Department of Public works and Engineering

Office of City Engineer.

Permit and Design related to Public works and Engineering and

Code Enforcement.

Manohar Datta ID-135137.

M.E Civil Engineering.

M. Kumar Arya P.E.

Supervisor

Introduction:

Houston is the largest city in the state of Texas and has the fourth-largest population among cities in the United States. There are many world class Universities and educational Institutions. Houston's energy industry is recognized worldwide particularly for oil and biomedical research, aeronautics, and the ship channel are also large parts of its economic base. With such immense economic activity, there is a requirement for improved infrastructure and City of Houston Public works plays a major role in improving infrastructure .The Importance of a City's local code enforcement program which monitors and enforces a variety of applicable ordinances, codes, and regulations related to zoning, land use, nuisance housing, building codes, traffic, health and safety, water waste, and other matters of public concern; and serves as a resource and provides information on City regulations to property owners, residents, businesses, the general public, and other City departments to ensure the positive growth of property values and a safe, healthy environment to work and live in. The value of Code Enforcement to the community lies in its ability to help maintain the quality of life of residents.

Traffic at Code Enforcement:

The Traffic Department deals with many aspects of a project like driveway permits, Stormwater and Paving permits, checking the grades and survey details to verify land conditions of existing facilities, proposed projects and demolition projects. Permitting of left turn lanes, median opening and oversize loads.
All plans are reviewed, inspected and recorded on the ILMS systems. This involves extensively studying, interpreting of applicable codes and performing calculation to ensure that the work is in compliance with IBC and with the city code of ordinance. Verifying the drainage plan for existing culvert sizes, proposed driveways and suggest replacing all undersized culvert pipes, checking for fences within visibility triangle, responding to public complaints, checking bonds and application for construction documents, perform studies and handle issues related to sidewalk, driveway and traffic, resolve phone inquiries and provide technical assistance with alternative rectification procedures compliant with applicable codes.

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City Of Houston Building Plan requirements.

Building Plan Reviews are based on the specified edition of the International Building Code and COH Ordinance. In order to perform a thorough Building Plan Review, the following specifications, drawings and details is required:

- Complete signed architectural plans, structural plans and material specifications of all work.
- A site plan including the following information:
  a. Size and location of all new construction and all existing structures on the site.
  b. Distances from lot lines.
  c. Established street grades and proposed finish grades.
- Architectural plans and specifications to include:
  a. Description of uses and the proposed use group(s) for all portions of the building.
  b. Proposed type of construction of the building.
  c. Fully dimensioned drawings to determine areas and building height.
  d. Adequate details and dimensions to evaluate means of egress, including occupant loads for each floor, exit arrangement and sizes, corridors, doors, stairs, etc.
  e. Exit signs/means of egress lighting, including power supply.
  f. Accessibility scoping provisions.

g. Description and details of proposed special occupancies such as a

covered mall, high-rise, mezzanine, atrium, public garage, etc.

h. Adequate details to evaluate fire resistive construction requirements, including data substantiating required ratings.

i. Details of plastic, insulation, and safety glazing installation.

j. Details of required fire protection systems.

- Structural plans, specifications, and engineering details to include:

a. Soils report indicating the soil type and recommended allowable bearing pressure and foundation type.

b. Signed structural design calculations which support the member sizes on the drawings.

c. Local design load criteria, including: frost depth; live loads; snow loads; Wind loads; earthquake design data; other special loads.

d. Details of foundations and superstructure.

e. Provisions for required special inspections.

f. Applicable construction standards and material specifications (I.e. masonry,concrete, wood, steel, etc).

DRIVEWAYS, SIDEWALKS, PARKING LOTS AND ALLEYS

Traffic enforces the following regulations governing the design and construction of driveways, sidewalks, parking lots and alleys. Construction or repair of any sidewalk, driveway, curb or gutter is done in accordance to this.

Driveway approval:

Upon receipt of an application for a driveway permit, the building official refers the same to traffic, which makes a determination, pursuant to the guidelines set out in the City Code Chapter 31 0f 2003 amendment to IBC, as to whether the driveway applied for is necessary to provide reasonable access to the private property consistent with the safety and convenience of the public. After determining that the plans comply with all applicable codes and ordinances, the plan is approved. If a proposed construction of driveways, sidewalks, parking lots and alleys into or abutting state highways and freeway frontage roads the City requires TXDOT approval.

Standards for design and construction

Plot plan:

A complete site plan should be prepared to a reasonable scale and submitted to Traffic at The Department of Public Works and Engineering showing the following information:

1. All right-of-way lines and property lines that bound the property planned for improvement.
2. Width and design of all existing driveways, sidewalks, and median openings as they exist on the ground.

3. Existing conditions between the right-of-way line and the traveled roadway, including curbs, ditches, storm sewer inlets, manholes, utility poles, fire hydrants, trees, etc. If median islands exist, the next median opening on each side of the property.
4. If open ditches exist, the diameter size of the nearest existing culvert pipe upstream and downstream.
5. The complete intersection when property planned for improvement fronts a "T" intersecting street.
6. All existing on-site conditions with dimensions when property is being improved with add-on construction, remodeling, accessories, repairs, erection of building parking lots or any other improvements.
7. Proposed parking lot layout showing the number of stalls, aisle width, general vehicular circulation pattern, and a chart illustrating the proposed means of compliance with the required parking standards and loading berths as specified by the City Code.
9. Existing parking lot layout showing the number of parking stalls, aisle width and general vehicular circulation pattern.

Sidewalks: Sidewalks should be constructed along all major thoroughfares, both existing and new, abutting the property being developed under the following circumstances:

1. The property's frontage spans an entire block;
2. Sidewalks exist on any adjacent property;
3. The property has more than 125 feet of total street frontage; or
4. The property is located with in the 610 Loop, state highways and freeway frontage roads within the jurisdiction also fall within the scope of this requirement. When ever the above requirement is determined that it is technically or otherwise infeasible to comply or when the property is situated in a planned community in which alternative pedestrian trails or passage ways are provided in lieu of sidewalks.

Loading berth. In no case a "back-in" loading berth is constructed on major thoroughfares where the vehicle will use the major thoroughfare for maneuvering purposes. Where off-street "back-out" loading berths is constructed, the loading area should be sufficiently designed and constructed to store the commercial motor vehicle, truck-tractor, tractor, trailer or semi trailer or combination of such vehicles within private property, and no part of the vehicle should protrude over the property. The depth of the loading berth from the right-of-way line extending into the private property is determined based on the types of commercial vehicles using the facility.

Street curb and gutter replacement.

Where construction of driveways and sidewalks will require the removal and replacement of curb and gutter over a continuous run in excess of 25 percent of any one block, a plan should be submitted showing the following on the plans:

1. A continuous profile plotted to a scale of 1 inch equals 2 feet horizontally, containing all the existing and proposed profiles necessary for reviewing. The proposed gutter grade should meet the following minimum design criteria:

2 Minimum gutter grade, except at corner curb returns, is to be 0.3 percent (3-inch fall per 100 feet).

3. Minimum gutter grade around corner curb returns is to be 1.00 percent (Example: 22-foot fall around 14-foot radius).

   A vertical curve with elevations given every 10 feet will be required where the algebraic difference of the proposed gutter grades exceeds 1.00 percent other than at corner curb radius grades.

4. Construction details for replacing curb and gutter and/or base should be provided when it is necessary to remove same for realignment of curb and gutter horizontally or vertically.Method of the tie of proposed curb and gutter and/or base to existing pavement, with or without reinforcing steel, is given in detail. In order to provide adequate cross-slope drainage on asphalt streets, Type F asphalt must be feathered toward the crown of the street.

   A minimum 1/4 inch per foot slope will be required when raising proposed gutter above existing gutter line.

5 Curb cuts and curb penetrations are prohibited excepted when specifically approved by the Office of the City Engineer.

Alley paving. The requirements for paving a public alley are identical to those for paving a public street. Plan-profile type of drawings prepared by a licensed professional engineer in the State of Texas and approved by all appropriate jurisdiction departments are required.. A separate paving permit is issued by the jurisdiction's Department of Public Works and Engineering and a separate paving bond is required prior to any construction.

Culvert pipes.

Pipe sizes. No culvert pipe of a diameter less than the inside diameter of the nearest upstream culvert pipe can be installed. In no case will a culvert pipe of less than 24-inch inside diameter be allowed. Culverts is installed in such a manner as to not impede or obstruct ditch drainage. When connecting a drain line into a culvert pipe a Type D or Type D-1 inlet shall be constructed.

New long run culvert pipe. Any culvert pipe in excess of the normal maximum 40-foot-wide driveway culvert,should follow the procedure mentioned below.

A plan-profile type drawing prepared by an engineer licensed in the State of Texas will be submitted to the jurisdiction's Office of the City Engineer in the Department of Public Works and Engineering for determination of the number and locations of Type D or D-1 inlets. The licensed engineer will have to certify that the installation of the long run culvert pipe will not have any negative impact to upstream and

downstream conditions and shall demonstrate that a positive impact will be achieved due this application. The drawing shall include the size, material and gradients required for the culvert installation. The drawing shall also include all driveways and concrete curbed islands. A distance of at least 10 feet must be allowed between the abutting property and the nearest driveway. The space may be open ditch or curbed island. A permit issued by the jurisdiction's Office of the City Engineer in the Department of Public Works and Engineering will be required after the drawing is accepted in the file room of the Department of Public Works and Engineering. The approved permit will be forwarded to the Construction Service Section of Office of the City Engineer in the Department of Public Works and Engineering for inspection.

Existing long run culvert pipe. Whenever a permit is sought for property having existing culvert pipe in excess of 40 feet without Type D or D-1 inlets as required by this section, such permit is not be issued without the construction of Type D or Type D-1 inlets. Stormwater discharging from a ditch into a storm sewer system must be received by use of an appropriate structure. The owner of the property may remove the existing culvert pipe in excess of 40 feet and return the ditch to its original condition in lieu of the installation of concrete curbed islands and Type D or Type D-1 inlets.

Parking lot design.

When an area is being developed for parking, a plan is to be prepared and submitted to the building official showing the boundary, entrances and exits, geometric layout of parking stalls and aisles, operating plan, drainage, and surfacing or paving. The area being developed for parking should be surfaced with materials that will not permit wind or waterborne erosion from the area.

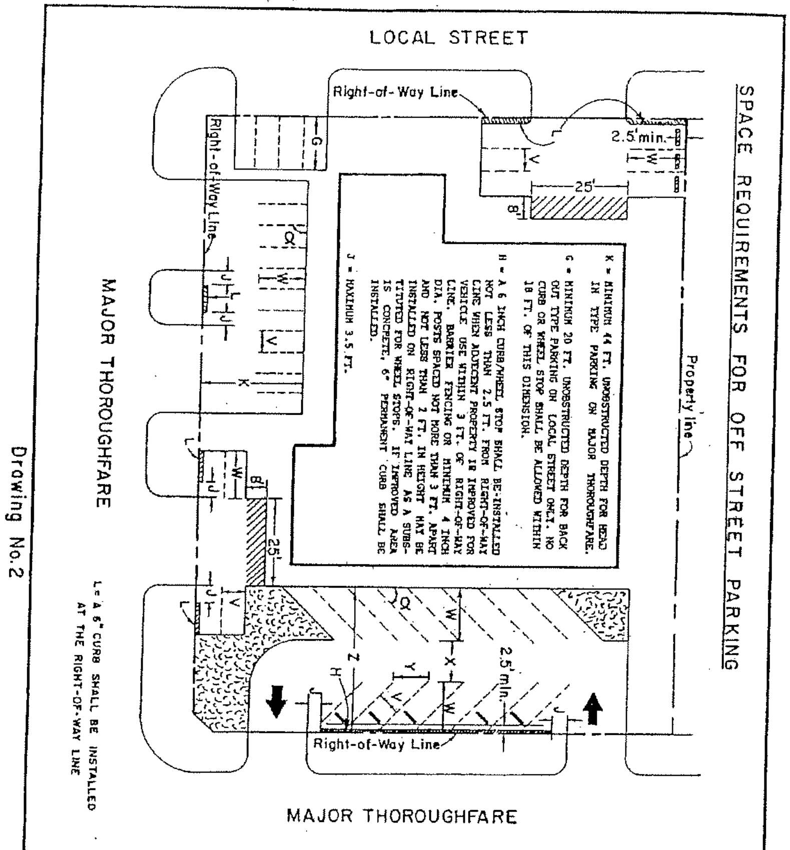
Exiting from lot. When the parking lot is designed to create a one-way aisle operation, an exit shall be provided to enable the vehicle exiting to enter the street in a head-out position.

Wheel stops. A 6-inch curb/wheel stop is installed not less than 2.5 feet from the right-of-way line when property is improved for vehicle use within 3 feet of the right-of-way line. Barrier fencing or minimum 4-inch-diameter posts spaced not more than 3 feet apart and not less than 2 feet in height may be installed on the right-of-way line as a substitute for wheel stops. If the improved area is concrete, a permanent 6-inch curb shall be installed in lieu of wheel stops.

Drainage. Paved areas (including alleys), yards, courts and courtyards should be drained into a storm sewer system where such systems are available; otherwise, they are to be drained to a place of disposal approved by the jurisdiction's Office of the City Engineer in the Department of Public Works and Engineering. Storm water drainage shall not discharge or flow over any public sidewalk or adjoining property.

SPECIAL CONSTRUCTION

DRAWING 31-2



α Angle of Parking	V Width of Stall	W Depth of Stall 90° to Aisle	X Width of Aisle	Y Width of Stall Parallel to Aisle	Z Width for 2 Rows & Aisle
45°	8.5	19.4	13.5	12.0	52.4
60°	8.5	20.7	18.5	9.8	59.9
75°	8.5	20.6	20.8	8.8	61.9
90°	8.5	190	25.0	8.5	63.0
45°	9.0	19.8	13.0	12.7	52.6
60°	9.0	21.0	18.0	10.4	59.9
75°	9.0	20.7	20.0	9.3	61.4
90°	9.0	19.0	24.0	9.0	62.0
45°	9.5	20.2	13.0	13.4	53.3
60°	9.5	21.2	18.0	11.0	60.4
75°	9.5	20.8	20.0	9.8	61.6
90°	9.5	19.0	240	9.5	62.0

Table - Minimum Dimensions For Aisles And Stalls

SPACE FOR COMPACT CARS - 7.5'X17' FOR 90° PARKING

CITY OF HOUSTON

SPACE REQUIREMENTS FOR OFF STREET PARKING

Approved [signature] Dept. of Traffic and Transportation

Date: May 85 Scale: None File: 2157
Rev.: 11/3/95 / 12/3/99

DRAWING 31-2

Storm water design: Determination of Run-off.

1. Design Storm Events.

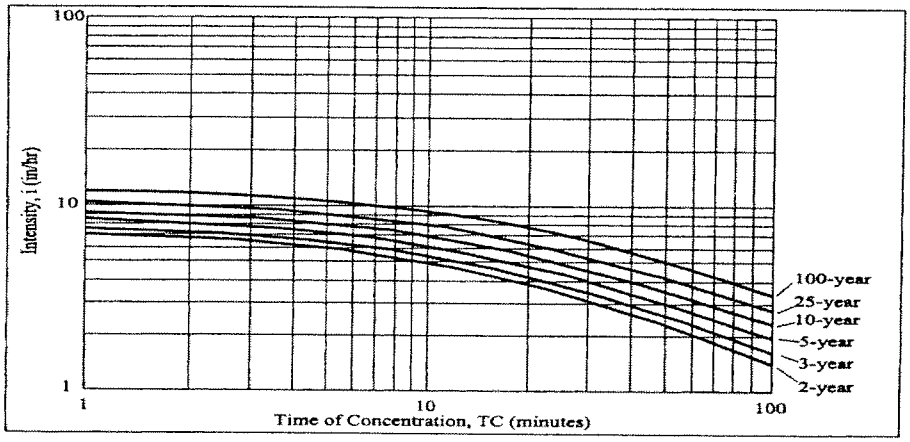
a. Rainfall Duration:

(1) For design purposes, the rainfall duration for drainage areas less than 200 acres will be no less than 3 hours in duration.

(2) For design purposes, the rainfall duration for drainage areas more than 200 acres will be no less than 6 hours in duration. b. Intensity-duration Curves. The chart below depicts the intensity-duration curves to be used for storm sewer and roadside ditch design in the city of Houston

FIGURE 9.1

City of Houston IDF Curves
Intensity vs. Time of Concentration vs Rainfall Frequency
Source: Hydro 35/TP-40



$$i = \frac{b}{(d+TC)^{e}}$$

$$TC = 10A^{0.1761} + 15$$

A = area in acres

Rainfall Frequency	b	d	e
2-year	75.01	16.2	0.8315
3-year	77.27	17.1	0.8075
5-year	84.14	17.8	0.7881
10-year	93.53	18.9	0.7742
25-year	115.9	21.2	0.7808
100-year	125.4	21.8	0.7500

2. Application of Run-off Calculation Models.

a. Rational Method: The rational method will be used for design on areas served by storm sewers up to 600 acres in size and for areas served by roadside ditches up to 500 acres in size.

b. Rainfall Run-off Modeling: Rainfall run-off modeling will be applied to areas greater than 500 acres in size that are drained by an open channel. Rainfall run-off modeling can be used for modeling of storm sewer areas greater than 600 acres provided the model considers the storage and ponding in streets. If the modeling is associated with establishing a flood-prone area for purposes of

3. Coefficients for the Rational Method.

a. Calculation of Run-off Coefficient.

(1) The run-off coefficient C values in the rational method formula will vary based on the land use. Land use types and C-values which can be used are as follows:

Land Use Type	Run-off Coefficient (C)
Residential Districts	
Lots more than 1/2 acre	0.35
Lots 1/4 - 1/2 acre	0.45
Lots less than 1/4 acre	0.55
Multi-Family areas	
Less than 20 Service Units/Acre	0.65
20 Service Units/Acre or Greater	0.80

Business Districts	0.80
Industrial Districts	
Light Areas	0.65
Heavy Areas	0.75
Railroad Yard Areas	0.30
Parks/Open Areas	0.18

(2) Alternatively, the run-off coefficient C in the rational method formula can be calculated from the equation:

$C = 0.6la + 0.2$

Where: C = watershed coefficient

la = impervious area/total area

b. Determination of Time of Concentration

Time of concentration can be calculated from the following formula:

$TC = 10A_{0.1761}+15$

Where: TC = time of concentration (minutes)

A = subarea (acres)

Use the following equations to calculate the required outflow orifice:

$Q = CA$

$D = Q_{1/2}/ (2.25\ h_{1/4})$

Where:

Q = outflow discharge (cfs)

C = coefficient of discharge

= 0.8 for short segment of pipe

= 0.6 for opening in plates, standpipes, or concrete walls

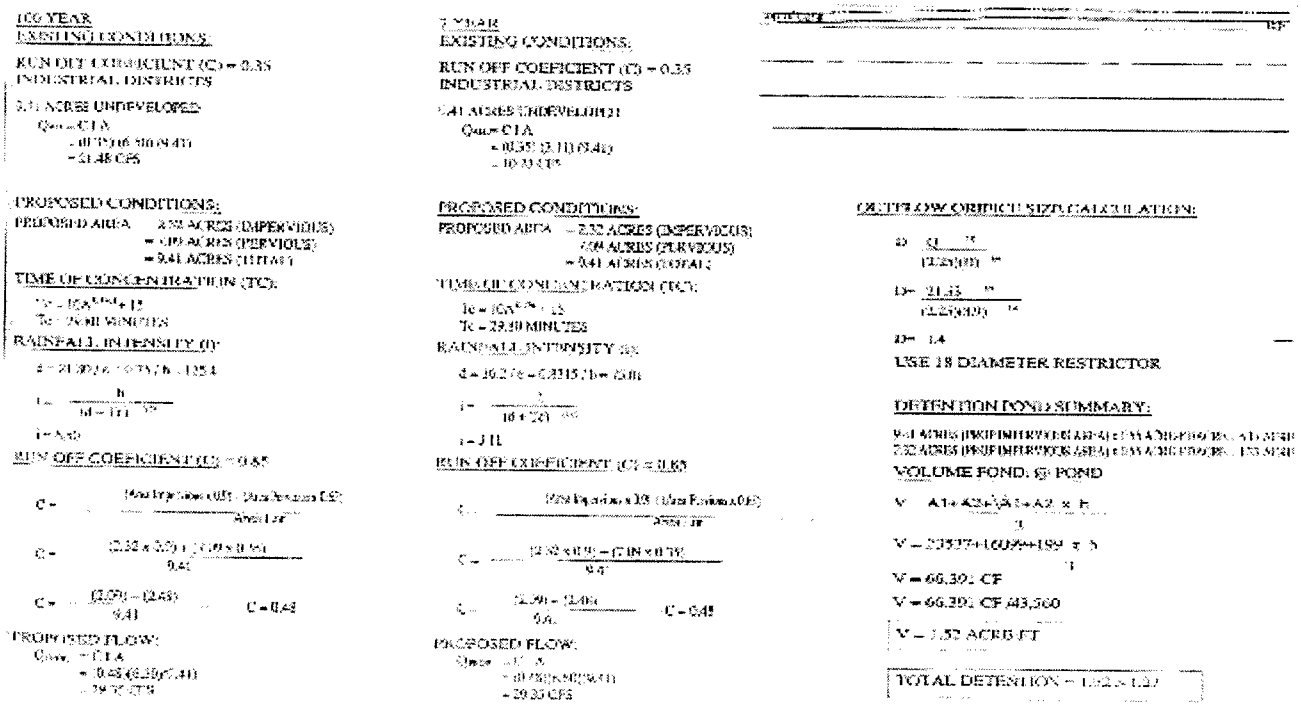
A = orifice area (square feet)

g = gravitational factor (32.2)

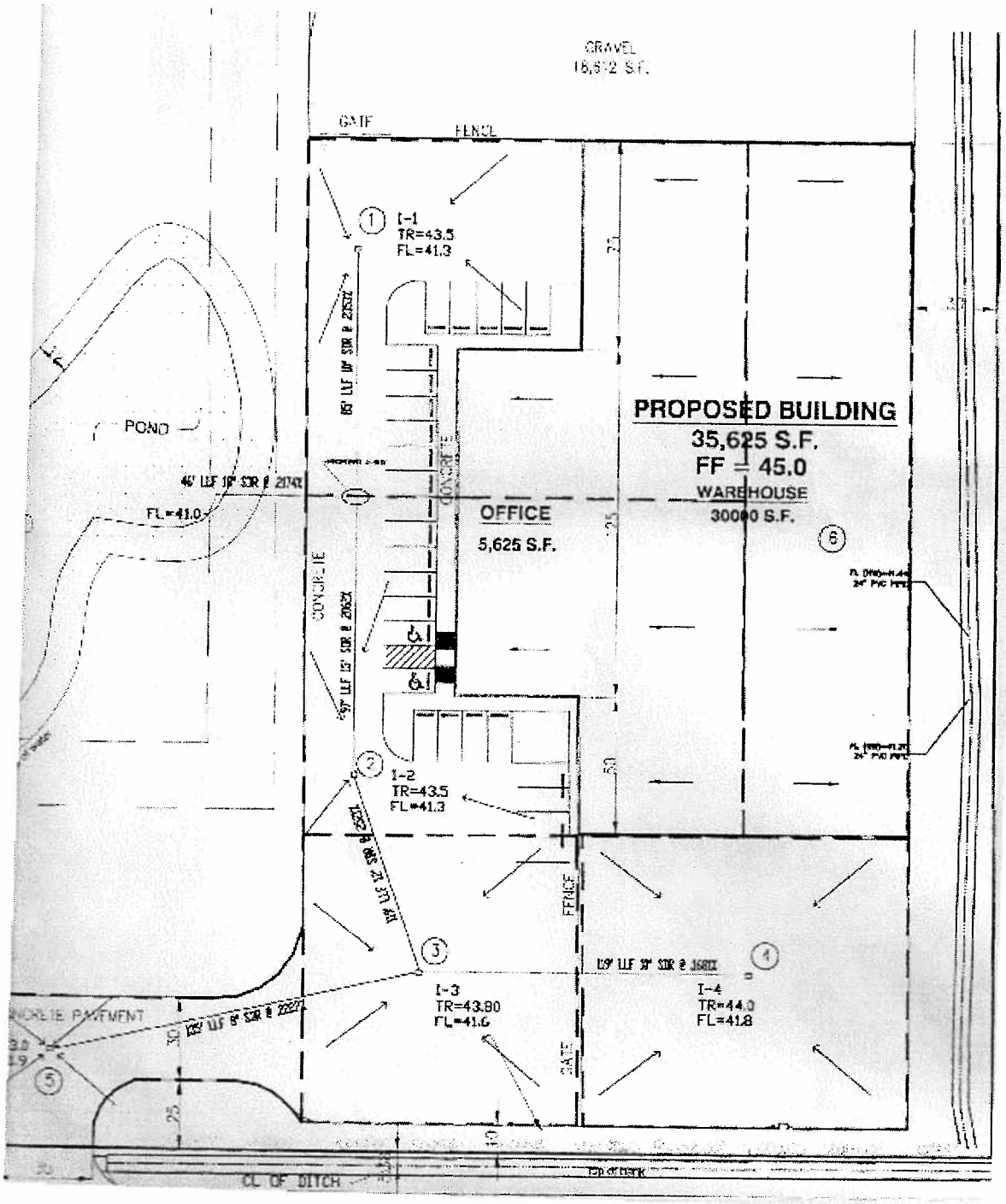
h = head, water surface differential (feet)

D = orifice diameter (feet)

An example of Storm water design calculation.



Permit and Design related to Public works and Engineering and Code Enforcement.



DRAINAGE CALCULATIONS

Upstream Node	Downstream Node	Length (ft)	Upstream Inlet Area (acres)	Upstream Inlet Rational Coefficient	Upstream Inlet CA (acres)	Upstream Calculated System CA	Upstream Inlet Rational Flow (cfs)	Section Size	Full Capacity (cfs)	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	System Rational Flow (cfs)	System Intensity (in/hr)
I-1	J-1	35	0.47	0.8	0.38	0.38	1.35	10 inch	1.38	2.43	41.3	41.1	0.002353	1.35	3.57
J-1	OUTFALL	46	N/A	N/A	N/A	1.28	N/A	18 inch	6.37	3.89	41.1	41	0.002174	4.4	3.41
I-5	I-3	135	0.12	0.85	0.11	0.11	0.39	8 inch	0.74	2.14	41.9	41.6	0.002222	0.38	3.63
I-4	I-3	119	0.28	0.85	0.24	0.24	0.86	10 inch	1.17	2.34	41.6	41.6	0.001681	0.86	3.55
I-3	I-2	119	0.24	0.85	0.2	0.55	0.73	12 inch	2.33	3.31	41.6	41.3	0.002521	1.93	3.49
I-2	J-1	97	0.44	0.8	0.35	0.9	1.27	15 inch	3.51	3.47	41.3	41.1	0.002062	3.13	3.44
ROOF	N/A	N/A	N/A	0.75	0.33	N/A	N/A	N/A	N/A		N/A	N/A	0.002	0.99	3.53

STORM SEWER NOTES:

HDPE MAY BE USED IN LIEU OF SDR-35 IF INSTALLED PER MFG INSTRUCTIONS AND 1.0 FT. MIN COVER IS PROVIDED.

Permit and Design related to Public works and Engineering and Code Enforcement.

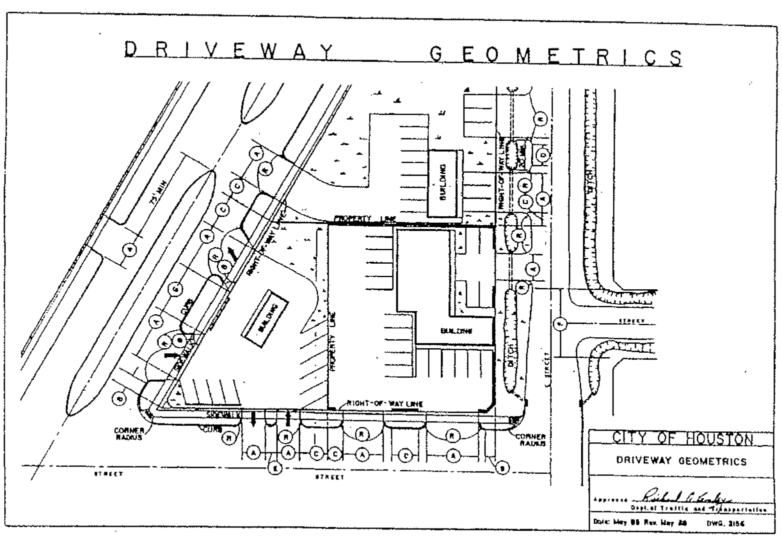
Notes to Drawing 31 1

		RESIDENTIAL	ALL OTHERS
Dimension ◯—	Driveway Width: (1), (2) one - way two - way	 10'-?' min. - 20' max. 12' min. - 24' max.	 15' min. - 20' max. 24' min. - 35' max.
Dimension ◯—	corner row line (3)	20' min.	30' min.
Dimension ◯—	side property line (3)	- R min.	R min.
Dimension ◯	two-way (3)	N/A	10' min.
Dimension ◯—	one-way (perpendicular)	20' min. (4)	5' min. 20' max.
Dimension ◯—	one-way (angular)	20' min.	30' min.
Dimension ◯—	**Driveway Radius**	24' min. 15' max.	10' min. 45 25' max.
Dimension ◯—	**Minimum Angle** (4)	45 deg.	45 deg.

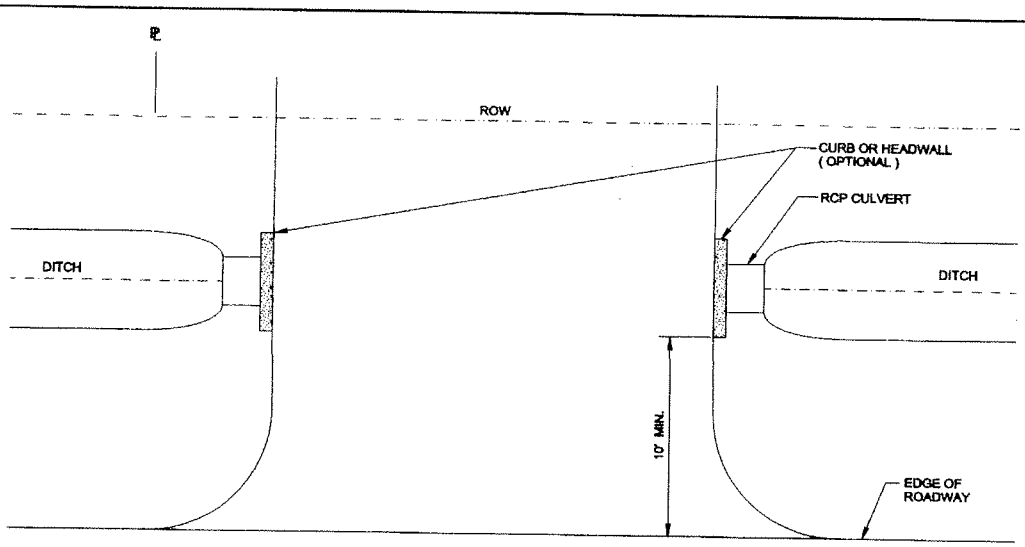
Dimension ◯— Driveway opening shall not be permitted withing the limits of any intersection with the exception that special consideration will be given to major thoroughfare with existing esplanades and streets primarily used for residential use.

1. Where off-street "back-in" type truck loading docks/wells are constructed on local streets, the width of the driveway opening may be increased to a maximum of 50 feet.
2. The two sides of a driveway shall be parallel within the right-of-way limits.
3. In no case shall the driveway radius encroach on abutting property or corner radius.
4. Driveways may be skewed at those locations where streets are one way or divided without median opening.

DRAWING 31-1

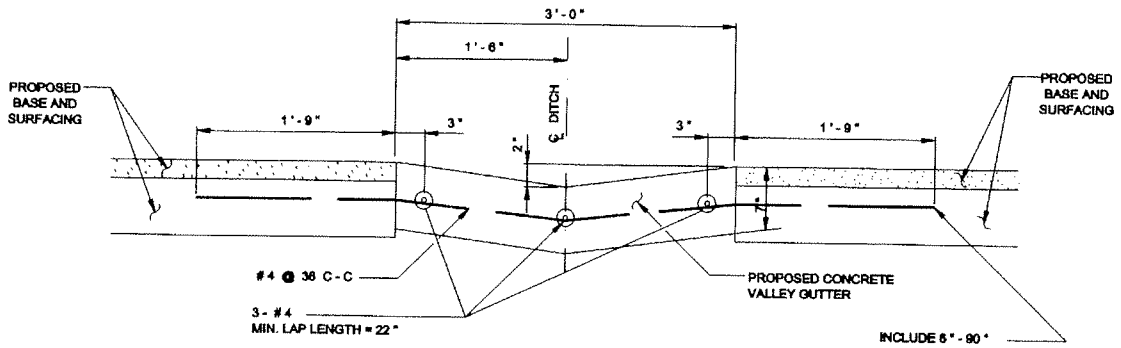


99999



STANDARD OPEN DITCH DRIVEWAY - PLAN

NTS

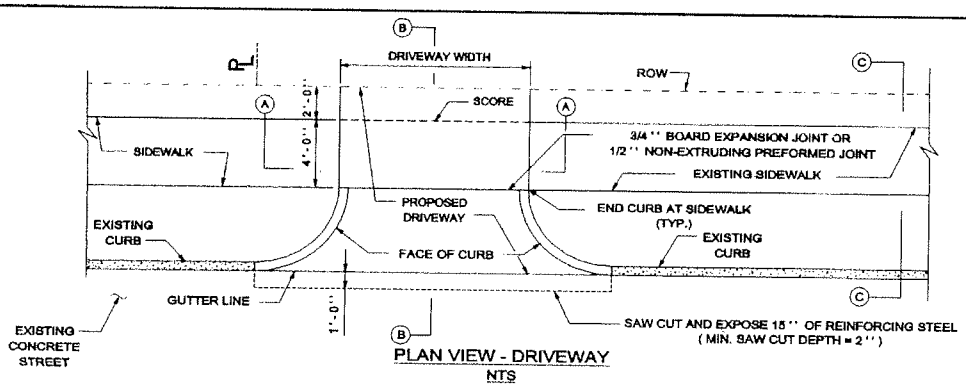


STANDARD CONCRETE VALLEY GUTTER SECTION

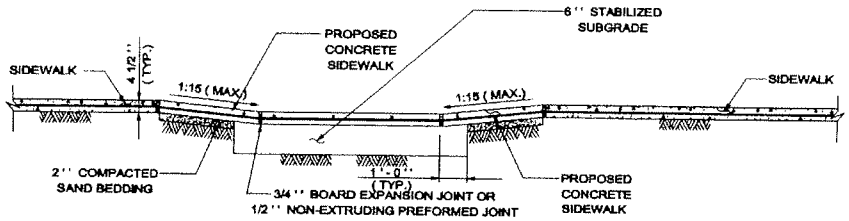
NTS

1. REINFORCED CONCRETE PIPE (RCP) CULVERTS AND CONCRETE VALLEY GUTTER GRADES SHALL BE SET BY CITY ENGINEER. PROFILE SHOWING THE PROPOSED AND EXISTING DITCH FLOWLINE WILL BE REQUIRED WHERE CONCRETE VALLEY GUTTERS ARE TO BE CONSTRUCTED IN LIEU OF CULVERTS.
2. CULVERT SIZE WILL BE APPROVED BY CITY ENGINEER WITH 18 " DIAMETER MINIMUM.
3. SPACING OF TYPE " D " OR " D - 1 " INLETS SHALL BE DETERMINED BY CITY ENGINEER. SEE DRAWING NO. 02632 - 07 FOR TYPE " D " OR DRAWING NO. 02632 - 08 FOR TYPE " D - 1 ".
4. DRIVEWAY MAY BE CONCRETE, ASPHALT OR ANY OTHER MATERIAL WHICH WILL NOT PERMIT WIND OR WATERBORNE EROSION.
5. A 3 - FOOT CONCRETE VALLEY GUTTER SECTION SHALL BE CONSTRUCTED THROUGH THE PROPOSED DRIVEWAY WHERE THE CITY ENGINEER DETERMINES THE INSTALLATION OF DITCH CULVERTS TO BE IMPRACTICAL DUE TO INSUFFICIENT DEPTH. THE VALLEY GUTTER SECTION WILL BE CONSTRUCTED OF 5 - 1 / 2 SACK CEMENT PER CUBIC YARD OF CONCRETE.

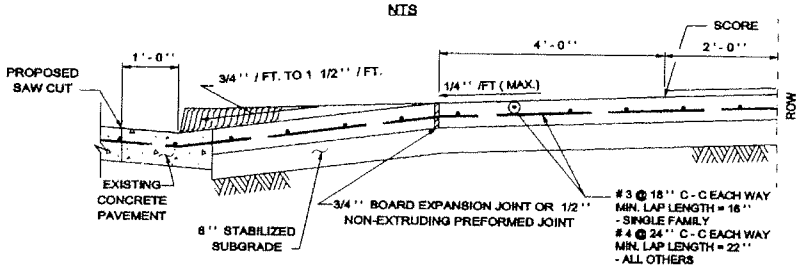
CITY OF HOUSTON DEPARTMENT OF PUBLIC WORKS AND ENGINEERING	
DRIVEWAYS WITH CULVERTS OR VALLEY GUTTERS ON OPEN DITCH TYPE STREETS	
APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
DATE: 05 - 23 - 03	
DWG NO: 02754 - 02	DWG NO: 17201 - 2 (BUILDING CODE)



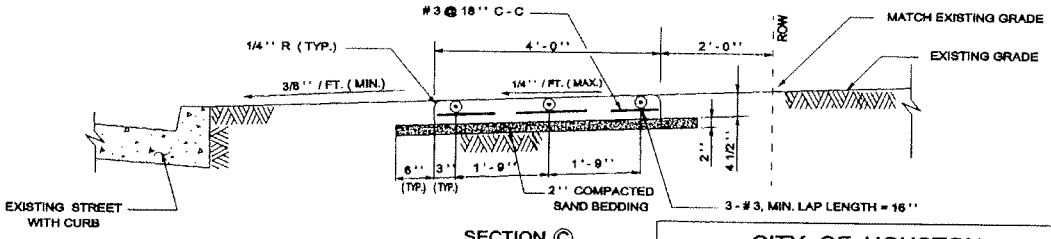
PLAN VIEW - DRIVEWAY
NTS



SECTION Ⓐ
PROPOSED SIDEWALK THROUGH DRIVEWAY
WITH EXCESSIVE ELEVATION DIFFERENCE
WITH EXISTING SIDEWALK
NTS



SECTION Ⓑ
TYPICAL DRIVEWAY SECTION
NTS



SECTION Ⓒ
TYPICAL SIDEWALK SECTION
NTS

NOTES:

1 - DRIVEWAYS SHALL BE 6" THICK FOR SINGLE FAMILY USE AND 7" THICK FOR ALL OTHERS (I. E. COMMERCIAL, INDUSTRIAL, ETC.)
2 - DRIVEWAYS AND SIDEWALKS SHALL BE CONSTRUCTED WITH PORTLAND CEMENT CONCRETE AND INCLUDE 5 - 1/2 SACKS OF CEMENT PER CUBLIC YARD OF CONCRETE.
3 - 6 X 6 - W 2.9 X W 2.9 WELDED WIRE FABRIC MAY BE USED IN LIEU OF THE REINFORCING STEEL.
4 - EXPANSION & CONSTRUCTION JOINTS ALONG SIDEWALKS SHALL BE ACCORDING TO DRAWING NO. 02752-02

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

REINFORCED CONCRETE
DRIVEWAY AND SIDEWALK DETAILS
ON CURBED TYPE STREETS

APPROVED BY:	APPROVED BY:
CITY ENGINEER	DIRECTOR OF PUBLIC WORKS AND ENGINEERING

DATE: 05 - 23 - 03

DWG NO: 02754 - 01 | DWG NO: 17201-1 (BUILDING CODE)