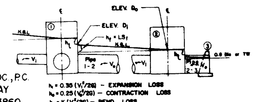
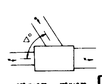
STORM DRAINAGE

LOCATION: CROSSINGS SOUTH PHASE I SH 2 OF 3
PRINCE GEO. COUNTY
DATE: 7-6-87 CALC. WMA JG CHKD. _____ P.N. 8708-11
REV. 7-24-87

J.K. TIMMONS & ASSOC., P.C.
411 E. BROADWAY
HOPEWELL, VA. 23860
458-8685



$h_e = 0.30\,(V^2/2g)$ – EXPANSION LOSS
$h_c = 0.25\,(V^2/2g)$ – CONTRACTION LOSS
$h_b = K\,(V^2/2g)$ – BEND LOSS
$h_j = h_e + h_c + h_b$ – TOTAL JUNCTION LOSS



$K_1 = 0.70 \times K$ BEND
$K_2 = 0.85 \times K$ BEND
$K_3 = 0.85 \times K$ BEND
$K_4 = 0.75 \times K$ BEND
$K_5 = 0.60 \times K$ BEND
$K_6 = 0.50 \times K$ BEND
$K_7 = 0.67 \times K$ BEND
$K_8 = 0.50 \times K$ BEND

THE ENERGY LOSS FOR THE INITIAL INLET OF A STORM SEWER SYSTEM IS $0.3\,(V^2/2g)$

WHEN MORE THAN ONE LINE ENTERS AN INLET DETERMINE LINE EXERTING GREATEST HUMPATRIM (SH) FOR h_j

USE LINE WITH GREATEST "K" VALUE FOR DETERMINING h_j

IF INLET SHAPING IS USED REDUCE "h_j" BY 50%

IF SURFACE INFLOW OCCURS INCREASE "h_j" BY 50%

NOTE: HYDRAULIC GRADE LINE AT PIPE OUTFALL VARIES 0.8 PIPE DIA. OR TW WHICHEVER IS GREATER

HYDRAULIC GRADE LINE										
JUNCTION LOSSES										PIPE FLOWING FULLY
SS	V_n			N	L3	50%	2 h_t		ELEV. D_2	S_f
SS	V_n									h_j
HYDRAULIC GRADIENT	Δ	V_n	V_n^2	K_j	$V_n^2/2g$				ELEV. D_1	
				M						

* SPECIAL CONDITIONS REGARDING USE OF CORRUGATED METAL PIPE

CONCRETE OR V.C.	= 0.013
PLAIN or FULLY COATED	= 0.021
PAVED INVERT (.25FL)	= 0.018
FULLY BOLTED	= 0.05
FULLY RIVETED	= 0.03

= 0.03 BARE EARTH
= 0.06 GRASS or JUTE MESH
= 0.08 RIPRAP } PROTECTIVE LINING

INLETS (CURB INLET W/LOCAL DEP.)	
SLOPE	SAG (WEIR)
$L_T = 60 \cdot S^{.3}\,(1/n\,S_e)^{.7}$ 100%	$d = (Q/12.3L)^{.5} + 5.6 S_x^{.2}$
$E = 1 - (1 - L/L_T)^{1.8}$	$L = EQ/d^{1.5}\,V/2.3 - 3.6$
$S_e = S_x + S_w\,E_o$	$a = VCL/S_w - S_x a$
$E_o = 1.33 + .67\,(n\,(W/T)\,S_x/S_w)^{.5}$	$L_T = (200\,a)^{.5}$
$E_o = 1.36 + .46\,(n\,(W/T)\,S_x/S_w)^{.5}$	$T = d/S_x$

STREET OR LOCATION	STRUCT. NO.	DROP INLET TYPE	DROP INLET L	AREA NO.	AREA ACRES	C	CA Δ	CA Σ	CA TIME	CA 30%	OVER-LAND L	OVER-LAND S_o	OVER-LAND T_c	CHANNEL L	CHANNEL S_o	CHANNEL T_c	CHANNEL T_t	PIPE TIME	TOTAL T_c	Q cfs Δ	Q cfs Σ	Q cfs CARRY OVER	Q cfs TOTAL Q
PHASE I EXISTING CONDITIONS																							
CROSSING 5-22 16+24 L/S	4																		8.5	1.1			
	5			1	0.5		0.9	0.36						5	400	4		9	8.3	2.0			
CROSSING 5-23 16+24 L/S	3			2	0.5		0.9	0.36										9	8.5	1.1			
																			8.3	2.0			
	1			3	0.15		0.8	0.16			180	1.6	1	100	1.6		1	7	8.5	2.7			
	2																		8.3	5.6			
CROSSING 5-24 18+10	6								1.40							0.8		9.4	6.3	8.8			
CROSSING 5-24 18+10	7	FLARE BOX 8-27		4	0.16		0.7		0.14	1.54								9.4	3.6	.29		.01	.50
	8																		8.2		9.6		
				5	1.8		0.75		0.16														
TEMP DITCH	1			7	5.3		0.4		1.12	0.08									2.9		8.9		
									3		6.38	0.5	300	0.5	400	8.16	14	17	3.3		11.7		
				5	0.12		0.4		0.05														
				8	0.06		0.4		0.04														
				11	0.24		0.4		0.10														
				10	0.01		0.4		0.01														
				11	3.4		0.4		1.5														
				12	0.36		0.4		0.14														
TEMP DITCH	2			13	0.82		0.4		0.13		6.61			110	1			28	2.9		.19		
									1.2					0.5					3.8		.55		
	16										6.61							28	2.9		.19		
																			3.8		.55		
EL. FLUME	17			14	2.29		0.4		0.92														
				15	3.3		0.4		1.32		8.85							28	2.9		.26		
																			3.8		.56		
DETENTION BASIN	18			DETENTION BASIN										REFER									
OUTLET STRUCT.	19			OUTLET STRUCTURE										REFER									

STREET OR LOCATION	STRUCT. NO.	B FREEBOARD	CULVERT HEADWATER COMPUTATION: INLET CONTROL HW/D	HW	S_o	S_f	S_f/S_o	TW	h_o	H	L/h_o	HW	CONTROLLING HW	HW ELEVATION	PIPE Φ	L	b	S_o	Z	CHANNEL S_o	n	S_f	S_o	S_f	S_o	S_f	WETTED PERIM. ELEV. IN	WETTED PERIM. ELEV. OUT	S_f	S_o	REMARKS
PHASE I EXISTING CONDITIONS																															
CROSSING 5-22 16+24 L/S	4																														
	5																														
CROSSING 5-23 16+24 L/S	3																														
	1																														
	2																														
CROSSING 5-24 18+10	6																														
CROSSING 5-24 18+10	7																														
	8																														
TEMP DITCH	1																														
TEMP DITCH	2																														
	16																														
EL. FLUME	17																														
DETENTION BASIN	18																														
OUTLET STRUCT.	19																														

8/7/85

RELEASED FOR CONSTRUCTION