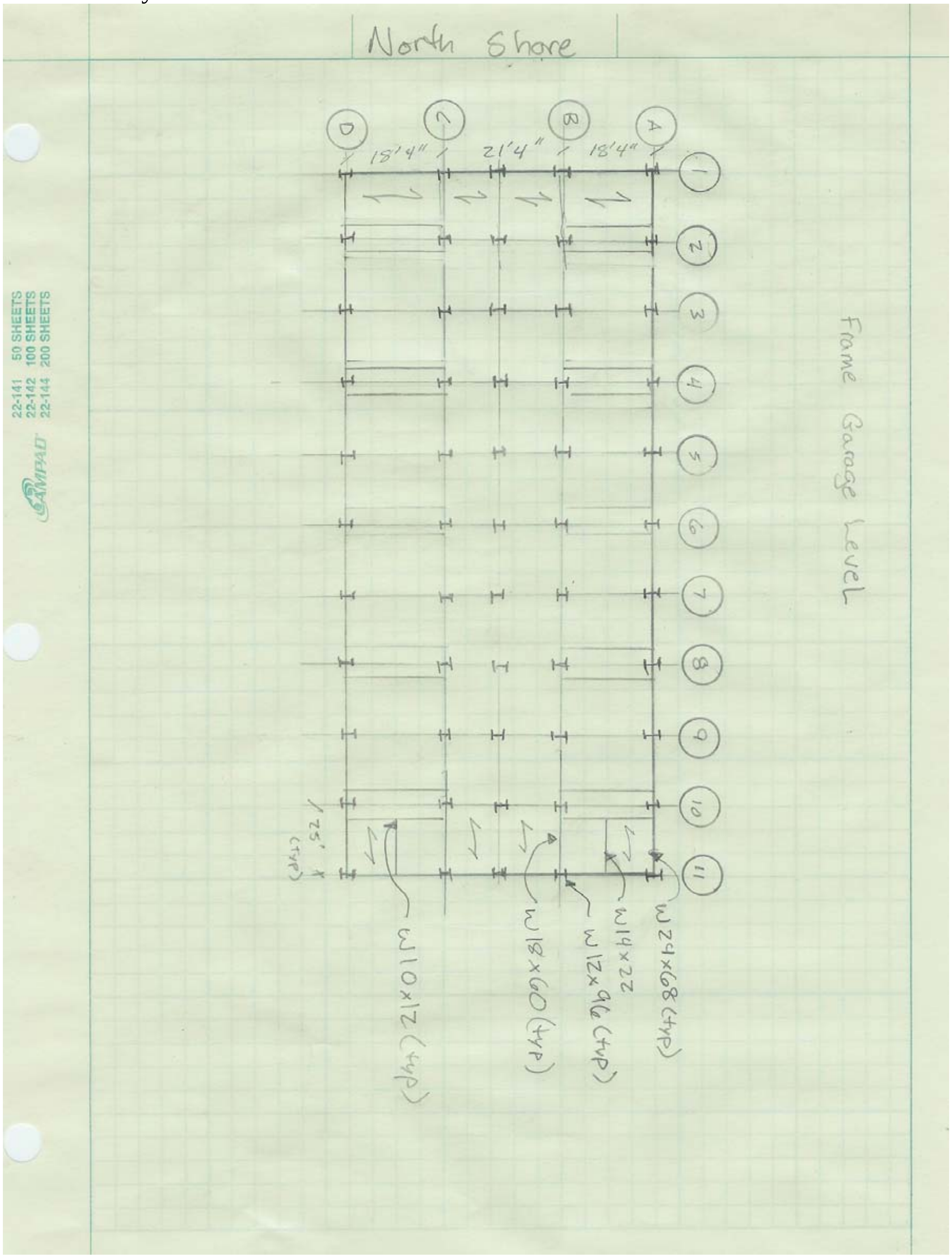
Appendix A

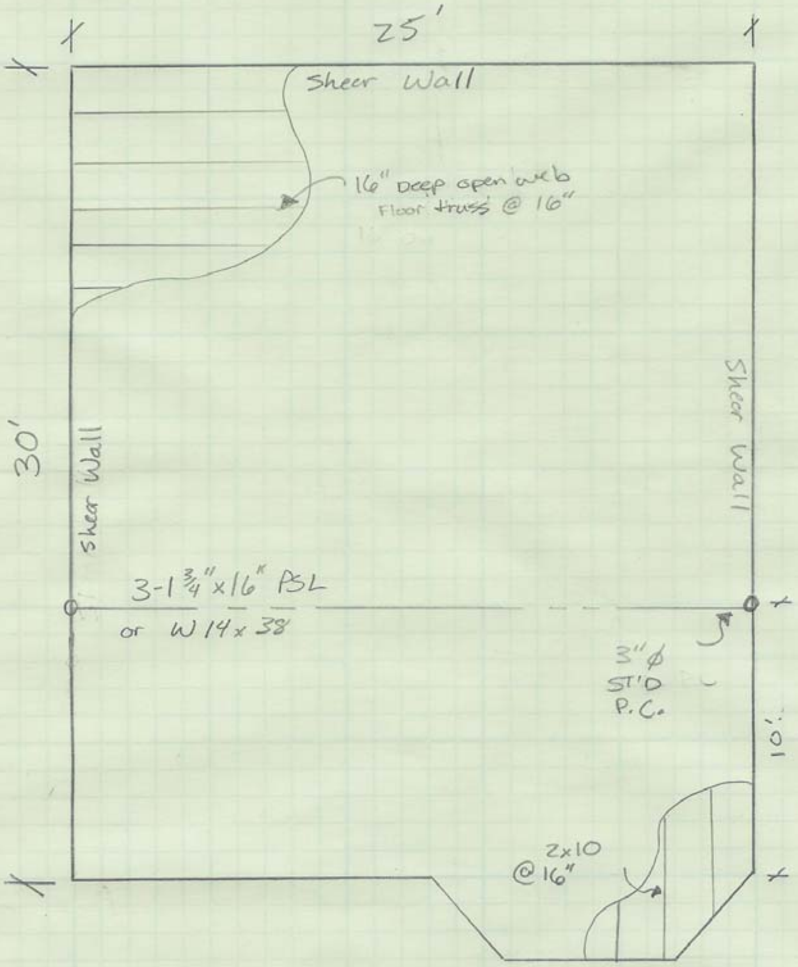
Current Structural System Details

Structural Layout:



North Shore

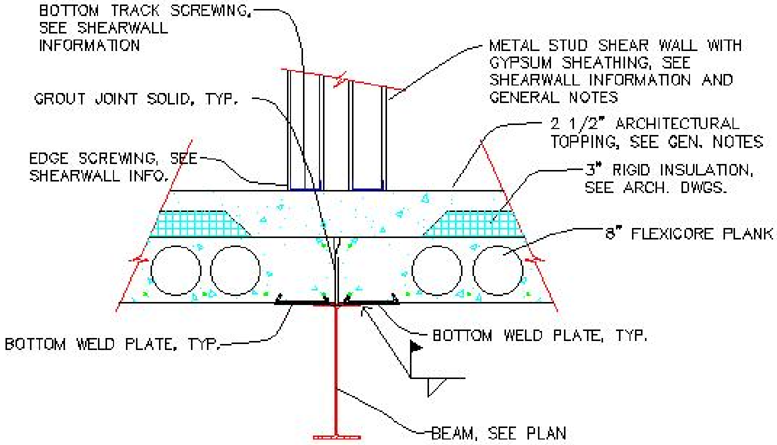
Typical Bay



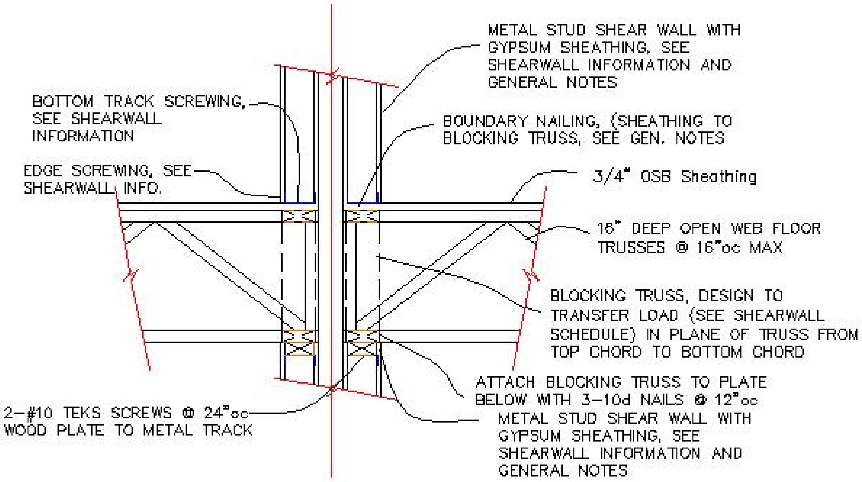
Typical Shear Wall

sheathing	studs	chords	sheathing Attachment	Chord anchor
½" Gypsum (Both sides)	JW16 @16" O.C.	Z-JW16	#6 TEKS Screws @ 6" o.c. (edge) @ 12" oc (field)	Z-CSZZ simpson straps

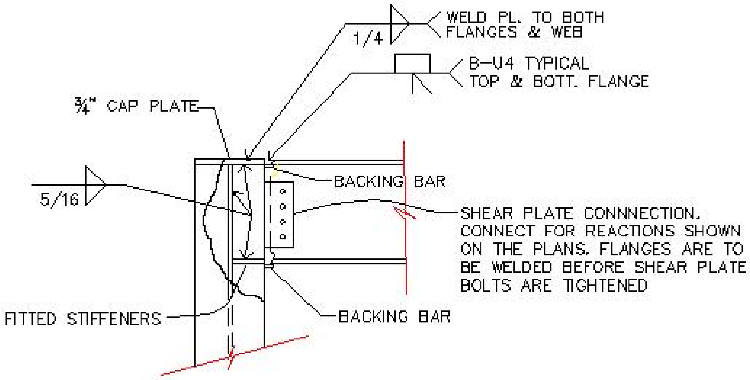
Shear Truss design load ≃ 140 plf



1st Floor
Floor Structure

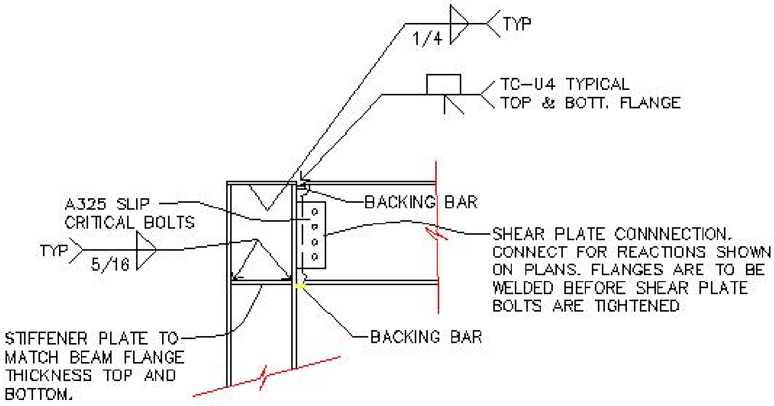


2nd, 3rd, and 4th Floor
Floor Structure



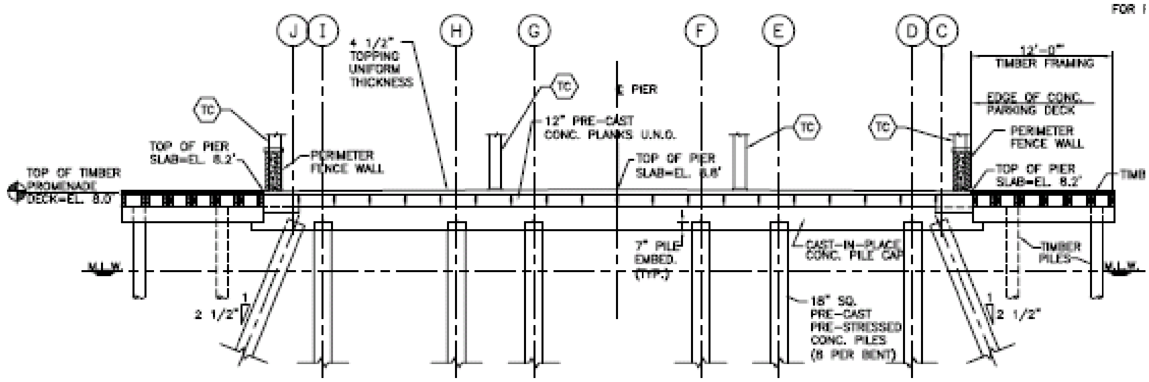
NOTE:
1) STIFFENER PLATE TO MATCH BEAM
FLANGE THICKNESS TOP & BOTTOM

Typical Moment Connection 1st
floor frame.
Perpendicular to column Web



Typical Moment Connection
1st floor frame.
Parallel to column Web

Pier structure, typical concrete bent.

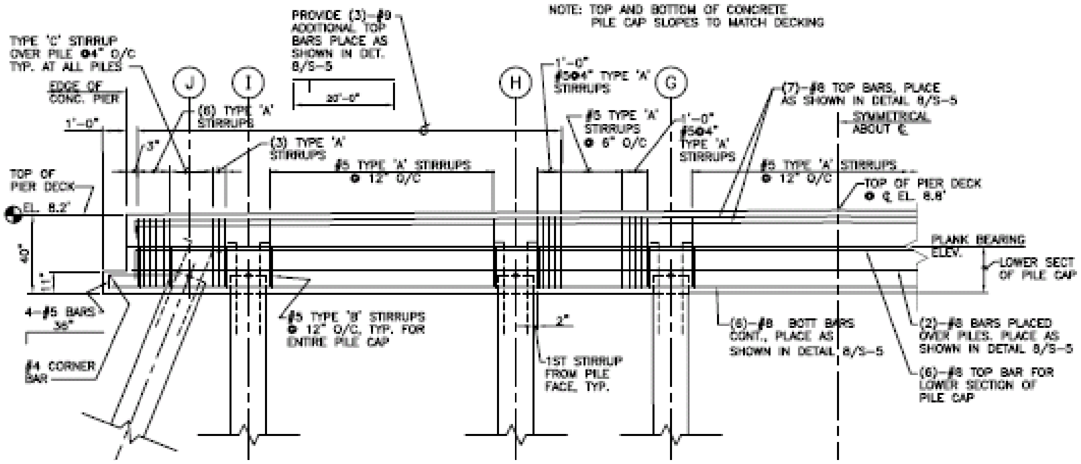


5
S-5
TYPICAL PIER SECTION @ PILE BENTS
SCALE: 3/16"=1'-0"

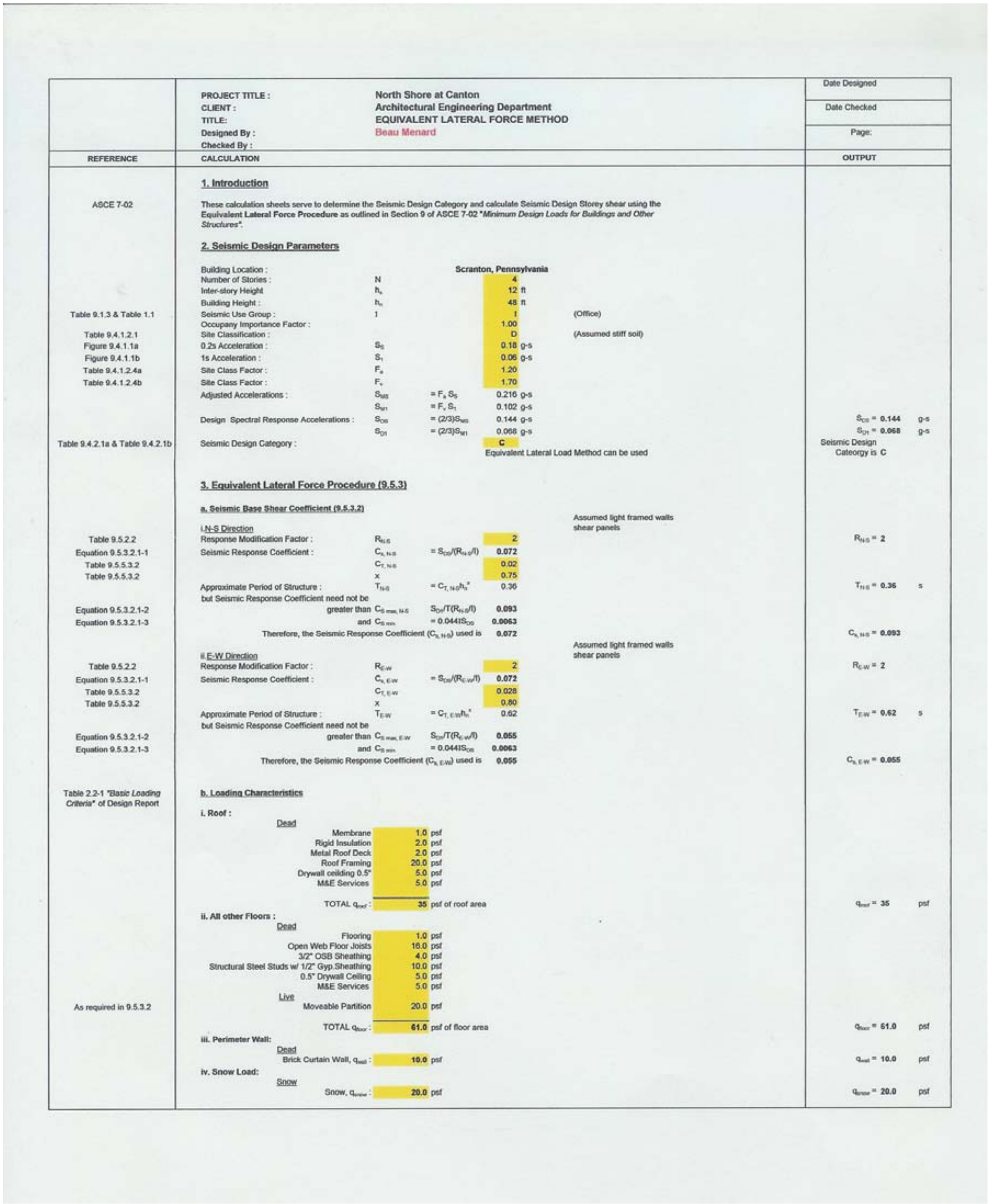
NOTE: IN SECTION TC INDICATES TOWNHOUSE BUILDING COLUMNS. SHOWN FOR REFERENCE. REFER TO TOWNHOUSE DWGS. FOR LOCATIONS.

NOTE: PILE BENT 2 THRU 10 SHOWN PILE BENT 11 SIMILAR

NOTE: TOP AND BOTTOM OF CONCRETE PILE CAP SLOPES TO MATCH DECKING



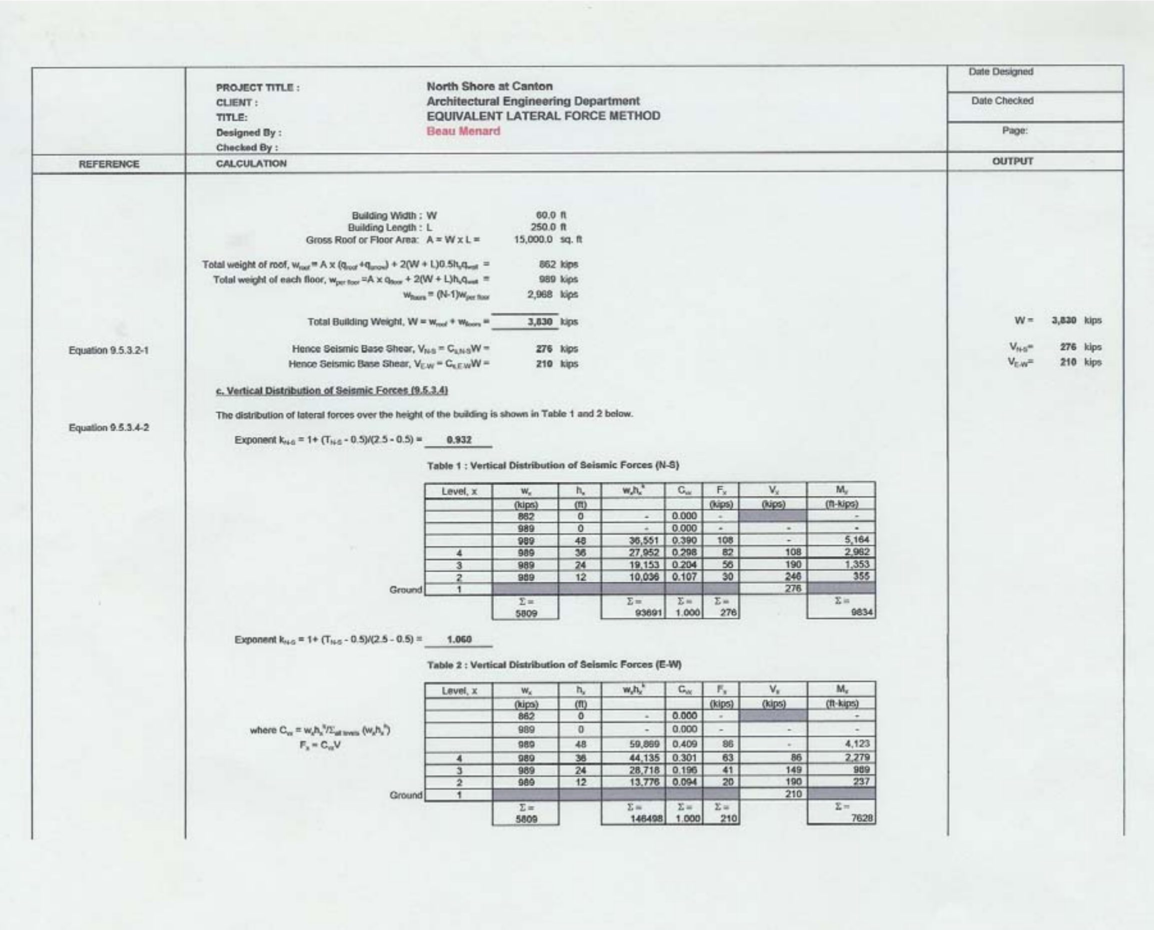
Seismic Loading:



PROJECT TITLE :	North Shore at Canton			Date Designed
CLIENT :	Architectural Engineering Department			Date Checked
TITLE:	EQUIVALENT LATERAL FORCE METHOD			Page:
Designed By :	Beau Menard			
Checked By :				

REFERENCE	CALCULATION					OUTPUT
	1. Introduction					
ASCE 7-02	These calculation sheets serve to determine the Seismic Design Category and calculate Seismic Design Storey shear using the **Equivalent Lateral Force Procedure** as outlined in Section 9 of ASCE 7-02 "*Minimum Design Loads for Buildings and Other Structures*".					
	2. Seismic Design Parameters					
	Building Location :			Scranton, Pennsylvania		
	Number of Stories :	N		4		
	Inter-story Height	h_s		12 ft		
	Building Height :	h_n		48 ft		
Table 9.1.3 & Table 1.1	Seismic Use Group :	I		I	(Office)	
	Occupany Importance Factor :			1.00		
Table 9.4.1.2.1	Site Classification :			D	(Assumed stiff soil)	
Figure 9.4.1.1a	0.2s Acceleration :	S_S		0.18 g-s		
Figure 9.4.1.1b	1s Acceleration :	S_1		0.06 g-s		
Table 9.4.1.2.4a	Site Class Factor :	F_a		1.20		
Table 9.4.1.2.4b	Site Class Factor :	F_v		1.70		
	Adjusted Accelerations :	S_{MS}	$= F_a S_S$	0.216 g-s		
		S_{M1}	$= F_v S_1$	0.102 g-s		
	Design Spectral Response Accelerations :	S_{DS}	$= (2/3)S_{MS}$	0.144 g-s		S_{DS} = **0.144** g-s
		S_{D1}	$= (2/3)S_{M1}$	0.068 g-s		S_{D1} = **0.068** g-s
Table 9.4.2.1a & Table 9.4.2.1b	Seismic Design Category :			C Equivalent Lateral Load Method can be used		Seismic Design Cateorgy is **C**
	3. Equivalent Lateral Force Procedure (9.5.3)					
	a. Seismic Base Shear Coefficient (9.5.3.2)					
	i.N-S Direction				Assumed light framed walls shear panels	
Table 9.5.2.2	Response Modification Factor :	R_{N-S}		2		R_{N-S} = **2**
Equation 9.5.3.2.1-1	Seismic Response Coefficient :	$C_{s, N-S}$	$= S_{DS}/(R_{N-S}/I)$	**0.072**		
Table 9.5.5.3.2		$C_{T, N-S}$		0.02		
Table 9.5.5.3.2		x		0.75		
	Approximate Period of Structure :	T_{N-S}	$= C_{T, N-S}h_n^x$	0.36		T_{N-S} = **0.36** s
	but Seismic Response Coefficient need not be					
Equation 9.5.3.2.1-2	greater than	$C_{S\ max,\ N-S}$	$S_{D1}/T(R_{N-S}/I)$	**0.093**		
Equation 9.5.3.2.1-3	and	$C_{S\ min}$	$= 0.044IS_{DS}$	**0.0063**		
	Therefore, the Seismic Response Coefficient ($C_{s, N-S}$) used is			**0.072**		$C_{s, N-S}$ = **0.093**
	ii.E-W Direction				Assumed light framed walls shear panels	
Table 9.5.2.2	Response Modification Factor :	R_{E-W}		2		R_{E-W} = **2**
Equation 9.5.3.2.1-1	Seismic Response Coefficient :	$C_{s, E-W}$	$= S_{DS}/(R_{E-W}/I)$	**0.072**		
Table 9.5.5.3.2		$C_{T, E-W}$		0.028		
Table 9.5.5.3.2		x		0.80		
	Approximate Period of Structure :	T_{E-W}	$= C_{T, E-W}h_n^x$	0.62		T_{E-W} = **0.62** s
	but Seismic Response Coefficient need not be					
Equation 9.5.3.2.1-2	greater than	$C_{S\ max,\ E-W}$	$S_{D1}/T(R_{E-W}/I)$	**0.055**		
Equation 9.5.3.2.1-3	and	$C_{S\ min}$	$= 0.044IS_{DS}$	**0.0063**		
	Therefore, the Seismic Response Coefficient ($C_{s, E-W}$) used is			**0.055**		$C_{s, E-W}$ = **0.055**
Table 2.2-1 "*Basic Loading Criteria*" of Design Report	**b. Loading Characteristics**					
	i. Roof :					
	Dead					
	Membrane			1.0 psf		
	Rigid Insulation			2.0 psf		
	Metal Roof Deck			2.0 psf		
	Roof Framing			20.0 psf		
	Drywall ceilding 0.5"			5.0 psf		
	M&E Services			5.0 psf		
	TOTAL q_{roof} :			**35** psf of roof area		q_{roof} = **35** psf
	ii. All other Floors :					
	Dead					
	Flooring			1.0 psf		
	Open Web Floor Joists			16.0 psf		
	3/2" OSB Sheathing			4.0 psf		
	Structural Steel Studs w/ 1/2" Gyp.Sheathing			10.0 psf		
	0.5" Drywall Ceiling			5.0 psf		
	M&E Services			5.0 psf		
	Live					
As required in 9.5.3.2	Moveable Partition			20.0 psf		
	TOTAL q_{floor} :			**61.0** psf of floor area		q_{floor} = **61.0** psf
	iii. Perimeter Wall:					
	Dead					
	Brick Curtain Wall, q_{wall} :			**10.0** psf		q_{wall} = **10.0** psf
	iv. Snow Load:					
	Snow					
	Snow, q_{snow} :			**20.0** psf		q_{snow} = **20.0** psf

Seismic Results:



PROJECT TITLE : North Shore at Canton
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Designed By : Beau Menard
Checked By :

Date Designed
Date Checked
Page:

REFERENCE | **CALCULATION** | **OUTPUT**

Building Width : W 60.0 ft
Building Length : L 250.0 ft
Gross Roof or Floor Area: A = W x L = 15,000.0 sq. ft

Total weight of roof, $w_{roof} = A \times (q_{roof} + q_{snow}) + 2(W + L)0.5h_x q_{wall}$ = 862 kips
Total weight of each floor, $w_{per\ floor} = A \times q_{floor} + 2(W + L)h_x q_{wall}$ = 989 kips
$w_{floors} = (N\text{-}1)w_{per\ floor}$ 2,968 kips

Total Building Weight, $W = w_{roof} + w_{floors}$ = **3,830** kips

Equation 9.5.3.2-1

Hence Seismic Base Shear, $V_{N\text{-}S} = C_{s,N\text{-}S}W$ = **276** kips
Hence Seismic Base Shear, $V_{E\text{-}W} = C_{s,E\text{-}W}W$ = **210** kips

W = **3,830** **kips**
$V_{N\text{-}S}$= **276** **kips**
$V_{E\text{-}W}$= **210** **kips**

c. Vertical Distribution of Seismic Forces (9.5.3.4)

The distribution of lateral forces over the height of the building is shown in Table 1 and 2 below.

Equation 9.5.3.4-2

Exponent $k_{N\text{-}S} = 1 + (T_{N\text{-}S} - 0.5)/(2.5 - 0.5)$ = **0.932**

Table 1 : Vertical Distribution of Seismic Forces (N-S)

Level, x	w_x	h_x	$w_x h_x^k$	C_{vx}	F_x	V_x	M_x
	(kips)	(ft)			(kips)	(kips)	(ft-kips)
	862	0	-	0.000	-		-
	989	0	-	0.000	-	-	-
	989	48	36,551	0.390	108	-	5,164
4	989	36	27,952	0.298	82	108	2,962
3	989	24	19,153	0.204	56	190	1,353
2	989	12	10,036	0.107	30	246	355
Ground 1						276	
	Σ = 5809		Σ = 93691	Σ = 1.000	Σ = 276		Σ = 9834

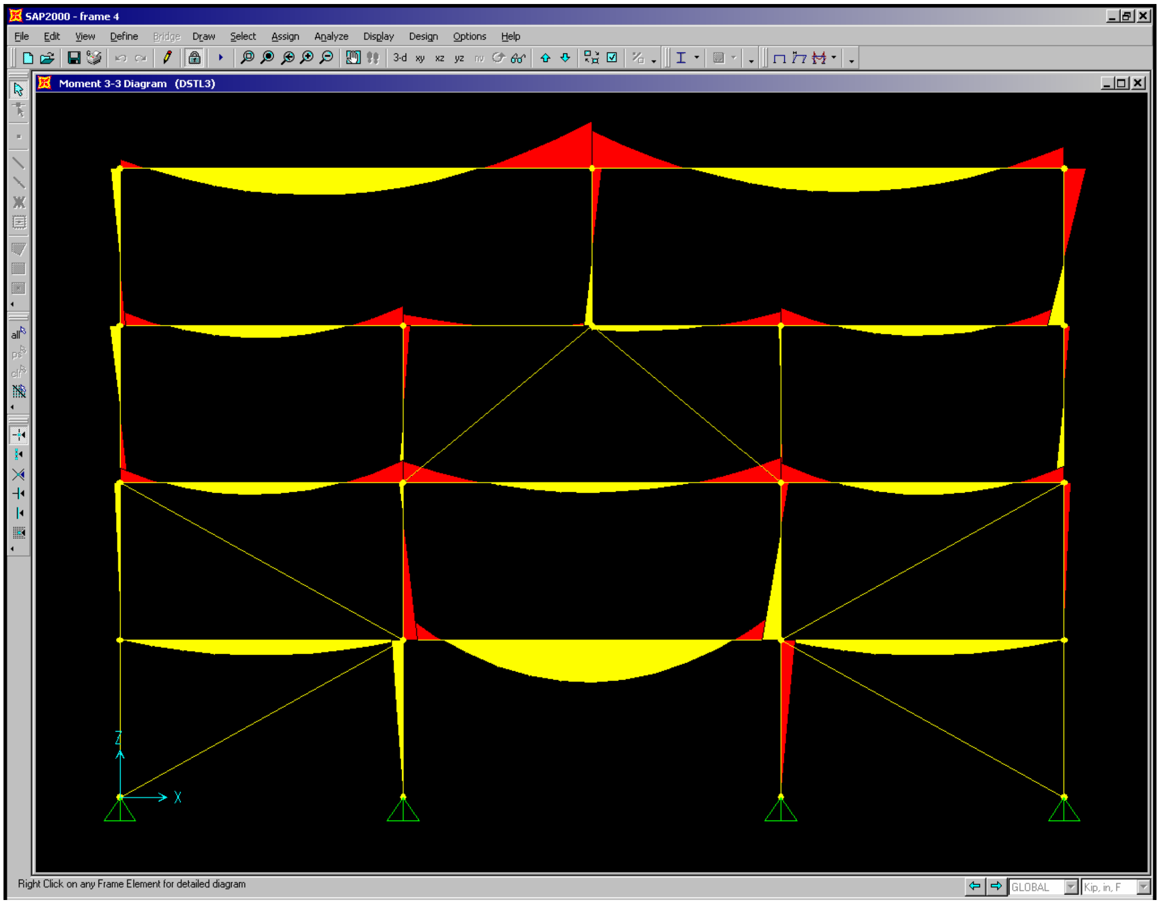
Exponent $k_{N\text{-}S} = 1 + (T_{N\text{-}S} - 0.5)/(2.5 - 0.5)$ = **1.060**

Table 2 : Vertical Distribution of Seismic Forces (E-W)

where $C_{vx} = w_x h_x^k / \Sigma_{all\ levels} (w_x h_x^k)$
$F_x = C_{vx}V$

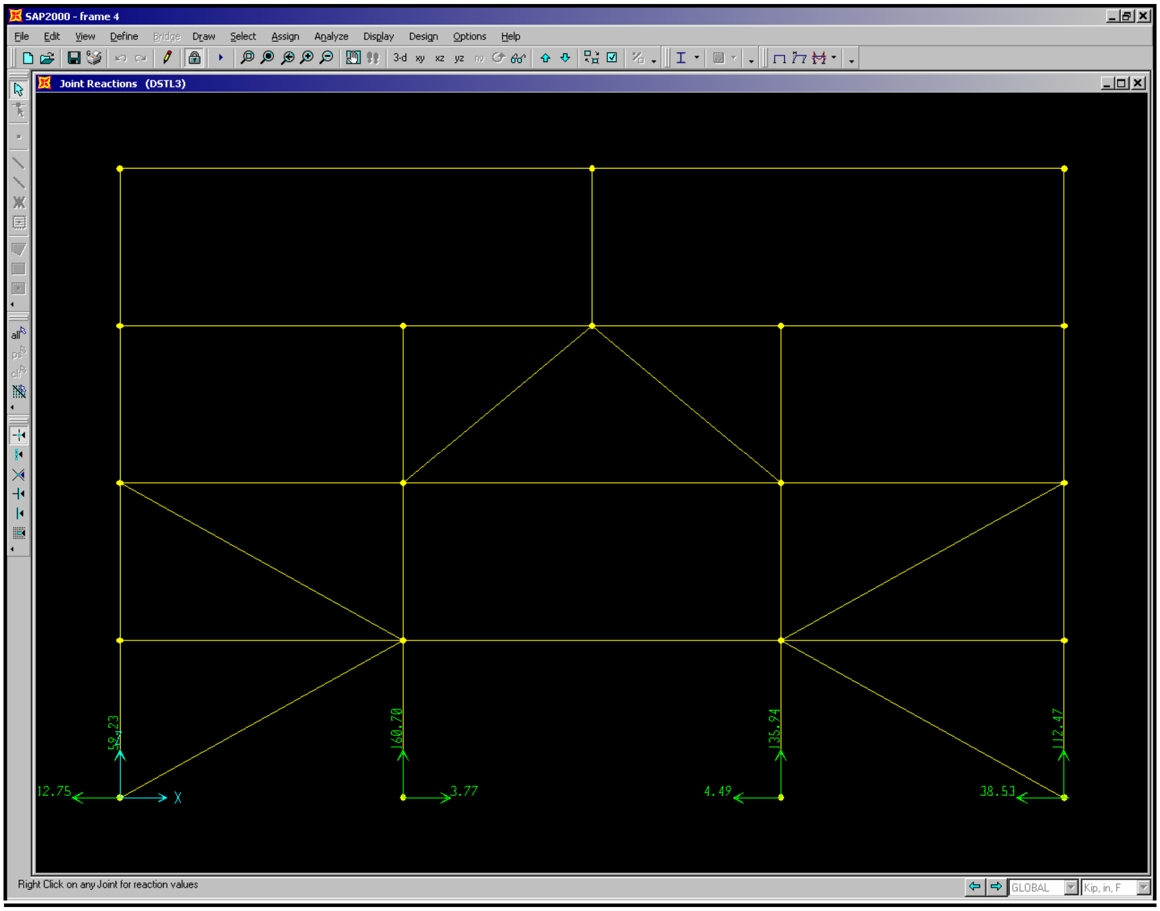
Level, x	w_x	h_x	$w_x h_x^k$	C_{vx}	F_x	V_x	M_x
	(kips)	(ft)			(kips)	(kips)	(ft-kips)
	862	0	-	0.000	-		-
	989	0	-	0.000	-	-	-
	989	48	59,869	0.409	86	-	4,123
4	989	36	44,135	0.301	63	86	2,279
3	989	24	28,718	0.196	41	149	989
2	989	12	13,776	0.094	20	190	237
Ground 1						210	
	Σ = 5809		Σ = 146498	Σ = 1.000	Σ = 210		Σ = 7628

Steel Frame Moment Diagrams



Right Click on any Frame Element for detailed diagram

Steel Frame Support Reactions



Right Click on any Joint for reaction values

Material estimates

Structural Steel Members estimate

Member	Quantity	Length	Cost	Total Cost
		(ft)	($/ft)	($)
W 10x49	132	10	66	87120
W 16x26	32	18	35.5	20448
	11	24	35.5	9372
W 18x40	160	25	53.5	214000
W 18x35	5	24	47.5	5700
	10	18	47.5	8550
W 8x24	38	10	37	14060
	22	15.5	37	12617
	20	20.5	37	15170
W 21x44	12	18	50.38	10882.08
	6	24	50.38	7254.72
W 21x50	5	24	56.88	6825.6
W 24x55	10	30	61.71	18513
	6	24	61.71	8886.24

Total = 439398.6

Metal Decking estimate

Member	Quantity	Area	Cost	Total Cost
		(ft^2)	($/ft^2)	($)
19 gauge Steel Decking		44000	1.64	72160

Steel Joist estimate

Member	Quantity	Length	Weight	Total Weight
		(ft)	(lbs/ft)	(lbs)
K-serie Joist	120	18	7	15120
	170	25	7	29750
	50	24	7	8400

Total Weight 26.635 (tons)

Cost 1775 ($/ton)

Total cost 47277.125 ($)

Concrete

Member	Quantity	Area	Cost	Total Cost
		(ft^2)	($/ft^2)	($)
Precast Walls 8"	9	540	13.05	63423
	6	225	13.05	17617.5

Total Cost 81040.5

Member	Quantity	Area	Cost	Total Cost
		(ft^2)	($/ft^2)	($)
Precast Planks		44000	8.4	369600

Member	Quantity	Length	Cost	Total Cost
		(ft)	($/ft)	($)
Precast Column	95	9	102	87210

Member	Quantity	Length	Cost	Total Cost
Precast Beam		(ft)	($/Unit)	($)
Interior	24	60	3150	75600
Perimeter	20	50	3150	63000

Total Cost 138600