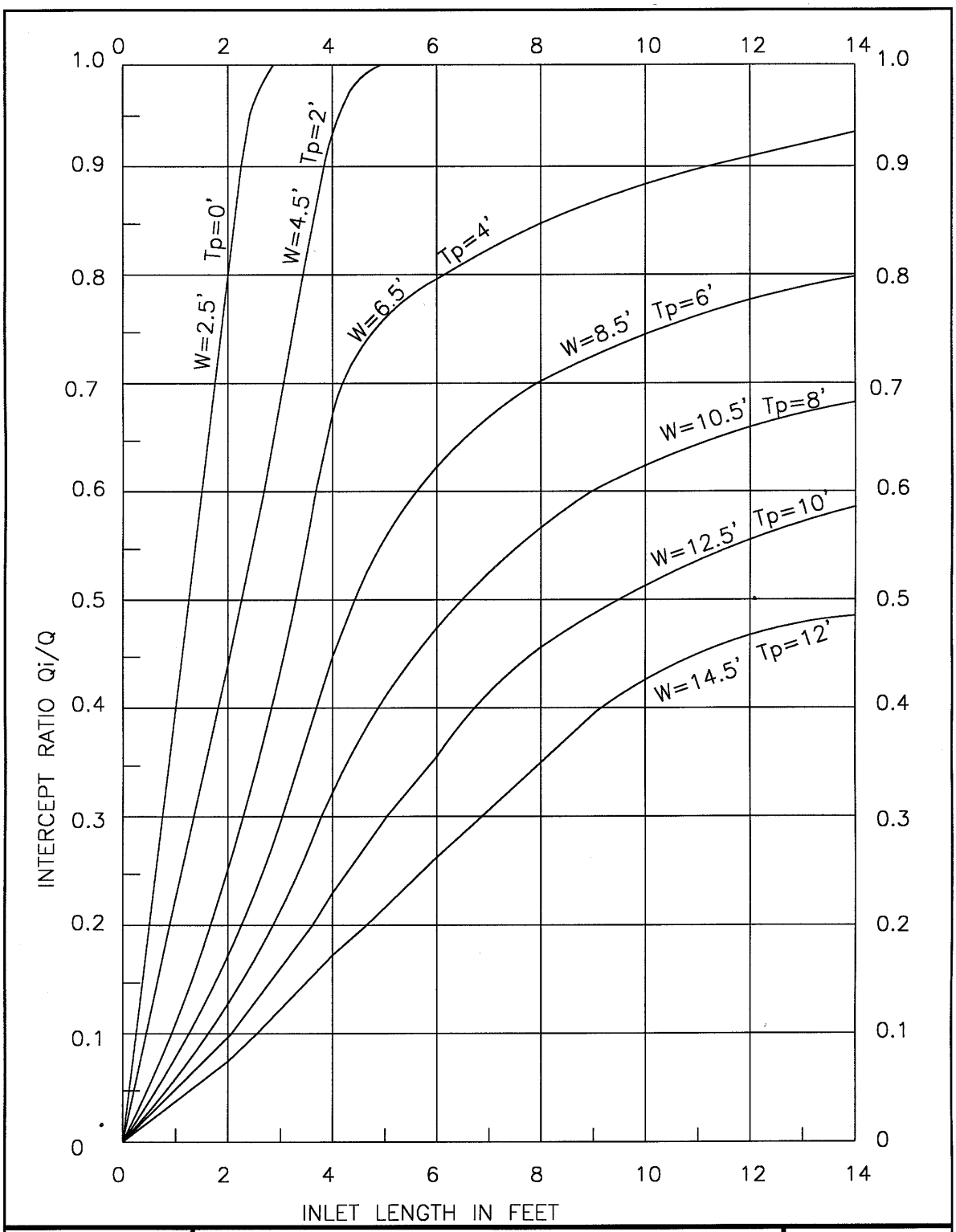
INLET CAPACITY TYPE I

So= 0.03, Sx=3/16"/ft.

ISSUED: JULY 9, 1999

REVISED:

FIGURE NO. 11.15



DRAWN BY: RRH

CHECKED BY:

APPROVED BY: J.O.

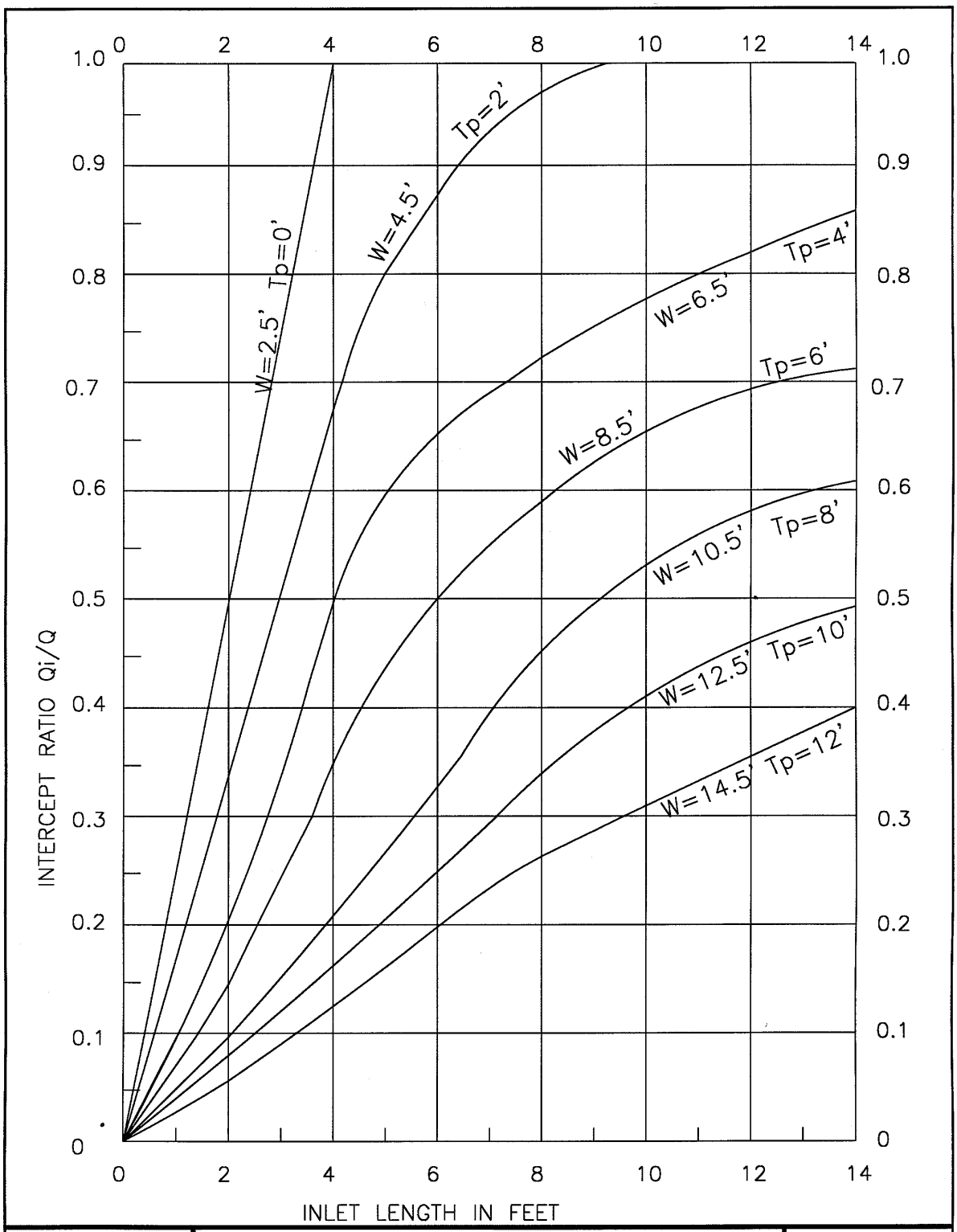
INLET CAPACITY TYPE I

So= 0.04, Sx=3/16"/ft.

ISSUED: JULY 9, 1999

REVISED:

FIGURE NO. 11.16



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: _____

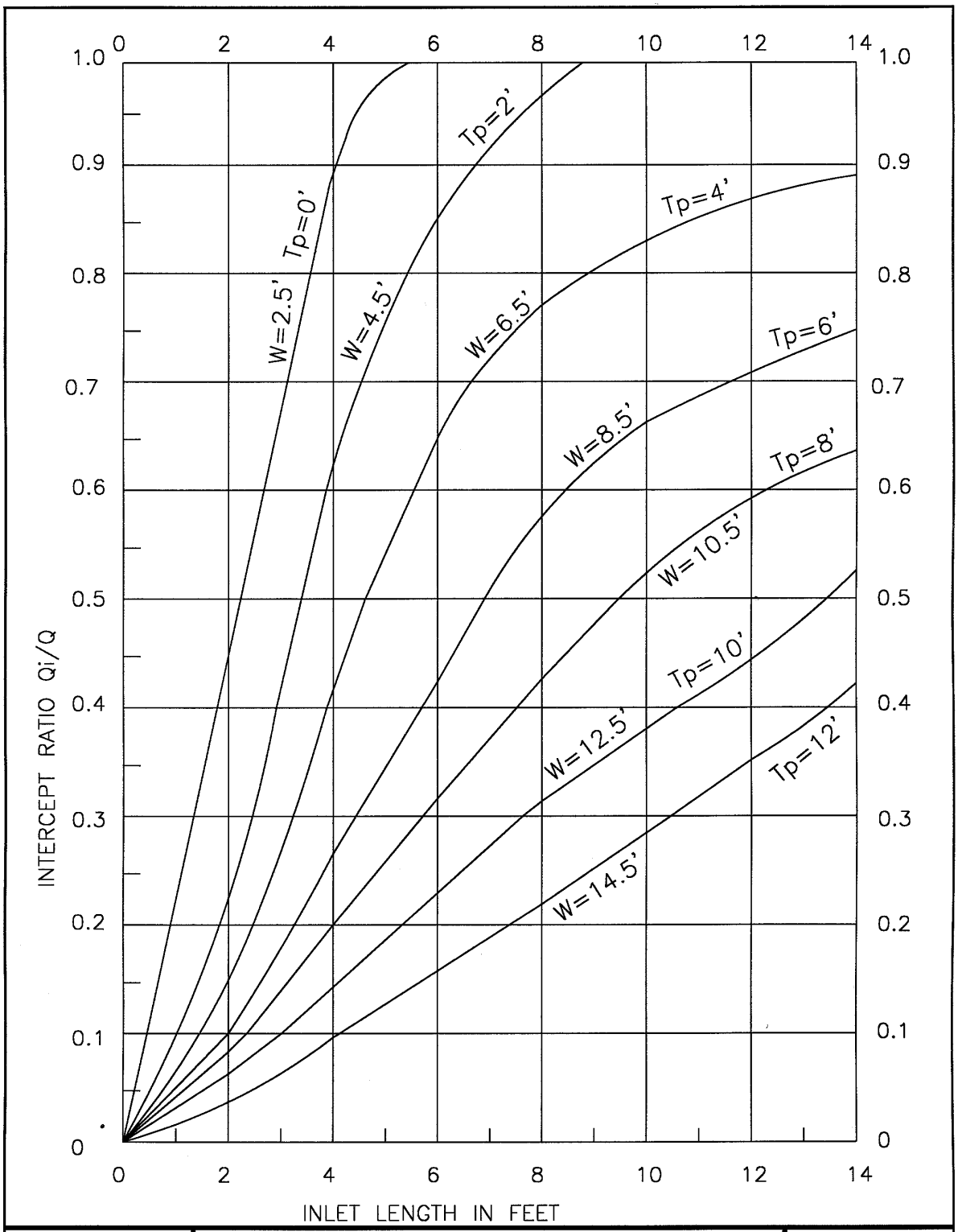
INLET CAPACITY TYPE I

So= 0.06, Sx=3/16"/ft.

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO. 11.17



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

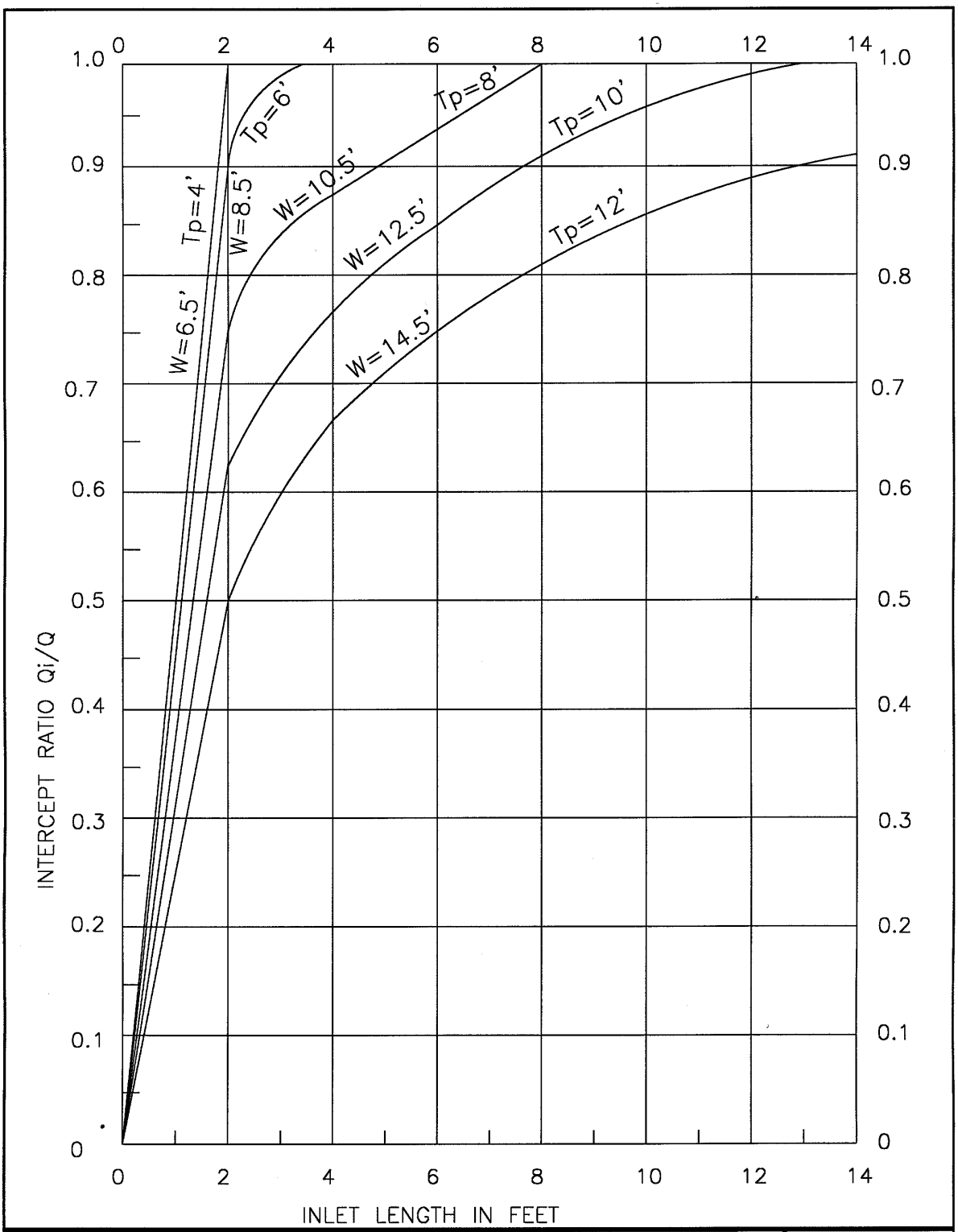
INLET CAPACITY TYPE I

So= 0.08, Sx=3/16"/ft.

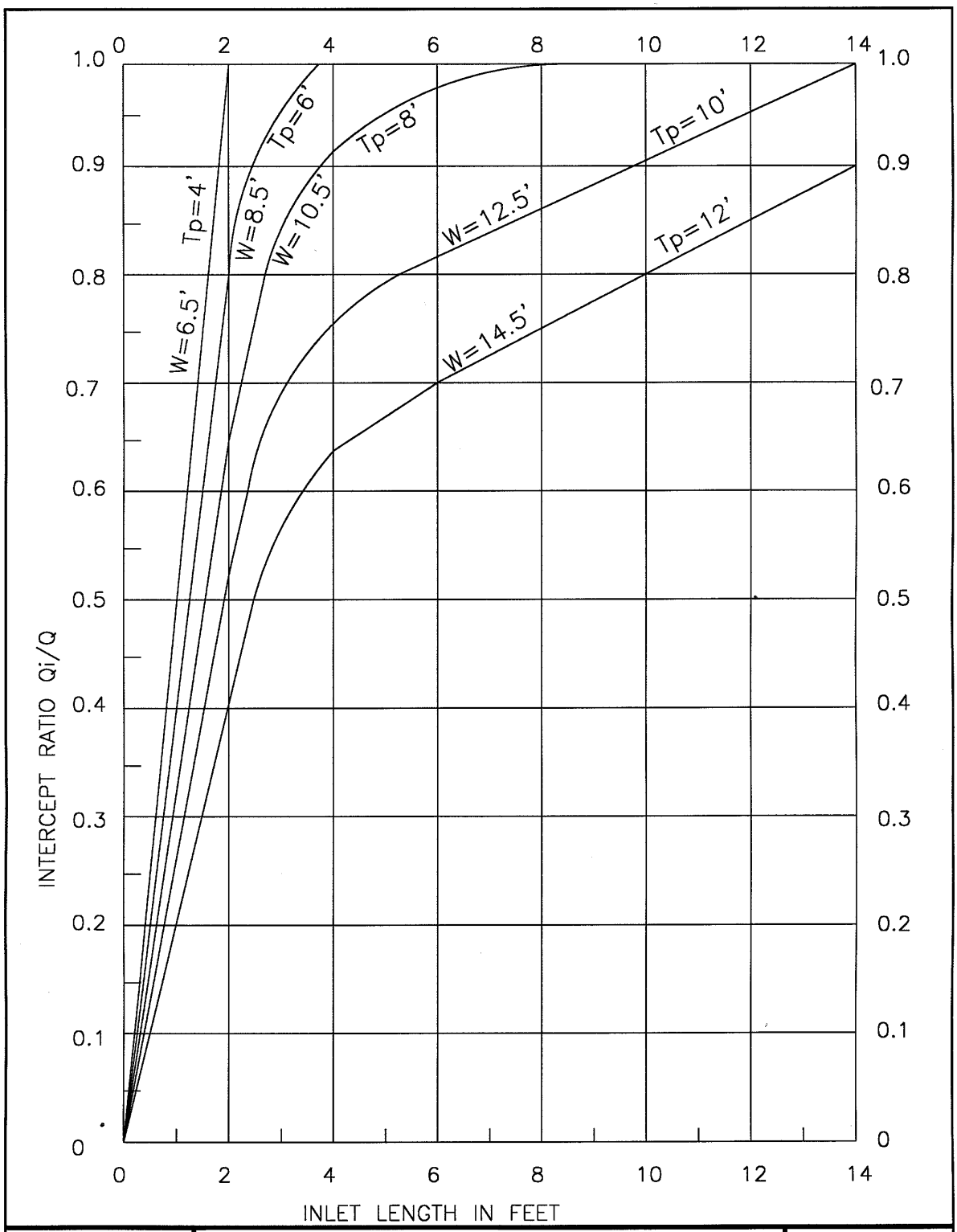
ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO. 11.18



DRAWN BY: RRH CHECKED BY: _____ APPROVED BY: J.O.	INLET CAPACITY TYPE I So= 0.002, Sx=1/4"/ft.	ISSUED: JULY 9, 1999 REVISED: _____ FIGURE NO. 11.19



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

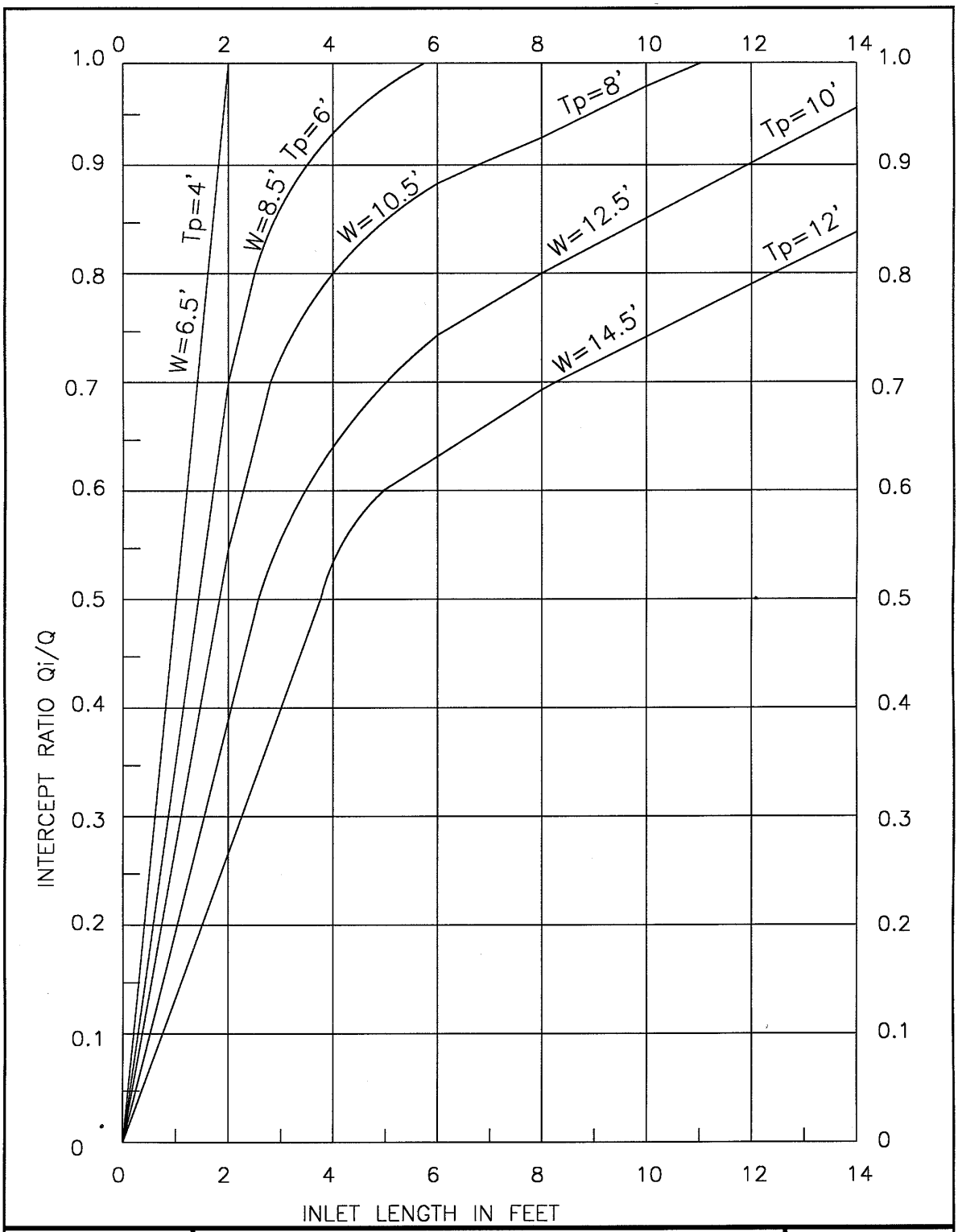
INLET
CAPACITY
TYPE I

So= 0.004, Sx=1/4"/ft.

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO.
11.20



DRAWN BY: RRH

CHECKED BY:

APPROVED BY: J.O.

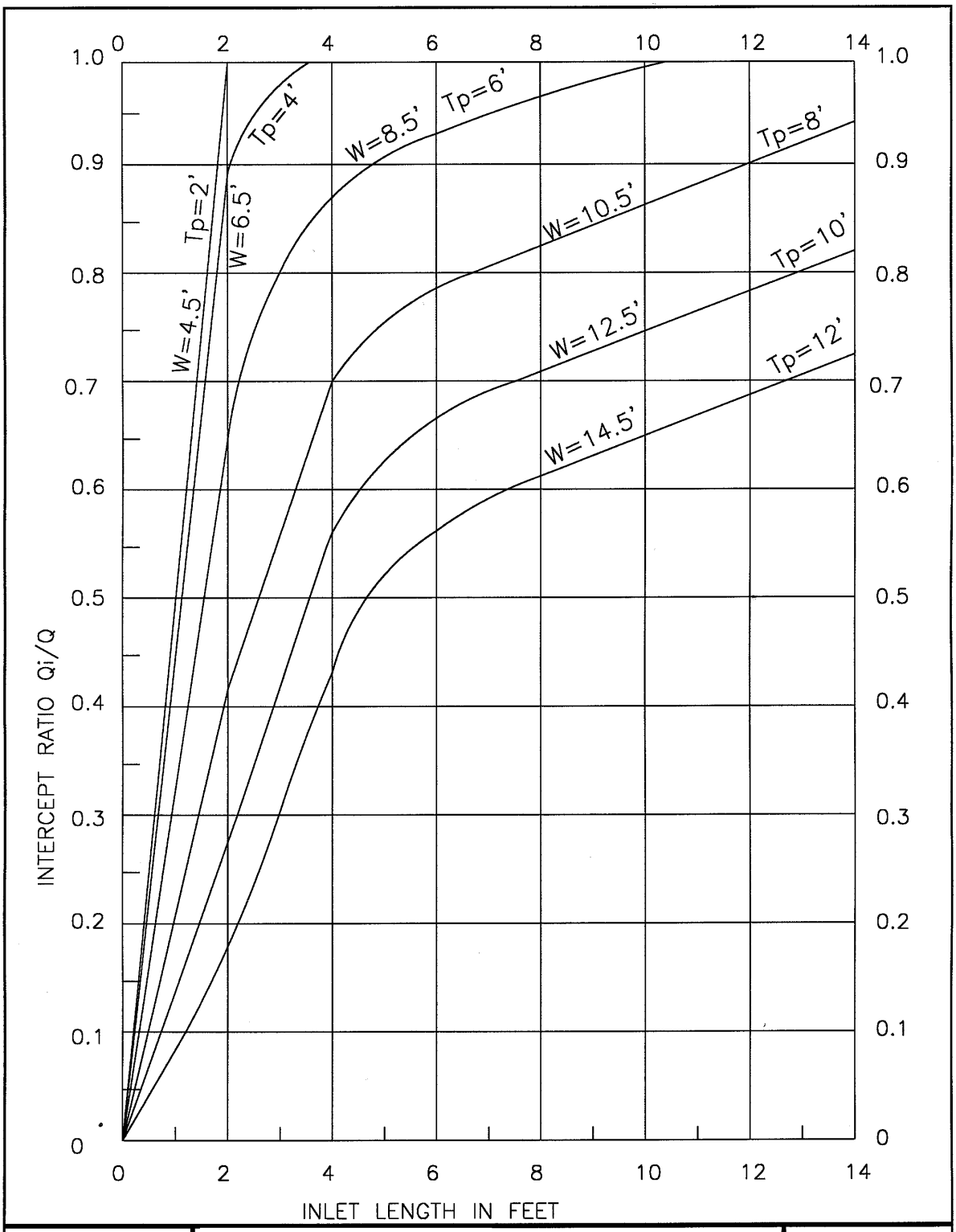
INLET CAPACITY TYPE I

So= 0.006, Sx=1/4"/ft.

ISSUED: JULY 9, 1999

REVISED:

FIGURE NO. 11.21



DRAWN BY: RRH

CHECKED BY:

APPROVED BY: J.O.

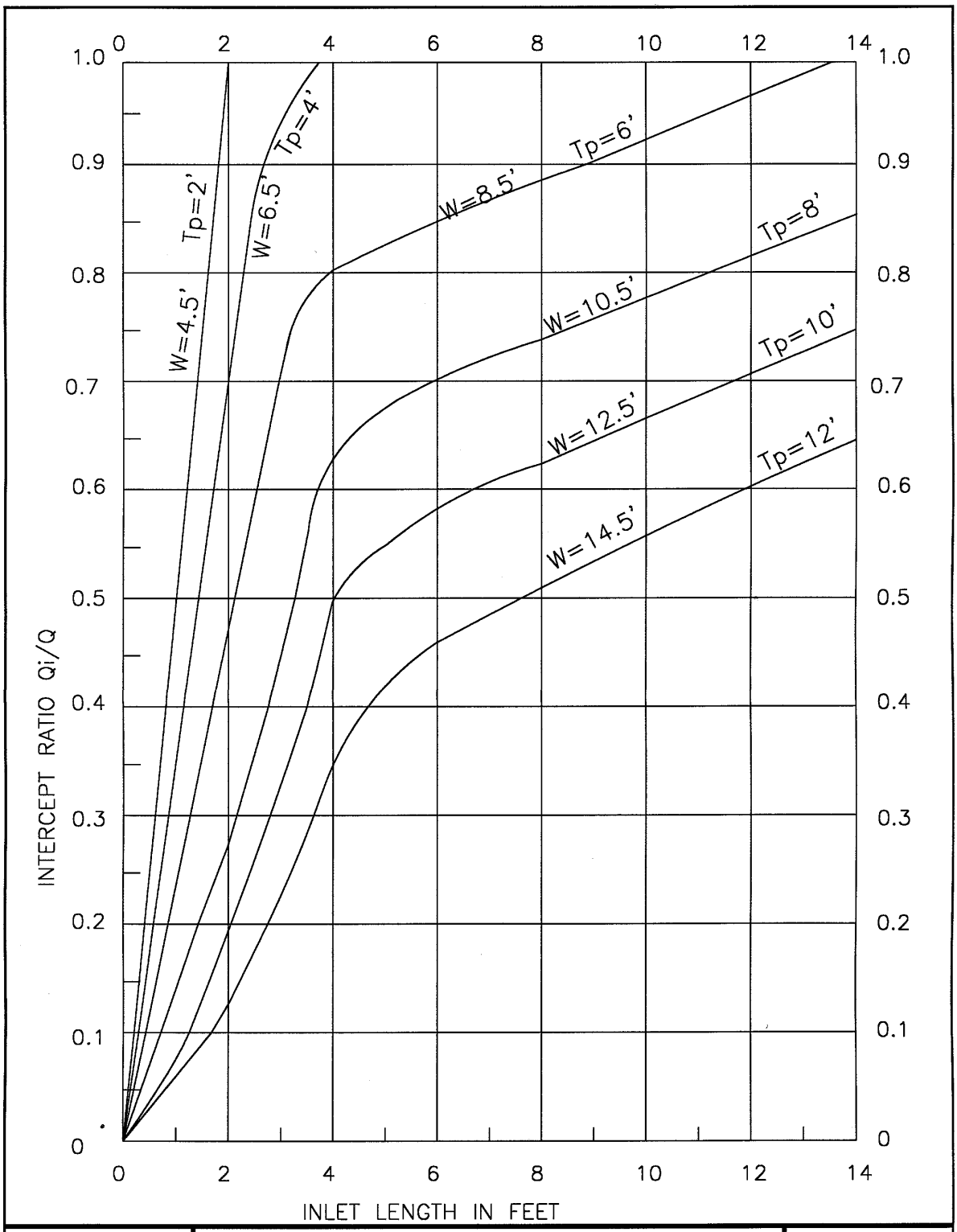
INLET CAPACITY TYPE I

So= 0.008, Sx=1/4"/ft.

ISSUED: JULY 9, 1999

REVISED:

FIGURE NO. 11.22



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

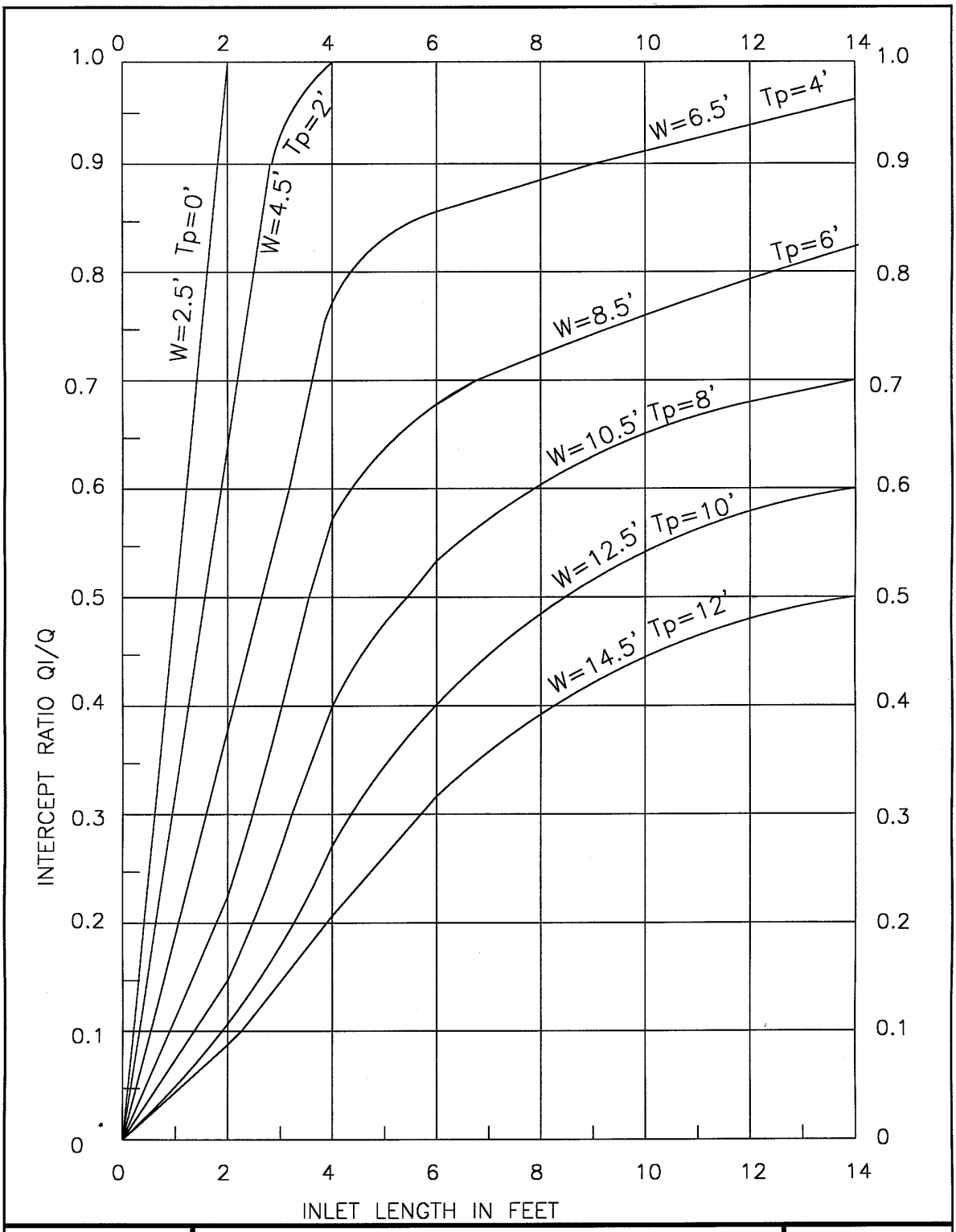
INLET
CAPACITY
TYPE I

So= 0.01, Sx=1/4"/ft.

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO.
11.23



DRAWN BY: RRH

CHECKED BY:

APPROVED BY:

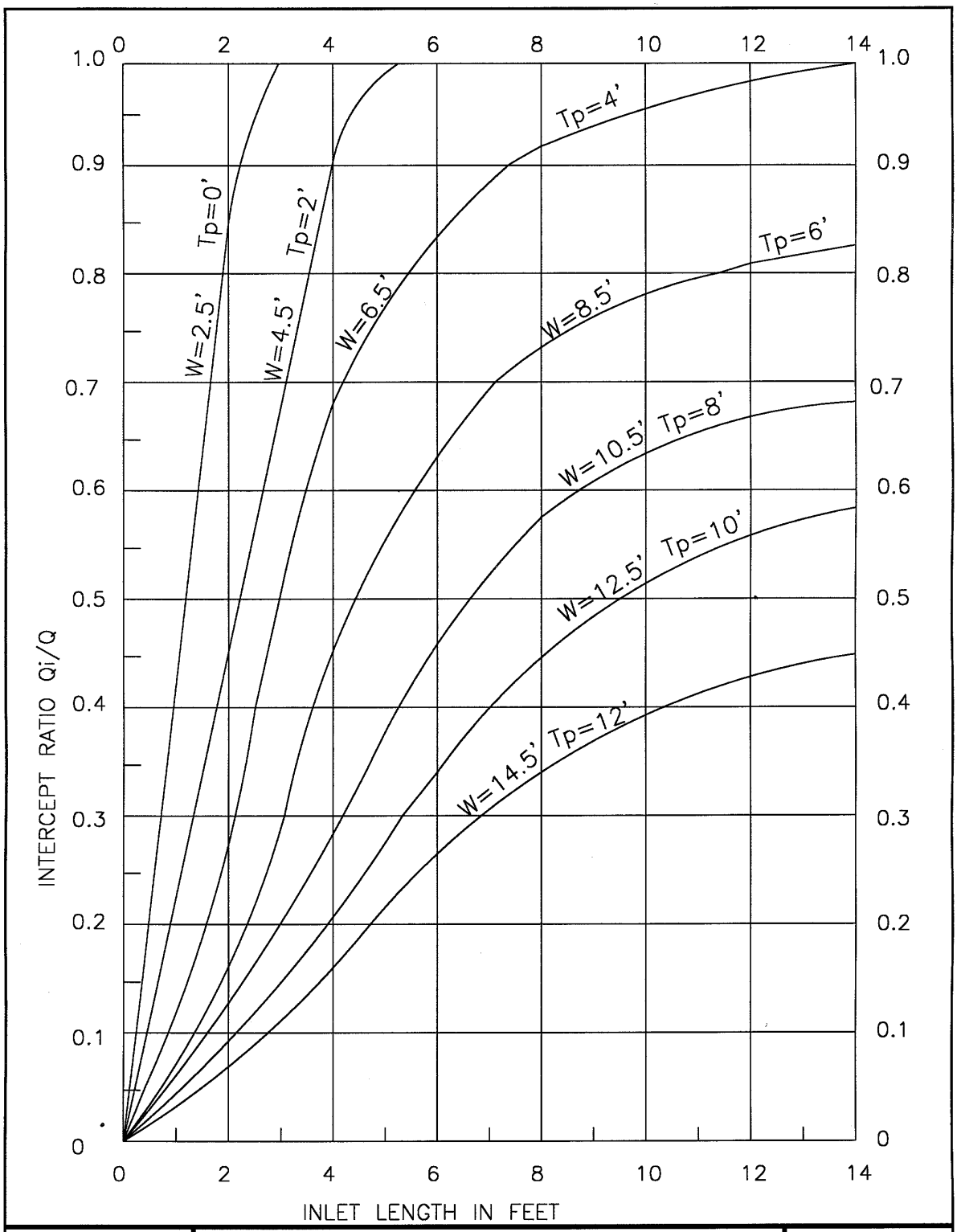
INLET CAPACITY TYPE I

So= 0.02, Sx=1/4"/ft.

ISSUED: JULY 9, 1999

REVISED:

FIGURE NO. 11.24



DRAWN BY: RRH

CHECKED BY:

APPROVED BY: J.O.

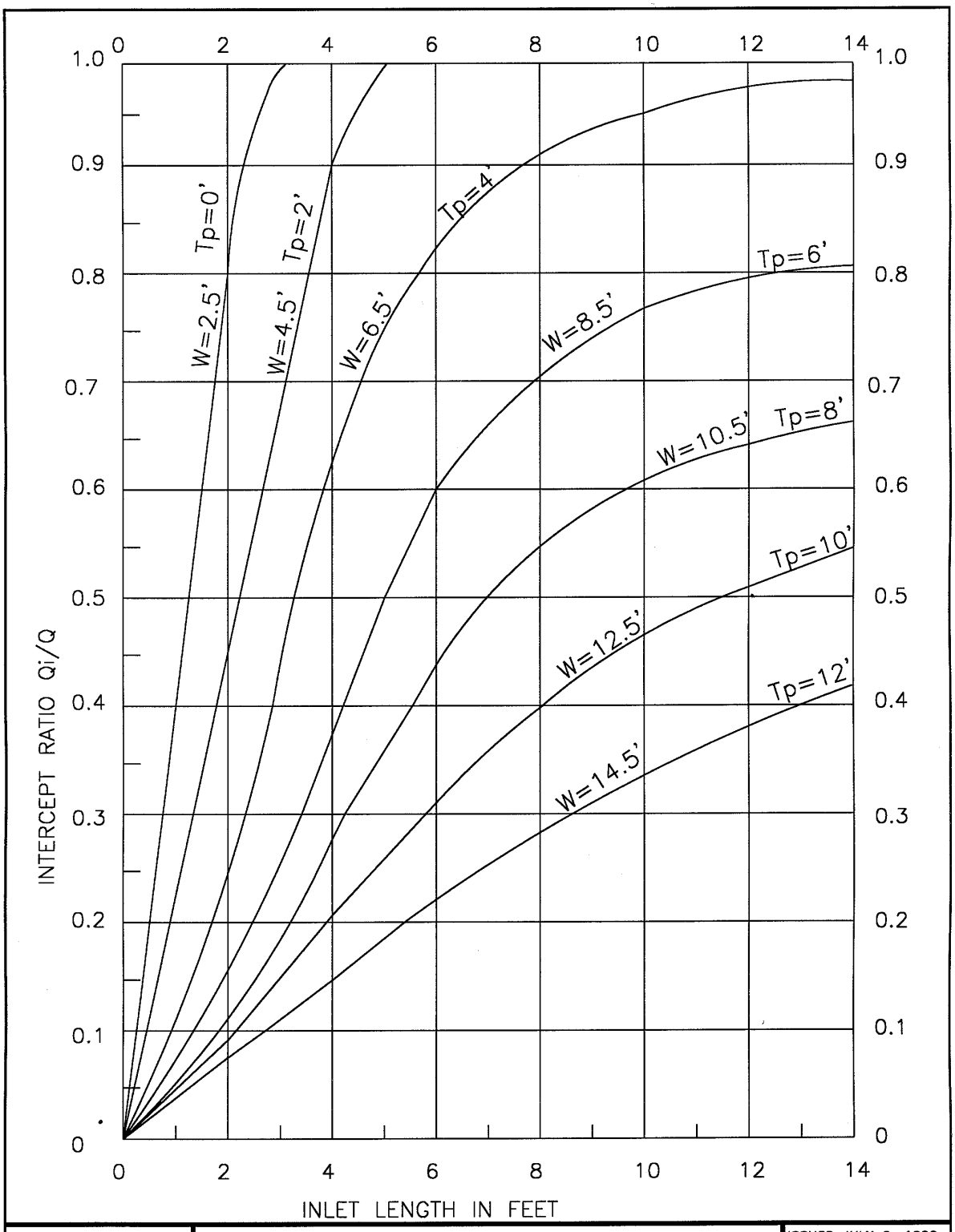
INLET CAPACITY TYPE I

So= 0.03, Sx=1/4"/ft.

ISSUED: JULY 9, 1999

REVISED:

FIGURE NO. 11.25



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

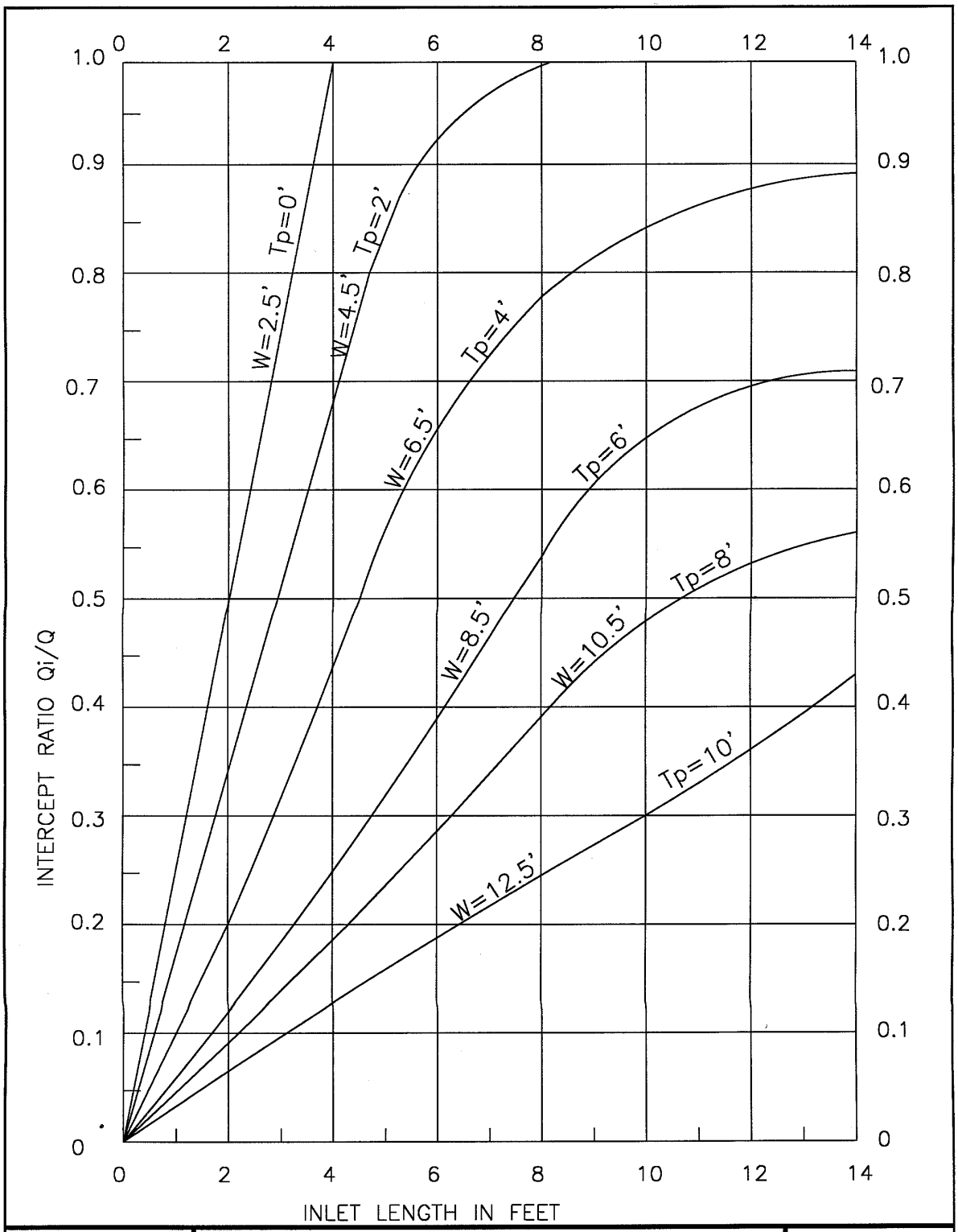
INLET CAPACITY TYPE I

So= 0.04, Sx=1/4"/ft.

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO. 11.26



DRAWN BY: RRH

CHECKED BY:

APPROVED BY: J.O.

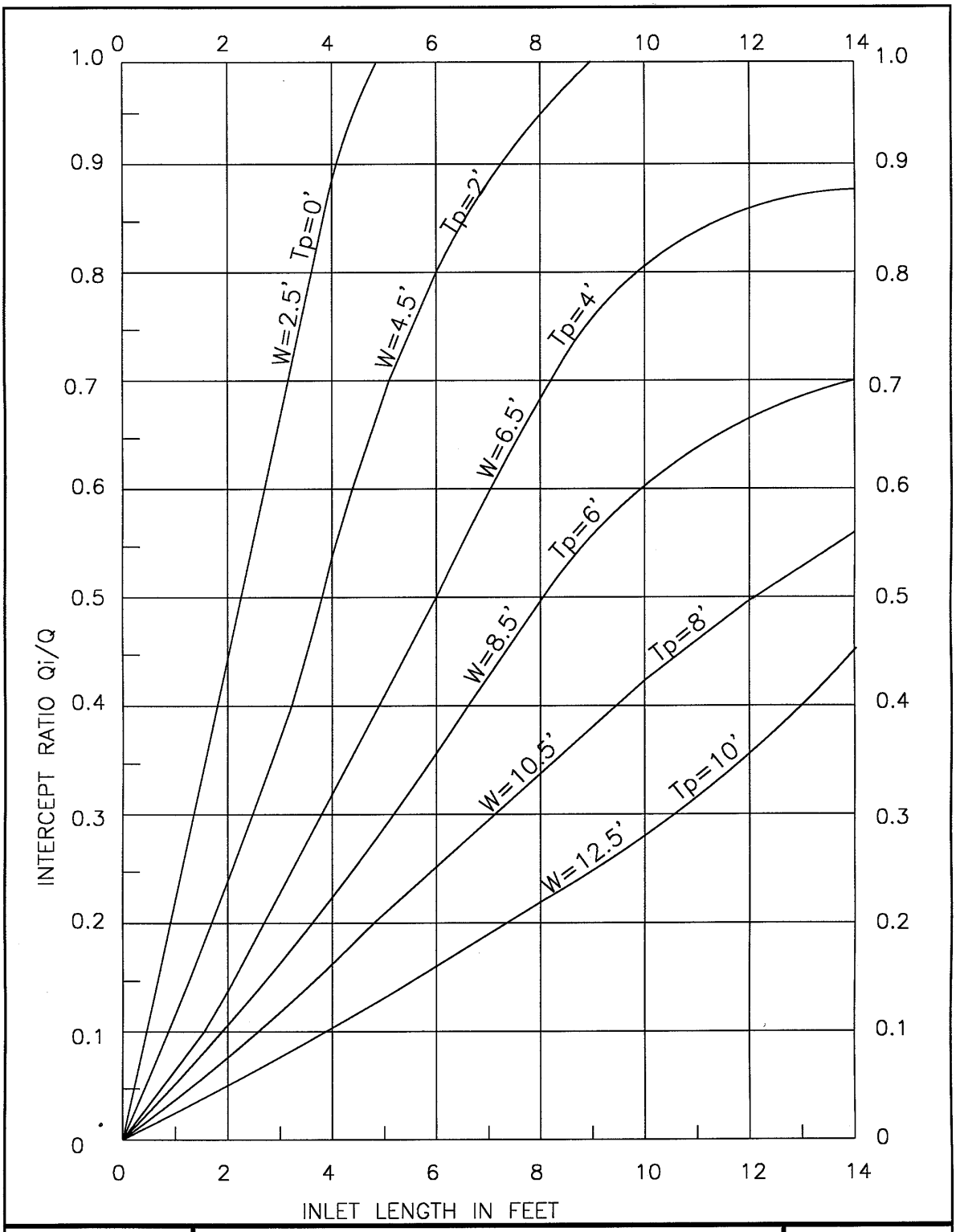
INLET CAPACITY TYPE I

So= 0.06, Sx=1/4"/ft.

ISSUED: JULY 9, 1999

REVISED:

FIGURE NO. 11.27



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

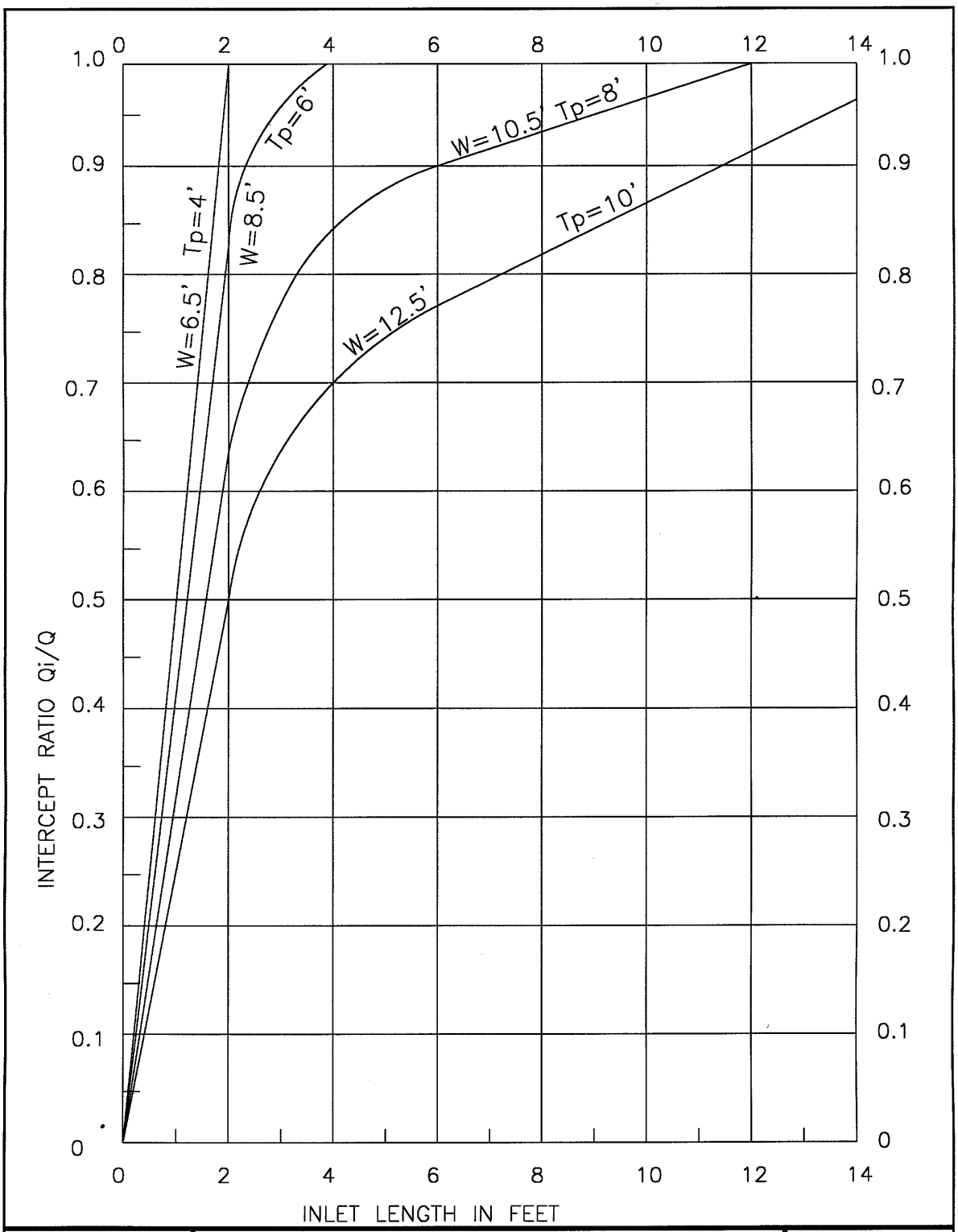
INLET CAPACITY TYPE I

So= 0.08, Sx=1/4"/ft.

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO. 11.28



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

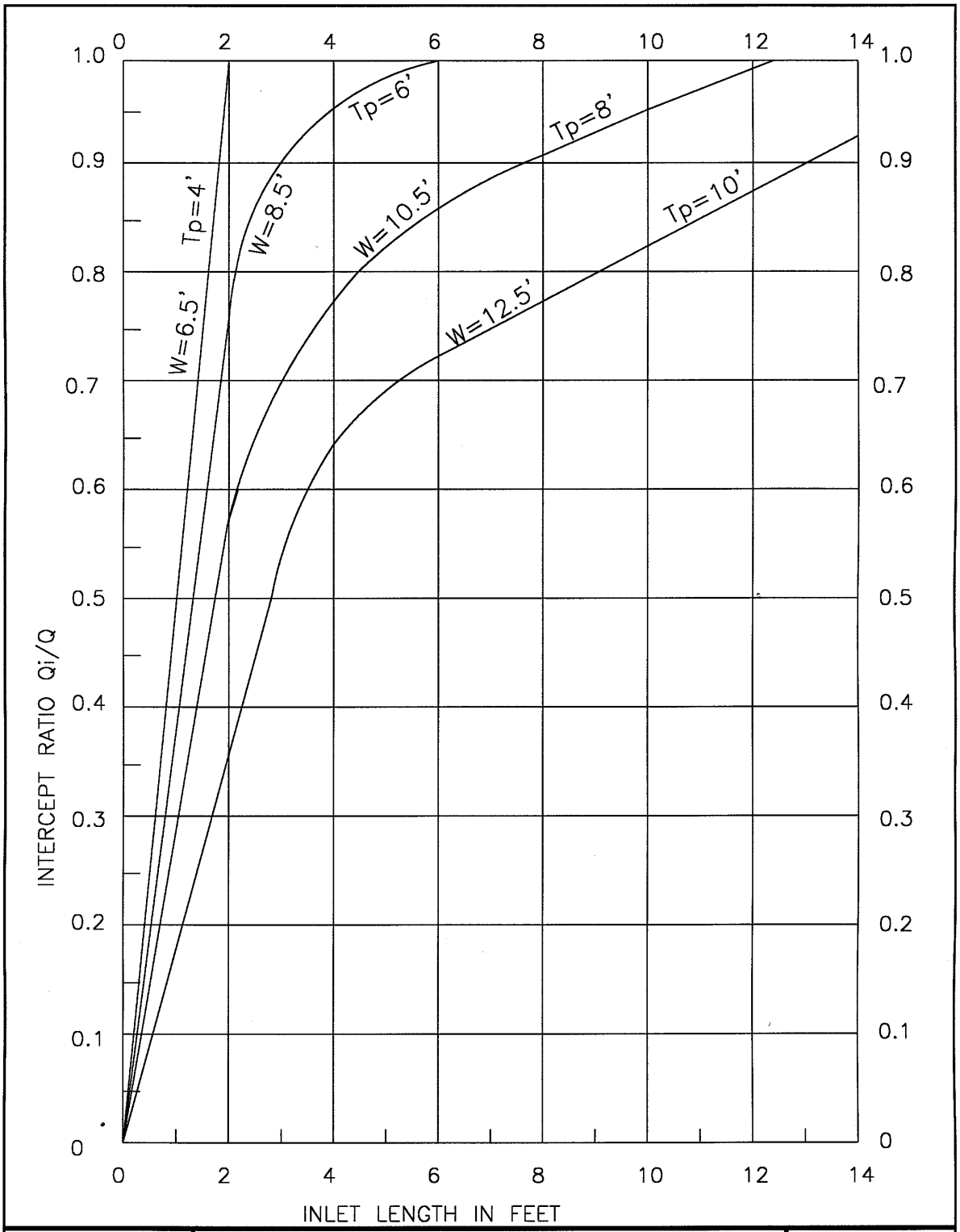
INLET
CAPACITY
TYPE I

So= 0.002, Sx=3/8"/ft.

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO.
11.29



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

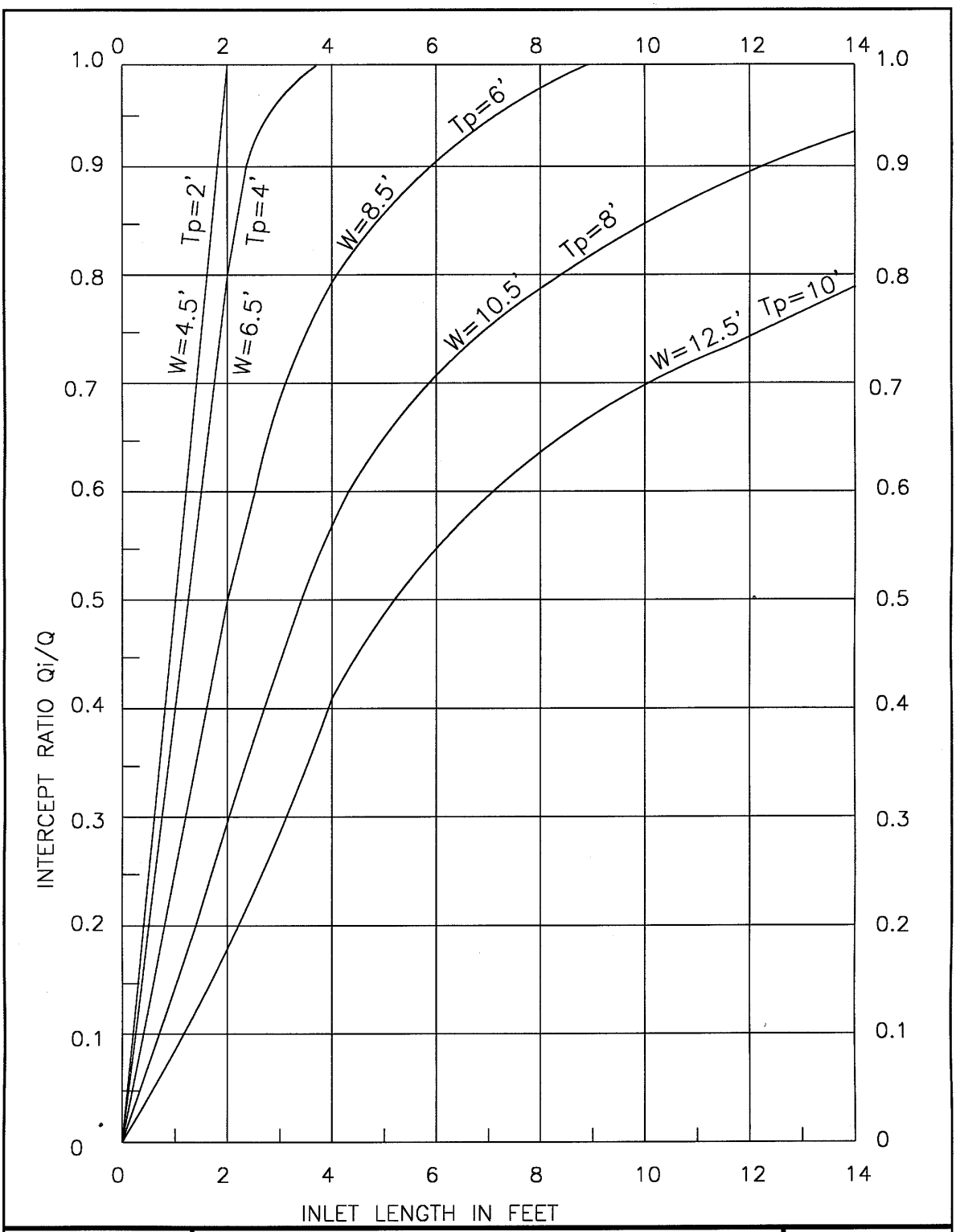
INLET
CAPACITY
TYPE I

So= 0.004, Sx=3/8"/ft.

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO.
11.30



DRAWN BY: RRH

CHECKED BY:

APPROVED BY: J.O.

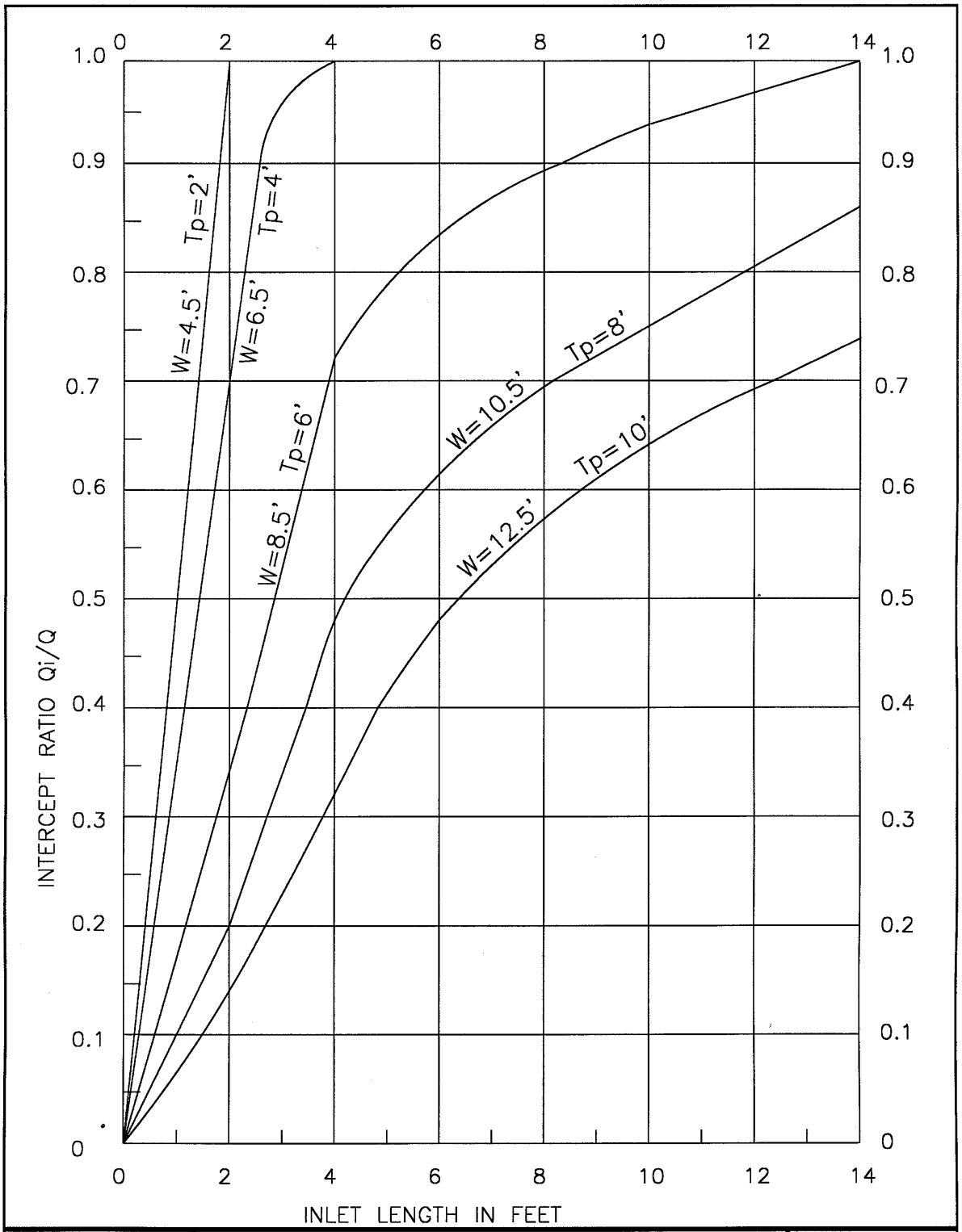
INLET
CAPACITY
TYPE I

So= 0.006, Sx=3/8"/ft.

ISSUED: JULY 9, 1999

REVISED:

FIGURE NO.
11.31



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

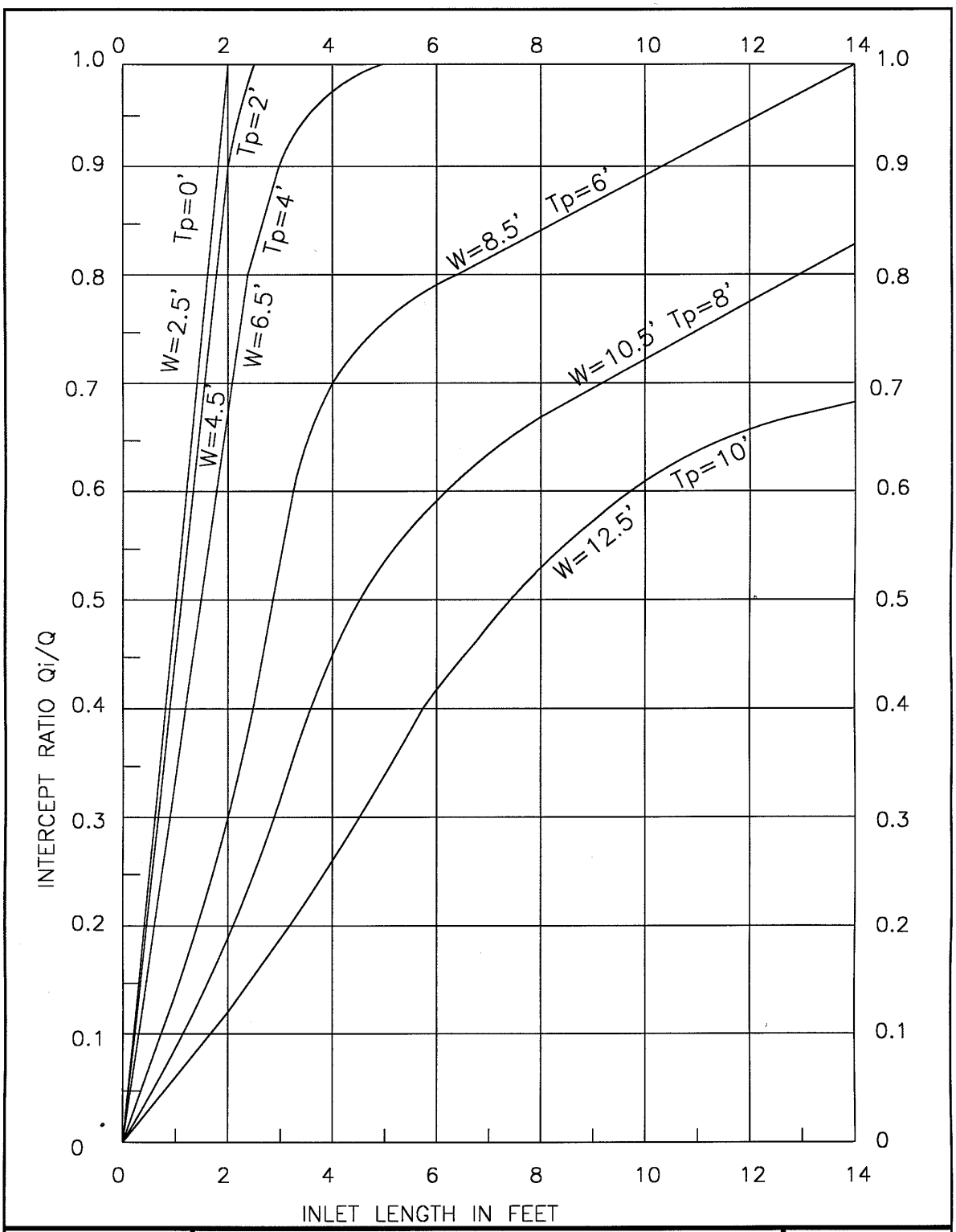
INLET
CAPACITY
TYPE I

So= 0.008, Sx=3/8"/ft.

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO.
11.32



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

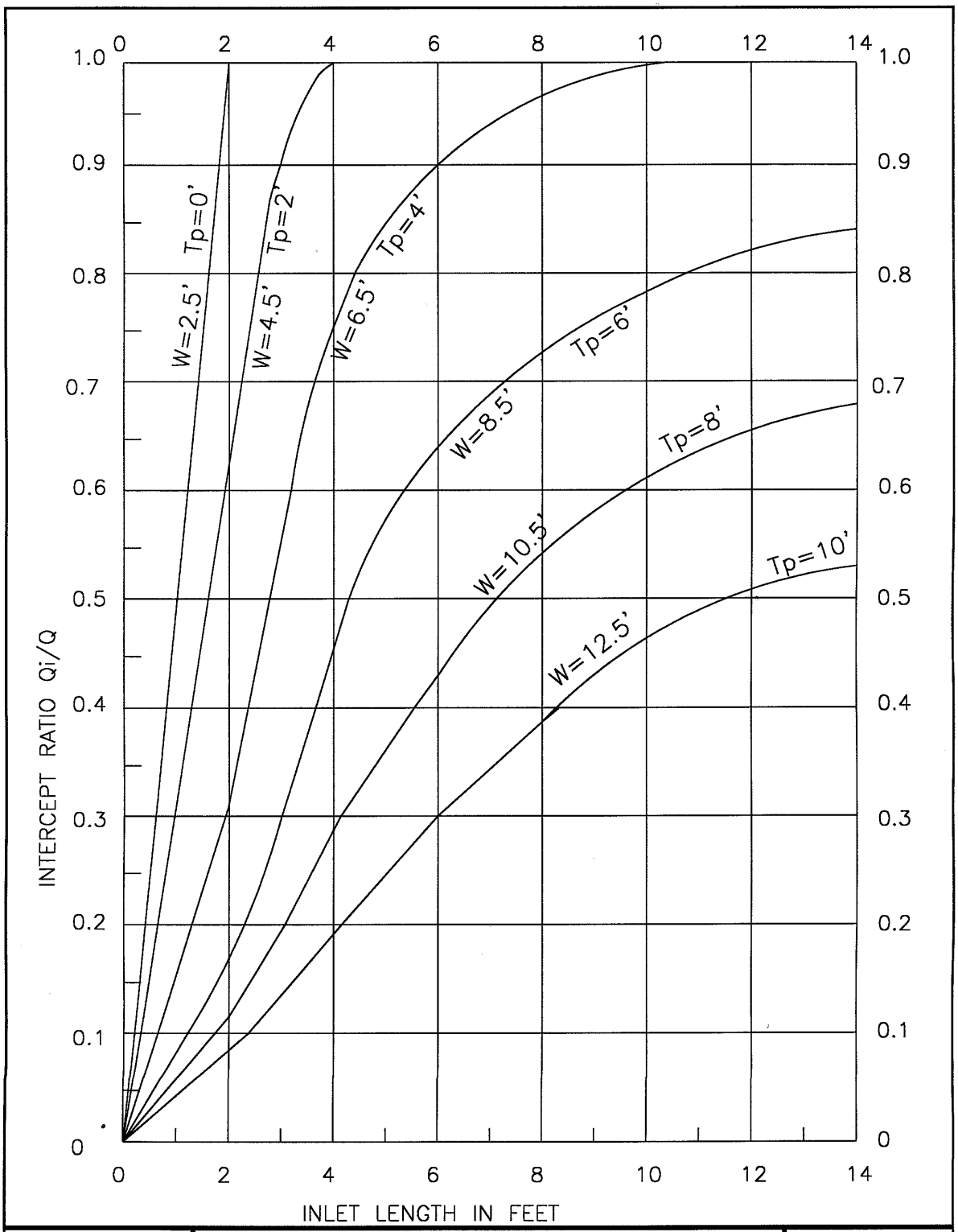
INLET CAPACITY TYPE I

So= 0.01, Sx=3/8"/ft.

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO. 11.33



DRAWN BY: RRH

CHECKED BY:

APPROVED BY: J.O.

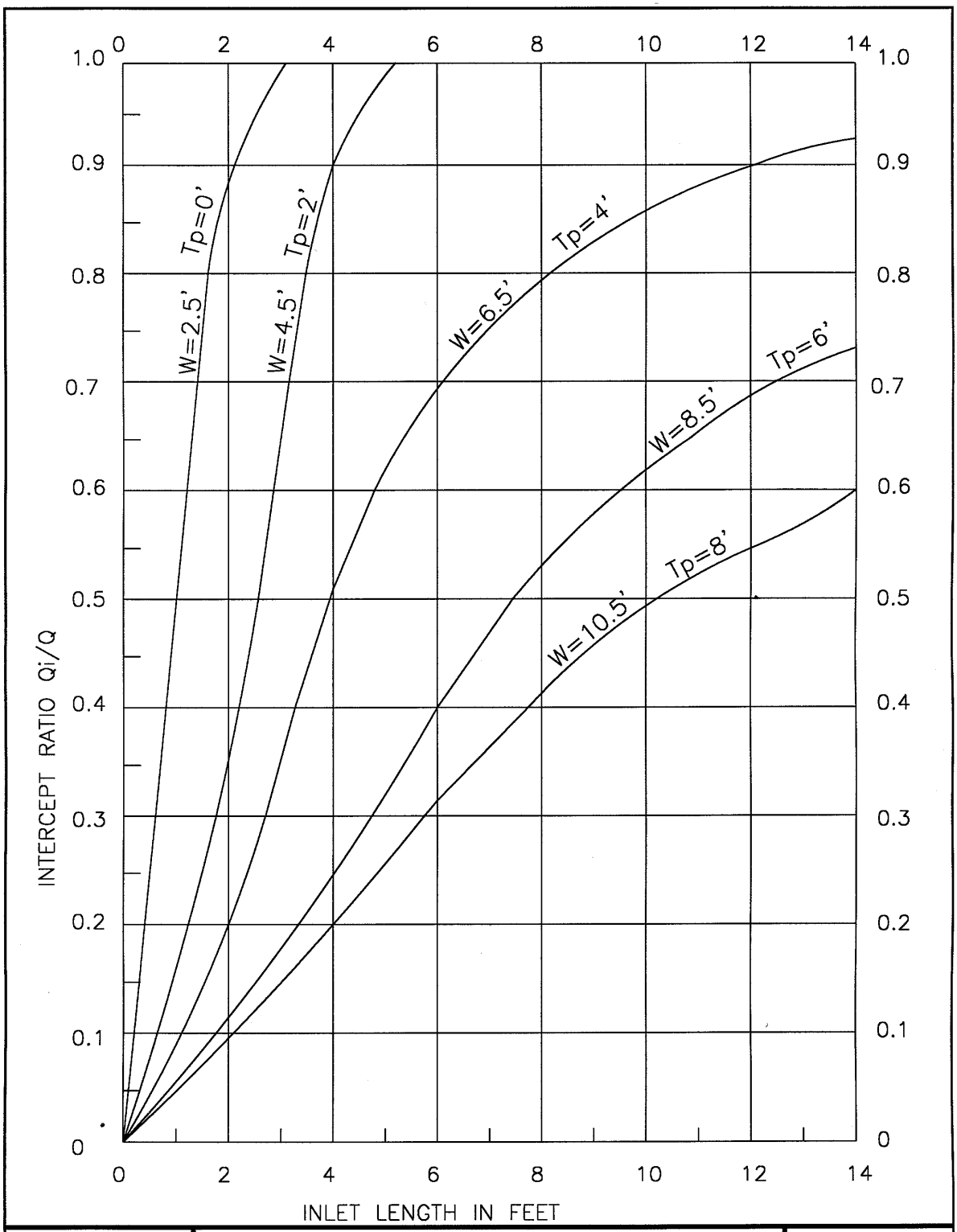
INLET CAPACITY TYPE I

So= 0.02, Sx=3/8"/ft.

ISSUED: JULY 9, 1999

REVISED:

FIGURE NO. 11.34



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

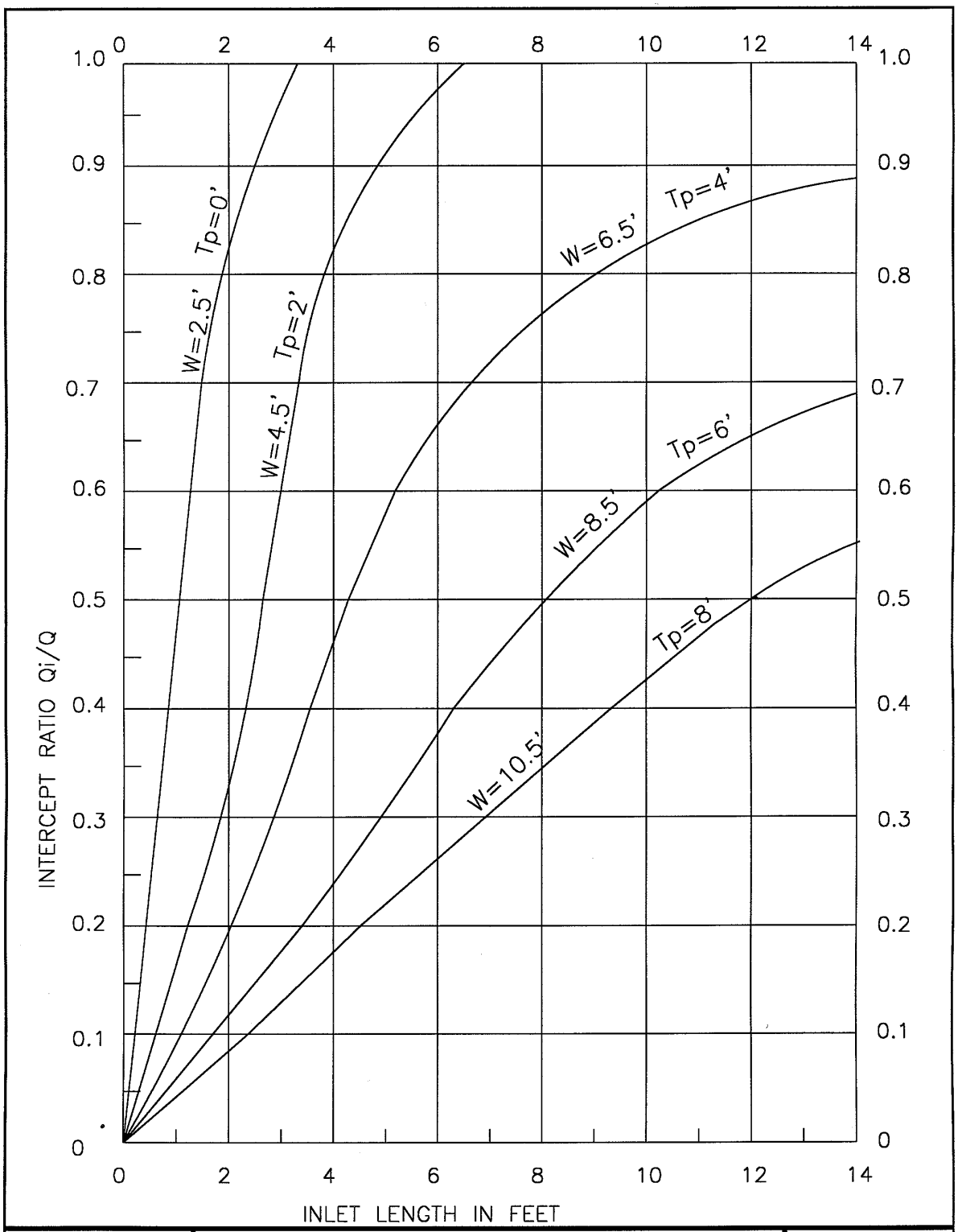
INLET
CAPACITY
TYPE I

So= 0.03, Sx=3/8"/ft.

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO.
11.35



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

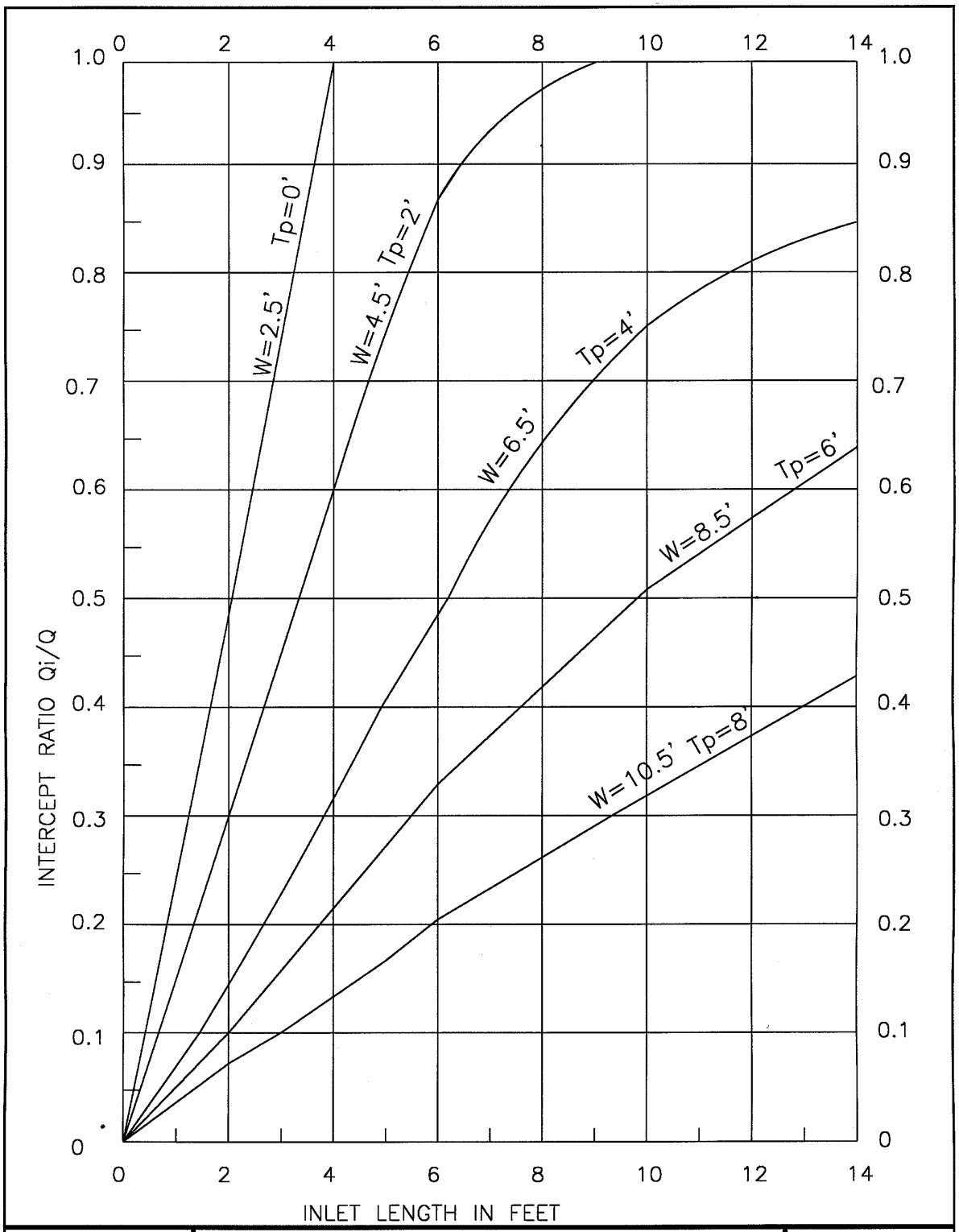
INLET CAPACITY TYPE I

So= 0.04, Sx=3/8"/ft.

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO. 11.36



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

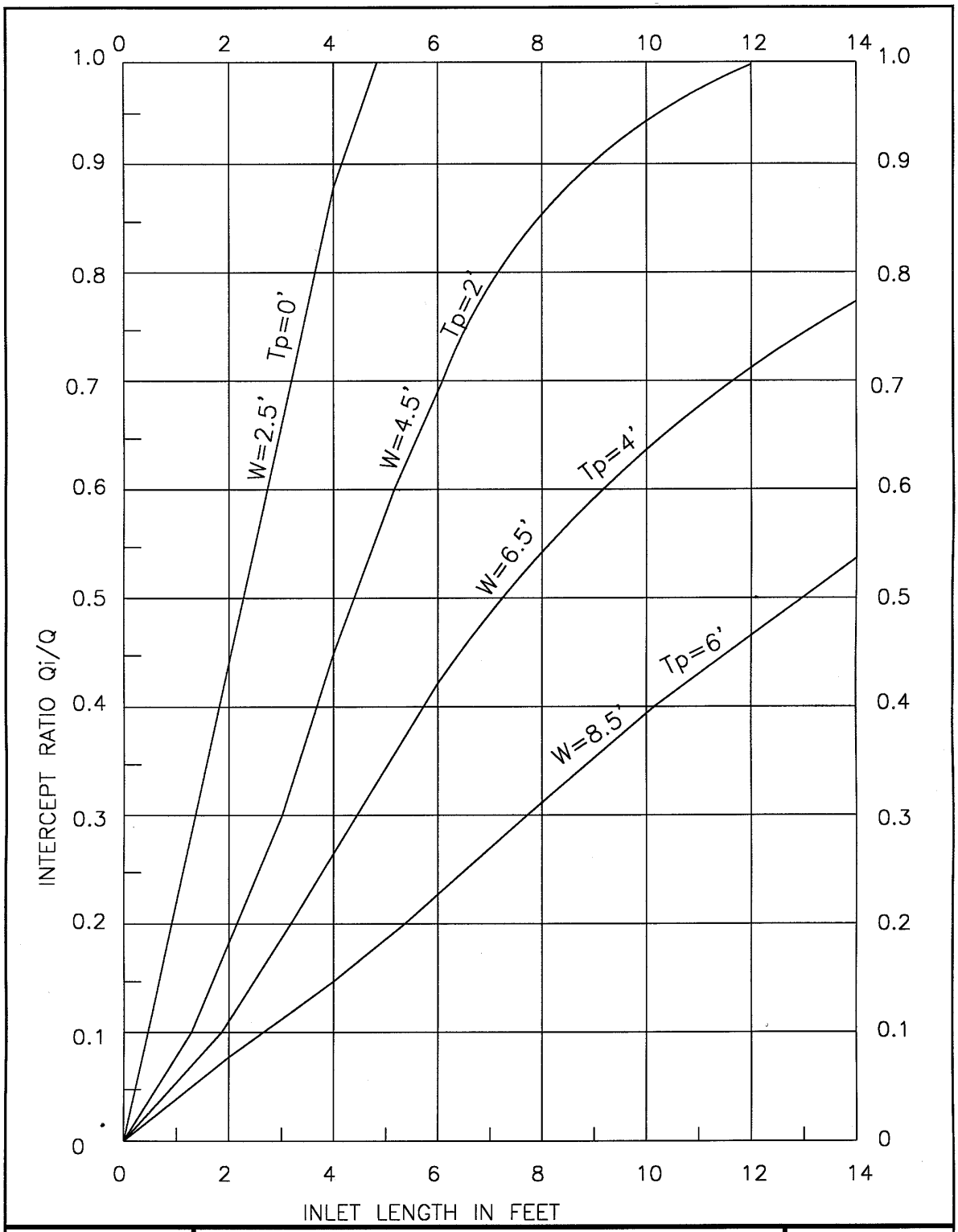
INLET CAPACITY TYPE I

So= 0.06, Sx=3/8"/ft.

ISSUED: JULY 9, 1999

REVISED: _____

FIGURE NO. 11.37



DRAWN BY: RRH

CHECKED BY: _____

APPROVED BY: J.O.

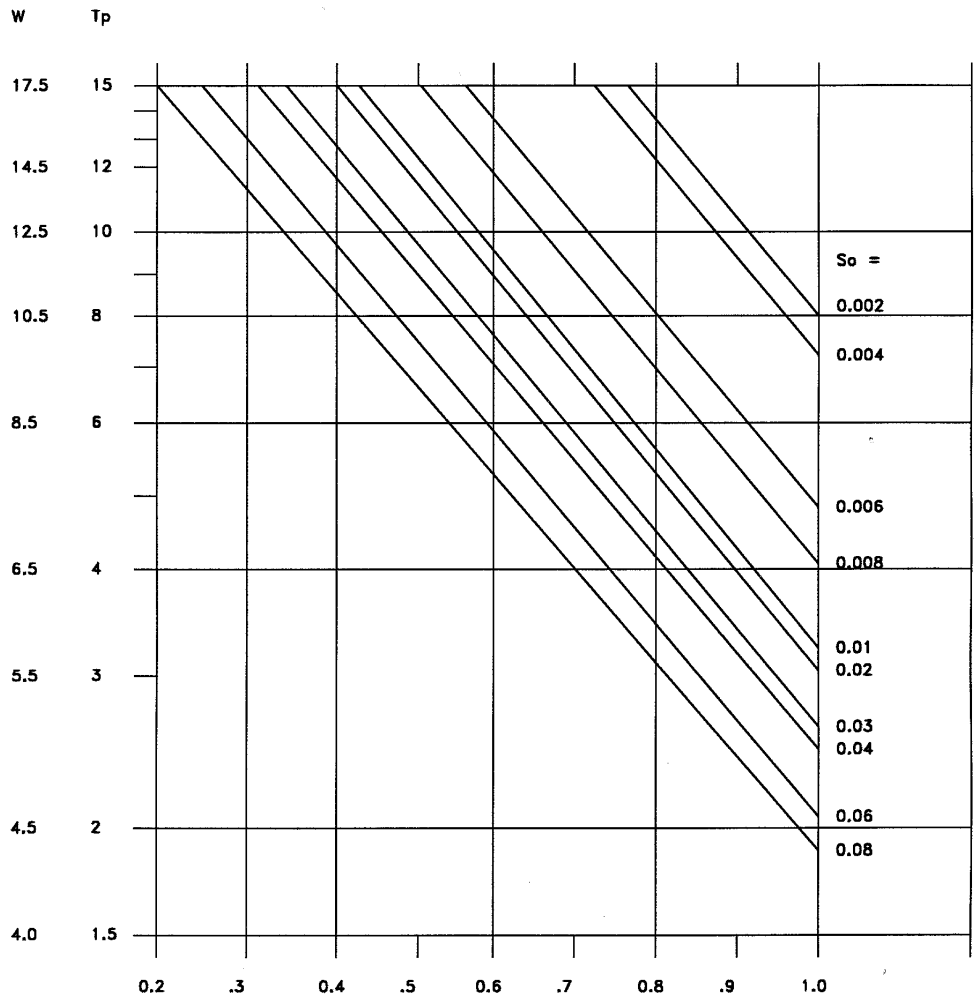
INLET
CAPACITY
TYPE I

So= 0.08, Sx=3/8"/ft.

ISSUED: JULY 9, 1999

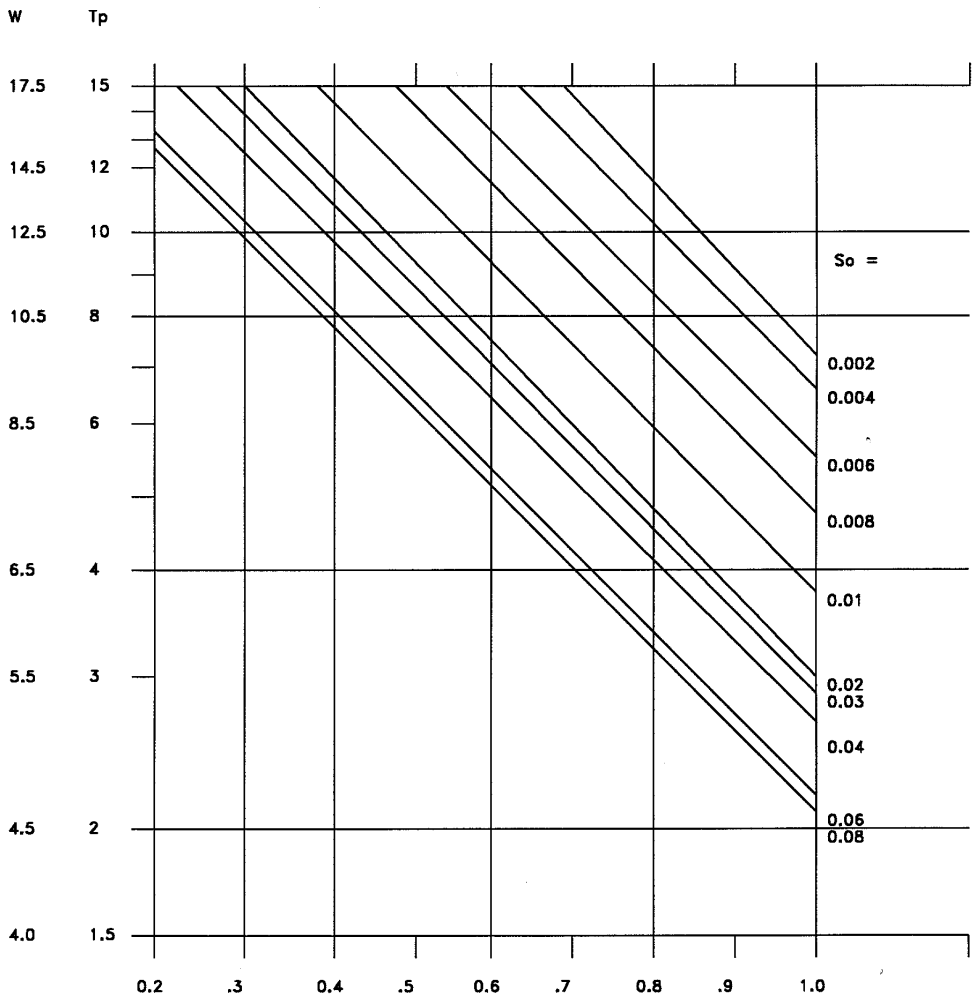
REVISED: _____

FIGURE NO. 11.38



Sx = 1:64 or 3/16"/ft

DRAWN BY: RRH CHECKED BY: APPROVED BY: J.O.	INLET CAPACITY TYPE II	ISSUED: JULY 9, 1999 REVISED: FIGURE NO. 11.39



Sx = 1:48 or 1/4"/ft

DRAWN BY: RRH

CHECKED BY:

APPROVED BY: J.O.

INLET CAPACITY TYPE II

ISSUED: JULY 9, 1999

REVISED:

FIGURE NO. 11.40

STORM SEWER DESIGN DATA

Project _____ From _____ To _____

Computed by _____ Checked by _____ Date _____ Sheet _____ of _____

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Inlet or Manhole No.	LOCATION	Drainage Area (Acres) A	Runoff Coefficient C	Equivalent Area C*A	Accumulative Equivalent Area	Time of Concentration (min.) T	Rainfall Rate (in. per hr.) I	Total Runoff (cfs) Q	Length of Sewer (ft)	Sewer Size (in.)	Slope Required (%)	Slope Provided (%)	Velocity Flowing Full (fps)	Capacity Flowing Full (fps)	Time of Flow in Section (min.)	Total Time (min.)	Type of Pipe	Remarks and/or Flowline Elevations

STORM SEWER DESIGN DATA

FIGURE NO. 11.41

ISSUED: JULY 9, 1999

REVISED: _____

DRAWN BY: RRH
CHECKED BY: ____
APPROVED BY: J.O.

STORM SEWER INLET DESIGN DATA

Project _____ From _____ To _____

Computed by _____ Checked by _____ Date _____ Sheet _____ of _____

Sketch of Drainage Pattern & Inlet Location

DR. AREA		INLET		HYDROLOGY						$Q_R = CiA$		GUTTER FLOW & INLET INTERCEPTION						
No.	Acres	No.	Location	S	L	T	C	i	A	Q_R	Q_G	Gutter slope	Pav t Slope	W	D	Q_{in}	Bypass	Inlet Type

STORM SEWER INLET DESIGN DATA

ISSUED: JULY 9, 1999
REVISED: ____

FIGURE NO. 11.42

Chapter 12 Erosion and Sediment Control

Chapter 12
Erosion and Sediment Control

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12.2 Submittals 1

12.3 Reference Documents and Permits 1

12.4 Objectives 2

12.5 Exemptions. 2

Chapter 12 Erosion and Sediment Control

12.1 Introduction

The Environmental Protection Agency (EPA) issued regulations on November 16, 1990, that require steps be taken to improve the quality of storm water from industrial activities, including certain construction activities. These criteria were developed to help mitigate the increased soil erosion and subsequent deposition of sediment offsite during the period of construction from start of earth disturbance until final landscaping and storm water quality measures are effectively in place. Compliance with these criteria will help meet the requirements of the EPA storm water regulations.

Implementation and maintenance of erosion and sediment control measures are ultimately the responsibility of the property owner. Because site conditions will affect the suitability and effectiveness of erosion control measures, a plan specific to each site is required. In addition, should the approved plan not function as intended, and it is determined by the City that additional measures are needed, the owner will have to provide additional measures needed to reduce soil erosion and sediment discharged from the construction site.

Nothing in these criteria limits the right of the City to impose additional or more stringent standards.

12.2 Submittals

12.2.1 A Storm Water Pollution Prevention Plan (SWPPP) shall be submitted to the City in conformance with the requirements found in the **General Permit** for Storm Water Discharges Associated with Construction Activities.

Submittal of a SWPPP to the City does not supercede the requirement for the applicant to also obtain any required permits from the State of South Dakota, such as a South Dakota Storm Water Discharge Permit for Construction Activities.

12.2.2. A copy of the Notice of Intent (NOI) shall be provided to the City prior to construction activities commencing at the site.

12.2.3 A copy of the SD DENR Secretary's authorization letter shall be provided to the City prior to construction activities commencing at the site.

12.2.4 A copy of the Notice of Termination (NOT) shall be provided within 30 days of the site reaching final stabilization.

12.3 Reference Documents and Permits

The following documents and permits may be found on the website of the South Dakota Department of Environment and Natural Resources (www.denr.sd.gov).

12.3.1 General Permit for Storm Water Discharges Associated with Construction Activities.

12.3.2 Notice of Intent for obtaining coverage under the General Permit for Storm Water Discharges Associated with Construction Activities.

12.3.3 Notice of Termination of need for coverage under the General Permit for Storm Water Discharges Associated with Construction Activities.

12.3.4 Transfer of Permit Coverage form for when ownership of a construction project or an individual lot in a larger common plan of development has been transferred to a different owner.

12.3.5 Contractor Certification form for coverage under the General Permit for Storm Water Discharges Associated with Construction Activities.

12.4 Objectives

The objectives for erosion and sediment control during construction include the following:

12.4.1 Conduct all land disturbing activities to effectively reduce accelerated soil erosion and reduce sediment movement and deposition offsite.

12.4.2 Schedule construction activities to minimize the total amount of soil exposed at any given time to reduce the period of accelerated soil erosion.

12.4.3 Establish temporary or permanent cover on areas that have been disturbed as soon as possible after final grading is completed.

12.4.4 Design and construct all temporary or permanent facilities for the conveyance of water around, through, or from the disturbed area to limit the flow of water to nonerosive velocities.

12.4.5 Remove sediment caused by accelerated soil erosion from surface runoff water before it leaves the site.

12.4.6 Stabilize the areas of land disturbance with permanent vegetative cover or storm water quality control measures.

12.5 Exemptions.

Exemptions from the erosion and sediment control planning process will be considered for any of the following; however, exempting the owner from preparing a SWPPP and applying for a grading permit does not exempt the owner from controlling erosion of soil at each construction site through the use of the techniques described in the General Permit for Storm Water Discharges Associated with Construction Activities.

12.5.1 Agricultural use of land.

12.5.2 Grading or an excavation below finished grade for basements, footings, retaining walls, or other structures on lots of less than one [1] acre in size in existing subdivisions unless required otherwise.

12.5.3 A sidewalk or driveway.

12.5.4 Land disturbing activities involving less than one [1] acre of disturbed area. Individual lots involving less than one [1] acre of disturbed area in a larger subdivision

project shall not be considered separate development projects, but rather as a part of the subdivision development as a whole. It will be the responsibility of the homeowner and homebuilder to conform to all requirements of the locally approved *Storm Water Pollution Prevention Plan* for the subdivision.

Chapter 13 Construction Plans

Chapter 13
Construction Plans

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13.2 General Plan Sheet Requirements 1

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13.6 Sanitary Sewer Plans 4

13.7 Drainage Ditch and Drainageway Plans 5

13.8 Water Main Plans 5

13.9 Erosion Control Plan 6

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Chapter 13 Construction Plans

13.1 General

Detailed reproducible plans, prepared by or under the direct supervision and certified by a Registered Professional Engineer in the State of South Dakota, shall be filed with the City for all work involved in public improvement contracts. Detailed plans shall conform to the following requirements.

13.2 General Plan Sheet Requirements

13.2.1 Plan Sheet Size. Prepare plans on sheets 11 inches by 17 inches in size, except for special layout sheets when specifically accepted by the City. Review plans may be submitted on sheets 22 inches by 34 inches. The maximum width of any sheet shall not be greater than 36 inches.

13.2.2 Names on Sheets. All persons designing, detailing and checking plans shall legibly place their names on the plan sheets in a space provided for this purpose.

13.2.3 Title Block. A title block listing the name of the project, Owner and Owner's Engineer in responsible charge of the plans along with sheet title, date, sheet number, and space to denote revisions. Title block shall go in lower right corner or right edge of each sheet except the title sheet so as to be read from the bottom or right side. Page numbers shall be in the lower right corner of each sheet.

13.2.4 Precision and Detail. Plans shall be prepared with such precision and in such detail as to be within the customary degree of accuracy for work of this kind and so permit the convenient layout in the field for construction and for other purposes. They shall also be of such character as to provide for the production of an accurate estimate of quantities for the several pertinent items of work to be performed in the construction of the improvement.

13.2.5 Special Provisions. Plans shall include special provisions for items of work included in the plans which are not covered by the Standard Plates and Supplemental Standard Specifications accepted by the City of Canton. Special provisions may be prepared on 8 1/2-inch by 11-inch paper and bound with other bid documents.

13.2.6 Plan Set Sections. See paragraph 13.10 for the typical plan set sections to be followed for public improvement projects. Modifications to the sections may be made based on project requirements.

13.3 Title Sheet

The following information shall be shown when applicable.

13.3.1 Project name and location.

13.3.2 Type of project.

13.3.3 Small scale map showing project location. Plan and profile sheet layout shall be shown on location map.

13.3.4 Index (A complete sheet index is to be shown).

13.3.5 Engineer's firm name and address.

13.3.6 Estimate of quantities (May be placed on separate plan sheet). Development plan shall contain utility quantities only.

13.3.7 Design Engineer's certification, registration number, and date certified.

13.3.8 Legal Description, including section, township, and range.

13.4 General Information to be Shown on Detailed Plans

The following information shall be shown when applicable.

13.4.1 Construction limits.

13.4.2 Benchmarks.

13.4.3 Street names.

13.4.4 Right-of-way widths.

13.4.5 Removal of large trees, buildings, pavement, structures, or other features as required.

13.4.6 Horizontal and Vertical Control. Alignment notes and benchmark descriptions are to be located on the plan portion of the sheets. All vertical control shall be based on NAVD 1988 vertical datum.

13.4.7 Lot and block numbers and subdivision name in new subdivisions. Otherwise, show property addresses.

13.4.8 Lot dimensions (along rights-of-way or easements).

13.4.9 Show scale (usually 1" = 20' horizontal and 1" = 5' vertical reduced to 1" = 40' horizontal and 1" = 10' vertical) using a bar type diagram and standard north arrow together. Show arrow on right hand side pointing to top or left of sheet.

13.4.10 Existing and proposed utilities-type, size, and location. (Show existing features less prominently or dashed.)

13.4.11 Pavement widths.

13.4.12 Where stationing is continuous from one sheet to the next, the last station on one sheet is to be the first station shown on the next. If possible locate on the sheet to avoid "breaking" the plan and profile.

13.4.13 Existing trees, fences, walks, drainage structures, ditches, pavements, buildings, and other obstacles or improvements that are in or near the work area. (Show existing features less prominently or dashed.)

13.4.14 Survey line or reference line shall be shown on plan view.

13.4.15 Temporary and permanent easements.

13.4.16 Special details and special notes when required.

13.4.17 Plan view and profile shall line up whenever possible.

13.4.18 Symbols and abbreviations used on plans if different from those shown in Standard Specifications or Standard Plates.

13.4.19 Any soils information available. (Show test hole locations on plan and profile sheets.)

13.4.20 Traffic control plan.

13.4.21 Other information deemed necessary by the Design Professional certifying the plans.

13.4.22 Revision block showing description, date and by.

13.4.23 City standard drawings and details (may be omitted on development plan).

13.5 Street and Storm Sewer Plans

The following information shall be shown when applicable.

13.5.1 Show BEGIN STA. and END STA.

13.5.2 Storm sewer plans shall be shown on the same sheets as paving unless it is a major installation or a benefit district.

13.5.3 Match lines to other plan and profile sheets where they do not follow in order in the plans such as at an intersection.

13.5.4 Horizontal curve data near curve or code for clarity if several are to be shown or if the sheet is crowded. Show Point of Intersection (PI) Station, angle, degree, radius, tangent, length, and superele-vation, if any. Show Point of Curvature (PC), Point of Intersection (PI), and Point of Tangent (PT) station on the plan. For vertical curves show stationing, length, and elevations of Point of Vertical Curvature (PVC), Point of Vertical Intersection (PVI), and Point of Vertical Tangent (PVT). Also show "K" value as defined in A Policy on Geometric Design of Highways and Streets published by AASHTO, latest English edition.

13.5.5 Drainage arrows designating direction of runoff.

13.5.6 Stationing of paving projects will generally run from north to south or from west to east so that the north arrow will point to the top or left hand side of the sheet. Sewer stationing, when used, shall run from the lower end of the project on the left of the sheet toward the higher end on the right.

13.5.7 General notes for construction.

13.5.8 Show profile of existing ground or proposed street high enough to allow for storm sewer information and profile grades below. Show street profile grade elevations every 25 feet, typical. Label the existing ground line and show percent of grade on the new grade line.

13.5.9. Show profile flow line elevations on all inlets, catch basins, pipes, and culverts. Show size, type, class (if necessary), and percent of grade on storm sewer pipes.

13.5.10 Show intersection details to the extent necessary to insure proper horizontal and vertical alignment. The following additional information is required:

a. Spot elevations along center lines and along curb lines extended through the intersection.

b. Drainage arrows showing direction of storm water flow.

Additional geometric information may be required including key distances, stations, angles, curve data and elevations necessary for design and staking.

13.5.11 Show typical sections as required including information on the following:

a. Shoulder slopes, backslopes, sideslopes

b. Paving widths, thicknesses and types

c. Lane widths

d. Pavement cross slopes

e. Sidewalks and slopes

f. Subgrades and paving treatment

g. Median details

h. Typical right-of-way lines

i. Other typical details of paving or grading sections as appropriate not otherwise covered on the standard paving details.

13.6 Sanitary Sewer Plans

The following information shall be shown when applicable.

13.6.1 Stationing, location and type of all manholes, intakes, or other structures. Type of structures shall be in conformance with the Supplemental Standard Specifications and Standard Plates.

13.6.2 Details shall be shown for all structures that are not in accordance with City of Canton standards.

13.6.3 Plan and profiles of all sewer lines (including existing ground profile and proposed finished grade profile).

13.6.4 Size, length, and grade of sewers.

13.6.5 Type of pipe materials and strengths (if necessary).

13.6.6 Invert elevations at all intakes, manholes and other structures.

13.6.7 On reconstruction projects, location, size and type of all sewer stubouts, wyes or tees. Stubout locations shall be referenced to lot corners. When risers are to be installed, riser location and size shall be shown on reconstruction plans.

13.6.8 Estimates shall include stubout quantities when they are to be constructed by City contract.

13.6.9 Rim elevations of manholes.

13.6.10 Manholes shall be identified with numbering system on plan and profile.

13.6.11 Class of pipe bedding if necessary.

13.6.12 Existing underground utilities such as cables, water, sewer, or gas lines or any other underground features that cross or are near the proposed sewer. Show exact elevations, if possible, where there may be conflict with new construction.

13.7 Drainage Ditch and Drainageway Plans

The following information shall be shown when applicable.

13.7.1 Stationing and flow line elevation at beginning and end of ditch construction.

13.7.2 Size, type, length and grade of ditch.

13.7.3 Typical sections showing ditch dimensions, backslopes, and invert and slope treatment.

13.7.4. Invert elevations at all structures.

13.7.5 All special structures shall be detailed on plans.

13.7.6. Drainage design data.

13.7.7 Cross-sections and topographic map showing existing ground and finished grade at intervals of 100'.

13.8 Water Main Plans

The following information shall be shown when applicable.

13.8.1 Stationing, location and type of all water lines, manholes, valves, fire hydrants, or other appurtenances.

a. Stationing and type of structure shall be shown on station bar.

b. Location shall be shown on plan or on station bar if referenced to survey line or center line.

c. Type of structures shall be in conformance with Standard Specifications or Standard Plates.

13.8.2 Details shall be shown for all structures that are not standard in Standard Specifications or Standard Plates.

13.8.3 Plan and profiles of all water lines where future changes in grade are possible.

13.8.4 Size and length of water lines.

13.8.5 Type of pipe materials and strengths if necessary.

13.8.6 Top of pipe grade to be six (6) feet below finished grade.

13.8.7 On reconstruction projects, location, size and type of all water stubs, wyes or tees. Stub locations shall be referenced to lot corners and stubbed to property line.

13.8.8 Estimates shall include stubout quantities when they are to be constructed by City contract.

13.8.9 Curb elevations at all hydrant locations.

13.8.10 All castings shall be City standard where maintained by the City.

13.8.11 Class of pipe bedding if necessary.

13.9 Erosion Control Plan

An erosion control plan shall be submitted as detailed in Chapter 12 of these Design Standards and Standard Plates.

13.10 Record Drawings

13.10.1 Design Drawing Modifications

All design and revised as-built information, both text and line work is to be shown on the original plan sheets. Design (original) text shall be crossed out and revised (as-built) data added. Design line work that is not representative of as-built line work shall be erased and substituted with as-built line work on the appropriate proposed layer, so that each utility layer may be isolated and imported in GIS. All utility features shall be spatially accurate as-builts in City coordinates (NAD88 State Plane, South Dakota South Zone, US Foot) for transfer to the GIS database as a permanent utility record.

1310.2 Submittals

As-built drawings will be submitted in both hard copy (paper) and two electronic formats. All the electronic drawings and associated files necessary to recreate the construction (as-built) plans must be submitted.

13.10.2.1 Electronic Formats:

a. Complete plan set including sheets/sections as listed below with all as-built information in dwf or pdf file format for archival. Dwf is the preferred file format.

Sheets/Sections	
A-1 thru A-X	Title Sheet (Updated) & Drawing Orientation (Original)
B-1 thru B-X	Estimated Quantities (Updated), Summary of Quantities (Original), Estimate of Pipe Quantities (Updated), and Table of Drop Inlets (Updated)
C-1 thru C-X	Typical Sections (Original)
D-1 thru D-X	Sequence of Operations/General Notes (Original)
E-1 thru E-X	Table of ROW and Easements (Updated)
F-1 thru F-X	Traffic Control (Original)
G-1 thru G-X	Erosion Control (Original)
H-1 thru H-X	Existing Conditions and Removals (Original)
I-1 thru I-X	Plan and Profile (Updated)
J-1 thru J-X	Pavement Layout (Updated)
K-1 thru K-X	Pavement Markings (Updated)
L-1 thru L-X	Lighting and Signals (Updated)
M-1 thru M-X	Cross Sections (Original)
N-1 thru N-X	Details (Original)

b. Dwg file or files shall contain a complete (entire project area) model space drawing. The dwg file(s) shall contain the following spatially correct as-built information at a minimum:

- Location of all City utilities installed or uncovered during the project
- Location of private utilities within the project limits
- Pavement layouts
- Street right-of-ways
- Easements

Chapter 14

Acceptance Procedures and Requirements for Private Construction of Public Improvements

Chapter 14
Acceptance Procedures and Requirements for Private Construction of Public Improvements

Section and Topic **Page**

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14.3 Minimum Testing Requirements..... 2

14.4 Acceptance Procedure..... 3

14.5 General Policy..... 3

Chapter 14 Acceptance Procedures and Requirements for Private Construction of Public Improvements

14.1 Application of Standards

The requirements contained herein shall apply to all new private development construction and site development construction within City dedicated right-of-way and easement areas that is planned for or subject to public use within the jurisdiction of the City of Canton. This acceptance shall consist of all improvements included in the Owner submitted construction plans accepted by the City.

14.1.1 Acceptance Limitation. The acceptance of an improvement shall in no way constitute an assumption by the City or City Engineer of liability for defects in the improvement. By accepting the improvement, the City or City Engineer does not warrant or guarantee that the improvement has been properly designed or constructed. Any errors or omission of the Owner/Developer/Engineer shall not be the responsibility of the City or City Engineer.

14.2 City Inspection Requirements

At a minimum, the following construction activities shall be observed by the City or City Engineer. The Owner or Owner's contractor shall provide the City 24-hour notice of all required inspections. No inspections shall be scheduled for weekends or holidays.

- Start-up of sanitary sewer system installation
- Start-up of water main installation
- Start-up of storm sewer system installation
- Proof rolling of finished street dirt subgrade prior to installing base course
- Proof rolling of finished gravel base course prior to installing pavement
- Start-up of street surfacing (ACC or PCC pavement)

These inspection requirements do not eliminate the need for other inspections required by City ordinances or permits. The City and/or City Engineer may perform other site visits to observe the work being performed.

If the City or City Engineer observes materials or work not meeting the project specifications the Owner's contractor and the Owner shall be notified. If the Owner does not repair or remedy the defective materials or work, the City may revoke the Owner's permits and issue no further permits until the defected materials or work is remedied to the satisfaction of the City.

The acceptance of an improvement shall in no way constitute an assumption by the City or City Engineer of liability for defects in the improvement. By accepting the improvement, the City or City Engineer does not warrant or guarantee that the improvement has been properly designed or constructed. Any errors or omission of the Owner/Developer/Engineer shall not be the responsibility of the City or City Engineer.

14.3 Minimum Testing Requirements

Testing shall be completed by engineering or testing companies approved by the City. The following list are minimum requirements. The testing company may recommend additional testing. The City reserves the right to increase or decrease testing requirements.

Test results shall be provided to the City or City Engineer in pdf format. The tester shall communicate with the City and Developer/Contractor immediately upon failure of any test so correction action can be determined.

The City will pay for all City required tests. Corrective action tests required due to failing tests shall be the responsibility of the contractor. If the contractor elects to test more than the minimum requirements indicated below, the additional tests will be at the contractors' expense.

The following are the minimum accepted testing requirements.

Asphalt Paving	1 per 900 lane feet per lift but no less than 2 per day
PCC Streets	Air content test on first truck. Air test, slump test and four concrete cylinders taken for every 150 cubic yards of concrete poured.
Sidewalks, curb and gutter, fillets, valley gutters, inlets and other miscellaneous concrete	Air test, slump tests and four concrete cylinders for every 100 cubic yards of pouring but no less than 1 set of tests per day. Additional strength test should be run when needed to determine when concrete is ready to carry traffic.
Structural concrete	Air tests, slump tests and strength tests shall be run at the frequency specified by the current version of the SDDOT Materials Manual in the Minimum Sampling and Testing Requirements section.
Subgrade	Soil density and moisture contents shall be performed on all pavement subgrade and roadway fills a minimum of one (1) per city block or every 600 feet, whichever is less, per four (4) feet of depth.
Utility trenches	A minimum of one density and moisture content shall be made for every 500 lineal feet of trench per four feet of depth.
Base Course and other aggregate materials	A minimum o fone (1) gradation shall be run per project per type of material. Density tests shall be run on base course for roadways a minimum of one (1) per city block or every 600 feet, whichever is less.
Additional subgrade, Utility trench, and Granular material requirements	In addition to the moisture and density test requirements, the contractor shall be responsible for providing a firm and unyielding surface. This requirement shall be checked by proof rolling the subgrade, trenches and granular materials using a fully loaded tandem axle truck or other equipment as approved by the City Engineer. A representative from the City or City Engineer shall observe these tests.

14.4 Acceptance Procedure

The acceptance process will proceed in two phases. The first phase will consist of Utility Acceptance which includes the water main, sanitary sewer, storm sewer and lighting facilities.

The second phase or Final Acceptance shall consist of all other public improvements including but not limited to grading, crushed base, curb and gutter, and surfacing. All items identified during the final inspection shall be complete before the final acceptance.

14.4.1 Utility Acceptance. A Utility Warranty Report or Certificate of Substantial Completion shall be sent to the developer's representative when the water main, sanitary sewer, storm sewer and lighting facilities are complete and accepted by the City. Storm sewer facilities shall include storm sewer pipe, storm sewer inlets, and storm sewer junction boxes. The warranty start date shall be shown on the Utility Warranty Report or Certificate of Substantial Completion.

The warranty start date shall be the date the two-year warranty period commences for the water main, sanitary sewer, storm sewer pipe, storm sewer inlets, storm sewer junction boxes and lighting facilities.

14.4.2 Final Acceptance. The City shall notify the developer's representative when all public improvements are complete and accepted by the City. The date the improvements are accepted shall be included in this notification. This date shall be the date the one-year warranty period commences for all improvements included in the final acceptance.

After the City grants final acceptance, the City will assume all maintenance responsibilities for the public improvements.

14.5 General Policy

The City shall provide snow removal service on streets where the lower lift of asphalt has been placed. The City shall not provide snow removal services on streets where manholes, valve boxes, and any other items protrude above the roadway surface.
Prior to the final acceptance, the Owner shall maintain the improvements and repair or correct any deficiencies that may occur before final acceptance is granted.

The City will accept responsibility for damage to curb and gutter caused by snow plow operations provided notification is given prior to the final lift of asphalt being placed.

The Developer/Owner shall be responsible for installation and maintenance of any barricades or warning signs required until final acceptance is granted.

Chapter 15 Street Lighting

Chapter 15
Street Lighting

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Chapter 15 Street Lighting

15.1 General

15.1.1 This chapter sets forth the design and technical criteria to be used in the preparation of all street lighting plans. Where design information is not provided herein, the following standards (most current edition) shall be used:

1. National Electrical Safety Code (NESC)
2. National Electrical Code (NEC)
3. City of Canton Standard Specifications
4. Canton Standard Detail Plates (hereafter referred to as Standard Plates).
5. Requirements and Standards of the State of South Dakota

15.1.2 Where a conflict occurs between the above standards, the most restrictive requirement shall apply.

15.1.3 Street lights shall be placed on lot/property lines that are perpendicular to street centerline where applicable.

15.1.4 Street lighting on cul-de-sacs must terminate with a street light on the lot line nearest where the turnaround begins.

15.1.5 Street lights, junction boxes, meter pedestals, and conduit shall be free and clear of any permanent obstructions which would impair the ability of future maintenance operations. Layout of street lighting must also consider vertical and horizontal alignment with respect to other utilities that might conflict with the installation of the street lighting system.

15.1.6 Street lights, conduit, junction boxes, wires, and meters will be furnished and installed by the utility company. A layout of the lighting system in comformance to these engineering design standardsshall be provided to the City and to the utiltiy company.

15.1.7 Design of street lighting systems will typically consist of installation of street lights in areas that have concrete curb and gutter installed. If concrete curb and gutter has not been installed, a street lighting system will not necessarily be required. The City will evaluate each project before final design is complete.

15.1.8 If necessary, removal of street lights shall be coordinated with the owner of the electrical utility. All materials removed will become the property of said utility unless otherwise noted.

15.2 Street Light Locations and Spacing

15.2.1 Street lights shall be installed as indicated in Chapter 4 of the City of Canton Design Standards for Public Improvements or as specified below.

15.2.2 Residential lighting shall be spaced 175–250 feet apart with a non-staggered pattern and located at intersections.

15.2.3 Local, Collector, or Arterial (minor) lighting shall be spaced 200-275 feet apart with a non-staggered pattern and located at intersections.

15.2.4 Commercial lighting, or Arterial (major), shall be spaced 170 - 250 feet apart located at intersections and with a staggered pattern if possible.

15.2.5 Generally, street lights will be located within the public right-of-way two (2) feet from the back of curb unless otherwise noted. Street lights shall be located on a lot line whenever possible. Streets that have sidewalks installed behind the curb and gutter will require street lights to be installed behind the sidewalk but still within the public right-of-way. If street lights cannot be installed within the public right-of-way, a utility easement will be required.

15.2.6 When street light locations are being considered, overhead obstructions must be evaluated prior to placement location. In general, street lights shall maintain a minimum clear distance of eight (8) feet from any overhead electrical power lines. Other overhead obstructions such as trees, cable television lines, communications lines, etc., shall be evaluated on a case-by-case basis.

15.3 Junction Boxes

15.3.1 Junction boxes shall be spaced a maximum of 275 feet from the furthest street light or junction box.

15.3.2 Standard size junction box is 18 inches. The need for larger junction boxes will be determined by owner of the electrical utility.

15.3.3 Generally, junction boxes will be located within the public right-of-way two (2) feet from the back of curb, unless otherwise noted, and on a lot line whenever possible.

15.3.4 Junction boxes shall generally be located such that they will not be in driveways.

15.3.5 Maximum number of conduits entering into a junction box shall not exceed six (6) and the minimum number of conduits shall not be less than two (2) into an 18-inch junction box.

15.3.6 All street light junction box lids shall be labeled “Electric”.

15.4 Conduits

15.4.1 All street lighting conduit shall be 2-inch diameter unless otherwise specfied.

15.4.2 Conduit shall have a minimum depth of bury of 24 inches from finished grade to the top of conduit.

15.4.3 All conduit installation shall be in compliance with the National Electrical Code.

15.4.4 Generally, conduit will be located within the public right-of-way two (2) feet from the back of curb unless otherwise noted.

15.4.5 When bends are required on any conduit run, no more than four (4) 90 degree bends will be allowed in one given conduit run.

15.5 Concrete Street Light Footings

15.5.1 Generally, street light footings will be located within the public right-of-way two (2) feet behind the back of curb unless otherwise noted and on a lot line whenever possible. Streets that have sidewalks installed behind the curb and gutter will require street light footings to be installed behind the sidewalk but still within the public right-of-way. If street light footings cannot be installed within the public right-of-way, a utility easement will be required.

15.5.2 The maximum number of conduits within a street light footing shall not exceed four (4). Included in the total number of conduits will be one spare conduit that will generally be installed facing away from the curb for future lighting needs.

15.5.3 Types of footings will be based on the desired location and the physical constraints which are encountered during design of the footing. Typically, the standard street light footing will be sufficient; however, specialty footings shall be used when necessary. Specialty footings consist of spread footings, historical footings, special footings for 25-foot brown fiberglass poles, and post top footings. The specialty footings are detailed in the Standard Plates.

15.5.4 When street lighting is installed near a location of pedestrian traffic, ADA clearance requirements will need to be met.

15.6 Direct Bury Street Lights

15.6.1 Generally, direct bury street lighting may be used for lighting at the beginning and end of construction projects through the transition zones. Locations are dependent on each specific project; however, standard locations shall be utilized whenever possible. Typical wire depth for direct bury lighting systems shall be 24 inches.

15.6.2 Direct bury street lights are used for all new residential areas and are designed in partnership with the electrical utilities. Direct bury street lights shall be 25’ aluminum embedded street light poles with a 22-foot mounting height.

15.7 Meters and Meter Pedestals

15.7.1 Electrical meters will be furnished and installed by the electrical utility if necessary.

15.7.2 When necessary, pedestals shall be installed at a location as determined by the electrical utility and by the electrical utility.

15.8 Power Supply

15.8.1 All street lighting plans shall indicate a designated power supply feed point. The power supply shall be installed from the designated supply point to a meter pedestal, if required.

15.8.2 The design engineer will be required to determine which power company will be utilized to supply power for street lighting.

15.8.3 Power supply lines will need to be installed in two- (2) inch schedule 80 pvc conduit up power pole within two (2) feet of secondary wire. Additionally, the power supply lines will need to be installed in two- (2) inch conduit from the power supply source to the meter pedestal.

15.8.4 Power supplies shall be centrally located within project boundaries for street lighting layouts whenever possible.

15.9 Material Specifications

15.9.1 Material specifications are included in the Supplemental Standard Specifications.

15.10 Easements

15.10.1 Lighting and power easements shall be obtained for all lighting and power lines located on private property. Lighting and power easements shall have a minimum width of ten (10) feet. In addition, temporary easements may be required for construction. Lighting and power easements shall be accessible for maintenance workers to maintain the lighting and power system.