CONSORCIO DISEÑOS
YUMBO

ESTUDIO ESTRUCTURAL
LA CALLE 12 DEL MUNICIPIO DE YUMBO



ESTUDIOS Y DISEÑOS TÉCNICOS PARA LA CONSTRUCCIÓN DE LA VIA CALLE DE LOS ESTUDIANTE
MUNICIPIO DE YUMBO
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CR 12 A # 3 A - 44 PISO 1
318 863 4258
consorciodisenosyumbo@gmail.com

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YUMBO

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1. INTRODUCCIÓN

El presente documento contiene la información del Estudio Estructural para realizar las diferentes obras propuestas en el desarrollo del proyecto para la construcción del corredor de la calle 12, entre la Carrera 1A y la Carrera 12, en el Municipio de Yumbo departamento de Valle del Cauca. Lo anterior bajo la normativa nacional actualmente vigente, Código Colombiano de Diseño Sismo Resistente NSR-10.

El presente informe corresponde alas memorias de cáclculo para la estructura de acero de las pergolas.

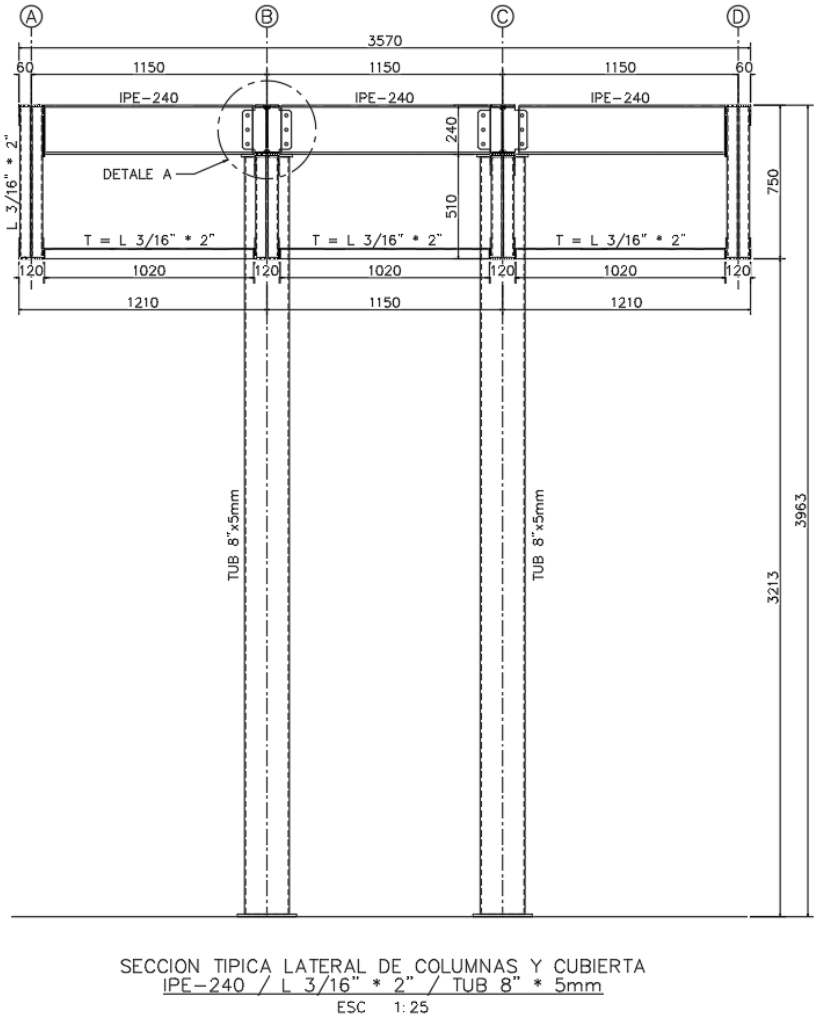


Figura 1. Geometria general de estructura de pergola, vista en alzada.

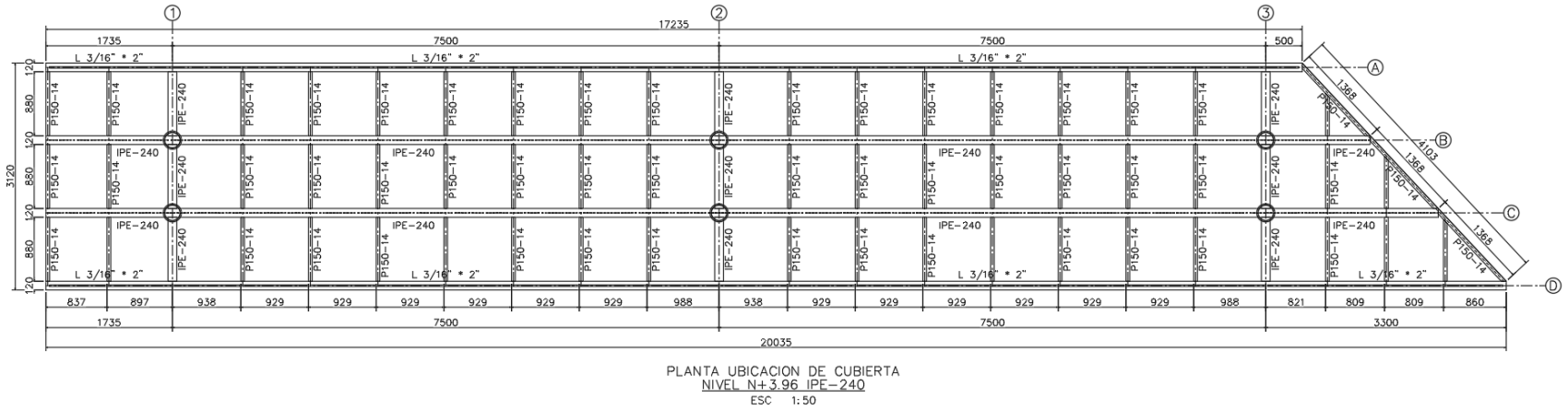


Figura 2. Geometria general de estructura de pergola, vista en planta de cubierta.

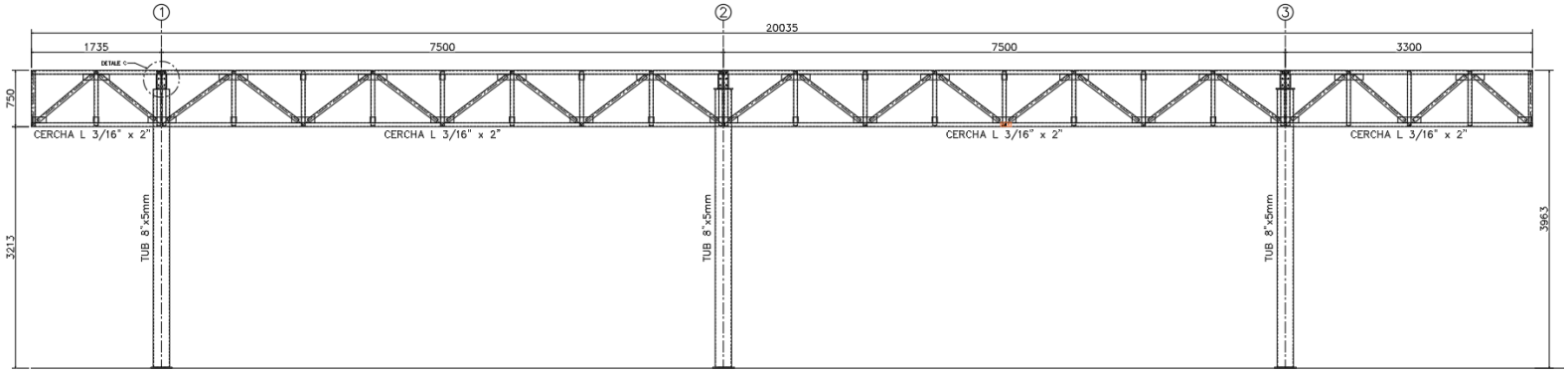


Figura 3. Geometria general de estructura de pergola, vista longitudinal en elevacion.

2. OBJETIVOS

2.1 OBJETIVO GENERAL

El objetivo general del estudio es la ejecución del diseño estructural de la nueva estructura aporticada de acero de un nivel tipo pergola, bajo el Código Colombiano de Diseño Sismo resistente NSR-10. En especial recomendaciones de los títulos F para estructuras de acero.

2.2 OBJETIVOS ESPECIFICOS

- Determinar las solicitaciones de cargas permanentes y transitorias, producto del peso propio de los materiales de la estructura y la carga viva actuante para este tipo de edificaciones.
- Dimensionar los diferentes elementos estructurales de la cimentación y demás estructuras de acuerdo a las solicitaciones anteriores y a los requerimientos arquitectónicos.
- Determinar las solicitaciones más desfavorables actuantes en los elementos estructurales.
- Diseñar el refuerzo requerido ante las solicitaciones previamente determinadas.
- Planos estructurales de construcción.
- Informe de memorias de cálculo.
- Cuantificar las cantidades de obra.

3. DESCRIPCIÓN DE LA ESTRUCTURA NUEVA

La estructura corresponde a un sistema metálico longitudinal conformado por cerchas tipo reticulado, apoyadas sobre columnas tubulares verticales, diseñado para soportar cargas de cubierta ligera y transmitirlas hacia la cimentación mediante un esquema resistente predominantemente axial.

El conjunto estructural está compuesto por un eje principal de aproximadamente 20.03 m de longitud total, dividido en claros intermedios apoyados en tres puntos estructurales principales (ejes 1, 2 y 3), los cuales funcionan como nodos de transferencia de carga hacia columnas metálicas tubulares.

El sistema presenta una configuración modular que favorece:

- Distribución uniforme de cargas.
- Reducción de momentos flectores mediante triangulación.
- Optimización del peso estructural.

4. CRITERIOS Y PARÁMETROS DE DISEÑO

Para el diseño se siguen los lineamientos establecidos en las siguientes normas:

- Reglamento de Construcción Sismoresistente **NSR-10.**

4.1 CARGAS

La estructura se diseña para soportar las siguientes cargas:

4.1.1 Carga Muerta, DC

Se considera como carga muerta el peso propio de la estructura, considerando una densidad del material de 2.4 ton/m^3 vigas de amarre de muros y de cimentación. Para los elementos de cubierta acero estructural densidad 7.85 ton/m^3.

Se considera como carga sobreimpuesta en las vigas de cubierta de teraza por 200 kg/m^2, esto para cubrir acabados en el piso y equipos de aires acondicionados.

4.1.2 Carga Viva, LL

Cargas mínimas en cubierta B.4.2.1 :

- Por tratarse de una terraza y de manera conservadora se asume una carga viva de uso residencial de 180 kg/m^2.

4.1.3 Viento, W.

Se considera una carga mínima de viento de 40 kg/m^2.

4.2 COMBINACIONES DE CARGA

Para el diseño de la estructura se tienen en cuenta los grupos o combinaciones de carga y los factores de mayoración establecidos en el Reglamento Colombiano de Construcción Sismoresistente NSR-10.

El diseño de las estructuras, sus componentes y cimentaciones debe hacerse de tal forma que sus resistencias de diseño igualen o excedan los efectos producidos por las cargas mayoradas en las siguientes combinaciones: B.2.4 NSR-10.

Resistencia:

1.4(D+ F)	(B.2.4-1)
1.2(D+ F + T) + 1.6(L + H) + 0.5(Lr ó G ó Le)	(B.2.4-2)
1.2D+ 1.6(Lr ó G ó Le) + (L ó 0.8W)	(B.2.4-3)
1.2D+ 1.6W+ 1.0L + 0.5(Lr ó G ó Le)	(B.2.4-4)
1.2D+ 1.0E + 1.0L	(B.2.4-5)
0.9D+ 1.6W+ 1.6H	(B.2.4-6)
0.9D+ 1.0E + 1.6H	(B.2.4-7)

Servicio:

D+ F	(B.2.3-1)
D+ H + F + L + T	(B.2.3-2)
D+ H+ F + (Lr ó G ó Le)	(B.2.3-3)
D+ H+ F + 0.75(L + T) + 0.75(Lr ó G ó Le)	(B.2.3-4)
D+ H + F + W	(B.2.3-5)
D+ H + F + 0.7E	(B.2.3-6)
D+ H+ F + 0.75W+ 0.75L + 0.75(Lr ó G ó Le)	(B.2.3-7)
D+ H + F + 0.75(0.7E) + 0.75L + 0.75(Lr ó G ó Le)	(B.2.3-8)
0.6D+W+ H	(B.2.3-9)
0.6D+ 0.7E + H	(B.2.3-10)

4.3 MATERIALES

Los materiales que conforman los diferentes elementos estructurales del puente son:

4.3.1 Concreto

- Vigas: f'c = 210 kgf/cm^2
- Concreto de limpieza f'c = 140 kgf/cm^2

4.3.2 Acero Estructural

Platinas y láminas:	ASTM A36
Perfil IPE:	ASTM A572 Gr. 50
Soldadura	E60XX,
Tornillería y tuercas:	ASTM A325
Pernos de anclaje:	Acero ASTM F1554 GR.36
Pintura:	Imprimante epóxico fosfato de zinc 3 mils. Acabado pintura epoxica 3 mils.
Limpieza:	Limpieza Sand Blasting SSPC-SP 6 grado comercial.

4.3.3 Acero de Refuerzo

El refuerzo debe ser corrugado con una resistencia nominal a la fluencia de 4218 kg /cm2 y debe cumplir con la norma NTC 2289 (ASTM A706).

5. MEMORIAS DE ANALISIS Y DISEÑO ESTRUCTURAL

Para el análisis y el diseño de los elementos de la estructura de acero se utiliza el programa ETABS. Los listados del análisis y diseño obtenidos de los diferentes elementos estructurales, se presentan como Anexos del presente informe.

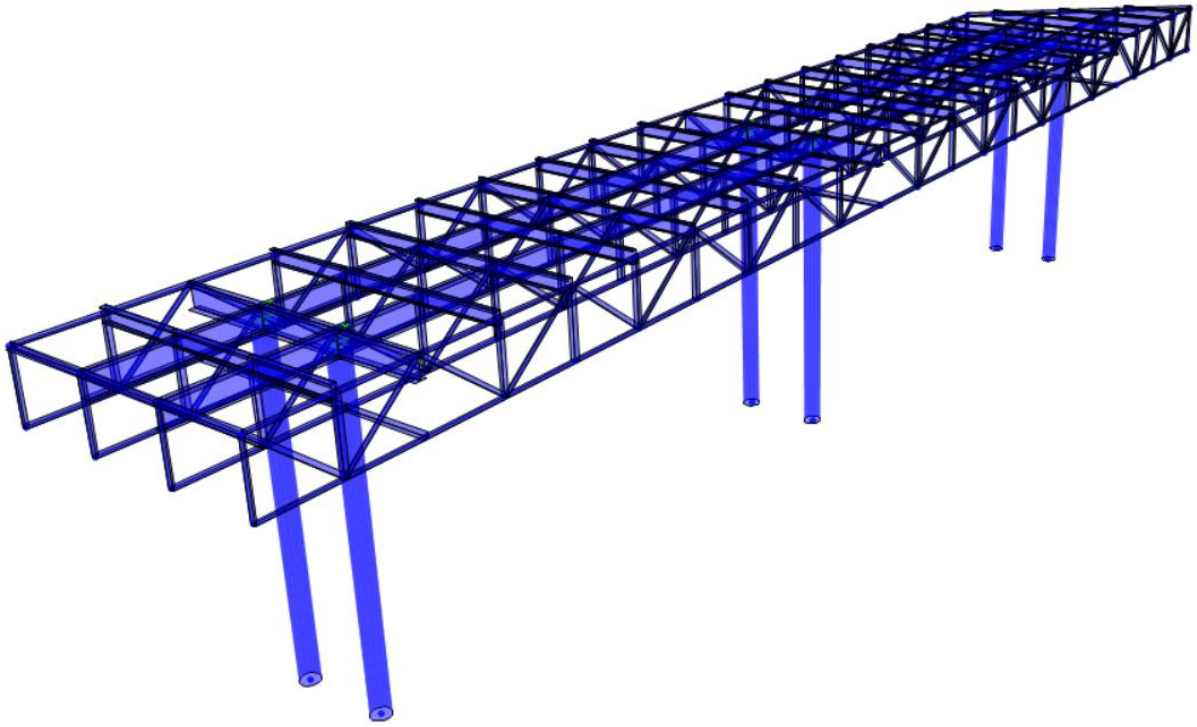


Figura 4. Modelo tridimensional estructura de acero de pergola, mediante el programa SAP2000.

5.1 SISTEMA ESTRUCTURAL

El método de análisis a utilizar es el análisis dinámico elástico, que según el A.3.4.2 (NSR-10) permite analizar casi cualquier tipo de edificación. Dentro del análisis dinámico, se utilizará el análisis dinámico elástico espectral, cumpliendo con los requisitos del título A.5.4. Las fuerzas sísmicas de diseño se introducirán por medio del espectro elástico de diseño definido en el A.2 NSR-10.

El reglamento NSR-10 reconoce 4 tipos de Sistemas Estructurales de resistencia sísmica. Cada uno de ellos se subdivide según los tipos de elementos verticales utilizados para resistir las fuerzas sísmicas y gravitacionales y el grado de capacidad de disipación de energía del material estructural empleado.

Para el pressente proyecto el sistema estructural de acuerdo con la norma es el que se presenta a continuacion según definicion.

3.2.1.3 — Sistema de pórtico — Es un sistema estructural compuesto por un pórtico espacial, resistente a momentos, esencialmente completo, sin diagonales, que resiste todas las cargas verticales y fuerzas horizontales.

El uso de la edificación será residencial; según la información arquitectónica entregada. A continuación, se describen las cargas de diseño:

Avaluo de Cargas
Cubierta

Tipo de carga	cantidad	unidad
Cielo raso	10	kg/m2
Equipos Aires o Paneles	15	kg/m2
Ductos	5	kg/m2
TOTAL, MUERTA X M2	**30**	**kg/m2**

Carga Viva: Cubierta	**50**	**kg/m2**
Carga de Viento: W min	**40**	**kg/m2**

Tabla 1. Evaluacion de cargas de cubierta.

5.1.1 Carga Muerta de Cubierta (DL)

La carga muerta sobreimpuesta en el modelo de la estructura incluyendo el peso de acabados 200 kg/m^2.



Figura 5. Carga muerta sobre cubierta (kg/m^2). (DL).

5.1.2 Carga Viva de Cubierta (Lr)

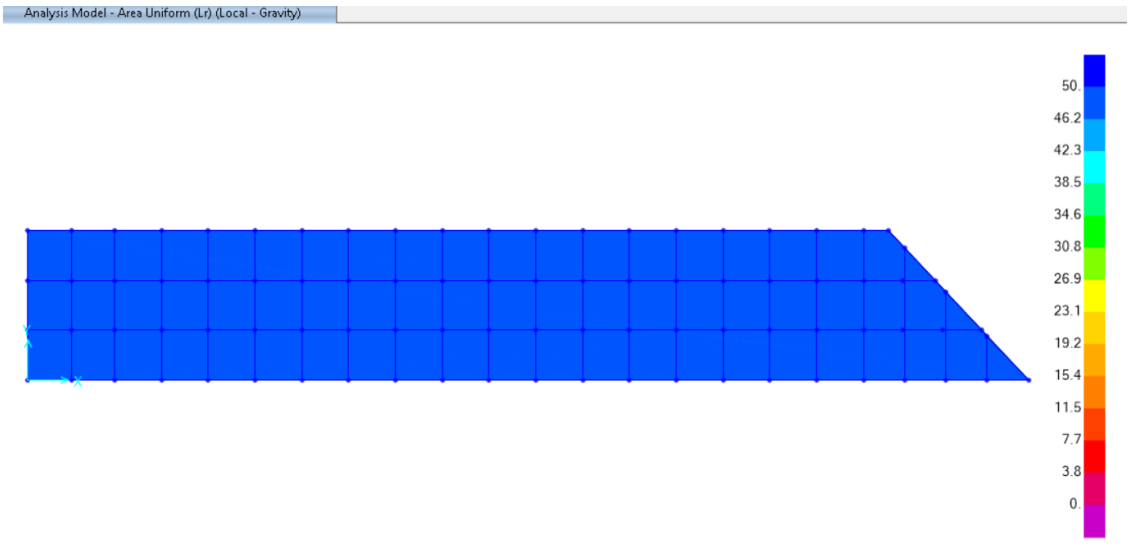


Figura 6. Carga viva sobre cubierta (kg/m^2). (Lr)

5.1.3 Carga de Viento (W)

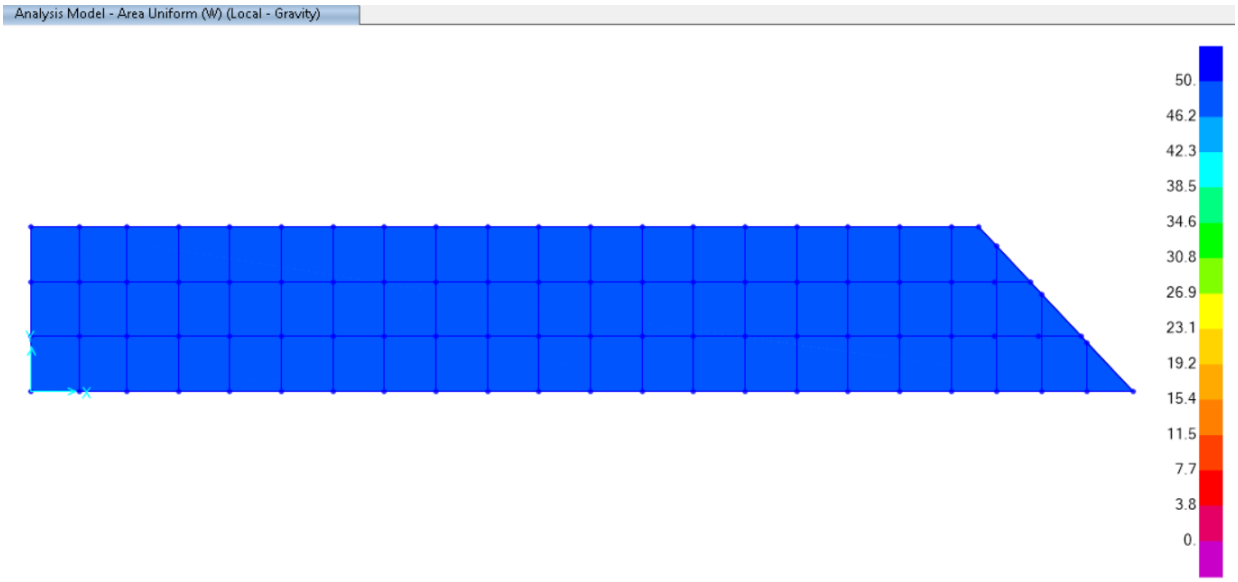


Figura 7. Carga de viento sobre cubierta (kg/m^2). (W)

5.2 PROPIEDADES MECÁNICAS DE LOS MATERIALES

Concreto

La NSR-10 permite el uso de dos correlaciones para el cálculo del módulo de elasticidad, para la aplicación de estas es necesario conocer la resistencia y masa unitaria del concreto. Dichas correlaciones se presentan en las ecuaciones (1) y (2).

$$E_c = 4700\sqrt{f'_c} \qquad (1) \qquad E_c = {W_c}^{1.5} 0{,}043 \sqrt{f'_c} \qquad (2)$$

Dónde:
$f'_c = Resistencia\ del\ concreto\ en\ (MPa)$
$W_c = Masa\ unitario\ (kg/m^3)$

Una vez obtenido el módulo de elasticidad por medio de las ecuaciones (1) y (2), se procede a determinar los valores promedios teniendo en cuenta la situación más crítica, la cual se presenta con la ecuación (1).

f´c murete, pedestales y zapata cimentacion = 21 MPa, 3000psi

$E = 4700\sqrt{f'c}$ (Cap, C,8,5, NSR-10) Ec= 21538 MPa

Acero de Refuerzo
Acero Grado 60 Corrugado, (A615Gr60)
fy= 420 MPa

Acero Estructural
Perfiles Tubulares, ASTM A572-gr50, Fy= 345Mpa
Ángulos y contravientos: A36, Fy=350 Mpa, Fu=400 MPa
Laminas de conexiones, ASTM A572-gr50, Fy= 345Mpa
Pernos: Acero A325 y A490
Anclajes: acero ASTM A193 Grado B7

5.3 ANÁLISIS DINÁMICO

El método de análisis usado para a modelación dinámica de la estructura es el Análisis Dinámico Elástico Espectral, para el cual la normativa colombiana NSR-10 en el capítulo A.4, plantea los requerimientos que se muestran a continuación:

5.3.1 Metodología del Análisis

Deben tenerse en cuenta los siguientes requisitos, cuando se utilice el método de análisis dinámico elástico espectral:

(a) Obtención de los modos de vibración — Los modos de vibración deben obtenerse utilizando metodologías establecidas de dinámica estructural, Deben utilizarse todos los modos de vibración de la estructura que contribuyan de una manera significativa a la respuesta dinámica de la misma, cumpliendo los requisitos de A.5.4.2.

(b) Respuesta espectral modal — La respuesta máxima de cada modo se obtiene utilizando las ordenadas del espectro de diseño definido en A.5.3.2. para el período de vibración propio del modo.

(c) Respuesta total — Las respuestas máximas modales, incluyendo las de deflexiones, derivas, fuerzas en los pisos, cortantes de piso, cortante en la base y fuerzas en los elementos, se combinan de una manera estadística para obtener la respuesta total de la estructura a los movimientos sísmicos de diseño, Deben cumplirse los requisitos de A.5.4.4 en la combinación estadística de las respuestas modales máximas.

(d) Ajuste de los resultados — Si los resultados de la respuesta total son menores que los valores mínimos prescritos en A.5.4.5, los resultados totales del análisis dinámico deben ser ajustados como se indica allí, El ajuste debe cubrir todos los resultados del análisis dinámico, incluyendo las

deflexiones, derivas, fuerzas en los pisos, cortantes de piso, cortante en la base y fuerzas en los elementos.

(e) Evaluación de las derivas — Se debe verificar que las derivas totales obtenidas, debidamente ajustadas de acuerdo con los requisitos de A.5.4.5, no excedan los límites establecidos en el Capítulo A.6.

(f) Fuerzas de diseño en los elementos — Las fuerzas sísmicas internas totales de los elementos, s F , debidamente ajustadas de acuerdo con los requisitos de A.5.4.5, se dividen por el valor del coeficiente de capacidad de disipación de energía, R, del sistema de resistencia sísmica, modificado de acuerdo con la irregularidad y la ausencia de redundancia según los requisitos de A.3.3.3, para obtener las fuerzas sísmicas reducidas de diseño, E, y se combinan con las otras cargas prescritas por este Reglamento, de acuerdo con el Título B.

(g) Diseño de los elementos estructurales — Los elementos estructurales se diseñan y detallan siguiendo los requisitos propios del grado de capacidad de disipación de energía correspondiente del material, de acuerdo con los requisitos del Capitulo A.3,

Adicionalmente, para la elaboración del espectro es necesario establecer el coeficiente de importancia de la edificación, para lo cual se siguen los lineamientos de la Norma de Sismo Resistencia Colombiana en el capítulo A:

5.3.2 Coeficiente de Importancia

A.2.5.2 El Coeficiente de Importancia, I, modifica el espectro, y con ello las fuerzas de diseño, de acuerdo con el grupo de uso a que esté asignada la edificación para tomar en cuenta que para edificaciones de los grupos II, III y IV deben considerarse valores de aceleración con una probabilidad menor de ser excedidos que aquella del diez por ciento en un lapso de cincuenta años considerada en el numeral A.2.2.1, Los valores de I se dan en la tabla A.2.5-1.

Tabla A.2.5-1
Valores del coeficiente de importancia, I

Grupo de Uso	Coeficiente de Importancia, I
IV	1.50
III	1.25
II	1.10
I	1.00

Tabla 2. Valores de coeficiende de importancia, I.

Para el presente proyecto por tratarse de una edificacion para uso de vivienda el coeficiente de importancia I = 1.0.

5.3.3 Análisis Modal y Periodos Fundamentales

La modelación de la estructura debe garantizar que efectivamente se cumplan los parámetros y limitaciones que exige la normativa colombiana, a continuación, se indican los peridos y frecuencias fundamentales de la estructura y la participacion modal de la masa.

TABLE: Modal Participating Mass Ratios									
OutputCase	StepType	StepNum	Period	UX	UY	UZ	SumUX	SumUY	SumRZ
Text	Text	Unitless	Sec	Unitless	Unitless	Unitless	Unitless	Unitless	Unitless
MODAL	Mode	1	0.42	0.000	0.007	0.000	0.000	0.007	0.975
MODAL	Mode	2	0.37	0.000	0.937	0.000	0.000	0.944	0.981
MODAL	Mode	3	0.24	0.000	0.002	0.073	0.000	0.946	0.983
MODAL	Mode	4	0.22	0.000	0.042	0.000	0.000	0.988	0.985
MODAL	Mode	5	0.19	0.979	0.000	0.000	0.979	0.988	0.985
MODAL	Mode	6	0.16	0.000	0.000	0.007	0.979	0.988	0.990
MODAL	Mode	7	0.15	0.000	0.000	0.002	0.979	0.988	0.991
MODAL	Mode	8	0.14	0.000	0.000	0.145	0.979	0.989	0.992
MODAL	Mode	9	0.13	0.000	0.001	0.221	0.979	0.990	0.992
MODAL	Mode	10	0.11	0.000	0.000	0.001	0.979	0.990	0.992
MODAL	Mode	11	0.08	0.000	0.000	0.000	0.979	0.990	0.995
MODAL	Mode	12	0.07	0.004	0.004	0.000	0.984	0.994	0.995

Tabla 3. Periodos y frecuencias fundamentales de la estructura.

5.3.4 Evaluación Sismica

La interacción suelo estructura durante sismos se puede evaluar de acuerdo con la metodología propuesta en el Título A-2 de la norma NSR-10. Se usarán los siguientes parámetros:

Tipo de perfil del suelo: D
Coeficiente de amplificación de aceleración (períodos cortos) (Fa): 1.30
Coeficiente de amplificación de aceleración (períodos intermedios) (Fv): 1.90
Coeficiente de aceleración (Aa) pico efectiva: 0.25
Coeficiente de velocidad (Av) pico efectiva: 0.25

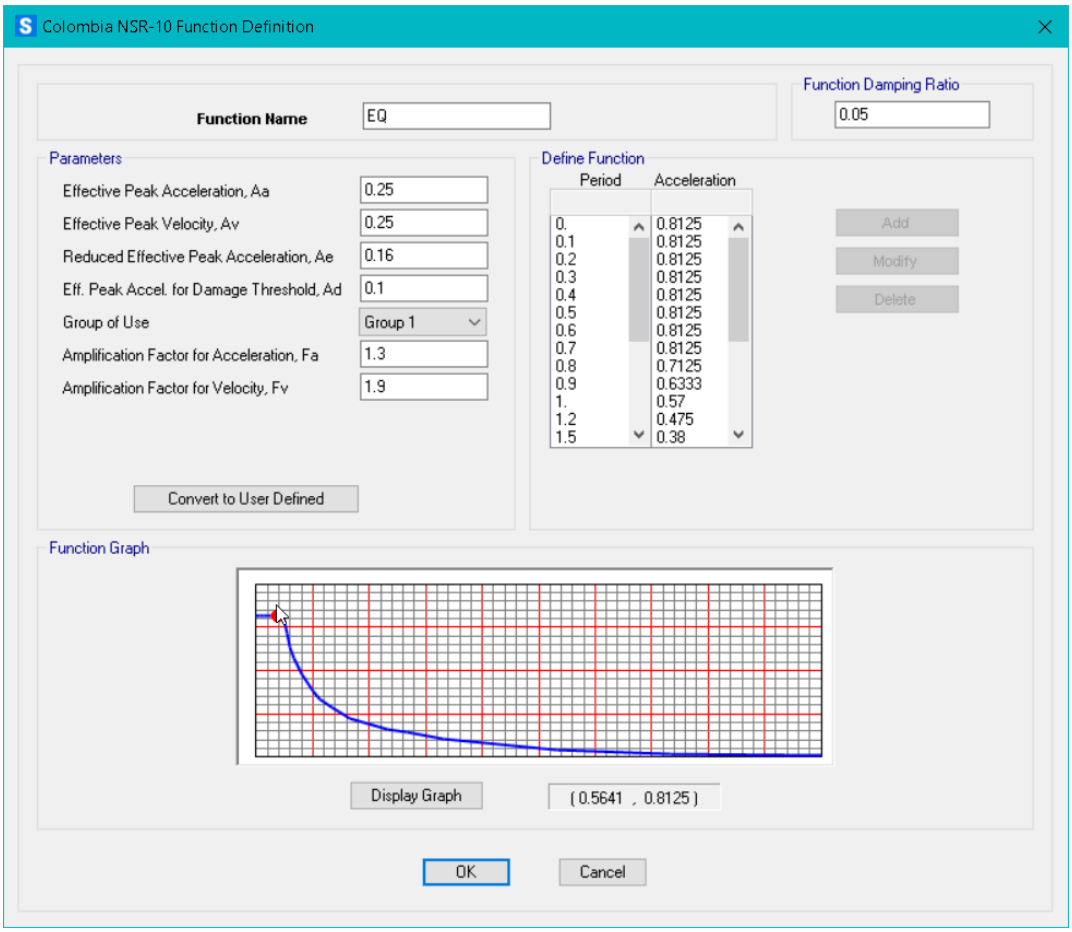


Figura 8. Espectro elastico de aceleraciones NSR-10.

5.3.5 Periodo Fundamental de la Estructura

TABLE: Modal Periods And Frequencies		
Case	Mode	Period
		sec
Modal	1	0.42
Modal	2	0.37

Tabla 4. Periodos fundamentales de los modos 1 y 2, de analisis modal. ETABS.

Cu = 1.75 - 1.2AvFv =	1.18		A.4.2-2
Av =	0.25		
Fv =	1.90		
Ta =	0.17	seg	A.4.2.2
Cu*Ta =	0.20	seg	

5.3.6 Ajuste de Cortante

Output Case	Case Type	Step Type	FX	FY	FZ
			tonf	tonf	tonf
EQ	LinRespSpec	Max	2.45	2.39	0
DL Total	Combination		0	0	4.89

Tabla 5. Sumatoria de fuerzas de reaccion en la base de las columnas. ETABS.

Peso Total	**w=**	4.89	Ton
Periodo en X	**T_x=**	0.19	seg
Periodo en Y	**T_y=**	0.62	seg
Aceleracion Horizontal en X	**Sa_x=**	0.81	g
Aceleracion Horizontal en Y	**Sa_y=**	0.81	g
Cortante Basal en X	**Vs_x=**	2.65	Ton
Cortante Basal en Y	**Vs_y=**	2.65	Ton
Cortante del Modelo en X	**Vx=**	2.45	Ton
Cortante del Modelo en Y	**Vy=**	2.39	Ton

Factores de Ajuste:

0.9*Vsx/Vx =	0.87
0.9*Vsy/Vy =	0.88

5.3.7 Chequeo de Irregularidades

El chequeo de irregularidades se realiza a partir de lo expuesto en la NSR-10 en las tablas A.3-6 y A.3-7 en el capítulo A.

Chequeo de Irregularidades NSR10 - A.3.3.3

Cuando una estructura se clasifica como irregular, el valor del coeficiente de disipación de energía R que se utilice en diseño se debe reducir multiplicandolo por ϕp y por ϕa:

En planta:	ϕp
1P: Irregularidad Torsional	1.0
2P: Retrocesos en las esquinas	1.0
3P: Irregularidad del diafragma	1.0
4P: Desplazamientos planos de Accion	1.0
5P: Sistemas no paralelos	1.0

En alzada:	ϕa
1A: Piso flexible	1.0
2A: Distribucion de masa	1.0
3A: Geometrica	1.0
4A: Desplazamientos planos	1.0
5A: Piso debil	1.0

factor de reducción de resistencia por ausencia de redundancia ϕ_r = **1.0**

Coeficiente de disipación de Energía

Ro x=	**1.5**	Portico resistente a momento DMI. tabla A.3-3.3.A NSR-10
Ro y=	**1.5**	Portico resistente a momento DMI. tabla A.3-2.3.A NSR-10

Teniendo en cuenta las irregularidades, el factor de modidicación de respuesta es :

Rx =	**1.5**
Ω0=	**1.5**

Ry =	**1.5**
Ω0=	**1.5**

El valor del coeficiente de capacidad de disipación de energía para ser empleado en el diseño, corresponde al coeficiente de disipación de energía básico, Ro, multiplicado por el menor valor de los coeficientes de reducción de capacidad de disipación de energía por irregularidades en altura y en planta (R = φa*φp*φr*Ro) de acuerdo también al A.3.3.3.

$\phi_a = 1.0$ $\phi_p = 1.0$ $\phi_r = 1.0$

5.3.8 Cálculo de La Deriva

En el capítulo A.6 de la norma NSR-10, se establecen los parámetros para la evaluación de la deriva en las estructuras. A continuación, se presenta los requisitos presentes en la norma.
Para estructuras de un piso no se requiere cumplir.

6. DISEÑO ESTRUCTURAL DE ELEMENTOS DE ACERO

Para el diseño de los elelementos de acero asi como la verificacion de la mamposteria de acuerdo con el titulo F de la norma NSR-10. El Título F2 adopta criterios basados principalmente en especificaciones tipo AISC, incorporando factores de resistencia (ϕ) para LRFD o factores de seguridad (Ω) para ASD, y establece requisitos adicionales cuando la estructura forma parte del sistema sismorresistente.

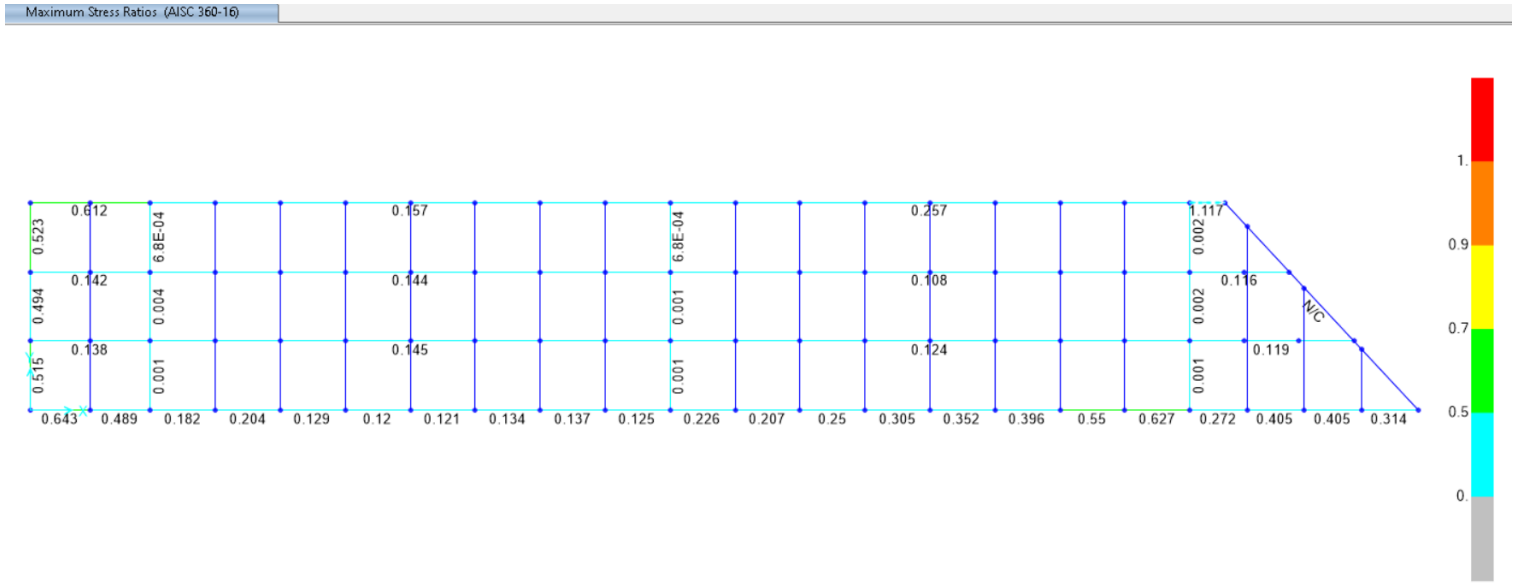


Figura 9. Resultados de diseño indices de sobreesfuerzo de vigas de acero de pergola. SAP2000.

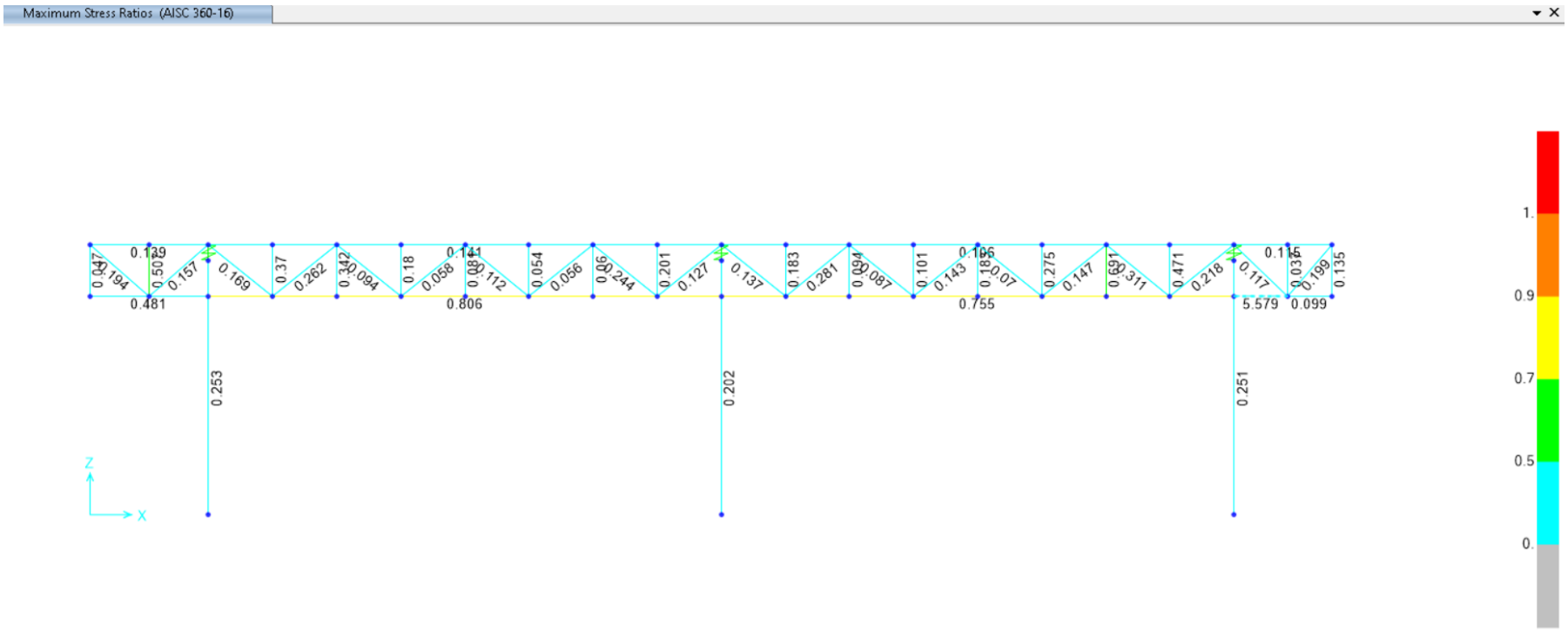
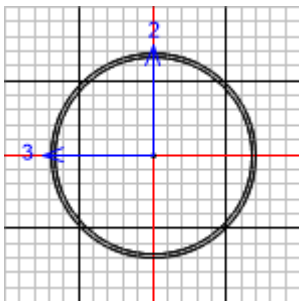


Figura 10. Resultados de diseño indices de sobreesfuerzo de columnas de acero de pergola. SAP2000.

6.1 Diseño de Columnas Tubo 8”x5mm




```
AISC 360-16 STEEL SECTION CHECK  (Summary for Combo and Station)
Units  : Tonf, mm, C

Frame :  24       X Mid:  1735.     Combo:  B.2.4-5         Design Type:  Column
Length:  3710.    Y Mid:  1000.     Shape:  Tub 8"x5mm      Frame Type:  OMF
Loc   :  0.       Z Mid:  1855.     Class:  Non-Compact     Princpl Rot: 0. degrees

Provision: LRFD   Analysis: Effective Length
D/C Limit=0.95    2nd Order: General 2nd Order
Ignore Seismic Code?  No            Ignore Special EQ Load?  No         D/P Plug Welded?  Yes

SDC: D            I=1.              Rho=1.            Sds=0.5
R=1.5.            Omega0=1.5.       Cd=1.5
PhiB=0.9          PhiC=0.9          PhiTY=0.9         PhiTF=0.75
PhiS=0.9          PhiS-RI=1.        PhiST=0.9

A=3363.075        I33=19280428.73   r33=75.716        S33=175996.611    Av3=1682.149
J=38560857.5      I22=19280428.73   r22=75.716        S22=175996.611    Av2=1682.149
E=20.389          Fy=0.035          Ry=1.1            z33=229235.717    Cw = Not Required
RLLF=1.           Fu=0.044                            z22=229235.717

HSS Welding: ERW  Reduce HSS Thickness? No

SLENDERNESS CHECK
    Buckling mode          K          L          r        KL/r  KL/r Limit         L/r   L/r Limit
     Major (3-3)          2.       3200.     75.716      84.514         200      42.263         300
     Minor (2-2)          2.       3200.     75.716      84.514         200      42.263         300

UNBRACED LENGTH LIMIT CHECK
    Buckling mode          K          L        KL/r
    K1 Major Flexure      1.       3200.     42.263
    K1 Minor Flexure      1.       3200.     42.263
    K2 Major Flexure      2.       3200.     84.514
    K2 Minor Flexure      2.       3200.     84.514
    LTB                   2.       3200.     84.514

STRESS CHECK FORCES & MOMENTS  (Combo B.2.4-5)
    Location              Pu        Mu33        Mu22         Vu2         Vu3          Tu
    0.                -1.426    -784.489    1538.653       0.384      -0.461     -171.48

PMM DEMAND/CAPACITY RATIO   (H1-1b)
    D/C Ratio:    0.254 = 0.011 + 0.11 + 0.216
                        = (1/2)(Pr/Pc) + (Mr33/Mc33) + (Mr22/Mc22)

COMPACTNESS
```

	Slenderness	Lambda	Lambda_hd	Lambda_md	Lambda_p	Lambda_r	Lambda_s	Compactness
Bending/Any	43.82	27.945	40.6	40.6	179.8	261.	Non-Compact	
Axial/Flange	43.82				63.8			Seismic HD

AXIAL FORCE & BIAXIAL MOMENT DESIGN (H1-1b)

Factor	L	K1	K2	B1	B2	Cm
Major Bending	0.863	1.	2.	1.	1.	1.
Minor Bending	0.863	1.	2.	1.	1.	1.

	Lltb	Kltb	Cb
LTB	0.863	2.	2.288

	Pu Force	phi*Pnc Capacity	phi*Pnt Capacity
Axial	-1.426	63.115	106.401

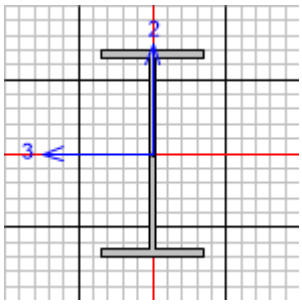
	Mu Moment	phi*Mn Capacity	phi*Mn No LTB	phi*Mn Cb=1
Major Moment	-784.489	7115.916	7115.916	7252.59
Minor Moment	1538.653	7115.916		

	Tu Moment	Tn Capacity	phi*Tn Capacity
Torsion	-171.48	7593.514	6834.163

SHEAR CHECK

	Vu Force	phi*Vn Capacity	Stress Ratio	Status Check
Major Shear	0.439	31.92	0.014	OK
Minor Shear	0.47	31.92	0.015	OK

6.2 Diseño de Vigas IPE



AISC 360-16 STEEL SECTION CHECK (Summary for Combo and Station)
Units : Tonf, mm, C

Frame :	10	X Mid:	1735.	Combo:	B.2.4-2a	Design Type:	Beam
Length:	1000.	Y Mid:	1500.	Shape:	IPE240	Frame Type:	OMF
Loc :	500.	Z Mid:	3950.	Class:	Compact	Princpl Rot:	0. degrees

Provision: LRFD Analysis: Effective Length
D/C Limit=0.95 2nd Order: General 2nd Order
Ignore Seismic Code? No Ignore Special EQ Load? No D/P Plug Welded? Yes

SDC: D	I=1.	Rho=1.	Sds=0.5
R=1.5.	Omega0=1.5.	Cd=1.5	
PhiB=0.9	PhiC=0.9	PhiTY=0.9	PhiTF=0.75
PhiS=0.9	PhiS-RI=1.	PhiST=0.9	

	A=3910.	I33=38920000.	r33=99.77	S33=324333.3	Av3=1960.
J=130000.	I22=2840000.	r22=26.951	S22=47333.33	Av2=1488.	
E=20.389	Fy=0.035	Ry=1.1	z33=367000.	Cw=37391183424.	
RLLF=1.	Fu=0.046		z22=73900.		

SLENDERNESS CHECK

Buckling mode	K	L	r	KL/r	KL/r Limit	L/r	L/r Limit
Major (3-3)	1.	1000.	99.77	10.023	200	10.023	300
Minor (2-2)	1.	1000.	26.951	37.105	200	37.105	300

UNBRACED LENGTH LIMIT CHECK

Buckling mode	K	L	KL/r
K1 Major Flexure	1.	1000.	10.023
K1 Minor Flexure	1.	1000.	37.105
K2 Major Flexure	1.	1000.	10.023
K2 Minor Flexure	1.	1000.	37.105
LTB	1.	1000.	37.105

STRESS CHECK FORCES & MOMENTS (Combo B.2.4-2a)

Location	Pu	Mu33	Mu22	Vu2	Vu3	Tu
500.	-0.774	4.603	0.	0.	0.	0.

PMM DEMAND/CAPACITY RATIO (H1-1b)

D/C Ratio: 0.004 = 0.003 + 0. + 0.
= (1/2)(Pr/Pc) + (Mr33/Mc33) + (Mr22/Mc22)

COMPACTNESS

Slenderness	Lambda	Lambda_p	Lambda_r	Lambda_s	Compactness
Major/Flange	6.122	9.152	24.083		Compact
/Web	30.71	90.553	137.274	232.	Compact
Minor/Flange	6.122	9.152	24.083		Compact
/Web	30.71	90.553	137.274	232.	Compact
Axial/Flange	6.122		13.487		Compact
/Web	30.71		35.884		Compact

AXIAL FORCE & BIAXIAL MOMENT DESIGN (H1-1b)

Factor	L	K1	K2	B1	B2	Cm
Major Bending	1.	1.	1.	1.	1.	1.
Minor Bending	1.	1.	1.	1.	1.	1.

	Lltb	Kltb	Cb
LTB	1.	1.	1.316

	Pu Force	phi*Pnc Capacity	phi*Pnt Capacity
Axial	-0.774	111.859	123.705

	Mu Moment	phi*Mn Capacity	phi*Mn No LTB	phi*Mn Cb=1
Major Moment	4.603	11611.195	11611.195	11611.195
Minor Moment	0.	2338.058		

SHEAR CHECK

	Vu Force	phi*Vn Capacity	Stress Ratio	Status Check
Major Shear	0.	31.385	0.	OK
Minor Shear	0.	44.648	0.	OK

CONNECTION SHEAR FORCES FOR BEAMS

	VMajor Left	VMajor Right
Major (V2)	0.021	0.021

TABLE: Steel Design 1 - Summary Data - AISC 360-16						
Frame	**DesignSect**	**DesignType**	**Ratio**	**RatioType**	**Combo**	**Location**
Text	Text	Text	Unitless	Text	Text	m
1	IPE240	Beam	0.14	PMM	B.2.4-2a	1.74
2	IPE240	Beam	0.14	PMM	B.2.4-2a	0.00
3	IPE240	Beam	0.11	PMM	B.2.4-2a	7.50
4	IPE240	Beam	0.11	PMM	B.2.4-5	0.00
5	IPE240	Beam	0.13	PMM	B.2.4-2a	1.74
6	IPE240	Beam	0.14	PMM	B.2.4-2a	0.00
7	IPE240	Beam	0.12	PMM	B.2.4-2a	7.50
8	IPE240	Beam	0.11	PMM	B.2.4-2a	0.00
9	IPE240	Beam	0.00	PMM	B.2.4-4a	0.50
10	IPE240	Beam	0.00	PMM	B.2.4-2a	0.50
11	IPE240	Beam	0.00	Major Shear	B.2.4-1	0.00
12	IPE240	Beam	0.00	PMM	B.2.4-4a	0.50
13	IPE240	Beam	0.00	PMM	B.2.4-4a	0.50
14	IPE240	Beam	0.00	Major Shear	B.2.4-1	0.00
15	IPE240	Beam	0.00	PMM	B.2.4-4a	0.50
16	IPE240	Beam	0.00	PMM	B.2.4-5	0.50
17	IPE240	Beam	0.00	PMM	B.2.4-5	0.50
21	Tub 8"x5mm	Column	0.25	PMM	B.2.4-5	0.00
22	Tub 8"x5mm	Column	0.20	PMM	B.2.4-5	0.00
23	Tub 8"x5mm	Column	0.25	PMM	B.2.4-5	0.00
24	Tub 8"x5mm	Column	0.25	PMM	B.2.4-5	0.00
25	Tub 8"x5mm	Column	0.20	PMM	B.2.4-5	0.00
26	Tub 8"x5mm	Column	0.25	PMM	B.2.4-5	0.00
27	L2X2X3/16	Beam	0.61	PMM	B.2.4-5	0.00
28	L2X2X3/16	Beam	0.15	PMM	B.2.4-2a	1.88
29	L2X2X3/16	Beam	0.25	PMM	B.2.4-5	7.50
34	L2X2X3/16	Beam	0.51	PMM	B.2.4-2a	1.00
35	L2X2X3/16	Beam	0.48	PMM	B.2.4-2a	1.00
36	L2X2X3/16	Beam	0.52	PMM	B.2.4-2a	0.00
73	L2X2X3/16	Beam	0.19	PMM	B.2.4-2a	0.94
74	L2X2X3/16	Beam	0.25	PMM	B.2.4-2a	0.00
75	L2X2X3/16	Beam	0.22	PMM	B.2.4-2a	0.00
76	L2X2X3/16	Beam	0.14	PMM	B.2.4-2a	0.00
77	L2X2X3/16	Beam	0.12	PMM	B.2.4-2a	0.00
78	L2X2X3/16	Beam	0.13	PMM	B.2.4-5	0.00
79	L2X2X3/16	Beam	0.13	PMM	B.2.4-5	0.94
80	L2X2X3/16	Beam	0.12	PMM	B.2.4-6b	0.94

TABLE: Steel Design 1 - Summary Data - AISC 360-16						
Frame	**DesignSect**	**DesignType**	**Ratio**	**RatioType**	**Combo**	**Location**
Text	Text	Text	Unitless	Text	Text	m
81	L2X2X3/16	Beam	0.23	PMM	B.2.4-4a	0.94
82	L2X2X3/16	Beam	0.19	PMM	B.2.4-5	0.00
83	L2X2X3/16	Beam	0.26	PMM	B.2.4-2a	0.94
84	L2X2X3/16	Beam	0.30	PMM	B.2.4-2a	0.94
85	L2X2X3/16	Beam	0.37	PMM	B.2.4-2a	0.94
86	L2X2X3/16	Beam	0.44	PMM	B.2.4-2a	0.00
87	L2X2X3/16	Beam	0.64	PMM	B.2.4-2a	0.94
88	L2X2X3/16	Beam	0.64	PMM	B.2.4-2a	0.00
132	L2X2X3/16	Beam	0.64	PMM	B.2.4-5	0.00
133	L2X2X3/16	Beam	0.47	PMM	B.2.4-2a	0.00
137	L2X2X3/16	Beam	0.26	PMM	B.2.4-5	0.83
138	L2X2X3/16	Beam	0.39	PMM	B.2.4-2a	0.83
139	L2X2X3/16	Beam	0.38	PMM	B.2.4-2a	0.00
140	L2X2X3/16	Beam	0.33	PMM	B.2.4-2a	0.83
144	L2X2X1/4	Beam	0.50	PMM	B.2.4-2a	1.74
145	L2X2X1/4	Beam	0.80	PMM	B.2.4-5	0.00
146	L2X2X1/4	Beam	0.75	PMM	B.2.4-5	0.00
148	L2X2X3/16	Column	0.06	PMM	B.2.4-2a	0.75
149	L2X2X3/16	Column	0.50	PMM	B.2.4-5	0.00
150	L2X2X3/16	Column	0.37	PMM	B.2.4-5	0.00
151	L2X2X3/16	Column	0.38	PMM	B.2.4-2a	0.00
152	L2X2X3/16	Column	0.17	PMM	B.2.4-2a	0.00
153	L2X2X3/16	Column	0.09	PMM	B.2.4-2a	0.00
154	L2X2X3/16	Column	0.05	PMM	B.2.4-5	0.00
155	L2X2X3/16	Column	0.07	PMM	B.2.4-5	0.00
156	L2X2X3/16	Column	0.20	PMM	B.2.4-5	0.00
157	L2X2X3/16	Column	0.17	PMM	B.2.4-5	0.00
158	L2X2X3/16	Column	0.09	PMM	B.2.4-5	0.75
159	L2X2X3/16	Column	0.06	PMM	B.2.4-5	0.00
160	L2X2X3/16	Column	0.19	PMM	B.2.4-2a	0.00
161	L2X2X3/16	Column	0.30	PMM	B.2.4-2a	0.00
162	L2X2X3/16	Column	0.66	PMM	B.2.4-2a	0.00
163	L2X2X3/16	Column	0.80	PMM	B.2.4-2a	0.00
164	L2X2X3/16	Column	0.25	PMM	B.2.4-2a	0.00
166	L2X2X1/4	Beam	0.17	PMM	B.2.4-2a	0.00
167	L2X2X1/4	Beam	0.09	PMM	B.2.4-2a	0.79
168	L2X2X3/16	Column	0.05	PMM	B.2.4-2a	0.75

TABLE: Steel Design 1 - Summary Data - AISC 360-16						
Frame	**DesignSect**	**DesignType**	**Ratio**	**RatioType**	**Combo**	**Location**
Text	Text	Text	Unitless	Text	Text	m
169	L2X2X3/16	Column	0.06	PMM	B.2.4-2a	0.75
170	L2X2X3/16	Brace	0.23	PMM	B.2.4-2a	1.15
171	L2X2X3/16	Brace	0.15	PMM	B.2.4-5	1.15
172	L2X2X3/16	Brace	0.16	PMM	B.2.4-5	0.00
173	L2X2X3/16	Brace	0.26	PMM	B.2.4-5	0.00
174	L2X2X3/16	Brace	0.09	PMM	B.2.4-2a	0.00
175	L2X2X3/16	Brace	0.06	PMM	B.2.4-7	0.00
176	L2X2X3/16	Brace	0.13	PMM	B.2.4-2a	0.00
177	L2X2X3/16	Brace	0.06	PMM	B.2.4-5	1.20
178	L2X2X3/16	Brace	0.23	PMM	B.2.4-5	1.20
179	L2X2X3/16	Brace	0.11	PMM	B.2.4-5	1.20
180	L2X2X3/16	Brace	0.13	PMM	B.2.4-5	0.00
181	L2X2X3/16	Brace	0.26	PMM	B.2.4-5	0.00
182	L2X2X3/16	Brace	0.09	PMM	B.2.4-2a	1.20
183	L2X2X3/16	Brace	0.25	PMM	B.2.4-2a	1.20
184	L2X2X3/16	Brace	0.07	PMM	B.2.4-2a	0.00
185	L2X2X3/16	Brace	0.13	PMM	B.2.4-2a	1.20
186	L2X2X3/16	Brace	0.45	PMM	B.2.4-2a	0.00
187	L2X2X3/16	Brace	0.23	PMM	B.2.4-2a	0.00
188	L2X2X3/16	Brace	0.15	PMM	B.2.4-2a	1.09
189	L2X2X3/16	Brace	0.23	PMM	B.2.4-2a	1.09
190	L2X2X3/16	Brace	0.20	PMM	B.2.4-2a	0.00
329	L2X2X1/4	Beam	0.48	PMM	B.2.4-5	1.74
330	L2X2X1/4	Beam	0.81	PMM	B.2.4-5	0.00
331	L2X2X1/4	Beam	0.75	PMM	B.2.4-5	0.00
332	L2X2X3/16	Column	0.05	PMM	B.2.4-2a	0.75
333	L2X2X3/16	Column	0.51	PMM	B.2.4-5	0.00
334	L2X2X3/16	Column	0.37	PMM	B.2.4-5	0.00
335	L2X2X3/16	Column	0.34	PMM	B.2.4-2a	0.00
336	L2X2X3/16	Column	0.18	PMM	B.2.4-2a	0.00
337	L2X2X3/16	Column	0.08	PMM	B.2.4-2a	0.00
338	L2X2X3/16	Column	0.05	PMM	B.2.4-2a	0.00
339	L2X2X3/16	Column	0.06	PMM	B.2.4-6b	0.00
340	L2X2X3/16	Column	0.20	PMM	B.2.4-5	0.00
341	L2X2X3/16	Column	0.18	PMM	B.2.4-5	0.00
342	L2X2X3/16	Column	0.09	PMM	B.2.4-5	0.75
343	L2X2X3/16	Column	0.10	PMM	B.2.4-2a	0.00

TABLE: Steel Design 1 - Summary Data - AISC 360-16						
Frame	**DesignSect**	**DesignType**	**Ratio**	**RatioType**	**Combo**	**Location**
Text	Text	Text	Unitless	Text	Text	m
344	L2X2X3/16	Column	0.18	PMM	B.2.4-2a	0.00
345	L2X2X3/16	Column	0.27	PMM	B.2.4-2a	0.00
346	L2X2X3/16	Column	0.69	PMM	B.2.4-2a	0.00
347	L2X2X3/16	Column	0.47	PMM	B.2.4-2a	0.00
350	L2X2X1/4	Beam	0.10	PMM	B.2.4-5	0.00
352	L2X2X3/16	Column	0.04	PMM	B.2.4-7	0.00
353	L2X2X3/16	Column	0.14	PMM	B.2.4-5	0.75
354	L2X2X3/16	Brace	0.19	PMM	B.2.4-2a	1.15
355	L2X2X3/16	Brace	0.16	PMM	B.2.4-5	1.15
356	L2X2X3/16	Brace	0.17	PMM	B.2.4-5	0.00
357	L2X2X3/16	Brace	0.26	PMM	B.2.4-5	0.00
358	L2X2X3/16	Brace	0.09	PMM	B.2.4-2a	0.00
359	L2X2X3/16	Brace	0.06	PMM	B.2.4-7	0.00
360	L2X2X3/16	Brace	0.11	PMM	B.2.4-5	1.20
361	L2X2X3/16	Brace	0.06	PMM	B.2.4-2a	0.00
362	L2X2X3/16	Brace	0.24	PMM	B.2.4-5	1.20
363	L2X2X3/16	Brace	0.13	PMM	B.2.4-5	1.20
364	L2X2X3/16	Brace	0.14	PMM	B.2.4-5	0.00
365	L2X2X3/16	Brace	0.28	PMM	B.2.4-4a	0.00
366	L2X2X3/16	Brace	0.09	PMM	B.2.4-2a	1.20
367	L2X2X3/16	Brace	0.14	PMM	B.2.4-2a	1.20
368	L2X2X3/16	Brace	0.07	PMM	B.2.4-7	1.20
369	L2X2X3/16	Brace	0.15	PMM	B.2.4-2a	1.20
370	L2X2X3/16	Brace	0.31	PMM	B.2.4-2a	0.00
371	L2X2X3/16	Brace	0.22	PMM	B.2.4-2a	0.00
372	L2X2X3/16	Brace	0.12	PMM	B.2.4-5	1.09
373	L2X2X3/16	Brace	0.20	PMM	B.2.4-5	0.99
375	L2X2X1/4	Beam	0.72	PMM	B.2.4-2a	1.74
378	L2X2X3/16	Column	0.07	PMM	B.2.4-2a	0.75
379	L2X2X3/16	Column	0.68	PMM	B.2.4-2a	0.00
380	L2X2X3/16	Column	0.63	PMM	B.2.4-2a	0.00
381	L2X2X3/16	Column	0.55	PMM	B.2.4-2a	0.00
382	L2X2X3/16	Column	0.20	PMM	B.2.4-2a	0.00
383	L2X2X3/16	Column	0.13	PMM	B.2.4-2a	0.00
384	L2X2X3/16	Column	0.05	PMM	B.2.4-5	0.00
385	L2X2X3/16	Column	0.06	PMM	B.2.4-5	0.75
386	L2X2X3/16	Column	0.15	PMM	B.2.4-5	0.00

TABLE: Steel Design 1 - Summary Data - AISC 360-16						
Frame	**DesignSect**	**DesignType**	**Ratio**	**RatioType**	**Combo**	**Location**
Text	Text	Text	Unitless	Text	Text	m
387	L2X2X3/16	Column	0.15	PMM	B.2.4-5	0.00
388	L2X2X3/16	Column	0.10	PMM	B.2.4-5	0.75
389	L2X2X3/16	Column	0.08	PMM	B.2.4-2a	0.00
390	L2X2X3/16	Column	0.31	PMM	B.2.4-2a	0.00
391	L2X2X3/16	Column	0.32	PMM	B.2.4-2a	0.00
393	L2X2X3/16	Column	0.86	PMM	B.2.4-2a	0.00
395	L2X2X1/4	Beam	0.23	PMM	B.2.4-2a	0.00
398	L2X2X3/16	Column	0.98	PMM	B.2.4-2a	0.75
400	L2X2X3/16	Brace	0.45	PMM	B.2.4-2a	1.15
401	L2X2X3/16	Brace	0.18	PMM	B.2.4-2a	0.00
402	L2X2X3/16	Brace	0.37	PMM	B.2.4-2a	1.20
403	L2X2X3/16	Brace	0.14	PMM	B.2.4-5	0.00
404	L2X2X3/16	Brace	0.18	PMM	B.2.4-2a	0.00
405	L2X2X3/16	Brace	0.07	PMM	B.2.4-2a	1.20
406	L2X2X3/16	Brace	0.07	PMM	B.2.4-2a	0.00
407	L2X2X3/16	Brace	0.09	PMM	B.2.4-2a	1.20
408	L2X2X3/16	Brace	0.08	PMM	B.2.4-5	1.20
409	L2X2X3/16	Brace	0.11	PMM	B.2.4-5	0.00
410	L2X2X3/16	Brace	0.18	PMM	B.2.4-4a	1.20
411	L2X2X3/16	Brace	0.10	PMM	B.2.4-5	0.00
412	L2X2X3/16	Brace	0.13	PMM	B.2.4-2a	0.60
413	L2X2X3/16	Brace	0.10	PMM	B.2.4-2a	1.20
414	L2X2X3/16	Brace	0.07	PMM	B.2.4-2a	0.00
415	L2X2X3/16	Brace	0.28	PMM	B.2.4-2a	1.20
416	L2X2X3/16	Brace	0.32	PMM	B.2.4-2a	0.00
417	L2X2X3/16	Brace	0.68	PMM	B.2.4-5	1.20
418	L2X2X3/16	Brace	0.26	PMM	B.2.4-5	0.00
421	L2X2X1/4	Beam	0.67	PMM	B.2.4-2a	1.74
424	L2X2X3/16	Column	0.09	PMM	B.2.4-4b	0.75
425	L2X2X3/16	Column	0.71	PMM	B.2.4-2a	0.00
426	L2X2X3/16	Column	0.66	PMM	B.2.4-2a	0.00
427	L2X2X3/16	Column	0.55	PMM	B.2.4-2a	0.00
428	L2X2X3/16	Column	0.21	PMM	B.2.4-2a	0.00
429	L2X2X3/16	Column	0.13	PMM	B.2.4-2a	0.00
430	L2X2X3/16	Column	0.05	PMM	B.2.4-5	0.00
431	L2X2X3/16	Column	0.06	PMM	B.2.4-5	0.75
432	L2X2X3/16	Column	0.13	PMM	B.2.4-5	0.00

TABLE: Steel Design 1 - Summary Data - AISC 360-16						
Frame	**DesignSect**	**DesignType**	**Ratio**	**RatioType**	**Combo**	**Location**
Text	Text	Text	Unitless	Text	Text	m
433	L2X2X3/16	Column	0.13	PMM	B.2.4-5	0.00
434	L2X2X3/16	Column	0.08	PMM	B.2.4-5	0.75
435	L2X2X3/16	Column	0.05	PMM	B.2.4-5	0.00
436	L2X2X3/16	Column	0.26	PMM	B.2.4-2a	0.00
437	L2X2X3/16	Column	0.30	PMM	B.2.4-2a	0.00
440	L2X2X3/16	Column	0.48	PMM	B.2.4-2a	0.00
441	L2X2X1/4	Beam	0.71	PMM	B.2.4-2a	0.00
442	L2X2X1/4	Beam	0.46	PMM	B.2.4-2a	0.00
443	L2X2X1/4	Beam	0.42	PMM	B.2.4-2a	0.83
444	L2X2X3/16	Column	0.38	PMM	B.2.4-5	0.75
445	L2X2X3/16	Column	0.10	PMM	B.2.4-5	0.75
446	L2X2X3/16	Brace	0.49	PMM	B.2.4-2a	1.15
447	L2X2X3/16	Brace	0.23	PMM	B.2.4-2a	0.00
448	L2X2X3/16	Brace	0.38	PMM	B.2.4-2a	1.20
449	L2X2X3/16	Brace	0.16	PMM	B.2.4-2a	1.20
450	L2X2X3/16	Brace	0.19	PMM	B.2.4-2a	0.00
451	L2X2X3/16	Brace	0.07	PMM	B.2.4-2a	0.00
452	L2X2X3/16	Brace	0.07	PMM	B.2.4-2a	0.00
453	L2X2X3/16	Brace	0.10	PMM	B.2.4-2a	1.20
454	L2X2X3/16	Brace	0.08	PMM	B.2.4-5	1.20
455	L2X2X3/16	Brace	0.18	PMM	B.2.4-4a	1.20
456	L2X2X3/16	Brace	0.23	PMM	B.2.4-4a	0.00
457	L2X2X3/16	Brace	0.09	PMM	B.2.4-5	0.00
458	L2X2X3/16	Brace	0.16	PMM	B.2.4-2a	0.00
459	L2X2X3/16	Brace	0.09	PMM	B.2.4-2a	1.20
460	L2X2X3/16	Brace	0.14	PMM	B.2.4-2a	0.00
461	L2X2X3/16	Brace	0.26	PMM	B.2.4-2a	1.20
462	L2X2X3/16	Brace	0.37	PMM	B.2.4-2a	0.00
463	L2X2X3/16	Brace	0.89	PMM	B.2.4-2a	0.00
464	L2X2X3/16	Brace	0.36	PMM	B.2.4-2a	1.11
465	L2X2X3/16	Brace	0.44	PMM	B.2.4-2a	1.11
466	L2X2X3/16	Brace	0.50	PMM	B.2.4-2a	0.00
467	L2X2X1/4	Beam	0.20	PMM	B.2.4-4a	0.00
468	L2X2X3/16	Column	0.18	PMM	B.2.4-6b	0.75
469	L2X2X3/16	Brace	0.39	PMM	B.2.4-2a	0.00
31	L2X2X3/16	Beam	0.44	PMM	B.2.4-5	1.00
32	L2X2X3/16	Beam	0.75	PMM	B.2.4-5	1.00

TABLE: Steel Design 1 - Summary Data - AISC 360-16						
Frame	**DesignSect**	**DesignType**	**Ratio**	**RatioType**	**Combo**	**Location**
Text	Text	Text	Unitless	Text	Text	m
33	L2X2X3/16	Beam	0.50	PMM	B.2.4-5	0.00
40	L2X2X3/16	Beam	0.41	PMM	B.2.4-2a	1.00
41	L2X2X3/16	Beam	0.12	PMM	B.2.4-2a	1.00
42	L2X2X3/16	Beam	0.40	PMM	B.2.4-2a	0.00
43	L2X2X3/16	Beam	0.13	PMM	B.2.4-5	1.00
44	L2X2X3/16	Beam	0.07	PMM	B.2.4-5	1.00
45	L2X2X3/16	Beam	0.12	PMM	B.2.4-5	0.00
46	L2X2X3/16	Beam	0.14	PMM	B.2.4-5	0.00
47	L2X2X3/16	Beam	0.09	PMM	B.2.4-5	1.00
48	L2X2X3/16	Beam	0.13	PMM	B.2.4-5	1.00
49	L2X2X3/16	Beam	0.16	PMM	B.2.4-5	0.00
50	L2X2X3/16	Beam	0.10	PMM	B.2.4-5	1.00
51	L2X2X3/16	Beam	0.17	PMM	B.2.4-5	1.00
52	L2X2X3/16	Beam	0.19	PMM	B.2.4-2a	1.00
53	L2X2X3/16	Beam	0.08	PMM	B.2.4-2a	1.00
54	L2X2X3/16	Beam	0.22	PMM	B.2.4-2a	0.00
55	L2X2X3/16	Beam	0.84	PMM	B.2.4-2a	1.00
56	L2X2X3/16	Beam	0.33	PMM	B.2.4-2a	0.00
58	L2X2X3/16	Beam	0.69	PMM	B.2.4-2a	1.00

Tabla 6. Resultados de indices de sobreesfuerzo de elementos de acero de pergola. ETABS.

7. DISEÑO DE CORREAS

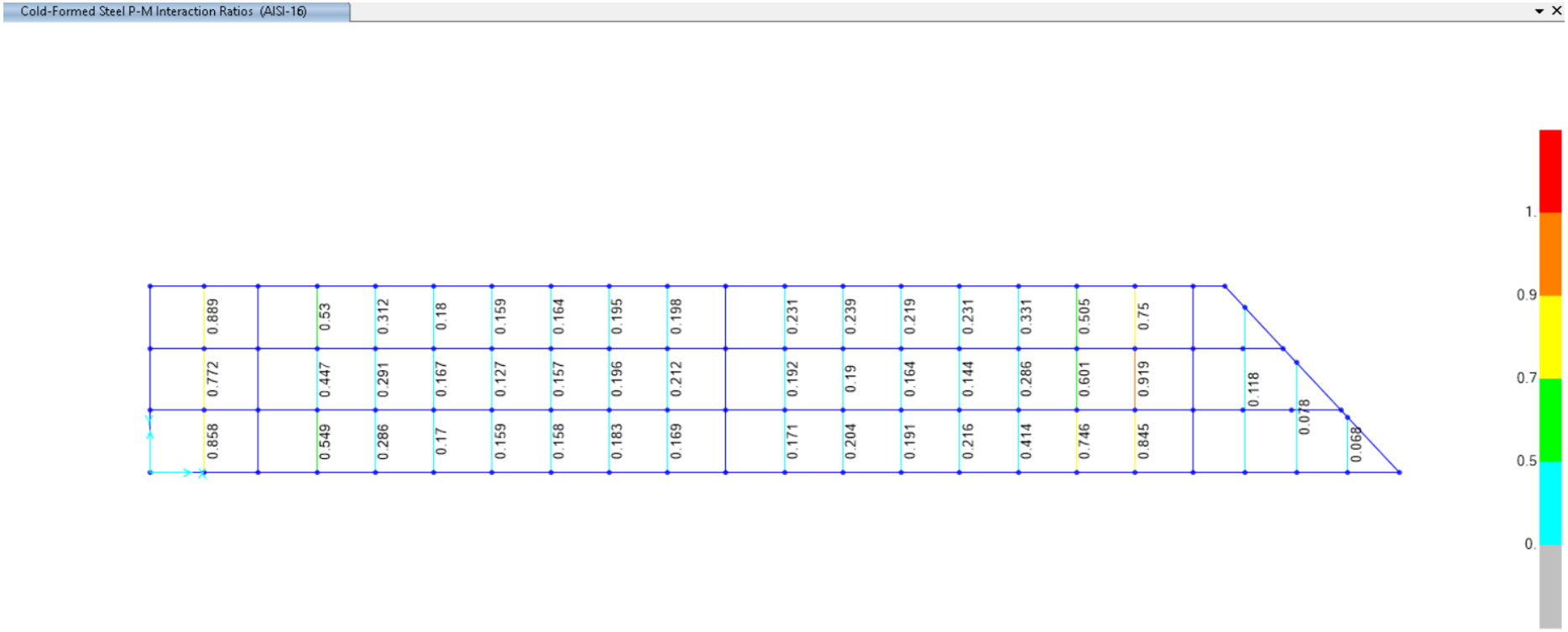
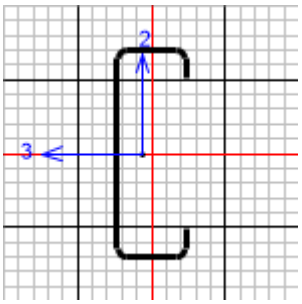


Figura 11. Resultados de diseño indices de sobreesfuerzo de correas de acero de pergola. ETABS.



AISI-16 COLD-FORMED STEEL SECTION CHECK
Units : Tonf, m, C

Frame	: 136	Design Sect	: P150-12	Through-Fastened To Deck:	No
X Mid	: 0.868	Design Type	: Beam	Fastener Eccentricity	: N/A
Y Mid	: 2.5	Frame Type	: Braced	Fastening R Value	: N/A
Z Mid	: 3.95	2nd-Order Method	: General 2nd-Order	Design Provision	: LRFD
Length	: 1.	LLRF	: 1.	Consider Lateral Factor	: No
Loc	: 0.	Major Axis	: 0. degrees		

MATERIAL PROPERTIES	E	Fy	Fu	G	U
	20740553.971	35153.481	45699.526	7977136.1	0.3

ELEMENT/SEGMENT INFO	L	K	Lg	LNet	iBraceLoc	jBraceLoc	LhRatio	Lh
Major	1.	1.	1.	0.	0.	1.	0.	0.
Minor	1.	1.	1.	0.	0.	1.	0.	0.
LTB	1.	1.	1.	0.	0.	1.	0.	0.
Distortional	1.	1.	N/A	N/A	0.	1.	N/A	N/A

SECTION PROPERTIES	rxx	ryy	Sxx Top	Sxx Bot	Syy Left	Syy Right
GROSS	0.057	0.018	2.892E-05	2.892E-05	1.455E-05	6.364E-06

	Ax	Ay	Ixx	Iyy	J	x0	y0	Cw
GROSS	6.67E-04	6.674E-04	2.169E-06	2.214E-07	1.390E-09	-0.037	0.	1.182E-09

RESISTANCE FACTORS	PhiTy	PhiTr	PhiC	PhiB	PhiBPipe	PhiV
	0.9	0.75	0.85	0.9	0.95	0.95

STRESS CHECK FORCES & MOMENTS
COMB. RATIO EQUATION - (H1.1-1)- GOVERNS THE DESIGN

			Mx/Maxt	+	My/Mayt	+	T/Ta
COMB. RATIO	0.889	=	0.818	+	0.065	+	0.006
COMB. RATIO LIMIT	1.						

	Combo	P	M33	M22	V2	V3	
DEMANDS	DCLD7	0.12	-0.748	0.013	-0.817		0.017
CAPACITIES		14.183	0.915	0.201	6.627		3.236
DEMAND/CAPACITY		0.006	0.818	0.065	0.123		0.005

EFFECTIVE WIDTH METHOD Applicability Limits
All limits are satisfied

AXIAL - TENSION	Area Ag	Area An	PhiTy*Yielding Tn	PhiTr*Rupture Tn	Phi*Tension Tn
	6.674E-04	6.674E-04	21.115	22.874	21.115

AXIAL - COMPRESSION GLOBAL BUCKLING	Fcre	LambdaC	Fn	PhiC*Pne	Buckling Axes	Hole Effects
Flex	67906.	0.72	28305.265	16.057	Geometric	Not Required
Flex-Tor	73920.	0.69	28808.675	16.342	Geometric	Not Required

x0	y0	r0	beta	Sigma_ex	Sigma_ey	Sigma_t
-0.037	0.	0.07	0.722	665182.426	67905.597	76484.213

LOCAL BUCKLING	Web	TopFlange	BotFlange	Lip	Corner	Total
Stiffening Condition	S	P/S	P/S	U/S	N/A	
Hole Diameter, dh	0.	N/A	N/A	N/A	N/A	
Hole Length, Lh	0.	N/A	N/A	N/A	N/A	
w/t <= 0.328S	N/A	No	No	N/A	N/A	
S	N/A	34.649	34.649	N/A	N/A	
n	N/A	0.489	0.489	N/A	N/A	
Ia	N/A	1.409E-12	1.409E-12	N/A	N/A	
Is	N/A	2.888E-10	2.888E-10	N/A	N/A	
RI	N/A	1.	1.	N/A	N/A	
k	4.	2.154	2.154	0.43	N/A	
Fcrl	26774.279	241892.902	241892.902	405224.969	N/A	
Lambda	1.028	0.342	0.342	0.264	N/A	
Rho	0.764	1.	1.	1.	N/A	
Flat Width, w	0.132	0.032	0.032	0.011	N/A	
Effective Width, b	0.101	0.032	0.032	0.011	N/A	
Effective Area, Ae	2.529E-04	8.075E-05	8.075E-05	5.575E-05	1.194E-04	5.895E-04
Global stress, Fn	28305.265	28305.265	28305.265	28305.265	28305.265	28305.265
PhiC*Pnl	6.083	1.943	1.943	1.341	2.872	14.183**
Hole at This Location	NO					

DISTORT. BUCKLING	Py	Pcrd	LambdaD	PhiC*Pnd	At hole
	23.461	32.787	0.846	16.927	NO

Fcrd	L	Lcrd	Lm	kPhi_fe	kPhi_we	kPhi	kPhi_fg	kPhi_wg
49127.653	0.432	0.432	1.	0.541	0.396	0.	1.164E-05	7.426E-06

Af	Jf	Ixf	Iyf	Ixyf	Cwf	xof	hxf	hyf(yof)
1.656E-04	3.451E-10	4.389E-09	4.128E-08	7.483E-09	0.	0.017	-0.03	-0.003

** INTERACTION BETWEEN MEMBER AND LOCAL BUCKLINGS governs AXIAL COMPRESSION CAPACITY

FLEXURE YIELDING	Fy	Sfy	SfyNet	PhiB*My	PhiB*MyNet	At Hole
Major	35153.	2.892E-05	N/A	0.915**	N/A	NO
Minor	35153.	6.364E-06	N/A	0.201	N/A	NO

GLOBAL BUCKLING	Buckling Axes	Fcre	Hole Effects	Fn	Sf	PhiB*Mne
Major	207595.	35153.481	2.892E-05	0.915	Geometric	Not Required
Minor	5.2E+06	35153.481	1.455E-05	0.46	Geometric	Not Required

	Cb	Cs	CTF	j	Lu	Sigma_ex	Sigma_ey	Sigma_t
Major	1.773	1.	1.	0.	N/A	665182.426	67905.597	76484.213
Minor	2.095	1.	1.	0.083	N/A			

LOCAL BUCKLING	Ie	Eff. N.A.	Se	Set	PhiB*Mnl	PhiB*Set*Fy	At hole
Major	2.2E-06	0.075	2.892E-05	2.892E-05	0.915	0.915	NO
Minor	2.0E-07	0.018	1.131E-05	6.145E-06	0.358	0.194**	NO

EFFECTIVE WIDTH	Web	Top Web	Bot Web	TopFlange	BotFlange	Top Lip	Bot Lip
Major							
Stiffening Condition	S	N/A	N/A	P/S	P/S	U/S	U/S
Stress Condition	Grad	N/A	N/A	Tension	UniComp	Tension	Grad
Buckling stress, Fn	35153.481	N/A	N/A	35153.481	35153.481	35153.481	35153.481
f1	-31005.371	N/A	N/A	N/A	N/A	25779.22	-31005.371
f2	31005.371	N/A	N/A	N/A	N/A	31005.371	-25779.22
f	-31005.371	N/A	N/A	35153.481	-35153.481	25779.22	-31005.371
Psi	1.	N/A	N/A	N/A	N/A	1.203	0.831
w/t <= 0.328S	N/A	N/A	N/A	N/A	No	N/A	N/A
S	N/A	N/A	N/A	N/A	31.091	N/A	N/A
n	N/A	N/A	N/A	N/A	0.478	N/A	N/A
Ia	N/A	N/A	N/A	N/A	1.046E-11	N/A	N/A
Is	N/A	N/A	N/A	N/A	2.888E-10	N/A	N/A
RI	N/A	N/A	N/A	N/A	1.	N/A	N/A
k	24.	N/A	N/A	N/A	2.154	N/A	0.493
Fcrl	160645.672	N/A	N/A	N/A	241892.902	N/A	464979.882
Lambda	0.439	N/A	N/A	N/A	0.381	N/A	0.258
Rho	1.	N/A	N/A	N/A	1.	N/A	1.
Flat Width, w	0.132	N/A	N/A	0.032	0.032	0.011	0.011
Effective Width, b (be)	0.132	N/A	N/A	0.032	0.032	0.011	0.011
Effective Width, b1	0.033	N/A	N/A	N/A	N/A	N/A	N/A
Effective Width, b2	0.066	N/A	N/A	N/A	N/A	N/A	N/A
ho/bo	3.	N/A	N/A	N/A	N/A	N/A	N/A
Minor							
Stiffening Condition	S				S		S

	Grad	Stress Grad	Condition Tension	UniComp Tension		
Buckling stress, Fn	35153.481			35153.481	35153.481	35153.481
f1	N/A		-9497.955	-9497.955	N/A	N/A
f2	N/A		25550.439	25550.439	N/A	N/A
f	-35153.481		-9497.955	-9497.955	35153.481	35153.481
Psi	N/A		2.69	2.69	N/A	N/A
k	4.		111.875	111.875	N/A	N/A
Fcrl	26774.279		12563362.915	12563362.9	N/A	N/A
Lambda	1.146		0.027	0.027	N/A	N/A
Rho	0.705		1.	1.	N/A	N/A
Flat Width, w	0.132		0.032	0.032	0.011	0.011
Effective Width, b (be)	0.093		0.032	0.032	0.011	0.011
Effective Width, b1	N/A		0.006	0.006	N/A	N/A
Effective Width, b2	N/A		0.016	0.016	N/A	N/A
ho/bo	N/A		0.333	0.333	N/A	N/A

DISTORT. BUCKLING	My	Mcrd	LambdaD	PhiB*Mnd
	1.016	3.255	0.559	0.915

Fcrd	L	Lcrd	Lm	kPhi_fe	kPhi_we	kPhi	kPhi_fg	kPhi_wg
112583.424	0.391	0.391	1.	0.77	0.686	0.	1.424E-05	1.538E-06

beta	XiWeb	At hole
1.22	2.	NO

Af	Jf	Ixf	Iyf	Ixyf	Cwf	xof	hxf	hyf(yof)
1.656E-04	3.451E-10	4.389E-09	4.128E-08	7.483E-09	0.	0.017	-0.03	-0.003

** YIELDING of GROSS SECTION governs MAJOR MOMENT CAPACITY
** INTERACTION between LOCAL BUCKLING and LTB (YIELDING) governs MINOR MOMENT CAPACITY

SHEAR	kv	Fcr	LambdaV	Vcr	Fy	Aw	Vy	PhiV*Vn	At Hole
Major	5.34	35743.662	0.768	11.822	35153.481	3.307E-04	6.976	6.627	NO
Minor	5.34	599671.886	0.188	96.847	35153.481	1.615E-04	3.406	3.236	NO

TABLE: Cold Formed Design 1 - Summary Data - AISI-16									
Frame	DesignSect	DesignType	Location	TotalRatio	PRatio	MMajRatio	MMinRatio	VMajRatio	VMinRatio
Text	Text	Text	m	Unitless	Unitless	Unitless	Unitless	Unitless	Unitless
89	P150-12	Beam	1.00	0.55	0.00	0.48	0.07	0.08	0.01
90	P150-12	Beam	0.00	0.45	0.03	0.37	0.04	0.00	0.00
91	P150-12	Beam	0.00	0.53	0.01	0.49	0.05	0.08	0.01
92	P150-12	Beam	1.00	0.29	0.01	0.28	0.00	0.05	0.00
93	P150-12	Beam	1.00	0.29	0.00	0.25	0.04	0.00	0.00
94	P150-12	Beam	0.00	0.31	0.01	0.28	0.03	0.05	0.00
95	P150-12	Beam	1.00	0.17	0.00	0.06	0.11	0.01	0.01
96	P150-12	Beam	0.00	0.17	0.00	0.14	0.03	0.00	0.00
97	P150-12	Beam	0.00	0.18	0.00	0.15	0.03	0.02	0.00
98	P150-12	Beam	1.00	0.16	0.00	0.03	0.13	0.01	0.01
99	P150-12	Beam	1.00	0.13	0.00	0.03	0.10	0.00	0.01
100	P150-12	Beam	0.00	0.16	0.00	0.03	0.13	0.00	0.01
101	P150-12	Beam	1.00	0.16	0.00	0.02	0.14	0.00	0.01
102	P150-12	Beam	1.00	0.16	0.00	0.03	0.13	0.00	0.01
103	P150-12	Beam	0.00	0.16	0.00	0.03	0.14	0.00	0.01
104	P150-12	Beam	1.00	0.18	0.00	0.02	0.16	0.00	0.02
105	P150-12	Beam	1.00	0.20	0.00	0.05	0.15	0.00	0.02
106	P150-12	Beam	0.00	0.19	0.00	0.04	0.15	0.00	0.01
107	P150-12	Beam	1.00	0.17	0.00	0.03	0.13	0.00	0.01
108	P150-12	Beam	1.00	0.21	0.00	0.08	0.13	0.01	0.01
109	P150-12	Beam	0.00	0.20	0.00	0.07	0.13	0.00	0.01
110	P150-12	Beam	1.00	0.17	0.00	0.02	0.15	0.00	0.01
111	P150-12	Beam	1.00	0.19	0.00	0.09	0.11	0.01	0.01
112	P150-12	Beam	0.00	0.23	0.00	0.07	0.16	0.00	0.01
113	P150-12	Beam	1.00	0.20	0.00	0.01	0.19	0.00	0.02
114	P150-12	Beam	1.00	0.19	0.00	0.05	0.14	0.00	0.02
115	P150-12	Beam	0.00	0.24	0.00	0.05	0.19	0.00	0.02
116	P150-12	Beam	1.00	0.19	0.00	0.02	0.17	0.00	0.02
117	P150-12	Beam	1.00	0.16	0.00	0.04	0.13	0.00	0.01
118	P150-12	Beam	0.00	0.22	0.00	0.04	0.18	0.00	0.02
119	P150-12	Beam	1.00	0.22	0.00	0.05	0.17	0.01	0.02
120	P150-12	Beam	1.00	0.14	0.00	0.05	0.09	0.00	0.01
121	P150-12	Beam	0.00	0.23	0.00	0.06	0.17	0.01	0.01
122	P150-12	Beam	1.00	0.41	0.00	0.28	0.13	0.04	0.01

TABLE: Cold Formed Design 1 - Summary Data - AISI-16									
Frame	DesignSect	DesignType	Location	TotalRatio	PRatio	MMajRatio	MMinRatio	VMajRatio	VMinRatio
Text	Text	Text	m	Unitless	Unitless	Unitless	Unitless	Unitless	Unitless
123	P150-12	Beam	0.00	0.29	0.01	0.26	0.02	0.00	0.00
124	P150-12	Beam	0.00	0.33	0.00	0.26	0.07	0.04	0.01
125	P150-12	Beam	1.00	0.75	0.01	0.61	0.13	0.11	0.01
126	P150-12	Beam	0.00	0.60	0.01	0.55	0.04	0.03	0.00
127	P150-12	Beam	0.00	0.50	0.01	0.43	0.06	0.08	0.01
130	P150-12	Beam	0.00	0.75	0.01	0.61	0.14	0.10	0.01
134	P150-12	Beam	1.00	0.86	0.00	0.81	0.04	0.12	0.00
135	P150-12	Beam	1.00	0.77	0.03	0.72	0.02	0.00	0.00
136	P150-12	Beam	0.00	0.89	0.01	0.82	0.07	0.12	0.01
141	P150-12	Beam	0.00	0.12	0.01	0.05	0.05	0.00	0.00
142	P150-12	Beam	0.00	0.08	0.00	0.02	0.05	0.00	0.00
143	P150-12	Beam	0.00	0.07	0.00	0.06	0.01	0.01	0.00

8. DISEÑO DE ZAPATAS DE CIMENTACION

8.1 Zapata Combinada

Datos Generales

Estatus global : Bien
Código de diseño : ACI 318-2019
Tipo de zapata : Combinadas
Tipo de columna : Pedestal

Materiales

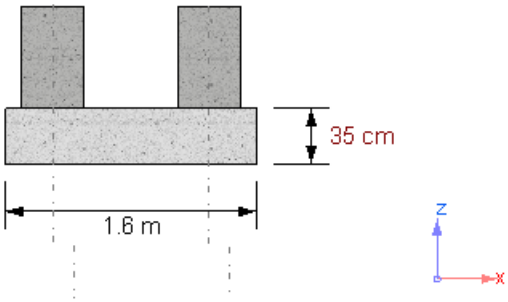
Hormigón, f'c : 0.21 [Ton/cm2]
Tipo de concreto : Normal
Módulo de elasticidad hormigón : 219.50 [Ton/cm2]
Peso unitario : 2.40 [Ton/m3]

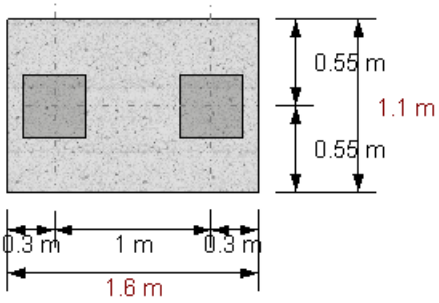
Acero, fy : 4.22 [Ton/cm2]
Recubrimiento epóxico : No
Módulo de elasticidad acero : 2038.89 [Ton/cm2]

Suelo

Coeficiente de balasto : 3203.68 [Ton/m3]
Peso unitario (húmedo) : 1.76 [Ton/m3]

Geometría





Longitud	:	1.60 [m]
Ancho	:	1.10 [m]
Espesor	:	0.35 [m]
Profundidad de la base	:	1.00 [m]
Área de la base	:	1.76 [m2]
Volumen de la zapata	:	0.62 [m3]

Longitud del pedestal 1	:	40.00 [cm]
Ancho del pedestal 1	:	40.00 [cm]
Alto del pedestal 1	:	65.00 [cm]
Longitud del pedestal 2	:	40.00 [cm]
Ancho del pedestal 2	:	40.00 [cm]
Alto del pedestal 2	:	65.00 [cm]
Distancia entre pedestales	:	1.00 [m]
Posición del pedestal respecto al c.g. de la zapata	:	Centrada

Reinforcement

Armadura longitudinal

Recubrimiento libre	:	7.62 [cm]
Relación máxima permitida entre Rho/Rho balanceo	:	0.75
Armadura // a L (xx) inferior	:	4-#5 @ 30.48cm
Armadura // a L (xx) superior	:	4-#5 @ 30.48cm
Armadura // a B (zz) inferior	:	3-#5 @ 30.48cm (Zona 1)
Armadura // a B (zz) inferior	:	2-#5 @ 17.78cm (Zona 2)
Armadura // a B (zz) inferior	:	3-#5 @ 30.48cm (Zona 3)

Armadura del pedestal 1

Longitudinal	:	8 - #6
Recubrimiento libre	:	4.0 [cm]
Área provista	:	22.71 [cm2]
Número de barras // al eje x	:	3
Número de barras // al eje z	:	3
Transversal	:	#6 @ 30.48cm
Número de ramas // al eje x	:	2
Número de ramas // al eje z	:	2

Armadura del pedestal 2

Longitudinal	:	8 - #6
Recubrimiento libre	:	4.0 [cm]
Área provista	:	22.71 [cm2]
Número de barras // al eje x	:	3
Número de barras // al eje z	:	3
Transversal	:	#6 @ 30.48cm
Número de ramas // al eje x	:	2
Número de ramas // al eje z	:	2

Condiciones de carga

Servicio:

S1	:	CM
S2	:	CM+LL
S3	:	CM+0.75LL
S4	:	CM+0.6W
S5	:	CM+0.7EQ
S6	:	CM+0.45W+0.75LL
S7	:	0.6CM+0.6W
S8	:	CM+0.7EQ
S9	:	CM+0.525EQ
S10	:	0.6CM+0.7EQ

Límite ultimo:

D1	:	1.4CM
D2	:	1.2CM+0.5LL
D3	:	1.2CM+1.6LL
D4	:	1.2CM+0.5W
D5	:	1.2CM+1.6LL+0.5W
D6	:	1.2CM+W
D7	:	1.2CM+W+0.5LL
D8	:	0.9CM+W
D9	:	1.2CM+EQ
D10	:	0.9CM+EQ

Cargas

Estado	Columna	Axial [Ton]	Mxx [Ton*m]	Mzz [Ton*m]	Vx [Ton]	Vz [Ton]
LL	1	0.46	-0.01	0.02	0.01	0.00
W	1	0.60	0.40	0.04	0.02	-0.13
EQ	1	0.53	1.02	0.79	0.45	0.31
CM	1	0.97	-0.01	0.01	0.01	0.00
LL	2	0.06	-0.01	0.04	0.03	0.00
W	2	-0.06	0.41	0.03	0.02	-0.13
EQ	2	0.50	1.02	0.79	0.45	0.31
CM	2	0.75	0.00	0.03	0.02	0.00

Diseño

Estatus : Bien

Interacción suelo - fundación

Presión admisible	:	1.5E04 [Kg/m2]
Factor de seguridad min. para deslizamiento	:	1.25
Factor de seguridad min. a vuelco	:	1.25
Estado gobernante	:	S10

Estado	qprom [Kg/m2]	qmax [Kg/m2]	Δmax [cm]	Área en compresión [m2]	Área en compresión (%)	Volteo FSx	Volteo FSz	FS desliz.
S10	4.29E03	1.23E04	0.383	1.04	59	1.92	2.77	5.54

Flexión

Factor ϕ	:	0.90
Cuantía mínima	:	0.00180
Longitud de desarrollo		

Eje	Pos.	ld [cm]	lhd [cm]	Dist1 [cm]	Dist2 [cm]
z	Inf.	43.82	15.34	27.38	27.38
x	Inf.	60.26	21.09	2.38	2.38
x	Sup.	30.48	15.24	2.38	2.38

Eje	Pos.	Estado	Mu [Ton*m]	ϕ*Mn [Ton*m]	Asreq [cm2]	Asprov [cm2]	Asreq/Asprov	Mu/(ϕ*Mn)
zz	Sup.	D9	-0.61	-7.82	0.61	8.00	0.076	0.078
zz	Inf.	D10	0.49	7.82	6.37	8.00	0.796	0.062
Zona 1 xx	Sup.	D1	0.00	0.00	0.00	0.00	0.000	0.000
Zona 1 xx	Inf.	D5	0.17	5.47	4.44	6.00	0.741	0.032
Zona 2 xx	Sup.	D1	0.00	0.00	0.00	0.00	0.000	0.000
Zona 2 xx	Inf.	D1	0.00	3.42	1.19	4.00	0.298	0.000
Zona 3 xx	Sup.	D1	0.00	0.00	0.00	0.00	0.000	0.000
Zona 3 xx	Inf.	D9	0.11	5.47	4.44	6.00	0.741	0.020

Cortantes

Factor ϕ : 0.75
Área de corte plano zz : 0.29 [m2]
Área de corte plano xx : 0.40 [m2]

Plano	Estado	Vu [Ton]	Vc [Ton]	Vu/(ϕ*Vn)
xy	D10	1.32	19.56	0.090
yz	D9	1.94	12.60	0.205

Corte por punzonamiento

Factor ϕ : 0.75
Perímetro de corte (bo 1) : 1.92 [m]
Área de punzonamiento : 0.49 [m2]
Perímetro de corte (bo 2) : 1.92 [m]
Área de punzonamiento : 0.49 [m2]

Columna	Estado	Vu [Ton]	Vc [Ton]	Vu/(ϕ*Vn)
columna 1	D9	2.55	76.12	0.045
columna 2	D9	0.03	76.12	0.001

Diseño del Pedestal

Armadura:

Pedestal	Asreq [cm2]	Asprov [cm2]	Asreq/Asprov
1	16.00	22.71	0.70
2	16.00	22.71	0.70

Flexión biaxial:

Pedestal	Estado	Muxx [Ton*m]	Muzz [Ton*m]	ϕ*Mnxx [Ton*m]	ϕ*Mnzz [Ton*m]	Mc/(ϕ*Mn)
1	D10	0.81	1.10	7.90	10.69	0.10
2	D9	0.81	1.14	7.73	10.86	0.11

Axial:

Pedestal	Estado	Pu [Ton]	ϕ*Pn [Ton]	Pu/(ϕ*Pn)
1	D5	-2.50	-196.86	0.01
2	D9	-1.70	-196.86	0.01

Corte:

Pedestal 1:

S adoptado : 30.48 [cm]
S calculado : 30.48 [cm]

Estado	Dir.	Vu [Ton]	Vc [Ton]	Vs [Ton]	ϕ*Vn [Ton]	Vu/(ϕ*Vn)
D10	x	0.46	10.74	27.19	28.44	0.02
D10	z	0.32	10.74	27.19	28.44	0.01

Pedestal 2:

S adoptado : 30.48 [cm]
S calculado : 30.48 [cm]

Estado	Dir.	Vu [Ton]	Vc [Ton]	Vs [Ton]	ϕ*Vn [Ton]	Vu/(ϕ*Vn)
D9	x	0.48	10.74	27.19	28.45	0.02
D9	z	0.32	10.74	27.19	28.45	0.01

9. DISEÑO DE VIGAS DE CIMENTACION

Para vigas sobre el terreno diseñadas para actuar como amarres horizontales entre las zapatas, según C.21.12.3. Las vigas sobre el terreno que estén sometidas a flexión por las columnas que son parte del sistema de resistencia ante fuerzas sísmicas deben cumplir con lo indicado en C.21.5.

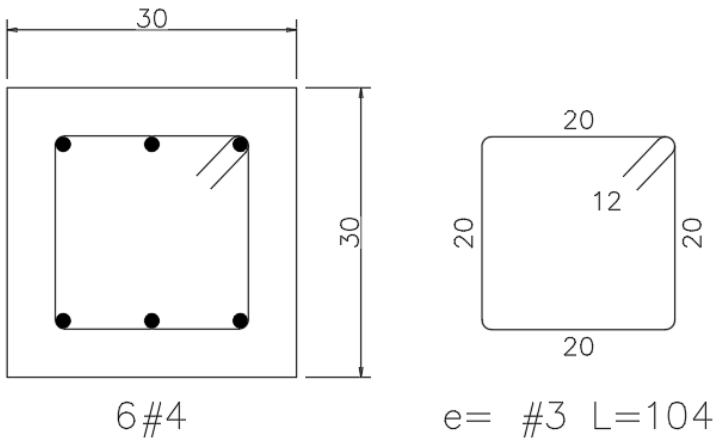
En cualquier sección de un elemento a flexión, excepto por lo dispuesto en C.10.5.3, para el refuerzo tanto superior como inferior, el área de refuerzo no debe ser menor que:

$$A_{s,min} = \frac{0.25\sqrt{f'_c}}{f_y} b_w d \qquad \text{(C.10-3)}$$

$$1.4 b_w d / f_y$$

Para vigas de 30X30:

F'c = 21MPa = 210 kg/cm^2
$A_{s,\,min}$ = 0.0033b_wd = 2.38 cm^2



Recubrimiento: 5 cm.

CONSORCIO DISEÑOS
YUMBO

ANEXO 1
REPORTE DE ENTRADA Y SALIDA DE DATOS

CR 12 A # 3 A - 44 PISO 1
318 863 4258
consorciodisenosyumbo@gmail.com

1. Model geometry

This section provides model geometry information, including items such as joint coordinates, joint restraints, and element connectivity.

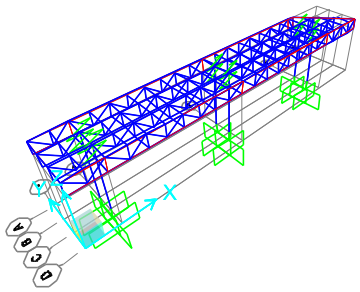


Figure 1: Finite element model

1.1. Joint coordinates

Table 1: Joint Coordinates

Table 1: Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			m	m	m
1	GLOBAL	Cartesian	0.	2.	3.95
2	GLOBAL	Cartesian	1.735	2.	3.95
3	GLOBAL	Cartesian	9.235	2.	3.95
4	GLOBAL	Cartesian	16.735	2.	3.95
6	GLOBAL	Cartesian	0.	1.	3.95
7	GLOBAL	Cartesian	1.735	1.	3.95
8	GLOBAL	Cartesian	9.235	1.	3.95
9	GLOBAL	Cartesian	16.735	1.	3.95
11	GLOBAL	Cartesian	1.735	0.	3.95
12	GLOBAL	Cartesian	1.735	3.	3.95
13	GLOBAL	Cartesian	9.235	0.	3.95
14	GLOBAL	Cartesian	9.235	3.	3.95
15	GLOBAL	Cartesian	16.735	0.	3.95
16	GLOBAL	Cartesian	16.735	3.	3.95
19	GLOBAL	Cartesian	1.735	1.	3.71
20	GLOBAL	Cartesian	9.235	1.	3.71
21	GLOBAL	Cartesian	16.735	1.	3.71

Table 1: Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			m	m	m
22	GLOBAL	Cartesian	1.735	2.	3.71
23	GLOBAL	Cartesian	9.235	2.	3.71
24	GLOBAL	Cartesian	16.735	2.	3.71
25	GLOBAL	Cartesian	1.735	2.	0.
26	GLOBAL	Cartesian	9.235	2.	0.
27	GLOBAL	Cartesian	16.735	2.	0.
28	GLOBAL	Cartesian	1.735	1.	0.
29	GLOBAL	Cartesian	9.235	1.	0.
30	GLOBAL	Cartesian	16.735	1.	0.
31	GLOBAL	Cartesian	0.	3.	3.95
32	GLOBAL	Cartesian	0.	0.	3.95
33	GLOBAL	Cartesian	20.035	0.	3.95
34	GLOBAL	Cartesian	17.235	3.	3.95
63	GLOBAL	Cartesian	2.6725	0.	3.95
64	GLOBAL	Cartesian	3.61	0.	3.95
65	GLOBAL	Cartesian	4.5475	0.	3.95
66	GLOBAL	Cartesian	5.485	0.	3.95
67	GLOBAL	Cartesian	6.4225	0.	3.95
68	GLOBAL	Cartesian	7.36	0.	3.95
69	GLOBAL	Cartesian	8.2975	0.	3.95
70	GLOBAL	Cartesian	10.1725	0.	3.95
71	GLOBAL	Cartesian	11.11	0.	3.95
72	GLOBAL	Cartesian	12.0475	0.	3.95
73	GLOBAL	Cartesian	12.985	0.	3.95
74	GLOBAL	Cartesian	13.9225	0.	3.95
75	GLOBAL	Cartesian	14.86	0.	3.95
76	GLOBAL	Cartesian	15.7975	0.	3.95
77	GLOBAL	Cartesian	2.6725	1.	3.95
78	GLOBAL	Cartesian	2.6725	2.	3.95
79	GLOBAL	Cartesian	2.6725	3.	3.95
80	GLOBAL	Cartesian	3.61	1.	3.95
81	GLOBAL	Cartesian	3.61	2.	3.95
82	GLOBAL	Cartesian	3.61	3.	3.95
83	GLOBAL	Cartesian	4.5475	1.	3.95
84	GLOBAL	Cartesian	4.5475	2.	3.95
85	GLOBAL	Cartesian	4.5475	3.	3.95
86	GLOBAL	Cartesian	5.485	1.	3.95
87	GLOBAL	Cartesian	5.485	2.	3.95
88	GLOBAL	Cartesian	5.485	3.	3.95
89	GLOBAL	Cartesian	6.4225	1.	3.95
90	GLOBAL	Cartesian	6.4225	2.	3.95
91	GLOBAL	Cartesian	6.4225	3.	3.95
92	GLOBAL	Cartesian	7.36	1.	3.95
93	GLOBAL	Cartesian	7.36	2.	3.95
94	GLOBAL	Cartesian	7.36	3.	3.95
95	GLOBAL	Cartesian	8.2975	1.	3.95

Table 1: Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			m	m	m
96	GLOBAL	Cartesian	8.2975	2.	3.95
97	GLOBAL	Cartesian	8.2975	3.	3.95
98	GLOBAL	Cartesian	10.1725	1.	3.95
99	GLOBAL	Cartesian	10.1725	2.	3.95
100	GLOBAL	Cartesian	10.1725	3.	3.95
101	GLOBAL	Cartesian	11.11	1.	3.95
102	GLOBAL	Cartesian	11.11	2.	3.95
103	GLOBAL	Cartesian	11.11	3.	3.95
104	GLOBAL	Cartesian	12.0475	1.	3.95
105	GLOBAL	Cartesian	12.0475	2.	3.95
106	GLOBAL	Cartesian	12.0475	3.	3.95
107	GLOBAL	Cartesian	12.985	1.	3.95
108	GLOBAL	Cartesian	12.985	2.	3.95
109	GLOBAL	Cartesian	12.985	3.	3.95
110	GLOBAL	Cartesian	13.9225	1.	3.95
111	GLOBAL	Cartesian	13.9225	2.	3.95
112	GLOBAL	Cartesian	13.9225	3.	3.95
113	GLOBAL	Cartesian	14.86	1.	3.95
114	GLOBAL	Cartesian	14.86	2.	3.95
115	GLOBAL	Cartesian	14.86	3.	3.95
116	GLOBAL	Cartesian	15.7975	1.	3.95
117	GLOBAL	Cartesian	15.7975	2.	3.95
118	GLOBAL	Cartesian	15.7975	3.	3.95
119	GLOBAL	Cartesian	18.1683	2.	3.95
120	GLOBAL	Cartesian	19.10167	1.	3.95
121	GLOBAL	Cartesian	0.8675	0.	3.95
122	GLOBAL	Cartesian	0.8675	1.	3.95
123	GLOBAL	Cartesian	0.8675	2.	3.95
124	GLOBAL	Cartesian	0.8675	3.	3.95
125	GLOBAL	Cartesian	17.56	0.	3.95
126	GLOBAL	Cartesian	18.385	0.	3.95
127	GLOBAL	Cartesian	19.21	0.	3.95
131	GLOBAL	Cartesian	17.56	2.65179	3.95
132	GLOBAL	Cartesian	18.385	1.76786	3.95
133	GLOBAL	Cartesian	19.21	0.88393	3.95
134	GLOBAL	Cartesian	0.	1.	3.2
135	GLOBAL	Cartesian	1.735	1.	3.2
136	GLOBAL	Cartesian	9.235	1.	3.2
137	GLOBAL	Cartesian	16.735	1.	3.2
139	GLOBAL	Cartesian	0.8675	1.	3.2
140	GLOBAL	Cartesian	2.6725	1.	3.2
141	GLOBAL	Cartesian	3.61	1.	3.2
142	GLOBAL	Cartesian	4.5475	1.	3.2
143	GLOBAL	Cartesian	5.485	1.	3.2
144	GLOBAL	Cartesian	6.4225	1.	3.2
145	GLOBAL	Cartesian	7.36	1.	3.2

Table 1: Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			m	m	m
146	GLOBAL	Cartesian	8.2975	1.	3.2
147	GLOBAL	Cartesian	10.1725	1.	3.2
148	GLOBAL	Cartesian	11.11	1.	3.2
149	GLOBAL	Cartesian	12.0475	1.	3.2
150	GLOBAL	Cartesian	12.985	1.	3.2
151	GLOBAL	Cartesian	13.9225	1.	3.2
152	GLOBAL	Cartesian	14.86	1.	3.2
153	GLOBAL	Cartesian	15.7975	1.	3.2
154	GLOBAL	Cartesian	19.10167	1.	3.2
157	GLOBAL	Cartesian	17.52389	1.	3.2
158	GLOBAL	Cartesian	18.31278	1.	3.2
159	GLOBAL	Cartesian	17.52389	1.	3.95
160	GLOBAL	Cartesian	18.31278	1.	3.95
255	GLOBAL	Cartesian	0.	2.	3.2
256	GLOBAL	Cartesian	0.8675	2.	3.2
257	GLOBAL	Cartesian	2.6725	2.	3.2
258	GLOBAL	Cartesian	3.61	2.	3.2
259	GLOBAL	Cartesian	4.5475	2.	3.2
260	GLOBAL	Cartesian	5.485	2.	3.2
261	GLOBAL	Cartesian	6.4225	2.	3.2
262	GLOBAL	Cartesian	7.36	2.	3.2
263	GLOBAL	Cartesian	8.2975	2.	3.2
264	GLOBAL	Cartesian	10.1725	2.	3.2
265	GLOBAL	Cartesian	11.11	2.	3.2
266	GLOBAL	Cartesian	12.0475	2.	3.2
267	GLOBAL	Cartesian	12.985	2.	3.2
268	GLOBAL	Cartesian	13.9225	2.	3.2
269	GLOBAL	Cartesian	14.86	2.	3.2
270	GLOBAL	Cartesian	15.7975	2.	3.2
272	GLOBAL	Cartesian	17.52389	2.	3.2
273	GLOBAL	Cartesian	18.1683	2.	3.2
274	GLOBAL	Cartesian	1.735	2.	3.2
275	GLOBAL	Cartesian	9.235	2.	3.2
276	GLOBAL	Cartesian	16.735	2.	3.2
278	GLOBAL	Cartesian	17.52389	2.	3.95
280	GLOBAL	Cartesian	0.	3.	3.2
281	GLOBAL	Cartesian	0.8675	3.	3.2
282	GLOBAL	Cartesian	2.6725	3.	3.2
283	GLOBAL	Cartesian	3.61	3.	3.2
284	GLOBAL	Cartesian	4.5475	3.	3.2
285	GLOBAL	Cartesian	5.485	3.	3.2
286	GLOBAL	Cartesian	6.4225	3.	3.2
287	GLOBAL	Cartesian	7.36	3.	3.2
288	GLOBAL	Cartesian	8.2975	3.	3.2
289	GLOBAL	Cartesian	10.1725	3.	3.2
290	GLOBAL	Cartesian	11.11	3.	3.2

Table 1: Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			m	m	m
291	GLOBAL	Cartesian	12.0475	3.	3.2
292	GLOBAL	Cartesian	12.985	3.	3.2
293	GLOBAL	Cartesian	13.9225	3.	3.2
294	GLOBAL	Cartesian	14.86	3.	3.2
295	GLOBAL	Cartesian	15.7975	3.	3.2
297	GLOBAL	Cartesian	17.235	3.	3.2
299	GLOBAL	Cartesian	1.735	3.	3.2
300	GLOBAL	Cartesian	9.235	3.	3.2
301	GLOBAL	Cartesian	16.735	3.	3.2
305	GLOBAL	Cartesian	0.	0.	3.2
306	GLOBAL	Cartesian	0.8675	0.	3.2
307	GLOBAL	Cartesian	2.6725	0.	3.2
308	GLOBAL	Cartesian	3.61	0.	3.2
309	GLOBAL	Cartesian	4.5475	0.	3.2
310	GLOBAL	Cartesian	5.485	0.	3.2
311	GLOBAL	Cartesian	6.4225	0.	3.2
312	GLOBAL	Cartesian	7.36	0.	3.2
313	GLOBAL	Cartesian	8.2975	0.	3.2
314	GLOBAL	Cartesian	10.1725	0.	3.2
315	GLOBAL	Cartesian	11.11	0.	3.2
316	GLOBAL	Cartesian	12.0475	0.	3.2
317	GLOBAL	Cartesian	12.985	0.	3.2
318	GLOBAL	Cartesian	13.9225	0.	3.2
319	GLOBAL	Cartesian	14.86	0.	3.2
320	GLOBAL	Cartesian	15.7975	0.	3.2
321	GLOBAL	Cartesian	19.21	0.	3.2
322	GLOBAL	Cartesian	17.56	0.	3.2
323	GLOBAL	Cartesian	18.385	0.	3.2
324	GLOBAL	Cartesian	1.735	0.	3.2
325	GLOBAL	Cartesian	9.235	0.	3.2
326	GLOBAL	Cartesian	16.735	0.	3.2
330	GLOBAL	Cartesian	20.035	0.	3.2

1.2. Joint restraints

Table 2: Joint Restraint Assignments

Table 2: Joint Restraint Assignments

Joint	U1	U2	U3	R1	R2	R3
25	Yes	Yes	Yes	Yes	Yes	Yes
26	Yes	Yes	Yes	Yes	Yes	Yes
27	Yes	Yes	Yes	Yes	Yes	Yes

Table 2: Joint Restraint Assignments

Joint	U1	U2	U3	R1	R2	R3
28	Yes	Yes	Yes	Yes	Yes	Yes
29	Yes	Yes	Yes	Yes	Yes	Yes
30	Yes	Yes	Yes	Yes	Yes	Yes

1.3. Element connectivity

Table 3: Connectivity - Frame

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length m
1	1	2	1.735
2	2	3	7.5
3	3	4	7.5
4	4	119	1.4333
5	6	7	1.735
6	7	8	7.5
7	8	9	7.5
8	9	120	2.36667
9	11	7	1.
10	7	2	1.
11	2	12	1.
12	13	8	1.
13	8	3	1.
14	3	14	1.
15	15	9	1.
16	9	4	1.
17	4	16	1.
18	324	135	1.
19	135	274	1.
20	274	299	1.
21	25	22	3.71
22	26	23	3.71
23	27	24	3.71
24	28	19	3.71
25	29	20	3.71
26	30	21	3.71
27	31	12	1.735
28	12	14	7.5
29	14	16	7.5
30	16	34	0.5
31	325	136	1.
32	136	275	1.
33	275	300	1.
34	32	6	1.
35	6	1	1.
36	1	31	1.

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length m
37	326	137	1.
38	137	276	1.
39	276	301	1.
40	308	141	1.
41	141	258	1.
42	258	283	1.
43	310	143	1.
44	143	260	1.
45	260	285	1.
46	312	145	1.
47	145	262	1.
48	262	287	1.
49	315	148	1.
50	148	265	1.
51	265	290	1.
52	317	150	1.
53	150	267	1.
54	267	292	1.
55	319	152	1.
56	152	269	1.
58	269	294	1.
73	11	63	0.9375
74	63	64	0.9375
75	64	65	0.9375
76	65	66	0.9375
77	66	67	0.9375
78	67	68	0.9375
79	68	69	0.9375
80	69	13	0.9375
81	13	70	0.9375
82	70	71	0.9375
83	71	72	0.9375
84	72	73	0.9375
85	73	74	0.9375
86	74	75	0.9375
87	75	76	0.9375
88	76	15	0.9375
89	63	77	1.
90	77	78	1.
91	78	79	1.
92	64	80	1.
93	80	81	1.
94	81	82	1.
95	65	83	1.
96	83	84	1.
97	84	85	1.
98	66	86	1.
99	86	87	1.
100	87	88	1.
101	67	89	1.
102	89	90	1.
103	90	91	1.
104	68	92	1.

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length m
105	92	93	1.
106	93	94	1.
107	69	95	1.
108	95	96	1.
109	96	97	1.
110	70	98	1.
111	98	99	1.
112	99	100	1.
113	71	101	1.
114	101	102	1.
115	102	103	1.
116	72	104	1.
117	104	105	1.
118	105	106	1.
119	73	107	1.
120	107	108	1.
121	108	109	1.
122	74	110	1.
123	110	111	1.
124	111	112	1.
125	75	113	1.
126	113	114	1.
127	114	115	1.
128	76	116	1.
129	116	117	1.
130	117	118	1.
131	33	34	4.10366
132	32	121	0.8675
133	121	11	0.8675
134	121	122	1.
135	122	123	1.
136	123	124	1.
137	15	125	0.825
138	125	126	0.825
139	126	127	0.825
140	127	33	0.825
141	125	131	2.65179
142	126	132	1.76786
143	127	133	0.88393
144	134	135	1.735
145	135	136	7.5
146	136	137	7.5
148	134	6	0.75
149	122	139	0.75
150	77	140	0.75
151	80	141	0.75
152	83	142	0.75
153	86	143	0.75
154	89	144	0.75
155	92	145	0.75
156	95	146	0.75
157	98	147	0.75
158	101	148	0.75

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length m
159	104	149	0.75
160	107	150	0.75
161	110	151	0.75
162	113	152	0.75
163	116	153	0.75
164	120	154	0.75
165	137	157	0.78889
166	157	158	0.78889
167	158	154	0.78889
168	157	159	0.75
169	158	160	0.75
170	6	139	1.14676
171	139	7	1.14676
172	7	140	1.20059
173	140	80	1.20059
174	80	142	1.20059
175	142	86	1.20059
176	86	144	1.20059
177	144	92	1.20059
178	92	146	1.20059
179	146	8	1.20059
180	8	147	1.20059
181	147	101	1.20059
182	101	149	1.20059
183	149	107	1.20059
184	107	151	1.20059
185	151	113	1.20059
186	113	153	1.20059
187	153	9	1.20059
188	9	157	1.08851
189	157	160	1.08851
190	160	154	1.08851
329	255	274	1.735
330	274	275	7.5
331	275	276	7.5
332	255	1	0.75
333	123	256	0.75
334	78	257	0.75
335	81	258	0.75
336	84	259	0.75
337	87	260	0.75
338	90	261	0.75
339	93	262	0.75
340	96	263	0.75
341	99	264	0.75
342	102	265	0.75
343	105	266	0.75
344	108	267	0.75
345	111	268	0.75
346	114	269	0.75
347	117	270	0.75
349	276	272	0.78889
350	272	273	0.64441

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length m
352	272	278	0.75
353	273	119	0.75
354	1	256	1.14676
355	256	2	1.14676
356	2	257	1.20059
357	257	81	1.20059
358	81	259	1.20059
359	259	87	1.20059
360	87	261	1.20059
361	261	93	1.20059
362	93	263	1.20059
363	263	3	1.20059
364	3	264	1.20059
365	264	102	1.20059
366	102	266	1.20059
367	266	108	1.20059
368	108	268	1.20059
369	268	114	1.20059
370	114	270	1.20059
371	270	4	1.20059
372	4	272	1.08851
373	272	119	0.98882
375	280	299	1.735
376	299	300	7.5
377	300	301	7.5
378	280	31	0.75
379	124	281	0.75
380	79	282	0.75
381	82	283	0.75
382	85	284	0.75
383	88	285	0.75
384	91	286	0.75
385	94	287	0.75
386	97	288	0.75
387	100	289	0.75
388	103	290	0.75
389	106	291	0.75
390	109	292	0.75
391	112	293	0.75
392	115	294	0.75
393	118	295	0.75
395	301	297	0.5
398	297	34	0.75
400	31	281	1.14676
401	281	12	1.14676
402	12	282	1.20059
403	282	82	1.20059
404	82	284	1.20059
405	284	88	1.20059
406	88	286	1.20059
407	286	94	1.20059
408	94	288	1.20059
409	288	14	1.20059

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length m
410	14	289	1.20059
411	289	103	1.20059
412	103	291	1.20059
413	291	109	1.20059
414	109	293	1.20059
415	293	115	1.20059
416	115	295	1.20059
417	295	16	1.20059
418	16	297	0.90139
421	305	324	1.735
422	324	325	7.5
423	325	326	7.5
424	305	32	0.75
425	121	306	0.75
426	63	307	0.75
427	64	308	0.75
428	65	309	0.75
429	66	310	0.75
430	67	311	0.75
431	68	312	0.75
432	69	313	0.75
433	70	314	0.75
434	71	315	0.75
435	72	316	0.75
436	73	317	0.75
437	74	318	0.75
438	75	319	0.75
439	76	320	0.75
440	127	321	0.75
441	326	322	0.825
442	322	323	0.825
443	323	321	0.825
444	322	125	0.75
445	323	126	0.75
446	32	306	1.14676
447	306	11	1.14676
448	11	307	1.20059
449	307	64	1.20059
450	64	309	1.20059
451	309	66	1.20059
452	66	311	1.20059
453	311	68	1.20059
454	68	313	1.20059
455	313	13	1.20059
456	13	314	1.20059
457	314	71	1.20059
458	71	316	1.20059
459	316	73	1.20059
460	73	318	1.20059
461	318	75	1.20059
462	75	320	1.20059
463	320	15	1.20059
464	15	322	1.11496

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length m
465	322	126	1.11496
466	126	321	1.11496
467	321	330	0.825
468	330	33	0.75
469	321	33	1.11496

Table 4: Frame Section Assignments

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
1	IPE240	IPE240	Default
2	IPE240	IPE240	Default
3	IPE240	IPE240	Default
4	IPE240	IPE240	Default
5	IPE240	IPE240	Default
6	IPE240	IPE240	Default
7	IPE240	IPE240	Default
8	IPE240	IPE240	Default
9	IPE240	IPE240	Default
10	IPE240	IPE240	Default
11	IPE240	IPE240	Default
12	IPE240	IPE240	Default
13	IPE240	IPE240	Default
14	IPE240	IPE240	Default
15	IPE240	IPE240	Default
16	IPE240	IPE240	Default
17	IPE240	IPE240	Default
18	L2X2X3/16	L2X2X3/16	Default
19	L2X2X3/16	L2X2X3/16	Default
20	L2X2X3/16	L2X2X3/16	Default
21	Tub 8"x5mm	Tub 8"x5mm	Default
22	Tub 8"x5mm	Tub 8"x5mm	Default
23	Tub 8"x5mm	Tub 8"x5mm	Default
24	Tub 8"x5mm	Tub 8"x5mm	Default
25	Tub 8"x5mm	Tub 8"x5mm	Default
26	Tub 8"x5mm	Tub 8"x5mm	Default
27	L2X2X3/16	L2X2X3/16	Default
28	L2X2X3/16	L2X2X3/16	Default
29	L2X2X3/16	L2X2X3/16	Default
30	L2X2X3/16	L2X2X3/16	Default
31	L2X2X3/16	L2X2X3/16	Default
32	L2X2X3/16	L2X2X3/16	Default
33	L2X2X3/16	L2X2X3/16	Default
34	L2X2X3/16	L2X2X3/16	Default
35	L2X2X3/16	L2X2X3/16	Default
36	L2X2X3/16	L2X2X3/16	Default
37	L2X2X3/16	L2X2X3/16	Default
38	L2X2X3/16	L2X2X3/16	Default
39	L2X2X3/16	L2X2X3/16	Default
40	L2X2X3/16	L2X2X3/16	Default

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
41	L2X2X3/16	L2X2X3/16	Default
42	L2X2X3/16	L2X2X3/16	Default
43	L2X2X3/16	L2X2X3/16	Default
44	L2X2X3/16	L2X2X3/16	Default
45	L2X2X3/16	L2X2X3/16	Default
46	L2X2X3/16	L2X2X3/16	Default
47	L2X2X3/16	L2X2X3/16	Default
48	L2X2X3/16	L2X2X3/16	Default
49	L2X2X3/16	L2X2X3/16	Default
50	L2X2X3/16	L2X2X3/16	Default
51	L2X2X3/16	L2X2X3/16	Default
52	L2X2X3/16	L2X2X3/16	Default
53	L2X2X3/16	L2X2X3/16	Default
54	L2X2X3/16	L2X2X3/16	Default
55	L2X2X3/16	L2X2X3/16	Default
56	L2X2X3/16	L2X2X3/16	Default
58	L2X2X3/16	L2X2X3/16	Default
73	L2X2X3/16	L2X2X3/16	Default
74	L2X2X3/16	L2X2X3/16	Default
75	L2X2X3/16	L2X2X3/16	Default
76	L2X2X3/16	L2X2X3/16	Default
77	L2X2X3/16	L2X2X3/16	Default
78	L2X2X3/16	L2X2X3/16	Default
79	L2X2X3/16	L2X2X3/16	Default
80	L2X2X3/16	L2X2X3/16	Default
81	L2X2X3/16	L2X2X3/16	Default
82	L2X2X3/16	L2X2X3/16	Default
83	L2X2X3/16	L2X2X3/16	Default
84	L2X2X3/16	L2X2X3/16	Default
85	L2X2X3/16	L2X2X3/16	Default
86	L2X2X3/16	L2X2X3/16	Default
87	L2X2X3/16	L2X2X3/16	Default
88	L2X2X3/16	L2X2X3/16	Default
89	P150-12	P150-12	Default
90	P150-12	P150-12	Default
91	P150-12	P150-12	Default
92	P150-12	P150-12	Default
93	P150-12	P150-12	Default
94	P150-12	P150-12	Default
95	P150-12	P150-12	Default
96	P150-12	P150-12	Default
97	P150-12	P150-12	Default
98	P150-12	P150-12	Default
99	P150-12	P150-12	Default
100	P150-12	P150-12	Default
101	P150-12	P150-12	Default
102	P150-12	P150-12	Default
103	P150-12	P150-12	Default
104	P150-12	P150-12	Default
105	P150-12	P150-12	Default
106	P150-12	P150-12	Default
107	P150-12	P150-12	Default
108	P150-12	P150-12	Default

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
109	P150-12	P150-12	Default
110	P150-12	P150-12	Default
111	P150-12	P150-12	Default
112	P150-12	P150-12	Default
113	P150-12	P150-12	Default
114	P150-12	P150-12	Default
115	P150-12	P150-12	Default
116	P150-12	P150-12	Default
117	P150-12	P150-12	Default
118	P150-12	P150-12	Default
119	P150-12	P150-12	Default
120	P150-12	P150-12	Default
121	P150-12	P150-12	Default
122	P150-12	P150-12	Default
123	P150-12	P150-12	Default
124	P150-12	P150-12	Default
125	P150-12	P150-12	Default
126	P150-12	P150-12	Default
127	P150-12	P150-12	Default
128	P150-11	P150-8	Default
129	P150-12	P150-11	Default
130	P150-12	P150-12	Default
131	L2X2X3/16	L2X2X3/16	Default
132	L2X2X3/16	L2X2X3/16	Default
133	L2X2X3/16	L2X2X3/16	Default
134	P150-12	P150-12	Default
135	P150-12	P150-12	Default
136	P150-12	P150-12	Default
137	L2X2X3/16	L2X2X3/16	Default
138	L2X2X3/16	L2X2X3/16	Default
139	L2X2X3/16	L2X2X3/16	Default
140	L2X2X3/16	L2X2X3/16	Default
141	P150-12	P150-12	Default
142	P150-12	P150-12	Default
143	P150-12	P150-12	Default
144	L2X2X1/4	L2X2X1/4	Default
145	L2X2X1/4	L2X2X1/4	Default
146	L2X2X1/4	L2X2X1/4	Default
148	L2X2X3/16	L2X2X3/16	Default
149	L2X2X3/16	L2X2X3/16	Default
150	L2X2X3/16	L2X2X3/16	Default
151	L2X2X3/16	L2X2X3/16	Default
152	L2X2X3/16	L2X2X3/16	Default
153	L2X2X3/16	L2X2X3/16	Default
154	L2X2X3/16	L2X2X3/16	Default
155	L2X2X3/16	L2X2X3/16	Default
156	L2X2X3/16	L2X2X3/16	Default
157	L2X2X3/16	L2X2X3/16	Default
158	L2X2X3/16	L2X2X3/16	Default
159	L2X2X3/16	L2X2X3/16	Default
160	L2X2X3/16	L2X2X3/16	Default
161	L2X2X3/16	L2X2X3/16	Default
162	L2X2X3/16	L2X2X3/16	Default

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
163	L2X2X3/16	L2X2X3/16	Default
164	L2X2X3/16	L2X2X3/16	Default
165	L2X2X1/4	L2X2X1/4	Default
166	L2X2X1/4	L2X2X1/4	Default
167	L2X2X1/4	L2X2X1/4	Default
168	L2X2X3/16	L2X2X3/16	Default
169	L2X2X3/16	L2X2X3/16	Default
170	L2X2X3/16	L2X2X3/16	Default
171	L2X2X3/16	L2X2X3/16	Default
172	L2X2X3/16	L2X2X3/16	Default
173	L2X2X3/16	L2X2X3/16	Default
174	L2X2X3/16	L2X2X3/16	Default
175	L2X2X3/16	L2X2X3/16	Default
176	L2X2X3/16	L2X2X3/16	Default
177	L2X2X3/16	L2X2X3/16	Default
178	L2X2X3/16	L2X2X3/16	Default
179	L2X2X3/16	L2X2X3/16	Default
180	L2X2X3/16	L2X2X3/16	Default
181	L2X2X3/16	L2X2X3/16	Default
182	L2X2X3/16	L2X2X3/16	Default
183	L2X2X3/16	L2X2X3/16	Default
184	L2X2X3/16	L2X2X3/16	Default
185	L2X2X3/16	L2X2X3/16	Default
186	L2X2X3/16	L2X2X3/16	Default
187	L2X2X3/16	L2X2X3/16	Default
188	L2X2X3/16	L2X2X3/16	Default
189	L2X2X3/16	L2X2X3/16	Default
190	L2X2X3/16	L2X2X3/16	Default
329	L2X2X1/4	L2X2X1/4	Default
330	L2X2X1/4	L2X2X1/4	Default
331	L2X2X1/4	L2X2X1/4	Default
332	L2X2X3/16	L2X2X3/16	Default
333	L2X2X3/16	L2X2X3/16	Default
334	L2X2X3/16	L2X2X3/16	Default
335	L2X2X3/16	L2X2X3/16	Default
336	L2X2X3/16	L2X2X3/16	Default
337	L2X2X3/16	L2X2X3/16	Default
338	L2X2X3/16	L2X2X3/16	Default
339	L2X2X3/16	L2X2X3/16	Default
340	L2X2X3/16	L2X2X3/16	Default
341	L2X2X3/16	L2X2X3/16	Default
342	L2X2X3/16	L2X2X3/16	Default
343	L2X2X3/16	L2X2X3/16	Default
344	L2X2X3/16	L2X2X3/16	Default
345	L2X2X3/16	L2X2X3/16	Default
346	L2X2X3/16	L2X2X3/16	Default
347	L2X2X3/16	L2X2X3/16	Default
349	L2X2X1/4	L2X2X1/4	Default
350	L2X2X1/4	L2X2X1/4	Default
352	L2X2X3/16	L2X2X3/16	Default
353	L2X2X3/16	L2X2X3/16	Default
354	L2X2X3/16	L2X2X3/16	Default
355	L2X2X3/16	L2X2X3/16	Default

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
356	L2X2X3/16	L2X2X3/16	Default
357	L2X2X3/16	L2X2X3/16	Default
358	L2X2X3/16	L2X2X3/16	Default
359	L2X2X3/16	L2X2X3/16	Default
360	L2X2X3/16	L2X2X3/16	Default
361	L2X2X3/16	L2X2X3/16	Default
362	L2X2X3/16	L2X2X3/16	Default
363	L2X2X3/16	L2X2X3/16	Default
364	L2X2X3/16	L2X2X3/16	Default
365	L2X2X3/16	L2X2X3/16	Default
366	L2X2X3/16	L2X2X3/16	Default
367	L2X2X3/16	L2X2X3/16	Default
368	L2X2X3/16	L2X2X3/16	Default
369	L2X2X3/16	L2X2X3/16	Default
370	L2X2X3/16	L2X2X3/16	Default
371	L2X2X3/16	L2X2X3/16	Default
372	L2X2X3/16	L2X2X3/16	Default
373	L2X2X3/16	L2X2X3/16	Default
375	L2X2X1/4	L2X2X1/4	Default
376	L2X2X1/4	L2X2X1/4	Default
377	L2X2X1/4	L2X2X1/4	Default
378	L2X2X3/16	L2X2X3/16	Default
379	L2X2X3/16	L2X2X3/16	Default
380	L2X2X3/16	L2X2X3/16	Default
381	L2X2X3/16	L2X2X3/16	Default
382	L2X2X3/16	L2X2X3/16	Default
383	L2X2X3/16	L2X2X3/16	Default
384	L2X2X3/16	L2X2X3/16	Default
385	L2X2X3/16	L2X2X3/16	Default
386	L2X2X3/16	L2X2X3/16	Default
387	L2X2X3/16	L2X2X3/16	Default
388	L2X2X3/16	L2X2X3/16	Default
389	L2X2X3/16	L2X2X3/16	Default
390	L2X2X3/16	L2X2X3/16	Default
391	L2X2X3/16	L2X2X3/16	Default
392	L2X2X3/16	L2X2X3/16	Default
393	L2X2X3/16	L2X2X3/16	Default
395	L2X2X1/4	L2X2X1/4	Default
398	L2X2X3/16	L2X2X3/16	Default
400	L2X2X3/16	L2X2X3/16	Default
401	L2X2X3/16	L2X2X3/16	Default
402	L2X2X3/16	L2X2X3/16	Default
403	L2X2X3/16	L2X2X3/16	Default
404	L2X2X3/16	L2X2X3/16	Default
405	L2X2X3/16	L2X2X3/16	Default
406	L2X2X3/16	L2X2X3/16	Default
407	L2X2X3/16	L2X2X3/16	Default
408	L2X2X3/16	L2X2X3/16	Default
409	L2X2X3/16	L2X2X3/16	Default
410	L2X2X3/16	L2X2X3/16	Default
411	L2X2X3/16	L2X2X3/16	Default
412	L2X2X3/16	L2X2X3/16	Default
413	L2X2X3/16	L2X2X3/16	Default

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
414	L2X2X3/16	L2X2X3/16	Default
415	L2X2X3/16	L2X2X3/16	Default
416	L2X2X3/16	L2X2X3/16	Default
417	L2X2X3/16	L2X2X3/16	Default
418	L2X2X3/16	L2X2X3/16	Default
421	L2X2X1/4	L2X2X1/4	Default
422	L2X2X1/4	L2X2X1/4	Default
423	L2X2X1/4	L2X2X1/4	Default
424	L2X2X3/16	L2X2X3/16	Default
425	L2X2X3/16	L2X2X3/16	Default
426	L2X2X3/16	L2X2X3/16	Default
427	L2X2X3/16	L2X2X3/16	Default
428	L2X2X3/16	L2X2X3/16	Default
429	L2X2X3/16	L2X2X3/16	Default
430	L2X2X3/16	L2X2X3/16	Default
431	L2X2X3/16	L2X2X3/16	Default
432	L2X2X3/16	L2X2X3/16	Default
433	L2X2X3/16	L2X2X3/16	Default
434	L2X2X3/16	L2X2X3/16	Default
435	L2X2X3/16	L2X2X3/16	Default
436	L2X2X3/16	L2X2X3/16	Default
437	L2X2X3/16	L2X2X3/16	Default
438	L2X2X3/16	L2X2X3/16	Default
439	L2X2X3/16	L2X2X3/16	Default
440	L2X2X3/16	L2X2X3/16	Default
441	L2X2X1/4	L2X2X1/4	Default
442	L2X2X1/4	L2X2X1/4	Default
443	L2X2X1/4	L2X2X1/4	Default
444	L2X2X3/16	L2X2X3/16	Default
445	L2X2X3/16	L2X2X3/16	Default
446	L2X2X3/16	L2X2X3/16	Default
447	L2X2X3/16	L2X2X3/16	Default
448	L2X2X3/16	L2X2X3/16	Default
449	L2X2X3/16	L2X2X3/16	Default
450	L2X2X3/16	L2X2X3/16	Default
451	L2X2X3/16	L2X2X3/16	Default
452	L2X2X3/16	L2X2X3/16	Default
453	L2X2X3/16	L2X2X3/16	Default
454	L2X2X3/16	L2X2X3/16	Default
455	L2X2X3/16	L2X2X3/16	Default
456	L2X2X3/16	L2X2X3/16	Default
457	L2X2X3/16	L2X2X3/16	Default
458	L2X2X3/16	L2X2X3/16	Default
459	L2X2X3/16	L2X2X3/16	Default
460	L2X2X3/16	L2X2X3/16	Default
461	L2X2X3/16	L2X2X3/16	Default
462	L2X2X3/16	L2X2X3/16	Default
463	L2X2X3/16	L2X2X3/16	Default
464	L2X2X3/16	L2X2X3/16	Default
465	L2X2X3/16	L2X2X3/16	Default
466	L2X2X3/16	L2X2X3/16	Default
467	L2X2X1/4	L2X2X1/4	Default
468	L2X2X3/16	L2X2X3/16	Default

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
469	L2X2X3/16	L2X2X3/16	Default

Table 5: Frame Release Assignments 1 - General, Part 1 of 2

Table 5: Frame Release Assignments 1 - General, Part 1 of 2

Frame	PI	V2I	V3I	TI	M2I	M3I
9	No	No	No	No	Yes	Yes
10	No	No	No	No	Yes	Yes
11	No	No	No	No	Yes	Yes
12	No	No	No	No	Yes	Yes
13	No	No	No	No	Yes	Yes
14	No	No	No	No	Yes	Yes
15	No	No	No	No	Yes	Yes
16	No	No	No	No	Yes	Yes
17	No	No	No	No	Yes	Yes

Table 5: Frame Release Assignments 1 - General, Part 2 of 2

Table 5: Frame Release Assignments 1 - General, Part 2 of 2

Frame	PJ	V2J	V3J	TJ	M2J	M3J
9	No	No	No	Yes	Yes	Yes
10	No	No	No	Yes	Yes	Yes
11	No	No	No	Yes	Yes	Yes
12	No	No	No	Yes	Yes	Yes
13	No	No	No	Yes	Yes	Yes
14	No	No	No	Yes	Yes	Yes
15	No	No	No	Yes	Yes	Yes
16	No	No	No	Yes	Yes	Yes
17	No	No	No	Yes	Yes	Yes

Table 6: Connectivity - Area

Table 6: Connectivity - Area

Area	Joint1	Joint2	Joint3	Joint4
1	32	33	34	31
6	305	324	11	32
7	324	325	13	11
8	325	326	15	13
9	326	330	33	15
10	280	299	12	31
11	299	300	14	12
12	300	301	16	14
13	301	297	34	16

Table 7: Area Section Assignments

Area	Section	MatProp
1	Teja	Default
6	Teja	Default
7	Teja	Default
8	Teja	Default
9	Teja	Default
10	Teja	Default
11	Teja	Default
12	Teja	Default
13	Teja	Default

2. Material properties

This section provides material property information for materials used in the model.

Table 8: Material Properties 02 - Basic Mechanical Properties

Table 8: Material Properties 02 - Basic Mechanical Properties

Material	UnitWeight	UnitMass	E1	G12	U12	A1
	Tonf/m3	Tonf-s2/m4	Tonf/m2	Tonf/m2		1/C
3000Psi	2.4028E+00	2.4501E-01	2194996.45	914581.85	0.2	9.9000E-06
4000Psi	2.4028E+00	2.4501E-01	2534563.54	1056068.14	0.2	9.9000E-06
A416Gr270	7.8490E+00	8.0038E-01	20037484.34			1.1700E-05
A500GrC	7.8490E+00	8.0038E-01	20389019.16	7841930.45	0.3	1.1700E-05
A572Gr50	7.8490E+00	8.0038E-01	20389019.16	7841930.45	0.3	1.1700E-05
A615Gr60	7.8490E+00	8.0038E-01	20389019.16			1.1700E-05
A653SQGr50	7.8490E+00	8.0038E-01	20740553.97	7977136.14	0.3	1.1700E-05
A992Fy50	7.8490E+00	8.0038E-01	20389019.16	7841930.45	0.3	1.1700E-05

Table 9: Material Properties 03a - Steel Data

Table 9: Material Properties 03a - Steel Data

Material	Fy	Fu	FinalSlope	CoupModType
	Tonf/m2	Tonf/m2		
A500GrC	35153.48	43590.32	-0.1	Von Mises
A572Gr50	35153.48	45699.53	-0.1	Von Mises
A992Fy50	35153.48	45699.53	-0.1	Von Mises

Table 10: Material Properties 03b - Concrete Data

Table 10: Material Properties 03b - Concrete Data

Material	Fc	eFc	FinalSlope	CoupModType
	Tonf/m2	Tonf/m2		
3000Psi	2109.21	2109.21	-0.1	Modified Darwin-Pecknold
4000Psi	2812.28	2812.28	-0.1	Modified Darwin-Pecknold

Table 11: Material Properties 03d - Cold Formed Data

Table 11: Material Properties 03d - Cold Formed Data

Material	Fy	Fu	CoupModType
	Tonf/m2	Tonf/m2	
A653SQGr50	35153.48	45699.53	Von Mises

Table 12: Material Properties 03e - Rebar Data

Table 12: Material Properties 03e - Rebar Data

Material	Fy	Fu	FinalSlope	CoupModType
	Tonf/m2	Tonf/m2		
A615Gr60	42184.18	63276.27	-0.1	Von Mises

Table 13: Material Properties 03f - Tendon Data

Table 13: Material Properties 03f - Tendon Data

Material	Fy	Fu	FinalSlope	CoupModType
	Tonf/m2	Tonf/m2		
A416Gr270	172322.37	189828.8	-0.1	Von Mises

3. Section properties

This section provides section property information for objects used in the model.

3.1. Frames

Table 14: Frame Section Properties 01 - General, Part 1 of 7

Table 14: Frame Section Properties 01 - General, Part 1 of 7

SectionName	Material	Shape	t3	t2	FilletRadius	tf	tw
			m	m	m	m	m
2Tub200X100X3mm	A500GrC	SD Section					
IPE240	A572Gr50	I/Wide Flange	0.24	0.12	0.015	0.0098	0.0062
L2X2X1/4	A572Gr50	Angle	0.0508	0.0508	0.00635	0.00635	0.00635
L2X2X3/16	A572Gr50	Angle	0.0508	0.0508	0.00635	0.004775	0.004775
P150-11	A653SQGr50	Cold Formed C	0.15	0.05			0.003
P150-12	A653SQGr50	Cold Formed C	0.15	0.05			0.0025
P150-14	A653SQGr50	Cold Formed C	0.15	0.05			0.002
P150-8	A653SQGr50	Cold Formed C	0.15	0.05			0.0045
Tub 8"x5mm	A500GrC	Pipe	0.2191				0.005
Tub100X100X2.5mm	A500GrC	Box/Tube	0.1	0.1	0.	0.0025	0.0025
Tub100X50X2mm	A500GrC	Box/Tube	0.1	0.05	0.	0.002	0.002
Tub200X100X2.5mm	A500GrC	Box/Tube	0.2	0.1	0.	0.0025	0.0025
Tub200X100X3mm	A500GrC	Box/Tube	0.2	0.1	0.	0.003	0.003

Table 14: Frame Section Properties 01 - General, Part 2 of 7

Table 14: Frame Section Properties 01 - General, Part 2 of 7

SectionName	t2b	tfb
	m	m
2Tub200X100X3mm		
IPE240	0.12	0.0098
L2X2X1/4		
L2X2X3/16		
P150-11		
P150-12		
P150-14		
P150-8		
Tub 8"x5mm		
Tub100X100X2.5mm		
Tub100X50X2mm		
Tub200X100X2.5mm		
Tub200X100X3mm		

Table 14: Frame Section Properties 01 - General, Part 3 of 7

Table 14: Frame Section Properties 01 - General, Part 3 of 7

SectionName	Area	TorsConst	S33Top	I33	S33Bot	I22	S22Left	I23
	m2	m4	m3	m4	m3	m4	m3	m4
2Tub200X100X3mm	0.003528	0.000023	0.000189	0.000019	0.000189	0.000015	0.000153	0.
IPE240	0.00391	1.300E-07	0.000324	0.000039	0.000324	2.840E-06	0.000047	0.
L2X2X1/4	0.000609	8.699E-09	4.010E-06	1.440E-07	9.676E-06	1.440E-07	9.676E-06	8.449E-08
L2X2X3/16	0.000466	3.833E-09	3.086E-06	1.128E-07	7.916E-06	1.128E-07	7.916E-06	6.676E-08
P150-11	0.000794	2.381E-09	0.000034	2.553E-06	0.000034	2.563E-07	0.000017	0.
P150-12	0.000667	1.390E-09	0.000029	2.169E-06	0.000029	2.214E-07	0.000015	0.
P150-14	0.000539	7.184E-10	0.000024	1.768E-06	0.000024	1.835E-07	0.000012	0.
P150-8	0.001158	7.814E-09	0.000048	3.614E-06	0.000048	3.443E-07	0.000023	0.
Tub 8"x5mm	0.003363	0.000039	0.000176	0.000019	0.000176	0.000019	0.000176	0.
Tub100X100X2.5mm	0.000975	2.317E-06	0.000031	1.546E-06	0.000031	1.546E-06	0.000031	0.
Tub100X50X2mm	0.000584	6.062E-07	0.000016	7.752E-07	0.000016	2.630E-07	0.000011	0.
Tub200X100X2.5mm	0.001475	6.285E-06	0.00008	7.966E-06	0.00008	2.734E-06	0.000055	0.
Tub200X100X3mm	0.001764	7.452E-06	0.000095	9.472E-06	0.000095	3.239E-06	0.000065	0.

Table 14: Frame Section Properties 01 - General, Part 4 of 7

Table 14: Frame Section Properties 01 - General, Part 4 of 7

SectionName	AS2	S22Right	AS3
	m2	m3	m2
2Tub200X100X3mm	0.002314	0.000153	0.00123
IPE240	0.001488	0.000047	0.00196
L2X2X1/4	0.000323	4.010E-06	0.000323
L2X2X3/16	0.000243	3.086E-06	0.000243
P150-11	0.000394	7.372E-06	0.000188
P150-12	0.000331	6.364E-06	0.000162
P150-14	0.000267	5.272E-06	0.000133
P150-8	0.000577	9.913E-06	0.000255
Tub 8"x5mm	0.001682	0.000176	0.001682
Tub100X100X2.5mm	0.0005	0.000031	0.0005
Tub100X50X2mm	0.0004	0.000011	0.0002
Tub200X100X2.5mm	0.001	0.000055	0.0005
Tub200X100X3mm	0.0012	0.000065	0.0006

Table 14: Frame Section Properties 01 - General, Part 5 of 7

Table 14: Frame Section Properties 01 - General, Part 5 of 7

SectionName	Z33	CGOffset3	Z22	R33	CGOffset2	R22
	m3	m	m3	m	m	m
2Tub200X100X3mm	0.000231	6.939E-18	0.000176	0.07328	0.	0.065849
IPE240	0.000367	1.388E-17	0.000074	0.09977	0.	0.026951
L2X2X1/4	7.210E-06	0.010516	7.210E-06	0.015378	-0.010516	0.015378
L2X2X3/16	5.539E-06	0.011151	5.539E-06	0.015561	-0.011151	0.015561
P150-11	0.000034	0.009772	7.372E-06	0.056725	0.	0.017973
P150-12	0.000029	0.009786	6.364E-06	0.057005	0.	0.018213
P150-14	0.000024	0.0098	5.272E-06	0.057283	0.	0.018454
P150-8	0.000048	0.009728	9.913E-06	0.055876	0.	0.017246
Tub 8"x5mm	0.000229	0.	0.000229	0.075716	0.	0.075716
Tub100X100X2.5mm	0.000036	0.	0.000036	0.039817	0.	0.039817
Tub100X50X2mm	0.000019	0.	0.000012	0.036433	0.	0.02122
Tub200X100X2.5mm	0.000097	0.	0.00006	0.073487	0.	0.043056
Tub200X100X3mm	0.000116	0.	0.000071	0.07328	0.	0.04285

Table 14: Frame Section Properties 01 - General, Part 6 of 7

Table 14: Frame Section Properties 01 - General, Part 6 of 7

SectionName	EccV2	EccV3	Cw	IncludeSCAn	AMod	A2Mod	A3Mod	JMod
	m	m	m6					
2Tub200X100X3mm	0.	0.	0.		1.	1.	1.	1.
IPE240	0.	0.	3.739E-08		1.	1.	1.	1.
L2X2X1/4	0.011321	-0.011321	1.536E-12		1.	1.	1.	1.
L2X2X3/16	0.011667	-0.011667	6.821E-13		1.	1.	1.	1.
P150-11	0.036538	0.	1.362E-09	Yes	1.	1.	1.	1.
P150-12	0.037088	0.	1.182E-09	Yes	1.	1.	1.	1.
P150-14	0.037638	0.	9.843E-10	Yes	1.	1.	1.	1.
P150-8	0.034893	0.	1.805E-09	Yes	1.	1.	1.	1.
Tub 8"x5mm	0.	0.	0.		1.	1.	1.	1.
Tub100X100X2.5mm	0.	0.	0.		1.	1.	1.	1.
Tub100X50X2mm	0.	0.	0.		1.	1.	1.	1.
Tub200X100X2.5mm	0.	0.	0.		1.	1.	1.	1.
Tub200X100X3mm	0.	0.	0.		1.	1.	1.	1.

Table 14: Frame Section Properties 01 - General, Part 7 of 7

Table 14: Frame Section Properties 01 - General, Part 7 of 7

SectionName	I2Mod	I3Mod	MMod	WMod
2Tub200X100X3mm	1.	1.	1.	1.

Table 14: Frame Section Properties 01 - General, Part 7 of 7

SectionName	I2Mod	I3Mod	MMod	WMod
IPE240	1.	1.	1.	1.
L2X2X1/4	1.	1.	1.	1.
L2X2X3/16	1.	1.	1.	1.
P150-11	1.	1.	1.	1.
P150-12	1.	1.	1.	1.
P150-14	1.	1.	1.	1.
P150-8	1.	1.	1.	1.
Tub 8"x5mm	1.	1.	1.	1.
Tub100X100X2.5mm	1.	1.	1.	1.
Tub100X50X2mm	1.	1.	1.	1.
Tub200X100X2.5mm	1.	1.	1.	1.
Tub200X100X3mm	1.	1.	1.	1.

3.2. Areas

Table 15: Area Section Properties, Part 1 of 3

Table 15: Area Section Properties, Part 1 of 3

Section	Material	AreaType	Type	DrillDOF	Thickness	BendThick	F11Mod
					m	m	
Teja	3000Psi	Shell	Membrane	Yes	0.025	0.025	1.

Table 15: Area Section Properties, Part 2 of 3

Table 15: Area Section Properties, Part 2 of 3

Section	F22Mod	F12Mod	M11Mod	M22Mod	M12Mod	V13Mod	V23Mod
Teja	1.	1.	1.	1.	1.	1.	1.

Table 15: Area Section Properties, Part 3 of 3

Table 15: Area Section Properties, Part 3 of 3

Section	MMod	WMod
Teja	1.	0.

3.3. Solids

Table 16: Solid Property Definitions

Table 16: Solid Property Definitions

SolidProp	Material	MatAngleA	MatAngleB	MatAngleC

		Degrees	Degrees	Degrees
Solid1	4000Psi	0.	0.	0.

4. Load patterns

This section provides loading information as applied to the model.

4.1. Definitions

Table 17: Load Pattern Definitions

Table 17: Load Pattern Definitions

LoadPat	DesignType	SelfWtMult	AutoLoad
DL	Dead	1.	
SD	Dead	0.	
Lr	Roof Live	0.	
W	Wind	0.	None

5. Load cases

This section provides load case information.

5.1. Definitions

Table 18: Load Case Definitions, Part 1 of 2

Table 18: Load Case Definitions, Part 1 of 2

Case	Type	InitialCond	ModalCase	BaseCase	MassSource	DesActOpt
DL	LinStatic	Zero				Prog Det
MODAL	LinModal	Zero				Prog Det
SD	LinStatic	Zero				Prog Det
Lr	LinStatic	Zero				Prog Det
W	LinStatic	Zero				Prog Det
EQ	LinRespSpec		MODAL			Prog Det

Table 18: Load Case Definitions, Part 2 of 2

Table 18: Load Case Definitions, Part 2 of 2

Case	DesignAct
DL	Non-Composite
MODAL	Other
SD	Non-Composite

Table 18: Load Case Definitions, Part 2 of 2

Case	DesignAct
Lr	Short-Term Composite
W	Short-Term Composite
EQ	Short-Term Composite

5.2. Static case load assignments

Table 19: Case - Static 1 - Load Assignments

Table 19: Case - Static 1 - Load Assignments

Case	LoadType	LoadName	LoadSF
DL	Load pattern	DL	1.
SD	Load pattern	SD	1.
Lr	Load pattern	Lr	1.
W	Load pattern	W	1.

5.3. Response spectrum case load assignments

Table 20: Case - Response Spectrum 1 - General, Part 1 of 2

Table 20: Case - Response Spectrum 1 - General, Part 1 of 2

Case	ModalCombo	GMCf1 Cyc/sec	GMCf2 Cyc/sec	PerRigid	DirCombo	MotionType	DampingType
EQ	CQC	1.0000E+00	0.0000E+00	SRSS	SRSS	Acceleration	Constant

Table 20: Case - Response Spectrum 1 - General, Part 2 of 2

Table 20: Case - Response Spectrum 1 - General, Part 2 of 2

Case	ConstDamp
EQ	0.05

Table 21: Case - Response Spectrum 2 - Load Assignments

Table 21: Case - Response Spectrum 2 - Load Assignments

Case	LoadType	LoadName	CoordSys	Function	Angle	TransAccSF
					Degrees	m/sec2
EQ	Acceleration	U1	GLOBAL	EQ	0.	6.5378
EQ	Acceleration	U2	GLOBAL	EQ	0.	6.5378

Table 22: Function - Response Spectrum - Colombia NSR-10, Part 1 of 2

Table 22: Function - Response Spectrum - Colombia NSR-10, Part 1 of 2

Name	Period	Accel	FuncDamp	Aa	Av	Ae	Ad
	Sec						
EQ	0.	0.8125	0.05	0.25	0.25	0.16	0.1
EQ	0.1	0.8125					
EQ	0.2	0.8125					
EQ	0.3	0.8125					
EQ	0.4	0.8125					
EQ	0.5	0.8125					
EQ	0.6	0.8125					
EQ	0.7	0.8125					
EQ	0.8	0.7125					
EQ	0.9	0.633333					
EQ	1.	0.57					
EQ	1.2	0.475					
EQ	1.5	0.38					
EQ	1.7	0.335294					
EQ	2.	0.285					
EQ	2.5	0.228					
EQ	3.	0.19					
EQ	3.5	0.162857					
EQ	4.	0.1425					
EQ	5.	0.103968					
EQ	8.	0.040612					
EQ	11.	0.021481					
EQ	15.	0.011552					

Table 22: Function - Response Spectrum - Colombia NSR-10, Part 2 of 2

Table 22: Function - Response Spectrum - Colombia NSR-10, Part 2 of 2

Name	Period	GroupUse	Fa	Fv
	Sec			
EQ	0.	Group 1	1.3	1.9
EQ	0.1			
EQ	0.2			
EQ	0.3			
EQ	0.4			
EQ	0.5			
EQ	0.6			
EQ	0.7			
EQ	0.8			
EQ	0.9			

Table 22: Function - Response Spectrum - Colombia NSR-10, Part 2 of 2

Name	Period	GroupUse	Fa	Fv
	Sec			
EQ	1.			
EQ	1.2			
EQ	1.5			
EQ	1.7			
EQ	2.			
EQ	2.5			
EQ	3.			
EQ	3.5			
EQ	4.			
EQ	5.			
EQ	8.			
EQ	11.			
EQ	15.			

6. Load combinations

This section provides load combination information.

Table 23: Combination Definitions

Table 23: Combination Definitions

ComboName	ComboType	CaseName	ScaleFactor
B.2.3-7	Linear Add	DL	1.
B.2.3-7		SD	1.
B.2.3-7		W	0.75
B.2.3-7		Lr	0.75
B.2.3-8	Linear Add	DL	1.
B.2.3-8		SD	1.
B.2.3-8		EQ	0.525
B.2.3-8		Lr	0.75
B.2.3-9	Linear Add	DL	0.6
B.2.3-9		SD	0.6
B.2.3-9		W	1.
B.2.3-10	Linear Add	DL	0.6
B.2.3-10		SD	0.6
B.2.3-10		EQ	0.7
B.2.4-1	Linear Add	DL	1.4
B.2.4-1		SD	1.4
B.2.4-2a	Linear Add	DL	1.2
B.2.4-2a		SD	1.2
B.2.4-2a		Lr	1.6
B.2.4-2a		W	0.8
B.2.4-2b	Linear Add	DL	1.2
B.2.4-2b		SD	1.2
B.2.4-2b		Lr	1.6
B.2.4-2b		W	-0.8
B.2.4-4a	Linear Add	DL	1.2
B.2.4-4a		SD	1.2
B.2.4-4a		Lr	0.5

Table 23: Combination Definitions

ComboName	ComboType	CaseName	ScaleFactor
B.2.4-4a	W		1.6
B.2.4-4b	Linear Add	DL	1.2
B.2.4-4b		SD	1.2
B.2.4-4b		Lr	0.5
B.2.4-4b		W	-1.6
B.2.4-5	Linear Add	DL	1.2
B.2.4-5		SD	1.2
B.2.4-5		EQ	1.
B.2.4-6a	Linear Add	DL	0.9
B.2.4-6a		SD	0.9
B.2.4-6a		W	1.6
B.2.4-6b	Linear Add	DL	0.9
B.2.4-6b		SD	0.9
B.2.4-6b		W	-1.6
B.2.4-7	Linear Add	DL	0.9
B.2.4-7		SD	0.9
B.2.4-7		EQ	1.
Env.Ser.	Envelope	B.2.3-10	1.
Env.Ser.		B.2.3-7	1.
Env.Ser.		B.2.3-8	1.
Env.Ser.		B.2.3-9	1.
Env.Ult.	Envelope	B.2.4-1	1.
Env.Ult.		B.2.4-2a	1.
Env.Ult.		B.2.4-2b	1.
Env.Ult.		B.2.4-4a	1.
Env.Ult.		B.2.4-4b	1.
Env.Ult.		B.2.4-5	1.
Env.Ult.		B.2.4-6a	1.
Env.Ult.		B.2.4-6b	1.
Env.Ult.		B.2.4-7	1.
DL Total	Linear Add	DL	1.
DL Total		SD	1.
DCLD1	Linear Add	DL	1.4
DCLD1		SD	1.4
DCLD2	Linear Add	DL	1.2
DCLD2		SD	1.2
DCLD2		Lr	1.6
DCLD3	Linear Add	DL	1.2
DCLD3		SD	1.2
DCLD3		W	1.
DCLD4	Linear Add	DL	1.2
DCLD4		SD	1.2
DCLD4		W	-1.
DCLD5	Linear Add	DL	1.2
DCLD5		SD	1.2
DCLD5		Lr	0.5
DCLD5		W	1.
DCLD6	Linear Add	DL	1.2
DCLD6		SD	1.2
DCLD6		Lr	0.5
DCLD6		W	-1.
DCLD7	Linear Add	DL	1.2
DCLD7		SD	1.2

Table 23: Combination Definitions

ComboName	ComboType	CaseName	ScaleFactor
DCLD7	Lr		1.6
DCLD7	W		0.5
DCLD8	Linear Add	DL	1.2
DCLD8	SD		1.2
DCLD8	Lr		1.6
DCLD8	W		-0.5
DCLD9	Linear Add	DL	0.9
DCLD9	SD		0.9
DCLD9	W		1.
DCLD10	Linear Add	DL	0.9
DCLD10	SD		0.9
DCLD10	W		-1.
DCLD11	Linear Add	DL	1.2
DCLD11	SD		1.2
DCLD11	EQ		1.
DCLD12	Linear Add	DL	0.9
DCLD12	SD		0.9
DCLD12	EQ		1.
DCLD13	Linear Add	DL	1.
DCLD13	SD		1.

7. Structure results

This section provides structure results, including items such as structural periods and base reactions.

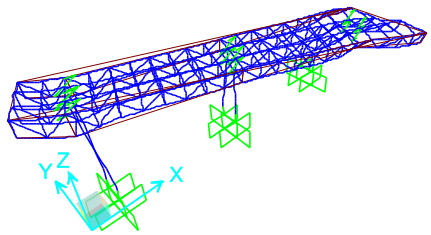


Figure 2: Deformed shape

7.1. Mass summary

Table 24: Assembled Joint Masses, Part 1 of 2

Table 24: Assembled Joint Masses, Part 1 of 2

Joint	MassSource	U1	U2	U3	R1	R2	R3	CenterX
		Tonf-s2/m	Tonf-s2/m	Tonf-s2/m	Tonf-m-s2	Tonf-m-s2	Tonf-m-s2	m
1	MSSSRC1	2.084E-03	2.084E-03	2.084E-03	0.	0.	0.	0.
2	MSSSRC1	6.391E-03	6.391E-03	6.391E-03	0.	0.	0.	1.735
3	MSSSRC1	6.511E-03	6.511E-03	6.511E-03	0.	0.	0.	9.235
4	MSSSRC1	6.258E-03	6.258E-03	6.258E-03	0.	0.	0.	16.735
6	MSSSRC1	2.084E-03	2.084E-03	2.084E-03	0.	0.	0.	0.
7	MSSSRC1	6.391E-03	6.391E-03	6.391E-03	0.	0.	0.	1.735
8	MSSSRC1	6.511E-03	6.511E-03	6.511E-03	0.	0.	0.	9.235
9	MSSSRC1	6.258E-03	6.258E-03	6.258E-03	0.	0.	0.	16.735
11	MSSSRC1	2.339E-03	2.339E-03	2.339E-03	0.	0.	0.	1.735
12	MSSSRC1	2.339E-03	2.339E-03	2.339E-03	0.	0.	0.	1.735
13	MSSSRC1	2.362E-03	2.362E-03	2.362E-03	0.	0.	0.	9.235
14	MSSSRC1	2.362E-03	2.362E-03	2.362E-03	0.	0.	0.	9.235
15	MSSSRC1	2.325E-03	2.325E-03	2.325E-03	0.	0.	0.	16.735
16	MSSSRC1	2.225E-03	2.225E-03	2.225E-03	0.	0.	0.	16.735
19	MSSSRC1	6.864E-04	6.864E-04	6.864E-04	0.	0.	0.	1.735
20	MSSSRC1	6.864E-04	6.864E-04	6.864E-04	0.	0.	0.	9.235
21	MSSSRC1	6.864E-04	6.864E-04	6.864E-04	0.	0.	0.	16.735
22	MSSSRC1	6.864E-04	6.864E-04	6.864E-04	0.	0.	0.	1.735
23	MSSSRC1	6.864E-04	6.864E-04	6.864E-04	0.	0.	0.	9.235
24	MSSSRC1	6.864E-04	6.864E-04	6.864E-04	0.	0.	0.	16.735
25	MSSSRC1	4.307E-03	4.307E-03	4.307E-03	0.	0.	0.	1.735
26	MSSSRC1	4.307E-03	4.307E-03	4.307E-03	0.	0.	0.	9.235
27	MSSSRC1	4.307E-03	4.307E-03	4.307E-03	0.	0.	0.	16.735
28	MSSSRC1	4.307E-03	4.307E-03	4.307E-03	0.	0.	0.	1.735
29	MSSSRC1	4.307E-03	4.307E-03	4.307E-03	0.	0.	0.	9.235
30	MSSSRC1	4.307E-03	4.307E-03	4.307E-03	0.	0.	0.	16.735

Table 24: Assembled Joint Masses, Part 1 of 2

Joint	MassSource	U1	U2	U3	R1	R2	R3	CenterX
		Tonf-s2/m	Tonf-s2/m	Tonf-s2/m	Tonf-m-s2	Tonf-m-s2	Tonf-m-s2	m
31	MSSSRC1	4.239E-02	4.239E-02	4.239E-02	0.	0.	0.	0.
32	MSSSRC1	4.453E-02	4.453E-02	4.453E-02	0.	0.	0.	0.
33	MSSSRC1	4.455E-02	4.455E-02	4.455E-02	0.	0.	0.	20.035
34	MSSSRC1	4.201E-02	4.201E-02	4.201E-02	0.	0.	0.	17.235
63	MSSSRC1	7.564E-04	7.564E-04	7.564E-04	0.	0.	0.	2.6725
64	MSSSRC1	1.204E-03	1.204E-03	1.204E-03	0.	0.	0.	3.61
65	MSSSRC1	7.564E-04	7.564E-04	7.564E-04	0.	0.	0.	4.5475
66	MSSSRC1	1.204E-03	1.204E-03	1.204E-03	0.	0.	0.	5.485
67	MSSSRC1	7.564E-04	7.564E-04	7.564E-04	0.	0.	0.	6.4225
68	MSSSRC1	1.204E-03	1.204E-03	1.204E-03	0.	0.	0.	7.36
69	MSSSRC1	7.564E-04	7.564E-04	7.564E-04	0.	0.	0.	8.2975
70	MSSSRC1	7.564E-04	7.564E-04	7.564E-04	0.	0.	0.	10.1725
71	MSSSRC1	1.204E-03	1.204E-03	1.204E-03	0.	0.	0.	11.11
72	MSSSRC1	7.564E-04	7.564E-04	7.564E-04	0.	0.	0.	12.0475
73	MSSSRC1	1.204E-03	1.204E-03	1.204E-03	0.	0.	0.	12.985
74	MSSSRC1	7.564E-04	7.564E-04	7.564E-04	0.	0.	0.	13.9225
75	MSSSRC1	1.204E-03	1.204E-03	1.204E-03	0.	0.	0.	14.86
76	MSSSRC1	8.069E-04	8.069E-04	8.069E-04	0.	0.	0.	15.7975
77	MSSSRC1	3.608E-03	3.608E-03	3.608E-03	0.	0.	0.	2.6725
78	MSSSRC1	3.608E-03	3.608E-03	3.608E-03	0.	0.	0.	2.6725
79	MSSSRC1	7.564E-04	7.564E-04	7.564E-04	0.	0.	0.	2.6725
80	MSSSRC1	4.055E-03	4.055E-03	4.055E-03	0.	0.	0.	3.61
81	MSSSRC1	4.055E-03	4.055E-03	4.055E-03	0.	0.	0.	3.61
82	MSSSRC1	1.204E-03	1.204E-03	1.204E-03	0.	0.	0.	3.61
83	MSSSRC1	3.608E-03	3.608E-03	3.608E-03	0.	0.	0.	4.5475
84	MSSSRC1	3.608E-03	3.608E-03	3.608E-03	0.	0.	0.	4.5475
85	MSSSRC1	7.564E-04	7.564E-04	7.564E-04	0.	0.	0.	4.5475
86	MSSSRC1	4.055E-03	4.055E-03	4.055E-03	0.	0.	0.	5.485
87	MSSSRC1	4.055E-03	4.055E-03	4.055E-03	0.	0.	0.	5.485
88	MSSSRC1	1.204E-03	1.204E-03	1.204E-03	0.	0.	0.	5.485
89	MSSSRC1	3.608E-03	3.608E-03	3.608E-03	0.	0.	0.	6.4225
90	MSSSRC1	3.608E-03	3.608E-03	3.608E-03	0.	0.	0.	6.4225
91	MSSSRC1	7.564E-04	7.564E-04	7.564E-04	0.	0.	0.	6.4225
92	MSSSRC1	4.055E-03	4.055E-03	4.055E-03	0.	0.	0.	7.36
93	MSSSRC1	4.055E-03	4.055E-03	4.055E-03	0.	0.	0.	7.36
94	MSSSRC1	1.204E-03	1.204E-03	1.204E-03	0.	0.	0.	7.36
95	MSSSRC1	3.608E-03	3.608E-03	3.608E-03	0.	0.	0.	8.2975
96	MSSSRC1	3.608E-03	3.608E-03	3.608E-03	0.	0.	0.	8.2975
97	MSSSRC1	7.564E-04	7.564E-04	7.564E-04	0.	0.	0.	8.2975
98	MSSSRC1	3.608E-03	3.608E-03	3.608E-03	0.	0.	0.	10.1725
99	MSSSRC1	3.608E-03	3.608E-03	3.608E-03	0.	0.	0.	10.1725
100	MSSSRC1	7.564E-04	7.564E-04	7.564E-04	0.	0.	0.	10.1725
101	MSSSRC1	4.055E-03	4.055E-03	4.055E-03	0.	0.	0.	11.11
102	MSSSRC1	4.055E-03	4.055E-03	4.055E-03	0.	0.	0.	11.11

Table 24: Assembled Joint Masses, Part 1 of 2

Joint	MassSource	U1	U2	U3	R1	R2	R3	CenterX
		Tonf-s2/m	Tonf-s2/m	Tonf-s2/m	Tonf-m-s2	Tonf-m-s2	Tonf-m-s2	m
103	MSSSRC1	1.204E-03	1.204E-03	1.204E-03	0.	0.	0.	11.11
104	MSSSRC1	3.608E-03	3.608E-03	3.608E-03	0.	0.	0.	12.0475
105	MSSSRC1	3.608E-03	3.608E-03	3.608E-03	0.	0.	0.	12.0475
106	MSSSRC1	7.564E-04	7.564E-04	7.564E-04	0.	0.	0.	12.0475
107	MSSSRC1	4.055E-03	4.055E-03	4.055E-03	0.	0.	0.	12.985
108	MSSSRC1	4.055E-03	4.055E-03	4.055E-03	0.	0.	0.	12.985
109	MSSSRC1	1.204E-03	1.204E-03	1.204E-03	0.	0.	0.	12.985
110	MSSSRC1	3.608E-03	3.608E-03	3.608E-03	0.	0.	0.	13.9225
111	MSSSRC1	3.608E-03	3.608E-03	3.608E-03	0.	0.	0.	13.9225
112	MSSSRC1	7.564E-04	7.564E-04	7.564E-04	0.	0.	0.	13.9225
113	MSSSRC1	4.055E-03	4.055E-03	4.055E-03	0.	0.	0.	14.86
114	MSSSRC1	4.055E-03	4.055E-03	4.055E-03	0.	0.	0.	14.86
115	MSSSRC1	1.204E-03	1.204E-03	1.204E-03	0.	0.	0.	14.86
116	MSSSRC1	3.658E-03	3.658E-03	3.658E-03	0.	0.	0.	15.7975
117	MSSSRC1	3.608E-03	3.608E-03	3.608E-03	0.	0.	0.	15.7975
118	MSSSRC1	7.564E-04	7.564E-04	7.564E-04	0.	0.	0.	15.7975
119	MSSSRC1	1.558E-03	1.558E-03	1.558E-03	0.	0.	0.	18.1683
120	MSSSRC1	1.600E-03	1.600E-03	1.600E-03	0.	0.	0.	19.10167
121	MSSSRC1	7.303E-04	7.303E-04	7.303E-04	0.	0.	0.	0.8675
122	MSSSRC1	3.389E-03	3.389E-03	3.389E-03	0.	0.	0.	0.8675
123	MSSSRC1	3.389E-03	3.389E-03	3.389E-03	0.	0.	0.	0.8675
124	MSSSRC1	7.303E-04	7.303E-04	7.303E-04	0.	0.	0.	0.8675
125	MSSSRC1	1.156E-03	1.156E-03	1.156E-03	0.	0.	0.	17.56
126	MSSSRC1	1.335E-03	1.335E-03	1.335E-03	0.	0.	0.	18.385
127	MSSSRC1	6.835E-04	6.835E-04	6.835E-04	0.	0.	0.	19.21
131	MSSSRC1	9.632E-04	9.632E-04	9.632E-04	0.	0.	0.	17.56
132	MSSSRC1	7.272E-04	7.272E-04	7.272E-04	0.	0.	0.	18.385
133	MSSSRC1	4.911E-04	4.911E-04	4.911E-04	0.	0.	0.	19.21
134	MSSSRC1	3.512E-04	3.512E-04	3.512E-04	0.	0.	0.	0.
135	MSSSRC1	5.806E-03	5.806E-03	5.806E-03	0.	0.	0.	1.735
136	MSSSRC1	5.823E-03	5.823E-03	5.823E-03	0.	0.	0.	9.235
137	MSSSRC1	5.787E-03	5.787E-03	5.787E-03	0.	0.	0.	16.735
139	MSSSRC1	9.902E-04	9.902E-04	9.902E-04	0.	0.	0.	0.8675
140	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	2.6725
141	MSSSRC1	9.696E-04	9.696E-04	9.696E-04	0.	0.	0.	3.61
142	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	4.5475
143	MSSSRC1	9.696E-04	9.696E-04	9.696E-04	0.	0.	0.	5.485
144	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	6.4225
145	MSSSRC1	9.696E-04	9.696E-04	9.696E-04	0.	0.	0.	7.36
146	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	8.2975
147	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	10.1725
148	MSSSRC1	9.696E-04	9.696E-04	9.696E-04	0.	0.	0.	11.11
149	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	12.0475
150	MSSSRC1	9.696E-04	9.696E-04	9.696E-04	0.	0.	0.	12.985

Table 24: Assembled Joint Masses, Part 1 of 2

Joint	MassSource	U1	U2	U3	R1	R2	R3	CenterX
		Tonf-s2/m	Tonf-s2/m	Tonf-s2/m	Tonf-m-s2	Tonf-m-s2	Tonf-m-s2	m
151	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	13.9225
152	MSSSRC1	9.696E-04	9.696E-04	9.696E-04	0.	0.	0.	14.86
153	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	15.7975
154	MSSSRC1	5.350E-04	5.350E-04	5.350E-04	0.	0.	0.	19.10167
157	MSSSRC1	9.302E-04	9.302E-04	9.302E-04	0.	0.	0.	17.52389
158	MSSSRC1	5.244E-04	5.244E-04	5.244E-04	0.	0.	0.	18.31278
159	MSSSRC1	2.609E-03	2.609E-03	2.609E-03	0.	0.	0.	17.52389
160	MSSSRC1	3.014E-03	3.014E-03	3.014E-03	0.	0.	0.	18.31278
255	MSSSRC1	3.512E-04	3.512E-04	3.512E-04	0.	0.	0.	0.
256	MSSSRC1	9.902E-04	9.902E-04	9.902E-04	0.	0.	0.	0.8675
257	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	2.6725
258	MSSSRC1	9.696E-04	9.696E-04	9.696E-04	0.	0.	0.	3.61
259	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	4.5475
260	MSSSRC1	9.696E-04	9.696E-04	9.696E-04	0.	0.	0.	5.485
261	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	6.4225
262	MSSSRC1	9.696E-04	9.696E-04	9.696E-04	0.	0.	0.	7.36
263	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	8.2975
264	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	10.1725
265	MSSSRC1	9.696E-04	9.696E-04	9.696E-04	0.	0.	0.	11.11
266	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	12.0475
267	MSSSRC1	9.696E-04	9.696E-04	9.696E-04	0.	0.	0.	12.985
268	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	13.9225
269	MSSSRC1	9.696E-04	9.696E-04	9.696E-04	0.	0.	0.	14.86
270	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	15.7975
272	MSSSRC1	8.764E-04	8.764E-04	8.764E-04	0.	0.	0.	17.52389
273	MSSSRC1	2.969E-04	2.969E-04	2.969E-04	0.	0.	0.	18.1683
274	MSSSRC1	5.806E-03	5.806E-03	5.806E-03	0.	0.	0.	1.735
275	MSSSRC1	5.823E-03	5.823E-03	5.823E-03	0.	0.	0.	9.235
276	MSSSRC1	5.787E-03	5.787E-03	5.787E-03	0.	0.	0.	16.735
278	MSSSRC1	2.383E-03	2.383E-03	2.383E-03	0.	0.	0.	17.52389
280	MSSSRC1	3.512E-04	3.512E-04	3.512E-04	0.	0.	0.	0.
281	MSSSRC1	9.902E-04	9.902E-04	9.902E-04	0.	0.	0.	0.8675
282	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	2.6725
283	MSSSRC1	7.832E-04	7.832E-04	7.832E-04	0.	0.	0.	3.61
284	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	4.5475
285	MSSSRC1	7.832E-04	7.832E-04	7.832E-04	0.	0.	0.	5.485
286	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	6.4225
287	MSSSRC1	7.832E-04	7.832E-04	7.832E-04	0.	0.	0.	7.36
288	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	8.2975
289	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	10.1725
290	MSSSRC1	7.832E-04	7.832E-04	7.832E-04	0.	0.	0.	11.11
291	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	12.0475
292	MSSSRC1	7.832E-04	7.832E-04	7.832E-04	0.	0.	0.	12.985
293	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	13.9225

Table 24: Assembled Joint Masses, Part 1 of 2

Joint	MassSource	U1	U2	U3	R1	R2	R3	CenterX
		Tonf-s2/m	Tonf-s2/m	Tonf-s2/m	Tonf-m-s2	Tonf-m-s2	Tonf-m-s2	m
294	MSSSRC1	7.832E-04	7.832E-04	7.832E-04	0.	0.	0.	14.86
295	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	15.7975
297	MSSSRC1	4.297E-04	4.297E-04	4.297E-04	0.	0.	0.	17.235
299	MSSSRC1	6.263E-04	6.263E-04	6.263E-04	0.	0.	0.	1.735
300	MSSSRC1	6.434E-04	6.434E-04	6.434E-04	0.	0.	0.	9.235
301	MSSSRC1	5.368E-04	5.368E-04	5.368E-04	0.	0.	0.	16.735
305	MSSSRC1	3.512E-04	3.512E-04	3.512E-04	0.	0.	0.	0.
306	MSSSRC1	9.902E-04	9.902E-04	9.902E-04	0.	0.	0.	0.8675
307	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	2.6725
308	MSSSRC1	7.832E-04	7.832E-04	7.832E-04	0.	0.	0.	3.61
309	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	4.5475
310	MSSSRC1	7.832E-04	7.832E-04	7.832E-04	0.	0.	0.	5.485
311	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	6.4225
312	MSSSRC1	7.832E-04	7.832E-04	7.832E-04	0.	0.	0.	7.36
313	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	8.2975
314	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	10.1725
315	MSSSRC1	7.832E-04	7.832E-04	7.832E-04	0.	0.	0.	11.11
316	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	12.0475
317	MSSSRC1	7.832E-04	7.832E-04	7.832E-04	0.	0.	0.	12.985
318	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	13.9225
319	MSSSRC1	7.832E-04	7.832E-04	7.832E-04	0.	0.	0.	14.86
320	MSSSRC1	1.044E-03	1.044E-03	1.044E-03	0.	0.	0.	15.7975
321	MSSSRC1	9.576E-04	9.576E-04	9.576E-04	0.	0.	0.	19.21
322	MSSSRC1	9.576E-04	9.576E-04	9.576E-04	0.	0.	0.	17.56
323	MSSSRC1	5.420E-04	5.420E-04	5.420E-04	0.	0.	0.	18.385
324	MSSSRC1	6.263E-04	6.263E-04	6.263E-04	0.	0.	0.	1.735
325	MSSSRC1	6.434E-04	6.434E-04	6.434E-04	0.	0.	0.	9.235
326	MSSSRC1	6.160E-04	6.160E-04	6.160E-04	0.	0.	0.	16.735
330	MSSSRC1	3.409E-04	3.409E-04	3.409E-04	0.	0.	0.	20.035
SumAccelUX	MSSSRC1	0.52	0.	0.	0.	0.	0.	9.35295
SumAccelUY	MSSSRC1	0.	0.52	0.	0.	0.	0.	9.35295
SumAccelUZ	MSSSRC1	0.	0.	0.52	0.	0.	0.	9.35295

Table 24: Assembled Joint Masses, Part 2 of 2

Table 24: Assembled Joint Masses, Part 2 of 2

Joint	MassSource	CenterY	CenterZ
		m	m
1	MSSSRC1	2.	3.95
2	MSSSRC1	2.	3.95
3	MSSSRC1	2.	3.95
4	MSSSRC1	2.	3.95
6	MSSSRC1	1.	3.95
7	MSSSRC1	1.	3.95
8	MSSSRC1	1.	3.95
9	MSSSRC1	1.	3.95
11	MSSSRC1	0.	3.95
12	MSSSRC1	3.	3.95
13	MSSSRC1	0.	3.95
14	MSSSRC1	3.	3.95

Table 24: Assembled Joint Masses, Part 2 of 2

Joint	MassSource	CenterY	CenterZ
		m	m
15	MSSSRC1	0.	3.95
16	MSSSRC1	3.	3.95
19	MSSSRC1	1.	3.71
20	MSSSRC1	1.	3.71
21	MSSSRC1	1.	3.71
22	MSSSRC1	2.	3.71
23	MSSSRC1	2.	3.71
24	MSSSRC1	2.	3.71
25	MSSSRC1	2.	0.
26	MSSSRC1	2.	0.
27	MSSSRC1	2.	0.
28	MSSSRC1	1.	0.
29	MSSSRC1	1.	0.
30	MSSSRC1	1.	0.
31	MSSSRC1	3.	3.95
32	MSSSRC1	0.	3.95
33	MSSSRC1	0.	3.95
34	MSSSRC1	3.	3.95
63	MSSSRC1	0.	3.95
64	MSSSRC1	0.	3.95
65	MSSSRC1	0.	3.95
66	MSSSRC1	0.	3.95
67	MSSSRC1	0.	3.95
68	MSSSRC1	0.	3.95
69	MSSSRC1	0.	3.95
70	MSSSRC1	0.	3.95
71	MSSSRC1	0.	3.95
72	MSSSRC1	0.	3.95
73	MSSSRC1	0.	3.95
74	MSSSRC1	0.	3.95
75	MSSSRC1	0.	3.95
76	MSSSRC1	0.	3.95
77	MSSSRC1	1.	3.95
78	MSSSRC1	2.	3.95
79	MSSSRC1	3.	3.95
80	MSSSRC1	1.	3.95
81	MSSSRC1	2.	3.95
82	MSSSRC1	3.	3.95
83	MSSSRC1	1.	3.95
84	MSSSRC1	2.	3.95
85	MSSSRC1	3.	3.95
86	MSSSRC1	1.	3.95
87	MSSSRC1	2.	3.95
88	MSSSRC1	3.	3.95
89	MSSSRC1	1.	3.95
90	MSSSRC1	2.	3.95
91	MSSSRC1	3.	3.95
92	MSSSRC1	1.	3.95
93	MSSSRC1	2.	3.95
94	MSSSRC1	3.	3.95
95	MSSSRC1	1.	3.95
96	MSSSRC1	2.	3.95
97	MSSSRC1	3.	3.95

Table 24: Assembled Joint Masses, Part 2 of 2

Joint	MassSource	CenterY	CenterZ
		m	m
98	MSSSRC1	1.	3.95
99	MSSSRC1	2.	3.95
100	MSSSRC1	3.	3.95
101	MSSSRC1	1.	3.95
102	MSSSRC1	2.	3.95
103	MSSSRC1	3.	3.95
104	MSSSRC1	1.	3.95
105	MSSSRC1	2.	3.95
106	MSSSRC1	3.	3.95
107	MSSSRC1	1.	3.95
108	MSSSRC1	2.	3.95
109	MSSSRC1	3.	3.95
110	MSSSRC1	1.	3.95
111	MSSSRC1	2.	3.95
112	MSSSRC1	3.	3.95
113	MSSSRC1	1.	3.95
114	MSSSRC1	2.	3.95
115	MSSSRC1	3.	3.95
116	MSSSRC1	1.	3.95
117	MSSSRC1	2.	3.95
118	MSSSRC1	3.	3.95
119	MSSSRC1	2.	3.95
120	MSSSRC1	1.	3.95
121	MSSSRC1	0.	3.95
122	MSSSRC1	1.	3.95
123	MSSSRC1	2.	3.95
124	MSSSRC1	3.	3.95
125	MSSSRC1	0.	3.95
126	MSSSRC1	0.	3.95
127	MSSSRC1	0.	3.95
131	MSSSRC1	2.65179	3.95
132	MSSSRC1	1.76786	3.95
133	MSSSRC1	0.88393	3.95
134	MSSSRC1	1.	3.2
135	MSSSRC1	1.	3.2
136	MSSSRC1	1.	3.2
137	MSSSRC1	1.	3.2
139	MSSSRC1	1.	3.2
140	MSSSRC1	1.	3.2
141	MSSSRC1	1.	3.2
142	MSSSRC1	1.	3.2
143	MSSSRC1	1.	3.2
144	MSSSRC1	1.	3.2
145	MSSSRC1	1.	3.2
146	MSSSRC1	1.	3.2
147	MSSSRC1	1.	3.2
148	MSSSRC1	1.	3.2
149	MSSSRC1	1.	3.2
150	MSSSRC1	1.	3.2
151	MSSSRC1	1.	3.2
152	MSSSRC1	1.	3.2
153	MSSSRC1	1.	3.2
154	MSSSRC1	1.	3.2

Table 24: Assembled Joint Masses, Part 2 of 2

Joint	MassSource	CenterY	CenterZ
		m	m
157	MSSSRC1	1.	3.2
158	MSSSRC1	1.	3.2
159	MSSSRC1	1.	3.95
160	MSSSRC1	1.	3.95
255	MSSSRC1	2.	3.2
256	MSSSRC1	2.	3.2
257	MSSSRC1	2.	3.2
258	MSSSRC1	2.	3.2
259	MSSSRC1	2.	3.2
260	MSSSRC1	2.	3.2
261	MSSSRC1	2.	3.2
262	MSSSRC1	2.	3.2
263	MSSSRC1	2.	3.2
264	MSSSRC1	2.	3.2
265	MSSSRC1	2.	3.2
266	MSSSRC1	2.	3.2
267	MSSSRC1	2.	3.2
268	MSSSRC1	2.	3.2
269	MSSSRC1	2.	3.2
270	MSSSRC1	2.	3.2
272	MSSSRC1	2.	3.2
273	MSSSRC1	2.	3.2
274	MSSSRC1	2.	3.2
275	MSSSRC1	2.	3.2
276	MSSSRC1	2.	3.2
278	MSSSRC1	2.	3.95
280	MSSSRC1	3.	3.2
281	MSSSRC1	3.	3.2
282	MSSSRC1	3.	3.2
283	MSSSRC1	3.	3.2
284	MSSSRC1	3.	3.2
285	MSSSRC1	3.	3.2
286	MSSSRC1	3.	3.2
287	MSSSRC1	3.	3.2
288	MSSSRC1	3.	3.2
289	MSSSRC1	3.	3.2
290	MSSSRC1	3.	3.2
291	MSSSRC1	3.	3.2
292	MSSSRC1	3.	3.2
293	MSSSRC1	3.	3.2
294	MSSSRC1	3.	3.2
295	MSSSRC1	3.	3.2
297	MSSSRC1	3.	3.2
299	MSSSRC1	3.	3.2
300	MSSSRC1	3.	3.2
301	MSSSRC1	3.	3.2
305	MSSSRC1	0.	3.2
306	MSSSRC1	0.	3.2
307	MSSSRC1	0.	3.2
308	MSSSRC1	0.	3.2
309	MSSSRC1	0.	3.2
310	MSSSRC1	0.	3.2
311	MSSSRC1	0.	3.2

Table 24: Assembled Joint Masses, Part 2 of 2

Joint	MassSource	CenterY	CenterZ
		m	m
312	MSSSRC1	0.	3.2
313	MSSSRC1	0.	3.2
314	MSSSRC1	0.	3.2
315	MSSSRC1	0.	3.2
316	MSSSRC1	0.	3.2
317	MSSSRC1	0.	3.2
318	MSSSRC1	0.	3.2
319	MSSSRC1	0.	3.2
320	MSSSRC1	0.	3.2
321	MSSSRC1	0.	3.2
322	MSSSRC1	0.	3.2
323	MSSSRC1	0.	3.2
324	MSSSRC1	0.	3.2
325	MSSSRC1	0.	3.2
326	MSSSRC1	0.	3.2
330	MSSSRC1	0.	3.2
SumAccelUX	MSSSRC1	1.46791	3.60236
SumAccelUY	MSSSRC1	1.46791	3.60236
SumAccelUZ	MSSSRC1	1.46791	3.60236

7.2. Modal results

Table 25: Modal Participating Mass Ratios

Table 25: Modal Participating Mass Ratios

OutputCase	StepNum	Period	UX	UY	UZ	SumUX	SumUY	SumUZ
		Sec						
MODAL	1.	0.419189	0.000125	0.01036	3.659E-06	0.000125	0.01036	3.659E-06
MODAL	2.	0.37379	5.843E-06	0.941765	3.348E-06	0.000131	0.952126	7.007E-06
MODAL	3.	0.227937	0.000607	0.001739	0.069655	0.000738	0.953865	0.069662
MODAL	4.	0.213156	0.000037	0.035546	0.000134	0.000775	0.989411	0.069796
MODAL	5.	0.191341	0.985193	0.000017	0.000016	0.985968	0.989429	0.069812
MODAL	6.	0.150399	0.000129	0.000012	0.001525	0.986097	0.989441	0.071338
MODAL	7.	0.144112	0.000051	0.000298	0.017245	0.986148	0.989739	0.088583
MODAL	8.	0.133237	1.649E-07	0.000486	0.092359	0.986148	0.990226	0.180942
MODAL	9.	0.124288	2.849E-07	0.000652	0.254449	0.986149	0.990878	0.435391
MODAL	10.	0.101133	0.000016	0.000158	0.00076	0.986164	0.991036	0.436151
MODAL	11.	0.075947	0.000093	0.000211	0.00014	0.986257	0.991247	0.436291
MODAL	12.	0.062081	0.000931	0.003343	0.000234	0.987188	0.99459	0.436525

7.3. Base reactions

Table 26: Base Reactions

Table 26: Base Reactions

OutputCase	GlobalFX	GlobalFY	GlobalFZ	GlobalMX	GlobalMY	GlobalMZ
	Tonf	Tonf	Tonf	Tonf-m	Tonf-m	Tonf-m
DL	-1.065E-14	2.909E-15	3.4459	5.06746	-32.25942	3.232E-14
SD	-5.625E-14	6.562E-15	1.6771	2.45272	-15.65625	7.114E-14
Lr	-9.438E-14	1.075E-14	2.7952	4.08787	-26.09374	1.138E-13
W	5.153E-14	-0.7513	2.7952	6.77382	-26.09374	-7.52627
EQ	2.5992	2.5009	0.0409	9.69192	9.7431	22.86855