



CITY OF FARMINGTON HILLS
DEPARTMENT OF PUBLIC SERVICES
ENGINEERING DIVISION

ENGINEERING DESIGN STANDARDS
For Site Development and Redevelopment

ADOPTED BY:
City of Farmington Hills
City Council – July 11, 1977

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INTRODUCTION

The following design standards are intended to provide a basis upon which all residential, commercial, industrial and office sites within the City of Farmington Hills are to be designed. The requirements outlined herein reflect the requirements of the Engineering Division of the Department of Public Services and conform to current engineering practices in the Metropolitan Detroit area. By no means are these standards intended as a substitute for sound professional engineering judgment. It is suggested that the applicant obtain a copy of the City of Farmington Hills Zoning Ordinance to supplement these standards. Note that the standards and plans required herein are to be used for construction purposes and must be completed and approved prior to the issuance of a building permit. They are the detail plans that follow the site plan approval process by the City's Planning Commission.

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GENERAL REQUIREMENTS AND PROCEDURES

A. GENERAL SUBMITTAL PROCEDURES:

1. Prior to the issuance of a building permit, the plans must first receive an approval from the Engineering and Planning Office.
2. A minimum of four complete sets of construction plans will be required, depending on the various agencies influenced by the proposed development. It is recommended that the applicant meet with the Engineering Division prior to submittal of any plans. The plans will be received at the Engineering Division Office, 31555 Eleven Mile Road, Farmington Hills. All plans must be sealed by an Engineer or Architect registered to practice in the State of Michigan.
3. Upon receipt of the plans, they will be forwarded by the Engineering Division to the Planning Office for comment. The comments of the Planning Office will be returned along with the Engineering review.
4. The Engineering Division will forward the plans to all other concerned agencies that may have jurisdiction over a certain phase or area of the site. The review comments of these other agencies will then be incorporated in the City review. The intent of this distribution is to restrict the review to one agency (the City), thereby eliminating any discrepancies in requirements between two or more jurisdictional agencies.
5. Upon completion of the review, the City will return one set of plans to the engineer or architect with revisions and/or corrections noted on the plans. Direction will be given at that time as to how many plans must be resubmitted.
6. AFTER THE REVIEW COMMENTS HAVE BEEN ADDRESSED BY THE ENGINEER OR ARCHITECT, A MEETING WITH THE REVIEW ENGINEER IS ENCOURAGED TO RESOLVE ALL COMMENTS.
7. Upon Engineering and Planning approval, notification will be given to the Building Division that the site plan is approved. An approved plan will be returned to the Building Permit Applicant at the time the Building Permit is issued.
8. Partial approvals will not be given. All revisions on all phases must be made prior to Engineering approval.
9. Approval will not be given until all required fees and inspection escrow accounts have been deposited and the necessary permits obtained.

B. FEES:

1. Review Fee:

This fee must be deposited with plan submittal. This fee is non-refundable and approval cannot be given without its receipt.

2.5% (minimum \$500) of the construction cost for all water main, sanitary sewer, paving, grading, drainage improvements and soil erosion measures, where applicable; and any other site improvements, regardless of whether private or public.

This fee must be based on either the signed contract for the work or an approved sealed engineer's or architect's itemized estimate for the work.

2. Inspection:

This is a cash amount to be deposited in an escrow (trust) account to cover the costs of City Engineering inspection and testing. The deposit is based on the construction cost of all water main, sanitary sewers, storm sewers, and paving that requires Engineering inspection. The construction cost shall be defined as either the signed contract for the work, or an approved sealed engineer's or architect's itemized estimate for the work.

<u>Cost of Construction</u>	<u>Deposit to Cover Inspection Fees</u>
0 - \$ 5,000.00	17% or as estimated by Engineering Division
\$ 5,000.00 - \$ 50,000.00	12% but not less than \$800.00
\$ 50,000.00 - \$ 100,000.00	7% but not less than \$4,000.00
\$ 100,000.00 - Plus	5% but not less than \$6,000.00

Inspection fees will be billed at an hourly rate of \$50.00/hour regular time and \$62.00/hour overtime. This is based on an 8-hour day and includes a 1-hour paid lunch period.

A minimum of four hours will be charged if the inspector keeps a scheduled inspection appointment and the Contractor does not work. All costs incurred for consulting services and testing requirements will be billed against this account.

If this account is depleted during the course of construction, additional deposits as required by the Engineering Division will be necessary.

Upon final approval of the site, the balance remaining in the trust account will be refunded.

3. Soil Erosion Fee:

A fee for a Soil Erosion and Sedimentation Control Permit shall be collected prior to site plan approval in accordance with the requirements for a permit under 1994 PA 451 Part 91. (See permit application for specific requirements).

C. GENERAL PLAN REQUIREMENTS:

1. Plans shall be submitted on 24" x 36" white prints, having blue or black lines. Judgment should be exercised in the design, layout and presentation of the proposed improvements. Acceptable scales shall be:

1" = 20'; 1" = 30'; 1" = 40'; 1" = 50', according to the size of the site.
2. When the size of the site prohibits the entire site from being shown on a single plan, a 1" = 100' or 1" = 200' general plan must be provided. This general plan should show the streets and their names, pavement, all units, utilities and site dimensions.
3. The site plan or, if in the case of number 2 above, the general plan shall also include lot or parcel dimensions and abutting rights-of-way. A location map shall be indicated with each site plan showing the approximate location of the site relative to major thoroughfares.
4. A legal description of the property must be indicated.
5. The City of Farmington Hills Standard Notes shall appear on the plan.
6. All plans submitted for review must be prepared and sealed by a Professional Engineer or Architect licensed to practice in the State of Michigan. All correspondence concerning the design of the site will be directed to the Engineer or Architect whose seal appears on the plan. The name, address and telephone number of the owner, engineer and/or architect shall be shown on the plan.
7. The sanitary sewer and water main shall be shown on the same plan view. Profiles are required for all public sanitary sewers, storm sewers, and all water mains over 12 inches.
8. All profiles shall have a vertical scale of 1" - 5' where applicable. The profile shall be shown below the plan view where possible, with as close an alignment as possible.

9. When many plans are in the set, each plan shall include in its title block, a summary of that particular sheet.
10. Benchmarks must be indicated on the general plan, defined on the U.S.G.S. Datum.
11. For all sites over two acres, mylar as-builts (3 mils thick) will be required prior to final approval of the construction.
12. All setbacks and building separations must be indicated in accordance with the Zoning Ordinance requirements.
13. A striping plan for the parking areas must also be indicated in accordance with the Zoning Ordinance requirements.
14. The height of all buildings and lighting structures must be shown on the plan in accordance with the Zoning Ordinance.
15. Loading spaces must be indicated in accordance with the Zoning Ordinance.
16. If a wall or berm is required by the Zoning Ordinance, it must be shown on the plan with a detail indicating the cross section.
17. The proposed building use must be indicated on the plan.
18. If propane tanks are proposed, their capacity and location must be indicated.
19. Required plantings in accordance with the Zoning Ordinance must be shown on the plan.

D. FIELD REQUIREMENTS:

1. The City of Farmington Hills will provide inspection on all public utilities and improvements in the City right-of-way. Wherever possible, inspection will be full-time on water mains, sanitary sewers, storm sewers, and paving. Part-time inspection may be provided at the discretion of the Engineering Division for sidewalks, approaches, taps to public storm sewers, on-site paving, and private storm sewer.
2. A minimum of 48 hours notice is required to ensure the presence of a City inspector when work commences.
3. Prior to starting any construction, the Contractor must obtain all required permits.

4. All public improvements must be field staked under the supervision of the Engineer, Architect, or Land Surveyor that prepared the plans. Staking must be in accordance with the approved plans.
5. All construction must conform to the current MIOSHA safety standards.
6. At the time of final inspection for all public improvements, the owner or his contractor shall provide all necessary labor and equipment to allow the City to inspect the system.
7. Generally, one inspector will be assigned to a particular project and will be responsible for that project until its completion. The contractor and the inspector may make arrangements for day-to-day inspection. Any interruption or moratorium on the flow of work may result in a re-assignment of that inspector to another project and require the normal 48-hour notice before work is resumed.
8. At the completion of the project, a certification from the design engineer will be required indicating that all work has been completed in accordance with the approved plans.

E. PERMIT REQUIREMENTS:

1. Construction Plan:

The approved construction plan constitutes a permit from the Planning Office and Engineering Division for the construction of the site. Note, however, that other Divisions of the City and other agencies may require additional permits.

The other agencies; such as Michigan Department of Transportation (MDOT), Oakland County Drain Commission (OCDC), Road Commission for Oakland County (RCOC) requiring permits will generally be listed on the approved plan.

2. Soil Erosion and Sedimentation Control Permit and Tree Permit:

These permits are required prior to final site construction plan approval. Applications are available for the soil erosion and sedimentation control permit at the City Engineering Division offices. A bond may be required in accordance with City Code, Chapter 24, Article III. Tree permits must be obtained from the City Planning Office.

3. Michigan Department of Environmental Quality Water Main:

All water main requires a construction permit from the Michigan of Department of Environmental Quality. The City will directly request approval from the Department of Environmental Quality during the course of site plan approval.

4. Michigan Department of Environmental Quality Sanitary Sewer:

All sanitary sewers require an Environmental Quality Construction Permit from the Michigan Department of Environmental Quality (MDEQ). The City will directly request approval from the MDEQ during the course of site plan approval.

5. Oakland County Drain Commissioner:

All taps to the water mains and sanitary sewers require permits from the Oakland County Drain Commissioner (ODCD)

6. Road Commission for Oakland County:

All work in roads under the jurisdiction of the Road Commission for Oakland County (RCOC) requires a permit from the Road Commission for Oakland County.

7. Other Permits:

Other agencies that may require a permit will be designated on the approved plan. These permits are generally the contractor's responsibility and will generally be required prior to construction.

City of Farmington
City of Southfield
Michigan Department of Transportation
Michigan Department of Environmental Quality
Wayne County Department of Public Services

II.

SURVEY

A. GENERAL:

1. A complete topographical survey is required for all sites. Existing off-site elevations must be given at a minimum of 50' and 100' abutting the entire perimeter of the site. Grades shall be indicated at all property corners and along all property lines. On site, intermittent elevations or defined contours are required to establish the existing site drainage.
2. All existing conditions shall be indicated. Locations and elevations must be given on the following:

- existing drainage courses
 - upstream and downstream culverts
 - all utilities, including sanitary, water main, gas, telephone, electrical, etc. Inverts and castings and finish grades are required where applicable.
 - sidewalks
 - finished grades of all adjacent buildings
 - all easements
3. A U.S.G.S. Benchmark is required.
4. Road topography shall extend across the entire site with grades shown on both sides of the street for:
- property line
 - ditch center line
 - top of bank
 - edge of shoulder
 - edge of pavement or top of curb
 - crown or center line
5. Property lines must be indicated by distances and bearings where applicable.
6. Existing rights-of-way of adjacent roads must be indicated.

III.

SOIL EROSION AND SEDIMENTATION CONTROL

A. SITES REQUIRING PERMITS:

All sites having a construction area of one or more acres require a Soil Erosion Permit. All sites within 500 feet of a drainage course require a Soil Erosion Permit.

B. INTENT OF PERMIT:

The intent of this requirement is to ensure that no silt or sediment enters the public streams or water courses. This is accomplished through means of siltation basins, filters, diversions, etc.

C. PLAN REQUIRED:

A soil erosion and sedimentation control plan is required for all sites that require a permit. This can be made a part of the site construction plans or may be a separate plan. Itemized on this plan shall be step-by-step requirements for controlling siltation. No work (including site clearing) will be allowed until approved siltation control measures are in effect.

Accelerated erosion and sedimentation must be prevented during all phases of construction, including:

- initial site clearing
- utility construction
- building construction
- site paving
- final site approval

D. INSPECTION:

Inspections will be made periodically throughout construction on the maintenance and effectiveness of soil sedimentation control methods.

The costs of these inspections are included in the permit fee and will not be charged against the inspection escrow account. If inspection reveals that the controls are not being implemented, a Cease and Desist Order on all site construction may be issued.

NOTE: THE SILTATION CONTROL REQUIREMENTS MAY CONTROL THE PROGRESS AND SCHEDULING OF ALL CONSTRUCTION ON THE SITE.

IV.

WATER MAIN

A. NOTES:

1. When applicable, the City of Farmington Hills Standard Water Main Notes must appear on the plan.
2. A quantity list itemizing all proposed public water main construction must appear on the plan.

B. SIZES AND DISTRIBUTION:

1. The minimum size water main in the City of Farmington Hills shall be eight inches. Six-inch mains may be used only for single fire hydrant leads having a

maximum length of 75 feet. No service leads are allowed from a six-inch main. Maximum dead end mains are as follows:

450 Ft. for 8" Mains
1000 Ft. for 12" Mains

Reducers are not allowed to meet the dead end requirements.

2. Twelve-inch water main may be considered as minimum for internal transmission on industrial and multiple sites.
3. Looping of mains will be required, wherever possible. All mains must end with a gate valve, hydrant, or blow-off.
4. No private services will be allowed from a water main over 16 inches in diameter.
5. The extension of water main will generally be required across the entire frontage of the site.
6. All water main installations must be in accordance with the City Master Water Main plans.

C. VALVES:

Gate valve spacing will generally be regulated by providing the following provisions in event of a breakage.

In the event of a breakage:

- no more than 24 single family units will lose service
- no more than 30 multiple units will lose service
- no more than two hydrants will be out of service
- no more than four valves shall have to be closed to isolate the break. Where possible, three valves should isolate the break.
- on line valve spacing shall be a maximum of 800 ft.

D. AUTOMATIC FIRE SPRINKLER SERVICE CONNECTIONS:

The City will allow installation of an unmetered fire service connection provided adequate provision is made to prevent the use of water from such fire service for purposes other than fire extinguishing.

In no case should hydrants be placed downstream of any check valve used for automatic sprinkler protection. Where hydrants are necessary, separate mains shall be installed for fire sprinkler service and hydrant protection.

Sprinkler systems are not a substitute for standard requirements for hydrants.

E. HYDRANTS:

1. Single family residential spacing shall be a maximum of 500 feet.
2. Commercial, industrial, office and multiple family residential spacing shall generally be a maximum of 400 feet on line, but may vary to meet the following requirements.

All points on the exterior of a building shall be no closer than 40 feet, nor further than 250 feet from a hydrant. Distances shall be measured along the shortest feasible exterior route (never through buildings) for laying hose.

3. Any hydrant located in a parking lot shall be protected by a minimum of six-inch curb or standard hydrant guard posts. In all cases, the visibility of the hydrant must be considered. No parking will be allowed within ten feet of the hydrant.
4. Additional hydrants may be required depending on the specific use.

F. MATERIALS:

1. All materials shall be in conformance with the City of Farmington Hills current standards and specifications.
2. Ductile Iron Water Main, Class 54, is required for all major road crossings.

G. CONSTRUCTION:

No building permits for wood frame construction will be issued above the foundation for any development prior to the active service of the required mains and hydrants and adequate access for fire fighting equipment. No occupancy shall be allowed in any instance without the required mains, hydrants and sprinklers being in active service.

H. EASEMENTS:

All public water mains must be located in an easement or public right-of-way. Standard easement forms are available at the City Engineering Division. The minimum easement shall be 12 ft. The dedication of the easement will be required prior to construction of the system.

V.

SANITARY SEWER

A. GENERAL:

1. Public sanitary sewers are required when two or more connections are made to the same sewer. In most instances, including multiple unit developments, the sewers may have to be public, even though the project has one owner.
2. The extension of the sanitary sewers will generally be required across the entire frontage of the site.
3. All construction shall conform to the current City of Farmington Hills Sanitary Sewer Standards and Specifications.

B. NOTES:

1. Where required, the City of Farmington Hills Standard Sanitary Sewer Notes shall appear on the plans.
2. A quantity summary itemizing all proposed public sanitary sewer construction must appear on the plans.

C. SEWERAGE:

Downspouts, weep tile, footing drains, or any conduit that carries storm or ground water shall not be allowed to discharge into the sanitary system.

D. GRADE:

1. The following table represents the minimum and maximum grade for public sanitary sewers. Note that these are minimum and maximum requirements and will generally be used only when topography requires it.

Size	<u>Standard Grade</u>	<u>Minimum Grade</u>	<u>Maximum Grade</u>
8"	0.80%	0.40%	8.0%
10"	0.60%	0.30%	6.2%
12"	0.40%	0.22%	6.0%
15"	0.24%	0.16%	3.6%
18"	0.18%	0.12%	2.8%
21"	0.14%	0.10%	2.2%

2. All upstream dead end sewers shall have a minimum last run grade of 1.0%.

E. MANHOLES:

1. Sanitary Sewer Manholes shall be spaced as follows

<u>Size</u>	<u>Standard Run</u>	<u>Maximum Sewer Run</u>
8"	300 Ft.	400 Ft.
10"	300 Ft.	400 Ft.
12"	400 Ft.	450 Ft.
15"	500 Ft.	500 Ft.
18"	600 Ft.	600 Ft.
21"	600 Ft.	600 Ft.

2. A manhole will be required at all changes in alignment, size or grade.

F. LOCATION:

1. Sanitary sewers shall be located so as to provide unrestricted access for maintenance and inspection. A minimum alignment separation of 10 ft. must be maintained between the sewer and all water mains. The water main and sanitary sewer shall be located on opposite sides of the street, wherever possible.
2. All public sewers must be located in a public right-of-way or an easement. Standard Easement forms are available at the City Engineering Division. The easement size will vary individually as required for maintenance and access. The minimum sanitary sewer easement shall be 20 feet. The dedication of the easement will be required prior to construction of the system.

G. LEADS:

1. Service leads shall be a minimum of 6 inches in diameter with a minimum slope of 1.0%.
2. Private sanitary sewer leads of excessive length, although not a public sewer, may require inspection and testing. Each site will be considered individually by the Engineering Division.

H. PROFILE:

The following information shall be indicated on the sanitary sewer profile:

- 1) Length of run between manholes.
- 2) Type and class of pipe between manholes.
- 3) Size and grade of pipe between manholes
- 4) Top of casting and invert of all manholes and sewers at manholes.
- 5) Existing and proposed ground elevation along the route of the sewer.
- 6) Progressive numbering system
- 7) All utility crossings.
- 8) Special backfill areas.
- 9) Provisions for infiltration testing.

I. DROP CONNECTIONS:

External drop connections are required where the invert of the outlet pipe is 18 inches or more below the invert of the inlet pipe. Internal drop connections will generally not be allowed.

J. SEPTIC TANK:

If sanitary sewer is not available, a copy of a valid septic tank permit from the Oakland County Health Division must be submitted prior to approval.

VI.

DRAINAGE

A. GENERAL:

1. All storm drainage must conform to the Master Drain Plan.
2. All construction must conform to the current Standards and Specifications of the City of Farmington Hills.
3. Where required, the City of Farmington Hills Standard Storm Sewer Notes shall appear on the plan.
4. All run-off on site must be accommodated and discharged in a controlled manner. The minimum on site pipe size is 8 inches. All public systems shall have a minimum pipe size of 12 inches. A minimum pipe size of 12 inches shall also be required for all storm sewer from the tap to the public system to the first structure upstream.
5. Sump pump discharge must be directed into the storm sewer via an enclosed system. A minimum of 4-inch pipe shall be utilized and will also be allowed to discharge unrestricted.

B. STRUCTURE:

1. Catch basins at the upstream end of the system shall be a minimum of 24 inches in diameter. Catch basins with an inlet pipe shall have a minimum diameter of 36 inches. All manholes and public catch basins shall be a minimum of 48 inches in diameter.
2. The first structure upstream from a public system within the confines of the private development shall be 48 inches in diameter and have a 24-inch sump.
3. Manholes shall be located at:
 - a) All changes in alignment.
 - b) Points where the sewer changes size.

- c) Points where the grade changes
- d) Junction of sewer lines

4. **Manufactured Treatment System**

Upstream of the discharge into a detention basin that does not have a forebay or at a location immediately prior to storm water discharge from the site on sites that do not have an open detention system, a manufactured treatment system shall be installed. Access to the system must be provided on the site for regular inspection and maintenance which will be required every six months. The structure must allow access from the surface for vacuum equipment to remove accumulated material. The system must treat 100% of the runoff from the 2-year/24-hour storm event and remove 80% of Total Suspended Solids (TSS) based on a 110-micron particle size. The City Engineer maintains a list of acceptable systems and performance standards that must be met prior to the system being included on the list of acceptable systems.

C. STORM SEWER DESIGN:

1. Storm sewers shall be designed using the Manning Equation for pipes flowing full. Runoff shall be determined using the Rational Method with an intensity formula of $I = \frac{175}{T+25}$. The initial time of concentration shall generally be 20 minutes maximum.
2. Storm sewer design computations must be submitted for review in the City Standard storm sewer design form which can be obtained at the Engineering Division. The velocity shall be a minimum of 2.5 fps and shall not exceed 10 fps.
3. The hydraulic gradient must be maintained within the pipe, wherever possible.
4. Runoff coefficients can be determined for each individual drainage area and calculations for each drainage area must be submitted as part of the design computations. In lieu of individual coefficient design, the following shall be used as minimum coefficients:

Single Family Residential	C=0 .35
Multiple Family	C=0 .55
Commercial	C=0 .70
Industrial	C=0 .70
Agricultural	C=0 .15

5. A storm district map must be provided showing all drainage districts within the development. The district limits must be overlaid on a proposed grading plan for the site. Color coding is encouraged.

6. All upstream drainage must be accommodated on site. Allowances for upstream area must be based on ultimate improvements and runoff. Discharge must not be diverted onto abutting properties.
7. The outlet must be in accordance with the Master Drain Plan and the existing natural drainage courses in the area.

D. PLAN AND PROFILE:

1. All public storm sewers must be shown in profile. For developments larger than one acre, the private sewer must also be shown in profile.
2. The following must be shown in profile:
 - a) Length of run between manholes and catch basins.
 - b) Type and class of pipe between manholes and catch basins.
 - c) Size and grade of sewer between manholes.
 - d) Top of casting elevations.
 - e) Inverts of all pipes at manholes.
 - f) Proposed and existing ground elevations along the route of the sewer.
 - g) Progressive numbering system on all manholes and catch basins.
 - h) All utility crossings.
 - i) Special backfill areas.

E. TAPS:

Connections must be made at manholes. Blind taps are generally not allowed.

F. DETENTION:

1. Any site that utilizes an unimproved outlet for drainage must detain the increased runoff on site. Acceptable means of detention can be achieved through standing water in parking areas (sites of $\frac{3}{4}$ acre or less), oversize storm pipes and a separate detention basin. Any or all of these designs may be utilized to achieve the required detention.
2. Detention must be provided to store a volume equivalent to the following depth of water over the entire site.

Single Family	1.65 Inches
Multiple	1.85 Inches
Commercial & Industrial	2.0 Inches

Discharge must be limited to 0.2 cfs per acre.

3. The layout and shape of the detention basin shall be in conformance with Landscape Design Principles as approved by the City Planning Commission. If the side slopes on any continuous 50 ft side of the basin do not include a section with a maximum slope of 1 vertical to 6 horizontal, a fence is required. In no case shall a side slope on an unfenced basin exceed 1 vertical to 4½ horizontal. This may be waived by the Engineering Division when the design is an integral part of the landscaping and the location and depth does not present a potential hazard. Fences shall be a minimum of 6 feet high constructed of a low/no maintenance material with a locking access gate, 8 feet wide. Chain link fences are discouraged.
4. The basin must be constructed to drain entirely, unless designed to retain a permanent water level that conforms to the aesthetics of a landscape plan relating to the surrounding landscape. Basins shall not be located within the property lines of a habitable lot in Subdivision Plats or Site Condominiums. Principles of earth sculpting shall be followed as outlined in “Landscape Design Principles” prepared by the Planning and Community Development Department. This may require additional property dedicated to the detention system beyond minimum storage requirements.
5. The basin shall be landscaped in accordance with “Landscape Design Principles” prepared by the Planning and Community Development Department. Paved channels will not be allowed.
6. A minimum of 12 inches of freeboard must be maintained with a positive, non-erodible overflow capable of handling the capacity of a 100-year storm.
7. All open detention basins shall have a sediment forebay installed at all incoming discharge points to the basin. The forebay shall be a separate basin, which can be formed within the main basin by creating a separation barrier with an earthen berm.
 - a. The sediment forebay shall be sized to accommodate 0.5” of rain over the contributing area that discharges to the forebay times the runoff coefficient for the contributing area.
 - b. The forebay may be included as part of the total required basin volume provided it is located above any permanent pool of water. The forebay cannot be included as available storage if it remains full of water.
 - c. The forebay must have a minimum depth of 2 feet to capture and prevent resuspension of sediment. Positive drainage must be provided from all points in the forebay to the outlet from the forebay.
 - d. Forebays located above permanent pools of water shall be designed to dewater gradually in 48 hours under full conditions. The outlet device must be designed to filter sediment, heavy pollutants, and oil from the water flow.

- e. The separation shall be designed to allow overtopping of flows in a controlled and non-erosive manner.
 - f. An access road shall be provided for forebay maintenance. The access road shall be stabilized to accommodate heavy equipment for maintenance purposes and provide direct access to the inlet and outlet facilities. The road surface shall consist of a non-erosive, non-pollutant, and dust free material wherever possible.
 - g. The forebay must have a fixed sediment depth marker at the lowest point to measure the amount of sediment that has accumulated. In accordance with the provisions of the detention basin maintenance agreement, the sediment must be removed to an approved upland disposal area when the sediment storage capacity has reached half or 12", whichever is less. The surface area disturbed by the sediment removal shall be restored to the original design conditions.
8. A Maintenance Agreement shall be required for all detention systems.

G. PUBLIC STORM SEWER:

- 1. All public storm sewers must be located in a public right-of-way or an easement. Standard easement forms are available at the Engineering Division. The easement size will vary as required for maintenance and access. The minimum storm sewer easement shall be 12 feet. The dedication of the easement will be required prior to construction of the system.
- 2. Any storm sewer that accepts runoff from abutting property or public right-of-way must be placed in a minimum 12 ft. storm sewer easement.

H. Water Quality Alternatives:

The above storm water standards represent the minimum criteria that is necessary in order to receive Engineering construction plan approval. Owners and their engineers, however are encouraged to explore alternate approaches to the site construction that address and treat both storm water quality and the quantity of runoff from the site. These alternate approaches include the following partial list of BMP's (best management practices):

- Green roofs
- Bioswales
- Cisterns
- Rain gardens
- Porous pavement

Native landscaping
Filter strips

The City will consider alternate designs that provide for improved water quality and/or water quantity reduction. In order to substitute these designs for the minimum standards, documentation must be provided that addresses the alternate's sustainability and long term maintenance requirements. Any alternate design must be approved by the Director of the Department of Public Services with recommendations provided by the City Engineer.

VII.

PAVING AND GRADING

A. GENERAL:

1. All public paving shall conform to the current standards and specifications of the City of Farmington Hills.
2. Where required, the City of Farmington Hills Standard Paving Notes shall appear on the plans.

B. ON SITE:

1. A cross section of all on site paving is required on the plans.

Minimum requirements are as follows:

a) Commercial and Multiple:

3" asphalt on 6" gravel base.
6" concrete

b) Industrial:

4" asphalt on 8" gravel base
8" concrete

These minimum requirements are based on adequate subgrade, subgrade drainage and average live loads. Each site will be examined individually and additional pavement thickness and/or increased base requirements may be necessary.

2. Minimum surface grade for asphalt paving shall be 1.0%. Minimum surface grade for concrete paving shall be 0.6%.

3. Bumper blocks and/or curbs shall be required where in the opinion of the City Engineering Division, the edge elevation of a paved drive or parking lot is of sufficient height above or below adjoining grades, that it creates a hazardous condition.

C. CITY PUBLIC RIGHT-OF-WAY:

1. A cross section of all off-site paving is required. Minimum requirements are dependent on the type of existing pavement as follows:
 - a) Concrete major thoroughfare and collector roads required 8 inches of PC concrete on sand subbase.
 - b) Asphalt major thoroughfare and collector roads require 8 inches of asphalt.
 - c) Concrete local roads generally require 6 inches of PC concrete on sand subbase.
 - d) Asphalt local roads generally require 3 inches of asphalt on an 8" gravel base.
 - e) Requirements for existing gravel roads will be considered on an individual basis by the City Engineering Division.
2. 7" concrete curb and gutter is required on all approaches.
3. Passing lanes, acceleration lanes and tapers, and deceleration lanes and tapers will be required in accordance with the Driveway Improvement Standards of the City of Farmington Hills. If curb is required on the passing acceleration, or deceleration lanes, it shall be 7" concrete curb and gutter.
4. The dedication of the following right-of-way along the frontage of the site to the ultimate requirement for future improvement is requested.

120 feet	-	major thoroughfare
86 feet	-	collector road
60 feet	-	local road
5. All shoulders shall be 8" of 22A gravel, 8 ft. wide on thoroughfares, 4 ft. wide on local roads.
6. Sufficient proposed grades must be given to determine proposed grading of all right-of-way improvements.

D. DRAINAGE IN RIGHT-OF-WAY:

1. Enclosures of drainage ditches across the frontage of the site will generally not be permitted. The City Engineering Division may, however, require the enclosure if adequate controls on pavements and shoulders cannot be maintained and the health, safety and welfare of the general public is endangered.
2. Side slopes on open ditch drainage shall be 3 minimum horizontal to 1 vertical. The ditch bottom shall be 2 feet wide.

E. SIDEWALKS:

1. Sidewalks are required along the frontage of all major and secondary thoroughfares. They shall be located in the right-of-way, one foot from the ultimate right-of-way line.
2. The walk shall be 5 feet wide, constructed of 4 inches of PC concrete on compacted porous subgrade. The walk must be continued through driveway sections where it shall be increased in thickness to 8 inches on major thoroughfares and collector roads and 6 inches in all other instances. Curbs must be tapered to meet the walk. Cross slopes on the sidewalk shall be 1/4 inch per foot toward the street.
3. Proposed grades must be indicated along the property line and of the walk, driveways, and intermittent locations along the length of the walk.
4. Any structures, hydrants, poles, etc. that are existing along the alignment of the walk, must be adjusted or relocated at the expense and coordination of the developer. All sidewalk construction shall be in accordance with Public Act No. 8, 1973 (handicap ramps at intersections).

F. SITE GRADING:

1. Sufficient proposed grades must be indicated on the plan to ensure that:
 - a) drainage is adequately discharged off-site with proper retention.
 - b) no upstream drainage is restricted.
 - c) paving is in accordance with standards outlined herein.
 - d) the site in general drains without standing water.
2. Elevations representing the brickledge, finished grade, and the first floor grade must be indicated.

3. Proposed grading shall meet abutting property line elevations. Differentials in grade must incorporate a minimum 4 horizontal to 1 vertical slope to the abutting property line.
4. Retaining walls are discouraged. Any wall separating a differential grade of more than 12 inches shall be considered a retaining structure and will require a structural engineering design and review.
5. Any site that abuts an open stream/creek that is included in the Oakland County Hydrography Layer shall provide for a 20 foot wide easement (each side) from the top of bank as a natural buffer immediately abutting the water course. The natural buffer shall be restricted to native plants and will not be fertilized. The buffer will not be mowed more than twice a year. The buffer shall be installed and maintained in accordance with an approved landscape plan or Exclusion of the Noxious Vegetation Ordinance. Applications and approvals are available through the City Planning Office.

VIII

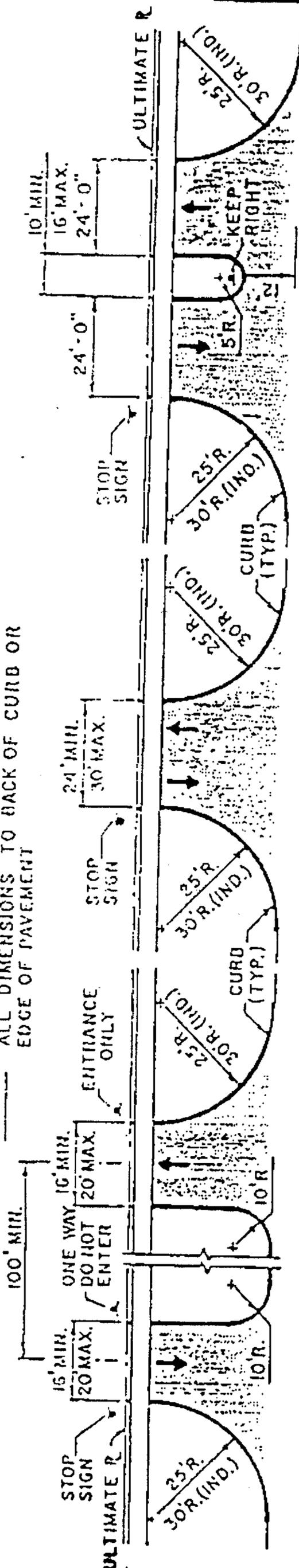
CITY OF FARMINGTON HILLS STANDARD NOTES

1. Notify the City of Farmington Hills Engineering Division (248) 871-2560 a minimum of 48 hours prior to the start of construction.
2. All construction must be conforming to the current standards and specifications adopted by the City of Farmington Hills.
3. Utilities to be underground.
4. Call MISS DIG (1-800-647-7344 / 1-800-MISS DIG) a minimum of 72 hours prior to the start of construction.
5. All soil erosion and silt must be controlled and contained on site.
6. All excavation under or within 3 feet of public pavement, existing or proposed, shall be backfilled and compacted with sand (Class II MDOT).
7. The contractor is responsible for all damage to existing utilities.
8. Prior to the issuance of an occupancy permit, engineering site inspection is required.

DRIVEWAY IMPROVEMENT STANDARDS

COMMERCIAL AND INDUSTRIAL DRIVEWAY IMPROVEMENT STANDARDS-TYPICAL

NOTE: ALL DIMENSIONS TO BACK OF CURB OR EDGE OF PAVEMENT



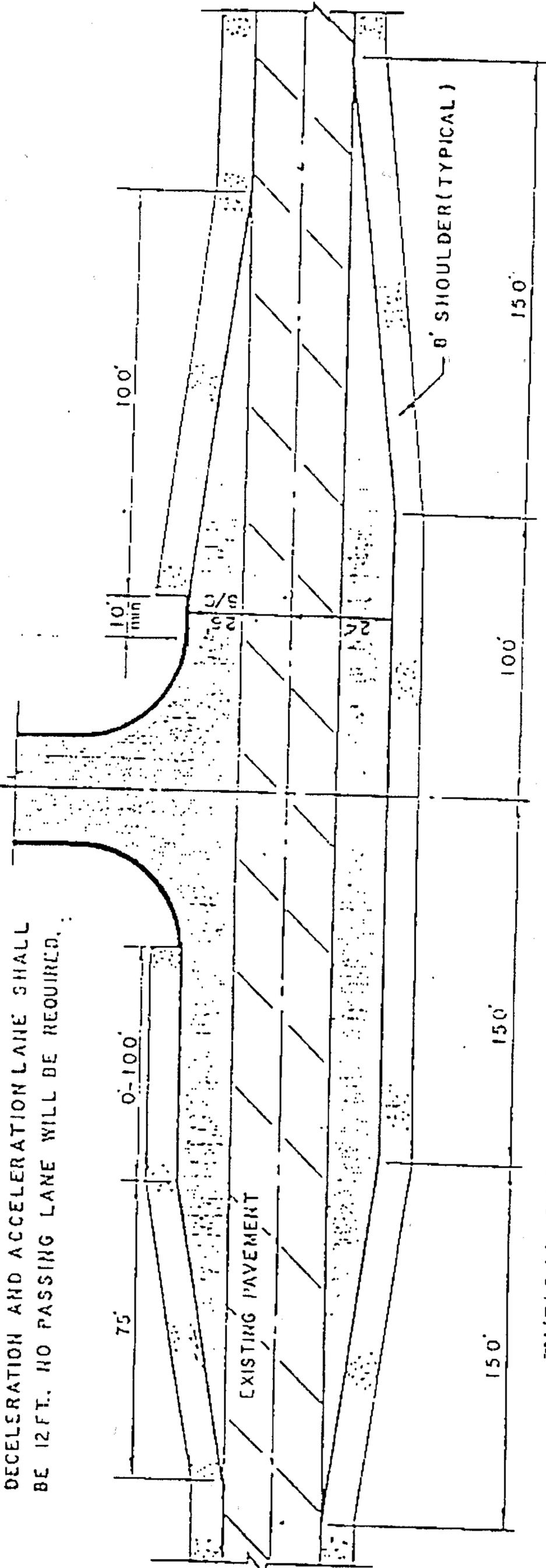
ONE WAY APPROACH

TWO WAY APPROACH

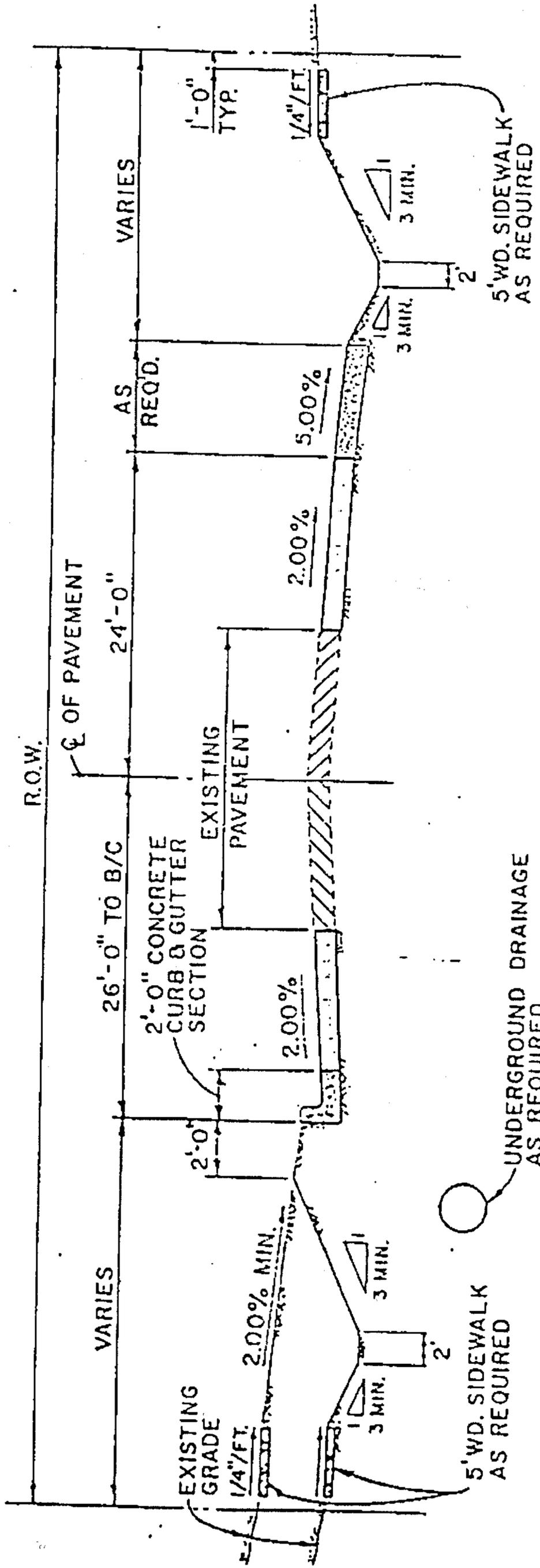
BOULEVARD APPROACH

NOTE: ON A THREE LANE HIGHWAY THE WIDTH OF THE DECELERATION AND ACCELERATION LANE SHALL BE 12 FT. NO PASSING LANE WILL BE REQUIRED.

C. OF INGRESS DRIVE OR STREET



TYPICAL PASSING; ACCELERATION, DECELERATION LANES AND TAPERS



NOTE

CURB & GUTTER IS REQUIRED WITH ENCLOSED DRAINAGE WHEN EXISTING RIGHT OF WAY IS INSUFFICIENT TO ACCOMMODATE THE WIDENING WITH SHOULDER, DITCH DRAINAGE & SIDEWALK CONSTRUCTION

TYPICAL CROSS SECTION

NO SCALE