PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

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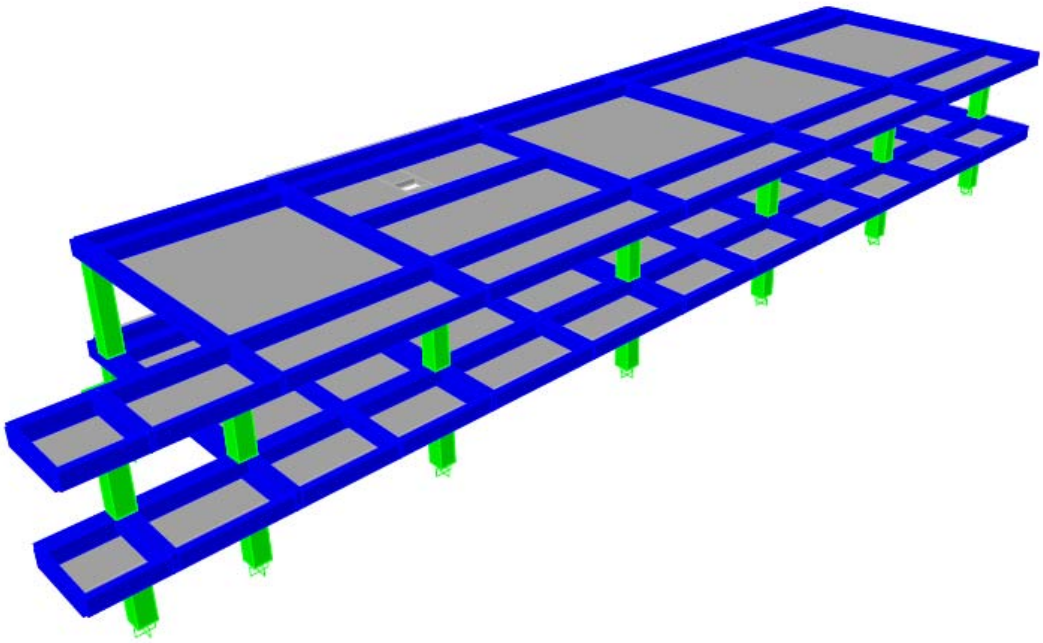

MEMORIAS DE ANÁLISIS Y DISEÑO ESTRUCTURAL

BOGOTÁ D.C., 18 DE NOVIEMBRE DE 2016

1. DESCRIPCIÓN DEL PROYECTO

1.1. INTRODUCCIÓN

El presente documento contiene las memorias de análisis y diseño estructural correspondiente al proyecto INSTITUCIÓN EDUCATIVA SAN JUAN ubicado IPIALES NARIÑO.

1.2. DESCRIPCIÓN ARQUITECTÓNICA

El proyecto se encuentra ubicado en un lote de **380 m²** de área aproximadamente, en la cual se contempla la construcción del COLEGIO SAN JUAN ubicado en IPIALES NARIÑO. El lote será destinado para uso Institucional.

1.3. DESCRIPCIÓN SISTEMA ESTRUCTURAL

Para el análisis se empleó el programa de computador ***ETABS v.9.7.4.***, el cual tiene en cuenta los efectos de segundo orden. Las consideraciones sísmicas empleadas en el análisis estructural del proyecto son las siguientes:

- ✓ Método de análisis: ***Análisis Modal***
- ✓ Zona de amenaza sísmica: ***Alta***
- ✓ Capacidad de disipación de energía: ***Especial***
- ✓ Coeficiente de disipación de energía: $R_0 = 7.00$
- ✓ Irregularidad en planta: $\phi p = 0.90$
- ✓ Ausencia de redundancia: $\phi r = 0.75$

El coeficiente de disipación de energía no se afecta por ninguna irregularidad descrita en la norma

Por lo tanto el valor final del coeficiente R es igual a **4.73**

Las cargas horizontales fueron distribuidas entre los diferentes pórticos en proporción a su rigidez y teniendo en cuenta los efectos de torsión.

El dimensionamiento dado a todos los elementos que intervienen en las estructuras satisfacen los requerimientos de solicitación ocasionados por las derivas presentes. Las cargas vivas de diseño son: **2.00 kN/m²** para salones, **0.50 kN/m²** para cubierta (Tipo de cubierta F), **5.00 kN/m²** para corredores de acuerdo a lo establecido en las tablas 4.2.1-1 y 4.2.1-2 de la NSR-10.

El diseño de todas las estructuras se realizó basado en la Norma Colombiana de Diseño y Construcción Sismo Resistente Ley 400 de 1997 (Modificada Ley 1229 de 2008) y Decreto 926 de Marzo de 2010, Decreto 092 del 17 de Enero de 2011, Decreto 0340 del 13 de Febrero de 2012 y en el Reglamento para Concreto Estructural ACI 318S-08.

1.4. MATERIALES

Los materiales utilizados son:

Concreto	21.1 MPa para vigas, columnas y placas.
Concreto	14 MPa (para concreto de limpieza).
Acero	para refuerzo fy = 420 MPa para todos los diámetros.

Atentamente:

_____

EDGAR ROLANDO BARRERA
ING. ESTRUCTURAL
T.P. 15202-102710 BYC

_____

JAIR USECHE MACÍAS
ING. ESTRUCTURAL
T.P. 25202-56174 CND

MEMORIAL DE RESPONSABILIDAD

Ipiales, 18 de Noviembre de 2016.

Señores
PLANEACIÓN MUNICIPAL
La Ciudad

Yo, **EDGAR ROLANDO BARRERA,** ingeniero civil con Matrícula Profesional Nº **15202-102710** de **BOYACÁ,** y Yo, **JAIR USECHE MACÍAS,** ingeniero civil con Matrícula Profesional Nº **25202-56174** de **CUNDINAMARCA** debidamente registrados en el consejo profesional de Ingeniería y Arquitectura de Boyacá y Cundinamarca, presentamos los Cálculos y Diseños Estructurales elaborados de acuerdo a los requerimientos de la **NORMA COLOMBIANA DE DISEÑO Y CONSTRUCCIÓN SISMO RESISTENTE LEY 400 DE 1997 (MODIFICADA LEY 1229 DE 2008) Y DECRETO 926 DE MARZO DE 2010**, para el proyecto INSTITUCIÓN EDUCATIVA SAN JUAN ubicado en IPIALES (NARIÑO), declaro que asumo la responsabilidad por los perjuicios que causa de ellos puedan deducirse, exonerando a esta PLANEACIÓN MUNICIPAL de cualquier responsabilidad.

Acepto y reconozco que la revisión efectuada por PLANEACION MUNICIPAL no constituye una aprobación al Diseño Estructural, sino una verificación del cumplimiento de la **NORMA COLOMBIANA DE DISEÑO Y CONSTRUCCIÓN SISMO RESISTENTE**.

Atentamente,

EDGAR ROLANDO BARRERA
ING. ESTRUCTURAL
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REPUBLICA DE COLOMBIA
Consejo Profesional Nacional de Ingeniería y Arquitectura
MATRICULA No. 2520256174CND
INGENIERO CIVIL
DE FECHA 27/07/95
APELLIDOS
USECHE MACIAS
NOMBRES
JAIR
C.C 19,428,425
UNIV. NACIONAL - BOGOTA

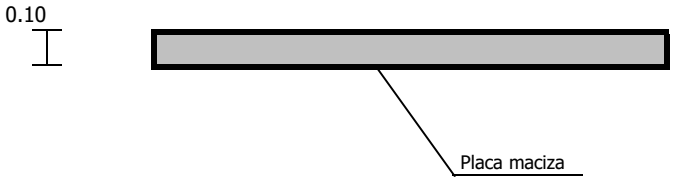
2. AVALÚO DE CARGAS

AVALÚO DE CARGAS

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

AVALÚO DE CARGAS

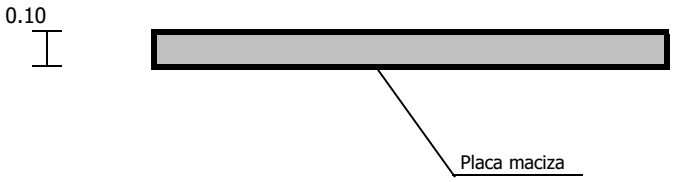
1. PLACA MACIZA SALONES



Placa maciza e=0.10m	0.10x24		2.40 kN/m²
Muros Divisorios			2.00 kN/m²
Acabados	20x0.05		1.00 kN/m²
Impermeabilización	20x0.05		1.00 kN/m²
		CM	6.40 kN/m²
		CV	2.00 kN/m²
		CR	8.40 kN/m²
CU = 1.2x6.4+1.6x2 =	***10.9 kN/m²***		
Muros Perimetrales	3.2x0.15x13		6.24 kN/m
Espesor de placa equivalente:	0		

e=CM/24 0.267 m

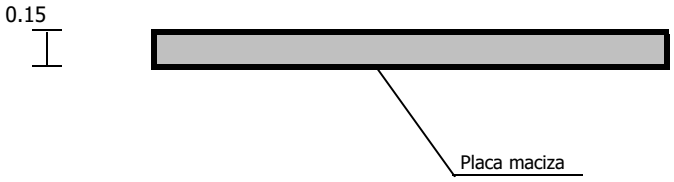
2. PLACA MACIZA CORREDORES



Placa maciza e=0.10m	0.10x24		2.40 kN/m²
Acabados	20x0.05		1.00 kN/m²
Impermeabilización	20x0.05		1.00 kN/m²
		CM	4.40 kN/m²
		CV	5.00 kN/m²
		CR	9.40 kN/m²
CU = 1.2x4.4+1.6x5 =	***13.3 kN/m²***		
Muros Perimetrales	3.2x0.15x13		6.24 kN/m
Espesor de placa equivalente:			

e=CM/24 0.183 m

3. PLACA MACIZA TANQUES



Placa maciza e=0.15m	0.15x24		3.60 kN/m²
Impermeabilización	20x0.05		1.00 kN/m²
		CM	4.60 kN/m²
		CV	9.80 kN/m²
		CR	14.40 kN/m²

CU = 1.2x4.6+1.6x9.8 = ***21.2 kN/m²***

Espesor de placa equivalente:

e=CM/24 0.192 m

4. CUBIERTA LIVIANA

Teja deck			0.20 kN/m²
Correas Metálicas			0.10 kN/m²
Acabados e iluminacion			0.10 kN/m²
		CM	0.40 kN/m²
	Tabla 4.2.1-2 de la NSR-10 (CASO F)	CV	0.50 kN/m²
		CR	0.90 kN/m²

CU = 1.2x0.4+1.6x0.5 = ***1.28 kN/m²***

Muros culata 1.6x0.15x13 3.12 kN/m

Espesor de placa equivalente:

e=CM/24 0.017 m

Pendiente de Cubierta α (º) = **8.6** → Equivale a 15%

Según la tabla B.4.2.1-2 - En cubiertas inclinadas con más de 15° de pendiente en estructura metálica o de madera la carga viva asumida puede ser 0.35 kN/m^2.

Según B.4.8.3.1 - Las cargas de granizo deben tenerse en cuenta en las regiones del país con más de 2.000 metros de altura sobre el nivel del mar o en lugares de menor altura donde la autoridad municipal o distrital así lo exija.

Según B.4.8.3.2 - Para cubiertas con inclinación mayor a 15% el valor de la carga viva para granizo puede reducirse a 0.50 kN/m^2.

PROYECTO: I.E. SAN JUAN
AVALÚO DE CARGAS DE VIENTO
ANÁLISIS SIMPLIFICADO (sprfv)

Para que le análisis se pueda realizar mediante el método de diseño simplificado se requiere que se cumpla con lo establecido por la NSR-10 titulo B.6.4.1.1. y B.6.4.1.2.

a - El edificio sea de diafragma simple como se define en la sección B.6.2.
b - El edificio sea bajo de acuerdo con lo establecido con la sección B.6.2.
c - El edificio sea cerrado como se define en la sección B.6.2. y cumpla las provisiones de zonas propensas a huracanes de acuerdo con la sección B.6.5.9.3.
d - El edificio sea de forma regular como se define en la sección B.6.2.
e - El edificio no sea clasificado como flexible como se define en la sección B.6.2.
f - Las características de respuesta del edificio sean tales que el mismo no esté sujeto a las cargas por viento a travéz de él, a generación de vórtices, a inestabilidad por golpeteo o aleteo, y no esté ubicado en un sitio en el que se puedan presentar efectos de canalización o sacudimiento por la estela de obstrucciones en barlovento, que obliguen a concideraciones especiales.
g - El edificio tenga una sección transversal aproximadamente simétrica en cada dirección y tenga una cubierta plana o cubierta a dos o cuatro aguas con ángulo de inclinación $\emptyset \leq 45°$
h - El edificio esta eximido de los casos de carga torsional indicados en la nota 5 de la figura B.6.5.7. o estos casos no conctrolan el diseño de ninguno de los elementos del SPRFV del edificio.

De los anteriores parametros se observa que la edificación cumple con lo estipulado, por lo tanto:

Tipo de análisis permitido: ANÁLISIS SIMPLIFICADO

Entonces: $Ps = \lambda KztIPs_{10}$

Donde:

λ=	Factor de ajuste por altura y exposición, figura B.6.4.2.
K_{zt}=	Factor topográfico comose define en la sección B.6.5.7. evaluado a la altura promedio de la cubierta, **h,** B.6.5.1.
I=	Factor de importancia como se define en la sección B.6.5.5.
P_{s10}=	Presión de viento de diseño simplificado para la categoria de exposición **B,** con **h=10** m de la figura B.6.4.2.

	CIUDAD	**ZONA**	**VELOCIDAD DEL VIENTO**
Zona de amenza eólica=	IPIALES	3	100

Luego:

λ=	1.0
K_{zt}=	1.0
I=	1.3
P_{s10}=	**0.23**

Según B.6.4.2.1.1. Presiones mínimas: Los efectos de carga de las presiones de viento de diseño de la sección B.6.4.2.1. no serán menores que el caso de carga mínima de la sección B.6.1.3.1. suponiendo presiones Ps, de +0.40 kN/m^2 para las zonas de A, B, C y D y de 0.00 kN/m^2 paras las zonas E, F, G y H.

Por lo tanto la carga de viento a emplear es: **0.40** kN/m^2

3. ANÁLISIS SÍSMICO

FUERZA HORIZONTAL EQUIVALENTE
CÁLCULO DE DERIVAS MÁXIMAS
VERIFICACIÓN DE IRREGULARIDAD TORSIONAL

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

ANÁLISIS SÍSMICO (ESPECTRO DE DISEÑO NSR-10)

ZONA DE AMENAZA SÍSMICA
ALTA

EFECTOS LOCALES

Perfil de Suelo	**E**
Coeficiente Aa	**0.30**
Coeficiente Av	**0.25**

COEFICIENTE DE IMPORTANCIA

Grupo de Uso	**III**
Coeficiente de importancia I	**1.25**

PERIODO FUNDAMENTAL DE LA EDIFICACIÓN

$T_a = C_t h^{\alpha}$		
C_t =	**0.047**	
h =	**6.35**	m
α =	**0.90**	
T_a=	**0.25**	Seg

VARIACIÓN COEFICIENTE DE CAPACIDAD DE DISIPACIÓN DE ENERGÍA

Ro: Coeficiente de capacidad de disipación de energía básico
R: Coeficiente de capacidad de disipación de energía, para ser empleado en el diseño.
ϕ_a: Coeficiente de reducción de R causado por irregularidades en altura de la edificación
ϕ_p: Coeficiente de reducción de R causado por irregularidades en planta de la edificación
ϕ_r: Coeficiente de reducción de R causado por ausencia de redundancia en el sistema estructural de resistencia sísmica

Ro	**7.00**
ϕ_a	**1.00**
ϕ_p	**0.90**
ϕ_r	**0.75**
ϕ	**1.00**
R	**4.73**

TIPO	DESCRIPCIÓN	VALOR
	NINGUNA	ϕ_a: 1.00
	RETROCESOS EN ESQUINAS (2P)	ϕ_p: 0.90
	REDUNDANCIA	ϕ_r: 0.75
	UNIONES SOLDADAS	ϕ: 1.00

ESPECTRO DE DISEÑO

Fa: Factor de ampliación de la aceleración.
Fv: Factor de ampliación de la aceleración en el rango de velocidades constantes.
Sa: Valor del espectro de aceleraciones de diseño para un periodo de vibración dado.
Aa: Coeficiente que representa la aceleración horizontal pico efectiva para diseño.
Av: Coeficiente que representa la velocidad horizontal pico efectiva para diseño.
T: Periodo de vibración del sistema elástico, en segundos.
Tc: Periodo de vibración, en segundos, correspondiente a la transición entre la zona de aceleración constante del espectro de diseño, para periodos cortos, y la parte descendiente del mismo.
Tl: Periodo de vibración, en segundos, correspondiente al inicio de la zona de desplazamiento aproximadamente constante del espectro de diseño para periodos largos.

ZONA DE AMENAZA ALTA		
To:	0.21	Seg
Tc:	1.00	Seg
Tl:	7.20	Seg
Aa:	0.30	
Av:	0.25	
Fa:	1.20	
Fv:	3.00	

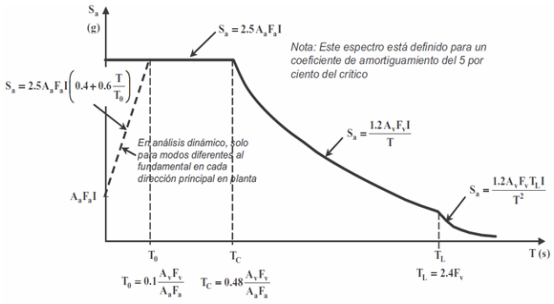
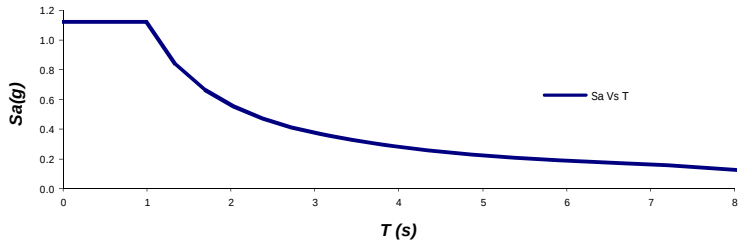


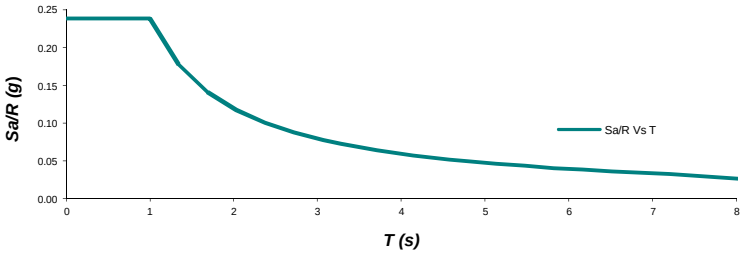
Figura A.2.6-1 — Espectro Elástico de Aceleraciones de Diseño como fracción de g

T	Sa	$Sa/R_{adoptado}$
(Seg)	(%g)	(%g)
0.00	1.125	0.238
0.05	1.125	0.238
0.10	1.125	0.238
0.16	1.125	0.238
0.21	1.125	0.238
0.41	1.125	0.238
0.60	1.125	0.238
0.80	1.125	0.238
1.00	1.125	0.238
1.34	0.837	0.177
1.69	0.666	0.141
2.03	0.553	0.117
2.38	0.473	0.100
2.72	0.413	0.087
3.07	0.367	0.078
3.41	0.330	0.070
3.76	0.300	0.063
4.10	0.274	0.058
4.44	0.253	0.054
4.79	0.235	0.050
5.13	0.219	0.046
5.48	0.205	0.043
5.82	0.193	0.041
6.17	0.182	0.039
6.51	0.173	0.037
6.86	0.164	0.035
7.20	0.156	0.033
8.20	0.120	0.025
9.20	0.096	0.020

Espectro Elástico de Diseño



Espectro Elástico de Diseño/R_{adop}



Sistema de resistencia Sísmica: Pórticos resistentes a momentos con Capacidad Especial de Disipación de Energía (DES).

Nota: El 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 las fuerzas horizontales.

MODELO MATEMÁTICO

Modelo Tridimensional con Diafragma Rígido: En este modelo los entrepisos se consideran diafragmas infinitamente rigidos en su propio plano. La masa de cada diafragma se considera concentrada en su centro de masa. Los efectos torsionales accidentales son incluidos haciendo ajustes en la localización de los centros de masa de los diafragmas.
Los efectos direccionales son tomados en cuenta a través de las componentes de los desplazamientos de los grados de libertad horizontales ortogonales del diafragma.

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

ANÁLISIS SÍSMICO (ESPECTRO DE UMBRAL DE DAÑO NSR-10)

ZONA DE AMENAZA SÍSMICA
ALTA

EFECTOS LOCALES

Perfil de Suelo	**E**
Coeficiente Ad	**0.08**
Coeficiente Fv	**3.50**

COEFICIENTE DE IMPORTANCIA

Grupo de Uso	**III**
Coeficiente de importancia I	**1.25**
Coeficiente de Sitio Ŝ:	**4.38**

ESPECTRO DE DISEÑO

Sad: Valor del espectro de aceleraciones del umbral de daño para un periodo de vibración dado.
Ad: Máxima aceleración pico efectiva para el umbral de daño.
T: Periodo de vibración del sistema elástico, en segundos.
T_{Cd}: Periodo de vibración, en segundos, correspondiente a la transición entre la zona de aceleración constante del espectro sísmico del umbral de daño, para periodos cortos, y la parte descendiente del mismo.
T_{Ld}: Periodo de vibración, en segundos, correspondiente a la transición entre la zona de desplazamiento constante del espectro sísmico del umbral de daño, para periodos largos.

Ad: **0.08**
T_{Cd}: 2.19 Seg
T_{Ld}: 10.5 Seg

T (Seg)	Sad (%g)
0.00	0.080
0.05	0.112
0.10	0.144
0.15	0.176
0.20	0.208
0.25	0.240
0.49	0.240
0.73	0.240
0.98	0.240
1.22	0.240
1.46	0.240
1.70	0.240
1.95	0.240

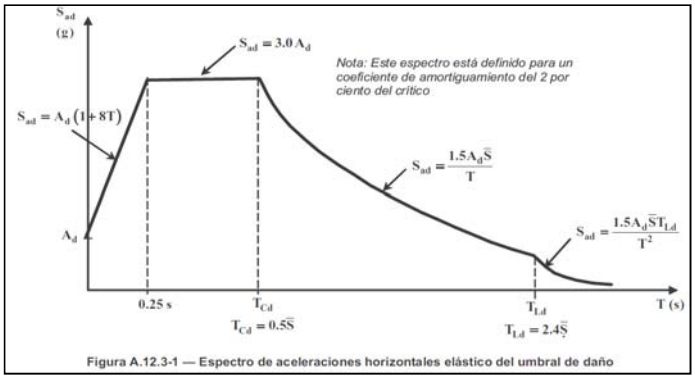
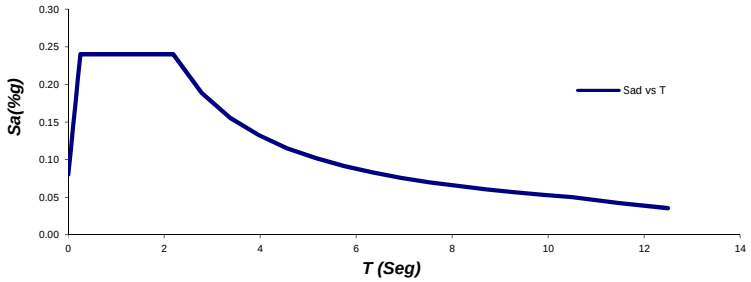


Figura A.12.3-1 — Espectro de aceleraciones horizontales elástico del umbral de daño

2.19	0.240
2.78	0.189
3.38	0.156
3.97	0.132
4.56	0.115
5.16	0.102
5.75	0.091
6.34	0.083
6.94	0.076
7.53	0.070
8.13	0.065
8.72	0.060
9.31	0.056
9.91	0.053
10.50	0.050
11.50	0.042
12.50	0.035

Espectro Del Umbral de Daño



Sistema de resistencia Sísmica: Pórticos resistentes a momentos con Capacidad Especial de Disipación de Energía (DES).

Nota: El 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 las fuerzas horizontales.

MODELO MATEMÁTICO

Modelo Tridimensional con Diafragma Rígido: En este modelo los entrepisos se consideran diafragmas infinitamente rigidos en su propio plano. La masa de cada diafragma se considera concentrada en su centro de masa. Los efectos torsionales accidentales son incluidos haciendo ajustes en la localización de los centros de masa de los diafragmas.
Los efectos direccionales son tomados en cuenta a través de las componentes de los desplazamientos de los grados de libertad horizontales ortogonales del diafragma.

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
CALCULO DEL CORTANTE BASAL DE LA ESTRUCTURA (ESPECTRO DE DISEÑO NSR-10)

CALCULO DEL CORTANTE BASAL DE LA ESTRUCTURA

$H_{edificio}$=	6.40	m	
Tipo de Perfil:	E		
Aa =	0.30		
Av =	0.25		
Fa =	1.20		
Fv =	3.00		
T_c =	1.00	Seg	
C_t =	0.047		
α =	0.90		
T_a =	0.25	Seg	
C_u =	1.20		
$C_u T_a$ =	0.30	Seg	
$T_{modelación\ estructural}$ =	0.27	Seg	
ΔT =	8.07	%	Ok!
$T_{adoptado}$ =	0.27	Seg	
S_a =	1.125		S_a obtenido del espectro de diseño
g =	9.81	m/s^2	
M =	435.27	Ton	Masa obtenida del modelo
V_s =	4803.75	kN	
90% Vs =	4323.37	kN	Cortante basal para comparación de acuerdo a A.5.4.5 NSR-10

MODELO INICIAL
Response Espectrum Base Reactions

PORCENTAJE PARA REVISIÓN DE CORTANTE BASAL DE ACUERDO A A.5.4.5 NSR-10: 90.0 %

	F1	F2	Total	Factor		g corregido
$V_{s(x)}$=	4315.78	0	4315.78	1.002	9.827	Se aplica en SISMO X
$V_{s(y)}$=	0	4012.79	4012.79	1.077	10.569	Se aplica en SISMO Y

MODELO CORREGIDO
Response Espectrum Base Reactions

	F1	F2	Total	90% Vs
$V_{s(x)}$=	4323.26	0	4323.26	4323.4
$V_{s(y)}$=	0	4323.26	4323.26	4323.4

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
CALCULO DEL CORTANTE BASAL DE LA ESTRUCTURA (ESPECTRO DE UMBRAL DE DAÑO NSR-10)

CALCULO DEL CORTANTE BASAL DE LA ESTRUCTURA

$H_{edificio}$=	**6.35**	m	
Tipo de Perfil:	**E**		
Ad =	0.08		
Fv =	3.50		
C_t =	**0.047**		
α =	**0.90**		
T_a =	0.25	Seg	
C_u =	1.20		
$C_u T_a$ =	0.30	Seg	
$T_{modelación\ estructural}$ =	**0.27**	Seg	
ΔT =	8.84	%	Ok!
$T_{adoptado}$ =	0.25	Seg	
S_a =	**0.240**		S_a obtenido del espectro de diseño
g =	9.81	m/s^2	
M =	**435.27**	Ton	Masa obtenida del modelo
V_s =	**1024.80**	kN	

MODELO INICIAL
Response Espectrum Base Reactions

PORCENTAJE PARA REVISIÓN DE CORTANTE BASAL DE ACUERDO A A.5.4.5 NSR-10: 100.0 %

	F1	F2	Total	Factor		g corregido
$V_{s(x)}$=	917.83	0	917.83	1.117	**10.953**	Se aplica en SISMO X
$V_{s(y)}$=	0	849.36	849.36	1.207	**11.836**	Se aplica en SISMO Y

MODELO CORREGIDO
Response Espectrum Base Reactions

	F1	F2	Total	100% Vs
$V_{s(x)}$=	1024.76	0	**1024.76**	**1024.8**
$V_{s(y)}$=	0	1024.77	**1024.77**	**1024.8**

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

CÁLCULO DE DERIVAS MÁXIMAS

ALTURA DE N+6.35	3.15	m
ALTURA DE N+3.20	3.20	m
ALTURA DE BASE	0.00	m

Deriva Máxima Permitida **1.00** **%**

Nivel	Punto	COMBINACIÓN DE CARGA	DESPLAZAMIENTOS FUERZA SÍSMICA		Deriva Δ	Deriva Δ	Observación
			Desplazamiento X	Desplazamiento Y	*m*	*%*	
N+6.35	4	COMDER1 MAX	0.02448	0.02464	0.01805	0.57	OK
N+6.35	4	COMDER1 MIN	-0.02448	-0.02464	0.01805	0.57	OK
N+6.35	4	COMDER2 MAX	0.01	0.05408	0.03097	0.98	OK
N+6.35	4	COMDER2 MIN	-0.01	-0.05408	0.03097	0.98	OK
N+3.20	4	COMDER1 MAX	0.0128	0.01088	0.01680	0.52	OK
N+3.20	4	COMDER1 MIN	-0.0128	-0.01088	0.01680	0.52	OK
N+3.20	4	COMDER2 MAX	0.00496	0.02352	0.02404	0.75	OK
N+3.20	4	COMDER2 MIN	-0.00496	-0.02352	0.02404	0.75	OK
BASE	4	COMDER1 MAX	0	0	--	--	--
BASE	4	COMDER1 MIN	0	0	--	--	--
BASE	4	COMDER2 MAX	0	0	--	--	--
BASE	4	COMDER2 MIN	0	0	--	--	--
N+6.35	6	COMDER1 MAX	0.02448	0.02208	0.01698	0.54	OK
N+6.35	6	COMDER1 MIN	-0.02448	-0.02208	0.01698	0.54	OK
N+6.35	6	COMDER2 MAX	0.01	0.0504	0.02884	0.92	OK
N+6.35	6	COMDER2 MIN	-0.01	-0.0504	0.02884	0.92	OK
N+3.20	6	COMDER1 MAX	0.0128	0.00976	0.01610	0.50	OK
N+3.20	6	COMDER1 MIN	-0.0128	-0.00976	0.01610	0.50	OK
N+3.20	6	COMDER2 MAX	0.00496	0.022	0.02255	0.70	OK
N+3.20	6	COMDER2 MIN	-0.00496	-0.022	0.02255	0.70	OK
BASE	6	COMDER1 MAX	0	0	--	--	--
BASE	6	COMDER1 MIN	0	0	--	--	--
BASE	6	COMDER2 MAX	0	0	--	--	--
BASE	6	COMDER2 MIN	0	0	--	--	--
N+6.35	7	COMDER1 MAX	0.0232	0.02208	0.01654	0.53	OK
N+6.35	7	COMDER1 MIN	-0.0232	-0.02208	0.01654	0.53	OK
N+6.35	7	COMDER2 MAX	0.01152	0.0504	0.02899	0.92	OK
N+6.35	7	COMDER2 MIN	-0.01152	-0.0504	0.02899	0.92	OK
N+3.20	7	COMDER1 MAX	0.01216	0.00976	0.01559	0.49	OK
N+3.20	7	COMDER1 MIN	-0.01216	-0.00976	0.01559	0.49	OK
N+3.20	7	COMDER2 MAX	0.00568	0.022	0.02272	0.71	OK
N+3.20	7	COMDER2 MIN	-0.00568	-0.022	0.02272	0.71	OK
BASE	7	COMDER1 MAX	0	0	--	--	--
BASE	7	COMDER1 MIN	0	0	--	--	--
BASE	7	COMDER2 MAX	0	0	--	--	--
BASE	7	COMDER2 MIN	0	0	--	--	--
N+6.35	10	COMDER1 MAX	0.02448	0.0172	0.01517	0.48	OK
N+6.35	10	COMDER1 MIN	-0.02448	-0.0172	0.01517	0.48	OK
N+6.35	10	COMDER2 MAX	0.01	0.04352	0.02492	0.79	OK
N+6.35	10	COMDER2 MIN	-0.01	-0.04352	0.02492	0.79	OK
N+3.20	10	COMDER1 MAX	0.0128	0.00752	0.01485	0.46	OK
N+3.20	10	COMDER1 MIN	-0.0128	-0.00752	0.01485	0.46	OK
N+3.20	10	COMDER2 MAX	0.00496	0.01912	0.01975	0.62	OK
N+3.20	10	COMDER2 MIN	-0.00496	-0.01912	0.01975	0.62	OK
BASE	10	COMDER1 MAX	0	0	--	--	--
BASE	10	COMDER1 MIN	0	0	--	--	--
BASE	10	COMDER2 MAX	0	0	--	--	--
BASE	10	COMDER2 MIN	0	0	--	--	--
N+6.35	11	COMDER1 MAX	0.0232	0.0172	0.01468	0.47	OK
N+6.35	11	COMDER1 MIN	-0.0232	-0.0172	0.01468	0.47	OK
N+6.35	11	COMDER2 MAX	0.01152	0.04352	0.02509	0.80	OK
N+6.35	11	COMDER2 MIN	-0.01152	-0.04352	0.02509	0.80	OK
N+3.20	11	COMDER1 MAX	0.01216	0.00752	0.01430	0.45	OK
N+3.20	11	COMDER1 MIN	-0.01216	-0.00752	0.01430	0.45	OK
N+3.20	11	COMDER2 MAX	0.00568	0.01912	0.01995	0.62	OK
N+3.20	11	COMDER2 MIN	-0.00568	-0.01912	0.01995	0.62	OK
BASE	11	COMDER1 MAX	0	0	--	--	--
BASE	11	COMDER1 MIN	0	0	--	--	--
BASE	11	COMDER2 MAX	0	0	--	--	--
BASE	11	COMDER2 MIN	0	0	--	--	--
N+6.35	14	COMDER1 MAX	0.02448	0.0112	0.01324	0.42	OK
N+6.35	14	COMDER1 MIN	-0.02448	-0.0112	0.01324	0.42	OK
N+6.35	14	COMDER2 MAX	0.01	0.03504	0.02008	0.64	OK
N+6.35	14	COMDER2 MIN	-0.01	-0.03504	0.02008	0.64	OK

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

CÁLCULO DE DERIVAS MÁXIMAS

ALTURA DE N+6.35	3.15	m
ALTURA DE N+3.20	3.20	m
ALTURA DE BASE	0.00	m

Deriva Máxima Permitida **1.00** **%**

Nivel	Punto	COMBINACIÓN DE CARGA	DESPLAZAMIENTOS FUERZA SÍSMICA		Deriva Δ	Deriva Δ	Observación
			Desplazamiento X	Desplazamiento Y	*m*	*%*	
N+3.20	14	COMDER1 MAX	0.0128	0.00496	0.01373	0.43	OK
N+3.20	14	COMDER1 MIN	-0.0128	-0.00496	0.01373	0.43	OK
N+3.20	14	COMDER2 MAX	0.00496	0.0156	0.01637	0.51	OK
N+3.20	14	COMDER2 MIN	-0.00496	-0.0156	0.01637	0.51	OK
BASE	14	COMDER1 MAX	0	0	--	--	--
BASE	14	COMDER1 MIN	0	0	--	--	--
BASE	14	COMDER2 MAX	0	0	--	--	--
BASE	14	COMDER2 MIN	0	0	--	--	--
N+6.35	15	COMDER1 MAX	0.0232	0.0112	0.01268	0.40	OK
N+6.35	15	COMDER1 MIN	-0.0232	-0.0112	0.01268	0.40	OK
N+6.35	15	COMDER2 MAX	0.01152	0.03504	0.02030	0.64	OK
N+6.35	15	COMDER2 MIN	-0.01152	-0.03504	0.02030	0.64	OK
N+3.20	15	COMDER1 MAX	0.01216	0.00496	0.01313	0.41	OK
N+3.20	15	COMDER1 MIN	-0.01216	-0.00496	0.01313	0.41	OK
N+3.20	15	COMDER2 MAX	0.00568	0.0156	0.01660	0.52	OK
N+3.20	15	COMDER2 MIN	-0.00568	-0.0156	0.01660	0.52	OK
BASE	15	COMDER1 MAX	0	0	--	--	--
BASE	15	COMDER1 MIN	0	0	--	--	--
BASE	15	COMDER2 MAX	0	0	--	--	--
BASE	15	COMDER2 MIN	0	0	--	--	--
N+6.35	18	COMDER1 MAX	0.02448	0.01256	0.01344	0.43	OK
N+6.35	18	COMDER1 MIN	-0.02448	-0.01256	0.01344	0.43	OK
N+6.35	18	COMDER2 MAX	0.01	0.0324	0.01823	0.58	OK
N+6.35	18	COMDER2 MIN	-0.01	-0.0324	0.01823	0.58	OK
N+3.20	18	COMDER1 MAX	0.0128	0.00592	0.01410	0.44	OK
N+3.20	18	COMDER1 MIN	-0.0128	-0.00592	0.01410	0.44	OK
N+3.20	18	COMDER2 MAX	0.00496	0.01488	0.01568	0.49	OK
N+3.20	18	COMDER2 MIN	-0.00496	-0.01488	0.01568	0.49	OK
BASE	18	COMDER1 MAX	0	0	--	--	--
BASE	18	COMDER1 MIN	0	0	--	--	--
BASE	18	COMDER2 MAX	0	0	--	--	--
BASE	18	COMDER2 MIN	0	0	--	--	--
N+6.35	19	COMDER1 MAX	0.0232	0.01256	0.01288	0.41	OK
N+6.35	19	COMDER1 MIN	-0.0232	-0.01256	0.01288	0.41	OK
N+6.35	19	COMDER2 MAX	0.01152	0.0324	0.01847	0.59	OK
N+6.35	19	COMDER2 MIN	-0.01152	-0.0324	0.01847	0.59	OK
N+3.20	19	COMDER1 MAX	0.01216	0.00592	0.01352	0.42	OK
N+3.20	19	COMDER1 MIN	-0.01216	-0.00592	0.01352	0.42	OK
N+3.20	19	COMDER2 MAX	0.00568	0.01488	0.01593	0.50	OK
N+3.20	19	COMDER2 MIN	-0.00568	-0.01488	0.01593	0.50	OK
BASE	19	COMDER1 MAX	0	0	--	--	--
BASE	19	COMDER1 MIN	0	0	--	--	--
BASE	19	COMDER2 MAX	0	0	--	--	--
BASE	19	COMDER2 MIN	0	0	--	--	--
N+6.35	22	COMDER1 MAX	0.02448	0.01608	0.01439	0.46	OK
N+6.35	22	COMDER1 MIN	-0.02448	-0.01608	0.01439	0.46	OK
N+6.35	22	COMDER2 MAX	0.01	0.03304	0.01823	0.58	OK
N+6.35	22	COMDER2 MIN	-0.01	-0.03304	0.01823	0.58	OK
N+3.20	22	COMDER1 MAX	0.0128	0.00768	0.01493	0.47	OK
N+3.20	22	COMDER1 MIN	-0.0128	-0.00768	0.01493	0.47	OK
N+3.20	22	COMDER2 MAX	0.00496	0.01552	0.01629	0.51	OK
N+3.20	22	COMDER2 MIN	-0.00496	-0.01552	0.01629	0.51	OK
BASE	22	COMDER1 MAX	0	0	--	--	--
BASE	22	COMDER1 MIN	0	0	--	--	--
BASE	22	COMDER2 MAX	0	0	--	--	--
BASE	22	COMDER2 MIN	0	0	--	--	--
N+6.35	23	COMDER1 MAX	0.0232	0.01608	0.01387	0.44	OK
N+6.35	23	COMDER1 MIN	-0.0232	-0.01608	0.01387	0.44	OK
N+6.35	23	COMDER2 MAX	0.01152	0.03304	0.01847	0.59	OK
N+6.35	23	COMDER2 MIN	-0.01152	-0.03304	0.01847	0.59	OK
N+3.20	23	COMDER1 MAX	0.01216	0.00768	0.01438	0.45	OK
N+3.20	23	COMDER1 MIN	-0.01216	-0.00768	0.01438	0.45	OK
N+3.20	23	COMDER2 MAX	0.00568	0.01552	0.01653	0.52	OK
N+3.20	23	COMDER2 MIN	-0.00568	-0.01552	0.01653	0.52	OK

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

CÁLCULO DE DERIVAS MÁXIMAS

ALTURA DE N+6.35	**3.15**	**m**
ALTURA DE N+3.20	**3.20**	**m**
ALTURA DE BASE	**0.00**	**m**

Deriva Máxima Permitida **1.00** **%**

Nivel	Punto	COMBINACIÓN DE CARGA	DESPLAZAMIENTOS FUERZA SÍSMICA		Deriva Δ	Deriva Δ	Observación
			Desplazamiento X	Desplazamiento Y	*m*	*%*	
BASE	23	COMDER1 MAX	0	0	--	--	--
BASE	23	COMDER1 MIN	0	0	--	--	--
BASE	23	COMDER2 MAX	0	0	--	--	--
BASE	23	COMDER2 MIN	0	0	--	--	--
N+6.35	26	COMDER1 MAX	0.02448	0.01984	0.01564	0.50	OK
N+6.35	26	COMDER1 MIN	-0.02448	-0.01984	0.01564	0.50	OK
N+6.35	26	COMDER2 MAX	0.01	0.03432	0.01862	0.59	OK
N+6.35	26	COMDER2 MIN	-0.01	-0.03432	0.01862	0.59	OK
N+3.20	26	COMDER1 MAX	0.0128	0.00944	0.01590	0.50	OK
N+3.20	26	COMDER1 MIN	-0.0128	-0.00944	0.01590	0.50	OK
N+3.20	26	COMDER2 MAX	0.00496	0.0164	0.01713	0.54	OK
N+3.20	26	COMDER2 MIN	-0.00496	-0.0164	0.01713	0.54	OK
BASE	26	COMDER1 MAX	0	0	--	--	--
BASE	26	COMDER1 MIN	0	0	--	--	--
BASE	26	COMDER2 MAX	0	0	--	--	--
BASE	26	COMDER2 MIN	0	0	--	--	--
N+6.35	27	COMDER1 MAX	0.0232	0.01984	0.01517	0.48	OK
N+6.35	27	COMDER1 MIN	-0.0232	-0.01984	0.01517	0.48	OK
N+6.35	27	COMDER2 MAX	0.01152	0.03432	0.01885	0.60	OK
N+6.35	27	COMDER2 MIN	-0.01152	-0.03432	0.01885	0.60	OK
N+3.20	27	COMDER1 MAX	0.01216	0.00944	0.01539	0.48	OK
N+3.20	27	COMDER1 MIN	-0.01216	-0.00944	0.01539	0.48	OK
N+3.20	27	COMDER2 MAX	0.00568	0.0164	0.01736	0.54	OK
N+3.20	27	COMDER2 MIN	-0.00568	-0.0164	0.01736	0.54	OK
BASE	27	COMDER1 MAX	0	0	--	--	--
BASE	27	COMDER1 MIN	0	0	--	--	--
BASE	27	COMDER2 MAX	0	0	--	--	--
BASE	27	COMDER2 MIN	0	0	--	--	--

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

CÁLCULO DE DERIVAS MÁXIMAS (ESPECTRO DE UMBRAL DE DAÑO)

ALTURA DE N+6.35	3.15	m
ALTURA DE N+3.20	3.20	m
ALTURA DE BASE	0.00	m

Deriva Máxima Permitida **0.40** **%**

Nivel	Punto	COMBINACIÓN DE CARGA	DESPLAZAMIENTOS FUERZA SÍSMICA		Deriva Δ	Deriva Δ	Observación
			Desplazamiento X	Desplazamiento Y	*m*	*%*	
N+6.35	4	COMDERUMB1 MAX	0.00650	0.00650	0.00475	0.15	OK
N+6.35	4	COMDERUMB1 MIN	-0.00650	-0.00650	0.00475	0.15	OK
N+6.35	4	COMDERUMB2 MAX	0.00270	0.01430	0.00822	0.26	OK
N+6.35	4	COMDERUMB2 MIN	-0.00270	-0.01430	0.00822	0.26	OK
N+3.20	4	COMDERUMB1 MAX	0.00340	0.00290	0.00447	0.14	OK
N+3.20	4	COMDERUMB1 MIN	-0.00340	-0.00290	0.00447	0.14	OK
N+3.20	4	COMDERUMB2 MAX	0.00130	0.00620	0.00633	0.20	OK
N+3.20	4	COMDERUMB2 MIN	-0.00130	-0.00620	0.00633	0.20	OK
BASE	4	COMDERUMB1 MAX	0.00000	0.00000	--	--	--
BASE	4	COMDERUMB1 MIN	0.00000	0.00000	--	--	--
BASE	4	COMDERUMB2 MAX	0.00000	0.00000	--	--	--
BASE	4	COMDERUMB2 MIN	0.00000	0.00000	--	--	--
N+6.35	6	COMDERUMB1 MAX	0.00650	0.00580	0.00446	0.14	OK
N+6.35	6	COMDERUMB1 MIN	-0.00650	-0.00580	0.00446	0.14	OK
N+6.35	6	COMDERUMB2 MAX	0.00270	0.01340	0.00773	0.25	OK
N+6.35	6	COMDERUMB2 MIN	-0.00270	-0.01340	0.00773	0.25	OK
N+3.20	6	COMDERUMB1 MAX	0.00340	0.00260	0.00428	0.13	OK
N+3.20	6	COMDERUMB1 MIN	-0.00340	-0.00260	0.00428	0.13	OK
N+3.20	6	COMDERUMB2 MAX	0.00130	0.00580	0.00594	0.19	OK
N+3.20	6	COMDERUMB2 MIN	-0.00130	-0.00580	0.00594	0.19	OK
BASE	6	COMDERUMB1 MAX	0.00000	0.00000	--	--	--
BASE	6	COMDERUMB1 MIN	0.00000	0.00000	--	--	--
BASE	6	COMDERUMB2 MAX	0.00000	0.00000	--	--	--
BASE	6	COMDERUMB2 MIN	0.00000	0.00000	--	--	--
N+6.35	7	COMDERUMB1 MAX	0.00620	0.00580	0.00439	0.14	OK
N+6.35	7	COMDERUMB1 MIN	-0.00620	-0.00580	0.00439	0.14	OK
N+6.35	7	COMDERUMB2 MAX	0.00310	0.01340	0.00777	0.25	OK
N+6.35	7	COMDERUMB2 MIN	-0.00310	-0.01340	0.00777	0.25	OK
N+3.20	7	COMDERUMB1 MAX	0.00320	0.00260	0.00412	0.13	OK
N+3.20	7	COMDERUMB1 MIN	-0.00320	-0.00260	0.00412	0.13	OK
N+3.20	7	COMDERUMB2 MAX	0.00150	0.00580	0.00599	0.19	OK
N+3.20	7	COMDERUMB2 MIN	-0.00150	-0.00580	0.00599	0.19	OK
BASE	7	COMDERUMB1 MAX	0.00000	0.00000	--	--	--
BASE	7	COMDERUMB1 MIN	0.00000	0.00000	--	--	--
BASE	7	COMDERUMB2 MAX	0.00000	0.00000	--	--	--
BASE	7	COMDERUMB2 MIN	0.00000	0.00000	--	--	--
N+6.35	10	COMDERUMB1 MAX	0.00650	0.00460	0.00405	0.13	OK
N+6.35	10	COMDERUMB1 MIN	-0.00650	-0.00460	0.00405	0.13	OK
N+6.35	10	COMDERUMB2 MAX	0.00270	0.01150	0.00655	0.21	OK
N+6.35	10	COMDERUMB2 MIN	-0.00270	-0.01150	0.00655	0.21	OK
N+3.20	10	COMDERUMB1 MAX	0.00340	0.00200	0.00394	0.12	OK
N+3.20	10	COMDERUMB1 MIN	-0.00340	-0.00200	0.00394	0.12	OK
N+3.20	10	COMDERUMB2 MAX	0.00130	0.00510	0.00526	0.16	OK
N+3.20	10	COMDERUMB2 MIN	-0.00130	-0.00510	0.00526	0.16	OK
BASE	10	COMDERUMB1 MAX	0.00000	0.00000	--	--	--
BASE	10	COMDERUMB1 MIN	0.00000	0.00000	--	--	--
BASE	10	COMDERUMB2 MAX	0.00000	0.00000	--	--	--
BASE	10	COMDERUMB2 MIN	0.00000	0.00000	--	--	--
N+6.35	11	COMDERUMB1 MAX	0.00620	0.00460	0.00397	0.13	OK
N+6.35	11	COMDERUMB1 MIN	-0.00620	-0.00460	0.00397	0.13	OK
N+6.35	11	COMDERUMB2 MAX	0.00310	0.01150	0.00660	0.21	OK
N+6.35	11	COMDERUMB2 MIN	-0.00310	-0.01150	0.00660	0.21	OK
N+3.20	11	COMDERUMB1 MAX	0.00320	0.00200	0.00377	0.12	OK
N+3.20	11	COMDERUMB1 MIN	-0.00320	-0.00200	0.00377	0.12	OK
N+3.20	11	COMDERUMB2 MAX	0.00150	0.00510	0.00532	0.17	OK
N+3.20	11	COMDERUMB2 MIN	-0.00150	-0.00510	0.00532	0.17	OK
BASE	11	COMDERUMB1 MAX	0.00000	0.00000	--	--	--
BASE	11	COMDERUMB1 MIN	0.00000	0.00000	--	--	--
BASE	11	COMDERUMB2 MAX	0.00000	0.00000	--	--	--
BASE	11	COMDERUMB2 MIN	0.00000	0.00000	--	--	--
N+6.35	14	COMDERUMB1 MAX	0.00650	0.00300	0.00354	0.11	OK
N+6.35	14	COMDERUMB1 MIN	-0.00650	-0.00300	0.00354	0.11	OK
N+6.35	14	COMDERUMB2 MAX	0.00270	0.00930	0.00529	0.17	OK
N+6.35	14	COMDERUMB2 MIN	-0.00270	-0.00930	0.00529	0.17	OK
N+3.20	14	COMDERUMB1 MAX	0.00340	0.00130	0.00364	0.11	OK
N+3.20	14	COMDERUMB1 MIN	-0.00340	-0.00130	0.00364	0.11	OK
N+3.20	14	COMDERUMB2 MAX	0.00130	0.00420	0.00440	0.14	OK
N+3.20	14	COMDERUMB2 MIN	-0.00130	-0.00420	0.00440	0.14	OK

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

CÁLCULO DE DERIVAS MÁXIMAS (ESPECTRO DE UMBRAL DE DAÑO)

ALTURA DE N+6.35	**3.15**	**m**			**Deriva Máxima Permitida**	**0.40**	**%**
ALTURA DE N+3.20	**3.20**	**m**					
ALTURA DE BASE	**0.00**	**m**					
BASE	14	COMDERUMB1 MAX	0.00000	0.00000	--	--	--
BASE	14	COMDERUMB1 MIN	0.00000	0.00000	--	--	--
BASE	14	COMDERUMB2 MAX	0.00000	0.00000	--	--	--
BASE	14	COMDERUMB2 MIN	0.00000	0.00000	--	--	--
N+6.35	15	COMDERUMB1 MAX	0.00620	0.00300	0.00345	0.11	OK
N+6.35	15	COMDERUMB1 MIN	-0.00620	-0.00300	0.00345	0.11	OK
N+6.35	15	COMDERUMB2 MAX	0.00310	0.00930	0.00535	0.17	OK
N+6.35	15	COMDERUMB2 MIN	-0.00310	-0.00930	0.00535	0.17	OK
N+3.20	15	COMDERUMB1 MAX	0.00320	0.00130	0.00345	0.11	OK
N+3.20	15	COMDERUMB1 MIN	-0.00320	-0.00130	0.00345	0.11	OK
N+3.20	15	COMDERUMB2 MAX	0.00150	0.00420	0.00446	0.14	OK
N+3.20	15	COMDERUMB2 MIN	-0.00150	-0.00420	0.00446	0.14	OK
BASE	15	COMDERUMB1 MAX	0.00000	0.00000	--	--	--
BASE	15	COMDERUMB1 MIN	0.00000	0.00000	--	--	--
BASE	15	COMDERUMB2 MAX	0.00000	0.00000	--	--	--
BASE	15	COMDERUMB2 MIN	0.00000	0.00000	--	--	--
N+6.35	18	COMDERUMB1 MAX	0.00650	0.00330	0.00354	0.11	OK
N+6.35	18	COMDERUMB1 MIN	-0.00650	-0.00330	0.00354	0.11	OK
N+6.35	18	COMDERUMB2 MAX	0.00270	0.00860	0.00481	0.15	OK
N+6.35	18	COMDERUMB2 MIN	-0.00270	-0.00860	0.00481	0.15	OK
N+3.20	18	COMDERUMB1 MAX	0.00340	0.00160	0.00376	0.12	OK
N+3.20	18	COMDERUMB1 MIN	-0.00340	-0.00160	0.00376	0.12	OK
N+3.20	18	COMDERUMB2 MAX	0.00130	0.00400	0.00421	0.13	OK
N+3.20	18	COMDERUMB2 MIN	-0.00130	-0.00400	0.00421	0.13	OK
BASE	18	COMDERUMB1 MAX	0.00000	0.00000	--	--	--
BASE	18	COMDERUMB1 MIN	0.00000	0.00000	--	--	--
BASE	18	COMDERUMB2 MAX	0.00000	0.00000	--	--	--
BASE	18	COMDERUMB2 MIN	0.00000	0.00000	--	--	--
N+6.35	19	COMDERUMB1 MAX	0.00620	0.00330	0.00345	0.11	OK
N+6.35	19	COMDERUMB1 MIN	-0.00620	-0.00330	0.00345	0.11	OK
N+6.35	19	COMDERUMB2 MAX	0.00310	0.00860	0.00487	0.15	OK
N+6.35	19	COMDERUMB2 MIN	-0.00310	-0.00860	0.00487	0.15	OK
N+3.20	19	COMDERUMB1 MAX	0.00320	0.00160	0.00358	0.11	OK
N+3.20	19	COMDERUMB1 MIN	-0.00320	-0.00160	0.00358	0.11	OK
N+3.20	19	COMDERUMB2 MAX	0.00150	0.00400	0.00427	0.13	OK
N+3.20	19	COMDERUMB2 MIN	-0.00150	-0.00400	0.00427	0.13	OK
BASE	19	COMDERUMB1 MAX	0.00000	0.00000	--	--	--
BASE	19	COMDERUMB1 MIN	0.00000	0.00000	--	--	--
BASE	19	COMDERUMB2 MAX	0.00000	0.00000	--	--	--
BASE	19	COMDERUMB2 MIN	0.00000	0.00000	--	--	--
N+6.35	22	COMDERUMB1 MAX	0.00650	0.00430	0.00386	0.12	OK
N+6.35	22	COMDERUMB1 MIN	-0.00650	-0.00430	0.00386	0.12	OK
N+6.35	22	COMDERUMB2 MAX	0.00270	0.00870	0.00481	0.15	OK
N+6.35	22	COMDERUMB2 MIN	-0.00270	-0.00870	0.00481	0.15	OK
N+3.20	22	COMDERUMB1 MAX	0.00340	0.00200	0.00394	0.12	OK
N+3.20	22	COMDERUMB1 MIN	-0.00340	-0.00200	0.00394	0.12	OK
N+3.20	22	COMDERUMB2 MAX	0.00130	0.00410	0.00430	0.13	OK
N+3.20	22	COMDERUMB2 MIN	-0.00130	-0.00410	0.00430	0.13	OK
BASE	22	COMDERUMB1 MAX	0.00000	0.00000	--	--	--
BASE	22	COMDERUMB1 MIN	0.00000	0.00000	--	--	--
BASE	22	COMDERUMB2 MAX	0.00000	0.00000	--	--	--
BASE	22	COMDERUMB2 MIN	0.00000	0.00000	--	--	--
N+6.35	23	COMDERUMB1 MAX	0.00620	0.00430	0.00378	0.12	OK
N+6.35	23	COMDERUMB1 MIN	-0.00620	-0.00430	0.00378	0.12	OK
N+6.35	23	COMDERUMB2 MAX	0.00310	0.00870	0.00487	0.15	OK
N+6.35	23	COMDERUMB2 MIN	-0.00310	-0.00870	0.00487	0.15	OK
N+3.20	23	COMDERUMB1 MAX	0.00320	0.00200	0.00377	0.12	OK
N+3.20	23	COMDERUMB1 MIN	-0.00320	-0.00200	0.00377	0.12	OK
N+3.20	23	COMDERUMB2 MAX	0.00150	0.00410	0.00437	0.14	OK
N+3.20	23	COMDERUMB2 MIN	-0.00150	-0.00410	0.00437	0.14	OK
BASE	23	COMDERUMB1 MAX	0.00000	0.00000	--	--	--
BASE	23	COMDERUMB1 MIN	0.00000	0.00000	--	--	--
BASE	23	COMDERUMB2 MAX	0.00000	0.00000	--	--	--
BASE	23	COMDERUMB2 MIN	0.00000	0.00000	--	--	--
N+6.35	26	COMDERUMB1 MAX	0.00650	0.00530	0.00418	0.13	OK
N+6.35	26	COMDERUMB1 MIN	-0.00650	-0.00530	0.00418	0.13	OK
N+6.35	26	COMDERUMB2 MAX	0.00270	0.00910	0.00500	0.16	OK
N+6.35	26	COMDERUMB2 MIN	-0.00270	-0.00910	0.00500	0.16	OK
N+3.20	26	COMDERUMB1 MAX	0.00340	0.00250	0.00422	0.13	OK
N+3.20	26	COMDERUMB1 MIN	-0.00340	-0.00250	0.00422	0.13	OK
N+3.20	26	COMDERUMB2 MAX	0.00130	0.00430	0.00449	0.14	OK

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

CÁLCULO DE DERIVAS MÁXIMAS (ESPECTRO DE UMBRAL DE DAÑO)

ALTURA DE N+6.35	**3.15**	**m**		**Deriva Máxima Permitida**	**0.40**	**%**	
ALTURA DE N+3.20	**3.20**	**m**					
ALTURA DE BASE	**0.00**	**m**					
N+3.20	26	COMDERUMB2 MIN	-0.00130	-0.00430	0.00449	0.14	OK
BASE	26	COMDERUMB1 MAX	0.00000	0.00000	--	--	--
BASE	26	COMDERUMB1 MIN	0.00000	0.00000	--	--	--
BASE	26	COMDERUMB2 MAX	0.00000	0.00000	--	--	--
BASE	26	COMDERUMB2 MIN	0.00000	0.00000	--	--	--
N+6.35	27	COMDERUMB1 MAX	0.00620	0.00530	0.00410	0.13	OK
N+6.35	27	COMDERUMB1 MIN	-0.00620	-0.00530	0.00410	0.13	OK
N+6.35	27	COMDERUMB2 MAX	0.00310	0.00910	0.00506	0.16	OK
N+6.35	27	COMDERUMB2 MIN	-0.00310	-0.00910	0.00506	0.16	OK
N+3.20	27	COMDERUMB1 MAX	0.00320	0.00250	0.00406	0.13	OK
N+3.20	27	COMDERUMB1 MIN	-0.00320	-0.00250	0.00406	0.13	OK
N+3.20	27	COMDERUMB2 MAX	0.00150	0.00430	0.00455	0.14	OK
N+3.20	27	COMDERUMB2 MIN	-0.00150	-0.00430	0.00455	0.14	OK
BASE	27	COMDERUMB1 MAX	0.00000	0.00000	--	--	--
BASE	27	COMDERUMB1 MIN	0.00000	0.00000	--	--	--
BASE	27	COMDERUMB2 MAX	0.00000	0.00000	--	--	--
BASE	27	COMDERUMB2 MIN	0.00000	0.00000	--	--	--

PROYECTO: I.E. SAN JUAN
VERIFICACIÓN DE INDICE DE ESTABILIDAD Qi

DESPLAZAMIENTO DE DIAFRAGMAS RIGIDOS

NIVEL	Diaphragm	COMBINACIÓN DE CARGA	DESPLAZAMIENTOS FUERZA SÍSMICA		Deriva Δ
			Desplazamiento X	Desplazamiento Y	*m*
N+6.35	D1	COMDER1 MAX	0.0529	0.0281	0.032
N+6.35	D1	COMDER1 MIN	-0.0529	-0.0281	0.032
N+6.35	D1	COMDER2 MAX	0.0188	0.0891	0.055
N+6.35	D1	COMDER2 MIN	-0.0188	-0.0891	0.055
N+3.20	D1	COMDER1 MAX	0.0249	0.0121	0.028
N+3.20	D1	COMDER1 MIN	-0.0249	-0.0121	0.028
N+3.20	D1	COMDER2 MAX	0.0086	0.0355	0.037
N+3.20	D1	COMDER2 MIN	-0.0086	-0.0355	0.037

FUERZA CORTANTE DEL PISO i

PISO	Fx	Vi
	kN	kN
N+6.35	580.9	580.90
N+3.20	1091.9	1672.80

CÁLCULO DE CARGA MUERTA POR NIVEL

NIVEL	Área	Carga Muerta kN	Acumulado Carga Muerta	Carga Viva kN/m^2	Carga Viva kN	Acumulado Carga Viva	Sumatoria de Cargas
N+6.35	367.52	100.27	100.27	0.35	128.63	128.63	228.90
N+3.20	370.18	335.00	335.00	2.45	906.94	906.94	1241.94

INDICE DE ESTABILIDAD

$$Qi = \frac{Pi\Delta cm}{ViHpi}$$

Donde:

Pi — Suma de la carga vertical total, incluyendo muerta y viva, que existe en el piso i, y todos los pisos localizados por encima. Para el cálculo de los efectos P-Delta, no hay necesidad que los coeficientes de carga sean mayores que la unidad.

Δcm — Deriva del piso i, en la dirección bajo estudio, medida en el centro de masa del piso, como la diferencia entre el desplazamiento horizontal del piso i menos el del piso i-1.

Vi — Fuerza cortante del piso, en la dirección bajo estudio, sin dividir por **R.** Se determina por medio de la ecuación A.3-2. Corresponde a la suma de las fuerzas horizontales sísmicas que se aplican en el nivel i, y todos los niveles localizados por encima de él.

Hpi — Altura del piso i, medida desde la superficie del diafragma del piso i hasta la superficie del diafragma del piso inmediatamente inferior i-1.

VERIFICACIÓN DE ESTABILIDAD

$$Qi(x) = \frac{Pi\Delta cm}{ViHpi}$$

NIVEL	COMBINACIÓN DE CARGA	Hpi	Pi	Δcm	Vi	Qi	ESTABILIDAD Qi<0.10
		m	kN	m	kN		
N+6.35	COMDER1 MAX	3.15	228.904	0.032	580.900	0.0040	ESTABLE
N+6.35	COMDER1 MIN	3.15	228.904	0.032	580.900	0.0040	ESTABLE

PROYECTO: I.E. SAN JUAN
VERIFICACIÓN DE INDICE DE ESTABILIDAD Qi

	DESPLAZAMIENTO DE DIAFRAGMAS RIGIDOS						
N+6.35	COMDER2 MAX	3.15	228.904	0.055	580.900	0.0068	ESTABLE
N+6.35	COMDER2 MIN	3.15	228.904	0.055	580.900	0.0068	ESTABLE
N+3.20	COMDER1 MAX	3.20	1241.937	0.028	1672.800	0.0064	ESTABLE
N+3.20	COMDER1 MIN	3.20	1241.937	0.028	1672.800	0.0064	ESTABLE
N+3.20	COMDER2 MAX	3.20	1241.937	0.037	1672.800	0.0085	ESTABLE
N+3.20	COMDER2 MIN	3.20	1241.937	0.037	1672.800	0.0085	ESTABLE

4. DISEÑO DE CIMENTACIÓN

DISEÑO DE CIMENTACIÓN

PROYECTO: INSTITUCION EDUCATIVA COLEGIO SAN JUAN
ELECCIÓN DE CARGAS PARA DISEÑO DE CIMENTACIÓN

Combinaciones de carga | **NSR-10** | **F.S.**

Cargas Gravitacionales: CIMEN= 1D + 1L — B.2.3-2 — **3.00**

Cargas por Estado Limite de Servicio — CIMEN2= 1D + 0.75L + 0.70*(0.75/R)Ex + 0.21*(0.75/ — **B.2.3-8** — **1.50**

CIMEN3= 1D + 0.75L + 0.21*(0.75/R)Ex + 0.70*(0.75/

Story	Point	Load	FX	FY	FZ	MX	MY	MZ	Load	COMBINACIÓN	Pumax
BASE	4	CIM1	-4.33	-13.7	194.87	-19.787	-3.532	-0.402	CIM1		
BASE	4	CIM2 MAX	4.55	-8.22	197.11	-6.523	13.783	-0.086	CIM2 MAX		
BASE	4	CIM2 MIN	-12.09	-16.78	173.03	-29.854	-19.819	-0.66	CIM2 MIN	CIM1	194.9
BASE	4	CIM3 MAX	-0.58	-3.48	190.36	7.318	3.486	0.053	CIM3 MAX		
BASE	4	CIM3 MIN	-6.96	-21.53	179.78	-43.695	-9.521	-0.8	CIM3 MIN		
BASE	6	CIM1	22.5	8.46	431.17	-41.496	24.073	-0.402	CIM1		
BASE	6	CIM2 MAX	30.37	13.18	421.29	-27.411	40.36	-0.086	CIM2 MAX		
BASE	6	CIM2 MIN	11.42	3.79	398.53	-50.121	4.376	-0.66	CIM2 MIN	CIM1	431.2
BASE	6	CIM3 MAX	24.44	19.6	421.46	-12.134	29.228	0.053	CIM3 MAX		
BASE	6	CIM3 MIN	17.36	-2.64	398.36	-65.398	15.508	-0.8	CIM3 MIN		
BASE	7	CIM1	28.41	1.4	248.32	-34.232	32.62	-0.402	CIM1		
BASE	7	CIM2 MAX	34.11	5.24	250.69	-18.652	46.111	-0.086	CIM2 MAX		
BASE	7	CIM2 MIN	19.49	-4.72	237.2	-41.953	15.35	-0.66	CIM2 MIN	CIM1	248.3
BASE	7	CIM3 MAX	30.02	11.75	252.08	-3.283	37.748	0.053	CIM3 MAX		
BASE	7	CIM3 MIN	23.59	-11.24	235.81	-57.322	23.713	-0.8	CIM3 MIN		
BASE	10	CIM1	13.63	7.53	680.01	-38.409	14.951	-0.402	CIM1		
BASE	10	CIM2 MAX	21.46	12.23	640.21	-27.388	31.184	-0.086	CIM2 MAX		
BASE	10	CIM2 MIN	4.22	4.28	632.41	-45.744	-3.033	-0.66	CIM2 MIN	CIM1	680.0
BASE	10	CIM3 MAX	16.14	18.58	644.12	-12.741	20.695	0.053	CIM3 MAX		
BASE	10	CIM3 MIN	9.54	-2.06	628.5	-60.392	7.455	-0.8	CIM3 MIN		
BASE	11	CIM1	1.42	-2.6	674.15	-27.981	4.847	-0.402	CIM1		
BASE	11	CIM2 MAX	11.11	0.28	628.68	-15.178	22.44	-0.086	CIM2 MAX		
BASE	11	CIM2 MIN	-5.72	-7.58	621.26	-33.448	-10.609	-0.66	CIM2 MIN	CIM1	674.2
BASE	11	CIM3 MAX	6.58	6.6	632.96	-0.568	13.64	0.053	CIM3 MAX		
BASE	11	CIM3 MIN	-1.2	-13.89	616.98	-48.059	-1.808	-0.8	CIM3 MIN		
BASE	14	CIM1	-4.24	5.07	708.62	-33.178	-3.447	-0.402	CIM1		
BASE	14	CIM2 MAX	4.35	8.76	664.77	-25.673	13.579	-0.086	CIM2 MAX		
BASE	14	CIM2 MIN	-12.61	3.37	660.7	-37.951	-20.36	-0.66	CIM2 MIN	CIM1	708.6
BASE	14	CIM3 MAX	-0.88	14.66	668.61	-12.184	3.177	0.053	CIM3 MAX		
BASE	14	CIM3 MIN	-7.38	-2.52	656.86	-51.439	-9.959	-0.8	CIM3 MIN		
BASE	15	CIM1	9.16	-5.25	694.95	-22.564	12.817	-0.402	CIM1		
BASE	15	CIM2 MAX	15.38	-3.4	646.95	-13.188	26.837	-0.086	CIM2 MAX		
BASE	15	CIM2 MIN	-0.95	-8.75	642.72	-25.438	-5.691	-0.66	CIM2 MIN	CIM1	695.0
BASE	15	CIM3 MAX	10.96	2.45	650.69	0.246	18.15	0.053	CIM3 MAX		
BASE	15	CIM3 MIN	3.47	-14.6	638.98	-38.871	2.996	-0.8	CIM3 MIN		
BASE	18	CIM1	2.97	10.44	644.22	-36.215	3.973	-0.402	CIM1		
BASE	18	CIM2 MAX	11.36	13.88	608.12	-26.747	20.793	-0.086	CIM2 MAX		
BASE	18	CIM2 MIN	-5.75	7.25	604.3	-41.516	-13.294	-0.66	CIM2 MIN	CIM1	644.2
BASE	18	CIM3 MAX	6.08	19.01	611.5	-15.167	10.344	0.053	CIM3 MAX		
BASE	18	CIM3 MIN	-0.47	2.13	600.92	-53.096	-2.845	-0.8	CIM3 MIN		
BASE	19	CIM1	2.63	-11.72	477.57	-13.408	6.091	-0.402	CIM1		
BASE	19	CIM2 MAX	10.93	-8.3	463.62	-3.933	22.257	-0.086	CIM2 MAX		
BASE	19	CIM2 MIN	-5.56	-14.92	459.4	-18.681	-10.443	-0.66	CIM2 MIN	CIM1	477.6
BASE	19	CIM3 MAX	6.47	-3.19	466.87	7.638	13.53	0.053	CIM3 MAX		
BASE	19	CIM3 MIN	-1.11	-20.03	456.16	-30.251	-1.715	-0.8	CIM3 MIN		
BASE	22	CIM1	4.14	9.22	662.35	-32.398	5.185	-0.402	CIM1		
BASE	22	CIM2 MAX	12.51	13.72	626.02	-21.076	21.973	-0.086	CIM2 MAX		
BASE	22	CIM2 MIN	-4.74	5.15	620.31	-40.111	-12.262	-0.66	CIM2 MIN	CIM1	662.4
BASE	22	CIM3 MAX	7.19	18.37	628.62	-10.734	11.477	0.053	CIM3 MAX		
BASE	22	CIM3 MIN	0.58	0.51	617.71	-50.453	-1.766	-0.8	CIM3 MIN		
BASE	23	CIM1	6	-14.32	505.14	-8.167	9.557	-0.402	CIM1		
BASE	23	CIM2 MAX	13.94	-9.67	489.2	2.98	25.356	-0.086	CIM2 MAX		
BASE	23	CIM2 MIN	-2.7	-18.22	484.45	-16.04	-7.496	-0.66	CIM2 MIN	CIM1	505.1
BASE	23	CIM3 MAX	9.44	-5.04	492.15	13.309	16.587	0.053	CIM3 MAX		
BASE	23	CIM3 MIN	1.8	-22.85	481.51	-26.369	1.273	-0.8	CIM3 MIN		
BASE	26	CIM1	-47.24	12.86	402.56	-33.606	-47.697	-0.402	CIM1		
BASE	26	CIM2 MAX	-36.58	17.64	387.7	-19.678	-28.552	-0.086	CIM2 MAX		
BASE	26	CIM2 MIN	-51.28	7.22	379.58	-42.974	-60.15	-0.66	CIM2 MIN	CIM1	402.6
BASE	26	CIM3 MAX	-41.11	21.76	389.19	-10.486	-38.233	0.053	CIM3 MAX		
BASE	26	CIM3 MIN	-46.75	3.11	378.1	-52.166	-50.469	-0.8	CIM3 MIN		
BASE	27	CIM1	-35.04	-7.38	299.54	-12.775	-32.679	-0.402	CIM1		
BASE	27	CIM2 MAX	-26.52	-2.55	297.09	1.031	-16.292	-0.086	CIM2 MAX		
BASE	27	CIM2 MIN	-40.71	-12.9	286.24	-22.193	-46.611	-0.66	CIM2 MIN	CIM1	299.5
BASE	27	CIM3 MAX	-30.4	1.58	297.61	10.24	-24.424	0.053	CIM3 MAX		
BASE	27	CIM3 MIN	-36.83	-17.03	285.72	-31.403	-38.479	-0.8	CIM3 MIN		

CARGAS A CIMENTACIÓN

PROYECTO: INSTITUCION EDUCATIVA COLEGIO SAN JUAN

Story	Point	Load	FX	FY	FZ	MX	MY	MZ
BASE	4	CIM1	-4.330	-13.700	194.870	-19.787	-3.532	-0.402
BASE	6	CIM1	22.500	8.460	431.170	-41.496	24.073	-0.402
BASE	7	CIM1	28.410	1.400	248.320	-34.232	32.620	-0.402
BASE	10	CIM1	13.630	7.530	680.010	-38.409	14.951	-0.402
BASE	11	CIM1	1.420	-2.600	674.150	-27.981	4.847	-0.402
BASE	14	CIM1	-4.240	5.070	708.620	-33.178	-3.447	-0.402
BASE	15	CIM1	9.160	-5.250	694.950	-22.564	12.817	-0.402
BASE	18	CIM1	2.970	10.440	644.220	-36.215	3.973	-0.402
BASE	19	CIM1	2.630	-11.720	477.570	-13.408	6.091	-0.402
BASE	22	CIM1	4.140	9.220	662.350	-32.398	5.185	-0.402
BASE	23	CIM1	6.000	-14.320	505.140	-8.167	9.557	-0.402
BASE	26	CIM1	-47.240	12.860	402.560	-33.606	-47.697	-0.402
BASE	27	CIM1	-35.040	-7.380	299.540	-12.775	-32.679	-0.402

DISEÑO VIGAS DE AMARRE

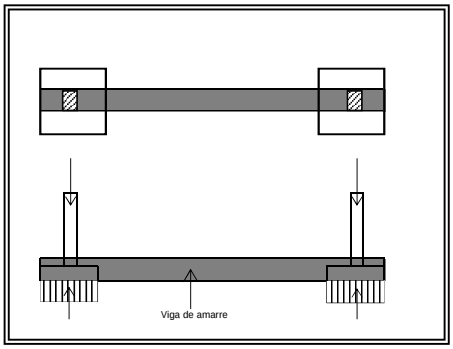
PROYECTO: INSTITUCION EDUCATIVA COLEGIO SAN JUAN

VIGA DE AMARRE TIPO

f'c = **21.1** MPa
fy = **420** MPa

b = **0.40** m
h = **0.45** m

Pmáx = 708.62 kN



De acuerdo a el numeral A.3.6.4.2
de la NSR-10 tenemos:

Aa = ***0.30***
Paxial = 0.25*Aa*Pmáx
Paxial = *53.147* kN

DISEÑO A TENSIÓN

As = 1.7*53.1465/(0.90*420)
As = **2.39** cm^2

DISEÑO A COMPRESIÓN

P com = 1.7*53.1465
P com = *90.3* kN

Para esta carga la sección requiere cuantía mínima:

As = 0.00333*0.4*0.4
As = **5.33** cm^2

Se suministra un refuerzo constituido por 4#5 arriba y abajo (como refuerzo mínimo).

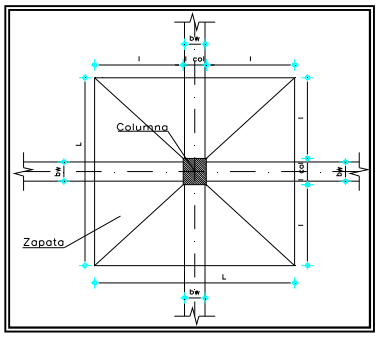
DISEÑO DE ZAPATAS

PROYECTO: INSTITUCION EDUCATIVA COLEGIO SAN JUAN

Zapata Tipo 1 - Concentrica Und. 3

Columna	**b =**	50	cm		**f'c =**	21.1	MPa		**σ =**	0.195	MPa
	t =	50	cm		**fy =**	420	MPa				

PREDIMENSIONAMIENTO



L =	1.300	m	
lcol =	0.500	m	
l =	0.400	m	

Cargas

Mu=	0.000	kN*m
Pu =	299.54	kN
Pp (10%) =	30	kN
Σ P =	329	kN

Area necesaria = $\frac{\Sigma P}{\sigma} = \frac{329.49}{0.195} =$ 1.69 m²

e =	0.00	m
L =	1.300	m

Aproximamos = 1.30 m

Carga de diseño = $\frac{Pu}{A\ real} = \frac{299.54}{1.690} =$ 0.177 MPa

Esfuerzos

σmáx=	0.195	MPa	OK
σmin=	0.195	MPa	OK

DISEÑO DE ZAPATA CONCENTRICA

FLEXIÓN

M borde de la columna = 15.60 kN*m

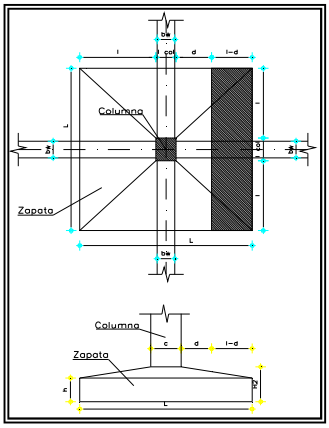
Mu = 1,7 * M borde de la columna = 26.52 kN*m

Con el criterio de calcular el refuerzo por metro lineal utilizamos una altura efectiva igual a:

d=	0.23	m
Cuantia =	0.002	
As =	4.60	cm²/m

Armadura: 7#416c./0.20 en ambos sentidos

CORTANTE



a. En una dirección (d)

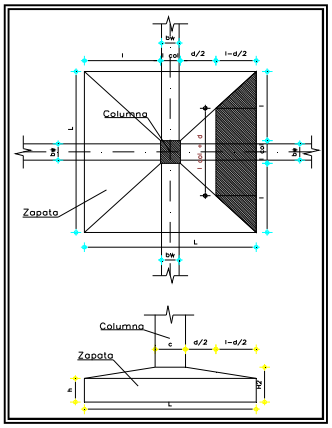
L =	1.30	m
l =	0.40	m
l - d =	0.17	m

H =	0.30	m
h =	0.30	m
H-h =	0.00	m

V (d) =	43.09	kN
Vu (d)=	1.7*V(d)	
Vu (d) =	73.25	kN
h´=	0.23	m

$\upsilon\nu = \frac{Vu}{L * h'} =$ 0.245 MPa

ϕvc = 0.574 MPa **OK**



b. En dos direcciones (d/2)

Zapata Tipo 1 - Concentrica

L =	1.300	m	**H =**	0.30	m
d/2 =	0.115	m	**h =**	0.30	m
l - d/2 =	0.285	m	**H-h =**	0.00	m

V (d/2) =	56.4	kN
Vu (d/2) =	1.5*V(d)	
Vu (d/2) =	84.6	kN
d_1 =	0.23	m

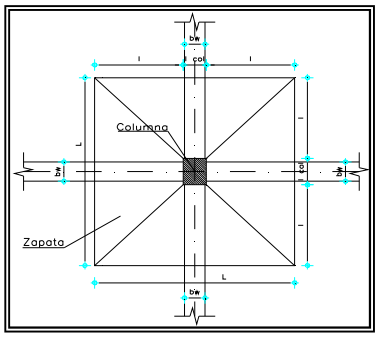
$$\nu u = \frac{Vu}{bo \times d_1} = 0.504 \text{ MPa}$$

ϕvc= 1.15 MPa **OK**

DISEÑO DE ZAPATAS
PROYECTO: INSTITUCION EDUCATIVA COLEGIO SAN JUAN
Zapata Tipo 2 - Concentrica Und. 2

Columna	**b =**	50	cm	**f'c =**	21.1	MPa	**σ =**	0.195	MPa
	t =	50	cm	**fy =**	420	MPa			

PREDIMENSIONAMIENTO



L =	1.600	m	
lcol =	0.500	m	
l =	0.550	m	

Cargas

Mu=	0.000	kN*m
Pu =	431.17	kN
Pp (10%) =	43	kN
Σ P =	474	kN

Area necesaria = $\frac{\Sigma P}{\sigma} = \frac{474.29}{0.195} =$ 2.43 m²

e =	0.00	m	
L =	1.560	m	*Aproximamos =* 1.60 m

Carga de diseño = $\frac{Pu}{A\ real} = \frac{431.17}{2.560} =$ 0.168 MPa

Esfuerzos

σmáx=	0.185	MPa	OK
σmin=	0.185	MPa	OK

DISEÑO DE ZAPATA CONCENTRICA

FLEXIÓN

M borde de la columna = 28.02 kN*m

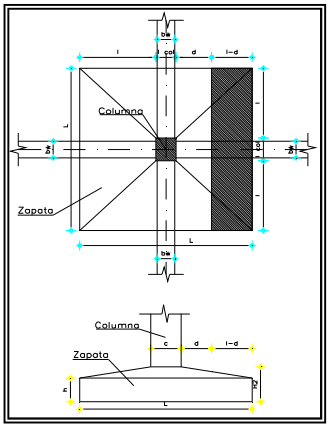
Mu = 1,7 * M borde de la columna = 47.64 kN*m

Con el criterio de calcular el refuerzo por metro lineal utilizamos una altura efectiva igual a:

d=	0.23	m
Cuantia =	0.00220097	
As =	5.06	cm²/m

Armadura: 9#419c./0.20
en ambos sentidos

CORTANTE



a. En una dirección (d)

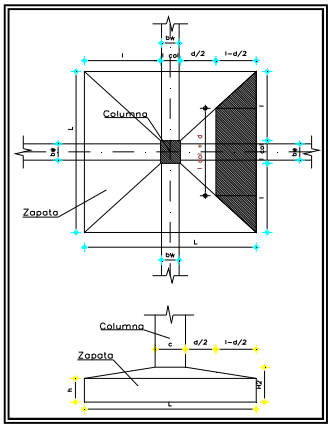
L =	1.60	m
l =	0.55	m
l - d =	0.32	m

H =	0.30	m
h =	0.30	m
H-h =	0.00	m

V (d) =	94.86	kN
Vu (d)=	1.7*V(d)	
Vu (d) =	161.26	kN
h´=	0.23	m

$\upsilon\nu = \frac{Vu}{L * h'} =$ 0.438 MPa

ϕvc = 0.574 MPa **OK**



b. En dos direcciones (d/2)

Zapata Tipo 2 - Concentrica

L =	1.600	m	**H =**	0.30	m
d/2 =	0.115	m	**h =**	0.30	m
l - d/2 =	0.435	m	**H-h =**	0.00	m

V (d/2) =	93.9	kN
Vu (d/2) =	1.5*V(d)	
Vu (d/2) =	140.8	kN
d_1 =	0.23	m

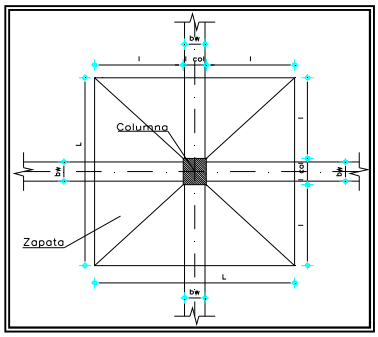
$$\nu u = \frac{Vu}{bo \times d_1} = 0.839 \text{ MPa}$$

ϕvc= 1.15 MPa **OK**

DISEÑO DE ZAPATAS
PROYECTO: INSTITUCION EDUCATIVA COLEGIO SAN JUAN
Zapata Tipo 3 - Concentrica Und. 2

Columna	**b =**	50	cm	**f'c =**	21.1	MPa	**σ =**	0.195	MPa
	t =	50	cm	**fy =**	420	MPa			

PREDIMENSIONAMIENTO



L =	1.700	m
lcol =	0.500	m
l =	0.600	m

Cargas

Mu=	0.000	kN*m
Pu =	505.14	kN
Pp (10%) =	51	kN
Σ P =	556	kN

Area necesaria = $\frac{\Sigma P}{\sigma} = \frac{555.65}{0.195} =$ 2.85 m²

e =	0.00	m
L =	1.688	m

Aproximamos = 1.70 m

Carga de diseño = $\frac{Pu}{A\ real} = \frac{505.14}{2.890} =$ 0.175 MPa

Esfuerzos

σmáx=	0.192	MPa	OK
σmin=	0.192	MPa	OK

DISEÑO DE ZAPATA CONCENTRICA

FLEXIÓN

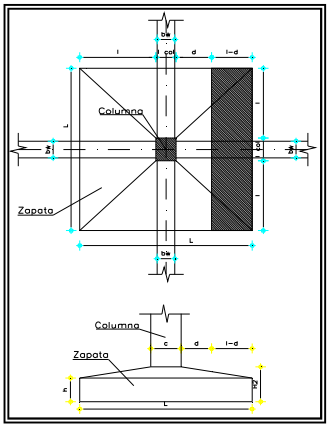
M borde de la columna = 34.61 kN*m

Mu = 1,7 * M borde de la columna = 58.83 kN*m

Con el criterio de calcular el refuerzo por metro lineal utilizamos una altura efectiva igual a:

d=	0.23	m
Cuantia =	0.00273594	
As =	6.29	cm²/m
Armadura:	9#420c./0.2	
	en ambos sentidos	

CORTANTE



a. En una dirección (d)

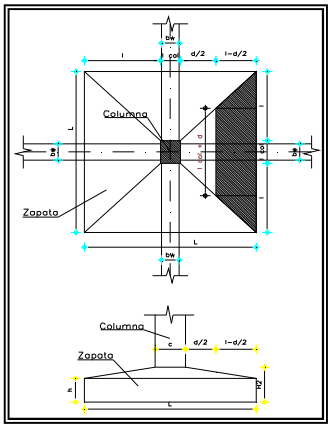
L =	1.70	m
l =	0.60	m
l - d =	0.37	m

H =	0.30	m
h =	0.30	m
H-h =	0.00	m

V (d) =	120.94	kN
Vu (d)=	1.7*V(d)	
Vu (d) =	205.59	kN
h´=	0.23	m

$\upsilon\nu = \frac{Vu}{L * h'} =$ 0.526 MPa

ϕvc = 0.574 MPa **OK**



b. En dos direcciones (d/2)

Zapata Tipo 3 - Concentrica

L =	1.700	m	**H =**	0.30	m
d/2 =	0.115	m	**h =**	0.30	m
l - d/2 =	0.485	m	**H-h =**	0.00	m

V (d/2) =	113.3	kN
Vu (d/2) =	1.5*V(d)	
Vu (d/2) =	169.9	kN
d_1 =	0.23	m

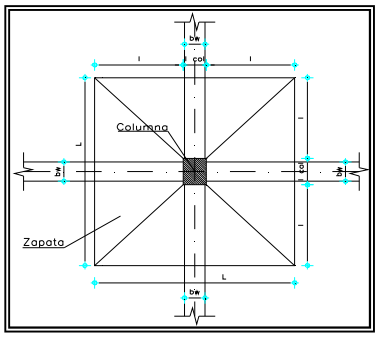
$$\nu u = \frac{Vu}{bo \times d_1} = 1.012 \text{ MPa}$$

ϕvc= 1.15 MPa **OK**

DISEÑO DE ZAPATAS
PROYECTO: INSTITUCION EDUCATIVA COLEGIO SAN JUAN
Zapata Tipo 4 - Concentrica Und. 6

Columna	**b =**	50	cm	**f'c =**	21.1	MPa	**σ =**	0.195	MPa
	t =	50	cm	**fy =**	420	MPa			

PREDIMENSIONAMIENTO



L =	2.000	m
lcol =	0.500	m
l =	0.750	m

Cargas

Mu=	0.000	kN*m
Pu =	708.62	kN
Pp (10%) =	71	kN
Σ P =	779	kN

Area necesaria = $\frac{\Sigma P}{\sigma} = \frac{779.48}{0.195} =$ 4.00 m²

e =	0.00	m
L =	1.999	m

Aproximamos = 2.00 m

Carga de diseño = $\frac{Pu}{A\ real} = \frac{708.62}{4.000} =$ 0.177 MPa

Esfuerzos

σmáx=	0.195	MPa	OK
σmin=	0.195	MPa	OK

DISEÑO DE ZAPATA CONCENTRICA

FLEXIÓN

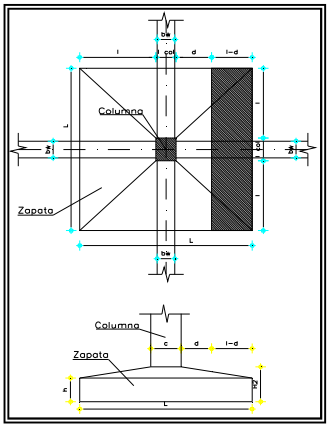
	M borde de la columna =	54.81	kN*m
Mu =	1,7 * M borde de la columna =	93.17	kN*m

Con el criterio de calcular el refuerzo por metro lineal utilizamos una altura efectiva igual a:

d=	0.33	m
Cuantia =	0.00208831	
As =	6.89	cm²/m

Armadura: 12#423c./0.18
en ambos sentidos

CORTANTE



a. En una dirección (d)

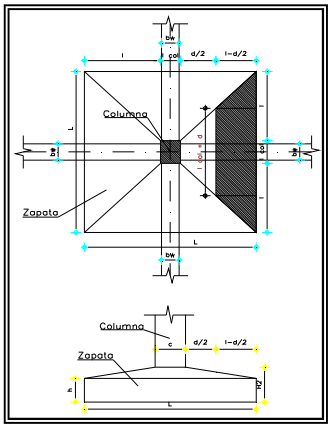
L =	2.00	m
l =	0.75	m
l - d =	0.42	m

H =	0.40	m
h =	0.30	m
H-h =	0.10	m

V (d) =	163.69	kN
Vu (d)=	1.7*V(d)	
Vu (d) =	278.28	kN
h´=	0.29	m

$\upsilon\nu = \frac{Vu}{L * h'} =$ 0.480 MPa

ϕvc = 0.574 MPa **OK**



b. En dos direcciones (d/2)

Zapata Tipo 4 - Concentrica

L =	2.000	m	**H =**	0.40	m
d/2 =	0.165	m	**h =**	0.30	m
l - d/2 =	0.585	m	**H-h =**	0.10	m

V (d/2) =	161.3	kN
Vu (d/2) =	1.5*V(d)	
Vu (d/2) =	242.0	kN
d_1 =	0.31357143	m

$$\nu u = \frac{Vu}{bo \times d_1} = 0.930 \text{ MPa}$$

ϕvc= 1.15 MPa **OK**

5. DISEÑO DE VIGAS Y COLUMNAS

DISEÑO DE VIGAS Y COLUMNAS

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

V-101/N+3.20

B=0.15 H=0.45 L=2.67			B=0.15 H=0.45 L=2.65			B=0.15 H=0.45 L=3.45		
Mu=-3.31 As =2.54 As(r)=2.32		Mu=-0.83 As =2.54 As(r)=1.96	Mu=-1.20 As =2.54 As(r)=1.96		Mu=-4.78 As =3.96 As(r)=3.43	Mu=-5.75 As =3.96 As(r)=4.19		Mu=-1.44 As =3.96 As(r)=1.96
	Mu=1.98 As =2.54 As(r)=1.96			Mu=1.20 As =2.54 As(r)=1.96			Mu=1.44 As =4.87 As(r)=1.96	
Vu=-3.48	Vu=-1.50	Vu=1.54	Vu=-0.81	Vu=2.04	Vu=4.02	Vu=-4.61	Vu=-2.03	Vu=1.08

B=0.15 H=0.45 L=3.45			B=0.15 H=0.45 L=3.17			B=0.15 H=0.45 L=3.16		
Mu=-1.47 As =3.96 As(r)=1.96		Mu=-5.89 As =3.96 As(r)=4.30	Mu=-5.49 As =3.96 As(r)=3.98		Mu=-1.37 As =3.96 As(r)=1.96	Mu=-1.34 As =3.96 As(r)=1.96		Mu=-5.34 As =3.96 As(r)=3.86
	Mu=1.47 As =5.08 As(r)=1.96			Mu=1.37 As =5.08 As(r)=1.96			Mu=1.34 As =5.08 As(r)=1.96	
Vu=-1.00	Vu=2.03	Vu=4.66	Vu=-4.37	Vu=-2.03	Vu=0.94	Vu=-0.93	Vu=1.98	Vu=4.32

B=0.15 H=0.45 L=3.27			B=0.15 H=0.45 L=3.26			B=0.15 H=0.45 L=3.22		
Mu=-5.57 As =3.96 As(r)=4.05		Mu=-1.39 As =3.96 As(r)=1.96	Mu=-1.38 As =3.96 As(r)=1.96		Mu=-5.54 As =3.96 As(r)=4.02	Mu=-6.01 As =3.96 As(r)=4.39		Mu=-1.50 As =3.96 As(r)=1.96
	Mu=1.39 As =3.60 As(r)=1.96			Mu=1.38 As =2.54 As(r)=1.96			Mu=1.50 As =2.54 As(r)=1.96	
Vu=-4.41	Vu=-2.00	Vu=0.97	Vu=-0.93	Vu=1.99	Vu=4.45	Vu=-4.58	Vu=-2.21	Vu=0.82

B=0.15 H=0.45 L=3.25		
Mu=-0.97 As =3.96 As(r)=1.96		Mu=-3.87 As =2.54 As(r)=2.74
	Mu=2.50 As =2.54 As(r)=1.96	
Vu=-1.57	Vu=1.54	Vu=3.94

V-102/N+3.20

B=0.40 H=0.45 L=5.45			B=0.40 H=0.45 L=7.05			B=0.40 H=0.45 L=6.48		
Mu=-15.49 As =11.40 As(r)=11.29		Mu=-17.47 As =17.90 As(r)=12.91	Mu=-22.04 As =17.90 As(r)=16.83		Mu=-22.18 As =17.90 As(r)=16.95	Mu=-19.29 As =17.90 As(r)=14.43		Mu=-19.68 As =15.52 As(r)=14.76
	Mu=9.72 As =7.92 As(r)=6.84			Mu=12.97 As =7.92 As(r)=9.30			Mu=11.09 As =8.28 As(r)=7.87	
Vu=-10.56	Vu=-5.59	Vu=11.40	Vu=-12.64	Vu=-5.58	Vu=12.65	Vu=-11.68	Vu=-5.37	Vu=11.82

B=0.40 H=0.45 L=6.67			B=0.40 H=0.45 L=6.60		
Mu=-20.50 As =15.52 As(r)=15.47		Mu=-20.30 As =17.90 As(r)=15.30	Mu=-22.38 As =17.90 As(r)=17.13		Mu=-18.22 As =13.46 As(r)=13.54
	Mu=11.58 As =13.62 As(r)=8.24			Mu=12.89 As =9.96 As(r)=9.24	
Vu=-12.06	Vu=-5.50	Vu=12.02	Vu=-13.03	Vu=5.24	Vu=11.73

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

V-103/N+3.20

B=0.20 H=0.45 L=2.67			B=0.20 H=0.45 L=2.65			B=0.20 H=0.45 L=3.45		
Mu=-4.36 As =3.96 As(r)=3.05		Mu=-1.09 As =3.96 As(r)=2.61	Mu=-2.05 As =3.96 As(r)=2.61		Mu=-8.20 As =7.76 As(r)=6.02	Mu=-9.99 As =7.76 As(r)=7.51		Mu=-2.50 As =7.76 As(r)=2.61
	Mu=3.09 As =3.96 As(r)=2.61			Mu=2.05 As =3.96 As(r)=2.61			Mu=3.16 As =3.96 As(r)=2.61	
Vu=-5.19	Vu=-3.03	Vu=0.67	Vu=0.67	Vu=4.30	Vu=6.68	Vu=-8.16	Vu=-4.46	Vu=0.54

B=0.20 H=0.45 L=3.45			B=0.20 H=0.45 L=3.17			B=0.20 H=0.45 L=3.16		
Mu=-2.69 As =7.76 As(r)=2.61		Mu=-10.75 As =7.76 As(r)=8.18	Mu=-9.84 As =7.76 As(r)=7.38		Mu=-2.46 As =7.76 As(r)=2.61	Mu=-2.32 As =7.76 As(r)=2.61		Mu=-9.27 As =7.76 As(r)=6.90
	Mu=2.69 As =3.96 As(r)=2.61			Mu=2.46 As =3.96 As(r)=2.61			Mu=2.32 As =3.96 As(r)=2.61	
Vu=0.54	Vu=4.96	Vu=8.37	Vu=-7.66	Vu=-4.45	Vu=-0.40	Vu=-0.40	Vu=4.53	Vu=7.49

B=0.20 H=0.45 L=3.27			B=0.20 H=0.45 L=3.26			B=0.20 H=0.45 L=3.22		
Mu=-9.62 As =7.76 As(r)=7.19		Mu=-2.40 As =7.76 As(r)=2.61	Mu=-2.52 As =7.76 As(r)=2.61		Mu=-10.08 As =7.76 As(r)=7.59	Mu=-10.42 As =7.76 As(r)=7.89		Mu=-2.61 As =7.76 As(r)=2.61
	Mu=2.47 As =3.96 As(r)=2.61			Mu=2.52 As =3.96 As(r)=2.61			Mu=2.61 As =3.96 As(r)=2.61	
Vu=-7.73	Vu=-4.36	Vu=0.27	Vu=0.27	Vu=4.76	Vu=7.86	Vu=-8.17	Vu=-5.12	Vu=-1.16

B=0.20 H=0.45 L=3.25		
Mu=-1.52 As =7.76 As(r)=2.61		Mu=-6.07 As =7.76 As(r)=4.34
	Mu=4.78 As =3.96 As(r)=3.61	
Vu=-1.16	Vu=3.47	Vu=6.79

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

V-104/N+3.20

B=0.45 H=0.45 L=1.65			B=0.45 H=0.45 L=2.63			B=0.45 H=0.45 L=5.45		
Mu=-0.02 As =0.00 As(r)=5.88		Mu=-5.26 As =12.51 As(r)=5.88	Mu=-12.65 As =12.51 As(r)=8.98		Mu=-14.20 As =12.51 As(r)=10.17	Mu=-18.17 As =12.51 As(r)=13.31		Mu=-23.31 As =22.97 As(r)=17.62
	Mu=0.00 As =6.50 As(r)=5.88			Mu=3.55 As =6.50 As(r)=5.88			Mu=13.23 As =11.71 As(r)=9.43	
Vu=1.79	Vu=2.88	Vu=3.96	Vu=-9.18	Vu=7.59	Vu=10.72	Vu=-13.06	Vu=-7.18	Vu=14.86

B=0.45 H=0.45 L=7.05			B=0.45 H=0.45 L=6.48			B=0.45 H=0.45 L=6.67		
Mu=-27.76 As =22.97 As(r)=21.64		Mu=-28.73 As =22.97 As(r)=22.55	Mu=-25.86 As =22.97 As(r)=19.88		Mu=-25.49 As =19.40 As(r)=19.56	Mu=-26.22 As =19.40 As(r)=20.22		Mu=-26.54 As =22.97 As(r)=20.50
	Mu=19.81 As =8.24 As(r)=14.65			Mu=16.66 As =8.24 As(r)=12.10			Mu=17.56 As =8.24 As(r)=12.82	
Vu=-17.03	Vu=-7.82	Vu=17.20	Vu=-15.76	Vu=-7.91	Vu=15.61	Vu=-16.06	Vu=-7.81	Vu=16.17

B=0.45 H=0.45 L=6.60		
Mu=-28.30 As =22.97 As(r)=22.15		Mu=-23.19 As =17.90 As(r)=17.52
	Mu=18.52 As =8.24 As(r)=13.59	
Vu=-16.94	Vu=7.17	Vu=15.23

V-105/N+3.20

B=0.15 H=0.45 L=1.70			B=0.15 H=0.45 L=2.63			B=0.15 H=0.45 L=2.67		
Mu=-0.08 As =0.00 As(r)=1.96		Mu=-1.58 As =2.54 As(r)=1.96	Mu=-2.81 As =2.54 As(r)=1.96		Mu=-3.01 As =2.54 As(r)=2.10	Mu=-3.45 As =2.54 As(r)=2.42		Mu=-0.86 As =5.70 As(r)=1.96
	Mu=0.00 As =2.54 As(r)=1.96			Mu=0.75 As =2.54 As(r)=1.96			Mu=1.43 As =2.54 As(r)=1.96	
Vu=0.21	Vu=0.84	Vu=1.57	Vu=-2.95	Vu=0.93	Vu=3.48	Vu=-4.05	Vu=-1.52	Vu=1.71

B=0.15 H=0.45 L=2.65			B=0.15 H=0.45 L=3.45			B=0.15 H=0.45 L=3.45		
Mu=-1.28 As =5.70 As(r)=1.96		Mu=-5.14 As =5.70 As(r)=3.70	Mu=-6.32 As =5.70 As(r)=4.65		Mu=-1.58 As =5.70 As(r)=1.96	Mu=-1.72 As =5.70 As(r)=1.96		Mu=-6.87 As =5.70 As(r)=5.11
	Mu=1.34 As =2.54 As(r)=1.96			Mu=1.97 As =2.54 As(r)=1.96			Mu=1.77 As =2.54 As(r)=1.96	
Vu=-1.04	Vu=1.99	Vu=4.71	Vu=-5.95	Vu=-2.27	Vu=1.57	Vu=-1.38	Vu=2.41	Vu=6.10

B=0.15 H=0.45 L=3.16			B=0.15 H=0.45 L=3.16			B=0.15 H=0.45 L=3.27		
Mu=-6.18 As =5.70 As(r)=4.54		Mu=-1.54 As =3.96 As(r)=1.96	Mu=-1.49 As =3.96 As(r)=1.96		Mu=-5.98 As =3.96 As(r)=4.37	Mu=-6.13 As =3.96 As(r)=4.49		Mu=-1.53 As =5.70 As(r)=1.96
	Mu=1.91 As =2.54 As(r)=1.96			Mu=1.49 As =2.54 As(r)=1.96			Mu=1.53 As =2.54 As(r)=1.96	
Vu=-5.52	Vu=-2.17	Vu=1.37	Vu=-1.38	Vu=2.12	Vu=5.47	Vu=-5.64	Vu=-2.19	Vu=1.39

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

B=0.15 H=0.45 L=3.26			B=0.15 H=0.45 L=3.22			B=0.15 H=0.45 L=3.25		
Mu=-1.62 As =5.70 As(r)=1.96		Mu=-6.47 As =5.70 As(r)=4.77	Mu=-6.60 As =5.70 As(r)=4.88		Mu=-1.65 As =2.54 As(r)=1.96	Mu=-1.07 As =2.54 As(r)=1.96		Mu=-4.29 As =2.54 As(r)=3.05
	Mu=1.62 As =2.54 As(r)=1.96			Mu=1.65 As =2.54 As(r)=1.96			Mu=3.11 As =2.54 As(r)=2.39	
Vu=-1.34	Vu=2.28	Vu=5.74	Vu=-5.96	Vu=-2.55	Vu=1.06	Vu=-1.88	Vu=1.82	Vu=5.17

V-106/N+3.20

B=0.15 H=0.45 L=1.83		
Mu=-0.48 As =2.54 As(r)=1.96		Mu=-1.91 As =2.54 As(r)=1.96
	Mu=0.48 As =2.54 As(r)=1.96	
Vu=-0.21	Vu=0.84	Vu=1.79

V-107/N+3.20

B=0.40 H=0.45 L=1.98		
Mu=-0.07 As =0.00 As(r)=5.23		Mu=-13.42 As =9.66 As(r)=9.66
	Mu=0.00 As =6.50 As(r)=5.23	
Vu=4.37	Vu=6.26	Vu=8.39

V-108/N+3.20

B=0.45 H=0.45 L=1.98			B=0.45 H=0.45 L=6.40			B=0.45 H=0.45 L=0.80		
Mu=-0.00 As =0.00 As(r)=5.88		Mu=-19.98 As =25.35 As(r)=14.79	Mu=-32.74 As =25.35 As(r)=26.51		Mu=-20.70 As =14.25 As(r)=15.39	Mu=-4.17 As =14.25 As(r)=5.88		Mu=-0.05 As =0.00 As(r)=5.88
	Mu=0.00 As =12.51 As(r)=5.88			Mu=8.81 As =12.51 As(r)=7.11			Mu=0.00 As =12.51 As(r)=5.88	
Vu=7.21	Vu=9.35	Vu=11.49	Vu=-15.53	Vu=-8.19	Vu=12.11	Vu=-5.00	Vu=-4.24	Vu=-3.48

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

V-109/N+3.20

B=0.20 H=0.45 L=1.98			B=0.20 H=0.45 L=3.15			B=0.20 H=0.45 L=3.20		
Mu=-0.27 As =0.00 As(r)=2.61		Mu=-9.08 As =10.14 As(r)=6.74	Mu=-12.93 As =10.14 As(r)=10.17		Mu=-3.23 As =5.70 As(r)=2.61	Mu=-1.85 As =5.70 As(r)=2.61		Mu=-7.38 As =5.70 As(r)=5.36
	Mu=0.00 As =5.70 As(r)=2.61			Mu=3.23 As =5.70 As(r)=2.61			Mu=4.99 As =5.70 As(r)=3.68	
Vu=2.65	Vu=4.10	Vu=5.81	Vu=-7.89	Vu=-4.67	Vu=-1.44	Vu=-2.07	Vu=3.06	Vu=6.29

B=0.20 H=0.45 L=0.80		
Mu=-2.64 As =5.70 As(r)=2.61		Mu=-0.30 As =0.00 As(r)=2.61
	Mu=0.00 As =5.70 As(r)=2.61	
Vu=-2.74	Vu=-2.38	Vu=-2.03

V-110/N+3.20

B=0.45 H=0.45 L=1.98			B=0.45 H=0.45 L=6.40			B=0.45 H=0.45 L=0.80		
Mu=-0.00 As =0.00 As(r)=5.88		Mu=-27.20 As =33.11 As(r)=21.11	Mu=-38.34 As =33.11 As(r)=32.68		Mu=-26.49 As =19.40 As(r)=20.46	Mu=-8.64 As =19.40 As(r)=6.01		Mu=-0.00 As =0.00 As(r)=5.88
	Mu=0.00 As =19.40 As(r)=5.88			Mu=17.35 As =19.40 As(r)=12.65			Mu=0.00 As =19.40 As(r)=5.88	
Vu=10.66	Vu=12.80	Vu=14.94	Vu=-19.51	Vu=-11.90	Vu=16.07	Vu=-9.56	Vu=-9.02	Vu=-8.48

V-111/N+3.20

B=0.20 H=0.45 L=1.98			B=0.20 H=0.45 L=3.15			B=0.20 H=0.45 L=3.20		
Mu=-0.29 As =0.00 As(r)=2.61		Mu=-9.92 As =10.14 As(r)=7.45	Mu=-12.66 As =10.14 As(r)=9.92		Mu=-3.16 As =5.70 As(r)=2.61	Mu=-1.89 As =5.70 As(r)=2.61		Mu=-7.58 As =5.70 As(r)=5.51
	Mu=0.00 As =5.70 As(r)=2.61			Mu=3.16 As =5.70 As(r)=2.61			Mu=4.75 As =5.70 As(r)=3.75	
Vu=2.85	Vu=4.49	Vu=6.28	Vu=-8.38	Vu=-4.99	Vu=-1.71	Vu=-1.10	Vu=3.55	Vu=6.83

B=0.20 H=0.45 L=0.80		
Mu=-2.57 As =5.70 As(r)=2.61		Mu=-0.36 As =0.00 As(r)=2.61
	Mu=0.00 As =5.70 As(r)=2.61	
Vu=-2.61	Vu=-2.25	Vu=-1.90

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

V-112/N+3.20

B=0.45 H=0.45 L=1.98			B=0.45 H=0.45 L=6.40			B=0.45 H=0.45 L=0.80		
Mu=-0.00 As =0.00 As(r)=5.88		Mu=-29.24 As =33.11 As(r)=23.04	Mu=-36.77 As =33.11 As(r)=31.70		Mu=-25.42 As =19.40 As(r)=19.49	Mu=-9.15 As =19.40 As(r)=6.39		Mu=-0.00 As =0.00 As(r)=5.88
	Mu=0.00 As =19.40 As(r)=5.88			Mu=18.41 As =19.40 As(r)=13.50			Mu=0.00 As =19.40 As(r)=5.88	
Vu=11.62	Vu=13.76	Vu=15.90	Vu=-19.35	Vu=-11.69	Vu=16.05	Vu=-10.11	Vu=-9.57	Vu=-9.03

V-113/N+3.20

B=0.20 H=0.45 L=1.98			B=0.20 H=0.45 L=3.15			B=0.20 H=0.45 L=3.20		
Mu=-0.34 As =0.00 As(r)=2.61		Mu=-9.38 As =10.14 As(r)=6.99	Mu=-11.78 As =10.14 As(r)=9.10		Mu=-2.95 As =5.70 As(r)=2.61	Mu=-1.65 As =5.70 As(r)=2.61		Mu=-6.61 As =5.70 As(r)=4.75
	Mu=0.00 As =5.70 As(r)=2.61			Mu=2.95 As =5.70 As(r)=2.61			Mu=4.52 As =5.70 As(r)=3.50	
Vu=2.58	Vu=4.20	Vu=6.00	Vu=-7.98	Vu=-4.53	Vu=-1.25	Vu=-1.42	Vu=3.05	Vu=6.33

B=0.20 H=0.45 L=0.80		
Mu=-2.25 As =5.70 As(r)=2.61		Mu=-0.33 As =0.00 As(r)=2.61
	Mu=0.00 As =5.70 As(r)=2.61	
Vu=-2.31	Vu=-1.96	Vu=-1.60

V-114/N+3.20

B=0.45 H=0.45 L=1.98			B=0.45 H=0.45 L=6.40			B=0.45 H=0.45 L=0.80		
Mu=-0.00 As =0.00 As(r)=5.88		Mu=-28.18 As =33.11 As(r)=22.03	Mu=-34.67 As =33.11 As(r)=30.39		Mu=-24.40 As =19.40 As(r)=18.58	Mu=-8.85 As =19.40 As(r)=6.16		Mu=-0.00 As =0.00 As(r)=5.88
	Mu=0.00 As =17.34 As(r)=5.88			Mu=17.99 As =17.34 As(r)=13.16			Mu=0.00 As =17.34 As(r)=5.88	
Vu=11.11	Vu=13.25	Vu=15.39	Vu=-18.61	Vu=-10.95	Vu=15.64	Vu=-9.79	Vu=-9.25	Vu=-8.71

V-115/N+3.20

B=0.20 H=0.45 L=1.98			B=0.20 H=0.45 L=3.15			B=0.20 H=0.45 L=3.20		
Mu=-0.32 As =0.00 As(r)=2.61		Mu=-9.48 As =10.14 As(r)=7.07	Mu=-11.75 As =10.14 As(r)=9.07		Mu=-2.94 As =5.70 As(r)=2.61	Mu=-1.72 As =5.70 As(r)=2.61		Mu=-6.90 As =5.70 As(r)=4.98
	Mu=0.00 As =5.70 As(r)=2.61			Mu=2.94 As =5.70 As(r)=2.61			Mu=4.53 As =5.70 As(r)=3.55	
Vu=2.62	Vu=4.26	Vu=6.05	Vu=-8.07	Vu=-4.61	Vu=-1.33	Vu=-1.24	Vu=3.23	Vu=6.51

B=0.20 H=0.45 L=0.80		
Mu=-2.34 As =5.70 As(r)=2.61		Mu=-0.34 As =0.00 As(r)=2.61
	Mu=0.00 As =5.70 As(r)=2.61	
Vu=-2.39	Vu=-2.04	Vu=-1.69

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

V-116 / N+3.20

B=0.45 H=0.45 L=1.98			B=0.45 H=0.45 L=6.40			B=0.45 H=0.45 L=0.80		
Mu=-0.00 As =0.00 As(r)=5.88		Mu=-29.40 As =33.11 As(r)=23.19	Mu=-35.20 As =33.11 As(r)=30.72		Mu=-25.49 As =19.40 As(r)=19.55	Mu=-9.13 As =19.40 As(r)=6.37		Mu=-0.00 As =0.00 As(r)=5.88
	Mu=0.00 As =17.34 As(r)=5.88			Mu=18.74 As =17.34 As(r)=13.77			Mu=0.00 As =17.34 As(r)=5.88	
Vu=11.70	Vu=13.84	Vu=15.98	Vu=-18.97	Vu=-11.31	Vu=16.14	Vu=-10.08	Vu=-9.54	Vu=-9.00

V-117 / N+3.20

B=0.20 H=0.45 L=1.98			B=0.20 H=0.45 L=3.15			B=0.20 H=0.45 L=3.20		
Mu=-0.18 As =0.00 As(r)=2.61		Mu=-9.51 As =10.14 As(r)=7.10	Mu=-11.90 As =10.14 As(r)=9.21		Mu=-2.98 As =5.70 As(r)=2.61	Mu=-1.87 As =5.70 As(r)=2.61		Mu=-7.47 As =5.70 As(r)=5.43
	Mu=0.00 As =5.70 As(r)=2.61			Mu=2.98 As =5.70 As(r)=2.61			Mu=4.47 As =5.70 As(r)=3.56	
Vu=2.72	Vu=4.35	Vu=6.15	Vu=-8.17	Vu=-4.75	Vu=-1.47	Vu=-1.03	Vu=3.48	Vu=6.76

B=0.20 H=0.45 L=0.80		
Mu=-2.64 As =5.70 As(r)=2.61		Mu=-0.32 As =0.00 As(r)=2.61
	Mu=0.00 As =5.70 As(r)=2.61	
Vu=-2.73	Vu=-2.37	Vu=-2.02

V-118 / N+3.20

B=0.45 H=0.45 L=1.98			B=0.45 H=0.45 L=6.40			B=0.45 H=0.45 L=0.80		
Mu=-0.05 As =0.00 As(r)=5.88		Mu=-15.83 As =22.97 As(r)=11.44	Mu=-27.01 As =22.97 As(r)=20.94		Mu=-19.59 As =14.25 As(r)=14.47	Mu=-4.53 As =14.25 As(r)=5.88		Mu=-0.00 As =0.00 As(r)=5.88
	Mu=0.00 As =9.90 As(r)=5.88			Mu=10.53 As =9.90 As(r)=7.40			Mu=0.00 As =9.90 As(r)=5.88	
Vu=5.17	Vu=7.35	Vu=9.53	Vu=-14.35	Vu=-6.95	Vu=12.23	Vu=-5.58	Vu=-4.72	Vu=-3.94

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

V-201/N+6.35

B=0.15 H=0.45 L=5.75			B=0.15 H=0.45 L=7.25			B=0.15 H=0.45 L=6.68		
Mu=-0.92 As =3.96 As(r)=1.96		Mu=-3.67 As =3.96 As(r)=2.58	Mu=-5.10 As =3.96 As(r)=3.68		Mu=-4.97 As =3.96 As(r)=3.57	Mu=-3.72 As =3.96 As(r)=2.62		Mu=-0.93 As =2.54 As(r)=1.96
	Mu=0.92 As =2.54 As(r)=1.96			Mu=5.13 As =2.54 As(r)=3.70			Mu=0.93 As =2.54 As(r)=1.96	
Vu=-0.47	Vu=0.70	Vu=1.26	Vu=-4.75	Vu=0.42	Vu=4.74	Vu=-1.24	Vu=-0.57	Vu=0.58

B=0.15 H=0.45 L=6.87			B=0.15 H=0.45 L=6.90		
Mu=-0.95 As =2.54 As(r)=1.96		Mu=-1.26 As =2.54 As(r)=1.96	Mu=-1.47 As =2.54 As(r)=1.96		Mu=-1.20 As =2.54 As(r)=1.96
	Mu=0.57 As =2.54 As(r)=1.96			Mu=0.54 As =2.54 As(r)=1.96	
Vu=-0.78	Vu=0.16	Vu=0.84	Vu=-0.90	Vu=-0.22	Vu=0.78

V-202/N+6.35

B=0.30 H=0.45 L=5.45			B=0.30 H=0.45 L=7.05			B=0.30 H=0.45 L=6.48		
Mu=-3.87 As =5.94 As(r)=3.92		Mu=-6.94 As =17.90 As(r)=4.87	Mu=-21.78 As =17.90 As(r)=17.63		Mu=-20.38 As =15.21 As(r)=16.22	Mu=-7.29 As =15.21 As(r)=5.13		Mu=-3.08 As =5.94 As(r)=3.92
	Mu=1.74 As =3.81 As(r)=3.92			Mu=14.60 As =3.81 As(r)=10.94			Mu=1.82 As =4.07 As(r)=3.92	
Vu=-1.71	Vu=1.58	Vu=2.71	Vu=-16.45	Vu=1.84	Vu=15.68	Vu=-2.71	Vu=-1.38	Vu=1.47

B=0.30 H=0.45 L=6.67			B=0.30 H=0.45 L=6.60		
Mu=-4.05 As =5.94 As(r)=3.92		Mu=-3.78 As =5.23 As(r)=3.92	Mu=-4.23 As =5.23 As(r)=3.92		Mu=-4.39 As =3.81 As(r)=3.92
	Mu=1.01 As =8.66 As(r)=3.92			Mu=1.10 As =10.09 As(r)=3.92	
Vu=-2.07	Vu=-0.70	Vu=2.00	Vu=-2.08	Vu=0.73	Vu=2.09

V-203/N+6.35

B=0.30 H=0.45 L=7.25		
Mu=-8.12 As =5.23 As(r)=5.75		Mu=-8.93 As =5.94 As(r)=6.36
	Mu=12.23 As =9.74 As(r)=8.97	
Vu=-9.62	Vu=-0.25	Vu=10.19

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

V-204/N+6.35

B=0.30 H=0.45 L=1.65			B=0.30 H=0.45 L=2.63			B=0.30 H=0.45 L=5.45		
Mu=-0.05 As =0.00 As(r)=3.92		Mu=-1.86 As =5.23 As(r)=3.92	Mu=-6.03 As =5.23 As(r)=4.20		Mu=-4.34 As =5.23 As(r)=3.92	Mu=-3.97 As =5.23 As(r)=3.92		Mu=-4.32 As =5.23 As(r)=3.92
	Mu=0.00 As =3.81 As(r)=3.92			Mu=1.51 As =3.81 As(r)=3.92			Mu=1.08 As =6.35 As(r)=3.92	
Vu=0.63	Vu=0.98	Vu=1.35	Vu=-4.26	Vu=-3.67	Vu=3.21	Vu=-2.05	Vu=0.99	Vu=2.12

B=0.30 H=0.45 L=7.05			B=0.30 H=0.45 L=6.48			B=0.30 H=0.45 L=6.67		
Mu=-3.99 As =5.23 As(r)=3.92		Mu=-3.87 As =5.23 As(r)=3.92	Mu=-4.65 As =5.23 As(r)=3.92		Mu=-3.95 As =5.23 As(r)=3.92	Mu=-4.24 As =5.23 As(r)=3.92		Mu=-4.07 As =5.23 As(r)=3.92
	Mu=1.24 As =3.81 As(r)=3.92			Mu=1.16 As =3.81 As(r)=3.92			Mu=1.06 As =3.81 As(r)=3.92	
Vu=-2.08	Vu=-0.64	Vu=2.05	Vu=-2.18	Vu=-0.85	Vu=1.97	Vu=-2.11	Vu=-0.74	Vu=2.06

B=0.30 H=0.45 L=6.60		
Mu=-4.03 As =5.23 As(r)=3.92		Mu=-5.06 As =5.23 As(r)=3.92
	Mu=1.27 As =3.81 As(r)=3.92	
Vu=-2.01	Vu=0.91	Vu=2.26

V-205/N+6.35

B=0.15 H=0.45 L=1.75			B=0.15 H=0.45 L=2.68			B=0.15 H=0.45 L=5.75		
Mu=-0.04 As =0.00 As(r)=1.96		Mu=-0.65 As =2.54 As(r)=1.96	Mu=-0.86 As =2.54 As(r)=1.96		Mu=-0.65 As =2.54 As(r)=1.96	Mu=-0.64 As =2.54 As(r)=1.96		Mu=-1.19 As =2.54 As(r)=1.96
	Mu=0.04 As =2.54 As(r)=1.96			Mu=0.22 As =2.54 As(r)=1.96			Mu=0.30 As =2.54 As(r)=1.96	
Vu=0.16	Vu=0.34	Vu=0.51	Vu=-0.55	Vu=0.31	Vu=0.61	Vu=-0.60	Vu=0.19	Vu=0.75

B=0.15 H=0.45 L=7.25			B=0.15 H=0.45 L=6.68			B=0.15 H=0.45 L=6.87		
Mu=-1.06 As =2.54 As(r)=1.96		Mu=-1.16 As =2.54 As(r)=1.96	Mu=-1.30 As =2.54 As(r)=1.96		Mu=-0.91 As =2.54 As(r)=1.96	Mu=-0.99 As =2.54 As(r)=1.96		Mu=-1.07 As =2.54 As(r)=1.96
	Mu=0.60 As =2.54 As(r)=1.96			Mu=0.40 As =2.54 As(r)=1.96			Mu=0.51 As =2.54 As(r)=1.96	
Vu=-0.83	Vu=0.08	Vu=0.86	Vu=-0.81	Vu=-0.14	Vu=0.75	Vu=-0.79	Vu=0.09	Vu=0.81

B=0.15 H=0.45 L=6.90		
Mu=-1.12 As =2.54 As(r)=1.96		Mu=-1.04 As =2.54 As(r)=1.96
	Mu=0.62 As =2.54 As(r)=1.96	
Vu=-0.84	Vu=-0.14	Vu=0.76

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

V-206/N+6.35

B=0.15 H=0.45 L=1.83		
Mu=-0.16 As =2.54 As(r)=1.96		Mu=-0.66 As =2.54 As(r)=1.96
	Mu=0.16 As =2.54 As(r)=1.96	
Vu=-0.16	Vu=0.33	Vu=0.63

V-207/N+6.35

B=0.30 H=0.45 L=1.98		
Mu=-0.04 As =0.00 As(r)=3.92		Mu=-4.50 As =5.23 As(r)=3.92
	Mu=0.00 As =5.23 As(r)=3.92	
Vu=1.07	Vu=2.14	Vu=3.21

V-208/N+6.35

B=0.30 H=0.45 L=1.98			B=0.30 H=0.45 L=6.40			B=0.30 H=0.45 L=0.80		
Mu=-0.04 As =0.00 As(r)=3.92		Mu=-5.00 As =14.02 As(r)=3.92	Mu=-16.51 As =14.02 As(r)=12.60		Mu=-9.27 As =7.68 As(r)=6.63	Mu=-0.91 As =7.68 As(r)=3.92		Mu=-0.03 As =0.00 As(r)=3.92
	Mu=0.00 As =5.94 As(r)=3.92			Mu=4.13 As =5.94 As(r)=3.92			Mu=0.00 As =5.94 As(r)=3.92	
Vu=1.03	Vu=2.32	Vu=3.64	Vu=-7.22	Vu=-3.61	Vu=5.08	Vu=-1.44	Vu=-0.93	Vu=-0.47

V-209/N+6.35

B=0.30 H=0.45 L=1.98			B=0.30 H=0.45 L=6.40			B=0.30 H=0.45 L=0.80		
Mu=-0.02 As =0.00 As(r)=3.92		Mu=-6.75 As =18.34 As(r)=4.73	Mu=-21.45 As =18.34 As(r)=17.29		Mu=-15.91 As =11.64 As(r)=12.08	Mu=-6.32 As =11.64 As(r)=4.42		Mu=-0.00 As =0.00 As(r)=3.92
	Mu=0.00 As =8.55 As(r)=3.92			Mu=11.32 As =8.55 As(r)=8.23			Mu=0.00 As =8.55 As(r)=3.92	
Vu=1.55	Vu=3.13	Vu=4.87	Vu=-11.27	Vu=-6.37	Vu=11.53	Vu=-7.60	Vu=-6.79	Vu=-5.98

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

V-209A/N+6.35

B=0.25 H=0.45 L=2.98			B=0.25 H=0.45 L=0.87		
Mu=-0.05 As =3.81 As(r)=3.27		Mu=-3.70 As =3.81 As(r)=3.27	Mu=-0.59 As =3.81 As(r)=3.27		Mu=-0.59 As =0.00 As(r)=3.27
Mu=6.05 As =5.23 As(r)=4.37			Mu=0.29 As =5.23 As(r)=3.27		
Vu=-4.55	Vu=1.54	Vu=7.63	Vu=-0.52	Vu=0.81	Vu=1.33

V-210/N+6.35

B=0.30 H=0.45 L=1.98			B=0.30 H=0.45 L=6.40			B=0.30 H=0.45 L=0.80		
Mu=-0.03 As =0.00 As(r)=3.92		Mu=-7.09 As =15.21 As(r)=4.98	Mu=-19.46 As =15.21 As(r)=15.33		Mu=-14.82 As =11.64 As(r)=11.12	Mu=-6.45 As =11.64 As(r)=4.51		Mu=-0.00 As =0.00 As(r)=3.92
Mu=0.00 As =8.55 As(r)=3.92			Mu=11.09 As =8.55 As(r)=8.05			Mu=0.00 As =8.55 As(r)=3.92		
Vu=1.66	Vu=3.29	Vu=5.10	Vu=-10.85	Vu=-5.64	Vu=11.78	Vu=-7.67	Vu=-6.83	Vu=-5.98

V-211/N+6.35

B=0.30 H=0.45 L=1.98			B=0.30 H=0.45 L=6.40			B=0.30 H=0.45 L=0.80		
Mu=-0.00 As =0.00 As(r)=3.92		Mu=-6.53 As =10.61 As(r)=4.57	Mu=-13.80 As =10.61 As(r)=10.26		Mu=-8.31 As =5.94 As(r)=5.89	Mu=-1.94 As =5.94 As(r)=3.92		Mu=-0.00 As =0.00 As(r)=3.92
Mu=0.00 As =5.23 As(r)=3.92			Mu=3.45 As =5.23 As(r)=3.92			Mu=0.00 As =5.23 As(r)=3.92		
Vu=1.53	Vu=3.05	Vu=4.83	Vu=-7.35	Vu=-2.35	Vu=5.76	Vu=-2.61	Vu=-1.98	Vu=-1.36

V-212/N+6.35

B=0.30 H=0.45 L=1.98			B=0.30 H=0.45 L=6.40			B=0.30 H=0.45 L=0.80		
Mu=-0.00 As =0.00 As(r)=3.92		Mu=-6.85 As =10.61 As(r)=4.80	Mu=-13.46 As =10.61 As(r)=9.98		Mu=-8.72 As =5.94 As(r)=6.21	Mu=-2.25 As =5.94 As(r)=3.92		Mu=-0.00 As =0.00 As(r)=3.92
Mu=0.00 As =5.23 As(r)=3.92			Mu=3.37 As =5.23 As(r)=3.92			Mu=0.00 As =5.23 As(r)=3.92		
Vu=1.64	Vu=3.20	Vu=4.99	Vu=-7.25	Vu=-2.23	Vu=5.88	Vu=-3.13	Vu=-2.31	Vu=-1.67

V-213/N+6.35

B=0.30 H=0.45 L=1.98			B=0.30 H=0.45 L=6.40			B=0.30 H=0.45 L=0.80		
Mu=-0.05 As =0.00 As(r)=3.92		Mu=-4.23 As =8.55 As(r)=3.92	Mu=-11.75 As =8.55 As(r)=8.58		Mu=-7.62 As =5.94 As(r)=5.38	Mu=-1.30 As =5.94 As(r)=3.92		Mu=-0.02 As =0.00 As(r)=3.92
Mu=0.00 As =5.23 As(r)=3.92			Mu=2.94 As =5.23 As(r)=3.92			Mu=0.00 As =5.23 As(r)=3.92		
Vu=0.76	Vu=1.95	Vu=3.25	Vu=-5.96	Vu=-2.15	Vu=4.76	Vu=-1.86	Vu=-1.32	Vu=-0.78

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN, IPIALES (NARIÑO)

Columnas A-1, B-1, B-2, D-2, E-1, E-2, F-1, F-2, G-1, G-2

Nivel	H Libre	Losa	B	H	M1	M2	P	V1	V2	Cuantia	m/mr	Col/Vig Eje ppal	Col/vig Eje sec
N+6.35					-6.28	-4.77				12/#6 #7 (1.5%)	0.28	2.68	4.66
	2.70	.45	.50	.50			-10.84	3.63	3.55				
					5.22	6.09				12/#6 #7 (1.5%)	0.29		
N+3.20					-10.00	-9.23				12/#6 #7 (1.5%)	0.47	2.57	4.41
	2.75	.45	.50	.50			-33.45	7.97	9.69				
		1.00			-5.52	-25.24				12/#6 #7 (1.5%)	0.81		

Columnas C-1, C-2

Nivel	H Libre	Losa	B	H	M1	M2	P	V1	V2	Cuantia	m/mr	Col/Vig Eje ppal	Col/vig Eje sec
N+6.35					6.79	17.29				12/#8 #7 (2.2%)	0.51	3.70	1.40
	2.70	.45	.50	.50			-17.11	6.01	9.51				
					-6.67	-12.73				12/#8 #7 (2.2%)	0.41		
N+3.20					12.75	1.85				12/#8 #7 (2.2%)	0.32	2.09	1.52
	2.75	.45	.50	.50			-74.58	9.34	10.26				
		1.00			-7.73	-25.93				12/#8 #7 (2.2%)	0.74		

Columna D-1

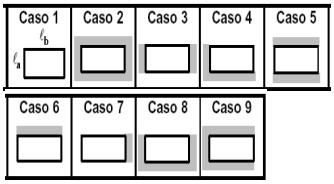
Nivel	H Libre	Losa	B	H	M1	M2	P	V1	V2	Cuantia	m/mr	Col/Vig Eje ppal	Col/vig Eje sec
N+6.35					-0.59	15.35				12/#8 #7 (2.2%)	0.38	3.71	1.54
	2.70	.45	.50	.50			-18.24	5.12	8.18				
					0.43	-10.51				12/#8 #7 (2.2%)	0.26		
N+3.20					-10.37	-3.98				12/#8 #7 (2.2%)	0.31	1.98	1.49
	2.75	.45	.50	.50			-83.21	8.14	8.56				
		1.00			-5.55	-21.56				12/#8 #7 (2.2%)	0.60		

6. DISEÑO DE ELEMENTOS COMPLEMENTARIOS

DISEÑO DE ELEMENTOS
COMPLEMENTARIOS

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN, IPIALES (NARIÑO)
DISEÑO PLACA MACIZA CORREDORES

El diseño de la placa maciza se realiza de acuerdo con lo establecido en C.13.9 de las NSR - 10



Geometría de la losa

la =	**1.83**	m	fy =	**420**	MPa
lb =	**3.48**	m	f'c =	**21.1**	MPa
Relación m =	**0.53**				

Espesor escogido: **0.10** **m**

Teniendo en cuenta que la relación m es mayor de 0.5, la placa maciza trabaja en dos direcciones

Cargas

Peso propio de la losa	0.1x1.0x24	2.40	kN/m²
Acabados	0.05x20	1.00	kN/m²
Impermeabilización	20x0.05	1.00	kN/m²
Carga Muerta Total		4.40	kN/m²
Carga Viva		5.00	kN/m²
Carga Última		13.28	kN/m²

Tipo de soporte CASO Nº 8

DISEÑO A MOMENTO FLECTOR

Coeficientes para momento positivo por carga muerta y viva:

C_{aD} =	0.056
C_{bD} =	0.004
C_{aV} =	0.076
C_{bV} =	0.005

Mua =	**2.10**	kN.m	*Cuantía:*	0.0020	*As =*	1.40	cm²/m
Mu_b =	**0.52**	kN.m	*Cuantía:*	0.0020	*As =*	1.40	cm²/m

Coeficientes para momento negativo por carga última:

C_a =	0.089	Mu_a =	**3.96**	kN.m	*Cuantía:*	0.0020	*As =*	1.40	cm²/m
C_b =	0.010	Mu_b =	**1.61**	kN.m	*Cuantía:*	0.0020	*As =*	1.40	cm²/m

Distribución de refuerzo inferior:

Sentido La *1#3c/0.2*

Sentido Lb *1#3c/0.2*

REVISIÓN A CORTANTE

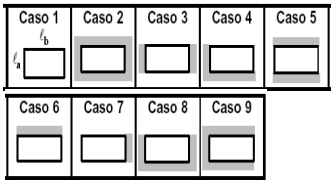
Coeficientes de relación de carga en las dos direcciones para cortante:

W_a =	0.89
W_b =	0.11

ϕvc =	**0.574**	**MPa**	
ϕvu_a =	**0.206**	**MPa**	**OK**
ϕvu_b =	**0.013**	**MPa**	**OK**

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN, IPIALES (NARIÑO)
DISEÑO PLACA MACIZA SALONES

El diseño de la placa maciza se realiza de acuerdo con lo establecido en C.13.9 de las NSR - 10



Geometría de la losa

la =	**3.20**	m	fy =	**420**	MPa
lb =	**3.48**	m	f'c =	**21.1**	MPa
Relación m =	**0.92**				

Espesor escogido: **0.10** **m**

Teniendo en cuenta que la relación m es mayor de 0.5, la placa maciza trabaja en dos direcciones

Cargas

Peso propio de la losa	0.1x1.0x24	2.40	kN/m²
Acabados	0.05x20	1.00	kN/m²
Muros divisorios		2.00	kN/m²
Impermeabilización	20x0.05	1.00	kN/m²
Carga Muerta Total		6.40	kN/m²
Carga Viva		2.00	kN/m²
Carga Última		10.88	kN/m²

Tipo de soporte CASO Nº 2

DISEÑO A MOMENTO FLECTOR

Coeficientes para momento positivo por carga muerta y viva:

C_{aD} =	0.020
C_{bD} =	0.014
C_{aV} =	0.034
C_{bV} =	0.022

Mua =	**2.01**	kN.m	*Cuantía:*	0.0020	*As =*	1.40 cm²/m
Mu_b =	**1.62**	kN.m	*Cuantía:*	0.0020	*As =*	1.40 cm²/m

Coeficientes para momento negativo por carga última:

C_a =	0.055	Mu_a =	**6.13**	kN.m	*Cuantía:*	0.0031	*As =*	2.16 cm²/m
C_b =	0.037	Mu_b =	**4.88**	kN.m	*Cuantía:*	0.0024	*As =*	1.71 cm²/m

Distribución de refuerzo inferior:

Sentido La *1#3c/0.2*

Sentido Lb *1#3c/0.2*

REVISIÓN A CORTANTE

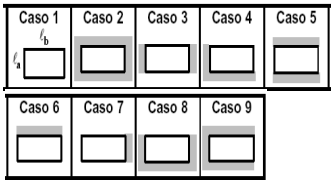
Coeficientes de relación de carga en las dos direcciones para cortante:

W_a =	0.60
W_b =	0.40

$\phi v c$ =	**0.574**	**MPa**	
$\phi v u_a$ =	**0.114**	**MPa**	**OK**
$\phi v u_b$ =	**0.070**	**MPa**	**OK**

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN, IPIALES (NARIÑO)
DISEÑO PLACA MACIZA TANQUES

El diseño de la placa maciza se realiza de acuerdo con lo establecido en C.13.9 de las NSR - 10



Geometría de la losa

la =	**2.98**	m	fy =	**420**	MPa
lb =	**4.10**	m	f'c =	**21.1**	MPa
Relación m =	**0.73**				

Espesor escogido: **0.15** **m**

Teniendo en cuenta que la relación m es mayor de 0.5, la placa maciza trabaja en dos direcciones

Cargas

Peso propio de la losa	0.15x1.0x24	3.60	kN/m²
Acabados	0.05x20	1.00	kN/m²
Impermeabilización	20x0.05	1.00	kN/m²
Tanques		5.00	kN/m²
Carga Muerta Total		10.60	kN/m²
Carga Viva		1.80	kN/m²
Carga Última		15.60	kN/m²

Tipo de soporte CASO Nº 8

DISEÑO A MOMENTO FLECTOR

Coeficientes para momento positivo por carga muerta y viva:

C_{aD} =	0.040
C_{bD} =	0.011
C_{aV} =	0.054
C_{bV} =	0.014

Mua =	**4.63**	kN.m	*Cuantía:*	0.0020	*As =*	2.40	cm²/m
Mu_b =	**2.38**	kN.m	*Cuantía:*	0.0020	*As =*	2.40	cm²/m

Coeficientes para momento negativo por carga última:

C_a =	0.068	Mu_a =	**9.42**	kN.m	*Cuantía:*	0.0020	*As =*	2.40 cm²/m
C_b =	0.029	Mu_b =	**7.60**	kN.m	*Cuantía:*	0.0020	*As =*	2.40 cm²/m

Distribución de refuerzo inferior:

Sentido La *1#3c/0.2*

Sentido Lb *1#3c/0.2*

Distribución de refuerzo superior:

Sentido La *1#3c/0.2*

Sentido Lb *1#3c/0.2*

REVISIÓN A CORTANTE

Coeficientes de relación de carga en las dos direcciones para cortante:

W_a =	0.68		
W_b =	0.32		
$\phi v c$ =	**0.574**	**MPa**	
$\phi v u_a$ =	**0.145**	**MPa**	**OK**
$\phi v u_b$ =	**0.050**	**MPa**	**OK**

Elementos calculados con el programa de diseño Arquimet 2.0 de ACESCO

REPORTE DE CORREAS

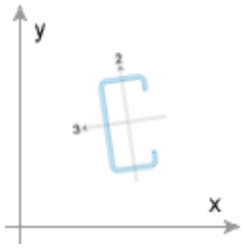
PHR C con atiesador 254 x 67 x 18 (3.00 mm)
con Fy = 35.15 Kgf/mm² cada 1.70 m con arriostramiento cada L/3.

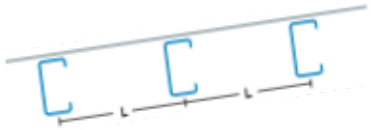
SECCION LONGITUDINAL

L1	7.15 m
A1	0.15 m
A2	0.15 m

CONFIGURACION	
TIPO DE CARGA	DISTRIBUIDA
Carga muerta	0.40 KN/m²
Peso propio correa	0.09 KN/m
Carga viva	0.50 KN/m²
Carga granizo	0.50 KN/m²
Viento compresión (Perpendicular)	0.40 KN/m²
Viento succión (Perpendicular)	0.40 KN/m²
Pendiente sección transversal	8.531° = 15.0000%

SECCION TRANSVERSAL





L = 1.70 m

Elementos calculados con el programa de diseño Arquimet 2.0 de ACESCO

REPORTES DE DISEÑO

REPORTE FLEXION				
	Apoyos		Interiores	
Ejes locales	3	2	3	2
Resistente (KN.m)	27.4497	3.4275	19.3937	3.5792
Calculado (KN.m)	7.7955E-06	4.6926E-08	17.3404	0.2010

REPORTE CORTANTE		
Ejes locales	2	3
Resistente (KN)	99.2653	60.1292
Calculado (KN)	9.4772	0.3956

REPORTE DEFLEXION		
Deflexiones máximas	Instantanea	Permanente
Admisible (m)	0.0270	0.0000
Calculado (m)	0.0141	0.0000

COMBINACIONES DE CARGA					
No	Muerta	Viva	Granizo	Viento compresión	Viento succión
1	1.4000	0.0000	0.0000	0.0000	0.0000
2	1.2000	0.5000	0.0000	0.0000	0.0000
3	1.2000	0.0000	0.5000	0.0000	0.0000
4	1.2000	1.6000	0.0000	0.5000	0.0000
5	1.2000	0.0000	1.6000	0.5000	0.0000
6	1.2000	1.6000	0.0000	0.0000	0.5000
7	1.2000	0.0000	1.6000	0.0000	0.5000
8	1.2000	0.5000	0.0000	0.0000	1.0000
9	1.2000	0.0000	0.5000	0.0000	1.0000
10	1.2000	0.5000	0.0000	1.0000	0.0000
11	1.2000	0.0000	0.5000	1.0000	0.0000
12	0.9000	0.0000	0.0000	0.0000	1.0000
13	0.9000	0.0000	0.0000	1.0000	0.0000

REACCIONES - EJES GLOBALES (KN-m)

Elementos calculados con el programa de diseño Arquimet 2.0 de ACESCO

APOYO 1		
Combinacion	Rx	Ry
Muerta	-0.3038	2.7786
Viva de Cub.	-0.3338	3.0524
Granizo	-0.3338	3.0524
Viento Comp.	-0.3682	2.4545
Viento Succion	0.3682	-2.4545
Comb. 1	-0.4254	3.8901
Comb. 2	-0.5315	4.8606
Comb. 3	-0.5315	4.8606
Comb. 4	-1.0827	9.4455
Comb. 5	-1.0827	9.4455
Comb. 6	-1.0827	9.4455
Comb. 7	-1.0827	9.4455
Comb. 8	-0.8997	7.3151
Comb. 9	-0.8997	7.3151
Comb. 10	-0.8997	7.3151
Comb. 11	-0.8997	7.3151
Comb. 12	-0.6416	4.9553
Comb. 13	-0.6416	4.9553

APOYO 2		
Combinacion	Rx	Ry
Muerta	-0.3038	2.7786
Viva de Cub.	-0.3338	3.0524
Granizo	-0.3338	3.0524
Viento Comp.	-0.3682	2.4545
Viento Succion	0.3682	-2.4545
Comb. 1	-0.4254	3.8901
Comb. 2	-0.5315	4.8606
Comb. 3	-0.5315	4.8606
Comb. 4	-1.0827	9.4455
Comb. 5	-1.0827	9.4455
Comb. 6	-1.0827	9.4455
Comb. 7	-1.0827	9.4455
Comb. 8	-0.8997	7.3151
Comb. 9	-0.8997	7.3151
Comb. 10	-0.8997	7.3151
Comb. 11	-0.8997	7.3151
Comb. 12	-0.6416	4.9553
Comb. 13	-0.6416	4.9553

FUERZAS INTERNAS - EJES LOCALES (KN-m)

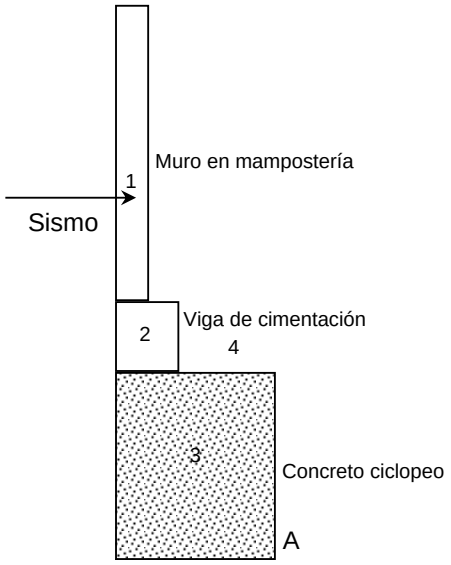
Elementos calculados con el programa de diseño Arquimet 2.0 de ACESCO

APOYO 1				
Combinacion	R2	R3	M2	M3
Muerta	0.1117	2.7929	-1.4365E-08	-2.8347E-06
Viva de Cub.	0.1227	3.0682	0.0000	-2.9497E-06
Granizo	0.1227	3.0682	0.0000	-2.9497E-06
Viento Comp.	0.0000	2.4820	0.0000	6.5122E-07
Viento Succion	0.0000	2.4820	0.0000	6.5122E-07
Comb. 1	0.1564	3.9101	-2.0111E-08	-3.9686E-06
Comb. 2	0.1954	4.8856	-1.7238E-08	-4.8765E-06
Comb. 3	0.1954	4.8856	-1.7238E-08	-4.8765E-06
Comb. 4	0.3304	9.5016	-1.7238E-08	-7.7955E-06
Comb. 5	0.3304	9.5016	-1.7238E-08	-7.7955E-06
Comb. 6	0.3304	9.5016	-1.7238E-08	-7.7955E-06
Comb. 7	0.3304	9.5016	-1.7238E-08	-7.7955E-06
Comb. 8	0.1954	7.3676	-1.7238E-08	-4.2253E-06
Comb. 9	0.1954	7.3676	-1.7238E-08	-4.2253E-06
Comb. 10	0.1954	7.3676	-1.7238E-08	-4.2253E-06
Comb. 11	0.1954	7.3676	-1.7238E-08	-4.2253E-06
Comb. 12	0.1005	4.9957	-1.2929E-08	-1.9000E-06
Comb. 13	0.1005	4.9957	-1.2929E-08	-1.9000E-06

APOYO 2				
Combinacion	R2	R3	M2	M3
Muerta	0.1117	2.7929	3.3519E-08	9.1937E-07
Viva de Cub.	0.1227	3.0682	-1.9154E-08	2.7581E-06
Granizo	0.1227	3.0682	-1.9154E-08	2.7581E-06
Viento Comp.	0.0000	2.4820	0.0000	3.3710E-06
Viento Succion	0.0000	2.4820	0.0000	3.3710E-06
Comb. 1	0.1564	3.9101	4.6926E-08	1.2871E-06
Comb. 2	0.1954	4.8856	3.0646E-08	2.4823E-06
Comb. 3	0.1954	4.8856	3.0646E-08	2.4823E-06
Comb. 4	0.3304	9.5016	9.5768E-09	7.2018E-06
Comb. 5	0.3304	9.5016	9.5768E-09	7.2018E-06
Comb. 6	0.3304	9.5016	9.5768E-09	7.2018E-06
Comb. 7	0.3304	9.5016	9.5768E-09	7.2018E-06
Comb. 8	0.1954	7.3676	3.0646E-08	5.8533E-06
Comb. 9	0.1954	7.3676	3.0646E-08	5.8533E-06
Comb. 10	0.1954	7.3676	3.0646E-08	5.8533E-06
Comb. 11	0.1954	7.3676	3.0646E-08	5.8533E-06
Comb. 12	0.1005	4.9957	3.0167E-08	4.1985E-06
Comb. 13	0.1005	4.9957	3.0167E-08	4.1985E-06

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN

ESTABILIDAD DE MUROS



Momento estabilizante

1 Muro:	H=	2.50	e=	0.12
2 Viga:	H=	0.30	b=	0.30
3 Ciclopeo:	H=	0.70	b=	0.90
4 suelo=	H=	0.30	b=	0.60

Pmuro=	**0.720**	**Ton**	Brazo 1=	**0.840**
Pviga=	**0.216**	**Ton**	Brazo 2=	**0.750**
Pciclopeo=	**1.260**	**Ton**	Brazo 3=	**0.450**
Psuelo=	**0.324**	**Ton**	Brazo 4=	**0.300**

M_{Muro}=	**0.605**	**Ton.m**
M_{Viga}=	**0.162**	**Ton.m**
$M_{Ciclopeo}$=	**0.567**	**Ton.m**
M_{Suelo}=	**0.097**	**Ton.m**
M_{Total}=	**1.431**	**Ton.m**

Momento desestabilizante

P_{Muro}=	**0.72**	**Ton**	Sismo = 2.5AaP/1.4 =	Aa=	0.30	Sismo = **0.386**
Brazo =	**2.25**	**m**	Momento sismico =	**0.8679**	**Ton.m**	

F.S.V. = 1.649 ***OK***

Chequeo esfuerzo del suelo

σ_{adm}=	0.195	MPa	
σ_{neto}=	0.024	Mpa	**OK**

PROYECTO: I.E. SAN JUAN
DISEÑO MIEMBROS ENSAMBLADOS

MATERIALES

Acero	A-36	
f_y =	252	N/mm^2
F_u =	400	N/mm^2

CARGAS

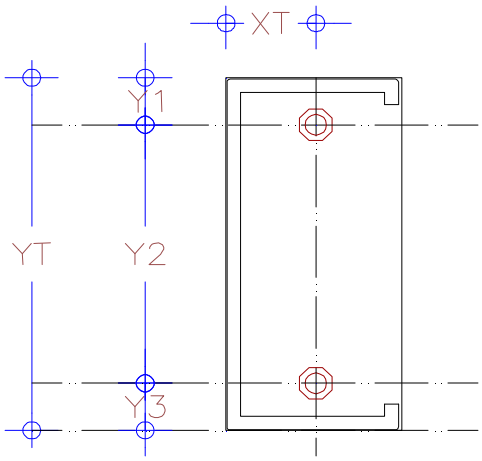
V = 4.66 KN

Pernos Φ = 6.35 mm
Agujeros Φ = 9.5 mm

Espesor platina = 6.35 mm

DATOS DEL ELEMENTO

X1 =	55	mm
t =	25	mm
XT =	55	mm
Y1 =	55	mm
Y2 =	245	mm
Y3 =	55	mm
YT =	355	mm
A_g =	1905	mm^2
A_e =	1754	mm^2



FLUENCIA EN LA SECCIÓN BRUTA

Se debe cumplir:

$P_u < 0.90\ F_y\ A_g$

Pu < 432 kN
OK

$A_{g\ Diseño}$ = 21 mm^2
OK

FRACTURA EN LA SECCIÓN EFECTIVA

Se debe cumplir:

$P_u < 0.75\ F_u\ A_e$

Pu < 526 kN
OK

$A_{e\ Diseño}$ = 16 mm^2
OK

Resistencia al desgarre de un bloque por tensión y cortante

A_{nv} =	1754	mm^2
A_{nt} =	320	mm^2
$F_u\ A_{nt}$ =	-	KN
$0.6\ F_u\ A_{nv}$ =	421	KN

Para el analisis se supone riesgo de falla por bloque, con base en dos estados limites definidos asi:

Si $F_u\ A_{nt} > 0.6\ F_u\ A_{nv}$ entonces; $P_u = \Phi\ [0.6\ F_y\ A_{gv} + F_u\ A_{nt}]$

Si $0.6\ F_u\ A_{nv} > F_u\ A_{nv}$ entonces; $P_u = \Phi\ [0.6\ F_u\ A_{nv} + F_y\ A_{gt}]$

Fractura de la sección neta a tensión y fluencia de la sección bruta a corte.

A_{gv} =	2254.25	mm^2
A_{gt} =	349.25	mm^2

Por lo tanto,

P_u = 352 kN

OK

PROYECTO: I.E SAN JUAN
CÁLCULO DE DEFLEXIONES

VIGA CON APOYOS CONTINUOS

Las deflexiones inmediatas se calcularán por las fórmulas de la teoría de la elasticidad considerando los efectos que tienen la fisuración y el refuerzo sobre la rigidez de la viga; las deflexiones adicionales deben determinarse multiplicando las deflexiones inmediatas causadas por la carga muerta por el factor λ de la NSR-10 Titulo C.9.5.2.5. En luces continuas el momento de inercia efectivo debe tomarse como el promedio de los valores del momento de inercia efectivo para la sección crítica del momento positivo y la seccion crítica de momento negativo.

MOMENTO POSITIVO

f'c=	**21.1**	**MPa**	h=	**45**	**cm**
fy=	**420**	**MPa**	d=	40	**cm**
			b=	**45**	**cm**

As=	**1250**	**mm²**	12.5 **cm²**
n=	**9.3**		
As'=	**1161**	**mm²**	11.61 **cm²**

DETERMINACIÓN DE LA PROFUNDIDAD DEL EJE NEUTRO

$$\frac{bx^2}{2}+(2n-1)As'(x\ -d')=nAs(d-x)$$

Donde:

n	Relación de módulos de elasticidad entre acero/concreto
b	Base de la sección
d	Altura efectiva de la sección
d'	Recubrimiento del refuerzo superior
x	Profundidad del eje neutro
As'	Área del acero a compresión (mm^2)
As	Área del acero a tracción (mm^2)

Luego:

n	**9.3**				
As'	**1161**	mm^2	(2n-1)A's =	20349.63	mm^2
As	**1250**	mm^2	nAs =	11579.80	mm^2
d'	**50**	mm	5	cm	

Profundidad del eje neutro:

x=	102.7	**mm**	10.27 **cm**

PROYECTO: I.E SAN JUAN
CÁLCULO DE DEFLEXIONES

MOMENTO DE INERCIA DE LA SECCION TRANSFORMADA FISURADA

$$\frac{bx^3}{3} + (2n-1)As'(x - d')^2 + nAs(d-x)^2$$

I cr= 124250.48 **cm^4** 0.00124 **m^4**

MOMENTO DE INERCIA SECCIÓN TOTAL DE CONCRETO

Ig= 341718.75 **cm^4** 0.00342 **m^4**
Yt= 34.73 **cm**

Mcr= $\dfrac{frIg}{Y_t}$ $fr = 0.7\sqrt{f'c}$

Mcr= 31.64 **kN-m**

Ma = Momento máximo presente en la viga

Ma= **40.0** **kN-m**

$$Ie = \left\{\frac{Mcr}{Ma}\right\}^3 * Ig + \left\{1 - \left\{\frac{Mcr}{Ma}\right\}^3\right\} * Icr$$

Ie= 231875.2 **cm^4** 23.188 ***OK***

MOMENTO NEGATIVO

f'c=	**21.1**	**MPa**	h=	**45**	**cm**
fy=	**420**	**MPa**	d=	40	**cm**
			b=	**40**	**cm**

As=	**3324** **mm^2**	33.24 **cm^2**
n=	**9.3**	
As'=	**1935** **mm^2**	19.35 **cm^2**

DETERMINACIÓN DE LA PROFUNDIDAD DEL EJE NEUTRO

$$\frac{bx^2}{2} + (2n-1)As'(x - d') = nAs(d-x)$$

Donde:

PROYECTO: I.E SAN JUAN
CÁLCULO DE DEFLEXIONES

n	Relación de módulos de elasticidad entre acero/concreto
b	Base de la sección
d	Altura efectiva de la sección
d'	Recubrimiento del refuerzo superior
x	Profundidad del eje neutro
As'	Área del acero a compresión (mm^2)
As	Área del acero a tracción (mm^2)

Luego:

n	**9.3**			
As'	**1935** mm^2	(2n-1)A's =	33916.05	mm^2
As	**3324** mm^2	nAs =	30792.99	mm^2
d'	**50** mm	5	cm	

Profundidad del eje neutro:

x= 149.6 **mm** 14.96 **cm**

MOMENTO DE INERCIA DE LA SECCION TRANSFORMADA FISURADA

$$\frac{bx^3}{3}+(2n-1)As'(x-d')^2+nAs(d-x)^2$$

I cr= 271357.61 **cm^4** 0.00271 **m^4**

MOMENTO DE INERCIA SECCIÓN TOTAL DE CONCRETO

Ig= 303750 **cm^4** 0.00304 **m^4**
Yt= 30.04 **cm**

Mcr= $\dfrac{frIg}{Y_t}$ $fr=0.7\sqrt{f'c}$

Mcr= 32.51 **kN-m**

Ma = Momento máximo presente en la viga

Ma= **36.8** **kN-m**

$$Ie=\left\{\frac{Mcr}{Ma}\right\}^3 *Ig+\left\{1-\left\{\frac{Mcr}{Ma}\right\}^3\right\}*Icr$$

Ie= 293742.1 **cm^4** 29.374 ***OK***

Según el numeral C.9.5.2.3. la inercia efectiva es igual al promedio de las secciones críticas:

PROYECTO: I.E SAN JUAN
CÁLCULO DE DEFLEXIONES

Ie= 262808.67 **cm^4** 26.281 **m^4**

DEFLEXIÓN ELÁSTICA INMEDIATA

$$\delta = \frac{5\,wl^4}{384\,EIg}$$

Donde:

δ	Deflexión elástica inmediata
w	Carga por metro lineal
l	Longitud de la viga
E	Módulo de elasticidad del concreto
Ig	Momento de la sección total

Luego:

w	**3.53 kN/m**
E	**21589 MPa**

δ= **0.0010 m**

DEFLEXIÓN INMEDIATA POR :

CARGA MUERTA 80%	0.001 m	0.084 mm
CARGA VIVA 20%	0.000 m	0.019 mm

DEFLEXIÓN ADICIONAL LARGO PLAZO (5 AÑOS O MAS)

La deflexión adicional a largo plazo causada por la retracción de fraguado y el flujo plástico, se determinará multiplicando la deflexión causada por la carga muerta por el factor λ.

$$\lambda = \frac{\xi}{1 + 50\,\rho'}$$

Donde:

ξ	Coeficientes de efectos de largo plazo. Según NSR- 10 Titulo C.9.5.2.5
ρ'	Cuantia del refuerzo a compresión

Luego:

ξ	2.0
ρ'	0.00680

λ= **1.493**

δ= **0.0012** m

PROYECTO: I.E SAN JUAN
CÁLCULO DE DEFLEXIONES

COMPARACION CON TABLA C.9-2 NSR 98
DEFLEXIONES MAXIMAS CALCULADAS PERMISIBLES

	L=	**6.40 m**	
DEFLEXION LIMITE	L/480	**0.0133 m**	
DEFLEXION LARGO PLAZO		**0.0013 m**	***OK***

7. DISEÑO DE ELEMENTOS NO ESTRUCTURALES

DISEÑO DE ELEMENTOS NO ESTRUCTURALES

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
DISEÑO DE ELEMENTOS NO ESTRUCTURALES

Units: kN*m

STORY DATA

Story	Height	Elevation	SimilarTo
N+6.35	3.15	6.35	None
N+3.20	3.20	3.20	None
BASE	0.00	0.00	None

CENTER MASS RIGIDITY

Story	Diaphragm	MassX	MassY	XCM	YCM	CumMassX	CumMassY
N+6.35	D1	100.2716	100.2716	18.112	3.329	100.2716	100.2716
N+3.20	D1	334.9958	334.9958	19.725	3.035	435.2674	435.2674

XCCM	YCCM	XCR	YCR
18.112	3.329	19.586	3.059
19.354	3.102	19.089	3.114

STORY SHEARS

Story	Load	Loc	P	VX	VY	T	MX	MY
N+6.35	SISDISX	Top	0	343.4	6.49	1073.919	0	0
N+6.35	SISDISX	Bottom	0	343.4	6.49	1073.919	20.434	1081.716
N+6.35	SISDISY	Top	0	15.15	385.78	7127.565	0	0
N+6.35	SISDISY	Bottom	0	15.15	385.78	7127.565	1215.209	47.733
N+3.20	SISDISX	Top	0	914.61	34.71	2718.44	20.434	1081.716
N+3.20	SISDISX	Bottom	0	914.61	34.71	2718.44	130.085	3946.52
N+3.20	SISDISY	Top	0	37.33	914.61	17849.777	1215.209	47.733
N+3.20	SISDISY	Bottom	0	37.33	914.61	17849.777	4042.172	166.811

$$F_p = \frac{a_x a_p}{R_p} gM_p \geq \frac{A_a I}{2} gM_p \qquad a_x = \frac{C_{vx} V_s}{m_x g} \leq 2 S_a \qquad C_{vx} = \frac{m_x h_x^k}{\sum_{i=1}^{n} (m_i h_i^k)}$$

g: 9.81 m/s^2
Sa: 1.125 s

$$V_s = S_a g M$$

Grupo de uso: III
Grado de desempeño: SUPERIOR

Grupo de Uso	Grado de desempeño
IV	SUPERIOR
III	SUPERIOR
II	BUENO
I	BAJO

Grado de desempeño de los elementos no estructurales: SUPERIOR

ANALISIS DE CARGAS PARA MUROS

Espesor de muros:	0.15	m
Espesor de pañete en una cara:	0	m
Densidad de mamposteria:	13	kN/m3
Densidad mortero de pañete:	21	kN/m3
Altura Fachada:	3.20	m
Carga	6.24	kN/m
Descripción:	mamposteria reforzada, separada lateralmente de la estructura, apoyada arriba y abajo	
ap:	1.0	
Rp:	6	

ANALISIS DE CARGAS PARA ANTEPECHOS

Espesor de muros:	0.15	m
Espesor de pañete en una cara:	0	m
Densidad de mamposteria:	13	kN/m3
Densidad mortero de pañete:	21	kN/m3
Altura Antepecho:	1	m
Carga	1.95	kN/m
Descripción:	mamposteria reforzada, separada lateralmente de la estructura, apoyada solo abajo	
ap:	2.5	
Rp:	6	

Sección de vigas verticales: 0.15x0.25 m
f'c = 21.1 MPa
fy = 420 MPa

DISEÑO PARA MUROS

Story	*Fx*	*Wx*	*ax*	*ap*	*Rp*	*Fp*	*M*	*V*
N+6.35	343.40	100.27	2.250	1.0	6	2.340	2.995	3.744
N+3.20	571.21	335.00	1.705	1.0	6	1.773	2.270	2.837

	Sección Vigas V.			*As. (cm2)*		*Separación column.*		*Fl. 1/4"*
Story	*b*	*d*	*ρ*	*neces.*	*ubicado*	*S max*	$S_{escogida}$	$S_{estribos}$
N+6.35	0.15	0.21	0.00109	0.34	0.71	2.06	2.10	0.188
N+3.20	0.15	0.21	0.00082	0.26	0.71	2.73	2.70	0.188

DISEÑO PARA ANTEPECHOS

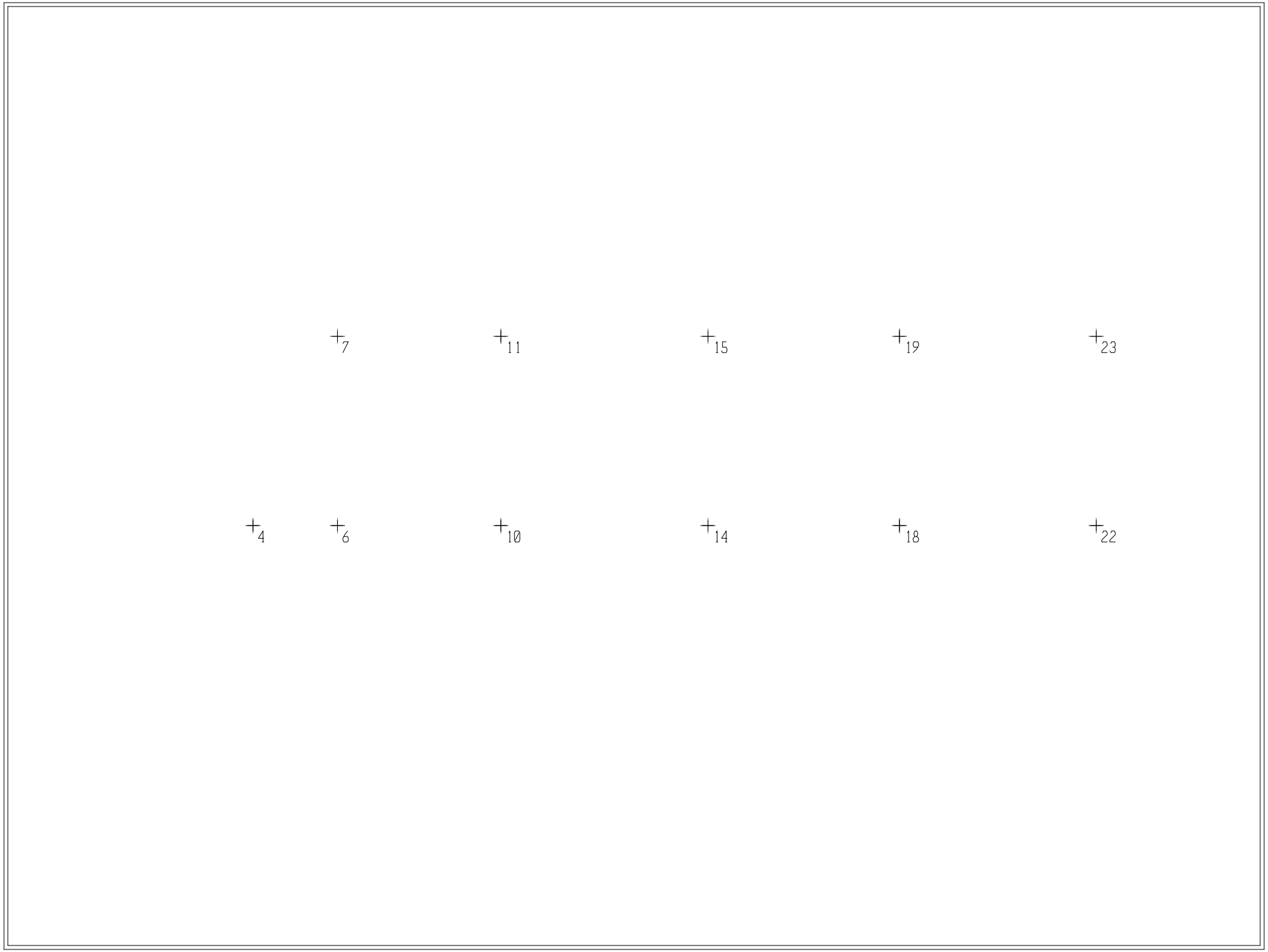
Story	*Fx*	*Wx*	*ax*	*ap*	*Rp*	*Fp*	*M*	*V*
N+6.35	343.40	100.27	2.250	2.5	6	5.850	7.488	9.360
N+3.20	571.21	335.00	1.705	2.5	6	4.433	5.675	7.093

	Sección columneta			*As. (cm2)*		*Separación column.*		*Fl. 1/4"*
Story	*b*	*d*	*ρ*	*neces.*	*ubicado*	*S max*	$S_{escogida}$	$S_{estribos}$
N+6.35	0.15	0.21	0.00279	0.88	1.29	1.47	1.50	0.188
N+3.20	0.15	0.21	0.00209	0.66	1.29	1.96	2.00	0.188

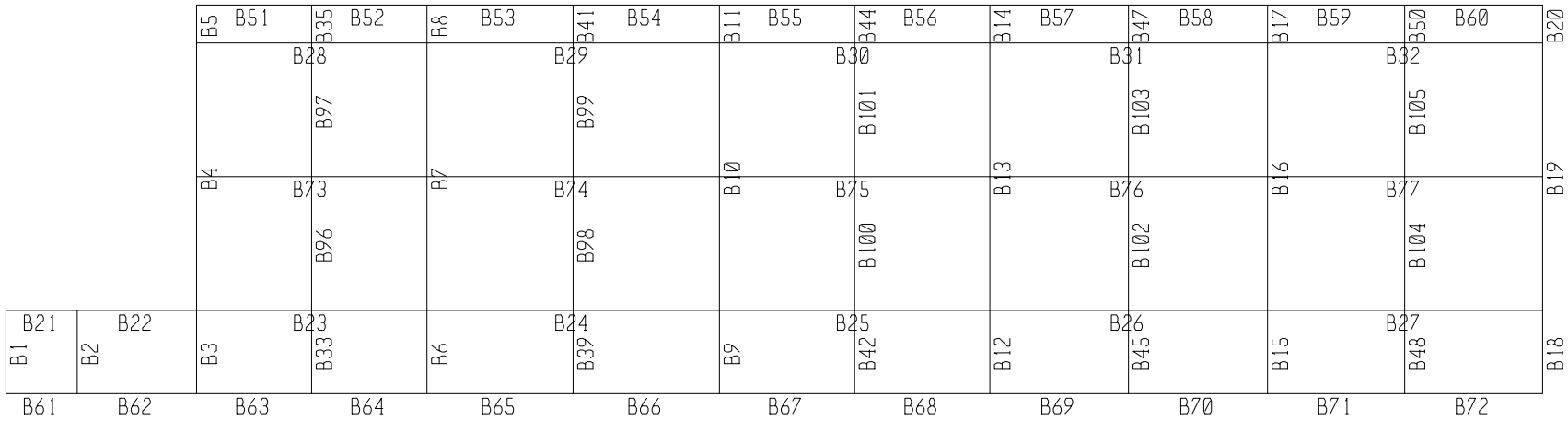
8. ANEXOS DE COMPUTADOR

ANEXOS DE COMPUTADOR

ETABS



ETABS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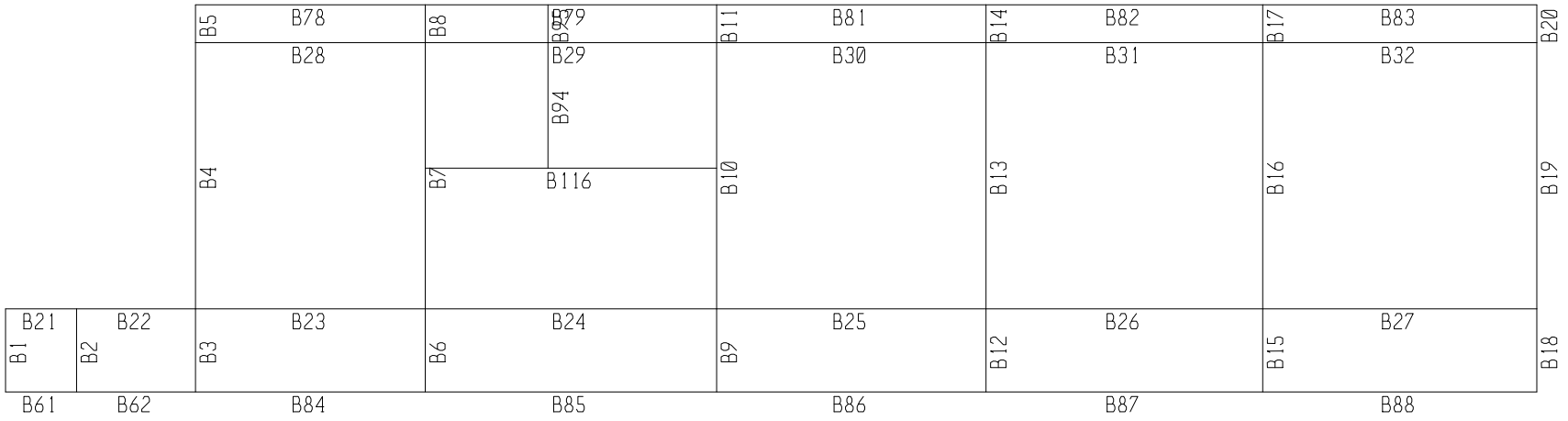
B97 B99 B101 B103 B105
B4 B7 B10 B13 B16
B73 B74 B75 B76 B77
B96 B98 B100 B102 B104
B19
B21 B22 B23 B24 B25 B26 B27
B1 B2 B3 B33 B6 B39 B9 B42 B12 B45 B15 B48 B18
B61 B62 B63 B64 B65 B66 B67 B68 B69 B70 B71 B72

ETABS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B19
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S T O R Y D A T A

STORY	SIMILAR TO	HEIGHT	ELEVATION
N+6.35	None	3.150	6.350
N+3.20	None	3.200	3.200
BASE	None		0.000

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P O I N T C O O R D I N A T E S

POINT	X	Y	DZ-BELOW
1	-1.840	-2.150	0.000
2	-1.840	0.000	0.000
3	0.000	-2.150	0.000
4	0.000	0.000	0.000
5	3.080	-2.150	0.000
6	3.080	0.000	0.000
7	3.080	6.900	0.000
8	3.080	7.880	0.000
9	9.030	-2.150	0.000
10	9.030	0.000	0.000
11	9.030	6.900	0.000
12	9.030	7.880	0.000
13	16.580	-2.150	0.000
14	16.580	0.000	0.000
15	16.580	6.900	0.000
16	16.580	7.880	0.000
17	23.560	-2.150	0.000
18	23.560	0.000	0.000
19	23.560	6.900	0.000
20	23.560	7.880	0.000
21	30.730	-2.150	0.000
22	30.730	0.000	0.000
23	30.730	6.900	0.000
24	30.730	7.880	0.000
25	37.830	-2.150	0.000
26	37.830	0.000	0.000
27	37.830	6.900	0.000
28	37.830	7.880	0.000
29	6.050	7.880	0.000
30	6.050	-2.150	0.000
31	6.050	0.000	0.000
32	6.050	6.900	0.000
37	12.800	-2.150	0.000
38	12.800	0.000	0.000
39	12.800	6.900	0.000
40	12.800	7.880	0.000
41	20.070	-2.150	0.000
42	20.070	0.000	0.000
43	20.070	6.900	0.000
44	20.070	7.880	0.000
45	27.140	-2.150	0.000
46	27.140	0.000	0.000
47	27.140	6.900	0.000
48	27.140	7.880	0.000
49	34.270	-2.150	0.000
50	34.270	0.000	0.000
51	34.270	6.900	0.000
52	34.270	7.880	0.000
53	3.080	3.450	0.000
54	9.030	3.450	0.000
55	16.580	3.450	0.000
56	23.560	3.450	0.000
57	30.730	3.450	0.000
58	37.830	3.450	0.000
59	9.030	3.650	0.000
60	16.580	3.650	0.000
62	12.210	6.900	0.000
63	12.210	3.650	0.000
64	12.210	7.880	0.000
65	6.050	3.450	0.000
66	12.800	3.450	0.000
67	20.070	3.450	0.000
68	27.140	3.450	0.000
69	34.270	3.450	0.000

C O L U M N C O N N E C T I V I T Y D A T A

COLUMN	I END PT	J END PT	I END STORY
C1	4	4	Below
C2	6	6	Below
C3	10	10	Below
C5	14	14	Below
C7	18	18	Below
C9	22	22	Below
C11	26	26	Below
C13	7	7	Below
C15	11	11	Below
C17	15	15	Below
C19	19	19	Below
C21	23	23	Below
C23	27	27	Below

B E A M C O N N E C T I V I T Y D A T A

BEAM	I END PT	J END PT
B1	1	2
B2	3	4
B3	5	6
B4	6	7
B5	7	8
B6	9	10
B7	10	11
B8	11	12
B9	13	14
B10	14	15
B11	15	16
B12	17	18
B13	18	19
B14	19	20
B15	21	22
B16	22	23
B17	23	24
B18	25	26
B19	26	27
B20	27	28
B21	2	4
B22	4	6
B23	6	10
B24	10	14
B25	14	18
B26	18	22
B27	22	26
B28	7	11
B29	11	15
B30	15	19
B31	19	23
B32	23	27
B33	30	31
B35	32	29
B39	37	38
B41	39	40
B42	41	42
B44	43	44
B45	45	46
B47	47	48
B48	49	50
B50	51	52
B51	8	29
B52	29	12
B53	12	40
B54	40	16
B55	16	44
B56	44	20
B57	20	48
B58	48	24
B59	24	52
B60	52	28
B61	1	3
B62	3	5
B63	5	30
B64	30	9
B65	9	37
B66	37	13
B67	13	41

B68	41	17
B69	17	45
B70	45	21
B71	21	49
B72	49	25
B73	53	54
B74	54	55
B75	55	56
B76	56	57
B77	57	58
B78	8	12
B79	12	16
B81	16	20
B82	20	24
B83	24	28
B84	5	9
B85	9	13
B86	13	17
B87	17	21
B88	21	25
B94	63	62
B95	62	64
B96	31	65
B97	65	32
B98	38	66
B99	66	39
B100	42	67
B101	67	43
B102	46	68
B103	68	47
B104	50	69
B105	69	51
B116	59	60

R I G I D D I A P H R A G M P O I N T C O N N E C T I V I T Y D A T A

STORY	DIAPHRAGM	POINT	POINT	POINT	POINT	POINT
N+6.35	D1	10	6	4	14	18
		22	26	7	11	15
		19	23	27	3	5
		8	9	12	13	16
		17	20	21	24	25
		28	1	2	59	60
		62	63	64		
N+3.20	D1	1	2	3	4	5
		6	7	8	9	10
		11	12	13	14	15
		16	17	18	19	20
		21	22	23	24	25
		26	27	28	29	30
		31	32	37	38	39
		40	41	42	43	44
		45	46	47	48	49
		50	51	52	53	54
		55	56	57	58	65
		66	67	68	69	

M A T E R I A L P R O P E R T Y D A T A

MATERIAL NAME	MATERIAL TYPE	DESIGN TYPE	MATERIAL DIR/PLANE	MODULUS OF ELASTICITY	POISSON'S RATIO	THERMAL COEFF	SHEAR MODULUS
STEEL	Iso	Steel	All	199947978.80	0.3000	1.1700E-05	76903068.77
CONC21	Iso	Concrete	All	21538000.000	0.2000	9.9000E-06	8974166.667
OTHER	Iso	None	All	199947978.80	0.3000	1.1700E-05	76903068.77

M A T E R I A L P R O P E R T Y M A S S A N D W E I G H T

MATERIAL NAME	MASS PER UNIT VOL	WEIGHT PER UNIT VOL
STEEL	7.8271E+00	7.6820E+01
CONC21	2.4007E+00	2.3562E+01
OTHER	7.8271E+00	7.6820E+01

M A T E R I A L D E S I G N D A T A F O R S T E E L M A T E R I A L S

MATERIAL NAME	STEEL FY	STEEL FU	STEEL COST ($)
STEEL	344737.894	448159.263	271447.16

M A T E R I A L D E S I G N D A T A F O R C O N C R E T E M A T E R I A L S

MATERIAL NAME	LIGHTWEIGHT CONCRETE	CONCRETE FC	REBAR FY	REBAR FYS	LIGHTWT REDUC FACT
CONC21	No	21000.000	420000.000	420000.000	N/A

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F R A M E S E C T I O N P R O P E R T Y D A T A

FRAME SECTION NAME	MATERIAL NAME	SECTION SHAPE NAME OR NAME IN SECTION DATABASE FILE	CONC COL	CONC BEAM
COL50X50	CONC21	Rectangular	Yes	
VIG45X45	CONC21	Rectangular		Yes
VIG20X45	CONC21	Rectangular		Yes
VIG15X45	CONC21	Rectangular		Yes
VIG30X45	CONC21	Rectangular		Yes
VIG25X45	CONC21	Rectangular		Yes
VIG35X45	CONC21	Rectangular		Yes

F R A M E S E C T I O N P R O P E R T Y D A T A

FRAME SECTION NAME	SECTION DEPTH	FLANGE WIDTH TOP	FLANGE THICK TOP	WEB THICK	FLANGE WIDTH BOT	FLANGE THICK BOT
COL50X50	0.5000	0.5000	0.0000	0.0000	0.0000	0.0000
VIG45X45	0.4500	0.4500	0.0000	0.0000	0.0000	0.0000
VIG20X45	0.4500	0.2000	0.0000	0.0000	0.0000	0.0000
VIG15X45	0.4500	0.1500	0.0000	0.0000	0.0000	0.0000
VIG30X45	0.4500	0.3000	0.0000	0.0000	0.0000	0.0000
VIG25X45	0.4500	0.2500	0.0000	0.0000	0.0000	0.0000
VIG35X45	0.4500	0.3500	0.0000	0.0000	0.0000	0.0000

F R A M E S E C T I O N P R O P E R T Y D A T A

FRAME SECTION NAME	SECTION AREA	TORSIONAL CONSTANT	MOMENTS OF INERTIA I33	MOMENTS OF INERTIA I22	SHEAR AREAS A2	SHEAR AREAS A3
COL50X50	0.2500	0.0088	0.0052	0.0052	0.2083	0.2083
VIG45X45	0.2025	0.0058	0.0034	0.0034	0.1688	0.1688
VIG20X45	0.0900	0.0009	0.0015	0.0003	0.0750	0.0750
VIG15X45	0.0675	0.0004	0.0011	0.0001	0.0563	0.0563
VIG30X45	0.1350	0.0024	0.0023	0.0010	0.1125	0.1125
VIG25X45	0.1125	0.0015	0.0019	0.0006	0.0938	0.0938
VIG35X45	0.1575	0.0034	0.0027	0.0016	0.1313	0.1313

F R A M E S E C T I O N P R O P E R T Y D A T A

FRAME SECTION NAME	SECTION MODULI S33	SECTION MODULI S22	PLASTIC MODULI Z33	PLASTIC MODULI Z22	RADIUS OF GYRATION R33	RADIUS OF GYRATION R22
COL50X50	0.0208	0.0208	0.0313	0.0313	0.1443	0.1443
VIG45X45	0.0152	0.0152	0.0228	0.0228	0.1299	0.1299
VIG20X45	0.0068	0.0030	0.0101	0.0045	0.1299	0.0577
VIG15X45	0.0051	0.0017	0.0076	0.0025	0.1299	0.0433
VIG30X45	0.0101	0.0068	0.0152	0.0101	0.1299	0.0866
VIG25X45	0.0084	0.0047	0.0127	0.0070	0.1299	0.0722
VIG35X45	0.0118	0.0092	0.0177	0.0138	0.1299	0.1010

F R A M E S E C T I O N W E I G H T S A N D M A S S E S

FRAME SECTION NAME	TOTAL WEIGHT	TOTAL MASS
COL50X50	486.2525	49.5444
VIG45X45	652.4649	66.4799
VIG20X45	180.0342	18.3437
VIG15X45	243.5551	24.8159

VIG30X45	434.9766	44.3199
VIG25X45	31.2250	3.1815
VIG35X45	0.0000	0.0000

C O N C R E T E C O L U M N D A T A

FRAME SECTION NAME	REINF CONFIGURATION LONGIT	LATERAL	REINF SIZE/TYPE	NUM BARS 3DIR/2DIR	NUM BARS CIRCULAR	BAR COVER
COL50X50	Rectangular Ties		#8/Design	3/3	N/A	0.0500

C O N C R E T E B E A M D A T A

FRAME SECTION NAME	TOP COVER	BOT COVER	TOP LEFT AREA	TOP RIGHT AREA	BOT LEFT AREA	BOT RIGHT AREA
VIG45X45	0.0500	0.0500	0.000	0.000	0.000	0.000
VIG20X45	0.0500	0.0500	0.000	0.000	0.000	0.000
VIG15X45	0.0500	0.0500	0.000	0.000	0.000	0.000
VIG30X45	0.0500	0.0500	0.000	0.000	0.000	0.000
VIG25X45	0.0500	0.0500	0.000	0.000	0.000	0.000
VIG35X45	0.0500	0.0500	0.000	0.000	0.000	0.000

S H E L L S E C T I O N P R O P E R T Y D A T A

SHELL SECTION	MATERIAL NAME	SHELL TYPE	LOAD DIST ONE WAY	MEMBRANE THICK	BENDING THICK	TOTAL WEIGHT	TOTAL MASS
SALONES	CONC21	Membrane	No	0.2670	0.2670	1722.6501	175.5214
CORREDORES	CONC21	Membrane	No	0.1830	0.1830	367.7533	37.4705
PLMACIZA	CONC21	Membrane	No	0.1920	0.1920	144.4752	14.7206
CUBLIVIANA	CONC21	Membrane	Yes	0.0170	10.0170	131.0526	13.3530

S T A T I C L O A D C A S E S

STATIC CASE	CASE TYPE	AUTO LAT LOAD	SELF WT MULTIPLIER	NOTIONAL FACTOR	NOTIONAL DIRECTION
DEAD	DEAD	N/A	1.0000		
LIVE	LIVE	N/A	0.0000		

R E S P O N S E S P E C T R U M C A S E S

RESP SPEC CASE: SISDISX

BASIC RESPONSE SPECTRUM DATA

MODAL COMBO	DIRECTION COMBO	MODAL DAMPING	SPECTRUM ANGLE	TYPICAL ECCEN
SRSS	SRSS	0.0500	0.0000	0.0500

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

DIRECTION	FUNCTION	SCALE FACT
U1	DISENIO	9.8270
U2	----	N/A
UZ	----	N/A

RESP SPEC CASE: SISDISY

BASIC RESPONSE SPECTRUM DATA

MODAL COMBO	DIRECTION COMBO	MODAL DAMPING	SPECTRUM ANGLE	TYPICAL ECCEN
SRSS	SRSS	0.0500	0.0000	0.0500

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

DIRECTION	FUNCTION	SCALE FACT
U1	----	N/A
U2	DISENIO	10.5690
UZ	----	N/A

RESP SPEC CASE: SISDERX

BASIC RESPONSE SPECTRUM DATA

MODAL COMBO	DIRECTION COMBO	MODAL DAMPING	SPECTRUM ANGLE	TYPICAL ECCEN
SRSS	SRSS	0.0500	0.0000	0.0500

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

DIRECTION	FUNCTION	SCALE FACT
U1	DERIVAS	9.8270
U2	----	N/A
UZ	----	N/A

RESP SPEC CASE: SISDERY

BASIC RESPONSE SPECTRUM DATA

MODAL COMBO	DIRECTION COMBO	MODAL DAMPING	SPECTRUM ANGLE	TYPICAL ECCEN
SRSS	SRSS	0.0500	0.0000	0.0500

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

DIRECTION	FUNCTION	SCALE FACT
U1	----	N/A
U2	DERIVAS	10.5690
UZ	----	N/A

RESP SPEC CASE: SISUMX

BASIC RESPONSE SPECTRUM DATA

MODAL COMBO	DIRECTION COMBO	MODAL DAMPING	SPECTRUM ANGLE	TYPICAL ECCEN
SRSS	SRSS	0.0200	0.0000	0.0500

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

DIRECTION	FUNCTION	SCALE FACT
U1	UMBRAL	10.9530
U2	----	N/A
UZ	----	N/A

RESP SPEC CASE: SISUMY

BASIC RESPONSE SPECTRUM DATA

MODAL COMBO	DIRECTION COMBO	MODAL DAMPING	SPECTRUM ANGLE	TYPICAL ECCEN
SRSS	SRSS	0.0200	0.0000	0.0500

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

DIRECTION	FUNCTION	SCALE FACT
U1	----	N/A
U2	UMBRAL	11.8360
UZ	----	N/A

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L O A D I N G C O M B I N A T I O N S

COMBO	COMBO TYPE	CASE	CASE TYPE	SCALE FACTOR
COMDIS1	ADD	DEAD	Static	1.4000
COMDIS2	ADD	DEAD	Static	1.2000
		LIVE	Static	1.6000
COMDIS3	ADD	DEAD	Static	1.2000
		LIVE	Static	1.0000
		SISDISX	Spectra	1.0000
		SISDISY	Spectra	0.3000
COMDIS4	ADD	DEAD	Static	1.2000
		LIVE	Static	1.0000
		SISDISX	Spectra	0.3000
		SISDISY	Spectra	1.0000
COMDIS5	ADD	DEAD	Static	0.9000
		SISDISX	Spectra	1.0000
		SISDISY	Spectra	0.3000
COMDIS6	ADD	DEAD	Static	0.9000
		SISDISX	Spectra	0.3000
		SISDISY	Spectra	1.0000
COMDER1	ADD	SISDERX	Spectra	1.0000
		SISDERY	Spectra	0.3000
COMDER2	ADD	SISDERX	Spectra	0.3000
		SISDERY	Spectra	1.0000
COMDERUMB1	ADD	SISUMX	Spectra	1.0000
		SISUMY	Spectra	0.3000
COMDERUMB2	ADD	SISUMX	Spectra	0.3000
		SISUMY	Spectra	1.0000
ENVOLVENTE	ENVE	COMDIS1	Combo	1.0000
		COMDIS2	Combo	1.0000
		COMDIS3	Combo	1.0000
		COMDIS4	Combo	1.0000
		COMDIS5	Combo	1.0000
		COMDIS6	Combo	1.0000
CIM1	ADD	DEAD	Static	1.0000
		LIVE	Static	1.0000
CIM2	ADD	DEAD	Static	1.0000
		LIVE	Static	0.7500
		SISDISX	Spectra	0.1110
		SISDISY	Spectra	0.0330
CIM3	ADD	DEAD	Static	1.0000
		LIVE	Static	0.7500
		SISDISX	Spectra	0.0330
		SISDISY	Spectra	0.1110

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R E S P O N S E S P E C T R U M F U N C T I O N - F R O M F I L E

FUNCTION NAME: DERIVAS

FILE NAME: c:\users\inv\desktop\ana\proyectos\2260 san juan\memorias\derivas.txt
DATA TYPE: Period vs Acceleration
NUMBER OF HEADER LINES = 0

PERIOD	ACCEL
0.0000	1.1250
0.0500	1.1250
0.1000	1.1250
0.1600	1.1250
0.2100	1.1250
0.4100	1.1250
0.6000	1.1250
0.8000	1.1250
1.0000	1.1250
1.3400	0.8370
1.6900	0.6660
2.0300	0.5530
2.3800	0.4730
2.7200	0.4130
3.0700	0.3670
3.4100	0.3300
3.7600	0.3000
4.1000	0.2740
4.4400	0.2530
4.7900	0.2350
5.1300	0.2190

5.4800	0.2050
5.8200	0.1930
6.1700	0.1820
6.5100	0.1730
6.8600	0.1640
7.2000	0.1560
8.2000	0.1200
9.2000	0.0960

FUNCTION NAME: DISENIO

FILE NAME: c:\users\inv\desktop\ana\proyectos\2260 san juan\memorias\diseño.txt
DATA TYPE: Period vs Acceleration
NUMBER OF HEADER LINES = 0

PERIOD	ACCEL
0.0000	0.2380
0.0500	0.2380
0.1000	0.2380
0.1600	0.2380
0.2100	0.2380
0.4100	0.2380
0.6000	0.2380
0.8000	0.2380
1.0000	0.2380
1.3400	0.1770
1.6900	0.1410
2.0300	0.1170
2.3800	0.1000
2.7200	0.0870
3.0700	0.0780
3.4100	0.0700
3.7600	0.0630
4.1000	0.0580
4.4400	0.0540
4.7900	0.0500
5.1300	0.0460
5.4800	0.0430
5.8200	0.0410
6.1700	0.0390
6.5100	0.0370
6.8600	0.0350
7.2000	0.0330
8.2000	0.0250
9.2000	0.0200

FUNCTION NAME: UMBRAL

FILE NAME: c:\users\inv\desktop\ana\proyectos\2260 san juan\memorias\umbral.txt
DATA TYPE: Period vs Acceleration
NUMBER OF HEADER LINES = 0

PERIOD	ACCEL
0.0000	0.0800
0.0500	0.1120
0.1000	0.1440
0.1500	0.1760
0.2000	0.2080
0.2500	0.2400
0.4900	0.2400
0.7300	0.2400
0.9800	0.2400
1.2200	0.2400
1.4600	0.2400
1.7000	0.2400
1.9500	0.2400
2.1900	0.2400
2.7800	0.1890
3.3800	0.1560
3.9700	0.1320
4.5600	0.1150
5.1600	0.1020
5.7500	0.0910
6.3400	0.0830
6.9400	0.0760
7.5300	0.0700
8.1300	0.0650

8.7200	0.0600
9.3100	0.0560
9.9100	0.0530
10.5000	0.0500
11.5000	0.0420
12.5000	0.0350

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F R A M E S E C T I O N A S S I G N M E N T S T O L I N E O B J E C T S

STORY LEVEL	LINE ID	LINE TYPE	SECTION TYPE	AUTO SELECT SECTION	ANALYSIS SECTION	DESIGN PROCEDURE	DESIGN SECTION
N+6.35	C1	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+6.35	C2	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+6.35	C3	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+6.35	C5	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+6.35	C7	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+6.35	C9	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+6.35	C11	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+6.35	C13	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+6.35	C15	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+6.35	C17	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+6.35	C19	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+6.35	C21	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+6.35	C23	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+3.20	C1	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+3.20	C2	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+3.20	C3	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+3.20	C5	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+3.20	C7	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+3.20	C9	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+3.20	C11	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+3.20	C13	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+3.20	C15	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+3.20	C17	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+3.20	C19	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+3.20	C21	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+3.20	C23	Column	Rectangular	None	COL50X50	Conc Frame	COL50X50
N+6.35	B1	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+6.35	B2	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B3	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B4	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B5	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B6	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B7	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B8	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B9	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B10	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B11	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B12	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B13	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B14	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B15	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B16	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B17	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B18	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B19	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B20	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B21	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B22	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B23	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B24	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B25	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B26	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B27	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B28	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B29	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B30	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B31	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B32	Beam	Rectangular	None	VIG30X45	Conc Frame	VIG30X45
N+6.35	B61	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+6.35	B62	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+6.35	B78	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+6.35	B79	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+6.35	B81	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+6.35	B82	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+6.35	B83	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+6.35	B84	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+6.35	B85	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+6.35	B86	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+6.35	B87	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45

N+6.35	B88	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+6.35	B94	Beam	Rectangular	None	VIG25X45	Conc Frame	VIG25X45
N+6.35	B95	Beam	Rectangular	None	VIG25X45	Conc Frame	VIG25X45
N+6.35	B116	Beam	Rectangular	None	VIG25X45	Conc Frame	VIG25X45
N+3.20	B1	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B2	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B3	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B4	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B5	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B6	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B7	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B8	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B9	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B10	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B11	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B12	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B13	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B14	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B15	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B16	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B17	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B18	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B19	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B20	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B21	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B22	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B23	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B24	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B25	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B26	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B27	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B28	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B29	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B30	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B31	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B32	Beam	Rectangular	None	VIG45X45	Conc Frame	VIG45X45
N+3.20	B33	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B35	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B39	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B41	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B42	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B44	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B45	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B47	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B48	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B50	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B51	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B52	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B53	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B54	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B55	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B56	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B57	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B58	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B59	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B60	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B61	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B62	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B63	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B64	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B65	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B66	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B67	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B68	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B69	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B70	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B71	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B72	Beam	Rectangular	None	VIG15X45	Conc Frame	VIG15X45
N+3.20	B73	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B74	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B75	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B76	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B77	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B96	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B97	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B98	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B99	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B100	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B101	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B102	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B103	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B104	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45
N+3.20	B105	Beam	Rectangular	None	VIG20X45	Conc Frame	VIG20X45

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D I S T R I B U T E D L O A D A S S I G N M E N T S T O L I N E O B J E C T S

LOAD CASE	STORY LEVEL	LINE ID	LOAD TYPE	LOAD DIRECTION	ABSOLUTE DISTANCE A	ABSOLUTE DISTANCE B	LOAD A PER LENGTH	LOAD B PER LENGTH
DEAD	N+6.35	B2	Force	Gravity	0.000	2.150	3.120	3.120
DEAD	N+6.35	B3	Force	Gravity	0.000	2.150	3.120	3.120
DEAD	N+6.35	B4	Force	Gravity	0.000	6.900	3.120	3.120
DEAD	N+6.35	B5	Force	Gravity	0.000	0.980	3.120	3.120
DEAD	N+6.35	B6	Force	Gravity	0.000	2.150	3.120	3.120
DEAD	N+6.35	B7	Force	Gravity	0.000	6.900	3.120	3.120
DEAD	N+6.35	B8	Force	Gravity	0.000	0.980	3.120	3.120
DEAD	N+6.35	B9	Force	Gravity	0.000	2.150	3.120	3.120
DEAD	N+6.35	B10	Force	Gravity	0.000	6.900	3.120	3.120
DEAD	N+6.35	B11	Force	Gravity	0.000	0.980	3.120	3.120
DEAD	N+6.35	B12	Force	Gravity	0.000	2.150	3.120	3.120
DEAD	N+6.35	B13	Force	Gravity	0.000	6.900	3.120	3.120
DEAD	N+6.35	B14	Force	Gravity	0.000	0.980	3.120	3.120
DEAD	N+6.35	B15	Force	Gravity	0.000	2.150	3.120	3.120
DEAD	N+6.35	B16	Force	Gravity	0.000	6.900	3.120	3.120
DEAD	N+6.35	B17	Force	Gravity	0.000	0.980	3.120	3.120
DEAD	N+6.35	B18	Force	Gravity	0.000	2.150	3.120	3.120
DEAD	N+6.35	B19	Force	Gravity	0.000	6.900	3.120	3.120
DEAD	N+6.35	B20	Force	Gravity	0.000	0.980	3.120	3.120
DEAD	N+3.20	B4	Force	Gravity	0.000	6.900	6.240	6.240
DEAD	N+3.20	B5	Force	Gravity	0.000	0.980	6.240	6.240
DEAD	N+3.20	B18	Force	Gravity	0.000	2.150	6.240	6.240
DEAD	N+3.20	B19	Force	Gravity	0.000	6.900	6.240	6.240
DEAD	N+3.20	B20	Force	Gravity	0.000	0.980	6.240	6.240
DEAD	N+3.20	B22	Force	Gravity	0.000	3.080	6.240	6.240
DEAD	N+3.20	B51	Force	Gravity	0.000	2.970	6.240	6.240
DEAD	N+3.20	B52	Force	Gravity	0.000	2.980	6.240	6.240
DEAD	N+3.20	B53	Force	Gravity	0.000	3.770	6.240	6.240
DEAD	N+3.20	B54	Force	Gravity	0.000	3.780	6.240	6.240
DEAD	N+3.20	B55	Force	Gravity	0.000	3.490	6.240	6.240
DEAD	N+3.20	B56	Force	Gravity	0.000	3.490	6.240	6.240
DEAD	N+3.20	B57	Force	Gravity	0.000	3.580	6.240	6.240
DEAD	N+3.20	B58	Force	Gravity	0.000	3.590	6.240	6.240
DEAD	N+3.20	B59	Force	Gravity	0.000	3.540	6.240	6.240
DEAD	N+3.20	B60	Force	Gravity	0.000	3.560	6.240	6.240
DEAD	N+3.20	B62	Force	Gravity	0.000	3.080	6.240	6.240
DEAD	N+3.20	B63	Force	Gravity	0.000	2.970	6.240	6.240
DEAD	N+3.20	B64	Force	Gravity	0.000	2.980	6.240	6.240
DEAD	N+3.20	B65	Force	Gravity	0.000	3.770	6.240	6.240
DEAD	N+3.20	B66	Force	Gravity	0.000	3.780	6.240	6.240
DEAD	N+3.20	B67	Force	Gravity	0.000	3.490	6.240	6.240
DEAD	N+3.20	B68	Force	Gravity	0.000	3.490	6.240	6.240
DEAD	N+3.20	B69	Force	Gravity	0.000	3.580	6.240	6.240
DEAD	N+3.20	B70	Force	Gravity	0.000	3.590	6.240	6.240
DEAD	N+3.20	B71	Force	Gravity	0.000	3.540	6.240	6.240
DEAD	N+3.20	B72	Force	Gravity	0.000	3.560	6.240	6.240

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U N I F O R M L O A D A S S I G N M E N T S T O A R E A O B J E C T S

CASE	STORY	AREA	AREATYPE	DIRECTION	LOAD
LIVE	N+6.35	F1	Floor	Gravity	0.5000
LIVE	N+6.35	F2	Floor	Gravity	0.5000
LIVE	N+6.35	F3	Floor	Gravity	0.5000
LIVE	N+6.35	F4	Floor	Gravity	0.5000
LIVE	N+6.35	F5	Floor	Gravity	0.5000
LIVE	N+6.35	F6	Floor	Gravity	0.5000
LIVE	N+6.35	F7	Floor	Gravity	0.5000
LIVE	N+6.35	F8	Floor	Gravity	0.5000
LIVE	N+6.35	F11	Floor	Gravity	0.5000
LIVE	N+6.35	F12	Floor	Gravity	0.5000
LIVE	N+6.35	F13	Floor	Gravity	0.5000
LIVE	N+6.35	F14	Floor	Gravity	0.5000
LIVE	N+6.35	F15	Floor	Gravity	0.5000
LIVE	N+6.35	F16	Floor	Gravity	0.5000
LIVE	N+6.35	F17	Floor	Gravity	0.5000
LIVE	N+6.35	F18	Floor	Gravity	0.5000
LIVE	N+6.35	F21	Floor	Gravity	9.8000
LIVE	N+6.35	F22	Floor	Gravity	9.8000
LIVE	N+6.35	F23	Floor	Gravity	9.8000
LIVE	N+6.35	F24	Floor	Gravity	9.8000
LIVE	N+3.20	F1	Floor	Gravity	5.0000
LIVE	N+3.20	F2	Floor	Gravity	5.0000

LIVE	N+3.20	F25	Floor	Gravity	2.0000
LIVE	N+3.20	F26	Floor	Gravity	2.0000
LIVE	N+3.20	F27	Floor	Gravity	2.0000
LIVE	N+3.20	F28	Floor	Gravity	2.0000
LIVE	N+3.20	F29	Floor	Gravity	2.0000
LIVE	N+3.20	F30	Floor	Gravity	2.0000
LIVE	N+3.20	F31	Floor	Gravity	2.0000
LIVE	N+3.20	F32	Floor	Gravity	2.0000
LIVE	N+3.20	F33	Floor	Gravity	2.0000
LIVE	N+3.20	F35	Floor	Gravity	2.0000
LIVE	N+3.20	F36	Floor	Gravity	5.0000
LIVE	N+3.20	F37	Floor	Gravity	5.0000
LIVE	N+3.20	F38	Floor	Gravity	5.0000
LIVE	N+3.20	F39	Floor	Gravity	5.0000
LIVE	N+3.20	F40	Floor	Gravity	5.0000
LIVE	N+3.20	F41	Floor	Gravity	5.0000
LIVE	N+3.20	F42	Floor	Gravity	5.0000
LIVE	N+3.20	F43	Floor	Gravity	5.0000
LIVE	N+3.20	F44	Floor	Gravity	5.0000
LIVE	N+3.20	F45	Floor	Gravity	5.0000
LIVE	N+3.20	F46	Floor	Gravity	2.0000
LIVE	N+3.20	F47	Floor	Gravity	2.0000
LIVE	N+3.20	F48	Floor	Gravity	2.0000
LIVE	N+3.20	F49	Floor	Gravity	2.0000
LIVE	N+3.20	F50	Floor	Gravity	2.0000
LIVE	N+3.20	F51	Floor	Gravity	2.0000
LIVE	N+3.20	F52	Floor	Gravity	2.0000
LIVE	N+3.20	F53	Floor	Gravity	2.0000
LIVE	N+3.20	F54	Floor	Gravity	2.0000
LIVE	N+3.20	F55	Floor	Gravity	2.0000
LIVE	N+3.20	F56	Floor	Gravity	2.0000
LIVE	N+3.20	F57	Floor	Gravity	2.0000
LIVE	N+3.20	F58	Floor	Gravity	2.0000
LIVE	N+3.20	F59	Floor	Gravity	2.0000
LIVE	N+3.20	F60	Floor	Gravity	2.0000
LIVE	N+3.20	F61	Floor	Gravity	2.0000
LIVE	N+3.20	F62	Floor	Gravity	2.0000
LIVE	N+3.20	F63	Floor	Gravity	2.0000
LIVE	N+3.20	F64	Floor	Gravity	2.0000
LIVE	N+3.20	F65	Floor	Gravity	2.0000

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN

FUERZAS EN VIGAS

BEAM FORCES
UNID: kN-m

Story	Story	Beam	Load	Loc	P	V2	V3	T	M3
CUBIERTA	N+6.35	B1	ENVOLVENTE MAX	0.000	0.000	0.580	0.000	0.506	0.499
CUBIERTA	N+6.35	B1	ENVOLVENTE MAX	1.075	0.000	3.290	0.000	0.506	-0.328
CUBIERTA	N+6.35	B1	ENVOLVENTE MAX	2.150	0.000	6.310	0.000	0.506	-1.984
CUBIERTA	N+6.35	B1	ENVOLVENTE MIN	0.000	0.000	-1.610	0.000	-0.400	-0.721
CUBIERTA	N+6.35	B1	ENVOLVENTE MIN	1.075	0.000	0.590	0.000	-0.400	-1.429
CUBIERTA	N+6.35	B1	ENVOLVENTE MIN	2.150	0.000	2.490	0.000	-0.400	-6.592
PISO2	N+3.20	B1	ENVOLVENTE MAX	0.000	0.000	0.990	0.000	0.216	0.172
PISO2	N+3.20	B1	ENVOLVENTE MAX	1.075	0.000	8.430	0.000	0.216	-1.170
PISO2	N+3.20	B1	ENVOLVENTE MAX	2.150	0.000	17.930	0.000	0.216	-5.883
PISO2	N+3.20	B1	ENVOLVENTE MIN	0.000	0.000	-2.100	0.000	-0.800	-1.566
PISO2	N+3.20	B1	ENVOLVENTE MIN	1.075	0.000	2.160	0.000	-0.800	-3.863
PISO2	N+3.20	B1	ENVOLVENTE MIN	2.150	0.000	5.900	0.000	-0.800	-19.081
CUBIERTA	N+6.35	B2	ENVOLVENTE MAX	0.000	0.000	10.660	0.000	5.920	1.014
CUBIERTA	N+6.35	B2	ENVOLVENTE MAX	1.075	0.000	21.380	0.000	5.920	-5.357
CUBIERTA	N+6.35	B2	ENVOLVENTE MAX	2.150	0.000	32.100	0.000	5.920	-17.919
CUBIERTA	N+6.35	B2	ENVOLVENTE MIN	0.000	0.000	1.110	0.000	-2.861	-0.392
CUBIERTA	N+6.35	B2	ENVOLVENTE MIN	1.075	0.000	8.160	0.000	-2.861	-16.219
CUBIERTA	N+6.35	B2	ENVOLVENTE MIN	2.150	0.000	15.200	0.000	-2.861	-44.958
PISO2	N+3.20	B2	ENVOLVENTE MAX	0.000	0.000	43.710	0.000	8.913	1.281
PISO2	N+3.20	B2	ENVOLVENTE MAX	1.075	0.000	62.650	0.000	8.913	-17.235
PISO2	N+3.20	B2	ENVOLVENTE MAX	2.150	0.000	83.870	0.000	8.913	-45.193
PISO2	N+3.20	B2	ENVOLVENTE MIN	0.000	0.000	11.700	0.000	-12.251	-0.653
PISO2	N+3.20	B2	ENVOLVENTE MIN	1.075	0.000	20.750	0.000	-12.251	-53.300
PISO2	N+3.20	B2	ENVOLVENTE MIN	2.150	0.000	29.810	0.000	-12.251	-134.247
CUBIERTA	N+6.35	B3	ENVOLVENTE MAX	0.000	0.000	10.290	0.000	5.009	0.092
CUBIERTA	N+6.35	B3	ENVOLVENTE MAX	1.075	0.000	23.180	0.000	5.009	-8.647
CUBIERTA	N+6.35	B3	ENVOLVENTE MAX	2.150	0.000	36.370	0.000	5.009	-25.634
CUBIERTA	N+6.35	B3	ENVOLVENTE MIN	0.000	0.000	4.030	0.000	-5.669	-0.371
CUBIERTA	N+6.35	B3	ENVOLVENTE MIN	1.075	0.000	11.880	0.000	-5.669	-18.173
CUBIERTA	N+6.35	B3	ENVOLVENTE MIN	2.150	0.000	19.720	0.000	-5.669	-50.015
PISO2	N+3.20	B3	ENVOLVENTE MAX	0.000	0.000	72.130	0.000	14.246	1.560
PISO2	N+3.20	B3	ENVOLVENTE MAX	1.075	0.000	93.510	0.000	14.246	-40.368
PISO2	N+3.20	B3	ENVOLVENTE MAX	2.150	0.000	114.890	0.000	14.246	-92.390
PISO2	N+3.20	B3	ENVOLVENTE MIN	0.000	0.000	33.990	0.000	-18.900	0.263
PISO2	N+3.20	B3	ENVOLVENTE MIN	1.075	0.000	43.100	0.000	-18.900	-85.050
PISO2	N+3.20	B3	ENVOLVENTE MIN	2.150	0.000	52.200	0.000	-18.900	-199.790
CUBIERTA	N+6.35	B4	ENVOLVENTE MAX	0.000	0.000	-4.010	0.000	0.600	40.189
CUBIERTA	N+6.35	B4	ENVOLVENTE MAX	3.450	0.000	19.250	0.000	0.600	24.139
CUBIERTA	N+6.35	B4	ENVOLVENTE MAX	6.900	0.000	50.770	0.000	0.600	83.669
CUBIERTA	N+6.35	B4	ENVOLVENTE MIN	0.000	0.000	-72.200	0.000	-1.651	-165.095
CUBIERTA	N+6.35	B4	ENVOLVENTE MIN	3.450	0.000	-36.050	0.000	-1.651	13.362
CUBIERTA	N+6.35	B4	ENVOLVENTE MIN	6.900	0.000	-8.150	0.000	-1.651	-92.666
PISO2	N+3.20	B4	ENVOLVENTE MAX	0.000	0.000	-33.130	0.000	21.432	27.809
PISO2	N+3.20	B4	ENVOLVENTE MAX	3.450	0.000	17.580	0.000	21.432	88.079
PISO2	N+3.20	B4	ENVOLVENTE MAX	3.450	0.000	47.620	0.000	-1.232	87.828
PISO2	N+3.20	B4	ENVOLVENTE MAX	6.900	0.000	121.070	0.000	-1.232	92.680
PISO2	N+3.20	B4	ENVOLVENTE MIN	0.000	0.000	-155.300	0.000	4.766	-327.368
PISO2	N+3.20	B4	ENVOLVENTE MIN	3.450	0.000	-81.850	0.000	4.766	50.817
CUBIERTA	N+3.20	B4	ENVOLVENTE MIN	3.450	0.000	-37.120	0.000	-23.814	50.362
CUBIERTA	N+3.20	B4	ENVOLVENTE MIN	6.900	0.000	13.590	0.000	-23.814	-206.998
CUBIERTA	N+6.35	B5	ENVOLVENTE MAX	0.000	0.000	-7.220	0.000	8.528	-3.767
CUBIERTA	N+6.35	B5	ENVOLVENTE MAX	0.490	0.000	-3.840	0.000	8.528	-0.625
CUBIERTA	N+6.35	B5	ENVOLVENTE MAX	0.980	0.000	1.290	0.000	8.528	0.229
CUBIERTA	N+6.35	B5	ENVOLVENTE MIN	0.000	0.000	-14.390	0.000	-7.662	-9.117
PISO2	N+6.35	B5	ENVOLVENTE MIN	0.490	0.000	-9.250	0.000	-7.662	-3.325
PISO2	N+6.35	B5	ENVOLVENTE MIN	0.980	0.000	-4.670	0.000	-7.662	-0.263
PISO2	N+3.20	B5	ENVOLVENTE MAX	0.000	0.000	-25.860	0.000	33.126	-18.718
PISO2	N+3.20	B5	ENVOLVENTE MAX	0.490	0.000	-20.330	0.000	33.126	-7.344
PISO2	N+3.20	B5	ENVOLVENTE MAX	0.980	0.000	-14.790	0.000	33.126	1.564
PISO2	N+3.20	B5	ENVOLVENTE MIN	0.000	0.000	-50.030	0.000	-3.772	-41.723
CUBIERTA	N+3.20	B5	ENVOLVENTE MIN	0.490	0.000	-42.400	0.000	-3.772	-18.985
CUBIERTA	N+3.20	B5	ENVOLVENTE MIN	0.980	0.000	-34.780	0.000	-3.772	-0.527
CUBIERTA	N+6.35	B6	ENVOLVENTE MAX	0.000	0.000	15.520	0.000	6.324	0.086
CUBIERTA	N+6.35	B6	ENVOLVENTE MAX	1.075	0.000	31.300	0.000	6.324	-15.069
CUBIERTA	N+6.35	B6	ENVOLVENTE MAX	2.150	0.000	48.720	0.000	6.324	-39.500
CUBIERTA	N+6.35	B6	ENVOLVENTE MIN	0.000	0.000	9.660	0.000	-5.796	-0.199

PISO2	N+6.35	B6	ENVOLVENTE MIN	1.075	0.000	18.370	0.000	-5.796	-24.478
PISO2	N+6.35	B6	ENVOLVENTE MIN	2.150	0.000	27.080	0.000	-5.796	-67.484
PISO2	N+3.20	B6	ENVOLVENTE MAX	0.000	0.000	106.610	0.000	8.251	3.203
PISO2	N+3.20	B6	ENVOLVENTE MAX	1.075	0.000	127.990	0.000	8.251	-54.609
PISO2	N+3.20	B6	ENVOLVENTE MAX	2.150	0.000	149.370	0.000	8.251	-122.414
PISO2	N+3.20	B6	ENVOLVENTE MIN	0.000	0.000	48.680	0.000	-24.959	1.369
CUBIERTA	N+3.20	B6	ENVOLVENTE MIN	1.075	0.000	57.780	0.000	-24.959	-120.165
CUBIERTA	N+3.20	B6	ENVOLVENTE MIN	2.150	0.000	66.880	0.000	-24.959	-271.972
CUBIERTA	N+6.35	B7	ENVOLVENTE MAX	0.000	0.000	-20.600	0.000	27.889	9.451
CUBIERTA	N+6.35	B7	ENVOLVENTE MAX	3.450	0.000	7.360	0.000	27.889	113.206
CUBIERTA	N+6.35	B7	ENVOLVENTE MAX	3.650	0.000	8.980	0.000	27.889	123.617
CUBIERTA	N+6.35	B7	ENVOLVENTE MAX	3.650	0.000	37.560	0.000	-3.901	111.691
PISO2	N+6.35	B7	ENVOLVENTE MAX	6.900	0.000	115.280	0.000	-3.901	42.671
PISO2	N+6.35	B7	ENVOLVENTE MIN	0.000	0.000	-112.670	0.000	4.909	-214.465
PISO2	N+6.35	B7	ENVOLVENTE MIN	3.450	0.000	-63.740	0.000	4.909	31.777
PISO2	N+6.35	B7	ENVOLVENTE MIN	3.650	0.000	-60.910	0.000	4.909	30.236
PISO2	N+6.35	B7	ENVOLVENTE MIN	3.650	0.000	-18.190	0.000	-22.416	29.936
PISO2	N+6.35	B7	ENVOLVENTE MIN	6.900	0.000	14.470	0.000	-22.416	-159.145
CUBIERTA	N+3.20	B7	ENVOLVENTE MAX	0.000	0.000	-63.360	0.000	15.074	-37.476
CUBIERTA	N+3.20	B7	ENVOLVENTE MAX	3.450	0.000	-15.160	0.000	15.074	173.527
CUBIERTA	N+3.20	B7	ENVOLVENTE MAX	3.450	0.000	84.600	0.000	2.428	172.319
CUBIERTA	N+3.20	B7	ENVOLVENTE MAX	6.900	0.000	160.650	0.000	2.428	26.003
CUBIERTA	N+3.20	B7	ENVOLVENTE MIN	0.000	0.000	-195.080	0.000	-5.011	-383.427
CUBIERTA	N+3.20	B7	ENVOLVENTE MIN	3.450	0.000	-119.030	0.000	-5.011	97.552
PISO2	N+3.20	B7	ENVOLVENTE MIN	3.450	0.000	-3.530	0.000	-18.421	96.557
PISO2	N+3.20	B7	ENVOLVENTE MIN	6.900	0.000	44.670	0.000	-18.421	-264.873
PISO2	N+6.35	B8	ENVOLVENTE MAX	0.000	0.000	-24.170	0.000	19.605	-18.353
PISO2	N+6.35	B8	ENVOLVENTE MAX	0.490	0.000	-20.380	0.000	19.605	-7.396
PISO2	N+6.35	B8	ENVOLVENTE MAX	0.980	0.000	-16.590	0.000	19.605	3.348
PISO2	N+6.35	B8	ENVOLVENTE MIN	0.000	0.000	-76.010	0.000	-5.093	-63.200
CUBIERTA	N+6.35	B8	ENVOLVENTE MIN	0.490	0.000	-67.910	0.000	-5.093	-27.733
CUBIERTA	N+6.35	B8	ENVOLVENTE MIN	0.980	0.000	-59.800	0.000	-5.093	0.039
CUBIERTA	N+3.20	B8	ENVOLVENTE MAX	0.000	0.000	-56.410	0.000	31.631	-49.343
CUBIERTA	N+3.20	B8	ENVOLVENTE MAX	0.490	0.000	-52.950	0.000	31.631	-22.440
CUBIERTA	N+3.20	B8	ENVOLVENTE MAX	0.980	0.000	-49.480	0.000	31.631	3.421
CUBIERTA	N+3.20	B8	ENVOLVENTE MIN	0.000	0.000	-95.610	0.000	-12.442	-86.386
PISO2	N+3.20	B8	ENVOLVENTE MIN	0.490	0.000	-90.220	0.000	-12.442	-41.174
PISO2	N+3.20	B8	ENVOLVENTE MIN	0.980	0.000	-84.830	0.000	-12.442	0.060
PISO2	N+6.35	B9	ENVOLVENTE MAX	0.000	0.000	16.640	0.000	5.260	-0.013
PISO2	N+6.35	B9	ENVOLVENTE MAX	1.075	0.000	32.850	0.000	5.260	-16.261
PISO2	N+6.35	B9	ENVOLVENTE MAX	2.150	0.000	50.980	0.000	5.260	-42.031
PISO2	N+6.35	B9	ENVOLVENTE MIN	0.000	0.000	10.610	0.000	-6.719	-0.272
CUBIERTA	N+6.35	B9	ENVOLVENTE MIN	1.075	0.000	19.520	0.000	-6.719	-25.843
CUBIERTA	N+6.35	B9	ENVOLVENTE MIN	2.150	0.000	28.430	0.000	-6.719	-70.905
CUBIERTA	N+3.20	B9	ENVOLVENTE MAX	0.000	0.000	116.220	0.000	19.673	3.406
CUBIERTA	N+3.20	B9	ENVOLVENTE MAX	1.075	0.000	137.600	0.000	19.673	-60.391
CUBIERTA	N+3.20	B9	ENVOLVENTE MAX	2.150	0.000	158.980	0.000	19.673	-134.179
CUBIERTA	N+3.20	B9	ENVOLVENTE MIN	0.000	0.000	54.240	0.000	-10.766	1.402
PISO2	N+3.20	B9	ENVOLVENTE MIN	1.075	0.000	63.340	0.000	-10.766	-130.295
PISO2	N+3.20	B9	ENVOLVENTE MIN	2.150	0.000	72.440	0.000	-10.766	-292.433
PISO2	N+6.35	B10	ENVOLVENTE MAX	0.000	0.000	-24.320	0.000	-4.615	-3.149
PISO2	N+6.35	B10	ENVOLVENTE MAX	3.450	0.000	4.280	0.000	-4.615	110.878
PISO2	N+6.35	B10	ENVOLVENTE MAX	3.650	0.000	5.940	0.000	-4.615	120.613
PISO2	N+6.35	B10	ENVOLVENTE MAX	3.650	0.000	33.390	0.000	20.965	111.404
CUBIERTA	N+6.35	B10	ENVOLVENTE MAX	6.900	0.000	117.770	0.000	20.965	25.867
CUBIERTA	N+6.35	B10	ENVOLVENTE MIN	0.000	0.000	-108.550	0.000	-27.191	-194.621
CUBIERTA	N+6.35	B10	ENVOLVENTE MIN	3.450	0.000	-56.380	0.000	-27.191	31.226
CUBIERTA	N+6.35	B10	ENVOLVENTE MIN	3.650	0.000	-53.450	0.000	-27.191	30.382
CUBIERTA	N+6.35	B10	ENVOLVENTE MIN	3.650	0.000	-13.670	0.000	3.561	29.688
CUBIERTA	N+6.35	B10	ENVOLVENTE MIN	6.900	0.000	19.600	0.000	3.561	-148.179
PISO2	N+3.20	B10	ENVOLVENTE MAX	0.000	0.000	-73.050	0.000	6.820	-64.541
PISO2	N+3.20	B10	ENVOLVENTE MAX	3.450	0.000	-24.540	0.000	6.820	184.099
PISO2	N+3.20	B10	ENVOLVENTE MAX	3.450	0.000	83.900	0.000	13.045	182.725
PISO2	N+3.20	B10	ENVOLVENTE MAX	6.900	0.000	160.480	0.000	13.045	-4.464
PISO2	N+3.20	B10	ENVOLVENTE MIN	0.000	0.000	-193.490	0.000	-11.605	-367.692
PISO2	N+3.20	B10	ENVOLVENTE MIN	3.450	0.000	-116.910	0.000	-11.605	103.663
PISO2	N+3.20	B10	ENVOLVENTE MIN	3.450	0.000	6.850	0.000	-5.469	102.814
PISO2	N+3.20	B10	ENVOLVENTE MIN	6.900	0.000	55.360	0.000	-5.469	-254.232
CUBIERTA	N+6.35	B11	ENVOLVENTE MAX	0.000	0.000	-25.940	0.000	5.644	-20.448
CUBIERTA	N+6.35	B11	ENVOLVENTE MAX	0.490	0.000	-22.060	0.000	5.644	-8.646
CUBIERTA	N+6.35	B11	ENVOLVENTE MAX	0.980	0.000	-18.170	0.000	5.644	2.407
CUBIERTA	N+6.35	B11	ENVOLVENTE MIN	0.000	0.000	-76.690	0.000	-16.977	-64.491
CUBIERTA	N+6.35	B11	ENVOLVENTE MIN	0.490	0.000	-68.260	0.000	-16.977	-28.770
CUBIERTA	N+6.35	B11	ENVOLVENTE MIN	0.980	0.000	-59.830	0.000	-16.977	-0.011
PISO2	N+3.20	B11	ENVOLVENTE MAX	0.000	0.000	-61.470	0.000	15.703	-54.367
PISO2	N+3.20	B11	ENVOLVENTE MAX	0.490	0.000	-58.010	0.000	15.703	-24.984
PISO2	N+3.20	B11	ENVOLVENTE MAX	0.980	0.000	-54.540	0.000	15.703	3.480

PISO2	N+3.20	B11	ENVOLVENTE MIN	0.000	0.000	-101.090	0.000	-24.182	-91.548
PISO2	N+3.20	B11	ENVOLVENTE MIN	0.490	0.000	-95.710	0.000	-24.182	-43.160
PISO2	N+3.20	B11	ENVOLVENTE MIN	0.980	0.000	-90.320	0.000	-24.182	0.398
PISO2	N+6.35	B12	ENVOLVENTE MAX	0.000	0.000	15.350	0.000	5.161	0.245
PISO2	N+6.35	B12	ENVOLVENTE MAX	1.075	0.000	30.470	0.000	5.161	-15.282
CUBIERTA	N+6.35	B12	ENVOLVENTE MAX	2.150	0.000	48.340	0.000	5.161	-40.091
CUBIERTA	N+6.35	B12	ENVOLVENTE MIN	0.000	0.000	9.820	0.000	-6.338	0.027
CUBIERTA	N+6.35	B12	ENVOLVENTE MIN	1.075	0.000	18.660	0.000	-6.338	-23.818
CUBIERTA	N+6.35	B12	ENVOLVENTE MIN	2.150	0.000	27.500	0.000	-6.338	-65.267
CUBIERTA	N+3.20	B12	ENVOLVENTE MAX	0.000	0.000	111.130	0.000	13.112	3.063
CUBIERTA	N+3.20	B12	ENVOLVENTE MAX	1.075	0.000	132.510	0.000	13.112	-58.073
PISO2	N+3.20	B12	ENVOLVENTE MAX	2.150	0.000	153.890	0.000	13.112	-129.339
PISO2	N+3.20	B12	ENVOLVENTE MIN	0.000	0.000	51.900	0.000	-15.148	1.300
PISO2	N+3.20	B12	ENVOLVENTE MIN	1.075	0.000	61.000	0.000	-15.148	-125.168
PISO2	N+3.20	B12	ENVOLVENTE MIN	2.150	0.000	70.100	0.000	-15.148	-281.837
PISO2	N+6.35	B13	ENVOLVENTE MAX	0.000	0.000	-17.340	0.000	1.023	5.057
PISO2	N+6.35	B13	ENVOLVENTE MAX	3.450	0.000	11.020	0.000	1.023	34.303
PISO2	N+6.35	B13	ENVOLVENTE MAX	6.900	0.000	57.620	0.000	1.023	36.351
PISO2	N+6.35	B13	ENVOLVENTE MIN	0.000	0.000	-73.540	0.000	-0.929	-138.008
CUBIERTA	N+6.35	B13	ENVOLVENTE MIN	3.450	0.000	-23.520	0.000	-0.929	15.953
CUBIERTA	N+6.35	B13	ENVOLVENTE MIN	6.900	0.000	8.270	0.000	-0.929	-83.068
CUBIERTA	N+3.20	B13	ENVOLVENTE MAX	0.000	0.000	-72.030	0.000	9.707	-64.141
CUBIERTA	N+3.20	B13	ENVOLVENTE MAX	3.450	0.000	-23.520	0.000	9.707	179.852
CUBIERTA	N+3.20	B13	ENVOLVENTE MAX	3.450	0.000	79.770	0.000	6.728	178.906
CUBIERTA	N+3.20	B13	ENVOLVENTE MAX	6.900	0.000	156.350	0.000	6.728	-9.737
PISO2	N+3.20	B13	ENVOLVENTE MIN	0.000	0.000	-186.140	0.000	-8.181	-346.728
PISO2	N+3.20	B13	ENVOLVENTE MIN	3.450	0.000	-109.550	0.000	-8.181	100.615
PISO2	N+3.20	B13	ENVOLVENTE MIN	3.450	0.000	7.470	0.000	-10.076	99.717
PISO2	N+3.20	B13	ENVOLVENTE MIN	6.900	0.000	55.980	0.000	-10.076	-243.967
PISO2	N+6.35	B14	ENVOLVENTE MAX	0.000	0.000	-16.570	0.000	13.713	-12.313
PISO2	N+6.35	B14	ENVOLVENTE MAX	0.490	0.000	-12.540	0.000	13.713	-5.180
PISO2	N+6.35	B14	ENVOLVENTE MAX	0.980	0.000	-7.100	0.000	13.713	0.069
PISO2	N+6.35	B14	ENVOLVENTE MIN	0.000	0.000	-26.100	0.000	-6.479	-19.411
CUBIERTA	N+6.35	B14	ENVOLVENTE MIN	0.490	0.000	-19.840	0.000	-6.479	-8.157
CUBIERTA	N+6.35	B14	ENVOLVENTE MIN	0.980	0.000	-13.570	0.000	-6.479	-0.022
CUBIERTA	N+3.20	B14	ENVOLVENTE MAX	0.000	0.000	-59.660	0.000	20.822	-52.712
CUBIERTA	N+3.20	B14	ENVOLVENTE MAX	0.490	0.000	-56.200	0.000	20.822	-24.216
CUBIERTA	N+3.20	B14	ENVOLVENTE MAX	0.980	0.000	-52.730	0.000	20.822	3.285
CUBIERTA	N+3.20	B14	ENVOLVENTE MIN	0.000	0.000	-97.870	0.000	-17.197	-88.451
PISO2	N+3.20	B14	ENVOLVENTE MIN	0.490	0.000	-92.490	0.000	-17.197	-41.640
PISO2	N+3.20	B14	ENVOLVENTE MIN	0.980	0.000	-87.100	0.000	-17.197	0.446
PISO2	N+6.35	B15	ENVOLVENTE MAX	0.000	0.000	16.450	0.000	5.818	0.341
PISO2	N+6.35	B15	ENVOLVENTE MAX	1.075	0.000	31.990	0.000	5.818	-15.595
PISO2	N+6.35	B15	ENVOLVENTE MAX	2.150	0.000	49.940	0.000	5.818	-40.856
PISO2	N+6.35	B15	ENVOLVENTE MIN	0.000	0.000	10.210	0.000	-5.756	0.141
PISO2	N+6.35	B15	ENVOLVENTE MIN	1.075	0.000	19.070	0.000	-5.756	-24.786
PISO2	N+6.35	B15	ENVOLVENTE MIN	2.150	0.000	27.930	0.000	-5.756	-68.476
CUBIERTA	N+3.20	B15	ENVOLVENTE MAX	0.000	0.000	116.990	0.000	13.615	3.487
CUBIERTA	N+3.20	B15	ENVOLVENTE MAX	1.075	0.000	138.370	0.000	13.615	-61.035
CUBIERTA	N+3.20	B15	ENVOLVENTE MAX	2.150	0.000	159.750	0.000	13.615	-135.457
CUBIERTA	N+3.20	B15	ENVOLVENTE MIN	0.000	0.000	54.830	0.000	-15.455	1.473
CUBIERTA	N+3.20	B15	ENVOLVENTE MIN	1.075	0.000	63.930	0.000	-15.455	-131.040
CUBIERTA	N+3.20	B15	ENVOLVENTE MIN	2.150	0.000	73.030	0.000	-15.455	-294.006
PISO2	N+6.35	B16	ENVOLVENTE MAX	0.000	0.000	-16.960	0.000	0.798	6.354
PISO2	N+6.35	B16	ENVOLVENTE MAX	3.450	0.000	11.480	0.000	0.798	33.707
PISO2	N+6.35	B16	ENVOLVENTE MAX	6.900	0.000	58.780	0.000	0.798	33.541
PISO2	N+6.35	B16	ENVOLVENTE MIN	0.000	0.000	-72.510	0.000	-1.084	-134.581
PISO2	N+6.35	B16	ENVOLVENTE MIN	3.450	0.000	-22.290	0.000	-1.084	15.746
PISO2	N+6.35	B16	ENVOLVENTE MIN	6.900	0.000	9.070	0.000	-1.084	-87.182
PISO2	N+3.20	B16	ENVOLVENTE MAX	0.000	0.000	-73.150	0.000	10.234	-64.122
PISO2	N+3.20	B16	ENVOLVENTE MAX	3.450	0.000	-24.640	0.000	10.234	187.396
CUBIERTA	N+3.20	B16	ENVOLVENTE MAX	3.450	0.000	84.810	0.000	7.057	186.243
CUBIERTA	N+3.20	B16	ENVOLVENTE MAX	6.900	0.000	161.390	0.000	7.057	-13.597
CUBIERTA	N+3.20	B16	ENVOLVENTE MIN	0.000	0.000	-189.650	0.000	-8.306	-351.957
CUBIERTA	N+3.20	B16	ENVOLVENTE MIN	3.450	0.000	-113.070	0.000	-8.306	104.373
CUBIERTA	N+3.20	B16	ENVOLVENTE MIN	3.450	0.000	9.790	0.000	-10.034	103.679
CUBIERTA	N+3.20	B16	ENVOLVENTE MIN	6.900	0.000	58.300	0.000	-10.034	-254.859
CUBIERTA	N+6.35	B17	ENVOLVENTE MAX	0.000	0.000	-18.300	0.000	9.876	-13.929
CUBIERTA	N+6.35	B17	ENVOLVENTE MAX	0.490	0.000	-14.260	0.000	9.876	-5.951
CUBIERTA	N+6.35	B17	ENVOLVENTE MAX	0.980	0.000	-10.220	0.000	9.876	0.139
CUBIERTA	N+6.35	B17	ENVOLVENTE MIN	0.000	0.000	-31.260	0.000	-8.155	-22.484
PISO2	N+6.35	B17	ENVOLVENTE MIN	0.490	0.000	-23.080	0.000	-8.155	-9.608
PISO2	N+6.35	B17	ENVOLVENTE MIN	0.980	0.000	-16.690	0.000	-8.155	0.048
PISO2	N+3.20	B17	ENVOLVENTE MAX	0.000	0.000	-61.470	0.000	22.060	-54.446
PISO2	N+3.20	B17	ENVOLVENTE MAX	0.490	0.000	-58.010	0.000	22.060	-25.063
PISO2	N+3.20	B17	ENVOLVENTE MAX	0.980	0.000	-54.540	0.000	22.060	3.352
PISO2	N+3.20	B17	ENVOLVENTE MIN	0.000	0.000	-100.780	0.000	-17.473	-91.275

PISO2	N+3.20	B17	ENVOLVENTE MIN	0.490	0.000	-95.400	0.000	-17.473	-43.038
PISO2	N+3.20	B17	ENVOLVENTE MIN	0.980	0.000	-90.010	0.000	-17.473	0.443
CUBIERTA	N+6.35	B18	ENVOLVENTE MAX	0.000	0.000	7.560	0.000	10.436	-0.028
CUBIERTA	N+6.35	B18	ENVOLVENTE MAX	1.075	0.000	19.530	0.000	10.436	-8.105
CUBIERTA	N+6.35	B18	ENVOLVENTE MAX	2.150	0.000	32.540	0.000	10.436	-24.099
CUBIERTA	N+6.35	B18	ENVOLVENTE MIN	0.000	0.000	3.670	0.000	-0.682	-0.454
CUBIERTA	N+6.35	B18	ENVOLVENTE MIN	1.075	0.000	11.140	0.000	-0.682	-14.850
CUBIERTA	N+6.35	B18	ENVOLVENTE MIN	2.150	0.000	18.610	0.000	-0.682	-42.280
CUBIERTA	N+3.20	B18	ENVOLVENTE MAX	0.000	0.000	51.690	0.000	42.883	0.215
CUBIERTA	N+3.20	B18	ENVOLVENTE MAX	1.075	0.000	73.510	0.000	42.883	-30.574
CUBIERTA	N+3.20	B18	ENVOLVENTE MAX	2.150	0.000	95.330	0.000	42.883	-75.835
CUBIERTA	N+3.20	B18	ENVOLVENTE MIN	0.000	0.000	22.390	0.000	5.624	-0.477
PISO2	N+3.20	B18	ENVOLVENTE MIN	1.075	0.000	35.280	0.000	5.624	-66.217
PISO2	N+3.20	B18	ENVOLVENTE MIN	2.150	0.000	48.180	0.000	5.624	-158.329
PISO2	N+6.35	B19	ENVOLVENTE MAX	0.000	0.000	-11.790	0.000	0.881	14.551
PISO2	N+6.35	B19	ENVOLVENTE MAX	3.450	0.000	12.190	0.000	0.881	24.797
PISO2	N+6.35	B19	ENVOLVENTE MAX	6.900	0.000	47.620	0.000	0.881	37.609
PISO2	N+6.35	B19	ENVOLVENTE MIN	0.000	0.000	-59.620	0.000	-1.533	-117.535
PISO2	N+6.35	B19	ENVOLVENTE MIN	3.450	0.000	-21.530	0.000	-1.533	13.725
PISO2	N+6.35	B19	ENVOLVENTE MIN	6.900	0.000	5.120	0.000	-1.533	-76.176
CUBIERTA	N+3.20	B19	ENVOLVENTE MAX	0.000	0.000	-47.280	0.000	-6.717	-11.715
CUBIERTA	N+3.20	B19	ENVOLVENTE MAX	3.450	0.000	3.760	0.000	-6.717	105.314
CUBIERTA	N+3.20	B19	ENVOLVENTE MAX	3.450	0.000	48.260	0.000	31.664	104.887
CUBIERTA	N+3.20	B19	ENVOLVENTE MAX	6.900	0.000	122.260	0.000	31.664	29.080
CUBIERTA	N+3.20	B19	ENVOLVENTE MIN	0.000	0.000	-143.520	0.000	-30.826	-270.127
CUBIERTA	N+3.20	B19	ENVOLVENTE MIN	3.450	0.000	-69.520	0.000	-30.826	60.619
PISO2	N+3.20	B19	ENVOLVENTE MIN	3.450	0.000	-15.950	0.000	8.240	60.360
PISO2	N+3.20	B19	ENVOLVENTE MIN	6.900	0.000	35.090	0.000	8.240	-195.859
PISO2	N+6.35	B20	ENVOLVENTE MAX	0.000	0.000	-9.870	0.000	2.374	-6.344
PISO2	N+6.35	B20	ENVOLVENTE MAX	0.490	0.000	-6.460	0.000	2.374	-2.342
PISO2	N+6.35	B20	ENVOLVENTE MAX	0.980	0.000	-3.060	0.000	2.374	0.163
PISO2	N+6.35	B20	ENVOLVENTE MIN	0.000	0.000	-18.640	0.000	-12.036	-13.010
PISO2	N+6.35	B20	ENVOLVENTE MIN	0.490	0.000	-13.230	0.000	-12.036	-5.201
PISO2	N+6.35	B20	ENVOLVENTE MIN	0.980	0.000	-7.820	0.000	-12.036	-0.214
CUBIERTA	N+3.20	B20	ENVOLVENTE MAX	0.000	0.000	-32.250	0.000	-4.300	-25.523
CUBIERTA	N+3.20	B20	ENVOLVENTE MAX	0.490	0.000	-26.710	0.000	-4.300	-11.016
CUBIERTA	N+3.20	B20	ENVOLVENTE MAX	0.980	0.000	-21.180	0.000	-4.300	1.645
CUBIERTA	N+3.20	B20	ENVOLVENTE MIN	0.000	0.000	-55.810	0.000	-38.722	-45.334
CUBIERTA	N+3.20	B20	ENVOLVENTE MIN	0.490	0.000	-47.200	0.000	-38.722	-20.076
CUBIERTA	N+3.20	B20	ENVOLVENTE MIN	0.980	0.000	-39.360	0.000	-38.722	-0.001
PISO2	N+6.35	B21	ENVOLVENTE MAX	0.000	0.000	6.310	0.000	-1.984	0.400
PISO2	N+6.35	B21	ENVOLVENTE MAX	0.920	0.000	9.830	0.000	-1.984	-3.101
PISO2	N+6.35	B21	ENVOLVENTE MAX	1.840	0.000	13.530	0.000	-1.984	-9.024
PISO2	N+6.35	B21	ENVOLVENTE MIN	0.000	0.000	2.490	0.000	-6.592	-0.506
PISO2	N+6.35	B21	ENVOLVENTE MIN	0.920	0.000	5.120	0.000	-6.592	-7.931
PISO2	N+6.35	B21	ENVOLVENTE MIN	1.840	0.000	7.760	0.000	-6.592	-18.586
PISO2	N+3.20	B21	ENVOLVENTE MAX	0.000	0.000	17.930	0.000	-5.883	0.800
PISO2	N+3.20	B21	ENVOLVENTE MAX	0.920	0.000	28.780	0.000	-5.883	-7.047
CUBIERTA	N+3.20	B21	ENVOLVENTE MAX	1.840	0.000	39.620	0.000	-5.883	-20.444
CUBIERTA	N+3.20	B21	ENVOLVENTE MIN	0.000	0.000	5.900	0.000	-19.081	-0.216
CUBIERTA	N+3.20	B21	ENVOLVENTE MIN	0.920	0.000	11.490	0.000	-19.081	-20.280
CUBIERTA	N+3.20	B21	ENVOLVENTE MIN	1.840	0.000	17.080	0.000	-19.081	-52.596
CUBIERTA	N+6.35	B22	ENVOLVENTE MAX	0.000	0.000	23.320	0.000	2.141	41.983
CUBIERTA	N+6.35	B22	ENVOLVENTE MAX	1.540	0.000	27.730	0.000	2.141	3.798
PISO2	N+6.35	B22	ENVOLVENTE MAX	3.080	0.000	32.130	0.000	2.141	52.715
PISO2	N+6.35	B22	ENVOLVENTE MIN	0.000	0.000	-42.580	0.000	-6.266	-60.317
PISO2	N+6.35	B22	ENVOLVENTE MIN	1.540	0.000	-36.700	0.000	-6.266	-0.393
PISO2	N+6.35	B22	ENVOLVENTE MIN	3.080	0.000	-30.820	0.000	-6.266	-43.412
PISO2	N+3.20	B22	ENVOLVENTE MAX	0.000	0.000	53.350	0.000	5.214	99.324
PISO2	N+3.20	B22	ENVOLVENTE MAX	1.540	0.000	75.910	0.000	5.214	3.269
PISO2	N+3.20	B22	ENVOLVENTE MAX	3.080	0.000	107.220	0.000	5.214	77.116
PISO2	N+3.20	B22	ENVOLVENTE MIN	0.000	0.000	-91.840	0.000	-17.485	-126.486
CUBIERTA	N+3.20	B22	ENVOLVENTE MIN	1.540	0.000	-63.650	0.000	-17.485	-6.890
CUBIERTA	N+3.20	B22	ENVOLVENTE MIN	3.080	0.000	-44.200	0.000	-17.485	-142.049
CUBIERTA	N+6.35	B23	ENVOLVENTE MAX	0.000	0.000	1.010	0.000	0.588	18.671
CUBIERTA	N+6.35	B23	ENVOLVENTE MAX	2.975	0.000	9.880	0.000	0.588	5.569
CUBIERTA	N+6.35	B23	ENVOLVENTE MAX	5.950	0.000	21.240	0.000	0.588	19.651
CUBIERTA	N+6.35	B23	ENVOLVENTE MIN	0.000	0.000	-20.460	0.000	-3.212	-39.739
CUBIERTA	N+6.35	B23	ENVOLVENTE MIN	2.975	0.000	-9.460	0.000	-3.212	2.984
CUBIERTA	N+6.35	B23	ENVOLVENTE MIN	5.950	0.000	-0.950	0.000	-3.212	-43.224
CUBIERTA	N+3.20	B23	ENVOLVENTE MAX	0.000	0.000	-43.900	0.000	9.432	-16.848
CUBIERTA	N+3.20	B23	ENVOLVENTE MAX	2.970	0.000	-10.760	0.000	9.432	132.307
CUBIERTA	N+3.20	B23	ENVOLVENTE MAX	2.970	0.000	89.460	0.000	15.331	133.488
CUBIERTA	N+3.20	B23	ENVOLVENTE MAX	5.950	0.000	148.560	0.000	15.331	-30.402
CUBIERTA	N+3.20	B23	ENVOLVENTE MIN	0.000	0.000	-130.620	0.000	-23.247	-181.713
CUBIERTA	N+3.20	B23	ENVOLVENTE MIN	2.970	0.000	-71.830	0.000	-23.247	54.996
CUBIERTA	N+3.20	B23	ENVOLVENTE MIN	2.970	0.000	14.730	0.000	-3.768	55.763

CUBIERTA	N+3.20	B23	ENVOLVENTE MIN	5.950	0.000	48.040	0.000	-3.768	-233.075
CUBIERTA	N+6.35	B24	ENVOLVENTE MAX	0.000	0.000	-4.580	0.000	1.034	10.643
CUBIERTA	N+6.35	B24	ENVOLVENTE MAX	3.775	0.000	6.220	0.000	1.034	12.417
CUBIERTA	N+6.35	B24	ENVOLVENTE MAX	7.550	0.000	20.520	0.000	1.034	11.118
CUBIERTA	N+6.35	B24	ENVOLVENTE MIN	0.000	0.000	-20.840	0.000	-1.401	-39.869
PISO2	N+6.35	B24	ENVOLVENTE MIN	3.775	0.000	-6.430	0.000	-1.401	7.532
PISO2	N+6.35	B24	ENVOLVENTE MIN	7.550	0.000	4.490	0.000	-1.401	-38.749
PISO2	N+3.20	B24	ENVOLVENTE MAX	0.000	0.000	-70.180	0.000	6.010	-77.978
PISO2	N+3.20	B24	ENVOLVENTE MAX	3.770	0.000	-22.780	0.000	6.010	198.099
PISO2	N+3.20	B24	ENVOLVENTE MAX	3.770	0.000	80.540	0.000	13.815	198.123
PISO2	N+3.20	B24	ENVOLVENTE MAX	7.550	0.000	172.020	0.000	13.815	-77.784
PISO2	N+3.20	B24	ENVOLVENTE MIN	0.000	0.000	-170.270	0.000	-18.495	-277.609
PISO2	N+3.20	B24	ENVOLVENTE MIN	3.770	0.000	-78.160	0.000	-18.495	89.465
CUBIERTA	N+3.20	B24	ENVOLVENTE MIN	3.770	0.000	22.200	0.000	-2.352	89.509
CUBIERTA	N+3.20	B24	ENVOLVENTE MIN	7.550	0.000	69.790	0.000	-2.352	-287.250
CUBIERTA	N+6.35	B25	ENVOLVENTE MAX	0.000	0.000	-2.870	0.000	2.507	12.637
CUBIERTA	N+6.35	B25	ENVOLVENTE MAX	3.490	0.000	7.120	0.000	2.507	8.304
CUBIERTA	N+6.35	B25	ENVOLVENTE MAX	6.980	0.000	19.730	0.000	2.507	15.149
CUBIERTA	N+6.35	B25	ENVOLVENTE MIN	0.000	0.000	-21.810	0.000	-0.738	-46.514
CUBIERTA	N+6.35	B25	ENVOLVENTE MIN	3.490	0.000	-8.490	0.000	-0.738	5.222
CUBIERTA	N+6.35	B25	ENVOLVENTE MIN	6.980	0.000	2.220	0.000	-0.738	-39.489
CUBIERTA	N+3.20	B25	ENVOLVENTE MAX	0.000	0.000	-61.390	0.000	4.427	-59.798
CUBIERTA	N+3.20	B25	ENVOLVENTE MAX	3.490	0.000	-19.090	0.000	4.427	166.611
CUBIERTA	N+3.20	B25	ENVOLVENTE MAX	3.490	0.000	77.980	0.000	12.842	166.353
CUBIERTA	N+3.20	B25	ENVOLVENTE MAX	6.980	0.000	156.070	0.000	12.842	-55.469
CUBIERTA	N+3.20	B25	ENVOLVENTE MIN	0.000	0.000	-157.560	0.000	-17.492	-258.563
CUBIERTA	N+3.20	B25	ENVOLVENTE MIN	3.490	0.000	-79.140	0.000	-17.492	75.060
PISO2	N+3.20	B25	ENVOLVENTE MIN	3.490	0.000	17.890	0.000	-3.454	75.028
PISO2	N+3.20	B25	ENVOLVENTE MIN	6.980	0.000	60.190	0.000	-3.454	-254.929
PISO2	N+6.35	B26	ENVOLVENTE MAX	0.000	0.000	-3.250	0.000	1.052	13.066
PISO2	N+6.35	B26	ENVOLVENTE MAX	3.585	0.000	7.010	0.000	1.052	9.822
PISO2	N+6.35	B26	ENVOLVENTE MAX	7.170	0.000	20.600	0.000	1.052	14.003
PISO2	N+6.35	B26	ENVOLVENTE MIN	0.000	0.000	-21.060	0.000	-1.308	-42.407
PISO2	N+6.35	B26	ENVOLVENTE MIN	3.585	0.000	-7.370	0.000	-1.308	6.289
PISO2	N+6.35	B26	ENVOLVENTE MIN	7.170	0.000	2.980	0.000	-1.308	-40.741
CUBIERTA	N+3.20	B26	ENVOLVENTE MAX	0.000	0.000	-63.370	0.000	3.064	-63.310
CUBIERTA	N+3.20	B26	ENVOLVENTE MAX	3.580	0.000	-19.430	0.000	3.064	175.648
CUBIERTA	N+3.20	B26	ENVOLVENTE MAX	3.580	0.000	78.000	0.000	13.366	175.650
CUBIERTA	N+3.20	B26	ENVOLVENTE MAX	7.170	0.000	161.750	0.000	13.366	-66.669
CUBIERTA	N+3.20	B26	ENVOLVENTE MIN	0.000	0.000	-160.630	0.000	-14.271	-262.246
CUBIERTA	N+3.20	B26	ENVOLVENTE MIN	3.580	0.000	-78.130	0.000	-14.271	79.780
PISO2	N+3.20	B26	ENVOLVENTE MIN	3.580	0.000	20.670	0.000	-3.557	79.940
PISO2	N+3.20	B26	ENVOLVENTE MIN	7.170	0.000	64.800	0.000	-3.557	-265.380
PISO2	N+6.35	B27	ENVOLVENTE MAX	0.000	0.000	-1.770	0.000	0.827	16.240
PISO2	N+6.35	B27	ENVOLVENTE MAX	3.550	0.000	9.060	0.000	0.827	8.037
PISO2	N+6.35	B27	ENVOLVENTE MAX	7.100	0.000	22.610	0.000	0.827	13.332
PISO2	N+6.35	B27	ENVOLVENTE MIN	0.000	0.000	-20.080	0.000	-1.438	-40.295
PISO2	N+6.35	B27	ENVOLVENTE MIN	3.550	0.000	-7.190	0.000	-1.438	4.473
PISO2	N+6.35	B27	ENVOLVENTE MIN	7.100	0.000	2.970	0.000	-1.438	-50.649
CUBIERTA	N+3.20	B27	ENVOLVENTE MAX	0.000	0.000	-65.440	0.000	2.225	-67.412
CUBIERTA	N+3.20	B27	ENVOLVENTE MAX	3.540	0.000	-22.230	0.000	2.225	187.145
CUBIERTA	N+3.20	B27	ENVOLVENTE MAX	3.540	0.000	71.660	0.000	13.598	185.816
CUBIERTA	N+3.20	B27	ENVOLVENTE MAX	3.550	0.000	71.720	0.000	13.598	185.189
CUBIERTA	N+3.20	B27	ENVOLVENTE MAX	7.100	0.000	152.260	0.000	13.598	-38.673
CUBIERTA	N+3.20	B27	ENVOLVENTE MIN	0.000	0.000	-169.380	0.000	-14.434	-283.021
PISO2	N+3.20	B27	ENVOLVENTE MIN	3.540	0.000	-89.780	0.000	-14.434	84.809
PISO2	N+3.20	B27	ENVOLVENTE MIN	3.540	0.000	15.990	0.000	-4.471	84.605
PISO2	N+3.20	B27	ENVOLVENTE MIN	3.550	0.000	16.030	0.000	-4.471	84.286
PISO2	N+3.20	B27	ENVOLVENTE MIN	7.100	0.000	59.570	0.000	-4.471	-231.930
PISO2	N+6.35	B28	ENVOLVENTE MAX	0.000	0.000	4.430	0.000	2.723	24.550
PISO2	N+6.35	B28	ENVOLVENTE MAX	2.975	0.000	15.790	0.000	2.723	1.346
PISO2	N+6.35	B28	ENVOLVENTE MAX	5.950	0.000	27.150	0.000	2.723	12.394
PISO2	N+6.35	B28	ENVOLVENTE MIN	0.000	0.000	-17.110	0.000	-0.911	-38.732
CUBIERTA	N+6.35	B28	ENVOLVENTE MIN	2.975	0.000	-8.590	0.000	-0.911	-10.629
CUBIERTA	N+6.35	B28	ENVOLVENTE MIN	5.950	0.000	-0.080	0.000	-0.911	-69.404
CUBIERTA	N+3.20	B28	ENVOLVENTE MAX	0.000	0.000	-32.030	0.000	26.722	6.472
CUBIERTA	N+3.20	B28	ENVOLVENTE MAX	2.970	0.000	0.090	0.000	26.722	97.208
CUBIERTA	N+3.20	B28	ENVOLVENTE MAX	2.970	0.000	64.080	0.000	4.123	97.306
CUBIERTA	N+3.20	B28	ENVOLVENTE MAX	5.950	0.000	114.000	0.000	4.123	-10.587
PISO2	N+3.20	B28	ENVOLVENTE MIN	0.000	0.000	-105.550	0.000	-9.557	-154.869
PISO2	N+3.20	B28	ENVOLVENTE MIN	2.970	0.000	-55.880	0.000	-9.557	41.557
PISO2	N+3.20	B28	ENVOLVENTE MIN	2.970	0.000	3.430	0.000	-20.851	41.011
PISO2	N+3.20	B28	ENVOLVENTE MIN	5.950	0.000	35.700	0.000	-20.851	-174.742
PISO2	N+6.35	B29	ENVOLVENTE MAX	0.000	0.000	-36.170	0.000	18.924	-35.346
PISO2	N+6.35	B29	ENVOLVENTE MAX	3.180	0.000	-11.400	0.000	18.924	156.775
PISO2	N+6.35	B29	ENVOLVENTE MAX	3.180	0.000	10.870	0.000	0.445	151.588
PISO2	N+6.35	B29	ENVOLVENTE MAX	3.775	0.000	18.440	0.000	0.445	145.959

CUBIERTA	N+6.35	B29	ENVOLVENTE MAX	7.550	0.000	156.810	0.000	0.445	-29.635
CUBIERTA	N+6.35	B29	ENVOLVENTE MIN	0.000	0.000	-164.460	0.000	-3.172	-217.807
CUBIERTA	N+6.35	B29	ENVOLVENTE MIN	3.180	0.000	-71.130	0.000	-3.172	33.603
CUBIERTA	N+6.35	B29	ENVOLVENTE MIN	3.180	0.000	-4.550	0.000	-12.638	32.464
CUBIERTA	N+6.35	B29	ENVOLVENTE MIN	3.775	0.000	-1.430	0.000	-12.638	33.617
CUBIERTA	N+6.35	B29	ENVOLVENTE MIN	7.550	0.000	33.860	0.000	-12.638	-203.804
PISO2	N+3.20	B29	ENVOLVENTE MAX	0.000	0.000	-59.520	0.000	27.401	-63.334
PISO2	N+3.20	B29	ENVOLVENTE MAX	3.770	0.000	-14.260	0.000	27.401	129.657
PISO2	N+3.20	B29	ENVOLVENTE MAX	3.770	0.000	55.630	0.000	-0.371	129.084
PISO2	N+3.20	B29	ENVOLVENTE MAX	7.550	0.000	126.520	0.000	-0.371	-59.424
PISO2	N+3.20	B29	ENVOLVENTE MIN	0.000	0.000	-126.410	0.000	-4.212	-220.416
PISO2	N+3.20	B29	ENVOLVENTE MIN	3.770	0.000	-55.790	0.000	-4.212	69.101
CUBIERTA	N+3.20	B29	ENVOLVENTE MIN	3.770	0.000	13.100	0.000	-23.602	69.388
CUBIERTA	N+3.20	B29	ENVOLVENTE MIN	7.550	0.000	58.530	0.000	-23.602	-221.759
CUBIERTA	N+6.35	B30	ENVOLVENTE MAX	0.000	0.000	-5.330	0.000	0.414	1.758
CUBIERTA	N+6.35	B30	ENVOLVENTE MAX	3.490	0.000	4.660	0.000	0.414	4.752
CUBIERTA	N+6.35	B30	ENVOLVENTE MAX	6.980	0.000	14.650	0.000	0.414	23.552
CUBIERTA	N+6.35	B30	ENVOLVENTE MIN	0.000	0.000	-27.150	0.000	-2.824	-72.949
PISO2	N+6.35	B30	ENVOLVENTE MIN	3.490	0.000	-13.830	0.000	-2.824	-4.991
PISO2	N+6.35	B30	ENVOLVENTE MIN	6.980	0.000	-0.500	0.000	-2.824	-30.795
PISO2	N+3.20	B30	ENVOLVENTE MAX	0.000	0.000	-50.950	0.000	24.259	-43.283
PISO2	N+3.20	B30	ENVOLVENTE MAX	3.490	0.000	-10.400	0.000	24.259	110.928
PISO2	N+3.20	B30	ENVOLVENTE MAX	3.490	0.000	55.150	0.000	0.787	111.141
PISO2	N+3.20	B30	ENVOLVENTE MAX	6.980	0.000	118.250	0.000	0.787	-37.900
CUBIERTA	N+3.20	B30	ENVOLVENTE MIN	0.000	0.000	-116.780	0.000	-2.994	-192.861
CUBIERTA	N+3.20	B30	ENVOLVENTE MIN	3.490	0.000	-53.690	0.000	-2.994	57.813
CUBIERTA	N+3.20	B30	ENVOLVENTE MIN	3.490	0.000	8.580	0.000	-21.643	57.690
CUBIERTA	N+3.20	B30	ENVOLVENTE MIN	6.980	0.000	49.130	0.000	-21.643	-196.767
CUBIERTA	N+6.35	B31	ENVOLVENTE MAX	0.000	0.000	-3.980	0.000	0.960	10.661
CUBIERTA	N+6.35	B31	ENVOLVENTE MAX	3.585	0.000	6.280	0.000	0.960	10.113
PISO2	N+6.35	B31	ENVOLVENTE MAX	7.170	0.000	19.960	0.000	0.960	13.237
PISO2	N+6.35	B31	ENVOLVENTE MIN	0.000	0.000	-20.710	0.000	-1.543	-40.535
PISO2	N+6.35	B31	ENVOLVENTE MIN	3.585	0.000	-7.030	0.000	-1.543	6.465
PISO2	N+6.35	B31	ENVOLVENTE MIN	7.170	0.000	3.240	0.000	-1.543	-37.765
PISO2	N+3.20	B31	ENVOLVENTE MAX	0.000	0.000	-54.160	0.000	22.677	-50.269
PISO2	N+3.20	B31	ENVOLVENTE MAX	3.580	0.000	-12.100	0.000	22.677	115.792
CUBIERTA	N+3.20	B31	ENVOLVENTE MAX	3.580	0.000	54.450	0.000	0.442	115.777
CUBIERTA	N+3.20	B31	ENVOLVENTE MAX	7.170	0.000	120.230	0.000	0.442	-46.937
CUBIERTA	N+3.20	B31	ENVOLVENTE MIN	0.000	0.000	-120.550	0.000	-0.552	-204.975
CUBIERTA	N+3.20	B31	ENVOLVENTE MIN	3.580	0.000	-55.040	0.000	-0.552	62.083
CUBIERTA	N+3.20	B31	ENVOLVENTE MIN	3.580	0.000	10.610	0.000	-23.374	61.680
CUBIERTA	N+3.20	B31	ENVOLVENTE MIN	7.170	0.000	52.840	0.000	-23.374	-203.039
PISO2	N+6.35	B32	ENVOLVENTE MAX	0.000	0.000	-2.860	0.000	1.111	12.568
PISO2	N+6.35	B32	ENVOLVENTE MAX	3.550	0.000	7.310	0.000	1.111	8.385
PISO2	N+6.35	B32	ENVOLVENTE MAX	7.100	0.000	20.860	0.000	1.111	13.840
PISO2	N+6.35	B32	ENVOLVENTE MIN	0.000	0.000	-20.800	0.000	-1.264	-42.278
PISO2	N+6.35	B32	ENVOLVENTE MIN	3.550	0.000	-7.270	0.000	-1.264	4.691
PISO2	N+6.35	B32	ENVOLVENTE MIN	7.100	0.000	2.900	0.000	-1.264	-43.861
CUBIERTA	N+3.20	B32	ENVOLVENTE MAX	0.000	0.000	-57.100	0.000	22.168	-55.535
CUBIERTA	N+3.20	B32	ENVOLVENTE MAX	3.540	0.000	-15.710	0.000	22.168	128.753
CUBIERTA	N+3.20	B32	ENVOLVENTE MAX	3.540	0.000	52.370	0.000	0.269	129.271
CUBIERTA	N+3.20	B32	ENVOLVENTE MAX	3.550	0.000	52.420	0.000	0.269	128.883
CUBIERTA	N+3.20	B32	ENVOLVENTE MAX	7.100	0.000	117.340	0.000	0.269	-23.335
CUBIERTA	N+3.20	B32	ENVOLVENTE MIN	0.000	0.000	-130.330	0.000	-0.458	-223.822
PISO2	N+3.20	B32	ENVOLVENTE MIN	3.540	0.000	-65.890	0.000	-0.458	68.781
PISO2	N+3.20	B32	ENVOLVENTE MIN	3.540	0.000	7.550	0.000	-26.434	69.427
PISO2	N+3.20	B32	ENVOLVENTE MIN	3.550	0.000	7.590	0.000	-26.434	69.211
PISO2	N+3.20	B32	ENVOLVENTE MIN	7.100	0.000	49.280	0.000	-26.434	-182.246
PISO2	N+3.20	B33	ENVOLVENTE MAX	0.000	0.000	26.490	0.000	0.501	-0.896
PISO2	N+3.20	B33	ENVOLVENTE MAX	1.075	0.000	40.980	0.000	0.501	-11.846
CUBIERTA	N+3.20	B33	ENVOLVENTE MAX	2.150	0.000	58.060	0.000	0.501	-31.430
CUBIERTA	N+3.20	B33	ENVOLVENTE MIN	0.000	0.000	7.670	0.000	-1.267	-2.723
CUBIERTA	N+3.20	B33	ENVOLVENTE MIN	1.075	0.000	14.200	0.000	-1.267	-36.878
CUBIERTA	N+3.20	B33	ENVOLVENTE MIN	2.150	0.000	20.740	0.000	-1.267	-90.826
CUBIERTA	N+3.20	B35	ENVOLVENTE MAX	0.000	0.000	-8.780	0.000	0.801	-5.988
CUBIERTA	N+3.20	B35	ENVOLVENTE MAX	0.490	0.000	-6.490	0.000	0.801	-2.128
PISO2	N+3.20	B35	ENVOLVENTE MAX	0.980	0.000	-4.190	0.000	0.801	0.409
PISO2	N+3.20	B35	ENVOLVENTE MIN	0.000	0.000	-27.380	0.000	-1.706	-26.370

PISO2	N+3.20	B35	ENVOLVENTE MIN	0.490	0.000	-23.840	0.000	-1.706	**-13.643**
PISO2	N+3.20	B35	ENVOLVENTE MIN	0.980	0.000	-20.300	0.000	-1.706	-3.048
PISO2	N+3.20	B39	ENVOLVENTE MAX	0.000	0.000	28.520	0.000	0.822	-1.089
PISO2	N+3.20	B39	ENVOLVENTE MAX	1.075	0.000	44.850	0.000	0.822	-16.480
CUBIERTA	N+3.20	B39	ENVOLVENTE MAX	2.150	0.000	62.810	0.000	0.822	-40.505
CUBIERTA	N+3.20	B39	ENVOLVENTE MIN	0.000	0.000	11.800	0.000	-0.836	-2.855
CUBIERTA	N+3.20	B39	ENVOLVENTE MIN	1.075	0.000	18.330	0.000	-0.836	-39.202
CUBIERTA	N+3.20	B39	ENVOLVENTE MIN	2.150	0.000	24.870	0.000	-0.836	-99.224
CUBIERTA	N+3.20	B41	ENVOLVENTE MAX	0.000	0.000	-13.000	0.000	1.120	-10.768
CUBIERTA	N+3.20	B41	ENVOLVENTE MAX	0.490	0.000	-10.710	0.000	1.120	-4.849
PISO2	N+3.20	B41	ENVOLVENTE MAX	0.980	0.000	-8.410	0.000	1.120	-0.275
PISO2	N+3.20	B41	ENVOLVENTE MIN	0.000	0.000	-26.060	0.000	-1.314	-25.659
PISO2	N+3.20	B41	ENVOLVENTE MIN	0.490	0.000	-22.520	0.000	-1.314	-13.568
PISO2	N+3.20	B41	ENVOLVENTE MIN	0.980	0.000	-18.980	0.000	-1.314	-3.588
PISO2	N+3.20	B42	ENVOLVENTE MAX	0.000	0.000	25.790	0.000	1.101	-1.448
PISO2	N+3.20	B42	ENVOLVENTE MAX	1.075	0.000	42.040	0.000	1.101	-15.769
CUBIERTA	N+3.20	B42	ENVOLVENTE MAX	2.150	0.000	60.000	0.000	1.101	-38.723
CUBIERTA	N+3.20	B42	ENVOLVENTE MIN	0.000	0.000	10.800	0.000	-0.731	-3.401
CUBIERTA	N+3.20	B42	ENVOLVENTE MIN	1.075	0.000	17.340	0.000	-0.731	-36.626
CUBIERTA	N+3.20	B42	ENVOLVENTE MIN	2.150	0.000	23.870	0.000	-0.731	-93.785
CUBIERTA	N+3.20	B44	ENVOLVENTE MAX	0.000	0.000	-11.350	0.000	1.227	-9.325
CUBIERTA	N+3.20	B44	ENVOLVENTE MAX	0.490	0.000	-9.060	0.000	1.227	-4.213
PISO2	N+3.20	B44	ENVOLVENTE MAX	0.980	0.000	-6.760	0.000	1.227	-0.448
PISO2	N+3.20	B44	ENVOLVENTE MIN	0.000	0.000	-23.120	0.000	-1.153	-22.472
PISO2	N+3.20	B44	ENVOLVENTE MIN	0.490	0.000	-19.580	0.000	-1.153	-11.825
PISO2	N+3.20	B44	ENVOLVENTE MIN	0.980	0.000	-16.040	0.000	-1.153	-3.288
PISO2	N+3.20	B45	ENVOLVENTE MAX	0.000	0.000	26.200	0.000	0.850	-1.346
PISO2	N+3.20	B45	ENVOLVENTE MAX	1.075	0.000	42.580	0.000	0.850	-16.061
CUBIERTA	N+3.20	B45	ENVOLVENTE MAX	2.150	0.000	60.540	0.000	0.850	-39.409
CUBIERTA	N+3.20	B45	ENVOLVENTE MIN	0.000	0.000	11.170	0.000	-0.817	-3.204
CUBIERTA	N+3.20	B45	ENVOLVENTE MIN	1.075	0.000	17.700	0.000	-0.817	-36.931
CUBIERTA	N+3.20	B45	ENVOLVENTE MIN	2.150	0.000	24.240	0.000	-0.817	-94.759
CUBIERTA	N+3.20	B47	ENVOLVENTE MAX	0.000	0.000	-12.130	0.000	1.141	-10.111
CUBIERTA	N+3.20	B47	ENVOLVENTE MAX	0.490	0.000	-9.830	0.000	1.141	-4.619
CUBIERTA	N+3.20	B47	ENVOLVENTE MAX	0.980	0.000	-7.540	0.000	1.141	-0.474
CUBIERTA	N+3.20	B47	ENVOLVENTE MIN	0.000	0.000	-23.940	0.000	-1.283	-23.378
CUBIERTA	N+3.20	B47	ENVOLVENTE MIN	0.490	0.000	-20.400	0.000	-1.283	-12.329
CUBIERTA	N+3.20	B47	ENVOLVENTE MIN	0.980	0.000	-16.860	0.000	-1.283	-3.390
CUBIERTA	N+3.20	B48	ENVOLVENTE MAX	0.000	0.000	27.190	0.000	1.769	-0.494
CUBIERTA	N+3.20	B48	ENVOLVENTE MAX	1.075	0.000	43.520	0.000	1.769	-15.803
CUBIERTA	N+3.20	B48	ENVOLVENTE MAX	2.150	0.000	61.480	0.000	1.769	-39.721
CUBIERTA	N+3.20	B48	ENVOLVENTE MIN	0.000	0.000	11.700	0.000	-0.393	-1.751
CUBIERTA	N+3.20	B48	ENVOLVENTE MIN	1.075	0.000	18.230	0.000	-0.393	-36.639
CUBIERTA	N+3.20	B48	ENVOLVENTE MIN	2.150	0.000	24.770	0.000	-0.393	-95.125
CUBIERTA	N+3.20	B50	ENVOLVENTE MAX	0.000	0.000	-14.400	0.000	1.741	-12.131
CUBIERTA	N+3.20	B50	ENVOLVENTE MAX	0.490	0.000	-12.110	0.000	1.741	-5.515
CUBIERTA	N+3.20	B50	ENVOLVENTE MAX	0.980	0.000	-9.820	0.000	1.741	-0.226
CUBIERTA	N+3.20	B50	ENVOLVENTE MIN	0.000	0.000	-27.270	0.000	-0.666	-26.421
CUBIERTA	N+3.20	B50	ENVOLVENTE MIN	0.490	0.000	-23.700	0.000	-0.666	-13.766
CUBIERTA	N+3.20	B50	ENVOLVENTE MIN	0.980	0.000	-20.150	0.000	-0.666	-3.241
CUBIERTA	N+3.20	B51	ENVOLVENTE MAX	0.000	0.000	-14.790	0.000	1.564	3.772
CUBIERTA	N+3.20	B51	ENVOLVENTE MAX	1.485	0.000	-0.890	0.000	1.564	19.846
CUBIERTA	N+3.20	B51	ENVOLVENTE MAX	2.970	0.000	15.440	0.000	1.564	16.376
CUBIERTA	N+3.20	B51	ENVOLVENTE MIN	0.000	0.000	-34.780	0.000	-0.527	-33.126
CUBIERTA	N+3.20	B51	ENVOLVENTE MIN	1.485	0.000	-15.030	0.000	-0.527	0.486
CUBIERTA	N+3.20	B51	ENVOLVENTE MIN	2.970	0.000	2.310	0.000	-0.527	1.539
CUBIERTA	N+3.20	B52	ENVOLVENTE MAX	0.000	0.000	1.320	0.000	-0.110	16.467
CUBIERTA	N+3.20	B52	ENVOLVENTE MAX	1.490	0.000	20.380	0.000	-0.110	8.892
CUBIERTA	N+3.20	B52	ENVOLVENTE MAX	2.980	0.000	40.210	0.000	-0.110	-13.907
CUBIERTA	N+3.20	B52	ENVOLVENTE MIN	0.000	0.000	-8.070	0.000	-1.491	2.353
CUBIERTA	N+3.20	B52	ENVOLVENTE MIN	1.490	0.000	6.650	0.000	-1.491	-4.124
CUBIERTA	N+3.20	B52	ENVOLVENTE MIN	2.980	0.000	20.610	0.000	-1.491	-47.836
CUBIERTA	N+3.20	B53	ENVOLVENTE MAX	0.000	0.000	-26.770	0.000	1.936	-23.470
CUBIERTA	N+3.20	B53	ENVOLVENTE MAX	1.885	0.000	-8.930	0.000	1.936	13.790
CUBIERTA	N+3.20	B53	ENVOLVENTE MAX	3.770	0.000	10.800	0.000	1.936	20.877
CUBIERTA	N+3.20	B53	ENVOLVENTE MIN	0.000	0.000	-46.070	0.000	-0.056	-57.462
CUBIERTA	N+3.20	B53	ENVOLVENTE MIN	1.885	0.000	-20.290	0.000	-0.056	2.517
CUBIERTA	N+3.20	B53	ENVOLVENTE MIN	3.770	0.000	3.200	0.000	-0.056	8.354
CUBIERTA	N+3.20	B54	ENVOLVENTE MAX	0.000	0.000	-3.380	0.000	-0.253	20.786
CUBIERTA	N+3.20	B54	ENVOLVENTE MAX	1.890	0.000	20.270	0.000	-0.253	13.503
CUBIERTA	N+3.20	B54	ENVOLVENTE MAX	3.780	0.000	46.620	0.000	-0.253	-24.867
CUBIERTA	N+3.20	B54	ENVOLVENTE MIN	0.000	0.000	-10.010	0.000	-1.730	8.639
CUBIERTA	N+3.20	B54	ENVOLVENTE MIN	1.890	0.000	9.670	0.000	-1.730	1.710
CUBIERTA	N+3.20	B54	ENVOLVENTE MIN	3.780	0.000	27.560	0.000	-1.730	-58.899
CUBIERTA	N+3.20	B55	ENVOLVENTE MAX	0.000	0.000	-24.980	0.000	1.823	-20.376
CUBIERTA	N+3.20	B55	ENVOLVENTE MAX	1.745	0.000	-8.520	0.000	1.823	11.991

CUBIERTA	N+3.20	B55	ENVOLVENTE MAX	3.490	0.000	9.360	0.000	1.823	18.652
CUBIERTA	N+3.20	B55	ENVOLVENTE MIN	0.000	0.000	-43.700	0.000	0.073	-54.911
CUBIERTA	N+3.20	B55	ENVOLVENTE MIN	1.745	0.000	-20.280	0.000	0.073	-0.937
CUBIERTA	N+3.20	B55	ENVOLVENTE MIN	3.490	0.000	1.710	0.000	0.073	6.571
CUBIERTA	N+3.20	B56	ENVOLVENTE MAX	0.000	0.000	-2.460	0.000	-0.213	18.586
CUBIERTA	N+3.20	B56	ENVOLVENTE MAX	1.745	0.000	19.810	0.000	-0.213	12.176
CUBIERTA	N+3.20	B56	ENVOLVENTE MAX	3.490	0.000	43.220	0.000	-0.213	-19.689
CUBIERTA	N+3.20	B56	ENVOLVENTE MIN	0.000	0.000	-9.260	0.000	-1.627	6.563
CUBIERTA	N+3.20	B56	ENVOLVENTE MIN	1.745	0.000	8.340	0.000	-1.627	-0.062
CUBIERTA	N+3.20	B56	ENVOLVENTE MIN	3.490	0.000	24.800	0.000	-1.627	-53.404
CUBIERTA	N+3.20	B57	ENVOLVENTE MAX	0.000	0.000	-25.540	0.000	1.700	-20.979
CUBIERTA	N+3.20	B57	ENVOLVENTE MAX	1.790	0.000	-8.640	0.000	1.700	12.195
PISO2	N+3.20	B57	ENVOLVENTE MAX	3.580	0.000	9.670	0.000	1.700	18.633
PISO2	N+3.20	B57	ENVOLVENTE MIN	0.000	0.000	-44.120	0.000	0.190	-55.738
PISO2	N+3.20	B57	ENVOLVENTE MIN	1.790	0.000	-20.020	0.000	0.190	0.387
PISO2	N+3.20	B57	ENVOLVENTE MIN	3.580	0.000	2.620	0.000	0.190	7.274
PISO2	N+3.20	B58	ENVOLVENTE MAX	0.000	0.000	-2.770	0.000	-0.229	18.829
PISO2	N+3.20	B58	ENVOLVENTE MAX	1.795	0.000	19.850	0.000	-0.229	11.979
PISO2	N+3.20	B58	ENVOLVENTE MAX	3.590	0.000	44.480	0.000	-0.229	-22.544
PISO2	N+3.20	B58	ENVOLVENTE MIN	0.000	0.000	-9.340	0.000	-1.743	7.221
PISO2	N+3.20	B58	ENVOLVENTE MIN	1.795	0.000	9.100	0.000	-1.743	0.292
PISO2	N+3.20	B58	ENVOLVENTE MIN	3.590	0.000	26.050	0.000	-1.743	-55.363
PISO2	N+3.20	B59	ENVOLVENTE MAX	0.000	0.000	-26.040	0.000	1.618	-22.444
PISO2	N+3.20	B59	ENVOLVENTE MAX	1.770	0.000	-9.340	0.000	1.618	11.142
PISO2	N+3.20	B59	ENVOLVENTE MAX	3.540	0.000	8.170	0.000	1.618	20.256
PISO2	N+3.20	B59	ENVOLVENTE MIN	0.000	0.000	-45.820	0.000	0.204	-60.050
PISO2	N+3.20	B59	ENVOLVENTE MIN	1.770	0.000	-22.060	0.000	0.204	-0.940
PISO2	N+3.20	B59	ENVOLVENTE MIN	3.540	0.000	0.910	0.000	0.204	8.372
PISO2	N+3.20	B60	ENVOLVENTE MAX	0.000	0.000	-5.170	0.000	0.001	19.850
PISO2	N+3.20	B60	ENVOLVENTE MAX	1.780	0.000	15.450	0.000	0.001	25.012
PISO2	N+3.20	B60	ENVOLVENTE MAX	3.560	0.000	39.360	0.000	0.001	-4.300
PISO2	N+3.20	B60	ENVOLVENTE MIN	0.000	0.000	-15.710	0.000	-1.645	7.704
PISO2	N+3.20	B60	ENVOLVENTE MIN	1.780	0.000	4.370	0.000	-1.645	4.814
PISO2	N+3.20	B60	ENVOLVENTE MIN	3.560	0.000	21.180	0.000	-1.645	-38.722
PISO2	N+6.35	B61	ENVOLVENTE MAX	0.000	0.000	1.610	0.000	0.721	0.506
PISO2	N+6.35	B61	ENVOLVENTE MAX	0.920	0.000	3.370	0.000	0.721	0.388
PISO2	N+6.35	B61	ENVOLVENTE MAX	1.840	0.000	5.120	0.000	0.721	-0.895
PISO2	N+6.35	B61	ENVOLVENTE MIN	0.000	0.000	-0.580	0.000	-0.499	-0.400
PISO2	N+6.35	B61	ENVOLVENTE MIN	0.920	0.000	0.740	0.000	-0.499	-2.644
PISO2	N+6.35	B61	ENVOLVENTE MIN	1.840	0.000	2.050	0.000	-0.499	-6.550
PISO2	N+3.20	B61	ENVOLVENTE MAX	0.000	0.000	2.100	0.000	1.566	0.216
PISO2	N+3.20	B61	ENVOLVENTE MAX	0.920	0.000	8.410	0.000	1.566	0.016
PISO2	N+3.20	B61	ENVOLVENTE MAX	1.840	0.000	15.740	0.000	1.566	-3.410
PISO2	N+3.20	B61	ENVOLVENTE MIN	0.000	0.000	-0.990	0.000	-0.172	-0.800
PISO2	N+3.20	B61	ENVOLVENTE MIN	0.920	0.000	1.970	0.000	-0.172	-4.858
PISO2	N+3.20	B61	ENVOLVENTE MIN	1.840	0.000	4.930	0.000	-0.172	-15.824
PISO2	N+6.35	B62	ENVOLVENTE MAX	0.000	0.000	0.950	0.000	0.256	4.243
PISO2	N+6.35	B62	ENVOLVENTE MAX	1.540	0.000	3.150	0.000	0.256	1.169
PISO2	N+6.35	B62	ENVOLVENTE MAX	3.080	0.000	6.050	0.000	0.256	0.435
PISO2	N+6.35	B62	ENVOLVENTE MIN	0.000	0.000	-5.530	0.000	-0.655	-8.629
PISO2	N+6.35	B62	ENVOLVENTE MIN	1.540	0.000	-2.600	0.000	-0.655	-2.452
PISO2	N+6.35	B62	ENVOLVENTE MIN	3.080	0.000	-0.360	0.000	-0.655	-6.534
PISO2	N+3.20	B62	ENVOLVENTE MAX	0.000	0.000	-6.770	0.000	1.040	5.503
PISO2	N+3.20	B62	ENVOLVENTE MAX	1.540	0.000	9.340	0.000	1.040	6.307
PISO2	N+3.20	B62	ENVOLVENTE MAX	3.080	0.000	34.780	0.000	1.040	-5.451
PISO2	N+3.20	B62	ENVOLVENTE MIN	0.000	0.000	-29.490	0.000	-0.274	-28.065
PISO2	N+3.20	B62	ENVOLVENTE MIN	1.540	0.000	-5.130	0.000	-0.274	-0.853
PISO2	N+3.20	B62	ENVOLVENTE MIN	3.080	0.000	9.910	0.000	-0.274	-30.090
PISO2	N+3.20	B63	ENVOLVENTE MAX	0.000	0.000	-16.400	0.000	0.163	-5.709
PISO2	N+3.20	B63	ENVOLVENTE MAX	1.485	0.000	-1.980	0.000	0.163	14.322
PISO2	N+3.20	B63	ENVOLVENTE MAX	2.970	0.000	17.140	0.000	0.163	12.875
PISO2	N+3.20	B63	ENVOLVENTE MIN	0.000	0.000	-40.480	0.000	-1.220	-34.487
PISO2	N+3.20	B63	ENVOLVENTE MIN	1.485	0.000	-15.190	0.000	-1.220	2.863
PISO2	N+3.20	B63	ENVOLVENTE MIN	2.970	0.000	4.420	0.000	-1.220	-2.071
PISO2	N+3.20	B64	ENVOLVENTE MAX	0.000	0.000	-2.180	0.000	1.922	12.040
PISO2	N+3.20	B64	ENVOLVENTE MAX	1.490	0.000	19.870	0.000	1.922	6.529
PISO2	N+3.20	B64	ENVOLVENTE MAX	2.980	0.000	47.100	0.000	1.922	-16.984
PISO2	N+3.20	B64	ENVOLVENTE MIN	0.000	0.000	-10.400	0.000	0.737	-2.001
PISO2	N+3.20	B64	ENVOLVENTE MIN	1.490	0.000	6.440	0.000	0.737	-3.569
PISO2	N+3.20	B64	ENVOLVENTE MIN	2.980	0.000	20.910	0.000	0.737	-51.365
PISO2	N+3.20	B65	ENVOLVENTE MAX	0.000	0.000	-26.840	0.000	-0.323	-22.480
PISO2	N+3.20	B65	ENVOLVENTE MAX	1.885	0.000	-7.930	0.000	-0.323	19.690
PISO2	N+3.20	B65	ENVOLVENTE MAX	3.770	0.000	15.710	0.000	-0.323	22.956
PISO2	N+3.20	B65	ENVOLVENTE MIN	0.000	0.000	-59.500	0.000	-1.499	-63.171
PISO2	N+3.20	B65	ENVOLVENTE MIN	1.885	0.000	-22.710	0.000	-1.499	5.576
PISO2	N+3.20	B65	ENVOLVENTE MIN	3.770	0.000	5.320	0.000	-1.499	6.339
PISO2	N+3.20	B66	ENVOLVENTE MAX	0.000	0.000	-5.470	0.000	1.514	22.780

PISO2	N+3.20	B66	ENVOLVENTE MAX	1.890	0.000	24.110	0.000	1.514	17.658
PISO2	N+3.20	B66	ENVOLVENTE MAX	3.780	0.000	61.020	0.000	1.514	-25.909
PISO2	N+3.20	B66	ENVOLVENTE MIN	0.000	0.000	-13.820	0.000	0.609	6.501
PISO2	N+3.20	B66	ENVOLVENTE MIN	1.890	0.000	9.370	0.000	0.609	4.180
PISO2	N+3.20	B66	ENVOLVENTE MIN	3.780	0.000	28.340	0.000	0.609	-68.717
PISO2	N+3.20	B67	ENVOLVENTE MAX	0.000	0.000	-24.900	0.000	-0.643	-21.809
PISO2	N+3.20	B67	ENVOLVENTE MAX	1.745	0.000	-7.560	0.000	-0.643	11.795
PISO2	N+3.20	B67	ENVOLVENTE MAX	3.490	0.000	13.650	0.000	-0.643	15.042
PISO2	N+3.20	B67	ENVOLVENTE MIN	0.000	0.000	-55.200	0.000	-1.923	-61.788
PISO2	N+3.20	B67	ENVOLVENTE MIN	1.745	0.000	-21.700	0.000	-1.923	0.458
PISO2	N+3.20	B67	ENVOLVENTE MIN	3.490	0.000	4.230	0.000	-1.923	2.793
PISO2	N+3.20	B68	ENVOLVENTE MAX	0.000	0.000	-4.950	0.000	1.509	15.152
PISO2	N+3.20	B68	ENVOLVENTE MAX	1.745	0.000	21.220	0.000	1.509	12.800
PISO2	N+3.20	B68	ENVOLVENTE MAX	3.490	0.000	54.720	0.000	1.509	-20.857
PISO2	N+3.20	B68	ENVOLVENTE MIN	0.000	0.000	-13.770	0.000	0.606	3.053
PISO2	N+3.20	B68	ENVOLVENTE MIN	1.745	0.000	7.560	0.000	0.606	1.290
PISO2	N+3.20	B68	ENVOLVENTE MIN	3.490	0.000	24.890	0.000	0.606	-59.798
PISO2	N+3.20	B69	ENVOLVENTE MAX	0.000	0.000	-25.900	0.000	-0.524	-21.996
PISO2	N+3.20	B69	ENVOLVENTE MAX	1.790	0.000	-8.060	0.000	-0.524	14.885
PISO2	N+3.20	B69	ENVOLVENTE MAX	3.580	0.000	13.950	0.000	-0.524	17.630
PISO2	N+3.20	B69	ENVOLVENTE MIN	0.000	0.000	-56.420	0.000	-1.622	-61.261
PISO2	N+3.20	B69	ENVOLVENTE MIN	1.790	0.000	-21.860	0.000	-1.622	2.550
PISO2	N+3.20	B69	ENVOLVENTE MIN	3.580	0.000	5.290	0.000	-1.622	4.284
PISO2	N+3.20	B70	ENVOLVENTE MAX	0.000	0.000	-4.740	0.000	1.651	17.523
PISO2	N+3.20	B70	ENVOLVENTE MAX	1.795	0.000	22.750	0.000	1.651	13.358
PISO2	N+3.20	B70	ENVOLVENTE MAX	3.590	0.000	57.430	0.000	1.651	-23.627
PISO2	N+3.20	B70	ENVOLVENTE MIN	0.000	0.000	-13.380	0.000	0.635	4.425
PISO2	N+3.20	B70	ENVOLVENTE MIN	1.795	0.000	8.410	0.000	0.635	1.961
PISO2	N+3.20	B70	ENVOLVENTE MIN	3.590	0.000	26.300	0.000	0.635	-64.660
PISO2	N+3.20	B71	ENVOLVENTE MAX	0.000	0.000	-27.240	0.000	-0.684	-23.977
PISO2	N+3.20	B71	ENVOLVENTE MAX	1.770	0.000	-9.630	0.000	-0.684	15.219
PISO2	N+3.20	B71	ENVOLVENTE MAX	3.540	0.000	10.600	0.000	-0.684	24.222
PISO2	N+3.20	B71	ENVOLVENTE MIN	0.000	0.000	-59.560	0.000	-1.836	-65.964
PISO2	N+3.20	B71	ENVOLVENTE MIN	1.770	0.000	-25.480	0.000	-1.836	2.538
PISO2	N+3.20	B71	ENVOLVENTE MIN	3.540	0.000	3.100	0.000	-1.836	7.614
PISO2	N+3.20	B72	ENVOLVENTE MAX	0.000	0.000	-6.390	0.000	0.215	25.317
PISO2	N+3.20	B72	ENVOLVENTE MAX	1.780	0.000	18.190	0.000	0.215	31.121
PISO2	N+3.20	B72	ENVOLVENTE MAX	3.560	0.000	51.690	0.000	0.215	-5.624
PISO2	N+3.20	B72	ENVOLVENTE MIN	0.000	0.000	-18.800	0.000	-0.477	7.909
PISO2	N+3.20	B72	ENVOLVENTE MIN	1.780	0.000	4.660	0.000	-0.477	8.127
PISO2	N+3.20	B72	ENVOLVENTE MIN	3.560	0.000	22.390	0.000	-0.477	-42.883
PISO2	N+3.20	B73	ENVOLVENTE MAX	0.000	0.000	-24.630	0.000	1.520	-7.633
PISO2	N+3.20	B73	ENVOLVENTE MAX	2.970	0.000	6.710	0.000	1.520	36.488
PISO2	N+3.20	B73	ENVOLVENTE MAX	2.970	0.000	13.150	0.000	0.822	35.655
PISO2	N+3.20	B73	ENVOLVENTE MAX	5.950	0.000	66.840	0.000	0.822	-36.137
PISO2	N+3.20	B73	ENVOLVENTE MIN	0.000	0.000	-51.910	0.000	-1.250	-43.611
PISO2	N+3.20	B73	ENVOLVENTE MIN	2.970	0.000	-1.160	0.000	-1.250	18.170
PISO2	N+3.20	B73	ENVOLVENTE MIN	2.970	0.000	3.020	0.000	-1.101	18.023
PISO2	N+3.20	B73	ENVOLVENTE MIN	5.950	0.000	33.840	0.000	-1.101	-82.033
PISO2	N+3.20	B74	ENVOLVENTE MAX	0.000	0.000	-43.050	0.000	1.775	-47.438
PISO2	N+3.20	B74	ENVOLVENTE MAX	3.770	0.000	5.360	0.000	1.775	46.610
PISO2	N+3.20	B74	ENVOLVENTE MAX	3.770	0.000	0.450	0.000	0.538	46.675
PISO2	N+3.20	B74	ENVOLVENTE MAX	7.550	0.000	83.700	0.000	0.538	-50.973
PISO2	N+3.20	B74	ENVOLVENTE MIN	0.000	0.000	-81.590	0.000	-0.845	-99.929
PISO2	N+3.20	B74	ENVOLVENTE MIN	3.770	0.000	0.460	0.000	-0.845	25.254
PISO2	N+3.20	B74	ENVOLVENTE MIN	3.770	0.000	-3.860	0.000	-1.395	25.039
PISO2	N+3.20	B74	ENVOLVENTE MIN	7.550	0.000	44.120	0.000	-1.395	-107.515
PISO2	N+3.20	B75	ENVOLVENTE MAX	0.000	0.000	-39.900	0.000	1.282	-46.053
PISO2	N+3.20	B75	ENVOLVENTE MAX	3.490	0.000	1.230	0.000	1.282	39.111
PISO2	N+3.20	B75	ENVOLVENTE MAX	3.490	0.000	2.470	0.000	0.666	38.879
PISO2	N+3.20	B75	ENVOLVENTE MAX	6.980	0.000	74.870	0.000	0.666	-42.647
PISO2	N+3.20	B75	ENVOLVENTE MIN	0.000	0.000	-76.560	0.000	-0.754	-98.369
PISO2	N+3.20	B75	ENVOLVENTE MIN	3.490	0.000	-3.990	0.000	-0.754	20.245
PISO2	N+3.20	B75	ENVOLVENTE MIN	3.490	0.000	-2.260	0.000	-1.024	20.347
PISO2	N+3.20	B75	ENVOLVENTE MIN	6.980	0.000	38.870	0.000	-1.024	-92.700
PISO2	N+3.20	B76	ENVOLVENTE MAX	0.000	0.000	-40.470	0.000	1.184	-44.876
PISO2	N+3.20	B76	ENVOLVENTE MAX	3.580	0.000	2.670	0.000	1.184	41.026
PISO2	N+3.20	B76	ENVOLVENTE MAX	3.580	0.000	2.150	0.000	0.660	41.054
PISO2	N+3.20	B76	ENVOLVENTE MAX	7.170	0.000	78.650	0.000	0.660	-47.922
PISO2	N+3.20	B76	ENVOLVENTE MIN	0.000	0.000	-77.270	0.000	-0.601	-96.162
PISO2	N+3.20	B76	ENVOLVENTE MIN	3.580	0.000	-1.320	0.000	-0.601	21.678
PISO2	N+3.20	B76	ENVOLVENTE MIN	3.580	0.000	-1.970	0.000	-1.163	21.921
PISO2	N+3.20	B76	ENVOLVENTE MIN	7.170	0.000	41.310	0.000	-1.163	-100.757
PISO2	N+3.20	B77	ENVOLVENTE MAX	0.000	0.000	-42.230	0.000	1.225	-48.269
PISO2	N+3.20	B77	ENVOLVENTE MAX	3.540	0.000	-0.020	0.000	1.225	50.010
PISO2	N+3.20	B77	ENVOLVENTE MAX	3.540	0.000	-2.400	0.000	0.809	50.439
PISO2	N+3.20	B77	ENVOLVENTE MAX	3.550	0.000	-2.380	0.000	0.809	50.531

PISO2	N+3.20	B77	ENVOLVENTE MAX	7.100	0.000	67.890	0.000	0.809	-16.717
PISO2	N+3.20	B77	ENVOLVENTE MIN	0.000	0.000	-81.730	0.000	-0.619	-104.218
PISO2	N+3.20	B77	ENVOLVENTE MIN	3.540	0.000	-7.250	0.000	-0.619	26.431
PISO2	N+3.20	B77	ENVOLVENTE MIN	3.540	0.000	-11.680	0.000	-1.168	25.628
PISO2	N+3.20	B77	ENVOLVENTE MIN	3.550	0.000	-11.650	0.000	-1.168	25.653
PISO2	N+3.20	B77	ENVOLVENTE MIN	7.100	0.000	33.950	0.000	-1.168	-60.731
PISO2	N+6.35	B78	ENVOLVENTE MAX	0.000	0.000	1.290	0.000	0.229	7.662
PISO2	N+6.35	B78	ENVOLVENTE MAX	2.975	0.000	6.970	0.000	0.229	0.653
PISO2	N+6.35	B78	ENVOLVENTE MAX	5.950	0.000	12.650	0.000	0.229	-6.042
PISO2	N+6.35	B78	ENVOLVENTE MIN	0.000	0.000	-4.670	0.000	-0.263	-8.528
PISO2	N+6.35	B78	ENVOLVENTE MIN	2.975	0.000	-0.410	0.000	-0.263	-8.542
PISO2	N+6.35	B78	ENVOLVENTE MIN	5.950	0.000	3.850	0.000	-0.263	-36.676
PISO2	N+6.35	B79	ENVOLVENTE MAX	0.000	0.000	-10.790	0.000	3.526	-9.913
PISO2	N+6.35	B79	ENVOLVENTE MAX	3.180	0.000	-0.870	0.000	3.526	46.161
PISO2	N+6.35	B79	ENVOLVENTE MAX	3.180	0.000	0.790	0.000	-0.153	51.754
PISO2	N+6.35	B79	ENVOLVENTE MAX	3.775	0.000	4.170	0.000	-0.153	51.288
PISO2	N+6.35	B79	ENVOLVENTE MAX	7.550	0.000	47.450	0.000	-0.153	-10.566
PISO2	N+6.35	B79	ENVOLVENTE MIN	0.000	0.000	-47.500	0.000	-0.195	-51.013
PISO2	N+6.35	B79	ENVOLVENTE MIN	3.180	0.000	-13.610	0.000	-0.195	7.492
PISO2	N+6.35	B79	ENVOLVENTE MIN	3.180	0.000	-2.260	0.000	-2.556	10.080
PISO2	N+6.35	B79	ENVOLVENTE MIN	3.775	0.000	-0.350	0.000	-2.556	10.682
PISO2	N+6.35	B79	ENVOLVENTE MIN	7.550	0.000	12.100	0.000	-2.556	-49.684
PISO2	N+6.35	B81	ENVOLVENTE MAX	0.000	0.000	-5.040	0.000	0.107	-7.998
PISO2	N+6.35	B81	ENVOLVENTE MAX	3.490	0.000	-0.040	0.000	0.107	1.288
PISO2	N+6.35	B81	ENVOLVENTE MAX	6.980	0.000	5.760	0.000	0.107	4.356
PISO2	N+6.35	B81	ENVOLVENTE MIN	0.000	0.000	-12.390	0.000	-0.289	-37.218
PISO2	N+6.35	B81	ENVOLVENTE MIN	3.490	0.000	-5.720	0.000	-0.289	-5.615
PISO2	N+6.35	B81	ENVOLVENTE MIN	6.980	0.000	0.940	0.000	-0.289	-7.721
PISO2	N+6.35	B82	ENVOLVENTE MAX	0.000	0.000	-3.900	0.000	0.153	-1.131
PISO2	N+6.35	B82	ENVOLVENTE MAX	3.585	0.000	1.600	0.000	0.153	5.721
PISO2	N+6.35	B82	ENVOLVENTE MAX	7.170	0.000	8.440	0.000	0.153	-2.250
PISO2	N+6.35	B82	ENVOLVENTE MIN	0.000	0.000	-7.800	0.000	-0.289	-9.468
PISO2	N+6.35	B82	ENVOLVENTE MIN	3.585	0.000	-1.010	0.000	-0.289	3.338
PISO2	N+6.35	B82	ENVOLVENTE MIN	7.170	0.000	4.120	0.000	-0.289	-12.619
PISO2	N+6.35	B83	ENVOLVENTE MAX	0.000	0.000	-3.860	0.000	0.214	-1.938
PISO2	N+6.35	B83	ENVOLVENTE MAX	3.550	0.000	1.220	0.000	0.214	5.406
PISO2	N+6.35	B83	ENVOLVENTE MAX	7.100	0.000	7.820	0.000	0.214	2.374
PISO2	N+6.35	B83	ENVOLVENTE MIN	0.000	0.000	-8.970	0.000	-0.163	-14.651
PISO2	N+6.35	B83	ENVOLVENTE MIN	3.550	0.000	-2.200	0.000	-0.163	2.740
PISO2	N+6.35	B83	ENVOLVENTE MIN	7.100	0.000	3.060	0.000	-0.163	-12.036
PISO2	N+6.35	B84	ENVOLVENTE MAX	0.000	0.000	-2.890	0.000	0.276	-0.395
PISO2	N+6.35	B84	ENVOLVENTE MAX	2.975	0.000	1.860	0.000	0.276	2.880
PISO2	N+6.35	B84	ENVOLVENTE MAX	5.950	0.000	7.540	0.000	0.276	-2.718
PISO2	N+6.35	B84	ENVOLVENTE MIN	0.000	0.000	-5.980	0.000	-0.396	-6.364
PISO2	N+6.35	B84	ENVOLVENTE MIN	2.975	0.000	-0.540	0.000	-0.396	1.333
PISO2	N+6.35	B84	ENVOLVENTE MIN	5.950	0.000	3.710	0.000	-0.396	-11.857
PISO2	N+6.35	B85	ENVOLVENTE MAX	0.000	0.000	-4.620	0.000	0.196	-3.458
PISO2	N+6.35	B85	ENVOLVENTE MAX	3.775	0.000	0.810	0.000	0.196	5.989
PISO2	N+6.35	B85	ENVOLVENTE MAX	7.550	0.000	8.550	0.000	0.196	-4.041
PISO2	N+6.35	B85	ENVOLVENTE MIN	0.000	0.000	-8.260	0.000	-0.208	-10.588
PISO2	N+6.35	B85	ENVOLVENTE MIN	3.775	0.000	-0.590	0.000	-0.208	3.773
PISO2	N+6.35	B85	ENVOLVENTE MIN	7.550	0.000	4.810	0.000	-0.208	-11.644
PISO2	N+6.35	B86	ENVOLVENTE MAX	0.000	0.000	-4.420	0.000	0.367	-4.122
PISO2	N+6.35	B86	ENVOLVENTE MAX	3.490	0.000	0.580	0.000	0.367	4.039
PISO2	N+6.35	B86	ENVOLVENTE MAX	6.980	0.000	7.450	0.000	0.367	-2.655
PISO2	N+6.35	B86	ENVOLVENTE MIN	0.000	0.000	-8.090	0.000	-0.146	-13.022
PISO2	N+6.35	B86	ENVOLVENTE MIN	3.490	0.000	-1.350	0.000	-0.146	2.575
PISO2	N+6.35	B86	ENVOLVENTE MIN	6.980	0.000	4.010	0.000	-0.146	-9.110
PISO2	N+6.35	B87	ENVOLVENTE MAX	0.000	0.000	-4.340	0.000	0.200	-2.994
PISO2	N+6.35	B87	ENVOLVENTE MAX	3.585	0.000	0.860	0.000	0.200	5.081
PISO2	N+6.35	B87	ENVOLVENTE MAX	7.170	0.000	8.070	0.000	0.200	-3.579
PISO2	N+6.35	B87	ENVOLVENTE MIN	0.000	0.000	-7.900	0.000	-0.202	-9.948
PISO2	N+6.35	B87	ENVOLVENTE MIN	3.585	0.000	-0.680	0.000	-0.202	3.169
PISO2	N+6.35	B87	ENVOLVENTE MIN	7.170	0.000	4.450	0.000	-0.202	-10.664
PISO2	N+6.35	B88	ENVOLVENTE MAX	0.000	0.000	-4.280	0.000	-0.028	-2.945
PISO2	N+6.35	B88	ENVOLVENTE MAX	3.550	0.000	0.800	0.000	-0.028	6.172
PISO2	N+6.35	B88	ENVOLVENTE MAX	7.100	0.000	7.560	0.000	-0.028	0.682
PISO2	N+6.35	B88	ENVOLVENTE MIN	0.000	0.000	-8.380	0.000	-0.454	-11.235
PISO2	N+6.35	B88	ENVOLVENTE MIN	3.550	0.000	-1.420	0.000	-0.454	3.243
PISO2	N+6.35	B88	ENVOLVENTE MIN	7.100	0.000	3.670	0.000	-0.454	-10.436
PISO2	N+6.35	B94	ENVOLVENTE MAX	0.000	0.000	-7.860	0.000	0.539	24.714
PISO2	N+6.35	B94	ENVOLVENTE MAX	1.625	0.000	15.410	0.000	0.539	60.515
PISO2	N+6.35	B94	ENVOLVENTE MAX	3.250	0.000	76.310	0.000	0.539	8.119
PISO2	N+6.35	B94	ENVOLVENTE MIN	0.000	0.000	-45.490	0.000	-0.877	-0.499
PISO2	N+6.35	B94	ENVOLVENTE MIN	1.625	0.000	2.190	0.000	-0.877	3.347
PISO2	N+6.35	B94	ENVOLVENTE MIN	3.250	0.000	16.820	0.000	-0.877	-37.032
PISO2	N+6.35	B95	ENVOLVENTE MAX	0.000	0.000	2.840	0.000	0.541	4.910

PISO2	N+6.35	B95	ENVOLVENTE MAX	0.490	0.000	8.050	0.000	0.541	2.932
PISO2	N+6.35	B95	ENVOLVENTE MAX	0.980	0.000	13.270	0.000	0.541	0.002
PISO2	N+6.35	B95	ENVOLVENTE MIN	0.000	0.000	-5.170	0.000	-5.983	-5.877
PISO2	N+6.35	B95	ENVOLVENTE MIN	0.490	0.000	-3.020	0.000	-5.983	-4.183
PISO2	N+6.35	B95	ENVOLVENTE MIN	0.980	0.000	-0.870	0.000	-5.983	-5.929
PISO2	N+3.20	B96	ENVOLVENTE MAX	0.000	0.000	-31.630	0.000	1.025	-18.360
PISO2	N+3.20	B96	ENVOLVENTE MAX	1.725	0.000	-11.810	0.000	1.025	24.208
PISO2	N+3.20	B96	ENVOLVENTE MAX	3.450	0.000	8.010	0.000	1.025	35.068
PISO2	N+3.20	B96	ENVOLVENTE MIN	0.000	0.000	-78.950	0.000	-0.333	-129.273
PISO2	N+3.20	B96	ENVOLVENTE MIN	1.725	0.000	-46.680	0.000	-0.333	-13.681
PISO2	N+3.20	B96	ENVOLVENTE MIN	3.450	0.000	-14.420	0.000	-0.333	20.308
PISO2	N+3.20	B97	ENVOLVENTE MAX	0.000	0.000	3.660	0.000	0.393	35.609
PISO2	N+3.20	B97	ENVOLVENTE MAX	1.725	0.000	30.620	0.000	0.393	49.926
PISO2	N+3.20	B97	ENVOLVENTE MAX	3.450	0.000	62.880	0.000	0.393	7.552
PISO2	N+3.20	B97	ENVOLVENTE MIN	0.000	0.000	-20.680	0.000	-0.850	20.345
PISO2	N+3.20	B97	ENVOLVENTE MIN	1.725	0.000	4.440	0.000	-0.850	1.567
PISO2	N+3.20	B97	ENVOLVENTE MIN	3.450	0.000	24.260	0.000	-0.850	-73.804
PISO2	N+3.20	B98	ENVOLVENTE MAX	0.000	0.000	-38.620	0.000	0.588	-33.231
PISO2	N+3.20	B98	ENVOLVENTE MAX	1.725	0.000	-18.480	0.000	0.588	23.060
PISO2	N+3.20	B98	ENVOLVENTE MAX	3.450	0.000	1.660	0.000	0.588	50.498
PISO2	N+3.20	B98	ENVOLVENTE MIN	0.000	0.000	-83.750	0.000	-0.580	-126.564
PISO2	N+3.20	B98	ENVOLVENTE MIN	1.725	0.000	-49.860	0.000	-0.580	-6.283
PISO2	N+3.20	B98	ENVOLVENTE MIN	3.450	0.000	-17.060	0.000	-0.580	28.712
PISO2	N+3.20	B99	ENVOLVENTE MAX	0.000	0.000	4.870	0.000	0.563	52.280
PISO2	N+3.20	B99	ENVOLVENTE MAX	1.725	0.000	35.530	0.000	0.563	47.523
PISO2	N+3.20	B99	ENVOLVENTE MAX	3.450	0.000	68.340	0.000	0.563	-7.806
PISO2	N+3.20	B99	ENVOLVENTE MIN	0.000	0.000	-11.040	0.000	-0.472	29.172
PISO2	N+3.20	B99	ENVOLVENTE MIN	1.725	0.000	11.240	0.000	-0.472	8.250
PISO2	N+3.20	B99	ENVOLVENTE MIN	3.450	0.000	31.380	0.000	-0.472	-75.783
PISO2	N+3.20	B100	ENVOLVENTE MAX	0.000	0.000	-37.300	0.000	0.641	-33.197
PISO2	N+3.20	B100	ENVOLVENTE MAX	1.725	0.000	-17.160	0.000	0.641	20.395
PISO2	N+3.20	B100	ENVOLVENTE MAX	3.450	0.000	2.980	0.000	0.641	42.692
PISO2	N+3.20	B100	ENVOLVENTE MIN	0.000	0.000	-79.820	0.000	-0.580	-117.811
PISO2	N+3.20	B100	ENVOLVENTE MIN	1.725	0.000	-45.340	0.000	-0.580	-4.908
PISO2	N+3.20	B100	ENVOLVENTE MIN	3.450	0.000	-12.540	0.000	-0.580	24.585
PISO2	N+3.20	B101	ENVOLVENTE MAX	0.000	0.000	1.720	0.000	0.502	43.563
PISO2	N+3.20	B101	ENVOLVENTE MAX	1.725	0.000	30.520	0.000	0.502	45.232
PISO2	N+3.20	B101	ENVOLVENTE MAX	3.450	0.000	63.320	0.000	0.502	-7.846
PISO2	N+3.20	B101	ENVOLVENTE MIN	0.000	0.000	-14.250	0.000	-0.650	24.742
PISO2	N+3.20	B101	ENVOLVENTE MIN	1.725	0.000	9.900	0.000	-0.650	9.244
	N+3.20	B101	ENVOLVENTE MIN	3.450	0.000	30.040	0.000	-0.650	-66.072
	N+3.20	B102	ENVOLVENTE MAX	0.000	0.000	-37.890	0.000	0.613	-33.505
	N+3.20	B102	ENVOLVENTE MAX	1.725	0.000	-17.750	0.000	0.613	22.002
	N+3.20	B102	ENVOLVENTE MAX	3.450	0.000	2.390	0.000	0.613	46.271
	N+3.20	B102	ENVOLVENTE MIN	0.000	0.000	-80.710	0.000	-0.583	-117.495
	N+3.20	B102	ENVOLVENTE MIN	1.725	0.000	-46.120	0.000	-0.583	-4.146
	N+3.20	B102	ENVOLVENTE MIN	3.450	0.000	-13.320	0.000	-0.583	26.192
	N+3.20	B103	ENVOLVENTE MAX	0.000	0.000	2.660	0.000	0.564	47.382
	N+3.20	B103	ENVOLVENTE MAX	1.725	0.000	32.310	0.000	0.564	45.260
	N+3.20	B103	ENVOLVENTE MAX	3.450	0.000	65.110	0.000	0.564	-9.562
	N+3.20	B103	ENVOLVENTE MIN	0.000	0.000	-12.410	0.000	-0.495	26.474
	N+3.20	B103	ENVOLVENTE MIN	1.725	0.000	10.880	0.000	-0.495	9.367
	N+3.20	B103	ENVOLVENTE MIN	3.450	0.000	31.020	0.000	-0.495	-68.984
	N+3.20	B104	ENVOLVENTE MAX	0.000	0.000	-38.440	0.000	0.535	-33.361
	N+3.20	B104	ENVOLVENTE MAX	1.725	0.000	-18.300	0.000	0.535	23.742
	N+3.20	B104	ENVOLVENTE MAX	3.450	0.000	1.840	0.000	0.535	49.526
	N+3.20	B104	ENVOLVENTE MIN	0.000	0.000	-81.720	0.000	-0.774	-119.040
	N+3.20	B104	ENVOLVENTE MIN	1.725	0.000	-47.470	0.000	-0.774	-4.004
	N+3.20	B104	ENVOLVENTE MIN	3.450	0.000	-14.670	0.000	-0.774	28.148
	N+3.20	B105	ENVOLVENTE MAX	0.000	0.000	4.300	0.000	0.678	50.579
	N+3.20	B105	ENVOLVENTE MAX	1.725	0.000	34.800	0.000	0.678	44.750
	N+3.20	B105	ENVOLVENTE MAX	3.450	0.000	67.610	0.000	0.678	-11.742
PISO2	N+3.20	B105	ENVOLVENTE MIN	0.000	0.000	-10.310	0.000	-0.444	28.356
PISO2	N+3.20	B105	ENVOLVENTE MIN	1.725	0.000	12.130	0.000	-0.444	8.458
PISO2	N+3.20	B105	ENVOLVENTE MIN	3.450	0.000	32.270	0.000	-0.444	-74.684
PISO2	N+6.35	B116	ENVOLVENTE MAX	0.000	0.000	-23.270	0.000	7.626	-13.480
PISO2	N+6.35	B116	ENVOLVENTE MAX	3.180	0.000	-5.390	0.000	7.626	123.717
PISO2	N+6.35	B116	ENVOLVENTE MAX	3.180	0.000	0.100	0.000	-0.117	119.998
PISO2	N+6.35	B116	ENVOLVENTE MAX	3.775	0.000	2.240	0.000	-0.117	122.350
PISO2	N+6.35	B116	ENVOLVENTE MAX	7.550	0.000	101.910	0.000	-0.117	-14.971
PISO2	N+6.35	B116	ENVOLVENTE MIN	0.000	0.000	-96.190	0.000	-0.402	-81.225
PISO2	N+6.35	B116	ENVOLVENTE MIN	3.180	0.000	-32.710	0.000	-0.402	28.479
PISO2	N+6.35	B116	ENVOLVENTE MIN	3.180	0.000	-7.130	0.000	-5.025	27.676
PISO2	N+6.35	B116	ENVOLVENTE MIN	3.775	0.000	-2.540	0.000	-5.025	29.097
PISO2	N+6.35	B116	ENVOLVENTE MIN	7.550	0.000	24.230	0.000	-5.025	-89.254

FUERZAS EN COLUMNAS

Diseños & Estructuras

COLUMN FORCES
UNID: kN-m

Story	Story	Column	Load	Loc	P	V2	V3	T	M2	M3
CUBIERTA	N+6.35	C1	ENVOLVENTE MAX	0.000	-18.260	36.280	35.500	6.170	72.480	52.24
CUBIERTA	N+6.35	C1	ENVOLVENTE MAX	1.575	-9.910	36.280	35.500	6.170	18.224	14.022
CUBIERTA	N+6.35	C1	ENVOLVENTE MAX	3.150	-1.560	36.280	35.500	6.170	-17.617	50.469
CUBIERTA	N+6.35	C1	ENVOLVENTE MIN	0.000	-108.360	-25.630	10.650	-4.608	5.556	-31.04
CUBIERTA	N+6.35	C1	ENVOLVENTE MIN	1.575	-97.230	-25.630	10.650	-4.608	-12.870	-9.59
CUBIERTA	N+6.35	C1	ENVOLVENTE MIN	3.150	-86.100	-25.630	10.650	-4.608	-49.711	-62.804
PISO2	N+3.20	C1	ENVOLVENTE MAX	0.000	-31.610	79.700	96.850	4.306	217.843	155.229
PISO2	N+3.20	C1	ENVOLVENTE MAX	1.600	-23.130	79.700	96.850	4.306	75.571	29.969
PISO2	N+3.20	C1	ENVOLVENTE MAX	3.200	-14.650	79.700	96.850	4.306	-2.396	83.9
PISO2	N+3.20	C1	ENVOLVENTE MIN	0.000	-334.490	-73.080	-73.350	-3.590	-252.363	-150.076
PISO2	N+3.20	C1	ENVOLVENTE MIN	1.600	-323.180	-73.080	-73.350	-3.590	-147.695	-35.42
PISO2	N+3.20	C1	ENVOLVENTE MIN	3.200	-311.870	-73.080	-73.350	-3.590	-107.333	-99.956
CUBIERTA	N+6.35	C2	ENVOLVENTE MAX	0.000	-41.740	33.020	36.190	6.170	50.478	37.005
CUBIERTA	N+6.35	C2	ENVOLVENTE MAX	1.575	-33.390	33.020	36.190	6.170	12.442	-0.879
CUBIERTA	N+6.35	C2	ENVOLVENTE MAX	3.150	-25.040	33.020	36.190	6.170	112.194	97.193
CUBIERTA	N+6.35	C2	ENVOLVENTE MIN	0.000	-149.990	-67.580	-66.130	-4.608	-97.045	-115.864
CUBIERTA	N+6.35	C2	ENVOLVENTE MIN	1.575	-138.860	-67.580	-66.130	-4.608	-11.848	-23.56
CUBIERTA	N+6.35	C2	ENVOLVENTE MIN	3.150	-127.720	-67.580	-66.130	-4.608	-64.439	-67.214
PISO2	N+3.20	C2	ENVOLVENTE MAX	0.000	-207.240	70.890	92.530	4.306	212.502	146.605
PISO2	N+3.20	C2	ENVOLVENTE MAX	1.600	-198.750	70.890	92.530	4.306	64.927	39.335
PISO2	N+3.20	C2	ENVOLVENTE MAX	3.200	-190.270	70.890	92.530	4.306	78.702	166.006
PISO2	N+3.20	C2	ENVOLVENTE MIN	0.000	-604.670	-111.100	-110.390	-3.590	-287.631	-189.657
PISO2	N+3.20	C2	ENVOLVENTE MIN	1.600	-593.360	-111.100	-110.390	-3.590	-111.486	-18.05
PISO2	N+3.20	C2	ENVOLVENTE MIN	3.200	-582.050	-111.100	-110.390	-3.590	-96.690	-80.383
CUBIERTA	N+6.35	C3	ENVOLVENTE MAX	0.000	-87.760	21.040	25.710	6.170	40.190	22.479
CUBIERTA	N+6.35	C3	ENVOLVENTE MAX	1.575	-79.410	21.040	25.710	6.170	31.182	8.253
CUBIERTA	N+6.35	C3	ENVOLVENTE MAX	3.150	-71.060	21.040	25.710	6.170	172.912	101.496
CUBIERTA	N+6.35	C3	ENVOLVENTE MIN	0.000	-222.810	-60.130	-95.090	-4.608	-127.316	-88.447
CUBIERTA	N+6.35	C3	ENVOLVENTE MIN	1.575	-211.680	-60.130	-95.090	-4.608	-5.891	-12.665
CUBIERTA	N+6.35	C3	ENVOLVENTE MIN	3.150	-200.540	-60.130	-95.090	-4.608	-41.498	-44.353
PISO2	N+3.20	C3	ENVOLVENTE MAX	0.000	-384.290	68.230	83.590	4.306	186.765	143.868
PISO2	N+3.20	C3	ENVOLVENTE MAX	1.600	-375.810	68.230	83.590	4.306	53.492	38.036
PISO2	N+3.20	C3	ENVOLVENTE MAX	3.200	-367.330	68.230	83.590	4.306	85.827	127.486
PISO2	N+3.20	C3	ENVOLVENTE MIN	0.000	-885.930	-93.370	-102.620	-3.590	-259.316	-171.412
PISO2	N+3.20	C3	ENVOLVENTE MIN	1.600	-874.620	-93.370	-102.620	-3.590	-95.604	-25.351
PISO2	N+3.20	C3	ENVOLVENTE MIN	3.200	-863.310	-93.370	-102.620	-3.590	-97.501	-74.573
CUBIERTA	N+6.35	C5	ENVOLVENTE MAX	0.000	-96.650	51.200	18.520	6.170	29.635	69.113
CUBIERTA	N+6.35	C5	ENVOLVENTE MAX	1.575	-88.300	51.200	18.520	6.170	33.374	10.518
CUBIERTA	N+6.35	C5	ENVOLVENTE MAX	3.150	-79.950	51.200	18.520	6.170	153.535	46.291
CUBIERTA	N+6.35	C5	ENVOLVENTE MIN	0.000	-228.820	-23.600	-81.800	-4.608	-105.097	-28.683
CUBIERTA	N+6.35	C5	ENVOLVENTE MIN	1.575	-217.690	-23.600	-81.800	-4.608	-5.492	-13.563
CUBIERTA	N+6.35	C5	ENVOLVENTE MIN	3.150	-206.560	-23.600	-81.800	-4.608	-29.658	-92.809
PISO2	N+3.20	C5	ENVOLVENTE MAX	0.000	-419.630	81.430	70.510	4.306	151.889	157.011
PISO2	N+3.20	C5	ENVOLVENTE MAX	1.600	-411.150	81.430	70.510	4.306	41.758	28.255
PISO2	N+3.20	C5	ENVOLVENTE MAX	3.200	-402.660	81.430	70.510	4.306	72.873	83.767
PISO2	N+3.20	C5	ENVOLVENTE MIN	0.000	-923.760	-73.020	-85.560	-3.590	-215.553	-150.019
PISO2	N+3.20	C5	ENVOLVENTE MIN	1.600	-912.450	-73.020	-85.560	-3.590	-81.343	-34.726
PISO2	N+3.20	C5	ENVOLVENTE MIN	3.200	-901.140	-73.020	-85.560	-3.590	-88.379	-103.701
CUBIERTA	N+6.35	C7	ENVOLVENTE MAX	0.000	-81.700	30.090	22.930	6.170	28.721	39.569
CUBIERTA	N+6.35	C7	ENVOLVENTE MAX	1.575	-73.350	30.090	22.930	6.170	8.503	8.891
CUBIERTA	N+6.35	C7	ENVOLVENTE MAX	3.150	-65.000	30.090	22.930	6.170	78.691	62.071
CUBIERTA	N+6.35	C7	ENVOLVENTE MIN	0.000	-165.930	-34.740	-47.790	-4.608	-73.114	-47.951
CUBIERTA	N+6.35	C7	ENVOLVENTE MIN	1.575	-154.800	-34.740	-47.790	-4.608	-13.734	-9.947
CUBIERTA	N+6.35	C7	ENVOLVENTE MIN	3.150	-143.670	-34.740	-47.790	-4.608	-44.760	-55.8
PISO2	N+3.20	C7	ENVOLVENTE MAX	0.000	-395.340	74.980	66.180	4.306	145.807	150.816
PISO2	N+3.20	C7	ENVOLVENTE MAX	1.600	-386.860	74.980	66.180	4.306	40.505	31.342
PISO2	N+3.20	C7	ENVOLVENTE MAX	3.200	-378.380	74.980	66.180	4.306	79.676	99.574
PISO2	N+3.20	C7	ENVOLVENTE MIN	0.000	-833.870	-80.510	-88.670	-3.590	-212.692	-158.176
PISO2	N+3.20	C7	ENVOLVENTE MIN	1.600	-822.560	-80.510	-88.670	-3.590	-71.410	-29.853
PISO2	N+3.20	C7	ENVOLVENTE MIN	3.200	-811.250	-80.510	-88.670	-3.590	-74.603	-89.235
CUBIERTA	N+6.35	C9	ENVOLVENTE MAX	0.000	-81.520	31.900	24.130	6.170	30.026	41.266
CUBIERTA	N+6.35	C9	ENVOLVENTE MAX	1.575	-73.170	31.900	24.130	6.170	9.515	7.225
CUBIERTA	N+6.35	C9	ENVOLVENTE MAX	3.150	-64.820	31.900	24.130	6.170	71.131	57.862
CUBIERTA	N+6.35	C9	ENVOLVENTE MIN	0.000	-166.000	-33.300	-42.500	-4.608	-64.489	-48.695
CUBIERTA	N+6.35	C9	ENVOLVENTE MIN	1.575	-154.870	-33.300	-42.500	-4.608	-15.048	-12.455
CUBIERTA	N+6.35	C9	ENVOLVENTE MIN	3.150	-143.740	-33.300	-42.500	-4.608	-47.732	-60.892
PISO2	N+3.20	C9	ENVOLVENTE MAX	0.000	-405.840	74.940	71.400	4.306	156.345	150.776
PISO2	N+3.20	C9	ENVOLVENTE MAX	1.600	-397.360	74.940	71.400	4.306	42.751	31.733
PISO2	N+3.20	C9	ENVOLVENTE MAX	3.200	-388.870	74.940	71.400	4.306	85.730	103.871
PISO2	N+3.20	C9	ENVOLVENTE MIN	0.000	-857.510	-82.490	-91.720	-3.590	-216.442	-160.214
PISO2	N+3.20	C9	ENVOLVENTE MIN	1.600	-846.200	-82.490	-91.720	-3.590	-70.339	-29.092

PISO2	N+3.20	C9	ENVOLVENTE MIN	3.200	-834.890	-82.490	-91.720	-3.590	-80.809	-89.15
CUBIERTA	N+6.35	C11	ENVOLVENTE MAX	0.000	-58.030	58.450	19.680	6.170	23.028	126.152
CUBIERTA	N+6.35	C11	ENVOLVENTE MAX	1.575	-49.680	58.450	19.680	6.170	10.967	52.844
CUBIERTA	N+6.35	C11	ENVOLVENTE MAX	3.150	-41.330	58.450	19.680	6.170	78.057	14.388
CUBIERTA	N+6.35	C11	ENVOLVENTE MIN	0.000	-127.840	11.070	-46.240	-4.608	-70.524	45.094
CUBIERTA	N+6.35	C11	ENVOLVENTE MIN	1.575	-116.710	11.070	-46.240	-4.608	-16.638	8.917
CUBIERTA	N+6.35	C11	ENVOLVENTE MIN	3.150	-105.580	11.070	-46.240	-4.608	-41.903	-62.112
PISO2	N+3.20	C11	ENVOLVENTE MAX	0.000	-244.180	120.240	74.020	4.306	165.857	196.927
PISO2	N+3.20	C11	ENVOLVENTE MAX	1.600	-235.700	120.240	74.020	4.306	48.169	18.602
PISO2	N+3.20	C11	ENVOLVENTE MAX	3.200	-227.220	120.240	74.020	4.306	92.163	2.701
PISO2	N+3.20	C11	ENVOLVENTE MIN	0.000	-517.940	-35.600	-99.150	-3.590	-226.397	-111.487
PISO2	N+3.20	C11	ENVOLVENTE MIN	1.600	-506.630	-35.600	-99.150	-3.590	-68.500	-68.585
PISO2	N+3.20	C11	ENVOLVENTE MIN	3.200	-495.320	-35.600	-99.150	-3.590	-72.283	-188.108
CUBIERTA	N+6.35	C13	ENVOLVENTE MAX	0.000	-25.140	2.740	54.970	6.170	85.121	-15.977
CUBIERTA	N+6.35	C13	ENVOLVENTE MAX	1.575	-16.790	2.740	54.970	6.170	11.768	-2.16
CUBIERTA	N+6.35	C13	ENVOLVENTE MAX	3.150	-8.440	2.740	54.970	6.170	89.499	48.178
CUBIERTA	N+6.35	C13	ENVOLVENTE MIN	0.000	-89.370	-37.900	-52.130	-4.608	-75.377	-78.68
CUBIERTA	N+6.35	C13	ENVOLVENTE MIN	1.575	-78.240	-37.900	-52.130	-4.608	-6.494	-37.119
CUBIERTA	N+6.35	C13	ENVOLVENTE MIN	3.150	-67.110	-37.900	-52.130	-4.608	-88.695	-32.079
PISO2	N+3.20	C13	ENVOLVENTE MAX	0.000	-134.370	46.100	106.470	4.306	226.852	116.073
PISO2	N+3.20	C13	ENVOLVENTE MAX	1.600	-125.890	46.100	106.470	4.306	56.968	48.38
PISO2	N+3.20	C13	ENVOLVENTE MAX	3.200	-117.410	46.100	106.470	4.306	63.029	139.969
PISO2	N+3.20	C13	ENVOLVENTE MIN	0.000	-367.850	-98.700	-104.370	-3.590	-281.448	-176.261
PISO2	N+3.20	C13	ENVOLVENTE MIN	1.600	-356.540	-98.700	-104.370	-3.590	-114.915	-24.405
PISO2	N+3.20	C13	ENVOLVENTE MIN	3.200	-345.230	-98.700	-104.370	-3.590	-124.327	-31.829
CUBIERTA	N+6.35	C15	ENVOLVENTE MAX	0.000	-114.170	4.650	86.320	6.170	119.715	10.857
CUBIERTA	N+6.35	C15	ENVOLVENTE MAX	1.575	-105.820	4.650	86.320	6.170	8.843	61.563
CUBIERTA	N+6.35	C15	ENVOLVENTE MAX	3.150	-97.470	4.650	86.320	6.170	60.539	235.074
CUBIERTA	N+6.35	C15	ENVOLVENTE MIN	0.000	-416.350	-116.330	-35.250	-4.608	-51.236	-131.886
CUBIERTA	N+6.35	C15	ENVOLVENTE MIN	1.575	-405.220	-116.330	-35.250	-4.608	-20.791	1.423
CUBIERTA	N+6.35	C15	ENVOLVENTE MIN	3.150	-394.090	-116.330	-35.250	-4.608	-152.915	-4.314
PISO2	N+3.20	C15	ENVOLVENTE MAX	0.000	-357.670	73.140	98.410	4.306	202.001	142.272
PISO2	N+3.20	C15	ENVOLVENTE MAX	1.600	-349.190	73.140	98.410	4.306	45.045	28.92
PISO2	N+3.20	C15	ENVOLVENTE MAX	3.200	-340.710	73.140	98.410	4.306	50.712	104.462
PISO2	N+3.20	C15	ENVOLVENTE MIN	0.000	-887.660	-81.720	-88.350	-3.590	-244.622	-157.153
PISO2	N+3.20	C15	ENVOLVENTE MIN	1.600	-876.350	-81.720	-88.350	-3.590	-103.758	-30.073
PISO2	N+3.20	C15	ENVOLVENTE MIN	3.200	-865.040	-81.720	-88.350	-3.590	-125.517	-91.888
CUBIERTA	N+6.35	C17	ENVOLVENTE MAX	0.000	-122.490	98.320	79.130	6.170	111.425	99.741
CUBIERTA	N+6.35	C17	ENVOLVENTE MAX	1.575	-114.140	98.320	79.130	6.170	9.817	-2.576
CUBIERTA	N+6.35	C17	ENVOLVENTE MAX	3.150	-105.790	98.320	79.130	6.170	41.028	12.859
CUBIERTA	N+6.35	C17	ENVOLVENTE MIN	0.000	-417.880	-10.690	-22.560	-4.608	-31.141	-21.522
CUBIERTA	N+6.35	C17	ENVOLVENTE MIN	1.575	-406.750	-10.690	-22.560	-4.608	-18.631	-65.424
CUBIERTA	N+6.35	C17	ENVOLVENTE MIN	3.150	-395.610	-10.690	-22.560	-4.608	-138.939	-210.671
PISO2	N+3.20	C17	ENVOLVENTE MAX	0.000	-392.260	72.350	84.490	4.306	167.607	143.14
PISO2	N+3.20	C17	ENVOLVENTE MAX	1.600	-383.780	72.350	84.490	4.306	33.034	30.583
PISO2	N+3.20	C17	ENVOLVENTE MAX	3.200	-375.300	72.350	84.490	4.306	37.097	105.639
PISO2	N+3.20	C17	ENVOLVENTE MIN	0.000	-914.120	-83.030	-69.820	-3.590	-200.687	-160.18
PISO2	N+3.20	C17	ENVOLVENTE MIN	1.600	-902.810	-83.030	-69.820	-3.590	-89.583	-30.539
PISO2	N+3.20	C17	ENVOLVENTE MIN	3.200	-891.500	-83.030	-69.820	-3.590	-117.116	-88.513
CUBIERTA	N+6.35	C19	ENVOLVENTE MAX	0.000	-59.970	26.120	48.790	6.170	86.065	34.916
CUBIERTA	N+6.35	C19	ENVOLVENTE MAX	1.575	-51.620	26.120	48.790	6.170	20.731	12.797
CUBIERTA	N+6.35	C19	ENVOLVENTE MAX	3.150	-43.270	26.120	48.790	6.170	48.380	77.803
CUBIERTA	N+6.35	C19	ENVOLVENTE MIN	0.000	-123.510	-42.270	-22.900	-4.608	-25.044	-56.007
CUBIERTA	N+6.35	C19	ENVOLVENTE MIN	1.575	-112.380	-42.270	-22.900	-4.608	-0.476	-8.458
CUBIERTA	N+6.35	C19	ENVOLVENTE MIN	3.150	-101.250	-42.270	-22.900	-4.608	-68.891	-48.033
PISO2	N+3.20	C19	ENVOLVENTE MAX	0.000	-323.730	71.780	89.840	4.306	166.217	142.555
PISO2	N+3.20	C19	ENVOLVENTE MAX	1.600	-315.250	71.780	89.840	4.306	29.185	27.91
PISO2	N+3.20	C19	ENVOLVENTE MAX	3.200	-306.770	71.780	89.840	4.306	35.877	94.022
PISO2	N+3.20	C19	ENVOLVENTE MIN	0.000	-608.520	-77.540	-65.710	-3.590	-185.128	-154.536
PISO2	N+3.20	C19	ENVOLVENTE MIN	1.600	-597.210	-77.540	-65.710	-3.590	-86.699	-30.672
PISO2	N+3.20	C19	ENVOLVENTE MIN	3.200	-585.900	-77.540	-65.710	-3.590	-131.994	-87.565
CUBIERTA	N+6.35	C21	ENVOLVENTE MAX	0.000	-64.830	28.970	48.590	6.170	88.516	36.73
CUBIERTA	N+6.35	C21	ENVOLVENTE MAX	1.575	-56.480	28.970	48.590	6.170	25.550	6.592
CUBIERTA	N+6.35	C21	ENVOLVENTE MAX	3.150	-48.130	28.970	48.590	6.170	47.913	62.302
CUBIERTA	N+6.35	C21	ENVOLVENTE MIN	0.000	-136.600	-37.360	-20.970	-4.608	-19.927	-55.98
CUBIERTA	N+6.35	C21	ENVOLVENTE MIN	1.575	-125.470	-37.360	-20.970	-4.608	-0.464	-12.623
CUBIERTA	N+6.35	C21	ENVOLVENTE MIN	3.150	-114.340	-37.360	-20.970	-4.608	-66.329	-55.114
PISO2	N+3.20	C21	ENVOLVENTE MAX	0.000	-340.760	70.960	97.190	4.306	177.370	141.715
PISO2	N+3.20	C21	ENVOLVENTE MAX	1.600	-332.280	70.960	97.190	4.306	31.090	28.378
PISO2	N+3.20	C21	ENVOLVENTE MAX	3.200	-323.800	70.960	97.190	4.306	40.628	103.175
PISO2	N+3.20	C21	ENVOLVENTE MIN	0.000	-639.450	-81.900	-68.780	-3.590	-187.317	-159.024
PISO2	N+3.20	C21	ENVOLVENTE MIN	1.600	-628.140	-81.900	-68.780	-3.590	-86.495	-28.185
PISO2	N+3.20	C21	ENVOLVENTE MIN	3.200	-616.830	-81.900	-68.780	-3.590	-141.490	-85.479
CUBIERTA	N+6.35	C23	ENVOLVENTE MAX	0.000	-41.370	48.510	42.540	6.170	72.106	101.359
CUBIERTA	N+6.35	C23	ENVOLVENTE MAX	1.575	-33.020	48.510	42.540	6.170	22.319	42.253
CUBIERTA	N+6.35	C23	ENVOLVENTE MAX	3.150	-24.670	48.510	42.540	6.170	45.456	16.579
CUBIERTA	N+6.35	C23	ENVOLVENTE MIN	0.000	-102.600	7.160	-20.270	-4.608	-21.328	34.972

CUBIERTA	N+6.35	C23	ENVOLVENTE MIN	1.575	-91.470	7.160	-20.270	-4.608	-6.613	6.397
CUBIERTA	N+6.35	C23	ENVOLVENTE MIN	3.150	-80.340	7.160	-20.270	-4.608	-64.822	-55.611
PISO2	N+3.20	C23	ENVOLVENTE MAX	0.000	-187.570	104.850	93.030	4.306	184.125	174.875
PISO2	N+3.20	C23	ENVOLVENTE MAX	1.600	-179.090	104.850	93.030	4.306	38.036	17.338
PISO2	N+3.20	C23	ENVOLVENTE MAX	3.200	-170.610	104.850	93.030	4.306	52.918	8.706
PISO2	N+3.20	C23	ENVOLVENTE MIN	0.000	-406.790	-37.530	-76.030	-3.590	-201.300	-111.651
PISO2	N+3.20	C23	ENVOLVENTE MIN	1.600	-395.480	-37.530	-76.030	-3.590	-82.420	-61.814
PISO2	N+3.20	C23	ENVOLVENTE MIN	3.200	-384.170	-37.530	-76.030	-3.590	-124.510	-160.881

VERIFICACIONES DE CORTANTE PARA VIGAS

C.21.3.3.1 (a)

C.21.3.3.1 (b)

9. VERIFICACIONES

VERIFICACIONES

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA VIGAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.1 (a)

f'c = 21.1 MPa
fy = 420 MPa
$\Phi_{Cortante}$ = 0.75
Estribos Φ = 9.5 mm
Av = 71 mm^2
R= 4.73

Mn = Momentos nominales de la viga en cada extremo restringido de la luz libre.
Vg = Cortante calculado para cargas gravitacionales mayoradas.
Vm = Cortante debido a flexion en curvatura inversa.
Vu = Vm + Vg

COMDIS3 = 1.2C.M.+1.0C.V.+1.0Ex+0.3Ey
COMDIS4 = 1.2C.M.+1.0C.V.+1.0(-Ex)+0.3Ey
COMDIS5 = 1.2C.M.+1.0C.V.+1.0Ex+0.3(-Ey)
COMDIS6 = 1.2C.M.+1.0C.V.+1.0(-Ex)+0.3(-Ey)
COMDIS7 = 1.2C.M.+1.0C.V.+0.3Ex+1.0Ey
COMDIS8 = 1.2C.M.+1.0C.V.+0.3(-Ex)+1.0Ey
COMDIS9 = 1.2C.M.+1.0C.V.+0.3Ex+1.0(-Ey)
COMDIS10 = 1.2C.M.+1.0C.V.+0.3(-Ex)+1.0(-Ey)
COMDIS11 = 0.9C.M.+1.0Ex+0.3Ey
COMDIS12 = 0.9C.M.+1.0(-Ex)+0.3Ey
COMDIS13 = 0.9C.M.+1.0Ex+0.3(-Ey)
COMDIS14 = 0.9C.M.+1.0(-Ex)+0.3(-Ey)
COMDIS15 = 0.9C.M.+0.3Ex+1.0Ey
COMDIS16 = 0.9C.M.+0.3(-Ex)+1.0Ey
COMDIS17 = 0.9C.M.+0.3Ex+1.0(-Ey)
COMDIS18 = 0.9C.M.+0.3(-Ex)+1.0(-Ey)

NIVEL	VIGA	LOC.	LONG.	PROPIEDADES DEL ELEMENTO			M3						Mn (kN.m)														
													Combinaciones para resistencias nominales a momento														
	ELEMENTO			SECCION	b	d	C.M.	C.V.	SISMO X	SISMO Y	-SISMO X	-SISMO Y															
	No.	(m)	(m)		(m)	(m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	COMDIS3	COMDIS4	COMDIS5	COMDIS6	COMDIS7	COMDIS8	COMDIS9	COMDIS10	COMDIS11	COMDIS12	COMDIS13	COMDIS14	COMDIS15	COMDIS16	COMDIS17	COMDIS18
N+6.35	B1	0	2.150	VIG15X45	0.15	0.40	-0.117	0.024	0.492	0.374	-0.492	-0.374	0.011	0.197	0.036	0.244	0.006	0.069	0.164	0.227	0.022	0.186	0.025	0.233	0.005	0.057	0.153	0.216
	B1	2.15					-3.782	-0.634	1.210	0.701	-1.210	-0.701	4.872	5.384	4.961	5.473	4.947	5.101	5.244	5.397	3.104	3.615	3.192	3.704	3.179	3.332	3.475	3.629
N+3.20	B1	0	2.150	VIG15X45	0.15	0.40	-0.587	-0.161	0.592	0.360	-0.592	-0.360	0.717	0.968	0.763	1.013	0.752	0.827	0.904	0.979	0.380	0.631	0.426	0.676	0.415	0.490	0.567	0.642
	B1	2.15					-8.814	-5.315	1.788	0.870	-1.788	-0.870	15.459	16.215	15.569	16.325	15.594	15.821	15.962	16.189	7.499	8.255	7.610	8.366	7.635	7.862	8.003	8.230
N+6.35	B2	0	2.150	VIG30X45	0.30	0.40	0.263	0.070	0.615	0.044	-0.615	-0.044	0.518	0.258	0.513	0.253	0.434	0.356	0.415	0.337	0.370	0.109	0.364	0.104	0.285	0.207	0.266	0.188
	B2	2.15					-28.290	-3.469	5.930	5.373	-5.930	-5.373	35.823	38.330	36.504	39.011	35.905	36.657	38.177	38.929	23.867	26.374	24.548	27.055	23.949	24.701	26.221	26.973
N+3.20	B2	0	2.150	VIG30X45	0.30	0.40	0.256	0.090	0.844	0.133	-0.844	-0.133	0.584	0.227	0.567	0.210	0.479	0.372	0.423	0.316	0.417	0.060	0.400	0.044	0.312	0.205	0.256	0.149
	B2	2.15					-68.376	-32.622	13.687	8.864	-13.687	-8.864	111.217	117.005	112.342	118.129	111.931	113.667	115.679	117.415	58.083	63.870	59.207	64.994	58.796	60.533	62.544	64.280
N+6.35	B3	0	2.150	VIG30X45	0.30	0.40	-0.158	0.053	0.194	0.115	-0.194	-0.115	0.088	0.170	0.103	0.185	0.100	0.125	0.149	0.173	0.094	0.176	0.108	0.191	0.106	0.130	0.154	0.179
	B3	2.15					-34.059	-4.125	2.703	4.209	-2.703	-4.209	44.157	45.300	44.691	45.834	43.935	44.277	45.714	46.057	29.815	30.958	30.349	31.492	29.592	29.935	31.372	31.714
N+3.20	B3	0	2.150	VIG30X45	0.30	0.40	0.771	0.204	0.415	0.053	-0.415	-0.053	1.220	1.045	1.214	1.038	1.167	1.114	1.144	1.092	0.785	0.610	0.778	0.603	0.731	0.679	0.709	0.656
	B3	2.15					-109.374	-42.838	5.679	1.226	-5.679	-1.226	172.808	175.210	172.964	175.365	173.467	174.188	173.986	174.706	97.158	99.559	97.314	99.715	97.817	98.538	98.336	99.056
N+6.35	B4	0	6.900	VIG30X45	0.30	0.40	-52.751	-14.128	11.793	84.127	-11.793	-84.127	69.600	74.587	80.272	85.258	58.895	60.391	94.467	95.963	39.647	44.633	50.318	55.305	28.942	30.438	64.514	66.010
	B4	6.9					-6.128	3.873	11.764	83.621	-11.764	-83.621	4.310	0.664	6.297	11.271	14.944	13.452	20.413	21.906	2.276	2.699	8.332	13.306	12.910	11.418	22.448	23.940
N+3.20	B4	0	6.900	VIG30X45	0.30	0.40	-127.025	-32.807	18.606	136.550	-18.606	-136.550	172.643	180.510	189.964	197.831	155.188	157.548	212.926	215.286	101.728	109.595	119.050	126.917	84.273	86.634	142.011	144.372
	B4	6.9					-55.172	1.544	22.233	135.665	-22.233	-135.665	51.357	60.758	68.567	77.967	34.570	37.391	91.934	94.754	36.350	45.751	53.559	62.960	19.563	22.383	76.926	79.747
N+6.35	B5	0	0.980	VIG30X45	0.30	0.40	-6.512	2.063	1.765	0.731	-1.765	-0.731	5.332	6.078	5.425	6.171	5.485	5.709	5.794	6.018	5.441	6.188	5.534	6.280	5.594	5.818	5.903	6.127
	B5	0.98					-0.037	0.043	0.096	0.201	-0.096	-0.201	0.032	0.009	0.006	0.034	0.047	0.035	0.038	0.050	0.000	0.041	0.026	0.066	0.015	0.003	0.070	0.082
N+3.20	B5	0	0.980	VIG30X45	0.30	0.40	-27.539	-2.609	3.866	4.907	-3.866	-4.907	34.527	36.162	35.150	36.784	34.373	34.864	36.448	36.938	23.657	25.291	24.279	25.914	23.502	23.993	25.577	26.068
	B5	0.98					0.428	0.139	0.203	0.851	-0.203	-0.851	0.749	0.664	0.642	0.556	0.845	0.820	0.486	0.460	0.482	0.396	0.374	0.288	0.578	0.552	0.218	0.192
N+6.35	B6	0	2.150	VIG30X45	0.30	0.40	0.012	-0.134	0.010	0.072	-0.010	-0.072	0.113	0.117	0.122	0.126	0.104	0.105	0.134	0.135	0.017	0.013	0.008	0.004	0.027	0.025	0.004	0.005
	B6	2.15					-44.639	-8.699	0.610	0.217	-0.610	-0.217	62.123	62.381	62.151	62.409	62.181	62.259	62.273	62.350	40.032	40.290	40.060	40.318	40.091	40.168	40.182	40.260
N+3.20	B6	0	2.150	VIG30X45	0.30	0.40	1.764	0.679	0.024	0.212	-0.024	-0.212	2.814	2.804	2.787	2.777	2.842	2.839	2.753	2.749	1.606	1.596	1.579	1.569	1.634	1.631	1.544	1.541
	B6	2.15					-147.790	-59.140	0.845	10.343	-0.845	-10.343	235.653	236.011	236.965	237.323	234.248	234.355	238.621	238.728	132.176	132.534	133.488	133.846	130.771	130.878	135.144	135.251
N+6.35	B7	0	6.900	VIG30X45	0.30	0.40	-73.895	-49.835	6.753	73.930	-6.753	-73.930	132.392	135.248	141.770	144.626	122.451	123.307	153.711	154.567	60.389	63.244	69.767	72.622	50.447	51.304	81.707	82.564
	B7	6.9					-34.250	-44.548	7.838	71.145	-7.838	-71.145	79.479	82.793	88.503	91.817	70.110	71.104	100.192	101.186	24.656	27.970	33.680	36.994	15.287	16.281	45.369	46.363
N+3.20	B7	0	6.900	VIG30X45	0.30	0.40	-174.113	-55.266	12.152	115.580	-12.152	-115.580	254.302	259.440	268.963	274.101	238.995	240.537	287.866	289.408	146.802	151.940	161.463	166.601	131.495	133.037	180.366	181.908
	B7	6.9					-104.875	-18.633	11.094	117.063	-11.094	-117.063	134.713	139.404	149.562	154.253	119.030	120.438	168.528	169.936	84.617	89.308	99.467	104.158	68.935	70.342	118.433	119.840
N+6.35	B8	0	0.980	VIG30X45	0.30	0.40	-24.273	-21.295	1.677	2.990	-1.677	-2.990	49.878	50.588	50.258	50.967	49.684	49.897	50.948	51.161	21.302	22.011	21.681	22.390	21.107	21.320	22.371	22.584
	B8	0.98					0.943	1.385	0.078	0.786	-0.078	-0.786	2.583	2.550	2.483	2.450	2.688	2.678	2.355	2.345	0.915	0.882	0.815	0.782	1.020	1.010	0.687	0.678
N+3.20	B8	0	0.980	VIG30X45	0.30	0.40	-61.705	-5.921	2.022	5.584	-2.022	-5.584	79.185	80.040	79.894	80.749	78.658	78.915	81.019	81.276	54.753	55.608	55.461	56.316	54.226	54.482	56.587	56.843
	B8	0.98					1.451	0.435	0.117	1.210	-0.117	-1.210	2.278	2.228	2.124	2.075	2.439	2.425	1.928	1.913	1.407	1.358	1.254	1.204	1.569	1.554	1.058	1.043
N+6.35	B9	0	2.150	VIG30X45	0.30	0.40	-0.047	-0.135	0.028	0.002	-0.028	-0.002	0.185	0.197	0.186	0.197	0.189	0.193	0.190	0.194	0.036	0.048	0.037	0.048	0.040	0.044	0.041	0.044
	B9	2.15					-46.897	-9.143	0.159	0.055	-0.159	-0.055	65.382	65.450	65.389	65.457	65.398	65.418	65.421	65.441	42.170	42.237	42.177	42.244	42.186	42.206	42.209	42.229
N+3.20	B9	0	2.150	VIG30X45	0.30	0.40	1.897	0.706	0.012	0.302	-0.012	-0.302	3.004	2.999	2.966	2.961	3.047	3.045	2.919	2.918	1.729	1.724	1.691	1.686	1.772	1.770	1.644	1.643
	B9	2.15					-158.545	-63.862	0.679	8.308	-0.679	-8.308	253.446	253.733	254.499	254.786	252.316	252.403	255.829	255.916	142.020	142.307	143.074	143.361	140.891	140.977	144.404	144.490
N+6.35	B10	0	6.900	VIG30X45	0.30	0.40	-70.923	-48.832	2.495	59.933	-2.495	-59.933	129.611	130.666	137.213	138.268	121.111	121.427	146.452	146.769	59.502	60.557	67.104	68.159	51.002	51.318	76.343	76.660
	B10	6.9					-36.331	-46.016	1.341	58.163	-1.341	-58.163	85.641	86.208	93.019	93.586	77.232	77.402	101.825	101.995	28.725	29.292	36.103	36.670	20.316	20.486	44.909	45.080
N+3.20	B10	0	6.900	VIG30X45	0.30	0.40	-178.764	-56.828	1.677	95.844	-1.677	-95.844	264.911	265.620	277.069	277.778	250.975	251.188	291.501	291.714	154.454	155.163	166.612	167.321	140.518	140.731	181.044	181.257
	B10	6.9					-113.157	-21.066	2.007	96.775	-2.007	-96.775	150.292	151.141	162.568	163.417	136.267	136.522	177.187	177.442	95.279	96.128	107.555	108.404	81.254	81.509	122.174	122.428
N+6.35	B11	0	0.980	VIG30X45	0.30	0.40	-25.056	-21.515	0.163	2.054	-0.163	-2.054	51.417	51.486	51.678	51.747	51.138	51.158	52.006	52.027	22.386	22.455	22.646	22.715	22.106	22.126	22.974	22.995
	B11	0.98					0.654	1.014	0.054	0.584	-0.054	-0.584	1.847	1.824	1.773	1.750	1.926	1.919	1.679	1.672	0.637	0.614	0.563	0.540	0.715	0.709	0.469	0.462
N+3.20	B11	0	0.980	VIG30X45	0.30	0.40	-65.391	-6.310	0.403	4.364	-0.403	-4.364	84.417	84.588	84.971	85.141	83.831	83.882	85.676	85.727	58.490	58.660	59.043	59.214	57.904	57.955	59.749	59.800
	B11	0.98					1.602	0.514	0.021	1.038	-0.021	-1.038	2.507	2.498	2.375	2.366	2.657	2.655	2.218	2.216	1.512	1.503	1.380	1.372	1.663	1.660	1.224	1.221
N+6.35	B12	0	2.150	VIG30X45	0.30	0.40	0.051	0.115	0.017	0.007	-0.017	-0.007	0.180	0.173	0.179	0.172	0.179	0.177	0.176	0.174	0.050	0.043	0.049	0.042	0.048	0.046	0.045	0.043
	B12	2.15					-44.633	-7.317	0.070	0.030	-0.070	-0.030	60.860	60.889	60.864	60.893	60.866	60.875	60.879	60.887	40.153	40.183	40.157	40.186	40.159	40.168	40.172	40.180
N+3.20	B12	0	2.150	VIG30X45	0.30	0.40	1.724	0.621	0.019	0.246	-0.019	-0.246	2.709	2.701	2.678	2.670	2.743	2.741	2.639	2.637	1.571	1.563	1.540	1.532	1.605	1.602	1.501	1.498
	B12	2.15					-152.481	-61.787	0.954	7.608	-0.954	-7.608	244.080	244.483	245.045	245.448	243.095	243.216	246.312	246.433	136.549	136.952	137.514	137.917	135.564	135.685	138.781	138.902
N+6.35	B13	0	6.900	VIG30X45	0.30	0.40	-54.023	-19.504	4.113	52.443	-4.113	-52.443	80.136	81.875	86.788	88.527	72.983	73.505	95.158	95.680	44.425	46.164	51.077	52.816	37.273	37.794	59.447	59.969
	B13	6.9					-19.235	-6.324	4.111	52.429	-4.111	-52.429	25.212	26.950	31.862	33.600	18.061	18.582	40.230	40.751	13.117	14.855	19.768	21.506	5.966	6.488	28.135	28.657
N+3.20	B13	0	6.900	VIG30X45	0.30	0.40	-170.579	-52.653	7.980	86.986	-7.980	-86.986	250.144	253.518	261.178	264.552	238.451	239.464	275.232	276.244	146.317	149.691	157.351	160.725	134.625	135.637	171.405	172.418
	B13	6.9					-111.061	-20.476	8.263	87.739	-8.263	-87.739	146.437	149.931	157.567	161.061	134.676	135.724	171.775	172.823	92.643	96.137	103.773	107.267	80.881	81.930	117.980	119.028
N+6.35	B14	0	0.980	VIG30X45	0.30	0.40	-13.865	1.082	0.067	0.146	-0.067	-0.146	15.533	15.561	15.551	15.579	15.521	15.529	15.583	15.591	12.455	12.483	12.474	12.502	12.443	12.452	12.505	12.514
	B14	0.98					0.019	0.005	0.011	0.036	-0.011	-0.036	0.032	0.028	0.028	0.023	0.036	0.035	0.021	0.019	0.022	0.017	0.017	0.012	0.025	0.024	0.010	0.009
N+3.20	B14	0	0.980	VIG30X45	0.30	0.40	-63.179	-6.870	0.321	4.053	-0.321	-4.053	82.360	82.496	82.874	83.010	81.808	81.848	83.521	83.562	56.536	56.672	57.050	57.186	55.984	56.025	57.698	57.738
	B14	0.98					1.561	0.453	0.088	0.933	-0.088	-0.933	2.404	2.367	2.286	2.248	2.529	2.518	2.135	2.123	1.483	1.445	1.364	1.327	1.608	1.597	1.213	1.202
N+6.35	B15	0	2.150	VIG30X45	0.30	0.40	0.218	0.023	0.050	0.019	-0.050	-0.019	0.296	0.275	0.294	0.273	0.292	0.285	0.284	0.277	0.208	0.187	0.206	0.184	0.203	0.197	0.195	0.189
	B15	2.15					-46.210	-8.140	0.674	0.198	-0.674	-0.198	63.437	63.722	63.462	63.747	63.507	63.593	63.591	63.677	41.434	41.719	41.459	41.744	41.504	41.590	41.588	41.674

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA VIGAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.1 (a)

f'c = 21.1 MPa
fy = 420 MPa
$\Phi_{Cortante}$ = 0.75
Estribos Φ = 9.5 mm
Av = 71 mm^2
R= 4.73

Mn = Momentos nominales de la viga en cada extremo restringido de la luz libre.
Vg = Cortante calculado para cargas gravitacionales mayoradas.
Vm = Cortante debido a flexion en curvatura inversa.
Vu = Vm + Vg

V_g	$V_m = M_{nl} + M_{nr} / l_n$															
	COMBDIS3	COMBDIS4	COMBDIS5	COMBDIS6	COMBDIS7	COMBDIS8	COMBDIS9	COMBDIS10	COMBDIS11	COMBDIS12	COMBDIS13	COMBDIS14	COMBDIS15	COMBDIS16	COMBDIS17	COMBDIS18
(kN)	(kN)															
0.78	2.271	2.596	2.324	2.659	2.304	2.404	2.515	2.616	1.454	1.768	1.496	1.831	1.481	1.577	1.688	1.788
5.85																
1.07	7.524	7.992	7.596	8.064	7.603	7.743	7.845	7.985	3.665	4.133	3.738	4.206	3.744	3.885	3.986	4.126
17.94																
7.05	16.903	17.948	17.217	18.262	16.902	17.215	17.950	18.263	11.273	12.318	11.587	12.632	11.272	11.585	12.320	12.633
30.08																
41.43	52.001	54.526	52.516	55.042	52.284	53.041	54.001	54.759	27.209	29.735	27.724	30.250	27.492	28.250	29.209	29.967
83.86																
7.69	20.579	21.149	20.835	21.404	20.481	20.652	21.332	21.502	13.911	14.481	14.166	14.736	13.813	13.984	14.663	14.834
36.38																
72.13	80.944	81.979	81.013	82.048	81.225	81.536	81.456	81.766	45.555	46.590	45.624	46.659	45.837	46.147	46.067	46.378
114.89																
51.52	10.712	10.906	12.546	13.990	10.701	10.702	16.649	17.082	6.076	6.860	8.500	9.944	6.065	6.066	12.603	13.036
26.94																
123.40	32.464	34.966	37.468	39.971	27.501	28.252	44.183	44.933	20.011	22.514	25.016	27.518	15.049	15.800	31.730	32.481
82.42																
10.21	5.473	6.211	5.542	6.332	5.645	5.861	5.951	6.192	5.553	6.356	5.673	6.476	5.724	5.940	6.095	6.336
0.94																
46.49	35.997	37.577	36.522	38.102	35.937	36.411	37.687	38.161	24.631	26.212	25.156	26.737	24.572	25.046	26.322	26.796
30.96																
13.88	28.947	29.069	28.964	29.086	28.970	29.006	29.027	29.063	18.628	18.746	18.636	18.754	18.659	18.695	18.691	18.728
48.72																
106.60	110.915	111.077	111.513	111.674	110.274	110.323	112.267	112.315	62.224	62.386	62.822	62.984	61.584	61.632	63.576	63.624
149.36																
109.59	30.706	31.600	33.373	34.267	27.907	28.176	36.798	37.066	12.325	13.219	14.992	15.886	9.527	9.795	18.417	18.685
115.28																
178.05	56.379	57.803	60.656	62.080	51.888	52.315	66.144	66.572	33.539	34.964	37.816	39.240	29.048	29.475	43.304	43.732
136.64																
76.01	53.532	54.222	53.817	54.507	53.441	53.648	54.392	54.599	22.670	23.360	22.955	23.645	22.579	22.786	23.530	23.737
59.81																
93.10	83.126	83.947	83.692	84.514	82.753	82.999	84.640	84.886	57.306	58.128	57.873	58.694	56.934	57.180	58.821	59.067
82.34																
14.72	30.497	30.533	30.500	30.537	30.506	30.517	30.517	30.528	19.631	19.668	19.634	19.671	19.640	19.651	19.651	19.662
50.97																
116.21	119.279	119.410	119.751	119.882	118.774	118.813	120.348	120.388	66.860	66.991	67.332	67.464	66.355	66.394	67.929	67.969
158.98																
108.55	31.196	31.431	33.367	33.602	28.745	28.816	35.982	36.053	12.787	13.022	14.958	15.193	10.336	10.406	17.573	17.643
117.78																
183.76	60.174	60.400	63.716	63.941	56.122	56.190	67.926	67.994	36.193	36.419	39.734	39.960	32.141	32.209	43.945	44.012
143.96																
76.69	54.352	54.399	54.542	54.589	54.146	54.160	54.780	54.795	23.493	23.540	23.683	23.730	23.287	23.301	23.921	23.935
59.84																
98.56	88.698	88.863	89.128	89.293	88.253	88.303	89.688	89.738	61.227	61.391	61.657	61.822	60.782	60.831	62.217	62.266
87.78																
12.59	28.391	28.401	28.392	28.403	28.393	28.396	28.397	28.400	18.699	18.709	18.700	18.711	18.701	18.704	18.706	18.709
48.34																
111.13	114.786	114.970	115.220	115.404	114.343	114.399	115.791	115.846	64.242	64.426	64.676	64.860	63.799	63.855	65.247	65.302
153.90																
66.45	15.268	15.772	17.196	17.700	13.195	13.346	19.621	19.773	8.339	8.843	10.267	10.771	6.267	6.418	12.693	12.844
48.23																
177.74	57.476	58.471	60.688	61.683	54.076	54.375	64.784	65.082	34.632	35.627	37.844	38.839	31.233	31.531	41.940	42.239
141.85																
23.38	15.883	15.907	15.897	15.921	15.874	15.882	15.922	15.929	12.731	12.756	12.746	12.770	12.723	12.731	12.771	12.778
7.10																
96.61	86.494	86.594	86.898	86.998	86.058	86.088	87.404	87.434	59.203	59.303	59.607	59.707	58.767	58.797	60.113	60.143
85.84																
14.04	29.643	29.766	29.654	29.777	29.674	29.711	29.709	29.746	19.368	19.491	19.379	19.502	19.399	19.436	19.434	19.471
49.94																

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA VIGAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.1 (a)

f'c = 21.1 MPa
fy = 420 MPa
Φ Cortante = 0.75
Estribos Φ = 9.5 mm
Av = 71 mm²
R= 4.73

Mn = Momentos nominales de la viga en cada extremo restringido de la luz libre.
Vg = Cortante calculado para cargas gravitacionales mayoradas.
Vm = Cortante debido a flexion en curvatura inversa.
Vu = Vm + Vg

Vu = Vm + Vg																	Vu_{max}	S	ΦVs	ΦVc	ΦVn	ΦVn > Vu_{max}
COMBDIS3	COMBDIS4	COMBDIS5	COMBDIS6	COMBDIS7	COMBDIS8	COMBDIS9	COMBDIS10	COMBDIS11	COMBDIS12	COMBDIS13	COMBDIS14	COMBDIS15	COMBDIS16	COMBDIS17	COMBDIS18						
(kN)																	(kN)	(m)	(kN)	(kN)	(kN)	
3.055	3.380	3.108	3.443	3.088	3.188	3.299	3.400	2.238	2.552	2.280	2.615	2.265	2.361	2.472	2.572						
5.852	5.852	5.852	5.852	5.852	5.852	5.852	5.852	5.852	5.852	5.852	5.852	5.852	5.852	5.852	5.852	5.9	0.10	178.92	34.45	213.37	OK
8.596	9.064	8.668	9.136	8.675	8.815	8.917	9.057	4.737	5.205	4.810	5.278	4.816	4.957	5.058	5.198						
17.944	17.944	17.944	17.944	17.944	17.944	17.944	17.944	17.944	17.944	17.944	17.944	17.944	17.944	17.944	17.944	17.9	0.10	178.92	34.45	213.37	OK
23.955	25.000	24.269	25.314	23.954	24.267	25.002	25.315	18.325	19.370	18.639	19.684	18.324	18.637	19.372	19.685						
30.084	30.084	30.084	30.084	30.084	30.084	30.084	30.084	30.084	30.084	30.084	30.084	30.084	30.084	30.084	30.084	30.1	0.10	178.92	68.90	247.82	OK
93.433	95.958	93.948	96.474	93.716	94.473	95.433	96.191	68.641	71.167	69.156	71.682	68.924	69.682	70.641	71.399						
83.864	83.864	83.864	83.864	83.864	83.864	83.864	83.864	83.864	83.864	83.864	83.864	83.864	83.864	83.864	83.864	96.5	0.10	178.92	68.90	247.82	OK
28.271	28.841	28.527	29.096	28.173	28.344	29.024	29.194	21.603	22.173	21.858	22.428	21.505	21.676	22.355	22.526						
36.380	36.380	36.380	36.380	36.380	36.380	36.380	36.380	36.380	36.380	36.380	36.380	36.380	36.380	36.380	36.380	36.4	0.10	178.92	68.90	247.82	OK
153.072	154.107	153.141	154.176	153.353	153.664	153.584	153.894	117.683	118.718	117.752	118.787	117.965	118.275	118.195	118.506						
114.888	114.888	114.888	114.888	114.888	114.888	114.888	114.888	114.888	114.888	114.888	114.888	114.888	114.888	114.888	114.888	154.2	0.10	178.92	68.90	247.82	OK
62.228	62.422	64.062	65.506	62.217	62.218	68.165	68.598	57.592	58.376	60.016	61.460	57.581	57.582	64.119	64.552						
26.940	26.940	26.940	26.940	26.940	26.940	26.940	26.940	26.940	26.940	26.940	26.940	26.940	26.940	26.940	26.940	68.6	0.10	178.92	68.90	247.82	OK
155.868	158.370	160.872	163.375	150.905	151.656	167.587	168.337	143.415	145.918	148.420	150.922	138.453	139.204	155.134	155.885						
82.416	82.416	82.416	82.416	82.416	82.416	82.416	82.416	82.416	82.416	82.416	82.416	82.416	82.416	82.416	82.416	168.3	0.10	178.92	68.90	247.82	OK
15.681	16.419	15.750	16.540	15.853	16.069	16.159	16.400	15.761	16.564	15.881	16.684	15.932	16.148	16.303	16.544						
0.936	0.936	0.936	0.936	0.936	0.936	0.936	0.936	0.936	0.936	0.936	0.936	0.936	0.936	0.936	0.936	16.7	0.10	178.92	68.90	247.82	OK
82.489	84.069	83.014	84.594	82.429	82.903	84.179	84.653	71.123	72.704	71.648	73.229	71.064	71.538	72.814	73.288						
30.964	30.964	30.964	30.964	30.964	30.964	30.964	30.964	30.964	30.964	30.964	30.964	30.964	30.964	30.964	30.964	84.7	0.10	178.92	68.90	247.82	OK
42.831	42.953	42.848	42.970	42.854	42.890	42.911	42.947	32.512	32.630	32.520	32.638	32.543	32.579	32.575	32.612						
48.716	48.716	48.716	48.716	48.716	48.716	48.716	48.716	48.716	48.716	48.716	48.716	48.716	48.716	48.716	48.716	48.7	0.10	178.92	68.90	247.82	OK
217.519	217.681	218.117	218.278	216.878	216.927	218.871	218.919	168.828	168.990	169.426	169.588	168.188	168.236	170.180	170.228						
149.364	149.364	149.364	149.364	149.364	149.364	149.364	149.364	149.364	149.364	149.364	149.364	149.364	149.364	149.364	149.364	218.9	0.10	178.92	68.90	247.82	OK
140.294	141.188	142.961	143.855	137.495	137.764	146.386	146.654	121.913	122.807	124.580	125.474	119.115	119.383	128.005	128.273						
115.276	115.276	115.276	115.276	115.276	115.276	115.276	115.276	115.276	115.276	115.276	115.276	115.276	115.276	115.276	115.276	146.7	0.10	178.92	68.90	247.82	OK
234.427	235.851	238.704	240.128	229.936	230.363	244.192	244.620	211.587	213.012	215.864	217.288	207.096	207.523	221.352	221.780						
136.640	136.640	136.640	136.640	136.640	136.640	136.640	136.640	136.640	136.640	136.640	136.640	136.640	136.640	136.640	136.640	244.6	0.10	178.92	68.90	247.82	OK
129.540	130.230	129.825	130.515	129.449	129.656	130.400	130.607	98.678	99.368	98.963	99.653	98.587	98.794	99.538	99.745						
59.808	59.808	59.808	59.808	59.808	59.808	59.808	59.808	59.808	59.808	59.808	59.808	59.808	59.808	59.808	59.808	130.6	0.10	178.92	68.90	247.82	OK
176.226	177.047	176.792	177.614	175.853	176.099	177.740	177.986	150.406	151.228	150.973	151.794	150.034	150.280	151.921	152.167						
82.336	82.336	82.336	82.336	82.336	82.336	82.336	82.336	82.336	82.336	82.336	82.336	82.336	82.336	82.336	82.336	178.0	0.10	178.92	68.90	247.82	OK
45.213	45.249	45.216	45.253	45.222	45.233	45.233	45.244	34.347	34.384	34.350	34.387	34.356	34.367	34.367	34.378						
50.972	50.972	50.972	50.972	50.972	50.972	50.972	50.972	50.972	50.972	50.972	50.972	50.972	50.972	50.972	50.972	51.0	0.10	178.92	68.90	247.82	OK
235.491	235.622	235.963	236.094	234.986	235.025	236.560	236.600	183.072	183.203	183.544	183.676	182.567	182.606	184.141	184.181						
158.984	158.984	158.984	158.984	158.984	158.984	158.984	158.984	158.984	158.984	158.984	158.984	158.984	158.984	158.984	158.984	236.6	0.10	178.92	68.90	247.82	OK
139.748	139.983	141.919	142.154	137.297	137.368	144.534	144.605	121.339	121.574	123.510	123.745	118.888	118.958	126.125	126.195						
117.776	117.776	117.776	117.776	117.776	117.776	117.776	117.776	117.776	117.776	117.776	117.776	117.776	117.776	117.776	117.776	144.6	0.10	178.92	68.90	247.82	OK
243.934	244.160	247.476	247.701	239.882	239.950	251.686	251.754	219.953	220.179	223.494	223.720	215.901	215.969	227.705	227.772						
143.956	143.956	143.956	143.956	143.956	143.956	143.956	143.956	143.956	143.956	143.956	143.956	143.956	143.956	143.956	143.956	251.8	0.10	268.38	68.90	337.28	OK
131.044	131.091	131.234	131.281	130.838	130.852	131.472	131.487	100.185	100.232	100.375	100.422	99.979	99.993	100.613	100.627						
59.840	59.840	59.840	59.840	59.840	59.840	59.840	59.840	59.840	59.840	59.840	59.840	59.840	59.840	59.840	59.840	131.5	0.10	178.92	68.90	247.82	OK
187.254	187.419	187.684	187.849	186.809	186.859	188.244	188.294	159.783	159.947	160.213	160.378	159.338	159.387	160.773	160.822						
87.780	87.780	87.780	87.780	87.780	87.780	87.780	87.780	87.780	87.780	87.780	87.780	87.780	87.780	87.780	87.780	188.3	0.10	178.92	68.90	247.82	OK
40.983	40.993	40.984	40.995	40.985	40.988	40.989	40.992	31.291	31.301	31.292	31.303	31.293	31.296	31.298	31.301						
48.336	48.336	48.336	48.336	48.336	48.336	48.336	48.336	48.336	48.336	48.336	48.336	48.336	48.336	48.336	48.336	48.3	0.10	178.92	68.90	247.82	OK
225.918	226.102	226.352	226.536	225.475	225.531	226.923	226.978	175.374	175.558	175.808	175.992	174.931	174.987	176.379	176.434						
153.904	153.904	153.904	153.904	153.904	153.904	153.904	153.904	153.904	153.904	153.904	153.904	153.904	153.904	153.904	153.904	227.0	0.10	178.92	68.90	247.82	OK
81.716	82.220	83.644	84.148	79.643	79.794	86.069	86.221	74.787	75.291	76.715	77.219	72.715	72.866	79.141	79.292						
48.228	48.228	48.228	48.228	48.228	48.228	48.228	48.228	48.228	48.228	48.228	48.228	48.228	48.228	48.228	48.228	86.2	0.10	178.92	68.90	247.82	OK
235.212	236.207	238.424	239.419	231.812	232.111	242.520	242.818	212.368	213.363	215.580	216.575	208.969	209.267	219.676	219.975						
141.848	141.848	141.848	141.848	141.848	141.848	141.848	141.848	141.848	141.848	141.848	141.848	141.848	141.848	141.848	141.848	242.8	0.10	178.92	68.90	247.82	OK
39.259	39.283	39.273	39.297	39.250	39.258	39.298	39.305	36.107	36.132	36.122	36.146	36.099	36.107	36.147	36.154						
7.100	7.100	7.100	7.100	7.100	7.100	7.100	7.100	7.100	7.100	7.100	7.100	7.100	7.100	7.100	7.100	39.3	0.10	178.92	68.90	247.82	OK
183.106	183.206	183.510	183.610	182.670	182.700	184.016	184.046	155.815	155.915	156.219	156.319	155.379	155.409	156.725	156.755						
85.836	85.836	85.836	85.836	85.836	85.836	85.836	85.836	85.836	85.836	85.836	85.836	85.836	85.836	85.836	85.836	184.0	0.10	178.92	68.90	247.82	OK
43.679	43.802	43.690	43.813	43.710	43.747	43.745	43.782	33.404	33.527	33.415	33.538	33.435	33.472	33.470	33.507						
49.936	49.936	49.936	49.936	49.936	49.936	49.936	49.936	49.936	49.936	49.936	49.936	49.936	49.936	49.936	49.936	49.9	0.10	178.92	68.90	247.82	OK

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA VIGAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.1 (a)

f'c = 21.1 MPa
fy = 420 MPa
$\Phi_{Cortante}$ = 0.75
Estribos Φ = 9.5 mm
Av = 71 mm^2
R= 4.73

Mn = Momentos nominales de la viga en cada extremo restringido de la luz libre.
Vg = Cortante calculado para cargas gravitacionales mayoradas.
Vm = Cortante debido a flexion en curvatura inversa.
Vu = Vm + Vg

COMDIS3 = 1.2C.M.+1.0C.V.+1.0Ex+0.3Ey
COMDIS4 = 1.2C.M.+1.0C.V.+1.0(-Ex)+0.3Ey
COMDIS5 = 1.2C.M.+1.0C.V.+1.0Ex+0.3(-Ey)
COMDIS6 = 1.2C.M.+1.0C.V.+1.0(-Ex)+0.3(-Ey)
COMDIS7 = 1.2C.M.+1.0C.V.+0.3Ex+1.0Ey
COMDIS8 = 1.2C.M.+1.0C.V.+0.3(-Ex)+1.0Ey
COMDIS9 = 1.2C.M.+1.0C.V.+0.3Ex+1.0(-Ey)
COMDIS10 = 1.2C.M.+1.0C.V.+0.3(-Ex)+1.0(-Ey)
COMDIS11 = 0.9C.M.+1.0Ex+0.3Ey
COMDIS12 = 0.9C.M.+1.0(-Ex)+0.3Ey
COMDIS13 = 0.9C.M.+1.0Ex+0.3(-Ey)
COMDIS14 = 0.9C.M.+1.0(-Ex)+0.3(-Ey)
COMDIS15 = 0.9C.M.+0.3Ex+1.0Ey
COMDIS16 = 0.9C.M.+0.3(-Ex)+1.0Ey
COMDIS17 = 0.9C.M.+0.3Ex+1.0(-Ey)
COMDIS18 = 0.9C.M.+0.3(-Ex)+1.0(-Ey)

NIVEL	VIGA	LOC.	LONG.	PROPIEDADES DEL ELEMENTO			M3						Mn (kN.m)													
													Combinaciones para resistencias nominales a momento													
	ELEMENTO			SECCION	b	d	C.M.	C.V.	SISMO X	SISMO Y	-SISMO X	-SISMO Y														
	No.	(m)	(m)		(m)	(m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	COMDIS3	COMDIS4	COMDIS5	COMDIS6	COMDIS7	COMDIS8	COMDIS9	COMDIS10	COMDIS11	COMDIS12	COMDIS13	COMDIS14	COMDIS15	COMDIS16	COMDIS17	COMDIS18
N+3.20	B15	0	2.150	VIG30X45	0.30	0.40	1.933	0.730	0.063	0.248	-0.063	-0.248	3.079	3.052	3.047	3.021	3.106	3.098	3.001	2.993	1.769	1.742	1.737	1.711	1.796	1.788	1.691	1.683
	B15	2.15					-159.230	-64.332	1.190	7.493	-1.190	-7.493	254.681	255.184	255.632	256.135	253.748	253.899	256.917	257.068	142.580	143.083	143.531	144.034	141.647	141.798	144.816	144.967
N+6.35	B16	0	6.900	VIG30X45	0.30	0.40	-52.078	-18.862	9.729	50.306	-9.729	-50.306	76.108	80.222	82.489	86.603	70.103	71.337	91.374	92.608	41.623	45.736	48.004	52.118	35.618	36.852	56.889	58.123
	B16	6.9					-21.834	-7.791	9.670	50.290	-9.670	-50.290	28.758	32.847	35.137	39.226	22.746	23.973	44.011	45.237	14.417	18.505	20.796	24.885	8.405	9.632	29.669	30.896
N+3.20	B16	0	6.900	VIG30X45	0.30	0.40	-172.837	-53.122	18.138	85.990	-18.138	-85.990	251.238	258.907	262.146	269.815	241.196	243.497	277.556	279.857	146.265	153.934	157.173	164.842	136.223	138.524	172.583	174.883
	B16	6.9					-117.326	-22.071	17.543	86.734	-17.543	-86.734	153.652	161.070	164.654	172.072	143.413	145.638	180.087	182.312	96.383	103.801	107.386	114.803	86.144	88.369	122.818	125.043
N+6.35	B17	0	0.980	VIG30X45	0.30	0.40	-16.002	-2.051	0.420	0.175	-0.420	-0.175	21.154	21.331	21.176	21.353	21.190	21.243	21.264	21.317	14.302	14.479	14.324	14.502	14.338	14.391	14.412	14.465
	B17	0.98					0.077	0.025	0.018	0.012	-0.018	-0.012	0.122	0.114	0.120	0.113	0.121	0.119	0.116	0.114	0.074	0.066	0.072	0.065	0.073	0.071	0.068	0.066
N+3.20	B17	0	0.980	VIG30X45	0.30	0.40	-65.197	-6.734	1.133	3.891	-1.133	-3.891	84.484	84.963	84.978	85.457	84.076	84.220	85.721	85.865	58.191	58.670	58.685	59.164	57.783	57.927	59.428	59.572
	B17	0.98					1.581	0.474	0.192	0.922	-0.192	-0.922	2.470	2.389	2.353	2.272	2.578	2.554	2.188	2.164	1.522	1.441	1.405	1.324	1.630	1.606	1.240	1.216
N+6.35	B18	0	2.150	VIG30X45	0.30	0.40	-0.222	-0.016	0.048	0.157	-0.048	-0.157	0.262	0.283	0.282	0.303	0.246	0.252	0.313	0.319	0.180	0.200	0.200	0.220	0.164	0.170	0.230	0.236
	B18	2.15					-29.477	-4.317	2.178	0.841	-2.178	-0.841	39.176	40.097	39.282	40.203	39.373	39.650	39.729	40.005	26.015	26.936	26.122	27.043	26.213	26.490	26.569	26.845
N+3.20	B18	0	2.150	VIG30X45	0.30	0.40	-0.062	-0.132	0.098	0.241	-0.098	-0.241	0.170	0.212	0.201	0.242	0.149	0.162	0.251	0.264	0.020	0.061	0.050	0.092	0.001	0.011	0.101	0.113
	B18	2.15					-92.324	-29.713	6.153	3.677	-6.153	-3.677	138.968	141.569	139.434	142.036	139.334	140.115	140.889	141.669	81.558	84.159	82.024	84.626	81.924	82.704	83.479	84.259
N+6.35	B19	0	6.900	VIG30X45	0.30	0.40	-43.335	-11.980	14.872	49.091	-14.872	-49.091	57.724	64.013	63.951	70.240	52.660	54.547	73.417	75.304	32.744	39.032	38.971	45.259	27.680	29.566	48.437	50.323
	B19	6.9					-17.762	-1.268	15.048	49.080	-15.048	-49.080	16.288	22.651	22.514	28.877	11.252	13.160	32.004	33.913	9.692	16.054	15.917	22.280	4.655	6.564	25.408	27.317
N+3.20	B19	0	6.900	VIG30X45	0.30	0.40	-120.556	-28.674	26.043	88.973	-26.043	-88.973	162.192	173.204	173.478	184.490	152.879	156.183	190.500	193.803	97.351	108.363	108.638	119.649	88.038	91.342	125.659	128.963
	B19	6.9					-76.740	-5.626	29.653	89.249	-29.653	-89.249	85.784	98.323	97.105	109.644	76.965	80.726	114.702	118.463	57.136	69.675	68.457	80.996	48.317	52.078	86.054	89.815
N+6.35	B20	0	0.980	VIG30X45	0.30	0.40	-8.837	-0.798	1.391	0.726	-1.391	-0.726	11.062	11.650	11.154	11.743	11.161	11.337	11.468	11.644	7.613	8.201	7.705	8.293	7.712	7.888	8.019	8.195
	B20	0.98					-0.031	0.014	0.073	0.164	-0.073	-0.164	0.003	0.028	0.018	0.049	0.016	0.007	0.053	0.063	0.002	0.033	0.023	0.054	0.011	0.002	0.058	0.067
N+3.20	B20	0	0.980	VIG30X45	0.30	0.40	-32.381	-2.574	2.987	2.113	-2.987	-2.113	40.666	41.929	40.934	42.197	40.795	41.174	41.688	42.067	28.377	29.640	28.645	29.908	28.507	28.886	29.400	29.779
	B20	0.98					0.656	0.267	0.227	0.523	-0.227	-0.523	1.135	1.039	1.069	0.973	1.179	1.150	0.958	0.929	0.672	0.576	0.605	0.509	0.715	0.687	0.494	0.465
N+6.35	B21	0	1.840	VIG30X45	0.30	0.40	-0.033	-0.036	0.353	0.256	-0.353	-0.256	0.015	0.134	0.017	0.166	0.001	0.044	0.107	0.152	0.061	0.088	0.029	0.121	0.047	0.002	0.061	0.106
	B21	1.84					-12.429	-1.509	1.809	1.176	-1.809	-1.176	15.967	16.732	16.116	16.881	16.060	16.290	16.558	16.787	10.729	11.494	10.878	11.643	10.823	11.052	11.320	11.549
N+3.20	B21	0	1.840	VIG30X45	0.30	0.40	0.270	0.017	0.390	0.231	-0.390	-0.231	0.438	0.273	0.409	0.244	0.415	0.365	0.317	0.267	0.340	0.175	0.311	0.146	0.317	0.267	0.219	0.169
	B21	1.84					-25.840	-13.492	2.427	1.283	-2.427	-1.283	43.906	44.932	44.068	45.094	44.075	44.383	44.617	44.925	22.662	23.688	22.824	23.850	22.831	23.139	23.373	23.681
N+6.35	B22	0	3.080	VIG30X45	0.30	0.40	-8.163	-1.192	47.343	6.622	-47.343	-6.622	0.559	20.577	1.399	21.417	6.585	12.590	9.385	15.390	3.082	16.936	2.242	17.776	2.944	8.949	5.744	11.749
	B22	3.08					3.172	2.642	44.528	5.795	-44.528	-5.795	16.230	2.598	15.495	3.333	10.498	4.849	8.047	2.399	12.636	6.192	11.901	6.927	6.904	1.256	4.454	1.195
N+3.20	B22	0	3.080	VIG30X45	0.30	0.40	-10.884	-4.304	105.642	11.595	-105.642	-11.595	5.705	38.964	4.234	40.435	8.213	21.614	13.116	26.517	13.274	31.395	11.803	32.865	0.644	14.045	5.547	18.947
	B22	3.08					-26.540	-9.198	97.510	11.642	-97.510	-11.642	19.692	60.923	21.169	62.400	32.400	44.769	37.323	49.692	2.532	43.763	4.009	45.240	15.240	27.609	20.163	32.532
N+6.35	B23	0	5.950	VIG30X45	0.30	0.40	-9.987	-0.096	26.342	4.389	-26.342	-4.389	6.233	17.371	6.790	17.928	9.482	12.823	11.338	14.679	3.141	14.279	3.698	14.836	6.390	9.731	8.245	11.587
	B23	5.95					-10.210	-2.132	27.401	4.797	-27.401	-4.797	8.287	19.873	8.895	20.481	11.632	15.108	13.660	17.136	3.092	14.678	3.700	15.286	6.437	9.913	8.465	11.941
N+3.20	B23	0	5.950	VIG30X45	0.30	0.40	-80.231	-30.077	53.097	7.541	-53.097	-7.541	114.650	137.101	115.607	138.058	121.392	128.128	124.581	131.316	60.504	82.955	61.461	83.912	67.246	73.981	70.435	77.170
	B23	5.95					-106.776	-39.248	60.131	18.550	-60.131	-18.550	153.490	178.915	155.843	181.268	159.644	167.271	167.487	175.115	82.209	107.635	84.562	109.988	88.363	95.990	96.206	103.834
N+6.35	B24	0	7.550	VIG30X45	0.30	0.40	-14.422	1.059	22.411	4.038	-22.411	-4.038	11.253	20.729	11.765	21.242	13.972	16.815	15.680	18.523	7.986	17.462	8.498	17.974	10.705	13.548	12.412	15.255
	B24	7.55					-14.009	1.788	22.533	3.979	-22.533	-3.979	10.007	19.534	10.511	20.039	12.752	15.611	14.435	17.293	7.592	17.120	8.097	17.624	10.338	13.196	12.020	14.878
N+3.20	B24	0	7.550	VIG30X45	0.30	0.40	-143.167	-54.937	48.264	8.695	-48.264	-8.695	215.982	236.390	217.085	237.493	221.838	227.960	225.515	231.637	118.095	138.503	119.198	139.606	123.951	130.073	127.627	133.750
	B24	7.55					-146.883	-56.580	49.639	15.906	-49.639	-15.906	221.336	242.325	223.354	244.343	226.328	232.625	233.054	239.351	120.691	141.680	122.709	143.698	125.684	131.980	132.409	138.706
N+6.35	B25	0	6.980	VIG30X45	0.30	0.40	-14.712	-2.983	24.604	4.243	-24.604	-4.243	15.167	25.570	15.705	26.108	18.180	21.301	19.974	23.095	7.770	18.173	8.308	18.712	10.783	13.904	12.577	15.698
	B25	6.98					-12.169	1.215	24.822	4.262	-24.822	-4.262	7.870	18.365	8.410	18.906	10.912	14.061	12.715	15.863	5.434	15.930	5.975	16.470	8.477	11.625	10.279	13.427
N+3.20	B25	0	6.980	VIG30X45	0.30	0.40	-128.590	-48.323	53.356	8.590	-53.356	-8.590	190.806	213.367	191.895	214.456	197.431	204.199	201.063	207.831	103.906	126.467	104.995	127.556	110.531	117.299	114.163	120.931
	B25	6.98					-124.978	-47.944	52.712	14.331	-52.712	-14.331	185.864	208.153	187.682	209.971	191.545	198.231	197.604	204.291	100.427	122.715	102.245	124.533	106.107	112.794	112.167	118.853
N+6.35	B26	0	7.170	VIG30X45	0.30	0.40	-13.968	-0.007	24.391	4.155	-24.391	-4.155	11.348	21.662	11.875	22.189	14.343	17.437	16.100	19.194	7.151	17.464	7.678	17.991	10.146	13.240	11.903	14.997
	B26	7.17					-12.881	0.311	24.354	4.138	-24.354	-4.138	9.735	20.033	10.260	20.557	12.727	15.816	14.476	17.566	6.182	16.479	6.707	17.004	9.173	12.263	10.923	14.012
N+3.20	B26	0	7.170	VIG30X45	0.30	0.40	-131.128	-50.186	52.064	8.805	-52.064	-8.805	195.974	217.988	197.091	219.105	202.376	208.980	206.099	212.703	106.450	128.464	107.566	129.581	112.852	119.456	116.575	123.179
	B26	7.17					-133.868	-50.927	50.109	12.342	-50.109	-12.342	200.192	221.380	201.758	222.945	205.781	212.137	211.000	217.356	109.105	130.292	110.670	131.858	114.694	121.050	119.912	126.269
N+6.35	B27	0	7.100	VIG30X45	0.30	0.40	-11.925	0.987	25.641	4.438	-25.641	-4.438	7.621	18.462	8.184	19.025	10.758	14.011	12.635	15.888	5.030	15.872	5.593	16.435	8.168	11.421	10.044	13.297
	B27	7.1					-16.680	-2.289	26.920	4.747	-26.920	-4.747	16.313	27.695	16.915	28.297	19.594	23.009	21.601	25.016	9.020	20.402	9.622	21.004	12.301	15.716	14.308	17.723
N+3.20	B27	0	7.100	VIG30X45	0.30	0.40	-141.423	-53.445	56.955	9.712	-56.955	-9.712	210.495	234.578	211.727	235.810	217.487	224.712	221.594	228.818	114.623	138.706	115.855	139.938	121.615	128.840	125.722	132.946
	B27	7.1					-109.359	-40.948	56.472	10.929	-56.472	-10.929	159.547	183.425	160.933	184.811	166.286	173.450	170.908	178.071	85.791	109.669	87.177	111.055	92.531	99.694	97.152	104.315
N+6.35	B28	0	5.950	VIG30X45	0.30	0.40	-9.429	5.620	27.651	8.648	-27.651	-8.648	0.700	10.992	0.397	12.089	2.113	5.620	5.769	9.277	2.092	13.783	3.189	14.880	4.904	8.412	8.561	12.068
	B28	5.95					-17.824	-19.580	25.883	8.507	-25.883	-8.507	34.957	45.901	36.036	46.980	37.529	40.812	41.126	44.409	10.030	20.974	11.109	22.053	12.601	15.885	16.198	19.482
N+3.20	B28	0	5.950	VIG30X45	0.30	0.40	-63.987	-14.023	61.129	9.770	-61.129	-9.770	77.264	103.111	78.503	104.351	84.865	92.619	88.996	96.750	44.045	69.892	45.284	71.132	51.646	59.400	55.777	63.531
	B28	5.95					-84.002	-8.925	57.808	24.022	-57.808	-24.022	95.982	120.425	99.029	123.473	100.982	108.315	111.140	118.473	61.857	86.300	64.904	89.347	66.857	74.190	77.014	84.347
N+6.35	B29	0	7.550	VIG30X45	0.30	0.40	-64.474	-87.774	21.169	5.038	-21.169	-5.038	160.348	169.299	160.987	169.938	162.735	165.420	164.865	167.551	53.232	62.183	53.871	62.822	55.619	58.304	57.749	60.434
	B29	7.55					-58.248	-83.692	19.771	10.058	-19.771	-10.058	148.772	157.132	150.048	158.407	150.209	152.717	154.462	156.970	47.605	55.965	48.881	57.241	49.043	51.551	53.296	55.804
N+3.20	B29	0	7.550	VIG30X45	0.30	0.40	-122.482	-26.538	44.258	8.804	-44.258	-8.804	163.601	182.315	164.718	183.432	168.848	174.462	172.571	178.185	100.319	119.032	101.435	120.149	105.565	111.180	109.288	114.902
	B29	7.55					-121.591	-25.842	44.435	18.576	-44.435	-18.576	161.179	179.967	163.535	182.324	165.006	170.642	172.860	178.497	98.859	117.648	101.216	120.004	102.686	108.323	110.541	116.177
N+6.35	B30	0	6.980	VIG30X45	0.30	0.40	-24.696	-19.329	21.993	6.638	-21.993	-6.638	43.894	53.193	44.736	54.035	46.166	48.956	48.973	51.762	17.156	26.455	17.998	27.297	19.428	22.218	22.235	25.025
	B30	6.98					-7.258	7.999	22.232	6.768	-22.232	-6.768	4.419	4.982	3.560	5.840	2.130	0.690	0.731	3.552	1.403	10.803	2.261	11.662	3.691	6.511	6.553	9.373
N+3.20	B30	0	6.980	VIG30X45	0.30	0.40	-105.284	-15.047	48.417	10.188	-48.417	-10.188	130.505	150.978	131.798	152.270	136.163	142.305	140.471	146.613	83.873	104.346	85.166	105.638	89.531	95.673	93.839	99.980
	B30	6.98					-101.836	-20.812	48.482	17.568	-48.482	-17.568	131.651	152.151	133.880	154.379	136.226	142.376	143.654	149.804	80.288	100.788	82.517	103.017	84.863	91.013	92.292	98.442
N+6.35	B31	0	7.170	VIG30X45	0.30	0.40	-14.685	0.964	21.867	6.702	-21.867	-6.702	11.610	20.856	12.460	21.706	13.854	16.628	16.688	19.462	8.168	17.414	9.019	18.265	10.413	13.187	13.247	16.020
	B31	7.17					-11.749	0.144	21.808	6.676	-21.808	-6.676	8.921	18.142	9.768	18.989	11.160	13.927	13.983	16.749	5.540	14.761	6.387	15.608	7.780	10.546	10.602	13.369

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA VIGAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.1 (a)

f'c = 21.1 MPa
fy = 420 MPa
$\Phi_{Cortante}$ = 0.75
Estribos Φ = 9.5 mm
Av = 71 mm^2
R= 4.73

Mn = Momentos nominales de la viga en cada extremo restringido de la luz libre.
Vg = Cortante calculado para cargas gravitacionales mayoradas.
Vm = Cortante debido a flexion en curvatura inversa.
Vu = Vm + Vg

V_g	$V_m = M_{nl} + M_{nr} / l_n$															
	COMBDIS3	COMBDIS4	COMBDIS5	COMBDIS6	COMBDIS7	COMBDIS8	COMBDIS9	COMBDIS10	COMBDIS11	COMBDIS12	COMBDIS13	COMBDIS14	COMBDIS15	COMBDIS16	COMBDIS17	COMBDIS18
(kN)	(kN)															
116.99	119.888	120.110	120.316	120.537	119.467	119.534	120.892	120.959	67.139	67.361	67.566	67.788	66.718	66.784	68.143	68.209
159.75																
65.43	15.198	16.387	17.047	18.236	13.456	13.813	19.621	19.978	8.122	9.310	9.971	11.160	6.380	6.737	12.545	12.901
49.77																
180.94	58.680	60.866	61.855	64.042	55.740	56.396	66.325	66.981	35.166	37.353	38.342	40.528	32.227	32.883	42.812	43.468
146.89																
31.26	21.710	21.883	21.731	21.904	21.746	21.798	21.816	21.868	14.669	14.843	14.690	14.864	14.705	14.757	14.776	14.828
14.90																
98.93	88.729	89.135	89.113	89.519	88.423	88.544	89.704	89.825	60.932	61.338	61.316	61.722	60.625	60.747	61.906	62.028
88.16																
6.52	18.343	18.781	18.402	18.840	18.428	18.559	18.624	18.755	12.184	12.622	12.243	12.680	12.268	12.400	12.465	12.596
32.55																
51.69	64.715	65.945	64.947	66.176	64.876	65.245	65.647	66.015	37.943	39.172	38.174	39.403	38.105	38.472	38.874	39.243
95.33																
48.71	10.726	12.560	12.531	14.365	9.263	9.813	15.279	15.829	6.150	7.984	7.955	9.788	4.686	5.236	10.702	11.252
34.84																
124.53	35.939	39.352	39.215	42.628	33.311	34.335	44.232	45.256	22.390	25.803	25.666	29.079	19.762	20.785	30.683	31.707
98.48																
18.04	11.291	11.917	11.401	12.032	11.405	11.575	11.756	11.946	7.771	8.402	7.886	8.518	7.881	8.051	8.241	8.431
6.18																
52.86	42.654	43.845	42.860	44.051	42.831	43.188	43.517	43.874	29.642	30.833	29.848	31.038	29.818	30.176	30.504	30.862
37.33																
5.85	8.686	9.166	8.768	9.265	8.729	8.877	9.057	9.206	5.864	6.295	5.928	6.393	5.907	6.008	6.186	6.335
12.87																
17.94	24.100	24.568	24.172	24.640	24.179	24.319	24.421	24.561	12.501	12.969	12.573	13.042	12.580	12.721	12.822	12.962
39.62																
12.28	5.451	7.524	5.485	8.036	5.546	5.662	5.660	5.776	5.103	7.509	4.592	8.020	3.197	3.313	3.311	4.203
0.52																
25.90	8.246	32.431	8.248	33.388	13.186	21.553	16.376	24.743	5.132	24.402	5.134	25.359	5.157	13.524	8.347	16.714
43.20																
10.77	2.440	6.259	2.636	6.455	3.549	4.694	4.201	5.347	1.047	4.867	1.243	5.063	2.156	3.301	2.809	3.954
11.94																
126.95	45.066	53.112	45.622	53.668	47.233	49.647	49.087	51.501	23.985	32.032	24.542	32.588	26.153	28.567	28.007	30.421
142.80																
14.63	2.816	5.333	2.951	5.468	3.540	4.295	3.989	4.744	2.063	4.580	2.198	4.715	2.787	3.542	3.236	3.991
14.18																
170.28	57.923	63.406	58.336	63.819	59.360	61.005	60.738	62.382	31.627	37.110	32.041	37.524	33.064	34.709	34.442	36.087
172.01																
14.72	3.300	6.294	3.455	6.449	4.168	5.066	4.683	5.581	1.892	4.886	2.046	5.040	2.759	3.658	3.275	4.173
11.93																
157.56	53.964	60.390	54.381	60.806	55.727	57.655	57.116	59.043	29.274	35.699	29.691	36.116	31.037	32.965	32.425	34.353
156.07																
13.92	2.940	5.815	3.087	5.962	3.775	4.638	4.264	5.127	1.860	4.734	2.006	4.881	2.694	3.557	3.184	4.046
13.44																
160.64	55.253	61.279	55.627	61.653	56.926	58.733	58.173	59.980	30.063	36.089	30.437	36.463	31.736	33.543	32.983	34.790
161.76																
12.01	3.371	6.501	3.535	6.665	4.275	5.214	4.822	5.761	1.979	5.109	2.143	5.273	2.883	3.822	3.430	4.369
15.09																
169.37	52.119	58.874	52.487	59.242	54.053	56.079	55.282	57.308	28.227	34.982	28.596	35.351	30.161	32.188	31.391	33.417
152.26																
2.88	5.993	9.562	6.123	9.928	6.662	7.804	7.882	9.023	2.037	5.842	2.403	6.207	2.942	4.083	4.161	5.303
19.83																
91.16	29.117	37.569	29.837	38.290	31.235	33.770	33.636	36.172	17.799	26.251	18.519	26.971	19.916	22.452	22.318	24.853
96.29																
164.46	40.943	43.236	41.197	43.489	41.450	42.137	42.295	42.983	13.356	15.649	13.610	15.902	13.862	14.550	14.708	15.396
156.81																
122.67	43.017	47.984	43.477	48.444	44.219	45.709	45.752	47.243	26.381	31.348	26.841	31.808	27.583	29.073	29.116	30.607
121.96																
22.59	6.922	8.334	6.919	8.578	6.919	7.113	7.121	7.925	2.659	5.338	2.902	5.581	3.312	4.116	4.124	4.928
4.05																
109.14	37.558	43.428	38.063	43.933	39.024	40.785	40.706	42.467	23.519	29.389	24.023	29.893	24.985	26.746	26.666	28.427
110.66																
14.00	2.863	5.439	3.100	5.676	3.489	4.261	4.278	5.050	1.912	4.488	2.149	4.724	2.537	3.310	3.326	4.099
13.36																

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA VIGAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.1 (a)

f'c = 21.1 MPa
fy = 420 MPa
Φ Cortante = 0.75
Estribos Φ = 9.5 mm
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Mn = Momentos nominales de la viga en cada extremo restringido de la luz libre.
Vg = Cortante calculado para cargas gravitacionales mayoradas.
Vm = Cortante debido a flexion en curvatura inversa.
Vu = Vm + Vg

Vu = Vm + Vg																	Vu_{max}	S	ΦVs	ΦVc	ΦVn	ΦVn > Vu_{max}
COMBDIS3	COMBDIS4	COMBDIS5	COMBDIS6	COMBDIS7	COMBDIS8	COMBDIS9	COMBDIS10	COMBDIS11	COMBDIS12	COMBDIS13	COMBDIS14	COMBDIS15	COMBDIS16	COMBDIS17	COMBDIS18						
(kN)																	(kN)	(m)	(kN)	(kN)	(kN)	
236.876	237.098	237.304	237.525	236.455	236.522	237.880	237.947	184.127	184.349	184.554	184.776	183.706	183.772	185.131	185.197						
159.748	159.748	159.748	159.748	159.748	159.748	159.748	159.748	159.748	159.748	159.748	159.748	159.748	159.748	159.748	159.748						
80.630	81.819	82.479	83.668	78.888	79.245	85.053	85.410	73.554	74.742	75.403	76.592	71.812	72.169	77.977	78.333	237.9	**0.10**	178.92	68.90	247.82	OK
49.772	49.772	49.772	49.772	49.772	49.772	49.772	49.772	49.772	49.772	49.772	49.772	49.772	49.772	49.772	49.772						
239.616	241.802	242.791	244.978	236.676	237.332	247.261	247.917	216.102	218.289	219.278	221.464	213.163	213.819	223.748	224.404						
146.892	146.892	146.892	146.892	146.892	146.892	146.892	146.892	146.892	146.892	146.892	146.892	146.892	146.892	146.892	146.892	247.9	**0.10**	268.38	68.90	337.28	OK
52.970	53.143	52.991	53.164	53.006	53.058	53.076	53.128	45.929	46.103	45.950	46.124	45.965	46.017	46.036	46.088						
14.896	14.896	14.896	14.896	14.896	14.896	14.896	14.896	14.896	14.896	14.896	14.896	14.896	14.896	14.896	14.896	53.2	**0.10**	178.92	68.90	247.82	OK
187.661	188.067	188.045	188.451	187.355	187.476	188.636	188.757	159.864	160.270	160.248	160.654	159.557	159.679	160.838	160.960						
88.156	88.156	88.156	88.156	88.156	88.156	88.156	88.156	88.156	88.156	88.156	88.156	88.156	88.156	88.156	88.156	188.8	**0.10**	178.92	68.90	247.82	OK
24.859	25.297	24.918	25.356	24.944	24.075	25.140	25.271	18.700	19.138	18.759	19.196	18.784	18.916	18.981	19.112						
32.548	32.548	32.548	32.548	32.548	32.548	32.548	32.548	32.548	32.548	32.548	32.548	32.548	32.548	32.548	32.548	32.5	**0.10**	178.92	68.90	247.82	OK
116.403	117.633	116.635	117.864	116.564	116.933	117.335	117.703	89.631	90.860	89.862	91.091	89.793	90.160	90.562	90.931						
95.328	95.328	95.328	95.328	95.328	95.328	95.328	95.328	95.328	95.328	95.328	95.328	95.328	95.328	95.328	95.328	117.9	**0.10**	178.92	68.90	247.82	OK
59.434	61.268	61.239	63.073	57.971	58.521	63.987	64.537	54.858	56.692	56.663	58.496	53.394	53.944	59.410	59.960						
34.840	34.840	34.840	34.840	34.840	34.840	34.840	34.840	34.840	34.840	34.840	34.840	34.840	34.840	34.840	34.840	64.5	**0.10**	178.92	68.90	247.82	OK
160.471	163.884	163.747	167.160	157.843	158.867	168.764	169.788	146.922	150.335	150.198	153.611	144.294	145.317	155.215	156.239						
98.484	98.484	98.484	98.484	98.484	98.484	98.484	98.484	98.484	98.484	98.484	98.484	98.484	98.484	98.484	98.484	169.8	**0.10**	178.92	68.90	247.82	OK
29.335	29.961	29.445	30.076	29.449	29.619	29.800	29.990	25.815	26.446	25.930	26.562	25.925	26.095	26.285	26.475						
6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	30.1	**0.10**	178.92	68.90	247.82	OK
95.510	96.701	95.716	96.907	95.687	96.044	96.373	96.730	82.498	83.689	82.704	83.894	82.674	83.032	83.360	83.718						
37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	96.9	**0.10**	178.92	68.90	247.82	OK
14.538	15.018	14.620	15.117	14.581	14.729	14.909	15.058	11.716	12.147	11.780	12.245	11.759	11.860	12.038	12.187						
12.872	12.872	12.872	12.872	12.872	12.872	12.872	12.872	12.872	12.872	12.872	12.872	12.872	12.872	12.872	12.872	15.1	**0.10**	178.92	68.90	247.82	OK
42.044	42.512	42.116	42.584	42.123	42.263	42.365	42.505	30.445	30.913	30.517	30.986	30.524	30.665	30.766	30.906						
39.616	39.616	39.616	39.616	39.616	39.616	39.616	39.616	39.616	39.616	39.616	39.616	39.616	39.616	39.616	39.616	42.6	**0.10**	178.92	68.90	247.82	OK
17.731	19.804	17.765	20.316	17.826	17.942	17.940	18.056	17.383	19.789	16.872	20.300	15.477	15.593	15.591	16.483						
0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520	20.3	**0.10**	178.92	68.90	247.82	OK
34.150	58.335	34.152	59.292	39.090	47.457	42.280	50.647	31.036	50.306	31.038	51.263	31.061	39.428	34.251	42.618						
43.196	43.196	43.196	43.196	43.196	43.196	43.196	43.196	43.196	43.196	43.196	43.196	43.196	43.196	43.196	43.196	59.3	**0.10**	178.92	68.90	247.82	OK
13.212	17.031	13.408	17.227	14.321	15.466	14.973	16.119	11.819	15.639	12.015	15.835	12.928	14.073	13.581	14.726						
11.944	11.944	11.944	11.944	11.944	11.944	11.944	11.944	11.944	11.944	11.944	11.944	11.944	11.944	11.944	11.944	17.2	**0.10**	178.92	68.90	247.82	OK
172.014	180.060	172.570	180.616	174.181	176.595	176.035	178.449	150.933	158.980	151.490	159.536	153.101	155.515	154.955	157.369						
142.804	142.804	142.804	142.804	142.804	142.804	142.804	142.804	142.804	142.804	142.804	142.804	142.804	142.804	142.804	142.804	180.6	**0.10**	178.92	68.90	247.82	OK
17.448	19.965	17.583	20.100	18.172	18.927	18.621	19.376	16.695	19.212	16.830	19.347	17.419	18.174	17.868	18.623						
14.180	14.180	14.180	14.180	14.180	14.180	14.180	14.180	14.180	14.180	14.180	14.180	14.180	14.180	14.180	14.180	20.1	**0.10**	178.92	68.90	247.82	OK
228.199	233.682	228.612	234.095	229.636	231.281	231.014	232.658	201.903	207.386	202.317	207.800	203.340	204.985	204.718	206.363						
172.012	172.012	172.012	172.012	172.012	172.012	172.012	172.012	172.012	172.012	172.012	172.012	172.012	172.012	172.012	172.012	234.1	**0.10**	178.92	68.90	247.82	OK
18.024	21.018	18.179	21.173	18.892	19.790	19.407	20.305	16.616	19.610	16.770	19.764	17.483	18.382	17.999	18.897						
11.928	11.928	11.928	11.928	11.928	11.928	11.928	11.928	11.928	11.928	11.928	11.928	11.928	11.928	11.928	11.928	21.2	**0.10**	178.92	68.90	247.82	OK
211.524	217.950	211.941	218.366	213.287	215.215	214.676	216.603	186.834	193.259	187.251	193.676	188.597	190.525	189.985	191.913						
156.068	156.068	156.068	156.068	156.068	156.068	156.068	156.068	156.068	156.068	156.068	156.068	156.068	156.068	156.068	156.068	218.4	**0.10**	178.92	68.90	247.82	OK
16.864	19.739	17.011	19.886	17.699	18.562	18.188	19.051	15.784	18.658	15.930	18.805	16.618	17.481	17.108	17.970						
13.436	13.436	13.436	13.436	13.436	13.436	13.436	13.436	13.436	13.436	13.436	13.436	13.436	13.436	13.436	13.436	19.9	**0.10**	178.92	68.90	247.82	OK
215.889	221.915	216.263	222.289	217.562	219.369	218.809	220.616	190.699	196.725	191.073	197.099	192.372	194.179	193.619	195.426						
161.756	161.756	161.756	161.756	161.756	161.756	161.756	161.756	161.756	161.756	161.756	161.756	161.756	161.756	161.756	161.756	222.3	**0.10**	178.92	68.90	247.82	OK
15.379	18.509	15.543	18.673	16.283	17.222	16.830	17.769	13.987	17.117	14.151	17.281	14.891	15.830	15.438	16.377						
15.088	15.088	15.088	15.088	15.088	15.088	15.088	15.088	15.088	15.088	15.088	15.088	15.088	15.088	15.088	15.088	18.7	**0.10**	178.92	68.90	247.82	OK
221.491	228.246	221.859	228.614	223.425	225.451	224.654	226.680	197.599	204.354	197.968	204.723	199.533	201.560	200.763	202.789						
152.264	152.264	152.264	152.264	152.264	152.264	152.264	152.264	152.264	152.264	152.264	152.264	152.264	152.264	152.264	152.264	228.6	**0.10**	178.92	68.90	247.82	OK
8.869	12.438	8.999	12.804	9.538	10.680	10.758	11.899	4.913	8.718	5.279	9.083	5.818	6.959	7.037	8.179						
19.828	19.828	19.828	19.828	19.828	19.828	19.828	19.828	19.828	19.828	19.828	19.828	19.828	19.828	19.828	19.828	19.8	**0.10**	178.92	68.90	247.82	OK
120.273	128.725	120.993	129.446	122.391	124.926	124.792	127.328	108.955	117.407	109.675	118.127	111.072	113.608	113.474	116.009						
96.292	96.292	96.292	96.292	96.292	96.292	96.292	96.292	96.292	96.292	96.292	96.292	96.292	96.292	96.292	96.292	129.4	**0.10**	178.92	68.90	247.82	OK
205.399	207.692	205.653	207.945	205.906	206.593	206.751	207.439	177.812	180.105	178.066	180.358	178.318	179.006	179.164	179.852						
156.812	156.812	156.812	156.812	156.812	156.812	156.812	156.812	156.812	156.812	156.812	156.812	156.812	156.812	156.812	156.812	207.9	**0.10**	178.92	68.90	247.82	OK
165.685	170.652	166.145	171.112	166.887	168.377	168.420	169.911	149.049	154.016	149.509	154.476	150.251	151.741	151.784	153.275						
121.964	121.964	121.964	121.964	121.964	121.964	121.964	121.964	121.964	121.964	121.964	121.964	121.964	121.964	121.964	121.964	171.1	**0.10**	178.92	68.90	247.82	OK
29.514	30.926	29.511	31.170	29.511	29.705	29.713	30.517	25.251	27.930	25.494	28.173	25.904	26.708	26.716	27.520						
4.048	4.048	4.048	4.048	4.048	4.048	4.048	4.048	4.048	4.048	4.048	4.048	4.048	4.048	4.048	4.048	31.2	**0.10**	178.92	68.90	247.82	OK
146.694	152.564	147.199	153.069	148.160	149.921	149.842	151.603	132.655	138.525	133.159	139.029	134.121	135.882	135.802	137.563						
110.660	110.660	110.660	110.660	110.660	110.660	110.660	110.660	110.660	110.660	110.660	110.660	110.660	110.660	110.660	110.660	153.1	**0.10**	178.92	68.90	247.82	OK
16.859	19.435	17.096	19.672	17.485	18.257	18.274	19.046	15.908	18.484	16.145	18.720	16.533	17.306	17.322	18.095						
13.364	13.364	13.364	13.364	13.364	13.364	13.364	13.364	13.364	13.364	13.364	13.364	13.364	13.364	13.364	13.364	19.7	**0.10**	178.92	68.90	247.82	OK

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA VIGAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.1 (a)

f'c = 21.1 MPa
fy = 420 MPa
$\Phi_{Cortante}$ = 0.75
Estribos Φ = 9.5 mm
Av = 71 mm^2
R= 4.73

Mn = Momentos nominales de la viga en cada extremo restringido de la luz libre.
Vg = Cortante calculado para cargas gravitacionales mayoradas.
Vm = Cortante debido a flexion en curvatura inversa.
Vu = Vm + Vg

COMDIS3 = 1.2C.M.+1.0C.V.+1.0Ex+0.3Ey
COMDIS4 = 1.2C.M.+1.0C.V.+1.0(-Ex)+0.3Ey
COMDIS5 = 1.2C.M.+1.0C.V.+1.0Ex+0.3(-Ey)
COMDIS6 = 1.2C.M.+1.0C.V.+1.0(-Ex)+0.3(-Ey)
COMDIS7 = 1.2C.M.+1.0C.V.+0.3Ex+1.0Ey
COMDIS8 = 1.2C.M.+1.0C.V.+0.3(-Ex)+1.0Ey
COMDIS9 = 1.2C.M.+1.0C.V.+0.3Ex+1.0(-Ey)
COMDIS10 = 1.2C.M.+1.0C.V.+0.3(-Ex)+1.0(-Ey)
COMDIS11 = 0.9C.M.+1.0Ex+0.3Ey
COMDIS12 = 0.9C.M.+1.0(-Ex)+0.3Ey
COMDIS13 = 0.9C.M.+1.0Ex+0.3(-Ey)
COMDIS14 = 0.9C.M.+1.0(-Ex)+0.3(-Ey)
COMDIS15 = 0.9C.M.+0.3Ex+1.0Ey
COMDIS16 = 0.9C.M.+0.3(-Ex)+1.0Ey
COMDIS17 = 0.9C.M.+0.3Ex+1.0(-Ey)
COMDIS18 = 0.9C.M.+0.3(-Ex)+1.0(-Ey)

NIVEL	VIGA	LOC.	LONG.	PROPIEDADES DEL ELEMENTO			M3						Mn (kN.m)													
													Combinaciones para resistencias nominales a momento													
	ELEMENTO			SECCION	b	d	C.M.	C.V.	SISMO X	SISMO Y	-SISMO X	-SISMO Y														
	No.	(m)	(m)		(m)	(m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	COMDIS3	COMDIS4	COMDIS5	COMDIS6	COMDIS7	COMDIS8	COMDIS9	COMDIS10	COMDIS11	COMDIS12	COMDIS13	COMDIS14	COMDIS15	COMDIS16	COMDIS17	COMDIS18
N+3.20	B31	0	7.170	VIG30X45	0.30	0.40	-110.905	-22.344	46.222	11.077	-46.222	-11.077	144.955	164.500	146.360	165.905	150.157	156.020	154.840	160.703	89.340	108.884	90.745	110.289	94.541	100.404	99.225	105.088
	B31	7.17					-109.438	-20.156	46.978	15.265	-46.978	-15.265	140.581	160.445	142.518	162.382	145.275	151.234	151.729	157.688	87.594	107.458	89.530	109.394	92.287	98.247	98.742	104.701
N+6.35	B32	0	7.100	VIG30X45	0.30	0.40	-13.992	-0.326	23.023	7.127	-23.023	-7.127	11.797	21.532	12.701	22.436	14.149	17.070	17.163	20.083	7.273	17.008	8.177	17.912	9.626	12.546	12.639	15.560
	B32	7.1					-14.116	-0.378	24.265	7.596	-24.265	-7.596	11.705	21.965	12.669	22.929	14.172	17.250	17.384	20.462	7.093	17.353	8.056	18.316	9.559	12.637	12.771	15.849
N+3.20	B32	0	7.100	VIG30X45	0.30	0.40	-121.762	-23.658	50.081	13.230	-50.081	-13.230	158.345	179.521	160.024	181.199	163.799	170.152	169.393	175.746	98.159	119.335	99.837	121.013	103.612	109.965	109.206	115.559
	B32	7.1					-90.041	-16.496	53.374	14.425	-53.374	-14.425	112.346	134.914	114.176	136.744	118.110	124.881	124.210	130.980	68.838	91.406	70.668	93.236	74.602	81.372	80.701	87.472
N+3.20	B33	0	2.150	VIG20X45	0.20	0.40	-1.448	-0.578	0.080	0.384	-0.080	-0.384	2.274	2.308	2.323	2.357	2.229	2.239	2.392	2.402	1.262	1.296	1.311	1.344	1.217	1.227	1.379	1.389
	B33	2.15					-49.413	-18.488	2.521	12.286	-2.521	-12.286	76.471	77.537	78.030	79.096	75.026	75.346	80.221	80.541	43.159	44.225	44.718	45.784	41.714	42.034	46.909	47.229
N+3.20	B35	0	0.980	VIG20X45	0.20	0.40	-15.207	-0.422	0.756	7.472	-0.756	-7.472	18.037	18.356	18.984	19.304	17.043	17.139	20.202	20.298	13.053	13.372	14.000	14.320	12.059	12.155	15.218	15.314
	B35	0.98					-1.107	-0.314	0.220	1.340	-0.220	-1.340	1.511	1.604	1.681	1.774	1.345	1.373	1.912	1.940	0.865	0.958	1.035	1.128	0.699	0.727	1.266	1.294
N+3.20	B39	0	2.150	VIG20X45	0.20	0.40	-1.628	-0.526	0.029	0.368	-0.029	-0.368	2.450	2.462	2.497	2.509	2.400	2.404	2.556	2.559	1.436	1.448	1.482	1.495	1.386	1.389	1.541	1.545
	B39	2.15					-54.691	-20.997	0.506	8.564	-0.506	-8.564	85.976	86.190	87.062	87.276	84.784	84.848	88.405	88.469	48.572	48.786	49.658	49.872	47.379	47.443	51.000	51.065
N+3.20	B41	0	0.980	VIG20X45	0.20	0.40	-16.983	-0.762	0.336	4.416	-0.336	-4.416	20.790	20.933	21.351	21.493	20.187	20.229	22.054	22.097	14.934	15.076	15.494	15.636	14.330	14.372	16.197	16.240
	B41	0.98					-1.587	-0.530	0.061	1.135	-0.061	-1.135	2.350	2.375	2.493	2.519	2.191	2.198	2.670	2.678	1.343	1.369	1.487	1.513	1.184	1.192	1.664	1.672
N+3.20	B42	0	2.150	VIG20X45	0.20	0.40	-1.879	-0.716	0.011	0.240	-0.011	-0.240	2.953	2.958	2.984	2.988	2.919	2.921	3.021	3.022	1.674	1.678	1.704	1.709	1.640	1.641	1.741	1.743
	B42	2.15					-51.807	-19.760	0.311	7.810	-0.311	-7.810	81.367	81.499	82.358	82.489	80.258	80.297	83.560	83.599	46.065	46.197	47.056	47.187	44.955	44.995	48.258	48.297
N+3.20	B44	0	0.980	VIG20X45	0.20	0.40	-15.081	-0.128	0.173	4.196	-0.173	-4.196	17.922	17.996	18.455	18.528	17.327	17.349	19.101	19.123	13.270	13.343	13.802	13.876	12.675	12.697	14.449	14.471
	B44	0.98					-1.564	-0.451	0.036	0.949	-0.036	-0.949	2.260	2.275	2.380	2.396	2.125	2.129	2.526	2.531	1.340	1.355	1.460	1.475	1.205	1.209	1.606	1.611
N+3.20	B45	0	2.150	VIG20X45	0.20	0.40	-1.796	-0.656	0.049	0.256	-0.049	-0.256	2.785	2.805	2.817	2.838	2.754	2.760	2.862	2.868	1.590	1.611	1.622	1.643	1.559	1.565	1.667	1.674
	B45	2.15					-52.414	-19.914	1.084	7.438	-1.084	-7.438	82.110	82.568	83.053	83.512	81.170	81.307	84.315	84.452	46.472	46.930	47.415	47.874	45.531	45.669	48.676	48.814
N+3.20	B47	0	0.980	VIG20X45	0.20	0.40	-15.803	-0.302	0.609	3.929	-0.609	-3.929	18.888	19.145	19.386	19.644	18.396	18.474	20.058	20.135	13.845	14.102	14.343	14.601	13.353	13.431	15.015	15.092
	B47	0.98					-1.604	-0.495	0.138	0.929	-0.138	-0.929	2.332	2.390	2.450	2.508	2.215	2.232	2.607	2.625	1.356	1.414	1.473	1.532	1.238	1.256	1.631	1.649
N+3.20	B48	0	2.150	VIG20X45	0.20	0.40	-0.945	-0.260	0.083	0.332	-0.083	-0.332	1.355	1.390	1.398	1.433	1.319	1.329	1.459	1.469	0.812	0.847	0.854	0.889	0.775	0.786	0.915	0.926
	B48	2.15					-53.046	-19.668	2.375	7.308	-2.375	-7.308	82.358	83.362	83.285	84.289	81.628	81.929	84.718	85.019	46.776	47.780	47.703	48.707	46.046	46.347	49.136	49.437
N+3.20	B50	0	0.980	VIG20X45	0.20	0.40	-18.006	-0.740	0.822	3.828	-0.822	-3.828	21.931	22.278	22.416	22.764	21.486	21.590	23.104	23.209	15.789	16.136	16.274	16.622	15.344	15.448	16.963	17.067
	B50	0.98					-1.416	-0.493	0.276	0.966	-0.276	-0.966	2.073	2.189	2.195	2.312	1.970	2.005	2.379	2.414	1.155	1.271	1.277	1.394	1.053	1.088	1.461	1.496
N+3.20	B51	0	2.970	VIG15X45	0.15	0.40	-13.056	-1.936	13.231	7.639	-13.231	-7.639	14.321	19.916	15.290	20.885	15.149	16.827	18.379	20.057	8.469	14.063	9.438	15.032	9.296	10.975	12.526	14.205
	B51	2.97					7.545	2.071	1.573	4.780	-1.573	-4.780	11.761	11.096	11.154	10.489	12.235	12.036	10.214	10.015	7.426	6.761	6.820	6.155	7.901	7.701	5.880	5.680
N+3.20	B52	0	2.980	VIG15X45	0.15	0.40	7.930	2.167	0.542	4.622	-0.542	-4.622	12.091	11.862	11.504	11.275	12.695	12.626	10.740	10.671	7.545	7.316	6.958	6.729	8.149	8.080	6.194	6.125
	B52	2.98					-28.368	-2.171	10.659	3.216	-10.659	-3.216	33.755	38.262	34.163	38.670	34.857	36.209	36.216	37.569	23.074	27.581	23.482	27.989	24.175	25.527	25.535	26.887
N+3.20	B53	0	3.770	VIG15X45	0.15	0.40	-36.264	-4.779	7.527	5.468	-7.527	-5.468	46.358	49.540	47.051	50.234	46.662	47.617	48.974	49.929	30.699	33.882	31.393	34.576	31.004	31.959	33.316	34.271
	B53	3.77					13.102	1.716	0.671	3.237	-0.671	-3.237	17.786	17.502	17.375	17.091	18.165	18.080	16.797	16.711	12.139	11.855	11.728	11.445	12.519	12.434	11.150	11.065
N+3.20	B54	0	3.780	VIG15X45	0.15	0.40	13.187	1.731	0.572	3.058	-0.572	-3.058	17.870	17.628	17.482	17.241	18.238	18.166	16.945	16.873	12.183	11.941	11.795	11.553	12.551	12.479	11.258	11.186
	B54	3.78					-37.582	-4.844	8.158	2.664	-8.158	-2.664	48.049	51.498	48.387	51.836	48.862	49.897	49.988	51.023	31.930	35.380	32.268	35.717	32.743	33.778	33.870	34.904
N+3.20	B55	0	3.490	VIG15X45	0.15	0.40	-34.353	-3.145	8.961	5.268	-8.961	-5.268	42.140	45.929	42.808	46.597	42.687	43.823	44.914	46.051	28.689	32.478	29.357	33.146	29.236	30.372	31.463	32.600
	B55	3.49					10.749	2.651	0.537	2.941	-0.537	-2.941	15.850	15.623	15.477	15.250	16.206	16.138	14.962	14.894	9.974	9.747	9.601	9.374	10.330	10.262	9.086	9.018
N+3.20	B56	0	3.490	VIG15X45	0.15	0.40	10.711	2.657	0.608	2.894	-0.608	-2.894	15.822	15.565	15.455	15.198	16.161	16.083	14.937	14.860	9.952	9.695	9.585	9.328	10.290	10.213	9.067	8.989
	B56	3.49					-32.600	-4.633	8.731	3.067	-8.731	-3.067	41.713	45.404	42.102	45.793	42.551	43.658	43.848	44.955	27.300	30.991	27.689	31.380	28.138	29.245	29.435	30.542
N+3.20	B57	0	3.580	VIG15X45	0.15	0.40	-34.293	-4.702	8.549	4.453	-8.549	-4.453	43.764	47.379	44.329	47.943	44.370	45.454	46.253	47.337	28.774	32.389	29.339	32.954	29.380	30.464	31.263	32.347
	B57	3.58					11.303	2.170	0.496	2.750	-0.496	-2.750	16.013	15.803	15.664	15.454	16.346	16.284	15.184	15.121	10.452	10.242	10.103	9.893	10.786	10.723	9.623	9.560
N+3.20	B58	0	3.590	VIG15X45	0.15	0.40	11.362	2.189	0.877	2.742	-0.877	-2.742	16.183	15.812	15.835	15.464	16.459	16.347	15.299	15.188	10.585	10.214	10.237	9.866	10.861	10.750	9.702	9.590
	B58	3.59					-35.081	-4.238	8.071	3.190	-8.071	-3.190	44.427	47.839	44.831	48.244	45.149	46.173	46.498	47.522	29.664	33.077	30.069	33.482	30.387	31.410	31.735	32.759
N+3.20	B59	0	3.540	VIG15X45	0.15	0.40	-36.969	-4.861	9.630	3.990	-9.630	-3.990	46.935	51.007	47.441	51.513	47.769	48.991	49.457	50.678	30.983	35.055	31.489	35.561	31.818	33.039	33.505	34.726
	B59	3.54					12.455	2.474	0.542	2.674	-0.542	-2.674	17.704	17.475	17.365	17.136	18.020	17.951	16.889	16.820	11.494	11.265	11.154	10.925	11.809	11.740	10.679	10.610
N+3.20	B60	0	3.560	VIG15X45	0.15	0.40	11.989	2.378	1.417	2.661	-1.417	-2.661	17.233	16.634	16.896	16.296	17.417	17.238	16.292	16.112	11.258	10.659	10.921	10.322	11.443	11.263	10.317	10.138
	B60	3.56					-19.662	-1.732	12.188	4.025	-12.188	-4.025	22.494	27.648	23.005	28.158	23.702	25.248	25.404	26.950	14.864	20.017	15.374	20.528	16.072	17.618	17.774	19.320
N+6.35	B61	0	1.840	VIG15X45	0.15	0.40	0.033	0.036	0.353	0.256	-0.353	-0.256	0.166	0.017	0.134	0.015	0.152	0.107	0.044	0.001	0.121	0.029	0.088	0.061	0.106	0.061	0.002	0.047
	B61	1.84					-3.397	-0.311	1.809	1.176	-1.809	-1.176	3.930	4.695	4.080	4.844	4.024	4.254	4.521	4.751	2.600	3.365	2.749	3.514	2.694	2.923	3.191	3.421
N+3.20	B61	0	1.840	VIG15X45	0.15	0.40	-0.270	-0.017	0.390	0.231	-0.390	-0.231	0.244	0.409	0.273	0.438	0.267	0.317	0.365	0.415	0.146	0.311	0.175	0.340	0.169	0.219	0.267	0.317
	B61	1.84					-6.913	-4.705	2.427	1.283	-2.427	-1.283	12.406	13.432	12.569	13.595	12.575	12.883	13.118	13.426	5.627	6.653	5.790	6.816	5.797	6.104	6.339	6.647
N+6.35	B62	0	3.080	VIG15X45	0.15	0.40	-2.132	0.091	5.113	3.497	-5.113	-3.497	1.165	3.327	1.608	3.770	1.404	2.052	2.882	3.531	0.616	2.778	1.060	3.222	0.855	1.504	2.334	2.982
	B62	3.08					-3.146	0.507	1.825	2.719	-1.825	-2.719	2.710	3.482	3.055	3.826	2.578	2.809	3.727	3.959	2.273	3.045	2.618	3.390	2.141	2.372	3.290	3.522
N+3.20	B62	0	3.080	VIG15X45	0.15	0.40	-8.749	-4.189	11.446	6.437	-11.446	-6.437	11.860	16.699	12.676	17.516	12.601	14.053	15.323	16.775	5.046	9.886	5.862	10.702	5.787	7.239	8.509	9.961
	B62	3.08					-14.115	-5.898	5.955	4.326	-5.955	-4.326	21.303	23.821	21.851	24.369	21.544	22.299	23.373	24.128	11.170	13.688	11.719	14.237	11.411	12.167	13.240	13.996
N+3.20	B63	0	2.970	VIG15X45	0.15	0.40	-15.814	-6.986	7.284	4.134	-7.284	-4.134	24.161	27.241	24.685	27.765	24.627	25.551	26.375	27.299	12.430	15.510	12.955	16.035	12.897	13.821	14.645	15.569
	B63	2.97					3.939	2.533	1.144	5.272	-1.144	-5.272	7.836	7.352	7.167	6.684	8.447	8.302	6.218	6.073	4.121	3.638	3.453	2.969	4.732	4.587	2.503	2.358
N+3.20	B64	0	2.980	VIG15X45	0.15	0.40	3.667	2.339	1.610	4.818	-1.610	-4.818	7.385	6.705	6.774	6.093	7.860	7.656	5.823	5.619	3.946	3.266	3.335	2.654	4.421	4.217	2.384	2.180
	B64	2.98					-27.339	-10.939	6.758	2.874	-6.758	-2.874	42.135	44.992	42.499	45.357	42.710	43.567	43.925	44.782	22.994	25.852	23.359	26.216	23.569	24.426	24.784	25.641
N+3.20	B65	0	3.770	VIG15X45	0.15	0.40	-33.760	-14.162	6.393	5.036	-6.393	-5.036	53.003	55.706	53.642	56.345	53.204	54.015	55.333	56.144	28.713	31.416	29.352	32.055	28.914	29.725	31.043	31.854
	B65	3.77					11.311	5.542	0.302	3.750	-0.302	-3.750	19.417	19.289	18.941	18.814	19.927	19.889	18.342	18.303	10.482	10.354	10.006	9.878	10.992	10.954	9.406	9.368
N+3.20	B66	0	3.780	VIG15X45	0.15	0.40	11.310	5.531	0.585	3.502	-0.585	-3.502	19.449	19.201	19.005	18.757	19.880	19.806	18.400	18.326	10.525	10.277	10.081	9.833	10.956	10.882	9.476	9.402
	B66	3.78					-36.701	-15.422	6.217	3.019	-6.217	-3.019	57.957	60.586	58.340	60.969	58.431	59.219	59.707	60.496	31.525	34.154	31.908	34.537	31.998	32.787	33.275	34.063
N+3.20	B67	0	3.490	VIG15X45	0.15	0.40	-33.312	-13.633	6.775	4.655	-6.775	-4.655	51.880	54.745	52.470	55.335	52.194	53.053	54.162	55.021	28.253	31.118	28.844	31.708	28.567	29.426	30.535	31.395
	B67	3.49					6.758	3.644	0.481	3.145	-0.481	-3.145	12.055	11.851	11.656	11.452	12.449	12.388	11.119	11.058	6.383	6.180	5.984	5.781	6.778	6.717	5.448	5.387
N+3.20	B68	0	3.490	VIG15X45	0.15	0.40	6.887	3.743	0.306	3.053	-0.306	-3.053	12.266	12.136	11.878	11.749	12.672	12.633	11.381	11.343	6.457	6.327	6.069	5.940	6.863	6.824	5.572	5.533
	B68	3.49					-31.786	-13.534	6.849	3.004	-6.849	-3.004	50.039	52.935	50.420	53.316	50.608	51.477	51.878	52.747	26.969	29.865	27.350	30.246	27.538	28.407	28.808	29.677

Diseños A Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA VIGAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.1 (a)

f'c = 21.1 MPa
fy = 420 MPa
$\Phi_{Cortante}$ = 0.75
Estribos Φ = 9.5 mm
Av = 71 mm^2
R= 4.73

Mn = Momentos nominales de la viga en cada extremo restringido de la luz libre.
Vg = Cortante calculado para cargas gravitacionales mayoradas.
Vm = Cortante debido a flexion en curvatura inversa.
Vu = Vm + Vg

V_g	$V_m = M_{nl} + M_{nr} / l_n$															
	COMBDIS3	COMBDIS4	COMBDIS5	COMBDIS6	COMBDIS7	COMBDIS8	COMBDIS9	COMBDIS10	COMBDIS11	COMBDIS12	COMBDIS13	COMBDIS14	COMBDIS15	COMBDIS16	COMBDIS17	COMBDIS18
(kN)	(kN)															
115.08	39.824	45.320	40.290	45.786	41.204	42.853	42.757	44.406	24.677	30.173	25.143	30.639	26.057	27.706	27.610	29.259
113.52																
13.51	3.310	6.126	3.573	6.389	3.989	4.834	4.866	5.711	2.023	4.840	2.286	5.103	2.702	3.547	3.579	4.424
13.59																
123.32	38.126	44.287	38.620	44.781	39.706	41.554	41.352	43.201	23.521	29.682	24.015	30.176	25.101	26.949	26.748	28.596
109.36																
22.14	36.626	37.137	37.373	37.885	35.933	36.086	38.425	38.578	20.661	21.173	21.409	21.920	19.968	20.121	22.460	22.613
58.06																
21.27	19.946	20.368	21.087	21.508	18.763	18.889	22.565	22.692	14.201	14.622	15.342	15.763	13.018	13.144	16.820	16.946
13.62																
26.89	41.128	41.234	41.655	41.761	40.550	40.582	42.307	42.339	23.259	23.365	23.786	23.891	22.681	22.713	24.438	24.469
62.81																
23.06	23.612	23.784	24.331	24.502	22.834	22.885	25.229	25.280	16.609	16.780	17.328	17.499	15.831	15.882	18.226	18.277
15.41																
24.08	39.219	39.282	39.694	39.757	38.687	38.706	40.270	40.289	22.204	22.267	22.679	22.742	21.672	21.691	23.255	23.274
60.00																
19.85	20.594	20.685	21.260	21.351	19.849	19.876	22.069	22.096	14.908	14.998	15.574	15.664	14.163	14.190	16.383	16.410
12.19																
24.62	39.486	39.709	39.940	40.163	39.034	39.101	40.547	40.614	22.354	22.577	22.808	23.031	21.903	21.969	23.416	23.483
60.56																
20.90	21.652	21.975	22.281	22.604	21.032	21.128	23.128	23.224	15.510	15.833	16.139	16.462	14.890	14.986	16.986	17.082
13.24																
25.56	38.936	39.420	39.387	39.870	38.580	38.725	40.082	40.227	22.134	22.617	22.585	23.068	21.777	21.922	23.280	23.425
61.50																
24.54	24.493	24.967	25.114	25.587	23.935	24.077	26.003	26.145	17.289	17.763	17.910	18.384	16.731	16.873	18.800	18.942
16.89																
30.96	8.782	10.442	8.904	10.564	9.220	9.718	9.627	10.125	5.352	7.012	5.474	7.134	5.790	6.288	6.197	6.695
10.00																
3.60	15.385	16.820	15.325	16.760	15.957	16.387	15.757	16.188	10.275	11.710	10.215	11.650	10.847	11.278	10.647	11.078
37.52																
44.82	17.014	17.783	17.089	17.858	17.196	17.426	17.446	17.677	11.363	12.132	11.438	12.207	11.545	11.775	11.795	12.025
7.87																
7.52	17.439	18.287	17.426	18.274	17.751	18.006	17.707	17.962	11.670	12.519	11.657	12.506	11.983	12.237	11.939	12.193
45.32																
42.46	16.616	17.637	16.701	17.721	16.875	17.181	17.156	17.463	11.078	12.099	11.163	12.183	11.337	11.643	11.619	11.925
6.13																
6.06	16.486	17.470	16.492	17.476	16.823	17.118	16.844	17.139	10.674	11.658	10.680	11.664	11.011	11.306	11.032	11.327
42.54																
43.31	16.697	17.649	16.758	17.709	16.960	17.245	17.161	17.446	10.957	11.908	11.017	11.968	11.219	11.505	11.421	11.706
6.59																
6.65	16.883	17.730	16.899	17.746	17.161	17.415	17.214	17.468	11.212	12.059	11.227	12.075	11.490	11.744	11.542	11.797
43.42																
44.74	18.260	19.345	18.307	19.392	18.585	18.910	18.742	19.067	11.999	13.085	12.046	13.132	12.324	12.650	12.481	12.807
4.59																
12.30	11.159	12.439	11.208	12.487	11.550	11.934	11.712	12.096	7.338	8.617	7.386	8.666	7.729	8.113	7.891	8.275
37.33																
0.78	2.227	2.561	2.290	2.641	2.270	2.370	2.481	2.582	1.479	1.844	1.542	1.943	1.522	1.622	1.735	1.884
4.30																
1.07	6.875	7.522	6.979	7.627	6.980	7.174	7.328	7.522	3.138	3.785	3.242	3.889	3.242	3.437	3.590	3.784
15.74																
2.75	1.258	2.210	1.514	2.466	1.293	1.578	2.146	2.432	0.938	1.891	1.194	2.147	0.973	1.258	1.826	2.112
3.13																
25.68	10.767	13.156	11.210	13.599	11.086	11.803	12.564	13.280	5.265	7.654	5.708	8.097	5.584	6.301	7.061	7.778
31.64																
40.48	10.773	11.647	10.725	11.599	11.136	11.398	10.974	11.236	5.573	6.447	5.524	6.399	5.936	6.198	5.774	6.036
14.27																
7.87	16.617	17.348	16.535	17.265	16.970	17.189	16.694	16.913	9.040	9.771	8.958	9.688	9.393	9.612	9.117	9.336
47.12																
59.50	19.210	19.893	19.253	19.936	19.398	19.603	19.542	19.747	10.396	11.080	10.440	11.123	10.585	10.790	10.729	10.934
14.09																
12.81	20.478	21.108	20.462	21.092	20.717	20.906	20.663	20.852	11.124	11.754	11.108	11.738	11.364	11.553	11.310	11.499
61.02																
55.19	18.319	19.082	18.374	19.137	18.522	18.751	18.705	18.934	9.925	10.687	9.979	10.742	10.127	10.356	10.310	10.539
11.80																
12.28	17.852	18.645	17.850	18.643	18.132	18.370	18.126	18.364	9.578	10.370	9.576	10.368	9.857	10.095	9.851	10.089
54.71																

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA VIGAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.1 (a)

f'c = 21.1 MPa
fy = 420 MPa
$\Phi_{Cortante}$ = 0.75
Estribos Φ = 9.5 mm
Av = 71 mm^2
R= 4.73

Mn = Momentos nominales de la viga en cada extremo restringido de la luz libre.
Vg = Cortante calculado para cargas gravitacionales mayoradas.
Vm = Cortante debido a flexion en curvatura inversa.
Vu = Vm + Vg

Vu = Vm + Vg																	Vu_{max}	S	ΦVs	ΦVc	ΦVn	ΦVn > Vu_{max}
COMBDIS3	COMBDIS4	COMBDIS5	COMBDIS6	COMBDIS7	COMBDIS8	COMBDIS9	COMBDIS10	COMBDIS11	COMBDIS12	COMBDIS13	COMBDIS14	COMBDIS15	COMBDIS16	COMBDIS17	COMBDIS18						
(kN)																	(kN)	(m)	(kN)	(kN)	(kN)	
154.908	160.404	155.374	160.870	156.288	157.937	157.841	159.490	139.761	145.257	140.227	145.723	141.141	142.790	142.694	144.343						
113.516	113.516	113.516	113.516	113.516	113.516	113.516	113.516	113.516	113.516	113.516	113.516	113.516	113.516	113.516	113.516		160.9	**0.10**	178.92	68.90	247.82	**OK**
16.818	19.634	17.081	19.897	17.497	18.342	18.374	19.219	15.531	18.348	15.794	18.611	16.210	17.055	17.087	17.932						
13.588	13.588	13.588	13.588	13.588	13.588	13.588	13.588	13.588	13.588	13.588	13.588	13.588	13.588	13.588	13.588		19.9	**0.10**	178.92	68.90	247.82	**OK**
161.450	167.611	161.944	168.105	163.030	164.878	164.676	166.525	146.845	153.006	147.339	153.500	148.425	150.273	150.072	151.920						
109.364	109.364	109.364	109.364	109.364	109.364	109.364	109.364	109.364	109.364	109.364	109.364	109.364	109.364	109.364	109.364		168.1	**0.10**	178.92	68.90	247.82	**OK**
58.766	59.277	59.513	60.025	58.073	58.226	60.565	60.718	42.801	43.313	43.549	44.060	42.108	42.261	44.600	44.753						
58.060	58.060	58.060	58.060	58.060	58.060	58.060	58.060	58.060	58.060	58.060	58.060	58.060	58.060	58.060	58.060		60.7	**0.10**	178.92	45.93	224.85	**OK**
41.218	41.640	42.359	42.780	40.035	40.161	43.837	43.964	35.473	35.894	36.614	37.035	34.290	34.416	38.092	38.218						
13.616	13.616	13.616	13.616	13.616	13.616	13.616	13.616	13.616	13.616	13.616	13.616	13.616	13.616	13.616	13.616		44.0	**0.10**	178.92	45.93	224.85	**OK**
68.016	68.122	68.543	68.649	67.438	67.470	69.195	69.227	50.147	50.253	50.674	50.779	49.569	49.601	51.326	51.357						
62.808	62.808	62.808	62.808	62.808	62.808	62.808	62.808	62.808	62.808	62.808	62.808	62.808	62.808	62.808	62.808		69.2	**0.10**	178.92	45.93	224.85	**OK**
46.676	46.848	47.395	47.566	45.898	45.949	48.293	48.344	39.673	39.844	40.392	40.563	38.895	38.946	41.290	41.341						
15.408	15.408	15.408	15.408	15.408	15.408	15.408	15.408	15.408	15.408	15.408	15.408	15.408	15.408	15.408	15.408		48.3	**0.10**	178.92	45.93	224.85	**OK**
63.299	63.362	63.774	63.837	62.767	62.786	64.350	64.369	46.284	46.347	46.759	46.822	45.752	45.771	47.335	47.354						
60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000		64.4	**0.10**	178.92	45.93	224.85	**OK**
40.442	40.533	41.108	41.199	39.697	39.724	41.917	41.944	34.756	34.846	35.422	35.512	34.011	34.038	36.231	36.258						
12.192	12.192	12.192	12.192	12.192	12.192	12.192	12.192	12.192	12.192	12.192	12.192	12.192	12.192	12.192	12.192		41.9	**0.10**	178.92	45.93	224.85	**OK**
64.110	64.333	64.564	64.787	63.658	63.725	65.171	65.238	46.978	47.201	47.432	47.655	46.527	46.593	48.040	48.107						
60.556	60.556	60.556	60.556	60.556	60.556	60.556	60.556	60.556	60.556	60.556	60.556	60.556	60.556	60.556	60.556		65.2	**0.10**	178.92	45.93	224.85	**OK**
42.548	42.871	43.177	43.500	41.928	42.024	44.024	44.120	36.406	36.729	37.035	37.358	35.786	35.882	37.882	37.978						
13.240	13.240	13.240	13.240	13.240	13.240	13.240	13.240	13.240	13.240	13.240	13.240	13.240	13.240	13.240	13.240		44.1	**0.10**	178.92	45.93	224.85	**OK**
64.500	64.984	64.951	65.434	64.144	64.289	65.646	65.791	47.698	48.181	48.149	48.632	47.341	47.486	48.844	48.989						
61.496	61.496	61.496	61.496	61.496	61.496	61.496	61.496	61.496	61.496	61.496	61.496	61.496	61.496	61.496	61.496		65.8	**0.10**	178.92	45.93	224.85	**OK**
49.037	49.511	49.658	50.131	48.479	48.621	50.547	50.689	41.833	42.307	42.454	42.928	41.275	41.417	43.344	43.486						
16.888	16.888	16.888	16.888	16.888	16.888	16.888	16.888	16.888	16.888	16.888	16.888	16.888	16.888	16.888	16.888		50.7	**0.10**	178.92	45.93	224.85	**OK**
39.746	41.406	39.868	41.528	40.184	40.682	40.591	41.089	36.316	37.976	36.438	38.098	36.754	37.252	37.161	37.659						
10.004	10.004	10.004	10.004	10.004	10.004	10.004	10.004	10.004	10.004	10.004	10.004	10.004	10.004	10.004	10.004		41.5	**0.10**	178.92	34.45	213.37	**OK**
18.985	20.420	18.925	20.360	19.557	19.987	19.357	19.788	13.875	15.310	13.815	15.250	14.447	14.878	14.247	14.678						
37.516	37.516	37.516	37.516	37.516	37.516	37.516	37.516	37.516	37.516	37.516	37.516	37.516	37.516	37.516	37.516		37.5	**0.10**	178.92	34.45	213.37	**OK**
61.834	62.603	61.909	62.678	62.016	62.246	62.266	62.497	56.183	56.952	56.258	57.027	56.365	56.595	56.615	56.845						
7.872	7.872	7.872	7.872	7.872	7.872	7.872	7.872	7.872	7.872	7.872	7.872	7.872	7.872	7.872	7.872		62.7	**0.10**	178.92	34.45	213.37	**OK**
24.959	25.807	24.946	25.794	25.271	25.526	25.227	25.482	19.190	20.039	19.177	20.026	19.503	19.757	19.459	19.713						
45.320	45.320	45.320	45.320	45.320	45.320	45.320	45.320	45.320	45.320	45.320	45.320	45.320	45.320	45.320	45.320		45.3	**0.10**	178.92	34.45	213.37	**OK**
59.076	60.097	59.161	60.181	59.335	59.641	59.616	59.923	53.538	54.559	53.623	54.643	53.797	54.103	54.079	54.385						
6.128	6.128	6.128	6.128	6.128	6.128	6.128	6.128	6.128	6.128	6.128	6.128	6.128	6.128	6.128	6.128		60.2	**0.10**	178.92	34.45	213.37	**OK**
22.550	23.534	22.556	23.540	22.887	23.182	22.908	23.203	16.738	17.722	16.744	17.728	17.075	17.370	17.096	17.391						
42.536	42.536	42.536	42.536	42.536	42.536	42.536	42.536	42.536	42.536	42.536	42.536	42.536	42.536	42.536	42.536		42.5	**0.10**	178.92	34.45	213.37	**OK**
60.009	60.961	60.070	61.021	60.272	60.557	60.473	60.758	54.269	55.220	54.329	55.280	54.531	54.817	54.733	55.018						
6.592	6.592	6.592	6.592	6.592	6.592	6.592	6.592	6.592	6.592	6.592	6.592	6.592	6.592	6.592	6.592		61.0	**0.10**	178.92	34.45	213.37	**OK**
23.531	24.378	23.547	24.394	23.809	24.063	23.862	24.116	17.860	18.707	17.875	18.723	18.138	18.392	18.190	18.445						
43.420	43.420	43.420	43.420	43.420	43.420	43.420	43.420	43.420	43.420	43.420	43.420	43.420	43.420	43.420	43.420		43.4	**0.10**	178.92	34.45	213.37	**OK**
62.996	64.081	63.043	64.128	63.321	63.646	63.478	63.803	56.735	57.821	56.782	57.868	57.060	57.386	57.217	57.543						
4.592	4.592	4.592	4.592	4.592	4.592	4.592	4.592	4.592	4.592	4.592	4.592	4.592	4.592	4.592	4.592		64.1	**0.10**	178.92	34.45	213.37	**OK**
23.455	24.735	23.504	24.783	23.846	24.230	24.008	24.392	19.634	20.913	19.682	20.962	20.025	20.409	20.187	20.571						
37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328	37.328		37.3	**0.10**	178.92	34.45	213.37	**OK**
3.011	3.345	3.074	3.425	3.054	3.154	3.265	3.366	2.263	2.628	2.326	2.727	2.306	2.406	2.519	2.668						
4.300	4.300	4.300	4.300	4.300	4.300	4.300	4.300	4.300	4.300	4.300	4.300	4.300	4.300	4.300	4.300		4.3	**0.10**	178.92	34.45	213.37	**OK**
7.947	8.594	8.051	8.699	8.052	8.246	8.400	8.594	4.210	4.857	4.314	4.961	4.314	4.509	4.662	4.856						
15.736	15.736	15.736	15.736	15.736	15.736	15.736	15.736	15.736	15.736	15.736	15.736	15.736	15.736	15.736	15.736		15.7	**0.10**	178.92	34.45	213.37	**OK**
4.010	4.962	4.266	5.218	4.045	4.330	4.898	5.184	3.690	4.643	3.946	4.899	3.725	4.010	4.578	4.864						
3.128	3.128	3.128	3.128	3.128	3.128	3.128	3.128	3.128	3.128	3.128	3.128	3.128	3.128	3.128	3.128		5.2	**0.10**	178.92	34.45	213.37	**OK**
36.447	38.836	36.890	39.279	36.766	37.483	38.244	38.960	30.945	33.334	31.388	33.777	31.264	31.981	32.741	33.458						
31.644	31.644	31.644	31.644	31.644	31.644	31.644	31.644	31.644	31.644	31.644	31.644	31.644	31.644	31.644	31.644		39.3	**0.10**	178.92	34.45	213.37	**OK**
51.257	52.131	51.209	52.083	51.620	51.882	51.458	51.720	46.057	46.931	46.008	46.883	46.420	46.682	46.258	46.520						
14.268	14.268	14.268	14.268	14.268	14.268	14.268	14.268	14.268	14.268	14.268	14.268	14.268	14.268	14.268	14.268		52.1	**0.10**	178.92	34.45	213.37	**OK**
24.489	25.220	24.407	25.137	24.842	25.061	24.566	24.785	16.912	17.643	16.830	17.560	17.265	17.484	16.989	17.208						
47.116	47.116	47.116	47.116	47.116	47.116	47.116	47.116	47.116	47.116	47.116	47.116	47.116	47.116	47.116	47.116		47.1	**0.10**	178.92	34.45	213.37	**OK**
78.714	79.397	78.757	79.440	78.902	79.107	79.046	79.251	69.900	70.584	69.944	70.627	70.089	70.294	70.233	70.438						
14.092	14.092	14.092	14.092	14.092	14.092	14.092	14.092	14.092	14.092	14.092	14.092	14.092	14.092	14.092	14.092		79.4	**0.10**	178.92	34.45	213.37	**OK**
33.290	33.920	33.274	33.904	33.529	33.718	33.475	33.664	23.936	24.566	23.920	24.550	24.176	24.365	24.122	24.311						
61.020	61.020	61.020	61.020	61.020	61.020	61.020	61.020	61.020	61.020	61.020	61.020	61.020	61.020	61.020	61.020		61.0	**0.10**	178.92	34.45	213.37	**OK**
73.511	74.274	73.566	74.329	73.714	73.943	73.897	74.126	65.117	65.879	65.171	65.934	65.319	65.548	65.502	65.731						
11.800	11.800	11.800	11.800	11.800	11.800	11.800	11.800	11.800	11.800	11.800	11.800	11.800	11.800	11.800	11.800		74.3	**0.10**	178.92	34.45	213.37	**OK**
30.132	30.925	30.130	30.923	30.412	30.650	30.406	30.644	21.858	22.650	21.856	22.648	22.137	22.375	22.131	22.369						
54.712	54.712	54.712	54.712	54.712	54.712	54.712	54.712	54.712	54.712	54.712	54.712	54.712	54.712	54.712	54.712		54.7	**0.10**	178.92	34.45	213.37	**OK**

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA VIGAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.1 (a)

f'c = 21.1 MPa
fy = 420 MPa
$\Phi_{Cortante}$ = 0.75
Estribos Φ = 9.5 mm
Av = 71 mm^2
R= 4.73

Mn = Momentos nominales de la viga en cada extremo restringido de la luz libre.
Vg = Cortante calculado para cargas gravitacionales mayoradas.
Vm = Cortante debido a flexion en curvatura inversa.
Vu = Vm + Vg

COMDIS3 = 1.2C.M.+1.0C.V.+1.0Ex+0.3Ey
COMDIS4 = 1.2C.M.+1.0C.V.+1.0(-Ex)+0.3Ey
COMDIS5 = 1.2C.M.+1.0C.V.+1.0Ex+0.3(-Ey)
COMDIS6 = 1.2C.M.+1.0C.V.+1.0(-Ex)+0.3(-Ey)
COMDIS7 = 1.2C.M.+1.0C.V.+0.3Ex+1.0Ey
COMDIS8 = 1.2C.M.+1.0C.V.+0.3(-Ex)+1.0Ey
COMDIS9 = 1.2C.M.+1.0C.V.+0.3Ex+1.0(-Ey)
COMDIS10 = 1.2C.M.+1.0C.V.+0.3(-Ex)+1.0(-Ey)
COMDIS11 = 0.9C.M.+1.0Ex+0.3Ey
COMDIS12 = 0.9C.M.+1.0(-Ex)+0.3Ey
COMDIS13 = 0.9C.M.+1.0Ex+0.3(-Ey)
COMDIS14 = 0.9C.M.+1.0(-Ex)+0.3(-Ey)
COMDIS15 = 0.9C.M.+0.3Ex+1.0Ey
COMDIS16 = 0.9C.M.+0.3(-Ex)+1.0Ey
COMDIS17 = 0.9C.M.+0.3Ex+1.0(-Ey)
COMDIS18 = 0.9C.M.+0.3(-Ex)+1.0(-Ey)

NIVEL	VIGA	LOC.	LONG.	PROPIEDADES DEL ELEMENTO			M3						Mn (kN.m)														
													Combinaciones para resistencias nominales a momento														
	ELEMENTO			SECCION	b	d	C.M.	C.V.	SISMO X	SISMO Y	-SISMO X	-SISMO Y															
	No.	(m)	(m)		(m)	(m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	COMBDIS3	COMBDIS4	COMBDIS5	COMBDIS6	COMBDIS7	COMBDIS8	COMBDIS9	COMBDIS10	COMBDIS11	COMBDIS12	COMBDIS13	COMBDIS14	COMBDIS15	COMBDIS16	COMBDIS17	COMBDIS18
N+3.20	B69	0	3.580	VIG15X45	0.15	0.40	-32.617	-13.825	6.183	3.920	-6.183	-3.920	51.410	54.024	51.907	54.521	51.744	52.529	53.402	54.186	27.799	30.414	28.297	30.911	28.134	28.919	29.792	30.576
	B69	3.58					8.365	4.347	0.783	3.010	-0.783	-3.010	14.741	14.410	14.360	14.029	15.071	14.972	13.798	13.699	7.885	7.554	7.503	7.172	8.215	8.115	6.942	6.842
N+3.20	B70	0	3.590	VIG15X45	0.15	0.40	8.379	4.352	0.414	2.992	-0.414	-2.992	14.684	14.509	14.305	14.130	15.066	15.013	13.800	13.748	7.818	7.643	7.439	7.264	8.200	8.147	6.935	6.882
	B70	3.59					-34.622	-14.446	6.619	3.046	-6.619	-3.046	54.400	57.199	54.786	57.585	54.929	55.768	56.217	57.056	29.567	32.366	29.954	32.752	30.096	30.936	31.384	32.224
N+3.20	B71	0	3.540	VIG15X45	0.15	0.40	-35.381	-14.692	6.847	3.394	-6.847	-3.394	55.486	58.382	55.917	58.812	55.997	56.866	57.432	58.301	30.180	33.075	30.611	33.506	30.691	31.560	32.126	32.995
	B71	3.54					12.100	6.064	0.549	3.111	-0.549	-3.111	20.897	20.665	20.503	20.271	21.277	21.207	19.961	19.891	11.203	10.971	10.809	10.577	11.583	11.513	10.267	10.197
N+3.20	B72	0	3.560	VIG15X45	0.15	0.40	12.613	6.363	0.981	3.148	-0.981	-3.148	21.906	21.491	21.506	21.092	22.226	22.102	20.895	20.771	11.759	11.344	11.359	10.945	12.079	11.955	10.748	10.624
	B72	3.56					-19.024	-8.556	10.642	2.852	-10.642	-2.852	28.954	33.454	29.316	33.816	30.107	31.457	31.313	32.663	14.691	19.191	15.053	19.552	15.844	17.194	17.050	18.400
N+3.20	B73	0	5.950	VIG20X45	0.20	0.40	-21.269	-6.579	11.265	0.815	-11.265	-0.815	29.669	34.432	29.772	34.535	31.215	32.644	31.560	32.989	16.709	21.472	16.812	21.575	18.255	19.684	18.600	20.029
	B73	5.95					-49.979	-13.213	8.521	1.077	-8.521	-1.077	71.318	74.921	71.455	75.058	72.420	73.501	72.875	73.956	43.111	46.714	43.248	46.851	44.213	45.294	44.668	45.749
N+3.20	B74	0	7.550	VIG20X45	0.20	0.40	-60.571	-17.027	6.942	0.449	-6.942	-0.449	88.216	91.151	88.273	91.208	89.177	90.058	89.367	90.247	53.018	55.953	53.075	56.010	53.979	54.859	54.169	55.049
	B74	7.55					-64.963	-18.475	7.283	0.704	-7.283	-0.704	94.846	97.926	94.936	98.015	95.820	96.744	96.118	97.041	56.882	59.962	56.972	60.051	57.856	58.780	58.154	59.077
N+3.20	B75	0	6.980	VIG20X45	0.20	0.40	-60.042	-16.449	7.838	0.488	-7.838	-0.488	86.811	90.126	86.873	90.187	87.899	88.893	88.105	89.100	52.350	55.664	52.412	55.726	53.438	54.432	53.644	54.638
	B75	6.98					-56.225	-15.769	7.760	0.651	-7.760	-0.651	81.557	84.838	81.640	84.921	82.609	83.594	82.884	83.869	48.921	52.202	49.003	52.284	49.973	50.957	50.248	51.232
N+3.20	B76	0	7.170	VIG20X45	0.20	0.40	-58.232	-16.427	7.381	0.506	-7.381	-0.506	84.713	87.834	84.777	87.898	85.730	86.667	85.944	86.881	50.816	53.937	50.880	54.001	51.834	52.770	52.048	52.984
	B76	7.17					-61.303	-16.996	7.089	0.539	-7.089	-0.539	89.027	92.024	89.095	92.093	89.996	90.895	90.224	91.123	53.640	56.637	53.708	56.706	54.609	55.508	54.837	55.736
N+3.20	B77	0	7.100	VIG20X45	0.20	0.40	-63.333	-17.636	8.545	0.619	-8.545	-0.619	91.790	95.403	91.868	95.481	92.963	94.047	93.225	94.308	55.154	58.767	55.232	58.846	56.327	57.411	56.589	57.673
	B77	7.1					-32.374	-9.463	12.204	0.718	-12.204	-0.718	45.686	50.846	45.777	50.937	47.386	48.934	47.690	49.238	26.511	31.671	26.602	31.762	28.211	29.759	28.514	30.062
N+6.35	B78	0	5.950	VIG15X45	0.15	0.40	-1.892	3.108	6.174	2.169	-6.174	-2.169	2.280	0.330	2.005	0.605	1.688	0.905	0.771	0.013	0.260	2.871	0.535	3.146	0.853	1.636	1.770	2.553
	B78	5.95					-12.575	-13.491	4.882	1.309	-4.882	-1.309	27.466	29.530	27.632	29.696	27.995	28.614	28.548	29.167	10.202	12.267	10.368	12.433	10.731	11.350	11.285	11.904
N+6.35	B79	0	7.550	VIG15X45	0.15	0.40	-16.687	-19.368	2.378	4.392	-2.378	-4.392	38.611	39.617	39.168	40.174	38.313	38.615	40.170	40.472	14.237	15.242	14.794	15.800	13.939	14.241	15.796	16.098
	B79	7.55					-16.392	-18.759	3.637	1.832	-3.637	-1.832	37.544	39.082	37.777	39.315	37.811	38.273	38.586	39.047	13.868	15.406	14.100	15.638	14.135	14.596	14.909	15.371
N+6.35	B81	0	6.980	VIG15X45	0.15	0.40	-13.768	-12.935	3.744	2.162	-3.744	-2.162	28.528	30.111	28.802	30.385	28.762	29.237	29.676	30.151	11.463	13.046	11.737	13.320	11.697	12.172	12.611	13.086
	B81	6.98					-3.762	4.536	3.820	1.715	-3.820	-1.715	0.938	0.677	0.720	0.895	0.626	0.142	0.099	0.583	2.469	4.085	2.687	4.302	2.781	3.266	3.506	3.991
N+6.35	B82	0	7.170	VIG15X45	0.15	0.40	-5.949	1.893	3.693	1.401	-3.693	-1.401	4.376	5.938	4.554	6.115	4.715	5.184	5.308	5.776	4.484	6.046	4.662	6.224	4.824	5.292	5.416	5.885
	B82	7.17					-6.857	-0.468	3.510	1.373	-3.510	-1.373	7.867	9.351	8.041	9.526	8.184	8.629	8.764	9.209	5.342	6.826	5.516	7.000	5.658	6.104	6.239	6.684
N+6.35	B83	0	7.100	VIG15X45	0.15	0.40	-7.739	-0.338	4.492	1.784	-4.492	-1.784	8.562	10.461	8.788	10.688	8.963	9.533	9.717	10.287	5.902	7.802	6.129	8.028	6.303	6.873	7.057	7.627
	B83	7.1					-4.581	-0.042	5.809	2.293	-5.809	-2.293	4.166	6.622	4.457	6.913	4.686	5.423	5.656	6.392	2.749	5.206	3.040	5.496	3.270	4.007	4.239	4.976
N+6.35	B84	0	5.950	VIG15X45	0.15	0.40	-3.614	0.830	2.669	0.627	-2.669	-0.627	2.903	4.031	2.982	4.111	3.205	3.544	3.470	3.809	2.649	3.777	2.728	3.857	2.951	3.289	3.216	3.554
	B84	5.95					-6.348	-1.244	2.740	0.852	-2.740	-0.852	8.228	9.387	8.336	9.495	8.508	8.855	8.868	9.216	5.080	6.238	5.188	6.347	5.359	5.707	5.720	6.067
N+6.35	B85	0	7.550	VIG15X45	0.15	0.40	-6.651	-0.079	2.289	0.795	-2.289	-0.795	7.526	8.494	7.627	8.595	7.747	8.037	8.083	8.373	5.452	6.419	5.552	6.520	5.673	5.963	6.009	6.299
	B85	7.55					-7.457	-0.025	2.434	0.789	-2.434	-0.789	8.409	9.438	8.509	9.538	8.652	8.961	8.986	9.295	6.147	7.176	6.247	7.276	6.390	6.699	6.724	7.032
N+6.35	B86	0	6.980	VIG15X45	0.15	0.40	-7.596	-1.192	2.468	0.823	-2.468	-0.823	9.733	10.777	9.838	10.881	9.977	10.290	10.325	10.638	6.262	7.306	6.367	7.410	6.506	6.819	6.854	7.167
	B86	6.98					-6.006	0.847	2.505	0.819	-2.505	-0.819	5.779	6.838	5.883	6.942	6.028	6.346	6.374	6.692	4.824	5.883	4.928	5.987	5.073	5.391	5.420	5.737
N+6.35	B87	0	7.170	VIG15X45	0.15	0.40	-6.373	0.442	2.499	0.810	-2.499	-0.810	6.626	7.683	6.729	7.785	6.876	7.193	7.218	7.535	5.156	6.213	5.259	6.315	5.406	5.723	5.748	6.065
	B87	7.17					-6.808	0.054	2.320	0.760	-2.320	-0.760	7.577	8.558	7.673	8.654	7.808	8.102	8.129	8.423	5.589	6.569	5.685	6.666	5.819	6.114	6.141	6.435
N+6.35	B88	0	7.100	VIG15X45	0.15	0.40	-6.823	0.147	2.916	0.931	-2.916	-0.931	7.365	8.598	7.483	8.716	7.659	8.029	8.052	8.422	5.465	6.698	5.583	6.816	5.759	6.129	6.153	6.522
	B88	7.1					-4.403	-0.509	4.245	1.332	-4.245	-1.332	4.811	6.606	4.980	6.775	5.242	5.780	5.805	6.343	2.981	4.776	3.150	4.945	3.412	3.950	3.975	4.514
N+6.35	B94	0	3.250	VIG25X45	0.25	0.40	8.219	6.957	0.470	7.754	-0.470	-7.754	17.411	17.212	16.427	16.229	18.489	18.429	15.210	15.151	7.988	7.790	7.005	6.806	9.066	9.007	5.788	5.728
	B94	3.25					-7.949	-12.219	1.534	14.813	-1.534	-14.813	20.494	21.143	22.373	23.022	18.529	18.723	24.792	24.987	5.890	6.539	7.769	8.418	3.925	4.120	10.189	10.383
N+6.35	B95	0	0.980	VIG25X45	0.25	0.40	-0.676	0.453	0.933	4.989	-0.933	-4.989	0.155	0.239	0.477	0.872	0.756	0.637	1.354	1.472	0.095	0.489	0.728	1.122	0.506	0.387	1.604	1.722
	B95	0.98					-1.626	-2.486	0.086	1.439	-0.086	-1.439	4.328	4.364	4.510	4.547	4.128	4.138	4.736	4.747	1.354	1.390	1.536	1.573	1.154	1.165	1.762	1.773
N+3.20	B96	0	3.450	VIG20X45	0.20	0.40	-60.941	-19.657	5.446	34.853	-5.446	-34.853	89.424	91.727	93.845	96.148	85.072	85.763	99.809	100.500	51.485	53.788	55.906	58.209	47.133	47.824	61.870	62.561
	B96	3.45					23.882	4.006	0.583	1.010	-0.583	-1.010	32.852	32.605	32.724	32.477	32.915	32.841	32.488	32.414	21.681	21.435	21.553	21.306	21.744	21.670	21.317	21.243
N+3.20	B97	0	3.450	VIG20X45	0.20	0.40	24.038	4.227	0.547	1.125	-0.547	-1.125	33.260	33.028	33.117	32.886	33.345	33.276	32.869	32.800	21.821	21.590	21.678	21.447	21.907	21.837	21.431	21.362
	B97	3.45					-29.480	-4.343	4.080	32.861	-4.080	-32.861	36.772	38.497	40.941	42.666	32.513	33.030	46.408	46.925	23.585	25.310	27.754	29.479	19.326	19.843	33.221	33.738
N+3.20	B98	0	3.450	VIG20X45	0.20	0.40	-66.076	-21.034	1.560	25.770	-1.560	-25.770	98.361	99.021	101.630	102.289	94.778	94.976	105.674	105.872	57.504	58.164	60.773	61.433	53.921	54.119	64.818	65.016
	B98	3.45					32.913	6.876	0.064	0.891	-0.064	-0.891	46.442	46.415	46.329	46.302	46.564	46.556	46.187	46.179	29.692	29.665	29.579	29.552	29.814	29.806	29.437	29.429
N+3.20	B99	0	3.450	VIG20X45	0.20	0.40	33.412	7.616	0.053	0.883	-0.053	-0.883	47.778	47.755	47.666	47.643	47.900	47.894	47.527	47.520	30.138	30.116	30.026	30.004	30.261	30.254	29.887	29.881
	B99	3.45					-36.059	-7.864	1.497	24.198	-1.497	-24.198	49.284	49.917	52.353	52.986	45.924	46.114	56.156	56.346	30.602	31.235	33.671	34.304	27.242	27.432	37.474	37.664
N+3.20	B100	0	3.450	VIG20X45	0.20	0.40	-62.238	-20.309	0.889	22.550	-0.889	-22.550	93.376	93.752	96.237	96.613	90.171	90.284	99.706	99.818	54.396	54.772	57.256	57.632	51.190	51.303	60.725	60.838
	B100	3.45					28.108	5.601	0.025	0.706	-0.025	-0.706	39.381	39.370	39.291	39.281	39.481	39.478	39.183	39.180	25.347	25.337	25.258	25.247	25.448	25.445	25.150	25.146
N+3.20	B101	0	3.450	VIG20X45	0.20	0.40	28.362	5.955	0.042	0.771	-0.042	-0.771	40.047	40.029	39.949	39.932	40.155	40.150	39.829	39.824	25.584	25.566	25.486	25.468	25.691	25.686	25.365	25.360
	B101	3.45					-32.517	-5.633	0.836	21.168	-0.836	-21.168	43.134	43.488	45.819	46.173	40.125	40.231	49.076	49.182	27.746	28.099	30.431	30.785	24.737	24.843	33.688	33.794
N+3.20	B102	0	3.450	VIG20X45	0.20	0.40	-62.455	-19.845	3.225	21.737	-3.225	-21.737	92.731	94.094	95.488	96.851	89.991	90.400	99.182	99.591	54.149	55.513	56.906	58.270	51.409	51.818	60.601	61.010
	B102	3.45					29.955	6.453	0.141	0.725	-0.141	-0.725	42.475	42.415	42.383	42.323	42.561	42.543	42.255	42.237	27.035	26.976	26.943	26.884	27.122	27.104	26.815	26.797
N+3.20	B103	0	3.450	VIG20X45	0.20	0.40	30.245	6.930	0.087	0.721	-0.087	-0.721	43.288	43.251	43.197	43.160	43.382	43.371	43.077	43.066	27.285	27.248	27.193	27.156	27.378	27.367	27.074	27.063
	B103	3.45					-34.296	-6.523	3.076	20.382	-3.076	-20.382	45.735	47.036	48.321	49.621	43.174	43.564	51.792	52.182	28.923	30.224	31.509	32.809	26.362	26.752	34.980	35.371
N+3.20	B104	0	3.450	VIG20X45	0.20	0.40	-63.386	-19.291	6.015	21.881	-6.015	-21.881	92.695	95.238	95.470	98.014	90.347	91.110	99.599	100.362	54.388	56.931	57.164	59.707	52.040	52.803	61.292	62.055
	B104	3.45					32.274	6.748	0.395	0.780	-0.395	-0.780	45.610	45.443	45.511	45.344	45.667	45.617	45.337	45.287	29.180	29.013	29.081	28.914	29.237	29.186	28.907	28.857
N+3.20	B105	0	3.450	VIG20X45	0.20	0.40	32.501	7.236	0.591	0.718	-0.591	-0.718	46.408	46.158	46.317	46.067	46.426	46.352	46.123	46.048	29.421	29.171	29.330	29.080	29.440	29.365	29.137	29.062
	B105	3.45					-37.582	-7.504	5.038	20.570	-5.038	-20.570	50.233	52.363	52.842	54.972	47.934	48.573	56.632	57.271	31.454	33.584	34.063	36.194	29.155	29.794	37.853	38.492
N+6.35	B116	0	7.550	VIG25X45	0.25	0.40	-23.370	-33.238	7.076	1.590	-7.076	-1.590	59.685	62.677	59.887	62.879	60.497	61.395	61.169	62.067	19.436	22.428	19.638	22.630	20.248	21.146	20.920	21.818
	B116	7.55					-25.420	-36.718	7.645	0.874	-7.645	-0.874	65.550	68.783	65.661	68.894	66.552	67.522	66.922	67.892	21.206	24.439	21.317	24.550	22.208	23.178	22.578	23.548

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA VIGAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.1 (a)

f'c = 21.1 MPa
fy = 420 MPa
$\Phi_{Cortante}$ = 0.75
Estribos Φ = 9.5 mm
Av = 71 mm^2
R= 4.73

Mn = Momentos nominales de la viga en cada extremo restringido de la luz libre.
Vg = Cortante calculado para cargas gravitacionales mayoradas.
Vm = Cortante debido a flexion en curvatura inversa.
Vu = Vm + Vg

V_g	$V_m = M_{nl} + M_{nr} / l_n$															
	COMBDIS3	COMBDIS4	COMBDIS5	COMBDIS6	COMBDIS7	COMBDIS8	COMBDIS9	COMBDIS10	COMBDIS11	COMBDIS12	COMBDIS13	COMBDIS14	COMBDIS15	COMBDIS16	COMBDIS17	COMBDIS18
(kN)	(kN)															
56.42	18.478	19.116	18.510	19.148	18.664	18.855	18.771	18.962	9.968	10.606	10.000	10.638	10.153	10.345	10.261	10.452
12.70																
11.92	19.243	19.974	19.245	19.976	19.497	19.716	19.503	19.723	10.414	11.145	10.416	11.147	10.667	10.887	10.674	10.893
57.43																
59.57	21.577	22.330	21.587	22.340	21.829	22.054	21.863	22.088	11.690	12.443	11.700	12.453	11.942	12.167	11.976	12.201
8.61																
16.96	14.286	15.434	14.276	15.423	14.700	15.045	14.665	15.009	7.430	8.577	7.419	8.567	7.844	8.188	7.808	8.153
51.69																
51.91	16.973	18.379	17.013	18.419	17.418	17.839	17.552	17.974	10.054	11.460	10.094	11.500	10.499	10.921	10.633	11.055
66.84																
81.60	24.247	25.043	24.266	25.063	24.503	24.742	24.567	24.806	14.556	15.353	14.576	15.372	14.813	15.052	14.877	15.116
83.70																
76.56	24.122	25.066	24.142	25.087	24.428	24.712	24.497	24.781	14.509	15.454	14.529	15.474	14.815	15.099	14.884	15.168
74.87																
77.27	24.231	25.085	24.250	25.103	24.509	24.765	24.570	24.826	14.568	15.422	14.587	15.440	14.846	15.102	14.907	15.163
78.65																
81.74	19.363	20.598	19.387	20.622	19.767	20.138	19.847	20.218	11.502	12.738	11.526	12.762	11.907	12.277	11.986	12.357
67.88																
0.94	4.999	5.019	4.981	5.093	4.989	4.961	4.928	4.904	1.758	2.544	1.833	2.618	1.947	2.183	2.194	2.430
12.30																
47.51	10.087	10.424	10.191	10.528	10.083	10.184	10.431	10.532	3.722	4.059	3.827	4.164	3.718	3.819	4.067	4.168
47.45																
12.38	4.221	4.411	4.230	4.481	4.210	4.209	4.266	4.403	1.996	2.454	2.066	2.525	2.074	2.212	2.309	2.446
0.94																
6.16	1.708	2.132	1.757	2.181	1.799	1.926	1.963	2.090	1.371	1.795	1.420	1.844	1.462	1.589	1.626	1.753
7.52																
7.37	1.793	2.406	1.865	2.479	1.922	2.106	2.165	2.349	1.219	1.832	1.291	1.905	1.348	1.532	1.591	1.775
6.18																
4.56	1.871	2.255	1.902	2.287	1.969	2.084	2.074	2.189	1.299	1.683	1.330	1.715	1.397	1.512	1.502	1.617
6.79																
7.10	2.111	2.375	2.137	2.402	2.172	2.251	2.261	2.340	1.536	1.801	1.563	1.827	1.598	1.677	1.686	1.766
7.32																
7.40	2.222	2.524	2.252	2.553	2.293	2.383	2.392	2.483	1.588	1.890	1.618	1.919	1.659	1.749	1.758	1.849
5.92																
6.69	1.981	2.265	2.009	2.293	2.048	2.133	2.141	2.226	1.499	1.783	1.526	1.811	1.566	1.651	1.658	1.743
6.99																
7.04	1.715	2.141	1.755	2.182	1.817	1.945	1.952	2.080	1.190	1.616	1.230	1.656	1.292	1.420	1.426	1.554
6.52																
45.49	11.663	11.801	11.939	12.077	11.390	11.432	12.308	12.350	4.270	4.409	4.546	4.684	3.997	4.039	4.916	4.957
76.31																
0.66	4.575	4.697	5.089	5.529	4.983	4.873	6.214	6.346	1.478	1.918	2.310	2.750	1.693	1.583	3.435	3.567
12.58																
76.25	35.442	36.038	36.687	37.283	34.199	34.378	38.347	38.526	21.208	21.804	22.452	23.048	19.964	20.143	24.112	24.291
4.70																
13.17	20.299	20.732	21.466	21.899	19.089	19.219	22.979	23.109	13.161	13.594	14.328	14.761	11.951	12.081	15.841	15.971
58.36																
83.75	41.972	42.155	42.887	43.070	40.969	41.024	44.018	44.073	25.274	25.458	26.189	26.372	24.271	24.326	27.320	27.375
11.01																
5.02	28.134	28.311	28.991	29.168	27.195	27.249	30.053	30.106	17.606	17.783	18.463	18.640	16.668	16.721	19.525	19.578
67.72																
79.81	38.480	38.586	39.283	39.389	37.580	37.612	40.258	40.289	23.114	23.220	23.917	24.023	22.214	22.246	24.891	24.923
7.07																
9.82	24.111	24.208	24.860	24.958	23.270	23.299	25.769	25.799	15.458	15.555	16.208	16.305	14.617	14.646	17.117	17.146
62.92																
80.70	39.190	39.568	39.963	40.340	38.421	38.534	40.996	41.110	23.532	23.910	24.304	24.682	22.763	22.876	25.338	25.451
7.96																
7.68	25.804	26.170	26.527	26.893	25.089	25.199	27.498	27.608	16.292	16.659	17.015	17.381	15.577	15.687	17.987	18.097
65.07																
81.72	40.088	40.777	40.864	41.553	39.424	39.631	42.010	42.217	24.222	24.911	24.998	25.687	23.558	23.765	26.145	26.351
8.98																
5.16	28.012	28.557	28.742	29.287	27.351	27.514	29.784	29.947	17.645	18.190	18.375	18.920	16.984	17.148	19.417	19.581
67.58																
96.19	16.587	17.412	16.629	17.453	16.828	17.075	16.966	17.213	5.383	6.208	5.425	6.249	5.623	5.871	5.761	6.009
101.92																

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA VIGAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.1 (a)

f'c = 21.1 MPa
fy = 420 MPa
$\Phi_{Cortante}$ = 0.75
Estribos Φ = 9.5 mm
Av = 71 mm^2
R= 4.73

Mn = Momentos nominales de la viga en cada extremo restringido de la luz libre.
Vg = Cortante calculado para cargas gravitacionales mayoradas.
Vm = Cortante debido a flexion en curvatura inversa.
Vu = Vm + Vg

Vu = Vm + Vg																	Vu_{max}	S	ΦVs	ΦVc	ΦVn	ΦVn > Vu_{max}
COMBDIS3	COMBDIS4	COMBDIS5	COMBDIS6	COMBDIS7	COMBDIS8	COMBDIS9	COMBDIS10	COMBDIS11	COMBDIS12	COMBDIS13	COMBDIS14	COMBDIS15	COMBDIS16	COMBDIS17	COMBDIS18						
(kN)																	(kN)	(m)	(kN)	(kN)	(kN)	
74.898	75.536	74.930	75.568	75.084	75.275	75.191	75.382	66.388	67.026	66.420	67.058	66.573	66.765	66.681	66.872		75.6	**0.10**	178.92	34.45	213.37	OK
12.700	12.700	12.700	12.700	12.700	12.700	12.700	12.700	12.700	12.700	12.700	12.700	12.700	12.700	12.700	12.700							
31.167	31.898	31.169	31.900	31.421	31.640	31.427	31.647	22.338	23.069	22.340	23.071	22.591	22.811	22.598	22.817		57.4	**0.10**	178.92	34.45	213.37	OK
57.432	57.432	57.432	57.432	57.432	57.432	57.432	57.432	57.432	57.432	57.432	57.432	57.432	57.432	57.432	57.432							
81.149	81.902	81.159	81.912	81.401	81.626	81.435	81.660	71.262	72.015	71.272	72.025	71.514	71.739	71.548	71.773		81.9	**0.10**	178.92	34.45	213.37	OK
8.608	8.608	8.608	8.608	8.608	8.608	8.608	8.608	8.608	8.608	8.608	8.608	8.608	8.608	8.608	8.608							
31.242	32.390	31.232	32.379	31.656	32.001	31.621	31.965	24.386	25.533	24.375	25.523	24.800	25.144	24.764	25.109		51.7	**0.10**	178.92	34.45	213.37	OK
51.688	51.688	51.688	51.688	51.688	51.688	51.688	51.688	51.688	51.688	51.688	51.688	51.688	51.688	51.688	51.688							
68.881	70.287	68.921	70.327	69.326	69.747	69.460	69.882	61.962	63.368	62.002	63.408	62.407	62.829	62.541	62.963		70.3	**0.10**	178.92	45.93	224.85	OK
66.844	66.844	66.844	66.844	66.844	66.844	66.844	66.844	66.844	66.844	66.844	66.844	66.844	66.844	66.844	66.844							
105.843	106.639	105.862	106.659	106.099	106.338	106.163	106.402	96.152	96.949	96.172	96.968	96.409	96.648	96.473	96.712		106.7	**0.10**	178.92	45.93	224.85	OK
83.700	83.700	83.700	83.700	83.700	83.700	83.700	83.700	83.700	83.700	83.700	83.700	83.700	83.700	83.700	83.700							
100.682	101.626	100.702	101.647	100.988	101.272	101.057	101.341	91.069	92.014	91.089	92.034	91.375	91.659	91.444	91.728		101.6	**0.10**	178.92	45.93	224.85	OK
74.872	74.872	74.872	74.872	74.872	74.872	74.872	74.872	74.872	74.872	74.872	74.872	74.872	74.872	74.872	74.872							
101.503	102.357	101.522	102.375	101.781	102.037	101.842	102.098	91.840	92.694	91.859	92.712	92.118	92.374	92.179	92.435		102.4	**0.10**	178.92	45.93	224.85	OK
78.648	78.648	78.648	78.648	78.648	78.648	78.648	78.648	78.648	78.648	78.648	78.648	78.648	78.648	78.648	78.648							
101.099	102.334	101.123	102.358	101.503	101.874	101.583	101.954	93.238	94.474	93.262	94.498	93.643	94.013	93.722	94.093		102.4	**0.10**	178.92	45.93	224.85	OK
67.884	67.884	67.884	67.884	67.884	67.884	67.884	67.884	67.884	67.884	67.884	67.884	67.884	67.884	67.884	67.884							
5.935	5.955	5.917	6.029	5.925	5.897	5.864	5.840	2.694	3.480	2.769	3.554	2.883	3.119	3.130	3.366		12.3	**0.10**	178.92	34.45	213.37	OK
12.300	12.300	12.300	12.300	12.300	12.300	12.300	12.300	12.300	12.300	12.300	12.300	12.300	12.300	12.300	12.300							
57.595	57.932	57.699	58.036	57.591	57.692	57.939	58.040	51.230	51.567	51.335	51.672	51.226	51.327	51.575	51.676		58.0	**0.10**	178.92	34.45	213.37	OK
47.448	47.448	47.448	47.448	47.448	47.448	47.448	47.448	47.448	47.448	47.448	47.448	47.448	47.448	47.448	47.448							
16.597	16.787	16.606	16.857	16.586	16.585	16.642	16.779	14.372	14.830	14.442	14.901	14.450	14.588	14.685	14.822		16.9	**0.10**	178.92	34.45	213.37	OK
0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944							
7.864	8.288	7.913	8.337	7.955	8.082	8.119	8.246	7.527	7.951	7.576	8.000	7.618	7.745	7.782	7.909		8.3	**0.10**	178.92	34.45	213.37	OK
7.524	7.524	7.524	7.524	7.524	7.524	7.524	7.524	7.524	7.524	7.524	7.524	7.524	7.524	7.524	7.524							
9.165	9.778	9.237	9.851	9.294	9.478	9.537	9.721	8.591	9.204	8.663	9.277	8.720	8.904	8.963	9.147		9.9	**0.10**	178.92	34.45	213.37	OK
6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176	6.176							
6.435	6.819	6.466	6.851	6.533	6.648	6.638	6.753	5.863	6.247	5.894	6.279	5.961	6.076	6.066	6.181		6.9	**0.10**	178.92	34.45	213.37	OK
6.788	6.788	6.788	6.788	6.788	6.788	6.788	6.788	6.788	6.788	6.788	6.788	6.788	6.788	6.788	6.788							
9.207	9.471	9.233	9.498	9.268	9.347	9.357	9.436	8.632	8.897	8.659	8.923	8.694	8.773	8.782	8.862		9.5	**0.10**	178.92	34.45	213.37	OK
7.316	7.316	7.316	7.316	7.316	7.316	7.316	7.316	7.316	7.316	7.316	7.316	7.316	7.316	7.316	7.316							
9.622	9.924	9.652	9.953	9.693	9.783	9.792	9.883	8.988	9.290	9.018	9.319	9.059	9.149	9.158	9.249		10.0	**0.10**	178.92	34.45	213.37	OK
5.920	5.920	5.920	5.920	5.920	5.920	5.920	5.920	5.920	5.920	5.920	5.920	5.920	5.920	5.920	5.920							
8.669	8.953	8.697	8.981	8.736	8.821	8.829	8.914	8.187	8.471	8.214	8.499	8.254	8.339	8.346	8.431		9.0	**0.10**	178.92	34.45	213.37	OK
6.992	6.992	6.992	6.992	6.992	6.992	6.992	6.992	6.992	6.992	6.992	6.992	6.992	6.992	6.992	6.992							
8.759	9.185	8.799	9.226	8.861	8.989	8.996	9.124	8.234	8.660	8.274	8.700	8.336	8.464	8.470	8.598		9.2	**0.10**	178.92	34.45	213.37	OK
6.516	6.516	6.516	6.516	6.516	6.516	6.516	6.516	6.516	6.516	6.516	6.516	6.516	6.516	6.516	6.516							
57.151	57.289	57.427	57.565	56.878	56.920	57.796	57.838	49.758	49.897	50.034	50.172	49.485	49.527	50.404	50.445		76.3	**0.10**	178.92	57.42	236.34	OK
76.308	76.308	76.308	76.308	76.308	76.308	76.308	76.308	76.308	76.308	76.308	76.308	76.308	76.308	76.308	76.308							
5.239	5.361	5.753	6.193	5.647	5.537	6.878	7.010	2.142	2.582	2.974	3.414	2.357	2.247	4.099	4.231		12.6	**0.10**	178.92	57.42	236.34	OK
12.580	12.580	12.580	12.580	12.580	12.580	12.580	12.580	12.580	12.580	12.580	12.580	12.580	12.580	12.580	12.580							
111.694	112.290	112.939	113.535	110.451	110.630	114.599	114.778	97.460	98.056	98.704	99.300	96.216	96.395	100.364	100.543		114.8	**0.10**	178.92	45.93	224.85	OK
4.704	4.704	4.704	4.704	4.704	4.704	4.704	4.704	4.704	4.704	4.704	4.704	4.704	4.704	4.704	4.704							
33.471	33.904	34.638	35.071	32.261	32.391	36.151	36.281	26.333	26.766	27.500	27.933	25.123	25.253	29.013	29.143		58.4	**0.10**	178.92	45.93	224.85	OK
58.360	58.360	58.360	58.360	58.360	58.360	58.360	58.360	58.360	58.360	58.360	58.360	58.360	58.360	58.360	58.360							
125.720	125.903	126.635	126.818	124.717	124.772	127.766	127.821	109.022	109.206	109.937	110.120	108.019	108.074	111.068	111.123		127.8	**0.10**	178.92	45.93	224.85	OK
11.008	11.008	11.008	11.008	11.008	11.008	11.008	11.008	11.008	11.008	11.008	11.008	11.008	11.008	11.008	11.008							
33.158	33.335	34.015	34.192	32.219	32.273	35.077	35.130	22.630	22.807	23.487	23.664	21.692	21.745	24.549	24.602		67.7	**0.10**	178.92	45.93	224.85	OK
67.716	67.716	67.716	67.716	67.716	67.716	67.716	67.716	67.716	67.716	67.716	67.716	67.716	67.716	67.716	67.716							
118.288	118.394	119.091	119.197	117.388	117.420	120.066	120.097	102.922	103.028	103.725	103.831	102.022	102.054	104.699	104.731		120.1	**0.10**	178.92	45.93	224.85	OK
7.068	7.068	7.068	7.068	7.068	7.068	7.068	7.068	7.068	7.068	7.068	7.068	7.068	7.068	7.068	7.068							
33.931	34.028	34.680	34.778	33.090	33.119	35.589	35.619	25.278	25.375	26.028	26.125	24.437	24.466	26.937	26.966		62.9	**0.10**	178.92	45.93	224.85	OK
62.920	62.920	62.920	62.920	62.920	62.920	62.920	62.920	62.920	62.920	62.920	62.920	62.920	62.920	62.920	62.920							
119.894	120.272	120.667	121.044	119.125	119.238	121.700	121.814	104.236	104.614	105.008	105.386	103.467	103.580	106.042	106.155		121.8	**0.10**	178.92	45.93	224.85	OK
7.964	7.964	7.964	7.964	7.964	7.964	7.964	7.964	7.964	7.964	7.964	7.964	7.964	7.964	7.964	7.964							
33.488	33.854	34.211	34.577	32.773	32.883	35.182	35.292	23.976	24.343	24.699	25.065	23.261	23.371	25.671	25.781		65.1	**0.10**	178.92	45.93	224.85	OK
65.068	65.068	65.068	65.068	65.068	65.068	65.068	65.068	65.068	65.068	65.068	65.068	65.068	65.068	65.068	65.068							
121.808	122.497	122.584	123.273	121.144	121.351	123.730	123.937	105.942	106.631	106.718	107.407	105.278	105.485	107.865	108.071		123.9	**0.10**	178.92	45.93	224.85	OK
8.980	8.980	8.980	8.980	8.980	8.980	8.980	8.980	8.980	8.980	8.980	8.980	8.980	8.980	8.980	8.980							
33.172	33.717	33.902	34.447	32.511	32.674	34.944	35.107	22.805	23.350	23.535	24.080	22.144	22.308	24.577	24.741		67.6	**0.10**	178.92	45.93	224.85	OK
67.580	67.580	67.580	67.580	67.580	67.580	67.580	67.580	67.580	67.580	67.580	67.580	67.580	67.580	67.580	67.580							
112.779	113.604	112.821	113.645	113.020	113.267	113.158	113.405	101.575	102.400	101.617	102.441	101.815	102.063	101.953	102.201		113.6	**0.10**	178.92	57.42	236.34	OK
101.920	101.920	101.920	101.920	101.920	101.920	101.920	101.920	101.920	101.920	101.920	101.920	101.920	101.920	101.920	101.920							

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA VIGAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.1 (b)

f'c = 21.0 MPa
fy = 420 MPa
Φ Cortante = 0.75
Estribos Φ = 9.5 mm
Av = 71 mm²
R= 4.73

2VE = Cortante maximo obtenido de las combinaciones de carga de diseño que incluyan E, considerando E, como el doble del prescrito por el reglamento general legalmente adoptado para diseño sismico vigente.

COMDIS3 = 1.2C.M.+1.0C.V.+(2*(1.0Ex))+(2*(0.3Ey))
COMDIS4 = 1.2C.M.+1.0C.V.+(2*(1.0(-Ex)))+(2*(0.3Ey)))
COMDIS5 = 1.2C.M.+1.0C.V.+(2*(1.0Ex))+(2*(0.3(-Ey)))
COMDIS6 = 1.2C.M.+1.0C.V.+(2*(1.0(-Ex)))+(2*(0.3(-Ey)))
COMDIS7 = 1.2C.M.+1.0C.V.+(2*(0.3Ex))+(2*(1.0Ey))
COMDIS8 = 1.2C.M.+1.0C.V.+(2*(0.3(-Ex)))+(2*(1.0Ey))
COMDIS9 = 1.2C.M.+1.0C.V.+(2*(0.3Ex))+(2*(1.0(-Ey)))
COMDIS10 = 1.2C.M.+1.0C.V.+(2*(0.3(-Ex)))+(2*(1.0(-Ey)))
COMDIS11 = 0.9C.M.+(2*(1.0Ex))+(2*(0.3Ey))
COMDIS12 = 0.9C.M.+(2*(1.0(-Ex)))+(2*(0.3Ey))
COMDIS13 = 0.9C.M.+(2*(1.0Ex))+(2*(0.3(-Ey)))
COMDIS14 = 0.9C.M.+(2*(1.0(-Ex)))+(2*(0.3(-Ey)))
COMDIS15 = 0.9C.M.+(2*(0.3Ex))+(2*(1.0Ey))
COMDIS16 = 0.9C.M.+(2*(0.3(-Ex)))+(2*(1.0Ey))
COMDIS17 = 0.9C.M.+(2*(0.3Ex))+(2*(1.0(-Ey)))
COMDIS17 = 0.9C.M.+(2*(0.3(-Ex)))+(2*(1.0(-Ey)))

NIVEL	VIGA	LOC.	LONG.	PROPIEDADES DEL ELEMENTO			V2						2Vc Combinaciones de carga de diseño para el doble del cortante donde se incluya E																$2V_{Emax}$	S	ΦVs	ΦVc	ΦVn	ΦVn > $2V_{Emax}$
	ELEMENTO																															
	No.	(m)	(m)	SECCION	b (m)	d (m)	C.M. (KN.m)	C.V. (KN.m)	SISMO X (KN.m)	SISMO Y (KN.m)	-SISMO X (KN.m)	-SISMO Y (KN.m)	COMBDIS3	COMBDIS4	COMBDIS5	COMBDIS6	COMBDIS7	COMBDIS8	COMBDIS9	COMBDIS10	COMBDIS11	COMBDIS12	COMBDIS13	COMBDIS14	COMBDIS15	COMBDIS16	COMBDIS17	COMBDIS18	(kN)	(m)	(kN)	(kN)	(kN)	
N+6.35	B1	0	2.15	VIG15X45	0.15	0.40	-0.4	0.8	1.58	1	-1.58	-1	0.717	0.049	0.591	0.077	0.632	0.431	0.209	0.008	0.037	0.631	0.089	0.757	0.048	0.249	0.471	0.672	4.7	0.10	178.92	34.37	213.29	OK
	B1	2.15					3.81	-0.43	2.22	1.14	-2.22	-1	4.684	3.745	4.548	3.609	4.524	4.242	4.071	3.790	3.971	3.032	3.835	2.896	3.811	3.529	3.358	3.077						
N+3.20	B1	0	2.15	VIG15X45	0.15	0.40	-0.32	5.23	2.22	1.14	-2.22	-1.14	5.388	4.449	5.243	4.304	5.228	4.946	4.746	4.464	0.254	0.685	0.109	0.830	0.094	0.188	0.388	0.670	11.5	0.10	178.92	34.37	213.29	OK
	B1	2.15					7.98	0.32	6.08	5.04	-6.08	-1.14	11.501	8.930	11.109	8.538	11.347	10.576	10.041	9.269	8.787	6.216	8.395	5.824	8.633	7.862	7.327	6.555						
N+6.35	B2	0	2.15	VIG30X45	0.30	0.40	5.45	2.97	6.08	5.04	-6.08	-5.04	11.115	8.544	10.476	7.905	10.961	10.190	8.830	8.059	6.510	3.939	5.871	3.300	6.356	5.585	4.225	3.454	38.2	0.10	178.92	68.74	247.66	OK
	B2	2.15					21.11	9.5	13.52	8.14	-13.52	-5.04	38.207	32.490	37.371	31.654	37.410	35.695	34.624	32.909	22.374	16.657	21.538	15.821	21.577	19.862	18.791	17.076						
N+3.20	B2	0	2.15	VIG30X45	0.30	0.40	21.86	20.93	13.52	8.14	-13.52	-8.14	50.537	44.820	49.504	43.787	49.740	48.025	46.299	44.584	23.049	17.332	22.016	16.299	22.252	20.537	18.811	17.096	50.9	0.10	178.92	68.74	247.66	OK
	B2	2.15					41.98	-0.48	2.7	3.82	-2.7	-8.14	50.709	49.567	49.951	48.809	50.875	50.532	48.346	48.004	38.595	37.453	37.837	36.695	38.761	38.418	36.232	35.890						
N+6.35	B3	0	2.15	VIG30X45	0.30	0.40	7.05	4.37	2.7	3.82	-2.7	-3.82	13.643	12.501	13.159	12.017	13.809	13.466	12.194	11.851	7.158	6.016	6.674	5.532	7.324	6.981	5.709	5.366	44.9	0.10	178.92	68.74	247.66	OK
	B3	2.15					24.49	14.24	5.66	1.18	-5.66	-3.82	44.899	42.506	44.582	42.189	44.236	43.518	43.179	42.461	23.312	20.919	22.995	20.602	22.649	21.931	21.592	20.874						
N+3.20	B3	0	2.15	VIG30X45	0.30	0.40	41.12	25.8	5.66	1.18	-5.66	-1.18	76.415	74.022	76.266	73.873	75.752	75.034	75.254	74.536	38.279	35.886	38.130	35.737	37.616	36.898	37.118	36.400	76.6	0.10	178.92	68.74	247.66	OK
	B3	2.15					61.34	-7.74	6.82	48.62	-6.82	-1.18	70.394	67.510	67.235	64.351	76.580	75.715	66.051	65.186	59.732	56.848	56.573	53.689	65.918	65.053	55.389	54.524						
N+6.35	B4	0	6.9	VIG30X45	0.30	0.40	-32.61	2.52	6.82	48.62	-6.82	-48.62	32.086	34.970	38.254	41.138	25.900	26.765	46.459	47.324	24.823	27.707	30.991	33.875	18.637	19.502	39.196	40.061	47.3	0.10	178.92	68.74	247.66	OK
	B4	6.9					19.09	-15.29	9.8	79.2	-9.8	-48.62	14.713	10.569	6.606	2.462	24.984	23.741	2.040	3.283	24.276	20.132	16.169	12.025	34.547	33.304	7.523	6.280						
N+3.20	B4	0	6.9	VIG30X45	0.30	0.40	-82.45	5.31	14.54	79.34	-14.54	-79.2	85.524	91.672	95.579	101.727	75.934	77.778	109.452	111.296	66.099	72.247	76.154	82.302	56.509	58.353	90.027	91.871	111.3	0.10	178.92	68.74	247.66	OK
	B4	6.9					61.6	1.33	3.72	1.12	-3.72	-79.34	76.108	74.535	71.004	69.431	75.723	75.251	58.712	58.240	56.298	54.725	51.194	49.621	55.913	55.441	38.902	38.430						
N+6.35	B5	0	0.98	VIG30X45	0.30	0.40	-10.28	2.79	3.72	1.12	-3.72	-1.12	8.688	10.261	8.831	10.404	9.073	9.545	9.547	10.019	8.394	9.967	8.537	10.110	8.779	9.251	9.253	9.725	10.4	0.10	178.92	68.74	247.66	OK
	B5	0.98					-2.94	-3.04	8.08	8.28	-8.08	-1.12	4.335	7.751	4.931	8.347	4.305	5.330	6.292	7.317	0.413	3.829	1.009	4.425	0.383	1.408	2.370	3.395						
N+3.20	B5	0	0.98	VIG30X45	0.30	0.40	-34.69	-2.56	8.08	8.28	-8.08	-8.28	41.955	45.371	43.005	46.421	41.925	42.950	45.426	46.451	28.988	32.404	30.038	33.454	28.958	29.983	32.459	33.484	46.5	0.10	178.92	68.74	247.66	OK
	B5	0.98					-22.39	0.36	0.56	0.24	-0.56	-8.28	26.374	26.611	26.915	27.152	26.422	26.493	28.223	28.294	20.017	20.254	20.558	20.795	20.065	20.136	21.866	21.937						
N+6.35	B6	0	2.15	VIG30X45	0.30	0.40	11.09	7.61	0.56	0.24	-0.56	-0.24	21.052	20.815	21.021	20.784	21.004	20.933	20.903	20.832	10.115	9.878	10.084	9.847	10.067	9.996	9.966	9.895	60.6	0.10	178.92	68.74	247.66	OK
	B6	2.15					30.45	22.04	0.76	9.42	-0.76	-0.24	59.338	59.017	58.725	58.404	60.620	60.523	58.577	58.481	28.163	27.842	27.550	27.229	29.445	29.348	27.402	27.306						
N+3.20	B6	0	2.15	VIG30X45	0.30	0.40	59.45	33.6	0.76	9.42	-0.76	-9.42	105.698	105.377	104.503	104.182	106.980	106.883	102.997	102.900	54.263	53.942	53.068	52.747	55.545	55.448	51.562	51.465	107.0	0.10	178.92	68.74	247.66	OK
	B6	2.15					79.67	-32.5	3.66	44.06	-3.66	-9.42	66.672	65.125	63.280	61.733	72.651	72.187	61.345	60.880	75.271	73.724	71.879	70.332	81.250	80.786	69.944	69.479						
N+6.35	B7	0	6.9	VIG30X45	0.30	0.40	-47.99	41.92	5.3	41.78	-5.3	-44.06	11.898	14.139	17.342	19.583	6.499	7.171	24.647	25.319	39.421	41.662	44.865	47.106	34.022	34.694	52.170	52.842	52.8	0.10	178.92	68.74	247.66	OK
	B7	6.9					40.17	-29.53	7.46	67.26	-7.46	-41.78	24.517	21.363	17.601	14.447	33.367	32.421	10.314	9.368	41.996	38.842	35.080	31.926	50.846	49.900	27.793	26.847						
N+3.20	B7	0	6.9	VIG30X45	0.30	0.40	-109	18.77	6.18	68.72	-6.18	-67.26	106.365	108.978	114.989	117.603	97.109	97.893	125.858	126.642	92.435	95.048	101.059	103.673	83.179	83.963	111.928	112.712	126.6	0.10	178.92	68.74	247.66	OK
	B7	6.9					88.84	-25.05	3.5	4.5	-3.5	-68.72	82.583	81.103	77.939	76.459	82.731	82.287	67.251	66.807	80.981	79.501	76.337	74.857	81.129	80.685	65.649	65.205						
N+6.35	B8	0	0.98	VIG30X45	0.30	0.40	-29.94	-21.24	3.5	4.5	-3.5	-4.5	56.143	57.623	56.713	58.193	55.995	56.439	57.897	58.341	25.921	27.401	26.491	27.971	25.773	26.217	27.675	28.119	58.3	0.10	178.92	68.74	247.66	OK
	B8	0.98					-21.52	-6.97	3.92	8.92	-3.92	-4.5	31.399	33.057	32.251	33.908	30.660	31.157	33.497	33.994	17.973	19.631	18.825	20.482	17.234	17.731	20.071	20.568						
N+3.20	B8	0	0.98	VIG30X45	0.30	0.40	-68.29	-6.01	3.92	8.92	-3.92	-8.92	86.563	88.221	87.695	89.353	85.824	86.321	89.595	90.092	60.066	61.724	61.198	62.856	59.327	59.824	63.098	63.595	90.1	0.10	178.92	68.74	247.66	OK
	B8	0.98					-60.6	0.28	0.18	0.06	-0.18	-8.92	72.398	72.474	72.968	73.044	72.416	72.439	74.314	74.337	54.498	54.574	55.068	55.144	54.516	54.539	56.414	56.437						
N+6.35	B9	0	2.15	VIG30X45	0.30	0.40	11.89	8.09	0.18	0.06	-0.18	-0.06	22.400	22.324	22.392	22.316	22.382	22.359	22.357	22.334	10.743	10.667	10.735	10.659	10.725	10.702	10.700	10.677	63.9	0.10	178.92	68.74	247.66	OK
	B9	2.15					31.69	24.25	0.64	7.44	-0.64	-0.06	62.885	62.615	62.410	62.139	63.892	63.810	62.306	62.225	29.128	28.858	28.653	28.382	30.135	30.053	28.549	28.468						
N+3.20	B9	0	2.15	VIG30X45	0.30	0.40	64.51	35.81	0.64	7.44	-0.64	-7.44	113.829	113.559	112.885	112.615	114.836	114.754	111.690	111.608	58.666	58.396	57.722	57.452	59.673	59.591	56.527	56.445	114.8	0.10	178.92	68.74	247.66	OK
	B9	2.15					84.74	-32.55	2.22	35.4	-2.22	-7.44	71.853	70.914	69.135	68.197	76.763	76.481	67.706	67.424	78.981	78.042	76.263	75.325	83.891	83.609	74.834	74.552						
N+6.35	B10	0	6.9	VIG30X45	0.30	0.40	-47.06	42.89	1.66	34.04	-1.66	-35.4	11.072	11.774	15.476	16.178	6.280	6.491	20.961	21.171	39.844	40.546	44.248	44.950	35.052	35.263	49.733	49.943	49.9	0.10	178.92	68.74	247.66	OK
	B10	6.9					40.96	-30.58	0.92	55.88	-0.92	-34.04	22.311	21.922	16.608	16.219	30.444	30.328	11.434	11.317	40.603	40.214	34.900	34.511	48.736	48.620	29.726	29.609						
N+3.20	B10	0	6.9	VIG30X45	0.30	0.40	-112.36	20.05	1.32	56.72	-1.32	-55.88	110.905	111.464	118.047	118.605	102.707	102.874	126.512	126.680	97.247	97.806	104.389	104.947	89.049	89.216	112.854	113.022	126.7	0.10	178.92	68.74	247.66	OK
	B10	6.9					93.23	-25.02	0.36	3	-0.36	-56.72	87.122	86.970	83.335	83.182	87.513	87.467	74.887	74.842	84.173	84.021	80.386	80.233	84.564	84.518	71.938	71.893						
N+6.35	B11	0	0.98	VIG30X45	0.30	0.40	-30.55	-20.96	0.36	3	-0.36	-3	57.354	57.506	57.734	57.886	56.963	57.009	58.231	58.277	27.229	27.381	27.609	27.761	26.838	26.884	28.106	28.152	58.3	0.10	178.92	68.74	247.66	OK
	B11	0.98					-21.92	-7.44	0.82	6.78	-0.82	-3	33.141	33.487	33.761	34.108	32.259	32.363	34.326	34.430	19.125	19.471	19.745	20.092	18.243	18.347	20.310	20.414						
N+3.20	B11	0	0.98	VIG30X45	0.30	0.40	-72.21	-6.48	0.82	6.78	-0.82	-6.78	92.529	92.875	93.389	93.735	91.647	91.751	94.513	94.617	64.386	64.732	65.246	65.592	63.504	63.608	66.370	66.474	94.6	0.10	178.92	68.74	247.66	OK
	B11	0.98					-64.51	-0.35	0.08	0.04	-0.08	-6.78	77.743	77.776	78.175	78.209	77.748	77.759	79.190	79.200	58.040	58.073	58.472	58.506	58.045	58.056	59.487	59.497						
N+6.35	B12	0	2.15	VIG30X45	0.30	0.40	10.96	7.26	0.08	0.04	-0.08	-0.04	20.431	20.398	20.426	20.393	20.426	20.415	20.409	20.398	9.883	9.850	9.878	9.845	9.878	9.867	9.861	9.850	61.5	0.10	178.92	68.74	247.66	OK
	B12	2.15					30.6	23.25	0.88	6.84	-0.88	-0.04	60.590	60.218	60.154	59.781	61.472	61.360	60.017	59.906	28.160	27.788	27.724	27.351	29.042	28.930	27.587	27.476						
N+3.20	B12	0	2.15	VIG30X45	0.30	0.40	61.61	34.81	0.88	6.84	-0.88	-6.84	109.362	108.990	108.494	108.122	110.244	110.132	107.352	107.240	56.069	55.697	55.201	54.829	56.951	56.839	54.059	53.947	110.2	0.10	178.92	68.74	247.66	OK
	B12	2.15					81.84	-14.11	2.38	30.4	-2.38	-6.84	86.529	85.523	84.167	83.161	90.676	90.374	82.803	82.501	76.087	75.081	73.725	72.719	80.234	79.932	72.361	72.059						
N+6.35	B13	0	6.9	VIG30X45	0.30	0.40	-36.56	10.29	2.38	30.4	-2.38	-30.4	31.151	32.157	35.007	36.013	27.004	27.306	39.858	40.160	30.473	31.479	34.329	35.335	26.326	26.628	39.180	39.482	40.2	0.10	178.92	68.74	247.66	OK
	B13	6.9					26.47	-29.38	4.6	50.66	-4.6	-30.4	6.570	4.625	1.428	0.517	13.386	12.803	3.751	4.335	28.009	26.064	22.867	20.922	34.825	34.242	17.688	17.104						
N+3.20	B13	0	6.9	VIG30X45	0.30	0.40	-108.94	19.94	4.9	51.48	-4.9	-50.66	106.487	108.559	112.965	115.037	99.593	100.215	121.188	121.809	93.745	95.817	100.223	102.295	86.851	87.473	108.446	109.067	121.8	0.10	178.92	68.74	247.66	OK
	B13	6.9					91.62	-0.63	0.16	0.38	-0.16	-51.48	109.372	109.304	106.083	106.015	109.404	109.384	98.440	98.420	82.516	82.448	79.227	79.159	82.548	82.528	71.584	71.564						
N+6.35	B14	0	0.98	VIG30X45	0.30	0.40	-18.64	2.83	0.16	0.38	-0.16	-0.38	19.480	19.548	19.528	19.596	19.448	19.468	19.608	19.628	16.718	16.786	16.766	16.834	16.686	16.706	16.846	16.866	19.7	0.10	178.92	68.74	247.66	OK
	B14	0.98					-9.69	-7.95	0.5	6.36	-0.5	-0.38	19.069	19.280	19.496	19.708	18.202	18.265	19.627	19.690	8.212	8.423	8.639	8.851	7.345	7.408	8.770	8.833						
N+3.20	B14	0	0.98	VIG30X45	0.30	0.40	-69.91	-6.99	0.5	6.36	-0.5	-6.36	90.373	90.584	91.180	91.391	89.506	89.569	92.195	92.258	62.410	62.621	63.217	63.428	61.543	61.606	64.232	64.295	92.3	0.10	178.92	68.74	247.66	OK
	B14	0.98					-62.21	-0.04	0.68	0.2	-0.68	-6.36	74.536	74.823	74.952	75.239	74.607	74.693	75.993	76.080	55.833	56.120	56.249	56.536	55.904	55.990	57.290	57.377						
N+6.35	B15	0	2.15	VIG30X45	0.30	0.40	11.75	7.63	0.68	0.2	-0.68	-0.2	21.886	21.599	21.861	21.574	21.815	21.729	21.731	21.645	10.731	10.444	10.706	10.419	10.660	10.574	10.576	10.490	63.7	0.10	178.92	68.74	247.66	OK
	B15	2.15					31.44	24.48	1.08	6.74	-1.08	-0.2	62.864	62.407	62.424	61.967	63.701	63.564	62.234	62.097	28.952	28.495	28.512	28.055	29.789	29.652	28.322	28.185						
N+3.20	B15	0	2.15	VIG30X45	0.30	0.40	64.85	36.04	1.08	6.74	-1.08	-6.74	114.516	114.059	113.661	113.204	115.353	115.216	112.504	112.367	59.021	58.564	58.166	57.709	59.858	59.721	57.009	56.872	115.4	0.10	178.92	68.74	247.66	OK
	B15	2.15					85.07	-13.91	5.62	29.16	-5.62	-6.74	91.212	88.835	88.935	86.558	94.695	93.982	87.106	86.393	79.601	77.224	77.324	74.947	83.084	82.371	75.495	74.782						
N+6.35	B16	0	6.9	VIG30X45	0.30	0.40	-35.98	10.7	5.62	29.16	-5.62	-29.16	29.438	31.815	33.137	35.514	25.955	26.668	38.284	38.997	29.344	31.721	33.043	35.420	25.861	26.574	38.190	38.903	39.0	0.10	178.92	68.74	247.66	OK
	B16	6.9					27.21	-29.91	10.78	50.08	-10.78	-29.16	8.197	3.639	3.172	1.387	14.013	12.646	2.739	4.107	29.944	25.386	24.919	20.360	35.760	34.393	19.008	17.640						
N+3.20	B16	0	6.9	VIG30X45	0.30	0.40	-110.9	20.76	10.1	50.88	-10.1	-50.08	106.958	111.228	113.361	117.632	100.923	102.204	122.267	123.548	94.448	98.718	100.851	105.122	88.413	89.694	109.757	111.038	123.5	0.10	178.92	68.74	247.66	OK
	B16	6.9					94.73	-3.87	0.9	0.38	-0.9	-50.88	110.020	109.640	106.769	106.389	109.943	109.829	99.106	98.992	85.471	85.091	82.220	81.840	85.394	85.280	74.557	74.443						
N+6.35	B17	0	0.98	VIG30X45	0.30	0.40	-20.89	-0.37	0.9	0.38	-0.9	-0.38	25.224	25.604	25.272	25.652	25.301	25.415	25.461	25.575	18.587	18.967	18.635	19.015	18.664	18.778	18.824	18.938	25.7	0.10	178.92	68.74	247.66	OK
	B17	0.98					-11.92	-7.84	1.94	6.06	-1.94	-0.38	21.349	22.170	21.758	22.578	20.740	20.986	22.101	22.347	9.933	10.754	10.342	11.162	9.324	9.570	10.685	10.931						
N+3.20	B17	0	0.98	VIG30X45	0.30	0.40	-71.99	-6.88	1.94	6.06	-1.94	-6.06	92.473	93.294	93.242	94.063	91.864	92.110	94.426	94.672	63.996	64.817	64.765	65.586	63.387	63.633	65.949	66.195	94.7	0.10	178.92	68.74	247.66	OK
	B17	0.98					-64.29	0.09	2.02	0.64	-2.02	-6.06	76.590	77.444	77.015	77.869	76.795	77.051	78.211	78.467	57.393	58.247	57.818	58.672	57.598	57.854	59.014	59.270						
N+6.35	B18	0	2.15	VIG30X45	0.30	0.40	5.31	3.91	2.02	0.64	-2.02	-0.64	10.750	9.896	10.668	9.814	10.545	10.289	10.275	10.019	5.247	4.393	5.165	4.311	5.042	4.786	4.772	4.516	38.6	0.10	178.92	68.74	247.66	OK
	B18	2.15					21.91	10.87	5.72	3.2	-5.72	-0.64	38.574	36.156	38.331	35.912	38.201	37.476	37.389	36.664	21.131	18.713	20.888	18.469	20.758	20.033	19.946	19.221						
N+3.20	B18	0	2.15	VIG30X45	0.30	0.40	28.58	16.65	5.72	3.2	-5.72	-3.2	52.358	49.940	51.952	49.534	51.985	51.260	50.632	49.907	27.134	24.716	26.728	24.310	26.761	26.036	25.408	24.683	67.6	0.10	178.92	68.74	247.66	OK
	B18	2.15					57.24	-7.68	8.68	28.46	-8.68	-3.2	64.648	60.978	62.640	58.970	67.575	66.474	60.882	59.781	55.156	51.486	53.148	49.478	58.083	56.982	51.390	50.289						

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA VIGAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.1 (b)

f'c = 21.0 MPa
fy = 420 MPa
Φ Cortante = 0.75
Estribos Φ = 9.5 mm
Av = 71 mm²
R= 4.73

2VE = Cortante maximo obtenido de las combinaciones de carga de diseño que incluyan E, considerando E, como el doble del prescrito por el reglamento general legalmente adoptado para diseño sismico vigente.

COMDIS3 = 1.2C.M.+1.0C.V.+(2*(1.0Ex))+(2*(0.3Ey))
COMDIS4 = 1.2C.M.+1.0C.V.+(2*(1.0(-Ex)))+(2*(0.3Ey)))
COMDIS5 = 1.2C.M.+1.0C.V.+(2*(1.0Ex))+(2*(0.3(-Ey)))
COMDIS6 = 1.2C.M.+1.0C.V.+(2*(1.0(-Ex)))+(2*(0.3(-Ey)))
COMDIS7 = 1.2C.M.+1.0C.V.+(2*(0.3Ex))+(2*(1.0Ey))
COMDIS8 = 1.2C.M.+1.0C.V.+(2*(0.3(-Ex)))+(2*(1.0Ey))
COMDIS9 = 1.2C.M.+1.0C.V.+(2*(0.3Ex))+(2*(1.0(-Ey)))
COMDIS10 = 1.2C.M.+1.0C.V.+(2*(0.3(-Ex)))+(2*(1.0(-Ey)))
COMDIS11 = 0.9C.M.+(2*(1.0Ex))+(2*(0.3Ey))
COMDIS12 = 0.9C.M.+(2*(1.0(-Ex)))+(2*(0.3Ey))
COMDIS13 = 0.9C.M.+(2*(1.0Ex))+(2*(0.3(-Ey)))
COMDIS14 = 0.9C.M.+(2*(1.0(-Ex)))+(2*(0.3(-Ey)))
COMDIS15 = 0.9C.M.+(2*(0.3Ex))+(2*(1.0Ey))
COMDIS16 = 0.9C.M.+(2*(0.3(-Ex)))+(2*(1.0Ey))
COMDIS17 = 0.9C.M.+(2*(0.3Ex))+(2*(1.0(-Ey)))
COMDIS17 = 0.9C.M.+(2*(0.3(-Ex)))+(2*(1.0(-Ey)))

NIVEL	VIGA	LOC.	LONG.	PROPIEDADES DEL ELEMENTO			V2						2V$_E$															$2V_{E\,max}$	S	ΦVs	ΦVc	ΦVn	ΦVn > $2V_{Emax}$
	ELEMENTO												Combinaciones de carga de diseño para el doble del cortante donde se incluya E																			
	No.	(m)	(m)	SECCION	b (m)	d (m)	C.M. (KN.m)	C.V. (KN.m)	SISMO X (KN.m)	SISMO Y (KN.m)	-SISMO X (KN.m)	-SISMO Y (KN.m)	COMBDIS3	COMBDIS4	COMBDIS5	COMBDIS6	COMBDIS7	COMBDIS8	COMBDIS9	COMBDIS10	COMBDIS11	COMBDIS12	COMBDIS13	COMBDIS14	COMBDIS15	COMBDIS16	COMBDIS17	COMBDIS18	(kN)	(m)	(kN)	(kN)	(kN)	
N+6.35	B19	0	6.9	VIG30X45	0.30	0.40	-30.35	4.57	8.68	28.46	-8.68	-28.46	28.210	31.880	31.820	35.490	25.283	26.384	37.316	38.417	23.675	27.345	27.285	30.955	20.748	21.849	32.781	33.882	38.4	0.10	178.92	68.74	247.66	OK
	B19	6.9					22.94	-15.08	14.36	51.74	-14.36	-28.46	18.766	12.694	13.679	7.607	24.297	22.476	7.342	5.520	26.964	20.892	21.877	15.805	32.495	30.674	15.540	13.718						
N+3.20	B19	0	6.9	VIG30X45	0.30	0.40	-83.67	8.34	18.38	52.04	-18.38	-51.74	84.878	92.649	91.460	99.231	79.896	82.228	101.837	104.168	68.117	75.888	74.699	82.470	63.135	65.467	85.076	87.407	104.2	0.10	178.92	68.74	247.66	OK
	B19	6.9					70.95	-1.7	2.9	1.14	-2.9	-52.04	84.125	82.899	80.752	79.526	83.865	83.497	72.622	72.254	64.540	63.314	61.167	59.941	64.280	63.912	53.037	52.669						
N+6.35	B20	0	0.98	VIG30X45	0.30	0.40	-12.77	0.04	2.9	1.14	-2.9	-1.14	14.599	15.825	14.743	15.969	14.859	15.227	15.341	15.709	10.808	12.034	10.952	12.178	11.068	11.436	11.550	11.918	16.0	0.10	178.92	68.74	247.66	OK
	B20	0.98					-5.2	-3.14	6.26	3.3	-6.26	-1.14	7.847	10.494	8.129	10.776	8.285	9.079	9.224	10.018	3.147	5.794	3.429	6.076	3.585	4.379	4.524	5.318						
N+3.20	B20	0	0.98	VIG30X45	0.30	0.40	-39.86	-2.66	6.26	3.3	-6.26	-3.3	48.959	51.606	49.378	52.025	49.397	50.191	50.793	51.587	34.341	36.988	34.760	37.407	34.779	35.573	36.175	36.969	52.0	0.10	178.92	68.74	247.66	OK
	B20	0.98					-27.56	0.8	1.58	1	-1.58	-3.3	31.875	32.543	32.147	32.815	31.960	32.161	32.869	33.070	24.407	25.075	24.679	25.347	24.492	24.693	25.401	25.602						
N+6.35	B21	0	1.84	VIG30X45	0.30	0.40	3.81	0.8	1.58	1	-1.58	-1	5.769	5.101	5.643	4.975	5.684	5.483	5.261	5.060	3.826	3.158	3.700	3.032	3.741	3.540	3.318	3.117	17.4	0.10	178.92	68.74	247.66	OK
	B21	1.84					9.66	5.23	2.22	1.14	-2.22	-1	17.364	16.425	17.228	16.289	17.204	16.922	16.751	16.470	9.236	8.297	9.100	8.161	9.076	8.794	8.623	8.342						
N+3.20	B21	0	1.84	VIG30X45	0.30	0.40	7.98	9.46	2.22	1.14	-2.22	-1.14	19.578	18.639	19.433	18.494	19.418	19.136	18.936	18.654	7.724	6.785	7.579	6.640	7.564	7.282	7.082	6.800	36.4	0.10	178.92	68.74	247.66	OK
	B21	1.84					20.4	-1.24	59.66	8.06	-59.66	-1.14	36.364	11.138	35.781	10.555	28.728	21.160	26.783	19.215	31.484	6.258	30.901	5.675	23.848	16.280	21.903	14.335						
N+6.35	B22	0	3.08	VIG30X45	0.30	0.40	-8.58	-1.24	59.66	8.06	-59.66	-8.06	1.588	23.638	0.566	24.660	6.048	13.616	9.456	17.024	5.402	19.824	4.380	20.846	2.234	9.802	5.642	13.210	30.7	0.10	178.92	68.74	247.66	OK
	B22	3.08					1.22	-3.8	131.92	15.08	-131.92	-8.06	26.511	29.270	25.043	30.737	9.219	7.515	4.327	12.407	29.945	25.836	28.477	27.303	12.653	4.081	7.761	8.973						
N+3.20	B22	0	3.08	VIG30X45	0.30	0.40	-16.52	6.98	131.92	15.08	-131.92	-15.08	16.003	39.778	14.090	41.691	1.289	18.023	7.665	24.399	13.979	41.802	12.066	43.715	3.313	20.047	9.689	26.423	43.7	0.10	178.92	68.74	247.66	OK
	B22	3.08					26.69	0.34	18.06	3.08	-18.06	-15.08	36.382	28.745	35.230	27.593	34.165	31.874	30.325	28.034	28.035	20.398	26.883	19.246	25.818	23.527	21.978	19.687						
N+6.35	B23	0	5.95	VIG30X45	0.30	0.40	-9.43	0.34	18.06	3.08	-18.06	-3.08	6.962	14.599	7.353	14.990	9.179	11.470	10.482	12.773	4.473	12.110	4.864	12.501	6.690	8.981	7.993	10.284	22.8	0.10	178.92	68.74	247.66	OK
	B23	5.95					9.5	-26.46	35.8	11	-35.8	-3.08	6.794	21.931	7.687	22.824	10.464	15.005	13.441	17.982	16.816	1.679	15.923	0.786	13.146	8.605	10.169	5.628						
N+3.20	B23	0	5.95	VIG30X45	0.30	0.40	-70.51	29.62	41.02	20.04	-41.02	-11	45.049	62.393	47.017	64.362	48.154	53.357	54.716	59.919	53.516	70.860	55.484	72.829	56.621	61.824	63.183	68.386	98.0	0.10	178.92	68.74	247.66	OK
	B23	5.95					79.51	-0.1	11.9	2.12	-11.9	-20.04	97.962	92.931	96.557	91.525	96.515	95.005	91.830	90.320	74.209	69.178	72.804	67.772	72.762	71.252	68.077	66.567						
N+6.35	B24	0	7.55	VIG30X45	0.30	0.40	-12.06	-0.1	11.9	2.12	-11.9	-2.12	11.922	16.953	12.191	17.222	13.369	14.879	14.265	15.775	8.204	13.235	8.473	13.504	9.651	11.161	10.547	12.057	27.3	0.10	178.92	68.74	247.66	OK
	B24	7.55					11.95	-36.05	25.74	9.32	-25.74	-2.12	15.677	26.561	16.403	27.286	18.107	21.372	20.526	23.791	16.788	5.904	16.062	5.179	14.358	11.093	11.939	8.674						
N+3.20	B24	0	7.55	VIG30X45	0.30	0.40	-93.83	36.46	26.78	13.86	-26.78	-9.32	69.595	80.919	71.065	82.389	71.507	74.904	76.408	79.805	77.906	89.230	79.376	90.700	79.818	83.215	84.719	88.116	116.2	0.10	178.92	68.74	247.66	OK
	B24	7.55					94.73	-0.6	14.16	2.44	-14.16	-13.86	116.224	110.237	115.191	109.203	114.490	112.694	111.044	109.248	88.405	82.418	87.372	81.384	86.671	84.875	83.225	81.429						
N+6.35	B25	0	6.98	VIG30X45	0.30	0.40	-11.47	-0.6	14.16	2.44	-14.16	-2.44	11.216	17.203	11.525	17.512	12.950	14.746	13.982	15.778	7.175	13.162	7.484	13.471	8.909	10.705	9.941	11.737	27.0	0.10	178.92	68.74	247.66	OK
	B25	6.98					10.74	-33.18	31	9.74	-31	-2.44	13.120	26.228	13.893	27.001	16.267	20.199	18.842	22.774	16.838	3.730	16.065	2.957	13.691	9.759	11.116	7.184						
N+3.20	B25	0	6.98	VIG30X45	0.30	0.40	-87.06	33.05	30.52	12.98	-30.52	-9.74	64.146	77.051	65.587	78.492	66.742	70.614	71.545	75.417	71.078	83.983	72.519	85.424	73.674	77.546	78.477	82.349	106.2	0.10	178.92	68.74	247.66	OK
	B25	6.98					85.99	-0.04	13.6	2.32	-13.6	-12.98	106.170	100.420	105.200	99.449	104.501	102.776	101.266	99.541	80.413	74.663	79.443	73.692	78.744	77.019	75.509	73.784						
N+6.35	B26	0	7.17	VIG30X45	0.30	0.40	-11.55	-0.04	13.6	2.32	-13.6	-2.32	10.878	16.628	11.172	16.922	12.547	14.272	13.528	15.253	7.373	13.123	7.667	13.417	9.042	10.767	10.023	11.748	26.9	0.10	178.92	68.74	247.66	OK
	B26	7.17					11.25	-33.97	29.82	9.46	-29.82	-2.32	13.566	26.174	14.313	26.922	16.579	20.361	19.069	22.852	17.029	4.421	16.282	3.673	14.016	10.234	11.526	7.743						
N+3.20	B26	0	7.17	VIG30X45	0.30	0.40	-88.57	34.16	27.88	10.58	-27.88	-9.46	65.559	77.347	66.830	78.618	68.119	71.656	72.356	75.892	73.148	84.936	74.419	86.207	75.708	79.245	79.945	83.481	110.9	0.10	178.92	68.74	247.66	OK
	B26	7.17					89.25	0.46	14.8	2.58	-14.8	-10.58	110.853	104.595	110.018	103.760	109.044	107.167	106.262	104.385	83.618	77.360	82.783	76.525	81.809	79.932	79.027	77.150						
N+6.35	B27	0	7.1	VIG30X45	0.30	0.40	-10.62	0.46	14.8	2.58	-14.8	-2.58	8.991	15.249	9.319	15.577	10.800	12.677	11.891	13.768	6.265	12.523	6.593	12.851	8.074	9.951	9.165	11.042	28.7	0.10	178.92	68.74	247.66	OK
	B27	7.1					11.96	-35.59	34.74	10.04	-34.74	-2.58	13.257	27.946	14.057	28.746	16.912	21.319	19.580	23.987	18.745	4.056	17.945	3.256	15.090	10.683	12.422	8.015						
N+3.20	B27	0	7.1	VIG30X45	0.30	0.40	-93.69	31.91	29.96	9.02	-29.96	-10.04	73.612	86.280	74.821	87.489	76.711	80.511	80.740	84.541	77.415	90.083	78.624	91.292	80.514	84.314	84.543	88.344	109.6	0.10	178.92	68.74	247.66	OK
	B27	7.1					84.34	4.24	18	5.76	-18	-9.02	109.619	102.008	108.681	101.070	107.807	105.524	104.683	102.399	80.077	72.466	79.139	71.528	78.265	75.982	75.141	72.857						
N+6.35	B28	0	5.95	VIG30X45	0.30	0.40	-8.05	4.24	18	5.76	-18	-5.76	1.249	8.860	1.980	9.591	3.061	5.344	5.496	7.779	3.074	10.685	3.805	11.416	4.886	7.169	7.321	9.604	19.0	0.10	178.92	68.74	247.66	OK
	B28	5.95					10.87	-12.19	40.32	10.28	-40.32	-5.76	10.030	7.018	9.013	8.036	5.585	0.470	2.194	2.921	18.959	1.911	17.942	0.893	14.514	9.399	11.123	6.008						
N+3.20	B28	0	5.95	VIG30X45	0.30	0.40	-59.71	10.45	40.72	24.12	-40.72	-10.28	51.063	68.281	53.245	70.463	53.520	58.685	60.793	65.958	43.600	60.818	45.782	63.000	46.057	51.222	53.330	58.495	70.5	0.10	178.92	68.74	247.66	OK
	B28	5.95					66.31	-66.65	12.64	5.84	-12.64	-24.12	15.965	10.620	14.064	8.720	14.958	13.355	8.624	7.021	62.722	57.377	60.821	55.477	61.715	60.112	55.381	53.778						
N+6.35	B29	0	7.55	VIG30X45	0.30	0.40	-48.18	64.52	10.48	7.22	-10.48	-5.84	9.378	4.946	8.549	4.118	8.895	7.566	6.134	4.805	40.688	45.120	41.517	45.948	41.171	42.500	43.932	45.261	45.9	0.10	178.92	68.74	247.66	OK
	B29	7.55					44.65	-15.97	24.16	8.24	-24.16	-7.22	43.240	33.025	42.260	32.044	40.884	37.820	37.616	34.551	45.815	35.600	44.835	34.619	43.459	40.395	40.191	37.126						
N+3.20	B29	0	7.55	VIG30X45	0.30	0.40	-80.93	15.77	23.64	14.64	-23.64	-8.24	75.420	85.415	76.871	86.867	76.751	79.750	81.589	84.587	66.911	76.906	68.362	78.358	68.242	71.241	73.080	76.078	95.7	0.10	178.92	68.74	247.66	OK
	B29	7.55					80.61	-3.92	12.68	3.84	-12.68	-14.64	95.736	90.375	94.564	89.203	94.428	92.820	90.521	88.913	75.473	70.112	74.301	68.940	74.165	72.557	70.258	68.650						
N+6.35	B30	0	6.98	VIG30X45	0.30	0.40	-13.6	-3.92	12.68	3.84	-12.68	-3.84	17.316	22.677	17.803	23.164	18.624	20.232	20.248	21.856	9.316	14.677	9.803	15.164	10.624	12.232	12.248	13.856	23.2	0.10	178.92	68.74	247.66	OK
	B30	6.98					8.6	-12.92	28.04	9.2	-28.04	-3.84	3.912	7.945	3.085	8.772	1.123	2.433	1.633	5.190	14.252	2.395	13.425	1.568	11.463	7.907	8.707	5.150						
N+3.20	B30	0	6.98	VIG30X45	0.30	0.40	-73.72	14.6	28.38	14.36	-28.38	-9.2	66.953	78.953	68.448	80.448	69.028	72.628	74.009	77.609	59.437	71.437	60.932	72.932	61.512	65.112	66.493	70.093	90.2	0.10	178.92	68.74	247.66	OK
	B30	6.98					72.75	0.11	12.18	3.74	-12.18	-14.36	90.222	85.072	89.074	83.924	88.973	87.428	85.147	83.602	68.287	63.137	67.139	61.989	67.038	65.493	63.212	61.667						
N+6.35	B31	0	7.17	VIG30X45	0.30	0.40	-11.81	0.11	12.18	3.74	-12.18	-3.74	11.250	16.400	11.724	16.874	12.499	14.044	14.080	15.625	7.817	12.967	8.291	13.441	9.066	10.611	10.647	12.192	16.9	0.10	178.92	68.74	247.66	OK
	B31	7.17					10.99	-14.83	25.9	9.36	-25.9	-3.74	4.427	6.524	3.596	7.355	1.980	1.306	0.790	4.075	15.960	5.009	15.129	4.178	13.513	10.227	10.743	7.458						
N+3.20	B31	0	7.17	VIG30X45	0.30	0.40	-76.13	14.21	26.98	11.7	-26.98	-9.36	70.700	82.108	72.036	83.444	72.961	76.384	77.414	80.836	62.071	73.479	63.407	74.815	64.332	67.755	68.785	72.207	93.9	0.10	178.92	68.74	247.66	OK
	B31	7.17					75.65	0.01	13.32	4.14	-13.32	-11.7	93.869	88.237	92.864	87.232	92.510	90.820	89.161	87.472	71.164	65.532	70.159	64.527	69.805	68.115	66.456	64.767						
N+6.35	B32	0	7.1	VIG30X45	0.30	0.40	-11.27	0.01	13.32	4.14	-13.32	-4.14	10.435	16.067	10.961	16.593	11.794	13.484	13.544	15.234	7.064	12.696	7.590	13.222	8.423	10.113	10.173	11.863	17.1	0.10	178.92	68.74	247.66	OK
	B32	7.1					11.31	-15.78	29.7	10.76	-29.7	-4.14	4.754	7.805	3.808	8.750	1.951	1.817	1.200	4.967	17.141	4.582	16.195	3.637	14.338	10.570	11.187	7.420						
N+3.20	B32	0	7.1	VIG30X45	0.30	0.40	-81.73	13.76	29.46	10.04	-29.46	-10.76	77.451	89.908	78.770	91.227	80.325	84.062	84.722	88.459	66.692	79.149	68.011	80.468	69.566	73.303	73.963	77.700	92.4	0.10	178.92	68.74	247.66	OK
	B32	7.1					72.79	2.55	2.28	11.08	-2.28	-10.04	91.083	90.119	89.743	88.779	92.385	92.096	87.920	87.631	66.696	65.732	65.356	64.392	67.998	67.709	63.533	63.244						
N+3.20	B33	0	2.15	VIG20X45	0.20	0.40	15.05	14.11	2.28	11.08	-2.28	-11.08	33.355	32.391	31.949	30.985	34.657	34.368	29.972	29.683	14.730	13.766	13.324	12.360	16.032	15.743	11.347	11.058	37.6	0.10	178.92	45.83	224.75	OK
	B33	2.15					29.57	-0.59	1.36	12.52	-1.36	-11.08	35.976	35.401	34.479	33.904	37.627	37.455	32.638	32.465	27.695	27.120	26.198	25.623	29.346	29.174	24.357	24.184						
N+3.20	B35	0	0.98	VIG20X45	0.20	0.40	-16.94	0.37	1.36	12.52	-1.36	-12.52	18.876	19.451	20.465	21.040	17.225	17.397	22.519	22.691	14.164	14.739	15.753	16.328	12.513	12.685	17.807	17.979	22.7	0.10	178.92	45.83	224.75	OK
	B35	0.98					-11.84	3.74	0.44	7.62	-0.44	-12.52	9.892	10.078	11.169	11.355	8.829	8.885	13.087	13.143	10.080	10.266	11.357	11.543	9.017	9.073	13.275	13.331						
N+3.20	B39	0	2.15	VIG20X45	0.20	0.40	17.42	15.3	0.44	7.62	-0.44	-7.62	36.780	36.594	35.814	35.628	37.843	37.787	34.621	34.565	16.254	16.068	15.288	15.102	17.317	17.261	14.095	14.039	39.1	0.10	178.92	45.83	224.75	OK
	B39	2.15					31.94	-0.72	0.58	6.7	-0.58	-7.62	38.156	37.910	37.247	37.002	39.061	38.988	36.034	35.960	29.294	29.048	28.385	28.140	30.199	30.126	27.172	27.098						
N+3.20	B41	0	0.98	VIG20X45	0.20	0.40	-18.26	0.24	0.58	6.7	-0.58	-6.7	21.124	21.370	21.974	22.220	20.219	20.292	23.052	23.125	15.886	16.132	16.736	16.982	14.981	15.054	17.814	17.887	23.1	0.10	178.92	45.83	224.75	OK
	B41	0.98					-13.16	3.08	0.28	7.04	-0.28	-6.7	12.206	12.325	13.078	13.196	11.206	11.241	14.111	14.146	11.338	11.457	12.210	12.328	10.338	10.373	13.243	13.278						
N+3.20	B42	0	2.15	VIG20X45	0.20	0.40	15.96	14.64	0.28	7.04	-0.28	-7.04	34.298	34.179	33.405	33.286	35.298	35.263	32.321	32.286	14.870	14.751	13.977	13.858	15.870	15.835	12.893	12.858	37.8	0.10	178.92	45.83	224.75	OK
	B42	2.15					30.48	-0.15	0.28	6.62	-0.28	-7.04	36.905	36.787	36.039	35.920	37.843	37.808	34.955	34.920	27.911	27.793	27.045	26.926	28.849	28.814	25.961	25.926						
N+3.20	B44	0	0.98	VIG20X45	0.20	0.40	-16.34	0.81	0.28	6.62	-0.28	-6.62	18.319	18.437	19.159	19.277	17.381	17.416	20.180	20.215	14.227	14.345	15.067	15.185	13.289	13.324	16.088	16.123	20.2	0.10	178.92	45.83	224.75	OK
	B44	0.98					-11.24	3.18	0.96	6.68	-0.96	-6.62	9.681	10.087	10.525	10.931	8.835	8.957	11.647	11.768	9.489	9.895	10.333	10.739	8.643	8.765	11.455	11.576						
N+3.20	B45	0	2.15	VIG20X45	0.20	0.40	16.28	14.74	0.96	6.68	-0.96	-6.68	34.903	34.497	34.055	33.649	35.749	35.627	32.925	32.803	15.279	14.873	14.431	14.025	16.125	16.003	13.301	13.179	38.0	0.10	178.92	45.83	224.75	OK
	B45	2.15					30.81	-0.28	0.96	6.12	-0.96	-6.68	37.283	36.877	36.471	36.065	38.047	37.925	35.341	35.219	28.320	27.914	27.508	27.102	29.084	28.962	26.378	26.256						
N+3.20	B47	0	0.98	VIG20X45	0.20	0.40	-17.04	0.68	0.96	6.12	-0.96	-6.12	19.177	19.583	19.953	20.359	18.413	18.535	21.001	21.123	14.745	15.151	15.521	15.927	13.981	14.103	16.569	16.691	21.1	0.10	178.92	45.83	224.75	OK
	B47	0.98					-11.94	3.25	2.22	6.48	-2.22	-6.12	10.198	11.136	10.997	11.936	9.567	9.849	12.231	12.513	9.866	10.804	10.665	11.604	9.235	9.517	11.899	12.181						
N+3.20	B48	0	2.15	VIG20X45	0.20	0.40	16.97	14.81	2.22	6.48	-2.22	-6.48	36.054	35.116	35.232	34.294	36.685	36.403	33.945	33.663	16.153	15.215	15.331	14.393	16.784	16.502	14.044	13.762	38.4	0.10	178.92	45.83	224.75	OK
	B48	2.15					31.5	-0.73	1.36	5.84	-1.36	-6.48	37.728	37.153	36.947	36.371	38.391	38.218	35.786	35.614	29.008	28.433	28.227	27.651	29.671	29.498	27.066	26.894						
N+3.20	B50	0	0.98	VIG20X45	0.20	0.40	-19.48	0.23	1.36	5.84	-1.36	-5.84	22.488	23.063	23.229	23.804	21.825	21.998	24.294	24.467	16.874	17.449	17.615	18.190	16.211	16.384	18.680	18.853	24.5	0.10	178.92	45.83	224.75	OK
	B50	0.98					-14.38	-2.56	8.08	8.28	-8.08	-5.84	17.583	20.999	18.478	21.895	17.553	18.578	20.538	21.563	10.709	14.125	11.604	15.021	10.679	11.704	13.664	14.689						
N+3.20	B51	0	3.97	VIG15X45	0.15	0.40	-22.39	-0.13	8.08	8.28	-8.08	-8.28	24.765	28.181	25.815	29.231	24.735	25.760	28.236	29.261	17.918	21.334	18.968	22.384	17.888	18.913	21.389	22.414	29.2	0.10	178.92	34.37	213.29	OK

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA VIGAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.1 (b)

f'c = 21.0 MPa
fy = 420 MPa
Φ Cortante = 0.75
Estribos Φ = 9.5 mm
Av = 71 mm²
R= 4.73

2VE = Cortante maximo obtenido de las combinaciones de carga de diseño que incluyan E, considerando E, como el doble del prescrito por el reglamento general legalmente adoptado para diseño sismico vigente.

COMDIS3 = 1.2C.M.+1.0C.V.+(2*(1.0Ex))+(2*(0.3Ey))
COMDIS4 = 1.2C.M.+1.0C.V.+(2*(1.0(-Ex)))+(2*(0.3Ey)))
COMDIS5 = 1.2C.M.+1.0C.V.+(2*(1.0Ex))+(2*(0.3(-Ey)))
COMDIS6 = 1.2C.M.+1.0C.V.+(2*(1.0(-Ex)))+(2*(0.3(-Ey)))
COMDIS7 = 1.2C.M.+1.0C.V.+(2*(0.3Ex))+(2*(1.0Ey))
COMDIS8 = 1.2C.M.+1.0C.V.+(2*(0.3(-Ex)))+(2*(1.0Ey))
COMDIS9 = 1.2C.M.+1.0C.V.+(2*(0.3Ex))+(2*(1.0(-Ey)))
COMDIS10 = 1.2C.M.+1.0C.V.+(2*(0.3(-Ex)))+(2*(1.0(-Ey)))
COMDIS11 = 0.9C.M.+(2*(1.0Ex))+(2*(0.3Ey))
COMDIS12 = 0.9C.M.+(2*(1.0(-Ex)))+(2*(0.3Ey))
COMDIS13 = 0.9C.M.+(2*(1.0Ex))+(2*(0.3(-Ey)))
COMDIS14 = 0.9C.M.+(2*(1.0(-Ex)))+(2*(0.3(-Ey)))
COMDIS15 = 0.9C.M.+(2*(0.3Ex))+(2*(1.0Ey))
COMDIS16 = 0.9C.M.+(2*(0.3(-Ex)))+(2*(1.0Ey))
COMDIS17 = 0.9C.M.+(2*(0.3Ex))+(2*(1.0(-Ey)))
COMDIS17 = 0.9C.M.+(2*(0.3(-Ex)))+(2*(1.0(-Ey)))

NIVEL	VIGA	LOC.	LONG.	PROPIEDADES DEL ELEMENTO			V2						2V$_E$ Combinaciones de carga de diseño para el doble del cortante donde se incluya E															2V$_{E\,max}$	S	ΦVs	ΦVc	ΦVn	ΦVn > 2V$_{Emax}$
	ELEMENTO			SECCION	b	d	C.M.	C.V.	SISMO X	SISMO Y	-SISMO X	-SISMO Y	COMBDIS3	COMBDIS4	COMBDIS5	COMBDIS6	COMBDIS7	COMBDIS8	COMBDIS9	COMBDIS10	COMBDIS11	COMBDIS12	COMBDIS13	COMBDIS14	COMBDIS15	COMBDIS16	COMBDIS17	COMBDIS18					
	No.	(m)	(m)		(m)	(m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)																	(kN)	(m)	(kN)	(kN)	(kN)	
N+3.20	B51	2.97	2.97	VIG15X45	0.15	0.40	8.51	0.24	7.28	4.46	-7.28	-8.28	12.274	9.196	11.466	8.388	11.857	10.933	9.163	8.240	9.481	6.403	8.673	5.595	9.064	8.140	6.370	5.447	23.3	0.10	178.92	34.37	213.29	OK
	B52	0					-3.32	2.68	7.28	4.46	-7.28	-4.46	0.518	2.560	0.048	3.126	0.101	0.823	1.785	2.709	1.166	4.244	1.732	4.810	1.583	2.507	3.469	4.393						
N+3.20	B52	2.98	2.98	VIG15X45	0.15	0.40	27.69	-3.33	3.72	4.58	-3.72	-4.46	30.975	29.402	30.402	28.829	31.102	30.630	29.191	28.719	25.998	24.425	25.425	23.852	26.125	25.653	24.214	23.742	31.1	0.10	178.92	34.37	213.29	OK
	B53	0					-32.91	-0.12	3.72	4.58	-3.72	-4.58	38.535	40.108	39.116	40.689	38.408	38.880	40.344	40.816	28.542	30.115	29.123	30.696	28.415	28.887	30.351	30.823						
N+3.20	B53	3.77	3.77	VIG15X45	0.15	0.40	6.72	0.13	4.02	2.7	-4.02	-4.58	9.215	7.515	8.753	7.054	9.020	8.510	7.481	6.971	7.069	5.369	6.607	4.908	6.874	6.364	5.335	4.825	40.8	0.10	178.92	34.37	213.29	OK
	B54	0					-6.44	3.35	4.02	2.7	-4.02	-2.7	3.357	5.057	3.699	5.399	3.552	4.062	4.694	5.204	4.775	6.475	5.117	6.817	4.970	5.480	6.112	6.622						
N+3.20	B54	3.78	3.78	VIG15X45	0.15	0.40	33.3	-3.13	4.84	4.64	-4.84	-2.7	38.148	36.101	37.682	35.635	38.118	37.504	36.566	35.952	31.288	29.241	30.822	28.775	31.258	30.644	29.706	29.092	38.1	0.10	178.92	34.37	213.29	OK
	B55	0					-31.21	-0.19	4.84	4.64	-4.84	-4.64	36.324	38.371	36.913	38.960	36.354	36.968	38.316	38.930	26.771	28.818	27.360	29.407	26.801	27.415	28.763	29.377						
N+3.20	B55	3.49	3.49	VIG15X45	0.15	0.40	5.36	0.62	4.68	3.24	-4.68	-4.64	8.247	6.268	7.747	5.768	8.034	7.440	6.368	5.774	6.019	4.040	5.519	3.540	5.806	5.212	4.140	3.546	39.0	0.10	178.92	34.37	213.29	OK
	B56	0					-5.88	3.56	4.68	3.24	-4.68	-3.24	2.301	4.280	2.712	4.691	2.514	3.108	3.884	4.478	4.097	6.076	4.508	6.487	4.310	4.904	5.680	6.274						
N+3.20	B56	3.49	3.49	VIG15X45	0.15	0.40	30.7	-3.43	4.54	3.7	-4.54	-3.24	34.605	32.685	34.164	32.245	34.480	33.904	33.013	32.437	28.825	26.905	28.384	26.465	28.700	28.124	27.233	26.657	34.6	0.10	178.92	34.37	213.29	OK
	B57	0					-31.52	-0.41	4.54	3.7	-4.54	-3.7	37.039	38.959	37.509	39.429	37.164	37.740	38.728	39.304	27.173	29.093	27.643	29.563	27.298	27.874	28.862	29.438						
N+3.20	B57	3.58	3.58	VIG15X45	0.15	0.40	6.04	0.27	4.14	3.1	-4.14	-3.7	8.590	6.839	8.159	6.408	8.436	7.911	6.998	6.473	6.508	4.757	6.077	4.326	6.354	5.829	4.916	4.391	39.4	0.10	178.92	34.37	213.29	OK
	B58	0					-5.9	3.31	4.14	3.1	-4.14	-3.1	2.698	4.449	3.091	4.842	2.852	3.377	4.163	4.688	4.238	5.989	4.631	6.382	4.392	4.917	5.703	6.228						
N+3.20	B58	3.59	3.59	VIG15X45	0.15	0.40	31.77	-3.57	5.5	3.18	-5.5	-3.1	35.918	33.593	35.520	33.195	35.575	34.877	34.247	33.550	29.957	27.632	29.559	27.234	29.614	28.916	28.286	27.589	35.9	0.10	178.92	34.37	213.29	OK
	B59	0					-32.52	-0.58	5.5	3.18	-5.5	-3.18	38.240	40.565	38.643	40.968	38.583	39.281	39.927	40.625	27.904	30.229	28.307	30.632	28.247	28.945	29.591	30.289						
N+3.20	B59	3.54	3.54	VIG15X45	0.15	0.40	4.6	-0.35	6.26	3.3	-6.26	-3.18	6.703	4.056	6.292	3.645	6.265	5.471	4.895	4.101	5.673	3.026	5.262	2.615	5.235	4.441	3.865	3.071	41.0	0.10	178.92	34.37	213.29	OK
	B60	0					-9.78	2.66	6.26	3.3	-6.26	-3.3	7.543	10.190	7.962	10.609	7.981	8.775	9.377	10.171	7.269	9.916	7.688	10.335	7.707	8.501	9.103	9.897						
N+3.20	B60	3.56	3.56	VIG15X45	0.15	0.40	27.56	0.19	1.58	1	-1.58	-3.3	33.659	32.991	33.387	32.719	33.574	33.373	32.665	32.464	25.201	24.533	24.929	24.261	25.116	24.915	24.207	24.006	33.7	0.10	178.92	34.37	213.29	OK
	B61	0					0.4	0.19	1.58	1	-1.58	-1	1.067	0.399	0.941	0.273	0.982	0.781	0.559	0.358	0.757	0.089	0.631	0.037	0.672	0.471	0.249	0.048						
N+6.35	B61	1.84	1.84	VIG15X45	0.15	0.40	3.33	0.43	2.22	1.14	-2.22	-1	4.968	4.029	4.832	3.893	4.808	4.526	4.355	4.074	3.539	2.600	3.403	2.464	3.379	3.097	2.926	2.645	5.0	0.10	178.92	34.37	213.29	OK
	B61	0					0.32	4.66	2.22	1.14	-2.22	-1.14	5.586	4.647	5.441	4.502	5.426	5.144	4.944	4.662	0.830	0.109	0.685	0.254	0.670	0.388	0.188	0.094						
N+3.20	B61	1.84	1.84	VIG15X45	0.15	0.40	6.9	-0.13	4.5	4.04	-4.5	-1.14	9.358	7.455	9.029	7.126	9.290	8.719	8.194	7.624	7.418	5.515	7.089	5.186	7.350	6.779	6.254	5.684	9.4	0.10	178.92	34.37	213.29	OK
	B62	0					-2.12	-0.13	4.5	4.04	-4.5	-4.04	1.466	3.369	1.979	3.882	1.534	2.105	3.243	3.814	0.700	2.603	1.213	3.116	0.768	1.339	2.477	3.048						
N+6.35	B62	3.08	3.08	VIG15X45	0.15	0.40	2.78	-4.83	11.3	6.98	-11.3	-4.04	1.338	3.440	0.639	4.139	0.698	0.735	1.631	3.065	5.334	0.556	4.635	0.143	4.694	3.261	2.365	0.931	5.3	0.10	178.92	34.37	213.29	OK
	B62	0					-14.96	5.94	11.3	6.98	-11.3	-6.98	9.180	13.958	10.066	14.844	9.820	11.253	12.771	14.204	10.632	15.410	11.518	16.296	11.272	12.705	14.223	15.656						
N+3.20	B62	3.08	3.08	VIG15X45	0.15	0.40	18.45	-8.3	5.64	6.32	-5.64	-6.98	15.433	13.048	14.590	12.205	15.534	14.818	12.722	12.007	18.198	15.813	17.355	14.970	18.299	17.583	15.487	14.772	18.3	0.10	178.92	34.37	213.29	OK
	B63	0					-22.67	1.89	5.64	6.32	-5.64	-6.32	23.721	26.106	24.522	26.907	23.620	24.336	26.292	27.008	18.810	21.195	19.611	21.996	18.709	19.425	21.381	22.097						
N+3.20	B63	2.97	2.97	VIG15X45	0.15	0.40	9.37	-0.66	3.58	4.78	-3.58	-6.32	11.644	10.130	10.940	9.426	11.822	11.368	9.475	9.021	9.493	7.979	8.789	7.275	9.671	9.217	7.324	6.870	27.0	0.10	178.92	34.37	213.29	OK
	B64	0					-5.68	9.58	3.58	4.78	-3.58	-4.78	3.824	2.310	3.218	1.704	4.002	3.548	1.980	1.526	4.052	5.566	4.658	6.172	3.874	4.328	5.896	6.350						
N+3.20	B64	2.98	2.98	VIG15X45	0.15	0.40	26.49	-12.47	3.34	4.66	-3.34	-4.78	20.320	18.907	19.721	18.309	20.515	20.091	18.519	18.096	24.843	23.430	24.244	22.832	25.038	24.614	23.042	22.619	25.0	0.10	178.92	34.37	213.29	OK
	B65	0					-32.96	2.02	3.34	4.66	-3.34	-4.66	36.530	37.943	37.121	38.534	36.335	36.759	38.305	38.729	28.662	30.075	29.253	30.666	28.467	28.891	30.437	30.861						
N+3.20	B65	3.77	3.77	VIG15X45	0.15	0.40	9.05	-1.73	2.98	3.22	-2.98	-4.66	9.964	8.704	9.464	8.204	10.000	9.622	8.334	7.956	8.979	7.719	8.479	7.219	9.015	8.637	7.349	6.971	38.7	0.10	178.92	34.37	213.29	OK
	B66	0					-8.37	12.81	2.98	3.22	-2.98	-3.22	3.600	2.340	3.192	1.932	3.636	3.258	2.274	1.896	6.699	7.959	7.107	8.367	6.663	7.041	8.025	8.403						
N+3.20	B66	3.78	3.78	VIG15X45	0.15	0.40	33.77	-11.44	3.62	4.46	-3.62	-3.22	30.132	28.602	29.645	28.114	30.257	29.797	28.633	28.174	31.441	29.911	30.954	29.423	31.566	31.106	29.942	29.483	31.6	0.10	178.92	34.37	213.29	OK
	B67	0					-30.74	1.54	3.62	4.46	-3.62	-4.46	34.300	35.830	34.866	36.396	34.175	34.635	36.061	36.521	26.618	28.148	27.184	28.714	26.493	26.953	28.379	28.839						
N+3.20	B67	3.49	3.49	VIG15X45	0.15	0.40	7.78	-1.54	3.8	3.44	-3.8	-4.46	8.818	7.211	8.317	6.710	8.764	8.282	7.094	6.612	8.024	6.417	7.523	5.916	7.970	7.488	6.300	5.818	36.5	0.10	178.92	34.37	213.29	OK
	B68	0					-8.18	11.44	3.8	3.44	-3.8	-3.44	2.646	1.039	2.209	0.602	2.592	2.110	1.138	0.656	6.340	7.947	6.777	8.384	6.394	6.876	7.848	8.330						
N+3.20	B68	3.49	3.49	VIG15X45	0.15	0.40	30.34	-11.81	3.04	3.58	-3.04	-3.44	25.468	24.182	25.023	23.737	25.548	25.162	24.064	23.678	28.176	26.890	27.731	26.445	28.256	27.870	26.772	26.386	28.3	0.10	178.92	34.37	213.29	OK
	B69	0					-31.27	1.66	3.04	3.58	-3.04	-3.58	34.994	36.280	35.448	36.734	34.914	35.300	36.428	36.814	27.273	28.559	27.727	29.013	27.193	27.579	28.707	29.093						
N+3.20	B69	3.58	3.58	VIG15X45	0.15	0.40	8.37	-1.52	3.74	3.32	-3.74	-3.58	9.525	7.944	9.088	7.506	9.463	8.989	8.004	7.530	8.534	6.953	8.097	6.515	8.472	7.998	7.013	6.539	36.8	0.10	178.92	34.37	213.29	OK
	B70	0					-7.91	12	3.74	3.32	-3.74	-3.32	3.509	1.928	3.088	1.507	3.447	2.973	2.043	1.569	6.118	7.699	6.539	8.120	6.180	6.654	7.584	8.058						
N+3.20	B70	3.59	3.59	VIG15X45	0.15	0.40	31.86	-12.49	3.86	3.44	-3.86	-3.32	26.776	25.144	26.347	24.715	26.714	26.224	25.285	24.795	29.708	28.076	29.279	27.647	29.646	29.156	28.217	27.727	29.7	0.10	178.92	34.37	213.29	OK
	B71	0					-32.99	0.76	3.86	3.44	-3.86	-3.44	37.794	39.426	38.230	39.862	37.856	38.346	39.310	39.800	28.657	30.289	29.093	30.725	28.719	29.209	30.173	30.663						
N+3.20	B71	3.54	3.54	VIG15X45	0.15	0.40	6.16	-2.49	5.72	3.2	-5.72	-3.44	6.314	3.896	5.893	3.475	5.941	5.216	4.538	3.812	6.956	4.538	6.535	4.117	6.583	5.858	5.180	4.454	39.9	0.10	178.92	34.37	213.29	OK
	B72	0					-10.81	10.87	5.72	3.2	-5.72	-3.2	0.690	3.108	1.096	3.514	1.063	1.788	2.416	3.141	8.317	10.735	8.723	11.141	8.690	9.415	10.043	10.768						
N+3.20	B72	3.56	3.56	VIG15X45	0.15	0.40	28.58	-8.93	7.04	0.42	-7.04	-3.2	26.881	23.904	26.651	23.675	25.901	25.008	25.136	24.243	27.237	24.260	27.007	24.031	26.257	25.364	25.492	24.599	27.2	0.10	178.92	34.37	213.29	OK
	B73	0					-31.35	11.11	5.58	1.14	-5.58	-0.42	25.258	27.617	25.357	27.716	25.915	26.623	26.245	26.953	26.963	29.322	27.062	29.421	27.620	28.328	27.950	28.658						
N+3.20	B73	5.95	5.95	VIG20X45	0.20	0.40	40.89	-13.61	3.5	0.42	-3.5	-1.14	36.225	34.745	36.126	34.646	35.769	35.325	35.439	34.995	37.568	36.088	37.469	35.989	37.112	36.668	36.782	36.338	37.6	0.10	178.92	45.83	224.75	OK
	B74	0					-49.85	14.01	3.52	0.54	-3.52	-0.42	45.032	46.520	45.092	46.581	45.473	45.919	45.676	46.122	44.087	45.575	44.147	45.636	44.528	44.974	44.731	45.177						
N+3.20	B74	7.55	7.55	VIG20X45	0.20	0.40	51.07	-12.81	4.16	0.42	-4.16	-0.54	49.380	47.621	49.319	47.560	48.827	48.299	48.624	48.096	46.869	45.110	46.808	45.049	46.316	45.788	46.113	45.585	49.4	0.10	178.92	45.83	224.75	OK
	B75	0					-46.72	12.58	4.2	0.54	-4.2	-0.42	42.562	44.338	42.623	44.399	43.103	43.636	43.306	43.839	41.126	42.902	41.187	42.963	41.667	42.200	41.870	42.403						
N+3.20	B75	6.98	6.98	VIG20X45	0.20	0.40	45.62	-12.94	3.78	0.42	-3.78	-0.54	42.630	41.031	42.569	40.971	42.133	41.653	41.930	41.450	41.884	40.285	41.823	40.225	41.387	40.907	41.184	40.704	44.4	0.10	178.92	45.83	224.75	OK
	B76	0					-47.14	13.11	3.74	0.46	-3.74	-0.42	42.638	44.220	42.694	44.275	43.124	43.598	43.310	43.784	41.606	43.188	41.662	43.243	42.092	42.566	42.278	42.752						
N+3.20	B76	7.17	7.17	VIG20X45	0.20	0.40	48.06	-13.75	5	0.5	-5	-0.46	45.011	42.897	44.950	42.836	44.345	43.711	44.142	43.508	44.343	42.229	44.282	42.168	43.677	43.043	43.474	42.840	45.0	0.10	178.92	45.83	224.75	OK
	B77	0					-49.78	11.52	6.16	0.46	-6.16	-0.5	46.884	49.489	46.945	49.550	47.728	48.509	47.931	48.712	43.470	46.075	43.531	46.136	44.314	45.095	44.517	45.298						
N+3.20	B77	7.1	7.1	VIG20X45	0.20	0.40	41.21	2.79	3.72	1.12	-3.72	-0.46	53.100	51.527	52.999	51.426	52.715	52.243	52.381	51.909	37.947	36.374	37.846	36.273	37.562	37.090	37.228	36.756	53.1	0.10	178.92	45.83	224.75	OK
	B78	0					-2.94	2.79	3.72	1.12	-3.72	-1.12	0.120	1.453	0.023	1.596	0.265	0.737	0.739	1.211	1.788	3.361	1.931	3.504	2.173	2.645	2.647	3.119						
N+6.35	B78	5.95	5.95	VIG15X45	0.15	0.40	6.53	-18.45	0.46	5.26	-0.46	-1.12	10.183	10.378	10.588	10.782	9.473	9.531	10.822	10.880	6.308	6.113	5.903	5.709	7.018	6.960	5.669	5.611	10.9	0.10	178.92	34.37	213.29	OK
	B79	0					-14.99	18.45	1.84	2.14	-1.84	-5.26	0.987	0.209	0.517	0.261	1.031	0.798	0.533	0.767	12.966	13.744	13.436	14.214	12.922	13.155	14.486	14.720						
N+6.35	B79	7.55	7.55	VIG15X45	0.15	0.40	14.94	-2.5	2.16	1.1	-2.16	-2.14	15.954	15.041	15.749	14.836	15.798	15.524	15.113	14.839	13.972	13.059	13.767	12.854	13.816	13.542	13.131	12.857	16.0	0.10	178.92	34.37	213.29	OK
	B81	0					-6.98	-2.5	2.16	1.1	-2.16	-1.1	10.350	11.263	10.489	11.402	10.506	10.780	10.972	11.246	5.756	6.669	5.895	6.808	5.912	6.186	6.378	6.652						
N+6.35	B81	6.98	6.98	VIG15X45	0.15	0.40	4.12	0.33	2	0.78	-2	-1.1	5.746	4.901	5.627	4.781	5.566	5.312	5.168	4.915	4.180	3.335	4.061	3.215	4.000	3.746	3.602	3.349	11.4	0.10	178.92	34.37	213.29	OK
	B82	0					-5.57	0.33	2	0.78	-2	-0.78	5.882	6.727	5.981	6.826	6.062	6.316	6.392	6.646	4.541	5.386	4.640	5.485	4.721	4.975	5.051	5.305						
N+6.35	B82	7.17	7.17	VIG15X45	0.15	0.40	5.83	-0.04	2.9	1.14	-2.9	-0.78	7.641	6.415	7.520	6.293	7.381	7.013	6.975	6.607	5.932	4.706	5.811	4.584	5.672	5.304	5.266	4.898	7.6	0.10	178.92	34.37	213.29	OK
	B83	0					-6.09	-0.04	2.9	1.14	-2.9	-1.14	6.663	7.889	6.807	8.033	6.923	7.291	7.405	7.773	4.796	6.022	4.940	6.166	5.056	5.424	5.538	5.906						
N+6.35	B83	7.1	7.1	VIG15X45	0.15	0.40	5.2	0.35	1.82	0.32	-1.82	-1.14	6.995	6.226	6.902	6.133	6.773	6.542	6.464	6.234	5.085	4.316	4.992	4.223	4.863	4.632	4.554	4.324	8.0	0.10	178.92	34.37	213.29	OK
	B84	0					-4.27	0.35	1.82	0.32	-1.82	-0.32	4.369	5.138	4.410	5.179	4.591	4.822	4.726	4.957	3.438	4.207	3.479	4.248	3.660	3.891	3.795	4.026						
N+6.35	B84	5.95	5.95	VIG15X45	0.15	0.40	5.19	-0.01	1.26	0.42	-1.26	-0.32	6.511	5.978	6.464	5.931	6.387	6.227	6.230	6.070	4.964	4.431	4.917	4.384	4.840	4.680	4.683	4.523	6.5	0.10	178.92	34.37	213.29	OK
	B85	0					-5.9	-0.01	1.26	0.42	-1.26	-0.42	6.797	7.330	6.850	7.383	6.921	7.081	7.099	7.259	5.017	5.550	5.070	5.603	5.141	5.301	5.319	5.479						
N+6.35	B85	7.55	7.55	VIG15X45	0.15	0.40	6.11	-0.29	1.42	0.48	-1.42	-0.42	7.373	6.772	7.316	6.715	7.234	7.053	7.043	6.863	5.830	5.229	5.773	5.172	5.691	5.510	5.500	5.320	7.4	0.10	178.92	34.37	213.29	OK
	B86	0					-5.78	-0.29	1.42	0.48	-1.42	-0.48	6.895	7.496	6.956	7.557	7.034	7.215	7.237	7.418	4.871	5.472	4.932	5.533	5.010	5.191	5.213	5.394						
N+6.35	B86	6.98	6.98	VIG15X45	0.15	0.40	5.32	0.05	1.34	0.44	-1.34	-0.48	6.745	6.179	6.687	6.120	6.612	6.442	6.418	6.248	5.099	4.533	5.041	4.474	4.966	4.796	4.772	4.602	7.6	0.10	178.92	34.37	213.29	OK
	B87	0					-5.64	0.05	1.34	0.44	-1.34	-0.44	6.407	6.973	6.463	7.029	6.540	6.710	6.726	6.896	4.765	5.331	4.821	5.387	4.898	5.068	5.084	5.254						
N+6.35	B87	7.17	7.17	VIG15X45	0.15	0.40	5.76	0.09	2.02	0.64	-2.02	-0.44	7.470	6.616	7.401	6.547	7.265	7.009	7.037	6.781	5.652	4.798	5.583	4.729	5.447	5.191	5.219	4.963	7.5	0.10	178.92	34.37	213.29	OK
	B88	0					-5.99	0.09	2.02	0.64	-2.02	-0.64	6.630	7.484	6.712	7.566	6.835	7.091	7.105	7.361	4.923	5.777	5.005	5.859	5.128	5.384	5.398	5.654						
N+6.35	B88	7.1	7.1	VIG15X45	0.15	0.40	5.31	-19.97	0.76	4.34	-0.76	-0.64	13.162	13.483	13.478	13.799	12.632	12.729	13.685	13.782	5.215	4.894	4.899	4.578	5.745	5.648	4.692	4.595	13.8	0.10	178.92	34.37	213.29	OK

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA VIGAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.1 (b)

f'c = 21.0 MPa
fy = 420 MPa
Φ Cortante = 0.75
Estribos Φ = 9.5 mm
Av = 71 mm²
R= 4.73

2VE = Cortante maximo obtenido de las combinaciones de carga de diseño que incluyan E, considerando E, como el doble del prescrito por el reglamento general legalmente adoptado para diseño sismico vigente.

COMDIS3 = 1.2C.M.+1.0C.V.+(2*(1.0Ex))+(2*(0.3Ey))
COMDIS4 = 1.2C.M.+1.0C.V.+(2*(1.0(-Ex)))+(2*(0.3Ey)))
COMDIS5 = 1.2C.M.+1.0C.V.+(2*(1.0Ex))+(2*(0.3(-Ey)))
COMDIS6 = 1.2C.M.+1.0C.V.+(2*(1.0(-Ex)))+(2*(0.3(-Ey)))
COMDIS7 = 1.2C.M.+1.0C.V.+(2*(0.3Ex))+(2*(1.0Ey))
COMDIS8 = 1.2C.M.+1.0C.V.+(2*(0.3(-Ex)))+(2*(1.0Ey))

COMDIS9 = 1.2C.M.+1.0C.V.+(2*(0.3Ex))+(2*(1.0(-Ey)))
COMDIS10 = 1.2C.M.+1.0C.V.+(2*(0.3(-Ex)))+(2*(1.0(-Ey)))
COMDIS11 = 0.9C.M.+(2*(1.0Ex))+(2*(0.3Ey))
COMDIS12 = 0.9C.M.+(2*(1.0(-Ex)))+(2*(0.3Ey))
COMDIS13 = 0.9C.M.+(2*(1.0Ex))+(2*(0.3(-Ey)))
COMDIS14 = 0.9C.M.+(2*(1.0(-Ex)))+(2*(0.3(-Ey)))

COMDIS15 = 0.9C.M.+(2*(0.3Ex))+(2*(1.0Ey))
COMDIS16 = 0.9C.M.+(2*(0.3(-Ex)))+(2*(1.0Ey))
COMDIS17 = 0.9C.M.+(2*(0.3Ex))+(2*(1.0(-Ey)))
COMDIS17 = 0.9C.M.+(2*(0.3(-Ex)))+(2*(1.0(-Ey)))

NIVEL	VIGA	LOC.	LONG.	PROPIEDADES DEL ELEMENTO			V2						2Vε Combinaciones de carga de diseño para el doble del cortante donde se incluya E																$2V_{E\,max}$	S	ΦVs	ΦVc	ΦVn	ΦVn > $2V_{Emax}$
	ELEMENTO						C.M.	C.V.	SISMO X	SISMO Y	-SISMO X	-SISMO Y																					
	No.	(m)	(m)	SECCION	b (m)	d (m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	(KN.m)	COMBDIS3	COMBDIS4	COMBDIS5	COMBDIS6	COMBDIS7	COMBDIS8	COMBDIS9	COMBDIS10	COMBDIS11	COMBDIS12	COMBDIS13	COMBDIS14	COMBDIS15	COMBDIS16	COMBDIS17	COMBDIS18	(kN)	(m)	(kN)	(kN)	(kN)	
N+6.35	B94	0	3.25	VIG25X45	0.25	0.40	-11.28	31.77	0.76	4.34	-0.76	-4.34	18.670	18.349	18.119	17.798	19.200	19.103	17.365	17.268	9.716	10.037	10.267	10.588	9.186	9.283	11.021	11.118	27.8	**0.10**	178.92	57.28	236.20	OK
	B94	3.25					21.23	0.65	1.8	7.24	-1.8	-4.34	26.966	26.205	26.231	25.470	27.771	27.542	25.323	25.094	19.947	19.186	19.212	18.451	20.752	20.523	18.304	18.075						
N+6.35	B95	0	0.98	VIG25X45	0.25	0.40	-1.42	5.35	1.8	7.24	-1.8	-7.24	4.486	3.725	3.567	2.806	5.291	5.062	2.230	2.001	0.438	1.199	1.357	2.118	0.367	0.138	2.694	2.923	10.4	**0.10**	178.92	57.28	236.20	OK
	B95	0.98					3.35	-12.7	3.38	19.62	-3.38	-7.24	6.721	8.150	8.425	9.854	4.318	4.746	9.996	10.425	4.974	3.545	3.270	1.841	7.377	6.949	1.699	1.270						
N+3.20	B96	0	3.45	VIG20X45	0.20	0.40	-46.61	-1.02	3.38	19.62	-3.38	-19.62	54.993	56.422	57.482	58.911	52.590	53.018	60.886	61.314	39.990	41.419	42.479	43.908	37.587	38.015	45.883	46.311	61.3	**0.10**	178.92	45.83	224.75	OK
	B96	3.45					-2.56	-3.35	2.12	18.4	-2.12	-19.62	4.807	5.703	7.218	8.115	2.397	2.666	10.436	10.704	0.689	1.585	3.100	3.997	1.721	1.452	6.318	6.586						
N+3.20	B97	0	3.45	VIG20X45	0.20	0.40	-6.51	8.32	2.12	18.4	-2.12	-18.4	2.123	1.227	0.211	1.107	4.533	4.264	3.248	3.517	4.244	5.140	6.578	7.474	1.834	2.103	9.615	9.884	36.9	**0.10**	178.92	45.83	224.75	OK
	B97	3.45					37.54	-14.04	0.86	14.42	-0.86	-18.4	32.104	31.741	30.023	29.659	34.111	34.002	27.172	27.063	34.882	34.519	32.801	32.437	36.889	36.780	29.950	29.841						
N+3.20	B98	0	3.45	VIG20X45	0.20	0.40	-51.07	-2.14	0.86	14.42	-0.86	-14.42	62.328	62.691	64.157	64.520	60.321	60.430	66.418	66.527	44.867	45.230	46.696	47.059	42.860	42.969	48.957	49.066	66.5	**0.10**	178.92	45.83	224.75	OK
	B98	3.45					-6.32	-1.46	0.84	13.52	-0.84	-14.42	8.009	8.364	9.781	10.136	6.132	6.239	12.039	12.146	4.653	5.008	6.425	6.780	2.776	2.883	8.683	8.790						
N+3.20	B99	0	3.45	VIG20X45	0.20	0.40	-2.24	10.44	0.84	13.52	-0.84	-13.52	8.787	8.432	7.072	6.717	10.664	10.557	4.947	4.840	0.981	1.336	2.696	3.051	0.896	0.789	4.821	4.928	41.0	**0.10**	178.92	45.83	224.75	OK
	B99	3.45					42.51	-13.46	0.5	12.66	-0.5	-13.52	38.461	38.249	36.800	36.589	40.260	40.197	34.725	34.662	39.168	38.956	37.507	37.296	40.967	40.904	35.432	35.369						
N+3.20	B100	0	3.45	VIG20X45	0.20	0.40	-48.56	-1.56	0.5	12.66	-0.5	-12.66	58.923	59.135	60.529	60.741	57.124	57.187	62.477	62.540	42.795	43.007	44.401	44.613	40.996	41.059	46.349	46.412	62.5	**0.10**	178.92	45.83	224.75	OK
	B100	3.45					-3.81	-2.59	0.46	11.82	-0.46	-12.66	6.315	6.510	7.868	8.062	4.634	4.692	9.809	9.868	2.582	2.777	4.135	4.329	0.901	0.959	6.076	6.135						
N+3.20	B101	0	3.45	VIG20X45	0.20	0.40	-4.73	9.31	0.46	11.82	-0.46	-11.82	4.481	4.286	2.982	2.787	6.162	6.104	1.164	1.106	3.410	3.605	4.909	5.104	1.729	1.787	6.727	6.785	38.7	**0.10**	178.92	45.83	224.75	OK
	B101	3.45					40.02	-13.57	1.8	12.18	-1.8	-11.82	35.607	34.846	34.085	33.324	37.143	36.915	32.069	31.841	37.171	36.410	35.649	34.888	38.707	38.479	33.633	33.405						
N+3.20	B102	0	3.45	VIG20X45	0.20	0.40	-49.16	-1.67	1.8	12.18	-1.8	-12.18	59.509	60.270	61.054	61.815	57.973	58.201	63.123	63.351	43.091	43.852	44.636	45.397	41.555	41.783	46.705	46.933	63.4	**0.10**	178.92	45.83	224.75	OK
	B102	3.45					-4.41	-2.05	1.74	11.4	-1.74	-12.18	6.251	6.987	7.747	8.482	4.821	5.042	9.807	10.027	2.878	3.614	4.374	5.109	1.448	1.669	6.434	6.654						
N+3.20	B103	0	3.45	VIG20X45	0.20	0.40	-3.67	9.85	1.74	11.4	-1.74	-11.4	6.537	5.801	5.091	4.355	7.967	7.746	3.146	2.925	2.212	2.948	3.658	4.394	0.782	1.003	5.603	5.824	39.8	**0.10**	178.92	45.83	224.75	OK
	B103	3.45					41.09	-13.5	3.56	12.24	-3.56	-11.4	37.337	35.832	35.838	34.332	38.622	38.170	33.624	33.172	38.510	37.005	37.011	35.505	39.795	39.343	34.797	34.345						
N+3.20	B104	0	3.45	VIG20X45	0.20	0.40	-50.1	-1.6	3.56	12.24	-3.56	-12.24	60.191	61.696	61.744	63.249	58.906	59.358	64.082	64.534	43.561	45.066	45.114	46.619	42.276	42.728	47.452	47.904	64.5	**0.10**	178.92	45.83	224.75	OK
	B104	3.45					-5.35	-1.68	2.66	11.5	-2.66	-12.24	6.808	7.933	8.314	9.439	5.500	5.837	10.519	10.856	3.523	4.648	5.029	6.154	2.215	2.552	7.234	7.571						
N+3.20	B105	0	3.45	VIG20X45	0.20	0.40	-2.06	10.22	2.66	11.5	-2.66	-11.5	9.040	7.915	7.581	6.456	10.348	10.011	5.485	5.148	0.562	1.687	2.021	3.146	0.746	0.409	4.117	4.454	39.3	**0.10**	178.92	45.83	224.75	OK
	B105	3.45					42.69	-39	3.46	2.34	-3.46	-11.5	13.108	11.645	12.230	10.767	12.942	12.503	10.016	9.577	39.301	37.838	38.423	36.960	39.135	38.696	36.209	35.770						
N+6.35	B116	0	7.55	VIG25X45	0.25	0.40	-28.16	41.65	4.04	1.4	-4.04	-2.34	8.801	7.093	8.564	6.855	8.410	7.898	7.620	7.107	24.401	26.109	24.638	26.347	24.792	25.304	25.582	26.095	35.3	**0.10**	178.92	57.28	236.20	OK
	B116	7.55					29.4	0	0	0	0	-1.4	35.280	35.280	35.191	35.191	35.280	35.280	34.984	34.984	26.460	26.460	26.371	26.371	26.460	26.460	26.164	26.164						

VERIFICACIONES DE CORTANTE PARA COLUMNAS

C.21.3.3.2 (a)

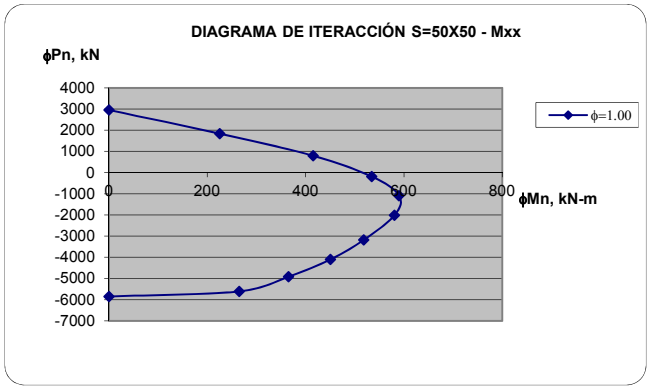
C.21.3.3.2 (b)

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA COLUMNAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.2 (a) - COLUMNA S=50X50 (8#6+4#7)

f'c =	**21.0**	MPa	**Estribos Φ =**	**9.5**	mm
fy =	**420**	MPa	**Av =**	**71**	mm^2
$\Phi_{Cortante}$ =	**0.75**		**Cantidad de ramas =**	**4**	
bx =	**0.50**	m	**S =**	**0.10**	m
by =	**0.50**	m	**Recub. =**	**0.05**	m
Lcol =	**6.35**	m			

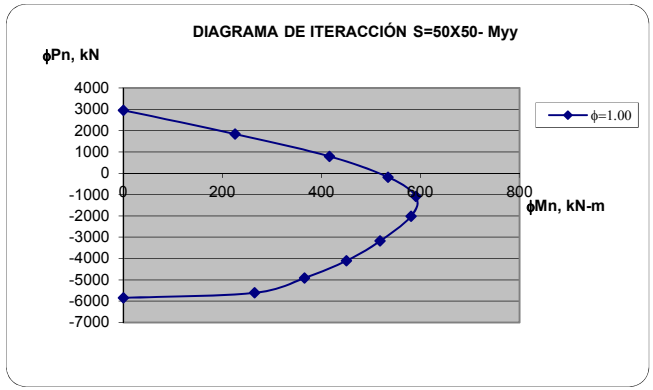
C.21.3.3.2(a) El cortante ΦVn no debe ser menor que la suma del cortante debido a flexión en curvatura inversa asociado con el desarrollo de los momentos nominales de la columna en cada extremo restringido de la longitud libre.

DATOS PARA LOS DIAGRAMAS DE ITERACCIÓN			
No.	**Curve 1**	**0. degrees**	
	P	**M3**	**M2**
1	-5852.00	0.00	0.00
2	-5614.00	264.83	0.00
3	-4918.00	365.50	0.00
4	-4104.00	450.44	0.00
5	-3181.00	518.36	0.00
6	-2015.00	580.91	0.00
7	-1088.00	590.14	0.00
8	-184.36	534.37	0.00
9	791.87	415.69	0.00
10	1836.70	225.66	0.00
11	2953.54	0.00	0.00



P_{ua} =	-832.13	**kN**
P_{ub} =	-809.51	**kN**
ΦM_{na} =	574.35	**kN-m**
ΦM_{nb} =	572.95	**kN-m**
$V_{umáx}$ =	180.68	**kN**
ΦV_s =	402.57	**kN**
ΦV_c =	128.88	**kN**
ΦV_n =	531.45	**kN**
$\Phi V_n > V_{umáx}$ =	OK	

DATOS PARA LOS DIAGRAMAS DE ITERACCIÓN			
No.	**Curve 7**	**90. degrees**	
	P	**M3**	**M2**
1	-5852.00	0.00	0.00
2	-5614.00	0.00	264.83
3	-4918.00	0.00	365.50
4	-4104.00	0.00	450.44
5	-3181.00	0.00	518.36
6	-2015.00	0.00	580.91
7	-1088.00	0.00	590.14
8	-184.36	0.00	534.37
9	791.87	0.00	415.69
10	1836.70	0.00	225.66
11	2953.54	0.00	0.00



P_{ua} =	-866.58	**kN**
P_{ub} =	-843.96	**kN**
ΦM_{na} =	576.48	**kN-m**
ΦM_{nb} =	575.08	**kN-m**
$V_{umáx}$ =	181.35	**kN**
ΦV_s =	402.57	**kN**
ΦV_c =	128.88	**kN**
ΦV_n =	531.45	**kN**
$\Phi V_n > V_{umáx}$ =	OK	

Diseños & Estructuras

PROYECTO: INSTITUCIÓN EDUCATIVA SAN JUAN
RESISTENCIA A CORTANTE PARA COLUMNAS
CHEQUEO PARA LA CONDICIÓN DESCRITA EN C.21.3.3.2 (b)

f'c =	**21.0**	MPa	**Estribos Φ =**	**9.5**	mm
fy =	**420**	MPa	**Av =**	**71**	mm^2
$\Phi_{Cortante}$ =	**0.75**		**Cantidad de ramas =**	**4**	
bx =	**0.50**	m	**S =**	**0.10**	m
by =	**0.50**	m	**Ω_o=**	**3.00**	
			Recub. =	**0.05**	m

C.21.3.3.2(b) El cortante ΦVn no debe ser menor que el cortante maximo obtenido de las combinaciones de carga de diseño que incluyan E, con E incrementado por medio de Ωo.

Para cortante V2

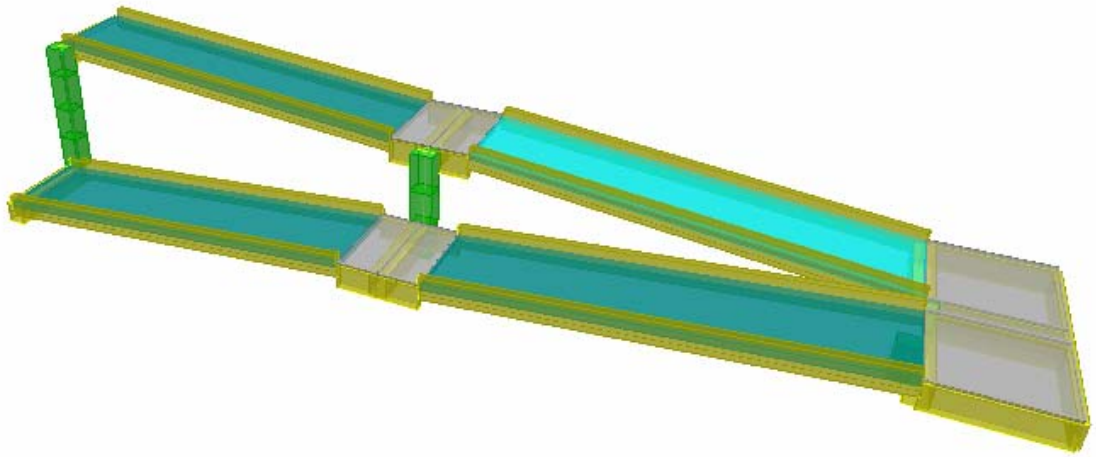
Ω_o*$V_{umáx}$ =	281.87	**kN**
ΦV_s =	402.57	**kN**
ΦV_c =	128.88	**kN**
ΦV_n =	531.45	**kN**
$\Phi V_n > \Omega_o$*$V_{umáx}$ =	OK	

Para cortante V3

Ω_o*$V_{umáx}$ =	292.97	**kN**
ΦV_s =	402.57	**kN**
ΦV_c =	128.88	**kN**
ΦV_n =	531.45	**kN**
$\Phi V_n > \Omega_o$*$V_{umáx}$ =	OK	

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN - RAMPA (IPIALES, NARIÑO)

dye16-2264



MEMORIAS DE ANÁLISIS Y DISEÑO ESTRUCTURAL

Bogotá D.C. 18 DE NOVIEMBRE DE 2016

1. DESCRIPCIÓN DEL PROYECTO

1.1. INTRODUCCIÓN

El presente documento contiene las memorias de análisis y diseño estructural correspondiente al proyecto ***INSTITUCION EDUCATIVA SAN JUAN - RAMPA*** ubicado en IPIALES (NARIÑO)

1.2. DESCRIPCIÓN ARQUITECTÓNICA

El proyecto se encuentra ubicado en un lote de 380m² de área aproximadamente, en la cual se contempla la construcción un edificio de dos niveles, que funcionarán como colegio.

1.3. DESCRIPCIÓN SISTEMA ESTRUCTURAL

El proyecto se soluciona mediante la construcción de una estructura aporticada en concreto, con placa maciza y vigas descolgadas. Se manejan luces que varían entre 2.00m y 9.50m en los dos sentidos de la estructura.

Para el análisis se empleó el programa de computador ***ETABS v.9.7.4.***, el cual tiene en cuenta los efectos de segundo orden. Las consideraciones sísmicas empleadas en el análisis estructural del proyecto son las siguientes:

Para la Rampa Peatonal:

- ✓ Método de análisis: ***Análisis Modal***
- ✓ Zona de amenaza sísmica: ***Alta***
- ✓ Capacidad de disipación de energía: ***Especial***
- ✓ Coeficiente de disipación de energía: $R_0 = 1.50$

Las cargas horizontales fueron distribuidas entre los diferentes pórticos en proporción a su rigidez y teniendo en cuenta los efectos de torsión.

El dimensionamiento dado a todos los elementos que intervienen en las estructuras satisfacen los requerimientos de solicitación ocasionados por las derivas presentes. Las cargas vivas de diseño son: **5.00kN/m²** para placa maciza.

Para la cimentación se siguieron las recomendaciones descritas en el respectivo estudio de suelos, que recomienda apoyar las estructuras mediante zapatas.

El diseño de todas las estructuras se realizó basado en la Norma Colombiana de Diseño y Construcción Sismo Resistente Ley 400 de 1997 (Modificada Ley 1229 de 2008) y Decreto 926 de Marzo de 2010, en el Decreto 411.20.0158 de Marzo 18 de 2014 (Microzonificación Sísmica de Santiago de Cali) y en el Reglamento para Concreto Estructural ACI 318S-11.

1.4. MATERIALES

Los materiales utilizados son:

Concreto	21.1 MPa para Dados, pilotes, vigas de cimentación, entrepiso y cubierta, placas macizas.
Concreto	28 MPa para columnas.
Concreto	14 MPa (para concreto de limpieza).
Acero fy = 420 MPa	para todos los diámetros.

Atentamente:

EDGAR ROLANDO BARRERA
ING. ESTRUCTURAL
T.P. 15202-102710 BYC

JAIR USECHE MACÍAS
ING. ESTRUCTURAL
T.P. 25202-56174 CND

MEMORIAL DE RESPONSABILIDAD

Ipiales, 18 de Noviembre 2016

Señores
PLANEACIÓN MUNICIPAL
La Ciudad

Yo, **EDGAR ROLANDO BARRERA,** ingeniero civil con Matrícula Profesional Nº **15202-102710** de **BOYACÁ,** y Yo, **JAIR USECHE MACÍAS,** ingeniero civil con Matrícula Profesional Nº **25202-56174** de **CUNDINAMARCA** debidamente registrados en el consejo profesional de Ingeniería y Arquitectura de Boyacá y Cundinamarca, presentamos los Cálculos y Diseños Estructurales elaborados de acuerdo a los requerimientos de la **NORMA COLOMBIANA DE DISEÑO Y CONSTRUCCIÓN SISMO RESISTENTE LEY 400 DE 1997 (MODIFICADA LEY 1229 DE 2008) Y DECRETO 926 DE MARZO DE 2010**, para el proyecto **INSTITUCION EDUCATIVA SAN JUAN - RAMPA** ubicado en IPIALES (NARIÑO) Declaro que asumo la responsabilidad por los perjuicios que causa de ellos puedan deducirse, exonerando a esta PLANEACIÓN MUNICIPAL de cualquier responsabilidad.

Acepto y reconozco que la revisión efectuada por esta CURADURÍA URBANA no constituye una aprobación al Diseño Estructural, sino una verificación del cumplimiento de la **NORMA COLOMBIANA DE DISEÑO Y CONSTRUCCIÓN SISMO RESISTENTE**.

Atentamente,

EDGAR ROLANDO BARRERA
ING. ESTRUCTURAL
T.P. 15202-102710 BYC

JAIR USECHE MACÍAS
ING. ESTRUCTURAL
T.P. 25202-56174 CND


REPUBLICA DE COLOMBIA
Consejo Profesional Nacional de Ingeniería y Arquitectura
MATRICULA No. 2520256174CND
INGENIERO CIVIL
DE FECHA 27/07/95
APELLIDOS
USECHE MACIAS
NOMBRES
JAIR
C.C 19,428,425
UNIV. NACIONAL - BOGOTA

2. AVALÚO DE CARGAS

AVALÚO DE CARGAS

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN - RAMPA

AVALUO DE CARGAS

1. PLACA MACIZA RAMPA

Placa Maciza e=0.10m	0.10x24		2.40 kN/m²
Impermeabilización	20x0.05		1.00 kN/m²
		CM	3.40 kN/m²
		CV	5.00 kN/m²
		CR	8.40 kN/m²

CU = 1.2x3.4+1.6x5 = ***12.1 kN/m²***

Espesor de placa equivalente:

e=CM/24 0.142 m

3. ANÁLISIS SÍSMICO

FUERZA HORIZONTAL EQUIVALENTE
CÁLCULO DE DERIVAS MÁXIMAS
VERIFICACIÓN DE IRREGULARIDAD TORSIONAL

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN - RAMPA
ANÁLISIS SÍSMICO (ESPECTRO DE DISEÑO NSR-10)

ZONA DE AMENAZA SÍSMICA
ALTA

EFECTOS LOCALES

Perfil de Suelo	**E**
Coeficiente Aa	**0.30**
Coeficiente Av	**0.25**

COEFICIENTE DE IMPORTANCIA

Grupo de Uso	**III**
Coeficiente de importancia III	**1.25**

PERIODO FUNDAMENTAL DE LA EDIFICACIÓN

$T_a = C_t h^{\alpha}$		
C_t =	**0.047**	
h =	**3.40**	m
α =	**0.90**	
T_a=	**0.14**	Seg

VARIACIÓN COEFICIENTE DE CAPACIDAD DE DISIPACIÓN DE ENERGÍA

Ro: Coeficiente de capacidad de disipación de energía básico
R: Coeficiente de capacidad de disipación de energía, para ser empleado en el diseño.
ϕ_a: Coeficiente de reducción de R causado por irregularidades en altura de la edificación
ϕ_p: Coeficiente de reducción de R causado por irregularidades en planta de la edificación
ϕ_r: Coeficiente de reducción de R causado por ausencia de redundancia en el sistema estructural de resistencia sísmica

Ro	**1.50**
ϕ_a	**1.00**
ϕ_p	**1.00**
ϕ_r	**1.00**
ϕ	**1.00**
R	**1.50**

TIPO	DESCRIPCIÓN	VALOR
	N.A	ϕ_P: 1.00
	N.A	ϕ_a: 1.00
	N.A	ϕ_r: 1.00
	N.A	ϕ: 1.00

ESPECTRO DE DISEÑO (AMORTIGUAMIENTO ξ=5% DEL CRÍTICO)

Fa: Factor de ampliación de la aceleración.
Fv: Factor de ampliación de la aceleración en el rango de velocidades constantes.

Sa: Valor del espectro de aceleraciones de diseño para un periodo de vibración dado.
Aa: Coeficiente que representa la aceleración horizontal pico efectiva para diseño.
Av: Coeficiente que representa la velocidad horizontal pico efectiva para diseño.
T: Periodo de vibración del sistema elástico, en segundos.
T_C: Periodo de vibración, en segundos, correspondiente a la transición entre la zona de aceleración constante del espectro de diseño, para periodos cortos, y la parte descendiente del mismo.
T_L: Periodo de vibración, en segundos, correspondiente al inicio de la zona de desplazamiento aproximadamente constante del espectro de diseño para periodos largos.

ZONA DE AMENAZA ALTA		
T_o:	0.21	Seg
T_C:	1.00	Seg
T_L:	7.20	Seg
Aa:	0.30	
Av:	0.25	
Fa:	1.20	
Fv:	3.00	

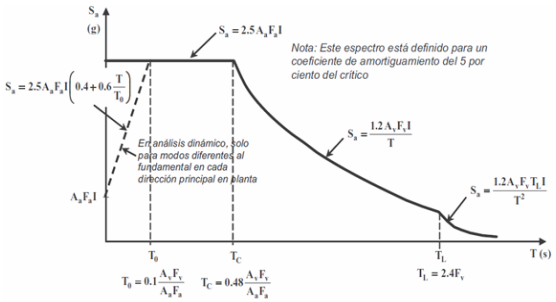
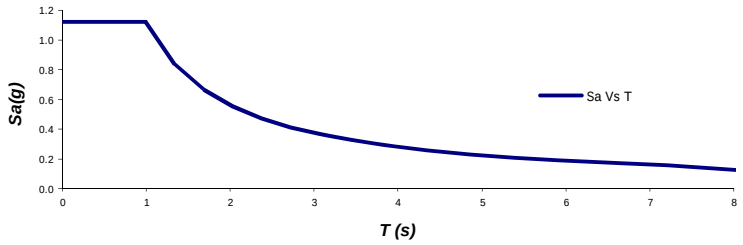


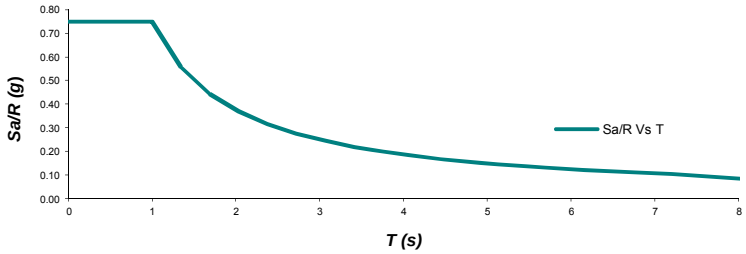
Figura A.2.6-1 — Espectro Elástico de Aceleraciones de Diseño como fracción de g

T	Sa	$Sa/R_{adoptado}$
(Seg)	**(%g)**	**(%g)**
0.00	1.125	0.750
0.05	1.125	0.750
0.10	1.125	0.750
0.16	1.125	0.750
0.21	1.125	0.750
0.41	1.125	0.750
0.60	1.125	0.750
0.80	1.125	0.750
1.00	1.125	0.750
1.34	0.837	0.558
1.69	0.666	0.444
2.03	0.553	0.369
2.38	0.473	0.315
2.72	0.413	0.276
3.07	0.367	0.245
3.41	0.330	0.220
3.76	0.300	0.200
4.10	0.274	0.183
4.44	0.253	0.169
4.79	0.235	0.157
5.13	0.219	0.146
5.48	0.205	0.137
5.82	0.193	0.129
6.17	0.182	0.122
6.51	0.173	0.115
6.86	0.164	0.109
7.20	0.156	0.104
8.20	0.120	0.080
9.20	0.096	0.064

Espectro Elástico de Diseño



Espectro Elástico de Diseño/R_{adop}



Sistema de resistencia Sísmica: Pórticos resistentes a momentos con Capacidad Especial de Disipación de Energía (DES).

Nota: El 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 las fuerzas horizontales.

MODELO MATEMÁTICO

Modelo Tridimensional con Diafragma Rígido: En este modelo los entrepisos se consideran diafragmas infinitamente rigidos en su propio plano. La masa de cada diafragma se considera concentrada en su centro de masa. Los efectos torsionales accidentales son incluidos haciendo ajustes en la localización de los centros de masa de los diafragmas.
Los efectos direccionales son tomados en cuenta a través de las componentes de los desplazamientos de los grados de libertad horizontales ortogonales del diafragma.

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN - RAMPA
ANÁLISIS SÍSMICO (ESPECTRO DE UMBRAL DE DAÑO NSR-10)

ZONA DE AMENAZA SÍSMICA
ALTA

EFECTOS LOCALES

Perfil de Suelo	**E**
Coeficiente Ad	**0.08**
Coeficiente Fv	**3.50**

COEFICIENTE DE IMPORTANCIA

Grupo de Uso	**III**
Coeficiente de importancia III	**1.25**
Coeficiente de Sitio Ŝ:	**4.38**

ESPECTRO DE UMBRAL DE DAÑO (AMORTIGUAMIENTO ξ=2% DEL CRÍTICO)

Sad: Valor del espectro de aceleraciones del umbral de daño para un periodo de vibración dado.
Ad: Máxima aceleración pico efectiva para el umbral de daño.
T: Periodo de vibración del sistema elástico, en segundos.
T_{Cd}: Periodo de vibración, en segundos, correspondiente a la transición entre la zona de aceleración constante del espectro sísmico del umbral de daño, para periodos cortos, y la parte descendiente del mismo.
T_{Ld}: Periodo de vibración, en segundos, correspondiente a la transición entre la zona de desplazamiento constante del espectro sísmico del umbral de daño, para periodos largos.

Ad: **0.08**
T_{Cd}: 2.19 Seg
T_{Ld}: 10.5 Seg

T (Seg)	Sad (%g)
0.00	0.080
0.05	0.112
0.10	0.144
0.15	0.176
0.20	0.208
0.25	0.240
0.49	0.240
0.73	0.240
0.98	0.240
1.22	0.240
1.46	0.240
1.70	0.240
1.95	0.240

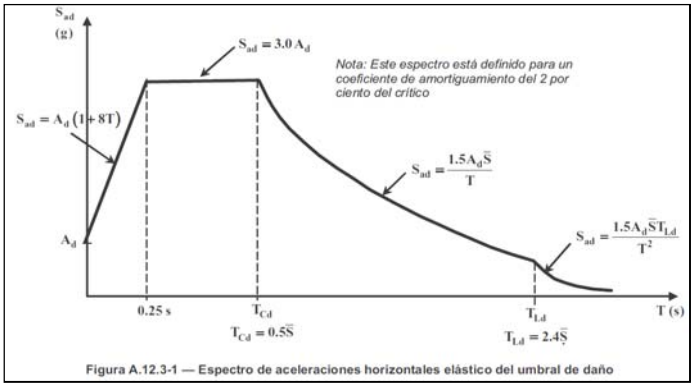
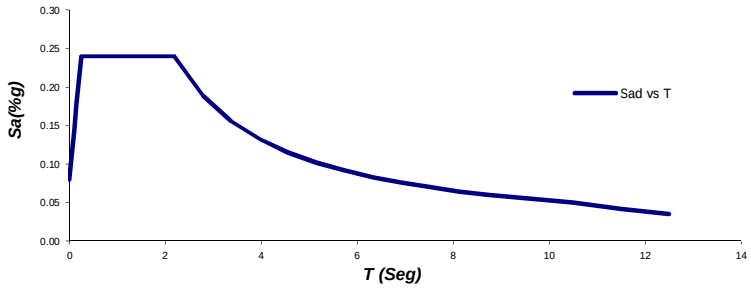


Figura A.12.3-1 — Espectro de aceleraciones horizontales elástico del umbral de daño

2.19	0.240
2.78	0.189
3.38	0.156
3.97	0.132
4.56	0.115
5.16	0.102
5.75	0.091
6.34	0.083
6.94	0.076
7.53	0.070
8.13	0.065
8.72	0.060
9.31	0.056
9.91	0.053
10.50	0.050
11.50	0.042
12.50	0.035

Espectro Del Umbral de Daño



Sistema de resistencia Sísmica: Pórticos resistentes a momentos con Capacidad Especial de Disipación de Energía (DES).

Nota: El 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 las fuerzas horizontales.

MODELO MATEMÁTICO

Modelo Tridimensional con Diafragma Rígido: En este modelo los entrepisos se consideran diafragmas infinitamente rigidos en su propio plano. La masa de cada diafragma se considera concentrada en su centro de masa. Los efectos torsionales accidentales son incluidos haciendo ajustes en la localización de los centros de masa de los diafragmas.
Los efectos direccionales son tomados en cuenta a través de las componentes de los desplazamientos de los grados de libertad horizontales ortogonales del diafragma.

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN - RAMPA
CALCULO DEL CORTANTE BASAL DE LA ESTRUCTURA (ESPECTRO DE DISEÑO)

CALCULO DEL CORTANTE BASAL DE LA ESTRUCTURA

$H_{edificio}$=	3.40	m	
Tipo de Perfil:	E		
Aa =	0.30	g	
Av =	0.25	g	
Fa =	1.20		
Fv =	3.00		
T_c =	1.00	Seg	
C_t =	0.047		
α =	0.90		
T_a =	0.14	Seg	
C_u =	1.20		
$C_u T_a$ =	0.17	Seg	
$T_{modelación\ estructural}$ =	0.1500	Seg	
ΔT =	6.09	%	Ok!
$T_{adoptado}$ =	0.15	Seg	
S_a =	1.125		S_a obtenido del espectro de diseño
g =	9.81	m/s^2	
M =	56.98	Ton	Masa obtenida del modelo
V_s =	628.85	kN	
90% Vs =	565.96	kN	Cortante basal para comparación de acuerdo a A.5.4.5 NSR-10

MODELO INICIAL
Response Espectrum Base Reactions

PORCENTAJE PARA REVISIÓN DE CORTANTE BASAL DE ACUERDO A A.5.4.5 NSR-10: 90.0 %

	F1 (kN)	F2 (kN)	Total (kN)	Factor		g corregido
$V_{s(x)}$=	430.09	0	430.09	1.316	12.909	Se aplica en SISMO X
$V_{s(y)}$=	0	430.09	430.09	1.316	12.909	Se aplica en SISMO Y

MODELO CORREGIDO
Response Espectrum Base Reactions

	F1 (kN)	F2 (kN)	Total (kN)	90% Vs (kN)
$V_{s(x)}$=	430.09	0	430.09	566.0
$V_{s(y)}$=	0	430.09	430.09	566.0

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN - RAMPA
CALCULO DEL CORTANTE BASAL DE LA ESTRUCTURA (ESPECTRO DE UMBRAL DE DAÑO)

CALCULO DEL CORTANTE BASAL DE LA ESTRUCTURA

$H_{edificio}$=	**3.40**	m	
Tipo de Perfil:	**E**		
Ad =	**0.09**	g	
Fv =	**3.00**		
C_t =	**0.047**		
α =	**0.90**		
T_a =	0.14	Seg	
C_u =	1.20		
$C_u T_a$ =	0.17	Seg	
$T_{modelación\ estructural}$ =	**0.15**	Seg	
ΔT =	6.09	%	Ok!
$T_{adoptado}$ =	**0.1500**	Seg	
S_a =	**0.240**		S_a obtenido del espectro de diseño
g =	9.81	m/s^2	
M =	**56.98**	Ton	Masa obtenida del modelo
V_s =	**134.15**	kN	
90% Vs =	**120.74**	kN	Cortante basal para comparación de acuerdo a A.5.4.5 NSR-10

MODELO INICIAL
Response Espectrum Base Reactions

PORCENTAJE PARA REVISIÓN DE CORTANTE BASAL DE ACUERDO A A.5.4.5 NSR-10: 90.0 %

	F1 (kN)	F2 (kN)	Total (kN)	Factor		g corregido
$V_{s(x)}$=	24.47	0	24.47	4.934	**48.404**	Se aplica en SISMO X
$V_{s(y)}$=	0	24.47	24.47	4.934	**48.404**	Se aplica en SISMO Y

MODELO CORREGIDO
Response Espectrum Base Reactions

	F1 (kN)	F2 (kN)	Total (kN)	90% Vs (kN)
$V_{s(x)}$=	91.75	0	**91.75**	**120.7**
$V_{s(y)}$=	0	91.74	**91.74**	**120.7**

4. DISEÑO DE CIMENTACIÓN

DISEÑO DE CIMENTACIÓN

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN - RAMPA
ELECCIÓN DE CARGAS PARA DISEÑO DE CIMENTACIÓN

ZAPATA TIPO 2 (2 ud). CIM 2

Combinaciones de carga

		NSR-10	**F.S.**
Cargas Gravitacionales:	CIMEN= 1D + 1L	B.2.3-2	**3.00**
Cargas por Estado Limite de Servicio	CIMEN2= 1D + 0.75L + 0.70*(0.75/R)Ex + 0.21*(0.75/	**B.2.3-8**	**1.50**
	CIMEN3= 1D + 0.75L + 0.21*(0.75/R)Ex + 0.70*(0.75/		

Story	Point	Load	FX	FY	FZ	MX	MY	MZ	Load	COMBINACIÓN	Pumax
BASE	1	CIM1	0.01	-17.35	53.11	0	0	0	CIM1		
BASE	1	CIM2 MAX	0.89	33.77	51.69	0	0	0	CIM2 MAX		
BASE	1	CIM2 MIN	-0.87	-64.3	42.57	0	0	0	CIM2 MIN	CIM1	53.1
BASE	1	CIM3 MAX	0.34	50.9	52.86	0	0	0	CIM3 MAX		
BASE	1	CIM3 MIN	-0.33	-81.43	41.4	0	0	0	CIM3 MIN		
BASE	2	CIM1	0.74	-57.91	169.7	-78.091	-112.669	-8.566	CIM1		
BASE	2	CIM2 MAX	41.27	-33.05	156.83	-56.243	25.057	-2.222	CIM2 MAX		
BASE	2	CIM2 MIN	-39.96	-68.01	149.31	-81.083	-224.955	-12.975	CIM2 MIN	CIM1	169.7
BASE	2	CIM3 MAX	16.14	-22.53	157.72	-52.384	-52.943	-0.55	CIM3 MAX		
BASE	2	CIM3 MIN	-14.82	-78.53	148.41	-84.942	-146.955	-14.647	CIM3 MIN		
BASE	5	CIM1	-0.07	-13.49	453.59	8.559	11.734	-13.925	CIM1		
BASE	5	CIM2 MAX	65.39	25.83	407.51	36.394	133.062	-0.047	CIM2 MAX		
BASE	5	CIM2 MIN	-65.53	-48.1	396.37	-22.255	-112.569	-24.408	CIM2 MIN	CIM1	453.6
BASE	5	CIM3 MAX	27.42	41.48	408.85	48.957	59.291	0.856	CIM3 MAX		
BASE	5	CIM3 MIN	-27.57	-63.75	395.03	-34.817	-38.797	-25.312	CIM3 MIN		
BASE	11	CIM1	-0.68	88.75	333.48	-21.207	-21.717	-3.667	CIM1		
BASE	11	CIM2 MAX	69.11	108.64	302.96	20.334	85.296	6.544	CIM2 MAX		
BASE	11	CIM2 MIN	-70.3	45.22	292.49	-57.513	-123.566	-12.894	CIM2 MIN	CIM1	333.5
BASE	11	CIM3 MAX	33.71	120.12	306.58	34.478	38.134	11.215	CIM3 MAX		
BASE	11	CIM3 MIN	-34.89	33.74	288.87	-71.657	-76.404	-17.565	CIM3 MIN		

CARGAS A CIMENTACIÓN
PROYECTO: INSTITUCION EDUCATIVA SAN JUAN - RAMPA

Story	Point	Load	FX	FY	FZ	MX	MY	MZ
N-0.05	1	CIM1	0.010	-17.350	53.110	0.000	0.000	0.000
N-0.05	2	CIM1	0.740	-57.910	169.700	-78.091	-112.669	-8.566
N-0.05	5	CIM1	-0.070	-13.490	453.590	8.559	11.734	-13.925
N-0.05	11	CIM1	-0.680	88.750	333.480	-21.207	-21.717	-3.667

ZAPATA TIPO 2 (2 ud). CIM 2

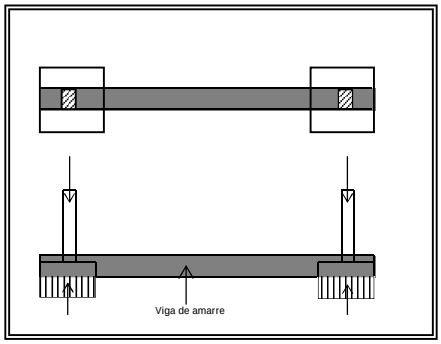
PROYECTO: INSTITUCION EDUCATIVA SAN JUAN - RAMPA

VIGA DE AMARRE TIPO

f'c = **21.1** MPa
fy = **420** MPa

b = **0.40** m
h = **0.40** m

Pmáx = 453.59 kN



De acuerdo a el numeral A.3.6.4.2
de la NSR-10 tenemos:

Aa = ***0.30***
Paxial = 0.25*Aa*Pmáx
Paxial = *34.019* kN

DISEÑO A TENSIÓN

As = 1.7*34.01925/(0.90*420)
As = **1.53** cm^2

DISEÑO A COMPRESIÓN

P com = 1.7*34.01925
P com = *57.8* kN

Para esta carga la sección requiere cuantía mínima:

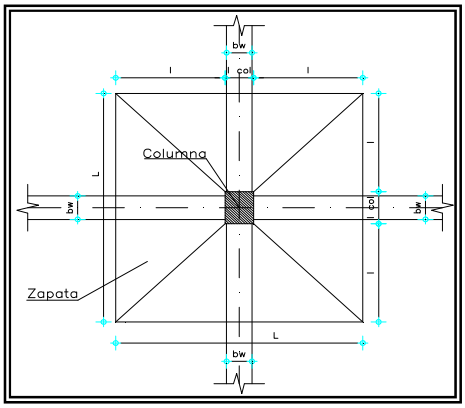
As = 0.00333*0.4*0.35
As = **4.66** cm^2

Se suministra un refuerzo constituido por 4#4 arriba y abajo (como refuerzo mínimo).

DISEÑO DE ZAPATAS RECTANGULAR
PROYECTO: INSTITUCION EDUCATIVA SAN JUAN - RAMPA
ZAPATA TIPO 1 (1 ud). CIM 2

Columna	**b =**	40	cm	**f'c =**	21.1	MPa	**σ =**	0.195	MPa
	t =	50	cm	**fy =**	420	MPa			

PREDIMENSIONAMIENTO



L =	2.700	m				
lcol =	0.500	m				
l =	1.100	m				

Cargas

Mu=	225	kN*m
Pu =	149.31	kN
Pp (10%) =	15	kN
Σ P =	164	kN

Area necesaria = $\frac{\Sigma P}{\sigma} = \frac{164.24}{0.195} =$ 0.84 m²

e =	1.51	m		L=	2.70	m
L =	0.918	m	*Aproximamos*	B=	1.40	m

Carga de diseño = $\frac{Pu}{A\ real} = \frac{149.31}{3.780} =$ 0.040 MPa

Esfuerzos

σmáx=	0.189	MPa	OK
σmin=	-0.237	MPa	OK

DISEÑO DE ZAPATA RECTANGULAR

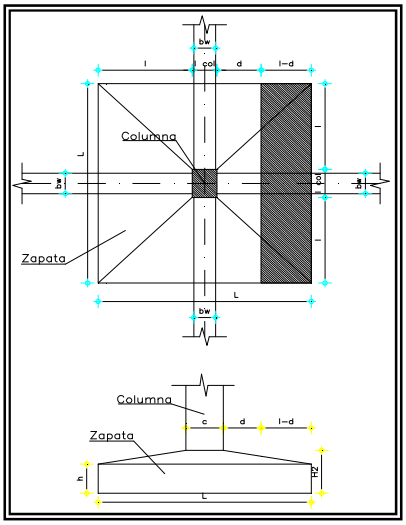
FLEXIÓN

M borde de la columna = 181.12 kN*m
1,7 * M borde de la columna = 307.91 kN*m

Con el criterio de calcular el refuerzo por metro lineal

d=	0.33	m
Cuantia =	0.00736987	
As =	24.32	cm²/m
Armadura:	20#417c./0.13	long.
	14#530c./0.09	Transv.

CORTANTE



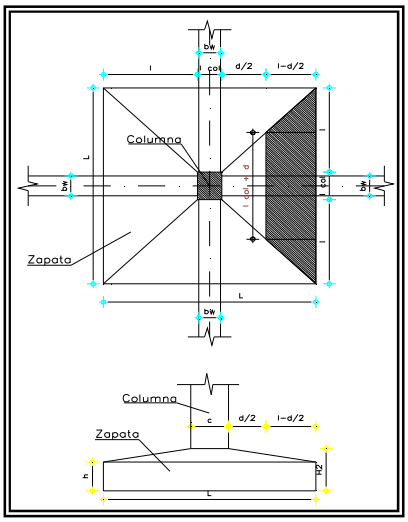
a. En una dirección (d)

L =	2.70	m	**H =**	0.40	m
l =	1.10	m	**h =**	0.30	m
l - d =	0.77	m	**H-h =**	0.10	m

V (d) =	266.48	kN
Vu (d)=	1.7*V(d)	
Vu (d) =	453.01	kN
h´=	0.30	m

$\upsilon\nu = \frac{Vu}{L * h'} =$ 0.553 MPa

ϕνc = 0.57 MPa **OK**



b. En dos direcciones (d/2)

ZAPATA TIPO 2 (2 ud). CIM

L =	2.700	m	**H =**	0.40	m
d/2 =	0.165	m	**h =**	0.30	m
l - d/2 =	0.935	m	**H-h =**	0.10	m

V (d/2) =	190.0	kN
Vu (d/2) =	1.5*V(d)	
Vu (d/2) =	285.1	kN
d_1 =	0.31904762	m

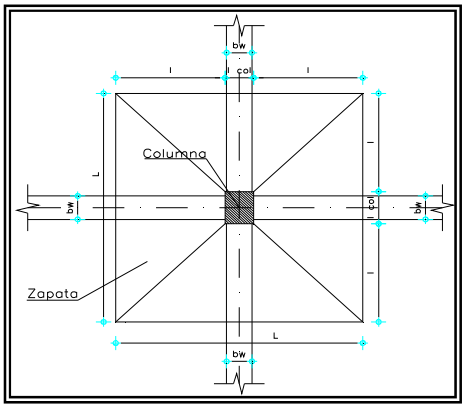
$$\nu u = \frac{Vu}{bo \times d_1} = 1.076 \text{ MPa}$$

$\phi\nu c$= 1.15 MPa **OK**

DISEÑO DE ZAPATAS RECTANGULAR
PROYECTO: INSTITUCION EDUCATIVA SAN JUAN - RAMPA
ZAPATA TIPO 2 (2 ud). CIM 2

Columna	**b =**	40	cm	**f'c =**	21.1	MPa	**σ =**	0.195	MPa
	t =	50	cm	**fy =**	420	MPa			

PREDIMENSIONAMIENTO



L =	2.800	m	
lcol =	0.500	m	
l =	1.150	m	

Cargas

Mu=	133	kN*m
Pu =	407.51	kN
Pp (10%) =	41	kN
Σ P =	448	kN

Area necesaria = $\frac{\Sigma P}{\sigma} = \frac{448.26}{0.195} =$ 2.30 m²

e =	0.33	m		L=	2.80	m
L =	1.516	m	*Aproximamos*	B=	1.40	m

Carga de diseño = $\frac{Pu}{A\ real} = \frac{407.51}{3.920} =$ 0.104 MPa

Esfuerzos

σmáx=	0.194	MPa	OK
σmin=	-0.046	MPa	OK

DISEÑO DE ZAPATA RECTANGULAR

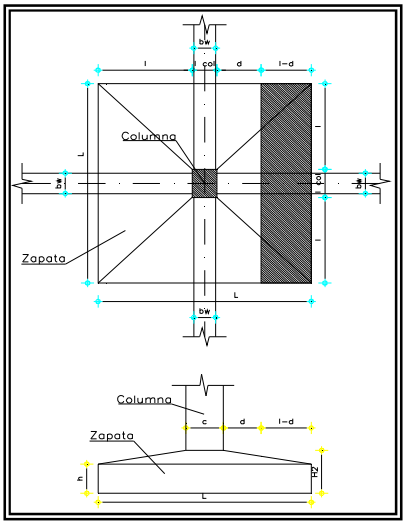
FLEXIÓN

M borde de la columna = 169.15 kN*m
1,7 * M borde de la columna = 287.55 kN*m

Con el criterio de calcular el refuerzo por metro lineal

d=	0.43	m
Cuantia =	0.00387957	
As =	16.68	cm²/m
Armadura:	14#417c./0.19	long.
	14#431c./0.09	Transv.

CORTANTE



a. En una dirección (d)

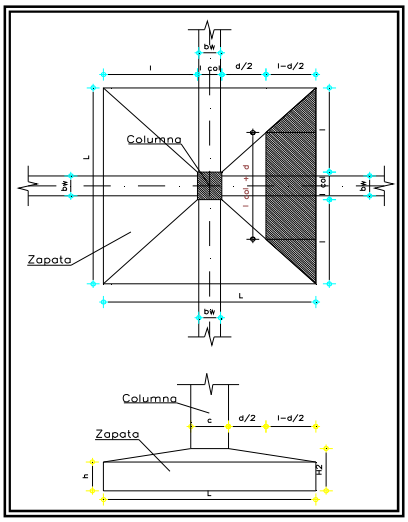
L =	2.80	m
l =	1.15	m
l - d =	0.72	m

H =	0.50	m
h =	0.30	m
H-h =	0.20	m

V (d) =	329.62	kN
Vu (d)=	1.7*V(d)	
Vu (d) =	560.36	kN
h´=	0.36	m

$\upsilon\nu = \frac{Vu}{L * h'} =$ 0.555 MPa

ϕνc = 0.57 MPa **OK**



b. En dos direcciones (d/2)

ZAPATA TIPO 2 (2 ud). CIM

L =	2.800	m	**H =**	0.50	m
d/2 =	0.215	m	**h =**	0.30	m
l - d/2 =	0.935	m	**H-h =**	0.20	m

V (d/2) =	269.0	kN
Vu (d/2) =	1.5*V(d)	
Vu (d/2) =	403.6	kN
d_1 =	0.4	m

$$\nu u = \frac{Vu}{bo \times d_1} = 1.085 \text{ MPa}$$

$\phi\nu c$= 1.15 MPa **OK**

5. DISEÑO DE VIGAS Y COLUMNAS

DISEÑO DE VIGAS Y COLUMNAS

DISEÑO DE VIGAS

VR-1 / BASE

B=0.40 H=0.50 L=2.10		
Mu=-3.70 As =0.00 As(r)=5.89		Mu=-14.81 As =6.50 As(r)=5.89
	Mu=3.70 As =6.50 As(r)=5.89	
Vu=-7.79	Vu=1.45	Vu=75.14

VR-2 / N+0.8

B=0.40 H=0.50 L=2.05		
Mu=-1.57 As =0.00 As(r)=5.89		Mu=-381.52 As =29.19 As(r)=30.12
	Mu=0.00 As =7.92 As(r)=5.89	
Vu=148.31	Vu=154.93	Vu=307.48

VL-1 / N+1.60

B=0.15 H=0.50 L=1.95			B=0.15 H=0.50 L=9.31			B=0.15 H=0.50 L=9.29		
Mu=-3.23 As =0.00 As(r)=2.21		Mu=-42.09 As =5.70 As(r)=2.62	Mu=-79.25 As =5.70 As(r)=5.17		Mu=-122.66 As =7.76 As(r)=8.57	Mu=-120.54 As =7.76 As(r)=8.39		Mu=-73.38 As =5.70 As(r)=4.75
	Mu=0.00 As =2.54 As(r)=2.21			Mu=67.16 As =5.70 As(r)=4.31			Mu=69.12 As =5.70 As(r)=4.45	
Vu=1.98	Vu=17.61	Vu=35.43	Vu=64.31	Vu=5.39	Vu=76.01	Vu=-74.07	Vu=-3.57	Vu=-63.59

VL-2 / N+1.60

B=0.15 H=0.50 L=1.95			B=0.15 H=0.50 L=9.31			B=0.15 H=0.50 L=9.29		
Mu=-0.00 As =0.00 As(r)=2.21		Mu=-48.82 As =5.70 As(r)=3.06	Mu=-89.77 As =5.70 As(r)=5.95		Mu=-124.39 As =7.76 As(r)=8.71	Mu=-114.24 As =7.76 As(r)=7.86		Mu=-101.24 As =7.76 As(r)=6.82
	Mu=0.00 As =3.96 As(r)=2.21			Mu=60.99 As =5.70 As(r)=3.88			Mu=56.96 As =5.70 As(r)=3.61	
Vu=6.44	Vu=23.54	Vu=42.71	Vu=65.47	Vu=5.11	Vu=78.02	Vu=-69.18	Vu=-4.86	Vu=-67.16

VL-5 / N+1.60

B=0.15 H=0.50 L=1.80			B=0.15 H=0.50 L=0.40			B=0.15 H=0.50 L=1.80		
Mu=-4.26 As =2.54 As(r)=2.21		Mu=-11.86 As =2.54 As(r)=2.21	Mu=-11.86 As =2.54 As(r)=2.21		Mu=-6.79 As =2.54 As(r)=2.21	Mu=-6.79 As =2.54 As(r)=2.21		Mu=-5.68 As =2.54 As(r)=2.21
	Mu=0.00 As =2.54 As(r)=2.21			Mu=2.97 As =2.54 As(r)=2.21			Mu=1.70 As =2.54 As(r)=2.21	
Vu=-1.98	Vu=4.46	Vu=1.73	Vu=1.73	Vu=-4.79	Vu=-3.55	Vu=-3.55	Vu=-2.31	Vu=2.37

DISEÑO DE VIGAS

VR-3 / N+1.60

B=0.40 H=0.50 L=2.05			B=0.40 H=0.50 L=2.05		
Mu=-0.00 As =0.00 As(r)=5.89		Mu=-257.99 As =20.28 As(r)=17.27	Mu=-286.67 As =20.28 As(r)=19.52		Mu=-1.44 As =0.00 As(r)=5.89
Mu=0.00 As =7.92 As(r)=5.89			Mu=0.00 As =7.92 As(r)=5.89		
Vu=97.78	Vu=104.40	Vu=215.35	Vu=-232.83	Vu=-113.98	Vu=-107.35

VR-2A / N+2.5

B=0.40 H=0.50 L=2.05		
Mu=-364.92 As =27.10 As(r)=26.16		Mu=-3.09 As =0.00 As(r)=5.89
Mu=0.00 As =7.92 As(r)=5.89		
Vu=-305.07	Vu=-149.81	Vu=-143.19

VL-3 / N+3.40

B=0.15 H=0.50 L=1.95			B=0.15 H=0.50 L=9.31			B=0.15 H=0.50 L=9.29		
Mu=-0.00 As =0.00 As(r)=2.21		Mu=-49.83 As =5.70 As(r)=3.13	Mu=-89.41 As =5.70 As(r)=5.92		Mu=-121.13 As =7.76 As(r)=8.44	Mu=-124.17 As =7.76 As(r)=8.69		Mu=-85.07 As =5.70 As(r)=5.60
Mu=0.00 As =3.96 As(r)=2.21			Mu=59.69 As =5.70 As(r)=3.79			Mu=64.62 As =5.70 As(r)=4.13		
Vu=6.14	Vu=24.14	Vu=43.31	Vu=-65.06	Vu=10.14	Vu=69.57	Vu=-79.06	Vu=-9.59	Vu=65.19

VL-4 / N+3.40

B=0.15 H=0.50 L=1.95			B=0.15 H=0.50 L=9.31			B=0.15 H=0.50 L=9.29		
Mu=-4.27 As =0.00 As(r)=2.21		Mu=-45.56 As =7.76 As(r)=2.84	Mu=-99.64 As =7.76 As(r)=6.70		Mu=-101.11 As =7.76 As(r)=6.81	Mu=-120.20 As =7.76 As(r)=8.36		Mu=-70.50 As =5.70 As(r)=4.55
Mu=0.00 As =2.54 As(r)=2.21			Mu=63.70 As =5.70 As(r)=4.07			Mu=77.26 As =5.70 As(r)=5.03		
Vu=2.37	Vu=18.63	Vu=36.45	Vu=-68.30	Vu=-9.01	Vu=67.59	Vu=-75.60	Vu=5.30	Vu=62.88

VR-1A / N+3.40

B=0.40 H=0.50 L=2.10		
Mu=-173.63 As =11.40 As(r)=11.11		Mu=-4.10 As =0.00 As(r)=5.89
Mu=0.00 As =7.92 As(r)=5.89		
Vu=-135.54	Vu=-69.50	Vu=-62.88

PROYECTO: RAMPA I.E. SAN JUAN IPIALES (NARIÑO)

Columna A-3

Nivel	H Libre	Losa	B	H	M1	M2	P	V1	V2	Cuantia	m/mr	Col/Vig Eje ppal	Col/vig Eje sec
N+3.40					173.63	-147.35				14/#8 (3.5%)	0.76	2.37	
	2.90	.50	.50	.40			-155.12	92.98	71.77				
		1.00			428.49	79.39				14/#8 (3.5%)	1.41	4.01	

Columna A-2

Nivel	H Libre	Losa	B	H	M1	M2	P	V1	V2	Cuantia	m/mr	Col/Vig Eje ppal	Col/vig Eje sec
N+2.5					323.15	40.97				16/#8 (3.2%)	0.73	1.72	
	1.20	.50	.50	.50			-243.56	124.66	52.56				
					479.66	27.55				16/#8 (3.2%)	0.90		
N+0.8					-185.14	-13.08				16/#8 (3.2%)	0.45	3.27	
	.30	.50	.50	.50			-516.93	153.12	173.04				
		1.00			-299.51	-65.35				16/#8 (3.2%)	0.63		

Columna A-1

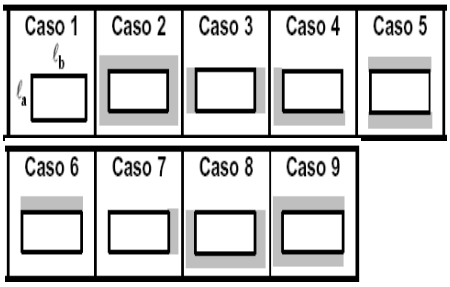
Nivel	H Libre	Losa	B	H	M1	M2	P	V1	V2	Cuantia	m/mr	Col/Vig Eje ppal	Col/vig Eje sec
N+1.60					65.20	162.17				16/#8 (3.2%)	0.43	1.54	
	1.10	.50	.50	.50			-358.01	164.70	226.77				
		1.00			270.80	74.94				16/#8 (3.2%)	0.59		

6. DISEÑO DE ELEMENTOS COMPLEMENTARIOS

DISEÑO DE ELEMENTOS
COMPLEMENTARIOS

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN - RAMPA
DISEÑO PLACA MACIZA (EN UNA DIRECCION)

El diseño de la placa maciza se realiza de acuerdo con lo establecido en C.13.9 de las NSR - 10



Geometría de la losa

la =	**1.90**	m	fy =	**420**	MPa
lb =	**9.31**	m	f'c =	**21**	MPa
Relación m =	**0.204**				

h = l/20 (0.4+Fy/700) =	0.10	m
Espesor escogido:	**0.10**	**m**

Teniendo en cuenta que la relación m es menor de 0.5, la placa maciza trabaja en una dirección

Cargas

Peso propio de la losa	0.1x1.0x24	2.40	kN/m²
Impermeabilización	0.05x20	1.00	kN/m²
Carga Muerta Total		3.40	kN/m²
Carga Viva		5.00	kN/m²
Carga Última		12.08	kN/m²

DISEÑO A MOMENTO FLECTOR

Mu_a =	**5.45**	kN.m	*Cuantía:*	0.0027	*As =*	2.74 cm²/m	***Transversal***
			Cuantía:	0.0018	*As =*	1.80 cm²/m	***Longitudinal***

Distribución de refuerzo:

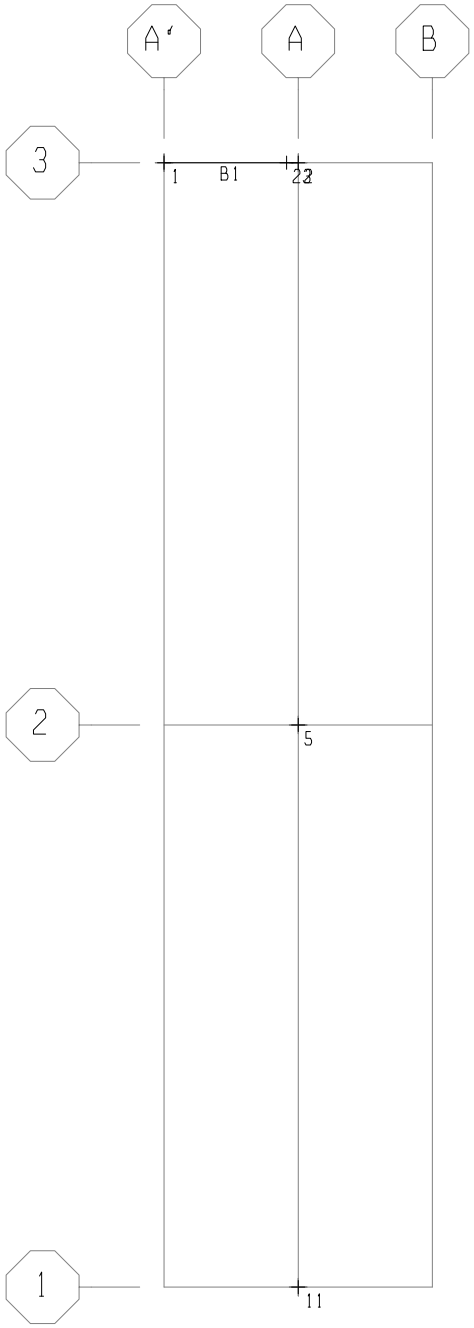
Colocar 1#3 c/.20 Transversalmente superior e inferior
Colocar 1#3 c/.20 Longitudinalmente superior e inferior

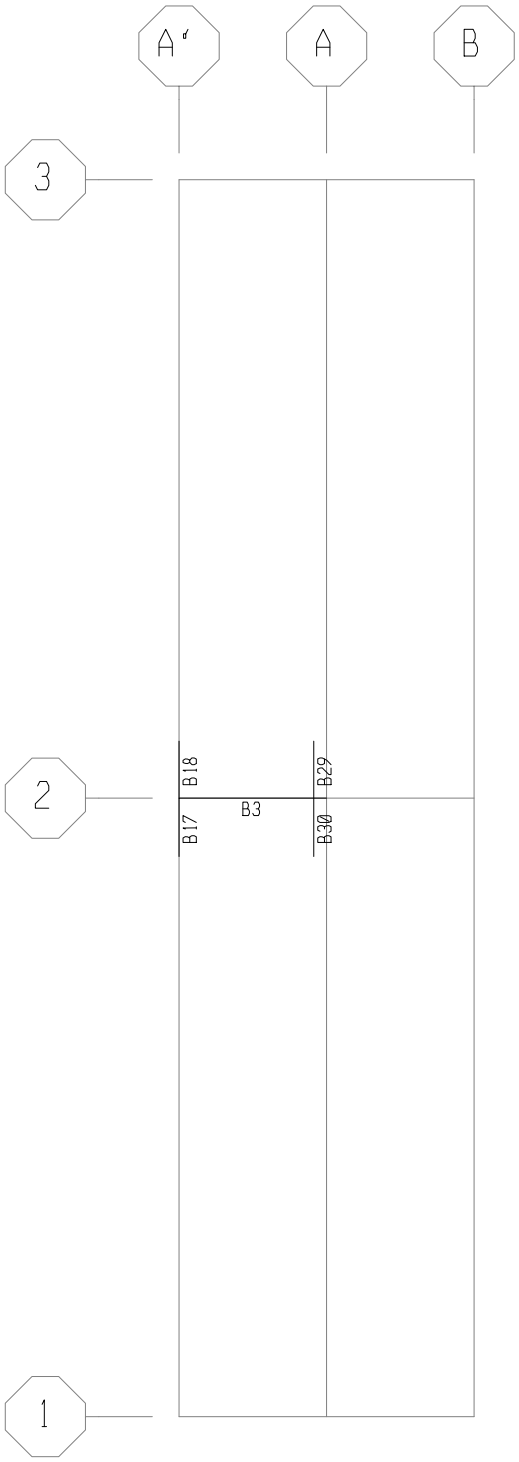
REVISIÓN A CORTANTE

R=	11.48	**kN**	
ϕvc =	**0.573**	**MPa**	
ϕvu =	**0.164**	**MPa**	**OK**

8. ANEXOS DE COMPUTADOR

ANEXOS DE COMPUTADOR


A'
A
B
3
1
B1
22
2
5
1
11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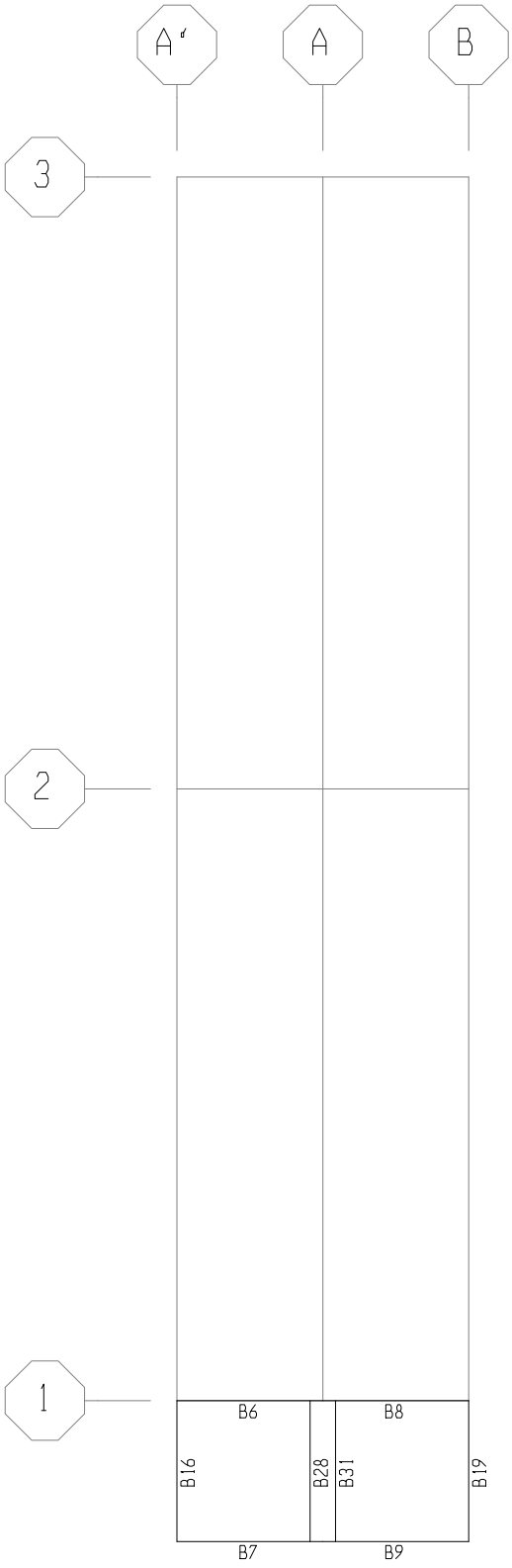
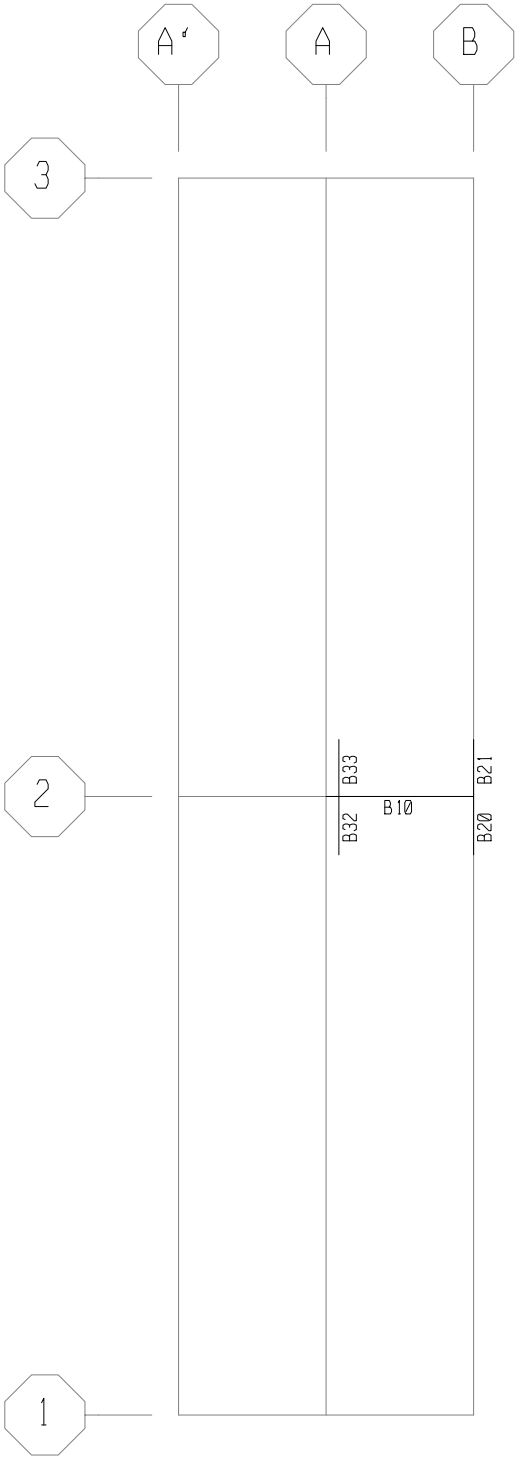
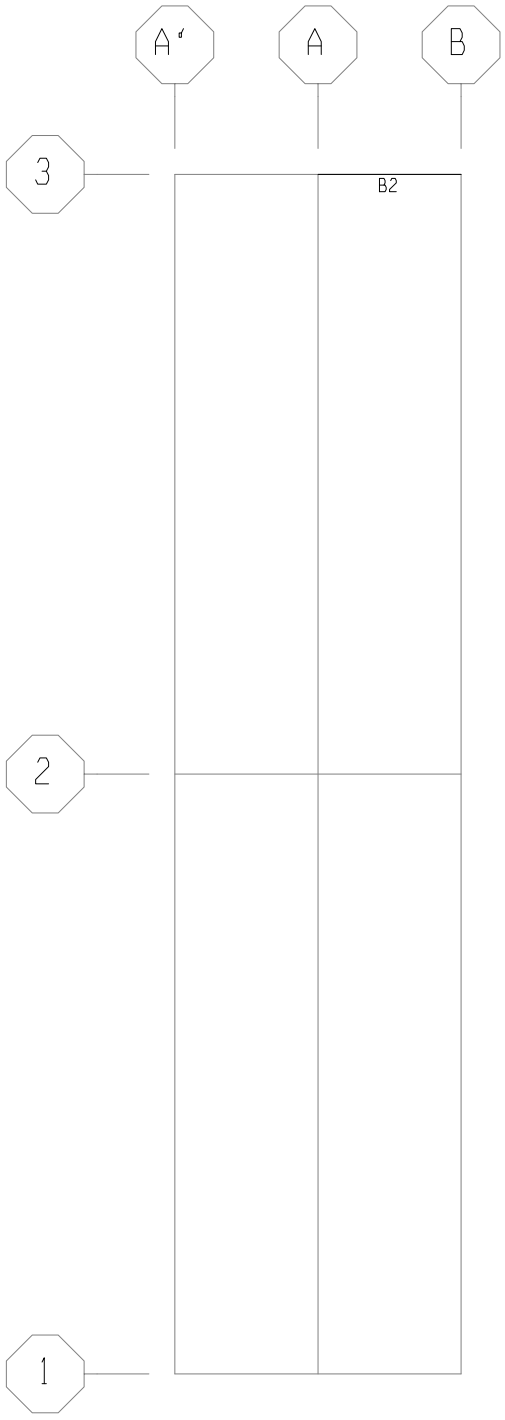
A
B
3
2
1
B18
B29
B3
B17
B30


A'
A
B
3
2
1
B6
B8
B16
B28
B31
B19
B7
B9


A'
A
B
3
2
1
B33
B21
B10
B32
B20


A'
A
B
3
B2
2
1

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S T O R Y D A T A

STORY	SIMILAR TO	HEIGHT	ELEVATION
N+3.40	None	0.900	3.400
N+2.5	N+3.40	0.900	2.500
N+1.60	N+3.40	0.800	1.600
N+0.8	N+3.40	0.800	0.800
BASE	None		0.000

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P O I N T C O O R D I N A T E S

POINT	X	Y	DZ-BELOW
1	0.000	19.280	0.000
2	2.300	19.280	0.000
3	4.600	19.280	0.000
4	0.000	9.640	0.000
5	2.300	9.640	0.000
6	0.000	10.530	0.000
8	0.000	8.730	0.000
10	0.000	0.000	0.000
11	2.300	0.000	0.000
12	0.000	-2.220	0.000
13	2.300	-2.220	0.000
14	4.600	0.000	0.000
15	4.600	-2.220	0.000
16	4.600	9.640	0.000
17	4.600	10.530	0.000
18	4.600	8.730	0.000
19	2.100	-2.220	0.000
20	2.100	0.000	0.000
21	2.100	9.640	0.000
22	2.100	10.530	0.000
23	2.100	19.280	0.000
24	2.100	8.730	0.000
25	2.500	-2.220	0.000
26	2.500	0.000	0.000
27	2.500	8.730	0.000
28	2.500	9.640	0.000
29	2.500	10.530	0.000
30	2.500	19.280	0.000

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C O L U M N C O N N E C T I V I T Y D A T A

COLUMN	I END PT	J END PT	I END STORY
C2	2	2	Below
C4	5	5	Below
C6	11	11	Below

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B E A M C O N N E C T I V I T Y D A T A

BEAM	I END PT	J END PT
B1	1	2
B2	2	3
B3	4	5
B6	10	11
B7	12	13
B8	11	14
B9	13	15
B10	5	16
B16	12	10
B17	8	4
B18	4	6
B19	15	14
B20	18	16
B21	16	17
B28	19	20
B29	21	22
B30	24	21
B31	25	26

B32	27	28
B33	28	29

B R A C E C O N N E C T I V I T Y D A T A

BRACE	I END PT	J END PT	I END STORY
D1	1	6	Below
D2	8	10	Below
D3	14	18	Below
D4	17	3	Below
D10	23	22	Below
D11	24	20	Below
D12	26	27	Below
D13	29	30	Below

R I G I D D I A P H R A G M P O I N T C O N N E C T I V I T Y D A T A

STORY	DIAPHRAGM	POINT	POINT	POINT	POINT	POINT
N+2.5	D1	5	16	17	18	27
		28	29			
N+1.60	D1	10	11	12	13	14
		15	19	20	25	26
N+0.8	D1	4	5	6	8	21
		22	24			

M A T E R I A L P R O P E R T Y D A T A

MATERIAL NAME	MATERIAL TYPE	DESIGN TYPE	MATERIAL DIR/PLANE	MODULUS OF ELASTICITY	POISSON'S RATIO	THERMAL COEFF	SHEAR MODULUS
STEEL	Iso	Steel	All	199947978.80	0.3000	1.1700E-05	76903068.77
CONC21	Iso	Concrete	All	21538110.000	0.2000	9.9000E-06	8974212.500
OTHER	Iso	None	All	199947978.80	0.3000	1.1700E-05	76903068.77
RAMPA	Iso	Concrete	All	0.010	0.2000	9.9000E-06	0.004

M A T E R I A L P R O P E R T Y M A S S A N D W E I G H T

MATERIAL NAME	MASS PER UNIT VOL	WEIGHT PER UNIT VOL
STEEL	7.8271E+00	7.6820E+01
CONC21	2.4000E+00	2.4000E+01
OTHER	7.8271E+00	7.6820E+01
RAMPA	2.4000E+00	0.0000E+00

M A T E R I A L D E S I G N D A T A F O R S T E E L M A T E R I A L S

MATERIAL NAME	STEEL FY	STEEL FU	STEEL COST ($)
STEEL	344737.894	448159.263	271447.16

M A T E R I A L D E S I G N D A T A F O R C O N C R E T E M A T E R I A L S

MATERIAL NAME	LIGHTWEIGHT CONCRETE	CONCRETE FC	REBAR FY	REBAR FYS	LIGHTWT REDUC FACT
CONC21	No	21000.000	420000.000	420000.000	N/A
RAMPA	No	21000.000	420000.000	420000.000	N/A

F R A M E S E C T I O N P R O P E R T Y D A T A

FRAME SECTION NAME	MATERIAL NAME	SECTION SHAPE NAME OR IN SECTION DATABASE FILE	CONC COL	CONC BEAM

VIG15X50	CONC21	Rectangular		Yes
VIG40X50	CONC21	Rectangular		Yes
COL40X50	CONC21	Rectangular	Yes	

F R A M E S E C T I O N P R O P E R T Y D A T A

FRAME SECTION NAME	SECTION DEPTH	FLANGE WIDTH TOP	FLANGE THICK TOP	WEB THICK	FLANGE WIDTH BOT	FLANGE THICK BOT
VIG15X50	0.5000	0.1500	0.0000	0.0000	0.0000	0.0000
VIG40X50	0.5000	0.4000	0.0000	0.0000	0.0000	0.0000
COL40X50	0.4000	0.5000	0.0000	0.0000	0.0000	0.0000

F R A M E S E C T I O N P R O P E R T Y D A T A

FRAME SECTION NAME	SECTION AREA	TORSIONAL CONSTANT	MOMENTS OF INERTIA I33	MOMENTS OF INERTIA I22	SHEAR AREAS A2	SHEAR AREAS A3
VIG15X50	0.0750	0.0005	0.0016	0.0001	0.0625	0.0625
VIG40X50	0.2000	0.0055	0.0042	0.0027	0.1667	0.1667
COL40X50	0.2000	0.0055	0.0027	0.0042	0.1667	0.1667

F R A M E S E C T I O N P R O P E R T Y D A T A

FRAME SECTION NAME	SECTION MODULI S33	SECTION MODULI S22	PLASTIC MODULI Z33	PLASTIC MODULI Z22	RADIUS OF GYRATION R33	RADIUS OF GYRATION R22
VIG15X50	0.0063	0.0019	0.0094	0.0028	0.1443	0.0433
VIG40X50	0.0167	0.0133	0.0250	0.0200	0.1443	0.1155
COL40X50	0.0133	0.0167	0.0200	0.0250	0.1155	0.1443

F R A M E S E C T I O N W E I G H T S A N D M A S S E S

FRAME SECTION NAME	TOTAL WEIGHT	TOTAL MASS
VIG15X50	163.6758	16.3676
VIG40X50	66.2400	6.6240
COL40X50	36.0000	3.6000

C O N C R E T E C O L U M N D A T A

FRAME SECTION NAME	REINF CONFIGURATION LONGIT	REINF CONFIGURATION LATERAL	REINF SIZE/TYPE	NUM BARS 3DIR/2DIR	NUM BARS CIRCULAR	BAR COVER
COL40X50	Rectangular	Ties	#8/Design	5/4	N/A	0.0500

C O N C R E T E B E A M D A T A

FRAME SECTION NAME	TOP COVER	BOT COVER	TOP LEFT AREA	TOP RIGHT AREA	BOT LEFT AREA	BOT RIGHT AREA
VIG15X50	0.0500	0.0500	0.000	0.000	0.000	0.000
VIG40X50	0.0500	0.0500	0.000	0.000	0.000	0.000

S H E L L S E C T I O N P R O P E R T Y D A T A

SHELL SECTION	MATERIAL NAME	SHELL TYPE	LOAD DIST ONE WAY	MEMBRANE THICK	BENDING THICK	TOTAL WEIGHT	TOTAL MASS
PLACAMACIZA	CONC21	Membrane	Yes	0.1420	0.1420	60.5670	6.0567
RAMPA	RAMPA	Membrane	No	0.1420	0.1420	0.0000	25.1386

S T A T I C L O A D C A S E S

STATIC CASE	CASE TYPE	AUTO LAT LOAD	SELF WT MULTIPLIER	NOTIONAL FACTOR	NOTIONAL DIRECTION
DEAD	DEAD	N/A	1.0000		

```
LIVE        LIVE        N/A              0.0000

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R E S P O N S E   S P E C T R U M   C A S E S

RESP SPEC CASE: SISDERX

  BASIC RESPONSE SPECTRUM DATA

    MODAL       DIRECTION          MODAL    SPECTRUM     TYPICAL
    COMBO       COMBO            DAMPING       ANGLE       ECCEN

    SRSS        SRSS              0.0500      0.0000      0.0500


  RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

    DIRECTION   FUNCTION      SCALE FACT

    U1          DERIVAS          15.8940
    U2          ----                 N/A
    UZ          ----                 N/A


RESP SPEC CASE: SISDERY

  BASIC RESPONSE SPECTRUM DATA

    MODAL       DIRECTION          MODAL    SPECTRUM     TYPICAL
    COMBO       COMBO            DAMPING       ANGLE       ECCEN

    SRSS        SRSS              0.0500      0.0000      0.0500


  RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

    DIRECTION   FUNCTION      SCALE FACT

    U1          ----                 N/A
    U2          DERIVAS          11.6510
    UZ          ----                 N/A


RESP SPEC CASE: SISDISX

  BASIC RESPONSE SPECTRUM DATA

    MODAL       DIRECTION          MODAL    SPECTRUM     TYPICAL
    COMBO       COMBO            DAMPING       ANGLE       ECCEN

    SRSS        SRSS              0.0500      0.0000      0.0500


  RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

    DIRECTION   FUNCTION      SCALE FACT

    U1          DISENO           15.8940
    U2          ----                 N/A
    UZ          ----                 N/A


RESP SPEC CASE: SISDISY

  BASIC RESPONSE SPECTRUM DATA

    MODAL       DIRECTION          MODAL    SPECTRUM     TYPICAL
    COMBO       COMBO            DAMPING       ANGLE       ECCEN

    SRSS        SRSS              0.0500      0.0000      0.0500


  RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

    DIRECTION   FUNCTION      SCALE FACT

    U1          ----                 N/A
    U2          DISENO           11.6510
    UZ          ----                 N/A
```

RESP SPEC CASE: SISUMBX

BASIC RESPONSE SPECTRUM DATA

MODAL COMBO	DIRECTION COMBO	MODAL DAMPING	SPECTRUM ANGLE	TYPICAL ECCEN
SRSS	SRSS	0.0200	0.0000	0.0500

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

DIRECTION	FUNCTION	SCALE FACT
U1	UMBRAL	5.2570
U2	----	N/A
UZ	----	N/A

RESP SPEC CASE: SISUMBY

BASIC RESPONSE SPECTRUM DATA

MODAL COMBO	DIRECTION COMBO	MODAL DAMPING	SPECTRUM ANGLE	TYPICAL ECCEN
SRSS	SRSS	0.0200	0.0000	0.0500

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

DIRECTION	FUNCTION	SCALE FACT
U1	----	N/A
U2	UMBRAL	5.7530
UZ	----	N/A

L O A D I N G C O M B I N A T I O N S

COMBO	COMBO TYPE	CASE	CASE TYPE	SCALE FACTOR
COMDIS1	ADD	DEAD	Static	1.4000
COMDIS2	ADD	DEAD	Static	1.2000
		LIVE	Static	1.6000
COMDIS3	ADD	DEAD	Static	1.2000
		LIVE	Static	1.0000
		SISDISX	Spectra	1.0000
		SISDISY	Spectra	0.3000
COMDIS4	ADD	DEAD	Static	1.2000
		LIVE	Static	1.0000
		SISDISY	Spectra	1.0000
		SISDISX	Spectra	0.3000
COMDIS5	ADD	DEAD	Static	0.9000
		SISDISX	Spectra	1.0000
		SISDISY	Spectra	0.3000
COMDIS6	ADD	DEAD	Static	0.9000
		SISDISY	Spectra	1.0000
		SISDISX	Spectra	0.3000
ENVOLVENTE	ENVE	COMDIS1	Combo	1.0000
		COMDIS2	Combo	1.0000
		COMDIS3	Combo	1.0000
		COMDIS4	Combo	1.0000
		COMDIS5	Combo	1.0000
		COMDIS6	Combo	1.0000
CIM1	ADD	DEAD	Static	1.0000
		LIVE	Static	1.0000
CIM2	ADD	DEAD	Static	1.0000
		LIVE	Static	0.7500
		SISDISX	Spectra	0.3500
		SISDISY	Spectra	0.1166
CIM3	ADD	DEAD	Static	1.0000
		LIVE	Static	0.7500
		SISDISY	Spectra	0.3500
		SISDISX	Spectra	0.1166
COMDER1	ADD	SISDERX	Spectra	1.0000
		SISDERY	Spectra	0.3000
COMDER2	ADD	SISDERY	Spectra	1.0000

		SISDERX	Spectra	0.3000
COMDERUMB1	ADD	SISUMBX	Spectra	1.0000
		SISUMBY	Spectra	0.3000
COMDERUMB2	ADD	SISUMBY	Spectra	1.0000
		SISUMBX	Spectra	0.3000

R E S P O N S E S P E C T R U M F U N C T I O N - F R O M F I L E

FUNCTION NAME: DERIVAS

FILE NAME: c:\users\inv\desktop\ana\proyectos\2260 san juan\rampa dye16-2264-rampa\modelo\derivas.txt
DATA TYPE: Period vs Acceleration
NUMBER OF HEADER LINES = 0

PERIOD	ACCEL
0.0000	1.1250
0.0500	1.1250
0.1000	1.1250
0.1600	1.1250
0.2100	1.1250
0.4100	1.1250
0.6000	1.1250
0.8000	1.1250
1.0000	1.1250
1.3400	0.8370
1.6900	0.6660
2.0300	0.5530
2.3800	0.4730
2.7200	0.4130
3.0700	0.3670
3.4100	0.3300
3.7600	0.3000
4.1000	0.2740
4.4400	0.2530
4.7900	0.2350
5.1300	0.2190
5.4800	0.2050
5.8200	0.1930
6.1700	0.1820
6.5100	0.1730
6.8600	0.1640
7.2000	0.1560
8.2000	0.1200
9.2000	0.0960

FUNCTION NAME: DISENO

FILE NAME: c:\users\inv\desktop\ana\proyectos\2260 san juan\rampa dye16-2264-rampa\modelo\diseño.txt
DATA TYPE: Period vs Acceleration
NUMBER OF HEADER LINES = 0

PERIOD	ACCEL
0.0000	0.7500
0.0500	0.7500
0.1000	0.7500
0.1600	0.7500
0.2100	0.7500
0.4100	0.7500
0.6000	0.7500
0.8000	0.7500
1.0000	0.7500
1.3400	0.5580
1.6900	0.4440
2.0300	0.3690
2.3800	0.3150
2.7200	0.2760
3.0700	0.2450
3.4100	0.2200
3.7600	0.2000
4.1000	0.1830
4.4400	0.1690
4.7900	0.1570
5.1300	0.1460
5.4800	0.1370

5.8200	0.1290
6.1700	0.1220
6.5100	0.1150
6.8600	0.1090
7.2000	0.1040
8.2000	0.0800
9.2000	0.0640

FUNCTION NAME: UMBRAL

FILE NAME: c:\users\inv\desktop\ana\proyectos\2260 san juan\rampa dye16-2264-rampa\modelo\umbral.txt
DATA TYPE: Period vs Acceleration
NUMBER OF HEADER LINES = 0

PERIOD	ACCEL
0.0000	0.3000
0.0500	0.4200
0.1000	0.5400
0.1500	0.6600
0.2000	0.7800
0.2500	0.9000
0.4500	0.9000
0.6400	0.9000
0.8400	0.9000
1.0300	0.9000
1.2300	0.9000
1.4200	0.9000
1.6200	0.9000
1.8100	0.9000
2.4300	0.6700
3.0500	0.5340
3.6700	0.4440
4.2900	0.3800
4.9200	0.3320
5.5400	0.2950
6.1600	0.2650
6.7800	0.2410
7.4000	0.2210
8.0200	0.2030
8.6400	0.1890
9.2600	0.1760
9.8800	0.1650
10.5000	0.1290
11.5000	0.1070
12.5000	0.0910

F R A M E S E C T I O N A S S I G N M E N T S T O L I N E O B J E C T S

STORY LEVEL	LINE ID	LINE TYPE	SECTION TYPE	AUTO SELECT SECTION	ANALYSIS SECTION	DESIGN PROCEDURE	DESIGN SECTION
N+3.40	C2	Column	Rectangular	None	COL40X50	Conc Frame	COL40X50
N+2.5	C2	Column	Rectangular	None	COL40X50	Conc Frame	COL40X50
N+2.5	C4	Column	Rectangular	None	COL40X50	Conc Frame	COL40X50
N+1.60	C2	Column	Rectangular	None	COL40X50	Conc Frame	COL40X50
N+1.60	C4	Column	Rectangular	None	COL40X50	Conc Frame	COL40X50
N+1.60	C6	Column	Rectangular	None	COL40X50	Conc Frame	COL40X50
N+0.8	C2	Column	Rectangular	None	COL40X50	Conc Frame	COL40X50
N+0.8	C4	Column	Rectangular	None	COL40X50	Conc Frame	COL40X50
N+0.8	C6	Column	Rectangular	None	COL40X50	Conc Frame	COL40X50
N+3.40	B2	Beam	Rectangular	None	VIG40X50	Conc Frame	VIG40X50
N+2.5	B10	Beam	Rectangular	None	VIG40X50	Conc Frame	VIG40X50
N+2.5	B20	Beam	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+2.5	B21	Beam	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+2.5	B32	Beam	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+2.5	B33	Beam	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+1.60	B6	Beam	Rectangular	None	VIG40X50	Conc Frame	VIG40X50
N+1.60	B7	Beam	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+1.60	B8	Beam	Rectangular	None	VIG40X50	Conc Frame	VIG40X50
N+1.60	B9	Beam	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+1.60	B16	Beam	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+1.60	B19	Beam	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+1.60	B28	Beam	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+1.60	B31	Beam	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+0.8	B3	Beam	Rectangular	None	VIG40X50	Conc Frame	VIG40X50
N+0.8	B17	Beam	Rectangular	None	VIG15X50	Conc Frame	VIG15X50

N+0.8	B18	Beam	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+0.8	B29	Beam	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+0.8	B30	Beam	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
BASE	B1	Beam	Rectangular	None	VIG40X50	Conc Frame	VIG40X50
N+3.40	D4	Brace	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+3.40	D13	Brace	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+2.5	D3	Brace	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+2.5	D12	Brace	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+1.60	D2	Brace	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+1.60	D11	Brace	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+0.8	D1	Brace	Rectangular	None	VIG15X50	Conc Frame	VIG15X50
N+0.8	D10	Brace	Rectangular	None	VIG15X50	Conc Frame	VIG15X50

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D I S T R I B U T E D L O A D A S S I G N M E N T S T O L I N E O B J E C T S

LOAD CASE	STORY LEVEL	LINE ID	LOAD TYPE	LOAD DIRECTION	ABSOLUTE DISTANCE A	ABSOLUTE DISTANCE B	LOAD A PER LENGTH	LOAD B PER LENGTH
DEAD	N+1.60	B16	Force	Gravity	0.000	2.220	1.000	1.000
DEAD	N+1.60	B19	Force	Gravity	0.000	2.220	1.000	1.000
DEAD	N+3.40	D4	Force	Gravity	0.000	8.796	3.400	3.400
DEAD	N+3.40	D13	Force	Gravity	0.000	8.796	3.400	3.400
DEAD	N+2.5	D3	Force	Gravity	0.000	8.776	3.400	3.400
DEAD	N+2.5	D12	Force	Gravity	0.000	8.776	3.400	3.400
DEAD	N+1.60	D2	Force	Gravity	0.000	8.767	3.400	3.400
DEAD	N+1.60	D11	Force	Gravity	0.000	8.767	3.400	3.400
DEAD	N+0.8	D1	Force	Gravity	0.000	8.786	3.400	3.400
DEAD	N+0.8	D10	Force	Gravity	0.000	8.786	3.400	3.400
LIVE	N+3.40	D4	Force	Gravity	0.000	8.796	5.000	5.000
LIVE	N+3.40	D13	Force	Gravity	0.000	8.796	5.000	5.000
LIVE	N+2.5	D3	Force	Gravity	0.000	8.776	5.000	5.000
LIVE	N+2.5	D12	Force	Gravity	0.000	8.776	5.000	5.000
LIVE	N+1.60	D2	Force	Gravity	0.000	8.767	5.000	5.000
LIVE	N+1.60	D11	Force	Gravity	0.000	8.767	5.000	5.000
LIVE	N+0.8	D1	Force	Gravity	0.000	8.786	5.000	5.000
LIVE	N+0.8	D10	Force	Gravity	0.000	8.786	5.000	5.000

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U N I F O R M L O A D A S S I G N M E N T S T O A R E A O B J E C T S

CASE	STORY	AREA	AREATYPE	DIRECTION	LOAD
LIVE	N+2.5	F9	Floor	Gravity	5.0000
LIVE	N+2.5	F10	Floor	Gravity	5.0000
LIVE	N+1.60	F11	Floor	Gravity	5.0000
LIVE	N+1.60	F12	Floor	Gravity	5.0000
LIVE	N+1.60	F13	Floor	Gravity	5.0000
LIVE	N+0.8	F7	Floor	Gravity	5.0000
LIVE	N+0.8	F8	Floor	Gravity	5.0000

Diseños & Estructuras

PROYECTO: INSTITUCION EDUCATIVA SAN JUAN - RAMPA

FUERZAS EN VIGAS

BEAM FORCES
UNID: kN-m

Story	Beam	Load	Loc	P	V2	V3	T	M2	M3
BASE	B1	ENVOLVENTE MAX	0	2.45	-3.31	0.95	-12.497	0.647	0.94
BASE	B1	ENVOLVENTE MAX	1.15	2.45	1.66	0.95	-12.497	1.114	2.682
BASE	B1	ENVOLVENTE MAX	2.1	2.45	7.09	0.95	-12.497	2.135	0.912
BASE	B1	ENVOLVENTE MAX	2.1	25.82	73.99	74.53	-44.42	1.806	0.449
BASE	B1	ENVOLVENTE MAX	2.3	25.82	75.14	74.53	-44.42	9.527	-5.296
BASE	B1	ENVOLVENTE MIN	0	-2.46	-8	-1.12	-73.378	-0.493	-3.197
BASE	B1	ENVOLVENTE MIN	1.15	-2.46	-1.37	-1.12	-73.378	-0.761	1.402
BASE	B1	ENVOLVENTE MIN	2.1	-2.46	3.35	-1.12	-73.378	-1.618	-1.645
BASE	B1	ENVOLVENTE MIN	2.1	-25.74	21.27	-55.09	-174.616	-1.508	-1.695
BASE	B1	ENVOLVENTE MIN	2.3	-25.74	22.14	-55.09	-174.616	-13.117	-14.814
N+3.40	B2	ENVOLVENTE MAX	0	91.43	-42.58	-6.17	147.345	16.312	-39.269
N+3.40	B2	ENVOLVENTE MAX	0.2	91.43	-41.71	-6.17	147.345	18.712	-30.616
N+3.40	B2	ENVOLVENTE MAX	0.2	50.69	-22.23	12.94	75.02	22.594	-34.176
N+3.40	B2	ENVOLVENTE MAX	1.15	50.69	-18.13	12.94	75.02	10.33	-14.967
N+3.40	B2	ENVOLVENTE MAX	2.3	50.69	-13.16	12.94	75.02	8.426	3.409
N+3.40	B2	ENVOLVENTE MIN	0	-92.54	-135.54	-63.53	20.97	-33.633	-173.631
N+3.40	B2	ENVOLVENTE MIN	0.2	-92.54	-134.39	-63.53	20.97	-22.092	-146.638
N+3.40	B2	ENVOLVENTE MIN	0.2	-51.18	-74.97	-16.81	-5.973	-28.611	-146.047
N+3.40	B2	ENVOLVENTE MIN	1.15	-51.18	-69.5	-16.81	-5.973	-12.669	-77.422
N+3.40	B2	ENVOLVENTE MIN	2.3	-51.18	-62.88	-16.81	-5.973	-6.312	-4.762
N+0.8	B3	ENVOLVENTE MAX	0	0	148.31	0	10.284	0	5.559
N+0.8	B3	ENVOLVENTE MAX	1.15	0	154.93	0	10.284	0	-44.946
N+0.8	B3	ENVOLVENTE MAX	2.1	0	160.4	0	10.284	0	-89.616
N+0.8	B3	ENVOLVENTE MAX	2.1	0	306.33	0	30.47	0	-86.15
N+0.8	B3	ENVOLVENTE MAX	2.3	0	307.48	0	30.47	0	-105.318
N+0.8	B3	ENVOLVENTE MIN	0	0	39.97	0	-12.406	0	-2.102
N+0.8	B3	ENVOLVENTE MIN	1.15	0	44.94	0	-12.406	0	-171.278
N+0.8	B3	ENVOLVENTE MIN	2.1	0	49.04	0	-12.406	0	-321.06
N+0.8	B3	ENVOLVENTE MIN	2.1	0	90.69	0	-42.789	0	-320.138
N+0.8	B3	ENVOLVENTE MIN	2.3	0	91.56	0	-42.789	0	-381.519
N+1.60	B6	ENVOLVENTE MAX	0	0	97.78	0	41.814	0	3.403
N+1.60	B6	ENVOLVENTE MAX	1.15	0	104.4	0	41.814	0	-27.199
N+1.60	B6	ENVOLVENTE MAX	2.1	0	109.87	0	41.814	0	-55.526
N+1.60	B6	ENVOLVENTE MAX	2.1	0	214.2	0	86.125	0	-54.308
N+1.60	B6	ENVOLVENTE MAX	2.3	0	215.35	0	86.125	0	-69.08
N+1.60	B6	ENVOLVENTE MIN	0	0	22.8	0	-1.922	0	0.266
N+1.60	B6	ENVOLVENTE MIN	1.15	0	27.76	0	-1.922	0	-113.097
N+1.60	B6	ENVOLVENTE MIN	2.1	0	31.87	0	-1.922	0	-214.877
N+1.60	B6	ENVOLVENTE MIN	2.1	0	64.57	0	-4.487	0	-215.037
N+1.60	B6	ENVOLVENTE MIN	2.3	0	65.43	0	-4.487	0	-257.992
N+1.60	B7	ENVOLVENTE MAX	0	0	1.85	0	3.384	0	-0.399
N+1.60	B7	ENVOLVENTE MAX	1.15	0	4.33	0	3.384	0	-0.637
N+1.60	B7	ENVOLVENTE MAX	2.1	0	6.39	0	3.384	0	-1.425
N+1.60	B7	ENVOLVENTE MAX	2.1	0	1.53	0	0.72	0	-1.939
N+1.60	B7	ENVOLVENTE MAX	2.3	0	1.96	0	0.72	0	-2.016
N+1.60	B7	ENVOLVENTE MIN	0	0	-1.86	0	0.116	0	-4.422
N+1.60	B7	ENVOLVENTE MIN	1.15	0	0	0	0.116	0	-6.672
N+1.60	B7	ENVOLVENTE MIN	2.1	0	1.54	0	0.116	0	-11.709
N+1.60	B7	ENVOLVENTE MIN	2.1	0	-1.36	0	-1.233	0	-11.686
N+1.60	B7	ENVOLVENTE MIN	2.3	0	-1.04	0	-1.233	0	-11.718
N+1.60	B8	ENVOLVENTE MAX	0	0	-71.29	0	-1.654	0	-78.168
N+1.60	B8	ENVOLVENTE MAX	0.2	0	-70.43	0	-1.654	0	-63.295
N+1.60	B8	ENVOLVENTE MAX	0.2	0	-35.79	0	-0.402	0	-64.209
N+1.60	B8	ENVOLVENTE MAX	1.15	0	-31.69	0	-0.402	0	-32.131
N+1.60	B8	ENVOLVENTE MAX	2.3	0	-26.72	0	-0.402	0	2.911
N+1.60	B8	ENVOLVENTE MIN	0	0	-232.83	0	-98.692	0	-286.67
N+1.60	B8	ENVOLVENTE MIN	0.2	0	-231.68	0	-98.692	0	-240.219
N+1.60	B8	ENVOLVENTE MIN	0.2	0	-119.45	0	-59.694	0	-237.176
N+1.60	B8	ENVOLVENTE MIN	1.15	0	-113.98	0	-59.694	0	-126.298
N+1.60	B8	ENVOLVENTE MIN	2.3	0	-107.35	0	-59.694	0	-1.754
N+1.60	B9	ENVOLVENTE MAX	0	0	1.96	0	0.72	0	-2.016
N+1.60	B9	ENVOLVENTE MAX	0.2	0	2.39	0	0.72	0	-2.152
N+1.60	B9	ENVOLVENTE MAX	0.2	0	-1.04	0	-0.453	0	-1.67
N+1.60	B9	ENVOLVENTE MAX	1.15	0	0.5	0	-0.453	0	-1.164
N+1.60	B9	ENVOLVENTE MAX	2.3	0	2.64	0	-0.453	0	-0.684
N+1.60	B9	ENVOLVENTE MIN	0	0	-1.04	0	-1.233	0	-11.718
N+1.60	B9	ENVOLVENTE MIN	0.2	0	-0.71	0	-1.233	0	-11.841

N+1.60	B9	ENVOLVENTE MIN	0.2	0	-5.73	0	-4.438	0	-10.708
N+1.60	B9	ENVOLVENTE MIN	1.15	0	-3.67	0	-4.438	0	-6.488
N+1.60	B9	ENVOLVENTE MIN	2.3	0	-1.47	0	-4.438	0	-5.814
N+2.5	B10	ENVOLVENTE MAX	0	0	-94.22	0	27.222	0	-87.382
N+2.5	B10	ENVOLVENTE MAX	0.2	0	-93.36	0	27.222	0	-68.493
N+2.5	B10	ENVOLVENTE MAX	0.2	0	-44.03	0	13.731	0	-75.837
N+2.5	B10	ENVOLVENTE MAX	1.15	0	-39.92	0	13.731	0	-35.91
N+2.5	B10	ENVOLVENTE MAX	2.3	0	-34.96	0	13.731	0	10.016
N+2.5	B10	ENVOLVENTE MIN	0	0	-305.07	0	-51.94	0	-364.923
N+2.5	B10	ENVOLVENTE MIN	0.2	0	-303.92	0	-51.94	0	-304.024
N+2.5	B10	ENVOLVENTE MIN	0.2	0	-155.28	0	-34.603	0	-308.11
N+2.5	B10	ENVOLVENTE MIN	1.15	0	-149.81	0	-34.603	0	-163.19
N+2.5	B10	ENVOLVENTE MIN	2.3	0	-143.19	0	-34.603	0	-4.155
N+1.60	B16	ENVOLVENTE MAX	0	0	1.86	0	-0.399	0	-0.116
N+1.60	B16	ENVOLVENTE MAX	1.11	0	17.61	0	-0.399	0	-2.355
N+1.60	B16	ENVOLVENTE MAX	2.22	0	35.43	0	-0.399	0	-11.156
N+1.60	B16	ENVOLVENTE MIN	0	0	-1.85	0	-4.422	0	-3.384
N+1.60	B16	ENVOLVENTE MIN	1.11	0	4.7	0	-4.422	0	-12.65
N+1.60	B16	ENVOLVENTE MIN	2.22	0	11.07	0	-4.422	0	-42.091
N+0.8	B17	ENVOLVENTE MAX	0	0	62.49	0	1.637	0	-3.584
N+0.8	B17	ENVOLVENTE MAX	0.455	0	69.25	0	1.637	0	-12.915
N+0.8	B17	ENVOLVENTE MAX	0.91	0	76.01	0	1.637	0	-22.348
N+0.8	B17	ENVOLVENTE MIN	0	0	8.55	0	-2.841	0	-62.678
N+0.8	B17	ENVOLVENTE MIN	0.455	0	10.75	0	-2.841	0	-89.614
N+0.8	B17	ENVOLVENTE MIN	0.91	0	12.95	0	-2.841	0	-122.661
N+0.8	B18	ENVOLVENTE MAX	0	0	-7.65	0	3.08	0	-22.747
N+0.8	B18	ENVOLVENTE MAX	0.445	0	-5.5	0	3.08	0	-15.794
N+0.8	B18	ENVOLVENTE MAX	0.89	0	-3.34	0	3.08	0	-5.29
N+0.8	B18	ENVOLVENTE MIN	0	0	-73.04	0	-0.827	0	-120.536
N+0.8	B18	ENVOLVENTE MIN	0.445	0	-67.83	0	-0.827	0	-89.835
N+0.8	B18	ENVOLVENTE MIN	0.89	0	-62.63	0	-0.827	0	-63.849
N+1.60	B19	ENVOLVENTE MAX	0	0	2.64	0	5.814	0	-0.453
N+1.60	B19	ENVOLVENTE MAX	1.11	0	18.63	0	5.814	0	-2.588
N+1.60	B19	ENVOLVENTE MAX	2.22	0	36.45	0	5.814	0	-11.578
N+1.60	B19	ENVOLVENTE MIN	0	0	-1.47	0	0.684	0	-4.438
N+1.60	B19	ENVOLVENTE MIN	1.11	0	4.9	0	0.684	0	-15.087
N+1.60	B19	ENVOLVENTE MIN	2.22	0	11.27	0	0.684	0	-45.56
N+2.5	B20	ENVOLVENTE MAX	0	0	54.07	0	5.967	0	7.699
N+2.5	B20	ENVOLVENTE MAX	0.455	0	60.83	0	5.967	0	0.734
N+2.5	B20	ENVOLVENTE MAX	0.91	0	67.59	0	5.967	0	-6.363
N+2.5	B20	ENVOLVENTE MIN	0	0	9.15	0	-1.014	0	-58.207
N+2.5	B20	ENVOLVENTE MIN	0.455	0	11.35	0	-1.014	0	-80.291
N+2.5	B20	ENVOLVENTE MIN	0.91	0	13.55	0	-1.014	0	-105.67
N+2.5	B21	ENVOLVENTE MAX	0	0	-17.46	0	4.525	0	-7.031
N+2.5	B21	ENVOLVENTE MAX	0.445	0	-15.31	0	4.525	0	0.585
N+2.5	B21	ENVOLVENTE MAX	0.89	0	-13.15	0	4.525	0	7.326
N+2.5	B21	ENVOLVENTE MIN	0	0	-75.6	0	-5.432	0	-125.874
N+2.5	B21	ENVOLVENTE MIN	0.445	0	-68.99	0	-5.432	0	-97.488
N+2.5	B21	ENVOLVENTE MIN	0.89	0	-62.38	0	-5.432	0	-71.503
N+1.60	B28	ENVOLVENTE MAX	0	0	6.41	0	0.805	0	3.438
N+1.60	B28	ENVOLVENTE MAX	1.11	0	23.54	0	0.805	0	-3.92
N+1.60	B28	ENVOLVENTE MAX	2.22	0	42.71	0	0.805	0	-15.525
N+1.60	B28	ENVOLVENTE MIN	0	0	1.35	0	-1.296	0	0.874
N+1.60	B28	ENVOLVENTE MIN	1.11	0	7.41	0	-1.296	0	-12.373
N+1.60	B28	ENVOLVENTE MIN	2.22	0	13.46	0	-1.296	0	-48.824
N+0.8	B29	ENVOLVENTE MAX	0	0	-16.88	0	1.901	0	-28.46
N+0.8	B29	ENVOLVENTE MAX	0.445	0	-14.72	0	1.901	0	-21.397
N+0.8	B29	ENVOLVENTE MAX	0.89	0	-12.57	0	1.901	0	-15.253
N+0.8	B29	ENVOLVENTE MIN	0	0	-69.18	0	-1.453	0	-114.236
N+0.8	B29	ENVOLVENTE MIN	0.445	0	-62.57	0	-1.453	0	-84.919
N+0.8	B29	ENVOLVENTE MIN	0.89	0	-55.96	0	-1.453	0	-58.545
N+0.8	B30	ENVOLVENTE MAX	0	0	66.24	0	1.955	0	-12.824
N+0.8	B30	ENVOLVENTE MAX	0.455	0	71.56	0	1.955	0	-15.16
N+0.8	B30	ENVOLVENTE MAX	0.91	0	76.89	0	1.955	0	-18.432
N+0.8	B30	ENVOLVENTE MIN	0	0	3.82	0	-2.542	0	-60.706
N+0.8	B30	ENVOLVENTE MIN	0.455	0	6.02	0	-2.542	0	-91.011
N+0.8	B30	ENVOLVENTE MIN	0.91	0	8.23	0	-2.542	0	-124.392
N+1.60	B31	ENVOLVENTE MAX	0	0	6.06	0	2.116	0	3.756
N+1.60	B31	ENVOLVENTE MAX	1.11	0	24.14	0	2.116	0	-4.381
N+1.60	B31	ENVOLVENTE MAX	2.22	0	43.31	0	2.116	0	-17.119
N+1.60	B31	ENVOLVENTE MIN	0	0	2.39	0	-0.5	0	0.974
N+1.60	B31	ENVOLVENTE MIN	1.11	0	8.44	0	-0.5	0	-12.395
N+1.60	B31	ENVOLVENTE MIN	2.22	0	14.5	0	-0.5	0	-49.827
N+2.5	B32	ENVOLVENTE MAX	0	0	56.05	0	5.838	0	-12.362
N+2.5	B32	ENVOLVENTE MAX	0.455	0	62.81	0	5.838	0	-18.135
N+2.5	B32	ENVOLVENTE MAX	0.91	0	69.57	0	5.838	0	-24.476
N+2.5	B32	ENVOLVENTE MIN	0	0	9.1	0	-1.296	0	-63.966
N+2.5	B32	ENVOLVENTE MIN	0.455	0	11.3	0	-1.296	0	-91.008
N+2.5	B32	ENVOLVENTE MIN	0.91	0	13.5	0	-1.296	0	-121.126
N+2.5	B33	ENVOLVENTE MAX	0	0	-20.99	0	5.01	0	-29.798
N+2.5	B33	ENVOLVENTE MAX	0.445	0	-18.83	0	5.01	0	-20.751
N+2.5	B33	ENVOLVENTE MAX	0.89	0	-16.68	0	5.01	0	-12.511
N+2.5	B33	ENVOLVENTE MIN	0	0	-79.06	0	-5.012	0	-124.166
N+2.5	B33	ENVOLVENTE MIN	0.445	0	-72.45	0	-5.012	0	-90.454
N+2.5	B33	ENVOLVENTE MIN	0.89	0	-65.84	0	-5.012	0	-59.683

FUERZAS EN VIGAS INCLINADAS

BRACE FORCES
UNID: kN-m

Story	Brace	Load	Loc	P	V2	V3	T	M2	M3
N+0.8	D1	ENVOLVENTE MAX	0	177.2	-17.93	0.18	3.153	0.703	-12.497
N+0.8	D1	ENVOLVENTE MAX	4.393	179.07	2.55	0.18	3.153	0.206	69.123
N+0.8	D1	ENVOLVENTE MAX	8.786	180.94	61.01	0.18	3.153	0.933	-5.29
N+0.8	D1	ENVOLVENTE MIN	0	-210.91	-63.59	-0.17	-0.891	-0.651	-73.378
N+0.8	D1	ENVOLVENTE MIN	4.393	-206.41	-4.04	-0.17	-0.891	-0.173	20.102
N+0.8	D1	ENVOLVENTE MIN	8.786	-201.92	17.01	-0.17	-0.891	-0.92	-63.849
N+1.60	D2	ENVOLVENTE MAX	0	142.55	-15.96	0.45	1.565	1.751	-3.584
N+1.60	D2	ENVOLVENTE MAX	4.383	144.42	5.38	0.45	1.565	0.254	67.164
N+1.60	D2	ENVOLVENTE MAX	8.767	146.3	64.31	0.45	1.565	2.483	-10.764
N+1.60	D2	ENVOLVENTE MIN	0	-176.6	-60.01	-0.52	-2.746	-2.057	-62.678
N+1.60	D2	ENVOLVENTE MIN	4.383	-172.1	-2.74	-0.52	-2.746	-0.274	19.665
N+1.60	D2	ENVOLVENTE MIN	8.767	-167.61	17.69	-0.52	-2.746	-2.216	-78.596
N+2.5	D3	ENVOLVENTE MAX	0	67.16	-17.76	1.31	6.552	5.65	-12.448
N+2.5	D3	ENVOLVENTE MAX	4.388	69.27	2.67	1.31	6.552	0.101	63.697
N+2.5	D3	ENVOLVENTE MAX	8.776	71.38	56.01	1.31	6.552	3.913	7.699
N+2.5	D3	ENVOLVENTE MIN	0	-100.03	-68.3	-0.88	-1.375	-3.779	-101.077
N+2.5	D3	ENVOLVENTE MIN	4.388	-94.97	-9.85	-0.88	-1.375	-0.123	16.067
N+2.5	D3	ENVOLVENTE MIN	8.776	-89.91	13.31	-0.88	-1.375	-5.828	-58.207
N+3.40	D4	ENVOLVENTE MAX	0	30.67	-14.42	1.84	3.929	8.013	7.326
N+3.40	D4	ENVOLVENTE MAX	4.398	32.77	6.35	1.84	3.929	0.034	77.265
N+3.40	D4	ENVOLVENTE MAX	8.796	36.45	62.88	1.84	3.929	5.905	5.973
N+3.40	D4	ENVOLVENTE MIN	0	-41.67	-61.72	-1.34	-5.059	-5.891	-71.503
N+3.40	D4	ENVOLVENTE MIN	4.398	-36.61	-5.79	-1.34	-5.059	-0.094	22.953
N+3.40	D4	ENVOLVENTE MIN	8.796	-33.12	14.68	-1.34	-5.059	-8.146	-75.02
N+0.8	D10	ENVOLVENTE MAX	0	50.43	-21.37	0.23	1.989	0.843	-31.073
N+0.8	D10	ENVOLVENTE MAX	4.393	52.3	-0.89	0.23	1.989	0.161	56.959
N+0.8	D10	ENVOLVENTE MAX	8.786	54.17	57.44	0.23	1.989	0.798	-15.253
N+0.8	D10	ENVOLVENTE MIN	0	-76.99	-67.16	-0.15	-1.498	-0.579	-101.237
N+0.8	D10	ENVOLVENTE MIN	4.393	-72.49	-4.86	-0.15	-1.498	-0.253	17.79
N+0.8	D10	ENVOLVENTE MIN	8.786	-67.99	18.18	-0.15	-1.498	-1.246	-58.545
N+1.60	D11	ENVOLVENTE MAX	0	143.26	-16.93	0.54	1.865	2.148	-12.824
N+1.60	D11	ENVOLVENTE MAX	4.383	145.13	4.95	0.54	1.865	0.274	60.988
N+1.60	D11	ENVOLVENTE MAX	8.767	147.01	65.47	0.54	1.865	2.244	-17.333
N+1.60	D11	ENVOLVENTE MIN	0	-195.36	-58.84	-0.46	-2.489	-1.77	-60.706
N+1.60	D11	ENVOLVENTE MIN	4.383	-190.87	-1.04	-0.46	-2.489	-0.256	16.563
N+1.60	D11	ENVOLVENTE MIN	8.767	-186.37	19.39	-0.46	-2.489	-2.586	-89.773
N+2.5	D12	ENVOLVENTE MAX	0	67.15	-19	1.42	6.469	6.137	-16.399
N+2.5	D12	ENVOLVENTE MAX	4.388	69.26	1.43	1.42	6.469	0.1	59.69
N+2.5	D12	ENVOLVENTE MAX	8.776	71.37	59.26	1.42	6.469	3.675	-12.362
N+2.5	D12	ENVOLVENTE MIN	0	-110.71	-65.06	-0.82	-1.627	-3.547	-89.41
N+2.5	D12	ENVOLVENTE MIN	4.388	-105.65	-4.89	-0.82	-1.627	-0.148	16.376
N+2.5	D12	ENVOLVENTE MIN	8.776	-100.59	16.8	-0.82	-1.627	-6.36	-63.966
N+3.40	D13	ENVOLVENTE MAX	0	12.96	-17.64	1.86	4.402	8.284	-12.511
N+3.40	D13	ENVOLVENTE MAX	4.398	15.06	4.17	1.86	4.402	0.115	64.622
N+3.40	D13	ENVOLVENTE MAX	8.796	17.17	65.19	1.86	4.402	5.392	-18.287
N+3.40	D13	ENVOLVENTE MIN	0	-85.97	-59.41	-1.24	-4.686	-5.545	-59.683
N+3.40	D13	ENVOLVENTE MIN	4.398	-80.91	-0.95	-1.24	-4.686	-0.085	19.631
N+3.40	D13	ENVOLVENTE MIN	8.796	-75.85	19.53	-1.24	-4.686	-8.072	-85.074

FUERZAS EN COLUMNAS

COLUMN FORCES
UNID: kN-m

Story	Column	Load	Loc	P	V2	V3	T	M2	M3
N+3.40	C2	ENVOLVENTE MAX	0	-46.46	105	65.94	33.633	-13.904	218.977
N+3.40	C2	ENVOLVENTE MAX	0.45	-44.52	105	65.94	33.633	-17.78	174.694
N+3.40	C2	ENVOLVENTE MAX	0.9	-42.58	105	65.94	33.633	-20.97	173.631
N+3.40	C2	ENVOLVENTE MIN	0	-140.72	-106.12	3.76	-16.312	-90.919	-16.705
N+3.40	C2	ENVOLVENTE MIN	0.45	-138.13	-106.12	3.76	-16.312	-119.132	28.078
N+3.40	C2	ENVOLVENTE MIN	0.9	-135.54	-106.12	3.76	-16.312	-147.345	39.269
N+2.5	C2	ENVOLVENTE MAX	0	-50.35	109.74	68.34	33.633	5.402	315.836
N+2.5	C2	ENVOLVENTE MAX	0.45	-48.41	109.74	68.34	33.633	-6.597	267.129
N+2.5	C2	ENVOLVENTE MAX	0.9	-46.46	109.74	68.34	33.633	-13.904	218.977
N+2.5	C2	ENVOLVENTE MIN	0	-145.91	-110.86	1.36	-16.312	-44.036	-114.565
N+2.5	C2	ENVOLVENTE MIN	0.45	-143.31	-110.86	1.36	-16.312	-63.404	-65.358
N+2.5	C2	ENVOLVENTE MIN	0.9	-140.72	-110.86	1.36	-16.312	-90.919	-16.705
N+1.60	C2	ENVOLVENTE MAX	0	-53.81	111.9	69.85	33.633	42.877	404.534
N+1.60	C2	ENVOLVENTE MAX	0.4	-52.08	111.9	69.85	33.633	20.142	360.134
N+1.60	C2	ENVOLVENTE MAX	0.8	-50.35	111.9	69.85	33.633	5.402	315.836
N+1.60	C2	ENVOLVENTE MIN	0	-150.51	-113.01	-0.15	-16.312	-25.748	-204.153
N+1.60	C2	ENVOLVENTE MIN	0.4	-148.21	-113.01	-0.15	-16.312	-30.895	-159.308
N+1.60	C2	ENVOLVENTE MIN	0.8	-145.91	-113.01	-0.15	-16.312	-44.036	-114.565
N+0.8	C2	ENVOLVENTE MAX	0	-57.26	112.52	70.45	33.633	98.286	493.933
N+0.8	C2	ENVOLVENTE MAX	0.4	-55.54	112.52	70.45	33.633	70.459	449.213
N+0.8	C2	ENVOLVENTE MAX	0.8	-53.81	112.52	70.45	33.633	42.877	404.534
N+0.8	C2	ENVOLVENTE MIN	0	-155.12	-113.63	-0.75	-16.312	-25.394	-294.442
N+0.8	C2	ENVOLVENTE MIN	0.4	-152.82	-113.63	-0.75	-16.312	-25.449	-249.277
N+0.8	C2	ENVOLVENTE MIN	0.8	-150.51	-113.63	-0.75	-16.312	-25.748	-204.153
N+2.5	C4	ENVOLVENTE MAX	0	-98.11	150	38.24	60.05	21.945	401.704
N+2.5	C4	ENVOLVENTE MAX	0.45	-96.17	150	38.24	60.05	31.327	364.94
N+2.5	C4	ENVOLVENTE MAX	0.9	-94.22	150	38.24	60.05	51.94	364.923
N+2.5	C4	ENVOLVENTE MIN	0	-310.25	-149.92	-47.27	-30.361	-5.357	15.185
N+2.5	C4	ENVOLVENTE MIN	0.45	-307.66	-149.92	-47.27	-30.361	-10.674	78.15
N+2.5	C4	ENVOLVENTE MIN	0.9	-305.07	-149.92	-47.27	-30.361	-27.222	87.382
N+1.60	C4	ENVOLVENTE MAX	0	-101.57	152.24	40.08	60.05	46.336	521.513
N+1.60	C4	ENVOLVENTE MAX	0.4	-99.84	152.24	40.08	60.05	32.382	461.274
N+1.60	C4	ENVOLVENTE MAX	0.8	-98.11	152.24	40.08	60.05	21.945	401.704
N+1.60	C4	ENVOLVENTE MIN	0	-314.86	-152.16	-49.11	-30.361	-36.975	-104.56
N+1.60	C4	ENVOLVENTE MIN	0.4	-312.56	-152.16	-49.11	-30.361	-19.408	-44.352
N+1.60	C4	ENVOLVENTE MIN	0.8	-310.25	-152.16	-49.11	-30.361	-5.357	15.185
N+0.8	C4	ENVOLVENTE MAX	0	-202.88	186.51	162.57	51.902	127.119	344.828
N+0.8	C4	ENVOLVENTE MAX	0.4	-201.16	186.51	162.57	51.902	62.943	273.695
N+0.8	C4	ENVOLVENTE MAX	0.8	-199.43	186.51	162.57	51.902	14.808	205.05
N+0.8	C4	ENVOLVENTE MIN	0	-626.95	-186.36	-144.6	-30.127	-115.7	-362.926
N+0.8	C4	ENVOLVENTE MIN	0.4	-624.65	-186.36	-144.6	-30.127	-58.712	-291.852
N+0.8	C4	ENVOLVENTE MIN	0.8	-622.34	-186.36	-144.6	-30.127	-17.766	-223.266
N+1.60	C6	ENVOLVENTE MAX	0	-142.89	197.31	83.55	44.597	106.538	163.883
N+1.60	C6	ENVOLVENTE MAX	0.4	-141.16	197.31	83.55	44.597	120.844	90.108
N+1.60	C6	ENVOLVENTE MAX	0.8	-139.44	197.31	83.55	44.597	176.779	71.713
N+1.60	C6	ENVOLVENTE MIN	0	-452.79	-196.26	-217.92	-39.061	-32.055	-130.477
N+1.60	C6	ENVOLVENTE MIN	0.4	-450.48	-196.26	-217.92	-39.061	28.574	-57.121
N+1.60	C6	ENVOLVENTE MIN	0.8	-448.18	-196.26	-217.92	-39.061	5.205	-39.146
N+0.8	C6	ENVOLVENTE MAX	0	-146.35	198.72	84.21	44.597	139.695	319.974
N+0.8	C6	ENVOLVENTE MAX	0.4	-144.62	198.72	84.21	44.597	116.238	241.533
N+0.8	C6	ENVOLVENTE MAX	0.8	-142.89	198.72	84.21	44.597	106.538	163.883
N+0.8	C6	ENVOLVENTE MIN	0	-457.39	-197.67	-218.59	-39.061	-172.713	-285.728
N+0.8	C6	ENVOLVENTE MIN	0.4	-455.09	-197.67	-218.59	-39.061	-95.506	-207.707
N+0.8	C6	ENVOLVENTE MIN	0.8	-452.79	-197.67	-218.59	-39.061	-32.055	-130.477