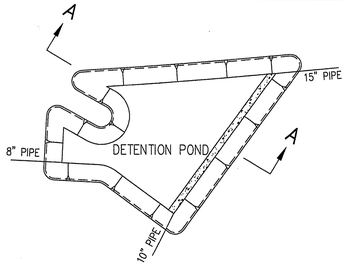
CITY OF HOUSTON DETENTION CALCULATION

TOTAL SITE ACREAGE = 0.9401 AC.
EXISTING IMPERVIOUS ACREAGE = 0.0595 AC.
PROPOSED IMPERVIOUS ACREAGE = 0.5021 AC. (proposed parking & building)
INCREASE OF IMPERVIOUS ACREAGE = 0.5021 – 0.0595 = 0.4426 AC.
STORAGE COEFFICIENT Cs = 0.50 Ac.Ft./Ac.
DETENTION REQUIRED:
0.4426 Ac. X 0.50 Ac.Ft./Ac. = 0.2213 Ac.Ft. = 9,640 Cu.Ft.

DET. VOL. REQUIRED = 0.2213 AC–FT

CALCULATION OF DETENTION VOLUME PROVIDED



TOP OF WATER ELEV. = 31.70'
AREA AT TOP OF POND = 5,589 SQ.FT.
AREA AT BOTTOM OF POND = 3,033 SQ.FT.
AVG. DEPTH = 2.50 FT.
DETENTION VOLUME PROVIDED BY POND = 10,778 CO.FT. = 0.2474 AC–FT

DET. VOL. PROVIDED = 0.2474 AC–FT

> 0.2213 ac.–ft. (required) O.K.

RESTRICTOR SIZING:

FROM CITY OF HOUSTON DESIGN MANUAL
– STORM WATER DESIGN REQUIREMENT
The reducer or restrictor will be sized for undeveloped rate of discharge at no greater than 0.5 cubic feet per second per acre.

$Q = C A\sqrt{2gh}$

$A = \frac{Q}{C\sqrt{2gh}}$

Q = Outflow discharge in cfs
C = 0.8
A = Restrictor x–sec. area, ft
h = Head, ft.
g = 32.2 ft/sec²

Allowable Q = 0.5 cfs per acre
h = 31.70' – 28.89' = 2.81'

$A = \frac{0.5 \text{ cfs/ac.} \times 0.9401 \text{ ac.}}{0.8 \times \sqrt{2 \times 32.2 \times 2.81}}$

= 0.0437 ft²

d = Dia. of restrictor = 0.24'

USE MINIMUM RESTRICTOR SIZE OF 6"

Storm Sewers Calculation

BASE ON CITY OF HOUSTON DESIGN MANUAL
2–YEAR RAINFALL FREQUENCY

Total Drainage Area = 0.9401 Acre
From City of Houston Design Manual 2–year Rainfall Frequency
Time of Concentration :

$TC=10A^{0.1761}+15=10x0.9401^{0.1761}+15= 24.89$ minutes

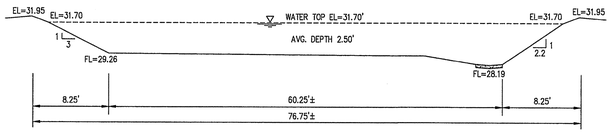
Rainfall Intensity :

$I=\frac{b}{(d+TC)^e} = \frac{75.01}{(16.2+24.89)^{0.8315}} = 3.41$ in/hr

Run–off Coefficient :
For Business Districts C=0.8

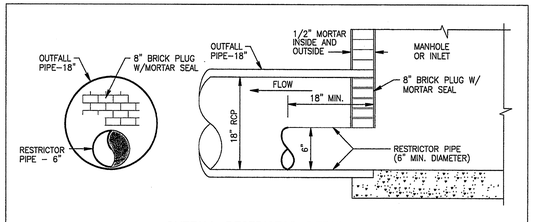
STORM SEWER CALCULATION FORM
STORM SEWER COMPUTATION FOR 2–YEAR FREQUENCY RAINFALL
b = 75.01 d = 16.2 e = 0.8315

AREA NO.	FROM INLET	TO INLET	AREA	TOTAL AREA	C	TC	I	Q	PIPE SIZE	GRADE %	CAPACITY Q	VELOCITY V
1	A1	A2	0.1012	0.1012	0.8	24.89	3.41	0.27	8" HDPE	0.64	1.05	3.00
2	A2	A3	0.1116	0.2128	0.8	24.89	3.41	0.58	8" HDPE	0.64	1.05	3.00
3	A3	A4	0.1428	0.3556	0.8	24.89	3.41	0.97	10" HDPE	0.48	1.64	3.02
4	A4	POND	0.1716	0.5272	0.8	24.89	3.41	1.44	10" HDPE	0.48	1.64	3.02
5	ROOF	POND	0.1941	0.1941	0.8	24.89	3.41	0.53	8" HDPE	0.64	1.05	3.00
6	POND	JB1	0.2188	0.9401	0.8	24.89	3.41	2.56	15" HDPE	0.28	3.70	3.02
7	JB1	A5	0	0.9401	0.8	24.89	3.41	2.56	18" RCP	0.26	5.36	3.03
8	A5	EXIST. INLET	0	0.9401	0.8	24.89	3.41	2.56	18" RCP	0.26	5.36	3.03
9	EXIST. INLET	EXIST. MH	0	0.9401	0.8	24.89	3.41	2.56	18" RCP	0.26	5.36	3.03

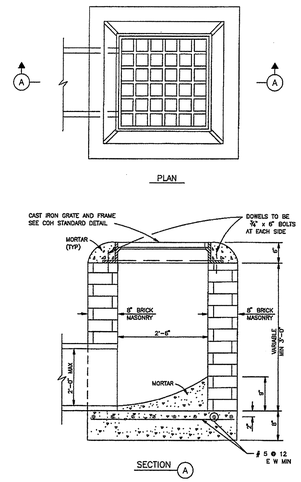


SECTION A–A

DETENTION POND CROSS–SECTION
NOT TO SCALE



OUTFALL RESTRICTOR DETAIL
N. T. S.



CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE DIVISION

STORM SEWER
TYPE "A" GRATE INLET
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER | APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: OCT–01–2002 DWG NO: 02632–01

NOTES:
1. DETAIL TO BE USED WHERE STORM SEWER SIZE IS 24" DIA OR LESS.
2. FOR SEWERS GREATER 24" DIA USE TYPE "C "MANHOLE.

NOTES TO SPECIFIER:
1. *WALLS TO BE 4" CONCRETE (WALLS TO BE 8" THICK IF CONSTRUCTED OF BRICK).*
2. *NOT TO BE USED IN STREET. FOR AREA BETWEEN CURB AND PROPERTY LINE ONLY.*

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE DIVISION

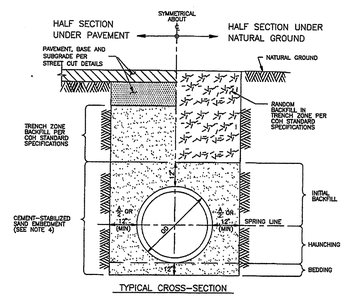
STORM SEWER
JUNCTION BOX WITH LID
OR GRATE TOP FOR A MAXIMUM
OF 24" DIAMETER STORM SEWER
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER | APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: OCT–01–2002 DWG NO: 02081–06

NOTES:
1. THIS DETAIL MAY BE USED ONLY FOR DRY STABLE TRENCH CONDITIONS PER COH STANDARD. SEE COH STANDARD SPECIFICATION FOR REQUIREMENTS IN OTHER CONDITIONS.
2. MIN TRENCH WIDTH SHALL BE PIPE OD PLUS AN ALLOWANCE "A" FOR THE NOMINAL PIPE SIZE:

NOMINAL PIPE SIZE	"A"
18" TO 30"	24"
OVER 30"	36"

3. MAX TRENCH WIDTH SHALL BE NOT GREATER THAN MIN TRENCH WIDTH PLUS 24 INCHES, UNLESS OTHERWISE NOTED.
4. ALTERNATIVE EMBEDMENT BACKFILL MATERIALS FOR FORCE MAINS MAY BE ALLOWED. SEE COH STANDARD SPECIFICATIONS.

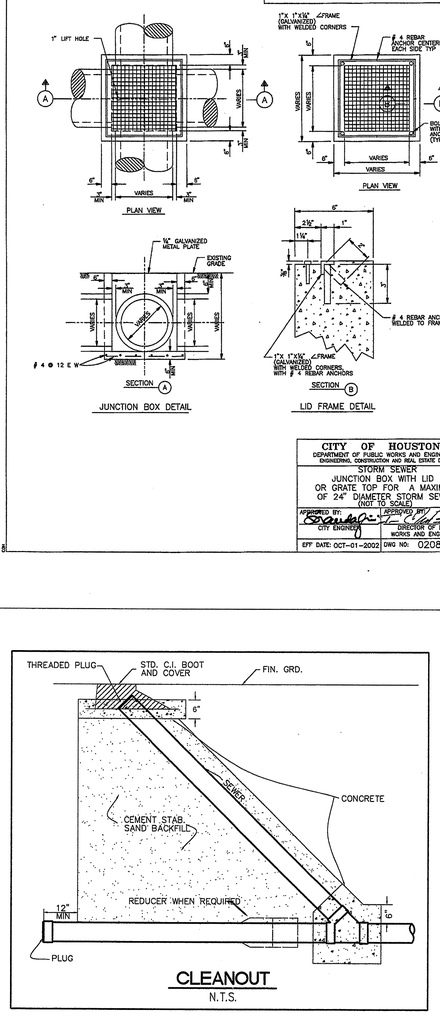


TYPICAL CROSS–SECTION

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE DIVISION

SANITARY OR STORM SEWER
BEDDING AND BACKFILL
FOR DRY STABLE TRENCH
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER | APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: OCT–01–2002 DWG NO: 02317–03



CLEANOUT
N.T.S.

STATE OF TEXAS
REN–CHYUN WENG
79426
REGISTERED PROFESSIONAL ENGINEER
4-30-07

RENEngineering, Inc.
Consulting Engineers
6100 Corporate Dr., Suite 515, Houston, TX 77036
Tel: 713-981-0041 • Fax: 713-981-1156

PROJ.: 06020	SUBMITTED: REN	SCALE: N.T.S.	DATE: 4/30/2007
DESIGNED: S.W.	DRAWN: S.W.	SURVEY:	SHEET 4 OF 10

Community Family Centers
Centros Familiares de la Comunidad

John P. McGovern, M.D. Community Sports & Recreation Building
7318 AVENUE F
HOUSTON, TEXAS 77011

THAT'S ARCHITECTURE
2402 COMMONWEALTH #100, HOUSTON, TX 77006
TELEPHONE 713/222-1406 FAX 713/222-1506

REGISTERED ARCHITECT NANCY GLASER SANDERS 15004 STATE OF TEXAS

ISSUES & REVISIONS

SHEET TITLE
DRAINAGE CALCULATIONS AND DETENTION DETAILS

PROJECT NO. 2001–30
SCALE AS NOTED

SHEET NUMBER
C4.0