



PROYECTO

COLEGIO Y TEATRO EL ENSUEÑO

MODULO XIII

ANALISIS Y DISEÑO ESTRUCTURAL

MEMORIA DE CALCULOS



1.0 DESCRIPCION DE PROYECTO.

El modulo XIII del colegio es una edificacion con un nivel de losa aligerada soportada en porticos y vigas de concreto, cimentados en caissons.

2.0 UBICACION

Bogota - Cundinamarca.

3.0 TIPO DE SISTEMA - ESTRUCTURAL

Porticos de concreto.



| | | | |
|----------------------|-------------------------------|-----------------|---------------------|
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| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | |
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4.0 GEOMETRIA

4.1 NIVELES

| | |
|--------|-------------------|
| N+0.00 | Primer piso |
| N+3.50 | Losa segundo piso |

4.2 EJES LONGITUDINALES

EJES 1-3

4.3 EJES TRANSVERSALES

EJES B1-B3

4.4 TIPOS DE LOSA

Losa Aligerada (H=50cm)

4.5 TIPOS DE CIMENTACION

Caissons

5.0 ESPECIFICACIONES DE MATERIALES

5.1 CONCRETO

| | |
|------------------------|---------------------------|
| $f'c = 21 \text{ Mpa}$ | Cimentacion y estructura. |
|------------------------|---------------------------|

5.2 ACERO DE REFUERZO

| | |
|-------------------------|------------------------|
| $F_y = 420 \text{ Mpa}$ | $\emptyset \geq 3/8"$ |
| $F_y = 260 \text{ Mpa}$ | $\emptyset \leq 1/4"$ |
| $F_y = 420 \text{ Mpa}$ | Mallas electrosoldadas |

| | | | |
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5.3 ACERO ESTRUCTURAL

Perfiles Laminados y Platinas ASTM A-572 gr50 (Fy=350 Mpa)
 Perfiles Tubulares ASTM A-588 (Fy=350 Mpa)
 Acero de Steel Deck -Lamina Colaborante ASTM A-570 (Fy=232 Mpa)
 Acero de Elementos Formados en Frio (Fy=350 Mpa)
 Uniones:
 Pernos de Anclaje Astm A-307 (Pernos B-7)
 Tornillos de Alta Resistencia ASTM A-325
 Soldaduras E70XX

6.0 RESUMEN DE CARGAS

N+3.50

CM: 730 kg/m2 CG: 100 kg/m2
 CV: 200 kg/m2

7.0 CALCULO DEL COEFICIENTE R

SISTEMA ESTRUCTURAL :
 GRADO DE DISIPACION DE ENERGIA:

R_o:
Ω_o:

IRREGULARIDADES: (ver Anexo)

Planta **Ø_p:**
 Alzada **Ø_a:**
 Redundancia **Ø_r:**

| Porticos de concreto | |
|----------------------|--|
| DMO | |
| 5 | |
| 3.0 | |
| 1 | |
| 1 | |
| 0.75 | |

FACTOR R:

3.75

8.0 PARAMETROS ESTUDIO DE SUELOS

Estudio de suelos realizado por el GRUPO CAÑASGORDAS: Ing. Carlos Julio Echeverry

8.1 ESPECTRO DE DISEÑO

Zona de Amenaza Sísmica:
 Aceleracion Pico Efectiva
 Velocidad Pico Efectiva

| Intermedia | |
|------------|-------------|
| Aa: | 0.15 |
| Av: | 0.2 |

8.2 RECOMENDACIONES DE CIMENTACION

Caissons a 17mts.



| | | | |
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9.0 REVISION DE DERIVAS

Deriva Maxima en el Sentido Longitudinal: 0.47% <= 1% **OK!**

Deriva Maxima en el Sentido Transversal: 0.31% <= 1% **OK!**

9.2 UMBRAL DE DAÑO

Deriva Maxima en el Sentido Longitudinal: 0.26% <= 0.40% **OK!**

Deriva Maxima en el Sentido Transversal: 0.18% <= 0.40% **OK!**



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- 2.2. ESPECTRO DE DISEÑO
- 2.3. REVISION DE IRREGULARIDADES
- 2.4. COMBINACIONES DE CARGA
- 2.5. ANALISIS DE VIENTO
- 2.6. AJUSTE DE CORTANTE SISMICA EN LA BASE
- 2.7. RESUMEN DE CARGAS SISMICAS

3. DATOS DE ENTRADA

4. ANALISIS ESTRUCTURAL

5. CHEQUEO DE DERIVAS

6. DISEÑO DE ELEMENTOS ESTRUCTURALES

- 6.1. DISEÑO DE COLUMNAS
- 6.2. DISEÑO DE VIGAS
- 6.3. DISEÑO DE COLUMNAS METALICAS
- 6.4. CHEQUEO DE CONFINAMIENTO
- 6.5. CHEQUEO DE COLUMNA FUERTE-VIGA DEBIL

7. REACCIONES DE CIMENTACION

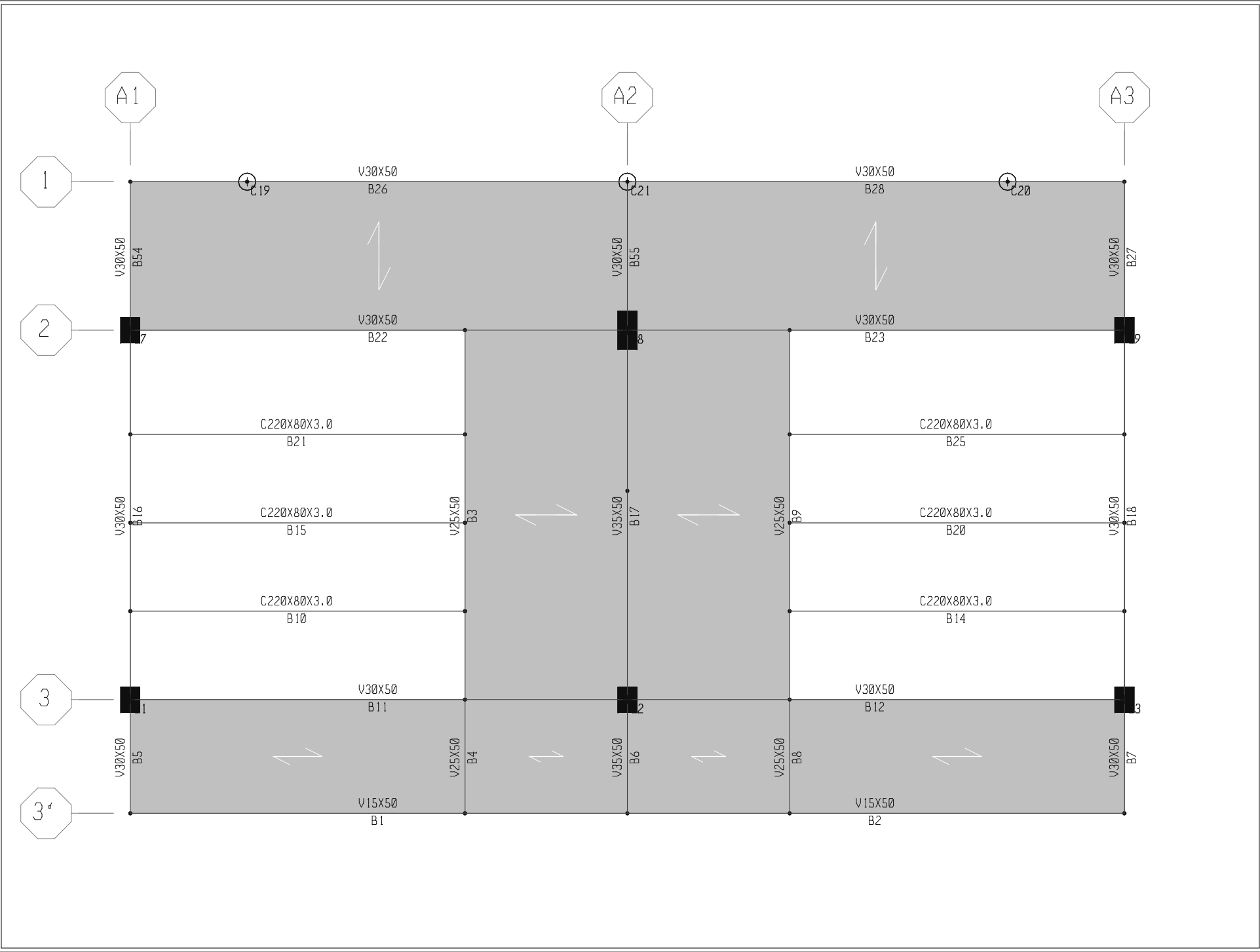
8. DISEÑO DE ELEMENTOS NO ESTRUCTURALES

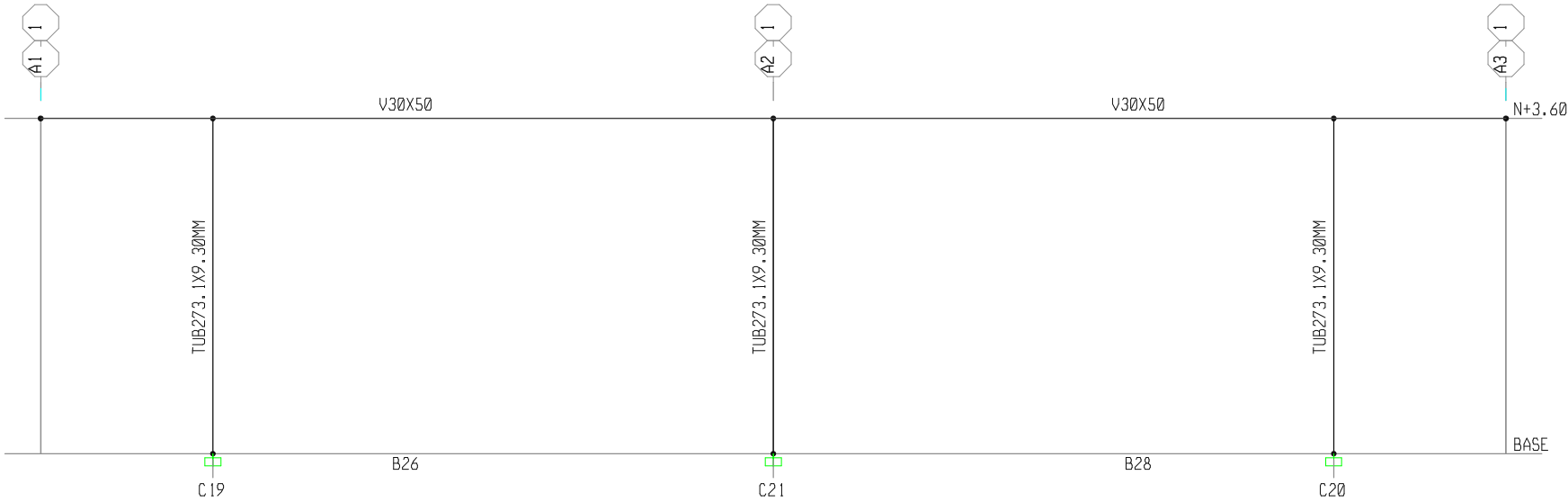


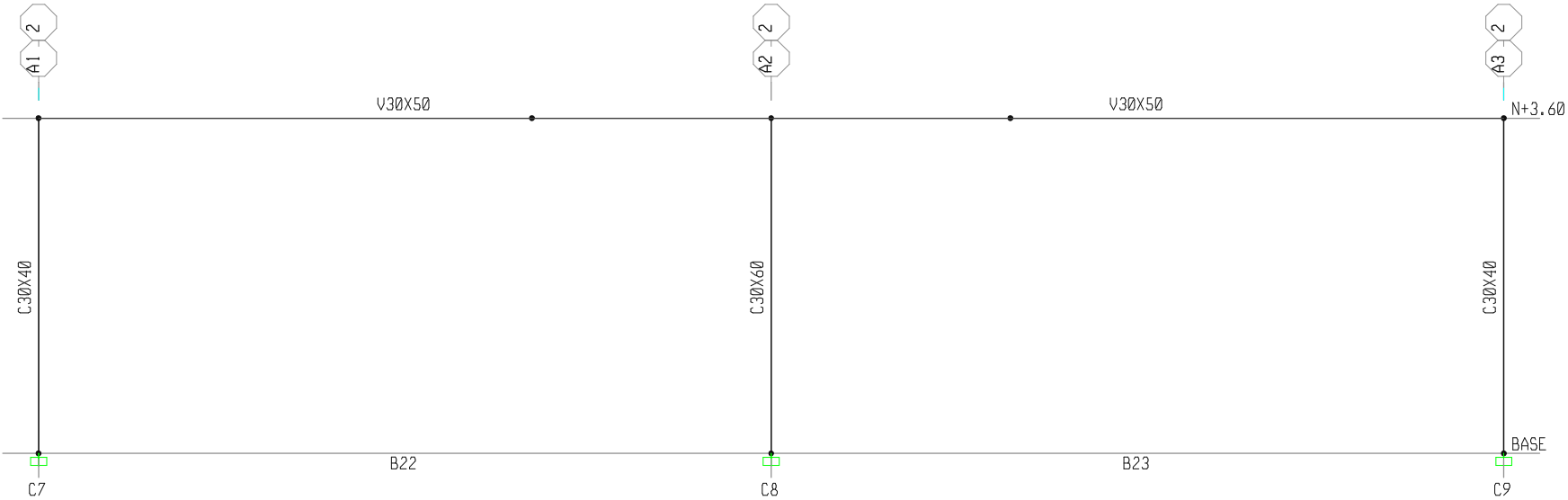
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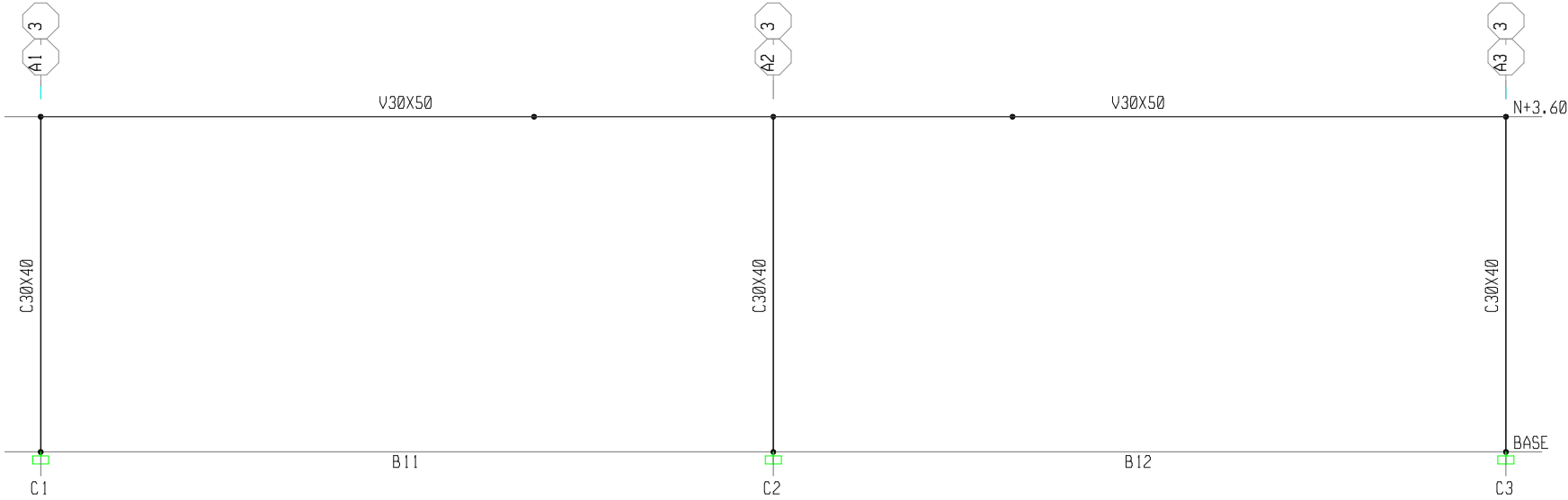
ANEXO 1 . ESQUEMAS DEL MODELO

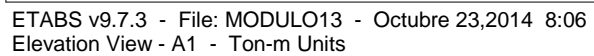
















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ANEXO 2 . AVALUO DE CARGAS



| | | | |
|----------------------|-------------------------------|-----------------|---------------------|
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ANEXO 2.1. AVALUO DE CARGAS VERTICALES

| | | | |
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AVALUO DE CARGAS LOSA - N+3.50 NORMA NSR-10

PESO DE LA LOSA

| | | | |
|--------------------------|------------|-----------|-------------------------------------|
| T: | 50 | Cm | (Espesor total de losa) |
| T_{sup}: | 8 | Cm | (Espesor Loseta Superior) |
| T_{inf}: | 0 | Cm | (Espesor Loseta Superior) |
| Sep: | 97 | Cm | (Separacion de Viguetas entre ejes) |
| t_{vig}: | 12 | Cm | (Ancho de Vigüeta) |
| Sep: | 300 | Cm | (separacion de Riostras) |
| t_{rios}: | 10 | Cm | (ancho de Riostra) |

| | | |
|-----------------------|--------------|--------------|
| Peso Loseta Superior: | 192.00 | Kg/m2 |
| Peso Loseta Inferior: | 0.00 | Kg/m2 |
| Peso Viguetas: | 124.70 | Kg/m2 |
| Peso Riostras: | 33.60 | Kg/m2 |
| Peso Casetón: | 30.00 | Kg/m2 |

| | | |
|---------------|---------------|--------------|
| Peso Acabados | 200.00 | Kg/m2 |
|---------------|---------------|--------------|

| | | |
|-----------------|---------------|--------------|
| Peso Divisiones | 150.00 | Kg/m2 |
|-----------------|---------------|--------------|

| | | | |
|------------|-------------|--------------|---------------------------|
| CM: | 730 | Kg/m2 | Total Carga Muerta |
| | 7.30 | KN/m2 | |

CARGAS VIVAS - REF: CAPITULO B-4

| | | | | | | |
|------------|------------|--------------|------------|------------|--------------|----------------|
| CM: | 200 | Kg/m2 | CM: | 500 | Kg/m2 | En losa maciza |
| | 2.0 | KN/m2 | | 5.0 | KN/m2 | |

CARGA DE GRANIZO - REF: CAPITULO B-4

| | | | |
|------------|------------|--------------|-------------------------------|
| CM: | 100 | Kg/m2 | Total Carga de Granizo |
| | 1.0 | KN/m2 | |

FACTORES DE CARGA

| | | | |
|------------|-----------------------|---------|--------------|
| Wu: | 1.4D | 1022.42 | Kg/m2 |
| Wu: | 1.2D+1.6L+0.5G | 1246.36 | Kg/m2 |
| Wu: | 1.2D+1.6G+1.0L | 1236.36 | Kg/m2 |

| | |
|------------|-------------|
| FC: | 1.21 |
|------------|-------------|

PESO DE MUROS

| | | |
|-----------------|-------------|-----------|
| Altura Libre: | 3.00 | mt |
| Ancho del Muro: | 12 | cm |

| | | | |
|---------------------------------|------------|-------------|----------------------------|
| Peso del muro por metro lineal: | 648 | kg/m | Muro en Arcilla |
| | 792 | kg/m | Muro en Bloque de Concreto |



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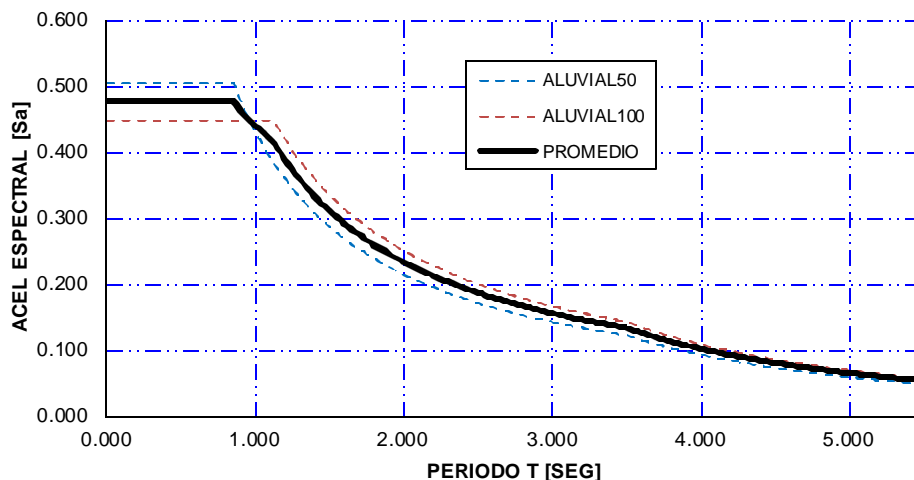
ANEXO 2.2 ESPECTRO DE DISEÑO

| | | | |
|----------------------|-------------------------------|-----------------|---------------------|
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ESPECTRO DE DISEÑO MICROZONIFICACIÓN SÍSMICA BOGOTA

| BOGOTA | | ALUVIAL50 | | ALUVIAL100 | |
|------------------|------|----------------|------|----------------|------|
| Aa = | 0.15 | Fa : | 1.35 | Fa : | 1.20 |
| Av = | 0.20 | Fv : | 1.80 | Fv : | 2.10 |
| | | Tc (s): | 0.85 | Tc (s): | 1.12 |
| | | TL (s): | 3.50 | TL (s): | 3.50 |
| | | Ao (g): | 0.20 | Ao (g): | 0.18 |
| A.6.2.1.2 | → | I : | 1.00 | I : | 1.00 |

ESPECTRO DE DISEÑO



Aceleraciones Espectrales para diferentes Períodos

| | T [seg] | Sa [g] |
|----------|----------------|---------------|
| Modo 1: | | |
| Modo 2: | | |
| Modo 3: | | |
| Modo 4: | | |
| Modo 5: | | |
| Modo 6: | | |
| Modo 7: | | |
| Modo 8: | | |
| Modo 9: | | |
| Modo 10: | | |

NOTA: El literal **A.6.2.1.2** permite que al calcular desplazamientos horizontales se use el coeficiente de importancia con un valor igual a la unidad ($I=1.0$).

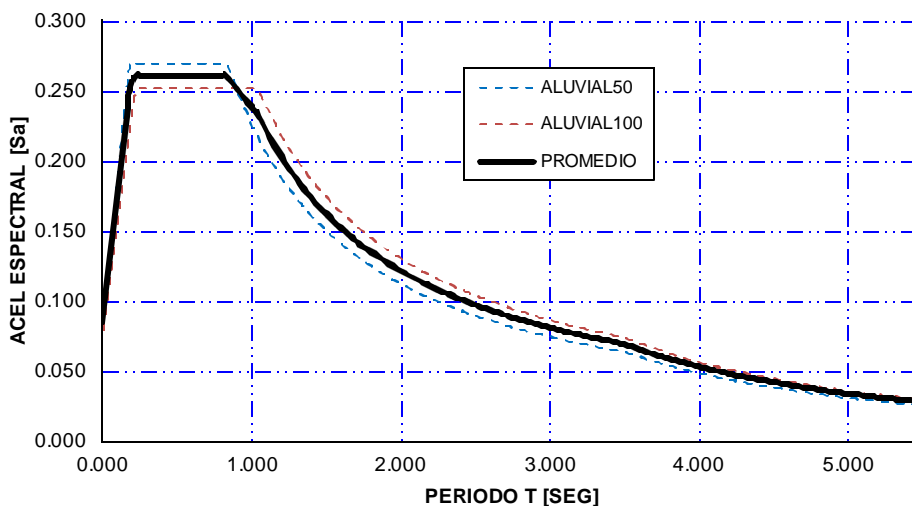


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UMBRAL DE DAÑO MICROZONIFICACIÓN SÍSMICA BOGOTA

| BOGOTA | | ALUVIAL50 | ALUVIAL100 |
|-------------|-------------|----------------|-------------|
| Ae = | 0.13 | Fa : | 1.50 |
| | | Fv : | 2.50 |
| | | Tc (s): | 0.83 |
| | | TL (s): | 3.50 |
| | | Ao (g): | 0.09 |
| | | Fa : | 1.40 |
| | | Fv : | 2.90 |
| | | Tc (s): | 1.04 |
| | | TL (s): | 3.50 |
| | | Ao (g): | 0.08 |

ESPECTRO PARA UMBRAL DE DAÑO



Aceleraciones Espectrales para diferentes Períodos

| | T [seg] | Sa [g] |
|----------|----------------|---------------|
| Modo 1: | | |
| Modo 2: | | |
| Modo 3: | | |
| Modo 4: | | |
| Modo 5: | | |
| Modo 6: | | |
| Modo 7: | | |
| Modo 8: | | |
| Modo 9: | | |
| Modo 10: | | |



| | | | |
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ANEXO 2.3. REVISION DE IRREGULARIDADES

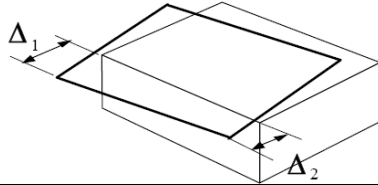


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REVISION DE IRREGULARIDADES NORMA NSR-10

IRREGULARIDADES EN PLANTA, Referencia Tabla A.3-6, Figura A.3-1

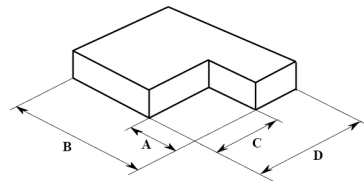
Tipo 1P



Tipo 1aP - Irregularidad Torsional $\phi_p=0.9$
Tipo 1bP - Irregularidad Torsional Extrema $\phi_p=0.8$

Δ_1 : 0.22 % ϕ_p : 1.0
 Δ_2 : 0.22 %

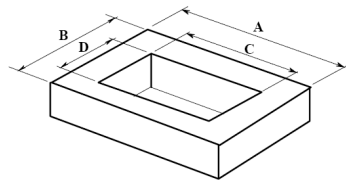
Tipo 2P



Tipo 2P - Retrocesos en las esquinas

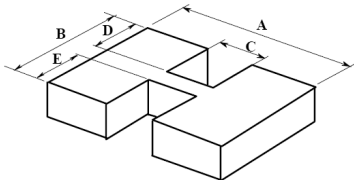
A: m
B: m
C: m
D: m ϕ_p : 1.0

Tipo 3P



Tipo 3P - Irregularidad del diafragma

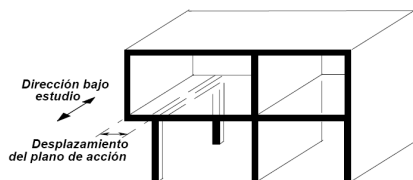
A: m
B: m
C: m
D: m ϕ_p : 1.0



Tipo 3P - Irregularidad del diafragma

A: m
B: m
C: m
D: m
E: m ϕ_p : 1.0

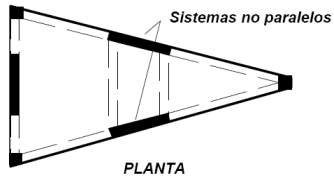
Tipo 4P



Tipo 4P - Desplazamiento del planos de acción $\phi_p=0.8$

ϕ_p : 1.0

Tipo 5P

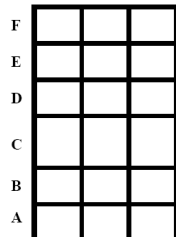


Tipo 5P - Sistemas no paralelos $\phi_p=0.9$

ϕ_p : **1.0**

IRREGULARIDADES EN ALZADA, Referencia Tabla A.3-7, Figura A.3-2

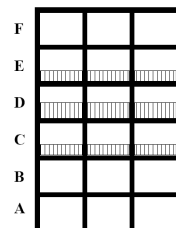
Tipo 1A.



Tipo 1aA - Piso Flexible $\phi_p=0.9$
Tipo 1bA - Piso Flexible Extremo $\phi_p=0.8$

Kc: ϕ_a : **1.0**
KD:
KE:
KF:

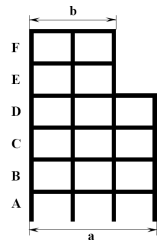
Tipo 2A.



Tipo 2A - Distribucion de Masa $\phi_p=0.9$

Mc: ϕ_a : **1.0**
MD:
ME:

Tipo 3A.



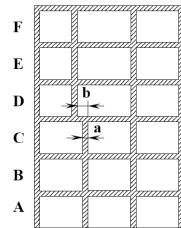
Tipo 3A - Geometrica $\phi_p=0.9$

a: m ϕ_a : **1.0**
b: m



| | | | |
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Tipo 4A.

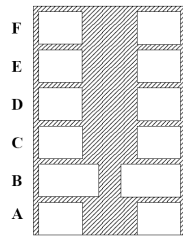


Tipo 4A - Desplazamiento del plano de acción $\phi_a=0.8$

a: m **ϕ_a :**

b: m

Tipo 5A.



Tipo 5aA - Piso Debil $\phi_p=0.9$

Tipo 5bA - Piso débil Extremo $\phi_p=0.8$

RpB: **ϕ_a :**

RpC:

IRREGULARIDAD POR AUSENCIA DE REDUNDANCIA, Referencia A.3.3.8

ϕ_r :

RESUMEN

ϕ_p :

ϕ_a :

ϕ_r :



| | | | |
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ANEXO 2.4. COMBINACIONES DE CARGA



| | | | |
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COMBINACIONES DE CARGA - SISMO NORMA NSR-10

| | | | |
|-----------------------------|-------------|--|----------------------|
| Ro: | 5 | $R = R_o * \phi_p * \phi_a * \phi_r =$ | 3.75 |
| ϕ_p: | 1 | $E = I * (1/R) * SISMO =$ | 0.333 * SISMO |
| ϕ_a: | 1 | | |
| ϕ_r: | 0.75 | | |
| I: | 1.25 | $0.3E = I * (1/R) * SISMO * 0.3 =$ | 0.100 * SISMO |

COMBINACIONES DE CARGA - DISEÑO DE ELEMENTOS

| COMBO | D | L | SISMOX | SISMOY |
|-------------|------------|------------|---------------|---------------|
| C1: | 1.4 | | | |
| C2: | 1.2 | 1.6 | | |
| C3: | 1.2 | 1 | 0.333 | 0.100 |
| C4: | 1.2 | 1 | 0.333 | -0.100 |
| C5: | 1.2 | 1 | -0.333 | 0.100 |
| C6: | 1.2 | 1 | -0.333 | -0.100 |
| C7: | 1.2 | 1 | 0.100 | 0.333 |
| C8: | 1.2 | 1 | 0.100 | -0.333 |
| C9: | 1.2 | 1 | -0.100 | 0.333 |
| C10: | 1.2 | 1 | -0.100 | -0.333 |
| C11: | 0.9 | | 0.333 | 0.100 |
| C12: | 0.9 | | 0.333 | -0.100 |
| C13: | 0.9 | | -0.333 | 0.100 |
| C14: | 0.9 | | -0.333 | -0.100 |
| C15: | 0.9 | | 0.100 | 0.333 |
| C16: | 0.9 | | 0.100 | -0.333 |
| C17: | 0.9 | | -0.100 | 0.333 |
| C18: | 0.9 | | -0.100 | -0.333 |

| |
|-----------------------|
| 1.4D |
| 1.2D+1.6L |
| 1.2D+1.0L+1.0E |
| 0.9D+1.0E |



| | | | |
|----------------------|-------------------------------|-----------------|---------------------|
| Propietario: | SEC. EDUCACION Y SEC. CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | |
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COMBINACIONES DE CARGA - CIMENTACION
NORMA NSR-10

| | | | |
|-----------------------------|-------------|--|---------------------|
| Ro: | 5 | $R = R_o * \phi_p * \phi_a * \phi_r =$ | 3.75 |
| ϕ_p: | 1 | | |
| ϕ_a: | 1 | $0.7E = 0.7 * I * (1/R) * SISMO =$ | 0.233 *SISMO |
| ϕ_r: | 0.75 | | |
| I: | 1.25 | $0.75 * 0.7E = 0.75 * 0.7 * I * (1/R) * SISMO =$ | 0.175 *SISMO |

COMBINACIONES DE CARGA - DISEÑO DE ELEMENTOS

| COMBO | D | L | SISMOX | SISMOY |
|--------------|------------|-------------|--------------|--------------|
| CIM1: | 1 | | | |
| CIM2: | 1 | 1 | | |
| CIM3: | 1 | | 0.233 | 0.070 |
| CIM4: | 1 | | 0.070 | 0.233 |
| CIM5: | 1 | 0.75 | 0.175 | 0.053 |
| CIM6: | 1 | 0.75 | 0.053 | 0.175 |
| CIM7: | 0.6 | | 0.233 | 0.070 |
| CIM8: | 0.6 | | 0.070 | 0.233 |

| |
|--------------------|
| D |
| D+L |
| D+0.7E |
| D+0.75L+0.75(0.7E) |
| 0.6D+0.7E |



| | | | |
|----------------------|-------------------------------|-----------------|---------------------|
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| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | |
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RESISTENCIA AL CORTANTE COLUMNAS
C.21.3.3.2.b - NORMA NSR-10

| | | | |
|-----------------------------|-------------|--|----------------------|
| Ro: | 5 | $R = R_o * \phi_p * \phi_a * \phi_r =$ | 3.75 |
| ϕ_p: | 1 | $\Omega * E = 3 * I * (1/R) * SISMO =$ | 1.000 * SISMO |
| ϕ_a: | 1 | | |
| ϕ_r: | 0.75 | | |
| I: | 1.25 | $\Omega * 0.3E = \Omega * I * (1/R) * SISMO * 0.3 =$ | 0.300 * SISMO |

COMBINACIONES DE CARGA - DISEÑO DE ELEMENTOS

| COMBO | D | L | SISMOX | SISMOY |
|--------|-----|---|--------|--------|
| VnC:1 | 1.3 | 1 | 1.000 | 0.300 |
| VnC:2 | 1.3 | 1 | 1.000 | -0.300 |
| VnC:3 | 1.1 | 1 | -1.000 | 0.300 |
| VnC:4 | 1.1 | 1 | -1.000 | -0.300 |
| VnC:5 | 1.3 | 1 | 0.300 | 1.000 |
| VnC:6 | 1.1 | 1 | 0.300 | -1.000 |
| VnC:7 | 1.3 | 1 | -0.300 | 1.000 |
| VnC:8 | 1.1 | 1 | -0.300 | -1.000 |
| VnC:9 | 1.0 | | 1.000 | 0.300 |
| VnC:10 | 1.0 | | 1.000 | -0.300 |
| VnC:11 | 0.8 | | -1.000 | 0.300 |
| VnC:12 | 0.8 | | -1.000 | -0.300 |
| VnC:13 | 1.0 | | 0.300 | 1.000 |
| VnC:14 | 0.8 | | 0.300 | -1.000 |
| VnC:15 | 1.0 | | -0.300 | 1.000 |
| VnC:16 | 0.8 | | -0.300 | -1.000 |

1.2D+1.0L+ Ω *E
 $\pm 0.5 * A_a * F_a * D$

0.9D+ Ω *E
 $\pm 0.5 * A_a * F_a * D$



| | | | |
|----------------------|-------------------------------|-----------------|---------------------|
| Propietario: | SEC. EDUCACION Y SEC. CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
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RESISTENCIA AL CORTANTE VIGAS
C.21.3.3.1.b - NORMA NSR-10

| | | | |
|-----------------------------|-------------|--|----------------------|
| Ro: | 5 | $R = R_o * \phi_p * \phi_a * \phi_r =$ | 3.75 |
| ϕ_p: | 1 | $2 * E = 2 * I * (1/R) * SISMO =$ | 0.667 * SISMO |
| ϕ_a: | 1 | | |
| ϕ_r: | 0.75 | | |
| I: | 1.25 | $2 * 0.3E = 2 * I * (1/R) * SISMO * 0.3 =$ | 0.200 * SISMO |

COMBINACIONES DE CARGA - DISEÑO DE ELEMENTOS

| COMBO | D | L | SISMOX | SISMOY |
|--------|-----|---|--------|--------|
| VnV:1 | 1.2 | 1 | 0.667 | 0.200 |
| VnV:2 | 1.2 | 1 | 0.667 | -0.200 |
| VnV:3 | 1.2 | 1 | -0.667 | 0.200 |
| VnV:4 | 1.2 | 1 | -0.667 | -0.200 |
| VnV:5 | 1.2 | 1 | 0.200 | 0.667 |
| VnV:6 | 1.2 | 1 | 0.200 | -0.667 |
| VnV:7 | 1.2 | 1 | -0.200 | 0.667 |
| VnV:8 | 1.2 | 1 | -0.200 | -0.667 |
| VnV:9 | 0.9 | | 0.667 | 0.200 |
| VnV:10 | 0.9 | | 0.667 | -0.200 |
| VnV:11 | 0.9 | | -0.667 | 0.200 |
| VnV:12 | 0.9 | | -0.667 | -0.200 |
| VnV:13 | 0.9 | | 0.200 | 0.667 |
| VnV:14 | 0.9 | | 0.200 | -0.667 |
| VnV:15 | 0.9 | | -0.200 | 0.667 |
| VnV:16 | 0.9 | | -0.200 | -0.667 |

1.2D+1.0L+2*E

0.9D+2*E



| | | | |
|----------------------|-------------------------------|-----------------|---------------------|
| Propietario: | SEC. EDUCACION Y SEC. CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | |
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ANEXO 2.5. ANALISIS DE VIENTO

ANÁLISIS DE CARGA DE VIENTO

NSR -10 Edificaciones cerradas con $h \leq 18\text{m}$ y cubiertas con $\theta \leq 45^\circ$

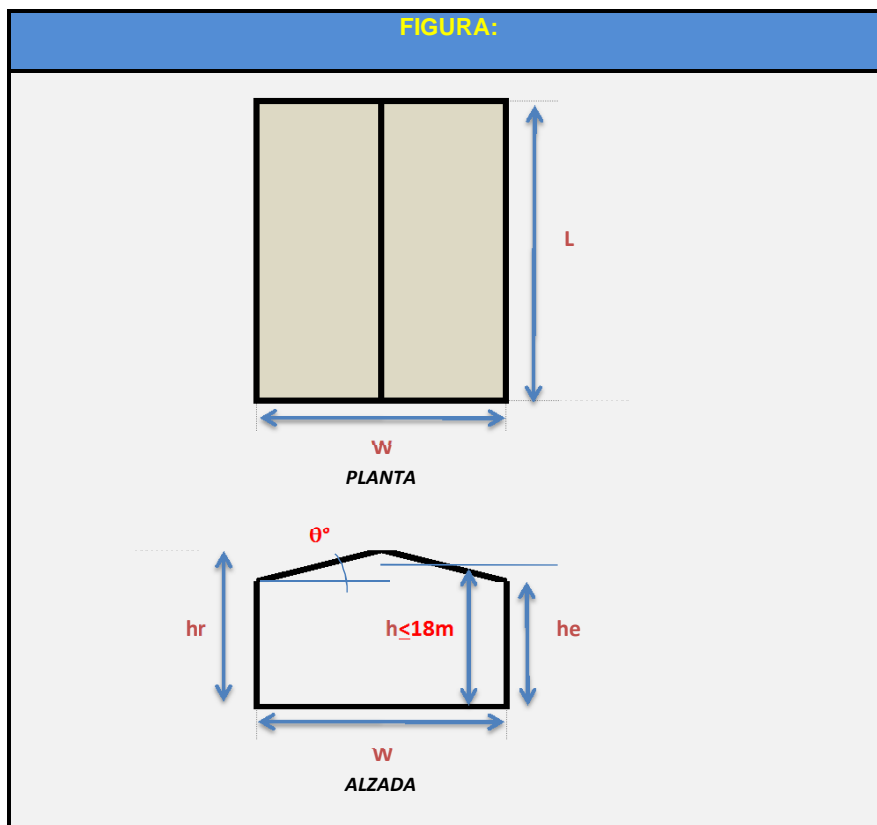
Método 1: Procedimiento simplificado (B.6.4)

| | | | |
|---------------|-----------------------------|------------|--------------------|
| proyecto: | Colegio y Teatro El Ensueño | Ingeniero: | Juan Carlos Patiño |
| Proyecto No.: | 2765 | Fecha: | Noviembre - 2014 |

Datos de entrada:

| | | |
|--|-----------------|--|
| Velocidad del viento, $V =$ | 22 m/s (80Km/h) | (Figura B.6.4-1) |
| Factor de Importancia, $I =$ | III | (Ver Tabla A.2.5-1 / Según grupo de uso) |
| Categoría de exposición = | C | (B.6.5.6.3) |
| Altura de la cumbrera, $h_r =$ | 3.50 | m ($h_r \geq h_e$) |
| Altura de la cornisa, $h_e =$ | 3.50 | m ($h_e \leq h_r$) |
| Ancho del edificio, $W =$ | 10.00 | m (Perpendicular a la cumbrera) |
| Dimension Horizontal del Edificio, $L =$ | 15.74 | m (Paralelo a la cumbrera) |
| Tipo de cubierta = | plana | (plana - 1 agua - 2 aguas) |
| Factor topografico, $K_{zt} =$ | 1.00 | (B.6.5.7 Y Figura 6.5-1) |
| C&R en fachada = | Correas | (correas de fachada, tejas de fachadas o fijaciones) |
| C&R Area efectiva en fachada = | 6.75 | m ² (Componentes/revestimientos) |
| C&R en cubierta = | Correas | (correas de cubierta, tejas de cubiertas o fijaciones) |
| C&R Area efectiva en cubierta = | 12.00 | m ² (Componentes/revestimientos) |
| Area efectiva en aleros = | 0.00 | m ² (Componentes/revestimientos) |
| Region propensa a huracanes? | No | |

FIGURA:



Parámetros resultantes y presiones netas de diseño

Para la dirección transversal:

(viento perpendicular a la cumbrera)

Angulo de inclinación de la cubierta, $\theta = 0.00^\circ$

Altura media del edificio, $h = 3.50$ m ($h = h_e$ para $\theta < 10^\circ$)

Factor de ajuste, $\lambda = 1.210$ (Ajustes por altura y exposición)

Factor de importancia, $I = 1.15$ (Tabla A.2.5-1)

$a = 1.000$ m (use: "2*a" para SPRFV, "a" para Componentes y Revestimientos)

| Presiones de viento neta Transversales para SPRFV, p_s (KN/m ²) | | | | |
|---|------------|------|--------------|--------------|
| Ubicación | Dirección | Zona | Cas. Carg. 1 | Cas. Carg. 2 |
| A = Zona final del muro | Horizontal | A | 0.26 | 0.00 |
| B = Zona final de la cubierta | Horizontal | B | -0.14 | 0.00 |
| C = Zona interior del muro | Horizontal | C | 0.17 | 0.00 |
| D = Zona interior de la cubierta | Horizontal | D | -0.08 | 0.00 |
| E = Zona final de cubierta a barlovento | Vertical | E | -0.32 | 0.00 |
| F = Zona final de cubierta a sotavento | Vertical | F | -0.18 | 0.00 |
| G = Zona interior de cubierta a barlovento | Vertical | G | -0.22 | 0.00 |
| H = Zona interior de cubierta a sotavento | Vertical | H | -0.14 | 0.00 |

$p_s = \lambda \cdot K_{zt} \cdot I \cdot p_{s10}$
(p_{s10} de la Fig. 6.4-2)

Para la dirección longitudinal:

(viento paralelo a la cubierta)

Angulo de inclinación de la cubierta, $\theta = 0.00^\circ$ (asumido)

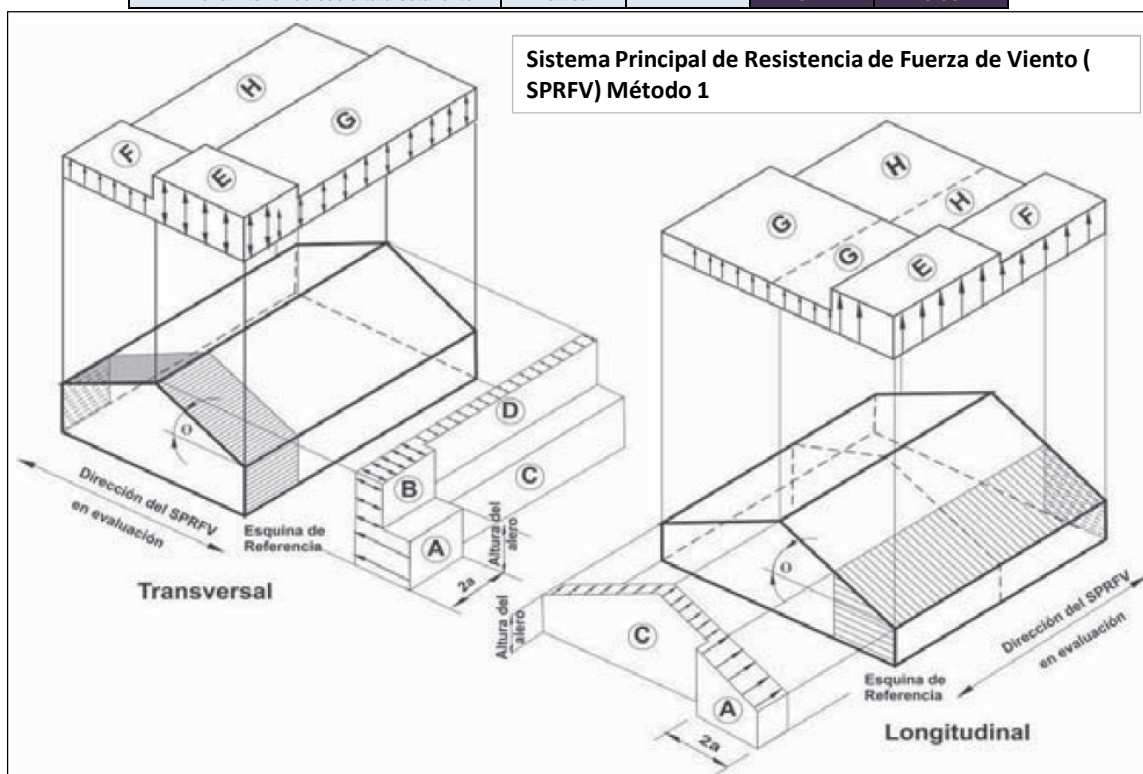
Altura media del edificio, $h = 3.50$ m ($h = (h_r + h_e)/2$)

Factor de ajuste, $\lambda = 1.210$ (Ajustes por altura y exposición)

$a = 1.00$ m (use: "2*a" para SPRFV, "a" para Componentes y Revestimientos)

| Presiones de viento neta Longitudinales para SPRFV, p_s (KN/m ²) | | | | |
|--|------------|------|--------------|--------------|
| Ubicación | Dirección | Zona | Cas. Carg. 1 | Cas. Carg. 2 |
| A = Zona final del muro | Horizontal | A | 0.26 | 0.00 |
| B = Zona final de la cubierta | Horizontal | B | 0.00 | 0.00 |
| C = Zona interior del muro | Horizontal | C | 0.17 | 0.00 |
| D = Zona interior de la cubierta | Horizontal | D | 0.00 | 0.00 |
| E = Zona final de cubierta a barlovento | Vertical | E | -0.32 | 0.00 |
| F = Zona final de cubierta a sotavento | Vertical | F | -0.18 | 0.00 |
| G = Zona interior de cubierta a barlovento | Vertical | G | -0.22 | 0.00 |
| H = Zona interior de cubierta a sotavento | Vertical | H | -0.14 | 0.00 |

$p_s = \lambda \cdot K_{zt} \cdot I \cdot p_{s10}$
(p_{s10} de la Fig. 6.4-2)



Parámetros resultantes y presiones netas de diseño

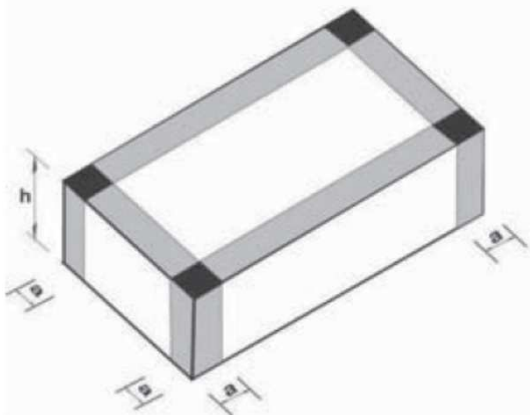
Para componentes y revestimientos: Las presiones calculadas se aplican en la dirección normal a la superficie

Angulo de inclinación de la cubierta, $\theta = 0.00^\circ$
Altura media del edificio, $h = 3.50$ m ($h = (h_r + h_e)/2$)
Factor de ajuste, $\lambda = 1.210$ (Ajustes por altura y exposición)
 $a = 1.00$ m (use: "2*a" para SPRFV, "a" para Componentes y Revestimientos)

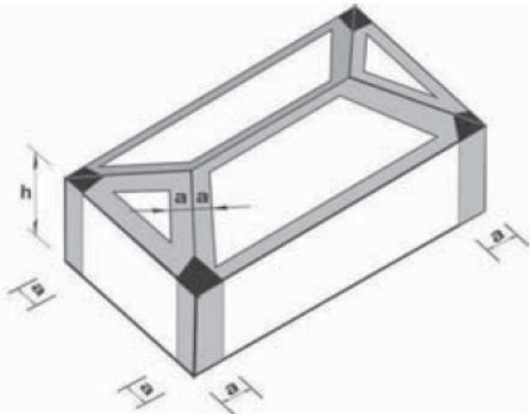
| Componentes y Revestimientos Presiones netas de viento de diseño , (KN/m2) | | | | |
|--|----------------------------|------|----------|----------|
| Item | Localización | Zona | Pos. (+) | Neg. (-) |
| Fachada - Correas | Zonas interiores Fachadas | 4 | 0.26 | -0.29 |
| | Zonas finales Fachadas | 5 | 0.26 | -0.32 |
| Cubierta - Correas | Zonas interiores Cubiertas | 1 | 0.10 | -0.26 |
| | Zonas finales Cubiertas | 2 | 0.10 | -0.32 |
| | Zonas esquineras Cubiertas | 3 | 0.10 | -0.32 |
| Alero | Zonas finales Aleros | 2 | --- | 0.00 |
| | Zonas esquineras Aleros | 3 | --- | 0.00 |

$p_{net} = \lambda \cdot K_z t \cdot I \cdot p_{net10}$
(p_{net10} de Fig. B.6.4-3)

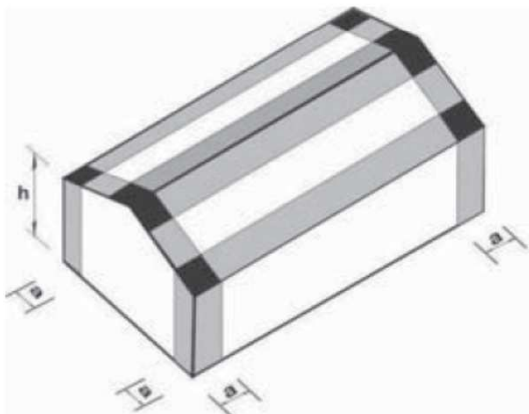
Componentes y Revestimientos – Método 1



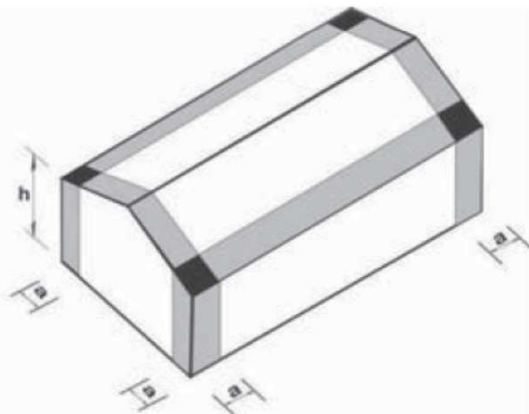
Cubierta Plana



Cubierta a Cuatro Aguas ($7^\circ < \theta \leq 27^\circ$)



Cubierta a Dos Aguas ($\theta \leq 7^\circ$)



Cubierta a Dos Aguas ($7^\circ < \theta \leq 45^\circ$)



Zonas Interiores
Cubiertas – Zona 1
Muros – Zona 4



Zonas Finales
Cubiertas – Zona 2
Muros – Zona 5



Zonas Esquineras
Cubiertas – Zona 3

CONDICIONES DEL PROCEDIMIENTO SIMPLIFICADO (NSR-10):

B.6.4.1.1 — Sistema Principal de Resistencia de Fuerzas de Viento (SPRFV) — Para el diseño del SPRFV el edificio debe cumplir todas las siguientes condiciones:

- (a) El edificio sea de diafragma simple como se define en la sección B.6.2.
- (b) El edificio sea bajo de acuerdo 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 cargas por viento a través 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 consideraciones 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 $\theta \leq 45^\circ$
- (h) El edificio esta eximido de los casos de carga torsional indicados en la Nota 5 de la fig. B.6.5-7, o estos casos no controlan el diseño de ninguno de los elementos del SPRFV del edificio.

B.6.4.1.2 — Componentes y Revestimientos — Para el diseño de los componentes y elementos de revestimiento, el edificio debe cumplir todas las siguientes condiciones:

- (a) La altura promedio h es igual o menor a 18.0 m.
- (b) El edificio es cerrado como se define en la sección B.6.2 y cumple las provisiones de zonas propensas a huracanes de acuerdo con la sección B.6.5.9.3.
- (c) El edificio es de forma regular como se define en la sección B.6.2.
- (d) El edificio tiene una cubierta plana, una cubierta a dos aguas con $\theta \leq 45^\circ$ o una cubierta a cuatro aguas con $\theta \leq 27^\circ$.

B.6.4.2.1.1 - Presiones Mínimas (SPRFV) - 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 p_s , de +0.40 kN/m² para las zonas A, B, C y D y de 0 kN/m² para las zonas E, F, G y H.

B.6.4.2.2.1 — Presiones Mínimas (C&R) - Las presiones de viento de diseño positivas y negativas, P_{net} de la sección B.6.4.2.2 no serán menores a +0.4 kN/m² y -0.4 kN/m², respectivamente.

Referencias:

Capítulo B.6 - NSR 10

ASCE 7-05 Standard, "Minimum Design Loads for Buildings and Other Structures"

Guide to the Use of the Wind Load Provisions of ASCE 7-02



| | | | |
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ANEXO 2.6. AJUSTE DE CORTANTE SISMICA EN LA BASE



| | | | |
|----------------------|-------------------------------|-----------------|---------------------|
| Propietario: | SEC. EDUCACION Y SEC. CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
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AJUSTE DE CORTANTE SISMICA EN LA BASE

1. Calculo del periodo aproximado según A.4.2.2 $T_a = C_t h^\alpha$

Tabla A.4.2-1

Valor de los parámetros C_t y α para el cálculo del período aproximado T_a

| Sistema estructural de resistencia sísmica | C_t | α |
|---|-----------------------------|----------|
| Pórticos resistentes a momentos de concreto reforzado que resisten la totalidad de las fuerzas sísmicas y que no están limitados o adheridos a componentes más rígidos, estructurales o no estructurales, que limiten los desplazamientos horizontales al verse sometidos a las fuerzas sísmicas. | 0.047 | 0.9 |
| Pórticos resistentes a momentos de acero estructural que resisten la totalidad de las fuerzas sísmicas y que no están limitados o adheridos a componentes más rígidos, estructurales o no estructurales, que limiten los desplazamientos horizontales al verse sometidos a las fuerzas sísmicas. | 0.072 | 0.8 |
| Pórticos arriostrados de acero estructural con diagonales excéntricas restringidas a pandeo. | 0.073 | 0.75 |
| Todos los otros sistemas estructurales basados en muros de rigidez similar o mayor a la de muros de concreto o mampostería | 0.049 | 0.75 |
| Alternativamente, para estructuras que tengan muros estructurales de concreto reforzado o mampostería estructural, pueden emplearse los siguientes parámetros C_t y α , donde C_w se calcula utilizando la ecuación A.4.2-4. | $\frac{0.0062}{\sqrt{C_w}}$ | 1.00 |

| | |
|-----------------------------|-------|
| Ct: | 0.047 |
| h: | 3.5 |
| α: | 0.9 |

Coeficiente para el calcular el periodo de la estructura
altura en metros, medida desde la base, del piso mas alto del edificio
Exponente del periodo aproximado

Ta: 0.145 Seg

2. Valor de la aceleración espectral (ver anexo Espectro de Diseño)

Sa: 0.478 g

3. Valor del exponente k

k: 1.00 Seg

| Valores de entrada - Etabs | Sa: | 0.48 |
|----------------------------|------------|------|
| | k: | 1.00 |

4. Valor del periodo máximo de la estructura (Análisis Dinámico)

$T < C_u T_a$ T: periodo de la estructura del análisis dinámico

$C_u = 1.75 - 1.2 A_v F_v > 1.2$

| | |
|------------|------|
| Av: | 0.2 |
| Fv: | 1.95 |

Cu: 1.28

CuTa: 0.19



| | | | |
|----------------------|-------------------------------|-----------------|---------------------|
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T1: 0.3166 Seg Período Fundamental del análisis dinámico (Etabs)

T2: 0.2497 Seg Período Fundamental del análisis dinámico (Etabs)

Sa: 0.478 g

5. Cortantes Sísmicas en la Base

Vu: 54.57 Ton Cortante Basal según FHE (Etabs)

0.8Vu: 43.656 Ton

Edificio Regular

0.9Vu: 49.113 Ton

Edificio Irregular

6. Ajuste de resultados (gravedad)

Vux: 53.4 Ton

Vuy: 54.53 Ton

Edificio Regular

Edificio Irregular

gx: 9.80

gy: 9.80

gx: 9.80

gy: 9.80

| Story Shears | | | | | | | | | |
|--------------|--------|--------|--------|------|--------|-------|---------|---------|----------|
| Edit View | | | | | | | | | |
| Story Shears | | | | | | | | | |
| | Story | Load | Loc | P | VX | VY | T | MX | MY |
| ▶ | N+3.60 | FHE | Top | 0.00 | -54.57 | 0.00 | 278.532 | 0.000 | 0.000 |
| | N+3.60 | FHE | Bottom | 0.00 | -54.57 | 0.00 | 278.532 | 0.000 | -196.438 |
| | N+3.60 | SISMOX | Top | 0.00 | 53.40 | 0.00 | 260.057 | 0.000 | 0.000 |
| | N+3.60 | SISMOX | Bottom | 0.00 | 53.40 | 0.00 | 260.057 | 0.000 | 192.252 |
| | N+3.60 | SISMOY | Top | 0.00 | 0.00 | 54.53 | 472.060 | 0.000 | 0.000 |
| | N+3.60 | SISMOY | Bottom | 0.00 | 0.00 | 54.53 | 472.060 | 196.305 | 0.000 |

FUENTE: Modelacion en Etabs



| | | | |
|----------------------|-------------------------------|-----------------|---------------------|
| Propietario: | SEC. EDUCACION Y SEC. CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | |
| Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

ANEXO 2.7. RESUMEN DE CARGAS SISMICAS



| | | | |
|----------------------|-------------------------------|-----------------|---------------------|
| Propietario: | SEC. EDUCACION Y SEC. CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | |
| Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

FUENTE DE MASA

| Tipo de carga | % de participacion |
|----------------------|---------------------------|
| Muerta | 100% |
| Viva | 10% |


MASA POR PISO

| Nivel | Masa (Ton/g) |
|--------------|---------------------|
| N+3.60 | 11.64 |


FUERZAS SISMICAS POR PISO (Ton, m)

| NIVEL | CARGA | P | VX | VY | T | MX | MY |
|--------------|--------------|----------|-----------|-----------|----------|-----------|-----------|
| N+3.60 | FHE | 3.99E-14 | -1.45E+02 | -6.20E-13 | 8.02E+02 | 2.65E-12 | -5.20E+02 |
| N+3.60 | FHEU | 1.63E-14 | -7.89E+01 | -3.38E-13 | 4.38E+02 | 1.42E-12 | -2.84E+02 |
| N+3.60 | SISMOX | 4.89E-14 | 1.44E+02 | 3.40E+00 | 8.13E+02 | 1.22E+01 | 5.19E+02 |
| N+3.60 | SISMOY | 2.74E-13 | 3.57E+00 | 1.30E+02 | 3.12E+03 | 4.69E+02 | 1.28E+01 |
| N+3.60 | UMBRALX | 2.79E-14 | 7.87E+01 | 2.39E+00 | 4.30E+02 | 8.59E+00 | 2.83E+02 |
| N+3.60 | UMBRALY | 1.68E-13 | 2.83E+00 | 7.11E+01 | 1.85E+03 | 2.56E+02 | 1.02E+01 |

NOTA: El analisis se hace por el metodo dinamico con el ajuste de cortante en la base.

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 1 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

ANEXO 3. DATOS DE ENTRADA

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 2 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

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S T O R Y D A T A

| STORY | SIMILAR TO | HEIGHT | ELEVATION |
|--------|------------|--------|-----------|
| N+3.60 | None | 3.600 | 3.600 |
| BASE | None | | 0.000 |

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M A S S S O U R C E D A T A

| | | |
|------|-----------|------------|
| MASS | LATERAL | LUMP MASS |
| FROM | MASS ONLY | AT STORIES |

Loads Yes Yes

M A S S S O U R C E L O A D S

LOAD MULTIPLIER

| | |
|------|--------|
| DEAD | 1.0000 |
| LIVE | 0.1000 |

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D I A P H R A G M M A S S D A T A

| STORY | DIAPHRAGM | MASS-X | MASS-Y | MMI | X-M | Y-M |
|--------|-----------|-----------|-----------|-----------|-------|-------|
| N+3.60 | D1 | 1.164E+01 | 1.164E+01 | 4.487E+02 | 7.870 | 5.104 |

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A S S E M B L E D P O I N T M A S S E S

| STORY | POINT | UX | UY | UZ | RX | RY | RZ |
|--------|-------|-----------|-----------|-----------|-----------|-----------|-----------|
| N+3.60 | 50 | 1.164E+01 | 1.164E+01 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 4.487E+02 |
| BASE | 7 | 5.293E-02 | 5.293E-02 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 |
| BASE | 8 | 5.293E-02 | 5.293E-02 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 |
| BASE | 9 | 5.293E-02 | 5.293E-02 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 |
| BASE | 13 | 5.293E-02 | 5.293E-02 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 |
| BASE | 14 | 7.939E-02 | 7.939E-02 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 |
| BASE | 15 | 5.293E-02 | 5.293E-02 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 |
| BASE | 21 | 1.108E-02 | 1.108E-02 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 |
| BASE | 43 | 1.108E-02 | 1.108E-02 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 |
| BASE | 44 | 1.108E-02 | 1.108E-02 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 |
| N+3.60 | All | 1.164E+01 | 1.164E+01 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 4.487E+02 |
| BASE | All | 3.773E-01 | 3.773E-01 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 |
| Totals | All | 1.202E+01 | 1.202E+01 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 4.487E+02 |

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M A T E R I A L L I S T B Y E L E M E N T T Y P E

| ELEMENT TYPE | MATERIAL | TOTAL MASS tons | NUMBER PIECES | NUMBER STUDS |
|--------------|----------|-----------------|---------------|--------------|
| Column | STEEL | 0.65 | 3 | |
| Column | CONC | 6.75 | 6 | |
| Beam | STEEL | 0.28 | 6 | 0 |
| Beam | CONC | 34.17 | 21 | 0 |
| Floor | CONC | 29.33 | | |
| Metal Deck | N.A. | 0.65 | | |

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 3 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

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M A T E R I A L L I S T B Y S E C T I O N

| SECTION | ELEMENT TYPE | NUMBER PIECES | TOTAL LENGTH meters | TOTAL MASS tons | NUMBER STUDS |
|-------------|--------------|------------------|---------------------------|-----------------------|-----------------|
| C30X60 | Column | 1 | 3.600 | 1.56 | |
| V30X50 | Beam | 13 | 69.570 | 23.81 | 0 |
| V35X50 | Beam | 2 | 7.650 | 2.92 | 0 |
| V25X50 | Beam | 4 | 15.300 | 4.60 | 0 |
| V15X50 | Beam | 2 | 15.740 | 2.84 | 0 |
| TUB273.1X9. | Column | 3 | 10.800 | 0.65 | |
| C30X40 | Column | 5 | 18.000 | 5.19 | |
| C220X80X3.0 | Beam | 6 | 31.800 | 0.28 | 0 |
| DECK1 | Floor | | | 9.18 | |
| DECK1 | Metal Deck | | | 0.34 | |
| LOSA50 | Floor | | | 9.48 | |
| LOSA50 | Metal Deck | | | 0.32 | |
| LOSA12 | Floor | | | 10.67 | |

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M A T E R I A L L I S T B Y S T O R Y

| STORY | ELEMENT TYPE | MATERIAL | TOTAL WEIGHT tons | FLOOR AREA m2 | UNIT WEIGHT kg/m2 | NUMBER PIECES | NUMBER STUDS |
|--------|--------------|----------|-------------------------|---------------------|-------------------------|------------------|-----------------|
| N+3.60 | Column | STEEL | 0.65 | 95.390 | 6.8356 | 3 | |
| N+3.60 | Column | CONC | 6.75 | 95.390 | 70.7372 | 6 | |
| N+3.60 | Beam | STEEL | 0.28 | 95.390 | 2.9300 | 6 | 0 |
| N+3.60 | Beam | CONC | 34.17 | 95.390 | 358.1778 | 21 | 0 |
| N+3.60 | Floor | CONC | 29.33 | 95.390 | 307.4330 | | |
| N+3.60 | Metal Deck | N.A. | 0.65 | 95.390 | 6.8663 | | |
| SUM | Column | STEEL | 0.65 | 95.390 | 6.8356 | 3 | |
| SUM | Column | CONC | 6.75 | 95.390 | 70.7372 | 6 | |
| SUM | Beam | STEEL | 0.28 | 95.390 | 2.9300 | 6 | 0 |
| SUM | Beam | CONC | 34.17 | 95.390 | 358.1778 | 21 | 0 |
| SUM | Floor | CONC | 29.33 | 95.390 | 307.4330 | | |
| SUM | Metal Deck | N.A. | 0.65 | 95.390 | 6.8663 | | |
| TOTAL | All | All | 71.83 | 95.390 | 752.9800 | 36 | 0 |

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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 | 20389020.000 | 0.3000 | 1.1700E-05 | 7841930.769 |
| CONC | Iso | Concrete | All | 2526710.000 | 0.2000 | 9.9000E-06 | 1052795.833 |
| OTHER | Iso | None | All | 20389020.000 | 0.3000 | 1.1700E-05 | 7841930.769 |

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 | 7.9814E-01 | 7.8334E+00 |
| CONC | 2.4480E-01 | 2.4030E+00 |
| OTHER | 7.9814E-01 | 7.8334E+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

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 4 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

| MATERIAL NAME | STEEL FY | STEEL FU | STEEL COST (\$) |
|---------------|-----------|-----------|-----------------|
| STEEL | 35153.480 | 45699.530 | 27679.91 |

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 |
|---------------|----------------------|-------------|-----------|-----------|--------------------|
| CONC | No | 2800.000 | 42000.000 | 42000.000 | 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 |
|--------------------|---------------|---|----------|-----------|
| C30X60 | CONC | Rectangular | Yes | |
| V30X50 | CONC | Rectangular | | Yes |
| V35X50 | CONC | Rectangular | | Yes |
| V25X50 | CONC | Rectangular | | Yes |
| V15X50 | CONC | Rectangular | | Yes |
| TUB273.1X9.30MM | STEEL | Pipe | | |
| C30X40 | CONC | Rectangular | Yes | |
| C220X80X3.0 | STEEL | Channel | | |

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 |
|--------------------|---------------|------------------|------------------|-----------|------------------|------------------|
| C30X60 | 0.6000 | 0.3000 | 0.0000 | 0.0000 | 0.3000 | 0.0000 |
| V30X50 | 0.5000 | 0.3000 | 0.0000 | 0.0000 | 0.3000 | 0.0000 |
| V35X50 | 0.5000 | 0.3500 | 0.0000 | 0.0000 | 0.3500 | 0.0000 |
| V25X50 | 0.5000 | 0.2500 | 0.0000 | 0.0000 | 0.2500 | 0.0000 |
| V15X50 | 0.5000 | 0.1500 | 0.0000 | 0.0000 | 0.1500 | 0.0000 |
| TUB273.1X9.30MM | 0.2731 | 0.2731 | 0.0093 | 0.0093 | 0.2731 | 0.0000 |
| C30X40 | 0.4000 | 0.3000 | 0.0000 | 0.0000 | 0.3000 | 0.0000 |
| C220X80X3.0 | 0.2200 | 0.0800 | 0.0030 | 0.0030 | 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 | | SHEAR AREAS | |
|--------------------|--------------|--------------------|--------------------|--------|-------------|--------|
| | | | I33 | I22 | A2 | A3 |
| C30X60 | 0.1800 | 0.0037 | 0.0054 | 0.0014 | 0.1500 | 0.1500 |
| V30X50 | 0.1500 | 0.0028 | 0.0031 | 0.0011 | 0.1250 | 0.1250 |
| V35X50 | 0.1750 | 0.0041 | 0.0036 | 0.0018 | 0.1458 | 0.1458 |
| V25X50 | 0.1250 | 0.0018 | 0.0026 | 0.0007 | 0.1042 | 0.1042 |
| V15X50 | 0.0750 | 0.0005 | 0.0016 | 0.0001 | 0.0625 | 0.0625 |
| TUB273.1X9.30MM | 0.0077 | 0.0001 | 0.0001 | 0.0001 | 0.0041 | 0.0041 |
| C30X40 | 0.1200 | 0.0019 | 0.0016 | 0.0009 | 0.1000 | 0.1000 |
| C220X80X3.0 | 0.0011 | 0.0000 | 0.0000 | 0.0000 | 0.0007 | 0.0005 |

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 |
|--------------------|--------------------|--------------------|--------------------|--------------------|------------------------|------------------------|
| C30X60 | 0.0180 | 0.0090 | 0.0270 | 0.0135 | 0.1732 | 0.0866 |
| V30X50 | 0.0125 | 0.0075 | 0.0188 | 0.0113 | 0.1443 | 0.0866 |
| V35X50 | 0.0146 | 0.0102 | 0.0219 | 0.0153 | 0.1443 | 0.1010 |

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 5 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

| | | | | | | |
|-----------------|--------|--------|--------|--------|--------|--------|
| V25X50 | 0.0104 | 0.0052 | 0.0156 | 0.0078 | 0.1443 | 0.0722 |
| V15X50 | 0.0063 | 0.0019 | 0.0094 | 0.0028 | 0.1443 | 0.0433 |
| TUB273.1X9.30MM | 0.0005 | 0.0005 | 0.0006 | 0.0006 | 0.0933 | 0.0933 |
| C30X40 | 0.0080 | 0.0060 | 0.0120 | 0.0090 | 0.1155 | 0.0866 |
| C220X80X3.0 | 0.0001 | 0.0000 | 0.0001 | 0.0000 | 0.0850 | 0.0243 |

FRAME SECTION WEIGHTS AND MASSES

| FRAME SECTION NAME | TOTAL WEIGHT | TOTAL MASS |
|--------------------|--------------|------------|
| C30X60 | 1.5571 | 0.1586 |
| V30X50 | 23.8115 | 2.4257 |
| V35X50 | 2.9226 | 0.2977 |
| V25X50 | 4.5957 | 0.4682 |
| V15X50 | 2.8367 | 0.2890 |
| TUB273.1X9.30MM | 0.6521 | 0.0664 |
| C30X40 | 5.1905 | 0.5288 |
| C220X80X3.0 | 0.2795 | 0.0285 |

CONCRETE COLUMN DATA

| FRAME SECTION NAME | REINF CONFIGURATION | | REINF SIZE/TYPE | NUM BARS 3DIR/2DIR | NUM BARS CIRCULAR | BAR COVER |
|--------------------|---------------------|---------|-----------------|--------------------|-------------------|-----------|
| | LONGIT | LATERAL | | | | |
| C30X60 | Rectangular Ties | | #9/Design | 2/4 | N/A | 0.0500 |
| C30X40 | Rectangular Ties | | #9/Design | 2/3 | N/A | 0.0400 |

CONCRETE BEAM DATA

| FRAME SECTION NAME | TOP COVER | BOT COVER | TOP LEFT AREA | TOP RIGHT AREA | BOT LEFT AREA | BOT RIGHT AREA |
|--------------------|-----------|-----------|---------------|----------------|---------------|----------------|
| V30X50 | 0.0500 | 0.0500 | 0.000 | 0.000 | 0.000 | 0.000 |
| V35X50 | 0.0500 | 0.0500 | 0.000 | 0.000 | 0.000 | 0.000 |
| V25X50 | 0.0500 | 0.0500 | 0.000 | 0.000 | 0.000 | 0.000 |
| V15X50 | 0.0500 | 0.0500 | 0.000 | 0.000 | 0.000 | 0.000 |

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DECK SECTION PROPERTY DATA


| DECK SECTION | DECK TYPE | SLAB MATERIAL | DECK MATERIAL | DECK SHEAR THICK | DECK UNIT WT |
|--------------|-----------|---------------|---------------|------------------|--------------|
| DECK1 | Filled | CONC | N/A | N/A | 1.1230E-02 |
| LOSA50 | Filled | CONC | N/A | N/A | 1.1200E-02 |
| LOSA12 | Solid | CONC | N/A | N/A | N/A |

DECK SECTION SHEAR STUD DATA

| DECK SECTION | STUD DIAM | STUD HEIGHT | STUD FU |
|--------------|-----------|-------------|-----------|
| DECK1 | 0.0191 | 0.1524 | 45699.530 |
| LOSA50 | 0.0191 | 0.1524 | 45699.530 |
| LOSA12 | 0.0191 | 0.1524 | 45699.530 |

DECK SECTION GEOMETRY DATA

| DECK SECTION | SLAB DEPTH | RIB DEPTH | RIB WIDTH | RIB SPACING |
|--------------|------------|-----------|-----------|-------------|
|--------------|------------|-----------|-----------|-------------|

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 6 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

| | | | | |
|--------|--------|--------|--------|--------|
| DECK1 | 0.0889 | 0.0762 | 0.1524 | 0.3048 |
| LOSA50 | 0.0800 | 0.4200 | 0.1200 | 0.8500 |
| LOSA12 | 0.1200 | N/A | N/A | N/A |

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STATIC LOAD CASES

| 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 | | |
| FHE | QUAKE | USER_COEFF | 0.0000 | | |
| FHEU | QUAKE | USER_COEFF | 0.0000 | | |
| VIENTO | WIND | None | 0.0000 | | |

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RESPONSE SPECTRUM CASES

RESP SPEC CASE: SISMOX

BASIC RESPONSE SPECTRUM DATA

| MODAL COMBO | DIRECTION COMBO | MODAL DAMPING | SPECTRUM ANGLE | TYPICAL ECCEN |
|-------------|-----------------|---------------|----------------|---------------|
| CQC | SRSS | 0.0500 | 0.0000 | 0.0500 |

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

| DIRECTION | FUNCTION | SCALE FACT |
|-----------|----------|------------|
| U1 | MICROBOG | 9.8000 |
| U2 | ---- | N/A |
| UZ | ---- | N/A |

RESP SPEC CASE: SISMOY

BASIC RESPONSE SPECTRUM DATA

| MODAL COMBO | DIRECTION COMBO | MODAL DAMPING | SPECTRUM ANGLE | TYPICAL ECCEN |
|-------------|-----------------|---------------|----------------|---------------|
| CQC | SRSS | 0.0500 | 0.0000 | 0.0500 |


RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

| DIRECTION | FUNCTION | SCALE FACT |
|-----------|----------|------------|
| U1 | ---- | N/A |
| U2 | MICROBOG | 9.8000 |
| UZ | ---- | N/A |

RESP SPEC CASE: UMBRALX

BASIC RESPONSE SPECTRUM DATA

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

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 7 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

| DIRECTION | FUNCTION | SCALE FACT |
|-----------|-------------|------------|
| U1 | UMBMICROBOG | 9.8000 |
| U2 | ---- | N/A |
| UZ | ---- | N/A |

RESP SPEC CASE: UMBRALY

BASIC RESPONSE SPECTRUM DATA

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

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

| DIRECTION | FUNCTION | SCALE FACT |
|-----------|-------------|------------|
| U1 | ---- | N/A |
| U2 | UMBMICROBOG | 9.8000 |
| UZ | ---- | N/A |

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LOADING COMBINATIONS

| COMBO | COMBO TYPE | CASE | CASE TYPE | SCALE FACTOR |
|-------|------------|--------|-----------|--------------|
| C1 | ADD | DEAD | Static | 1.4000 |
| C2 | ADD | DEAD | Static | 1.2000 |
| | | LIVE | Static | 1.6000 |
| C3 | ADD | DEAD | Static | 1.2000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | 0.3330 |
| | | SISMOY | Spectra | 0.1000 |
| C4 | ADD | DEAD | Static | 1.2000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | 0.3330 |
| | | SISMOY | Spectra | -0.1000 |
| C5 | ADD | DEAD | Static | 1.2000 |
| | | SISMOX | Spectra | -0.3330 |
| | | SISMOY | Spectra | 0.1000 |
| | | LIVE | Static | 1.0000 |
| C6 | ADD | DEAD | Static | 1.2000 |
| | | SISMOX | Spectra | -0.3330 |
| | | SISMOY | Spectra | -0.1000 |
| | | LIVE | Static | 1.0000 |
| C7 | ADD | DEAD | Static | 1.2000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | 0.1000 |
| | | SISMOY | Spectra | 0.3330 |
| C8 | ADD | DEAD | Static | 1.2000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | -0.1000 |
| | | SISMOY | Spectra | 0.3330 |
| C9 | ADD | DEAD | Static | 1.2000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | 0.1000 |
| | | SISMOY | Spectra | -0.3330 |
| C10 | ADD | DEAD | Static | 1.2000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | -0.1000 |




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|---------------|--|----------|----------------------------|
| Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 8 DE 48 |
| Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

| | | | | |
|------|------|--------|---------|---------|
| C11 | ADD | SISMOY | Spectra | -0.3330 |
| | | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | 0.3330 |
| C12 | ADD | SISMOY | Spectra | 0.1000 |
| | | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | 0.3330 |
| C13 | ADD | SISMOY | Spectra | -0.1000 |
| | | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | -0.3330 |
| C14 | ADD | SISMOY | Spectra | 0.1000 |
| | | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | -0.3330 |
| C15 | ADD | SISMOY | Spectra | -0.1000 |
| | | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | 0.1000 |
| C16 | ADD | SISMOY | Spectra | 0.3330 |
| | | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | 0.1000 |
| C17 | ADD | SISMOY | Spectra | -0.3330 |
| | | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | -0.1000 |
| C18 | ADD | SISMOY | Spectra | 0.3330 |
| | | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | -0.1000 |
| ENVC | ENVE | SISMOY | Spectra | -0.3330 |
| | | C1 | Combo | 1.0000 |
| | | C2 | Combo | 1.0000 |
| | | C3 | Combo | 1.0000 |
| | | C4 | Combo | 1.0000 |
| | | C5 | Combo | 1.0000 |
| | | C6 | Combo | 1.0000 |
| | | C7 | Combo | 1.0000 |
| | | C8 | Combo | 1.0000 |
| | | C9 | Combo | 1.0000 |
| | | C10 | Combo | 1.0000 |
| | | C11 | Combo | 1.0000 |
| | | C12 | Combo | 1.0000 |
| | | C13 | Combo | 1.0000 |
| | | C14 | Combo | 1.0000 |
| | | C15 | Combo | 1.0000 |
| | | C16 | Combo | 1.0000 |
| | | C17 | Combo | 1.0000 |
| | | C18 | Combo | 1.0000 |
| F1 | ADD | DEAD | Static | 1.0000 |
| F2 | ADD | DEAD | Static | 1.0000 |
| F3 | ADD | LIVE | Static | 1.0000 |
| | | DEAD | Static | 1.0000 |
| | | SISMOX | Spectra | 0.2330 |
| F4 | ADD | SISMOY | Spectra | 0.0700 |
| | | DEAD | Static | 1.0000 |
| | | SISMOX | Spectra | 0.0700 |
| F5 | ADD | SISMOY | Spectra | 0.2330 |
| | | DEAD | Static | 1.0000 |
| | | SISMOX | Spectra | 0.1750 |
| F6 | ADD | SISMOY | Spectra | 0.0530 |
| | | LIVE | Static | 0.7500 |
| | | DEAD | Static | 1.0000 |
| F7 | ADD | SISMOX | Spectra | 0.0530 |
| | | SISMOY | Spectra | 0.1750 |
| | | LIVE | Static | 0.7500 |
| F8 | ADD | DEAD | Static | 0.6000 |
| | | SISMOX | Spectra | 0.2330 |
| | | SISMOY | Spectra | 0.0700 |
| ENVF | ENVE | DEAD | Static | 0.6000 |
| | | SISMOX | Spectra | 0.0700 |
| | | SISMOY | Spectra | 0.2330 |
| | | F1 | Combo | 1.0000 |
| | | F2 | Combo | 1.0000 |
| | | F3 | Combo | 1.0000 |




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|---------------|--|----------|----------------------------|
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| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 9 DE 48 |
| Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

| | | | | |
|-------|-----|--------|---------|---------|
| | | F4 | Combo | 1.0000 |
| | | F5 | Combo | 1.0000 |
| | | F6 | Combo | 1.0000 |
| | | F7 | Combo | 1.0000 |
| | | F8 | Combo | 1.0000 |
| VNC1 | ADD | DEAD | Static | 1.3000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | 1.0000 |
| | | SISMOY | Spectra | 0.3000 |
| VNC2 | ADD | DEAD | Static | 1.3000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | 1.0000 |
| | | SISMOY | Spectra | -0.3000 |
| VNC3 | ADD | DEAD | Static | 1.1000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | -1.0000 |
| | | SISMOY | Spectra | 0.3000 |
| VNC4 | ADD | DEAD | Static | 1.1000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | -1.0000 |
| | | SISMOY | Spectra | -0.3000 |
| VNC5 | ADD | DEAD | Static | 1.3000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | 0.3000 |
| | | SISMOY | Spectra | 1.0000 |
| VNC6 | ADD | DEAD | Static | 1.1000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | 0.3000 |
| | | SISMOY | Spectra | -1.0000 |
| VNC7 | ADD | DEAD | Static | 1.3000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | -0.3000 |
| | | SISMOY | Spectra | 1.0000 |
| VNC8 | ADD | DEAD | Static | 1.1000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | -0.3000 |
| | | SISMOY | Spectra | -1.0000 |
| VNC9 | ADD | DEAD | Static | 1.0000 |
| | | SISMOX | Spectra | 1.0000 |
| | | SISMOY | Spectra | 0.3000 |
| VNC10 | ADD | DEAD | Static | 1.0000 |
| | | SISMOX | Spectra | 1.0000 |
| | | SISMOY | Spectra | -0.3000 |
| VNC11 | ADD | DEAD | Static | 0.8000 |
| | | SISMOX | Spectra | -1.0000 |
| | | SISMOY | Spectra | 0.3000 |
| VNC12 | ADD | DEAD | Static | 0.8000 |
| | | SISMOX | Spectra | -1.0000 |
| | | SISMOY | Spectra | -0.3000 |
| VNC13 | ADD | DEAD | Static | 1.0000 |
| | | SISMOX | Spectra | 0.3000 |
| | | SISMOY | Spectra | 1.0000 |
| VNC14 | ADD | DEAD | Static | 0.8000 |
| | | SISMOX | Spectra | 0.3000 |
| | | SISMOY | Spectra | -1.0000 |
| VNC15 | ADD | DEAD | Static | 1.0000 |
| | | SISMOX | Spectra | -0.3000 |
| | | SISMOY | Spectra | 1.0000 |
| VNC16 | ADD | DEAD | Static | 0.8000 |
| | | SISMOX | Spectra | -0.3000 |
| | | SISMOY | Spectra | -1.0000 |
| VNV1 | ADD | DEAD | Static | 1.2000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | 0.6670 |
| | | SISMOY | Spectra | 0.2000 |
| VNV2 | ADD | DEAD | Static | 1.2000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | 0.6670 |
| | | SISMOY | Spectra | -0.2000 |

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|---|---------------|--|----------|----------------------------|
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| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 10 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

| | | | | |
|-------|-----|---------|---------|---------|
| VNV3 | ADD | DEAD | Static | 1.2000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | -0.6670 |
| | | SISMOY | Spectra | 0.2000 |
| VNV4 | ADD | DEAD | Static | 1.2000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | -0.6670 |
| | | SISMOY | Spectra | -0.2000 |
| VNV5 | ADD | DEAD | Static | 1.2000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | 0.2000 |
| | | SISMOY | Spectra | 0.6670 |
| VNV6 | ADD | DEAD | Static | 1.2000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | 0.2000 |
| | | SISMOY | Spectra | -0.6670 |
| VNV7 | ADD | DEAD | Static | 1.2000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | -0.2000 |
| | | SISMOY | Spectra | 0.6670 |
| VNV8 | ADD | DEAD | Static | 1.2000 |
| | | LIVE | Static | 1.0000 |
| | | SISMOX | Spectra | -0.2000 |
| | | SISMOY | Spectra | -0.6670 |
| VNV9 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | 0.6670 |
| | | SISMOY | Spectra | 0.2000 |
| | | DEAD | Static | 0.9000 |
| VNV10 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | 0.6670 |
| | | SISMOY | Spectra | -0.2000 |
| | | DEAD | Static | 0.9000 |
| VNV11 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | -0.6670 |
| | | SISMOY | Spectra | 0.2000 |
| | | DEAD | Static | 0.9000 |
| VNV12 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | -0.6670 |
| | | SISMOY | Spectra | -0.2000 |
| | | DEAD | Static | 0.9000 |
| VNV13 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | 0.2000 |
| | | SISMOY | Spectra | 0.6670 |
| | | DEAD | Static | 0.9000 |
| VNV14 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | 0.2000 |
| | | SISMOY | Spectra | -0.6670 |
| | | DEAD | Static | 0.9000 |
| VNV15 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | -0.2000 |
| | | SISMOY | Spectra | 0.6670 |
| | | DEAD | Static | 0.9000 |
| VNV16 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | -0.2000 |
| | | SISMOY | Spectra | -0.6670 |
| | | DEAD | Static | 0.9000 |
| DU1 | ADD | DEAD | Static | 0.9000 |
| | | UMBRALX | Spectra | 1.0000 |
| | | UMBRALY | Spectra | 0.3000 |
| | | DEAD | Static | 0.9000 |
| DU2 | ADD | DEAD | Static | 0.9000 |
| | | UMBRALX | Spectra | 1.0000 |
| | | UMBRALY | Spectra | -0.3000 |
| | | DEAD | Static | 0.9000 |
| DU3 | ADD | DEAD | Static | 0.9000 |
| | | UMBRALX | Spectra | -1.0000 |
| | | UMBRALY | Spectra | 0.3000 |
| | | DEAD | Static | 0.9000 |
| DU4 | ADD | DEAD | Static | 0.9000 |
| | | UMBRALX | Spectra | -1.0000 |
| | | UMBRALY | Spectra | -0.3000 |
| | | DEAD | Static | 0.9000 |
| DU5 | ADD | DEAD | Static | 0.9000 |
| | | UMBRALX | Spectra | 0.3000 |
| | | UMBRALY | Spectra | 1.0000 |
| | | DEAD | Static | 0.9000 |
| DU6 | ADD | DEAD | Static | 0.9000 |
| | | UMBRALX | Spectra | 0.3000 |
| | | UMBRALY | Spectra | -1.0000 |
| | | DEAD | Static | 0.9000 |
| DU7 | ADD | DEAD | Static | 0.9000 |
| | | UMBRALX | Spectra | -0.3000 |
| | | UMBRALY | Spectra | 1.0000 |
| | | DEAD | Static | 0.9000 |

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|---|---------------|--|----------|----------------------------|
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| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 11 DE 48 |
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|-----|-----|---------|---------|---------|
| DU8 | ADD | DEAD | Static | 0.9000 |
| | | UMBRALX | Spectra | -0.3000 |
| | | UMBRALY | Spectra | -1.0000 |
| D1 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | 1.0000 |
| | | SISMOY | Spectra | 0.3000 |
| D2 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | 1.0000 |
| | | SISMOY | Spectra | -0.3000 |
| D3 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | -1.0000 |
| | | SISMOY | Spectra | 0.3000 |
| D4 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | -1.0000 |
| | | SISMOY | Spectra | -0.3000 |
| D5 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | 0.3000 |
| | | SISMOY | Spectra | 1.0000 |
| D6 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | 0.3000 |
| | | SISMOY | Spectra | -1.0000 |
| D7 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | -0.3000 |
| | | SISMOY | Spectra | 1.0000 |
| D8 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | -0.3000 |
| | | SISMOY | Spectra | -1.0000 |

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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 - U S E R

FUNCTION NAME: MICROBOG

| PERIOD | ACCEL |
|--------|--------|
| 0.0000 | 0.4780 |
| 0.0250 | 0.4780 |
| 0.0500 | 0.4780 |
| 0.0750 | 0.4780 |
| 0.1000 | 0.4780 |
| 0.1250 | 0.4780 |
| 0.1500 | 0.4780 |
| 0.1750 | 0.4780 |
| 0.2000 | 0.4780 |
| 0.2250 | 0.4780 |
| 0.2500 | 0.4780 |
| 0.2750 | 0.4780 |
| 0.3000 | 0.4780 |
| 0.3250 | 0.4780 |
| 0.3500 | 0.4780 |
| 0.3750 | 0.4780 |
| 0.4000 | 0.4780 |
| 0.4250 | 0.4780 |
| 0.4500 | 0.4780 |
| 0.4750 | 0.4780 |
| 0.5000 | 0.4780 |
| 0.5250 | 0.4780 |
| 0.5500 | 0.4780 |
| 0.5750 | 0.4780 |
| 0.6500 | 0.4780 |
| 0.6750 | 0.4780 |
| 0.7000 | 0.4780 |
| 0.7250 | 0.4780 |
| 0.7500 | 0.4780 |
| 0.7750 | 0.4780 |
| 0.8000 | 0.4780 |
| 0.8250 | 0.4780 |
| 0.8500 | 0.4780 |




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| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 12 DE 48 |
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| | |
|--------|--------|
| 0.8750 | 0.4720 |
| 0.9000 | 0.4650 |
| 0.9250 | 0.4590 |
| 0.9500 | 0.4520 |
| 0.9750 | 0.4470 |
| 1.0000 | 0.4410 |
| 1.0250 | 0.4360 |
| 1.0500 | 0.4310 |
| 1.0750 | 0.4260 |
| 1.1000 | 0.4210 |
| 1.1250 | 0.4160 |
| 1.1500 | 0.4070 |
| 1.1750 | 0.3980 |
| 1.2000 | 0.3900 |
| 1.2250 | 0.3820 |
| 1.2500 | 0.3740 |
| 1.2750 | 0.3670 |
| 1.3000 | 0.3600 |
| 1.3250 | 0.3530 |
| 1.3500 | 0.3470 |
| 1.3750 | 0.3400 |
| 1.4000 | 0.3340 |
| 1.4250 | 0.3280 |
| 1.4500 | 0.3230 |
| 1.4750 | 0.3170 |
| 1.5000 | 0.3120 |
| 1.5250 | 0.3070 |
| 1.5500 | 0.3020 |
| 1.5750 | 0.2970 |
| 1.6000 | 0.2930 |
| 1.6250 | 0.2880 |
| 1.6500 | 0.2840 |
| 1.6750 | 0.2790 |
| 1.7000 | 0.2750 |
| 1.7250 | 0.2710 |
| 1.7500 | 0.2670 |
| 1.7750 | 0.2640 |
| 1.8000 | 0.2600 |
| 1.8250 | 0.2560 |
| 1.8500 | 0.2530 |
| 1.8750 | 0.2500 |
| 1.9000 | 0.2460 |
| 1.9250 | 0.2430 |
| 1.9500 | 0.2400 |
| 1.9750 | 0.2370 |
| 2.0000 | 0.2340 |
| 2.0250 | 0.2310 |
| 2.0500 | 0.2280 |
| 2.0750 | 0.2260 |
| 2.1000 | 0.2230 |
| 2.1250 | 0.2200 |
| 2.1500 | 0.2180 |
| 2.1750 | 0.2150 |
| 2.2000 | 0.2130 |
| 2.2250 | 0.2100 |
| 2.2500 | 0.2080 |
| 2.2750 | 0.2060 |
| 2.3000 | 0.2030 |
| 2.3250 | 0.2010 |
| 2.3500 | 0.1990 |
| 2.3750 | 0.1970 |
| 2.4000 | 0.1950 |
| 2.4250 | 0.1930 |
| 2.4500 | 0.1910 |
| 2.4750 | 0.1890 |
| 2.5000 | 0.1870 |
| 2.5250 | 0.1850 |
| 2.5500 | 0.1840 |
| 2.5750 | 0.1820 |



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|---------------|--|----------|----------------------------|
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| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 13 DE 48 |
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| | |
|--------|--------|
| 2.6000 | 0.1800 |
| 2.6250 | 0.1780 |
| 2.6500 | 0.1770 |
| 2.6750 | 0.1750 |
| 2.7000 | 0.1730 |
| 2.7250 | 0.1720 |
| 2.7500 | 0.1700 |
| 2.7750 | 0.1690 |
| 2.8000 | 0.1670 |
| 2.8250 | 0.1660 |
| 2.8500 | 0.1640 |
| 2.8750 | 0.1630 |
| 2.9000 | 0.1610 |
| 2.9250 | 0.1600 |
| 2.9500 | 0.1590 |
| 2.9750 | 0.1570 |
| 3.0000 | 0.1560 |
| 3.0250 | 0.1550 |
| 3.0500 | 0.1530 |
| 3.0750 | 0.1520 |
| 3.1000 | 0.1510 |
| 3.1250 | 0.1500 |
| 3.1500 | 0.1490 |
| 3.1750 | 0.1470 |
| 3.2000 | 0.1460 |
| 3.2250 | 0.1450 |
| 3.2500 | 0.1440 |
| 3.2750 | 0.1430 |
| 3.3000 | 0.1420 |
| 3.3250 | 0.1410 |
| 3.3500 | 0.1400 |
| 3.3750 | 0.1390 |
| 3.4000 | 0.1380 |
| 3.4250 | 0.1370 |
| 3.4500 | 0.1360 |
| 3.4750 | 0.1350 |
| 3.5000 | 0.1340 |
| 3.5250 | 0.1320 |
| 3.5500 | 0.1300 |
| 3.5750 | 0.1280 |
| 3.6000 | 0.1260 |
| 3.6250 | 0.1250 |
| 3.6500 | 0.1230 |
| 3.6750 | 0.1210 |
| 3.7000 | 0.1200 |
| 3.7250 | 0.1180 |
| 3.7500 | 0.1160 |
| 3.7750 | 0.1150 |
| 3.8000 | 0.1130 |
| 3.8250 | 0.1120 |
| 3.8500 | 0.1110 |
| 3.8750 | 0.1090 |
| 3.9000 | 0.1080 |
| 3.9250 | 0.1060 |
| 3.9500 | 0.1050 |
| 3.9750 | 0.1040 |
| 4.0000 | 0.1020 |
| 4.0250 | 0.1010 |
| 4.0500 | 0.1000 |
| 4.0750 | 0.0990 |
| 4.1000 | 0.0970 |
| 4.1250 | 0.0960 |
| 4.1500 | 0.0950 |
| 4.1750 | 0.0940 |
| 4.2000 | 0.0930 |
| 4.2250 | 0.0920 |
| 4.2500 | 0.0910 |
| 4.2750 | 0.0900 |
| 4.3000 | 0.0890 |

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 14 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

| | |
|--------|--------|
| 4.3250 | 0.0880 |
| 4.3500 | 0.0870 |
| 4.3750 | 0.0860 |
| 4.4000 | 0.0850 |
| 4.4250 | 0.0840 |
| 4.4500 | 0.0830 |
| 4.4750 | 0.0820 |
| 4.5000 | 0.0810 |
| 4.5250 | 0.0800 |
| 4.5500 | 0.0790 |
| 4.5750 | 0.0780 |
| 4.6000 | 0.0770 |
| 4.6250 | 0.0770 |
| 4.6500 | 0.0760 |
| 4.6750 | 0.0750 |
| 4.7000 | 0.0740 |
| 4.7250 | 0.0730 |
| 4.7500 | 0.0730 |
| 4.7750 | 0.0720 |
| 4.8000 | 0.0710 |
| 4.8250 | 0.0700 |
| 4.8500 | 0.0700 |
| 4.8750 | 0.0690 |
| 4.9000 | 0.0680 |
| 4.9250 | 0.0680 |
| 4.9500 | 0.0670 |
| 4.9750 | 0.0660 |
| 5.0000 | 0.0660 |
| 5.0250 | 0.0650 |
| 5.0500 | 0.0640 |
| 5.0750 | 0.0640 |
| 5.1000 | 0.0630 |
| 5.1250 | 0.0620 |
| 5.1500 | 0.0620 |
| 5.1750 | 0.0610 |
| 5.2000 | 0.0610 |
| 5.2250 | 0.0600 |
| 5.2500 | 0.0590 |
| 5.2750 | 0.0590 |
| 5.3000 | 0.0580 |
| 5.3250 | 0.0580 |
| 5.3500 | 0.0570 |
| 5.3750 | 0.0570 |
| 5.4000 | 0.0560 |
| 5.4250 | 0.0560 |
| 5.4500 | 0.0550 |
| 5.4750 | 0.0550 |
| 5.5000 | 0.0540 |

FUNCTION NAME: UMBMICROBOG

| PERIOD | ACCEL |
|--------|--------|
| 0.0000 | 0.2610 |
| 0.0250 | 0.2610 |
| 0.0500 | 0.2610 |
| 0.0750 | 0.2610 |
| 0.1000 | 0.2610 |
| 0.1250 | 0.2610 |
| 0.1500 | 0.2610 |
| 0.1750 | 0.2610 |
| 0.2000 | 0.2610 |
| 0.2250 | 0.2610 |
| 0.2500 | 0.2610 |
| 0.2750 | 0.2610 |
| 0.3000 | 0.2610 |
| 0.3250 | 0.2610 |
| 0.3500 | 0.2610 |



| | | | |
|---------------|--|----------|----------------------------|
| Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 15 DE 48 |
| Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

| | |
|--------|--------|
| 0.3750 | 0.2610 |
| 0.4000 | 0.2610 |
| 0.4250 | 0.2610 |
| 0.4500 | 0.2610 |
| 0.4750 | 0.2610 |
| 0.5000 | 0.2610 |
| 0.5250 | 0.2610 |
| 0.5500 | 0.2610 |
| 0.5750 | 0.2610 |
| 0.6000 | 0.2610 |
| 0.6250 | 0.2610 |
| 0.6500 | 0.2610 |
| 0.6750 | 0.2610 |
| 0.7000 | 0.2610 |
| 0.7250 | 0.2610 |
| 0.7500 | 0.2610 |
| 0.7750 | 0.2610 |
| 0.8000 | 0.2610 |
| 0.8250 | 0.2610 |
| 0.8500 | 0.2580 |
| 0.8750 | 0.2550 |
| 0.9000 | 0.2510 |
| 0.9250 | 0.2480 |
| 0.9500 | 0.2440 |
| 0.9750 | 0.2410 |
| 1.0000 | 0.2390 |
| 1.0250 | 0.2360 |
| 1.0500 | 0.2310 |
| 1.0750 | 0.2260 |
| 1.1000 | 0.2210 |
| 1.1250 | 0.2160 |
| 1.1500 | 0.2110 |
| 1.1750 | 0.2070 |
| 1.2000 | 0.2030 |
| 1.2250 | 0.1980 |
| 1.2500 | 0.1940 |
| 1.2750 | 0.1910 |
| 1.3000 | 0.1870 |
| 1.3250 | 0.1830 |
| 1.3500 | 0.1800 |
| 1.3750 | 0.1770 |
| 1.4000 | 0.1740 |
| 1.4250 | 0.1710 |
| 1.4500 | 0.1680 |
| 1.4750 | 0.1650 |
| 1.5000 | 0.1620 |
| 1.5250 | 0.1590 |
| 1.5500 | 0.1570 |
| 1.5750 | 0.1540 |
| 1.6000 | 0.1520 |
| 1.6250 | 0.1500 |
| 1.6500 | 0.1470 |
| 1.6750 | 0.1450 |
| 1.7000 | 0.1430 |
| 1.7250 | 0.1410 |
| 1.7500 | 0.1390 |
| 1.7750 | 0.1370 |
| 1.8000 | 0.1350 |
| 1.8250 | 0.1330 |
| 1.8500 | 0.1310 |
| 1.8750 | 0.1300 |
| 1.9000 | 0.1280 |
| 1.9250 | 0.1260 |
| 1.9500 | 0.1250 |
| 1.9750 | 0.1230 |
| 2.0000 | 0.1220 |
| 2.0250 | 0.1200 |
| 2.0500 | 0.1190 |
| 2.0750 | 0.1170 |




| | | | |
|---------------|--|----------|----------------------------|
| Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 16 DE 48 |
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| | |
|--------|--------|
| 2.1000 | 0.1160 |
| 2.1250 | 0.1140 |
| 2.1500 | 0.1130 |
| 2.1750 | 0.1120 |
| 2.2000 | 0.1100 |
| 2.2250 | 0.1090 |
| 2.2500 | 0.1080 |
| 2.2750 | 0.1070 |
| 2.3000 | 0.1060 |
| 2.3250 | 0.1050 |
| 2.3500 | 0.1030 |
| 2.3750 | 0.1020 |
| 2.4000 | 0.1010 |
| 2.4250 | 0.1000 |
| 2.4500 | 0.0990 |
| 2.4750 | 0.0980 |
| 2.5000 | 0.0970 |
| 2.5250 | 0.0960 |
| 2.5500 | 0.0950 |
| 2.5750 | 0.0940 |
| 2.6000 | 0.0930 |
| 2.6250 | 0.0930 |
| 2.6500 | 0.0920 |
| 2.6750 | 0.0910 |
| 2.7000 | 0.0900 |
| 2.7250 | 0.0890 |
| 2.7500 | 0.0880 |
| 2.7750 | 0.0880 |
| 2.8000 | 0.0870 |
| 2.8250 | 0.0860 |
| 2.8500 | 0.0850 |
| 2.8750 | 0.0850 |
| 2.9000 | 0.0840 |
| 2.9250 | 0.0830 |
| 2.9500 | 0.0820 |
| 2.9750 | 0.0820 |
| 3.0000 | 0.0810 |
| 3.0250 | 0.0800 |
| 3.0500 | 0.0800 |
| 3.0750 | 0.0790 |
| 3.1000 | 0.0780 |
| 3.1250 | 0.0780 |
| 3.1500 | 0.0770 |
| 3.1750 | 0.0770 |
| 3.2000 | 0.0760 |
| 3.2250 | 0.0750 |
| 3.2500 | 0.0750 |
| 3.2750 | 0.0740 |
| 3.3000 | 0.0740 |
| 3.3250 | 0.0730 |
| 3.3500 | 0.0730 |
| 3.3750 | 0.0720 |
| 3.4000 | 0.0710 |
| 3.4250 | 0.0710 |
| 3.4500 | 0.0700 |
| 3.4750 | 0.0700 |
| 3.5000 | 0.0690 |
| 3.5250 | 0.0680 |
| 3.5500 | 0.0670 |
| 3.5750 | 0.0670 |
| 3.6000 | 0.0660 |
| 3.6250 | 0.0650 |
| 3.6500 | 0.0640 |
| 3.6750 | 0.0630 |
| 3.7000 | 0.0620 |
| 3.7250 | 0.0610 |
| 3.7500 | 0.0600 |
| 3.7750 | 0.0600 |
| 3.8000 | 0.0590 |




| | | | |
|---------------|--|----------|----------------------------|
| Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 17 DE 48 |
| Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

| | |
|--------|--------|
| 3.8250 | 0.0580 |
| 3.8500 | 0.0570 |
| 3.8750 | 0.0570 |
| 3.9000 | 0.0560 |
| 3.9250 | 0.0550 |
| 3.9500 | 0.0550 |
| 3.9750 | 0.0540 |
| 4.0000 | 0.0530 |
| 4.0250 | 0.0520 |
| 4.0500 | 0.0520 |
| 4.0750 | 0.0510 |
| 4.1000 | 0.0510 |
| 4.1250 | 0.0500 |
| 4.1500 | 0.0490 |
| 4.1750 | 0.0490 |
| 4.2000 | 0.0480 |
| 4.2250 | 0.0480 |
| 4.2500 | 0.0470 |
| 4.2750 | 0.0470 |
| 4.3000 | 0.0460 |
| 4.3250 | 0.0450 |
| 4.3500 | 0.0450 |
| 4.3750 | 0.0440 |
| 4.4000 | 0.0440 |
| 4.4250 | 0.0430 |
| 4.4500 | 0.0430 |
| 4.4750 | 0.0420 |
| 4.5000 | 0.0420 |
| 4.5250 | 0.0420 |
| 4.5500 | 0.0410 |
| 4.5750 | 0.0410 |
| 4.6000 | 0.0400 |
| 4.6250 | 0.0400 |
| 4.6500 | 0.0390 |
| 4.6750 | 0.0390 |
| 4.7000 | 0.0390 |
| 4.7250 | 0.0380 |
| 4.7500 | 0.0380 |
| 4.7750 | 0.0370 |
| 4.8000 | 0.0370 |
| 4.8250 | 0.0370 |
| 4.8500 | 0.0360 |
| 4.8750 | 0.0360 |
| 4.9000 | 0.0350 |
| 4.9250 | 0.0350 |
| 4.9500 | 0.0350 |
| 4.9750 | 0.0340 |
| 5.0000 | 0.0340 |
| 5.0250 | 0.0340 |
| 5.0500 | 0.0330 |
| 5.0750 | 0.0330 |
| 5.1000 | 0.0330 |
| 5.1250 | 0.0320 |
| 5.1500 | 0.0320 |
| 5.1750 | 0.0320 |
| 5.2000 | 0.0310 |
| 5.2250 | 0.0310 |
| 5.2500 | 0.0310 |
| 5.2750 | 0.0310 |
| 5.3000 | 0.0300 |
| 5.3250 | 0.0300 |
| 5.3500 | 0.0300 |
| 5.3750 | 0.0290 |
| 5.4000 | 0.0290 |
| 5.4250 | 0.0290 |
| 5.4500 | 0.0290 |
| 5.4750 | 0.0280 |
| 5.5000 | 0.0280 |

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 18 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

ANEXO 4. ANALISIS ESTRUCTURAL

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 19 DE 48 |
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PROJECT INFORMATION

Company Name = Solarte y Cia Ingenieros Calculistas

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S T O R Y D A T A

| STORY | SIMILAR TO | HEIGHT | ELEVATION |
|--------|------------|--------|-----------|
| N+3.50 | None | 3.500 | 3.500 |
| BASE | None | | 0.000 |

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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 |
|-------------|-----------|---------------|--------------------|-----------------|--------------------|
| FHEU | QUAKE | USER_COEFF | 0.0000 | | |
| VIENTO | WIND | None | 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: SISMOX

BASIC RESPONSE SPECTRUM DATA

| MODAL COMBO | DIRECTION COMBO | MODAL DAMPING | SPECTRUM ANGLE | TYPICAL ECCEN |
|-------------|-----------------|---------------|----------------|---------------|
| CQC | SRSS | 0.0500 | 0.0000 | 0.0500 |

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

| DIRECTION | FUNCTION | SCALE FACT |
|-----------|----------|------------|
| U1 | MICROBOG | 9.8000 |
| U2 | ---- | N/A |
| UZ | ---- | N/A |


RESP SPEC CASE: SISMOY

BASIC RESPONSE SPECTRUM DATA

| MODAL COMBO | DIRECTION COMBO | MODAL DAMPING | SPECTRUM ANGLE | TYPICAL ECCEN |
|-------------|-----------------|---------------|----------------|---------------|
| CQC | SRSS | 0.0500 | 0.0000 | 0.0500 |

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

| DIRECTION | FUNCTION | SCALE FACT |
|-----------|----------|------------|
| U1 | ---- | N/A |
| U2 | MICROBOG | 9.8000 |
| UZ | ---- | N/A |

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 20 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

RESP SPEC CASE: UMBRALX

BASIC RESPONSE SPECTRUM DATA

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

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

| DIRECTION | FUNCTION | SCALE FACT |
|-----------|-------------|------------|
| U1 | UMBMICROBOG | 9.8000 |
| U2 | ---- | N/A |
| UZ | ---- | N/A |

RESP SPEC CASE: UMBRALY

BASIC RESPONSE SPECTRUM DATA

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

RESPONSE SPECTRUM FUNCTION ASSIGNMENT DATA

| DIRECTION | FUNCTION | SCALE FACT |
|-----------|-------------|------------|
| U1 | ---- | N/A |
| U2 | UMBMICROBOG | 9.8000 |
| UZ | ---- | N/A |

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AUTO SEISMIC USER COEFFICIENT
Case: FHEU

AUTO SEISMIC INPUT DATA

Direction: X
Typical Eccentricity = 5%
Eccentricity Overrides: No

Period Calculation: Program Calculated
Ct = 0.035 (in feet units)

Top Story: N+3.50
Bottom Story: BASE

C = 0.261
K = 1


AUTO SEISMIC CALCULATION FORMULAS

$V = C W$

AUTO SEISMIC CALCULATION RESULTS

W Used = 143.74

V Used = 0.2610W = 37.52

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 21 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

AUTO SEISMIC STORY FORCES

| STORY | FX | FY | FZ | MX | MY | MZ |
|--------|-------|------|------|-------|-------|-------|
| N+3.50 | 37.52 | 0.00 | 0.00 | 0.000 | 0.000 | 0.000 |

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M A S S S O U R C E D A T A

| | | |
|------|-----------|------------|
| MASS | LATERAL | LUMP MASS |
| FROM | MASS ONLY | AT STORIES |

| | | |
|-------|-----|-----|
| Loads | Yes | Yes |
|-------|-----|-----|

M A S S S O U R C E L O A D S

| | |
|------|------------|
| LOAD | MULTIPLIER |
|------|------------|

| | |
|------|--------|
| DEAD | 1.0000 |
| LIVE | 0.1000 |

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D I A P H R A G M M A S S D A T A

| STORY | DIAPHRAGM | MASS-X | MASS-Y | MMI | X-M | Y-M |
|--------|-----------|-----------|-----------|-----------|-------|-------|
| N+3.50 | D1 | 1.466E+01 | 1.466E+01 | 6.433E+02 | 7.870 | 5.015 |

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A S S E M B L E D P O I N T M A S S E S

| STORY | UX | UY | UZ | RX | RY | RZ |
|--------|-----------|-----------|-----------|-----------|-----------|-----------|
| N+3.50 | 1.466E+01 | 1.466E+01 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 6.433E+02 |
| BASE | 3.668E-01 | 3.668E-01 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 |
| Totals | 1.502E+01 | 1.502E+01 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 6.433E+02 |

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C E N T E R S O F C U M U L A T I V E M A S S & C E N T E R S O F R I G I D I T Y

| STORY | DIAPHRAGM | /-----CENTER OF MASS-----//--CENTER OF RIGIDITY--/ | | | | |
|--------|-----------|--|------------|------------|------------|------------|
| LEVEL | NAME | MASS | ORDINATE-X | ORDINATE-Y | ORDINATE-X | ORDINATE-Y |
| N+3.50 | D1 | 1.466E+01 | 7.870 | 5.015 | 7.870 | 6.001 |

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M O D A L P E R I O D S A N D F R E Q U E N C I E S

| MODE | PERIOD | FREQUENCY | CIRCULAR FREQ |
|--------|---------|---------------|----------------|
| NUMBER | (TIME) | (CYCLES/TIME) | (RADIANS/TIME) |
| Mode 1 | 0.38454 | 2.60053 | 16.33963 |
| Mode 2 | 0.30080 | 3.32447 | 20.88828 |
| Mode 3 | 0.28547 | 3.50297 | 22.00981 |

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 22 DE 48 |
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MODAL PARTICIPATING MASS RATIOS

| MODE NUMBER | X-TRANS %MASS <SUM> | Y-TRANS %MASS <SUM> | Z-TRANS %MASS <SUM> | RX-ROTN %MASS <SUM> | RY-ROTN %MASS <SUM> | RZ-ROTN %MASS <SUM> |
|-------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Mode 1 | 93.63 < 94> | 0.00 < 0> | 0.00 < 0> | 0.00 < 0> | 93.63 < 94> | 6.44 < 6> |
| Mode 2 | 6.37 <100> | 0.00 < 0> | 0.00 < 0> | 0.00 < 0> | 6.37 <100> | 93.56 <100> |
| Mode 3 | 0.00 <100> | 100.00 <100> | 0.00 < 0> | 100.00 <100> | 0.00 <100> | 0.00 <100> |

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MODAL LOAD PARTICIPATION RATIOS
(STATIC AND DYNAMIC RATIOS ARE IN PERCENT)

| TYPE | NAME | STATIC | DYNAMIC |
|-------|--------|----------|----------|
| Load | DEAD | 2.0829 | 0.0000 |
| Load | LIVE | 0.8791 | 0.0000 |
| Load | FHE | 100.0000 | 100.0000 |
| Load | FHEU | 100.0000 | 100.0000 |
| Load | VIENTO | 0.0000 | 0.0000 |
| Accel | UX | 100.0000 | 100.0000 |
| Accel | UY | 100.0000 | 100.0000 |
| Accel | UZ | 0.0000 | 0.0000 |
| Accel | RX | 100.0000 | 100.0000 |
| Accel | RY | 100.0000 | 100.0000 |
| Accel | RZ | 112.9274 | 100.0000 |

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TOTAL REACTIVE FORCES (RECOVERED LOADS) AT ORIGIN

| LOAD | FX | FY | FZ | MX | MY | MZ |
|---------|------------|------------|------------|------------|------------|------------|
| DEAD | 7.521E-15 | -1.597E-13 | 1.448E+02 | 7.244E+02 | -1.139E+03 | -1.966E-12 |
| LIVE | 1.432E-15 | -3.358E-14 | 4.258E+01 | 2.553E+02 | -3.351E+02 | -4.086E-13 |
| FHE | -6.871E+01 | 8.266E-14 | -3.476E-15 | -3.170E-13 | -2.405E+02 | 3.446E+02 |
| FHEU | -3.752E+01 | 4.508E-14 | 1.682E-16 | -1.647E-13 | -1.313E+02 | 1.881E+02 |
| VIENTO | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 |
| SISMOX | 6.505E+01 | 3.624E-12 | 1.869E-15 | 1.268E-11 | 2.277E+02 | 2.976E+02 |
| SISMOY | 3.056E-12 | 6.866E+01 | 1.086E-14 | 2.403E+02 | 1.069E-11 | 5.944E+02 |
| UMBRALX | 3.525E+01 | 3.127E-12 | 9.052E-16 | 1.094E-11 | 1.234E+02 | 1.555E+02 |
| UMBRALY | 2.767E-12 | 3.749E+01 | 5.779E-15 | 1.312E+02 | 9.676E-12 | 3.246E+02 |

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STORY FORCES

| STORY | LOAD | P | VX | VY | T | MX | MY |
|--------|---------|------------|------------|-----------|-----------|------------|------------|
| N+3.50 | FHE | -3.476E-15 | -6.871E+01 | 8.266E-14 | 3.446E+02 | -3.170E-13 | -2.405E+02 |
| N+3.50 | FHEU | 1.682E-16 | -3.752E+01 | 4.508E-14 | 1.881E+02 | -1.647E-13 | -1.313E+02 |
| N+3.50 | VIENTO | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 |
| N+3.50 | SISMOX | 1.869E-15 | 6.505E+01 | 3.624E-12 | 2.976E+02 | 1.268E-11 | 2.277E+02 |
| N+3.50 | SISMOY | 1.086E-14 | 3.056E-12 | 6.866E+01 | 5.944E+02 | 2.403E+02 | 1.069E-11 |
| N+3.50 | UMBRALX | 9.052E-16 | 3.525E+01 | 3.127E-12 | 1.555E+02 | 1.094E-11 | 1.234E+02 |
| N+3.50 | UMBRALY | 5.779E-15 | 2.767E-12 | 3.749E+01 | 3.246E+02 | 1.312E+02 | 9.676E-12 |

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 23 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

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STORY DRIFTS

| STORY | DIRECTION | LOAD | MAX DRIFT |
|--------|-----------|---------|-----------|
| N+3.50 | X | FHE | 1/195 |
| N+3.50 | X | FHEU | 1/357 |
| N+3.50 | X | SISMOX | 1/185 |
| N+3.50 | Y | SISMOY | 1/311 |
| N+3.50 | X | UMBRALX | 1/337 |
| N+3.50 | Y | UMBRALY | 1/570 |

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DISPLACEMENTS AT DIAPHRAGM CENTER OF MASS

| STORY | DIAPHRAGM | LOAD | UX | UY | RZ |
|--------|-----------|---------|--------|--------|---------|
| N+3.50 | D1 | FHE | 0.0171 | 0.0000 | 0.00025 |
| N+3.50 | D1 | FHEU | 0.0093 | 0.0000 | 0.00014 |
| N+3.50 | D1 | VIENTO | 0.0000 | 0.0000 | 0.00000 |
| N+3.50 | D1 | SISMOX | 0.0167 | 0.0000 | 0.00083 |
| N+3.50 | D1 | SISMOY | 0.0002 | 0.0097 | 0.00020 |
| N+3.50 | D1 | UMBRALX | 0.0091 | 0.0000 | 0.00047 |
| N+3.50 | D1 | UMBRALY | 0.0001 | 0.0053 | 0.00011 |


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STORY MAXIMUM AND AVERAGE LATERAL DISPLACEMENTS

| STORY | LOAD | DIR | MAXIMUM | AVERAGE | RATIO |
|--------|---------|-----|---------|---------|-------|
| N+3.50 | FHE | X | 0.0179 | 0.0169 | 1.061 |
| N+3.50 | FHEU | X | 0.0098 | 0.0092 | 1.061 |
| N+3.50 | VIENTO | Y | 0.0000 | 0.0000 | |
| N+3.50 | SISMOX | X | 0.0189 | 0.0166 | 1.139 |
| N+3.50 | SISMOY | Y | 0.0112 | 0.0105 | 1.075 |
| N+3.50 | UMBRALX | X | 0.0104 | 0.0090 | 1.151 |
| N+3.50 | UMBRALY | Y | 0.0061 | 0.0057 | 1.075 |

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 24 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

ANEXO 5. CHEQUEO DE DERIVAS

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 25 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

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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 |
|-------|---------------|--------|--------------|-----------------|
| D1 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | 1.0000 |
| | | SISMOY | Spectra | 0.3000 |
| D2 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | 1.0000 |
| | | SISMOY | Spectra | -0.3000 |
| D3 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | -1.0000 |
| | | SISMOY | Spectra | 0.3000 |
| D4 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | -1.0000 |
| | | SISMOY | Spectra | -0.3000 |
| D5 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | 0.3000 |
| | | SISMOY | Spectra | 1.0000 |
| D6 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | 0.3000 |
| | | SISMOY | Spectra | -1.0000 |
| D7 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | -0.3000 |
| | | SISMOY | Spectra | 1.0000 |
| D8 | ADD | DEAD | Static | 0.9000 |
| | | SISMOX | Spectra | -0.3000 |
| | | SISMOY | Spectra | -1.0000 |

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

| STORY | DIAPHRAGM | LOAD | POINT | X | Y | UX | UY | RZ |
|--------|-----------|--------|-------|-------|-------|---------|---------|----------|
| N+3.50 | D1 | D1 Max | 24 | 7.870 | 5.015 | 0.0167 | 0.0024 | 0.00089 |
| N+3.50 | D1 | D1 Min | 24 | 7.870 | 5.015 | -0.0167 | -0.0034 | -0.00089 |
| N+3.50 | D1 | D2 Max | 24 | 7.870 | 5.015 | 0.0167 | 0.0024 | 0.00089 |
| N+3.50 | D1 | D2 Min | 24 | 7.870 | 5.015 | -0.0167 | -0.0034 | -0.00089 |
| N+3.50 | D1 | D3 Max | 24 | 7.870 | 5.015 | 0.0167 | 0.0024 | 0.00089 |
| N+3.50 | D1 | D3 Min | 24 | 7.870 | 5.015 | -0.0167 | -0.0034 | -0.00089 |
| N+3.50 | D1 | D4 Max | 24 | 7.870 | 5.015 | 0.0167 | 0.0024 | 0.00089 |
| N+3.50 | D1 | D4 Min | 24 | 7.870 | 5.015 | -0.0167 | -0.0034 | -0.00089 |
| N+3.50 | D1 | D5 Max | 24 | 7.870 | 5.015 | 0.0052 | 0.0092 | 0.00045 |
| N+3.50 | D1 | D5 Min | 24 | 7.870 | 5.015 | -0.0052 | -0.0101 | -0.00045 |
| N+3.50 | D1 | D6 Max | 24 | 7.870 | 5.015 | 0.0052 | 0.0092 | 0.00045 |
| N+3.50 | D1 | D6 Min | 24 | 7.870 | 5.015 | -0.0052 | -0.0101 | -0.00045 |
| N+3.50 | D1 | D7 Max | 24 | 7.870 | 5.015 | 0.0052 | 0.0092 | 0.00045 |
| N+3.50 | D1 | D7 Min | 24 | 7.870 | 5.015 | -0.0052 | -0.0101 | -0.00045 |
| N+3.50 | D1 | D8 Max | 24 | 7.870 | 5.015 | 0.0052 | 0.0092 | 0.00045 |
| N+3.50 | D1 | D8 Min | 24 | 7.870 | 5.015 | -0.0052 | -0.0101 | -0.00045 |

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S T O R Y D R I F T S

| STORY | DIRECTION | LOAD | POINT | X | Y | Z | MAX DRIFT |
|--------|-----------|------|-------|--------|-------|-------|-----------|
| N+3.50 | X | D1 | 9 | 15.740 | 1.800 | 3.500 | 0.005484 |
| N+3.50 | Y | D1 | 13 | 0.000 | 7.650 | 3.500 | 0.002959 |
| N+3.50 | X | D2 | 9 | 15.740 | 1.800 | 3.500 | 0.005484 |
| N+3.50 | Y | D2 | 13 | 0.000 | 7.650 | 3.500 | 0.002959 |
| N+3.50 | X | D3 | 9 | 15.740 | 1.800 | 3.500 | 0.005484 |


| | | | | |
|---|---------------|--|----------|----------------------------|
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| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 26 DE 48 |
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| | | | | | | | |
|--------|---|----|----|--------|-------|-------|----------|
| N+3.50 | Y | D3 | 13 | 0.000 | 7.650 | 3.500 | 0.002959 |
| N+3.50 | X | D4 | 9 | 15.740 | 1.800 | 3.500 | 0.005484 |
| N+3.50 | Y | D4 | 13 | 0.000 | 7.650 | 3.500 | 0.002959 |
| N+3.50 | Y | D5 | 15 | 15.740 | 7.650 | 3.500 | 0.003902 |
| N+3.50 | Y | D6 | 15 | 15.740 | 7.650 | 3.500 | 0.003902 |
| N+3.50 | Y | D7 | 15 | 15.740 | 7.650 | 3.500 | 0.003902 |
| N+3.50 | Y | D8 | 15 | 15.740 | 7.650 | 3.500 | 0.003902 |

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D I A P H R A G M D R I F T S

| STORY | DIAPHRAGM | DIRECTION | LOAD | POINT | X | Y | Z | MAX DRIFT |
|--------|-----------|-----------|------|-------|--------|-------|-------|-----------|
| N+3.50 | D1 | X | D1 | 9 | 15.740 | 1.800 | 3.500 | 0.005484 |
| N+3.50 | D1 | Y | D1 | 13 | 0.000 | 7.650 | 3.500 | 0.002959 |
| N+3.50 | D1 | X | D2 | 9 | 15.740 | 1.800 | 3.500 | 0.005484 |
| N+3.50 | D1 | Y | D2 | 13 | 0.000 | 7.650 | 3.500 | 0.002959 |
| N+3.50 | D1 | X | D3 | 9 | 15.740 | 1.800 | 3.500 | 0.005484 |
| N+3.50 | D1 | Y | D3 | 13 | 0.000 | 7.650 | 3.500 | 0.002959 |
| N+3.50 | D1 | X | D4 | 9 | 15.740 | 1.800 | 3.500 | 0.005484 |
| N+3.50 | D1 | Y | D4 | 13 | 0.000 | 7.650 | 3.500 | 0.002959 |
| N+3.50 | D1 | X | D5 | 9 | 15.740 | 1.800 | 3.500 | 0.001864 |
| N+3.50 | D1 | Y | D5 | 15 | 15.740 | 7.650 | 3.500 | 0.003902 |
| N+3.50 | D1 | X | D6 | 9 | 15.740 | 1.800 | 3.500 | 0.001864 |
| N+3.50 | D1 | Y | D6 | 15 | 15.740 | 7.650 | 3.500 | 0.003902 |
| N+3.50 | D1 | X | D7 | 9 | 15.740 | 1.800 | 3.500 | 0.001864 |
| N+3.50 | D1 | Y | D7 | 15 | 15.740 | 7.650 | 3.500 | 0.003902 |
| N+3.50 | D1 | X | D8 | 9 | 15.740 | 1.800 | 3.500 | 0.001864 |
| N+3.50 | D1 | Y | D8 | 15 | 15.740 | 7.650 | 3.500 | 0.003902 |

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 27 DE 48 |
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DERIVAS PARA EL UMBRAL DE DAÑO

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LOADING COMBINATIONS

| COMBO | COMBO TYPE | CASE | CASE TYPE | SCALE FACTOR |
|-------|---------------|---------|--------------|-----------------|
| DU1 | ADD | DEAD | Static | 0.9000 |
| | | UMBRALX | Spectra | 1.0000 |
| | | UMBRALY | Spectra | 0.3000 |
| DU2 | ADD | DEAD | Static | 0.9000 |
| | | UMBRALX | Spectra | 1.0000 |
| | | UMBRALY | Spectra | -0.3000 |
| DU3 | ADD | DEAD | Static | 0.9000 |
| | | UMBRALX | Spectra | -1.0000 |
| | | UMBRALY | Spectra | 0.3000 |
| DU4 | ADD | DEAD | Static | 0.9000 |
| | | UMBRALX | Spectra | -1.0000 |
| | | UMBRALY | Spectra | -0.3000 |
| DU5 | ADD | DEAD | Static | 0.9000 |
| | | UMBRALX | Spectra | 0.3000 |
| | | UMBRALY | Spectra | 1.0000 |
| DU6 | ADD | DEAD | Static | 0.9000 |
| | | UMBRALX | Spectra | 0.3000 |
| | | UMBRALY | Spectra | -1.0000 |
| DU7 | ADD | DEAD | Static | 0.9000 |
| | | UMBRALX | Spectra | -0.3000 |
| | | UMBRALY | Spectra | 1.0000 |
| DU8 | ADD | DEAD | Static | 0.9000 |
| | | UMBRALX | Spectra | -0.3000 |
| | | UMBRALY | Spectra | -1.0000 |

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DISPLACEMENTS AT DIAPHRAGM CENTER OF MASS

| STORY | DIAPHRAGM | LOAD | POINT | X | Y | UX | UY | RZ |
|--------|-----------|---------|-------|-------|-------|---------|---------|----------|
| N+3.50 | D1 | DU1 Max | 24 | 7.870 | 5.015 | 0.0091 | 0.0011 | 0.00051 |
| N+3.50 | D1 | DU1 Min | 24 | 7.870 | 5.015 | -0.0091 | -0.0020 | -0.00051 |
| N+3.50 | D1 | DU2 Max | 24 | 7.870 | 5.015 | 0.0091 | 0.0011 | 0.00051 |
| N+3.50 | D1 | DU2 Min | 24 | 7.870 | 5.015 | -0.0091 | -0.0020 | -0.00051 |
| N+3.50 | D1 | DU3 Max | 24 | 7.870 | 5.015 | 0.0091 | 0.0011 | 0.00051 |
| N+3.50 | D1 | DU3 Min | 24 | 7.870 | 5.015 | -0.0091 | -0.0020 | -0.00051 |
| N+3.50 | D1 | DU4 Max | 24 | 7.870 | 5.015 | 0.0091 | 0.0011 | 0.00051 |
| N+3.50 | D1 | DU4 Min | 24 | 7.870 | 5.015 | -0.0091 | -0.0020 | -0.00051 |
| N+3.50 | D1 | DU5 Max | 24 | 7.870 | 5.015 | 0.0028 | 0.0048 | 0.00025 |
| N+3.50 | D1 | DU5 Min | 24 | 7.870 | 5.015 | -0.0028 | -0.0057 | -0.00025 |
| N+3.50 | D1 | DU6 Max | 24 | 7.870 | 5.015 | 0.0028 | 0.0048 | 0.00025 |
| N+3.50 | D1 | DU6 Min | 24 | 7.870 | 5.015 | -0.0028 | -0.0057 | -0.00025 |
| N+3.50 | D1 | DU7 Max | 24 | 7.870 | 5.015 | 0.0028 | 0.0048 | 0.00025 |
| N+3.50 | D1 | DU7 Min | 24 | 7.870 | 5.015 | -0.0028 | -0.0057 | -0.00025 |
| N+3.50 | D1 | DU8 Max | 24 | 7.870 | 5.015 | 0.0028 | 0.0048 | 0.00025 |
| N+3.50 | D1 | DU8 Min | 24 | 7.870 | 5.015 | -0.0028 | -0.0057 | -0.00025 |

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 28 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

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S T O R Y D R I F T S

| STORY | DIRECTION | LOAD | POINT | X | Y | Z | MAX DRIFT |
|--------|-----------|------|-------|--------|-------|-------|-----------|
| N+3.50 | X | DU1 | 9 | 15.740 | 1.800 | 3.500 | 0.003004 |
| N+3.50 | Y | DU1 | 15 | 15.740 | 7.650 | 3.500 | 0.001723 |
| N+3.50 | X | DU2 | 9 | 15.740 | 1.800 | 3.500 | 0.003004 |
| N+3.50 | Y | DU2 | 15 | 15.740 | 7.650 | 3.500 | 0.001723 |
| N+3.50 | X | DU3 | 9 | 15.740 | 1.800 | 3.500 | 0.003004 |
| N+3.50 | Y | DU3 | 15 | 15.740 | 7.650 | 3.500 | 0.001723 |
| N+3.50 | X | DU4 | 9 | 15.740 | 1.800 | 3.500 | 0.003004 |
| N+3.50 | Y | DU4 | 15 | 15.740 | 7.650 | 3.500 | 0.001723 |
| N+3.50 | Y | DU5 | 15 | 15.740 | 7.650 | 3.500 | 0.002204 |
| N+3.50 | Y | DU6 | 15 | 15.740 | 7.650 | 3.500 | 0.002204 |
| N+3.50 | Y | DU7 | 15 | 15.740 | 7.650 | 3.500 | 0.002204 |
| N+3.50 | Y | DU8 | 15 | 15.740 | 7.650 | 3.500 | 0.002204 |


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D I A P H R A G M D R I F T S


| STORY | DIAPHRAGM | DIRECTION | LOAD | POINT | X | Y | Z | MAX DRIFT |
|--------|-----------|-----------|------|-------|--------|-------|-------|-----------|
| N+3.50 | D1 | X | DU1 | 9 | 15.740 | 1.800 | 3.500 | 0.003004 |
| N+3.50 | D1 | Y | DU1 | 15 | 15.740 | 7.650 | 3.500 | 0.001723 |
| N+3.50 | D1 | X | DU2 | 9 | 15.740 | 1.800 | 3.500 | 0.003004 |
| N+3.50 | D1 | Y | DU2 | 15 | 15.740 | 7.650 | 3.500 | 0.001723 |
| N+3.50 | D1 | X | DU3 | 9 | 15.740 | 1.800 | 3.500 | 0.003004 |
| N+3.50 | D1 | Y | DU3 | 15 | 15.740 | 7.650 | 3.500 | 0.001723 |
| N+3.50 | D1 | X | DU4 | 9 | 15.740 | 1.800 | 3.500 | 0.003004 |
| N+3.50 | D1 | Y | DU4 | 15 | 15.740 | 7.650 | 3.500 | 0.001723 |
| N+3.50 | D1 | X | DU5 | 9 | 15.740 | 1.800 | 3.500 | 0.001021 |
| N+3.50 | D1 | Y | DU5 | 15 | 15.740 | 7.650 | 3.500 | 0.002204 |
| N+3.50 | D1 | X | DU6 | 9 | 15.740 | 1.800 | 3.500 | 0.001021 |
| N+3.50 | D1 | Y | DU6 | 15 | 15.740 | 7.650 | 3.500 | 0.002204 |
| N+3.50 | D1 | X | DU7 | 9 | 15.740 | 1.800 | 3.500 | 0.001021 |
| N+3.50 | D1 | Y | DU7 | 15 | 15.740 | 7.650 | 3.500 | 0.002204 |
| N+3.50 | D1 | X | DU8 | 9 | 15.740 | 1.800 | 3.500 | 0.001021 |
| N+3.50 | D1 | Y | DU8 | 15 | 15.740 | 7.650 | 3.500 | 0.002204 |

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 29 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

ANEXO 6. DISEÑO DE ELEMENTOS ESTRUCTURALES

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 30 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

ANEXO 6.1. DISEÑO DE COLUMNAS


| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 31 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

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CONCRETE COLUMN DESIGN OUTPUT (ACI 318-08/IBC 2009)

BIAXIAL P-M INTERACTION AND SHEAR DESIGN OF COLUMN-TYPE ELEMENTS

| STORY ID | COLUMN LINE | SECTION ID | STATION ID | <-----REQUIRED REINFORCING-----> | | | | | |
|-------------|----------------|---------------|---------------|----------------------------------|-------|---------|-------|---------|-------|
| | | | | LONGITUDINAL | COMBO | SHEAR22 | COMBO | SHEAR33 | COMBO |
| N+3.50 | C1 | C30X40 | 0.000 | 19.117 | C6 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C1 | C30X40 | 30.000 | 12.165 | C6 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C1 | C30X40 | 60.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C1 | C30X40 | 90.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C1 | C30X40 | 120.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C1 | C30X40 | 150.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C1 | C30X40 | 180.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C1 | C30X40 | 210.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C1 | C30X40 | 240.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C1 | C30X40 | 270.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C1 | C30X40 | 300.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C2 | C30X40 | 0.000 | 12.000 | C18 | 0.000 | C18 | 0.000 | C18 |
| N+3.50 | C2 | C30X40 | 30.000 | 12.000 | C18 | 0.000 | C18 | 0.000 | C18 |
| N+3.50 | C2 | C30X40 | 60.000 | 12.000 | C18 | 0.000 | C18 | 0.000 | C18 |
| N+3.50 | C2 | C30X40 | 90.000 | 12.000 | C18 | 0.000 | C18 | 0.000 | C18 |
| N+3.50 | C2 | C30X40 | 120.000 | 12.000 | C18 | 0.000 | C18 | 0.000 | C18 |
| N+3.50 | C2 | C30X40 | 150.000 | 12.000 | C18 | 0.000 | C18 | 0.000 | C18 |
| N+3.50 | C2 | C30X40 | 180.000 | 12.000 | C18 | 0.000 | C18 | 0.000 | C18 |
| N+3.50 | C2 | C30X40 | 210.000 | 12.000 | C18 | 0.000 | C18 | 0.000 | C18 |
| N+3.50 | C2 | C30X40 | 240.000 | 12.000 | C18 | 0.000 | C18 | 0.000 | C18 |
| N+3.50 | C2 | C30X40 | 270.000 | 12.000 | C18 | 0.000 | C18 | 0.000 | C18 |
| N+3.50 | C2 | C30X40 | 300.000 | 12.000 | C18 | 0.000 | C18 | 0.000 | C18 |
| N+3.50 | C3 | C30X40 | 0.000 | 19.117 | C4 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C3 | C30X40 | 30.000 | 12.165 | C4 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C3 | C30X40 | 60.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C3 | C30X40 | 90.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C3 | C30X40 | 120.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C3 | C30X40 | 150.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C3 | C30X40 | 180.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C3 | C30X40 | 210.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C3 | C30X40 | 240.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C3 | C30X40 | 270.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C3 | C30X40 | 300.000 | 12.000 | C18 | 0.051 | C18 | 0.052 | C14 |
| N+3.50 | C7 | C30X40 | 0.000 | 16.108 | C6 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C7 | C30X40 | 30.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C7 | C30X40 | 60.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C7 | C30X40 | 90.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C7 | C30X40 | 120.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C7 | C30X40 | 150.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C7 | C30X40 | 180.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C7 | C30X40 | 210.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C7 | C30X40 | 240.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C7 | C30X40 | 270.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C7 | C30X40 | 300.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C8 | C30X60 | 0.000 | 18.000 | C18 | 0.009 | C10 | 0.000 | C18 |
| N+3.50 | C8 | C30X60 | 30.000 | 18.000 | C18 | 0.009 | C10 | 0.000 | C18 |
| N+3.50 | C8 | C30X60 | 60.000 | 18.000 | C18 | 0.009 | C10 | 0.000 | C18 |
| N+3.50 | C8 | C30X60 | 90.000 | 18.000 | C18 | 0.009 | C10 | 0.000 | C18 |
| N+3.50 | C8 | C30X60 | 120.000 | 18.000 | C18 | 0.009 | C10 | 0.000 | C18 |
| N+3.50 | C8 | C30X60 | 150.000 | 18.000 | C18 | 0.009 | C10 | 0.000 | C18 |
| N+3.50 | C8 | C30X60 | 180.000 | 18.000 | C18 | 0.009 | C10 | 0.000 | C18 |
| N+3.50 | C8 | C30X60 | 210.000 | 18.000 | C18 | 0.009 | C10 | 0.000 | C18 |
| N+3.50 | C8 | C30X60 | 240.000 | 18.000 | C18 | 0.009 | C10 | 0.000 | C18 |
| N+3.50 | C8 | C30X60 | 270.000 | 18.000 | C18 | 0.009 | C10 | 0.000 | C18 |
| N+3.50 | C8 | C30X60 | 300.000 | 18.000 | C18 | 0.009 | C10 | 0.000 | C18 |

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 32 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

| | | | | | | | | | |
|--------|----|--------|---------|--------|-----|-------|-----|-------|-----|
| N+3.50 | C9 | C30X40 | 0.000 | 16.108 | C6 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C9 | C30X40 | 30.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C9 | C30X40 | 60.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C9 | C30X40 | 90.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C9 | C30X40 | 120.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C9 | C30X40 | 150.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C9 | C30X40 | 180.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C9 | C30X40 | 210.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C9 | C30X40 | 240.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C9 | C30X40 | 270.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |
| N+3.50 | C9 | C30X40 | 300.000 | 12.000 | C18 | 0.052 | C18 | 0.049 | C14 |

RESISTENCIA AL CORTANTE DE COLUMNAS (C.21.3.3.2.b)

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CONCRETE COLUMN DESIGN OUTPUT (ACI 318-08/IBC 2009)


BIAXIAL P-M INTERACTION AND SHEAR DESIGN OF COLUMN-TYPE ELEMENTS

| STORY ID | COLUMN LINE | SECTION ID | STATION ID | <-----REQUIRED REINFORCING-----> | | | | | |
|-------------|----------------|---------------|---------------|----------------------------------|-------|---------|-------|---------|-------|
| | | | | LONGITUDINAL | COMBO | SHEAR22 | COMBO | SHEAR33 | COMBO |
| N+3.50 | C1 | C30X40 | 0.000 | 52.494 | VNC2 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C1 | C30X40 | 30.000 | 33.138 | VNC2 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C1 | C30X40 | 60.000 | 18.180 | VNC12 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C1 | C30X40 | 90.000 | 12.000 | VNC16 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C1 | C30X40 | 120.000 | 12.000 | VNC16 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C1 | C30X40 | 150.000 | 12.000 | VNC16 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C1 | C30X40 | 180.000 | 12.000 | VNC16 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C1 | C30X40 | 210.000 | 12.000 | VNC16 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C1 | C30X40 | 240.000 | 12.000 | VNC16 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C1 | C30X40 | 270.000 | 25.204 | VNC2 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C1 | C30X40 | 300.000 | 44.336 | VNC2 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C2 | C30X40 | 0.000 | 59.506 | VNC2 | 0.035 | VNC7 | 0.071 | VNC12 |
| N+3.50 | C2 | C30X40 | 30.000 | 40.388 | VNC2 | 0.035 | VNC7 | 0.071 | VNC12 |
| N+3.50 | C2 | C30X40 | 60.000 | 21.554 | VNC2 | 0.035 | VNC7 | 0.071 | VNC12 |
| N+3.50 | C2 | C30X40 | 90.000 | 12.000 | VNC16 | 0.036 | VNC7 | 0.071 | VNC12 |
| N+3.50 | C2 | C30X40 | 120.000 | 12.000 | VNC16 | 0.036 | VNC7 | 0.071 | VNC12 |
| N+3.50 | C2 | C30X40 | 150.000 | 12.000 | VNC16 | 0.036 | VNC7 | 0.071 | VNC12 |
| N+3.50 | C2 | C30X40 | 180.000 | 12.000 | VNC16 | 0.036 | VNC7 | 0.071 | VNC12 |
| N+3.50 | C2 | C30X40 | 210.000 | 12.000 | VNC16 | 0.036 | VNC7 | 0.071 | VNC12 |
| N+3.50 | C2 | C30X40 | 240.000 | 12.000 | VNC16 | 0.036 | VNC7 | 0.071 | VNC12 |
| N+3.50 | C2 | C30X40 | 270.000 | 26.701 | VNC2 | 0.036 | VNC7 | 0.072 | VNC12 |
| N+3.50 | C2 | C30X40 | 300.000 | 45.467 | VNC2 | 0.036 | VNC7 | 0.072 | VNC12 |
| N+3.50 | C3 | C30X40 | 0.000 | 52.494 | VNC2 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C3 | C30X40 | 30.000 | 33.138 | VNC2 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C3 | C30X40 | 60.000 | 18.180 | VNC12 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C3 | C30X40 | 90.000 | 12.000 | VNC16 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C3 | C30X40 | 120.000 | 12.000 | VNC16 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C3 | C30X40 | 150.000 | 12.000 | VNC16 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C3 | C30X40 | 180.000 | 12.000 | VNC16 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C3 | C30X40 | 210.000 | 12.000 | VNC16 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C3 | C30X40 | 240.000 | 12.000 | VNC16 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C3 | C30X40 | 270.000 | 25.204 | VNC2 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C3 | C30X40 | 300.000 | 44.336 | VNC2 | 0.129 | VNC15 | 0.146 | VNC10 |
| N+3.50 | C7 | C30X40 | 0.000 | 61.962 | VNC2 | 0.137 | VNC15 | 0.132 | VNC4 |
| N+3.50 | C7 | C30X40 | 30.000 | 42.421 | VNC2 | 0.137 | VNC15 | 0.132 | VNC4 |
| N+3.50 | C7 | C30X40 | 60.000 | 25.326 | VNC2 | 0.137 | VNC15 | 0.132 | VNC4 |
| N+3.50 | C7 | C30X40 | 90.000 | 15.906 | VNC12 | 0.137 | VNC15 | 0.132 | VNC4 |
| N+3.50 | C7 | C30X40 | 120.000 | 12.000 | VNC16 | 0.137 | VNC15 | 0.132 | VNC4 |
| N+3.50 | C7 | C30X40 | 150.000 | 12.000 | VNC16 | 0.137 | VNC15 | 0.132 | VNC4 |
| N+3.50 | C7 | C30X40 | 180.000 | 12.000 | VNC16 | 0.137 | VNC15 | 0.132 | VNC4 |




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|---------------|--|----------|----------------------------|
| Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 33 DE 48 |
| Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

| | | | | | | | | | |
|--------|----|--------|---------|--------|-------|-------|-------|-------|-------|
| N+3.50 | C7 | C30X40 | 210.000 | 12.000 | VNC16 | 0.137 | VNC15 | 0.132 | VNC4 |
| N+3.50 | C7 | C30X40 | 240.000 | 12.140 | VNC2 | 0.142 | VNC8 | 0.132 | VNC4 |
| N+3.50 | C7 | C30X40 | 270.000 | 27.597 | VNC2 | 0.142 | VNC8 | 0.132 | VNC4 |
| N+3.50 | C7 | C30X40 | 300.000 | 45.492 | VNC2 | 0.142 | VNC8 | 0.132 | VNC4 |
| N+3.50 | C8 | C30X60 | 0.000 | 96.130 | VNC7 | 0.183 | VNC16 | 0.195 | VNC12 |
| N+3.50 | C8 | C30X60 | 30.000 | 70.188 | VNC7 | 0.183 | VNC16 | 0.195 | VNC12 |
| N+3.50 | C8 | C30X60 | 60.000 | 45.592 | VNC7 | 0.183 | VNC16 | 0.195 | VNC12 |
| N+3.50 | C8 | C30X60 | 90.000 | 30.607 | VNC16 | 0.183 | VNC16 | 0.195 | VNC12 |
| N+3.50 | C8 | C30X60 | 120.000 | 21.257 | VNC16 | 0.183 | VNC16 | 0.195 | VNC12 |
| N+3.50 | C8 | C30X60 | 150.000 | 18.000 | VNC16 | 0.183 | VNC16 | 0.195 | VNC12 |
| N+3.50 | C8 | C30X60 | 180.000 | 18.000 | VNC16 | 0.187 | VNC15 | 0.195 | VNC12 |
| N+3.50 | C8 | C30X60 | 210.000 | 18.000 | VNC16 | 0.187 | VNC15 | 0.195 | VNC12 |
| N+3.50 | C8 | C30X60 | 240.000 | 18.000 | VNC16 | 0.187 | VNC15 | 0.195 | VNC12 |
| N+3.50 | C8 | C30X60 | 270.000 | 25.655 | VNC12 | 0.187 | VNC15 | 0.195 | VNC12 |
| N+3.50 | C8 | C30X60 | 300.000 | 46.267 | VNC2 | 0.187 | VNC15 | 0.195 | VNC12 |
| N+3.50 | C9 | C30X40 | 0.000 | 61.962 | VNC2 | 0.137 | VNC15 | 0.132 | VNC4 |
| N+3.50 | C9 | C30X40 | 30.000 | 42.421 | VNC2 | 0.137 | VNC15 | 0.132 | VNC4 |
| N+3.50 | C9 | C30X40 | 60.000 | 25.326 | VNC2 | 0.137 | VNC15 | 0.132 | VNC4 |
| N+3.50 | C9 | C30X40 | 90.000 | 15.906 | VNC12 | 0.137 | VNC15 | 0.132 | VNC4 |
| N+3.50 | C9 | C30X40 | 120.000 | 12.000 | VNC16 | 0.137 | VNC15 | 0.132 | VNC4 |
| N+3.50 | C9 | C30X40 | 150.000 | 12.000 | VNC16 | 0.137 | VNC15 | 0.132 | VNC4 |
| N+3.50 | C9 | C30X40 | 180.000 | 12.000 | VNC16 | 0.137 | VNC15 | 0.132 | VNC4 |
| N+3.50 | C9 | C30X40 | 210.000 | 12.000 | VNC16 | 0.137 | VNC15 | 0.132 | VNC4 |
| N+3.50 | C9 | C30X40 | 240.000 | 12.140 | VNC2 | 0.142 | VNC8 | 0.132 | VNC4 |
| N+3.50 | C9 | C30X40 | 270.000 | 27.597 | VNC2 | 0.142 | VNC8 | 0.132 | VNC4 |
| N+3.50 | C9 | C30X40 | 300.000 | 45.492 | VNC2 | 0.142 | VNC8 | 0.132 | VNC4 |

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|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 34 DE 48 |
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ANEXO 6.2. DISEÑO DE VIGAS

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 35 DE 48 |
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CONCRETE BEAM DESIGN OUTPUT (ACI 318-08/IBC 2009)

FLEXURAL AND TORSION DESIGN OF BEAM-TYPE ELEMENTS

| STORY ID | BEAM BAY | SECTION ID | STATION ID | -----REQUIRED REINFORCING-----> | | | | | |
|-------------|-------------|---------------|---------------|---------------------------------|-------|--------|-------|---------|-------|
| | | | | TOP | COMBO | BOTTOM | COMBO | TORSION | COMBO |
| N+3.50 | B1 | V15X50 | 0.000 | 0.807 | ENVC | 0.517 | ENVC | 0.000 | ENVC |
| N+3.50 | B1 | V15X50 | 78.700 | 0.397 | ENVC | 0.775 | ENVC | 0.000 | ENVC |
| N+3.50 | B1 | V15X50 | 157.400 | 0.364 | ENVC | 0.951 | ENVC | 0.000 | ENVC |
| N+3.50 | B1 | V15X50 | 236.100 | 0.364 | ENVC | 1.021 | ENVC | 0.000 | ENVC |
| N+3.50 | B1 | V15X50 | 314.800 | 0.364 | ENVC | 0.985 | ENVC | 0.000 | ENVC |
| N+3.50 | B1 | V15X50 | 393.500 | 0.364 | ENVC | 0.844 | ENVC | 0.000 | ENVC |
| N+3.50 | B1 | V15X50 | 472.200 | 0.364 | ENVC | 0.609 | ENVC | 0.000 | ENVC |
| N+3.50 | B1 | V15X50 | 550.900 | 0.364 | ENVC | 0.364 | ENVC | 0.000 | ENVC |
| N+3.50 | B1 | V15X50 | 629.600 | 0.364 | ENVC | 0.364 | ENVC | 0.000 | ENVC |
| N+3.50 | B1 | V15X50 | 708.300 | 0.790 | ENVC | 0.364 | ENVC | 0.000 | ENVC |
| N+3.50 | B1 | V15X50 | 787.000 | 1.472 | ENVC | 0.730 | ENVC | 0.000 | ENVC |
| N+3.50 | B2 | V15X50 | 0.000 | 1.472 | ENVC | 0.730 | ENVC | 0.000 | ENVC |
| N+3.50 | B2 | V15X50 | 78.700 | 0.790 | ENVC | 0.364 | ENVC | 0.000 | ENVC |
| N+3.50 | B2 | V15X50 | 157.400 | 0.364 | ENVC | 0.364 | ENVC | 0.000 | ENVC |
| N+3.50 | B2 | V15X50 | 236.100 | 0.364 | ENVC | 0.364 | ENVC | 0.000 | ENVC |
| N+3.50 | B2 | V15X50 | 314.800 | 0.364 | ENVC | 0.609 | ENVC | 0.000 | ENVC |
| N+3.50 | B2 | V15X50 | 393.500 | 0.364 | ENVC | 0.844 | ENVC | 0.000 | ENVC |
| N+3.50 | B2 | V15X50 | 472.200 | 0.364 | ENVC | 0.985 | ENVC | 0.000 | ENVC |
| N+3.50 | B2 | V15X50 | 550.900 | 0.364 | ENVC | 1.021 | ENVC | 0.000 | ENVC |
| N+3.50 | B2 | V15X50 | 629.600 | 0.364 | ENVC | 0.951 | ENVC | 0.000 | ENVC |
| N+3.50 | B2 | V15X50 | 708.300 | 0.397 | ENVC | 0.775 | ENVC | 0.000 | ENVC |
| N+3.50 | B2 | V15X50 | 787.000 | 0.807 | ENVC | 0.517 | ENVC | 0.000 | ENVC |
| N+3.50 | B5 | V30X50 | 0.000 | 0.034 | ENVC | 0.017 | ENVC | 6.361 | C18 |
| N+3.50 | B5 | V30X50 | 16.000 | 1.481 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B5 | V30X50 | 32.000 | 1.481 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B5 | V30X50 | 48.000 | 1.481 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B5 | V30X50 | 64.000 | 1.481 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B5 | V30X50 | 80.000 | 1.715 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B5 | V30X50 | 96.000 | 2.364 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B5 | V30X50 | 112.000 | 3.120 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B5 | V30X50 | 128.000 | 3.986 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B5 | V30X50 | 144.000 | 4.520 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B5 | V30X50 | 160.000 | 4.545 | ENVC | 2.983 | ENVC | 6.361 | C18 |
| N+3.50 | B6 | V35X50 | 0.000 | 0.000 | ENVC | 0.045 | ENVC | 7.274 | ENVC |
| N+3.50 | B6 | V35X50 | 16.000 | 3.071 | ENVC | 3.071 | ENVC | 7.274 | ENVC |
| N+3.50 | B6 | V35X50 | 32.000 | 3.071 | ENVC | 3.071 | ENVC | 7.274 | ENVC |
| N+3.50 | B6 | V35X50 | 48.000 | 3.071 | ENVC | 3.071 | ENVC | 7.274 | ENVC |
| N+3.50 | B6 | V35X50 | 64.000 | 3.071 | ENVC | 3.071 | ENVC | 7.274 | ENVC |
| N+3.50 | B6 | V35X50 | 80.000 | 3.695 | ENVC | 3.071 | ENVC | 7.274 | ENVC |
| N+3.50 | B6 | V35X50 | 96.000 | 5.058 | ENVC | 3.071 | ENVC | 7.274 | ENVC |
| N+3.50 | B6 | V35X50 | 112.000 | 5.273 | ENVC | 3.071 | ENVC | 7.274 | ENVC |
| N+3.50 | B6 | V35X50 | 128.000 | 6.340 | ENVC | 3.071 | ENVC | 7.274 | ENVC |
| N+3.50 | B6 | V35X50 | 144.000 | 7.880 | ENVC | 3.071 | ENVC | 7.274 | ENVC |
| N+3.50 | B6 | V35X50 | 160.000 | 9.612 | ENVC | 5.273 | ENVC | 7.274 | ENVC |
| N+3.50 | B7 | V30X50 | 0.000 | 0.034 | ENVC | 0.017 | ENVC | 6.361 | C18 |
| N+3.50 | B7 | V30X50 | 16.000 | 1.481 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B7 | V30X50 | 32.000 | 1.481 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B7 | V30X50 | 48.000 | 1.481 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B7 | V30X50 | 64.000 | 1.481 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B7 | V30X50 | 80.000 | 1.715 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B7 | V30X50 | 96.000 | 2.364 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B7 | V30X50 | 112.000 | 3.120 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B7 | V30X50 | 128.000 | 3.986 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B7 | V30X50 | 144.000 | 4.520 | ENVC | 1.481 | ENVC | 6.361 | C18 |
| N+3.50 | B7 | V30X50 | 160.000 | 4.545 | ENVC | 2.983 | ENVC | 6.361 | C18 |




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| Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 36 DE 48 |
| Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

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|--------|-----|--------|---------|--------|------|--------|------|-------|------|
| N+3.50 | B11 | V30X50 | 15.000 | 3.283 | ENVC | 2.763 | ENVC | 0.000 | ENVC |
| N+3.50 | B11 | V30X50 | 90.700 | 2.216 | ENVC | 2.945 | ENVC | 0.000 | ENVC |
| N+3.50 | B11 | V30X50 | 166.400 | 1.316 | ENVC | 2.935 | ENVC | 0.000 | ENVC |
| N+3.50 | B11 | V30X50 | 242.100 | 1.049 | ENVC | 2.726 | ENVC | 0.000 | ENVC |
| N+3.50 | B11 | V30X50 | 317.800 | 1.049 | ENVC | 2.318 | ENVC | 0.000 | ENVC |
| N+3.50 | B11 | V30X50 | 393.500 | 1.049 | ENVC | 1.714 | ENVC | 0.000 | ENVC |
| N+3.50 | B11 | V30X50 | 469.200 | 1.049 | ENVC | 1.119 | ENVC | 0.000 | ENVC |
| N+3.50 | B11 | V30X50 | 544.900 | 1.049 | ENVC | 1.062 | ENVC | 0.000 | ENVC |
| N+3.50 | B11 | V30X50 | 620.600 | 1.250 | ENVC | 1.049 | ENVC | 0.000 | ENVC |
| N+3.50 | B11 | V30X50 | 696.300 | 2.646 | ENVC | 1.049 | ENVC | 0.000 | ENVC |
| N+3.50 | B11 | V30X50 | 772.000 | 4.265 | ENVC | 2.110 | ENVC | 0.000 | ENVC |
| | | | | | | | | | |
| N+3.50 | B12 | V30X50 | 15.000 | 4.265 | ENVC | 2.110 | ENVC | 0.000 | ENVC |
| N+3.50 | B12 | V30X50 | 90.700 | 2.646 | ENVC | 1.049 | ENVC | 0.000 | ENVC |
| N+3.50 | B12 | V30X50 | 166.400 | 1.250 | ENVC | 1.049 | ENVC | 0.000 | ENVC |
| N+3.50 | B12 | V30X50 | 242.100 | 1.049 | ENVC | 1.062 | ENVC | 0.000 | ENVC |
| N+3.50 | B12 | V30X50 | 317.800 | 1.049 | ENVC | 1.119 | ENVC | 0.000 | ENVC |
| N+3.50 | B12 | V30X50 | 393.500 | 1.049 | ENVC | 1.714 | ENVC | 0.000 | ENVC |
| N+3.50 | B12 | V30X50 | 469.200 | 1.049 | ENVC | 2.318 | ENVC | 0.000 | ENVC |
| N+3.50 | B12 | V30X50 | 544.900 | 1.049 | ENVC | 2.726 | ENVC | 0.000 | ENVC |
| N+3.50 | B12 | V30X50 | 620.600 | 1.316 | ENVC | 2.935 | ENVC | 0.000 | ENVC |
| N+3.50 | B12 | V30X50 | 696.300 | 2.216 | ENVC | 2.945 | ENVC | 0.000 | ENVC |
| N+3.50 | B12 | V30X50 | 772.000 | 3.283 | ENVC | 2.763 | ENVC | 0.000 | ENVC |
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| N+3.50 | B16 | V30X50 | 20.000 | 9.127 | ENVC | 4.520 | ENVC | 6.361 | C10 |
| N+3.50 | B16 | V30X50 | 74.500 | 4.520 | ENVC | 2.902 | ENVC | 6.361 | C10 |
| N+3.50 | B16 | V30X50 | 129.000 | 2.902 | ENVC | 3.603 | ENVC | 6.361 | C10 |
| N+3.50 | B16 | V30X50 | 183.500 | 2.902 | ENVC | 4.520 | ENVC | 6.361 | C10 |
| N+3.50 | B16 | V30X50 | 238.000 | 2.902 | ENVC | 5.921 | C2 | 6.361 | C10 |
| N+3.50 | B16 | V30X50 | 292.500 | 2.902 | ENVC | 6.583 | C2 | 6.361 | C10 |
| N+3.50 | B16 | V30X50 | 347.000 | 2.902 | ENVC | 6.356 | C2 | 6.361 | C10 |
| N+3.50 | B16 | V30X50 | 401.500 | 2.902 | ENVC | 5.251 | C2 | 6.361 | C10 |
| N+3.50 | B16 | V30X50 | 456.000 | 2.902 | ENVC | 4.520 | ENVC | 6.361 | C10 |
| N+3.50 | B16 | V30X50 | 510.500 | 2.902 | ENVC | 2.902 | ENVC | 6.361 | C10 |
| N+3.50 | B16 | V30X50 | 565.000 | 6.170 | ENVC | 4.027 | ENVC | 6.361 | C10 |
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| N+3.50 | B17 | V35X50 | 20.000 | 13.866 | ENVC | 6.642 | ENVC | 0.000 | ENVC |
| N+3.50 | B17 | V35X50 | 73.500 | 5.697 | ENVC | 4.342 | ENVC | 0.000 | ENVC |
| N+3.50 | B17 | V35X50 | 127.000 | 4.342 | ENVC | 5.156 | C2 | 0.000 | ENVC |
| N+3.50 | B17 | V35X50 | 180.500 | 4.342 | ENVC | 8.139 | C2 | 0.000 | ENVC |
| N+3.50 | B17 | V35X50 | 234.000 | 4.342 | ENVC | 10.911 | C2 | 0.000 | ENVC |
| N+3.50 | B17 | V35X50 | 287.500 | 4.342 | ENVC | 12.021 | C2 | 0.000 | ENVC |
| N+3.50 | B17 | V35X50 | 341.000 | 4.342 | ENVC | 11.398 | C2 | 0.000 | ENVC |
| N+3.50 | B17 | V35X50 | 394.500 | 4.342 | ENVC | 9.082 | C2 | 0.000 | ENVC |
| N+3.50 | B17 | V35X50 | 448.000 | 4.342 | ENVC | 5.273 | ENVC | 0.000 | ENVC |
| N+3.50 | B17 | V35X50 | 501.500 | 5.273 | ENVC | 4.342 | ENVC | 0.000 | ENVC |
| N+3.50 | B17 | V35X50 | 555.000 | 11.468 | ENVC | 5.537 | ENVC | 0.000 | ENVC |
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| N+3.50 | B18 | V30X50 | 20.000 | 9.127 | ENVC | 4.520 | ENVC | 6.361 | C10 |
| N+3.50 | B18 | V30X50 | 74.500 | 4.520 | ENVC | 2.902 | ENVC | 6.361 | C10 |
| N+3.50 | B18 | V30X50 | 129.000 | 2.902 | ENVC | 3.603 | ENVC | 6.361 | C10 |
| N+3.50 | B18 | V30X50 | 183.500 | 2.902 | ENVC | 4.520 | ENVC | 6.361 | C10 |
| N+3.50 | B18 | V30X50 | 238.000 | 2.902 | ENVC | 5.921 | C2 | 6.361 | C10 |
| N+3.50 | B18 | V30X50 | 292.500 | 2.902 | ENVC | 6.583 | C2 | 6.361 | C10 |
| N+3.50 | B18 | V30X50 | 347.000 | 2.902 | ENVC | 6.356 | C2 | 6.361 | C10 |
| N+3.50 | B18 | V30X50 | 401.500 | 2.902 | ENVC | 5.251 | C2 | 6.361 | C10 |
| N+3.50 | B18 | V30X50 | 456.000 | 2.902 | ENVC | 4.520 | ENVC | 6.361 | C10 |
| N+3.50 | B18 | V30X50 | 510.500 | 2.902 | ENVC | 2.902 | ENVC | 6.361 | C10 |
| N+3.50 | B18 | V30X50 | 565.000 | 6.170 | ENVC | 4.027 | ENVC | 6.361 | C10 |
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| N+3.50 | B22 | V30X50 | 15.000 | 4.520 | ENVC | 2.730 | ENVC | 0.000 | ENVC |
| N+3.50 | B22 | V30X50 | 90.700 | 2.865 | ENVC | 3.038 | ENVC | 0.000 | ENVC |
| N+3.50 | B22 | V30X50 | 166.400 | 2.865 | ENVC | 4.520 | ENVC | 0.000 | ENVC |
| N+3.50 | B22 | V30X50 | 242.100 | 2.865 | ENVC | 5.055 | C2 | 0.000 | ENVC |
| N+3.50 | B22 | V30X50 | 317.800 | 2.865 | ENVC | 5.803 | C2 | 0.000 | ENVC |
| N+3.50 | B22 | V30X50 | 393.500 | 2.865 | ENVC | 5.812 | C2 | 0.000 | ENVC |
| N+3.50 | B22 | V30X50 | 469.200 | 2.865 | ENVC | 5.082 | C2 | 0.000 | ENVC |
| N+3.50 | B22 | V30X50 | 544.900 | 2.865 | ENVC | 4.520 | C2 | 0.000 | ENVC |
| N+3.50 | B22 | V30X50 | 620.600 | 2.865 | ENVC | 2.865 | ENVC | 0.000 | ENVC |



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|---------------|--|----------|----------------------------|
| Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 37 DE 48 |
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|--------|-----|--------|---------|-----------|------|-------|------|-------|------|
| N+3.50 | B22 | V30X50 | 696.300 | 4.849 | ENVC | 2.865 | ENVC | 0.000 | ENVC |
| N+3.50 | B22 | V30X50 | 772.000 | 9.004 | ENVC | 4.520 | ENVC | 0.000 | ENVC |
| N+3.50 | B23 | V30X50 | 15.000 | 9.004 | ENVC | 4.520 | ENVC | 0.000 | ENVC |
| N+3.50 | B23 | V30X50 | 90.700 | 4.849 | ENVC | 2.865 | ENVC | 0.000 | ENVC |
| N+3.50 | B23 | V30X50 | 166.400 | 2.865 | ENVC | 2.865 | ENVC | 0.000 | ENVC |
| N+3.50 | B23 | V30X50 | 242.100 | 2.865 | ENVC | 4.520 | C2 | 0.000 | ENVC |
| N+3.50 | B23 | V30X50 | 317.800 | 2.865 | ENVC | 5.082 | C2 | 0.000 | ENVC |
| N+3.50 | B23 | V30X50 | 393.500 | 2.865 | ENVC | 5.812 | C2 | 0.000 | ENVC |
| N+3.50 | B23 | V30X50 | 469.200 | 2.865 | ENVC | 5.803 | C2 | 0.000 | ENVC |
| N+3.50 | B23 | V30X50 | 544.900 | 2.865 | ENVC | 5.055 | C2 | 0.000 | ENVC |
| N+3.50 | B23 | V30X50 | 620.600 | 2.865 | ENVC | 4.520 | ENVC | 0.000 | ENVC |
| N+3.50 | B23 | V30X50 | 696.300 | 2.865 | ENVC | 3.038 | ENVC | 0.000 | ENVC |
| N+3.50 | B23 | V30X50 | 772.000 | 4.520 | ENVC | 2.730 | ENVC | 0.000 | ENVC |
| N+3.50 | B27 | V30X50 | 20.000 | 4.439 | ENVC | 2.195 | ENVC | 0.000 | ENVC |
| N+3.50 | B27 | V30X50 | 41.500 | 3.913 | ENVC | 1.092 | ENVC | 0.000 | ENVC |
| N+3.50 | B27 | V30X50 | 63.000 | 3.406 | ENVC | 1.092 | ENVC | 0.000 | ENVC |
| N+3.50 | B27 | V30X50 | 84.500 | 2.917 | ENVC | 1.092 | ENVC | 0.000 | ENVC |
| N+3.50 | B27 | V30X50 | 106.000 | 2.447 | ENVC | 1.092 | ENVC | 0.000 | ENVC |
| N+3.50 | B27 | V30X50 | 127.500 | 1.995 | ENVC | 1.092 | ENVC | 0.000 | ENVC |
| N+3.50 | B27 | V30X50 | 149.000 | 1.561 | ENVC | 1.092 | ENVC | 0.000 | ENVC |
| N+3.50 | B27 | V30X50 | 170.500 | 1.145 | ENVC | 1.092 | ENVC | 0.000 | ENVC |
| N+3.50 | B27 | V30X50 | 192.000 | 1.092 | ENVC | 1.092 | ENVC | 0.000 | ENVC |
| N+3.50 | B27 | V30X50 | 213.500 | 1.092 | ENVC | 1.092 | ENVC | 0.000 | ENVC |
| N+3.50 | B27 | V30X50 | 235.000 | 1.006E-06 | ENVC | 0.000 | ENVC | 0.000 | ENVC |
| N+3.50 | B44 | V25X50 | 0.000 | 0.000 | ENVC | 0.000 | ENVC | 0.000 | ENVC |
| N+3.50 | B44 | V25X50 | 17.135 | 0.331 | ENVC | 0.331 | ENVC | 0.000 | ENVC |
| N+3.50 | B44 | V25X50 | 34.269 | 0.331 | ENVC | 0.484 | ENVC | 0.000 | ENVC |
| N+3.50 | B44 | V25X50 | 51.404 | 0.331 | ENVC | 0.662 | ENVC | 0.000 | ENVC |
| N+3.50 | B44 | V25X50 | 68.538 | 0.331 | ENVC | 0.798 | ENVC | 0.000 | ENVC |
| N+3.50 | B44 | V25X50 | 85.673 | 0.331 | ENVC | 0.891 | ENVC | 0.000 | ENVC |
| N+3.50 | B44 | V25X50 | 102.807 | 0.344 | ENVC | 0.942 | ENVC | 0.000 | ENVC |
| N+3.50 | B44 | V25X50 | 119.942 | 0.480 | ENVC | 0.951 | ENVC | 0.000 | ENVC |
| N+3.50 | B44 | V25X50 | 137.076 | 0.720 | ENVC | 0.999 | ENVC | 0.000 | ENVC |
| N+3.50 | B44 | V25X50 | 154.211 | 1.004 | ENVC | 1.026 | ENVC | 0.000 | ENVC |
| N+3.50 | B44 | V25X50 | 171.345 | 1.332 | ENVC | 1.030 | ENVC | 0.000 | ENVC |
| N+3.50 | B45 | V25X50 | 13.655 | 2.492 | ENVC | 1.246 | ENVC | 5.376 | C14 |
| N+3.50 | B45 | V25X50 | 71.124 | 1.575 | ENVC | 2.163 | ENVC | 5.376 | C14 |
| N+3.50 | B45 | V25X50 | 128.593 | 1.575 | ENVC | 3.188 | ENVC | 5.376 | C14 |
| N+3.50 | B45 | V25X50 | 186.062 | 1.575 | ENVC | 3.766 | C2 | 5.376 | C14 |
| N+3.50 | B45 | V25X50 | 243.531 | 1.575 | ENVC | 3.766 | ENVC | 5.376 | C14 |
| N+3.50 | B45 | V25X50 | 301.000 | 1.575 | ENVC | 3.766 | C2 | 5.376 | C14 |
| N+3.50 | B45 | V25X50 | 358.469 | 1.575 | ENVC | 3.766 | C2 | 5.376 | C14 |
| N+3.50 | B45 | V25X50 | 415.938 | 1.575 | ENVC | 2.740 | C2 | 5.376 | C14 |
| N+3.50 | B45 | V25X50 | 473.407 | 1.575 | ENVC | 1.575 | ENVC | 5.376 | C14 |
| N+3.50 | B45 | V25X50 | 530.876 | 3.473 | ENVC | 1.575 | ENVC | 5.376 | C14 |
| N+3.50 | B45 | V25X50 | 588.345 | 4.866 | ENVC | 3.180 | ENVC | 5.376 | C14 |
| N+3.50 | B46 | V25X50 | 13.655 | 4.866 | ENVC | 3.180 | ENVC | 5.376 | C14 |
| N+3.50 | B46 | V25X50 | 71.124 | 3.473 | ENVC | 1.575 | ENVC | 5.376 | C14 |
| N+3.50 | B46 | V25X50 | 128.593 | 1.575 | ENVC | 1.575 | ENVC | 5.376 | C14 |
| N+3.50 | B46 | V25X50 | 186.062 | 1.575 | ENVC | 2.740 | C2 | 5.376 | C14 |
| N+3.50 | B46 | V25X50 | 243.531 | 1.575 | ENVC | 3.766 | C2 | 5.376 | C14 |
| N+3.50 | B46 | V25X50 | 301.000 | 1.575 | ENVC | 3.766 | C2 | 5.376 | C14 |
| N+3.50 | B46 | V25X50 | 358.469 | 1.575 | ENVC | 3.766 | ENVC | 5.376 | C14 |
| N+3.50 | B46 | V25X50 | 415.938 | 1.575 | ENVC | 3.766 | C2 | 5.376 | C14 |
| N+3.50 | B46 | V25X50 | 473.407 | 1.575 | ENVC | 3.188 | ENVC | 5.376 | C14 |
| N+3.50 | B46 | V25X50 | 530.876 | 1.575 | ENVC | 2.163 | ENVC | 5.376 | C14 |
| N+3.50 | B46 | V25X50 | 588.345 | 2.492 | ENVC | 1.246 | ENVC | 5.376 | C14 |
| N+3.50 | B47 | V25X50 | 13.655 | 1.332 | ENVC | 1.030 | ENVC | 0.000 | ENVC |
| N+3.50 | B47 | V25X50 | 30.790 | 1.004 | ENVC | 1.026 | ENVC | 0.000 | ENVC |
| N+3.50 | B47 | V25X50 | 47.924 | 0.720 | ENVC | 0.999 | ENVC | 0.000 | ENVC |
| N+3.50 | B47 | V25X50 | 65.059 | 0.480 | ENVC | 0.951 | ENVC | 0.000 | ENVC |
| N+3.50 | B47 | V25X50 | 82.193 | 0.344 | ENVC | 0.942 | ENVC | 0.000 | ENVC |
| N+3.50 | B47 | V25X50 | 99.328 | 0.331 | ENVC | 0.891 | ENVC | 0.000 | ENVC |

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| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 38 DE 48 |
| | Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

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|--------|-----|--------|---------|-----------|------|-------|------|-------|------|
| N+3.50 | B47 | V25X50 | 116.462 | 0.331 | ENVC | 0.798 | ENVC | 0.000 | ENVC |
| N+3.50 | B47 | V25X50 | 133.597 | 0.331 | ENVC | 0.662 | ENVC | 0.000 | ENVC |
| N+3.50 | B47 | V25X50 | 150.731 | 0.331 | ENVC | 0.484 | ENVC | 0.000 | ENVC |
| N+3.50 | B47 | V25X50 | 167.866 | 0.331 | ENVC | 0.331 | ENVC | 0.000 | ENVC |
| N+3.50 | B47 | V25X50 | 185.000 | 0.000 | ENVC | 0.000 | ENVC | 0.000 | ENVC |
| | | | | | | | | | |
| N+3.50 | B54 | V30X50 | 20.000 | 4.439 | ENVC | 2.195 | ENVC | 0.000 | ENVC |
| N+3.50 | B54 | V30X50 | 63.000 | 3.406 | ENVC | 1.092 | ENVC | 0.000 | ENVC |
| N+3.50 | B54 | V30X50 | 106.000 | 2.447 | ENVC | 1.092 | ENVC | 0.000 | ENVC |
| N+3.50 | B54 | V30X50 | 149.000 | 1.561 | ENVC | 1.092 | ENVC | 0.000 | ENVC |
| N+3.50 | B54 | V30X50 | 192.000 | 1.092 | ENVC | 1.092 | ENVC | 0.000 | ENVC |
| N+3.50 | B54 | V30X50 | 235.000 | 1.006E-06 | ENVC | 0.000 | ENVC | 0.000 | ENVC |
| | | | | | | | | | |
| N+3.50 | B55 | V30X50 | 30.000 | 8.660 | ENVC | 4.520 | ENVC | 0.000 | ENVC |
| N+3.50 | B55 | V30X50 | 77.836 | 5.935 | ENVC | 2.761 | ENVC | 0.000 | ENVC |
| N+3.50 | B55 | V30X50 | 125.672 | 4.496 | ENVC | 2.761 | ENVC | 0.000 | ENVC |
| N+3.50 | B55 | V30X50 | 173.509 | 2.761 | ENVC | 2.761 | ENVC | 0.000 | ENVC |
| N+3.50 | B55 | V30X50 | 221.345 | 1.258 | ENVC | 1.804 | ENVC | 0.000 | ENVC |

RESISTENCIA AL CORTANTE DE VIGAS (C.21.3.3.1.b)

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C O N C R E T E B E A M D E S I G N O U T P U T (ACI 318-08/IBC 2009)

TORSION AND SHEAR DESIGN OF BEAM-TYPE ELEMENTS

| STORY ID | BEAM BAY | SECTION ID | STATION ID | <-----REQUIRED REINFORCING-----> | | | |
|-------------|-------------|---------------|---------------|----------------------------------|-------|-------|-------|
| | | | | TORSION | COMBO | SHEAR | COMBO |
| N+3.50 | B1 | V15X50 | 0.000 | 0.000 | VNV16 | 0.010 | VNV16 |
| N+3.50 | B1 | V15X50 | 78.700 | 0.000 | VNV16 | 0.009 | VNV16 |
| N+3.50 | B1 | V15X50 | 157.400 | 0.000 | VNV16 | 0.008 | VNV16 |
| N+3.50 | B1 | V15X50 | 236.100 | 0.000 | VNV16 | 0.007 | VNV16 |
| N+3.50 | B1 | V15X50 | 314.800 | 0.000 | VNV16 | 0.006 | VNV16 |
| N+3.50 | B1 | V15X50 | 393.500 | 0.000 | VNV16 | 0.007 | VNV16 |
| N+3.50 | B1 | V15X50 | 472.200 | 0.000 | VNV16 | 0.008 | VNV16 |
| N+3.50 | B1 | V15X50 | 550.900 | 0.000 | VNV16 | 0.009 | VNV16 |
| N+3.50 | B1 | V15X50 | 629.600 | 0.000 | VNV16 | 0.010 | VNV16 |
| N+3.50 | B1 | V15X50 | 708.300 | 0.000 | VNV16 | 0.011 | VNV16 |
| N+3.50 | B1 | V15X50 | 787.000 | 0.000 | VNV16 | 0.011 | VNV16 |
| | | | | | | | |
| N+3.50 | B2 | V15X50 | 0.000 | 0.000 | VNV16 | 0.011 | VNV16 |
| N+3.50 | B2 | V15X50 | 78.700 | 0.000 | VNV16 | 0.011 | VNV16 |
| N+3.50 | B2 | V15X50 | 157.400 | 0.000 | VNV16 | 0.010 | VNV16 |
| N+3.50 | B2 | V15X50 | 236.100 | 0.000 | VNV16 | 0.009 | VNV16 |
| N+3.50 | B2 | V15X50 | 314.800 | 0.000 | VNV16 | 0.008 | VNV16 |
| N+3.50 | B2 | V15X50 | 393.500 | 0.000 | VNV16 | 0.007 | VNV16 |
| N+3.50 | B2 | V15X50 | 472.200 | 0.000 | VNV16 | 0.006 | VNV16 |
| N+3.50 | B2 | V15X50 | 550.900 | 0.000 | VNV16 | 0.007 | VNV16 |
| N+3.50 | B2 | V15X50 | 629.600 | 0.000 | VNV16 | 0.008 | VNV16 |
| N+3.50 | B2 | V15X50 | 708.300 | 0.000 | VNV16 | 0.009 | VNV16 |
| N+3.50 | B2 | V15X50 | 787.000 | 0.000 | VNV16 | 0.010 | VNV16 |
| | | | | | | | |
| N+3.50 | B5 | V30X50 | 0.000 | 0.040 | VNV4 | 0.049 | VNV16 |
| N+3.50 | B5 | V30X50 | 16.000 | 0.040 | VNV4 | 0.052 | VNV16 |
| N+3.50 | B5 | V30X50 | 32.000 | 0.040 | VNV4 | 0.056 | VNV16 |
| N+3.50 | B5 | V30X50 | 48.000 | 0.040 | VNV4 | 0.059 | VNV16 |
| N+3.50 | B5 | V30X50 | 64.000 | 0.040 | VNV4 | 0.062 | VNV16 |
| N+3.50 | B5 | V30X50 | 80.000 | 0.040 | VNV4 | 0.065 | VNV16 |
| N+3.50 | B5 | V30X50 | 96.000 | 0.040 | VNV4 | 0.068 | VNV16 |
| N+3.50 | B5 | V30X50 | 112.000 | 0.040 | VNV4 | 0.071 | VNV16 |
| N+3.50 | B5 | V30X50 | 128.000 | 0.040 | VNV4 | 0.074 | VNV16 |
| N+3.50 | B5 | V30X50 | 144.000 | 0.040 | VNV4 | 0.078 | VNV16 |
| N+3.50 | B5 | V30X50 | 160.000 | 0.040 | VNV4 | 0.081 | VNV16 |



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|---------------|--|----------|----------------------------|
| Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 39 DE 48 |
| Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

| | | | | | | | |
|--------|-----|--------|---------|-------|-------|-------|-------|
| N+3.50 | B6 | V35X50 | 0.000 | 0.028 | VNV4 | 0.098 | VNV16 |
| N+3.50 | B6 | V35X50 | 16.000 | 0.028 | VNV4 | 0.104 | VNV16 |
| N+3.50 | B6 | V35X50 | 32.000 | 0.028 | VNV4 | 0.110 | VNV16 |
| N+3.50 | B6 | V35X50 | 48.000 | 0.028 | VNV4 | 0.116 | VNV16 |
| N+3.50 | B6 | V35X50 | 64.000 | 0.028 | VNV4 | 0.122 | VNV16 |
| N+3.50 | B6 | V35X50 | 80.000 | 0.028 | VNV4 | 0.128 | VNV16 |
| N+3.50 | B6 | V35X50 | 96.000 | 0.028 | VNV4 | 0.134 | VNV16 |
| N+3.50 | B6 | V35X50 | 112.000 | 0.028 | VNV4 | 0.140 | VNV16 |
| N+3.50 | B6 | V35X50 | 128.000 | 0.028 | VNV4 | 0.146 | VNV16 |
| N+3.50 | B6 | V35X50 | 144.000 | 0.028 | VNV4 | 0.152 | VNV16 |
| N+3.50 | B6 | V35X50 | 160.000 | 0.028 | VNV4 | 0.158 | VNV16 |
| | | | | | | | |
| N+3.50 | B7 | V30X50 | 0.000 | 0.040 | VNV4 | 0.049 | VNV16 |
| N+3.50 | B7 | V30X50 | 16.000 | 0.040 | VNV4 | 0.052 | VNV16 |
| N+3.50 | B7 | V30X50 | 32.000 | 0.040 | VNV4 | 0.056 | VNV16 |
| N+3.50 | B7 | V30X50 | 48.000 | 0.040 | VNV4 | 0.059 | VNV16 |
| N+3.50 | B7 | V30X50 | 64.000 | 0.040 | VNV4 | 0.062 | VNV16 |
| N+3.50 | B7 | V30X50 | 80.000 | 0.040 | VNV4 | 0.065 | VNV16 |
| N+3.50 | B7 | V30X50 | 96.000 | 0.040 | VNV4 | 0.068 | VNV16 |
| N+3.50 | B7 | V30X50 | 112.000 | 0.040 | VNV4 | 0.071 | VNV16 |
| N+3.50 | B7 | V30X50 | 128.000 | 0.040 | VNV4 | 0.074 | VNV16 |
| N+3.50 | B7 | V30X50 | 144.000 | 0.040 | VNV4 | 0.078 | VNV16 |
| N+3.50 | B7 | V30X50 | 160.000 | 0.040 | VNV4 | 0.081 | VNV16 |
| | | | | | | | |
| N+3.50 | B11 | V30X50 | 15.000 | 0.000 | VNV16 | 0.029 | VNV8 |
| N+3.50 | B11 | V30X50 | 90.700 | 0.000 | VNV16 | 0.027 | VNV8 |
| N+3.50 | B11 | V30X50 | 166.400 | 0.000 | VNV16 | 0.025 | VNV8 |
| N+3.50 | B11 | V30X50 | 242.100 | 0.000 | VNV16 | 0.022 | VNV8 |
| N+3.50 | B11 | V30X50 | 317.800 | 0.000 | VNV16 | 0.020 | VNV16 |
| N+3.50 | B11 | V30X50 | 393.500 | 0.000 | VNV16 | 0.022 | VNV8 |
| N+3.50 | B11 | V30X50 | 469.200 | 0.000 | VNV16 | 0.024 | VNV8 |
| N+3.50 | B11 | V30X50 | 544.900 | 0.000 | VNV16 | 0.027 | VNV8 |
| N+3.50 | B11 | V30X50 | 620.600 | 0.000 | VNV16 | 0.029 | VNV8 |
| N+3.50 | B11 | V30X50 | 696.300 | 0.000 | VNV16 | 0.031 | VNV8 |
| N+3.50 | B11 | V30X50 | 772.000 | 0.000 | VNV16 | 0.034 | VNV8 |
| | | | | | | | |
| N+3.50 | B12 | V30X50 | 15.000 | 0.000 | VNV16 | 0.034 | VNV8 |
| N+3.50 | B12 | V30X50 | 90.700 | 0.000 | VNV16 | 0.031 | VNV8 |
| N+3.50 | B12 | V30X50 | 166.400 | 0.000 | VNV16 | 0.029 | VNV8 |
| N+3.50 | B12 | V30X50 | 242.100 | 0.000 | VNV16 | 0.027 | VNV8 |
| N+3.50 | B12 | V30X50 | 317.800 | 0.000 | VNV16 | 0.024 | VNV8 |
| N+3.50 | B12 | V30X50 | 393.500 | 0.000 | VNV16 | 0.022 | VNV8 |
| N+3.50 | B12 | V30X50 | 469.200 | 0.000 | VNV16 | 0.020 | VNV16 |
| N+3.50 | B12 | V30X50 | 544.900 | 0.000 | VNV16 | 0.022 | VNV8 |
| N+3.50 | B12 | V30X50 | 620.600 | 0.000 | VNV16 | 0.025 | VNV8 |
| N+3.50 | B12 | V30X50 | 696.300 | 0.000 | VNV16 | 0.027 | VNV8 |
| N+3.50 | B12 | V30X50 | 772.000 | 0.000 | VNV16 | 0.029 | VNV8 |
| | | | | | | | |
| N+3.50 | B16 | V30X50 | 20.000 | 0.014 | VNV4 | 0.080 | VNV8 |
| N+3.50 | B16 | V30X50 | 74.500 | 0.014 | VNV4 | 0.058 | VNV8 |
| N+3.50 | B16 | V30X50 | 129.000 | 0.014 | VNV4 | 0.041 | VNV8 |
| N+3.50 | B16 | V30X50 | 183.500 | 0.014 | VNV4 | 0.024 | VNV8 |
| N+3.50 | B16 | V30X50 | 238.000 | 0.014 | VNV4 | 0.011 | VNV16 |
| N+3.50 | B16 | V30X50 | 292.500 | 0.014 | VNV4 | 0.033 | VNV16 |
| N+3.50 | B16 | V30X50 | 347.000 | 0.014 | VNV4 | 0.019 | VNV16 |
| N+3.50 | B16 | V30X50 | 401.500 | 0.014 | VNV4 | 0.013 | VNV8 |
| N+3.50 | B16 | V30X50 | 456.000 | 0.014 | VNV4 | 0.031 | VNV8 |
| N+3.50 | B16 | V30X50 | 510.500 | 0.014 | VNV4 | 0.048 | VNV8 |
| N+3.50 | B16 | V30X50 | 565.000 | 0.014 | VNV4 | 0.067 | VNV8 |
| | | | | | | | |
| N+3.50 | B17 | V35X50 | 20.000 | 0.000 | VNV16 | 0.164 | VNV8 |
| N+3.50 | B17 | V35X50 | 73.500 | 0.000 | VNV16 | 0.128 | VNV8 |
| N+3.50 | B17 | V35X50 | 127.000 | 0.000 | VNV16 | 0.096 | VNV8 |
| N+3.50 | B17 | V35X50 | 180.500 | 0.000 | VNV16 | 0.063 | VNV8 |
| N+3.50 | B17 | V35X50 | 234.000 | 0.000 | VNV16 | 0.030 | VNV8 |
| N+3.50 | B17 | V35X50 | 287.500 | 0.000 | VNV16 | 0.000 | VNV16 |
| N+3.50 | B17 | V35X50 | 341.000 | 0.000 | VNV16 | 0.020 | VNV8 |
| N+3.50 | B17 | V35X50 | 394.500 | 0.000 | VNV16 | 0.053 | VNV8 |
| N+3.50 | B17 | V35X50 | 448.000 | 0.000 | VNV16 | 0.086 | VNV8 |




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|---------------|--|----------|----------------------------|
| Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 40 DE 48 |
| Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

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|--------|-----|--------|---------|-------|-------|-------|-------|
| N+3.50 | B17 | V35X50 | 501.500 | 0.000 | VNV16 | 0.118 | VNV8 |
| N+3.50 | B17 | V35X50 | 555.000 | 0.000 | VNV16 | 0.152 | VNV8 |
| N+3.50 | B18 | V30X50 | 20.000 | 0.014 | VNV4 | 0.080 | VNV8 |
| N+3.50 | B18 | V30X50 | 74.500 | 0.014 | VNV4 | 0.058 | VNV8 |
| N+3.50 | B18 | V30X50 | 129.000 | 0.014 | VNV4 | 0.041 | VNV8 |
| N+3.50 | B18 | V30X50 | 183.500 | 0.014 | VNV4 | 0.024 | VNV8 |
| N+3.50 | B18 | V30X50 | 238.000 | 0.014 | VNV4 | 0.011 | VNV16 |
| N+3.50 | B18 | V30X50 | 292.500 | 0.014 | VNV4 | 0.033 | VNV16 |
| N+3.50 | B18 | V30X50 | 347.000 | 0.014 | VNV4 | 0.019 | VNV16 |
| N+3.50 | B18 | V30X50 | 401.500 | 0.014 | VNV4 | 0.013 | VNV8 |
| N+3.50 | B18 | V30X50 | 456.000 | 0.014 | VNV4 | 0.031 | VNV8 |
| N+3.50 | B18 | V30X50 | 510.500 | 0.014 | VNV4 | 0.048 | VNV8 |
| N+3.50 | B18 | V30X50 | 565.000 | 0.014 | VNV4 | 0.067 | VNV8 |
| N+3.50 | B22 | V30X50 | 15.000 | 0.000 | VNV16 | 0.054 | VNV16 |
| N+3.50 | B22 | V30X50 | 90.700 | 0.000 | VNV16 | 0.049 | VNV16 |
| N+3.50 | B22 | V30X50 | 166.400 | 0.000 | VNV16 | 0.044 | VNV16 |
| N+3.50 | B22 | V30X50 | 242.100 | 0.000 | VNV16 | 0.038 | VNV16 |
| N+3.50 | B22 | V30X50 | 317.800 | 0.000 | VNV16 | 0.033 | VNV16 |
| N+3.50 | B22 | V30X50 | 393.500 | 0.000 | VNV16 | 0.036 | VNV16 |
| N+3.50 | B22 | V30X50 | 469.200 | 0.000 | VNV16 | 0.041 | VNV16 |
| N+3.50 | B22 | V30X50 | 544.900 | 0.000 | VNV16 | 0.046 | VNV16 |
| N+3.50 | B22 | V30X50 | 620.600 | 0.000 | VNV16 | 0.052 | VNV16 |
| N+3.50 | B22 | V30X50 | 696.300 | 0.000 | VNV16 | 0.057 | VNV16 |
| N+3.50 | B22 | V30X50 | 772.000 | 0.000 | VNV16 | 0.062 | VNV16 |
| N+3.50 | B23 | V30X50 | 15.000 | 0.000 | VNV16 | 0.062 | VNV16 |
| N+3.50 | B23 | V30X50 | 90.700 | 0.000 | VNV16 | 0.057 | VNV16 |
| N+3.50 | B23 | V30X50 | 166.400 | 0.000 | VNV16 | 0.052 | VNV16 |
| N+3.50 | B23 | V30X50 | 242.100 | 0.000 | VNV16 | 0.046 | VNV16 |
| N+3.50 | B23 | V30X50 | 317.800 | 0.000 | VNV16 | 0.041 | VNV16 |
| N+3.50 | B23 | V30X50 | 393.500 | 0.000 | VNV16 | 0.036 | VNV16 |
| N+3.50 | B23 | V30X50 | 469.200 | 0.000 | VNV16 | 0.033 | VNV16 |
| N+3.50 | B23 | V30X50 | 544.900 | 0.000 | VNV16 | 0.038 | VNV16 |
| N+3.50 | B23 | V30X50 | 620.600 | 0.000 | VNV16 | 0.044 | VNV16 |
| N+3.50 | B23 | V30X50 | 696.300 | 0.000 | VNV16 | 0.049 | VNV16 |
| N+3.50 | B23 | V30X50 | 772.000 | 0.000 | VNV16 | 0.054 | VNV16 |
| N+3.50 | B27 | V30X50 | 20.000 | 0.000 | VNV16 | 0.050 | VNV8 |
| N+3.50 | B27 | V30X50 | 41.500 | 0.000 | VNV16 | 0.049 | VNV8 |
| N+3.50 | B27 | V30X50 | 63.000 | 0.000 | VNV16 | 0.049 | VNV8 |
| N+3.50 | B27 | V30X50 | 84.500 | 0.000 | VNV16 | 0.048 | VNV8 |
| N+3.50 | B27 | V30X50 | 106.000 | 0.000 | VNV16 | 0.047 | VNV8 |
| N+3.50 | B27 | V30X50 | 127.500 | 0.000 | VNV16 | 0.047 | VNV8 |
| N+3.50 | B27 | V30X50 | 149.000 | 0.000 | VNV16 | 0.046 | VNV8 |
| N+3.50 | B27 | V30X50 | 170.500 | 0.000 | VNV16 | 0.045 | VNV8 |
| N+3.50 | B27 | V30X50 | 192.000 | 0.000 | VNV16 | 0.045 | VNV8 |
| N+3.50 | B27 | V30X50 | 213.500 | 0.000 | VNV16 | 0.044 | VNV8 |
| N+3.50 | B27 | V30X50 | 235.000 | 0.000 | VNV16 | 0.043 | VNV8 |
| N+3.50 | B44 | V25X50 | 0.000 | 0.000 | VNV16 | 0.032 | VNV8 |
| N+3.50 | B44 | V25X50 | 17.135 | 0.000 | VNV16 | 0.030 | VNV8 |
| N+3.50 | B44 | V25X50 | 34.269 | 0.000 | VNV16 | 0.028 | VNV8 |
| N+3.50 | B44 | V25X50 | 51.404 | 0.000 | VNV16 | 0.025 | VNV8 |
| N+3.50 | B44 | V25X50 | 68.538 | 0.000 | VNV16 | 0.024 | VNV16 |
| N+3.50 | B44 | V25X50 | 85.673 | 0.000 | VNV16 | 0.024 | VNV8 |
| N+3.50 | B44 | V25X50 | 102.807 | 0.000 | VNV16 | 0.026 | VNV8 |
| N+3.50 | B44 | V25X50 | 119.942 | 0.000 | VNV16 | 0.029 | VNV8 |
| N+3.50 | B44 | V25X50 | 137.076 | 0.000 | VNV16 | 0.031 | VNV8 |
| N+3.50 | B44 | V25X50 | 154.211 | 0.000 | VNV16 | 0.033 | VNV8 |
| N+3.50 | B44 | V25X50 | 171.345 | 0.000 | VNV16 | 0.035 | VNV8 |
| N+3.50 | B45 | V25X50 | 13.655 | 0.029 | VNV8 | 0.039 | VNV16 |
| N+3.50 | B45 | V25X50 | 71.124 | 0.029 | VNV8 | 0.035 | VNV16 |
| N+3.50 | B45 | V25X50 | 128.593 | 0.029 | VNV8 | 0.032 | VNV16 |
| N+3.50 | B45 | V25X50 | 186.062 | 0.029 | VNV8 | 0.028 | VNV16 |
| N+3.50 | B45 | V25X50 | 243.531 | 0.029 | VNV8 | 0.024 | VNV16 |
| N+3.50 | B45 | V25X50 | 301.000 | 0.029 | VNV8 | 0.028 | VNV16 |




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|---------------|--|----------|----------------------------|
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| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
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|--------|-----|--------|---------|-------|-------|-------|-------|
| N+3.50 | B45 | V25X50 | 358.469 | 0.029 | VNV8 | 0.031 | VNV16 |
| N+3.50 | B45 | V25X50 | 415.938 | 0.029 | VNV8 | 0.035 | VNV16 |
| N+3.50 | B45 | V25X50 | 473.407 | 0.029 | VNV8 | 0.039 | VNV16 |
| N+3.50 | B45 | V25X50 | 530.876 | 0.029 | VNV8 | 0.043 | VNV16 |
| N+3.50 | B45 | V25X50 | 588.345 | 0.029 | VNV8 | 0.047 | VNV16 |
| | | | | | | | |
| N+3.50 | B46 | V25X50 | 13.655 | 0.029 | VNV8 | 0.047 | VNV16 |
| N+3.50 | B46 | V25X50 | 71.124 | 0.029 | VNV8 | 0.043 | VNV16 |
| N+3.50 | B46 | V25X50 | 128.593 | 0.029 | VNV8 | 0.039 | VNV16 |
| N+3.50 | B46 | V25X50 | 186.062 | 0.029 | VNV8 | 0.035 | VNV16 |
| N+3.50 | B46 | V25X50 | 243.531 | 0.029 | VNV8 | 0.031 | VNV16 |
| N+3.50 | B46 | V25X50 | 301.000 | 0.029 | VNV8 | 0.028 | VNV16 |
| N+3.50 | B46 | V25X50 | 358.469 | 0.029 | VNV8 | 0.024 | VNV16 |
| N+3.50 | B46 | V25X50 | 415.938 | 0.029 | VNV8 | 0.028 | VNV16 |
| N+3.50 | B46 | V25X50 | 473.407 | 0.029 | VNV8 | 0.032 | VNV16 |
| N+3.50 | B46 | V25X50 | 530.876 | 0.029 | VNV8 | 0.035 | VNV16 |
| N+3.50 | B46 | V25X50 | 588.345 | 0.029 | VNV8 | 0.039 | VNV16 |
| | | | | | | | |
| N+3.50 | B47 | V25X50 | 13.655 | 0.000 | VNV16 | 0.035 | VNV8 |
| N+3.50 | B47 | V25X50 | 30.790 | 0.000 | VNV16 | 0.033 | VNV8 |
| N+3.50 | B47 | V25X50 | 47.924 | 0.000 | VNV16 | 0.031 | VNV8 |
| N+3.50 | B47 | V25X50 | 65.059 | 0.000 | VNV16 | 0.029 | VNV8 |
| N+3.50 | B47 | V25X50 | 82.193 | 0.000 | VNV16 | 0.026 | VNV8 |
| N+3.50 | B47 | V25X50 | 99.328 | 0.000 | VNV16 | 0.024 | VNV8 |
| N+3.50 | B47 | V25X50 | 116.462 | 0.000 | VNV16 | 0.024 | VNV16 |
| N+3.50 | B47 | V25X50 | 133.597 | 0.000 | VNV16 | 0.025 | VNV8 |
| N+3.50 | B47 | V25X50 | 150.731 | 0.000 | VNV16 | 0.028 | VNV8 |
| N+3.50 | B47 | V25X50 | 167.866 | 0.000 | VNV16 | 0.030 | VNV8 |
| N+3.50 | B47 | V25X50 | 185.000 | 0.000 | VNV16 | 0.032 | VNV8 |
| | | | | | | | |
| N+3.50 | B54 | V30X50 | 20.000 | 0.000 | VNV16 | 0.050 | VNV8 |
| N+3.50 | B54 | V30X50 | 63.000 | 0.000 | VNV16 | 0.049 | VNV8 |
| N+3.50 | B54 | V30X50 | 106.000 | 0.000 | VNV16 | 0.047 | VNV8 |
| N+3.50 | B54 | V30X50 | 149.000 | 0.000 | VNV16 | 0.046 | VNV8 |
| N+3.50 | B54 | V30X50 | 192.000 | 0.000 | VNV16 | 0.045 | VNV8 |
| N+3.50 | B54 | V30X50 | 235.000 | 0.000 | VNV16 | 0.043 | VNV8 |
| | | | | | | | |
| N+3.50 | B55 | V30X50 | 30.000 | 0.016 | VNV4 | 0.160 | VNV8 |
| N+3.50 | B55 | V30X50 | 77.836 | 0.016 | VNV4 | 0.159 | VNV8 |
| N+3.50 | B55 | V30X50 | 125.672 | 0.016 | VNV4 | 0.157 | VNV8 |
| N+3.50 | B55 | V30X50 | 173.509 | 0.016 | VNV4 | 0.156 | VNV8 |
| N+3.50 | B55 | V30X50 | 221.345 | 0.016 | VNV4 | 0.154 | VNV8 |

| | | | | |
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|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 42 DE 48 |
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ANEXO 5.4. DISEÑO DE COLUMNAS METALICAS

| | | | | |
|---|---------------|--|----------|----------------------------|
|  | Propietario: | SECRETARIA DE EDUCACION Y SECRETARIA DE CULTURA | Calculó: | ING. FABIO RIVERA |
| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| | Localización: | BOGOTA - CUNDINAMARCA | Hoja: | PAGINA 43 DE 48 |
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| C O L U M N S T E E L S T R E S S C H E C K O U T P U T (AISC360-05/IBC2006) | | | | | | | | | | |
|--|----------------|-----------------|--------------------------------------|-------|-------|-------|---------------------|-----|------------------|-------|
| STORY LEVEL | COLUMN LINE | SECTION ID | /-----MOMENT INTERACTION CHECK-----/ | | | | //----SHEAR22----// | | /----SHEAR33---/ | |
| | | | COMBO | RATIO | = | AXL + | B33 + | B22 | COMBO | RATIO |
| N+3.50 | C19 | TUB273.1X9.30MM | | | | | | | | |
| | | C6(C) | 0.168 | = | 0.017 | + | 0.141 | + | 0.055 | |
| N+3.50 | C20 | TUB273.1X9.30MM | | | | | | | | |
| | | C4(C) | 0.168 | = | 0.017 | + | 0.141 | + | 0.055 | |
| N+3.50 | C21 | TUB273.1X9.30MM | | | | | | | | |
| | | C6(C) | 0.151 | = | 0.022 | + | 0.118 | + | 0.051 | |

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| C O L U M N S P E C I A L S E I S M I C R E Q U I R E M E N T S (AISC360-05/IBC2006) | | | | | | | | | |
|--|----------------|---------------|------------------|---------------------|------|---------------------|-------|--------------------|-------|
| STORY LEVEL | COLUMN LINE | SECTION ID | SECTION CLASS | /--CONTN. PLATE--// | | --DOUBLER PLATE--// | | /---B/C RATIOS---/ | |
| | | | | COMBO | AREA | COMBO | THICK | MAJOR | MINOR |
| N+3.50 | C19 | TUB273.1X9.3 | Compact | | | | | | |
| N+3.50 | C20 | TUB273.1X9.3 | Compact | | | | | | |
| N+3.50 | C21 | TUB273.1X9.3 | Compact | | | | | | |



| | | | |
|----------------------|-------------------------------|-----------------|---------------------|
| Propietario: | SEC. EDUCACION Y SEC. CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUENO | Revisó: | ING. JUAN C. PATINO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | |
| Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

ANEXO 6.4. CHEQUEO DE CONFINAMIENTO

CHEQUEO DE CONFINAMIENTO
CAPACIDAD MODERADA DE DISIPACION DE ENERGIA (DMO)

| SECCION cm | | RECUBRIMIENTO | d (cm) |
|------------|----|---------------|--------|
| b | h | 4 cm | 46 |
| 35 | 50 | | |

| CONFINAMIENTO | | | | |
|---------------|-------|-------------|---|---------------------------------|
| VIGAS DMO | | | | |
| d/4 | 11.5 | | | |
| 8db | 15.92 | 5 | # | barra menor diametro DMO |
| 32dv | 30.96 | 4 | # | barra del estribo 8db |
| 150 mm | 15 | | | |
| 11.50 | | USAR | | |

| NO CONFINADO | | |
|--------------|----|-------------|
| VIGAS DMO | | |
| d/2 | 23 | |
| 23 | | USAR |

| | | |
|-----------------------------|------------------|------------------|
| Ec (T/m²) | f'c = 28 | Mpa |
| 2675250 | Wc = 2400 | k/m ³ |
| 2487006 | | |



| | | | |
|----------------------|-------------------------------|-----------------|---------------------|
| Propietario: | SEC. EDUCACION Y SEC. CULTURA | Calculó: | ING. FABIO RIVERA |
| Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
| Localización: | BOGOTA - CUNDINAMARCA | Hoja: | |
| Contenido: | MODULO XIII - M. DE CALCULOS | Fecha: | NOVIEMBRE - 2014 |

ANEXO 6.5. CHEQUEO DE COLUMNA FUERTE-VIGA DEBIL

CHEQUEO CONDICION COLUMNA FUERTE - VIGA DEBIL

Chequeo de la Condición

$$\sum M_{nc} \geq 1.2 \sum M_{nb}$$

1. Calculo de los momentos resistentes de las vigas

Sentido y-y

Dimensiones de la viga:

| Lado Izquierdo | | |
|----------------|------|-------|
| B: | 35 | [cm] |
| H: | 50 | [cm] |
| d': | 5 | [cm] |
| As-sup: | 11.9 | [cm2] |
| As-inf: | 7.92 | [cm2] |

| Lado Derecho | | |
|--------------|------|-------|
| B: | 30 | [cm] |
| H: | 50 | [cm] |
| d': | 5 | [cm] |
| As-sup: | 11.9 | [cm2] |
| As-inf: | 7.92 | [cm2] |

| | | |
|---------------------------|------|----------|
| Resistencia del concreto: | 280 | [kg/cm2] |
| Resistencia del acero: | 4200 | [kg/cm2] |

| | | |
|-------------------|------------|------------|
| Cuantias de acero | Ro1: ##### | Ro1: ##### |
| | Ro2: ##### | Ro2: ##### |

$$Mn = \rho f_y b d^2 \left(1 - 0.59 \rho \frac{f_y}{f'_c} \right)$$

| | | |
|---------------------|--------------------|--------------------|
| Momentos Nominales: | Mn1: 20.95 [Ton-m] | Mn1: 20.7 [Ton-m] |
| | Mn2: 14.3 [Ton-m] | Mn2: 14.19 [Ton-m] |

Suma de momentos en sentido Horario: Mn1-izq+Mn2-der: 35.1 [Ton-m]

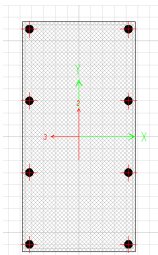
Suma de momentos en Sentido Contrahorario: Mn2-izq+Mn1-der: 35 [Ton-m]

Maximo: 35.15 [Ton-m]

2. Calculo de los momentos resistentes de las columnas

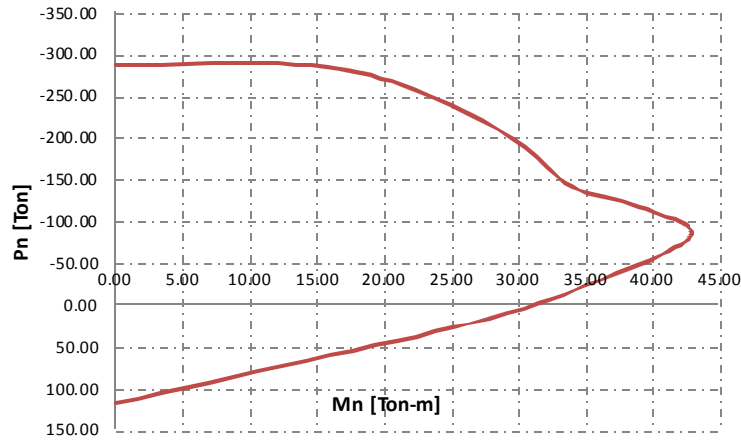
| Pn | Mn |
|-------|-------|
| [Ton] | [T-m] |
| ##### | 0.00 |
| ##### | 13.49 |
| ##### | 20.58 |
| ##### | 26.24 |
| ##### | 30.54 |
| ##### | 34.02 |
| ##### | 38.96 |
| ##### | 42.84 |
| ##### | 35.04 |
| 22.72 | 26.27 |
| ##### | 0.00 |

Dimensiones de columna: 30x60
Refuerzo de la columna: 8#7



REF: SD-SECTION ETABS

DIAGRAMA DE INTERACCION



| | | | |
|---------------------------------|--------------------|---------------------------------|--------------------|
| Momento Nominal Superior | | Momento Nominal Inferior | |
| Pu= | 0 Ton | Pu= | -55.91 Ton |
| Posición: | 9 | Posición: | 8 |
| Pu0: #### | Mn-0: 35.04 | Pu0: #### | Mn-0: 42.84 |
| Pu1: 22.72 | Mn-1: 26.27 | Pu1: #### | Mn-1: 35.04 |
| Mn: 30.62 [Ton-m] | | Mn: 39.4 [Ton-m] | |

Suma de Momentos en la columna:

Mn-sup+Mn-inf: 70.0 [Ton-m]

3. Chequeo de la condición

$$1.2 \sum M_{nb} \quad 42.18 \text{ [Ton-m]}$$

$$\sum M_{nc} \quad 70.0 \text{ [Ton-m]}$$

$$\sum M_{nc} \geq 1.2 \sum M_{nb} \quad \text{OK!}$$

CHEQUEO CONDICION COLUMNA FUERTE - VIGA DEBIL

Chequeo de la Condición

$$\sum M_{nc} \geq 1.2 \sum M_{nb}$$

1. Calculo de los momentos resistentes de las vigas

Sentido x-x

| | Lado Izquierdo | Lado Derecho |
|-------------------------|----------------|--------------|
| Dimensiones de la viga: | | |
| B: | 30 [cm] | 30 [cm] |
| H: | 50 [cm] | 50 [cm] |
| d': | 5 [cm] | 5 [cm] |
| As-sup: | 9.9 [cm2] | 9.9 [cm2] |
| As-inf: | 5.94 [cm2] | 5.94 [cm2] |

| | |
|---------------------------|---------------|
| Resistencia del concreto: | 280 [kg/cm2] |
| Resistencia del acero: | 4200 [kg/cm2] |

| | | |
|-------------------|------------|------------|
| Cuantias de acero | Ro1: ##### | Ro1: ##### |
| | Ro2: ##### | Ro2: ##### |

$$Mn = \rho f_y b d^2 \left(1 - 0.59 \rho \frac{f_y}{f'_c} \right)$$

| | | |
|---------------------|--------------------|--------------------|
| Momentos Nominales: | Mn1: 17.5 [Ton-m] | Mn1: 17.5 [Ton-m] |
| | Mn2: 10.79 [Ton-m] | Mn2: 10.79 [Ton-m] |

| | |
|--------------------------------------|-------------------------------|
| Suma de momentos en sentido Horario: | Mn1-izq+Mn2-der: 28.3 [Ton-m] |
|--------------------------------------|-------------------------------|

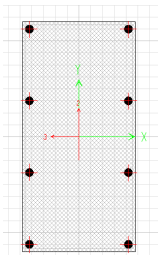
| | |
|--|-------------------------------|
| Suma de momentos en Sentido Contrahorario: | Mn2-izq+Mn1-der: 28.3 [Ton-m] |
|--|-------------------------------|

Maximo: 28.29 [Ton-m]

2. Calculo de los momentos resistentes de las columnas

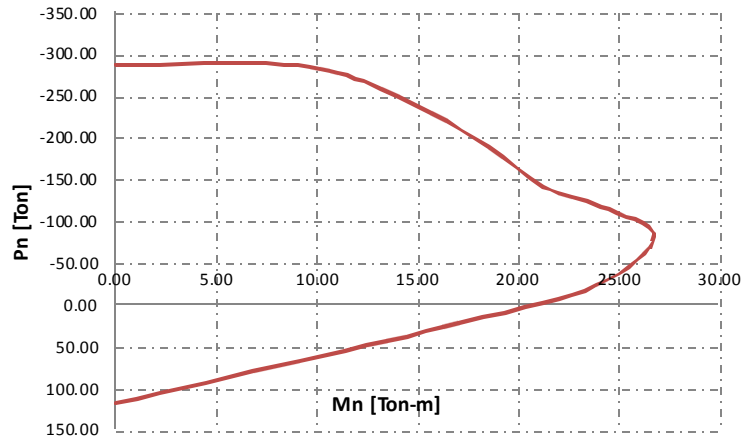
| Pn | Mn |
|-------|-------|
| [Ton] | [T-m] |
| ##### | 0.00 |
| ##### | 8.33 |
| ##### | 12.33 |
| ##### | 15.68 |
| ##### | 18.56 |
| ##### | 21.27 |
| ##### | 24.11 |
| ##### | 26.76 |
| ##### | 23.86 |
| 22.72 | 17.05 |
| ##### | 0.00 |

Dimensiones de columna: 30x60
Refuerzo de la columna: 8#7



REF: SD-SECTION ETABS

DIAGRAMA DE INTERACCION



| Momento Nominal Superior | | | | Momento Nominal Inferior | | | |
|--------------------------|--------------|--------------|--------------|--------------------------|---------------|--------------|--------------|
| Pu= | 0 | Ton | | Pu= | -55.91 | Ton | |
| Posición: | 9 | | | Posición: | 8 | | |
| Pu0: | #### | Mn-0: | 23.86 | Pu0: | #### | Mn-0: | 26.76 |
| Pu1: | 22.72 | Mn-1: | 17.05 | Pu1: | #### | Mn-1: | 23.86 |
| Mn: 20.42 [Ton-m] | | | | Mn: 25.5 [Ton-m] | | | |

Suma de Momentos en la columna:


Mn-sup+Mn-inf: 45.9 [Ton-m]

3. Chequeo de la condición

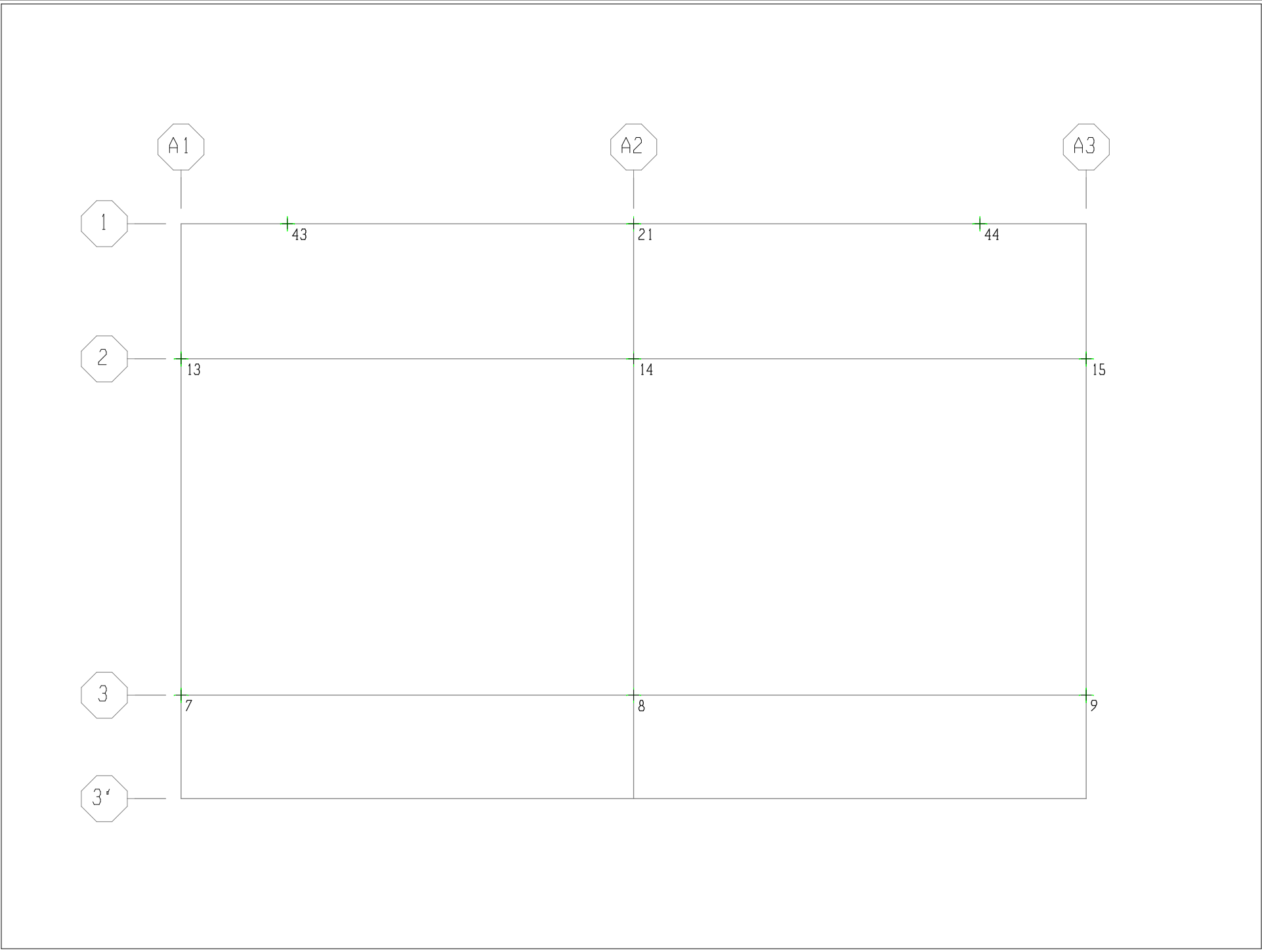
$$1.2 \sum M_{nb} = 33.94 \text{ [Ton-m]}$$


$$\sum M_{nc} = 45.9 \text{ [Ton-m]}$$

$$\sum M_{nc} \geq 1.2 \sum M_{nb} \quad \text{OK!}$$

| | | | | |
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ANEXO 7. REACCIONES DE CIMENTACION



| | | | | |
|---|---------------|--|----------|----------------------------|
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| | Proyecto: | COLEGIO Y TEATRO EL ENSUEÑO | Revisó: | ING. JUAN C. PATIÑO |
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LOADING COMBINATIONS

| COMBO | COMBO TYPE | CASE | CASE TYPE | SCALE FACTOR |
|-------|------------|--------|-----------|--------------|
| F1 | ADD | DEAD | Static | 1.0000 |
| F2 | ADD | DEAD | Static | 1.0000 |
| | | LIVE | Static | 1.0000 |
| F3 | ADD | DEAD | Static | 1.0000 |
| | | SISMOX | Spectra | 0.2330 |
| | | SISMOY | Spectra | 0.0700 |
| F4 | ADD | DEAD | Static | 1.0000 |
| | | SISMOX | Spectra | 0.0700 |
| | | SISMOY | Spectra | 0.2330 |
| F5 | ADD | DEAD | Static | 1.0000 |
| | | SISMOX | Spectra | 0.1750 |
| | | SISMOY | Spectra | 0.0530 |
| | | LIVE | Static | 0.7500 |
| F6 | ADD | DEAD | Static | 1.0000 |
| | | SISMOX | Spectra | 0.0530 |
| | | SISMOY | Spectra | 0.1750 |
| | | LIVE | Static | 0.7500 |
| F7 | ADD | DEAD | Static | 0.6000 |
| | | SISMOX | Spectra | 0.2330 |
| | | SISMOY | Spectra | 0.0700 |
| F8 | ADD | DEAD | Static | 0.6000 |
| | | SISMOX | Spectra | 0.0700 |
| | | SISMOY | Spectra | 0.2330 |
| ENVF | ENVE | F1 | Combo | 1.0000 |
| | | F2 | Combo | 1.0000 |
| | | F3 | Combo | 1.0000 |
| | | F4 | Combo | 1.0000 |
| | | F5 | Combo | 1.0000 |
| | | F6 | Combo | 1.0000 |
| | | F7 | Combo | 1.0000 |
| | | F8 | Combo | 1.0000 |

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SUPPORT REACTIONS

| STORY | POINT | LOAD | FX | FY | FZ | MX | MY | MZ |
|-------|-------|----------|-------|-------|-------|--------|--------|--------|
| BASE | 13 | F1 | 0.93 | -0.95 | 15.05 | 0.755 | 1.068 | 0.000 |
| BASE | 13 | F2 | 1.40 | -1.26 | 19.50 | 1.037 | 1.617 | 0.000 |
| BASE | 13 | F3 Max | 2.60 | 1.00 | 16.29 | 4.514 | 4.329 | 0.121 |
| BASE | 13 | F3 Min | -0.75 | -2.90 | 13.81 | -3.003 | -2.193 | -0.121 |
| BASE | 13 | F4 Max | 1.47 | 1.73 | 15.86 | 5.856 | 2.117 | 0.061 |
| BASE | 13 | F4 Min | 0.39 | -3.63 | 14.24 | -4.345 | 0.019 | -0.061 |
| BASE | 13 | F5 Max | 2.54 | 0.29 | 19.32 | 3.798 | 3.930 | 0.091 |
| BASE | 13 | F5 Min | 0.02 | -2.65 | 17.45 | -1.864 | -0.969 | -0.091 |
| BASE | 13 | F6 Max | 1.69 | 0.84 | 19.00 | 4.802 | 2.274 | 0.046 |
| BASE | 13 | F6 Min | 0.87 | -3.20 | 17.77 | -2.868 | 0.687 | -0.046 |
| BASE | 13 | F7 Max | 2.23 | 1.38 | 10.27 | 4.212 | 3.902 | 0.121 |
| BASE | 13 | F7 Min | -1.12 | -2.52 | 7.79 | -3.305 | -2.620 | -0.121 |
| BASE | 13 | F8 Max | 1.10 | 2.11 | 9.84 | 5.553 | 1.690 | 0.061 |
| BASE | 13 | F8 Min | 0.02 | -3.25 | 8.22 | -4.647 | -0.408 | -0.061 |
| BASE | 13 | ENVF Max | 2.60 | 2.11 | 19.50 | 5.856 | 4.329 | 0.121 |
| BASE | 13 | ENVF Min | -1.12 | -3.63 | 7.79 | -4.647 | -2.620 | -0.121 |
| BASE | 7 | F1 | 0.41 | 1.30 | 17.93 | -1.816 | 0.468 | 0.000 |
| BASE | 7 | F2 | 0.44 | 1.68 | 21.74 | -2.325 | 0.509 | 0.000 |
| BASE | 7 | F3 Max | 2.55 | 3.16 | 18.60 | 1.841 | 4.600 | 0.121 |
| BASE | 7 | F3 Min | -1.74 | -0.57 | 17.25 | -5.473 | -3.664 | -0.121 |
| BASE | 7 | F4 Max | 1.14 | 3.72 | 18.98 | 2.985 | 1.880 | 0.061 |
| BASE | 7 | F4 Min | -0.33 | -1.12 | 16.88 | -6.617 | -0.944 | -0.061 |
| BASE | 7 | F5 Max | 2.04 | 2.99 | 21.29 | 0.556 | 3.603 | 0.091 |



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| | | | | | | | | |
|------|---|----------|-------|-------|-------|--------|--------|--------|
| BASE | 7 | F5 Min | -1.18 | 0.18 | 20.27 | -4.952 | -2.606 | -0.091 |
| BASE | 7 | F6 Max | 0.99 | 3.40 | 21.57 | 1.413 | 1.567 | 0.046 |
| BASE | 7 | F6 Min | -0.12 | -0.24 | 19.99 | -5.808 | -0.570 | -0.046 |
| BASE | 7 | F7 Max | 2.38 | 2.64 | 11.43 | 2.568 | 4.413 | 0.121 |
| BASE | 7 | F7 Min | -1.90 | -1.09 | 10.08 | -4.746 | -3.852 | -0.121 |
| BASE | 7 | F8 Max | 0.98 | 3.20 | 11.81 | 3.712 | 1.693 | 0.061 |
| BASE | 7 | F8 Min | -0.49 | -1.64 | 9.71 | -5.890 | -1.131 | -0.061 |
| BASE | 7 | ENVF Max | 2.55 | 3.72 | 21.74 | 3.712 | 4.600 | 0.121 |
| BASE | 7 | ENVF Min | -1.90 | -1.64 | 9.71 | -6.617 | -3.852 | -0.121 |

| | | | | | | | | |
|------|----|----------|-------|-------|-------|--------|--------|--------|
| BASE | 15 | F1 | -0.93 | -0.95 | 15.05 | 0.755 | -1.068 | 0.000 |
| BASE | 15 | F2 | -1.40 | -1.26 | 19.50 | 1.037 | -1.617 | 0.000 |
| BASE | 15 | F3 Max | 0.75 | 1.00 | 16.29 | 4.514 | 2.193 | 0.121 |
| BASE | 15 | F3 Min | -2.60 | -2.90 | 13.81 | -3.003 | -4.329 | -0.121 |
| BASE | 15 | F4 Max | -0.39 | 1.73 | 15.86 | 5.856 | -0.019 | 0.061 |
| BASE | 15 | F4 Min | -1.47 | -3.63 | 14.24 | -4.345 | -2.117 | -0.061 |
| BASE | 15 | F5 Max | -0.02 | 0.29 | 19.32 | 3.798 | 0.969 | 0.091 |
| BASE | 15 | F5 Min | -2.54 | -2.65 | 17.45 | -1.864 | -3.930 | -0.091 |
| BASE | 15 | F6 Max | -0.87 | 0.84 | 19.00 | 4.802 | -0.687 | 0.046 |
| BASE | 15 | F6 Min | -1.69 | -3.20 | 17.77 | -2.868 | -2.274 | -0.046 |
| BASE | 15 | F7 Max | 1.12 | 1.38 | 10.27 | 4.212 | 2.620 | 0.121 |
| BASE | 15 | F7 Min | -2.23 | -2.52 | 7.79 | -3.305 | -3.902 | -0.121 |
| BASE | 15 | F8 Max | -0.02 | 2.11 | 9.84 | 5.553 | 0.408 | 0.061 |
| BASE | 15 | F8 Min | -1.10 | -3.25 | 8.22 | -4.647 | -1.690 | -0.061 |
| BASE | 15 | ENVF Max | 1.12 | 2.11 | 19.50 | 5.856 | 2.620 | 0.121 |
| BASE | 15 | ENVF Min | -2.60 | -3.63 | 7.79 | -4.647 | -4.329 | -0.121 |

| | | | | | | | | |
|------|---|----------|-------|-------|-------|--------|--------|--------|
| BASE | 9 | F1 | -0.41 | 1.30 | 17.93 | -1.816 | -0.468 | 0.000 |
| BASE | 9 | F2 | -0.44 | 1.68 | 21.74 | -2.325 | -0.509 | 0.000 |
| BASE | 9 | F3 Max | 1.74 | 3.16 | 18.60 | 1.841 | 3.664 | 0.121 |
| BASE | 9 | F3 Min | -2.55 | -0.57 | 17.25 | -5.473 | -4.600 | -0.121 |
| BASE | 9 | F4 Max | 0.33 | 3.72 | 18.98 | 2.985 | 0.944 | 0.061 |
| BASE | 9 | F4 Min | -1.14 | -1.12 | 16.88 | -6.617 | -1.880 | -0.061 |
| BASE | 9 | F5 Max | 1.18 | 2.99 | 21.29 | 0.556 | 2.606 | 0.091 |
| BASE | 9 | F5 Min | -2.04 | 0.18 | 20.27 | -4.952 | -3.603 | -0.091 |
| BASE | 9 | F6 Max | 0.12 | 3.40 | 21.57 | 1.413 | 0.570 | 0.046 |
| BASE | 9 | F6 Min | -0.99 | -0.24 | 19.99 | -5.808 | -1.567 | -0.046 |
| BASE | 9 | F7 Max | 1.90 | 2.64 | 11.43 | 2.568 | 3.852 | 0.121 |
| BASE | 9 | F7 Min | -2.38 | -1.09 | 10.08 | -4.746 | -4.413 | -0.121 |
| BASE | 9 | F8 Max | 0.49 | 3.20 | 11.81 | 3.712 | 1.131 | 0.061 |
| BASE | 9 | F8 Min | -0.98 | -1.64 | 9.71 | -5.890 | -1.693 | -0.061 |
| BASE | 9 | ENVF Max | 1.90 | 3.72 | 21.74 | 3.712 | 3.852 | 0.121 |
| BASE | 9 | ENVF Min | -2.55 | -1.64 | 9.71 | -6.617 | -4.600 | -0.121 |

| | | | | | | | | |
|------|----|----------|-------|-------|-------|---------|--------|--------|
| BASE | 14 | F1 | 0.00 | -2.57 | 32.17 | 1.747 | 0.000 | 0.000 |
| BASE | 14 | F2 | 0.00 | -3.35 | 42.98 | 2.382 | 0.000 | 0.000 |
| BASE | 14 | F3 Max | 2.86 | -0.94 | 32.61 | 5.079 | 5.292 | 0.231 |
| BASE | 14 | F3 Min | -2.86 | -4.20 | 31.73 | -1.584 | -5.292 | -0.231 |
| BASE | 14 | F4 Max | 0.91 | 2.86 | 33.63 | 12.836 | 1.691 | 0.117 |
| BASE | 14 | F4 Min | -0.91 | -8.00 | 30.71 | -9.342 | -1.691 | -0.117 |
| BASE | 14 | F5 Max | 2.15 | -1.92 | 40.61 | 4.746 | 3.975 | 0.174 |
| BASE | 14 | F5 Min | -2.15 | -4.39 | 39.95 | -0.299 | -3.975 | -0.174 |
| BASE | 14 | F6 Max | 0.69 | 0.93 | 41.38 | 10.552 | 1.280 | 0.088 |
| BASE | 14 | F6 Min | -0.69 | -7.23 | 39.18 | -6.105 | -1.280 | -0.088 |
| BASE | 14 | F7 Max | 2.86 | 0.09 | 19.74 | 4.380 | 5.292 | 0.231 |
| BASE | 14 | F7 Min | -2.86 | -3.17 | 18.86 | -2.283 | -5.292 | -0.231 |
| BASE | 14 | F8 Max | 0.91 | 3.89 | 20.77 | 12.137 | 1.691 | 0.117 |
| BASE | 14 | F8 Min | -0.91 | -6.97 | 17.84 | -10.041 | -1.691 | -0.117 |
| BASE | 14 | ENVF Max | 2.86 | 3.89 | 42.98 | 12.836 | 5.292 | 0.231 |
| BASE | 14 | ENVF Min | -2.86 | -8.00 | 17.84 | -10.041 | -5.292 | -0.231 |

| | | | | | | | | |
|------|---|--------|-------|-------|-------|--------|--------|--------|
| BASE | 8 | F1 | 0.00 | 1.47 | 34.14 | -2.019 | 0.000 | 0.000 |
| BASE | 8 | F2 | 0.00 | 1.99 | 41.58 | -2.676 | 0.000 | 0.000 |
| BASE | 8 | F3 Max | 2.58 | 2.04 | 34.48 | -0.921 | 4.633 | 0.121 |
| BASE | 8 | F3 Min | -2.58 | 0.90 | 33.81 | -3.118 | -4.633 | -0.121 |
| BASE | 8 | F4 Max | 0.88 | 3.37 | 35.26 | 1.637 | 1.579 | 0.061 |
| BASE | 8 | F4 Min | -0.88 | -0.42 | 33.03 | -5.675 | -1.579 | -0.061 |
| BASE | 8 | F5 Max | 1.93 | 2.29 | 39.98 | -1.680 | 3.480 | 0.091 |
| BASE | 8 | F5 Min | -1.93 | 1.43 | 39.47 | -3.343 | -3.480 | -0.091 |



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|-----------|------------|----------|--------|--------|--------|---------|-----------|----------|
| BASE | 8 | F6 Max | 0.66 | 3.28 | 40.56 | 0.234 | 1.194 | 0.046 |
| BASE | 8 | F6 Min | -0.66 | 0.44 | 38.89 | -5.258 | -1.194 | -0.046 |
| BASE | 8 | F7 Max | 2.58 | 1.45 | 20.82 | -0.113 | 4.633 | 0.121 |
| BASE | 8 | F7 Min | -2.58 | 0.31 | 20.15 | -2.310 | -4.633 | -0.121 |
| BASE | 8 | F8 Max | 0.88 | 2.78 | 21.60 | 2.445 | 1.579 | 0.061 |
| BASE | 8 | F8 Min | -0.88 | -1.01 | 19.37 | -4.868 | -1.579 | -0.061 |
| BASE | 8 | ENVF Max | 2.58 | 3.37 | 41.58 | 2.445 | 4.633 | 0.121 |
| BASE | 8 | ENVF Min | -2.58 | -1.01 | 19.37 | -5.675 | -4.633 | -0.121 |
| | | | | | | | | |
| BASE | 43 | F1 | 0.29 | 0.08 | 3.82 | -0.182 | 0.332 | 0.000 |
| BASE | 43 | F2 | 0.41 | 0.10 | 6.17 | -0.224 | 0.470 | 0.000 |
| BASE | 43 | F3 Max | 1.19 | 0.31 | 4.39 | 0.429 | 1.975 | 0.062 |
| BASE | 43 | F3 Min | -0.61 | -0.15 | 3.26 | -0.793 | -1.311 | -0.062 |
| BASE | 43 | F4 Max | 0.68 | 0.43 | 4.55 | 0.734 | 0.987 | 0.032 |
| BASE | 43 | F4 Min | -0.10 | -0.27 | 3.10 | -1.098 | -0.323 | -0.032 |
| BASE | 43 | F5 Max | 1.06 | 0.27 | 6.01 | 0.247 | 1.670 | 0.047 |
| BASE | 43 | F5 Min | -0.30 | -0.08 | 5.16 | -0.674 | -0.798 | -0.047 |
| BASE | 43 | F6 Max | 0.67 | 0.36 | 6.13 | 0.475 | 0.931 | 0.024 |
| BASE | 43 | F6 Min | 0.09 | -0.17 | 5.04 | -0.902 | -0.059 | -0.024 |
| BASE | 43 | F7 Max | 1.08 | 0.28 | 2.86 | 0.502 | 1.842 | 0.062 |
| BASE | 43 | F7 Min | -0.73 | -0.18 | 1.73 | -0.721 | -1.444 | -0.062 |
| BASE | 43 | F8 Max | 0.56 | 0.40 | 3.02 | 0.807 | 0.854 | 0.032 |
| BASE | 43 | F8 Min | -0.21 | -0.30 | 1.57 | -1.025 | -0.456 | -0.032 |
| BASE | 43 | ENVF Max | 1.19 | 0.43 | 6.17 | 0.807 | 1.975 | 0.062 |
| BASE | 43 | ENVF Min | -0.73 | -0.30 | 1.57 | -1.098 | -1.444 | -0.062 |
| | | | | | | | | |
| BASE | 44 | F1 | -0.29 | 0.08 | 3.82 | -0.182 | -0.332 | 0.000 |
| BASE | 44 | F2 | -0.41 | 0.10 | 6.17 | -0.224 | -0.470 | 0.000 |
| BASE | 44 | F3 Max | 0.61 | 0.31 | 4.39 | 0.429 | 1.311 | 0.062 |
| BASE | 44 | F3 Min | -1.19 | -0.15 | 3.26 | -0.793 | -1.975 | -0.062 |
| BASE | 44 | F4 Max | 0.10 | 0.43 | 4.55 | 0.734 | 0.323 | 0.032 |
| BASE | 44 | F4 Min | -0.68 | -0.27 | 3.10 | -1.098 | -0.987 | -0.032 |
| BASE | 44 | F5 Max | 0.30 | 0.27 | 6.01 | 0.247 | 0.798 | 0.047 |
| BASE | 44 | F5 Min | -1.06 | -0.08 | 5.16 | -0.674 | -1.670 | -0.047 |
| BASE | 44 | F6 Max | -0.09 | 0.36 | 6.13 | 0.475 | 0.059 | 0.024 |
| BASE | 44 | F6 Min | -0.67 | -0.17 | 5.04 | -0.902 | -0.931 | -0.024 |
| BASE | 44 | F7 Max | 0.73 | 0.28 | 2.86 | 0.502 | 1.444 | 0.062 |
| BASE | 44 | F7 Min | -1.08 | -0.18 | 1.73 | -0.721 | -1.842 | -0.062 |
| BASE | 44 | F8 Max | 0.21 | 0.40 | 3.02 | 0.807 | 0.456 | 0.032 |
| BASE | 44 | F8 Min | -0.56 | -0.30 | 1.57 | -1.025 | -0.854 | -0.032 |
| BASE | 44 | ENVF Max | 0.73 | 0.43 | 6.17 | 0.807 | 1.444 | 0.062 |
| BASE | 44 | ENVF Min | -1.19 | -0.30 | 1.57 | -1.098 | -1.975 | -0.062 |
| | | | | | | | | |
| BASE | 21 | F1 | 0.00 | 0.24 | 4.87 | -0.370 | 0.000 | 0.000 |
| BASE | 21 | F2 | 0.00 | 0.31 | 7.99 | -0.466 | 0.000 | 0.000 |
| BASE | 21 | F3 Max | 0.95 | 0.45 | 5.55 | -0.018 | 1.697 | 0.062 |
| BASE | 21 | F3 Min | -0.95 | 0.04 | 4.19 | -0.722 | -1.697 | -0.062 |
| BASE | 21 | F4 Max | 0.33 | 0.91 | 7.15 | 0.801 | 0.590 | 0.032 |
| BASE | 21 | F4 Min | -0.33 | -0.43 | 2.59 | -1.541 | -0.590 | -0.032 |
| BASE | 21 | F5 Max | 0.71 | 0.45 | 7.73 | -0.176 | 1.275 | 0.047 |
| BASE | 21 | F5 Min | -0.71 | 0.14 | 6.69 | -0.709 | -1.275 | -0.047 |
| BASE | 21 | F6 Max | 0.25 | 0.80 | 8.92 | 0.437 | 0.447 | 0.024 |
| BASE | 21 | F6 Min | -0.25 | -0.21 | 5.50 | -1.322 | -0.447 | -0.024 |
| BASE | 21 | F7 Max | 0.95 | 0.35 | 3.61 | 0.130 | 1.697 | 0.062 |
| BASE | 21 | F7 Min | -0.95 | -0.05 | 2.24 | -0.574 | -1.697 | -0.062 |
| BASE | 21 | F8 Max | 0.33 | 0.82 | 5.20 | 0.949 | 0.590 | 0.032 |
| BASE | 21 | F8 Min | -0.33 | -0.52 | 0.65 | -1.393 | -0.590 | -0.032 |
| BASE | 21 | ENVF Max | 0.95 | 0.91 | 8.92 | 0.949 | 1.697 | 0.062 |
| BASE | 21 | ENVF Min | -0.95 | -0.52 | 0.65 | -1.541 | -1.697 | -0.062 |
| | | | | | | | | |
| Summation | 0, 0, Base | F1 | 0.00 | 0.00 | 144.79 | 724.433 | -1139.481 | 0.000 |
| Summation | 0, 0, Base | F2 | 0.00 | 0.00 | 187.36 | 979.761 | -1474.560 | 0.000 |
| Summation | 0, 0, Base | F3 MAX | 15.82 | 10.50 | 151.21 | 788.761 | -1160.331 | -3.727 |
| Summation | 0, 0, Base | F3 MIN | -15.82 | -10.50 | 138.37 | 660.104 | -1118.632 | 3.727 |
| Summation | 0, 0, Base | F4 MAX | 5.44 | 18.90 | 154.82 | 828.707 | -1208.370 | 118.762 |
| Summation | 0, 0, Base | F4 MIN | -5.44 | -18.90 | 134.75 | 620.158 | -1070.593 | -118.762 |
| Summation | 0, 0, Base | F5 MAX | 11.89 | 7.92 | 181.56 | 964.415 | -1406.575 | -2.559 |
| Summation | 0, 0, Base | F5 MIN | -11.89 | -7.92 | 171.88 | 867.443 | -1375.005 | 2.559 |



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|-----------|------------|----------|--------|--------|--------|----------|-----------|----------|
| Summation | 0, 0, Base | F6 MAX | 4.11 | 14.20 | 184.26 | 994.313 | -1442.531 | 89.120 |
| Summation | 0, 0, Base | F6 MIN | -4.11 | -14.20 | 169.18 | 837.545 | -1339.050 | -89.120 |
| Summation | 0, 0, Base | F7 MAX | 15.82 | 10.50 | 93.30 | 498.988 | -704.538 | -3.727 |
| Summation | 0, 0, Base | F7 MIN | -15.82 | -10.50 | 80.45 | 370.331 | -662.839 | 3.727 |
| Summation | 0, 0, Base | F8 MAX | 5.44 | 18.90 | 96.91 | 538.934 | -752.577 | 118.762 |
| Summation | 0, 0, Base | F8 MIN | -5.44 | -18.90 | 76.84 | 330.385 | -614.801 | -118.762 |
| Summation | 0, 0, Base | ENVF MAX | 16.47 | 20.68 | 188.30 | 1029.829 | -1451.443 | 72.127 |
| Summation | 0, 0, Base | ENVF MIN | -16.47 | -20.68 | 75.98 | 321.289 | -628.420 | -72.127 |



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ANEXO 8. DISEÑO DE ELEMENTOS NO ESTRUCTURALES



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DISEÑO DE ELEMENTOS NO ESTRUCTURALES (MUROS)

COLEGIO ENSUEÑO

MUROS PRIMER PISO

REF: CAPITULO A.9 NSR-10

1. Grado de Desempeño requerido: **Superior (Grupo de Uso III)**

2. Criterio de Diseño: **Elementos separados de la Estructura**

3. Fuerzas Sísmicas de Diseño:

$$F_p = \frac{a_x a_p}{R_p} g M_p \geq \frac{A_a I}{2} g M_p$$

a_x = Aceleración del Punto de Soporte (ref: A.9.4.2.1)

$$a_x = A_s + \frac{(S_a - A_s) h_x}{h_{eq}} \quad h_x \leq h_{eq}$$

$$a_x = S_a \frac{h_x}{h_{eq}} \quad h_x \geq h_{eq}$$

a_p = Amplificación Dinámica del Elemento No Estructural (ref: A.9.4.2.2 y Tabla A.9.5-1)

R_p = Capacidad de Disipación de Energía en el Rango Inelástico del Elemento (ref: A.9.4.9 y Tabla A.9.5-1)

Muros de Fachada:

Mampostería Reforzada Separada lateralmente de la Estructura, Apoyada solo Abajo

a_p = **2.5** R_p mínimo: **6**

Muros Divisorios:

Corredores

a_p = **1.0** R_p mínimo: **3**

Muros de Altura Total

a_p = **1.0** R_p mínimo: **1.5**

Muros de Altura Parcial

a_p = **2.5** R_p mínimo: **1.5**

Tipos de Anclaje:

| | |
|--------------|--------------------|
| Especiales: | R_p = 6.0 |
| Dúctiles: | R_p = 3.0 |
| No Dúctiles: | R_p = 1.5 |
| Húmedos: | R_p = 0.5 |

4. Calculo de las Aceleraciones de Piso:

| | | | |
|---------|--------------|------------------------------|---|
| A_a = | 0.15 | Bogotá (Cundinamarca) | Coefficiente de aceleración Pico-efectiva |
| A_s = | 0.478 | | Aceleración espectral, para un período de vibración igual a cero. |
| S_a = | 0.478 | | Aceleración espectral. (referencia FHE) |
| I = | 1.25 | | Coefficiente de Importancia |
| h_n = | 3.5 | | Altura desde la base al piso mas alto de la edificación |

h_{eq} : **2.63** Altura equivalente del sistema de un GDL, que simula la edificación. ($h_{eq} = 0.75 h_n$)



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| NIVEL | hx | ax |
|-------|------|-------|
| BASE | 0.00 | 0.598 |

5. Diseño de los elementos de reforzamiento

Mampostería de perforación Vertical

Altura del Muro: 3 m

Separación Dóvelas(máx: 150 cms) 1.5 m

Use Separación de: 0.9 m

Espesor del Muro: 0.12 m

Amplificación dinámica: 1

Aceleración del elemento : 0.598 Ver Tabla de Arriba.

Rp- Relacionado con el Anclaje: 3

Masa del Muro: 583.2 kg

$$Fp = \frac{a_x a_p}{R_p} gMp \geq \frac{a_a I}{2} gMp = 116.3 \text{ kg} \quad 54.7 \text{ kg}$$

HIPOTESIS 1. MURO EN VOLADIZO

$$Mu = Fp \cdot h/2 = 174.4 \text{ kg-m}$$

HIPOTESIS 2. MURO SIMPLEMENTE APOYADO

$$Mu = Fp \cdot h/4 = 87.2 \text{ kg-m}$$

HIPOTESIS 3. MURO EMPOTRADO EN LA BASE Y APOYADO SUPERIORMENTE

$$Mu+ = 5Fp \cdot h/32 = 54.5 \text{ kg-m}$$

$$Mu- = 3Fp \cdot h/16 = 65.4 \text{ kg-m} \quad Mmax = 65.4 \text{ kg-m}$$

Diseño de las Dovelas:

Separacion entre dovelas: 120 cm

Espesor del muro: 0.14 m

Recubrimiento a la barra: 7 cm

Nota: f'm=80 kg/cm² y Acero de 4200 kg/cm²

HIPOTESIS 1. MURO EN VOLADIZO

FLEXION

$$a = 117085.5$$

$$b = -3780.0$$

$$c = 3.0$$

$$Ro1: 0.031479$$

$$Ro2: 0.000805$$

$$Ro \text{ max: } 0.0159$$

$$\text{use: } Ro = 0.0008 < Romax = 0.0159 \text{ OK!}$$



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Acero de Refuerzo Longitudinal en cada d6vela:

As= 0.68 cm² use: 4 Ø5mm
3 Ø1/4"
1 Ø3/8"

HIPOTESIS 2. MURO SIMPLEMENTE APOYADO

FLEXION

a= 117085.5

b= -3780.0

c= 1.5

Ro1: 0.031887

use: Ro= 0.0004 < Romax= 0.0159 OK!

Ro2: 0.000397

Ro max: 0.0159

Acero de Refuerzo Longitudinal en cada d6vela:

As= 0.33 cm² use: 2 Ø5mm
2 Ø1/4"
1 Ø3/8"

HIPOTESIS 3. MURO EMPOTRADO EN LA BASE Y APOYADO SUPERIORMENTE

FLEXION

a= 117085.5

b= -3780.0

c= 1.1

Ro1: 0.031987

use: Ro= 0.0003 < Romax= 0.0159 OK!

Ro2: 0.000297

Ro max: 0.0159

Acero de Refuerzo Longitudinal en cada d6vela:

As= 0.25 cm² use: 2 Ø5mm
1 Ø1/4"
1 Ø3/8"

CORTANTE

Fuerza Cortante resistida por el muro:

ØVc= 3384.7 kg

Fuerza Cortante Total Resistida por el muro:

ØV= 3384.7 kg

HIPOTESIS 1. MURO EN VOLADIZO

Vu max= Fp= 116.3 kg ØV= 3384.7 kg OK!

HIPOTESIS 2. MURO SIMPLEMENTE APOYADO

Vu max= Fp/2= 58.1 kg ØV= 3384.7 kg OK!

HIPOTESIS 3. MURO EMPOTRADO EN LA BASE Y APOYADO SUPERIORMENTE

Vu max= 11Fp/16= 79.9 kg ØV= 3384.7 kg OK!