



Title	HYDRAULICS GRABER	7.3/7.7	Sheet No. of	11
By	NC	119102	Chk.	/ /
			Job No.	CET-2210

SSOE, Inc. • 1001 Madison Avenue • Toledo, Ohio 43624 • Fax 419-255-6101 • 419-255-3830

7.3 | TWIN 48" PIPES, GROOVE END w/ HEADWALL
 $Q = 285$ cfs, INLET CONTROL. FIND HW_I .

$$Q = 285 / 2 = 142.5 \quad \text{ASSUME CONC. PIPE.}$$

From CULVERT CHART 1 $\rightarrow HW/D = 1.7$

$$D = 1.7 \times 4' = 6.8'$$

7.7 | 60" RCP, $n = 0.012$, $Q = 100$ cfs - OUTLET CONTROL
 $L = 250'$, SLOPE = 0.55%, $TW = 3.33'$,
SQUARE-END w/ 95° HEADWALL, FIND HW_0 .

$$S_0 L = (0.0055)(250) = 1.38'$$

$$d_c = 0.325 \left(\frac{100}{5} \right)^{2/3} + 0.083(5) = 2.81'$$

$$\frac{d_c + D}{2} = \frac{2.81 + 5}{2} = 3.90' > TW = 3.33'$$

\hookrightarrow USE $h_0 = 3.90'$

$$K_e = 0.5$$

$H = 0.96$ From Chart 7

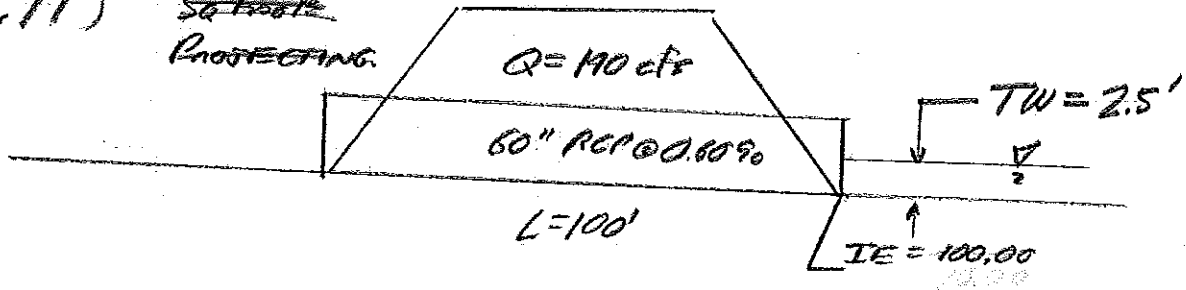
$$HW_0 = H + h_0 - S_0 L = 0.96 + 3.90 - 1.38 = 3.48$$



Title HYDRAULICS		7.11	Sheet No. / of
CULVERT ANALYSIS			
By AK	4/13/00	Chk. / /	Job No. CET-2210

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7.11) HW-22
~~Sq Foot~~
 PROTECTING



- Upstream IE = $100.00 + 100(0.009) = 109.00$
 Sol

INLET CONTROL

From Chart 1 ~ $Q = 140 \text{ cfs}$
 $D = 60''$ \rightarrow $\frac{HW}{D} = 1.03$
 SCALE 3
 ONLY CHOICE $HW_I = (1.03) \left(\frac{60}{12}\right) = \underline{\underline{5.15'}}$

OUTLET CONTROLS

From ~~B-3 (346)~~ $K_c = 0.2$ ~ ~~PROTECTIVE ENDGATE END~~ HW-22

From Chart 7 $Q = 140 \text{ cfs}$ $K_r = 0.2$ $L = 100$ \rightarrow $H = 1.20'$
 $D = 60''$

From Chart 13 $d_c = 3.3'$ $\frac{d_c + D}{2} = \frac{3.3 + 5}{2} = 4.15'$

$h_o = \text{Max}(4.15, 2.50) = 4.15'$

$HW_o = H + h_o - S_o L = 1.20 + 4.15 - 0.60 = \underline{\underline{4.75'}}$

AWW Elev. = $109.00 + 5.15' = \underline{\underline{114.15}}$ INLET CONTROL

CIVE-3520 CULVERT ANALYSIS

Fig. 1156-2

Oct. 1981

County _____ Route _____ Section _____

By _____ Date _____

Max. Cover Elevation _____
Min. Cover Elevation _____

$L = 100'$

$S_0 = 0.6090$, EL. 100.00
 $S_0 L = 0.60$

CULVERT DESCRIPTION (Entrance type)	Q (CFS)	SIZE	INLET CONTROL		HEADWATER COMPUTATION OUTLET CONTROL - $HWO = H + h_0 - L S_0$										Outlet Velocity	MH Controlling
			HWI O	HWI	K ₀	H	d _c	TW	$\frac{d_c d}{2}$	h ₀	SoL	HWO	HWI			
														SoL		
HW-2.2		60"		103	515	0.2	170	3.3	2.5	415	415	0.00	475	515	515	

Ditch break _____ AHW _____

Edge of pavement _____ AHW _____

Critical Property _____ AHW _____

Cover or Final Selection

(1)	(2)
Min. _____	Min. _____
Max. _____	Max. _____