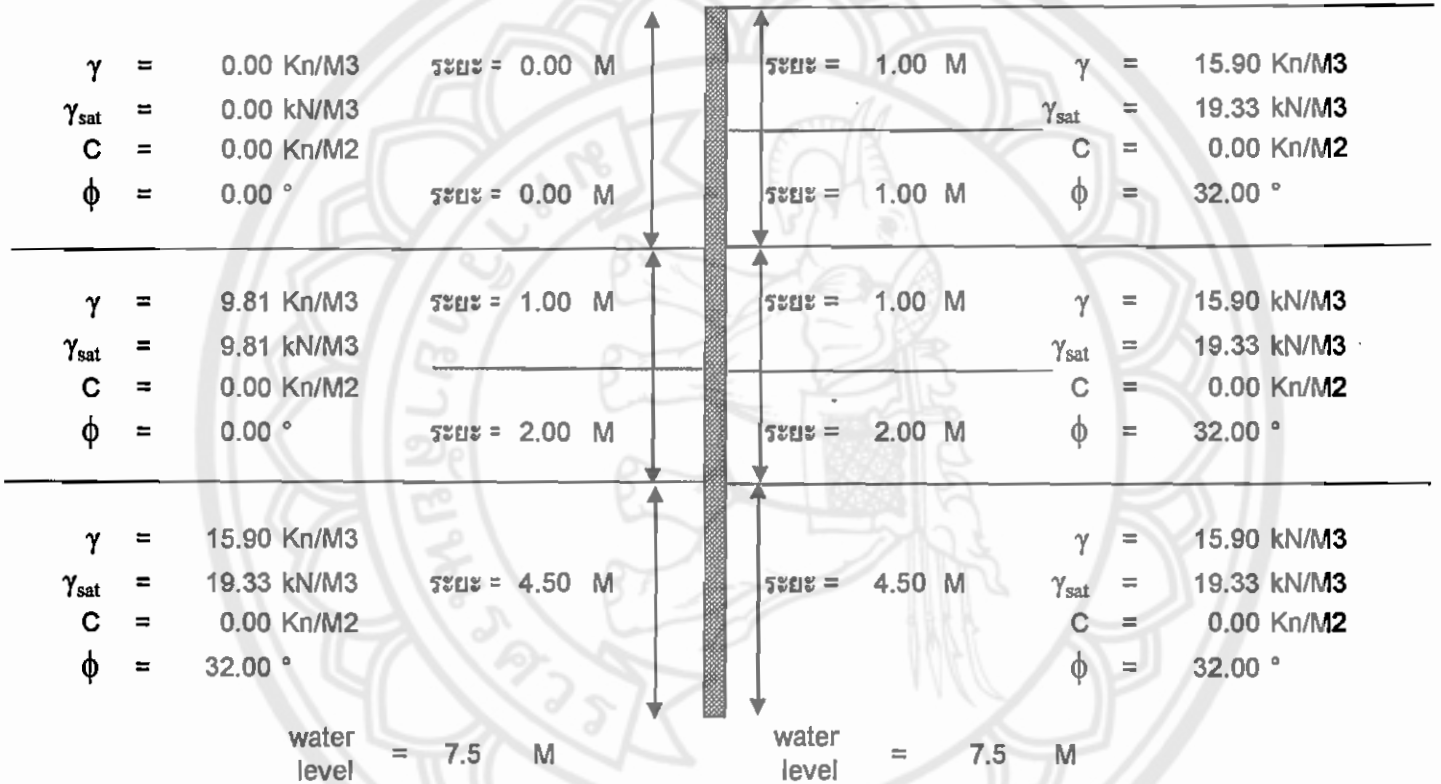
ภาคผนวก

EX 9.1 **Try** **1** **st**

select unit 1 = kN/M3
2 = Lb/ft^3 1 σ_{allow} = 172000 kN/M2
3 = T/M^3

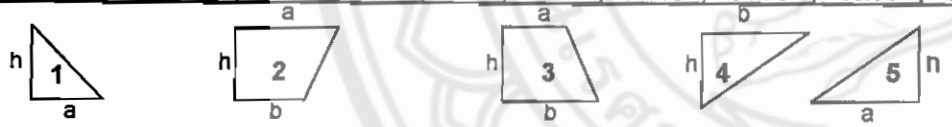


Right Hand Side

EL.		C	Z	ϕ	γ	Ka	Kp	σ v	u	σ' v	Active		Passive	
											σ' h	σ h	σ' h	σ h
0		0	0	32	15.9	0.3073	3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	-	0	1	32	15.9	0.3073	3.25	15.90	0.00	15.90	4.89	4.89	51.75	51.75
1	+	0	1	32	15.9	0.3073	3.25	15.90	0.00	15.90	4.89	4.89	51.75	51.75
2	-	0	1	32	15.9	0.3073	3.25	31.80	0.00	31.80	9.77	9.77	103.50	103.50
2	+	0	1	32	15.9	0.3073	3.25	31.80	0.00	31.80	9.77	9.77	103.50	103.50
3	-	0	1	32	19.33	0.3073	3.25	51.13	9.81	41.32	12.70	22.51	134.48	144.29
3	+	0	1	32	19.33	0.3073	3.25	51.13	9.81	41.32	12.70	22.51	134.48	144.29
5	-	0	2	32	19.33	0.3073	3.25	89.79	29.43	60.36	18.55	47.98	196.45	225.88
5	+	0	2	32	19.33	0.3073	3.25	89.79	29.43	60.36	18.55	47.98	196.45	225.88
10.46		0	5.46	32	19.33	0.3073	3.25	195.33	82.99	112.34	34.52	117.51	365.62	448.61

Left Hand Side

EL.		C	Z	ϕ	γ	Ka	Kp	σ v	u	σ' v	Active		Passive	
											σ' h	σ h	σ' h	σ h
0		0	0	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	-	0	1	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	+	0	1	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	-	0	1	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	+	0	1	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	-	0	1	0	9.81	1	1	9.81	0.00	9.81	9.81	9.81	9.81	9.81
3	+	0	1	0	9.81	1	1	9.81	0.00	9.81	9.81	9.81	9.81	9.81
5	-	0	2	0	9.81	1	1	29.43	19.62	9.81	9.81	29.43	9.81	29.43
5	+	0	2	0	9.81	1	1	29.43	19.62	9.81	9.81	29.43	9.81	29.43
10.46		0	5.46	32	19.33	0.307	3.255	134.97	73.18	61.79	18.99	92.17	201.10	274.28

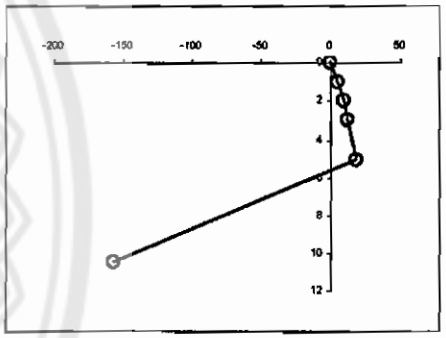


EL.			Case	a	b	h	ARM	σ	Moment
0.00	-	1.00	1	4.89	0.00	1.00	9.79	2.45	23.94
1.00	-	2.00	3	4.89	9.77	1.00	8.90	7.33	65.27
2.00	-	3.00	3	9.77	12.70	1.00	7.94	11.24	89.19
3.00	-	5.00	3	12.70	18.55	2.00	6.40	31.25	199.93
5.00	-	5.58	4	0.00	18.55	0.58	5.27	5.36	28.22
5.58	-	10.46	5	-156.77	0.00	4.88	1.63	-382.70	-622.82
							Total	-325.08	-216.27

ok

EX 9.1 **Try 1 st**

EL.		Net Pressure		
		σh_p	σh_a	σh_{net}
0		0.00	0.00	0.00
1	-	0.00	4.89	4.89
1	+	0.00	4.89	4.89
2	-	0.00	9.77	9.77
2	+	0.00	9.77	9.77
3	-	9.81	22.51	12.70
3	+	9.81	22.51	12.70
5	-	29.43	47.98	18.55
5	+	29.43	47.98	18.55
10.46	-	274.28	117.51	-156.77



Section Modulus = 0.0013 m3/m

Right Hand Side

at 1	-	Ka = Tan^2	(45	- (32 / 2))	=	0.31		
		Kp = Tan^2	(45	+ (32 / 2))	=	3.25		
		σ v = 0.00	+ (15.9	* 1)	=	15.90	Kn/M2	
		u = 0.00	+ (1	* 0)	=	0.00	Kn/M2	
		σ' v = 15.90	- 0.00		=	15.90	Kn/M2	
		σ' h = (15.90	* 0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	4.89	Kn/M2	
		σh_a = 4.89	+ 0.00		=	4.89	Kn/M2	
		σ' h = (3.25	* 15.90)	+ (2 * 0 * $\sqrt{3.25}$)	=	51.75	Kn/M2	
		σh_p = 51.75	+ 0.00		=	51.75	Kn/M2	
at 1	+	Ka = Tan^2	(45	- (32 / 2))	=	0.31		
		Kp = Tan^2	(45	+ (32 / 2))	=	3.25		
		σ v = 0.00	+ (15.9	* 1)	=	15.90	Kn/M2	
		u = 0.00	+ (1	* 0)	=	0.00	Kn/M2	
		σ' v = 15.90	- 0.00		=	15.90	Kn/M2	
		σ' h = (15.90	* 0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	4.89	Kn/M2	
		σh_a = 0.00	+ 0.00		=	4.89	Kn/M2	
		σ' h = (3.25	* 15.90)	+ (2 * 0 * $\sqrt{3.25}$)	=	51.75	Kn/M2	
		σh_p = 51.75	+ 0.00		=	51.75	Kn/M2	
at 2	-	Ka = Tan^2	(45	- (32 / 2))	=	0.31		
		Kp = Tan^2	(45	+ (32 / 2))	=	3.25		
		σ v = 15.90	+ (15.9	* 1)	=	31.80	Kn/M2	
		u = 0.00	+ (1	* 0)	=	0.00	Kn/M2	
		σ' v = 31.80	- 0.00		=	31.80	Kn/M2	
		σ' h = (31.80	* 0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	9.77	Kn/M2	
		σh_a = 9.77	+ 0.00		=	9.77	Kn/M2	
		σ' h = (3.25	* 31.80)	+ (2 * 0 * $\sqrt{3.25}$)	=	103.50	Kn/M2	
		σh_p = 103.50	+ 0.00		=	103.50	Kn/M2	

at 2	+	Ka	=	Tan^2	(45	-	(32	/ 2))	=	0.31	
		Kp	=	Tan^2	(45	+	(32	/ 2))	=	3.25	
		σ v	=	15.90	+ (15.9	*	1	)	=	31.80	Kn/M2
		u	=	0.00	+ (1	*	0	)	=	0.00	Kn/M2
		σ' v	=	31.80	- 0.00				=	31.80	Kn/M2
		σ' h	=	(31.80	* 0.30726)	-	(2	* 0 * $\sqrt{0.31}$)	=	9.77	Kn/M2
		σh_a	=	9.77	+ 0.00				=	9.77	Kn/M2
		σ' h	=	(3.25	* 31.80)	+	(2	* 0 * $\sqrt{3.25}$)	=	103.50	Kn/M2
		σh_p	=	103.50	+ 0.00				=	103.50	Kn/M2
at 3	-	Ka	=	Tan^2	(45	-	(32	/ 2))	=	0.31	
		Kp	=	Tan^2	(45	+	(32	/ 2))	=	3.25	
		σ v	=	31.80	+ (19.33	*	1	)	=	51.13	Kn/M2
		u	=	0.00	+ (1	*	10	)	=	9.81	Kn/M2
		σ' v	=	51.13	- 9.81				=	41.32	Kn/M2
		σ' h	=	(41.32	* 0.30726)	-	(2	* 0 * $\sqrt{0.31}$)	=	12.70	Kn/M2
		σh_a	=	12.70	+ 9.81				=	22.51	Kn/M2
		σ' h	=	(3.25	* 41.32)	+	(2	* 0 * $\sqrt{3.25}$)	=	134.48	Kn/M2
		σh_p	=	134.48	+ 9.81				=	144.29	Kn/M2
at 3	+	Ka	=	Tan^2	(45	-	(32	/ 2))	=	0.31	
		Kp	=	Tan^2	(45	+	(32	/ 2))	=	3.25	
		σ v	=	31.80	+ (19.33	*	1	)	=	51.13	Kn/M2
		u	=	0.00	+ (1	*	10	)	=	9.81	Kn/M2
		σ' v	=	51.13	- 9.81				=	41.32	Kn/M2
		σ' h	=	(41.32	* 0.30726)	-	(2	* 0 * $\sqrt{0.31}$)	=	12.70	Kn/M2
		σh_a	=	12.70	+ 9.81				=	22.51	Kn/M2
		σ' h	=	(3.25	* 41.32)	+	(2	* 0 * $\sqrt{3.25}$)	=	134.48	Kn/M2
		σh_p	=	134.48	+ 9.81				=	144.29	Kn/M2

at 5	-	Ka	=	Tan^2	(	45	-	(	32	/	2))	=	0.31	
		Kp	=	Tan^2	(	45	+	(	32	/	2))	=	3.25	
		σ v	=	51.13	+ (	19.33	*	2	)			=	89.79	Kn/M2
		u	=	9.81	+ (	2	*	10	)			=	29.43	Kn/M2
		σ' v	=	89.79	-	29.43						=	60.36	Kn/M2
		σ' h	=	(60.36	*	0.30726	)	-	(2	*	0 * $\sqrt{0.31}$)	=	18.55	Kn/M2
		σh_a	=	18.55	+	29.43						=	47.98	Kn/M2
		σ' h	=	(3.25	*	60.36	)	+	(2	*	0 * $\sqrt{3.25}$)	=	196.45	Kn/M2
		σh_p	=	196.45	+	29.43						=	225.88	Kn/M2
at 5	+	Ka	=	Tan^2	(	45	-	(	32	/	2))	=	0.31	
		Kp	=	Tan^2	(	45	+	(	32	/	2))	=	3.25	
		σ v	=	51.13	+ (	19.33	*	2	)			=	89.79	Kn/M2
		u	=	9.81	* (	2	*	10	)			=	29.43	Kn/M2
		σ' v	=	89.79	-	29.43						=	60.36	Kn/M2
		σ' h	=	(60.36	*	0.30726	)	-	(2	*	0 * $\sqrt{0.31}$)	=	18.55	Kn/M2
		σh_a	=	18.55	+	29.43						=	47.98	Kn/M2
		σ' h	=	(3.25	*	60.36	)	+	(2	*	0 * $\sqrt{3.25}$)	=	196.45	Kn/M2
		σh_p	=	196.45	+	29.43						=	225.88	Kn/M2
at 9.5		Ka	=	Tan^2	(	45	-	(	32	/	2))	=	0.31	
		Kp	=	Tan^2	(	45	+	(	32	/	2))	=	3.25	
		σ v	=	89.79	+ (	19.33	*	5	)			=	176.78	Kn/M2
		u	=	19.62	+ (	4.5	*	s v	)			=	73.58	Kn/M2
		σ' v	=	176.78	-	73.58						=	103.20	Kn/M2
		σ' h	=	(103.20	*	0.30726	)	-	(2	*	0 * $\sqrt{0.31}$)	=	31.71	Kn/M2
		σh_a	=	31.71	+	73.58						=	105.28	Kn/M2
		σ' h	=	(3.25	*	103.20	)	+	(2	*	0 * $\sqrt{3.25}$)	=	335.87	Kn/M2
		σh_p	=	335.87	+	73.58						=	409.45	Kn/M2

Left Hand Side

at 1 - $Ka = Tan^2 (45 - (0 / 2)) = 1.00$

$Kp = Tan^2 (45 + (0 / 2)) = 1.00$

$\sigma v = 0.00 + (0 * 1) = 0.00$ Kn/M2

$u = 0.00 + (1 * 0) = 0.00$ Kn/M2

$\sigma' v = 0.00 - 0.00 = 0.00$ Kn/M2

$\sigma' h = (0.00 * 1) - (2 * 0 * \sqrt{1.00}) = 0.00$ Kn/M2

$\sigma h_a = 0.00 + 0.00 = 0.00$ Kn/M2

$\sigma' h = (1.00 * 0.00) + (2 * 0 * \sqrt{1.00}) = 0.00$ Kn/M2

$\sigma h_p = 0.00 + 0.00 = 0.00$ Kn/M2

at 1 + $Ka = Tan^2 (45 - (0 / 2)) = 1.00$

$Kp = Tan^2 (45 + (0 / 2)) = 1.00$

$\sigma v = a + (0 * 1) = 0.00$ Kn/M2

$u = 0.00 + (1 * 0) = 0.00$ Kn/M2

$\sigma' v = 0.00 - 0.00 = 0.00$ Kn/M2

$\sigma' h = (0.00 * 1) - (2 * 0 * \sqrt{1.00}) = 0.00$ Kn/M2

$\sigma h_a = 0.00 + 0.00 = 0.00$ Kn/M2

$\sigma' h = (1.00 * 0.00) + (2 * 0 * \sqrt{1.00}) = 0.00$ Kn/M2

$\sigma h_p = 0.00 + 0.00 = 0.00$ Kn/M2

at 2 - $Ka = Tan^2 (45 - (0 / 2)) = 1.00$

$Kp = Tan^2 (45 + (0 / 2)) = 1.00$

$\sigma v = 0.00 + (0 * 1) = 0.00$ Kn/M2

$u = 0.00 + (1 * 0) = 0.00$ Kn/M2

$\sigma' v = 0.00 - 0.00 = 0.00$ Kn/M2

$\sigma' h = (0.00 * 1) - (2 * 0 * \sqrt{1.00}) = 0.00$ Kn/M2

$\sigma h_a = 0.00 + 0.00 = 0.00$ Kn/M2

$\sigma' h = (1.00 * 0.00) + (2 * 0 * \sqrt{1.00}) = 0.00$ Kn/M2

$\sigma h_p = 0.00 + 0.00 = 0.00$ Kn/M2

at 2 +

$Ka = Tan^2 (45 - (0 / 2)) = 1.00$

$Kp = Tan^2 (45 + (0 / 2)) = 1.00$

$\sigma v = 0.00 + (0 * 1) = 0.00$ Kn/M2

$u = 0.00 + (1 * 0) = 0.00$ Kn/M2

$\sigma' v = 0.00 - 0.00 = 0.00$ Kn/M2

$\sigma' h = (0.00 * 1) - (2 * 0 * \sqrt{0.00}) = 0.00$ Kn/M2

$\sigma h_a = 0.00 + 0.00 = 0.00$ Kn/M2

$\sigma' h = (1.00 * 0.00) + (2 * 0 * \sqrt{0.00}) = 0.00$ Kn/M2

$\sigma h_p = 0.00 + 0.00 = 0.00$ Kn/M2

at 3 -

$Ka = Tan^2 (45 - (0 / 2)) = 1.00$

$Kp = Tan^2 (45 + (0 / 2)) = 1.00$

$\sigma v = 0.00 + (9.81 * 1) = 9.81$ Kn/M2

$u = 0.00 + (1 * 0) = 0.00$ Kn/M2

$\sigma' v = 9.81 - 0.00 = 9.81$ Kn/M2

$\sigma' h = (9.81 * 1) - (2 * 0 * \sqrt{1.00}) = 9.81$ Kn/M2

$\sigma h_a = 9.81 + 0.00 = 9.81$ Kn/M2

$\sigma' h = (1.00 * 9.81) + (2 * 0 * \sqrt{1.00}) = 9.81$ Kn/M2

$\sigma h_p = 9.81 + 0.00 = 9.81$ Kn/M2

at 3 +

$Ka = Tan^2 (45 - (0 / 2)) = 1.00$

$Kp = Tan^2 (45 + (0 / 2)) = 1.00$

$\sigma v = 0.00 + (9.81 * 1) = 9.81$ Kn/M2

$u = 0.00 + (1 * 0) = 0.00$ Kn/M2

$\sigma' v = 9.81 - 0.00 = 9.81$ Kn/M2

$\sigma' h = (9.81 * 1) - (2 * 0 * \sqrt{1.00}) = 9.81$ Kn/M2

$\sigma h_a = 9.81 + 0.00 = 9.81$ Kn/M2

$\sigma' h = (1.00 * 9.81) + (2 * 0 * \sqrt{1.00}) = 9.81$ Kn/M2

$\sigma h_p = 9.81 + 0.00 = 9.81$ Kn/M2

at 5	+	Ka	=	Tan^2	(	45	-	(	0	/	2))	=	1.00			
		Kp	=	Tan^2	(	45	+	(	0	/	2))	=	1.00			
		σv	=	9.81	+ (	9.81	*	2	)			=	29.43	Kn/M2		
		u	=	0.00	+ (	2	*	10	)			=	19.62	Kn/M2		
		$\sigma' v$	=	29.43	-	19.62						=	9.81	Kn/M2		
		$\sigma' h$	= (	9.81	*	1	)	- (2	*	0 *	$\sqrt{1.00}$)	=	9.81	Kn/M2		
		σh_a	=	9.81	+	19.62						=	29.43	Kn/M2		
		$\sigma' h$	= (	1.00	*	9.81	)	+ (2	*	0 *	$\sqrt{1.00}$)	=	9.81	Kn/M2		
		σh_p	=	9.81	+	19.62						=	29.43	Kn/M2		
at 5	+	Ka	=	Tan^2	(	45	-	(	0	/	2))	=	1.00			
		Kp	=	Tan^2	(	45	+	(	0	/	2))	=	1.00			
		σv	=	9.81	+ (	9.81	*	2	)			=	29.43	Kn/M2		
		u	=	0.00	+ (	2	*	10	)			=	19.62	Kn/M2		
		$\sigma' v$	=	29.43	-	19.62						=	9.81	Kn/M2		
		$\sigma' h$	= (	9.81	*	1	)	- (2	*	0 *	$\sqrt{1.00}$)	=	9.81	Kn/M2		
		σh_a	=	9.81	+	19.62						=	29.43	Kn/M2		
		$\sigma' h$	= (	1.00	*	9.81	)	+ (2	*	0 *	$\sqrt{1.00}$)	=	9.81	Kn/M2		
		σh_p	=	9.81	+	19.62						=	29.43	Kn/M2		
at 9.5		Ka	=	Tan^2	(	45	-	(	32	/	2))	=	0.31			
		Kp	=	Tan^2	(	45	+	(	32	/	2))	=	3.25			
		σv	=	29.43	+ (	19.33	*	5	)			=	116.42	Kn/M2		
		u	=	19.62	+ (	4.5	*	10	)			=	63.77	Kn/M2		
		$\sigma' v$	=	116.42	-	63.77						=	52.65	Kn/M2		
		$\sigma' h$	= (	52.65	*	0.30726	)	- (2	*	0 *	$\sqrt{0.31}$)	=	16.18	Kn/M2		
		σh_a	=	16.18	+	63.77						=	79.94	Kn/M2		
		$\sigma' h$	= (	3.25	*	52.65	)	+ (2	*	0 *	$\sqrt{3.25}$)	=	171.35	Kn/M2		
		σh_p	=	171.35	+	63.77						=	235.12	Kn/M2		

Moment

EL.				0.5	*	(a+b)	*	h	*	Moment arm			
0.00	-	1.00	=	0.5	*	4.89	*	1.00	*	8.83	=	21.60	kN-m/m
1.00	-	2.00	=	0.5	*	14.66	*	1.00	*	7.94	=	58.23	kN-m/m
2.00	-	3.00	=	0.5	*	22.47	*	1.00	*	6.98	=	78.40	kN-m/m
3.00	-	5.00	=	0.5	*	31.25	*	2.00	*	5.44	=	169.93	kN-m/m
5.00	-	5.56	=	0.5	*	18.55	*	0.56	*	4.31	=	22.50	kN-m/m
5.56	-	9.50	=	0.5	*	-129.83	*	3.94	*	1.31	=	-335.47	kN-m/m
						Total Moment					=	15.19	kN-m/m

Try Length again

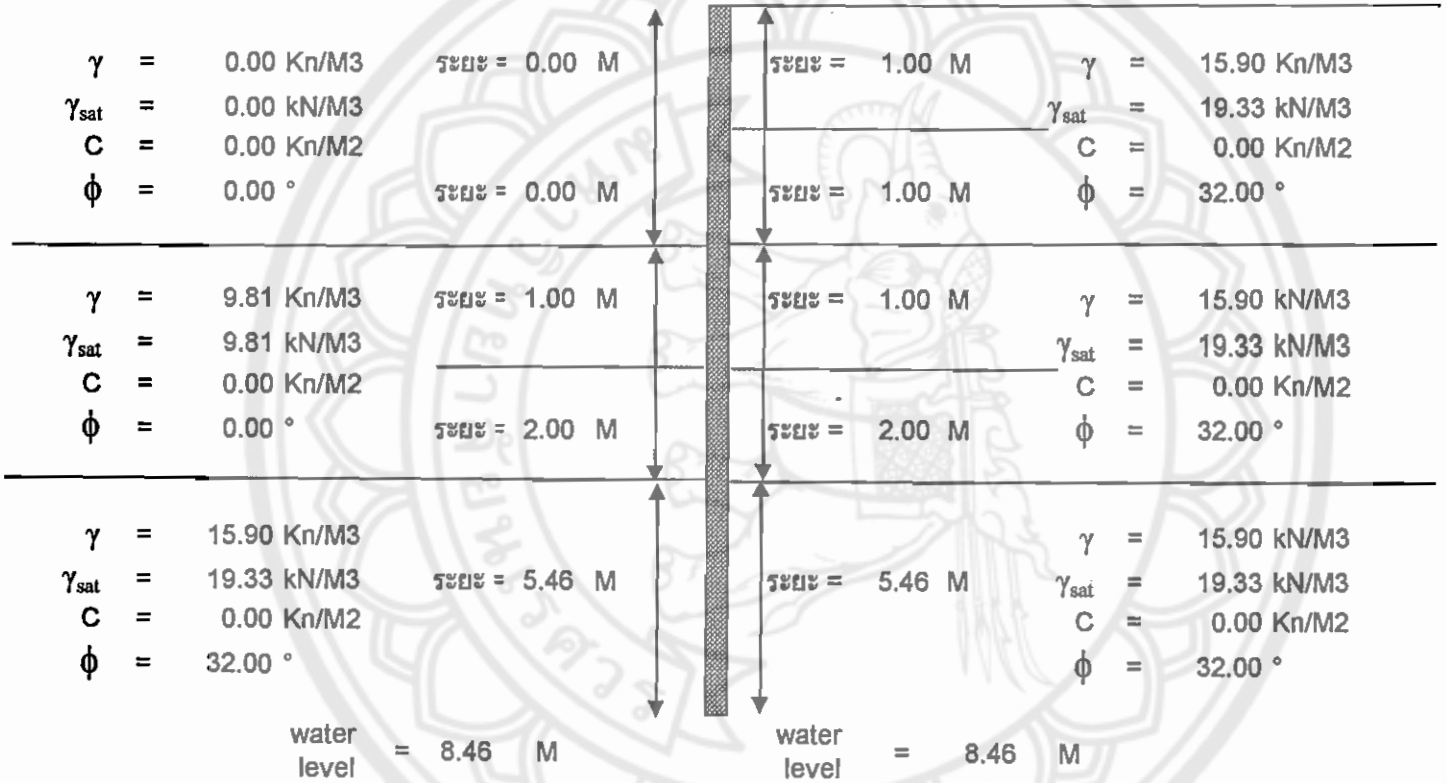
$$\text{Section Modulus} = \frac{15.19}{172000} = 0.000088 \text{ m3/m}$$

EX 9.1 **Try 1 st**

select unit 1 = kN/M3
2 = Lb/ft^3
3 = T/M^3

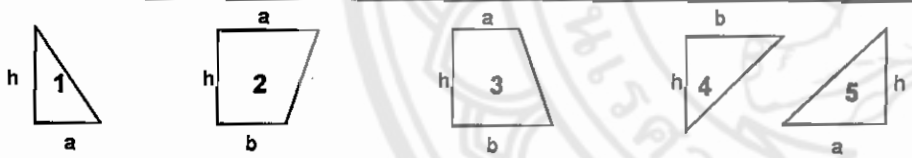
1

σ_{allow} = 172000 kN/M2



Right Hand Side														
EL.		C	Z	ϕ	γ	Ka	Kp	σ'v	u	σv	Active		Passive	
											σ'h	σh	σ'h	σh
0		0	0	32	15.9	0.307	3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	-	0	1	32	15.9	0.307	3.25	15.90	0.00	15.90	4.89	4.89	51.75	51.75
1	+	0	1	32	15.9	0.307	3.25	15.90	0.00	15.90	4.89	4.89	51.75	51.75
2	-	0	1	32	15.9	0.307	3.25	31.80	0.00	31.80	9.77	9.77	103.50	103.50
2	+	0	1	32	15.9	0.307	3.25	31.80	0.00	31.80	9.77	9.77	103.50	103.50
3	-	0	1	32	19.33	0.307	3.25	51.13	9.81	41.32	12.70	22.51	134.48	144.29
3	+	0	1	32	19.33	0.307	3.25	51.13	9.81	41.32	12.70	22.51	134.48	144.29
5	-	0	2	32	19.33	0.307	3.25	89.79	29.43	60.36	18.55	47.98	196.45	225.88
5	+	0	2	32	19.33	0.307	3.25	89.79	29.43	60.36	18.55	47.98	196.45	225.88
9.5		0	4.5	32	19.33	0.307	3.25	176.78	73.58	103.20	31.71	105.28	335.87	409.45

Left Hand Side														
EL.		C	Z	ϕ	γ	Ka	Kp	σ'v	u	σv	Active		Passive	
											σ'h	σh	σ'h	σh
0		0	0	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	-	0	1	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	+	0	1	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	-	0	1	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	+	0	1	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	-	0	1	0	9.81	1	1	9.81	0.00	9.81	9.81	9.81	9.81	9.81
3	+	0	1	0	9.81	1	1	9.81	0.00	9.81	9.81	9.81	9.81	9.81
5	-	0	2	0	9.81	1	1	29.43	19.62	9.81	9.81	29.43	9.81	29.43
5	+	0	2	0	9.81	1	1	29.43	19.62	9.81	9.81	29.43	9.81	29.43
9.5		0	4.5	32	19.33	0.307	3.2546	116.42	63.77	52.65	16.18	79.94	171.35	235.12

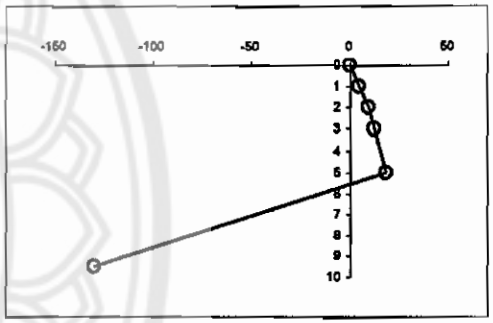


EL.			Case	a	b	h	ARM	σ	Moment
0.00	-	1.00	1	4.89	0.00	1.00	8.83	2.45	21.60
1.00	-	2.00	3	4.89	9.77	1.00	7.94	7.33	58.23
2.00	-	3.00	3	9.77	12.70	1.00	6.98	11.24	78.40
3.00	-	5.00	3	12.70	18.55	2.00	5.44	31.25	169.93
5.00	-	5.56	4	0.00	18.55	0.56	4.31	5.22	22.50
5.56	-	9.50	5	-129.83	0.00	3.94	1.31	-255.60	-335.47
							Total	-198.12	15.19

Try Length again

EX 9.1 Try 1 st

Net Pressure				
EL.		σh_p	σh_a	σh_{net}
0		0.00	0.00	0.00
1	-	0.00	4.89	4.89
1	+	0.00	4.89	4.89
2	-	0.00	9.77	9.77
2	+	0.00	9.77	9.77
3	-	9.81	22.51	12.70
3	+	9.81	22.51	12.70
5	-	29.43	47.98	18.55
5	+	29.43	47.98	18.55
9.5	-	235.12	105.28	-129.83



Section Modulus = 8.833E-05 m3/m

Right Hand Side

at 1	-	$Ka = Tan^2$	(45	- (32 / 2))	=	0.31		
		$Kp = Tan^2$	(45	+ (32 / 2))	=	3.25		
		σv = 0.00	+ (15.9	* 1)	=	15.90	Kn/M2	
		u = 0.00	+ (1	* 0)	=	0.00	Kn/M2	
		$\sigma' v$ = 15.90	- 0.00		=	15.90	Kn/M2	
		$\sigma' h$ = (15.90	* 0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	4.89	Kn/M2	
		σh_a = 4.89	+ 0.00		=	4.89	Kn/M2	
		$\sigma' h$ = (3.25	* 15.90)	+ (2 * 0 * $\sqrt{3.25}$)	=	51.75	Kn/M2	
		σh_p = 51.75	+ 0.00		=	51.75	Kn/M2	
at 1	+	$Ka = Tan^2$	(45	- (32 / 2))	=	0.31		
		$Kp = Tan^2$	(45	+ (32 / 2))	=	3.25		
		σv = 0.00	+ (15.9	* 1)	=	15.90	Kn/M2	
		u = 0.00	+ (1	* 0)	=	0.00	Kn/M2	
		$\sigma' v$ = 15.90	- 0.00		=	15.90	Kn/M2	
		$\sigma' h$ = (15.90	* 0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	4.89	Kn/M2	
		σh_a = 0.00	+ 0.00		=	4.89	Kn/M2	
		$\sigma' h$ = (3.25	* 15.90)	+ (2 * 0 * $\sqrt{3.25}$)	=	51.75	Kn/M2	
		σh_p = 51.75	+ 0.00		=	51.75	Kn/M2	
at 2	-	$Ka = Tan^2$	(45	- (32 / 2))	=	0.31		
		$Kp = Tan^2$	(45	+ (32 / 2))	=	3.25		
		σv = 15.90	+ (15.9	* 1)	=	31.80	Kn/M2	
		u = 0.00	+ (1	* 0)	=	0.00	Kn/M2	
		$\sigma' v$ = 31.80	- 0.00		=	31.80	Kn/M2	
		$\sigma' h$ = (31.80	* 0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	9.77	Kn/M2	
		σh_a = 9.77	+ 0.00		=	9.77	Kn/M2	
		$\sigma' h$ = (3.25	* 31.80)	+ (2 * 0 * $\sqrt{3.25}$)	=	103.50	Kn/M2	
		σh_p = 103.50	+ 0.00		=	103.50	Kn/M2	

at 2	+	Ka	=	Tan^2	(	45	-	(	32	/	2))	=	0.31	
		Kp	=	Tan^2	(	45	+	(	32	/	2))	=	3.25	
		σv	=	15.90	+ (	15.9	*	1	)			=	31.80	Kn/M2
		u	=	0.00	+ (	1	*	0	)			=	0.00	Kn/M2
		$\sigma' v$	=	31.80	-	0.00						=	31.80	Kn/M2
		$\sigma' h$	=	(31.80	*	0.30726	)	-	(2	*	0 * $\sqrt{0.31}$)	=	9.77	Kn/M2
		σh_a	=	9.77	+	0.00						=	9.77	Kn/M2
		$\sigma' h$	=	(3.25	*	31.80	)	+	(2	*	0 * $\sqrt{3.25}$)	=	103.50	Kn/M2
		σh_p	=	103.50	+	0.00						=	103.50	Kn/M2
at 3	-	Ka	=	Tan^2	(	45	-	(	32	/	2))	=	0.31	
		Kp	=	Tan^2	(	45	+	(	32	/	2))	=	3.25	
		σv	=	31.80	+ (	19.33	*	1	)			=	51.13	Kn/M2
		u	=	0.00	+ (	1	*	10	)			=	9.81	Kn/M2
		$\sigma' v$	=	51.13	-	9.81						=	41.32	Kn/M2
		$\sigma' h$	=	(41.32	*	0.30726	)	-	(2	*	0 * $\sqrt{0.31}$)	=	12.70	Kn/M2
		σh_a	=	12.70	+	9.81						=	22.51	Kn/M2
		$\sigma' h$	=	(3.25	*	41.32	)	+	(2	*	0 * $\sqrt{3.25}$)	=	134.48	Kn/M2
		σh_p	=	134.48	+	9.81						=	144.29	Kn/M2
at 3	+	Ka	=	Tan^2	(	45	-	(	32	/	2))	=	0.31	
		Kp	=	Tan^2	(	45	+	(	32	/	2))	=	3.25	
		σv	=	31.80	+ (	19.33	*	1	)			=	51.13	Kn/M2
		u	=	0.00	+ (	1	*	10	)			=	9.81	Kn/M2
		$\sigma' v$	=	51.13	-	9.81						=	41.32	Kn/M2
		$\sigma' h$	=	(41.32	*	0.30726	)	-	(2	*	0 * $\sqrt{0.31}$)	=	12.70	Kn/M2
		σh_a	=	12.70	+	9.81						=	22.51	Kn/M2
		$\sigma' h$	=	(3.25	*	41.32	)	+	(2	*	0 * $\sqrt{3.25}$)	=	134.48	Kn/M2
		σh_p	=	134.48	+	9.81						=	144.29	Kn/M2

at 5 - $Ka = Tan^2 (45 - (32 / 2))$ = 0.31

$Kp = Tan^2 (45 + (32 / 2))$ = 3.25

$\sigma v = 51.13 + (19.33 * 2)$ = 89.79 Kn/M2

$u = 9.81 + (2 * 10)$ = 29.43 Kn/M2

$\sigma' v = 89.79 - 29.43$ = 60.36 Kn/M2

$\sigma' h = (60.36 * 0.30726) - (2 * 0 * \sqrt{0.31})$ = 18.55 Kn/M2

$\sigma h_a = 18.55 + 29.43$ = 47.98 Kn/M2

$\sigma' h = (3.25 * 60.36) + (2 * 0 * \sqrt{3.25})$ = 196.45 Kn/M2

$\sigma h_p = 196.45 + 29.43$ = 225.88 Kn/M2

at 5 + $Ka = Tan^2 (45 - (32 / 2))$ = 0.31

$Kp = Tan^2 (45 + (32 / 2))$ = 3.25

$\sigma v = 51.13 + (19.33 * 2)$ = 89.79 Kn/M2

$u = 9.81 * (2 * 10)$ = 29.43 Kn/M2

$\sigma' v = 89.79 - 29.43$ = 60.36 Kn/M2

$\sigma' h = (60.36 * 0.30726) - (2 * 0 * \sqrt{0.31})$ = 18.55 Kn/M2

$\sigma h_a = 18.55 + 29.43$ = 47.98 Kn/M2

$\sigma' h = (3.25 * 60.36) + (2 * 0 * \sqrt{3.25})$ = 196.45 Kn/M2

$\sigma h_p = 196.45 + 29.43$ = 225.88 Kn/M2

at 10.46 $Ka = Tan^2 (45 - (32 / 2))$ = 0.31

$Kp = Tan^2 (45 + (32 / 2))$ = 3.25

$\sigma v = 89.79 + (19.33 * 5)$ = 195.33 Kn/M2

$u = 19.62 + (5.46 * s v)$ = 82.99 Kn/M2

$\sigma' v = 195.33 - 82.99$ = 112.34 Kn/M2

$\sigma' h = (112.34 * 0.30726) - (2 * 0 * \sqrt{0.31})$ = 34.52 Kn/M2

$\sigma h_a = 34.52 + 82.99$ = 117.51 Kn/M2

$\sigma' h = (3.25 * 112.34) + (2 * 0 * \sqrt{3.25})$ = 365.62 Kn/M2

$\sigma h_p = 365.62 + 82.99$ = 448.61 Kn/M2

Left Hand Side

at 1	-	$Ka = Tan^2 (45 - (0 / 2))$	=	1.00	
		$Kp = Tan^2 (45 + (0 / 2))$	=	1.00	
		$\sigma v =$ 0.00 + (0 * 1)	=	0.00	Kn/M2
		u = 0.00 + (1 * 0)	=	0.00	Kn/M2
		$\sigma' v =$ 0.00 - 0.00	=	0.00	Kn/M2
		$\sigma' h =$ (0.00 * 1) - (2 * 0 * $\sqrt{1.00}$)	=	0.00	Kn/M2
		$\sigma h_a =$ 0.00 + 0.00	=	0.00	Kn/M2
		$\sigma' h =$ (1.00 * 0.00) + (2 * 0 * $\sqrt{1.00}$)	=	0.00	Kn/M2
		$\sigma h_p =$ 0.00 + 0.00	=	0.00	Kn/M2
at 1	+	$Ka = Tan^2 (45 - (0 / 2))$	=	1.00	
		$Kp = Tan^2 (45 + (0 / 2))$	=	1.00	
		$\sigma v =$ a + (0 * 1)	=	0.00	Kn/M2
		u = 0.00 + (1 * 0)	=	0.00	Kn/M2
		$\sigma' v =$ 0.00 - 0.00	=	0.00	Kn/M2
		$\sigma' h =$ (0.00 * 1) - (2 * 0 * $\sqrt{1.00}$)	=	0.00	Kn/M2
		$\sigma h_a =$ 0.00 + 0.00	=	0.00	Kn/M2
		$\sigma' h =$ (1.00 * 0.00) + (2 * 0 * $\sqrt{1.00}$)	=	0.00	Kn/M2
		$\sigma h_p =$ 0.00 + 0.00	=	0.00	Kn/M2
at 2	-	$Ka = Tan^2 (45 - (0 / 2))$	=	1.00	
		$Kp = Tan^2 (45 + (0 / 2))$	=	1.00	
		$\sigma v =$ 0.00 + (0 * 1)	=	0.00	Kn/M2
		u = 0.00 + (1 * 0)	=	0.00	Kn/M2
		$\sigma' v =$ 0.00 - 0.00	=	0.00	Kn/M2
		$\sigma' h =$ (0.00 * 1) - (2 * 0 * $\sqrt{1.00}$)	=	0.00	Kn/M2
		$\sigma h_a =$ 0.00 + 0.00	=	0.00	Kn/M2
		$\sigma' h =$ (1.00 * 0.00) + (2 * 0 * $\sqrt{1.00}$)	=	0.00	Kn/M2
		$\sigma h_p =$ 0.00 + 0.00	=	0.00	Kn/M2

at 2	+	Ka	=	Tan^2	(	45	-	(	0	/	2))	=	1.00			
		Kp	=	Tan^2	(	45	+	(	0	/	2))	=	1.00			
		σ v	=	0.00	+ (	0	*	1	)			=	0.00	Kn/M2		
		u	=	0.00	+ (	1	*	0	)			=	0.00	Kn/M2		
		σ' v	=	0.00	-	0.00						=	0.00	Kn/M2		
		σ' h	= (	0.00	*	1	)	-	(2	*	0 * $\sqrt{}$ 0.00)	=	0.00	Kn/M2		
		σh_a	=	0.00	+	0.00						=	0.00	Kn/M2		
		σ' h	= (	1.00	*	0.00	)	+	(2	*	0 * $\sqrt{}$ 0.00)	=	0.00	Kn/M2		
		σh_p	=	0.00	+	0.00						=	0.00	Kn/M2		
at 3	-	Ka	=	Tan^2	(	45	-	(	0	/	2))	=	1.00			
		Kp	=	Tan^2	(	45	+	(	0	/	2))	=	1.00			
		σ v	=	0.00	+ (	9.81	*	1	)			=	9.81	Kn/M2		
		u	=	0.00	+ (	1	*	0	)			=	0.00	Kn/M2		
		σ' v	=	9.81	-	0.00						=	9.81	Kn/M2		
		σ' h	= (	9.81	*	1	)	-	(2	*	0 * $\sqrt{}$ 1.00)	=	9.81	Kn/M2		
		σh_a	=	9.81	+	0.00						=	9.81	Kn/M2		
		σ' h	= (	1.00	*	9.81	)	+	(2	*	0 * $\sqrt{}$ 1.00)	=	9.81	Kn/M2		
		σh_p	=	9.81	+	0.00						=	9.81	Kn/M2		
at 3	+	Ka	=	Tan^2	(	45	-	(	0	/	2))	=	1.00			
		Kp	=	Tan^2	(	45	+	(	0	/	2))	=	1.00			
		σ v	=	0.00	+ (	9.81	*	1	)			=	9.81	Kn/M2		
		u	=	0.00	+ (	1	*	0	)			=	0.00	Kn/M2		
		σ' v	=	9.81	-	0.00						=	9.81	Kn/M2		
		σ' h	= (	9.81	*	1	)	-	(2	*	0 * $\sqrt{}$ 1.00)	=	9.81	Kn/M2		
		σh_a	=	9.81	+	0.00						=	9.81	Kn/M2		
		σ' h	= (	1.00	*	9.81	)	+	(2	*	0 * $\sqrt{}$ 1.00)	=	9.81	Kn/M2		
		σh_p	=	9.81	+	0.00						=	9.81	Kn/M2		

at 5 + $K_a = \tan^2 (45 - (0 / 2))$ = 1.00

$K_p = \tan^2 (45 + (0 / 2))$ = 1.00

σv = 9.81 + (9.81 * 2) = 29.43 Kn/M2

u = 0.00 + (2 * 10) = 19.62 Kn/M2

$\sigma' v$ = 29.43 - 19.62 = 9.81 Kn/M2

$\sigma' h$ = (9.81 * 1) - (2 * 0 * $\sqrt{1.00}$) = 9.81 Kn/M2

σh_a = 9.81 + 19.62 = 29.43 Kn/M2

$\sigma' h$ = (1.00 * 9.81) + (2 * 0 * $\sqrt{1.00}$) = 9.81 Kn/M2

σh_p = 9.81 + 19.62 = 29.43 Kn/M2

at 5 + $K_a = \tan^2 (45 - (0 / 2))$ = 1.00

$K_p = \tan^2 (45 + (0 / 2))$ = 1.00

σv = 9.81 + (9.81 * 2) = 29.43 Kn/M2

u = 0.00 + (2 * 10) = 19.62 Kn/M2

$\sigma' v$ = 29.43 - 19.62 = 9.81 Kn/M2

$\sigma' h$ = (9.81 * 1) - (2 * 0 * $\sqrt{1.00}$) = 9.81 Kn/M2

σh_a = 9.81 + 19.62 = 29.43 Kn/M2

$\sigma' h$ = (1.00 * 9.81) + (2 * 0 * $\sqrt{1.00}$) = 9.81 Kn/M2

σh_p = 9.81 + 19.62 = 29.43 Kn/M2

at 10.46 $K_a = \tan^2 (45 - (32 / 2))$ = 0.31

$K_p = \tan^2 (45 + (32 / 2))$ = 3.25

σv = 29.43 + (19.33 * 5) = 134.97 Kn/M2

u = 19.62 + (5.46 * 10) = 73.18 Kn/M2

$\sigma' v$ = 134.97 - 73.18 = 61.79 Kn/M2

$\sigma' h$ = (61.79 * 0.30726) - (2 * 0 * $\sqrt{0.31}$) = 18.99 Kn/M2

σh_a = 18.99 + 73.18 = 92.17 Kn/M2

$\sigma' h$ = (3.25 * 61.79) + (2 * 0 * $\sqrt{3.25}$) = 201.10 Kn/M2

σh_p = 201.10 + 73.18 = 274.28 Kn/M2

Moment

EL.				0.5	*	(a+b)	*	h	*	Moment arm			
0.00	-	1.00	=	0.5	*	4.89	*	1.00	*	9.79	=	23.94	kN-m/m
1.00	-	2.00	=	0.5	*	14.66	*	1.00	*	8.90	=	65.27	kN-m/m
2.00	-	3.00	=	0.5	*	22.47	*	1.00	*	7.94	=	89.19	kN-m/m
3.00	-	5.00	=	0.5	*	31.25	*	2.00	*	6.40	=	199.93	kN-m/m
5.00	-	5.58	=	0.5	*	18.55	*	0.58	*	5.27	=	28.22	kN-m/m
5.58	-	10.46	=	0.5	*	-156.77	*	4.88	*	1.63	=	-622.82	kN-m/m
						Total Moment					=	-216.27	kN-m/m

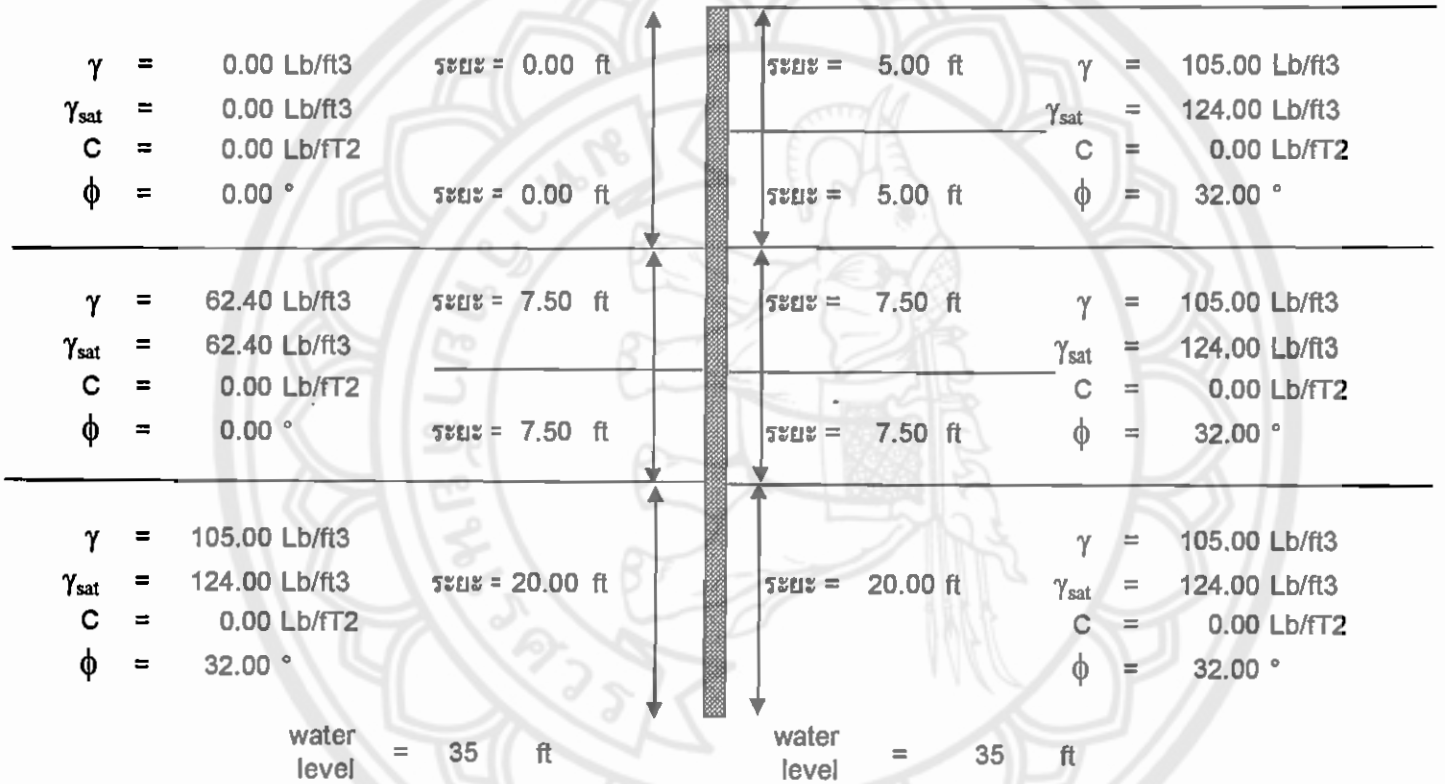
ok

$$\text{Section Modulus} = \frac{216.27}{172000} = 0.001257 \text{ m3/m}$$

Prob 9.3 **Try 1 st**

select unit 1 = kN/M^3
2 = Lb/ft^3 2
3 = T/M^3

σ_{allow} = 0 Lb/ft2

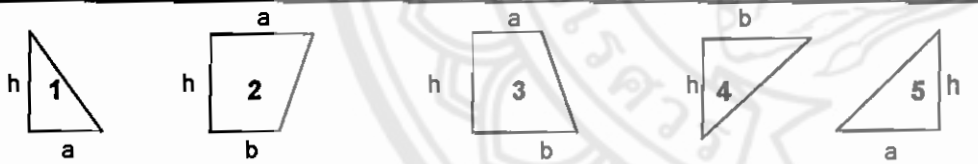


Right Hand Side

EL.		C	Z	ϕ	γ	Ka	Kp	σ'v	u	σv	Active σ'h	Active σh	Passive σ'h	Passive σh
0		0	0	32	105	0.3073	3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	-	0	5	32	105	0.3073	3.25	525.00	0.00	525.00	161.31	161.31	1708.66	1708.66
5	+	0	5	32	105	0.3073	3.25	525.00	0.00	525.00	161.31	161.31	1708.66	1708.66
10	-	0	5	32	105	0.3073	3.25	1050.00	0.00	1050.00	322.62	322.62	3417.32	3417.32
10	+	0	5	32	105	0.3073	3.25	1050.00	0.00	1050.00	322.62	322.62	3417.32	3417.32
17.5	-	0	7.5	32	124	0.3073	3.25	1980.00	468.00	1512.00	464.57	932.57	4920.94	5388.94
17.5	+	0	7.5	32	124	0.3073	3.25	1980.00	468.00	1512.00	464.57	932.57	4920.94	5388.94
25	-	0	7.5	32	124	0.3073	3.25	2910.00	936.00	1974.00	606.53	1542.53	6424.56	7360.56
25	+	0	7.5	32	124	0.3073	3.25	2910.00	936.00	1974.00	606.53	1542.53	6424.56	7360.56
45		0	20	32	124	0.3073	3.25	5390.00	2184.00	3206.00	985.07	3169.07	10434.21	12618.21

Left Hand Side

EL.		C	Z	ϕ	γ	Ka	Kp	σ'v	u	σv	Active σ'h	Active σh	Passive σ'h	Passive σh
0		0	0	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	-	0	5	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	+	0	5	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	-	0	5	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	+	0	5	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17.5	-	0	7.5	0	62.4	1	1	468.00	0.00	468.00	468.00	468.00	468.00	468.00
17.5	+	0	7.5	0	62.4	1	1	468.00	0.00	468.00	468.00	468.00	468.00	468.00
25	-	0	7.5	0	62.4	1	1	936.00	468.00	468.00	468.00	936.00	468.00	936.00
25	+	0	7.5	0	62.4	1	1	936.00	468.00	468.00	468.00	936.00	468.00	936.00
45		0	20	32	124	0.3073	3.2546	3416.00	1716.00	1700.00	522.34	2238.34	5532.80	7248.80

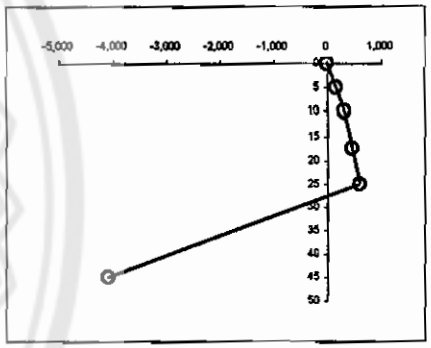


EL.			Case	a	b	h	ARM	σ	Moment
0.00	-	5.00	1	161.31	0.00	5.00	41.67	403.28	16803.13
5.00	-	10.00	3	161.31	322.62	5.00	37.22	1209.83	45032.38
10.00	-	17.50	3	322.62	464.57	7.50	31.02	2951.96	91583.44
17.50	-	25.00	3	464.57	606.53	7.50	23.58	4016.63	94729.41
25.00	-	27.59	4	0.00	606.53	2.59	19.14	785.14	15025.19
27.59	-	45.00	5	-4079.00	0.00	17.41	5.80	-35509.84	-206087.86
							Total	-26143.01	57085.68

Try Length again

Prob 9.3 Try 1 st

Net Pressure				
EL.		σh_p	σh_a	σh_{net}
0		0.00	0.00	0.00
5	-	0.00	161.31	161.31
5	+	0.00	161.31	161.31
10	-	0.00	322.62	322.62
10	+	0.00	322.62	322.62
17.5	-	468.00	932.57	464.57
17.5	+	468.00	932.57	464.57
25	-	936.00	1542.53	606.53
25	+	936.00	1542.53	606.53
45	-	7248.80	3169.07	-4079.73



Section Modulus = Input / Allowable Stress ft3/ft

Right Hand Side

at 5	-	Ka	=	Tan^2	(	45	-	(	32	/	2))	=	0.31	
		Kp	=	Tan^2	(	45	+	(	32	/	2))	=	3.25	
		σ v	=	0.00	+ (	105	*	5	)			=	525.00	Lb/FT2
		u	=	0.00	+ (	5	*	0	)			=	0.00	Lb/FT2
		σ' v	=	525.00	-	0.00						=	525.00	Lb/FT2
		σ' h	=	(525.00	*	0.30726	)	-	(2	*	0 * $\sqrt{0.31}$)	=	161.31	Lb/FT2
		σ h_a	=	161.31	+	0.00						=	161.31	Lb/FT2
		σ' h	=	(3.25	*	525.00	)	+	(2	*	0 * $\sqrt{3.25}$)	=	1708.66	Lb/FT2
		σ h_p	=	1708.66	+	0.00						=	1708.66	Lb/FT2
at 5	+	Ka	=	Tan^2	(	45	-	(	32	/	2))	=	0.31	
		Kp	=	Tan^2	(	45	+	(	32	/	2))	=	3.25	
		σ v	=	0.00	+ (	105	*	5	)			=	525.00	Lb/FT2
		u	=	0.00	+ (	5	*	0	)			=	0.00	Lb/FT2
		σ' v	=	525.00	-	0.00						=	525.00	Lb/FT2
		σ' h	=	(525.00	*	0.30726	)	-	(2	*	0 * $\sqrt{0.31}$)	=	161.31	Lb/FT2
		σ h_a	=	0.00	+	0.00						=	161.31	Lb/FT2
		σ' h	=	(3.25	*	525.00	)	+	(2	*	0 * $\sqrt{3.25}$)	=	1708.66	Lb/FT2
		σ h_p	=	1708.66	+	0.00						=	1708.66	Lb/FT2
at 10	-	Ka	=	Tan^2	(	45	-	(	32	/	2))	=	0.31	
		Kp	=	Tan^2	(	45	+	(	32	/	2))	=	3.25	
		σ v	=	525.00	+ (	105	*	5	)			=	1050.00	Lb/FT2
		u	=	0.00	+ (	5	*	0	)			=	0.00	Lb/FT2
		σ' v	=	1050.00	-	0.00						=	1050.00	Lb/FT2
		σ' h	=	(1050.00	*	0.30726	)	-	(2	*	0 * $\sqrt{0.31}$)	=	322.62	Lb/FT2
		σ h_a	=	322.62	+	0.00						=	322.62	Lb/FT2
		σ' h	=	(3.25	*	1050.00	)	+	(2	*	0 * $\sqrt{3.25}$)	=	3417.32	Lb/FT2
		σ h_p	=	3417.32	+	0.00						=	3417.32	Lb/FT2

at 10 + $Ka = Tan^2 (45 - (32 / 2))$ = 0.31

$Kp = Tan^2 (45 + (32 / 2))$ = 3.25

σv = 525.00 + (105 * 5) = 1050.00 Lb/FT2

u = 0.00 + (5 * 0) = 0.00 Lb/FT2

$\sigma' v$ = 1050.00 - 0.00 = 1050.00 Lb/FT2

$\sigma' h$ = (1050.00 * 0.30726) - (2 * 0 * $\sqrt{0.31}$) = 322.62 Lb/FT2

σh_a = 322.62 + 0.00 = 322.62 Lb/FT2

$\sigma' h$ = (3.25 * 1050.00) + (2 * 0 * $\sqrt{3.25}$) = 3417.32 Lb/FT2

σh_p = 3417.32 + 0.00 = 3417.32 Lb/FT2

at 17.5 - $Ka = Tan^2 (45 - (32 / 2))$ = 0.31

$Kp = Tan^2 (45 + (32 / 2))$ = 3.25

σv = 1050.00 + (124 * 8) = 1980.00 Lb/FT2

u = 0.00 + (7.5 * 62) = 468.00 Lb/FT2

$\sigma' v$ = 1980.00 - 468.00 = 1512.00 Lb/FT2

$\sigma' h$ = (1512.00 * 0.30726) - (2 * 0 * $\sqrt{0.31}$) = 464.57 Lb/FT2

σh_a = 464.57 + 468.00 = 932.57 Lb/FT2

$\sigma' h$ = (3.25 * 1512.00) + (2 * 0 * $\sqrt{3.25}$) = 4920.94 Lb/FT2

σh_p = 4920.94 + 468.00 = 5388.94 Lb/FT2

at 17.5 + $Ka = Tan^2 (45 - (32 / 2))$ = 0.31

$Kp = Tan^2 (45 + (32 / 2))$ = 3.25

σv = 1050.00 + (124 * 8) = 1980.00 Lb/FT2

u = 0.00 + (7.5 * 62) = 468.00 Lb/FT2

$\sigma' v$ = 1980.00 - 468.00 = 1512.00 Lb/FT2

$\sigma' h$ = (1512.00 * 0.30726) - (2 * 0 * $\sqrt{0.31}$) = 464.57 Lb/FT2

σh_a = 464.57 + 468.00 = 932.57 Lb/FT2

$\sigma' h$ = (3.25 * 1512.00) + (2 * 0 * $\sqrt{3.25}$) = 4920.94 Lb/FT2

σh_p = 4920.94 + 468.00 = 5388.94 Lb/FT2

at 25 - $Ka = Tan^2 (45 - (32 / 2)) = 0.31$

$Kp = Tan^2 (45 + (32 / 2)) = 3.25$

$\sigma v = 1980.00 + (124 * 8) = 2910.00$ Lb/FT2

$u = 468.00 + (7.5 * 62) = 936.00$ Lb/FT2

$\sigma' v = 2910.00 - 936.00 = 1974.00$ Lb/FT2

$\sigma' h = (1974.00 * 0.30726) - (2 * 0 * \sqrt{0.31}) = 606.53$ Lb/FT2

$\sigma h_a = 606.53 + 936.00 = 1542.53$ Lb/FT2

$\sigma' h = (3.25 * 1974.00) + (2 * 0 * \sqrt{3.25}) = 6424.56$ Lb/FT2

$\sigma h_p = 6424.56 + 936.00 = 7360.56$ Lb/FT2

at 25 + $Ka = Tan^2 (45 - (32 / 2)) = 0.31$

$Kp = Tan^2 (45 + (32 / 2)) = 3.25$

$\sigma v = 1980.00 + (124 * 8) = 2910.00$ Lb/FT2

$u = 468.00 * (7.5 * Kp) = 936.00$ Lb/FT2

$\sigma' v = 2910.00 - 936.00 = 1974.00$ Lb/FT2

$\sigma' h = (1974.00 * 0.30726) - (2 * 0 * \sqrt{0.31}) = 606.53$ Lb/FT2

$\sigma h_a = 606.53 + 936.00 = 1542.53$ Lb/FT2

$\sigma' h = (3.25 * 1974.00) + (2 * 0 * \sqrt{3.25}) = 6424.56$ Lb/FT2

$\sigma h_p = 6424.56 + 936.00 = 7360.56$ Lb/FT2

at 45 $Ka = Tan^2 (45 - (32 / 2)) = 0.31$

$Kp = Tan^2 (45 + (32 / 2)) = 3.25$

$\sigma v = 2910.00 + (124 * 20) = 5390.00$ Lb/FT2

$u = 468.00 + (20 * s v) = 2184.00$ Lb/FT2

$\sigma' v = 5390.00 - 2184.00 = 3206.00$ Lb/FT2

$\sigma' h = (3206.00 * 0.30726) - (2 * 0 * \sqrt{0.31}) = 985.07$ Lb/FT2

$\sigma h_a = 985.07 + 2184.00 = 3169.07$ Lb/FT2

$\sigma' h = (3.25 * 3206.00) + (2 * 0 * \sqrt{3.25}) = 10434.21$ Lb/FT2

$\sigma h_p = 10434.21 + 2184.00 = 12618.21$ Lb/FT2

Left Hand Side

at 5	-	Ka = Tan^2	(	45	- (	0 / 2))	=	1.00	
		Kp = Tan^2	(	45	+ (	0 / 2))	=	1.00	
		σ v =	0.00	+ (	0	* 5)	=	0.00	Lb/FT2
		u =	0.00	+ (	5	* 0)	=	0.00	Lb/FT2
		σ' v =	0.00	-	0.00		=	0.00	Lb/FT2
		σ' h = (	0.00	*	1	) - (2 * 0 * $\sqrt{1.00}$)	=	0.00	Lb/FT2
		σh_a =	0.00	+	0.00		=	0.00	Lb/FT2
		σ' h = (	1.00	*	0.00	) + (2 * 0 * $\sqrt{1.00}$)	=	0.00	Lb/FT2
		σh_p =	0.00	+	0.00		=	0.00	Lb/FT2
at 5	+	Ka = Tan^2	(	45	- (	0 / 2))	=	1.00	
		Kp = Tan^2	(	45	+ (	0 / 2))	=	1.00	
		σ v =	a	+ (	0	* 5)	=	0.00	Lb/FT2
		u =	0.00	+ (	5	* 0)	=	0.00	Lb/FT2
		σ' v =	0.00	-	0.00		=	0.00	Lb/FT2
		σ' h = (	0.00	*	1	) - (2 * 0 * $\sqrt{1.00}$)	=	0.00	Lb/FT2
		σh_a =	0.00	+	0.00		=	0.00	Lb/FT2
		σ' h = (	1.00	*	0.00	) + (2 * 0 * $\sqrt{1.00}$)	=	0.00	Lb/FT2
		σh_p =	0.00	+	0.00		=	0.00	Lb/FT2
at 10	-	Ka = Tan^2	(	45	- (	0 / 2))	=	1.00	
		Kp = Tan^2	(	45	+ (	0 / 2))	=	1.00	
		σ v =	0.00	+ (	0	* 5)	=	0.00	Lb/FT2
		u =	0.00	+ (	5	* 0)	=	0.00	Lb/FT2
		σ' v =	0.00	-	0.00		=	0.00	Lb/FT2
		σ' h = (	0.00	*	1	) - (2 * 0 * $\sqrt{1.00}$)	=	0.00	Lb/FT2
		σh_a =	0.00	+	0.00		=	0.00	Lb/FT2
		σ' h = (	1.00	*	0.00	) + (2 * 0 * $\sqrt{1.00}$)	=	0.00	Lb/FT2
		σh_p =	0.00	+	0.00		=	0.00	Lb/FT2

at 10 +	Ka	$= \tan^2 (45 - (0 / 2))$	= 1.00	
	Kp	$= \tan^2 (45 + (0 / 2))$	= 1.00	
	σv	= 0.00 + (0 * 5)	= 0.00	Lb/FT2
	u	= 0.00 + (5 * 0)	= 0.00	Lb/FT2
	$\sigma' v$	= 0.00 - 0.00	= 0.00	Lb/FT2
	$\sigma' h$	$= (0.00 * 1) - (2 * 0 * \sqrt{0.00})$	= 0.00	Lb/FT2
	σh_a	= 0.00 + 0.00	= 0.00	Lb/FT2
	$\sigma' h$	$= (1.00 * 0.00) + (2 * 0 * \sqrt{0.00})$	= 0.00	Lb/FT2
	σh_p	= 0.00 + 0.00	= 0.00	Lb/FT2
at 17.5 -	Ka	$= \tan^2 (45 - (0 / 2))$	= 1.00	
	Kp	$= \tan^2 (45 + (0 / 2))$	= 1.00	
	σv	= 0.00 + (62.4 * 8)	= 468.00	Lb/FT2
	u	= 0.00 + (7.5 * 0)	= 0.00	Lb/FT2
	$\sigma' v$	= 468.00 - 0.00	= 468.00	Lb/FT2
	$\sigma' h$	$= (468.00 * 1) - (2 * 0 * \sqrt{1.00})$	= 468.00	Lb/FT2
	σh_a	= 468.00 + 0.00	= 468.00	Lb/FT2
	$\sigma' h$	$= (1.00 * 468.00) + (2 * 0 * \sqrt{1.00})$	= 468.00	Lb/FT2
	σh_p	= 468.00 + 0.00	= 468.00	Lb/FT2
at 17.5 +	Ka	$= \tan^2 (45 - (0 / 2))$	= 1.00	
	Kp	$= \tan^2 (45 + (0 / 2))$	= 1.00	
	σv	= 0.00 + (62.4 * 8)	= 468.00	Lb/FT2
	u	= 0.00 + (7.5 * 0)	= 0.00	Lb/FT2
	$\sigma' v$	= 468.00 - 0.00	= 468.00	Lb/FT2
	$\sigma' h$	$= (468.00 * 1) - (2 * 0 * \sqrt{1.00})$	= 468.00	Lb/FT2
	σh_a	= 468.00 + 0.00	= 468.00	Lb/FT2
	$\sigma' h$	$= (1.00 * 468.00) + (2 * 0 * \sqrt{1.00})$	= 468.00	Lb/FT2
	σh_p	= 468.00 + 0.00	= 468.00	Lb/FT2

at 25	+	Ka	=	Tan^2	(	45	-	(	0	/	2))	=	1.00					
		Kp	=	Tan^2	(	45	+	(	0	/	2))	=	1.00					
		σ v	=	468.00	+ (	62.4	*	8	)			=	936.00	Lb/FT2				
		u	=	0.00	+ (	7.5	*	62	)			=	468.00	Lb/FT2				
		σ' v	=	936.00	-	468.00						=	468.00	Lb/FT2				
		σ' h	= (	468.00	*	1	)	- (2	*	0 *	$\sqrt{1.00}$)	=	468.00	Lb/FT2				
		σh_a	=	468.00	+	468.00						=	936.00	Lb/FT2				
		σ' h	= (	1.00	*	468.00	)	+ (2	*	0 *	$\sqrt{1.00}$)	=	468.00	Lb/FT2				
		σh_p	=	468.00	+	468.00						=	936.00	Lb/FT2				
at 25	+	Ka	=	Tan^2	(	45	-	(	0	/	2))	=	1.00					
		Kp	=	Tan^2	(	45	+	(	0	/	2))	=	1.00					
		σ v	=	468.00	+ (	62.4	*	8	)			=	936.00	Lb/FT2				
		u	=	0.00	+ (	7.5	*	62	)			=	468.00	Lb/FT2				
		σ' v	=	936.00	-	468.00						=	468.00	Lb/FT2				
		σ' h	= (	468.00	*	1	)	- (2	*	0 *	$\sqrt{1.00}$)	=	468.00	Lb/FT2				
		σh_a	=	468.00	+	468.00						=	936.00	Lb/FT2				
		σ' h	= (	1.00	*	468.00	)	+ (2	*	0 *	$\sqrt{1.00}$)	=	468.00	Lb/FT2				
		σh_p	=	468.00	+	468.00						=	936.00	Lb/FT2				
at 45		Ka	=	Tan^2	(	45	-	(	32	/	2))	=	0.31					
		Kp	=	Tan^2	(	45	+	(	32	/	2))	=	3.25					
		σ v	=	936.00	+ (	124	*	20	)			=	3416.00	Lb/FT2				
		u	=	468.00	+ (	20	*	62	)			=	1716.00	Lb/FT2				
		σ' v	=	3416.00	-	1716.00						=	1700.00	Lb/FT2				
		σ' h	= (	1700.00	*	0.30726	)	- (2	*	0 *	$\sqrt{0.31}$)	=	522.34	Lb/FT2				
		σh_a	=	522.34	+	1716.00						=	2238.34	Lb/FT2				
		σ' h	= (	3.25	*	1700.00	)	+ (2	*	0 *	$\sqrt{3.25}$)	=	5532.80	Lb/FT2				
		σh_p	=	5532.80	+	1716.00						=	7248.80	Lb/FT2				

Moment

EL.				0.5	*	(a+b)	*	h	*	Moment arm			
0.00	-	5.00	=	0.5	*	161.31	*	5.00	*	41.67	=	16803.13	Lb-ft/ft
5.00	-	10.00	=	0.5	*	483.93	*	5.00	*	37.22	=	45032.38	Lb-ft/ft
10.00	-	17.50	=	0.5	*	787.19	*	7.50	*	31.02	=	91583.44	Lb-ft/ft
17.50	-	25.00	=	0.5	*	1071.10	*	7.50	*	23.58	=	94729.41	Lb-ft/ft
25.00	-	27.59	=	0.5	*	606.53	*	2.59	*	19.14	=	15025.19	Lb-ft/ft
27.59	-	45.00	=	0.5	*	-4079.00	*	17.41	*	5.80	=	-206087.86	Lb-ft/ft
						Total Moment					=	57085.68	Lb-ft/ft

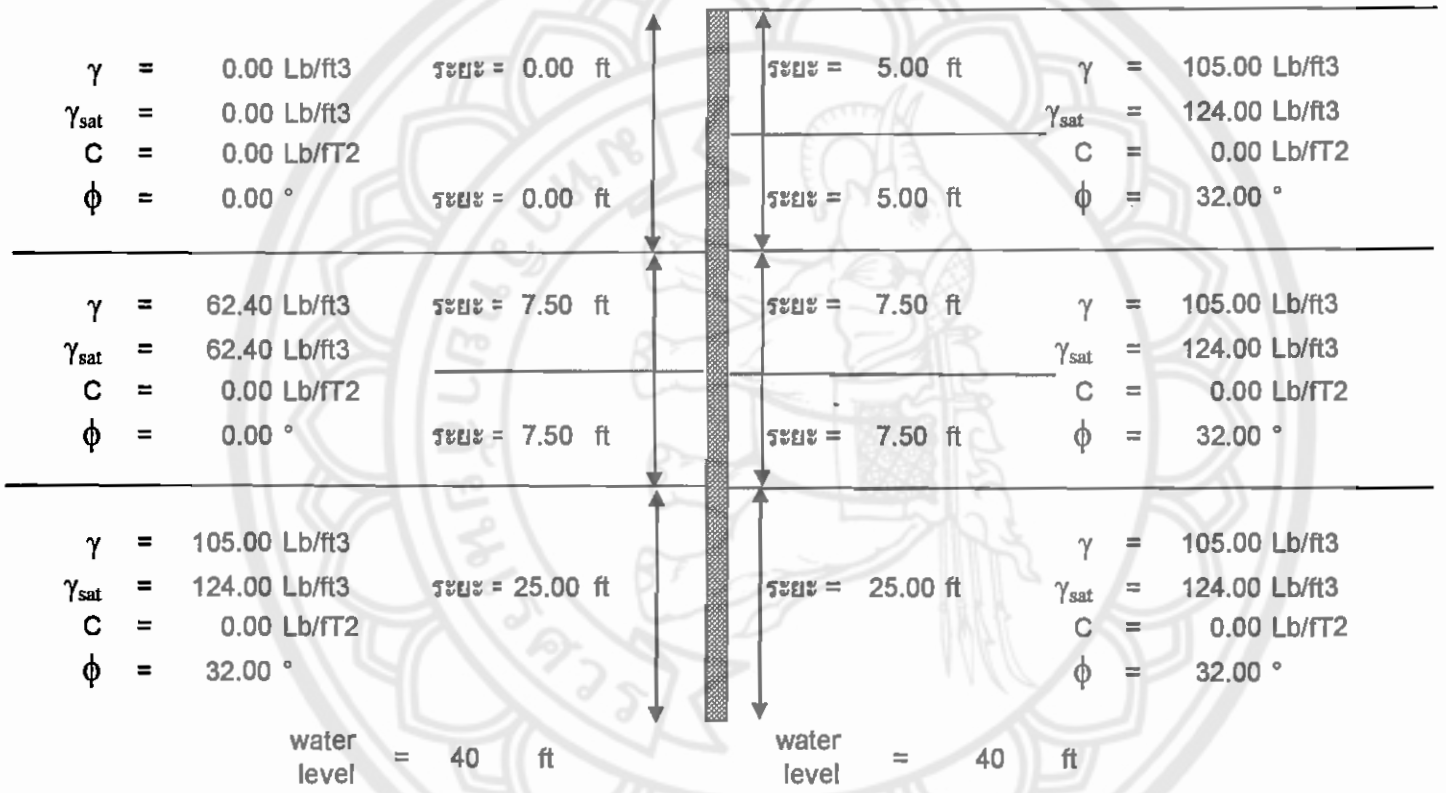
Try Length again

$$\text{Section Modulus} = \frac{57085.68}{0} = \frac{\text{Input Allowable}}{\text{Stress}} \quad \text{ft3/ft}$$

Prob 9.3 **Try 1 st**

select unit 1 = kN/M^3
2 = Lb/ft^3 2
3 = T/M^3

σ_{allow} = 0 Lb/ft2



Right Hand Side

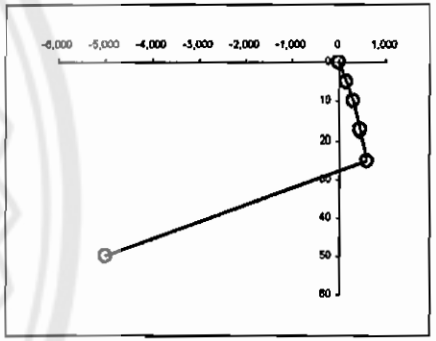
EL.		C	Z	ϕ	γ	Ka	Kp	σ v	u	σ'v	Active		Passive	
											σ'h	σh	σ'h	σh
0		0	0	32	105	0.3073	3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	-	0	5	32	105	0.3073	3.25	525.00	0.00	525.00	161.31	161.31	1708.66	1708.66
5	+	0	5	32	105	0.3073	3.25	525.00	0.00	525.00	161.31	161.31	1708.66	1708.66
10	-	0	5	32	105	0.3073	3.25	1050.00	0.00	1050.00	322.62	322.62	3417.32	3417.32
10	+	0	5	32	105	0.3073	3.25	1050.00	0.00	1050.00	322.62	322.62	3417.32	3417.32
17.5	-	0	7.5	32	124	0.3073	3.25	1980.00	468.00	1512.00	464.57	932.57	4920.94	5388.94
17.5	+	0	7.5	32	124	0.3073	3.25	1980.00	468.00	1512.00	464.57	932.57	4920.94	5388.94
25	-	0	7.5	32	124	0.3073	3.25	2910.00	936.00	1974.00	606.53	1542.53	6424.56	7360.56
25	+	0	7.5	32	124	0.3073	3.25	2910.00	936.00	1974.00	606.53	1542.53	6424.56	7360.56
50		0	25	32	124	0.3073	3.25	6010.00	2496.00	3514.00	1079.71	3575.71	11436.62	13932.62

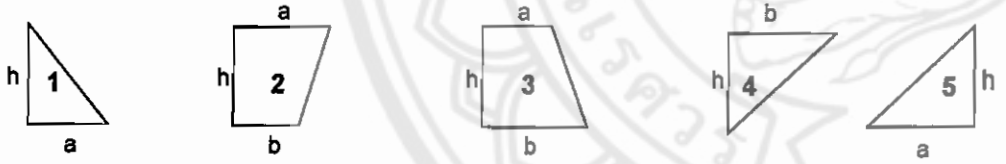
Left Hand Side

EL.		C	Z	ϕ	γ	Ka	Kp	σ v	u	σ'v	Active		Passive	
											σ'h	σh	σ'h	σh
0		0	0	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	-	0	5	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	+	0	5	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	-	0	5	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	+	0	5	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17.5	-	0	7.5	0	62.4	1	1	468.00	0.00	468.00	468.00	468.00	468.00	468.00
17.5	+	0	7.5	0	62.4	1	1	468.00	0.00	468.00	468.00	468.00	468.00	468.00
25	-	0	7.5	0	62.4	1	1	936.00	468.00	468.00	468.00	936.00	468.00	936.00
25	+	0	7.5	0	62.4	1	1	936.00	468.00	468.00	468.00	936.00	468.00	936.00
50		0	25	32	124	0.3073	3.255	4036.00	2028.00	2008.00	616.98	2644.98	6535.21	8563.21

Prob 9.3 **Try** **1** **st**

EL.		Net Pressure σ h_p	σ h_a	σ h_{net}
0		0.00	0.00	0.00
5	-	0.00	161.31	161.31
5	+	0.00	161.31	161.31
10	-	0.00	322.62	322.62
10	+	0.00	322.62	322.62
17.5	-	468.00	932.57	464.57
17.5	+	468.00	932.57	464.57
25	-	936.00	1542.53	606.53
25	+	936.00	1542.53	606.53
50	-	8563.21	3575.71	-4987.51





EL.			Case	a	b	h	ARM	σ	Moment
0.00	-	5.00	1	161.31	0.00	5.00	46.67	403.28	18819.50
5.00	-	10.00	3	161.31	322.62	5.00	42.22	1209.83	51081.50
10.00	-	17.50	3	322.62	464.57	7.50	36.02	2951.96	106343.25
17.50	-	25.00	3	464.57	606.53	7.50	28.58	4016.63	114812.53
25.00	-	27.71	4	0.00	606.53	2.71	24.10	822.11	19809.82
27.71	-	50.00	5	-4987	0.00	22.29	7.43	-55577.98	-412928.57
							Total	-46174.19	-102061.97

ok

Section Modulus = Input ft3/ft
Allowabl
e Stress

Right Hand Side

at 5	-	Ka = Tan^2	(45	- (32 / 2))	=	0.31		
		Kp = Tan^2	(45	+ (32 / 2))	=	3.25		
		σ v = 0.00	+ (105	* 5)	=	525.00	Lb/FT2	
		u = 0.00	+ (5	* 0)	=	0.00	Lb/FT2	
		σ' v = 525.00	- 0.00		=	525.00	Lb/FT2	
		σ' h = (525.00	* 0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	161.31	Lb/FT2	
		σh_a = 161.31	+ 0.00		=	161.31	Lb/FT2	
		σ' h = (3.25	* 525.00)	+ (2 * 0 * $\sqrt{3.25}$)	=	1708.66	Lb/FT2	
		σh_p = 1708.66	+ 0.00		=	1708.66	Lb/FT2	
at 5	+	Ka = Tan^2	(45	- (32 / 2))	=	0.31		
		Kp = Tan^2	(45	+ (32 / 2))	=	3.25		
		σ v = 0.00	+ (105	* 5)	=	525.00	Lb/FT2	
		u = 0.00	+ (5	* 0)	=	0.00	Lb/FT2	
		σ' v = 525.00	- 0.00		=	525.00	Lb/FT2	
		σ' h = (525.00	* 0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	161.31	Lb/FT2	
		σh_a = 0.00	+ 0.00		=	161.31	Lb/FT2	
		σ' h = (3.25	* 525.00)	+ (2 * 0 * $\sqrt{3.25}$)	=	1708.66	Lb/FT2	
		σh_p = 1708.66	+ 0.00		=	1708.66	Lb/FT2	
at 10	-	Ka = Tan^2	(45	- (32 / 2))	=	0.31		
		Kp = Tan^2	(45	+ (32 / 2))	=	3.25		
		σ v = 525.00	+ (105	* 5)	=	1050.00	Lb/FT2	
		u = 0.00	+ (5	* 0)	=	0.00	Lb/FT2	
		σ' v = 1050.00	- 0.00		=	1050.00	Lb/FT2	
		σ' h = (1050.00	* 0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	322.62	Lb/FT2	
		σh_a = 322.62	+ 0.00		=	322.62	Lb/FT2	
		σ' h = (3.25	* 1050.00)	+ (2 * 0 * $\sqrt{3.25}$)	=	3417.32	Lb/FT2	
		σh_p = 3417.32	+ 0.00		=	3417.32	Lb/FT2	

at 10 + $Ka = Tan^2 (45 - (32 / 2))$ = 0.31

$Kp = Tan^2 (45 + (32 / 2))$ = 3.25

σv = 525.00 + (105 * 5) = 1050.00 Lb/FT2

u = 0.00 + (5 * 0) = 0.00 Lb/FT2

$\sigma' v$ = 1050.00 - 0.00 = 1050.00 Lb/FT2

$\sigma' h$ = (1050.00 * 0.30726) - (2 * 0 * $\sqrt{0.31}$) = 322.62 Lb/FT2

σh_a = 322.62 + 0.00 = 322.62 Lb/FT2

$\sigma' h$ = (3.25 * 1050.00) + (2 * 0 * $\sqrt{3.25}$) = 3417.32 Lb/FT2

σh_p = 3417.32 + 0.00 = 3417.32 Lb/FT2

at 17.5 - $Ka = Tan^2 (45 - (32 / 2))$ = 0.31

$Kp = Tan^2 (45 + (32 / 2))$ = 3.25

σv = 1050.00 + (124 * 8) = 1980.00 Lb/FT2

u = 0.00 + (7.5 * 62) = 468.00 Lb/FT2

$\sigma' v$ = 1980.00 - 468.00 = 1512.00 Lb/FT2

$\sigma' h$ = (1512.00 * 0.30726) - (2 * 0 * $\sqrt{0.31}$) = 464.57 Lb/FT2

σh_a = 464.57 + 468.00 = 932.57 Lb/FT2

$\sigma' h$ = (3.25 * 1512.00) + (2 * 0 * $\sqrt{3.25}$) = 4920.94 Lb/FT2

σh_p = 4920.94 + 468.00 = 5388.94 Lb/FT2

at 17.5 + $Ka = Tan^2 (45 - (32 / 2))$ = 0.31

$Kp = Tan^2 (45 + (32 / 2))$ = 3.25

σv = 1050.00 + (124 * 8) = 1980.00 Lb/FT2

u = 0.00 + (7.5 * 62) = 468.00 Lb/FT2

$\sigma' v$ = 1980.00 - 468.00 = 1512.00 Lb/FT2

$\sigma' h$ = (1512.00 * 0.30726) - (2 * 0 * $\sqrt{0.31}$) = 464.57 Lb/FT2

σh_a = 464.57 + 468.00 = 932.57 Lb/FT2

$\sigma' h$ = (3.25 * 1512.00) + (2 * 0 * $\sqrt{3.25}$) = 4920.94 Lb/FT2

σh_p = 4920.94 + 468.00 = 5388.94 Lb/FT2

at 25 - $Ka = Tan^2 (45 - (32 / 2))$ = 0.31

$Kp = Tan^2 (45 + (32 / 2))$ = 3.25

$\sigma v = 1980.00 + (124 * 8)$ = 2910.00 Lb/FT2

$u = 468.00 + (7.5 * 62)$ = 936.00 Lb/FT2

$\sigma' v = 2910.00 - 936.00$ = 1974.00 Lb/FT2

$\sigma' h = (1974.00 * 0.30726) - (2 * 0 * \sqrt{0.31})$ = 606.53 Lb/FT2

$\sigma h_a = 606.53 + 936.00$ = 1542.53 Lb/FT2

$\sigma' h = (3.25 * 1974.00) + (2 * 0 * \sqrt{3.25})$ = 6424.56 Lb/FT2

$\sigma h_p = 6424.56 + 936.00$ = 7360.56 Lb/FT2

at 25 + $Ka = Tan^2 (45 - (32 / 2))$ = 0.31

$Kp = Tan^2 (45 + (32 / 2))$ = 3.25

$\sigma v = 1980.00 + (124 * 8)$ = 2910.00 Lb/FT2

$u = 468.00 * (7.5 * Kp)$ = 936.00 Lb/FT2

$\sigma' v = 2910.00 - 936.00$ = 1974.00 Lb/FT2

$\sigma' h = (1974.00 * 0.30726) - (2 * 0 * \sqrt{0.31})$ = 606.53 Lb/FT2

$\sigma h_a = 606.53 + 936.00$ = 1542.53 Lb/FT2

$\sigma' h = (3.25 * 1974.00) + (2 * 0 * \sqrt{3.25})$ = 6424.56 Lb/FT2

$\sigma h_p = 6424.56 + 936.00$ = 7360.56 Lb/FT2

at 50 $Ka = Tan^2 (45 - (32 / 2))$ = 0.31

$Kp = Tan^2 (45 + (32 / 2))$ = 3.25

$\sigma v = 2910.00 + (124 * 25)$ = 6010.00 Lb/FT2

$u = 468.00 + (25 * s v)$ = 2496.00 Lb/FT2

$\sigma' v = 6010.00 - 2496.00$ = 3514.00 Lb/FT2

$\sigma' h = (3514.00 * 0.30726) - (2 * 0 * \sqrt{0.31})$ = 1079.71 Lb/FT2

$\sigma h_a = 1079.71 + 2496.00$ = 3575.71 Lb/FT2

$\sigma' h = (3.25 * 3514.00) + (2 * 0 * \sqrt{3.25})$ = 11436.62 Lb/FT2

$\sigma h_p = 11436.62 + 2496.00$ = 13932.62 Lb/FT2

Left Hand Side

at 5	-	$Ka = Tan^2 (45 - (0 / 2))$	=	1.00	
		$Kp = Tan^2 (45 + (0 / 2))$	=	1.00	
		$\sigma v = 0.00 + (0 * 5)$	=	0.00	Lb/I
		$u = 0.00 + (5 * 0)$	=	0.00	Lb/F
		$\sigma' v = 0.00 - 0.00$	=	0.00	Lb/F
		$\sigma' h = (0.00 * 1) - (2 * 0 * \sqrt{1.00})$	=	0.00	Lb/F
		$\sigma h_a = 0.00 + 0.00$	=	0.00	Lb/F'
		$\sigma' h = (1.00 * 0.00) + (2 * 0 * \sqrt{1.00})$	=	0.00	Lb/FT
		$\sigma h_p = 0.00 + 0.00$	=	0.00	Lb/FT
at 5	+	$Ka = Tan^2 (45 - (0 / 2))$	=	1.00	
		$Kp = Tan^2 (45 + (0 / 2))$	=	1.00	
		$\sigma v = a + (0 * 5)$	=	0.00	Lb/FT2
		$u = 0.00 + (5 * 0)$	=	0.00	Lb/FT2
		$\sigma' v = 0.00 - 0.00$	=	0.00	Lb/FT2
		$\sigma' h = (0.00 * 1) - (2 * 0 * \sqrt{1.00})$	=	0.00	Lb/FT2
		$\sigma h_a = 0.00 + 0.00$	=	0.00	Lb/FT2
		$\sigma' h = (1.00 * 0.00) + (2 * 0 * \sqrt{1.00})$	=	0.00	Lb/FT2
		$\sigma h_p = 0.00 + 0.00$	=	0.00	Lb/FT2
at 10	-	$Ka = Tan^2 (45 - (0 / 2))$	=	1.00	
		$Kp = Tan^2 (45 + (0 / 2))$	=	1.00	
		$\sigma v = 0.00 + (0 * 5)$	=	0.00	Lb/FT2
		$u = 0.00 + (5 * 0)$	=	0.00	Lb/FT2
		$\sigma' v = 0.00 - 0.00$	=	0.00	Lb/FT2
		$\sigma' h = (0.00 * 1) - (2 * 0 * \sqrt{1.00})$	=	0.00	Lb/FT2
		$\sigma h_a = 0.00 + 0.00$	=	0.00	Lb/FT2
		$\sigma' h = (1.00 * 0.00) + (2 * 0 * \sqrt{1.00})$	=	0.00	Lb/FT2
		$\sigma h_p = 0.00 + 0.00$	=	0.00	Lb/FT2

at 10 +	K_a	$= \tan^2(45 - (0 / 2))$	=	1.00	
	K_p	$= \tan^2(45 + (0 / 2))$	=	1.00	
	σ_v	$= 0.00 + (0 * 5)$	=	0.00	Lb/FT2
	u	$= 0.00 + (5 * 0)$	=	0.00	Lb/FT2
	σ'_v	$= 0.00 - 0.00$	=	0.00	Lb/FT2
	σ'_h	$= (0.00 * 1) - (2 * 0 * \sqrt{0.00})$	=	0.00	Lb/FT2
	σ_{h_a}	$= 0.00 + 0.00$	=	0.00	Lb/FT2
	σ'_h	$= (1.00 * 0.00) + (2 * 0 * \sqrt{0.00})$	=	0.00	Lb/FT2
	σ_{h_p}	$= 0.00 + 0.00$	=	0.00	Lb/FT2
at 17.5 -	K_a	$= \tan^2(45 - (0 / 2))$	=	1.00	
	K_p	$= \tan^2(45 + (0 / 2))$	=	1.00	
	σ_v	$= 0.00 + (62.4 * 8)$	=	468.00	Lb/FT2
	u	$= 0.00 + (7.5 * 0)$	=	0.00	Lb/FT2
	σ'_v	$= 468.00 - 0.00$	=	468.00	Lb/FT2
	σ'_h	$= (468.00 * 1) - (2 * 0 * \sqrt{1.00})$	=	468.00	Lb/FT2
	σ_{h_a}	$= 468.00 + 0.00$	=	468.00	Lb/FT2
	σ'_h	$= (1.00 * 468.00) + (2 * 0 * \sqrt{1.00})$	=	468.00	Lb/FT2
	σ_{h_p}	$= 468.00 + 0.00$	=	468.00	Lb/FT2
at 17.5 +	K_a	$= \tan^2(45 - (0 / 2))$	=	1.00	
	K_p	$= \tan^2(45 + (0 / 2))$	=	1.00	
	σ_v	$= 0.00 + (62.4 * 8)$	=	468.00	Lb/FT2
	u	$= 0.00 + (7.5 * 0)$	=	0.00	Lb/FT2
	σ'_v	$= 468.00 - 0.00$	=	468.00	Lb/FT2
	σ'_h	$= (468.00 * 1) - (2 * 0 * \sqrt{1.00})$	=	468.00	Lb/FT2
	σ_{h_a}	$= 468.00 + 0.00$	=	468.00	Lb/FT2
	σ'_h	$= (1.00 * 468.00) + (2 * 0 * \sqrt{1.00})$	=	468.00	Lb/FT2
	σ_{h_p}	$= 468.00 + 0.00$	=	468.00	Lb/FT2

at 25 + $Ka = Tan^2 (45 - (0 / 2))$ = 1.00

$Kp = Tan^2 (45 + (0 / 2))$ = 1.00

σv = 468.00 + (62.4 * 8) = 936.00 Lb/FT2

u = 0.00 + (7.5 * 62) = 468.00 Lb/FT2

$\sigma' v$ = 936.00 - 468.00 = 468.00 Lb/FT2

$\sigma' h = (468.00 * 1) - (2 * 0 * \sqrt{1.00})$ = 468.00 Lb/FT2

σh_a = 468.00 + 468.00 = 936.00 Lb/FT2

$\sigma' h = (1.00 * 468.00) + (2 * 0 * \sqrt{1.00})$ = 468.00 Lb/FT2

σh_p = 468.00 + 468.00 = 936.00 Lb/FT2

at 25 + $Ka = Tan^2 (45 - (0 / 2))$ = 1.00

$Kp = Tan^2 (45 + (0 / 2))$ = 1.00

σv = 468.00 + (62.4 * 8) = 936.00 Lb/FT2

u = 0.00 + (7.5 * 62) = 468.00 Lb/FT2

$\sigma' v$ = 936.00 - 468.00 = 468.00 Lb/FT2

$\sigma' h = (468.00 * 1) - (2 * 0 * \sqrt{1.00})$ = 468.00 Lb/FT2

σh_a = 468.00 + 468.00 = 936.00 Lb/FT2

$\sigma' h = (1.00 * 468.00) + (2 * 0 * \sqrt{1.00})$ = 468.00 Lb/FT2

σh_p = 468.00 + 468.00 = 936.00 Lb/FT2

at 50 $Ka = Tan^2 (45 - (32 / 2))$ = 0.31

$Kp = Tan^2 (45 + (32 / 2))$ = 3.25

σv = 936.00 + (124 * 25) = 4036.00 Lb/FT2

u = 468.00 + (25 * 62) = 2028.00 Lb/FT2

$\sigma' v$ = 4036.00 - 2028.00 = 2008.00 Lb/FT2

$\sigma' h = (2008.00 * 0.30726) - (2 * 0 * \sqrt{0.31})$ = 616.98 Lb/FT2

σh_a = 616.98 + 2028.00 = 2644.98 Lb/FT2

$\sigma' h = (3.25 * 2008.00) + (2 * 0 * \sqrt{3.25})$ = 6535.21 Lb/FT2

σh_p = 6535.21 + 2028.00 = 8563.21 Lb/FT2

Moment

EL.				0.5	*	(a+b)	*	h	*	Moment arm			
0.00	-	5.00	=	0.5	*	161.31	*	5.00	*	46.67	=	18819.50	Lb-ft/ft
5.00	-	10.00	=	0.5	*	483.93	*	5.00	*	42.22	=	51081.50	Lb-ft/ft
10.00	-	17.50	=	0.5	*	787.19	*	7.50	*	36.02	=	106343.25	Lb-ft/ft
17.50	-	25.00	=	0.5	*	1071.10	*	7.50	*	28.58	=	114812.53	Lb-ft/ft
25.00	-	27.71	=	0.5	*	606.53	*	2.71	*	24.10	=	19809.82	Lb-ft/ft
27.71	-	50.00	=	0.5	*	-4987.00	*	22.29	*	7.43	=	-412928.57	Lb-ft/ft
						Total Moment					=	-102061.97	Lb-ft/ft

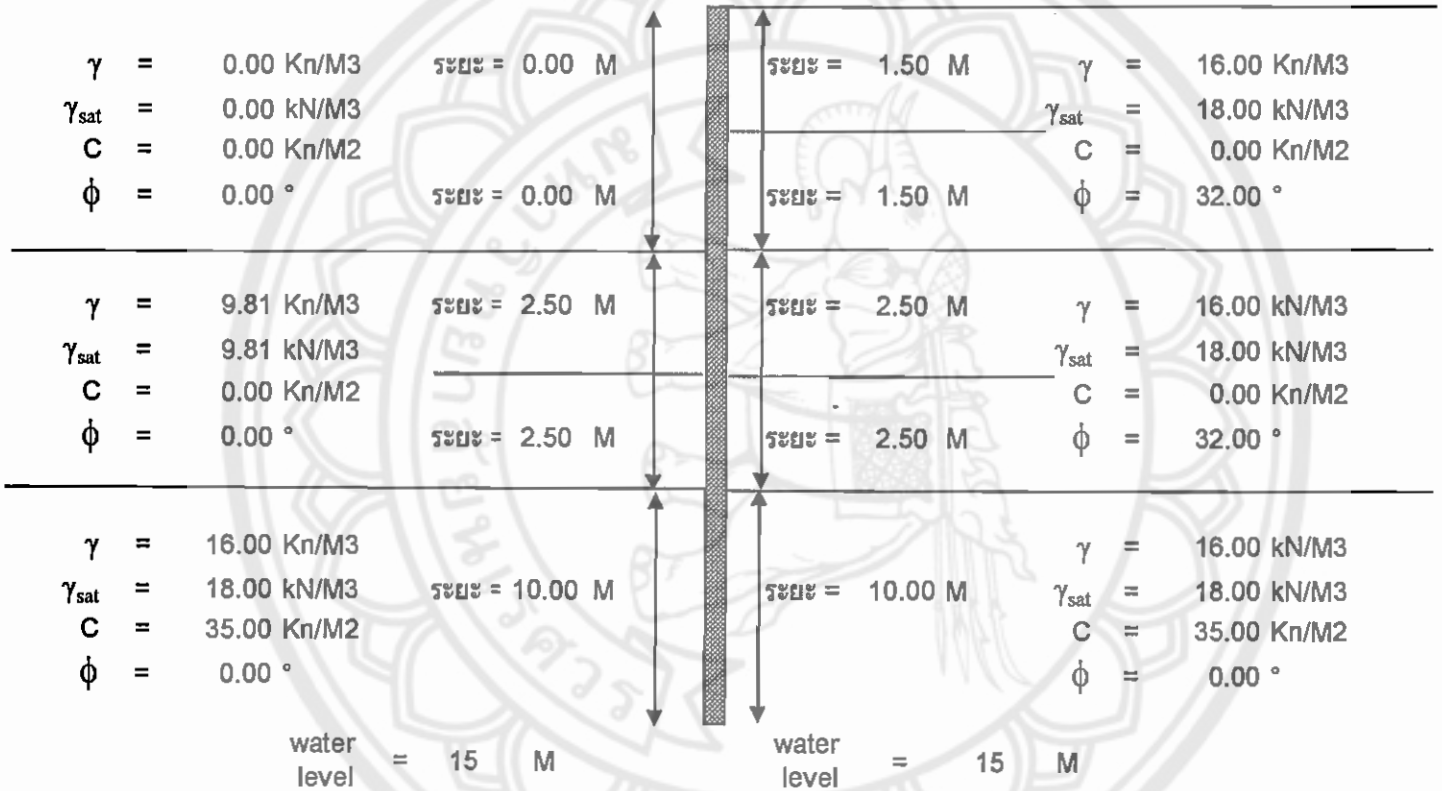
ok

$$\text{Section Modulus} = \frac{102061.97}{0} = \frac{\text{Input Allowable}}{\text{Stress}} \quad \text{ft3/ft}$$

Prob 9.7 **Try** **1** **st**

select unit 1 = kN/M^3
2 = Lb/ft^3 1
3 = T/M^3

σ_{allow} = 0 kN/M2



Right Hand Side

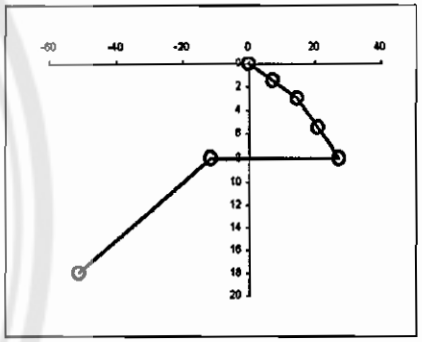
EL.		C	Z	ϕ	γ	Ka	Kp	σ'v	u	σv	Active σ'h	Active σh	Passive σ'h	Passive σh
0		0	0	32	16	0.3073	3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.5	-	0	1.5	32	16	0.3073	3.25	24.00	0.00	24.00	7.37	7.37	78.11	78.11
1.5	+	0	1.5	32	16	0.3073	3.25	24.00	0.00	24.00	7.37	7.37	78.11	78.11
3	-	0	1.5	32	16	0.3073	3.25	48.00	0.00	48.00	14.75	14.75	156.22	156.22
3	+	0	1.5	32	16	0.3073	3.25	48.00	0.00	48.00	14.75	14.75	156.22	156.22
5.5	-	0	2.5	32	18	0.3073	3.25	93.00	24.53	68.48	21.04	45.56	222.86	247.38
5.5	+	0	2.5	32	18	0.3073	3.25	93.00	24.53	68.48	21.04	45.56	222.86	247.38
8	-	0	2.5	32	18	0.3073	3.25	138.00	49.05	88.95	27.33	76.38	289.50	338.55
8	+	35	2.5	32	18	0.3073	3.25	138.00	49.05	88.95	-11.47	37.58	415.78	464.83
18		35	10	0	18	1	1.00	318.00	147.15	170.85	100.85	248.00	240.85	388.00

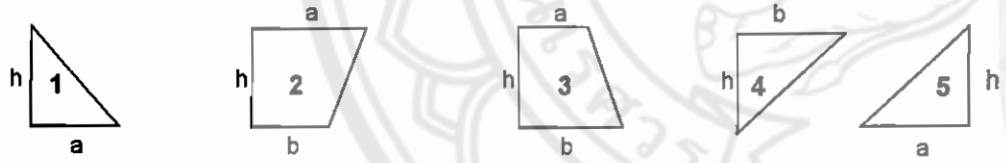
Prob 9.7 Try 1 st

EL.		Net Pressure σh_p	σh_s	σh_{net}
0		0.00	0.00	0.00
1.5	-	0.00	7.37	7.37
1.5	+	0.00	7.37	7.37
3	-	0.00	14.75	14.75
3	+	0.00	14.75	14.75
5.5	-	24.53	45.56	21.04
5.5	+	24.53	45.56	21.04
8	-	49.05	76.38	27.33
8	+	49.05	37.58	-11.47
18	-	299.05	248.00	-51.05

Left Hand Side

EL.		C	Z	ϕ	γ	Ka	Kp	σ'v	u	σv	Active σ'h	Active σh	Passive σ'h	Passive σh
0		0	0	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.5	-	0	1.5	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.5	+	0	1.5	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	-	0	1.5	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	+	0	1.5	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.5	-	0	2.5	0	9.81	1	1	24.53	0.00	24.53	24.53	24.53	24.53	24.53
5.5	+	0	2.5	0	9.81	1	1	24.53	0.00	24.53	24.53	24.53	24.53	24.53
8	-	0	2.5	0	9.81	1	1	49.05	24.53	24.53	24.53	49.05	24.53	49.05
8	+	0	2.5	0	9.81	1	1	49.05	24.53	24.53	24.53	49.05	24.53	49.05
18		35	10	0	18	1	1	229.05	122.63	106.43	36.43	159.05	176.43	299.05





EL.			Case	a	b	h	ARM	σ	Moment
0.00	-	1.50	1	7.37	0.00	1.50	17.00	5.53	93.97
1.50	-	3.00	3	7.37	14.75	1.50	15.67	16.59	259.91
3.00	-	5.50	3	14.75	21.04	2.50	13.68	44.74	611.86
5.50	-	8.00	3	21.04	27.33	2.50	11.20	60.46	676.93
8.00	-	18.00	3	-11.47	-51.05	10.00	3.33	-312.60	-1042.00
18.00	-	18.00	5	0.00	0.00	0.00	0.00	0.00	0.00
							Total	-185.28	600.67

Try Length again

Section Modulus = Input Allowable Stress m3/m

Right Hand Side

at 1.5	-	Ka = Tan^2	(45	- (32 / 2))	=	0.31		
		Kp = Tan^2	(45	+ (32 / 2))	=	3.25		
		σ v = 0.00	+ (16	* 2)	=	24.00	Kn/M2	
		u = 0.00	+ (1.5	* 0)	=	0.00	Kn/M2	
		σ' v = 24.00	- 0.00		=	24.00	Kn/M2	
		σ' h = (24.00	* 0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	7.37	Kn/M2	
		σh_a = 7.37	+ 0.00		=	7.37	Kn/M2	
		σ' h = (3.25	* 24.00)	+ (2 * 0 * $\sqrt{3.25}$)	=	78.11	Kn/M2	
		σh_p = 78.11	+ 0.00		=	78.11	Kn/M2	
at 1.5	+	Ka = Tan^2	(45	- (32 / 2))	=	0.31		
		Kp = Tan^2	(45	+ (32 / 2))	=	3.25		
		σ v = 0.00	+ (16	* 2)	=	24.00	Kn/M2	
		u = 0.00	+ (1.5	* 0)	=	0.00	Kn/M2	
		σ' v = 24.00	- 0.00		=	24.00	Kn/M2	
		σ' h = (24.00	* 0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	7.37	Kn/M2	
		σh_a = 0.00	+ 0.00		=	7.37	Kn/M2	
		σ' h = (3.25	* 24.00)	+ (2 * 0 * $\sqrt{3.25}$)	=	78.11	Kn/M2	
		σh_p = 78.11	+ 0.00		=	78.11	Kn/M2	
at 3	-	Ka = Tan^2	(45	- (32 / 2))	=	0.31		
		Kp = Tan^2	(45	+ (32 / 2))	=	3.25		
		σ v = 24.00	+ (16	* 2)	=	48.00	Kn/M2	
		u = 0.00	+ (1.5	* 0)	=	0.00	Kn/M2	
		σ' v = 48.00	- 0.00		=	48.00	Kn/M2	
		σ' h = (48.00	* 0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	14.75	Kn/M2	
		σh_a = 14.75	+ 0.00		=	14.75	Kn/M2	
		σ' h = (3.25	* 48.00)	+ (2 * 0 * $\sqrt{3.25}$)	=	156.22	Kn/M2	
		σh_p = 156.22	+ 0.00		=	156.22	Kn/M2	

at 3	+	Ka	=	Tan^2	(45	-	(32 / 2))	=	0.31		
		Kp	=	Tan^2	(45	+	(32 / 2))	=	3.25		
		σ v	=	24.00	+ (16	*	2)	=	48.00	Kn/M2	
		u	=	0.00	+ (1.5	*	0)	=	0.00	Kn/M2	
		σ' v	=	48.00	-	0.00		=	48.00	Kn/M2	
		σ' h	=	(48.00	*	0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	14.75	Kn/M2	
		σh_a	=	14.75	+	0.00		=	14.75	Kn/M2	
		σ' h	=	(3.25	*	48.00	) + (2 * 0 * $\sqrt{3.25}$)	=	156.22	Kn/M2	
		σh_p	=	156.22	+	0.00		=	156.22	Kn/M2	
at 5.5	-	Ka	=	Tan^2	(45	-	(32 / 2))	=	0.31		
		Kp	=	Tan^2	(45	+	(32 / 2))	=	3.25		
		σ v	=	48.00	+ (18	*	3)	=	93.00	Kn/M2	
		u	=	0.00	+ (2.5	*	10)	=	24.53	Kn/M2	
		σ' v	=	93.00	-	24.53		=	68.48	Kn/M2	
		σ' h	=	(68.48	*	0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	21.04	Kn/M2	
		σh_a	=	21.04	+	24.53		=	45.56	Kn/M2	
		σ' h	=	(3.25	*	68.48	) + (2 * 0 * $\sqrt{3.25}$)	=	222.86	Kn/M2	
		σh_p	=	222.86	+	24.53		=	247.38	Kn/M2	
at 5.5	+	Ka	=	Tan^2	(45	-	(32 / 2))	=	0.31		
		Kp	=	Tan^2	(45	+	(32 / 2))	=	3.25		
		σ v	=	48.00	+ (18	*	3)	=	93.00	Kn/M2	
		u	=	0.00	+ (2.5	*	10)	=	24.53	Kn/M2	
		σ' v	=	93.00	-	24.53		=	68.48	Kn/M2	
		σ' h	=	(68.48	*	0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	21.04	Kn/M2	
		σh_a	=	21.04	+	24.53		=	45.56	Kn/M2	
		σ' h	=	(3.25	*	68.48	) + (2 * 0 * $\sqrt{3.25}$)	=	222.86	Kn/M2	
		σh_p	=	222.86	+	24.53		=	247.38	Kn/M2	

at 8 - $Ka = Tan^2 (45 - (32 / 2)) = 0.31$

$Kp = Tan^2 (45 + (32 / 2)) = 3.25$

$\sigma v = 93.00 + (18 * 3) = 138.00$ Kn/M2

$u = 24.53 + (2.5 * 10) = 49.05$ Kn/M2

$\sigma' v = 138.00 - 49.05 = 88.95$ Kn/M2

$\sigma' h = (88.95 * 0.30726) - (2 * 0 * \sqrt{0.31}) = 27.33$ Kn/M2

$\sigma h_a = 27.33 + 49.05 = 76.38$ Kn/M2

$\sigma' h = (3.25 * 88.95) + (2 * 0 * \sqrt{3.25}) = 289.50$ Kn/M2

$\sigma h_p = 289.50 + 49.05 = 338.55$ Kn/M2

at 8 + $Ka = Tan^2 (45 - (32 / 2)) = 0.31$

$Kp = Tan^2 (45 + (32 / 2)) = 3.25$

$\sigma v = 93.00 + (18 * 3) = 138.00$ Kn/M2

$u = 24.53 * (2.5 * 10) = 49.05$ Kn/M2

$\sigma' v = 138.00 - 49.05 = 88.95$ Kn/M2

$\sigma' h = (88.95 * 0.30726) - (2 * \# * \sqrt{0.31}) = -11.47$ Kn/M2

$\sigma h_a = -11.47 + 49.05 = 37.58$ Kn/M2

$\sigma' h = (3.25 * 88.95) + (2 * \# * \sqrt{3.25}) = 415.78$ Kn/M2

$\sigma h_p = 415.78 + 49.05 = 464.83$ Kn/M2

at 18 $Ka = Tan^2 (45 - (0 / 2)) = 1.00$

$Kp = Tan^2 (45 + (0 / 2)) = 1.00$

$\sigma v = 138.00 + (18 * 10) = 318.00$ Kn/M2

$u = 24.53 + (10 * s v) = 147.15$ Kn/M2

$\sigma' v = 318.00 - 147.15 = 170.85$ Kn/M2

$\sigma' h = (170.85 * 1) - (2 * \# * \sqrt{1}) = 100.85$ Kn/M2

$\sigma h_a = 100.85 + 147.15 = 248.00$ Kn/M2

$\sigma' h = (1.00 * 170.85) + (2 * \# * \sqrt{1.00}) = 240.85$ Kn/M2

$\sigma h_p = 240.85 + 147.15 = 388.00$ Kn/M2

Left Hand Side

at 1.5 -

$Ka = Tan^2 (45 - (0 / 2)) = 1.00$

$Kp = Tan^2 (45 + (0 / 2)) = 1.00$

$\sigma v = 0.00 + (0 * 2) = 0.00$ Kn/M2

$u = 0.00 + (1.5 * 0) = 0.00$ Kn/M2

$\sigma' v = 0.00 - 0.00 = 0.00$ Kn/M2

$\sigma' h = (0.00 * 1) - (2 * 0 * \sqrt{1.00}) = 0.00$ Kn/M2

$\sigma h_a = 0.00 + 0.00 = 0.00$ Kn/M2

$\sigma' h = (1.00 * 0.00) + (2 * 0 * \sqrt{1.00}) = 0.00$ Kn/M2

$\sigma h_p = 0.00 + 0.00 = 0.00$ Kn/M2

at 1.5 +

$Ka = Tan^2 (45 - (0 / 2)) = 1.00$

$Kp = Tan^2 (45 + (0 / 2)) = 1.00$

$\sigma v = a + (0 * 2) = 0.00$ Kn/M2

$u = 0.00 + (1.5 * 0) = 0.00$ Kn/M2

$\sigma' v = 0.00 - 0.00 = 0.00$ Kn/M2

$\sigma' h = (0.00 * 1) - (2 * 0 * \sqrt{1.00}) = 0.00$ Kn/M2

$\sigma h_a = 0.00 + 0.00 = 0.00$ Kn/M2

$\sigma' h = (1.00 * 0.00) + (2 * 0 * \sqrt{1.00}) = 0.00$ Kn/M2

$\sigma h_p = 0.00 + 0.00 = 0.00$ Kn/M2

at 3 -

$Ka = Tan^2 (45 - (0 / 2)) = 1.00$

$Kp = Tan^2 (45 + (0 / 2)) = 1.00$

$\sigma v = 0.00 + (0 * 2) = 0.00$ Kn/M2

$u = 0.00 + (1.5 * 0) = 0.00$ Kn/M2

$\sigma' v = 0.00 - 0.00 = 0.00$ Kn/M2

$\sigma' h = (0.00 * 1) - (2 * 0 * \sqrt{1.00}) = 0.00$ Kn/M2

$\sigma h_a = 0.00 + 0.00 = 0.00$ Kn/M2

$\sigma' h = (1.00 * 0.00) + (2 * 0 * \sqrt{1.00}) = 0.00$ Kn/M2

$\sigma h_p = 0.00 + 0.00 = 0.00$ Kn/M2

at 3	+	$Ka = Tan^2 (45 - (0 / 2))$	=	1.00	
		$Kp = Tan^2 (45 + (0 / 2))$	=	1.00	
		$\sigma v = 0.00 + (0 * 2)$	=	0.00	Kn/M2
		$u = 0.00 + (1.5 * 0)$	=	0.00	Kn/M2
		$\sigma' v = 0.00 - 0.00$	=	0.00	Kn/M2
		$\sigma' h = (0.00 * 1) - (2 * 0 * \sqrt{0.00})$	=	0.00	Kn/M2
		$\sigma h_a = 0.00 + 0.00$	=	0.00	Kn/M2
		$\sigma' h = (1.00 * 0.00) + (2 * 0 * \sqrt{0.00})$	=	0.00	Kn/M2
		$\sigma h_p = 0.00 + 0.00$	=	0.00	Kn/M2
at 5.5	-	$Ka = Tan^2 (45 - (0 / 2))$	=	1.00	
		$Kp = Tan^2 (45 + (0 / 2))$	=	1.00	
		$\sigma v = 0.00 + (9.81 * 3)$	=	24.53	Kn/M2
		$u = 0.00 + (2.5 * 0)$	=	0.00	Kn/M2
		$\sigma' v = 24.53 - 0.00$	=	24.53	Kn/M2
		$\sigma' h = (24.53 * 1) - (2 * 0 * \sqrt{1.00})$	=	24.53	Kn/M2
		$\sigma h_a = 24.53 + 0.00$	=	24.53	Kn/M2
		$\sigma' h = (1.00 * 24.53) + (2 * 0 * \sqrt{1.00})$	=	24.53	Kn/M2
		$\sigma h_p = 24.53 + 0.00$	=	24.53	Kn/M2
at 5.5	+	$Ka = Tan^2 (45 - (0 / 2))$	=	1.00	
		$Kp = Tan^2 (45 + (0 / 2))$	=	1.00	
		$\sigma v = 0.00 + (9.81 * 3)$	=	24.53	Kn/M2
		$u = 0.00 + (2.5 * 0)$	=	0.00	Kn/M2
		$\sigma' v = 24.53 - 0.00$	=	24.53	Kn/M2
		$\sigma' h = (24.53 * 1) - (2 * 0 * \sqrt{1.00})$	=	24.53	Kn/M2
		$\sigma h_a = 24.53 + 0.00$	=	24.53	Kn/M2
		$\sigma' h = (1.00 * 24.53) + (2 * 0 * \sqrt{1.00})$	=	24.53	Kn/M2
		$\sigma h_p = 24.53 + 0.00$	=	24.53	Kn/M2

at 8 + $Ka = Tan^2 (45 - (0 / 2))$ = 1.00

$Kp = Tan^2 (45 + (0 / 2))$ = 1.00

σv = 24.53 + (9.81 * 3) = 49.05 Kn/M2

u = 0.00 + (2.5 * 10) = 24.53 Kn/M2

$\sigma' v$ = 49.05 - 24.53 = 24.53 Kn/M2

$\sigma' h$ = (24.53 * 1) - (2 * 0 * $\sqrt{1.00}$) = 24.53 Kn/M2

σh_a = 24.53 + 24.53 = 49.05 Kn/M2

$\sigma' h$ = (1.00 * 24.53) + (2 * 0 * $\sqrt{1.00}$) = 24.53 Kn/M2

σh_p = 24.53 + 24.53 = 49.05 Kn/M2

at 8 + $Ka = Tan^2 (45 - (0 / 2))$ = 1.00

$Kp = Tan^2 (45 + (0 / 2))$ = 1.00

σv = 24.53 + (9.81 * 3) = 49.05 Kn/M2

u = 0.00 + (2.5 * 10) = 24.53 Kn/M2

$\sigma' v$ = 49.05 - 24.53 = 24.53 Kn/M2

$\sigma' h$ = (24.53 * 1) - (2 * 0 * $\sqrt{1.00}$) = 24.53 Kn/M2

σh_a = 24.53 + 24.53 = 49.05 Kn/M2

$\sigma' h$ = (1.00 * 24.53) + (2 * 0 * $\sqrt{1.00}$) = 24.53 Kn/M2

σh_p = 24.53 + 24.53 = 49.05 Kn/M2

at 18 $Ka = Tan^2 (45 - (0 / 2))$ = 1.00

$Kp = Tan^2 (45 + (0 / 2))$ = 1.00

σv = 49.05 + (18 * 10) = 229.05 Kn/M2

u = 24.53 + (10 * 10) = 122.63 Kn/M2

$\sigma' v$ = 229.05 - 122.63 = 106.43 Kn/M2

$\sigma' h$ = (106.43 * 1) - (2 * # * $\sqrt{1.00}$) = 36.43 Kn/M2

σh_a = 36.43 + 122.63 = 159.05 Kn/M2

$\sigma' h$ = (1.00 * 106.43) + (2 * # * $\sqrt{1.00}$) = 176.43 Kn/M2

σh_p = 176.43 + 122.63 = 299.05 Kn/M2

Moment

EL.				0.5	*	(a+b)	*	h	*	Moment arm			
0.00	-	1.50	=	0.5	*	7.37	*	1.50	*	17.00	=	93.97	kN-m/m
1.50	-	3.00	=	0.5	*	22.12	*	1.50	*	15.67	=	259.91	kN-m/m
3.00	-	5.50	=	0.5	*	35.79	*	2.50	*	13.68	=	611.86	kN-m/m
5.50	-	8.00	=	0.5	*	48.37	*	2.50	*	11.20	=	676.93	kN-m/m
8.00	-	18.00	=	0.5	*	-62.52	*	10.00	*	3.33	=	-1042.00	kN-m/m
18.00	-	18.00	=	0.5	*	0.00	*	0.00	*	0.00	=	0.00	kN-m/m
						Total Moment					=	600.67	kN-m/m

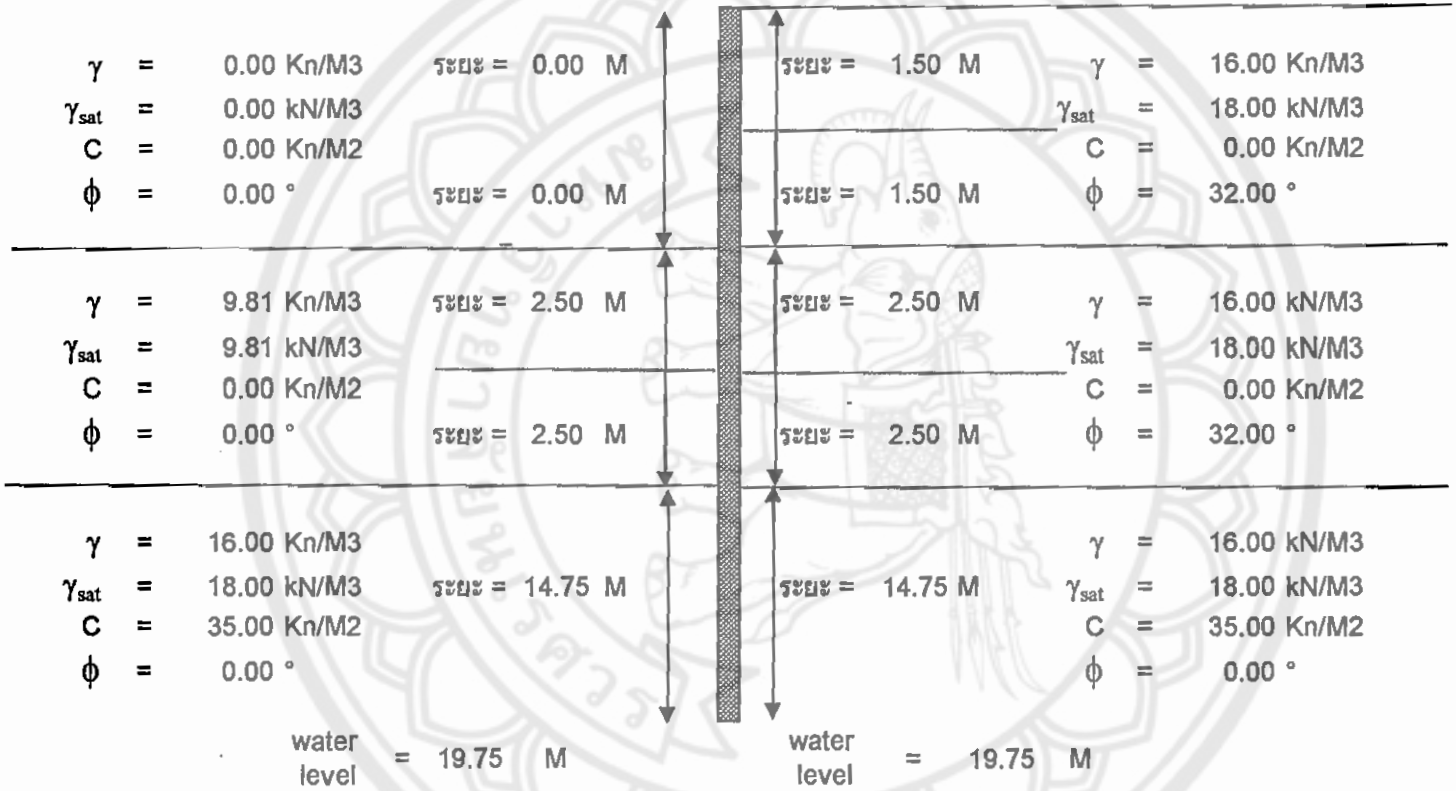
Try Length again

$$\text{Section Modulus} = \frac{600.67}{0} = \frac{\text{Input Allowable}}{\text{Stress}} \quad \text{m3/m}$$

Prob 9.7 **Try 2 nd**

select unit 1 = kN/M^3
2 = Lb/ft^3 1
3 = T/M^3

σ_{allow} = 0 kN/M2

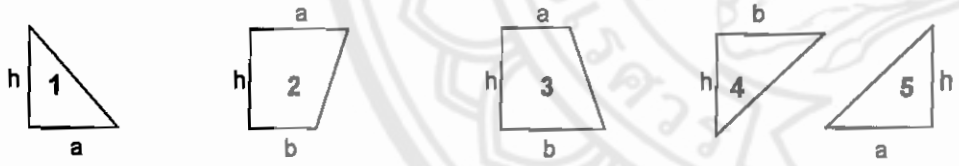


Right Hand Side

EL.		C	Z	ϕ	γ	Ka	Kp	σv	u	σ'v	Active		Passive	
											σ'h	σh	σ'h	σh
0		0	0	32	16	0.3073	3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.5	-	0	1.5	32	16	0.3073	3.25	24.00	0.00	24.00	7.37	7.37	78.11	78.11
1.5	+	0	1.5	32	16	0.3073	3.25	24.00	0.00	24.00	7.37	7.37	78.11	78.11
3	-	0	1.5	32	16	0.3073	3.25	48.00	0.00	48.00	14.75	14.75	156.22	156.22
3	+	0	1.5	32	16	0.3073	3.25	48.00	0.00	48.00	14.75	14.75	156.22	156.22
5.5	-	0	2.5	32	18	0.3073	3.25	93.00	24.53	68.48	21.04	45.56	222.86	247.38
5.5	+	0	2.5	32	18	0.3073	3.25	93.00	24.53	68.48	21.04	45.56	222.86	247.38
8	-	0	2.5	32	18	0.3073	3.25	138.00	49.05	88.95	27.33	76.38	289.50	338.55
8	+	35	2.5	32	18	0.3073	3.25	138.00	49.05	88.95	-11.47	37.58	415.78	464.83
22.75		35	14.75	0	18	1	1.00	403.50	193.75	209.75	139.75	333.50	279.75	473.50

Left Hand Side

EL.		C	Z	ϕ	γ	Ka	Kp	σv	u	σ'v	Active		Passive	
											σ'h	σh	σ'h	σh
0		0	0	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.5	-	0	1.5	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.5	+	0	1.5	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	-	0	1.5	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	+	0	1.5	0	0	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.5	-	0	2.5	0	9.81	1	1	24.53	0.00	24.53	24.53	24.53	24.53	24.53
5.5	+	0	2.5	0	9.81	1	1	24.53	0.00	24.53	24.53	24.53	24.53	24.53
8	-	0	2.5	0	9.81	1	1	49.05	24.53	24.53	24.53	49.05	24.53	49.05
8	+	0	2.5	0	9.81	1	1	49.05	24.53	24.53	24.53	49.05	24.53	49.05
22.75		35	14.75	0	18	1	1	314.55	169.22	145.33	75.33	244.55	215.33	384.55

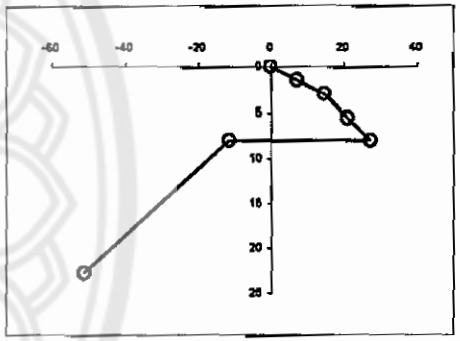


EL.			Case	a	b	h	ARM	σ	Moment
0.00	-	1.50	1	7.37	0.00	1.50	21.75	5.53	120.22
1.50	-	3.00	3	7.37	14.75	1.50	20.42	16.59	338.71
3.00	-	5.50	3	14.75	21.04	2.50	18.43	44.74	824.37
5.50	-	8.00	3	21.04	27.33	2.50	15.95	60.46	964.12
8.00	-	22.75	3	-11.47	-51.05	14.75	4.92	-461.09	-2267.00
22.75	-	22.75	5	0.00	0.00	0.00	0.00	0.00	0.00
							Total	-333.77	-19.58

ok

Prob 9.7 Try 2 nd

Net Pressure				
EL.		σh_p	σh_a	σh_{net}
0		0.00	0.00	0.00
1.5	-	0.00	7.37	7.37
1.5	+	0.00	7.37	7.37
3	-	0.00	14.75	14.75
3	+	0.00	14.75	14.75
5.5	-	24.53	45.56	21.04
5.5	+	24.53	45.56	21.04
8	-	49.05	76.38	27.33
8	+	49.05	37.58	-11.47
22.75	-	384.55	333.50	-51.05



Section Modulus = Input / Allowable Stress m3/m

Right Hand Side

at 1.5	-	$Ka = Tan^2$	(45	- (32 / 2))	=	0.31		
		$Kp = Tan^2$	(45	+ (32 / 2))	=	3.25		
		σv = 0.00	+ (16	* 2)	=	24.00	Kn/M2	
		u = 0.00	+ (1.5	* 0)	=	0.00	Kn/M2	
		$\sigma' v$ = 24.00	- 0.00		=	24.00	Kn/M2	
		$\sigma' h$ = (24.00	* 0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	7.37	Kn/M2	
		σh_a = 7.37	+ 0.00		=	7.37	Kn/M2	
		$\sigma' h$ = (3.25	* 24.00)	+ (2 * 0 * $\sqrt{3.25}$)	=	78.11	Kn/M2	
		σh_p = 78.11	+ 0.00		=	78.11	Kn/M2	
at 1.5	+	$Ka = Tan^2$	(45	- (32 / 2))	=	0.31		
		$Kp = Tan^2$	(45	+ (32 / 2))	=	3.25		
		σv = 0.00	+ (16	* 2)	=	24.00	Kn/M2	
		u = 0.00	+ (1.5	* 0)	=	0.00	Kn/M2	
		$\sigma' v$ = 24.00	- 0.00		=	24.00	Kn/M2	
		$\sigma' h$ = (24.00	* 0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	7.37	Kn/M2	
		σh_a = 0.00	+ 0.00		=	7.37	Kn/M2	
		$\sigma' h$ = (3.25	* 24.00)	+ (2 * 0 * $\sqrt{3.25}$)	=	78.11	Kn/M2	
		σh_p = 78.11	+ 0.00		=	78.11	Kn/M2	
at 3	-	$Ka = Tan^2$	(45	- (32 / 2))	=	0.31		
		$Kp = Tan^2$	(45	+ (32 / 2))	=	3.25		
		σv = 24.00	+ (16	* 2)	=	48.00	Kn/M2	
		u = 0.00	+ (1.5	* 0)	=	0.00	Kn/M2	
		$\sigma' v$ = 48.00	- 0.00		=	48.00	Kn/M2	
		$\sigma' h$ = (48.00	* 0.30726)	- (2 * 0 * $\sqrt{0.31}$)	=	14.75	Kn/M2	
		σh_a = 14.75	+ 0.00		=	14.75	Kn/M2	
		$\sigma' h$ = (3.25	* 48.00)	+ (2 * 0 * $\sqrt{3.25}$)	=	156.22	Kn/M2	
		σh_p = 156.22	+ 0.00		=	156.22	Kn/M2	

at 3	+	Ka	=	Tan^2	(	45	-	(	32	/	2))	=	0.31	
		Kp	=	Tan^2	(	45	+	(	32	/	2))	=	3.25	
		σ v	=	24.00	+ (	16	*	2	)			=	48.00	Kn/M2
		u	=	0.00	+ (	1.5	*	0	)			=	0.00	Kn/M2
		σ' v	=	48.00	-	0.00						=	48.00	Kn/M2
		σ' h	=	(48.00	*	0.30726	)	-	(2	*	0 * $\sqrt{0.31}$)	=	14.75	Kn/M2
		σh_a	=	14.75	+	0.00						=	14.75	Kn/M2
		σ' h	=	(3.25	*	48.00	)	+	(2	*	0 * $\sqrt{3.25}$)	=	156.22	Kn/M2
		σh_p	=	156.22	+	0.00						=	156.22	Kn/M2
at 5.5	-	Ka	=	Tan^2	(	45	-	(	32	/	2))	=	0.31	
		Kp	=	Tan^2	(	45	+	(	32	/	2))	=	3.25	
		σ v	=	48.00	+ (	18	*	3	)			=	93.00	Kn/M2
		u	=	0.00	+ (	2.5	*	10	)			=	24.53	Kn/M2
		σ' v	=	93.00	-	24.53						=	68.48	Kn/M2
		σ' h	=	(68.48	*	0.30726	)	-	(2	*	0 * $\sqrt{0.31}$)	=	21.04	Kn/M2
		σh_a	=	21.04	+	24.53						=	45.56	Kn/M2
		σ' h	=	(3.25	*	68.48	)	+	(2	*	0 * $\sqrt{3.25}$)	=	222.86	Kn/M2
		σh_p	=	222.86	+	24.53						=	247.38	Kn/M2
at 5.5	+	Ka	=	Tan^2	(	45	-	(	32	/	2))	=	0.31	
		Kp	=	Tan^2	(	45	+	(	32	/	2))	=	3.25	
		σ v	=	48.00	+ (	18	*	3	)			=	93.00	Kn/M2
		u	=	0.00	+ (	2.5	*	10	)			=	24.53	Kn/M2
		σ' v	=	93.00	-	24.53						=	68.48	Kn/M2
		σ' h	=	(68.48	*	0.30726	)	-	(2	*	0 * $\sqrt{0.31}$)	=	21.04	Kn/M2
		σh_a	=	21.04	+	24.53						=	45.56	Kn/M2
		σ' h	=	(3.25	*	68.48	)	+	(2	*	0 * $\sqrt{3.25}$)	=	222.86	Kn/M2
		σh_p	=	222.86	+	24.53						=	247.38	Kn/M2

at 8	-	Ka	=	Tan^2	(	45	-	(	32	/	2))	=	0.31	
		Kp	=	Tan^2	(	45	+	(	32	/	2))	=	3.25	
		σ v	=	93.00	+ (	18	*	3	)			=	138.00	Kn/M2
		u	=	24.53	+ (	2.5	*	10	)			=	49.05	Kn/M2
		σ' v	=	138.00	-	49.05						=	88.95	Kn/M2
		σ' h	= (	88.95	*	0.30726	)	- (2	*	0 *	$\sqrt{0.31}$)	=	27.33	Kn/M2
		σh_a	=	27.33	+	49.05						=	76.38	Kn/M2
		σ' h	= (	3.25	*	88.95	)	+ (2	*	0 *	$\sqrt{3.25}$)	=	289.50	Kn/M2
		σh_p	=	289.50	+	49.05						=	338.55	Kn/M2
at 8	+	Ka	=	Tan^2	(	45	-	(	32	/	2))	=	0.31	
		Kp	=	Tan^2	(	45	+	(	32	/	2))	=	3.25	
		σ v	=	93.00	+ (	18	*	3	)			=	138.00	Kn/M2
		u	=	24.53	* (	2.5	*	10	)			=	49.05	Kn/M2
		σ' v	=	138.00	-	49.05						=	88.95	Kn/M2
		σ' h	= (	88.95	*	0.30726	)	- (2	*	# *	$\sqrt{0.31}$)	=	-11.47	Kn/M2
		σh_a	=	-11.47	+	49.05						=	37.58	Kn/M2
		σ' h	= (	3.25	*	88.95	)	+ (2	*	# *	$\sqrt{3.25}$)	=	415.78	Kn/M2
		σh_p	=	415.78	+	49.05						=	464.83	Kn/M2
at 22.75		Ka	=	Tan^2	(	45	-	(	0	/	2))	=	1.00	
		Kp	=	Tan^2	(	45	+	(	0	/	2))	=	1.00	
		σ v	=	138.00	+ (	18	*	15	)			=	403.50	Kn/M2
		u	=	24.53	+ (	14.75	*	s v	)			=	193.75	Kn/M2
		σ' v	=	403.50	-	193.75						=	209.75	Kn/M2
		σ' h	= (	209.75	*	1	)	- (2	*	# *	$\sqrt{1}$)	=	139.75	Kn/M2
		σh_a	=	139.75	+	193.75						=	333.50	Kn/M2
		σ' h	= (	1.00	*	209.75	)	+ (2	*	# *	$\sqrt{1.00}$)	=	279.75	Kn/M2
		σh_p	=	279.75	+	193.75						=	473.50	Kn/M2

Left Hand Side

at 1.5	-	Ka	=	Tan^2	(	45	-	(	0	/ 2))	=	1.00	
		Kp	=	Tan^2	(	45	+	(	0	/ 2))	=	1.00	
		σ v	=	0.00	+ (	0	*	2	)		=	0.00	Kn/M2
		u	=	0.00	+ (	1.5	*	0	)		=	0.00	Kn/M2
		σ' v	=	0.00	-	0.00					=	0.00	Kn/M2
		σ' h	= (	0.00	*	1	)	- (2	*	0 * $\sqrt{}$ 1.00)	=	0.00	Kn/M2
		σh_a	=	0.00	+	0.00					=	0.00	Kn/M2
		σ' h	= (	1.00	*	0.00	)	+ (2	*	0 * $\sqrt{}$ 1.00)	=	0.00	Kn/M2
		σh_p	=	0.00	+	0.00					=	0.00	Kn/M2
at 1.5	+	Ka	=	Tan^2	(	45	-	(	0	/ 2))	=	1.00	
		Kp	=	Tan^2	(	45	+	(	0	/ 2))	=	1.00	
		σ v	=	a	+ (	0	*	2	)		=	0.00	Kn/M2
		u	=	0.00	+ (	1.5	*	0	)		=	0.00	Kn/M2
		σ' v	=	0.00	-	0.00					=	0.00	Kn/M2
		σ' h	= (	0.00	*	1	)	- (2	*	0 * $\sqrt{}$ 1.00)	=	0.00	Kn/M2
		σh_a	=	0.00	+	0.00					=	0.00	Kn/M2
		σ' h	= (	1.00	*	0.00	)	+ (2	*	0 * $\sqrt{}$ 1.00)	=	0.00	Kn/M2
		σh_p	=	0.00	+	0.00					=	0.00	Kn/M2
at 3	-	Ka	=	Tan^2	(	45	-	(	0	/ 2))	=	1.00	
		Kp	=	Tan^2	(	45	+	(	0	/ 2))	=	1.00	
		σ v	=	0.00	+ (	0	*	2	)		=	0.00	Kn/M2
		u	=	0.00	+ (	1.5	*	0	)		=	0.00	Kn/M2
		σ' v	=	0.00	-	0.00					=	0.00	Kn/M2
		σ' h	= (	0.00	*	1	)	- (2	*	0 * $\sqrt{}$ 1.00)	=	0.00	Kn/M2
		σh_a	=	0.00	+	0.00					=	0.00	Kn/M2
		σ' h	= (	1.00	*	0.00	)	+ (2	*	0 * $\sqrt{}$ 1.00)	=	0.00	Kn/M2
		σh_p	=	0.00	+	0.00					=	0.00	Kn/M2

at 3	+	Ka = Tan^2			(45	-	(0 / 2))			=	1.00	
		Kp = Tan^2			(45	+	(0 / 2))			=	1.00	
		σ v =	0.00	+ (	0	*	2)			=	0.00	Kn/M2
		u =	0.00	+ (	1.5	*	0)			=	0.00	Kn/M2
		σ' v =	0.00	-	0.00					=	0.00	Kn/M2
		σ' h = (	0.00	*	1	)	- (2	* 0 *	$\sqrt{0.00}$)	=	0.00	Kn/M2
		σ h_a =	0.00	+	0.00					=	0.00	Kn/M2
		σ' h = (	1.00	*	0.00	)	+ (2	* 0 *	$\sqrt{0.00}$)	=	0.00	Kn/M2
		σ h_p =	0.00	+	0.00					=	0.00	Kn/M2
at 5.5	-	Ka = Tan^2			(45	-	(0 / 2))			=	1.00	
		Kp = Tan^2			(45	+	(0 / 2))			=	1.00	
		σ v =	0.00	+ (	9.81	*	3)			=	24.53	Kn/M2
		u =	0.00	+ (	2.5	*	0)			=	0.00	Kn/M2
		σ' v =	24.53	-	0.00					=	24.53	Kn/M2
		σ' h = (	24.53	*	1	)	- (2	* 0 *	$\sqrt{1.00}$)	=	24.53	Kn/M2
		σ h_a =	24.53	+	0.00					=	24.53	Kn/M2
		σ' h = (	1.00	*	24.53	)	+ (2	* 0 *	$\sqrt{1.00}$)	=	24.53	Kn/M2
		σ h_p =	24.53	+	0.00					=	24.53	Kn/M2
at 5.5	+	Ka = Tan^2			(45	-	(0 / 2))			=	1.00	
		Kp = Tan^2			(45	+	(0 / 2))			=	1.00	
		σ v =	0.00	+ (	9.81	*	3)			=	24.53	Kn/M2
		u =	0.00	+ (	2.5	*	0)			=	0.00	Kn/M2
		σ' v =	24.53	-	0.00					=	24.53	Kn/M2
		σ' h = (	24.53	*	1	)	- (2	* 0 *	$\sqrt{1.00}$)	=	24.53	Kn/M2
		σ h_a =	24.53	+	0.00					=	24.53	Kn/M2
		σ' h = (	1.00	*	24.53	)	+ (2	* 0 *	$\sqrt{1.00}$)	=	24.53	Kn/M2
		σ h_p =	24.53	+	0.00					=	24.53	Kn/M2

at 8	+	Ka	=	Tan^2	(	45	-	(	0	/	2))	=	1.00			
		Kp	=	Tan^2	(	45	+	(	0	/	2))	=	1.00			
		σ v	=	24.53	+ (	9.81	*	3	)			=	49.05	Kn/M2		
		u	=	0.00	+ (	2.5	*	10	)			=	24.53	Kn/M2		
		σ' v	=	49.05	-	24.53						=	24.53	Kn/M2		
		σ' h	= (	24.53	*	1	)	- (2	*	0 *	$\sqrt{1.00}$)	=	24.53	Kn/M2		
		σh_a	=	24.53	+	24.53						=	49.05	Kn/M2		
		σ' h	= (	1.00	*	24.53	)	+ (2	*	0 *	$\sqrt{1.00}$)	=	24.53	Kn/M2		
		σh_p	=	24.53	+	24.53						=	49.05	Kn/M2		
at 8	+	Ka	=	Tan^2	(	45	-	(	0	/	2))	=	1.00			
		Kp	=	Tan^2	(	45	+	(	0	/	2))	=	1.00			
		σ v	=	24.53	+ (	9.81	*	3	)			=	49.05	Kn/M2		
		u	=	0.00	+ (	2.5	*	10	)			=	24.53	Kn/M2		
		σ' v	=	49.05	-	24.53						=	24.53	Kn/M2		
		σ' h	= (	24.53	*	1	)	- (2	*	0 *	$\sqrt{1.00}$)	=	24.53	Kn/M2		
		σh_a	=	24.53	+	24.53						=	49.05	Kn/M2		
		σ' h	= (	1.00	*	24.53	)	+ (2	*	0 *	$\sqrt{1.00}$)	=	24.53	Kn/M2		
		σh_p	=	24.53	+	24.53						=	49.05	Kn/M2		
at 22.75		Ka	=	Tan^2	(	45	-	(	0	/	2))	=	1.00			
		Kp	=	Tan^2	(	45	+	(	0	/	2))	=	1.00			
		σ v	=	49.05	+ (	18	*	15	)			=	314.55	Kn/M2		
		u	=	24.53	+ (	14.75	*	10	)			=	169.22	Kn/M2		
		σ' v	=	314.55	-	169.22						=	145.33	Kn/M2		
		σ' h	= (	145.33	*	1	)	- (2	*	# *	$\sqrt{1.00}$)	=	75.33	Kn/M2		
		σh_a	=	75.33	+	169.22						=	244.55	Kn/M2		
		σ' h	= (	1.00	*	145.33	)	+ (2	*	# *	$\sqrt{1.00}$)	=	215.33	Kn/M2		
		σh_p	=	215.33	+	169.22						=	384.55	Kn/M2		

Moment

EL.				0.5	*	(a+b)	*	h	*	Moment arm			
0.00	-	1.50	=	0.5	*	7.37	*	1.50	*	21.75	=	120.22	kN-m/m
1.50	-	3.00	=	0.5	*	22.12	*	1.50	*	20.42	=	338.71	kN-m/m
3.00	-	5.50	=	0.5	*	35.79	*	2.50	*	18.43	=	824.37	kN-m/m
5.50	-	8.00	=	0.5	*	48.37	*	2.50	*	15.95	=	964.12	kN-m/m
8.00	-	22.75	=	0.5	*	-62.52	*	14.75	*	4.92	=	-2267.00	kN-m/m
22.75	-	22.75	=	0.5	*	0.00	*	0.00	*	0.00	=	0.00	kN-m/m
						Total Moment					=	-19.58	kN-m/m

ok

$$\text{Section Modulus} = \frac{19.58}{0} = \frac{\text{Input Allowable}}{\text{Stress}} \text{ m3/m}$$