A MANUAL OF PRACTICE

for

The Design of Public & Private Improvements

APRIL 25, 1997

A MANUAL OF PRACTICE
FOR
THE DESIGN OF PUBLIC & PRIVATE IMPROVEMENTS

Village of Arlington Heights
Department of Engineering
33 S. Arlington Heights Road
Arlington Heights, IL 60005

(847)368-5250

FORWARD

The basic purpose of this Manual is to present parameters for the design of public and private improvements that will result in quality construction.. It is not intended as a text book or as a substitute for good engineering judgement. It anticipates that actual design work will be done by qualified, professional engineers.

It is our sincere hope that this Manual will prove beneficial to those involved in and responsible for the design of public and private improvements and will aid in attaining a better environment for present and future residents of the Village.

-from original Manual, April 1, 1974

This updated Manual of Practice was the beneficiary of input from the entire Engineering Department. Special thanks goes to Douglas Young for contributions to Chapter 5 and Thomas Ponsot for writing Chapter 8.

This edition prepared by:
Karen Daulton Lange, P.E.
Deputy Director of Engineering
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Approved by:
Mark L. Schoeffmann, P.E.
Director of Engineering

TABLE OF CONTENTS

CHAPTER 1 - Engineering and Administrative Procedures

1.01 Introduction....1
1.02 Definition of Terms....1
1.03 Scope....4
1.04 Pre-Design Conference....5
1.05 Plan Preparation Requirements....5
1.06 Specification Requirements....5
1.07 Design Computation Requirements....6
1.08 Cost Estimate Requirements....6
1.09 Other Permit Applications and Approvals....7
1.10 Document Submission and Processing....7
1.11 Approval Period....8
1.12 Fees and Deposits....8
1.13 Revisions to Approved Plans and Specifications....10
1.14 Construction Supervision....10
1.15 As-Built Plans (Record Drawings)....10
1.16 Existing Facilities....11
1.17 Final Processing and Acceptance....11
1.18 Waiver for Manual Requirements....11
1.19 Safety Requirements....11
1.20 Agency Notification....11
1.21 Accident Notification....12

CHAPTER 2 - Erosion Control, Grading, Protection and Restoration Requirements

2.01 Introduction....13
2.02 Erosion Control....13
2.03 Grading....14
    2.03A Engineering Requirements....14
    2.03B Grading Plan Requirements....14
2.04 Excavation....15
2.05 Bracing and Sheeting....15
2.06 Piling Excavated Material....15
2.07 Structure Protection....15
2.08 Protection of Property....16
2.09 Interruption to Utilities....16
2.10 Traffic Control....16

CHAPTER 2 - continued

2.11 Pavement Crossings 17
2.12 Backfill Requirements 17
2.13 Restoration of Existing Improved Surfaces 18
2.13A General 18
2.13B Saw Cutting 19
2.13C Removal of Roadway Pavements, Sidewalks, Driveway & Curb 19
2.13D Concrete Pavement Patching 19
2.13E Bituminous Surface with Rigid Base Patching 19
2.13F Bituminous Surface with Flexible Base Patching 20
2.13G Concrete Sidewalks, Driveways, Curb, Curb and Gutter 20
2.13H Bituminous Driveways 20
2.13I Lawns 20
2.14 Cleanup 21

CHAPTER 3 - Storm Water Facilities

3.01 Introduction 22
3.02 General Project Requirements 22
3.02A Storm Sewers 22
3.02B Surface Flow-Ways (Overland Flow Routes) 22
3.02C Storm Water Holding Reservoirs 23
3.03 Village Owned or Proposed Facilities 23
3.04 Design Criteria for Storm Sewers and Flow-Ways 23
3.04A Design Formula 23
3.04B Intensity 24
3.04C Run-Off Coefficient 24
3.04D Design Flow 24
3.05 Design Criteria for Storm Water Holding Reservoirs 24
3.05A Design Formula 24
3.05B Area 25
3.05C Release Rate 25
3.05D Compensatory Storage 25
3.05E Small Developments 26
3.06 Design Details for Storm Sewers 26
3.06A Connections to Storm Sewers 26
3.06B Sump Pumps 27
3.06C Sewer Types 27
3.06D Joints 27
3.06E Loadings 27
3.06F Frames & Grates 28

CHAPTER 3 - continued

3.06G Minimum Size 29
3.06H Sewer Slope 29
3.06I Alignment 29
3.06J Sewer Size Changes 29
3.06K High Velocity Protection 29
3.06L Bedding 29
3.06M Dewatering 30
3.07 Design Details for Inlets an Catch Basins 30
3.07A Tributary Areas 30
3.07B Construction Requirements 30
3.08 Design Details for Manholes 30
3.08A Location 30
3.08B Type 31
3.08C Drop Manholes 31
3.09 Design Requirements for Overland Flow Routes (Surface Flow-Ways) 31
3.09A Description 31
3.09B Capacity 32
3.09C Swales 32
3.09D Boundary Flow-Ways 32
3.10 Design Details for Storm Water Holding Reservoirs 32
3.10A Ownership 32
3.10B High Water Level 33
3.10C Surface Details 33
3.10D Under Drain System 33
3.10E Guard Rails, Fencing, and Gates 33
3.10F Special Requirements for Wet Bottom Reservoirs 34
3.10G Reservoir Outlet 34
3.10H Secondary Benefits 35
3.10I Control Facilities 35
3.10J Proximity to Right-of-Way 35
3.11 Erosion Control 35
3.12 Storm Water Pumping Facilities and Force Mains 35
3.13 Water Main Protection 35
3.14 Quality of Work 35

CHAPTER 4 - Sanitary Sewage Facilities

4.01 Introduction 37
4.02 System Connection 37
4.03 Sewer Design 37
4.03A Design Formula 37

CHAPTER 4 - continued

4.03B Sanitary Sewage Flow Population Estimates 38
4.03C Sanitary Sewage Flow from Residential Developments 38
4.03D Sanitary Sewage Flow from Non-Residential Developments 38
4.03E Inspection Manholes 39
4.04 Design Details for Sanitary Sewer 39
4.04A Pipe and Joint Types 39
4.04B Deflection Testing & Televising of Sewers 40
4.04C Minimum Size 40
4.04D Alignment 40
4.04E High Velocity Protection 40
4.04F Infiltration 40
4.04G Dewatering 40
4.05 Bedding 40
4.06 Sanitary Sewer Service Lines 40
4.06A Description 41
4.06B Minimum Diameter/Material 41
4.06C Design Standards 42
4.06D Plugs 42
4.06E Sanitary Sewer Service Line Connections 42
4.07 Sewer Depth 42
4.08 Manholes 42
4.09 Water Main Protection 43
4.10 Sanitary Sewage Pumping Stations and Force Mains 43
4.11 Auguring & Tunneling 43
4.12 Quality of Work 43

CHAPTER 5 - Water Distribution System

5.01 Introduction 44
5.02 General Design Considerations 44
5.03 Main Capacity 45
5.03A Pressure and Velocity 45
5.03B Required Fire Flow 45
5.03C Maximum Day Consumption 45
5.03D Head Losses 46
5.04 General Design Details for Water Mains 46
5.04A Pipe, Fittings and Joint Type 46
5.04B Interior Coating 47
5.04C Exterior Coating 47
5.04D Polyethylene Encasement 47
5.04E Depth of Cover 47

CHAPTER 5 - Continued

5.04F Thrust Blocks 47
5.04G Trench Width 47
5.04H Foundation 47
5.04I Dewatering 48
5.04J Backfill 48
5.04K Pavement Crossings 48
5.05 Fire Hydrants 48
5.05A Spacing 48
5.05B Details of Construction 49
5.06 Valves & Vaults 49
5.06A Spacing 49
5.06B Vaults 49
5.06C Types 50
5.07 Connections to Existing Mains 50
5.08 Water Service Lines 50
5.08A Description 50
5.08B Minimum Diameter 50
5.08C Service Line Pipe Material 51
5.08D Corporation Stop 51
5.08E Curb Stop 51
5.08F Buffalo Boxes (B-Boxes) 52
5.09 Water Main Protection 52
5.09A Horizontal Separation 52
5.09B Vertical Separation 52
5.09C Water Service Line Protection 53
5.11 Testing 53
5.11A Pressure Test 54
5.11B Disinfection 55
5.11C Flushing 56
5.11 Quality of Work 56

CHAPTER 6 - Pavement Design

6.01 Introduction 57
6.02 Street Classification & Geometrics 57
6.03 Zoning Classification 57
6.04 Construction Specification - Roads 58
6.05 Standard Design Methods for Pavements 58
6.06 Other Construction Requirements for Pavement 59
6.07 Combination Concrete Curb and Gutter 59
6.08 Driveways 59

CHAPTER 6 - Continued

6.09 Sidewalks Through Driveways 60
6.10 Curb Cuts 60
6.11 Parking Lots 61
6.12 Fire Lanes 61

CHAPTER 7 - Sidewalks

7.01 Introduction 62
7.02 Sidewalk Geometries 62
7.03 Reinforcement 62
7.04 Subgrade & Subbase 62
7.05 Embankment 63
7.06 Forms 63
7.07 Form Removal and Backfill 63
7.08 Expansion Joints 63
7.09 Placing, Finishing, Protection and Curing 64
7.10 Disposal of Surplus Material 64
7.11 Accessibility Requirements 64

CHAPTER 8 - Lighting

8.01 Introduction 65
8.02 Codes and Regulations 65
8.03 Design Criteria for Local and Collector Streets 65
8.04 Design Criteria for Arterial Streets 66
8.05 Pole Spacing 66
8.06 Uniformity Ratio 66
8.07 Equipment Standardization & Installation Specifications 67
8.08 Quality of Work 68

APPENDIX 69

Type A Catch Basin 70
Type C Inlet 71
Type A Manhole 72
Curb & Gutter Notes 73
IDOT Standard 2130-16; A-7.03 74
IDOT Standard 2130.16; A-7.04 75
Lighting Standards 76
Required Lighting Levels 77

CHAPTER 1

ENGINEERING & ADMINISTRATIVE PROCEDURES

1.01 INTRODUCTION

This manual has been prepared to ensure that the design and construction of public improvements will meet the requirements of the Village of Arlington Heights. The intent of Chapter 1 is to identify the processing requirements and procedures required by the Municipal Code, which govern the design and construction of public improvements. The manual is also intended to provide a uniform design criteria for facilities designed for or by the Village, as well as provide specifications to be followed by private development within the Village. Plans and specifications presented for Village approval shall provide for the implementation of the requirements of this Chapter.

1.02 DEFINITION OF TERMS

As-Built Plans .....Design plans checked in the field and revised to show actual locations, elevations, and specification of materials for constructed improvements and utilities, including detention basins. Actual location of structures, including top of foundation grades are to be shown on the as-built plans.

AWWA.....American Water Works Association.

Board of Trustees.....The Board of Trustees of the Village of Arlington Heights.

Conduit.....A horizontal or vertical pipe for the installation of wires or cables, or for the conveyance of gas, water, storm water or sewage.

Contractor .....An individual, company, firm or other party or organization who contracts to physically construct all or a portion of a Development for either a Developer or the Village.

CCHD.....Cook County Highway Department.

Cradle.....Bedding placed under and around a conduit for proper support.

Design Engineer .....The licensed individual, company or firm responsible for the design and preparation of plans and contract documents for a Development.

Developer .....**An individual, company, firm or other party or organization who will be responsible for permitting and construction of a Development.**

Development .....**A residential, commercial, industrial or other area in which the Developer proposes to offer parcel(s) of property for sale or in which the Developer proposes to make certain improvements for his/her own use or sale.**

Director of Engineering.....**The individual occupying that office in the Village of Arlington Heights, or a designated representative.**

Director of Public Works .....**The individual occupying that office in the Village of Arlington Heights, or a designated representative.**

Engineering Inspector .....**An individual, company or firm appointed by the Director of Engineering to inspect construction to ensure compliance with approved plans and specifications.**

IDOT.. .....**Illinois Department of Transportation.**

IEPA.....**Illinois Environmental Protection Agency.**

Improvements.....**Grading, street pavement, curbs, gutters, sidewalks street lighting, water mains, fire hydrants, sanitary sewers, storm sewers, trees, and other additions to the natural state of the land which increases its value, utility, or habitability in accordance with the provisions of these specifications.**

JULIE.....**Joint Utility Locating Information for Excavators. Phone Number is: 1-800-892-0123.**

Letter of Credit .....**A form of security for the installation and maintenance of certain improvements in an amount and form accepted by the Village of Arlington Heights.**

Live Storage.....**That volume available in a storm water holding reservoir for storm water run-off designed in accordance with the requirements of this manual.**

Manual ..... **This document, entitled "A Manual of Practice for the Design of Public and Private Improvements in the Village of Arlington Heights."**

Municipal Code ..... **A document adopted by Ordinance by the President and Board of Trustees.**

MUTCD ..... **Manual of Uniform Traffic Control Devices, Published by the US Department of Transportation, Federal Highway Administration, latest revision.**

MWRDGC ..... **Metropolitan Water Reclamation District of Greater Chicago.**

NAVD 88 ..... **North American Vertical Datum, 1988 reference**

NFPA ..... **National Fire Protection Association.**

Parkway ..... **That part of the public street right-of-way not occupied by the street pavement and located between the back of curb (or edge of pavement) and the right-of-way line.**

PCC ..... **Portland Cement Concrete.**

Private Improvement ..... **Any facility for which the responsibility of maintenance and ownership will be retained by the owner or a private association.**

Public Improvement ..... **Any facility for which the Village of Arlington Heights may ultimately assume the responsibility for maintenance and operation or which is constructed for general public use or benefit.**

Punch List ..... **A written list of deficiencies, requiring corrective action prior to final acceptance of the Project by the Engineering Department. The punch list is prepared after all improvements have been made.**

PVC ..... **Poly Vinyl Chloride. A type of pipe.**

Release Rate ..... **The controlled rate at which storm water is released from a storm water holding reservoir.**

Right-of-Way ..... **Land owned, dedicated, or used as a public street or easement**

Road/Roadway .....The paved area utilized for vehicular motorized travel, existing in the right-of-way. A private road is located on private property.

<u>Standard Specifications for Road and Bridge Construction</u> .....A Manual published by the Illinois Department of Transportation, latest revision.

<u>Standard Specifications for Water and Sewer Main Construction in Illinois</u> .....A Manual published by the Illinois Society of Professional Engineers adopted May, 1986 or latest revision.

Storm Water Holding Reservoir .....A reservoir for the temporary storage of storm water.

Surface Flow-ways ...A surface drainage channel meeting certain specific criteria as established in this manual for the surface movement of storm water.

USGS .....United States Geological Survey.

Village .....The Village of Arlington Heights.

Watershed.....The land area from which all run-off from rainfall would eventually reach the point in question by flowing over the surface of the ground or through the existing improvement.

1.03 SCOPE

The review and approval of contract documents for certain types of improvements is also the legal responsibility of other public agencies in addition to the Village. This Manual is not intended as a substitute for the requirements of other public agencies. It shall be the Design Engineer's responsibility to see that the proposed contract documents meet the legal requirements of all other public agencies and that any and all permits, bonds and insurance required by such agencies are secured.

In the case where conflicts may arise between this document, the Municipal Code, and/or rules and regulations of other public agencies, the issue will be resolved by the Director of Engineering.

1.04 PRE-DESIGN CONFERENCE

It is recommended that prior to the development of detailed plans, the Design Engineer arrange a meeting with the Director of Engineering to review Village requirements and the proposed project.

1.05 PLAN PREPARATION REQUIREMENTS

All plans submitted for approval shall bear the name of the Design Engineer, his/her signature, the imprint or stamp of the Professional Engineer's seal, and his/her address and telephone number. Plans should be drawn on 24" x 36" sheets, and shall be clear and legible. They shall be drawn to a minimum scale of 1"=40', or larger scale which will permit all necessary information to be plainly shown. If plans are required to be submitted in metric units, the design engineer will be notified by the Director of Engineering.

All elevations shall be referenced to NAVD 88 datum, and benchmarks shall be noted on the plans. A list of benchmark locations referenced to NAVD 88 datum is available for inspection in the Engineering Department. All materials to be used on the project shall be indicated on the plans. All proposed improvements and all existing municipal and privately owned utilities shall be shown in both plan and profile. The proposed project plans shall include the existing topography and a finished grading plan for the entire development. Existing topography shall be shown for at least 50 feet beyond the Development's property line, or to the right-of-way on the opposite side of the street on all sides of the Development.

1.06 SPECIFICATION REQUIREMENTS

Technical specifications shall be complete in themselves, except that appropriate specific sections of the most recent edition of the <u>Standard Specifications for Road and Bridge Construction</u> may be referenced. The various standard published material specifications prepared by associations such as the American Society for Testing and Materials (ASTM) and the American Water Works Association (AWWA), may also be incorporated by reference.

The specifications shall include, but not be limited to, all information not shown on the drawings which is necessary to establish in detail the type and quality of materials and work required in the project, as well as parameters and instructions for testing the various completed improvements in the project.

The specifications for public improvements shall also include a clause that all work was installed in conformance with the approved plans and specifications and shall be guaranteed by the contractor to be free from defects in construction and materials for 18 months from acceptance of all public improvements by the Village Board of Trustees.

The Developer shall have replaced or repaired any work or material found to be defective upon written notice from either the Design Engineer or the Director of Engineering that said defects exist. The Developer will be responsible to maintain all work free from defects until the project has been accepted by passage of a resolution by the Village Board of Trustees.

1.07 DESIGN COMPUTATION REQUIREMENTS

Design computations and analysis shall be made by the Design Engineer for all phases of the project when such computations are required in the opinion of the Director of Engineering to ensure the adequacy, stability and safety of the work. Said computations shall be neat and legible and in a form that can be readily followed and understood. Said computations may include, but not necessarily be limited to, the following:

Compensatory Flood Plain Storage
Fire Flow Determination and Water Main Sizing
Retention/Detention Reservoir Capacity Design
Sanitary Sewer Design
Soil Information
Storm Sewer System Design, including Hydraulic Gradients, and Inlet Capacity
Street Lighting System Calculations
Structural Strength Design for Structures
Traffic Signal Warrant Analysis and Intersection Design Studies, including Uniformity Ratio
Wetlands Mitigation

1.08 COST ESTIMATE REQUIREMENTS

The Design Engineer shall prepare an itemized estimate of the cost of the Improvements. The estimate shall be broken down into public and private (usually onsite) improvements when applicable. The cost estimate is to be submitted with the final design plans.

1.09 OTHER PERMIT APPLICATIONS AND APPROVALS

Other governmental agencies may review and approve for construction, all or certain parts of the work included in a project and may require a permit or require that such a permit or application for a permit be executed by the Village. When such permit or permit application is required, it shall be prepared by the Design Engineer, forwarded to the Director of Engineering with all attachments and applicable fees, who will then review and submit the application if acceptable.

1.10 DOCUMENT SUBMISSION AND PROCESSING

Final Engineering documents shall be submitted by the Design Engineer to the Director of Building and Zoning of the Village of Arlington Heights. The initial submittal will be reviewed by all concerned departments. The Design Engineer will be contacted by the Director of Building and Zoning with all the comments. It will be the Design Engineer's responsibility to coordinate these comments. If there is a discrepancy between Village Departments, the Design Engineer must contact the concerned Departments so that the discrepancy can be resolved. The Engineering Department must be notified of all discrepancies. The Design Engineer shall then revise the documents and make the final submission.

Documents included in the initial submittal are as follows:

Engineering & Architect Plans ..... 6 sets
Engineering Specifications .....1 set
Engineering Design Computations.....1 set

Architectural documents in the final submittal shall be made directly to the Building Department. Contact the Building Department for the number of sets to be submitted.

Engineering documents in the final submittal should be submitted directly to the Engineering Department and shall include the following:

Plans ..... 3 sets
Specifications ..... 3 sets
Estimate of Cost .....1 set
Design Computations.....1 set
Other Agency Permit Applications ... as required
Onsite Utility Maintenance Agreement
(if applicable) ..... 2 sets
All Fees, Escrow Deposits or Letters
of Credit (if applicable) . . . . . 1 set

When the final submittal meets the requirements of the Director of Engineering, a recommendation will be made concerning the same to the Plan Commission for transmittal to the Board of Trustees for Final Engineering Plan Approval. In the case of a subdivision, the Engineering Director's recommendation consists of affixing the Director's signature on the Final Approved Plat.

For Development projects not needing Plan Commission or Village Board approval, all documents should be submitted directly to the Building Department along with the appropriate Building Department permit application forms and fees.

1.11 APPROVAL PERIOD

Approvals granted for final engineering plans shall be applicable for a period of 12 months from the date of approval of the Final Plat by the Board of Trustees. If construction is not commenced within 12 months, the approval will be void. Reactivation of voided approvals will require a written request to the Director of Engineering for extension, who will then review the project for any new requirements that may have been established by the Village in the interim. New fees may be charged based upon current cost estimates.

1.12 FEES AND DEPOSITS

Prior to the Director of Engineering submitting a recommendation for Final Engineering Plan Approval to the Plan Commission, and prior to the signing of any Final Plat, the Developer shall cause to be delivered to the Village all fees, deposits, agreements and guarantees in accordance with this Manual.

Such fees, deposits, and guarantees shall include, but are not limited to, the following:

1) ***Plan Review & Inspection Fee*:**

Per Chapter 20, Section 20-106(c)(3) of the Municipal Code, from the Engineer's estimate of cost for public and private site development, the plan review & inspection fee shall be equal to 3% of the Engineer's estimate of cost.

2) ***Public Improvement Deposit or Letter of Credit*:**

Per Chapter 29, Section 29-503(b) of the Municipal Code, computed at the estimated public construction cost x 1.15.

This Letter of Credit may be reduced as public improvements are installed with the Director's approval, based upon the receipt of waivers of lien provided by the Developer.

3) ***Maintenance Deposit or Letter of Credit*:**

Per Chapter 29, Section 29-503(c) of the Municipal Code, computed at the Public
Improvement Deposit x 0.15.

This Letter of Credit is returned 18 months after acceptance of the public improvements, submission of as-built drawings to the Engineering Department, and correction of all Punch List items.

4) ***Bench Mark Expense*:**

Per Chapter 29, Section 29-205 of the Municipal Code $50 for every 20 acre portion of the site.

5) ***Street Sign Expense*:**

Per Chapter 20, Section 20-112(c) of the Municipal Code, at the Village's cost for each street sign needed.

6) ***Recording Expenses*:**

Per Chapter 29, Section 29-215(c) of the Municipal Code, including recording, travel, printing and tax stamp. It will cost $120 + $1.00/lot as a recording fee.

7) ***Money in Lieu of Detention Fee (if applicable)*:**

Per Ordinance of the Village Board, $1/CF of required storage.

Note: This list does NOT include dedications of land or payment of fees for park land, school sites, trees, and other public areas, which may be required. Developers should refer to the Municipal Code for complete information. For Building permits and other fees, Developer should contact Building Department.

In addition to the above, for land heretofore not annexed to the Village, when land has not borne any of the costs of installation of a public water or sewer system, the Developer shall pay connection fees as described in Chapter 29, Article VI of the Municipal Code.

If the Developer wishes to proceed with mass grading prior to final Engineering

approval, and is given permission to do so by the Director of Engineering, the Developer must first deposit a cash erosion control escrow in the amount of $2,000/acre

of development, along with an erosion control plan and a release of claims letter to the Director of Engineering. The release of claims letter shall include the property description, and the statement that the Developer acknowledges proceeding without final approval, that final approval may not be granted, and that the Developer is responsible for returning the site to its original condition if construction approval is not granted.

1.13 REVISIONS TO APPROVED PLANS AND SPECIFICATIONS

Any deviations from approved plans or specifications affecting the development shall be approved in writing by the Director of Engineering before such changes are made. All revisions must be depicted on the as-built plans.

1.14 CONSTRUCTION SUPERVISION

All public and private projects require periodic inspection and construction supervision. For Village owned projects the Director of Engineering or Director of Public Works shall be responsible for project supervision and all required inspections. Projects by private developers may have spot inspections performed by the Village Engineering Department, but full-time inspection and performance certification is the responsibility of the Developer.

1.15 AS-BUILT PLANS (RECORD DRAWINGS)

An as-built plan shall be submitted by the Developer to the Director of Engineering prior to the preparation of the final punch list. The Engineering Inspector will prepare the punch list after receiving the as-built plans. The Developer will then satisfactorily address all issues on the punch list, and notify the Engineering Inspector after all items are completed. The Engineering Inspector will then make a reinspection of the punch list items, and notify the Developer if all items have been satisfactorily addressed. The as-built plans will be rejected if they do not accurately reflect constructed conditions.

After all punch list items have been satisfactorily addressed, the Developer is required to submit 7 sets of as-built plans. The Village will forward 4 sets to the MWRDGC as per their requirements. When applicable, as-built plans must accompany the Request for Final Inspection (RFI) form prior to scheduling and conducting the MWRDGC final inspection. Each sheet in the set is to be labeled "As-Built" or “Record Drawings” and signed and sealed by a Registered Professional Engineer.

1.16 EXISTING FACILITIES

Plans and specifications shall provide for the continuous operation of existing facilities without interruption during construction, unless otherwise specifically authorized by the Director of Engineering. Plans shall include phasing schedules when work will not be continuous.

1.17 FINAL PROCESSING AND ACCEPTANCE

Prior to the final approval of the project, the Director of Engineering shall prepare a final punch list, listing all items not meeting the requirements of the approved plans and specifications. This punch list will be prepared after the Developer submits as-built plans as described in Article 1.15 of this Manual. The Developer will have six months from the date of the punch list to correct ALL punch list items or will be subject to forfeiture of ALL escrows, compliance bonds, and letters of credit that are being held by the Village.

If damage occurs to a Public Improvement before the Village Board passes a resolution accepting the Public Improvements, the Developer will be responsible to correct the damage.

1.18 WAIVER FOR MANUAL REQUIREMENTS

Where conditions so warrant, the President and Board of Trustees of the Village of Arlington Heights may, after a hearing, choose to waive any of the requirements of this Manual.

1.19 SAFETY REQUIREMENTS

All requirements of other governmental agencies, including the federal government, relative to safety, shall be complied with by the Developer.

1.20 AGENCY NOTIFICATION

The Developer must notify the Director of Engineering 48 hours in advance of starting any work on the site. It is the Developer's responsibility to notify other agencies such as JULIE, MWRDGC, IDOT, and CCHD where applicable. The Director of Engineering strongly urges Developers to arrange for a pre-construction meeting with all concerned parties.

1.21 ACCIDENT NOTIFICATION

In case of an unplanned interruption of utility service, the owner of said utility shall be notified immediately. If the utility is under ownership of the Village of Arlington Heights, the Public Works Department shall be notified immediately at 577-5600.

In the event of any accident requiring police or fire department assistance, the Contractor shall call 911 immediately.

CHAPTER 2

EROSION CONTROL, GRADING, PROTECTION AND RESTORATION REQUIREMENTS

2.01 INTRODUCTION

Project construction required in connection with a Development is often in or adjacent to areas with existing surface or underground improvements. Plans and specifications presented for Village approval shall provide for the implementation of the requirements of this Chapter.

2.02 EROSION CONTROL

Erosion and sediment control due to storm water run-off, wind, equipment leaving and entering a construction site, etc., is required per Chapters 20-110(l) and 23-507 of the Municipal Code for all construction within the Village. Site engineering for projects shall therefore contain an erosion control plan. The plan will follow accepted techniques and details as found in the most recent edition of the Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control, (The Green Book), or as instructed by the Director of Engineering.

Steep slopes or extreme cuts and fills are to be avoided whenever possible. Natural vegetation should be retained next to lakes, creeks, or other natural water sources.

The erosion control plan should indicate the location of soil stock piles and specify seed materials to be used on those stock piles. Seeding shall be required for all soil stock piles that are scheduled to remain onsite longer than thirty days.

Erosion control measures should be used which include, but are not limited to, sediment basins, diversion channels, stone haul roads at all construction entrances, pavement cleaning operations, silt fences, straw bales, sodded swales and any other measures necessary or as instructed by the Director of Engineering.

Straw bale filters or silt fences are required around inlet structures, catch basins and manholes and can be used as site run-off filters if the tributary drainage area is less than one acre. If tributary drainage areas are greater than one acre, silt fences must be used. Erosion control must be inspected weekly by the Developer or after a rainfall to determine damage and if replacement is needed. As a minimum, straw bales are to be replaced every three months or as required by the Director of Engineering.

Erosion control measures shall be included in the Construction cost estimate as required in Article 1.08 of this Manual.

If permission is granted by the Director of Engineering to begin mass grading work prior to final engineering plan approval, the Developer shall deposit a cash erosion control escrow in the amount of $2000/acre of development, along with an erosion control plan and a release of claims letter to the Director of Engineering. The release of claims letter shall include the property description, and the statement that the Developer acknowledges proceeding without final approval, that final approval may not be granted, and that the Developer is responsible for returning the site to its original condition if construction approval is not granted.

At the completion of any project, all utility structures will be inspected by the Engineering Department to determine any cleaning or flushing of trapped sediment which may be required. These items will be included in the Punch List.

2.03 GRADING

A grading plan is required for all plans submitted for approval. All existing and proposed conditions shall be shown, along with elevation contour lines for the proposed plan, for a distance of 50 feet beyond the site boundaries, or longer if needed to show the grading pattern.

2.03A - ENGINEERING REQUIREMENTS

- **Two percent minimum grassed area and drainage swale slopes.**
- **Twenty percent maximum grassed area and drainage swale slopes.**
- **Six inch exposed foundation required with adjacent grades sloping away from structure.**

2.03B - GRADING PLAN REQUIREMENTS

- **Elevations needed to be shown are those required to properly construct the project from the submitted plan. Elevations required include top of foundation, property corners, high and low points, top of all utility covers, top of curb, swale slope elevations, and driveway slopes.**
- **Benchmarks in USGS datum.**
- **Detention basin limits, high and normal water lines, storage volumes, release rate and**

overflow route.

- **Flood Plain and Floodway limits if applicable.**
- **Proposed street centerline and top of curb elevations indicated every 50' and at high and low points.**
- **Retaining wall elevations and locations including top and bottom of wall.**

2.04 EXCAVATION

Where working space will permit, trenches may be excavated by machine, provided that public and private improvements will not be subjected to damage. If excavation by machine methods cannot be made without damage, hand excavation or tunneling shall be used.

2.05 BRACING AND SHEETING

Open-cut trenches shall be sloped, sheeted and/or braced as required by any governing federal or state laws and municipal ordinances, including all OSHA safety and health standards, and as necessary to protect life, property and the work.

2.06 PILING EXCAVATED MATERIAL

All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks, driveways, and pavements open to traffic. Fire hydrants, valve boxes, points of access, and other utility controls shall be left unobstructed and accessible until the work is completed. All pavement and gutters shall be kept clear and clean as required in Chapter 20 of the Municipal Code. Natural and manmade watercourses shall not be obstructed.

2.07 STRUCTURE PROTECTION

Adequate protection, support, and maintenance of all underground and surface structures, drains, sewers, water mains, service lines, foundations, and other obstructions encountered in the progress of the work is required. Structures which have been disturbed shall be restored or replaced at the Developer's expense to their original condition.

2.08 PROTECTION OF PROPERTY

Trees, shrubbery, fences, poles and all other property and structures shall be protected during construction operations. Any fences, poles or other man made improvements which are moved or disturbed shall be restored at the Developer's expense to their original condition. In a timely manner. If an existing improvement in the public right of way is not permitted in public right of way, the improvement will not be required to be replaced. Any trees, shrubbery or other vegetation which are approved for removal shall be removed completely, including stumps and roots.

A Tree Preservation Plan will be required for all public and private new construction, enlargements, or expansion of any structure, building or parking, service areas and other construction except single family residential lots. A brochure titled Requirements for Landscape Approval is available from the Planning Department.

2.09 INTERRUPTION TO UTILITIES

At least 48 hours prior to commencement of work, JULIE (1-800-892-0123) must be notified for location of any existing utilities. All reasonable precautions shall be taken against damage to existing utilities.

In the event of damage to an existing water, gas, sewer main, utility service or underground cable, the Contractor shall immediately notify a responsible official from the organization operating the utility interrupted. The Contractor shall lend all possible assistance in restoring service and shall assume all costs, charges or claims connected with the interruption and repair of such services in accordance with JULIE specifications.

In the case of Village utilities, the cost of such work and equipment will be billed to the Contractor at the prevailing rates established by the Public Works Department.

2.10 TRAFFIC CONTROL

All work within public right of ways and on private roads shall conform to the requirements of the latest edition of the MUTCD:

1. **When an opening is made into the existing pavement.**

2. **When construction takes place adjacent to the edge of the existing pavement.**

3. **When a utility crossing is made beneath the existing pavement.**
4. **When it is necessary to close a lane of traffic due to construction operations or any other work within the right-of-way which affects traffic flow.**

A full lane closure will be required when a lane normally used for through traffic is blocked by construction, when a vehicle is parked there, or when construction material or equipment is temporarily placed in the lane, even if this facility is on a four-lane roadway. Permission for such a lane closure must be obtained from the Director of Engineering prior to commencing construction. The Director of Engineering will inform the Developer if permission from other agencies, such as IDOT or the CCHD is required. Signing will be required in strict conformance with the MUTCD. No construction operation is to commence until such time that all required signs and barricades have been erected.

Unless written authorization is obtained from the Director of Engineering or the Director of Public Works, all openings in any pavement or traveled way will be backfilled prior to the end of the working day. All excavations will be backfilled with CA-6, Grade 8 or 9 crushed stone (crushed concrete is not permitted) and a temporary bituminous patch of at least 2 inches in thickness shall be placed over the backfill. It is understood that this backfilling and patching is only temporary and that permanent pavement repair will be required as specified in Article 2.13 of this Manual. In lieu of a bituminous patch, a steel plate (minimum of 1 inch of thickness) over the excavation may be used if approved by the Director of Engineering or Public Works. The steel plate should be sealed with cold patch along its perimeter to ensure stability of the plate.

2.11 PAVEMENT CROSSINGS

Unless otherwise specifically approved by the Director of Engineering, all conduits crossing under existing pavements shall be installed by tunneling, jacking, hand mining or augering. When the carrier pipe is a conduit intended to operate under internal pressure, a casing pipe of adequate strength for all applied loads shall be used, extended 10 feet beyond pavement or back of curb. The nearest face of pits or other open excavations on each side of a traveled pavement shall be a minimum of 10 feet from the edge of the pavement. See Article 5.04 of this Manual for more requirements on watermain crossings.

2.12 BACKFILL REQUIREMENTS

PVC watermain will require a granular cradle as described in Section 20-2.20A of the <u>Standard Specifications for Water & Sewer Main Construction in Illinois</u>, latest edition.

All PVC sanitary and storm sewer, *under paved and non-paved areas,* requires CA-11 or CA-13 bedding and backfill material. Bedding beneath the pipe shall be placed to a thickness equal to ¼th of the outside diameter of the sewer pipe with a maximum

thickness of 8 inches, but shall not be less than 4 inches, and the backfill extend to one foot above the pipe.

RCCP storm sewer, *under non-paved* areas, requires CA-11 or CA-13 bedding material. Bedding beneath the pipe shall be placed to a thickness equal to ¼th of the outside diameter of the sewer pipe with a maximum thickness of 8 inches, but shall not be less than 4 inches.
The bedding material shall be placed to the springline of the pipe.
RCCP storm sewer, *under paved* areas, requires CA-11 or CA-13 bedding and CA-6, GR 8 or GR 9 backfill. Bedding shall be placed below the pipe, to a thickness equal to ¼th of the outside diameter of the sewer pipe with a maximum thickness of 8 inches, but shall not be less than 4 inches. Backfill material must be CA-6 GR 8 or GR 9 crushed stone. Backfill must be placed to the pavement sub-base.

Ductile iron pipe, *under paved areas,* requires CA-6, GR 8 or GR 9 backfill to the pavement sub-base. Ductile iron pipe does not require granular cradle.

Ductile iron pipe, *under non-paved areas*, may be backfilled with the originally excavated material. Ductile iron pipe does not require granular cradle.

Backfill must be compacted by mechanical methods unless otherwise instructed by the Director of Engineering.

In all of the above descriptions, "*under paved areas*" includes locations within three feet from the back of curb, edge of pavement, or sidewalk.

2.13 RESTORATION OF EXISTING IMPROVED SURFACES

2.13A - GENERAL

The Contractor shall restore all pavements, sidewalks, driveways, curbs, gutters, trees, shrubbery, lawns, fences, poles and other property and surface structures removed or disturbed during or as a result of construction operations to a condition which is equal in appearance and quality to the condition that existed before the work began. The material replaced shall be constructed of the same material and match in appearance the improvements which were removed. Damage that occurs to non-involved party's property shall be restored promptly.

2.13B - SAW CUTTING

When necessary to remove sections of existing pavement, sidewalk, or curb and gutter, the edges of the section to be removed shall be cleanly sawcut the full depth with a

pavement saw. Dust control must be provided.

2.13C - REMOVAL OF ROADWAY PAVEMENTS, SIDEWALKS, DRIVEWAY AND CURB

When a conduit is located along or across an improved surface, the width of the trench at the top of the excavation shall be held as nearly as possible to the maximum width indicated in the Standard Specifications for Water & Sewer Main Construction in Illinois, latest edition. Where concrete pavement, sidewalk, driveway or curbing is cut, the width of the cut shall exceed the actual width of the top of the trench at sub-grade by a minimum of 12 inches on each side. Exposed surface of Portland Cement or asphaltic concrete shall be cut with a pavement saw to full depth before removal. Care shall be taken in cutting to insure that a straight joint is obtained.

2.13D - CONCRETE PAVEMENT PATCHING

Where the existing roadway pavement surface is PCC, the pavement replacement shall consist of a minimum of 6 inch PCC pavement or existing concrete depth whichever is greater. PCC shall be class "PP". Construction methods for portland cement concrete pavement patching shall conform to the current requirements of the Standard Specifications for Road and Bridge Construction for Pavement Patching, except that Class C patches shall be tied into existing pavement with 5/8 inch J-Bolts drilled and anchored every 30 inches along the entire perimeter of the patch.

2.13E - BITUMINOUS SURFACE WITH RIGID BASE PATCHING

Where the existing pavement surface is bituminous concrete and the base consists of a rigid material such as brick or PCC, the base replacement shall consist of a minimum of 6 inch PCC as described in Article 2.13D of this Manual. The Surface replacement shall consist of a bituminous prime coat, a 1½ inch binder course and a 1½ inch minimum surface course conforming to the requirements of the Standard Specifications for Road and Bridge Construction for Bituminous Concrete Binder and Surface Course, Class I.

2.13F - BITUMINOUS SURFACE WITH FLEXIBLE BASE PATCHING

Where the existing pavement is bituminous plant mix material or bituminous surface treatment and the base consists of a flexible material such as gravel, crushed stone, Bituminous Aggregate Mixture, Pozzolanic Material or Soil Cement, the base replacement shall consist of a 6 inch compacted thickness of bituminous aggregate

mixture base course conforming to the Standard Specifications for Road and Bridge Construction. The sub-base must be replaced with a minimum of 4 inches of CA-6 granular sub-base.

The Surface replacement shall consist of a bituminous prime coat, a 1½ inch binder course and a 1½ inch minimum surface course conforming to the requirements of the Standard Specifications for Road and Bridge Construction for Bituminous Concrete Binder and Surface Course, Class I.

See Chapter 6 of this Manual for more information on Pavement Design.

2.13G - CONCRETE SIDEWALKS, DRIVEWAYS, CURB, CURB AND GUTTER

Where necessary to remove and replace concrete sidewalk, driveways, curb and curb and gutter, replacements shall be made in accordance with Chapters 6 and 7 of this Manual.

2.13H - BITUMINOUS DRIVEWAYS

Bituminous residential driveways shall be restored to a condition equal in appearance and quality of the existing driveway prior to construction, and in accordance with Article 6.08 of this Manual.

2.13I - LAWNS

When lawn areas are damaged they shall be restored as detailed in this section. All single family lots constructed or restored shall follow the provisions of this Article.

Sodding is required for all drainage swales, dry-bottom storm water holding reservoirs, and the side slopes of storm water holding reservoirs.

Top soil shall be furnished and placed to a minimum depth of 4 inches. Topsoil shall be furnished and placed in accordance with Section 211 of the Standard Specifications for Road and Bridge Construction.

Sodding shall be furnished and placed in accordance with Section 252 of the Standard Specifications for Road and Bridge Construction.

2.14 CLEANUP

Before acceptance of underground conduit construction, all pipes, manholes, catch basins, fire hydrants, and other appurtenances shall be cleaned of all debris and foreign

material. Appurtenances shall be at the proper line and grade.

CHAPTER 3

STORM WATER FACILITIES

3.01 INTRODUCTION

All Developments, regardless of size, within the corporate limits or under the control of the Village, shall include provisions for the construction of storm water facilities designed in accordance with this Chapter. The design of all storm water facilities proposed for construction as independent projects under the control of the Village shall also meet the technical requirements of this Chapter. The requirements of Chapters 1 and 2 are also applicable to storm water facility construction.

Developers are required to obtain a National Pollutant Discharge Elimination System permit (NPDES) if their development is greater than 5 acres in size.

All storm sewers, streams or channels shall be designed to accommodate storm water runoff from all areas which naturally flow to the area of development.

3.02 GENERAL PROJECT REQUIREMENTS

3.02A - STORM SEWERS

Required storm water facilities shall include an underground storm sewer system complete with all appurtenances, complying with all requirements of this Chapter and designed to provide an adequate outfall for run-off from a 10 year, 24 hour storm event selected from "Bulletin 70" (as published in <u>Frequency Distributions and Hydroclimatic Characteristics of Heavy Rainstorms in Illinois</u>). The design should limit surcharge in the sewers to grades lower than any paved areas.

3.02B - SURFACE FLOW-WAYS (Overland Flow Routes)

Developments must include surface flow-ways as described in Article 3.09 of this Manual, designed in accordance with the requirements of this Chapter. The surface flow-ways, together with the underground storm sewer system, shall provide an adequate outfall for run-off from a 100 year, 24 hour storm event selected from "Bulletin 70". The overflow routes must be clearly marked on the plans and identified with a different arrow symbol than used for overland drainage.

3.02C - STORM WATER HOLDING RESERVOIRS

The underground storm sewer system and surface flow-ways shall discharge to a storm water holding reservoir, with a release rate and size designed to not increase the existing flow
rates prior to the development, and if located within an area prone to flooding, reduce the probability of flooding downstream.

3.03 VILLAGE OWNED OR PROPOSED FACILITIES

The Village has constructed storm water holding reservoirs and appurtenances and is contemplating others at certain locations to serve upstream watersheds not yet fully developed. If a proposed Development lies within an area served by an adequate existing or proposed reservoir, at the option of the Director of Engineering, the Project need not include a storm water holding reservoir. The local storm sewer system and flow-ways may discharge directly to that reservoir, an adequate trunk sewer, or surface flow-way feeding it. In such a case, the Developer shall pay a fee per cubic foot of live storage required for this Development, computed in accordance with the requirements of this Chapter. The option to pay money in lieu of detention is at the sole discretion of the Director of Engineering. The fee will be as described in Article 1.12 of this Manual.

3.04 DESIGN CRITERIA FOR STORM SEWERS AND FLOW-WAYS

3.04A - DESIGN FORMULA

Unless otherwise approved by the Director of Engineering, run-off to be used in connection with the design of storm sewers, surface flow-ways and appurtenances shall be determined by the Rational Method, as expressed by the design formula:

Q=CIA
where
A=Total tributary drainage area in acres,
I=Average Rainfall Intensity, in inches per hour
C=Coefficient of run-off
Q=Run-off, in cubic feet per second.

When in the opinion of the Director of Engineering the Rational Method is not sufficient for the Development, a different design formula, such as TR55 may be required.

3.04B - INTENSITY

The average rainfall intensity used in the design formula shall be selected from the Rainfall Intensity vs. Duration Curves shown in Bulletin 70. Underground storm water conduits shall be designed for a 10-year storm. Underground storm water conduits in combination with surface flow-ways, if any, shall be designed for a 100-year storm.

Duration time used in selecting a specific point on the curves shall be equal to the time of concentration, defined as inlet time plus the time of flow between the most distant inlet and the point in the system under consideration.

3.04C - RUN-OFF COEFFICIENT

The run-off coefficient "C" in the design formula, is the ratio of run-off to rainfall. All proposed impervious areas (paved, hard surfaced areas, and buildings) shall be assumed to have a C value of 0.95. Retention ponds or other areas holding a normal water elevation shall have a C value of 1.00. Proposed pervious area (all areas not classified as impervious) shall be assumed to have a C value of 0.50. The run-off coefficient used in the design formula shall be the weighted average for the tributary watershed based on the above coefficients.

The run-off coefficient shall be computed assuming ultimate build-out within the Development. Where ultimate development plans are not available at the time of the design of the storm sewer system, a coefficient will be selected by the Director of Engineering, based on the zoning classification, knowledge of the specific Development and previous experience with similar Developments.

3.04D - DESIGN FLOW

Design flow used in sizing storm sewers and flow-ways shall be the sum of the run-off determined as described above plus the release rate from any existing storm water holding facilities tributary to the point under consideration.

3.05 DESIGN CRITERIA FOR STORM WATER HOLDING RESERVOIRS

3.05A - DESIGN FORMULA

Required live storage for storm water holding reservoirs for watersheds less than 8 acres shall include the volume computed in accordance with the design formula:

$$V=AT(CI-Qr)$$

where **V=Volume of storage, in acre feet**
A=Total tributary drainage area, in acres
C=Run-off coefficient
I=100-year storm intensity, in inches per hour
T=Duration of storm, in hours
Qr=Release rate, selected per Article 3.05C of this Manual, in cubic feet per second per acre.

When the watershed is greater than 8 acres, the Director of Engineering will determine the Detention Basin Design to be used. In some instances, the requirements of the MWRDGC may override Village requirements and must be followed.

3.05B - AREA

The area used in the design formula for storm water holding reservoirs shall include the total area within the Development tributary to the reservoir.

When so instructed by the Director of Engineering, the total area shall also include areas outside the Development whose flow is not intercepted by another storm water holding reservoir, but is tributary to the reservoir under design. When such areas outside the Development are not currently fully developed, provisions may be made for the recapture by the Developer of the additional reservoir construction cost resulting from including the area outside the Development when that area is developed. When such areas are fully developed, the incremental cost of the reservoir may be set by the Village as may be authorized by the Village Board of Trustees.

3.05C - RELEASE RATE

The allowable maximum release rate, Qr, in cubic feet per second per acre used in the volume design formula shall not exceed 0.18 cubic feet per second per acre.

It shall also be limited to a rate that in the opinion of the Director of Engineering will not, in combination with run-off from other sources, exceed the capacity of the downstream receiving sewer or stream.

The minimum restrictor size that may be used is 2 inches in diameter. All restrictors between 2 and 4 inches in diameter must be in a trap.

3.05D - COMPENSATORY STORAGE

Whenever any portion of a flood plain is authorized for use, the volume of space which will be occupied by the authorized fill or structure below the base flood or 100-year

frequency flood elevation shall be compensated for and balanced by a hydraulically equivalent volume of excavation taken from below the base flood or 100-year frequency flood elevation. The excavation volume shall be at least equal to the volume of storage lost due to the fill or structure. In the case of streams and watercourses, such excavation shall be made opposite or adjacent to the areas so filled or occupied. All flood plain storage lost below the existing 10-year flood elevation shall be replaced below the 10-year flood elevation. All flood plain storage lost above the existing 10-year flood elevation shall be replaced above the proposed 10-year flood elevation. All such excavations shall be constructed to drain freely and openly to the watercourse.

Areas identified as "Flood Plains" are special flood hazard areas and designated as "Zone A" on the Flood Insurance Rate Map (FIRM), published by the Federal Emergency Management Agency (FEMA), copies of which are available for inspection in the Engineering Department.

All elements of flood protection and permitting requirements shall comply with the Village flood control ordinance as found in Chapter 15 of the Municipal Code.

3.05E - SMALL DEVELOPMENTS

The Director of Engineering may exempt the Developer from the storm water holding reservoir requirements in circumstances when, in the Director's opinion, the immediate downstream flooding conditions will not be significantly worsened. A cash payment to the Village in the amount set out in Article 1.12 of this Manual, will be required.

3.06 DESIGN DETAILS FOR STORM SEWERS

3.06A - CONNECTIONS TO STORM SEWERS

Storm water run-off shall enter the underground storm sewer system only through inlets and catch basins after passing over the surface of the ground or through a storm sewer service line connection designed to receive flow from a single building. Storm sewer service lines may be designed to receive the storm water run-off from roof drains, window wells, footing drains or sump pumps, providing provisions for restricted release are incorporated into the system design.

Storm sewer service lines shall meet all the requirements of the storm sewer system as detailed in Articles 3.06B through 3.06M of this Manual, except their minimum diameter will be 6 inches in private property and 10 inches in public right of way.

3.06B - SUMP PUMPS

Sump pumps may be connected to the storm sewer via an air gap hook-up at the building. Minimum storm sewer size to which a sump pump discharge pipe may be connected is 10 inches. Sump pump pipe material in private property may be PVC or PE plastic pipe, or other material as approved, with a maximum 4 inch diameter size. If sump discharge is not into the storm sewer system, it must be terminated no more than 10 feet from the building, as described in Section 22-106b. of the Municipal Code.

3.06C - SEWER TYPES

Storm sewer pipes in public right of way shall be reinforced concrete pipe as described in Section 550 of the Standard Specifications for Road and Bridge Construction. Any other storm pipe material in public right of way must be approved by the Director of Engineering.

Storm sewer pipes on private property may be PVC SDR 26, DIP, or RCCP. Other pipe material may be used with permission from the Director of Engineering.

3.06D - JOINTS

Joints for precast reinforced concrete storm sewer pipe shall be preformed, flexible, gasket type (ASTM C-443).

All joints between pre-cast sections of a manhole, and the connection between the sewer and manhole shall be wetted and then completely filled with mortar, smoothed and tuck pointed both inside and out, to ensure water tightness. Lift holes must be filled with concrete plugs and bituminous joint material used to seal the plug. Preformed bitumastic (butyl rope) may be used between manhole sections.

Straight and transition couplings for sewer construction and repair shall be Style CNSS non-shear sewer couplings as manufactured by Cascade Waterworks Mfg. Co. Of Yorkville, IL, or approved equal.

3.06E - LOADINGS

The type and class of storm sewer pipe shall be in accordance with Section 550 of the Standard Specifications for Road and Bridge Construction.

3.06F - FRAMES & GRATES

All closed public storm, sanitary, and water lids shall have the words "Arlington Heights" cast into them, as well as the designation of "Sanitary", "Storm", or "Water". Additionally, all castings shall be coated with a non-toxic, water base asphalt coating complying with AWWA C104.

The frames, grates and lids (with "Arlington Heights" and the "designation" cast into them) shall be manufactured by East Jordan Iron Works and are specified as follows:

FRAMES & GRATES

STRUCTURE	EJIW PRODUCT #
Inlet, 2' Diameter	EJIW 7463 Type M2* grate
Type A Manhole	EJIW 1051-3HD Frame & Cover
Type C Inlet	EJIW 7463 Type M2* grate
Type A Catch Basin	EJIW 6527 (beehive)

***A Type M1 grate may be used for structures at a low point.**

LIDS

STRUCTURE	DESIGNATION	EJIW PRODUCT #
Sanitary MH (w/gasket)	Sanitary	102245
Combined MH	Combined	102262
Storm MH	Storm	102244
Valve Vault	Water	102243

Equivalent frames and lids may be used with permission of the Director of Engineering. Please note that Neenah R-3337-A is <u>not</u> an approved equal to Inlet EJIW 7463.

3.06G - MINIMUM SIZE

No storm sewer shall be less than 10 inches in diameter, unless otherwise approved by the Director of Engineering.

3.06H - SEWER SLOPE

Minimum slope of the sewer invert for storm sewers shall be adequate to insure a mean velocity in the sewer when flowing full with no surcharge of not less than 2.0 feet per second. Maximum allowable slope of the sewer shall insure a velocity less than 15 feet per second.
The relationship between the velocity in the sewer and the slope of the hydraulic gradient shall be in accordance with Manning's formula:

$$V = \frac{1.486}{n} R^{2/3} S^{1/2}$$

where **n=0.013,**
R=sewer cross-sectional area divided by the wetted perimeter
S=slope of the hydraulic gradient
V=mean velocity

3.06I - ALIGNMENT

Sewers shall be laid straight in both horizontal and vertical planes between manholes, unless otherwise approved by the Director of Engineering.

3.06J - SEWER SIZE CHANGES

Under normal conditions where storm sewers of different diameters join, the invert elevations shall be adjusted to maintain a uniform energy gradient. A manhole or catch basin shall be used at all sewer size changes.

3.06K - HIGH VELOCITY PROTECTION

Where velocities greater than 15 feet per second will occur in a sewer when flowing full, special provisions shall be taken to prevent erosion or displacement of the pipe.

3.06L - BEDDING

Bedding shall be provided for all storm sewers constructed in trench in accordance with the requirements of Article 2.12 of this Manual.

3.06M - DEWATERING

If requested by the Engineering Inspector, prior to pipe laying and jointing, the trench shall be dewatered sufficient to maintain the water level in the trench at or below the base of the bedding.

3.07 DESIGN DETAILS FOR INLETS AND CATCH BASINS

3.07A - TRIBUTARY AREAS

Inlets shall be provided so that surface water is not carried across or around street intersections. Roadway inlets shall not exceed 300-foot spacing. Inlets shall be provided at all low points. The overland flow route shall be limited to 200 feet wherever possible without flowing into an inlet or catch basin.

3.07B - CONSTRUCTION REQUIREMENTS

See Article 3.06F of this Manual for frame, grate and lid types for inlets and catch basins.

Inlets will not discharge directly to the storm sewer, but will be connected to a storm sewer by a catch basin. Not more than two inlets shall be upstream of any one catch basin.

3.08 DESIGN DETAILS FOR MANHOLES

3.08A - LOCATION

Manholes shall be provided at the following locations:

- **The termination of all sewers which do not terminate at a catch basin or inlet.**
- **All changes in grade, size or alignment. At all connections to sewers.**
- **A spacing no greater than 400 feet for 15 inch diameter sewers or less.**
- **A spacing no greater than 500 feet for sewers 18 inches through 33 inches in diameter.**
- **A spacing no greater than 660 feet for sewers with a diameter greater than 33 inches, but less than 84 inches.**

- **A spacing calculated from: 100 x pipe diameter in feet, for sewers with a diameter greater than 84 inches.**

3.08B - TYPE

Type A Manholes with an inside diameter of no less than 48 inches, shall be used when the downstream sewer diameter is 18 inches or less.

Type A Manholes with an inside diameter of no less than 60 inches, shall be used where the downstream sewer diameter is greater than 18 inches and less than 36 inches.

Where the inside diameter of the downstream sewer is 36 inches or greater, the Developer must include a detail on the plans of the control structure or junction chamber, to be approved by the Director of Engineering.

A maximum of two-4 inch thick concrete adjusting rings will be permitted per structure.

Steps in manholes shall be made of copolymer Polypropylene plastic with ½ inch grade 60 steel reinforcement, Step PSI-PF, as manufactured by M.A. Industries, Inc., or approved equal. Steps to be spaced 16 inches on-center.

Benches must be poured and smooth finished, or pre-cast, for storm manholes, inlets, and sanitary manholes. The rise of the bench shall be a minimum of 6 inches higher than the centerline of the sewer.

3.08C - DROP MANHOLES

Drop manholes shall be provided for all sanitary sewers entering a Village maintained manhole with their invert elevation more than 12 inches above the invert of the sewer leaving the manhole. If the manhole is not maintained by the Village, the drop may be 24 inches.

3.09 DESIGN REQUIREMENTS FOR OVERLAND FLOW ROUTES (SURFACE FLOW-WAYS)

3.09A - DESCRIPTION

Natural water courses or ditches and sodded swales are classified as overland flow routes, provided they lie or are constructed in an easement of such a width and configuration as to insure that the horizontal projection of the water surface for the 100-year storm will lie within the limits of the easement, and also that the easement itself will be of sufficient width

to provide adequate room for proper maintenance and operation. Public rights of way may also be designated, designed and used as an overland flow route with the stipulations that at no point shall the vertical distance from the water surface for the 100-year storm to the lowest point in the right of way cross section exceed 12 inches and that the width utilized as an overland flow route lie wholly within the right of way.

3.09B - CAPACITY

Surface flow-way capacity shall be determined using the Manning Equation. Roughness coefficients (n), to be used in the equation are as follows:

Material	n
ordinary concrete or asphalt	0.013
sodded channel	0.027
natural channels with light brush	0.050

If the roughness is not uniform across the surface flow-way, an average value based on the above table shall be computed.

3.09C - SWALES

All swales shall be sodded as part of the Development. Maximum water depth shall be 12 inches. Minimum side slopes of swales shall be 20:1. Maximum side slopes of swales shall be 5:1. Minimum slope of the drainage way shall be 50:1.

3.09D - BOUNDARY FLOW-WAYS

Where the storm sewer system is being designed in connection with a Development, and the tributary drainage area extends more than 100 feet beyond the boundary of the Development, surface flow-ways shall be constructed along the upstream boundary of the Development in such a fashion as to intercept all run-off from the upstream watershed.

3.10 DESIGN DETAILS FOR STORM WATER HOLDING RESERVOIRS

3.10A - OWNERSHIP

Title for storm water holding reservoirs constructed by private interests shall remain with the Developer, or be transferred to the Village upon resolution of acceptance by the Village Board, as the Village may elect.

In the event that the Village elects that ownership shall remain with the Developer, the responsibility for and expense of maintenance and operation shall remain with the Developer. A written Onsite Utility Maintenance Agreement must be given to the Village prior to final Engineering approval of plans. The Onsite Utility Maintenance Agreement form is available in the Engineering Department.

3.10B - HIGH WATER LEVEL

Design high water level for live storage in the reservoir shall be set at such an elevation that for the 100-year storm, all flood water on the upstream watershed shall be confined within the underground storm sewer system and reservoir.

The engineer shall design into the storm water holding reservoir at least one foot of freeboard. A permanent overflow route must also be designed into the system, at 0.5 feet above the high water level and below the freeboard elevation.

3.10C - SURFACE DETAILS

All surfaces within storm water holding reservoirs designed as a dry bottom basin, and all areas within a permanent pond not covered by the actual pond, including side slopes, and swales, shall be sodded. Pavement or other concrete surfaces will be permitted only with the approval of the Director of Engineering. All turf areas shall have a minimum grade of 2 percent in the direction in which sheet flow is intended to move, and all side slopes and low flow swales shall have slopes less than 5 horizontal to 1 vertical. The finished reservoir shall drain by gravity to the reservoir outlet structure by underground piping or to a natural waterway.

3.10D - UNDER DRAIN SYSTEM

An under drain system shall be provided for detention basins when design conditions warrant their use. Under drains shall be provided at locations where surface water movement is intended to follow the flow line of troughs or swales. Clean-outs shall be provided at the upstream end of all under drains.

3.10E - GUARD RAILS, FENCING, AND GATES

All sharp or vertical breaks in grade, for example at inlet and outlet structures, head wall, etc., shall be protected with guard rails or fencing meeting the requirements of the Building Officials and Code Administrator (BOCA) code. Where differences in grade level are in excess of 4 feet, and are located closer than 2 feet to a walk, path, parking lot, or driveway

on the high side, guard rails shall be provided with guards that are in accordance with BOCA Section 824.0, or other approved measures.

All discharge pipes and flared end sections 24 inch diameter and greater shall be covered with a grate as specified in Standards 2364-3 and 2379-2 of the Highway Standards, latest revision, provided by the IDOT Division of Highways, Bureau of Design.

3.10F - SPECIAL REQUIREMENTS FOR WET BOTTOM RESERVOIRS

Where the construction of a wet bottom basin has been approved, the pond shall be constructed with a minimum depth of no less than six feet. A safety ledge, five feet wide, back pitched towards the shore three inches, at three feet below normal water level (NWL) must be provided. The slope to the safety ledge from the NWL must be no greater than 3:1.
If the reservoir has not been classified as a wetland, the design of the shore line shall be such as to minimize maintenance and the growth of aquatic weeds. Provision shall also be made if required, in the opinion of the Director of Engineering, to maintain the water in a nuisance free condition, by recirculation or other acceptable methods.

3.10G - RESERVOIR OUTLET

The holding reservoir outfall system shall include the outfall structure itself and the outfall sewer or pipeline proposed for construction. Wherever possible, the facility is to be maintained and operated by gravity. When pumping is required, a pumping station meeting the detailed requirements of the Director of Engineering shall be provided. The outfall sewer shall meet all the applicable requirements for storm sewers and appurtenances previously described.

The maximum allowable release rate shall be limited to the amount determined as described in Article 3.05C of this Manual.

The maximum capacity of a hydraulic release rate control device shall be its capacity with the water in the reservoir at the design 100-year water level and the water in the downstream receiving sewer at the crown of the sewer, or in the case of a surface receiving channel with the water level at the hydraulic gradient under the 100 year storm condition.

A permanent type of overflow structure will be required. The design shall be shown on the Engineering plans.

3.10H - SECONDARY BENEFITS

The design of storm water holding facilities to provide secondary recreational and other benefits is encouraged. Approval of the details of design for such secondary benefits is required as necessary to protect public health and safety.

3.10I - CONTROL FACILITIES

For those facilities whose performance is considered particularly critical, as determined by the Director of Engineering, telemetering control and data logging capability will be required and must be compatible with the Supervisory Control and Data Acquisition (SCADA) system.

3.10J - PROXIMITY TO RIGHT-OF-WAY

Holding reservoirs shall not be constructed within a distance of 10 feet plus 1½ times the depth adjacent to the right-of-way of any arterial or collector street. The toe of any earthen berm shall not be closer than 10 feet to the right-of-way of any arterial or collector street.

3.11 EROSION CONTROL

Plans and specifications shall include planned, positive action to control erosion during the construction period for the Development. Requirements of <u>Procedures and Standards for Urban Soil Erosion and Sedimentation Control in Illinois</u>, latest edition, must be followed.

3.12 STORM WATER PUMPING FACILITIES AND FORCE MAINS

Wherever possible storm water facilities shall be designed to avoid the necessity of using pumps or force mains. Where pumps or force mains are required, detailed specifications and design of the pump system must be submitted to the Director of Engineering for approval.

3.13 WATER MAIN PROTECTION

The requirements of Article 5.09 of this Manual relative to water main protection are applicable to storm water facility construction.

3.14 QUALITY OF WORK

As a minimum requirement, the specifications for the construction of storm water facilities shall follow, except as noted in this Chapter, the Standard Specifications for Water and Sewer Main Construction in Illinois, adopted by a joint committee of the Illinois Society of Professional Engineers, Consulting Engineers Council of Illinois, Illinois Chapter of the American Public Works Association, Illinois Municipal League and the Associated General Contractors of Illinois. Copies are obtainable from the organizations mentioned.

CHAPTER 4

SANITARY SEWAGE FACILITIES

4.01 INTRODUCTION

All Developments, regardless of size within the corporate limits or under the control of the Village, shall include provisions for the construction of sanitary sewage facilities, designed in accordance with this Manual and in accordance with the Manual of Procedures for the Administration of the Sewer Permit Ordinance, latest edition, as published by the MWRDGC. For areas outside of the MWRDGC jurisdiction, developments must be designed in accordance with this Chapter and the governing Sanitary Authority.

4.02 SYSTEM CONNECTION

The location of proposed connections to the existing sanitary sewer system shall be approved by the Director of Engineering. If no existing sanitary sewer is reasonably available, a connection to an existing combined sewer may be approved by the Village.

4.03 SEWER DESIGN

4.03A - DESIGN FORMULA

Sanitary sewers shall be designed to provide adequate capacity without surcharge for the Design Flow, using Manning's formula:

$$V = \frac{1.486}{n} R^{2/3} S^{1/2}$$

Where:
V = velocity, in feet per second.
n = 0.013 for ductile iron pipe
= 0.009 for plastic pipe
R = sewer cross-sectional area divided by the wetted perimeter, in square feet.
S = slope of the hydraulic gradient.

Minimum full flowing velocity shall be 2.0 fps. Maximum full flowing velocity shall be 15.0 fps.

Design flow at any point in the system shall be the total of the allowable infiltration as described in this Chapter, the sanitary sewage flow from the fully developed ultimate service area, plus any other approved wastes from the ultimate service area.

The ultimate service area shall include the entire area proposed to be ultimately served by all or a portion of the sanitary sewer design being submitted for approval. If extending the ultimate service area beyond the limits of the Development results in additional construction cost within the Development, provisions may be made for the establishment of a recapture agreement of the incremental cost upon submittal of all waivers of lien and paid invoices for the offsite improvements. The Director of Engineering will determine the recapture amounts based upon the waivers of lien and submit the ordinance for Village Board approval.

4.03B - SANITARY SEWAGE FLOW POPULATION ESTIMATES

Sanitary sewage flow from both single family and multiple family residential areas shall be based on the population after full development of the area. For areas where the details of a proposed development are known, population shall be estimated as follows:

Type of Dwelling Unit	Number of Persons
Studio	1
1 bedroom	2
2 bedroom	3
3 bedroom	4
4 bedroom	5

4.03C - SANITARY SEWAGE FLOW FROM RESIDENTIAL DEVELOPMENTS

Sanitary sewage flow per capita used in developing design flow from residential areas shall be computed using the formula:

$$Q = \frac{500}{P^{1/5}}$$

where: **Q = Sanitary sewage design flow in gallons per capita per day (gpcpd).**
P = Population in thousands, estimated as above.

Q is not to exceed 400 gpcpd or be less than 250 gpcpd.

4.03D - SANITARY SEWAGE FLOW FROM NON-RESIDENTIAL DEVELOPMENTS

In non-residential areas, estimated sanitary sewage design flow shall be based on the type of establishment and the following table:

NONRESIDENTIAL DESIGN FLOWS

TYPE OF ESTABLISHMENT	UNIT	AVERAGE FLOW IN GAL/DAY/UNIT	FLOW FOR SEWER DESIGN IN GAL/DAY/UNIT*
Shopping Center	Employee (1 shift)	50	200
Store	Employee (1 shift)	30	120
Office	Employee (1 shift)	25	100
Industrial	Employee (1 shift)	35	140
Restaurant	Per seat	50	200
Theater	Per seat	5	20
Hotel	Per guest	100	400

*** Quantities are exclusive of water requirements which must be estimated and added.**

For Developments where the details of the Development are not established, domestic sewage design flow shall be estimated by the Design Engineer and approved by the Director of Engineering. Such approval shall not relieve the Developer of the responsibility of providing adequate sanitary sewers to meet any and all future requirements within the Development.

4.03E - INSPECTION MANHOLES

An inspection manhole having a minimum inside diameter of 48" is required for all commercial and industrial buildings in accordance with MWRDGC requirements.

4.04 DESIGN DETAILS FOR SANITARY SEWER

4.04A - PIPE AND JOINT TYPES

Sanitary sewer pipes and joints shall conform with the following standards:

Pipe Type	Pipe Specifications	Joint
Ductile Iron Pipe	ANSI A-21.51 CL 52	ANSI A-21.11
PVC SDR 26	ASTM D-3034	ASTM D-3212(GASKET)

Straight and transition couplings for sewer construction and repair shall be Style CNSS

non-shear sewer couplings as manufactured by Cascade Waterworks Mfg. Co. Of Yorkville, IL, or approved equal.

4.04B - DEFLECTION TESTING & TELEVISING OF SEWERS

Deflection of pipe shall not exceed the maximum deflection recommended by the pipe manufacturer. All PVC sanitary sewer which has been installed for a minimum of 45 days, shall be deflection tested with a mandrel. No pipe shall exceed 5 percent deflection. All sanitary sewer shall be televised by the Developer and a copy of the VHS tape delivered to the Director of Engineering along with as-built plans.

4.04C - MINIMUM SIZE

The minimum inside sanitary sewer diameter shall be 8 inches.

4.04D - ALIGNMENT

Sewers shall be laid straight in both horizontal and vertical planes between manholes, unless otherwise approved by the Director of Engineering.

4.04E - HIGH VELOCITY PROTECTION

Where velocities greater than 10 fps will occur when flowing full, special provisions shall be taken to prevent erosion or displacement of the pipe. Maximum velocity permitted is 15 fps.

4.04F - INFILTRATION

Sanitary sewers, including manholes and sewer service lines, shall be so designed and constructed that infiltration of ground water into the sewer and exfiltration from the sewer shall not exceed 100 gallons per inch diameter per mile per day (gpipmpd) of the sewer pipe for any section of the system at any time during its service life.

4.04G - DEWATERING

If requested by the Engineering Inspector, prior to pipe laying and jointing, the trench shall be dewatered sufficient to maintain the water level in the trench at or below the base of the bedding.

4.05 BEDDING

Bedding, other than concrete embedment, shall consist of gravel, crushed gravel, crushed stone or crushed slag, ¼ inch to 1 inch in size. As a minimum, the material

shall conform to the requirements of Section 704 of the Standard Specifications for Road and Bridge Construction or ASTM C-33. The gradation shall conform to gradation CA 11 or CA 13 crushed stone of the Standard Specifications for Road and Bridge Construction. The pipe shall be laid so that it will be uniformly supported and the entire length of the pipe barrel will have full bearing. No blocking of any kind shall be used to adjust the pipe to grade except when used with embedment concrete. Bedding shall be required for all sewer construction except ductile iron pipe, and shall be of a thickness equal to ¼th of the outside diameter of the sewer pipe with a maximum thickness of 8 inches, but shall not be less than 4 inches. Where polyvinyl chloride (PVC) pipe is specified, the backfill material shall be one foot over the top of the pipe and shall be of the same material as the bedding material specified above and shall be carefully placed so as to completely fill the space under and around the pipe, and compacted to the satisfaction of the Engineering Inspector.

Where unsuitable material is encountered at the grade established, all such unsuitable soil shall be removed under the pipe and for the width of the trench, and shall be replaced with well compacted bedding material, to the satisfaction of the Engineering Inspector.

Where rock is encountered, it shall be removed below grade and replaced with a cushion of properly compacted bedding material having a thickness under the pipe of not less than eight inches.

Frozen bedding material will not be permitted.

4.06 SANITARY SEWER SERVICE LINES

4.06A - DESCRIPTION

A sanitary sewer service line, for the purposes of this Manual, is defined as a sewer pipe designed to receive flow from a single building, extending from the sewer main to the building.

4.06B - MINIMUM DIAMETER/MATERIAL

Minimum inside diameter of sanitary sewer service lines shall be 6 inches. If the service line is larger than 6 inch diameter, a manhole shall be constructed at the point of its connection with the sewer main or lateral. Allowable service line material is the same as outlined for sanitary sewer pipes earlier in this Chapter.

4.06C - DESIGN STANDARDS

Capacity requirements and design details described in this Chapter for sanitary sewers shall apply to sanitary sewer service lines, except that the minimum slope shall be ¼ inch per foot (2%).

4.06D - PLUGS

In those instances when the service line is not immediately connected to the building to be served, it shall be tightly plugged, using a manufactured plug held firmly in place.

4.06E - SANITARY SEWER SERVICE LINE CONNECTIONS

When sanitary sewer service lines are constructed as part of the same project as the sewer main or lateral, they shall be connected to the sewer main or lateral using a wye.

Where a sanitary sewer service line is to connect to an existing sewer main or lateral, or where specific approval has been granted by the Director of Engineering for the construction of a service line after the completion of the sewer main or lateral, the connection shall be made by one of the methods detailed below:

a. Installation of a manhole. (Required if service line is larger than 6 inches. Not recommended for 6" service lines).

b. Circular saw-cut of sewer main and installation of a hub wye saddle or a hub tee saddle, in accordance with manufacturer's recommendations.

c. Using pipe cutter, cut out desired length of pipe for insertion of fittings. Use "Band-Seal" couplings, and shear rings and clamps to fasten the inserted fitting and hold it firmly in place. Follow manufacturer's recommendations for the installation. Cement mortar joints are prohibited.

4.07 SEWER DEPTH

Sanitary sewers and service lines shall be constructed sufficiently deep so as to prevent freezing. A minimum depth of 5 feet to the sewer invert shall be required unless otherwise approved by the Director of Engineering. In addition, they shall be sufficiently deep to provide an outfall for all sanitary sewage within the ultimate service area, both existing and future, assuming all present and future basement floor drains and sanitary fixtures below finished grade to be connected to ejector pumps discharging to the sanitary sewers.

4.08 MANHOLES

The requirements relative to manholes and appurtenances set out in Chapter 3 are applicable to sanitary sewer manholes. Drop manholes must be provided for a sewer entering a manhole at an elevation of 18 inches or more above the manhole invert. All other requirements for the construction of a drop manhole shall be in compliance with Section II, Article 3-3 of the MWRDGC's <u>Manual of Procedures for the Administration of the Sewer Permit Ordinance.</u>

4.09 WATER MAIN PROTECTION

The requirements relative to water main protection set out in Chapter 5 are applicable to sanitary sewer facility construction.

4.10 SANITARY SEWAGE PUMPING STATIONS AND FORCE MAINS

Sanitary sewage facilities shall be designed to avoid the necessity of providing pumping stations and force mains. Where such facilities are unavoidable, or desirable, in the opinion of the Director of Engineering, plans shall be submitted to the Director of Engineering for approval.

4.11 AUGERING & TUNNELING

Where sewer is to be installed under pavement, at the discretion of the Director of Engineering, augering may be required. Pipe sleeves for augering or tunneling shall be _ inch thick steel with a continuous, circular ½ inch bead weld and shall meet the requirements of ASTM A-120.

All construction work within the right-of-way must follow the provisions of Articles 2.10 and 2.11 of this Manual.

4.12 QUALITY OF WORK

As a minimum requirement, the specifications for the construction of sanitary sewer facilities shall not be less stringent than the Standard Specifications for Water and Sewer Main Construction in Illinois, adopted by a joint committee of the Illinois Society of Professional Engineers, Consulting Engineers Council of Illinois, Illinois Chapter of the American Public Works Association, Illinois Municipal League and the Associated General Contractors of Illinois, copies of which are obtainable from the organizations mentioned; the specifications of the MWRDGC, and this Manual.

CHAPTER 5

WATER DISTRIBUTION SYSTEM

5.01 INTRODUCTION

All Developments regardless of size, within the corporate limits or under the control of the Village, shall include provisions for the construction of water distribution facilities, complete with valves, fire hydrants and other appurtenances designed in accordance with this Chapter and the requirements of the Illinois Environmental Protection Agency (IEPA), Division of Public Water supplies.

Before construction can begin, an approved IEPA permit, where applicable, must be received by the Village.

As a minimum, the distribution system shall include a system of water mains and service lines between a connection or connections to the existing distribution system at approved locations. Where more than one building is located or planned on one parcel of property, or when water main construction is required on the property for fire protection, the proposed construction shall also include all water main construction and appurtenances within the parcel.

The design of all water distribution system facilities proposed for construction as independent projects under the control of the Village shall meet the technical requirements of this Chapter.

5.02 GENERAL DESIGN CONSIDERATIONS

Extensions to the distribution system shall include primary mains, secondary mains and distribution mains, conforming in general to the existing grid distribution system.

Primary mains are those mains forming the arterial system of the Village and, in the case of construction within a Development, are further defined as mains having an inside diameter of 12 inches and larger, except when a diameter larger than 12 inches is required to meet local fire protection needs. Where the construction of primary mains is required, the incremental cost in excess of that required for a 12 inch main at the same location may be met by the Village.

Secondary mains shall be sized and shall be looped with spacing as required for fire flows and shall have a minimum inside diameter of 8 inches.

Distribution mains shall form a grid to supply water to the local fire hydrants and

service lines. These mains shall have a minimum inside diameter of 8 inches and then only when system interconnections are provided at intervals of not more than 600 feet. At all other locations, a minimum inside diameter of 10 inches is required. Dead ends on water mains shall be avoided whenever possible.

5.03 MAIN CAPACITY

Primary feeders, secondary feeders and distribution mains shall be sized to provide sufficient capacity to deliver the required fire flow to all areas served by the proposed construction with consumption at the maximum daily rate.

5.03A - PRESSURE AND VELOCITY

Required fire flow is to be delivered to the fire location with a residual water pressure in the main of 20 pounds per square inch during flow. At the option of the Director of Engineering, for plan review purposes, this requirement may be considered met if theoretical velocity in the mains during assumed fire flow within 600 feet of the assumed fire location is not less than 6 feet per second and not less than 3½ feet per second in the balance of the proposed construction.

5.03B - REQUIRED FIRE FLOW

Fire flow shall meet the requirements of the National Fire Protection Association's book, NFPA 13. Fire flows will be reviewed by the Fire Review Coordinator in the Building Department. Minimum fire flow requirement is 500 gallons per minute.

5.03C - MAXIMUM DAY CONSUMPTION

For residential Developments, maximum day consumption shall be based on 210 gallons per capita per day, with population estimated in accordance with Article 4.03B of this Manual.

For non-residential Developments, when the details of the development are not known, maximum day consumption and fire flow shall be estimated by the Design Engineer, subject to the approval of the Director of Engineering. Such approval shall not relieve the Developer of the responsibility of providing adequate main capacity for any and all future construction within the Development.

In other than residential areas, maximum day consumption shall be based on the type of development and the following table:

Maximum Day Consumption

DEVELOPMENT	UNIT	GAL/DAY/UNIT*
Hotel	Per Guest	210
Industrial	Employee (1 shift)	75
Offices	Employee (1 shift)	50
Restaurant	Per Seat	105
Shopping Center	Employee (1 shift)	105
Store	Employee (1 shift)	65
Theater	Per Seat	10

*** Add all process water requirements to these figures.**

5.03D - HEAD LOSSES

Head losses in relation to velocity in water mains shall be computed using the Hazen-Williams formula:

$$V = 1.32\ CR^{0.63}\ S^{0.54}$$

where

V=velocity, in feet per second
C=roughness coefficient, 100 for cement lined pipes
R=the hydraulic radius
S=slope of the energy grade line

5.04 GENERAL DESIGN DETAILS FOR WATER MAINS

5.04A - PIPE, FITTINGS AND JOINT TYPE

Pipe shall be ductile iron pipe, manufactured in accordance with American Standard Association Specifications A21.51 with a 60-42-10 metal.

Thickness for ductile iron pipe shall be determined in accordance with ASA Specifications A21.50 latest edition and shall not be less than Class 52.

Fittings shall be ductile iron in accordance with ANSI/AWWA C110/A21.10-93, or latest revision.

All joints and gaskets shall meet requirements of ANSI/AWWA C111/A21.11-85, or latest revision. Push joint and mechanical joint pipes are permitted.

All pipe adjacent to fittings and valves shall be a minimum of 5 feet in length.

5.04B - INTERIOR COATING

Interior lining of pipe and fittings shall be cement-mortar, conforming with ANSI/AWWA C104/A21.4-90, or latest revision.

5.04C - EXTERIOR COATING

Outside coating shall be standard, as specified for general use in ANSI/AWWA C151/A21.51-91, or latest revision.

5.04D - POLYETHYLENE ENCASEMENT

All ductile iron pipe water main shall be wrapped with polyethylene material conforming to ANSI/AWWA C105/A21.5-93, or latest revision. This specification can be waived based on a report by the Ductile Iron Pipe Research Association who would declare the soil for the subject installation non-corrosive.

5.04E - DEPTH OF COVER

Water mains and services shall be constructed so that the minimum depth is 5½ feet measured from finished grade to the top of the pipe, unless otherwise specified and/or approved by the Director of Engineering.

5.04F - THRUST BLOCKS

Blocking to prevent movement of lines under pressure at bends and fittings shall be PCC, a minimum of 12 inches thick, placed between undisturbed soil and the fittings in such a manner that pipe fittings and joints will be accessible for repairs. All bends of 22½ degrees or greater, tees and plugs shall be thrust protected to prevent movement of the line under pressure. Thrust protection may also be attained by the use of a combination of retaining glands and threaded rods or restrained joint glands (Megalug) as approved by the Director of Engineering.

5.04G - TRENCH WIDTH

Minimum trench width shall be ample for proper jointing and in compliance with applicable OSHA regulations.

5.04H - FOUNDATION

The trench bottom shall be flat, and provide full bearing for the length of the pipe, with bell holes excavated for joints.

5.04I - DEWATERING

Where water is encountered in the trench, it shall be removed during pipe-laying and jointing operations. Trench water shall not be allowed to enter the pipe at any time.

5.04J - BACKFILL

All private PVC water mains and services will require a granular cradle as described in Section 20-2.20A of the Standard Specifications for Water and Sewer Main Construction in Illinois. Public ductile iron pipe water mains do not require granular cradle or backfill unless located beneath pavement or within three feet of the edge of pavement.

5.04K - PAVEMENT CROSSINGS

Refer to Article 2.11 of this Manual for pavement crossing requirements.

5.05 FIRE HYDRANTS

5.05A - SPACING

Distribution of hydrants shall be based upon the required fire flow, as described in Item No. 11 of the Grading Schedule for Municipal Fire Protection, latest revision, as published by:

Insurance Services Office
Municipal Survey Service
160 Water Street
New York, New York 10038

- **As a minimum, fire hydrants shall be installed along all mains constructed in public rights of way at a maximum spacing of 330 feet when measured along the normal route of travel between hydrants.**

- **Hydrants may not be placed closer than 30 feet to any building without the permission of the Fire Chief.**
- **All water mains servicing a hydrant shall be of a looped design so as to eliminate dead end mains. If a dead end main cannot be avoided, the maximum distance of the dead end main shall not exceed 150 feet. A fire hydrant is required at the end of a dead end main.**

5.05B - DETAILS OF CONSTRUCTION

Fire hydrants shall meet AWWA C-502 and be Traverse City Iron Works, East Jordan 5 BR, or approved equal, with one 5¼ inch valve opening, two 2½ inch hose nozzles and one 5 inch pumper nozzle. Threads shall conform with National Standard Specifications. Each hydrant shall be equipped with an auxiliary resilient seal gate valve complete with Roadway Box, Tyler, 6850 Series, item 668-S. Fire hydrants must have their discharge at least 18 inches but not more than 24 inches from the surface of the adjacent ground.

Hydrants shall be installed no closer than 3 feet nor further than 8 feet from the back of curb or edge of pavement to the 5 inch steamer nut. No barriers, trees, bushes, walls or other obstacles which may hide or impede the use of a fire hydrant shall be installed, maintained, constructed, or enlarged, within 48 inches of a hydrant.

Hydrants which will be maintained by the Village shall be painted red, and privately maintained hydrants shall be painted yellow. All nozzle caps will be painted a reflective gray or white by the Public Works Department after notification from the Developer. Contact the Superintendent of Utilities at 847/368-5800 for further details.

5.06 VALVES & VAULTS

5.06A - SPACING

A sufficient number of valves shall be provided so that a break or other failure will not affect more than 800 feet of watermain in residential areas or 500 feet of main in other areas. Valves shall be placed so that the closure of a maximum of three valves is necessary to shutdown any point in the system.

5.06B - VAULTS

All valves shall be installed in precast vaults, except auxiliary valves at fire hydrants, which shall be installed in roadway boxes, and butterfly valves which shall be installed in vaults, but modified as necessary to provide for access to the operating nut and for the proper operation of the valve. Vault cover to be EJIW 102243.

Steps in vaults shall be made of copolymer Polypropylene plastic with ½ inch grade 60 steel reinforcement, Step PSI-PF, as manufactured by M.A. Industries, Inc., or approved equal. Steps to be spaced 16 inches on-center.

5.06C - TYPES

All valves 12 inches and smaller shall be resilient wedge seal valves in accordance with ANSI/AWWA C-509-94, or latest revision,, for 200 pound per square inch working pressure.

All valves larger than 12 inches shall be butterfly valves, iron body rubber seat type conforming to ANSI/AWWA C504, or latest revision, Class 150-B.

All underground distribution system valves shall open counter-clockwise with non-rising stem. Hand valves located inside meter vaults or inside buildings must have rising stems. Valves in meter pits servicing fire suppression systems shall be open stem and yoke type.

5.07 CONNECTIONS TO EXISTING MAINS

All connections to the Village water distribution system shall be made under full water service pressure, and of a smaller diameter size unless otherwise approved by the Director of Engineering and the Director of Public Works, at locations approved by the Director of Engineering. Connection shall be made using a tapping sleeve and valve. Tapping sleeves shall be Mueller H-615 cast iron, or Cascade CST-EX stainless steel. The size of the valve will be as determined by the Director of Public Works.

Any accidental disruption of normal water service due to the construction of new water main or services will require the immediate stoppage of work and the contractor shall contact the Superintendent of Utilities at 847/368-5800.

5.08 WATER SERVICE LINES

5.08A - DESCRIPTION

A water service line is defined as a water pipe designed to deliver water from a water main to a single building, extending from the water main to the building, and including corporation stop, curb stop and buffalo box. For a 3 inch service line or larger, a pressure connection with tapping valve and vault, or cut-in tee with valve and vault is required. The service line should be installed at a right angle to the street when possible.

5.08B - MINIMUM DIAMETER

No water service line shall be less than 1 inch internal diameter.

5.08C - SERVICE LINE PIPE MATERIAL

All service lines 2 inches or less in internal diameter shall be Type K copper tubing, soft temper, for underground service, conforming to ASTM B-88 and B-251. Outside diameter and weight per foot shall not be less than that listed in ASTM B-251, Table II.

When a service line is less than 2 inches in diameter, it shall be continuous from corporation to curb stop and from curb stop to the building. No couplings will be permitted.

When a service line is 2 inches in diameter, it shall be continuous from corporation to curb stop, and the number of couplings between the curb stop and the building shall be kept to a minimum. All couplings shall be checked for leaks prior to backfilling. All couplings shall be flared. No compression connections or couplings will be permitted.

When a service line greater than 2 inches is to be installed, it shall be polyethylene encased ductile iron pipe. The connection to the new main shall be made with a ductile iron "T" and valve. The connection to the existing main shall be made with a tapping sleeve and valve. A valve vault complying with Article 5.06 of this Manual shall be constructed over the sleeve and valve unless otherwise directed by the Superintendent of Utilities.

5.08D - CORPORATION STOP

The corporation stop shall be of the same diameter as the service line and shall be inserted in the main at the 12:00 o'clock position with an 18 inch horizontal loop, and shall be manufactured by Mueller, H-15020 or approved equal. A typical water service detail is shown on the Standard Details plan sheet, available from the Engineering Department.

Service taps of 2 inches shall be made using a double-strap saddle tap. Straps shall be stainless steel.

5.08E - CURB STOP

The curb stop (roundway) shall be installed when possible in public right-of-way 8 feet from the right-of-way line in a cast iron buffalo box (B-Box). The curb stop shall be a Mueller Ori-Seal, H-15201, or approved equal.

5.08F - BUFFALO BOXES (B-BOXES)

B-Boxes shall be Tyler 95E, or approved equal, with the word "water" cast in the cover. B-Boxes shall be set to the proper grade in good operating condition and must be kept in such condition until final acceptance by the Village or be repaired or replaced at the Developer's expense.

5.09 WATER MAIN PROTECTION

All water main, storm and sanitary sewer construction shall meet the requirements of this Article.

5.09A - HORIZONTAL SEPARATION

a. **Water mains shall be laid at least ten feet horizontally from any existing or proposed drain, storm sewer, sanitary sewer, combined sewer or sewer service connection.**

b. **Water mains may be laid closer than ten feet to a sewer line when:**

i. **local conditions prevent a lateral separation of ten feet;**

ii. **the water main invert is at least 18 inches above the crown of the sewer; and**

iii. **the watermain is either in a separate trench or in the same trench on an undisturbed earth shelf located to one side of the sewer.**

c. **Both the water main and sewer pipe shall be constructed of push joint or mechanical joint ductile iron pipe, pressure pipe, prestressed concrete pipe, or PVC SDR 18 pipe with AWWA C-900 joints, meeting the requirements of Section 653.111 of the IEPA's Title 35 Subtitle F, when it is impossible to meet (a) or (b) above. The drain or sewer shall be pressure tested to the maximum expected surcharge head before backfilling.**

5.09B - VERTICAL SEPARATION

a. **A water main shall be laid so that its invert is 18 inches above the crown of the drain or sewer whenever water mains cross storm sewers, sanitary sewers or sewer service connections. The vertical separation shall be maintained for**
that portion of the water main located within three feet horizontally of any sewer or drain crossed. A length of water main pipe shall be centered over the sewer to be crossed with joints equidistant from the

sewer or drain.

b. Both the water main and sewer shall be constructed of push joint or mechanical joint ductile iron pipe, prestressed concrete pipe, or PVC pipe meeting requirements of Section 653.111 of the IEPA's Title 35, Subtitle F, and construction shall extend on each side of the crossing until the perpendicular distance from the water main to the sewer drain line is at least ten feet when:

i. it is impossible to obtain the proper vertical separation as described in (a) above; or

ii. the water main passes under a sewer or drain.

c. A vertical separation of 18 inches between the invert of the sewer or drain and the crown of the water main shall be maintained where a water main crosses under a sewer. Support the sewer or drain lines to prevent settling and breaking the water main.

5.09C - WATER SERVICE LINE PROTECTION

Water quality pipe described in 5.09A & 5.09B above shall be used for sanitary sewer service lines when minimum horizontal and vertical separation cannot be maintained.

Whenever possible, a water service shall be laid at least 10 feet horizontally from any existing or proposed drain or sewer line.

Should local conditions exist which would prevent a horizontal separation of 10 feet, a water service may be laid closer than 10 feet to a storm or sanitary sewer, provided the main is laid in a separate trench and at such an elevation that the bottom of the water service line is at least 18 inches above the top of the sewer.

Vertical separation of water service lines is the same as water main separation described in Article 5.09B of this Manual. Benching of a copper water service with a sewer line is not allowed on Village maintained systems.

5.11 TESTING

The following procedures are to be strictly followed by all persons engaged in the pressure testing and/or disinfection of public water distribution mains and private water services 3 inches and larger in diameter. The requirements of this Manual and the requirements of the Illinois Environmental Protection Agency water permit shall be strictly enforced.

The contractor is required to provide any and all equipment necessary to complete the pressure testing and/or disinfection of the water mains and services. Equipment required should include, but is not limited to required taps, pressure gauges, booster pumps, chlorination equipment, sample bottles, etc. Prior to any test, the contractor shall arrange with the Engineering Department, a minimum of 24 hours in advance, to have the required tests witnessed by an Engineering Inspector.

The contractor is forbidden to operate any and all valves on the existing public water supply system unless permission is granted by the Engineering Inspector or Superintendent of Utilities. Requests for valve operations are to be made 24 hours prior to the scheduled operations through the Public Works Department, 847/368-5800.

5.11A - PRESSURE TEST

The contractor shall pressure test all new water main and water services 3 inches and larger in diameter so as to determine that the maximum allowable leakage rates are not exceeded. The pressure test is performed prior to the installation of the corporation stops. The contractor shall perform a preliminary test to insure that all segments of the system meet the leakage rates as set forth in the Standard Specifications for Water and Sewer Main Construction in Illinois. Then the contractor will arrange for witnessing of the pressure test through the Engineering Department. Twenty-four hours advance notice shall be given. The test shall be conducted for a period of at least 2 hours, at an initial pressure of 150 psi, unless directed otherwise by the Engineering Inspector. Any segment of main exceeding the maximum leakage rate will automatically fail the test. If at anytime during the test, the pressure drops below 115 psi the water main is automatically failed. The contractor will then be required to take any and all steps to insure that the problems have been corrected and arrange for retesting of the segment.

Maximum allowable leakage shall be computed as follows:

$$L = \frac{SDP^{1/2}}{133{,}200}$$

Where **L = Total allowable leakage, in gallons per hour of test.**
S = Length of pipe tested, in feet
D = Diameter of pipe, in inches
P = Average test pressure, in psi

The use of repair devices to enable a section of newly placed watermain to pass the pressure test will not be allowed.

Air release valves will not be permitted. Proper fire hydrant placement and hydraulics are expected to be used to allow air to escape the main.

5.11B - DISINFECTION

After all mains have successfully pressure tested and before service taps are made, the contractor shall proceed to disinfect the main in accordance with ANSI/AWWA C-651-92, or latest revision. Copper service taps may be made prior to disinfection if the corporation stops are in the closed position.

On ductile iron water services, a permanent OS & Y valve is to be installed on the interior flange of the system riser prior to chlorination. If a system service is to pass through a full flow fire meter, the meter spread, complete with OS & Y valves and adjusting sleeve are to be in place prior to chlorination. A full size spreader pipe is to be used between the valves for chlorination purposes.

The initial chlorine concentration shall be 50 mg/l during disinfection and shall be maintained at a minimum 25 mg/l free chlorine. The chlorinated water shall be retained in the main for a period of at least 24 hours. At the end of the 24 hour period, the treated water shall contain no less than 10 mg/l free chlorine throughout the main. The Engineering Department inspector will sample the chlorinated disinfecting solution to assure that these minimums are maintained.

After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system or less than 1 mg/l.

After final flushing, the inspector will take a minimum of two samples per day from different locations to be bacteriologically tested to show the absence of all bacteria. For major water main installation, the number of samples may be increased as determined by the inspector. A second series of samples shall be collected from the same locations no less than 24 hours after the first set of samples has been collected. The individual sets of samples will be bacteriologically tested by an independent laboratory approved by the State and Village.

If both sets of samples are satisfactory, the inspector will direct the Public Works Department to open all valves on the system. The contractor and the developer's engineer will be furnished with copies of the bacteriological report for their records if they so request.

If either, or both sets, of samples do not pass the bacteriological examination, the contractor shall re-disinfect the main in accordance with the procedures until such time

that satisfactory samples are collected and analyzed on two successive days.

Transporting, handling, and usage of liquid chlorine shall be in accordance with applicable OSHA standards.

5.11C - FLUSHING

Underground watermains and lead-in connections to system risers shall be flushed thoroughly before a connection is made to sprinkler, standpipe or other fire protection system piping. Flushing operations shall be conducted according to NFPA standards. The flush test shall be coordinated with the Building Department.

5.12 QUALITY OF WORK

As a minimum requirement, the specifications for the construction of water distribution facilities shall not be less stringent than the Standard Specifications for Water and Sewer Main Construction in Illinois, adopted by a joint committee of the Illinois Society of Professional Engineers, Consulting Engineers Council of Illinois, Illinois Chapter of the American Public Works Association, Illinois Municipal League and the Associated General Contractors of Illinois, copies of which are obtainable from the organizations mentioned.

CHAPTER 6

PAVEMENT DESIGN

6.01 INTRODUCTION

The design of all roadways and pavement proposed for construction shall meet the requirements of this Chapter.

6.02 STREET CLASSIFICATION & GEOMETRICS

Certain variables in design discussed in this Chapter are dependent on the functional classification of the street in question. For the purposes of this Chapter, all streets will be classified under one of the following categories: local, sub-collector, collector, secondary arterial or major arterial.

The functional category of the street under consideration shall be as set out as in the Arlington Heights Thoroughfare Policy Plan, a copy of which may be inspected in the office of the Director of Engineering and, if not so set out on that Plan, shall be established by the Director of Engineering.

Roadway geometrics shall be as set forth in the Arlington Heights Thoroughfare Policy Plan and Section 20-108 of the Village Code.

6.03 ZONING CLASSIFICATION

Certain variables are dependent on the zoning district in which the roadway is located. The zoning districts referred to are those noted on the "Zoning Map", the original of which is on file in the office of the Village Clerk. If not noted on the Zoning Map, zoning districts will be established by the Village President and Board of Trustees.

In a case where a street under consideration follows the boundary between zoning districts, and the roadway is intended to serve abutting properties in both districts, the geometric and structural design for that street shall be the most stringent required in either district.

6.04 CONSTRUCTION SPECIFICATIONS - ROADS

Roadway pavement shall be constructed in accordance with the <u>Standard Specifications for Road and Bridge Construction</u> and at the minimum thickness specified below, or as specified in Section 20-108 of the Municipal Code and Article 6.05 of this Manual:

ROADWAY PAVEMENT DESIGN

STREET TYPE	FLEXIBLE DESIGN	RIGID DESIGN
Major Arterials, Secondary Arterials, and all streets in Manufacturing zoning districts & adjoining frontage drives.	1½" Surface Course 1½" Binder Course 10" BAM 4" CA-6 Granular Sub-base	10" Portland Cement Concrete (w/joints at 15' maximum spacing) 4" CA-6 Granular Sub-base
Central Business District streets and those streets adjoining Business, Office-Transitional, Institutional, and Office-Research zoning districts.	1½" Surface Course 1½" Binder Course 9" BAM 4" CA-6 Granular Sub-base	8" Portland Cement Concrete (w/joints at 15' maximum spacing) 4" CA-6 Granular Sub-base
Collector streets, Sub-Collector streets, and those streets adjoining Multi-Family zoning districts.	1½" Surface Course 1½" Binder Course 7" BAM 4" CA-6 Granular Sub-base	7" Portland Cement Concrete (w/joints at 15' maximum spacing) 4" CA-6 Granular Sub-base
Local Streets	1½" Surface Course 1½" Binder Course 6" BAM 4" CA-6 Granular Sub-base	6" Portland Cement Concrete (w/joints at 15' maximum spacing) 4" CA-6 Granular Sub-base

6.05 STANDARD DESIGN METHOD FOR PAVEMENTS

The design of pavement shall follow current IDOT procedures, but in no case shall the thickness of pavement be less than that specified in Article 6.04 of this Manual. For this specification, the following comparison of Roadway Classifications shall be used:

<u>IDOT</u> <u>VILLAGE</u>

Class 1	**Major & Secondary Arterial**
Class II	**Collector**
Class III	**Sub-collector**
Class IV	**Local**

6.06 OTHER CONSTRUCTION REQUIREMENTS FOR PAVEMENT

Construction activities required by this Chapter may NOT be done between November 1 and April 1 without authorization from the Director of Engineering. Authorization will not be granted when frost is present in the subgrade.

Minimum acceptable Illinois Bearing Ratio (IBR) for subgrade is 2.5. Where IBR for underlying soil is less than 2.5, it shall be removed and replaced with a suitable fill material, or otherwise modified as required to meet this minimum.

The Developer is responsible for all materials testing required by the Village.

6.07 COMBINATION CONCRETE CURB AND GUTTER

Combination concrete curb and gutter shall be constructed along the edge of all pavement. Cross section and details for barrier or roll type curb shall conform with those shown in the Appendix of this Manual. Material and construction shall conform to the requirements of Section 606 of the Standard Specifications for Road and Bridge Construction, latest edition.

6.08 DRIVEWAYS

***Residential asphalt driveways* (on private property) *and approaches* (from right-of-way to street, excluding sidewalk), shall be constructed with a minimum of 2½ inches compacted surface course over 6 inches compacted CA-6, Gr 8 or Gr 9 gravel base. Crushed concrete meeting the CA-6 gradations may be used for the aggregate base.**

***Residential concrete driveways* (on private property) shall be constructed with a minimum 4 inches Portland Cement Concrete, Class PV (formerly Class X), over 4 inches compacted CA-6, Gr 8 or Gr 9 gravel base. Woven wire mesh reinforcement may be used on private property, but not withing the right-of-way. Crushed concrete meeting the CA-6 gradations may be used for the gravel base.**

***Residential concrete approaches* (from right-of-way to street) shall be constructed with a minimum 6 inches Portland Cement Concrete, Class PV, over a 2 inches compacted CA-6, Gr 8 or Gr 9 gravel base. No wire mesh is permitted within the right-of-way.**

***Non-residential driveways* shall be designed to support the expected vehicular use, but in**

no case shall be a lesser cross-section than a residential driveway. Crushed concrete meeting the CA-6, Gr 8 or Gr 9 gradations may be used for the gravel base.

***Non-residential driveway approaches* shall be constructed with a minimum 8 inches Portland Cement Concrete, Class PV, over a 2 inches compacted CA-6, Gr 8 or Gr 9 gravel base. No wire mesh is permitted within Village right-of-way.**

In all driveways and approaches, CA-6 Gr 7 or pea gravel is NOT permitted.

6.09 SIDEWALKS THROUGH DRIVEWAYS

Sidewalk grade shall be carried straight through driveways, with no change of elevation between the driveway and sidewalk or approach and sidewalk. The cross-slope of the sidewalk shall be a maximum of 2 percent.

***Sidewalks across residential driveways* shall be constructed with a minimum 6 inches Portland Cement Concrete, Class SI, over 2 inches compacted CA-6 gravel base.**

***Sidewalks across non-residential driveways* shall be constructed with a minimum 8 inches Portland Cement Concrete, Class SI, over 2" compacted CA-6 gravel base.**

See Chapter 7 of this Manual for more sidewalk requirements.

6.10 CURB CUTS

The existing curb portion of a concrete curb and gutter section may be sawcut for the installation of a depressed sidewalk or driveway if the cut area is sealed with BSM 40 Chem Treat Silane Sealer. The application of the sealer must be witnessed by the Engineering Inspector. If the cut is irregular, or exposes voids in the concrete, the Contractor will be required to remove and replace the curb and gutter.

6.11 PARKING LOTS

Parking lots for commercial or industrial buildings shall be constructed of a minimum of 1½ inches compacted surface course, 1½ inches compacted binder course, over 10 inches compacted CA-6 crushed aggregate. An alternative is 6 inches of reinforced concrete pavement over 4 inches CA-6 crushed aggregate.

Parking lots require continuous concrete curb around the perimeter.

6.12 FIRE LANES

Fire Lanes shall be built to the same structural standards as local streets. Geometric design shall meet standards set forth in Section 27-904:F-313.0 of the Village Code.

CHAPTER 7

SIDEWALKS

7.01 INTRODUCTION

All Developments shall include provisions for the construction of sidewalks in dedicated rights-of-way to serve each parcel of property within the Development, constructed in accordance with Section 424 of the Standard Specifications for Road and Bridge Construction. Sidewalks shall be provided adjacent and parallel to all streets in the Development, and located one foot inside of the right-of-way wherever possible.

7.02 SIDEWALK GEOMETRIES

Sidewalks shall be a minimum of 5 inches thick. Sidewalks shall be continuous through driveways and shall be a minimum of 6 inches thick through residential driveways and 8 inches thick through commercial and industrial driveways. Sidewalk width shall be 5 feet, except when in the Director's opinion, a wider width is justified on the basis of anticipated traffic.

7.03 REINFORCEMENT

No welded wire fabric is allowed to be placed in any sidewalk in the Village right-of-way or any sidewalk to be maintained by the Village. Where sidewalk crosses over a utility conduit, two #4 reinforcing bars shall be placed mid-depth within sidewalk and extend to a minimum of 5 feet beyond either side of the utility crossing.

7.04 SUBGRADE & SUBBASE

If unsuitable material is present at the proposed sub-grade, the unsuitable material shall be removed to a minimum of 5 inches below the proposed sub-grade and replaced with approved and properly compacted CA-6 Grade 8 or Grade 9 crushed gravel.

Sub-base material shall be a minimum of 2 inches thick, consisting of approved and properly compacted CA-6 Grade 8 or 9 crushed gravel. Pea-gravel is not allowed.

A minimum of 24-hours prior to placing concrete, the Contractor shall notify the Director of Engineering that the sub-grade is ready for inspection. No concrete shall be placed until the sub-grade has been inspected and approved by the Engineering Inspector.

7.05 EMBANKMENT

When it is necessary to construct sidewalk on fill material, the fill material shall be placed in 6 inch lifts, thoroughly compacted to 95% density. Embankment shall extend 1 foot beyond the edge of walk. Side slopes shall not exceed a 5:1 slope, except as approved by the Director of Engineering.

7.06 FORMS

Side forms shall be lumber with a nominal thickness of 2 inches and a depth equal to the sidewalk thickness specified or of steel with equal rigidity. 2x4 forms will not be allowed. Side forms shall be held securely in place by stakes or braces, with the top edges of the forms true to grade. The forms shall be lightly coated with oil prior to placing concrete.

7.07 FORM REMOVAL AND BACKFILL

Unless otherwise approved by the Director of Engineering, all forms shall remain undisturbed for a minimum of 24 hours after the concrete has been placed, and be removed within 48 hours. Upon the removal of the forms, the Contractor shall have seven calendar days to backfill between the side of the sidewalk and the ground using top soil. The Contractor is responsible for maintaining proper barricades until soil has been placed.

7.08 EXPANSION JOINTS

Expansion joints shall consist of preformed joint filler, ½ inch thick. The top of the expansion joint shall be placed ¼ inch below the surface of the sidewalk, and extend to the full depth of the walk.

Expansion joints shall be spaced a minimum of 50 feet and shall also be placed between the sidewalk and all structures, such as light standards, manholes, etc., which extend through the sidewalk.

Where the sidewalk is constructed adjacent to pavement or curb having expansion joints, the expansion joints in the sidewalk shall be placed opposite the existing expansion joints as nearly as practicable. Expansion joints shall also be placed where the sidewalk abuts existing sidewalks, between concrete driveway pavement and sidewalk, and between sidewalk and curbs where the sidewalk abuts a curb.

7.09 PLACING, FINISHING, PROTECTION AND CURING

The concrete sidewalk shall be placed and finished in accordance with Article 424.06 of the Standard Specifications for Road and Bridge Construction.

All exposed concrete surfaces shall be protected against damage by rain or other natural causes. The Contractor shall be responsible for protecting the concrete against vandalism until the concrete is set and cured.

The concrete shall be cured for a minimum period of three days after placement as described in Article 720.13 of the Standard Specifications for Road and Bridge Construction.

7.10 DISPOSAL OF SURPLUS MATERIAL

Surplus or waste material resulting from sidewalk construction shall be properly disposed of by the Contractor off of public right-of-way at the Contractor's expense.

7.11 ACCESSIBILITY REQUIREMENTS

All sidewalks intersecting public or private roadways or driveways, shall be ramped to meet a depressed curb and gutter section, and constructed in conformance with State of Illinois Accessibility Code (IAC). A rough broom finish shall be used to provide the detectable warning texture of the ramp.

CHAPTER 8

STREET LIGHTING

8.01 INTRODUCTION

All Developments, regardless of size, within the corporate limits or under the control of the Village, shall include provisions for the construction of street lighting facilities for the illumination of all dedicated streets required to serve the Development, designed in accordance with this Chapter.

The design of street lighting systems proposed for construction as independent projects under the control of the Village shall also meet the technical requirements of this Chapter. When lighting is erected on private property to illuminate off-street parking, it shall comply with the provisions of Chapter 28 of the Village Municipal Code.

The requirements of Chapters 1 and 2 are also applicable to the construction of street lighting facilities.

8.02 CODES AND REGULATIONS

All work required under this Chapter shall conform with the requirements of the National Electric Code and the rules and regulations of the Village as set out in Chapters 25, 28 and 29 of the Municipal Code except as may be specifically noted herein, and the Illuminating Engineering Society of North America, ANSI/IES roadway Lighting criteria (RP-8-1983), latest revision.

8.03 DESIGN CRITERIA FOR LOCAL AND COLLECTOR STREETS

Required illumination on local and collector streets is established based upon the predominate land in use associated with the Project or affected roadway. Required intensities and maximum uniformity ratios for the various districts are set out in the Appendix.

The identification of local and collector streets shall be made as described in the Arlington Heights Thoroughfare Policy Plan. Establishment of the lighting orientation across multiple zoning districts along the same streets shall be indicated on the plans and approved by the Director of Engineering.

8.04 DESIGN CRITERIA FOR ARTERIAL STREETS

In the absence of design criteria established by the agency controlling any major or secondary arterial roadways, the required intensities and maximum uniformity ratios shall be as provided in Required Lighting Levels in the Appendix.

8.05 POLE SPACING

Unless otherwise instructed by the Director of Engineering, at least one luminaire, oriented at right angles to the roadway center line, shall be provided at each 4-way intersection at about the point of tangency of the curb return of the far side of the street from the direction of traffic. For "T" intersections a luminaire shall be provided at the center line extended of the intersecting roadway at the top of the "T." Luminaires shall also be provided at all cul-de-sacs and bends in the roadway. The Director of Engineering may opt to match existing pole line spacing, but new lighting system design between the points described above will not exceed the spacing determined from the following formula:

$$S = \frac{L \times U \times 0.8}{I \times W}$$

where

S = spacing of luminaires in feet,
(measured along center line of street).
L = mean lap lumens,
(from approved manufacturers data,)
U = coefficient of utilization,
(from an approved utilization curve,)
I = minimum required average illumination
in horizontal foot candles
W = Roadway width in feet,
(measured face to face of curbs).

8.06 UNIFORMITY RATIO

The uniformity ratio, defined as the ratio between the required average intensity and the minimum illumination provided by the design at any point on the roadway shall not exceed the maximum values set out in Required Lighting Levels in the Appendix. Calculations must utilize approved isometric foot candle diagrams to generate photometric site lighting plans.

In single family zoning districts required uniformity ratios and intensities will be considered to have been met with a system in which the maximum spacing between luminaries does not exceed 220 feet, at the luminare, wattage, and pole height requirements as listed in Required Lighting Levels in the Appendix.

8.07 EQUIPMENT STANDARDIZATION & INSTALLATION SPECIFICATIONS

The Village is interested in encouraging uniform appearance, standardization of inventory, and familiarization of maintenance personnel with the equipment. The standard requirements to be utilized for uniformity of installation procedures, and control of material shall be the Illinois Department of Transportation District One, Recurring Special Provisions for Roadway Lighting, latest revision, and shall be incorporated by reference into all specifications, unless otherwise required by the Director of Engineering.

Identified below are specific items that the Village will require on lighting system designs. The items with the note "*Contact the Director of Engineering for detailed diagram*" vary from IDOT standard specifications and will require special provisions. All specifications of the following items should be included in the Engineering plans submitted for permit:

- ☐ **General Electrical Provisions**
- ☐ **Basic Materials and Methods, Electrical**
- ☐ **Electric Cable in conduit, or in unit duct**
- ☐ **Grounding Conductor and Ground Rod**
- ☐ **Unit Duct**
- ☐ **Conduit**
- ☐ **Handhole**
- ☐ **Lighting Controller**
- ☐ **Electrical Service Installation**
- ☐ **Light Pole Foundation, Concrete -** ***Contact the Director of Engineering for detailed diagram***
- ☐ **Breakaway Device, Coupling and Transformer Base**
- ☐ **Light Pole, Aluminum w/Mast Arm -** ***Contact the Director of Engineering for detailed diagram***
- ☐ **Luminaire, Sodium Vapor, Horizontal Mount -** ***Contact the Director of Engineering for detailed diagram***

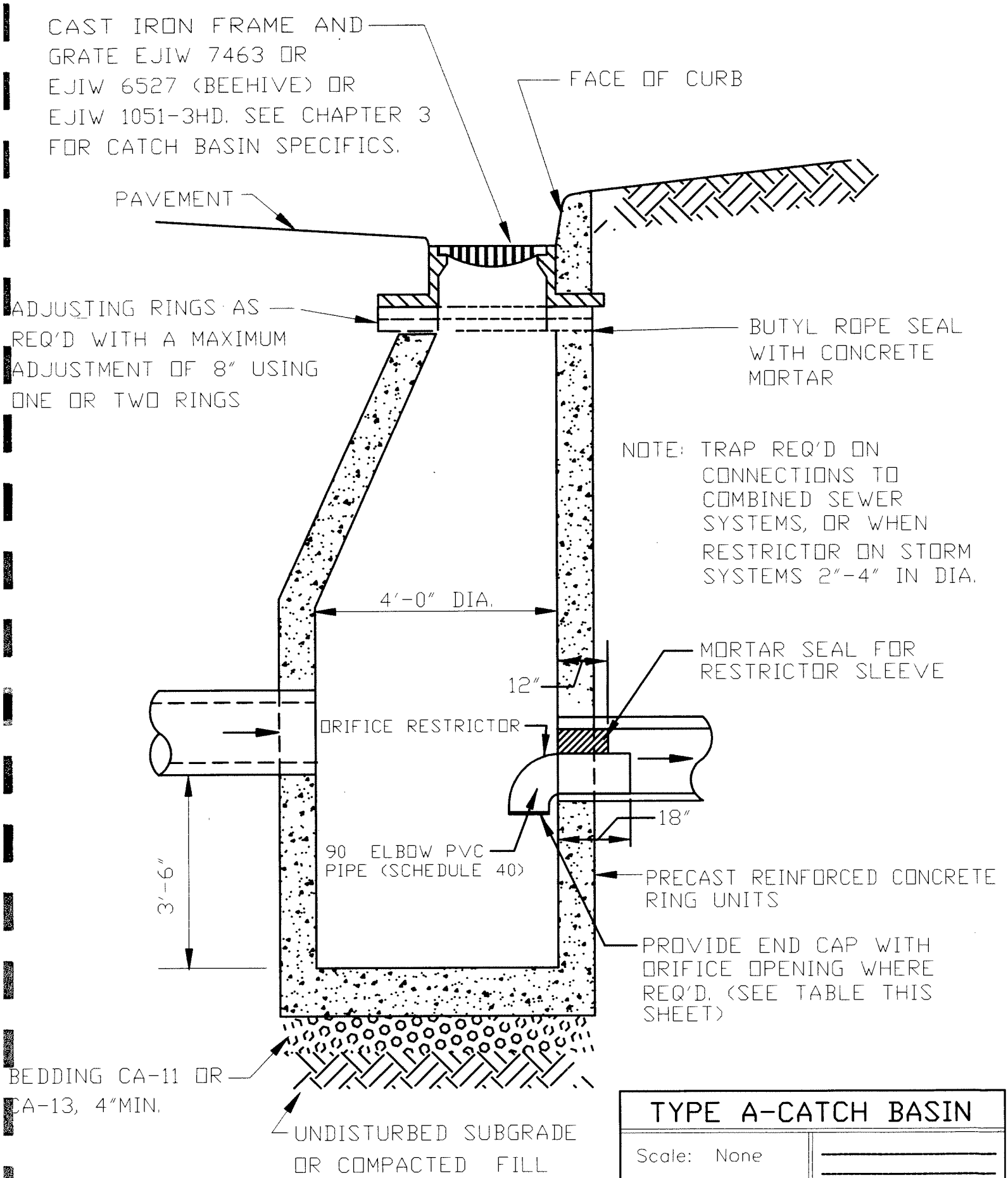
All Village provisions shall be incorporated by reference; however, failure to do so shall not relieve the engineer, developer, or owner from the requirement to provide the lighting system in compliance with these stipulations.

8.08 QUALITY OF WORK

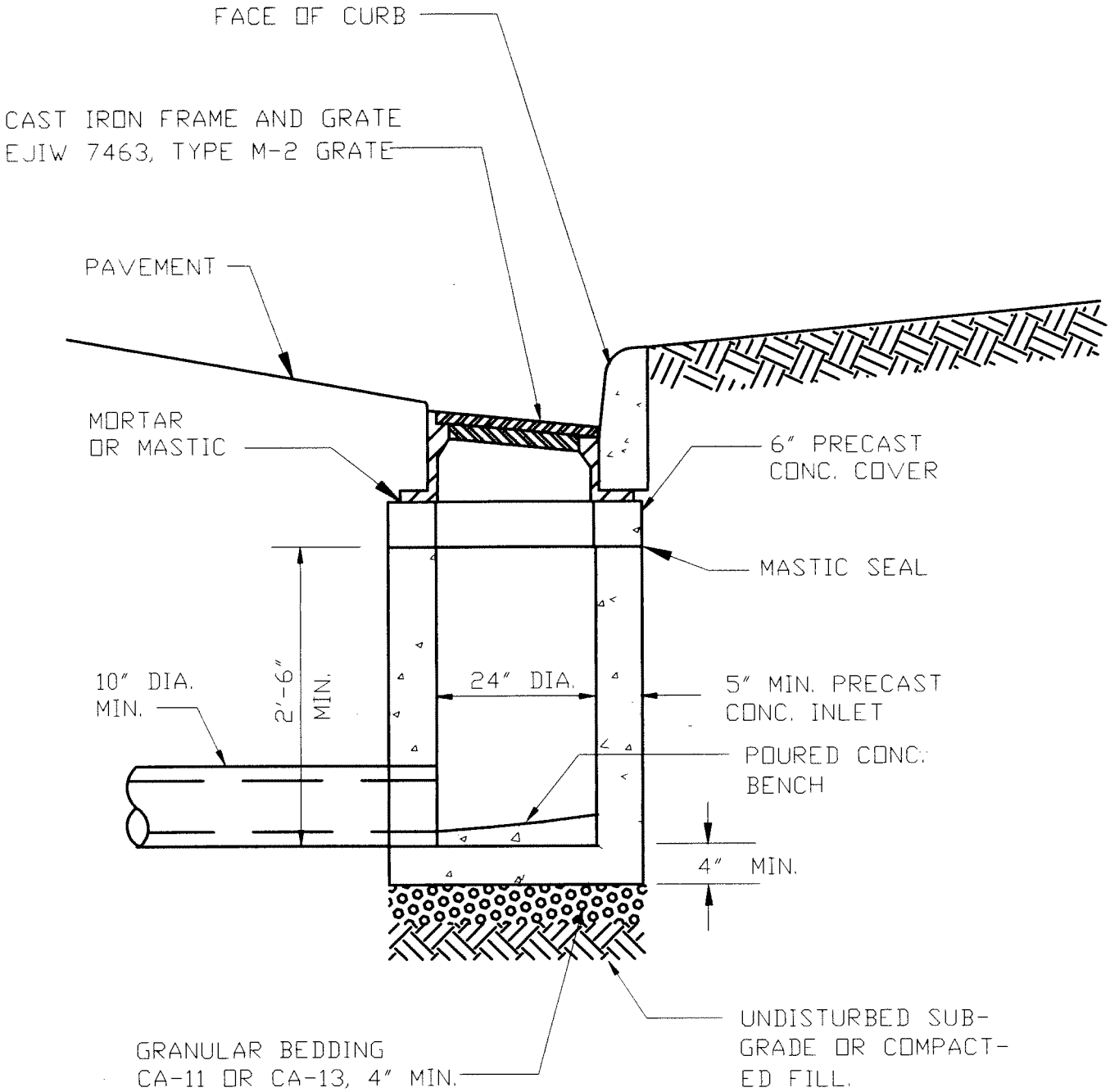
As a minimum requirement, the specifications for the construction of street lighting facilities shall not be less stringent than those adopted by the Illinois Department of Transportation. However, any conflicts between State and Village criteria shall be resolved by the Director of Engineering.

Appendix

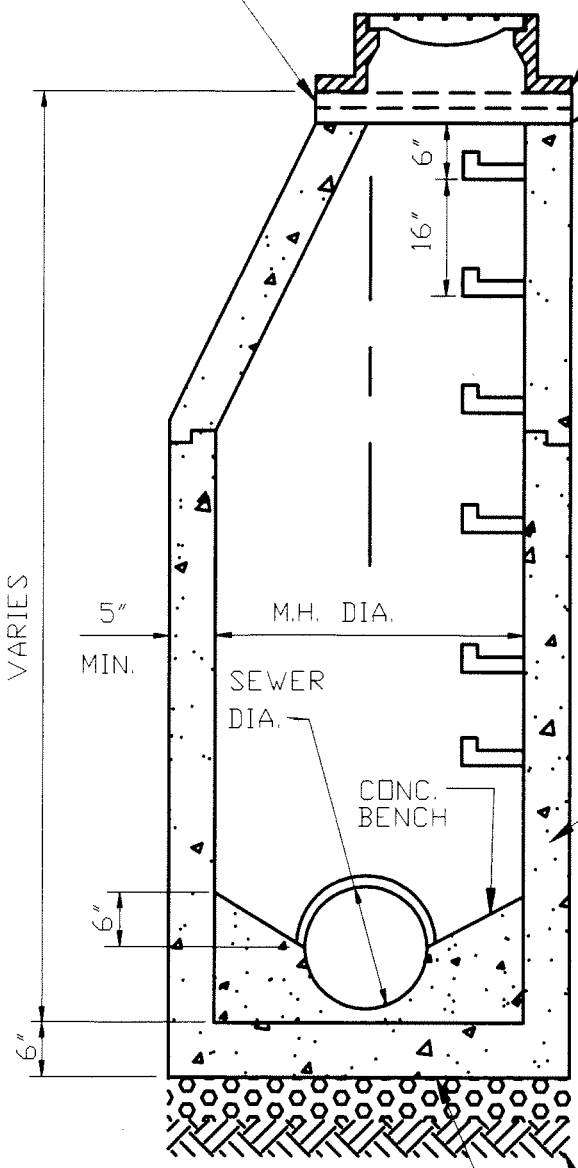
Page	Detail
70	Catch Basin - Type A
71	Inlet - Type C
72	Manhole - Type A
73	Curb & Gutter Notes
74	IDOT Standard 2130-16; A-7.03
75	IDOT Standard 2130-16; A-7.04
76	Lighting Standards
77	Required Lighting Levels



TYPE A-CATCH BASIN	
Scale: None Drafter: C.D.F.,C.H.	Revisions:
Village of Arlington Heights Engineering Department	Date: APRIL 25, 1997 File Name: C:\CURT\TACB.DWG Page No. 70



TYPE C-INLET	
Scale: NONE Drafter: C.D.F.	Revisions:
Village of Arlington Heights Engineering Department	Date: JA. 1, 1996 File Name: C:\CURT\INLET.DWG Page No. 71



NOTES:

1. ALL PUBLIC MANHOLE LIDS SHALL HAVE THE WORDS "ARLINGTON HEIGHTS" TYPE CAST INTO THEM, AS WELL AS THE DESIGNATION "SANITARY" OR "STORM".

2. WHEN MANHOLE IS LOCATED AT SEWER INTERSECTIONS, OR BENDS, THE BENCH SHALL BE SHAPED TO PROVIDE SMOOTH UN-OBSTRUCTED FLOW CONDITIONS

3. MANHOLE STEPS MADE OF CO-POLYMER PROPYLENE PLASTIC PER ASTM SPEC. NO. C-478M AND AS MANUFACTURED BY M.A. INDUSTRIES, INC., CAT. NO. PSI-PF OR APPROVED EQUAL.

4. ALL PIPES ENTERING OR EXITING SANITARY MANHOLES SHALL HAVE A WATERPROOF FLEXIBLE GASKET SEAL CONFORMING TO A.S.T.M. SPECIFICATION NO. C-923-79.

5. FOR COMPLETE MANHOLE SPECIFICATIONS SEE CHAPTER 3 OF THIS MANUAL.

TYPE A-MANHOLE		
Scale: NONE Drafter: C.D.F., CH.	Revisions:	
Village of Arlington Heights Engineering Department	Date: APRIL 25, 1997	
	File Name C:\CURT\TAMH.DWG	Page No. 72

CURB AND GUTTER NOTES

Curb and gutter and monolithic curb for public and private streets, and parking lot barrier curb shall be the same as IDOT State Standard 2130-16 (or latest revision) for Concrete Curb, Type B and Combination Concrete Curb and Gutter except the following notes override:

Adjacent to PCC Pavement

1. No change for new construction.

2. For maintenance removal and replacement of monolithic curb, substitute 16mm (5/8") J-Bolts at 760mm (30") centers for the tie bars.

3. Expansion and contraction joints shall match those in existing pavement.

Adjacent to PCC Base Course with Bituminous Overlay

1. No change for new construction.

2. For maintenance removal and replacement of monolithic curb, substitute 16mm (5/8") J-Bolts at 760mm (30") centers for the tie bars.

3. For total curb replacement with or without widening, see IDOT standard 2130-16 (or latest revision) for curb and gutter adjacent to flexible pavement.

4. Expansion and contraction joints shall match those in existing pavement.

Adjacent to Flexible Pavement

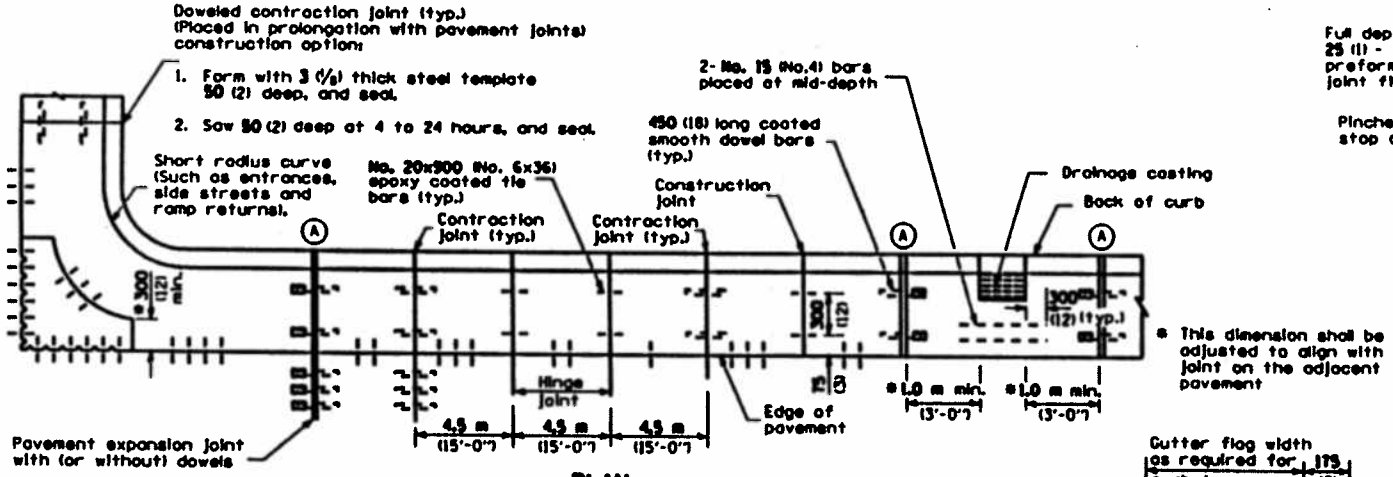
1. Two - No. 15 (No.4) longitudinal bars 6m (20') in length placed at mid-depth with 300mm (12") overlaps. Bars shall be left 300mm (12") short of expansion joints.

2. Expansion joints shall be placed at 18m (60') intervals.

3. Contraction joints shall be placed at 6m (20') intervals.

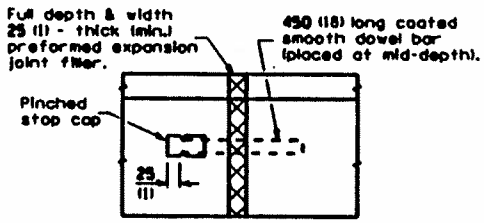
4. Expansion joints shall be placed 1.5m (5') on both sides of a structure in the curb line.

general/pcc

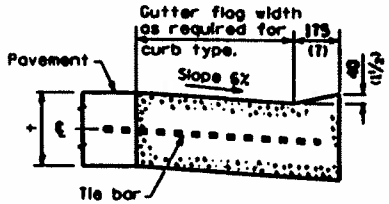


PLAN

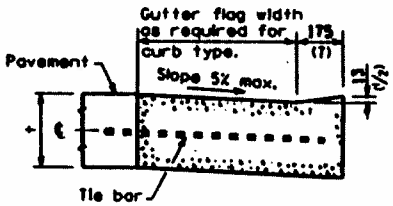
ADJACENT TO PCC PAVEMENT OR PCC BASE COURSE



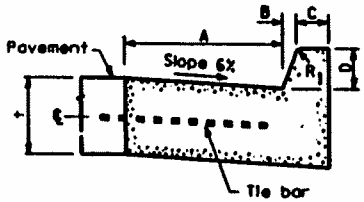
DETAIL (A) EXPANSION JOINT



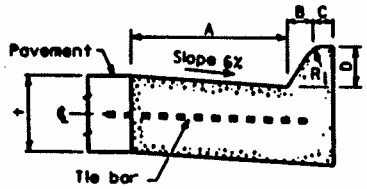
DEPRESSED CURB (TYPICAL)



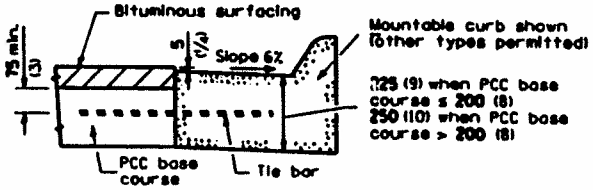
DEPRESSED CURB ADJACENT TO CURB RAMP ACCESSIBLE TO THE DISABLED



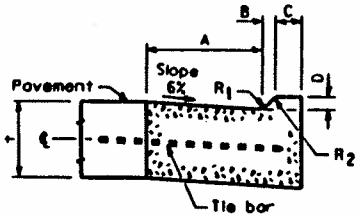
BARRIER CURB



MOUNTABLE CURB



ADJACENT TO PCC BASE COURSE AND BITUMINOUS SURFACING



M-5.15 (M-2.06) and M-5.30 (M-2.12)

GENERAL NOTES

The bottom slope of combination curb and gutter constructed adjacent to pcc pavement shall be the same slope as the subbase or 6% when subbase is omitted.

t = Thickness of pavement.

Longitudinal joint tie bars shall be No. 20 (No. 6) at 600 mm (24") centers in accordance with details for longitudinal construction joint shown on Standard 2323.

A minimum clearance of 50 mm (2") between the end of the tie bar and the back of the curb shall be maintained.

All dimensions are in millimeters (inches) unless otherwise shown.

TABLE OF DIMENSIONS BARRIER CURB					
TYPE	A	B	C	D	R_1
B-15.30 (B-6.12)	300 (12)	25 (1)	150 (6)	150 (6)	25 (1)
B-15.45 (B-6.18)	450 (18)	25 (1)	150 (6)	150 (6)	25 (1)
B-15.60 (B-6.24)	600 (24)	25 (1)	150 (6)	150 (6)	25 (1)
B-22.30 (B-9.12)	300 (12)	50 (2)	125 (5)	225 (9)	25 (1)
B-22.45 (B-9.18)	450 (18)	50 (2)	125 (5)	225 (9)	25 (1)
B-22.60 (B-9.24)	600 (24)	50 (2)	125 (5)	225 (9)	25 (1)

TABLE OF DIMENSIONS MOUNTABLE CURB						
TYPE	A	B	C	D	R_1	R_2
M-5.15 (M-2.06)	150 (6)	50 (2)	100 (4)	50 (2)	75 (3)	50 (2)
M-5.30 (M-2.12)	300 (12)	50 (2)	100 (4)	50 (2)	75 (3)	50 (2)
M-10.15 (M-4.06)	150 (6)	100 (4)	75 (3)	100 (4)	75 (3)	NA
M-10.30 (M-4.12)	300 (12)	100 (4)	75 (3)	100 (4)	75 (3)	NA
M-10.45 (M-4.18)	450 (18)	100 (4)	75 (3)	100 (4)	75 (3)	NA
M-10.60 (M-4.24)	600 (24)	100 (4)	75 (3)	100 (4)	75 (3)	NA
M-15.15 (M-6.06)	150 (6)	150 (6)	50 (2)	150 (6)	50 (2)	NA
M-15.30 (M-6.12)	300 (12)	150 (6)	50 (2)	150 (6)	50 (2)	NA
M-15.45 (M-6.18)	450 (18)	150 (6)	50 (2)	150 (6)	50 (2)	NA
M-15.60 (M-6.24)	600 (24)	150 (6)	50 (2)	150 (6)	50 (2)	NA

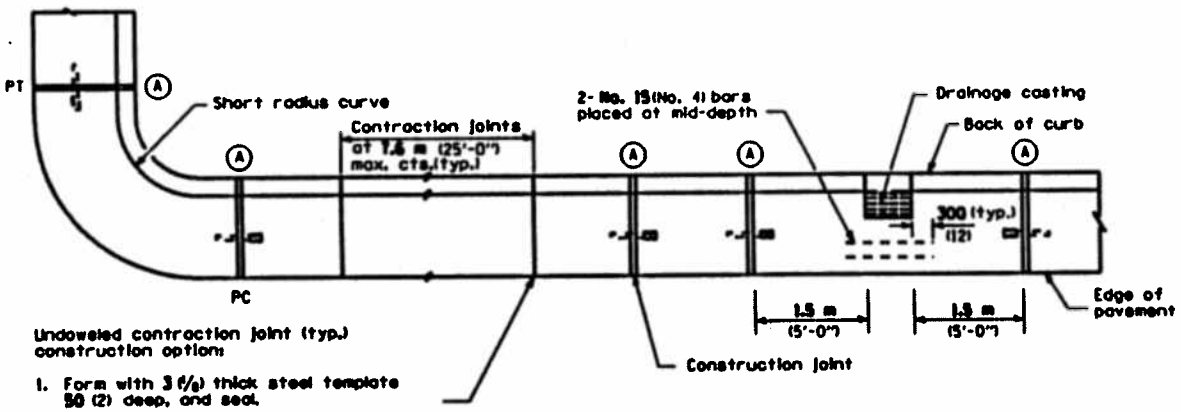
Illinois Department of Transportation
PASSED October 6, 1995
ENGINEER OF POLICY AND PROCEDURES
APPROVED October 6, 1995
ENGINEER OF HIGHWAY STANDARDS
Revised 1-1-95

DATE	REVISIONS
10-1-95	Added depressed curb detail. Added note regarding joint alignment.
6-15-94	Revised tie bars and 3rd G.N.

CONCRETE CURB TYPE B AND COMBINATION CONCRETE CURB AND GUTTER

STANDARD 2130-16

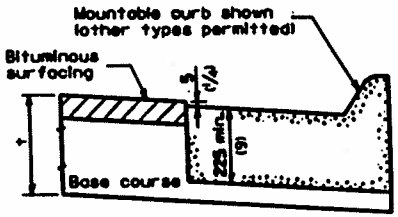
A-7.03



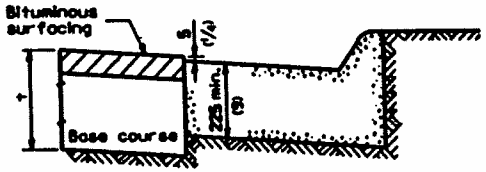
Undoweled contraction joint (typ.) construction option:

1. Form with 3 (1/8) thick steel template 50 (2) deep, and seal.
2. Saw 50 (2) deep at 4 to 24 hours, and seal.
3. Insert 20 (3/4) thick preformed joint filler full depth and width.

PLAN

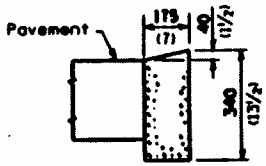


ON DISTURBED SUBGRADE

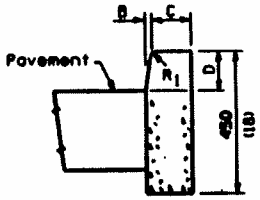


ON UNDISTURBED SUBGRADE

ADJACENT TO FLEXIBLE PAVEMENT

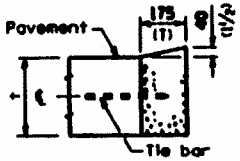


DEPRESSED CURB

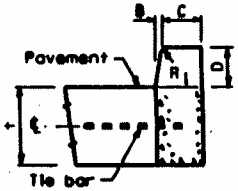


BARRIER CURB

ADJACENT TO FLEXIBLE PAVEMENT



DEPRESSED CURB



BARRIER CURB

ADJACENT TO PCC PAVEMENT OR PCC BASE COURSE

CONCRETE CURB TYPE B

All dimensions are in millimeters (inches) unless otherwise shown.

CONCRETE CURB TYPE B AND COMBINATION CONCRETE CURB AND GUTTER
STANDARD 2130-16

Illinois Department of Transportation
PASSED October 1, 1986
ENGINEER OF BRIDGES AND STRUCTURES
APPROVED October 1, 1986
ENGINEER OF DESIGN AND STANDARDS

LIGHTING STANDARDS

	Major Arterials 45 MPH			Secondary Arterials 45 MPH			Collectors 35 MPH			Sub-Collector 35 MPH			Locals 30 MPH			Comments
	R	I	C	R	I	C	R	I	C	R	I	C	R	I	C	R-Residential I-Intermediate C-Commercial
Horizontal Foot Candles	1.0	1.4	2.0	.6	.9	1.2	.4	.6	.9	.4	.6	.9	.2	.4	.6	
Uniformity Ratio	1:3	1:3	1:3	1:3	1:3	1:3	1:6	1:4	1:3	1:6	1:4	1:3	1:10	1:8	1:6	
Pole	ALUM	ALUM	ALUM	ALUM	ALUM	ALUM	CONC	CONC	CONC	CONC	CONC	CONC	CONC	CONC	CONC	Standard or Alternate
Mounting Height	35' 47-6"	35' 47-6"	35' 47-6"	30	30	30	26	26	26	26	26	26	26	26	26	Standard
							22	22	22	22	22	22	22	22	22	Alternate
Bracket Arm	15 20	15 20	15 20	12	12	12	8	8	8	8	8	8	8	8	8	Standard
							6	6	6	6	6	6	6	6	6	Alternate
Luminaire	250 400 HPSV	250 400 HPSV	250 400 HPSV	150 HPSV	250 HPSV	250 HPSV	100	150	150	100	150	150	100	150	150	HPSV
Spacing	150 200	125 150	75 100	165	165	124	165	165	124	165	165	124	220	220	165	
	STATE OR COUNTY MAINTAINED						VILLAGE MAINTAINED									

REQUIRED LIGHTING LEVELS

Local Streets

Zoning Classification	Average Intensity (In H.F.G.)	Maximum Uniformity Ratio
R-1 to R-3	0.2	1:10
R-4 & B1	0.4	1:8
R-5, R-6 B-2 to B-5, O-R & all M	0.6	1:6

Collector Streets

Zoning Classification	Average Intensity (In H.F.G.)	Maximum Uniformity Ratio
R-1 to R-3	0.4	1:6
R-4 & B-1	0.6	1:4
R-5, R-6, B-2 to B-5, O-R & all M	0.9	1:3

Secondary Streets

Residential	.6	1:3
Intermediate	.9	1:3
Commercial	1.2	1:3

Arterial Streets

Type	Average Intensity (In H.F.G.)	Maximum Uniformity Ratio
Residential	1.0	1:3
Intermediate	1.4	1:3
Commercial	2.0	1:3