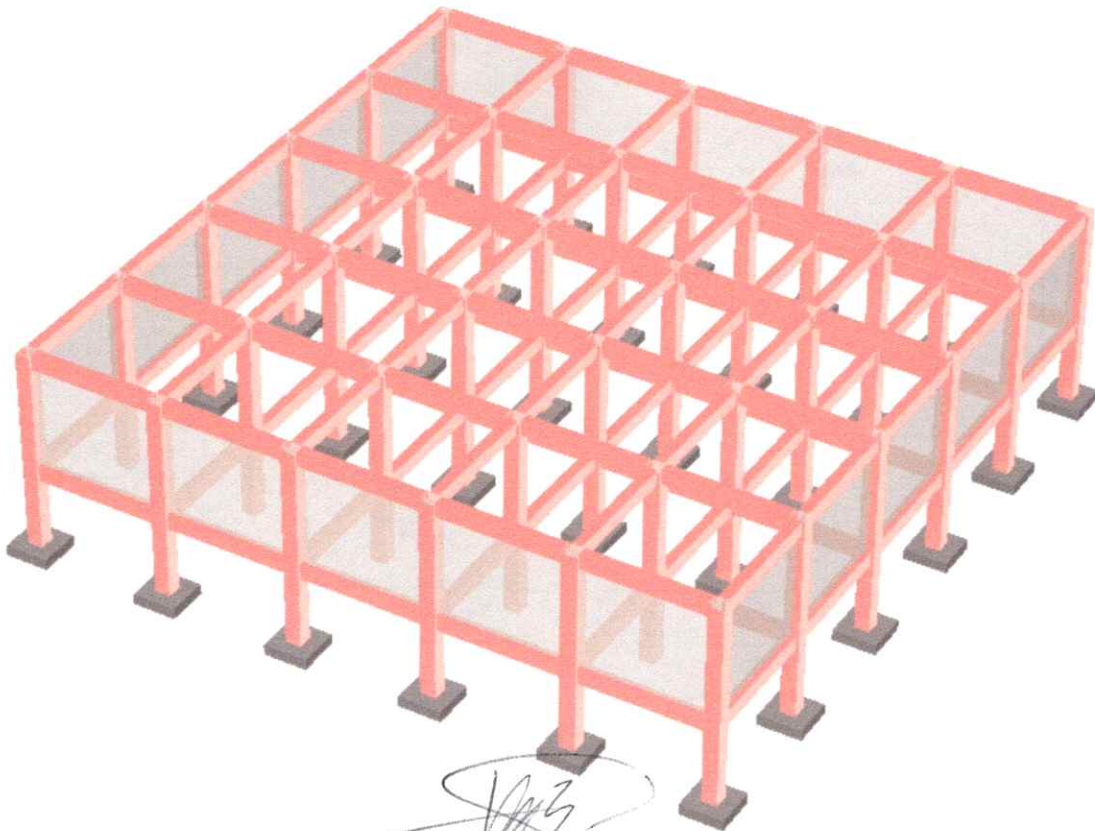

DISEÑO ESTRUCTURAL TANQUE DE ALMACENAMIENTO DE 1300m³ EN EL MUNICIPIO DE ACACIAS-META



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AGOSTO DE 2022

TABLA DE CONTENIDO

1	INTRODUCCIÓN	4
2	LOCALIZACIÓN GENERAL DEL PROYECTO.....	5
3	CARACTERÍSTICAS GENERALES DE LA ESTRUCTURA.....	6
4	PARÁMETROS SÍSMICOS DEL PROYECTO.....	7
5	NORMAS TÉCNICAS Y RECOMENDACIONES.....	8
6	SISTEMA DE UNIDADES	9
7	MATERIALES.....	10
7.1	ACERO ASTM A572 G. 50.....	10
7.2	ACERO ASTM A500 G. C.....	10
7.3	ACERO ASTM A36.....	10
7.4	CONCRETO.....	11
7.5	ACERO DE REFUERZO	11
8	ANÁLISIS DE CARGAS.....	12
8.1	CARGAS MUERTAS.....	12
8.2	CARGAS VIVAS.....	12
8.3	CARGAS VIVAS EN CUBIERTA.....	12
8.4	CARGAS DE VIENTO.....	13
8.5	CARGAS DE SISMO.....	16
8.6	ESPECTRO DE DISEÑO.....	20
9	IRREGULARIDAD EN ALTURA.....	21
10	IRREGULARIDAD EN PLANTA.....	23
11	CONSIDERACIONES ESPECIALES DE DISEÑO.....	24
12	ANÁLISIS ESTRUCTURAL DEL MODELO MATEMÁTICO 3D.....	25
12.1	DATOS DE ENTRADA DEL MODELO MATEMÁTICO	25
12.2	IMÁGENES DEL MODELO MATEMÁTICO	30
12.3	DISEÑO DE LOS ELEMENTOS ESTRUCTURALES.....	32
12.3.1	DISEÑO DE LOSA DE CIMENTACION.....	32
12.3.2	DISEÑO DE VIGAS.....	39
12.3.3	DISEÑO DE MUROS.....	83
12.3.4	VERIFICACION DE CORTANTE EN EL NODO.....	86
12.3.5	VERIFICACION DE JERARQUIA C.21.6 NSR10	89
12.3.6	DISEÑO DE COLUMNAS.....	90

TABLA DE IMÁGENES

Imagen 1. Modelo matemático 3D de la estructura	4
Imagen 2. Localización general del proyecto	5
Imagen 3. Vista en planta cimentación	30
Imagen 4. Vista en planta entrepiso	30
Imagen 5. Vista en planta entrepiso	30

ÍNDICE DE TABLAS

Tabla 1. Características generales de la estructura.....	6
Tabla 2. Unidades empleadas en el análisis	9
Tabla 3. Propiedades de las barras de acero de refuerzo corrugado	11
Tabla 4. Cargas vivas mínimas en cubiertas - Fuente NSR – 10.....	12

1 INTRODUCCIÓN

Se plantea la construcción de una estructura en concreto reforzado la cual se encuentra prevista como tanque de almacenamiento para una capacidad aproximada de 1300m^3 . Para el desarrollo estructural se planteo un sistema de resistencia sísmica de pórticos resistente a momentos PRM constituido por una losa aligerada en dos direcciones apoyada sobre vigas de $30\text{X}45\text{ cm}$ y a su vez a las columnas de $45\text{X}45\text{ cm}$ las cuales transmitirán la carga generada por la superestructura hasta el terreno mediante el sistema de cimentación empleado.

Se realizó evaluación de cargas gravitacionales muertas vivas y se realizó análisis sísmico modal espectral, validado con el método de la fuerza horizontal equivalente, de acuerdo con lo establecido en el Capítulo A.5 del Título A de NSR-10.

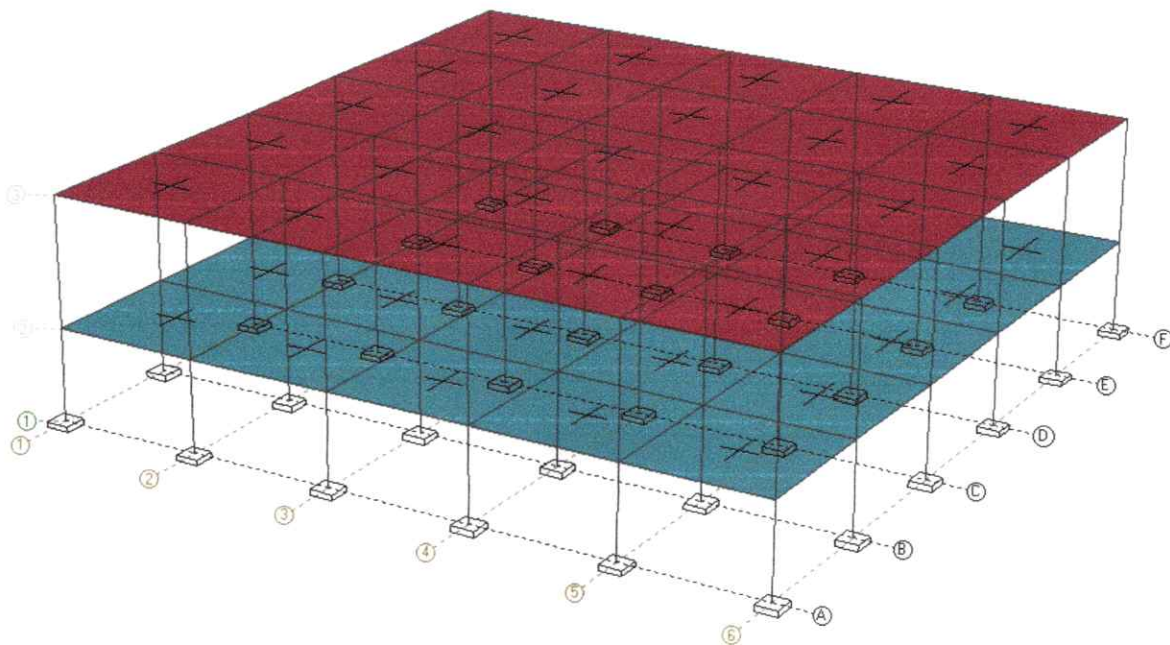


Imagen 1. Modelo matemático 3D de la estructura
Fuente: Elaboración propia

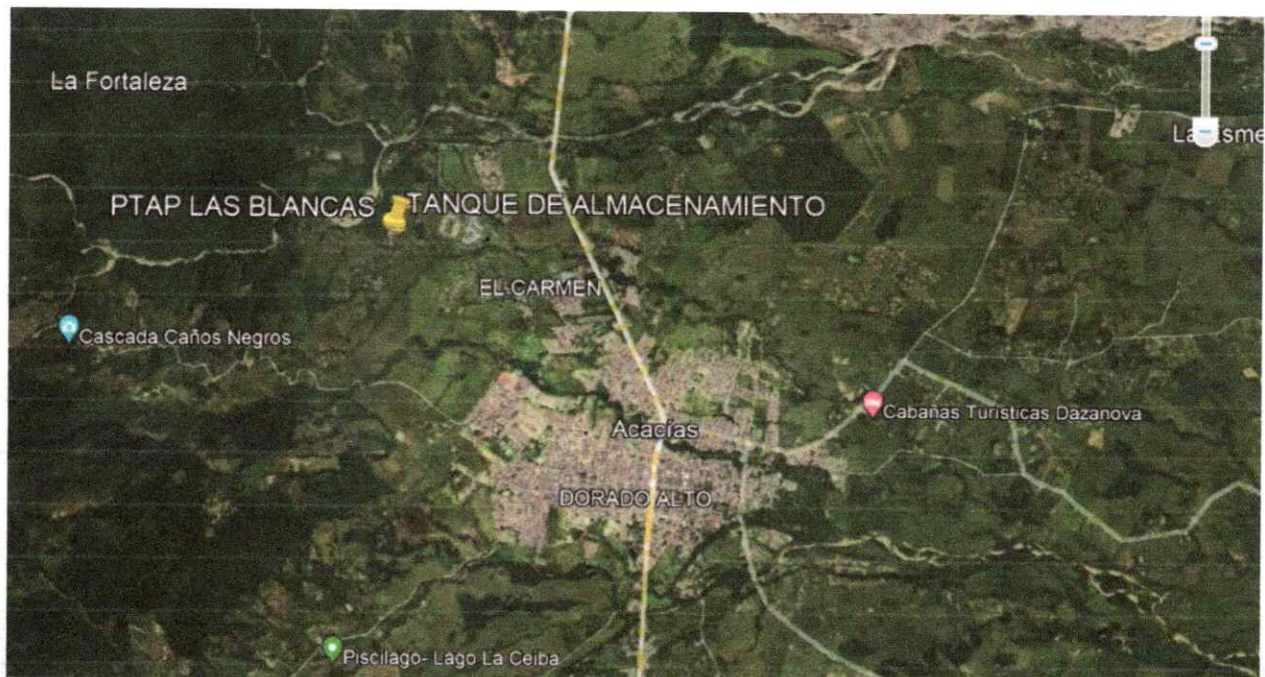
2 LOCALIZACIÓN GENERAL DEL PROYECTO

El proyecto se encuentra localizado en el municipio de acacias, en el departamento del Meta. El municipio de Acacias tiene una superficie de 1169 km², una altitud media de 498 m.s.n.m. y una temperatura media anual entre los 27 y 28 °C. Se encuentra localizado a 86 km de la capital del departamento, la ciudad de Villavicencio.



Imagen 2. Localización general del proyecto
Fuente: Wikipedia

La planta de tratamiento de agua potable se localiza en las coordenadas 4° 0'33.83"N y 73°47'30.90"O y el tanque de almacenamiento proyectado en las coordenadas 4° 0'35.99"N y 73°47'30.53"O



3 CARACTERÍSTICAS GENERALES DE LA ESTRUCTURA

El proyecto presenta las siguientes características desde el punto de vista estructural:

Tipo de estructura:	PRM
Zona de amenaza sísmica (según NSR-10)	Alta
Resistencia a la compresión del concreto $f'c$	28 MPa (4000 psi)
Acero para perfiles tubulares estructurales PTEC	ASTM A500 Gr. C
Sistema de cubierta	Losa aligerada
Sistema de entrepiso	Losa aligerada
Tipo de cimentación	Superficial

Tabla 1. Características generales de la estructura

Fuente: Elaboración propia

4 PARÁMETROS SÍSMICOS DEL PROYECTO

SEISMIC PARAMETERS - NSR-10

Effective peak acceleration, A_a = 0.30 ✓
 Effective peak velocity coeff, A_v = 0.30 ✓
 Importance coefficient, I = 1.50 ✓
 Site profile type, S = D ✓
 Amplification coefficient, F_a = 1.20 ✓
 Amplification coefficient, F_v = 1.80 ✓
 Limit period, T_o (sec) = 0.15 ✓
 Limit period, T_c (sec) = 0.72 ✓
 Long-period transition period, T_l (sec) . . = 4.32 ✓
 Amplified peak acceleration $A_a F_a$ = 0.36 ✓
 Amplified peak veloc. coefficient $A_v F_v$. . = 0.54 ✓
 Effective Building Weight = 2072.3 ton ✓
 Seismic base level = 1 ✓

X - DIRECTION Y - DIRECTION

	X - DIRECTION	Y - DIRECTION
Seismic Force-resisting system	= C: Moment	C: Moment
Fundamental period, T	= 0.240	0.240
Energy Dissipation Coefficient, R_o	= 7.00	7.00
Reduced Energy Dissipation Coefficient, R	= 6.30	6.30
Design base shear, V	= 2797.5	2797.5

5 NORMAS TÉCNICAS Y RECOMENDACIONES

Para el diseño de los elementos de concreto reforzado y de los elementos de acero, se consideraron los siguientes códigos y/o normativa:

- REGLAMENTO COLOMBIANO DE CONSTRUCCIÓN SISMO RESISTENTE NSR-10. Decreto 926 de 2010", Asociación Colombiana de Ingeniería Sísmica, AIS, 2010.
- GUÍA TÉCNICA ICCA- NAVES INDUSTRIALES CON ESTRUCTURA DE ACERO (GUÍA No. 1).
- NORMA COLOMBIANA DE DISEÑO DE PUENTES CCP14", Asociación Colombiana de Ingeniería Sísmica, AIS, 2014.
- REQUISITOS DE REGLAMENTO PARA CONCRETO ESTRUCTURAL ACI 318S-14, American Concrete Institute.
- STEEL CONSTRUCTION MANUAL. 14th Edition, American Institute of Steel Construction, AISC, 2005.
- ASCE. Minimum Design Loads for Buildings and Other Structures.
- Manual of Steel Construction Load and Resistance Factor Design 3rd Edition.
- ANSI/AISC 360-10 Specification for Structural Steel Buildings.
- AWS D1.1/D1.1M:2008 Structural Welding Code – Steel.
- AISC Detailing for Steel Construction.

6 SISTEMA DE UNIDADES

Los elementos de la estructura fueron analizados y diseñados empleando las unidades del sistema internacional de unidades SI:

Longitud	metros (m); centímetros (cm); milímetros (mm)
Área	metros cuadrados (m ²); milímetros cuadrados (mm ²)
Fuerza	Newton (N); kilo Newton (kN)
Esfuerzo	mega Pascales (MPa)
Masa	kilogramo (kg); Toneladas (T)
Períodos	segundos (s)
Frecuencias	Radianes por segundo (rad/s)

Tabla 2. Unidades empleadas en el análisis

Fuente: Elaboración propia

7 MATERIALES

7.1 ACERO ASTM A572 G. 50

Para los miembros tipo columnas y vigas se emplearon perfiles tipo W, IPE y HEA, cuyo material cumple la norma ASTM A572 Gr. 50. Las propiedades mecánicas del material se presentan a continuación:

Resistencia a la cedencia del acero	$f_y = 345 \text{ MPa}$
Resistencia última a la tracción	$f_y = 450 \text{ MPa}$
Módulo de elasticidad del acero	$E = 200\,000 \text{ MPa}$

7.2 ACERO ASTM A500 G. C

Para los elementos tipo correa que conforman la cubierta y los arriostramientos verticales de los PAC, se emplearon perfiles tubulares rectangulares tipo HSS cuyo material cumple la norma ASTM A500 Gr. C. Las propiedades mecánicas del material se presentan a continuación:

Resistencia a la cedencia del acero	$f_y = 345 \text{ MPa}$
Resistencia última a la tracción	$f_y = 430 \text{ MPa}$
Módulo de elasticidad del acero	$E = 200\,000 \text{ MPa}$

7.3 ACERO ASTM A36

Para las conexiones se empleó acero que cumple la norma ASTM A36. Las propiedades mecánicas del material se presentan a continuación:

Resistencia a la cedencia del acero	$f_y = 250 \text{ MPa}$
Resistencia última a la tracción	$f_y = 400 \text{ MPa}$
Módulo de elasticidad del acero	$E = 200\,000 \text{ MPa}$

7.4 CONCRETO

El concreto empleado en el análisis y diseño de los elementos de la cimentación corresponde a un concreto de 28 Mpa, las propiedades mecánicas más importantes se presentan a continuación:

Resistencia a la compresión del concreto

$$f'_c = 28 \text{ MPa}$$

Módulo de elasticidad del concreto

$$E = 21\,538 \text{ MPa}$$

7.5 ACERO DE REFUERZO

Malla electrosoldadas y acero de refuerzo en barras corrugadas:

Resistencia a la fluencia del acero

$$F_y = 420 \text{ MPa}$$

Módulo de elasticidad del acero

$$E = 200.000 \text{ MPa}$$

En la siguiente tabla se presentan las propiedades de las barras corrugadas empleadas en el diseño estructural del proyecto. Las dimensiones nominales corresponden a las establecidas en el título C del NSR – 10.

Designación de la barra	Diámetro en pulgadas	Dimensiones nominales		Peso (kg/m)
		Ø (mm)	A (mm ²)	
No. 2	1/4	6.4	32	0.25
No. 3	3/8	9.5	71	0.56
No. 4	1/2	12.7	129	0.994
No. 5	5/8	15.9	199	1.552
No. 6	3/4	19.1	284	2.235
No. 7	7/8	22.2	387	23.042
No. 8	1	25.4	510	3.973

Tabla 3. Propiedades de las barras de acero de refuerzo corrugado

Fuente: Elaboración propia

8 ANÁLISIS DE CARGAS

Las cargas aplicadas en la estructura están bajo las consideraciones y recomendaciones establecidas en el título B del NSR-10. A continuación se definen los parámetros generales que se tuvieron en cuenta en el análisis de las cargas y se detallan en los anexos.

8.1 CARGAS MUERTAS

Se proyectó un sistema de losa aligerada en 02 direcciones para la losa del nivel N+ 2.50m que resistirá todo el contenido equivalente a 1300 m³ con un peso estimado de 1300 ton/m²

8.2 CARGAS VIVAS

Se realizó el diseño para una carga viva de 180 Kg/m²

8.3 CARGAS VIVAS EN CUBIERTA

Debido a que el proyecto exige el uso de una carga viva de 50 kg/m², se asoció esta carga al valor según tabla B.4.2.1-2 del título B del NSR-10, para cubiertas con ángulos de inclinación menores a 15°, la carga que se debe utilizar corresponde a 50 kg/m².

Tipo de Cubierta	Carga uniforme (kN/m ²) m ² de área en planta	Carga uniforme (kg/m) m ² de área en planta
Cubiertas, Azoteas y Terrazas	La misma del resto de la edificación (Nota-1)	La misma del resto de la edificación (Nota-1)
Cubiertas usadas para jardines de cubierta o para reuniones	5.00 ✓	500
Cubiertas inclinadas con más de 15° de pendiente en estructura metálica o de madera con imposibilidad física de verse sometidas a cargas superiores a la aquí estipulada	0.35 ✓	35
Cubiertas inclinadas con pendiente de 15° o menos en estructura metálica o de madera con imposibilidad física de verse sometidas a cargas superiores a la aquí estipulada	0.50 ✓	50

Nota-1 — La carga viva de la cubierta no debe ser menor que el máximo valor de las cargas vivas usadas en el resto de la edificación, y cuando esta tenga uso mixto, tal carga debe ser la mayor de las cargas vivas correspondientes a los diferentes usos.

Tabla 4. Cargas vivas mínimas en cubiertas - Fuente NSR - 10

8.4 CARGAS DE VIENTO

WIND LOADS NSR-10

Wind pressure

$$p = q G C_p \text{ rigid buildings}$$

$$= q G_f C_p \text{ flexible buildings}$$

$$q_z = 0.00483 K_z K_{zt} K_d V^2 I \text{ (Kg/m}^2\text{); } V \text{ in Km/h}$$

WIND LOADING PARAMETERS

Basic wind speed (Km/h), V = 150

V : 3-second gust speed at 10 m, with annual probability of 0.002

Importance factor, I = 1.15

OCCUPANCY CATEGORY IMPORTANCE FACTOR

	(1)	(2)
I Normal occupancy buildings	0.87	0.77
II Especial occupancy buildings	1.00	1.00
III Public assistance facilities	1.15	1.15
IV Essential facilities	1.15	1.15

(1): Non-hurricane prone regions with $V=140-160$ km/h

(2): Hurricane prone regions with $V > 160$ Km/h

Exposure category = D

ROUGHNESS DESCRIPTION

- B Urban and suburban areas, wooded areas, obstructions > 30ft
- C Open terrain with scattered obstructions less than 30 ft
- D Flat, unobstructed areas, wind over large bodies of water

Directionality factor, K_d = 0.85

Topographic factor, K_{zt} = 1.0

$$K_{zt} = (1 + K_1 K_2 K_3)^2$$

Wall pressure coefficients, C_p

Windward wall	= 0.8
Leeward wall (Wind X)	= -0.5
Leeward wall (Wind Y)	= -0.5
Side walls	= -0.7
Roof	= 0.0

GUST EFFECTS FACTORS

Basic wind velocity, (Km/h) = 150

Exposure category = D

Exposed height, (m) = 6

X-direction Y-direction

Estimated natural frequency, f (Hz) =	5.36	5.36
Height / Length ratio, H/L =	.3	.3
Structure classification	RIGID	RIGID

Background response index, Q = .91 .91 (Eq. B.6.5-4)

Resonant response factor, R_1 * = .083 .083 (Eq. B.6.5-8)

Gh: Rigid - Simplified analysis .. = .85 .85 (Sec B.6.5.8.1)

Gh: Rigid - Complete analysis = .878 .878 (Eq. B.6.5-2)

Gf: Flexible -Analytical(2% dampng)= 1.125 1.125 (Eq. B.6.5-2)

Gf: Flexible -Analytical(1% dampng)= 1.126 1.126 (Eq. B.6.5-2)

Gust effects factor, G = .878 .878

* 1% damping ratio. For damping ratio B , $R = R_1 * (0.01/B)^{1/2}$

VELOCITY PRESSURE

Floor Height Pressure
- z, m qz, K/m²

Floor	Height z, m	Pressure qz, K/m ²
3	6.00	115.97
2	2.50	110.61
1	0.0	110.61

ACCIDENTAL TORSION FOR WIND LOADS

X-direction Y-direction

Accidental eccentricity as a percentage of building dimension, (%) = 15 15

WY is Envelope of: WX is Envelope of:
Case 1: Pwy + Ply Case 1: Pwx + Plx
Case 2: 0.75 (Pwy + Ply) + Mt Case 2: 0.75 (Pwx + Plx) + Mt
Mt = 0.75(Pwy + Ply)Bx ex Mt = 0.75(Pwx + Plx)By ey
NOTE: Load cases 3 and 4 are handled through load combinations

ACCIDENTAL ECCENTRICITY WIND LOADS

X-DIRECTION (WY) Y-DIRECTION (WX)

Level ex ey
- (m) (m)

Level	ex (m)	ey (m)
3	3.00	3.00
2	3.00	3.00

WY is Envelope of: WX is Envelope of:
Case 1: Pwy + Ply Case 1: Pwx + Plx
Case 2: 0.75 (Pwy + Ply) + Mt Case 2: 0.75 (Pwx + Plx) + Mt
Mt = 0.75(Pwy + Ply)Bx ex Mt = 0.75(Pwx + Plx)By ey
NOTE: Load cases 3 and 4 are handled through load combinations

Wind nodal forces:

$$\begin{aligned} P_w &= S p_z A_i & P_l &= S p_h A_i \\ P_s &= S p_h A_i & P_r &= S p_h A_i \\ A_i &= \text{Nodal tributary area} \end{aligned}$$

WIND FORCES: X-DIRECTION

Floor No	Height z, m	Windward Pw, Ton	Leeward Pl, Ton	Side Ps, Ton	Roof Pr, Ton
3	6.00	2.84	1.78	2.49	0.0
2	2.50	4.65	3.04	4.28	0.0
1	0.0	1.94	1.26	1.78	0.0

Base shear, V: S(Pw + Pl) .. = 15.56 ton
Building Weight, W = 2072.25 ton (V/W = 0.008)
Overturning moment
From horizontal forces . = 47.09 ton-m
From roof forces = 0.0 ton-m
Total moment, Mo = 47.09 ton-m

Stabilizing moment, Ms... = 20722.44 ton-m (Mo/Ms = 0.002)

Wind nodal forces:

$$P_w = S p_z A_i \quad P_l = S p_h A_i$$

$$P_s = S p_h A_i \quad P_r = S p_h A_i$$

A_i = Nodal tributary area

WIND FORCES: Y-DIRECTION

Floor No	Height z, m	Windward Pw, Ton	Leeward Pl, Ton	Side Ps, Ton	Roof Pr, Ton
3	6.00	2.84	1.78	2.49	0.0
2	2.50	4.65	3.04	4.28	0.0
1	0.0	1.94	1.26	1.78	0.0

Base shear, V:S(Pw+Pl) .. = 15.56 ton

Building Weight, W = 2072.25 ton (V/W = 0.008)

Overtuning moment

From horizontal forces . = 47.09 ton-m

From roof forces = 0.0 ton-m

Total moment, Mo = 47.09 ton-m

Stabilizing moment, Ms... = 20722.44 ton-m (Mo/Ms = 0.002)

8.5 CARGAS DE SISMO

SEISMIC FORCE RESISTING SYSTEM

System X-Direction: C: Moment Res.Frame
System Y-Direction: C: Moment Res.Frame
Energy dissip capacity: 3: Special-DES
EQUIVALENT STATIC EARTHQUAKE FORCES COL NSR-10
Base Shear

$$V = S_a W$$

$$S_a = 1.2 A_v F_v I / T, S_a = 1.2 A_v F_v T_I / T^2 \text{ for } T > T_I$$

$$S_a = 2.5 A_a F_a I \text{ for } T < T_c, \text{ where } T_c = 0.48 A_v F_v / A_a F_a$$

SEISMIC PARAMETERS

Eff. peak acceleration & veloc., $A_a = .3$ $A_v = .3$
Region: 10 9 8 7 6 5 4 3 2 1
Aa or Av 0.50 0.45 0.40 0.35 0.30 0.25 0.20 0.15 0.10 0.05

LOCATION	Aa	Av	Menace
Barranquilla, Cartagena, San Andres, Valledupar	0.10	0.10	Low
Bogota, Medellin	0.15	0.20	Interm
Armenia, Bucaramanga, Cali, Manizalez, Pereira	0.25	0.25	High
Cucuta, Villavicencio	0.35	0.30	High
Quibdo	0.35	0.35	High

Importance coefficient, I = 1.50

GROUP	COEFFICIENT
IV - Essential facilities	1.50
III - Public assistance facilities	1.25
II - Especial occupancy buildings	1.10
I - Normal occupancy buildings	1.00

Site profile type, S = D

TYPE	SOIL PROFILE TYPE	Shear Wave Velocity
A	Hard Rock	> 1500 m/s
B	Rock	1500 - 760 m/s
C	Very Dense Soil & Soft Rock	760 - 360 m/s
D	Stiff Soil Profile	360 - 180 m/s
E	Soft Soil Profile	< 180 m/s
F	Soils requiring site-specific evaluations	

	X-direction	Y-direction
Seismic Force-resisting system	= C: Moment	C: Moment
Energy Dissipation Coefficient, Ro	= 7	7
T = 0.1 N	= .2	.2
Ta = Ct (Hn) ^ x	= 0.047 H ^ 0.9	0.047 H ^ 0.9
	= .24	.24
*Tmax: 1.7 Ta	= .41	.41
*Tmax = Cu Ta		
Cu = 1.75 - 1.2 Av Fv	>= 1.2	
Fundamental period, T	= .24	.24

DESIGN SPECTRAL RESPONSE ACCELERATION PARAMETERS

	Short Periods	Long Periods
Effect. peak acceleration & velc., Aa	= 0.30	Av = 0.30
Site coefficients (Tables below), Fa	= 1.20	Fv = 1.80
Design response parameters, Aa Fa	= 0.36	Av Fv = 0.54
Long-period transition period, TI sec	= 4.32	(2.4 Fv)

Site Coefficient Fa

Site Class	Aa<=0.1	Aa=0.2	Aa=0.3	Aa=0.4	Ss>=0.5
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	a	a	a	a	a

Site Coefficient Fv

Site Class	Av<=0.1	Av=0.2	Av=0.3	Av=0.4	Av>=0.5
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	a	a	a	a	a

a: Site-specific geotechnical investigation required

Reduction in R for Irregularity and Lack of Redundancy:

PLAN IRREGULARITIES		ELEVATION IRREGULARITIES	
Type Description	ϕ_p	Type Description	ϕ_a
1aP Torsional	0.9	1aA Flexible	0.9
1bP Torsional Extrme	0.8	1bA Flexible Extrme	0.8
2P Reentrant corners	0.9	2A Mass	0.9
3P Diaph. discontin.	0.9	3A Geometrical	0.9
4P Plane shifting	0.8	4A Plane shifting	0.8
5P Unparallel grid	0.9	5aA Weak Story	0.9
		5bA Weak Story Extr	0.8

NOTE: EngSolutions RCB assumes irregular building.
For regular buildings make ($\phi_p \cdot \phi_a$) = 1.0

X-DIRECTION Y-DIRECTION

Reduct. factor, ($\phi_p \cdot \phi_a$) = .9 .9
Redundancy factor, ϕ_r = 1 1
R = ($\phi_p \cdot \phi_a$) ϕ_r Ro

TOTAL BASE SHEAR

Building Weight, W, (ton) = 2072.25

Peak Acceleration Coeffi., Fa Aa = .36
Peak Velocity coefficient, Fv Av = .54
Transition period, Tc = .72
Importance factor, I = 1.5
Site class, S = D

X-direction Y-direction

Energ-disspat coeff, R = 6.3 6.3
Period, T, (sec) . . . = .24 .24
1.2 Av Fv I / T = 4.05 4.05
2.5 Aa Fa I = 1.35 1.35
Sa = 1.35 1.35
Total Base Shear, V, (ton) = 2797.54 2797.54

ACCIDENTAL TORSION

X-direction Y-direction

Accidental eccentricity as a
percentage of building dimension, (%) = 5 5

ACCIDENTAL ECCENTRICITY:

X-DIRECTION (EQY)		Y-DIRECTION (EQX)				
Level	dexo	Ax	dex	dexo	Ax	dex
-	(m)	-	(m)	(m)	-	(m)
3	1.00	1.00	1.00	1.00	1.00	1.00
2	1.00	1.00	1.00	1.00	1.00	1.00

Ax: Amplification factor for accidental eccentricity
 EQY: Envelope (1) $E_x = e_x$ EQX: Envelope (1) $E_y = e_y$
 (2) $E_x = e_x + dex$ (2) $E_y = e_y + dey$
 (3) $E_x = e_x - dex$ (3) $E_y = e_y - dey$

DESIGN ECCENTRICITY: $E = e + de$

X-DIRECTION (EQY)				Y-DIRECTION (EQX)				
Level	Center	Inherent	Accident	Design	Center	Inherent	Accident	Design
-	Mass	Eccent.	Eccent.	Eccent.	Mass	Eccent.	Eccent.	Eccent.
-	CMx	e_x^*	dex	E_x	CMy	e_y^*	dey	E_y
3	10.00	0.00	1.00	1.0000	10.00	0.00	1.00	1.0000
2	10.00	0.00	1.00	1.0000	10.00	0.00	1.00	1.0000

Note: * Inherent eccentricity: $e_x = CM_x - CR_x$ and $e_y = CM_y - CR_y$
 All values are in meters

DESIGN ECCENTRICITY: $E = e - de$

X-DIRECTION (EQY)				Y-DIRECTION (EQX)				
Level	Center	Inherent	Accident	Design	Center	Inherent	Accident	Design
-	Mass	Eccent.	Eccent.	Eccent.	Mass	Eccent.	Eccent.	Eccent.
-	CMx	e_x^*	dex	E_x	CMy	e_y^*	dey	E_y
3	10.00	0.00	1.00	-1.000	10.00	0.00	1.00	-1.000
2	10.00	0.00	1.00	-1.000	10.00	0.00	1.00	-1.000

Note: * Inherent eccentricity: $e_x = CM_x - CR_x$ and $e_y = CM_y - CR_y$
 All values are in meters

Equivalent Forces

$$F_i = (W_i H_i^n / \sum W_j H_j^n) V$$

$$V = \sum F_i$$

$$V = S_a W$$

EQUIVALENT FORCES: X-DIRECTION (EQUAKE X)

Floor	Height	Weight	$W_i H_i^n$	Force	Shear	Torsion
i	H _i	W _i	$\sum W_j H_j^n$	F _i	V _i	T _i =F _i (E _y -e _y)
-	(m)	(ton)	(ton)	(ton)	(ton)	(ton-m)
3	6.00	400.8	0.365	1021.00	1021.0	1021.0
2	2.50	1671	0.635	1776.4	2797.5	1776.4
S		2072.25		2797.5		

n = 1

EQUIVALENT FORCES: Y-DIRECTION (EQUAKE Y)

Floor	Height	Weight	$W_i H_i^n$	Force	Shear	Torsion
i	H _i	W _i	$\sum W_j H_j^n$	F _i	V _i	T _i =F _i (E _x -e _x)
-	(m)	(ton)	(ton)	(ton)	(ton)	(ton-m)
3	6.00	400.8	0.365	1021.00	1021.0	1021.0
2	2.50	1671	0.635	1776.4	2797.5	1776.4
S		2072.25		2797.5		

n = 1

ACCELERATIONS ON NON-STRUCTURAL ELEMENTS- NSR-10

FLOOR ACCELERATIONS

Level	hx	hx/heq	ax
3	6.00	1.33	1.799
2	2.50	0.56	0.990

Seismic base level = 1
 Height above seismic base, hn = 6.00 m
 Equivalent height, heq = 0.75 hn = 4.50 m
 Ground acceleration, As = Aa Fa I = 0.540
 Spectral acceleration, Sa = 1.350

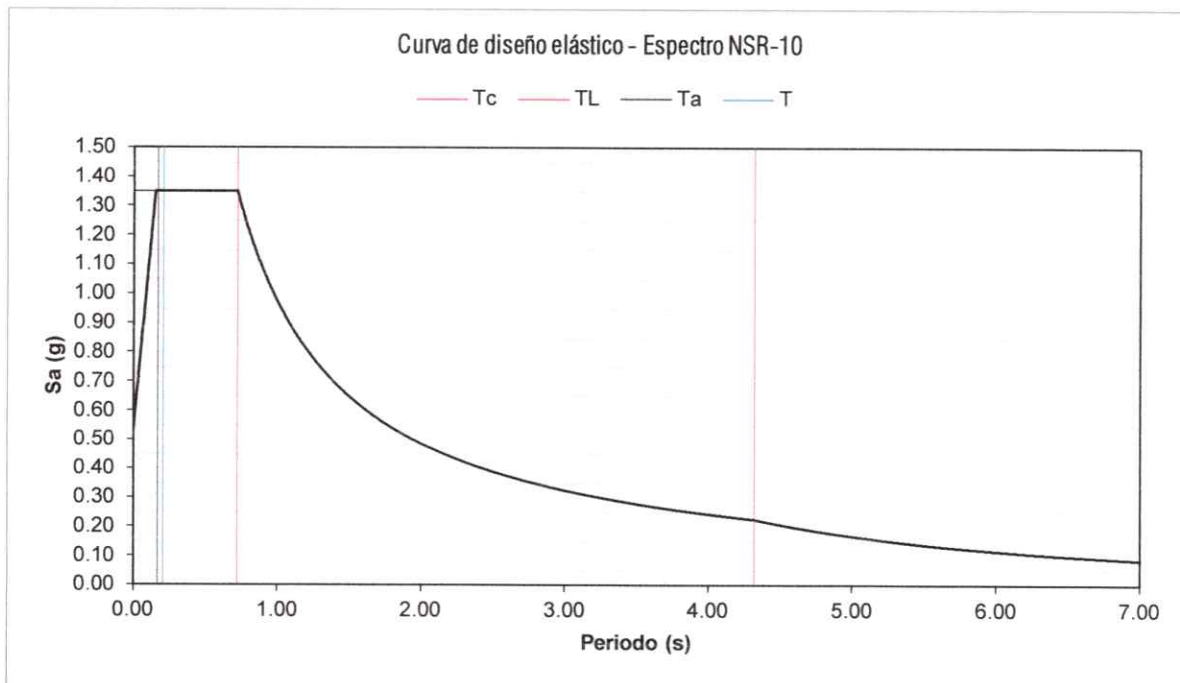
$ax = Sa \cdot hx/heq$ for $hx > heq$
 $ax = As + (Sa - As) \cdot hx/heq$ for $hx < heq$

Force on structural non-seismic element : $Fp = ax \cdot Wp / Ro$
 Force on nonstructural element : $Fp = ax \cdot ap \cdot Wp / Rp$
 $> 0.5 Aa I Wp$
 ap : component amplification factor

8.6 ESPECTRO DE DISEÑO

LOCALIZACIÓN GEOGRÁFICA Y
PARÁMETROS SÍSMICOS

Municipio:	Acacias	
Departamento:	Meta	
Perfil del suelo:	D	
Aa	0.30	Coefficiente de aceleración pico espectral
Av	0.30	Coefficiente de velocidad pico espectral
Fa	1.20	Coefficiente que modifica la aceleración pico espectral
Fv	1.80	Coefficiente que modifica la velocidad pico espectral
I	1.50	Coefficiente de importancia
Ta (s)	0.17	Periodo aproximado de la estructura
T ₀ (s)	0.15	Periodo inicial
T _c (s)	0.72	Periodo corto
T _L (s)	4.32	Periodo largo



9 IRREGULARIDAD EN ALTURA

DRIFT-BASED FLEXIBLE-STORY CHECK - NSR-10
EARTHQUAKE - X EARTHQUAKE - Y

Story Dn/Dn+1	Dcm* Irregular	Dcm/h	Dn/Dn+1	Irregular	Dcm*	Dcm/h
2	0.0644	0.0002	-	-	0.0644	0.0002
1	15.6706 ?	1.0087	0.0040	15.6706 ?	1.0087	0.0040

* Dcm: Story drift at center of mass (cm)
n/n+1 D/h: (Dcm/h)n/(Dcm/h)n+1: Ratio between drift ratio at CM of a story and that of story above

Vertical irregularities type 1a, 1b, 2 and 3 do not apply if drift ratio of each story is less than 1.3 that of next story above (i.e. n/n+1 D/h < 1.3). Story drift ratio of top two stories are not considered

Stiffness-based flexible story check is not required!
It can be considered that vertical irregularities type 1aA, 1bA, 2A and 3A DO NOT EXIST!

Use: $\alpha_a = 1$

DESIGN-SHEAR BASED STORY STIFFNESS

Story	X-DIRECTION			Y-DIRECTION		
	Shear X	Dcm X	Kx	Shear Y	Dcm Y	Ky
2	1021.0	0.0644	15861.8	1021.0	0.0644	15861.8
1	2797.4	1.0087	2773.3	2797.4	1.0087	2773.3

Shear: Design Shear, in ton
Dcm: Drift at center of mass, in cm
K: Story stiffness, in ton/cm

STIFFNESS-BASED FLEXIBLE-STORY CHECK - NSR-10
EARTHQUAKE - X EARTHQUAKE - Y

Story Kn/Kavg3	Kn Irregular	Kn/Kn+1	Kn/Kavg3	Irregular	Kn	Kn/Kn+1
2	15861.8	-	-	-	15861.8	-
1	2773.3	0.175	-	EXT	2773.3	0.175

Kn: Stiffness of story n, in ton/cm
Kn/Kn+1: Ratio between stiffness of story n and that of store above n
Kn/Kavg3: Ratio between stiffness of story n and average stiffness of three stories above n

Stiffness-soft story irregularity is considered to exist if $Kn/Kn+1 < 0.7$ or $Kn/Kavg3 < 0.8$
Stiffness-EXTreme soft story irregularity is considered to exist if $Kn/Kn+1 < 0.6$ or $Kn/Kavg3 < 0.7$

STIFFNESS-SOFT STORY IRREGULARITY (1aA) EXIST !!!
STIFFNESS-EXTREME SOFT STORY IREGULARITY (1bA) EXIST !!!

Notes:

The determination stiffness-soft story irregularity (vertical structural irregularity types 1a and 1b) is conducted based on story-stiffness computed for the design seismic shear distribution, according to FEMA's NEHRP Recommended Provisions for Seismic Regulations for New Buildings and other Structures, Provisions and Commentary ed. 1994, 1997, 2000, 2003, 2009, which is applicable to the following building codes derived from the above documents: (USA) IBC-03/06, ASCE 7-05/10, CBC-01/07, UBC-97, (COLOMBIA) NSR-10, (PAN) REP-2004,(DOM) R-001, (GUA) NSE10.

WEIGHT (MASS) IRREGULARITY CHECK

Floor	Wn	Wn/Wn+1	Wn/Wn-1	Irregular
3	400.8	-	0.240	-
2	1671.4	-	-	-

Wn: Effective weight of floor n, in ton
Wn/Wn+1: Ratio between weight of floor n and weight of floor above n
Wn/Wn-1: Ratio between weight of floor n and weight of floor below n

Weight (mass) irregularity is considered to exist if effective weight of any floory is more than 1.5 times the effective weight of an adjacent floor. That is, if $Wn/Wn+1 > 1.5$ or $Wn/Wn-1 > 1.5$.
A roof that is lighter than the floor below is not considered.

Weight (mass) irregularity (2A) does NOT exist.

10 IRREGULARIDAD EN PLANTA

PLAN TORSIONAL IRREGULARITY CHECK - NS

R - 10		EARTHQUAKE - X				EARTHQUAKE - Y	
Level	D/h max	D/h avg	max/avg D/h	Irregular	D/h max	D/h avg	
3	0.0002	0.0002	1.0000	NO	0.0002	0.0002	
1.0000	NO						
2	0.0043	0.0040	1.0768	NO	0.0043	0.0040	
1.0768	NO						

Torsional irregularity is considered to exist if D/h max > 1.2 D/h ave
 EXTreme torsional irregularity is considered to exist if D/h max > 1.4 D/h ave

Torsional irregularities do NOT exist.

Accidental torsion does not have to be amplified

Notes:

The determination of torsional irregularities (plan structural irregularity type 1) and computation

of amplification factors for accidental torsion A_x , is conducted according to FEMA's NEHRP Recommended

Provisions for Seismic Regulations for New Buildings and other Structures, Provisions and Commentary

ed. 1994, 1997, 2000, 2003, 2009, which is applicable to the following building codes derived from the above

documents: (USA) IBC-03/06, ASCE 7-05/10, CBC-01/07, UBC-97, (COLOMBIA) NSR-10, and (PAN) REP-2004,(Dom) R-001, (GUA) NSE10.

11 CONSIDERACIONES ESPECIALES DE DISEÑO

Para el diseño estructural de la caja se tuvieron en cuenta las siguientes consideraciones:

- Se escogió un sistema estructural para el proyecto según clasificación de NSR-10.
- Se realizó predimensionamiento y configuración estructural del sistema según requisitos de NSR-10.
- Se definieron los materiales de la estructura en el modelo matemático.
- Se crearon elementos tipo frame para columnas y vigas y elementos tipo membrana para las losas nervadas del entrepiso y para la cubierta.
- Se realizó evaluación de carga gravitacionales (muertas y vivas).
- Las cargas muertas se asignaron según uso de la estructura.
- Se asignaron cargas vivas según uso de la estructura.
- Se aplicaron cargas distribuidas sobre los elementos tipo membrana.
- Se asignó un diafragma rígido para los entrepisos y un diafragma flexible para el nivel de la cubierta (que está compuesto por una cubierta liviana).
- Se aplicaron cargas sísmicas por el método de la fuerza horizontal equivalente (en el centro de masa de los respectivos diafragmas).
- Se realizó análisis modal de la estructura según las propiedades dinámicas de a misma y de tal forma que se excitara el 90 % de la masa participante según lo establecido en el capítulo A.5 de NSR-10.
- Se realizó ajuste de la estructura hasta lograr el cumplimiento de un margen de error del 10 % del periodo estimado inicialmente con el periodo real de la estructura, obtenido del análisis modal.
- Se realizó proceso iterativo (modificando secciones transversales y propiedades mecánicas del concreto) para lograr una rigidez de la estructura, tal que se cumplan los requisitos de análisis sísmico establecidos en los capítulos A.4 y A.5 del Título A de NSR-10.

12 ANÁLISIS ESTRUCTURAL DEL MODELO MATEMÁTICO 3D

12.1 DATOS DE ENTRADA DEL MODELO MATEMÁTICO

GENERAL INPUT DATA

Structure type: Three-Dimensional Frame/Wall Structure
Number of Floor Grids = 1
Building total length = 20 m
Building total width = 20 m

STORY INFORMATION

Number of Stories = 2
Total Frame Height = 6 m

Floor	Story Height	Grid No
1	2.50	1
2	3.50	1
3	-	1

* Story Height in (m)

STRUCTURAL GRID INFORMATION

GRID No 1

Grid Point	X	Y
A-1	0.00	0.00
B-1	0.00	4.00
C-1	0.00	8.00
D-1	0.00	12.00
E-1	0.00	16.00
F-1	0.00	20.00
A-2	4.00	0.00
B-2	4.00	4.00
C-2	4.00	8.00
D-2	4.00	12.00
E-2	4.00	16.00
F-2	4.00	20.00
A-3	8.00	0.00
B-3	8.00	4.00
C-3	8.00	8.00
D-3	8.00	12.00
E-3	8.00	16.00
F-3	8.00	20.00
A-4	12.00	0.00
B-4	12.00	4.00
C-4	12.00	8.00
D-4	12.00	12.00
E-4	12.00	16.00
F-4	12.00	20.00
A-5	16.00	0.00
B-5	16.00	4.00

C-5	16.00	8.00
D-5	16.00	12.00
E-5	16.00	16.00
F-5	16.00	20.00
A-6	20.00	0.00
B-6	20.00	4.00
C-6	20.00	8.00
D-6	20.00	12.00
E-6	20.00	16.00
F-6	20.00	20.00

* Coordinates X & Y are in (m)

MATERIALS

Number of materials = 1

REINFORCED CONCRETE

Mat	Name	f'c	fy	fys1	fys2	E	G	w
		Kg/cm2	Kg/cm2	Kg/cm2	Kg/cm2	Kg/cm2	Kg/cm2	Kg/cm2
1	4000PSI	280	4200	4200	4200	206368	87430	

f'c: Compressive strength of concrete

fy: Yield strength of longitudinal reinforcement

fys1: Yield strength of shear reinforcement, bar sizes <= 3/8"

fys2: Yield strength of shear reinforcement, bar sizes > 3/8"

MEMBER DATA

Total number of members..... = 192

Number of columns..... = 72

Number of beams = 120

Number of braces = 0

COLUMN SECTIONS

Number of prismatic sections = 1

Sec	Name	Shape	b	h	tw	tf	P1	P2	A	I2
			(cm)	(cm)	(cm)	(cm)	(cm)	(cm)	(cm2)	(cm4)
1	C45X45	Rectang	45.00	45.00	-	-	-	-	2025.0	

COLUMNS

Column	Story	L	Lu	a	c	Theta	Sec	Mat	System
		(m)	(m)	(m)	(m)	(o)	-	-	-

F-6	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L
F-6	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L
E-6	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L
E-6	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L
D-6	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L

D-6	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L	B-3	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L
C-6	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L	A-3	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L
C-6	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L	A-3	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L
B-6	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L	F-2	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L
B-6	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L	F-2	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L
A-6	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L	E-2	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L
A-6	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L	E-2	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L
F-5	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L	D-2	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L
F-5	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L	D-2	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L
E-5	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L	C-2	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L
E-5	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L	C-2	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L
D-5	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L	B-2	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L
D-5	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L	B-2	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L
C-5	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L	A-2	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L
C-5	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L	A-2	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L
B-5	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L	F-1	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L
B-5	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L	F-1	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L
A-5	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L	E-1	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L
A-5	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L	E-1	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L
F-4	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L	D-1	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L
F-4	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L	D-1	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L
E-4	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L	C-1	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L
E-4	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L	C-1	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L
D-4	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L	B-1	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L
D-4	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L	B-1	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L
C-4	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L	A-1	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L
C-4	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L	A-1	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L
B-4	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L										
B-4	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L										
A-4	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L										
A-4	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L										
F-3	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L										
F-3	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L										
E-3	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L										
E-3	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L										
D-3	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L										
D-3	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L										
C-3	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L										
C-3	1	2.50	2.13	0.00	0.38	90.0	1	1	G&L										
B-3	2	3.50	3.05	0.08	0.38	90.0	1	1	G&L										

BEAM SECTIONS

Number of prismatic sections = 1

Sec	Name	Shape	b	h	tw	tf	P1	P2	A	I2
I3	J		(cm)	(cm)	(cm)	(cm)	(cm)	(cm)	(cm2)	(cm4)
(cm4)	(cm4)									
1	V30X45	Rectang	30.00	45.00	-	-	-	-	-	1350.0
227812	101250	234900								

BEAMS

Beam	Floor	L	Lu	a	c	Sec	Mat	System
		(m)	(m)	(m)	(m)	-	-	-
A(1-2)	2	4.00	3.55	0.23	0.23	1	1	G&L
A(2-3)	2	4.00	3.55	0.23	0.23	1	1	G&L
A(3-4)	2	4.00	3.55	0.23	0.23	1	1	G&L
A(4-5)	2	4.00	3.55	0.23	0.23	1	1	G&L
A(5-6)	2	4.00	3.55	0.23	0.23	1	1	G&L

B(1-2)	2	4.00	3.55	0.23	0.23	1	1	G&L	1(D-E)	2	4.00	3.55	0.23	0.23	1	1	G&L
B(2-3)	2	4.00	3.55	0.23	0.23	1	1	G&L	1(E-F)	2	4.00	3.55	0.23	0.23	1	1	G&L
B(3-4)	2	4.00	3.55	0.23	0.23	1	1	G&L	2(A-B)	2	4.00	3.55	0.23	0.23	1	1	G&L
B(4-5)	2	4.00	3.55	0.23	0.23	1	1	G&L	2(B-C)	2	4.00	3.55	0.23	0.23	1	1	G&L
B(5-6)	2	4.00	3.55	0.23	0.23	1	1	G&L	2(C-D)	2	4.00	3.55	0.23	0.23	1	1	G&L
C(1-2)	2	4.00	3.55	0.23	0.23	1	1	G&L	2(D-E)	2	4.00	3.55	0.23	0.23	1	1	G&L
C(2-3)	2	4.00	3.55	0.23	0.23	1	1	G&L	2(E-F)	2	4.00	3.55	0.23	0.23	1	1	G&L
C(3-4)	2	4.00	3.55	0.23	0.23	1	1	G&L	3(A-B)	2	4.00	3.55	0.23	0.23	1	1	G&L
C(4-5)	2	4.00	3.55	0.23	0.23	1	1	G&L	3(B-C)	2	4.00	3.55	0.23	0.23	1	1	G&L
C(5-6)	2	4.00	3.55	0.23	0.23	1	1	G&L	3(C-D)	2	4.00	3.55	0.23	0.23	1	1	G&L
D(1-2)	2	4.00	3.55	0.23	0.23	1	1	G&L	3(D-E)	2	4.00	3.55	0.23	0.23	1	1	G&L
D(2-3)	2	4.00	3.55	0.23	0.23	1	1	G&L	3(E-F)	2	4.00	3.55	0.23	0.23	1	1	G&L
D(3-4)	2	4.00	3.55	0.23	0.23	1	1	G&L	4(A-B)	2	4.00	3.55	0.23	0.23	1	1	G&L
D(4-5)	2	4.00	3.55	0.23	0.23	1	1	G&L	4(B-C)	2	4.00	3.55	0.23	0.23	1	1	G&L
D(5-6)	2	4.00	3.55	0.23	0.23	1	1	G&L	4(C-D)	2	4.00	3.55	0.23	0.23	1	1	G&L
E(1-2)	2	4.00	3.55	0.23	0.23	1	1	G&L	4(D-E)	2	4.00	3.55	0.23	0.23	1	1	G&L
E(2-3)	2	4.00	3.55	0.23	0.23	1	1	G&L	4(E-F)	2	4.00	3.55	0.23	0.23	1	1	G&L
E(3-4)	2	4.00	3.55	0.23	0.23	1	1	G&L	5(A-B)	2	4.00	3.55	0.23	0.23	1	1	G&L
E(4-5)	2	4.00	3.55	0.23	0.23	1	1	G&L	5(B-C)	2	4.00	3.55	0.23	0.23	1	1	G&L
E(5-6)	2	4.00	3.55	0.23	0.23	1	1	G&L	5(C-D)	2	4.00	3.55	0.23	0.23	1	1	G&L
F(1-2)	2	4.00	3.55	0.23	0.23	1	1	G&L	5(D-E)	2	4.00	3.55	0.23	0.23	1	1	G&L
F(2-3)	2	4.00	3.55	0.23	0.23	1	1	G&L	5(E-F)	2	4.00	3.55	0.23	0.23	1	1	G&L
F(3-4)	2	4.00	3.55	0.23	0.23	1	1	G&L	6(A-B)	2	4.00	3.55	0.23	0.23	1	1	G&L
F(4-5)	2	4.00	3.55	0.23	0.23	1	1	G&L	6(B-C)	2	4.00	3.55	0.23	0.23	1	1	G&L
F(5-6)	2	4.00	3.55	0.23	0.23	1	1	G&L	6(C-D)	2	4.00	3.55	0.23	0.23	1	1	G&L
									6(D-E)	2	4.00	3.55	0.23	0.23	1	1	G&L
									6(E-F)	2	4.00	3.55	0.23	0.23	1	1	G&L
A(1-2)	3	4.00	3.55	0.23	0.23	1	1	G&L	1(A-B)	3	4.00	3.55	0.23	0.23	1	1	G&L
A(2-3)	3	4.00	3.55	0.23	0.23	1	1	G&L	1(B-C)	3	4.00	3.55	0.23	0.23	1	1	G&L
A(3-4)	3	4.00	3.55	0.23	0.23	1	1	G&L	1(C-D)	3	4.00	3.55	0.23	0.23	1	1	G&L
A(4-5)	3	4.00	3.55	0.23	0.23	1	1	G&L	1(D-E)	3	4.00	3.55	0.23	0.23	1	1	G&L
A(5-6)	3	4.00	3.55	0.23	0.23	1	1	G&L	1(E-F)	3	4.00	3.55	0.23	0.23	1	1	G&L
B(1-2)	3	4.00	3.55	0.23	0.23	1	1	G&L	2(A-B)	3	4.00	3.55	0.23	0.23	1	1	G&L
B(2-3)	3	4.00	3.55	0.23	0.23	1	1	G&L	2(B-C)	3	4.00	3.55	0.23	0.23	1	1	G&L
B(3-4)	3	4.00	3.55	0.23	0.23	1	1	G&L	2(C-D)	3	4.00	3.55	0.23	0.23	1	1	G&L
B(4-5)	3	4.00	3.55	0.23	0.23	1	1	G&L	2(D-E)	3	4.00	3.55	0.23	0.23	1	1	G&L
B(5-6)	3	4.00	3.55	0.23	0.23	1	1	G&L	2(E-F)	3	4.00	3.55	0.23	0.23	1	1	G&L
C(1-2)	3	4.00	3.55	0.23	0.23	1	1	G&L	3(A-B)	3	4.00	3.55	0.23	0.23	1	1	G&L
C(2-3)	3	4.00	3.55	0.23	0.23	1	1	G&L	3(B-C)	3	4.00	3.55	0.23	0.23	1	1	G&L
C(3-4)	3	4.00	3.55	0.23	0.23	1	1	G&L	3(C-D)	3	4.00	3.55	0.23	0.23	1	1	G&L
C(4-5)	3	4.00	3.55	0.23	0.23	1	1	G&L	3(D-E)	3	4.00	3.55	0.23	0.23	1	1	G&L
C(5-6)	3	4.00	3.55	0.23	0.23	1	1	G&L	3(E-F)	3	4.00	3.55	0.23	0.23	1	1	G&L
D(1-2)	3	4.00	3.55	0.23	0.23	1	1	G&L	4(A-B)	3	4.00	3.55	0.23	0.23	1	1	G&L
D(2-3)	3	4.00	3.55	0.23	0.23	1	1	G&L	4(B-C)	3	4.00	3.55	0.23	0.23	1	1	G&L
D(3-4)	3	4.00	3.55	0.23	0.23	1	1	G&L	4(C-D)	3	4.00	3.55	0.23	0.23	1	1	G&L
D(4-5)	3	4.00	3.55	0.23	0.23	1	1	G&L	4(D-E)	3	4.00	3.55	0.23	0.23	1	1	G&L
D(5-6)	3	4.00	3.55	0.23	0.23	1	1	G&L	4(E-F)	3	4.00	3.55	0.23	0.23	1	1	G&L
E(1-2)	3	4.00	3.55	0.23	0.23	1	1	G&L	5(A-B)	3	4.00	3.55	0.23	0.23	1	1	G&L
E(2-3)	3	4.00	3.55	0.23	0.23	1	1	G&L	5(B-C)	3	4.00	3.55	0.23	0.23	1	1	G&L
E(3-4)	3	4.00	3.55	0.23	0.23	1	1	G&L	5(C-D)	3	4.00	3.55	0.23	0.23	1	1	G&L
E(4-5)	3	4.00	3.55	0.23	0.23	1	1	G&L	5(D-E)	3	4.00	3.55	0.23	0.23	1	1	G&L
E(5-6)	3	4.00	3.55	0.23	0.23	1	1	G&L	5(E-F)	3	4.00	3.55	0.23	0.23	1	1	G&L
F(1-2)	3	4.00	3.55	0.23	0.23	1	1	G&L	6(A-B)	3	4.00	3.55	0.23	0.23	1	1	G&L
F(2-3)	3	4.00	3.55	0.23	0.23	1	1	G&L	6(B-C)	3	4.00	3.55	0.23	0.23	1	1	G&L
F(3-4)	3	4.00	3.55	0.23	0.23	1	1	G&L	6(C-D)	3	4.00	3.55	0.23	0.23	1	1	G&L
F(4-5)	3	4.00	3.55	0.23	0.23	1	1	G&L	6(D-E)	3	4.00	3.55	0.23	0.23	1	1	G&L
F(5-6)	3	4.00	3.55	0.23	0.23	1	1	G&L	6(E-F)	3	4.00	3.55	0.23	0.23	1	1	G&L
1(A-B)	2	4.00	3.55	0.23	0.23	1	1	G&L									
1(B-C)	2	4.00	3.55	0.23	0.23	1	1	G&L									
1(C-D)	2	4.00	3.55	0.23	0.23	1	1	G&L									

WALL DATA

Total number of wall panels..... = 20

WALL PANELS

Wall	Story	B (m)	H (m)	t (cm)	Material	System
A(1-2)	2	4.00	3.50	20.0	1	L
A(2-3)	2	4.00	3.50	20.0	1	L
A(3-4)	2	4.00	3.50	20.0	1	L
A(4-5)	2	4.00	3.50	20.0	1	L
A(5-6)	2	4.00	3.50	20.0	1	L
F(1-2)	2	4.00	3.50	20.0	1	L
F(2-3)	2	4.00	3.50	20.0	1	L
F(3-4)	2	4.00	3.50	20.0	1	L
F(4-5)	2	4.00	3.50	20.0	1	L
F(5-6)	2	4.00	3.50	20.0	1	L
1(A-B)	2	4.00	3.50	20.0	1	L
1(B-C)	2	4.00	3.50	20.0	1	L
1(C-D)	2	4.00	3.50	20.0	1	L
1(D-E)	2	4.00	3.50	20.0	1	L
1(E-F)	2	4.00	3.50	20.0	1	L
6(A-B)	2	4.00	3.50	20.0	1	L
6(B-C)	2	4.00	3.50	20.0	1	L
6(C-D)	2	4.00	3.50	20.0	1	L
6(D-E)	2	4.00	3.50	20.0	1	L
6(E-F)	2	4.00	3.50	20.0	1	L

GROUND SUPPORT DATA

Total number of ground supports = 36

K = Spring constant(ton/cm)

Characteristics for All Degrees of Freedom

Value = K Dash = free C = constrained

Support	Floor	Type	Ux	Uy	Uz	TetX	TetY	TetZ
A-1	1	Fixed	C	C	C	C	C	C
B-1	1	Fixed	C	C	C	C	C	C
C-1	1	Fixed	C	C	C	C	C	C
D-1	1	Fixed	C	C	C	C	C	C
E-1	1	Fixed	C	C	C	C	C	C
F-1	1	Fixed	C	C	C	C	C	C
A-2	1	Fixed	C	C	C	C	C	C
B-2	1	Fixed	C	C	C	C	C	C
C-2	1	Fixed	C	C	C	C	C	C
D-2	1	Fixed	C	C	C	C	C	C
E-2	1	Fixed	C	C	C	C	C	C
F-2	1	Fixed	C	C	C	C	C	C
A-3	1	Fixed	C	C	C	C	C	C
B-3	1	Fixed	C	C	C	C	C	C
C-3	1	Fixed	C	C	C	C	C	C
D-3	1	Fixed	C	C	C	C	C	C
E-3	1	Fixed	C	C	C	C	C	C
F-3	1	Fixed	C	C	C	C	C	C
A-4	1	Fixed	C	C	C	C	C	C
B-4	1	Fixed	C	C	C	C	C	C
C-4	1	Fixed	C	C	C	C	C	C

D-4	1	Fixed	C	C	C	C	C	C
E-4	1	Fixed	C	C	C	C	C	C
F-4	1	Fixed	C	C	C	C	C	C
A-5	1	Fixed	C	C	C	C	C	C
B-5	1	Fixed	C	C	C	C	C	C
C-5	1	Fixed	C	C	C	C	C	C
D-5	1	Fixed	C	C	C	C	C	C
E-5	1	Fixed	C	C	C	C	C	C
F-5	1	Fixed	C	C	C	C	C	C
A-6	1	Fixed	C	C	C	C	C	C
B-6	1	Fixed	C	C	C	C	C	C
C-6	1	Fixed	C	C	C	C	C	C
D-6	1	Fixed	C	C	C	C	C	C
E-6	1	Fixed	C	C	C	C	C	C
F-6	1	Fixed	C	C	C	C	C	C

SUMMARY OF TOTAL FLOOR LOADS

LOAD CASE 1: SELFW (D0)

Floor	Force (ton)			Moment (ton-m)		
	Px	Py	Pz	Mx	My	Mz
3	0.00	0.00	265.52	0.0	0.0	0.0
2	0.00	0.00	114.94	0.0	0.0	0.0
1	0.00	0.00	0.00	0.0	0.0	0.0
Total	0.00	0.00	380.46	0.0	0.0	0.0

LOAD CASE 2: DEAD (DL)

Floor	Force (ton)			Moment (ton-m)		
	Px	Py	Pz	Mx	My	Mz
3	0.00	0.00	135.30	0.0	0.0	0.0
2	0.00	0.00	1556.53	0.0	0.0	0.0
1	0.00	0.00	0.00	0.0	0.0	0.0
Total	0.00	0.00	1691.83	0.0	0.0	0.0

LOAD CASE 3: LIVE (LL)

Floor	Force (ton)			Moment (ton-m)		
	Px	Py	Pz	Mx	My	Mz
3	0.00	0.00	72.00	0.0	0.0	0.0
2	0.00	0.00	72.00	0.0	0.0	0.0
1	0.00	0.00	0.00	0.0	0.0	0.0
Total	0.00	0.00	143.99	0.0	0.0	0.0

LOAD CASE 4 : EQuAKE X (EQX) - TYPE : EQUIVALENT STATIC
Force (ton) Acc. Tors. Mom. (ton-m)

Floor	Px	Py	Pz	Mx	My	Mz
3	1021.00	0.00	0.00	0.0	0.0	1021.0
2	1776.40	0.00	0.00	0.0	0.0	1776.0
1	0.00	0.00	0.00	0.0	0.0	0.0
Total	2797.40	0.00	0.00	0.0	0.0	2797.0

C O L U M N S

Item	Section	Material	Length m	Weight/Len ton/m	Total Weight ton
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1	C45X45	4000PSI	186.30	0.486	90.54
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TOTAL = 90.54

B E A M S

Item	Section	Material	Length m	Weight/Len ton/m	Total Weight ton
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1	V30X45	4000PSI	453.00	0.324	146.77
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TOTAL = 146.77

LOAD CASE 5 : EQuAKE Y (EQY) - TYPE : EQUIVALENT STATIC
Force (ton) Acc. Tors. Mom. (ton-m)

Floor	Px	Py	Pz	Mx	My	Mz
3	0.00	1021.00	0.00	0.0	0.0	1021.0
2	0.00	1776.40	0.00	0.0	0.0	1776.0
1	0.00	0.00	0.00	0.0	0.0	0.0
Total	0.00	2797.40	0.00	0.0	0.0	2797.0

W A L L S

Item	Section	Material	Area m ²	Weight/Area ton/m ²	Total Weight ton
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1	t=20	4000PSI	280.00	0.480	134.40
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TOTAL = 134.40

LOAD CASE 6 : WIND X (WLX)
Force (ton) Moment (ton-m)

Floor	Px	Py	Pz	Mx	My	Mz
3	4.63	0.00	0.00	0.0	0.0	4.9
2	7.72	0.00	0.00	0.0	0.0	8.1
1	3.22	0.00	0.00	0.0	0.0	0.0
Total	15.56	0.00	0.00	0.0	0.0	13.0

S L A B S

Item	Section	Material	Area m ²	Weight/Area ton/m ²	Total Weight ton
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1	N+2.50m	w =2.4	400.00	0.391	156.48
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2	N+6.00m	w =2.4	400.00	0.228	91.31
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TOTAL = 247.79

LOAD CASE 7 : WIND Y (WLY)
Force (ton) Moment (ton-m)

Floor	Px	Py	Pz	Mx	My	Mz
3	0.00	4.63	0.00	0.0	0.0	4.9
2	0.00	7.72	0.00	0.0	0.0	8.1
1	0.00	3.22	0.00	0.0	0.0	0.0
Total	0.00	15.56	0.00	0.0	0.0	13.0

SUMMARY QUANTITY OF MATERIALS

12.2 IMÁGENES DEL MODELO MATEMÁTICO

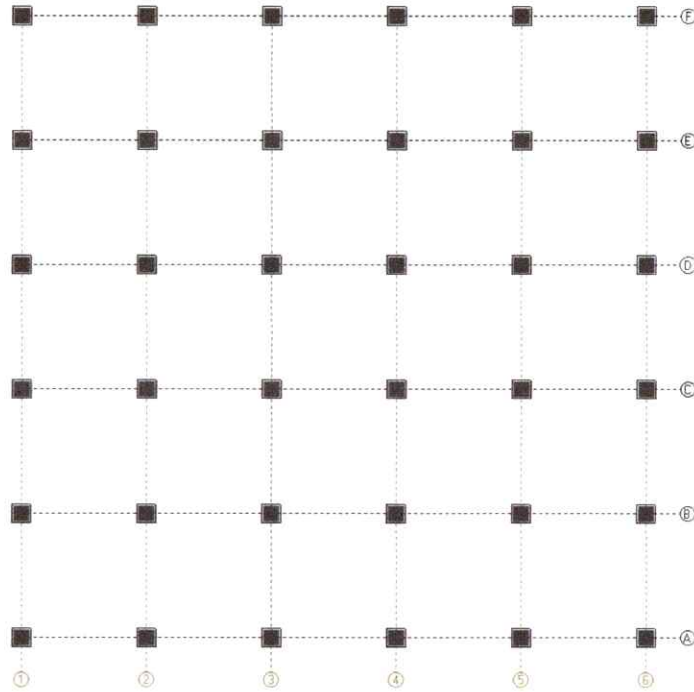


Imagen 4. Vista en planta cimentación

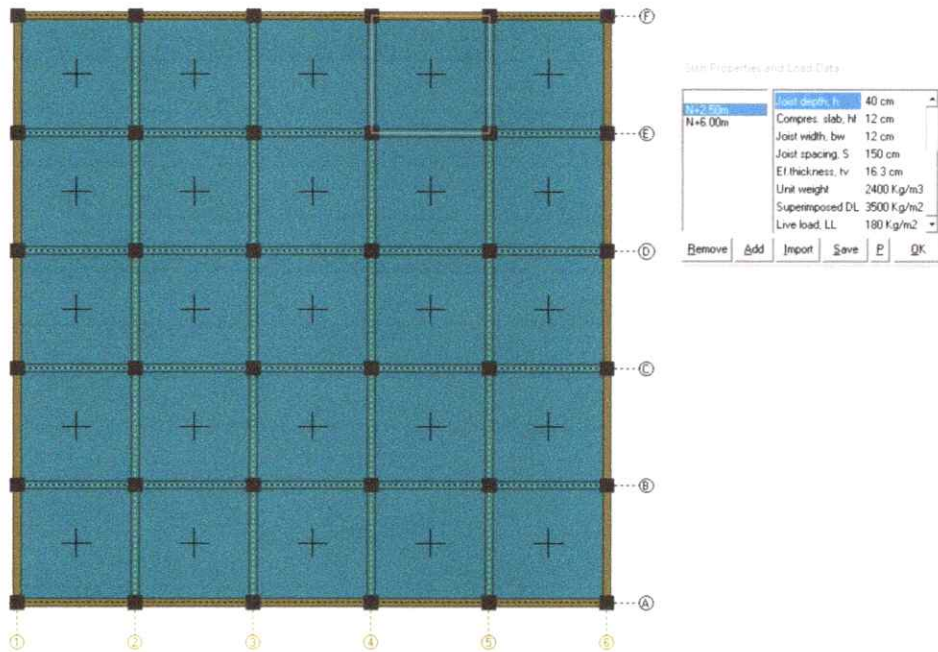


Imagen 5. Vista en planta entrepiso

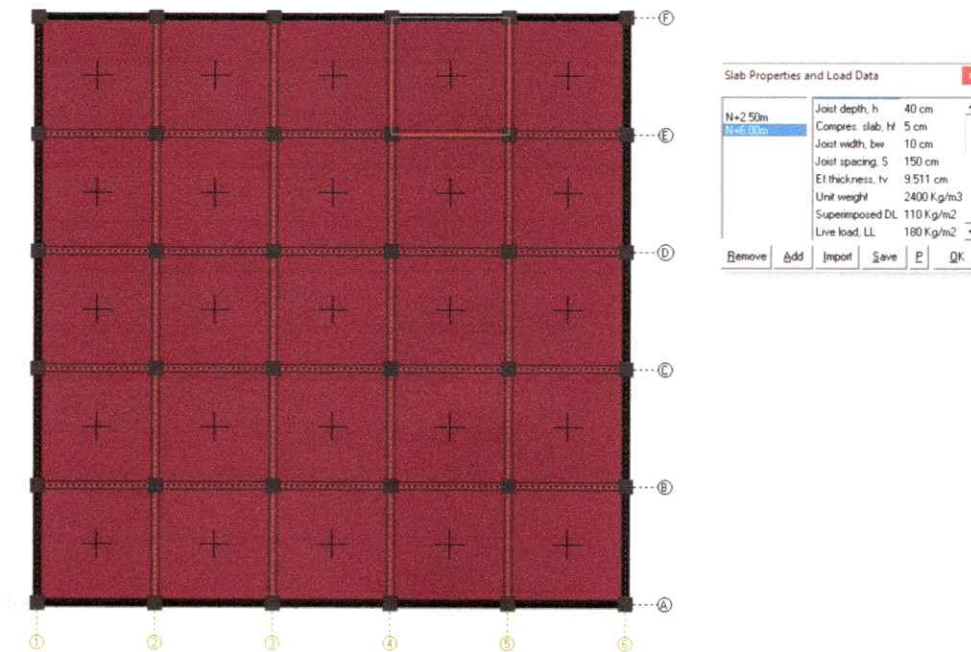


Imagen 6. Vista en planta entresiso

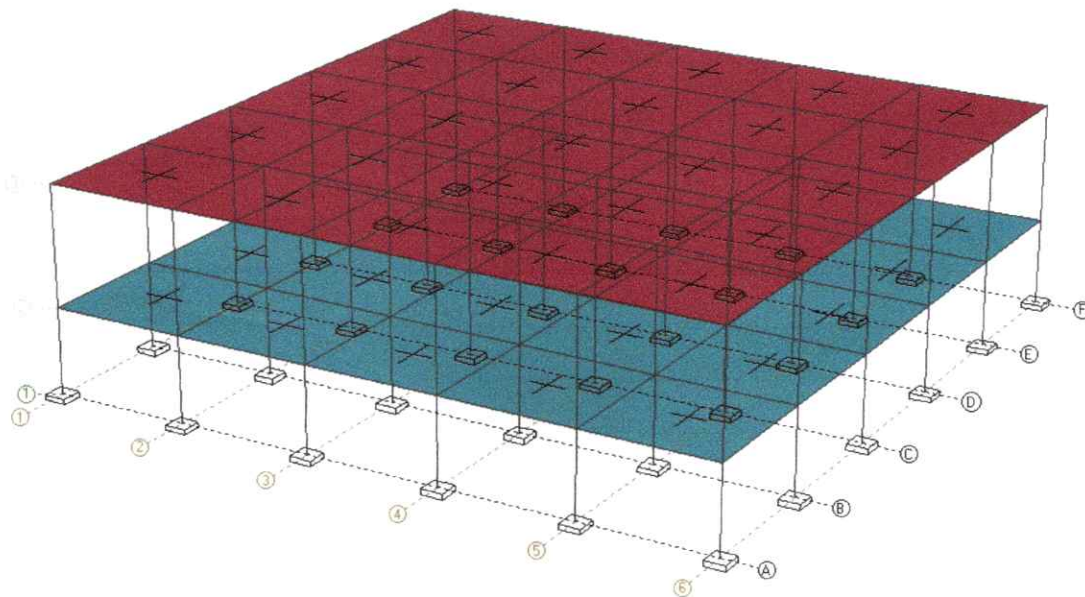


imagen 9. Vista 3D

12.3 DISEÑO DE LOS ELEMENTOS ESTRUCTURALES

12.3.1 DISEÑO DE LOSA DE CIMENTACION

DATOS DEL TERRENO

σ (kN/m ²)	82.00	Presión admisible del terreno
δ (cm)	0.34	Asentamiento máximo esperado
Ks (kN/m ³)	24,000.00	Coefficiente de Winkler

PROPIEDADES DE LOS MATERIALES

$f'c$ (N/mm ²)	28.00	Resistencia a la compresión del concreto
E_c (N/mm ²)	20,636.86	Módulo de elasticidad del concreto
μ	0.20	Coefficiente de Poisson del concreto reforzado
G (MPa)	8,598.69	Módulo de cortante del concreto
γ (kN/m ²)	24.00	Peso específico del concreto

CÁLCULO DE LA PRESIÓN A ALIVIAR

w_{piso} (kN/m ²)	35.00	Presión actuante estimada inicialmente por nivel
N_{pisos}	2	Número de pisos
w (kN/m ²)	70.00	Presión actuante estimada en el terreno
σ_{adm} (kN/m ²)	82.00	Presión admisible del terreno
σ (kN/m ²)	-12.00	Presión a aliviar
γ (kN/m ²)	16.00	Peso específico del terreno
Z (m)	-0.75	Profundidad de cimentación

GEOMETRÍA DE LA LOSA ALIGERADA TÍPICA DE ENTREPISO

b (m)	0.12	Ancho de viguetas
h (m)	0.45	Altura de las viguetas
t (m)	0.12	Espesor de la losa superior
hL (m)	0.33	Altura libre de la vigueta
S (m)	1.10	Separación entre ejes de viguetas
Tipo placa	2	Forma de trabajo de la placa (1 o 2 direcciones)

EVALUACIÓN DE CARGAS PLACA MACIZA N+0,00

Placa	0.10	Peso de la loseta por m ²
Carga muerta	1.00	Carga muerta por m ²
carga viva	1.80	Carga viva por m ²
wtotal	2.80	Carga total por m ² de entrepiso

EVALUACIÓN DE CARGAS LOSA ALIGERADA PISO N+2,00

Loseta	2.88	Peso de la loseta por m ²
Viguetas	1.90	Peso de las viguetas por m ²
Casetón	0.00	Peso del casetón por m ²
Acabados	0.00	Peso de los acabados por m ²
Cielorraso	0.00	Peso del cielorraso por m ²
Agua	35.00	Peso de los muros por m ²
Carga muerta	39.78	Carga muerta por m ²
carga viva	0.00	Carga viva por m ²
wtotal	39.78	Carga total por m ² de entrepiso

EVALUACIÓN DE CARGAS LOSA ALIGERADA PISO N + 5,50

Loseta	2.88	Peso de la loseta por m ²
Viguetas	1.90	Peso de las viguetas por m ²
Casetón	0.00	Peso del casetón por m ²
Acabados	0.00	Peso de los acabados por m ²
Cielorraso	0.00	Peso del cielorraso por m ²
Carga muerta	4.78	Carga muerta por m ²
carga viva	1.80	Carga viva por m ²
wtotal	6.58	Carga total por m ² de entrepiso

EVALUACIÓN DE CARGAS DE COLUMNAS

H ₁₋₂ (m)	5.50	Altura de los pisos 1-4
H _{sótano} (m)	2.50	Altura del sótano

Columnas

H (m)	8.00	Altura de la columna
N col	36	Cantidad de columnas
b (m)	0.45	Ancho de columna
h (m)	0.45	Largo de columna

PESO EDIFICIO

B (m)	20.00	Ancho del edificio
L (m)	20.00	Largo del edificio
A _{sótano} (m ²)	400.00	Área de los sótanos
A _{placas 1-5} (m ²)	400.00	Área de las placas 1-5
W ₁₋₅ (kN)	17,824.64	Peso por carga muerta de placas 1-5
W _{columnas} (kN)	1,399.68	Peso por carga muerta de las columnas

Carga m. total **19,224.32** Carga muerta total

CARGA VIVA

$L_{oficinas}$ (kN/m²) 1.80 Carga viva para uso oficinas
 $L_{parqueaderos}$ (kN/m²) **1.80** Carga viva para uso parqueaderos
 W_{cub} (kN) 720.00 Peso por carga viva de la placa superior
 $W_{sotanos}$ (kN) 720.00 Peso por carga viva de parqueaderos

Carga v. total **1,440.00** Carga viva total

D+L TOTAL **20,664.32** Carga total (muerta + viva)

LOSA CIMENTACIÓN

GEOMETRÍA DE LA LOSA PLACA DE CIMENTACIÓN

B (m) **22.00** Ancho de viguetas
L (m) **22.00** Altura de las viguetas
A (m²) 484.00 Área de la placa de cimentación
Tipo placa **1** Forma de trabajo de la placa (1 o 2 direcciones)

GEOMETRÍA DE LA LOSA ALIGERADA DE CIMENTACIÓN

b (m) **0.20** Ancho de viguetas
h (m) **0.60** Altura de las viguetas (y placa)
 t_{sup} (m) **0.10** Espesor de la losa superior
 t_{inf} (m) **0.20** Espesor de la losa inferior
hL (m) 0.30 Altura libre de la vigueta
S (m) **1.30** Separación entre ejes de viguetas

EVALUACIÓN DE CARGAS LOSA ALIGERADA

Losa superior 2.40 Peso de la losa superior por m²
Losa inferior 4.80 Peso de la losa inferior por m²
Viguetas 1.11 Peso de las viguetas por m²
Casetón **0.50** Peso del casetón por m²
Acabados **1.20** Peso de los acabados por m²
Carga muerta **10.01** Carga muerta por m²
peso total **4,003.08** Carga total por m² de placa de cimentación

PESO DEL TERRENO POR ENCIMA DE LA PLACA

Df (m)	2.00	Profundidad de cimentación
hR (m)	1.40	Altura del relleno por encima de la placa
w (kN/m ²)	22.4	Peso por el relleno entre la placa de cimentación la placa de contrapiso
P (kN)	10841.6	Peso total producido por el relleno

	A _{piso} (m ²)	D (kN/m ²)	L (kN/m ²)	Np	D (kN)	L (kN)	D + L (kN)
Niveles ₀	400.00	1.00	1.80	1	400.00	720.00	1,120.00
Niveles ₁	400.00	39.78	0.00	1	15,912.32	0.00	15,912.32
Niveles ₂	400.00	4.78	1.80	1	1,912.32	720.00	2,632.32
Columnas	-	-	-	-	1,399.68	0.00	1,399.68
Σ	-	-	-	-	19,624.32	1,440.00	21,064.32

W _{TOTAL} (kN)	24,667.40	Peso total del edificio (carga muerta + viva + peso placa)
A _{LOSA} (m ²)	484.00	Área de la losa de cimentación
σ _{act (D)} (kN/m ²)	62.95	Presión actuante en el terreno (por carga muerta sin considerar el peso de la losa)
σ _{act (D)} (kN/m ²)	71.22	Presión actuante en el terreno (por carga muerta)
σ _{act (L)} (kN/m ²)	2.98	Presión actuante en el terreno (por carga viva)
σ _{act} (kN/m ²)	73.37	Presión actuante en el terreno
σ _{exceso} (kN/m ²)	-8.63	Presión a aliviar
Z (m)	-0.54	Profundidad de cimentación necesaria

GEOMETRÍA DE LA VIGA T INVERTIDA (PLACA ALIGERADA)

b (m)	0.20	Ancho del alma de la viga T
B (m)	1.30	Ancho del patín de la viga Y
h (m)	0.20	Espesor de la base de la viga T invertida
H (m)	0.60	Altura de la viga T

ANCHO EFECTIVO DE LA SECCIÓN

$b_{defec-1}$ (m)	2.60	Ancho efectivo 1 - 12 veces el espesor de la losa + el ancho de la viga
$b_{defec-2}$ (m)	1.30	Ancho efectivo 2 - La separación entre vigas
$b_{defec-3}$ (m)	0.98	Ancho efectivo 3 - La cuarta parte de la longitud de la viga
b_{defec} (m)	0.98	Se toma como el menor valor de los anteriores

INERCIA DE LA SECCIÓN COMPUESTA

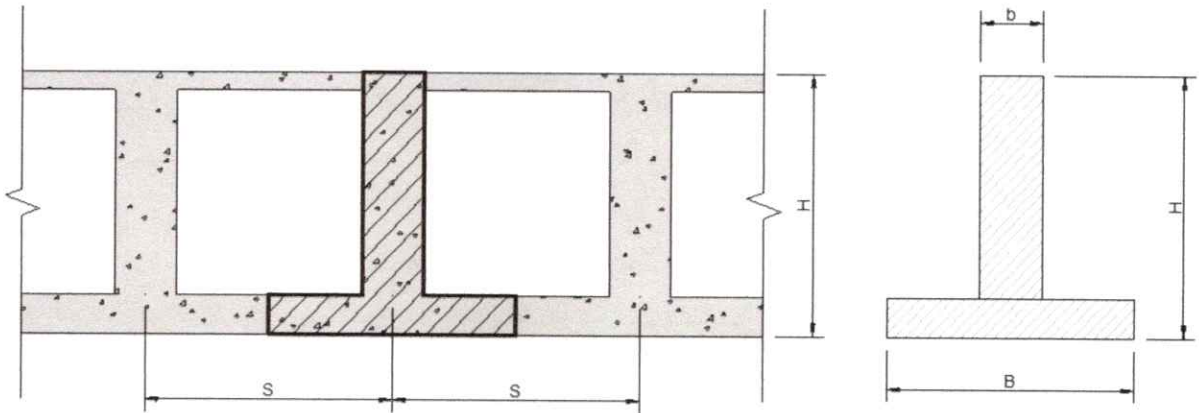


Figura	b (cm)	h (cm)	A (cm ²)	A·y (cm ² ·cm)	I (cm ⁴)	cg _y (cm)	d _i (cm)	A·d _i ² (cm ⁴)	I + A·d _i ² (cm ⁴)
Patín	130	20	2,600	52,000	86,667	10	-15	562,284	648,950
Alma	20	40	800	32,000	106,667	40	15	187,128	293,795
Σ	-	-	3,400	84,000	193,333	-	-	749,412	942,745

y_{cg} (m)	24.71	Centro de gravedad en el eje Y
I (m ⁴)	0.01	Segundo momento de área (momento de inercia) de la sección tipo T invertida

CÁLCULO DEL ESPESOR DE LA ZAPATA

K_s (kN/m ³)	24,000.00	Coefficiente de Winkler
B (m)	0.98	Ancho de la zapata
H (m)	0.60	Espesor de la zapata calculado
I (m ⁴)	0.01	Momento de inercia de la zapata
L (m)	3.91	Longitud entre ejes de columnas
E (kN/m ²)	20,636,860.23	Longitud entre ejes de columnas
β	0.42	Parámetro de rigidez del cimiento
βL	1.63	Parámetro de rigidez del cimiento

Clasificación: Rigidez media

ANÁLISIS DE CARGAS POR COLUMNAS (NIVELES 1 - 5)								Peso propio de la columna				Carga total en la columna			
COLU	Coordenadas		Longitud aferente		Área	N. de pisos	Carga columna		Altura	anchura	longitud	Peso columna	C. Muerta	C. Viva	D + L
MNA	X	Y	Lx	Ly	A	N	C. Muerta	C.V iva	H	b	h	P _{col}	(kN)	(kN)	(kN)
	(m)	(m)	(m)	(m)	(m ²)	-	(kN)	(kN)	(m)	(m)	(m)	(kN)	(kN)	(kN)	(kN)
A - 1	0.0	0.0	7.5	6.2	46.88	5	9,323.6	0.0	8.0	0.4	0.0	38.88	9,362.51	0.00	9,362.51
A - 2	0.0	12.50	7.5	13.75	103.13	5	20,511.98	0.0	8.0	0.4	0.0	38.88	20,550.86	0.00	20,550.86
A - 3	0.0	27.50	7.5	15.00	112.50	5	22,376.70	0.0	8.0	0.4	0.0	38.88	22,415.58	0.00	22,415.58
A - 4	0.0	42.50	7.5	13.75	103.13	5	20,511.98	0.0	8.0	0.4	0.0	38.88	20,550.86	0.00	20,550.86
A - 5	0.0	55.00	7.5	6.2	46.88	5	9,323.6	0.0	8.0	0.4	0.0	38.88	9,362.51	0.00	9,362.51
B - 1	15.00	0.0	17.5	6.2	109.38	5	21,755.13	0.0	8.0	0.4	0.0	38.88	21,794.01	0.00	21,794.01
B - 2	15.00	12.50	17.5	13.75	240.63	5	47,861.28	0.0	8.0	0.4	0.0	38.88	47,900.16	0.00	47,900.16
B - 3	15.00	27.50	17.5	15.00	262.50	5	52,212.30	0.0	8.0	0.4	0.0	38.88	52,251.18	0.00	52,251.18
B - 4	15.00	42.50	17.5	13.75	240.63	5	47,861.28	0.0	8.0	0.4	0.0	38.88	47,900.16	0.00	47,900.16
B - 5	15.00	55.00	17.5	6.2	109.38	5	21,755.13	0.0	8.0	0.4	0.0	38.88	21,794.01	0.00	21,794.01
C - 1	35.00	0.0	20.5	6.2	125.00	5	24,863.00	0.0	8.0	0.4	0.0	38.88	24,901.88	0.00	24,901.88

C - 2	35.	12.	20.	13.	275.0	5	54,698.	0.0	8.0	0.4	0.	38.88	54,73	0.	54,73
	00	50	00	75	0		60	0	0	5	45		7.48	00	7.48
C - 3	35.	27.	20.	15.	300.0	5	59,671.	0.0	8.0	0.4	0.	38.88	59,71	0.	59,71
	00	50	00	00	0		20	0	0	5	45		0.08	00	0.08
C - 4	35.	42.	20.	13.	275.0	5	54,698.	0.0	8.0	0.4	0.	38.88	54,73	0.	54,73
	00	50	00	75	0		60	0	0	5	45		7.48	00	7.48
C - 5	35.	55.	20.	6.2	125.0	5	24,863.	0.0	8.0	0.4	0.	38.88	24,90	0.	24,90
	00	00	00	5	0		00	0	0	5	45		1.88	00	1.88
D - 1	55.	0.0	20.	6.2	125.0	5	24,863.	0.0	8.0	0.4	0.	38.88	24,90	0.	24,90
	00	0	00	5	0		00	0	0	5	45		1.88	00	1.88
D - 2	55.	12.	20.	13.	275.0	5	54,698.	0.0	8.0	0.4	0.	38.88	54,73	0.	54,73
	00	50	00	75	0		60	0	0	5	45		7.48	00	7.48
D - 3	55.	27.	20.	15.	300.0	5	59,671.	0.0	8.0	0.4	0.	38.88	59,71	0.	59,71
	00	50	00	00	0		20	0	0	5	45		0.08	00	0.08
D - 4	55.	42.	20.	13.	275.0	5	54,698.	0.0	8.0	0.4	0.	38.88	54,73	0.	54,73
	00	50	00	75	0		60	0	0	5	45		7.48	00	7.48
D - 5	55.	55.	20.	6.2	125.0	5	24,863.	0.0	8.0	0.4	0.	38.88	24,90	0.	24,90
	00	00	00	5	0		00	0	0	5	45		1.88	00	1.88
E - 1	75.	0.0	17.	6.2	109.3	5	21,755.	0.0	8.0	0.4	0.	38.88	21,79	0.	21,79
	00	0	50	5	8		13	0	0	5	45		4.01	00	4.01
E - 2	75.	12.	17.	13.	240.6	5	47,861.	0.0	8.0	0.4	0.	38.88	47,90	0.	47,90
	00	50	50	75	3		28	0	0	5	45		0.16	00	0.16
E - 3	75.	27.	17.	15.	262.5	5	52,212.	0.0	8.0	0.4	0.	38.88	52,25	0.	52,25
	00	50	50	00	0		30	0	0	5	45		1.18	00	1.18
E - 4	75.	42.	17.	13.	240.6	5	47,861.	0.0	8.0	0.4	0.	38.88	47,90	0.	47,90
	00	50	50	75	3		28	0	0	5	45		0.16	00	0.16
E - 5	75.	55.	17.	6.2	109.3	5	21,755.	0.0	8.0	0.4	0.	38.88	21,79	0.	21,79
	00	00	50	5	8		13	0	0	5	45		4.01	00	4.01
F - 1	90.	0.0	7.5	6.2	46.88	5	9,323.6	0.0	8.0	0.4	0.	38.88	9,362	0.	9,362
	00	0	0	5			3	0	0	5	45		.51	00	.51
F - 2	90.	12.	7.5	13.	103.1	5	20,511.	0.0	8.0	0.4	0.	38.88	20,55	0.	20,55
	00	50	0	75	3		98	0	0	5	45		0.86	00	0.86
F - 3	90.	27.	7.5	15.	112.5	5	22,376.	0.0	8.0	0.4	0.	38.88	22,41	0.	22,41
	00	50	0	00	0		70	0	0	5	45		5.58	00	5.58
F - 4	90.	42.	7.5	13.	103.1	5	20,511.	0.0	8.0	0.4	0.	38.88	20,55	0.	20,55
	00	50	0	75	3		98	0	0	5	45		0.86	00	0.86
F - 5	90.	55.	7.5	6.2	46.88	5	9,323.6	0.0	8.0	0.4	0.	38.88	9,362	0.	9,362
	00	00	0	5			3	0	0	5	45		.51	00	.51
Σ	-	-	-	-	4,950	-	984,57	0.0	-	-	-	1,166.40	985,7	0.	985,7
					.00		4.80	0					41.20	00	41.20

CENTRO DE GRAVEDAD DE LA LOSA

x_{cg} (m)	10.00	Centro de gravedad en el eje X
y_{cg} (m)	10.00	Centro de gravedad en el eje Y

CÁLCULO DEL CENTRO DE CARGAS DE LA LOSA

COLUMNA	Coordenadas		Calculo de momentos		
	X (m)	Y (m)	P_{TOTAL} (kN)	P.x (kN)	P.y (kN)
A - 1	0.00	0.00	9,362.51	0.00	0.00
A - 2	0.00	12.50	20,550.86	0.00	256,885.69
A - 3	0.00	27.50	22,415.58	0.00	616,428.45
A - 4	0.00	42.50	20,550.86	0.00	873,411.34
A - 5	0.00	55.00	9,362.51	0.00	514,937.78
B - 1	15.00	0.00	21,794.01	326,910.08	0.00
B - 2	15.00	12.50	47,900.16	718,502.33	598,751.94
B - 3	15.00	27.50	52,251.18	783,767.70	1,436,907.45
B - 4	15.00	42.50	47,900.16	718,502.33	2,035,756.59
B - 5	15.00	55.00	21,794.01	326,910.08	1,198,670.28
C - 1	35.00	0.00	24,901.88	871,565.80	0.00
C - 2	35.00	12.50	54,737.48	1,915,811.80	684,218.50
C - 3	35.00	27.50	59,710.08	2,089,852.80	1,642,027.20
C - 4	35.00	42.50	54,737.48	1,915,811.80	2,326,342.90
C - 5	35.00	55.00	24,901.88	871,565.80	1,369,603.40
D - 1	55.00	0.00	24,901.88	1,369,603.40	0.00
D - 2	55.00	12.50	54,737.48	3,010,561.40	684,218.50
D - 3	55.00	27.50	59,710.08	3,284,054.40	1,642,027.20
D - 4	55.00	42.50	54,737.48	3,010,561.40	2,326,342.90
D - 5	55.00	55.00	24,901.88	1,369,603.40	1,369,603.40
E - 1	75.00	0.00	21,794.01	1,634,550.38	0.00
E - 2	75.00	12.50	47,900.16	3,592,511.63	598,751.94
E - 3	75.00	27.50	52,251.18	3,918,838.50	1,436,907.45
E - 4	75.00	42.50	47,900.16	3,592,511.63	2,035,756.59
E - 5	75.00	55.00	21,794.01	1,634,550.38	1,198,670.28
F - 1	90.00	0.00	9,362.51	842,625.45	0.00
F - 2	90.00	12.50	20,550.86	1,849,576.95	256,885.69
F - 3	90.00	27.50	22,415.58	2,017,402.20	616,428.45
F - 4	90.00	42.50	20,550.86	1,849,576.95	873,411.34
F - 5	90.00	55.00	9,362.51	842,625.45	514,937.78
Σ	-	-	985,741.20	44,358,354.00	27,107,883.00

x_{cc} (m)	45.00	Centro de cargas en el eje X
y_{cc} (m)	27.50	Centro de cargas en el eje Y

EXCENTRICIDAD ENTRE EL CENTRO DE CARGAS Y EL CENTRO DE GRAVEDAD

e_x (m)	35.00	Excentricidad en X
e_y (m)	17.50	Excentricidad en Y

punto	Coord. X	Coord. Y
C. de masa	10.00	10.00
C. de cargas	45.00	27.50

BALANCEO DE CARGAS

S (m)	15.00	Aferencia de la viga
C.M. (kN/m)	1,068.25	Carga muerta
C.V. (kN/m)	44.63	Carga viva
L (m)	20.00	Longitud de la viga
w_{eq} (kN/m)	16,023.81	Carga equivalente (100% de la carga total)
y (m)	0.20	Flecha máxima del cable
P (kN)	4,005,952.64	Valor de la fuerza necesaria

DISEÑO DE VIGA EN CONCRETO REFORZADO

MATERIALES

f'_c (N/mm ²)	28	Resistencia a la compresión de la viga
β	0.85	Coefficiente que depende de f'_c del concreto
f_y (N/mm ²)	420	Resistencia a la cedencia de la viga

GEOMETRÍA DE LA VIGA

ts (m)	0.12	Altura total de la placa
b (m)	1.00	Ancho para diseño de la placa
barra	#3	Barra de refuerzo
d_b (mm)	9.5	Diámetro de la barra de refuerzo
A_b (mm ²)	70.9	Área de la barra de refuerzo
dr (mm)	50.0	Recubrimiento inferior
d (m)	0.07	Profundidad efectiva de la viga
L (m)	1.50	Longitud de la placa

SOLICITACIONES

q_n (kN/m ²)	37.88	Carga nominal por metro cuadrado
q_u (kN/m ²)	53.03	Carga última (con un factor de carga de 1,5)

w_u (kN/m)	53.03	Carga última por unidad de longitud
V_u (kN)	39.77	Cortante último
M_u (kN-m)	9.94	Momento último en la parte superior
M_u (kN-m)	4.97	Momento último en la parte inferior

DISEÑO A FLEXIÓN

ϕ	0.90	Coefficiente de reducción de resistencia para esfuerzos de flexión
M_u (kN-m)	9.94	Momento último para diseño
ρ_{min}	0.0018	Cuantía mínima
ρ_{max}	0.0100	Cuantía máxima
ρ_{cal}	0.0066	Cuantía calculada
ρ	0.0066	Cuantía de diseño
A_s (mm ²)	427.91	Área de acero necesaria según diseño
s (m)	0.17	Separación de varillas
N	7	Cantidad de barras necesarias según diseño
N	7	Número de varillas suministradas
A_s (mm ²)	496.18	Área de acero suministrada
α (mm)	8.76	Altura del bloque de compresiones de Whitney
ϕM_n (kN-m)	11.42	Momento nominal

fig	x	y	A	x ²	A·x
rectangulo	20.00	3.00	60.00	10.00	600.00
triangulo	20.00	0.50	10.00	13.33	133.33
o			70.00	10.476	733.33
				1905	

1 V30X45 Rectang 30.00 45.00 - - - - 1350.0
227812 101250 234900
Design Results - Beams (DES)
BEAM: A(1-2) FLOOR: 2
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

f'c (MPa)	28
fy (MPa)	420
b (m)	1
h (m)	0.45
d (m)	0.39205
w (kN/m ²)	76.32
S (m)	3.91
w (kN/m)	298.41637
L (m)	3.91
M (kN·m)	380.184942
V (kN)	583.404004
ρ	0.00697263
As	2733.61985
	352.670713

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-8.47	-4.87	-2.39	-2.39	-2.39	-2.39	-2.39	-2.39
-2.39	-2.66	-5.76	-9.58					
Mu(+), ton-m:	4.23	2.39	2.39	3.20	3.51	3.46	3.27	
2.74	2.39	2.39	4.79					
As(-), cm ² :	6.02	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	4.03	6.85						
As(+), cm ² :	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92	3.92					
Vu, ton:	11.69	11.69	10.17	8.47	6.78	5.72	7.41	9.11
10.80	12.32	12.32						
Tu, ton-m:	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.03	0.03	0.03						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
19.00	9.00	9.00	9.00					

12.3.2 DISEÑO DE VIGAS

MATERIALS

Number of materials = 1
REINFORCED CONCRETE

Mat	Name	f'c	fy	fys1	fys2	E	G	w
		Kg/cm ²	Kg/cm ²	Kg/cm ²	Kg/cm ²	Kg/cm ²	Kg/cm ²	Kg/cm ²
1	4000PSI	280	4200	4200	4200	206368	87430	
2400.0								

f'c: Compressive strength of concrete
fy: Yield strength of longitudinal reinforcement
fys1: Yield strength of shear reinforcement, bar sizes <= 3/8"
fys2: Yield strength of shear reinforcement, bar sizes > 3/8"

BEAM SECTIONS

Number of prismatic sections = 1

Sec	Name	Shape	b	h	tw	tf	P1	P2	A	I2
			(cm)	(cm)	(cm)	(cm)	(cm)	(cm)	(cm ²)	(cm ⁴)
13	J									
(cm4)	(cm4)									

DESIGN

A-1 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
A-2

BEAM: A(2-3) FLOOR: 2

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-9.27	-5.56	-2.58	-2.32	-2.32	-2.32	-2.32	-2.32
-2.32	-2.58	-5.58	-9.29					
Mu(+), ton-m:	4.64	2.32	2.32	2.74	3.15	3.18	3.14	
2.73	2.32	2.32	4.64					
As(-), cm ² :	6.62	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	6.63						

As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
Vu, ton: 12.05 12.05 10.52 8.83 7.13 5.45 7.15 8.84
10.53 12.06 12.06
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

BEAM: A(4-5) FLOOR: 2

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=====
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

DESIGN

A-2 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
A-3
BEAM: A(3-4) FLOOR: 2

=====
=====
=====
=====
=====
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -9.29 -5.58 -2.58 -2.32 -2.32 -2.32 -2.32
-2.32 -2.58 -5.56 -9.27
Mu(+), ton-m: 4.64 2.32 2.32 2.73 3.14 3.18 3.15
2.74 2.32 2.32 4.64
As(-), cm2: 6.63 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 6.62
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 12.06 12.06 10.53 8.84 7.15 5.45 7.13 8.83
10.52 12.05 12.05
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -9.30 -5.61 -2.64 -2.33 -2.33 -2.33 -2.33
-2.33 -2.63 -5.60 -9.29
Mu(+), ton-m: 4.65 2.33 2.33 2.80 3.22 3.18 3.21
2.79 2.33 2.33 4.64
As(-), cm2: 6.64 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 6.63
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
Vu, ton: 12.06 12.06 10.53 8.84 7.15 5.46 7.15 8.84
10.53 12.06 12.06
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

DESIGN

A-4 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
A-5
BEAM: A(5-6) FLOOR: 2

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=====
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

DESIGN

A-3 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
A-4

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -9.58 -5.76 -2.66 -2.39 -2.39 -2.39 -2.39
-2.39 -2.39 -4.87 -8.47

	X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78							
	Mu(-), ton-m:	-16.44	-9.59	-4.14	-4.11	-4.11	-4.11	-4.11	-4.11
-4.11	-4.16	-9.61	-16.45						
	Mu(+), ton-m:	8.22	4.11	4.11	4.75	5.85	6.13	5.85	
4.76	4.11	4.11	8.22						
	As(-), cm2:	12.29	6.86	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	6.88	12.30						
	As(+), cm2:	5.83	3.92	3.92	3.92	4.09	4.30	4.09	
3.92	3.92	3.92	5.84						
	Vu, ton:	22.38	22.38	19.44	16.18	12.91	9.65	12.91	
16.18	19.44	22.38	22.38						
	Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00							
	Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3							
	Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
19.00	9.00	9.00	9.00						

DESIGN

B-4

11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

B-5

BEAM: B(5-6) FLOOR: 2

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45

Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:

4000PSI

DESIGN

	X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78							
	Mu(-), ton-m:	-17.43	-10.21	-4.37	-4.36	-4.36	-4.36	-4.36	-4.36
-4.36	-4.36	-8.38	-15.06						
	Mu(+), ton-m:	8.71	4.36	4.36	4.75	6.06	6.85	6.95	
6.24	4.45	4.36	7.53						
	As(-), cm2:	13.12	7.33	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	5.95	11.15						
	As(+), cm2:	6.20	3.92	3.92	3.92	4.25	4.82	4.90	
4.38	3.92	3.92	5.32						
	Vu, ton:	23.27	23.27	20.33	17.07	13.80	10.54	12.25	
15.51	18.78	21.72	21.72						
	Tu, ton-m:	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01							
	Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3							
	Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
19.00	9.00	9.00	9.00						

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45

Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:

4000PSI

	X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78							
	Mu(-), ton-m:	-16.33	-9.51	-4.13	-4.13	-4.13	-4.13	-4.13	-4.13
-4.13	-4.16	-9.65	-16.52						
	Mu(+), ton-m:	8.17	4.13	4.13	4.67	5.75	6.06	5.67	
4.54	4.13	4.13	8.26						
	As(-), cm2:	12.20	6.80	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	6.91	12.36						
	As(+), cm2:	5.79	3.92	3.92	3.92	4.02	4.25	3.96	
3.92	3.92	3.92	5.86						
	Vu, ton:	22.33	22.33	19.38	16.12	12.86	9.72	12.98	
16.25	19.51	22.45	22.45						
	Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00							
	Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3							
	Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
19.00	9.00	9.00	9.00						

DESIGN

B-5

11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

B-6

BEAM: C(1-2) FLOOR: 2

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45

	Lu = 3.55 m	c = 0.23 m	h = 45.0 cm					Mat:	Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
4000PSI									#3	#3	#3	#3	#3	#3	#3	#3	
									Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	
									19.00	9.00	9.00	9.00					
X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71									
3.07	3.42	3.78															
Mu(-), ton-m:	-14.79	-8.17	-4.30	-4.30	-4.30	-4.30	-4.30	-4.30									
-4.30	-4.30	-10.01	-17.19														
Mu(+), ton-m:	7.39	4.30	4.30	6.13	6.90	6.85	6.02										
4.66	4.30	4.30	8.59														
As(-), cm2:	10.93	5.79	3.92	3.92	3.92	3.92	3.92										
3.92	3.92	7.18	12.92														
As(+), cm2:	5.22	3.92	3.92	4.30	4.86	4.82	4.22										
3.92	3.92	3.92	6.11														
Vu, ton:	21.57	21.57	18.63	15.36	12.10	10.40	13.66										
16.92	20.19	23.13	23.13														
Tu, ton-m:	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01									
0.01	0.01	0.01															
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3									
#3	#3	#3															
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00										
19.00	9.00	9.00	9.00														

DESIGN

C-2

11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

BEAM: C(3-4) FLOOR: 2

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45

Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:

4000PSI

	Lu = 3.55 m	c = 0.23 m	h = 45.0 cm					Mat:	Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
DESIGN																	
X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71									
3.07	3.42	3.78															
Mu(-), ton-m:	-16.19	-9.39	-4.05	-4.05	-4.05	-4.05	-4.05	-4.05									
-4.05	-4.05	-9.39	-16.20														
Mu(+), ton-m:	8.10	4.05	4.05	4.61	5.75	6.13	5.75										
4.61	4.05	4.05	8.10														
As(-), cm2:	12.09	6.71	3.92	3.92	3.92	3.92	3.92										
3.92	3.92	6.71	12.09														
As(+), cm2:	5.74	3.92	3.92	3.92	4.02	4.30	4.03										
3.92	3.92	3.92	5.74														
Vu, ton:	22.23	22.23	19.29	16.03	12.77	9.50	12.77										
16.03	19.29	22.23	22.23														
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00									
0.00	0.00	0.00															
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3									
#3	#3	#3															
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00										
19.00	9.00	9.00	9.00														

DESIGN

C-1

11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

C-2

BEAM: C(2-3) FLOOR: 2

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45

Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:

	Lu = 3.55 m	c = 0.23 m	h = 45.0 cm					Mat:	Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
4000PSI																	
X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71									
3.07	3.42	3.78															
Mu(-), ton-m:	-16.28	-9.46	-4.07	-4.07	-4.07	-4.07	-4.07	-4.07									
-4.07	-4.07	-9.31	-16.09														
Mu(+), ton-m:	8.14	4.07	4.07	4.45	5.62	6.06	5.70										
4.57	4.07	4.07	8.05														
As(-), cm2:	12.16	6.76	3.92	3.92	3.92	3.92	3.92										
3.92	3.92	6.65	12.00														
As(+), cm2:	5.77	3.92	3.92	3.92	3.93	4.25	3.99										
3.92	3.92	3.92	5.70														
Vu, ton:	22.31	22.31	19.37	16.11	12.84	9.58	12.72										
15.98	19.24	22.18	22.18														
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00									
0.00	0.00	0.00															

DESIGN

C-3

11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

BEAM: C(4-5) FLOOR: 2

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=====
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI
-----
X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -16.09 -9.31 -4.07 -4.07 -4.07 -4.07 -4.07
-4.07 -4.07 -9.46 -16.28
Mu(+), ton-m: 8.05 4.07 4.07 4.57 5.70 6.06 5.62
4.45 4.07 4.07 8.14
As(-), cm2: 12.00 6.65 3.92 3.92 3.92 3.92 3.92
3.92 3.92 6.76 12.16
As(+), cm2: 5.70 3.92 3.92 3.92 3.99 4.25 3.93
3.92 3.92 3.92 5.77
Vu, ton: 22.18 22.18 19.24 15.98 12.72 9.58 12.84
16.11 19.37 22.31 22.31
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00
-----
DESIGN
-----
C-5 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
C-6
BEAM: D(1-2) FLOOR: 2
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=====
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI
-----
X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -14.79 -8.17 -4.30 -4.30 -4.30 -4.30 -4.30
-4.30 -4.30 -10.01 -17.19
Mu(+), ton-m: 7.39 4.30 4.30 6.13 6.90 6.85 6.02
4.66 4.30 4.30 8.59
As(-), cm2: 10.93 5.79 3.92 3.92 3.92 3.92 3.92
3.92 3.92 7.18 12.92
As(+), cm2: 5.22 3.92 3.92 4.30 4.86 4.82 4.22
3.92 3.92 3.92 6.11
Vu, ton: 21.57 21.57 18.63 15.36 12.10 10.40 13.66
16.92 20.19 23.13 23.13
Tu, ton-m: 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
0.01 0.01 0.01
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00
-----
DESIGN
-----
D-1 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
D-2
BEAM: C(5-6) FLOOR: 2
=====

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BEAM: D(2-3) FLOOR: 2
=====

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-16.28	-9.46	-4.07	-4.07	-4.07	-4.07	-4.07	-4.07
-4.07	-4.07	-9.31	-16.09					
Mu(+), ton-m:	8.14	4.07	4.07	4.45	5.62	6.06	5.70	
4.57	4.07	4.07	8.05					
As(-), cm2:	12.16	6.76	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	6.65	12.00					
As(+), cm2:	5.77	3.92	3.92	3.92	3.93	4.25	3.99	
3.92	3.92	3.92	5.70					
Vu, ton:	22.31	22.31	19.37	16.11	12.84	9.58	12.72	
15.98	19.24	22.18	22.18					
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.00	0.00	0.00						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	
19.00	9.00	9.00	9.00					

DESIGN

D-2 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

BEAM: D(3-4) FLOOR: 2
=====

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-16.19	-9.39	-4.05	-4.05	-4.05	-4.05	-4.05	-4.05
-4.05	-4.05	-9.39	-16.20					
Mu(+), ton-m:	8.10	4.05	4.05	4.61	5.75	6.13	5.75	
4.61	4.05	4.05	8.10					

As(-), cm2:	12.09	6.71	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	6.71	12.09					
As(+), cm2:	5.74	3.92	3.92	3.92	4.02	4.30	4.03	
3.92	3.92	3.92	5.74					
Vu, ton:	22.23	22.23	19.29	16.03	12.77	9.50	12.77	
16.03	19.29	22.23	22.23					
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.00	0.00	0.00						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	
19.00	9.00	9.00	9.00					

DESIGN

D-3 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

BEAM: D(4-5) FLOOR: 2
=====

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-16.09	-9.31	-4.07	-4.07	-4.07	-4.07	-4.07	-4.07
-4.07	-4.07	-9.46	-16.28					
Mu(+), ton-m:	8.05	4.07	4.07	4.57	5.70	6.06	5.62	
4.45	4.07	4.07	8.14					
As(-), cm2:	12.00	6.65	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	6.76	12.16					
As(+), cm2:	5.70	3.92	3.92	3.92	3.99	4.25	3.93	
3.92	3.92	3.92	5.77					
Vu, ton:	22.18	22.18	19.24	15.98	12.72	9.58	12.84	
16.11	19.37	22.31	22.31					
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.00	0.00	0.00						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	
19.00	9.00	9.00	9.00					

DESIGN

D-5	D-4	11 #3 @ 9	8 #3 @ 19	11 #3 @ 9	Mu(-), ton-m:	-15.06	-8.38	-4.36	-4.36	-4.36	-4.36	-4.36	-4.36
					-4.36	-4.37	-10.21	-17.43					
					Mu(+), ton-m:	7.53	4.36	4.45	6.24	6.95	6.85	6.06	
					4.75	4.36	4.36	8.71					
					As(-), cm2:	11.15	5.95	3.92	3.92	3.92	3.92	3.92	
					3.92	3.92	7.33	13.12					
					As(+), cm2:	5.32	3.92	3.92	4.38	4.90	4.82	4.25	
					3.92	3.92	3.92	6.20					
					Vu, ton:	21.72	21.72	18.78	15.51	12.25	10.54	13.80	
					17.07	20.33	23.27	23.27					
					Tu, ton-m:	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
					0.01	0.01	0.01						
					Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
					#3	#3	#3						
					Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	
					19.00	9.00	9.00	9.00					

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
 Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-17.19	-10.01	-4.30	-4.30	-4.30	-4.30	-4.30	-4.30
-4.30	-4.30	-8.17	-14.79					
Mu(+), ton-m:	8.59	4.30	4.30	4.66	6.02	6.85	6.90	
6.13	4.30	4.30	7.39					
As(-), cm2:	12.92	7.18	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	5.79	10.93					
As(+), cm2:	6.11	3.92	3.92	3.92	4.22	4.82	4.86	
4.30	3.92	3.92	5.22					
Vu, ton:	23.13	23.13	20.19	16.92	13.66	10.40	12.10	
15.36	18.63	21.57	21.57					
Tu, ton-m:	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
0.01	0.01	0.01						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	
19.00	9.00	9.00	9.00					

DESIGN

E-1 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

E-2

BEAM: E(2-3) FLOOR: 2

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
 Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-16.52	-9.65	-4.16	-4.13	-4.13	-4.13	-4.13	-4.13
-4.13	-4.13	-9.51	-16.33					
Mu(+), ton-m:	8.26	4.13	4.13	4.54	5.67	6.06	5.75	
4.67	4.13	4.13	8.17					
As(-), cm2:	12.36	6.91	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	6.80	12.20					
As(+), cm2:	5.86	3.92	3.92	3.92	3.96	4.25	4.02	
3.92	3.92	3.92	5.79					
Vu, ton:	22.45	22.45	19.51	16.25	12.98	9.72	12.86	
16.12	19.38	22.33	22.33					
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.00	0.00	0.00						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	
19.00	9.00	9.00	9.00					

DESIGN

D-5 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

D-6

BEAM: E(1-2) FLOOR: 2

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
 Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-16.52	-9.65	-4.16	-4.13	-4.13	-4.13	-4.13	-4.13
-4.13	-4.13	-9.51	-16.33					
Mu(+), ton-m:	8.26	4.13	4.13	4.54	5.67	6.06	5.75	
4.67	4.13	4.13	8.17					
As(-), cm2:	12.36	6.91	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	6.80	12.20					
As(+), cm2:	5.86	3.92	3.92	3.92	3.96	4.25	4.02	
3.92	3.92	3.92	5.79					
Vu, ton:	22.45	22.45	19.51	16.25	12.98	9.72	12.86	
16.12	19.38	22.33	22.33					
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.00	0.00	0.00						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	
19.00	9.00	9.00	9.00					

DESIGN									

E-3	E-2	11 #3 @ 9	8 #3 @ 19	11 #3 @ 9					
BEAM: E(3-4) FLOOR: 2									
=====									
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=====									
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm									
Sec: V30X45									
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:									
4000PSI									

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71	
3.07	3.42	3.78							
Mu(-), ton-m:	-16.33	-9.51	-4.13	-4.13	-4.13	-4.13	-4.13	-4.13	
-4.13	-4.16	-9.65	-16.52						
Mu(+), ton-m:	8.17	4.13	4.13	4.67	5.75	6.06	5.67		
4.54	4.13	4.13	8.26						
As(-), cm2:	12.20	6.80	3.92	3.92	3.92	3.92	3.92		
3.92	3.92	6.91	12.36						
As(+), cm2:	5.79	3.92	3.92	3.92	4.02	4.25	3.96		
3.92	3.92	3.92	5.86						
Vu, ton:	22.33	22.33	19.38	16.12	12.86	9.72	12.98		
16.25	19.51	22.45	22.45						
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
0.00	0.00	0.00							
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3							
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00		
19.00	9.00	9.00	9.00						

DESIGN									

E-4	E-3	11 #3 @ 9	8 #3 @ 19	11 #3 @ 9					
BEAM: E(4-5) FLOOR: 2									
=====									
=====									
=====									
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm									
Sec: V30X45									
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:									
4000PSI									

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71	
3.07	3.42	3.78							
Mu(-), ton-m:	-17.43	-10.21	-4.37	-4.36	-4.36	-4.36	-4.36	-4.36	
-4.36	-4.36	-8.38	-15.06						
Mu(+), ton-m:	8.71	4.36	4.36	4.75	6.06	6.85	6.95		
6.24	4.45	4.36	7.53						
As(-), cm2:	13.12	7.33	3.92	3.92	3.92	3.92	3.92		
3.92	3.92	5.95	11.15						
As(+), cm2:	6.20	3.92	3.92	3.92	4.25	4.82	4.90		
4.38	3.92	3.92	5.32						
Vu, ton:	23.27	23.27	20.33	17.07	13.80	10.54	12.25		
15.51	18.78	21.72	21.72						
Tu, ton-m:	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
0.01	0.01	0.01							
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3							

Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00 Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
19.00 9.00 9.00 9.00 Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

DESIGN

E-6 E-5 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
BEAM: F(1-2) FLOOR: 2
=====

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: #3 #3
4000PSI

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -8.47 -4.87 -2.39 -2.39 -2.39 -2.39 -2.39
-2.39 -2.66 -5.76 -9.58
Mu(+), ton-m: 4.23 2.39 2.39 3.20 3.51 3.46 3.27
2.74 2.39 2.39 4.79
As(-), cm2: 6.02 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 4.03 6.85
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 11.69 11.69 10.17 8.47 6.78 5.72 7.41 9.11
10.80 12.32 12.32
Tu, ton-m: 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
0.03 0.03 0.03
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -9.27 -5.56 -2.58 -2.32 -2.32 -2.32 -2.32
-2.58 -5.58 -9.29
Mu(+), ton-m: 4.64 2.32 2.32 2.74 3.15 3.18 3.14
2.73 2.32 2.32 4.64
As(-), cm2: 6.62 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 6.63
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 12.05 12.05 10.52 8.83 7.13 5.45 7.15 8.84
10.53 12.06 12.06
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

DESIGN

F-2 F-1 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
BEAM: F(2-3) FLOOR: 2
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DESIGN

F-3 F-2 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
BEAM: F(3-4) FLOOR: 2
=====

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -9.30 -5.61 -2.64 -2.33 -2.33 -2.33 -2.33
-2.63 -5.60 -9.29
Mu(+), ton-m: 4.65 2.33 2.33 2.80 3.22 3.18 3.21
2.79 2.33 2.33 4.64
As(-), cm2: 6.64 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 6.63
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 12.06 12.06 10.53 8.84 7.15 5.46 7.15 8.84
10.53 12.06 12.06

Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

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Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

DESIGN

F-4 F-3 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

BEAM: F(4-5) FLOOR: 2

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=====
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -9.58 -5.76 -2.66 -2.39 -2.39 -2.39 -2.39
-2.39 -2.39 -4.87 -8.47
Mu(+), ton-m: 4.79 2.39 2.39 2.74 3.27 3.46 3.51
3.20 2.39 2.39 4.23
As(-), cm2: 6.85 4.03 3.92 3.92 3.92 3.92 3.92
3.92 3.92 6.02
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
Vu, ton: 12.32 12.32 10.80 9.11 7.41 5.72 6.78 8.47
10.17 11.69 11.69
Tu, ton-m: 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
0.03 0.03 0.03
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -9.29 -5.58 -2.58 -2.32 -2.32 -2.32 -2.32
-2.32 -2.58 -5.56 -9.27
Mu(+), ton-m: 4.64 2.32 2.32 2.73 3.14 3.18 3.15
2.74 2.32 2.32 4.64
As(-), cm2: 6.63 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 6.62
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 12.06 12.06 10.53 8.84 7.15 5.45 7.13 8.83
10.52 12.05 12.05
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

DESIGN

F-5 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
F-6

BEAM: A(1-2) FLOOR: 3

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Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

DESIGN

F-5 F-4 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

BEAM: F(5-6) FLOOR: 2

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -1.74 -1.03 -0.61 -0.61 -0.61 -0.61 -0.61
-0.61 -0.87 -1.59 -2.45
Mu(+), ton-m: 0.87 0.90 0.95 0.97 0.87 0.70 0.73
0.68 0.61 0.61 1.22
As(-), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92

As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92		
3.92	3.92	3.92	3.92							
Vu, ton:	2.32	2.32	2.03	1.72	1.41	1.50	1.81	2.12		BEAM: A(3-4) FLOOR: 3
2.43	2.72	2.72								
Tu, ton-m:	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02		=====
0.02	0.02	0.02								=====
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3		=====
#3	#3	#3								=====
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00		Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
19.00	9.00	9.00	9.00							Sec: V30X45
										Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
										4000PSI

DESIGN										

A-2	A-1									11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
										-0.56
										0.73
										0.69 0.63 1.12
										3.92
										3.92 3.92
										3.92
										3.92 3.92 3.92
										3.92
										2.25
										2.53 2.53
										0.00
										0.00 0.00
										0.00
										0.00 0.00
										#3
										#3 #3 #3
										Spacing, cm:
										9.00 9.00 9.00 19.00 19.00 19.00 19.00
										19.00 9.00 9.00 9.00

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71		
3.07	3.42	3.78								
Mu(-), ton-m:	-2.18	-1.40	-0.76	-0.57	-0.57	-0.57	-0.57	-0.57		DESIGN
-0.57	-0.81	-1.47	-2.26							-----
Mu(+), ton-m:	1.09	0.65	0.71	0.74	0.70	0.59	0.68			
0.70	0.67	0.60	1.13							
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92		A-3
3.92	3.92	3.92								11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92		A-4
3.92	3.92	3.92								
Vu, ton:	2.51	2.51	2.22	1.91	1.60	1.34	1.65	1.96		BEAM: A(4-5) FLOOR: 3
2.27	2.55	2.55								
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		=====
0.00	0.00	0.00								=====
0.00	0.00	0.00								=====
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3		=====
#3	#3	#3								=====
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00		Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
19.00	9.00	9.00	9.00							Sec: V30X45
										Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
										4000PSI

DESIGN										

A-3	A-2									11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
										-0.57
										0.70
										0.67 0.60 1.13
										3.92
										3.92 3.92
										3.92
										3.92 3.92 3.92
										3.92
										2.27
										2.55 2.55
										0.00
										0.00 0.00
										0.00
										0.00 0.00
										#3
										#3 #3 #3
										Spacing, cm:
										9.00 9.00 9.00 19.00 19.00 19.00 19.00
										19.00 9.00 9.00 9.00

	Lu = 3.55 m	c = 0.23 m		h = 45.0 cm	Mat:	Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
4000PSI						#3	#3	#3						

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71						
3.07	3.42	3.78												
Mu(-), ton-m:	-2.59	-1.49	-0.90	-0.90	-0.90	-0.90	-0.90	-0.90						
-0.90	-1.39	-2.38	-3.60											
Mu(+), ton-m:	1.30	0.90	0.90	0.90	0.90	1.00	1.08							
0.97	0.90	0.90	1.80											
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92						
3.92	3.92	3.92												
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92						
3.92	3.92	3.92	3.92											
Vu, ton:	3.71	3.71	3.25	2.75	2.25	2.08	2.58	3.08						
3.59	4.04	4.04												
Tu, ton-m:	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03						
0.03	0.03	0.03												
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3						
#3	#3	#3												
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00						
19.00	9.00	9.00	9.00											

DESIGN

C-1

11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

C-2

BEAM: C(2-3) FLOOR: 3

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45

Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:

4000PSI

DESIGN

B-5

11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

B-6

BEAM: C(1-2) FLOOR: 3

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45

Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:

4000PSI

	Lu = 3.55 m	c = 0.23 m		h = 45.0 cm	Mat:	Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
4000PSI						#3	#3	#3						

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71						
3.07	3.42	3.78												
Mu(-), ton-m:	-3.48	-2.28	-1.31	-0.87	-0.87	-0.87	-0.87	-0.87						
-0.87	-0.87	-1.43	-2.51											
Mu(+), ton-m:	1.74	0.87	0.87	0.91	1.04	0.98	0.87							
0.87	0.87	0.87	1.25											
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92						
3.92	3.92	3.92												
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92						
3.92	3.92	3.92	3.92											
Vu, ton:	3.98	3.98	3.52	3.02	2.52	2.02	2.19	2.69						
3.19	3.64	3.64												
Tu, ton-m:	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03						
0.03	0.03	0.03												

DESIGN

C-2

11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

C-3

BEAM: C(3-4) FLOOR: 3

=====	Vu, ton:	3.42	3.42	2.97	2.47	1.96	1.46	1.86	2.36
=====	2.86	3.32	3.32						
Length: L = 4.00 m	a = 0.23 m	Section: b = 30.0 cm							
Sec: V30X45									
	Lu = 3.55 m	c = 0.23 m	h = 45.0 cm	Mat:					
4000PSI									

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71	
3.07	3.42	3.78							
Mu(-), ton-m:	-2.52	-1.47	-0.65	-0.63	-0.63	-0.63	-0.63	-0.63	
-0.63	-0.65	-1.47	-2.52						
Mu(+), ton-m:	1.26	0.63	0.63	0.70	0.87	0.94	0.87		
0.70	0.63	0.63	1.26						
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	3.92							
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	3.92	3.92						
Vu, ton:	3.44	3.44	2.99	2.48	1.98	1.48	1.98	2.48	
2.99	3.44	3.44							
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.00	0.00	0.00							
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3	
#3	#3	#3							
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00	
19.00	9.00	9.00	9.00						

DESIGN

C-4 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

C-5

BEAM: C(5-6) FLOOR: 3

DESIGN

C-4 C-3 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

BEAM: C(4-5) FLOOR: 3

=====	Length: L = 4.00 m	a = 0.23 m	Section: b = 30.0 cm
Sec: V30X45			
	Lu = 3.55 m	c = 0.23 m	h = 45.0 cm
4000PSI			Mat:

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-2.49	-1.44	-0.62	-0.62	-0.62	-0.62	-0.62	-0.62
-0.62	-0.62	-1.22	-2.23					
Mu(+), ton-m:	1.24	0.62	0.62	0.71	0.92	0.99	0.90	
0.72	0.62	0.62	1.12					
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92						
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92	3.92					

DESIGN

C-5 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

C-6

BEAM: D(1-2) FLOOR: 3

=====

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-3.48	-2.28	-1.31	-0.87	-0.87	-0.87	-0.87	-0.87
-0.87	-0.87	-1.43	-2.51					
Mu(+), ton-m:	1.74	0.87	0.87	0.91	1.04	0.98	0.87	
0.87	0.87	0.87	1.25					
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92						
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92	3.92					
Vu, ton:	3.98	3.98	3.52	3.02	2.52	2.02	2.19	2.69
3.19	3.64	3.64						
Tu, ton-m:	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.03	0.03	0.03						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
19.00	9.00	9.00	9.00					

As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92						
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92	3.92					
Vu, ton:	3.32	3.32	2.86	2.36	1.86	1.46	1.96	2.47
2.97	3.42	3.42						
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
19.00	9.00	9.00	9.00					

DESIGN

D-2 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

D-3

BEAM: D(3-4) FLOOR: 3

=====

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-2.52	-1.47	-0.65	-0.63	-0.63	-0.63	-0.63	-0.63
-0.63	-0.65	-1.47	-2.52					
Mu(+), ton-m:	1.26	0.63	0.63	0.70	0.87	0.94	0.87	
0.70	0.63	0.63	1.26					
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92						
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92	3.92					
Vu, ton:	3.44	3.44	2.99	2.48	1.98	1.48	1.98	2.48
2.99	3.44	3.44						
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
19.00	9.00	9.00	9.00					

DESIGN

DESIGN

D-1 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

D-2

BEAM: D(2-3) FLOOR: 3

=====

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-2.23	-1.22	-0.62	-0.62	-0.62	-0.62	-0.62	-0.62
-0.62	-0.62	-1.44	-2.49					
Mu(+), ton-m:	1.12	0.62	0.62	0.72	0.90	0.99	0.92	
0.71	0.62	0.62	1.24					

Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00 Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
19.00 9.00 9.00 9.00 Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

DESIGN

E-4 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
E-5
BEAM: E(5-6) FLOOR: 3
=====

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: #3 #3 #3 #3 #3 #3 #3 #3
4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-1.74	-1.03	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61
-0.61	-0.87	-1.59	-2.45					
Mu(+), ton-m:	0.87	0.90	0.95	0.97	0.87	0.70	0.73	
0.68	0.61	0.61	1.22					
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92						
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92	3.92					
Vu, ton:	2.32	2.32	2.03	1.72	1.41	1.50	1.81	2.12
2.43	2.72	2.72						
Tu, ton-m:	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
19.00	9.00	9.00	9.00					

DESIGN

F-1 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
F-2
BEAM: F(2-3) FLOOR: 3
=====

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: #3 #3 #3 #3 #3 #3 #3 #3
4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-2.59	-1.49	-0.90	-0.90	-0.90	-0.90	-0.90	-0.90
-0.90	-1.39	-2.38	-3.60					
Mu(+), ton-m:	1.30	0.90	0.90	0.90	1.00	1.08		
0.97	0.90	0.90	1.80					
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92						
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92	3.92					
Vu, ton:	3.71	3.71	3.25	2.75	2.25	2.08	2.58	3.08
3.59	4.04	4.04						
Tu, ton-m:	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.03	0.03	0.03						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
19.00	9.00	9.00	9.00					

DESIGN

E-5 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
E-6
BEAM: F(1-2) FLOOR: 3
=====

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: #3 #3 #3 #3 #3 #3 #3 #3
4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-2.18	-1.40	-0.76	-0.57	-0.57	-0.57	-0.57	-0.57
-0.57	-0.81	-1.47	-2.26					
Mu(+), ton-m:	1.09	0.65	0.71	0.74	0.70	0.59	0.68	
0.70	0.67	0.60	1.13					
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92						
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92	3.92					
Vu, ton:	2.51	2.51	2.22	1.91	1.60	1.34	1.65	1.96
2.27	2.55	2.55						

Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

DESIGN

F-3 F-2 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

BEAM: F(3-4) FLOOR: 3

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -2.24 -1.46 -0.81 -0.56 -0.56 -0.56 -0.56
-0.56 -0.81 -1.45 -2.23
Mu(+), ton-m: 1.12 0.63 0.70 0.74 0.72 0.63 0.71
0.73 0.69 0.63 1.12
As(-), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 2.53 2.53 2.25 1.94 1.62 1.31 1.62 1.94
2.25 2.53 2.53
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -2.26 -1.47 -0.81 -0.57 -0.57 -0.57 -0.57
-0.57 -0.76 -1.40 -2.18
Mu(+), ton-m: 1.13 0.60 0.67 0.70 0.68 0.59 0.70
0.74 0.71 0.65 1.09
As(-), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
Vu, ton: 2.55 2.55 2.27 1.96 1.65 1.34 1.60 1.91
2.22 2.51 2.51
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

DESIGN

F-4 F-3 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

BEAM: F(4-5) FLOOR: 3

F-4 F-5 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

BEAM: F(5-6) FLOOR: 3

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -2.45 -1.59 -0.87 -0.61 -0.61 -0.61 -0.61
-0.61 -0.61 -1.03 -1.74
Mu(+), ton-m: 1.22 0.61 0.61 0.68 0.73 0.70 0.87
0.97 0.95 0.90 0.87
As(-), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92

As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
Vu, ton: 2.72 2.72 2.43 2.12 1.81 1.50 1.41 1.72
2.03 2.32 2.32
Tu, ton-m: 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02
0.02 0.02 0.02
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

BEAM: 1(B-C) FLOOR: 2

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45

Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:

4000PSI

DESIGN

F-5 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
F-6
BEAM: 1(A-B) FLOOR: 2

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -8.23 -4.78 -2.31 -2.31 -2.31 -2.31 -2.31
-2.31 -2.62 -5.60 -9.26
Mu(+), ton-m: 4.12 2.31 2.35 3.11 3.37 3.28 3.15
2.68 2.31 2.31 4.63
As(-), cm2: 5.84 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 6.61
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
Vu, ton: 11.21 11.21 9.76 8.15 6.55 5.53 7.13 8.74
10.35 11.80 11.80
Tu, ton-m: 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
0.03 0.03 0.03
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -8.98 -5.43 -2.55 -2.25 -2.25 -2.25 -2.25
-2.25 -2.56 -5.44 -9.00
Mu(+), ton-m: 4.49 2.25 2.25 2.67 3.03 3.02 3.02
2.25 2.25 4.50
As(-), cm2: 6.40 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 6.41
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 11.54 11.54 10.09 8.49 6.88 5.28 6.89 8.50
10.11 11.56 11.56
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

DESIGN

DESIGN

A-1 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
B-1

B-1 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
C-1
BEAM: 1(C-D) FLOOR: 2

Sec: V30X45

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:

4000PSI

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -9.01 -5.47 -2.62 -2.25 -2.25 -2.25 -2.25
-2.25 -2.60 -5.46 -9.00

	X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71	
3.07	3.42	3.78								
	Mu(-), ton-m:	-14.60	-8.21	-4.20	-4.20	-4.20	-4.20	-4.20	-4.20	
-4.20	-4.31	-9.89	-16.79							DESIGN
	Mu(+), ton-m:	7.30	4.20	4.40	6.04	6.66	6.49	5.80		
4.62	4.20	4.20	8.40							
	As(-), cm2:	10.78	5.83	3.92	3.92	3.92	3.92	3.92		
3.92	3.92	7.09	12.58							
	As(+), cm2:	5.15	3.92	3.92	4.23	4.68	4.56	4.06		
3.92	3.92	3.92	5.96							
	Vu, ton:	20.77	20.77	17.98	14.88	11.79	10.15	13.25		
16.34	19.43	22.22	22.22							
	Tu, ton-m:	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
0.01	0.01	0.01								
	Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3	
#3	#3	#3								
	Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00		
19.00	9.00	9.00	9.00							

DESIGN

B-2 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
C-2
BEAM: 2(C-D) FLOOR: 2
=====
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI

DESIGN

A-2 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
B-2
BEAM: 2(B-C) FLOOR: 2
=====
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI

	X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78							
	Mu(-), ton-m:	-15.86	-9.31	-4.09	-3.97	-3.97	-3.97	-3.97	-3.97
-3.97	-4.11	-9.33	-15.87						
	Mu(+), ton-m:	7.93	3.97	3.97	4.61	5.60	5.81	5.60	
4.62	3.97	3.97	7.93						
	As(-), cm2:	11.81	6.65	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	6.67	11.82						
	As(+), cm2:	5.62	3.92	3.92	3.92	3.92	4.07	3.92	
3.92	3.92	3.92	5.62						
	Vu, ton:	21.38	21.38	18.59	15.50	12.40	9.31	12.40	
15.50	18.59	21.38	21.38						
	Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00							
	Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3							
	Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	
19.00	9.00	9.00	9.00						

	X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78							
	Mu(-), ton-m:	-15.93	-9.36	-4.10	-3.98	-3.98	-3.98	-3.98	
-3.98	-4.03	-9.23	-15.76						
	Mu(+), ton-m:	7.96	3.98	3.98	4.42	5.43	5.75	5.51	
4.54	3.98	3.98	7.88						
	As(-), cm2:	11.87	6.69	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	6.59	11.72						
	As(+), cm2:	5.64	3.92	3.92	3.92	3.92	4.02	3.92	
3.92	3.92	3.92	5.58						
	Vu, ton:	21.44	21.44	18.65	15.56	12.47	9.37	12.35	
15.44	18.53	21.32	21.32						
	Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.00	0.00	0.00							
	Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3							
	Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	
19.00	9.00	9.00	9.00						

DESIGN

C-2 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
D-2
BEAM: 2(D-E) FLOOR: 2
=====
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45

	Lu = 3.55 m	c = 0.23 m	h = 45.0 cm					Mat:	Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
4000PSI								#3	#3	#3							
								Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00	19.00
									19.00	9.00	9.00	9.00					
X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71									
3.07	3.42	3.78															
Mu(-), ton-m:	-15.76	-9.23	-4.03	-3.98	-3.98	-3.98	-3.98	-3.98									
-3.98	-4.10	-9.36	-15.93														
Mu(+), ton-m:	7.88	3.98	3.98	4.54	5.51	5.75	5.43										
4.42	3.98	3.98	7.96														
As(-), cm2:	11.72	6.59	3.92	3.92	3.92	3.92	3.92	3.92									
3.92	3.92	6.69	11.87														
As(+), cm2:	5.58	3.92	3.92	3.92	3.92	3.92	4.02	3.92									
3.92	3.92	3.92	5.64														
Vu, ton:	21.32	21.32	18.53	15.44	12.35	9.37	12.47										
15.56	18.65	21.44	21.44														
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00									
0.00	0.00	0.00															
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3									
#3	#3	#3															
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00									
19.00	9.00	9.00	9.00														

DESIGN

E-2

11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

BEAM: 3(A-B) FLOOR: 2

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45

Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:

4000PSI

DESIGN

	Lu = 3.55 m	c = 0.23 m	h = 45.0 cm					Mat:	Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71									
3.07	3.42	3.78															
Mu(-), ton-m:	-14.33	-7.99	-4.14	-4.14	-4.14	-4.14	-4.14	-4.14									
-4.14	-4.16	-9.70	-16.55														
Mu(+), ton-m:	7.16	4.14	4.24	5.93	6.60	6.49	5.75										
4.52	4.14	4.14	8.28														
As(-), cm2:	10.56	5.66	3.92	3.92	3.92	3.92	3.92	3.92									
3.92	3.92	6.94	12.38														
As(+), cm2:	5.05	3.92	3.92	4.15	4.64	4.56	4.03										
3.92	3.92	3.92	5.87														
Vu, ton:	20.62	20.62	17.83	14.74	11.64	10.01	13.10										
16.19	19.29	22.08	22.08														
Tu, ton-m:	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01									
0.01	0.01	0.01															
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3									
#3	#3	#3															
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00									
19.00	9.00	9.00	9.00														

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45

Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:

4000PSI

	Lu = 3.55 m	c = 0.23 m	h = 45.0 cm					Mat:	Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71									
3.07	3.42	3.78															
Mu(-), ton-m:	-16.79	-9.89	-4.31	-4.20	-4.20	-4.20	-4.20										
-4.20	-4.20	-8.21	-14.60														
Mu(+), ton-m:	8.40	4.20	4.20	4.62	5.80	6.49	6.66										
6.04	4.40	4.20	7.30														
As(-), cm2:	12.58	7.09	3.92	3.92	3.92	3.92	3.92	3.92									
3.92	3.92	5.83	10.78														
As(+), cm2:	5.96	3.92	3.92	3.92	4.06	4.56	4.68										
4.23	3.92	3.92	5.15														
Vu, ton:	22.22	22.22	19.43	16.34	13.25	10.15	11.79										
14.88	17.98	20.77	20.77														
Tu, ton-m:	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01									
0.01	0.01	0.01															

DESIGN

A-3

11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

BEAM: 3(B-C) FLOOR: 2

```

=====
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI
-----
X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -15.69 -9.17 -3.96 -3.92 -3.92 -3.92 -3.92
-3.92 -3.92 -9.04 -15.51
Mu(+), ton-m: 7.84 3.92 3.92 4.32 5.38 5.75 5.46
4.44 3.92 3.92 7.76
As(-), cm2: 11.67 6.54 3.92 3.92 3.92 3.92 3.92
3.92 3.92 6.44 11.53
As(+), cm2: 5.55 3.92 3.92 3.92 3.92 4.02 3.92
3.92 3.92 3.92 5.49
Vu, ton: 21.30 21.30 18.51 15.42 12.32 9.23 12.21
15.30 18.39 21.18 21.18
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

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DESIGN

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-----
B-3 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
C-3
BEAM: 3(C-D) FLOOR: 2
=====
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI
-----
X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -15.61 -9.11 -3.92 -3.90 -3.90 -3.90 -3.90
-3.90 -3.93 -9.11 -15.62
Mu(+), ton-m: 7.81 3.90 3.90 4.48 5.51 5.81 5.51
4.48 3.90 3.90 7.81
As(-), cm2: 11.61 6.50 3.92 3.92 3.92 3.92 3.92
3.92 3.92 6.50 11.61
As(+), cm2: 5.53 3.92 3.92 3.92 3.92 4.07 3.92
3.92 3.92 3.92 5.53

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Vu, ton: 21.23 21.23 18.44 15.35 12.26 9.16 12.26
15.35 18.44 21.23 21.23
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

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DESIGN

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-----
C-3 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
D-3
BEAM: 3(D-E) FLOOR: 2
=====
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI
-----
X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -15.51 -9.04 -3.92 -3.92 -3.92 -3.92 -3.92
-3.92 -3.96 -9.17 -15.69
Mu(+), ton-m: 7.76 3.92 3.92 4.44 5.46 5.75 5.38
4.32 3.92 3.92 7.84
As(-), cm2: 11.53 6.44 3.92 3.92 3.92 3.92 3.92
3.92 3.92 6.54 11.67
As(+), cm2: 5.49 3.92 3.92 3.92 3.92 4.02 3.92
3.92 3.92 3.92 5.55
Vu, ton: 21.18 21.18 18.39 15.30 12.21 9.23 12.32
15.42 18.51 21.30 21.30
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

```

DESIGN

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-----
D-3 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
E-3

```


BEAM: 3(E-F) FLOOR: 2

=====

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-16.55	-9.70	-4.16	-4.14	-4.14	-4.14	-4.14	-4.14
-4.14	-4.14	-7.99	-14.33					
Mu(+), ton-m:	8.28	4.14	4.14	4.52	5.75	6.49	6.60	
5.93	4.24	4.14	7.16					
As(-), cm2:	12.38	6.94	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	5.66	10.56					
As(+), cm2:	5.87	3.92	3.92	3.92	4.03	4.56	4.64	4.64
4.15	3.92	3.92	5.05					
Vu, ton:	22.08	22.08	19.29	16.19	13.10	10.01	11.64	
14.74	17.83	20.62	20.62					
Tu, ton-m:	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
19.00	9.00	9.00	9.00					

DESIGN

E-3 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

F-3

BEAM: 4(A-B) FLOOR: 2

=====

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-14.33	-7.99	-4.14	-4.14	-4.14	-4.14	-4.14	-4.14
-4.14	-4.16	-9.70	-16.55					
Mu(+), ton-m:	7.16	4.14	4.24	5.93	6.60	6.49	5.75	
4.52	4.14	4.14	8.28					

As(-), cm2:	10.56	5.66	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	6.94	12.38					
As(+), cm2:	5.05	3.92	3.92	4.15	4.64	4.56	4.03	
3.92	3.92	3.92	5.87					
Vu, ton:	20.62	20.62	17.83	14.74	11.64	10.01	13.10	
16.19	19.29	22.08	22.08					
Tu, ton-m:	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
19.00	9.00	9.00	9.00					

DESIGN

A-4 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

B-4

BEAM: 4(B-C) FLOOR: 2

=====

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-15.69	-9.17	-3.96	-3.92	-3.92	-3.92	-3.92	-3.92
-3.92	-3.92	-9.04	-15.51					
Mu(+), ton-m:	7.84	3.92	3.92	4.32	5.38	5.75	5.46	
4.44	3.92	3.92	7.76					
As(-), cm2:	11.67	6.54	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	6.44	11.53					
As(+), cm2:	5.55	3.92	3.92	3.92	3.92	4.02	3.92	
3.92	3.92	3.92	5.49					
Vu, ton:	21.30	21.30	18.51	15.42	12.32	9.23	12.21	
15.30	18.39	21.18	21.18					
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
19.00	9.00	9.00	9.00					

DESIGN

C-4	B-4	11 #3 @ 9	8 #3 @ 19	11 #3 @ 9	Mu(-), ton-m:	-15.51	-9.04	-3.92	-3.92	-3.92	-3.92	-3.92	-3.92
						-3.92	-3.96	-9.17	-15.69				
					Mu(+), ton-m:	7.76	3.92	3.92	4.44	5.46	5.75	5.38	
						4.32	3.92	3.92	7.84				
					As(-), cm2:	11.53	6.44	3.92	3.92	3.92	3.92	3.92	
						3.92	3.92	6.54	11.67				
					As(+), cm2:	5.49	3.92	3.92	3.92	3.92	4.02	3.92	
						3.92	3.92	3.92	5.55				
					Vu, ton:	21.18	21.18	18.39	15.30	12.21	9.23	12.32	
						15.42	18.51	21.30	21.30				
					Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						0.00	0.00	0.00					
					Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
						#3	#3	#3					
					Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
						19.00	9.00	9.00					
					X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
						3.07	3.42	3.78					
					Mu(-), ton-m:	-15.61	-9.11	-3.92	-3.90	-3.90	-3.90	-3.90	-3.90
						-3.90	-3.93	-9.11	-15.62				
					Mu(+), ton-m:	7.81	3.90	3.90	4.48	5.51	5.81	5.51	
						4.48	3.90	3.90	7.81				
					As(-), cm2:	11.61	6.50	3.92	3.92	3.92	3.92	3.92	
						3.92	3.92	6.50	11.61				
					As(+), cm2:	5.53	3.92	3.92	3.92	3.92	4.07	3.92	
						3.92	3.92	3.92	5.53				
					Vu, ton:	21.23	21.23	18.44	15.35	12.26	9.16	12.26	
						15.35	18.44	21.23	21.23				
					Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						0.00	0.00	0.00					
					Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
						#3	#3	#3					
					Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
						19.00	9.00	9.00					

DESIGN

DESIGN

D-4	C-4	11 #3 @ 9	8 #3 @ 19	11 #3 @ 9	Mu(-), ton-m:	-16.55	-9.70	-4.16	-4.14	-4.14	-4.14	-4.14	-4.14
						-4.14	-4.14	-7.99	-14.33				
					Mu(+), ton-m:	8.28	4.14	4.14	4.52	5.75	6.49	6.60	
						5.93	4.24	4.14	7.16				
					As(-), cm2:	12.38	6.94	3.92	3.92	3.92	3.92	3.92	
						3.92	3.92	5.66	10.56				
					As(+), cm2:	5.87	3.92	3.92	3.92	4.03	4.56	4.64	
						4.15	3.92	3.92	5.05				
					Vu, ton:	22.08	22.08	19.29	16.19	13.10	10.01	11.64	
						14.74	17.83	20.62	20.62				
					Tu, ton-m:	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
						0.01	0.01	0.01					
					Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
						#3	#3	#3					
					Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
						19.00	9.00	9.00					
					X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
						3.07	3.42	3.78					

DESIGN									

F-4	E-4	11 #3 @ 9 8 #3 @ 19 11 #3 @ 9							
BEAM: 5(A-B) FLOOR: 2									
=====									
=====									
=====									
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm									
Sec: V30X45	Lu = 3.55 m		c = 0.23 m	h = 45.0 cm		Mat:			
4000PSI	-----								
X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71	
3.07	3.42	3.78							
Mu(-), ton-m:	-14.60	-8.21	-4.20	-4.20	-4.20	-4.20	-4.20	-4.20	
-4.20	-4.31	-9.89	-16.79						
Mu(+), ton-m:	7.30	4.20	4.40	6.04	6.66	6.49	5.80		
4.62	4.20	4.20	8.40						
As(-), cm2:	10.78	5.83	3.92	3.92	3.92	3.92	3.92		
3.92	3.92	7.09	12.58						
As(+), cm2:	5.15	3.92	3.92	4.23	4.68	4.56	4.06		
3.92	3.92	3.92	5.96						
Vu, ton:	20.77	20.77	17.98	14.88	11.79	10.15	13.25		
16.34	19.43	22.22	22.22						
Tu, ton-m:	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
0.01	0.01	0.01							
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3	
#3	#3	#3							
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00	
19.00	9.00	9.00	9.00						

DESIGN									

B-5	A-5	11 #3 @ 9 8 #3 @ 19 11 #3 @ 9							
BEAM: 5(B-C) FLOOR: 2									
=====									
=====									
=====									
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm									
Sec: V30X45	Lu = 3.55 m		c = 0.23 m	h = 45.0 cm		Mat:			
4000PSI	-----								
X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71	
3.07	3.42	3.78							
Mu(-), ton-m:	-15.86	-9.31	-4.09	-3.97	-3.97	-3.97	-3.97		
-3.97	-4.11	-9.33	-15.87						
Mu(+), ton-m:	7.93	3.97	3.97	4.61	5.60	5.81	5.60		
4.62	3.97	3.97	7.93						
As(-), cm2:	11.81	6.65	3.92	3.92	3.92	3.92	3.92		
3.92	3.92	6.67	11.82						
As(+), cm2:	5.62	3.92	3.92	3.92	3.92	4.07	3.92		
3.92	3.92	3.92	5.62						
Vu, ton:	21.38	21.38	18.59	15.50	12.40	9.31	12.40		
15.50	18.59	21.38	21.38						
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.00	0.00	0.00							
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3	
#3	#3	#3							

Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00 Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
19.00 9.00 9.00 9.00 Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

DESIGN									
D-5									
C-5 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9									
BEAM: 5(D-E) FLOOR: 2									
=====									
=====									
=====									
=====									
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm									
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: #3									
4000PSI									

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71	
3.07	3.42	3.78							
Mu(-), ton-m:	-16.79	-9.89	-4.31	-4.20	-4.20	-4.20	-4.20	-4.20	
-4.20	-4.20	-8.21	-14.60						
Mu(+), ton-m:	8.40	4.20	4.20	4.62	5.80	6.49	6.66		
6.04	4.40	4.20	7.30						
As(-), cm2:	12.58	7.09	3.92	3.92	3.92	3.92	3.92		
3.92	3.92	5.83	10.78						
As(+), cm2:	5.96	3.92	3.92	3.92	4.06	4.56	4.68		
4.23	3.92	3.92	5.15						
Vu, ton:	22.22	22.22	19.43	16.34	13.25	10.15	11.79		
14.88	17.98	20.77	20.77						
Tu, ton-m:	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
0.01	0.01	0.01							
Stirrup:	#3	#3	#3	#3	#3	#3	#3		
#3	#3	#3							
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00		
19.00	9.00	9.00	9.00						

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71	
3.07	3.42	3.78							
Mu(-), ton-m:	-15.76	-9.23	-4.03	-3.98	-3.98	-3.98	-3.98		
-3.98	-4.10	-9.36	-15.93						
Mu(+), ton-m:	7.88	3.98	3.98	4.54	5.51	5.75	5.43		
4.42	3.98	3.98	7.96						
As(-), cm2:	11.72	6.59	3.92	3.92	3.92	3.92	3.92		
3.92	3.92	6.69	11.87						
As(+), cm2:	5.58	3.92	3.92	3.92	3.92	4.02	3.92		
3.92	3.92	3.92	5.64						
Vu, ton:	21.32	21.32	18.53	15.44	12.35	9.37	12.47		
15.56	18.65	21.44	21.44						
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
0.00	0.00	0.00							
Stirrup:	#3	#3	#3	#3	#3	#3	#3		
#3	#3	#3							
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00		
19.00	9.00	9.00	9.00						

DESIGN									
E-5									
D-5 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9									
BEAM: 5(E-F) FLOOR: 2									
=====									
=====									
=====									
=====									
Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm									
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI									

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71	
3.07	3.42	3.78							
Mu(-), ton-m:	-8.23	-4.78	-2.31	-2.31	-2.31	-2.31	-2.31		
-2.31	-2.62	-5.60	-9.26						
Mu(+), ton-m:	4.12	2.31	2.35	3.11	3.37	3.28	3.15		
2.68	2.31	2.31	4.63						
As(-), cm2:	5.84	3.92	3.92	3.92	3.92	3.92	3.92		
3.92	3.92	6.61							
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92		
3.92	3.92	3.92							
Vu, ton:	11.21	11.21	9.76	8.15	6.55	5.53	7.13		
10.35	11.80	11.80							

Tu, ton-m: 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
0.03 0.03 0.03
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

DESIGN

A-6 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
B-6

BEAM: 6(B-C) FLOOR: 2

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -8.98 -5.43 -2.55 -2.25 -2.25 -2.25 -2.25
-2.25 -2.56 -5.44 -9.00
Mu(+), ton-m: 4.49 2.25 2.25 2.67 3.03 3.02 3.02
2.66 2.25 2.25 4.50
As(-), cm2: 6.40 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 6.41
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 11.54 11.54 10.09 8.49 6.88 5.28 6.89 8.50
10.11 11.56 11.56
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -9.01 -5.47 -2.62 -2.25 -2.25 -2.25 -2.25
-2.25 -2.60 -5.46 -9.00
Mu(+), ton-m: 4.51 2.25 2.25 2.73 3.09 3.02 3.09
2.72 2.25 2.25 4.50
As(-), cm2: 6.42 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 6.41
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 11.56 11.56 10.11 8.50 6.89 5.29 6.89 8.50
10.11 11.56 11.56
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

DESIGN

C-6 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
D-6

BEAM: 6(D-E) FLOOR: 2

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

DESIGN

B-6 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
C-6

BEAM: 6(C-D) FLOOR: 2

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -9.00 -5.44 -2.56 -2.25 -2.25 -2.25 -2.25
-2.25 -2.55 -5.43 -8.98
Mu(+), ton-m: 4.50 2.25 2.25 2.66 3.02 3.02 3.03
2.67 2.25 2.25 4.49
As(-), cm2: 6.41 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 6.40

As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 11.56 11.56 10.11 8.50 6.89 5.28 6.88 8.49
10.09 11.54 11.54
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

BEAM: 1(A-B) FLOOR: 3

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45

Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:

4000PSI

DESIGN

D-6 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

E-6

BEAM: 6(E-F) FLOOR: 2

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -1.71 -1.02 -0.60 -0.60 -0.60 -0.60 -0.60
-0.60 -0.87 -1.58 -2.41
Mu(+), ton-m: 0.86 0.91 0.95 0.96 0.86 0.68 0.71
0.67 0.60 0.60 1.21
As(-), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 2.26 2.26 1.99 1.68 1.38 1.48 1.78 2.08
2.38 2.66 2.66
Tu, ton-m: 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02
0.02 0.02 0.02
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -9.26 -5.60 -2.62 -2.31 -2.31 -2.31 -2.31
-2.31 -2.31 -4.78 -8.23
Mu(+), ton-m: 4.63 2.31 2.31 2.68 3.15 3.28 3.37
3.11 2.35 2.31 4.12
As(-), cm2: 6.61 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 5.84
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 11.80 11.80 10.35 8.74 7.13 5.53 6.55 8.15
9.76 11.21 11.21
Tu, ton-m: 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
0.03 0.03 0.03
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

DESIGN

A-1 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
B-1

BEAM: 1(B-C) FLOOR: 3

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

DESIGN

E-6 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

F-6

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -2.14 -1.38 -0.76 -0.56 -0.56 -0.56 -0.56
-0.56 -0.81 -1.45 -2.23

	X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78							
	Mu(-), ton-m:	-2.41	-1.58	-0.87	-0.60	-0.60	-0.60	-0.60	-0.60
-0.60	-0.60	-1.02	-1.71						
	Mu(+), ton-m:	1.21	0.60	0.60	0.67	0.71	0.68	0.86	
0.96	0.95	0.91	0.86						
	As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92							
	As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92	3.92						
	Vu, ton:	2.66	2.66	2.38	2.08	1.78	1.48	1.38	1.68
1.99	2.26	2.26							
	Tu, ton-m:	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02							
	Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3							
	Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
19.00	9.00	9.00	9.00						

DESIGN

A-2 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

B-2

BEAM: 2(B-C) FLOOR: 3

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45

Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:

4000PSI

DESIGN

	E-1	11 #3 @ 9	8 #3 @ 19	11 #3 @ 9					
F-1									
	Mu(-), ton-m:	-2.19	-1.21	-0.61	-0.61	-0.61	-0.61	-0.61	
-0.61	-0.63	-1.43	-2.45						
	Mu(+), ton-m:	1.10	0.61	0.61	0.70	0.86	0.95	0.90	
0.71	0.61	0.61	1.22						
	As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	3.92							
	As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	3.92	3.92						
	Vu, ton:	3.21	3.21	2.78	2.30	1.82	1.44	1.92	2.40
2.88	3.31	3.31							
	Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.00	0.00	0.00							
	Stirrup:	#3	#3	#3	#3	#3	#3	#3	
#3	#3	#3							
	Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	
19.00	9.00	9.00	9.00						

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71

3.07 3.42 3.78

Mu(-), ton-m: -2.19 -1.21 -0.61 -0.61 -0.61 -0.61 -0.61 -0.61

-0.61 -0.63 -1.43 -2.45

Mu(+), ton-m: 1.10 0.61 0.61 0.70 0.86 0.95 0.90

0.71 0.61 0.61 1.22

As(-), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92

3.92 3.92 3.92

As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92

3.92 3.92 3.92 3.92

Vu, ton: 3.21 3.21 2.78 2.30 1.82 1.44 1.92 2.40

2.88 3.31 3.31

Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

0.00 0.00 0.00

Stirrup: #3 #3 #3 #3 #3 #3 #3 #3

#3 #3 #3

Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00

19.00 9.00 9.00 9.00

	X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78							
	Mu(-), ton-m:	-3.51	-2.33	-1.37	-0.88	-0.88	-0.88	-0.88	-0.88
-0.88	-0.88	-1.46	-2.53						
	Mu(+), ton-m:	1.76	0.88	0.88	0.96	1.06	0.97	0.88	
0.88	0.88	0.88	1.26						
	As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92							
	As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92	3.92						
	Vu, ton:	3.91	3.91	3.47	2.99	2.51	2.03	2.19	2.67
3.15	3.58	3.58							
	Tu, ton-m:	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.03	0.03	0.03							
	Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3							
	Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
19.00	9.00	9.00	9.00						

DESIGN

B-2 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

C-2

BEAM: 2(C-D) FLOOR: 3

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45

Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI

										Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
										#3 #3 #3
										Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
										19.00 9.00 9.00 9.00
X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71		
3.07	3.42	3.78								
Mu(-), ton-m:	-2.49	-1.47	-0.67	-0.62	-0.62	-0.62	-0.62	-0.62		
-0.62	-0.67	-1.47	-2.49							
Mu(+), ton-m:	1.25	0.62	0.62	0.71	0.86	0.90	0.86	0.86		
0.71	0.62	0.62	1.24							
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92		
3.92	3.92	3.92								
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92		
3.92	3.92	3.92	3.92							
Vu, ton:	3.34	3.34	2.91	2.42	1.94	1.46	1.94	2.42		
2.91	3.34	3.34								
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
0.00	0.00	0.00								
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3		
#3	#3	#3								
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00		
19.00	9.00	9.00	9.00							

DESIGN

D-2 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

E-2

BEAM: 2(E-F) FLOOR: 3

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Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45

Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71		
3.07	3.42	3.78								
Mu(-), ton-m:	-2.53	-1.46	-0.88	-0.88	-0.88	-0.88	-0.88	-0.88		
-0.88	-1.37	-2.33	-3.51							
Mu(+), ton-m:	1.26	0.88	0.88	0.88	0.88	0.88	0.97	1.06		
0.96	0.88	0.88	1.76							
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92		
3.92	3.92	3.92								
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92		
3.92	3.92	3.92	3.92							
Vu, ton:	3.58	3.58	3.15	2.67	2.19	2.03	2.51	2.99		
3.47	3.91	3.91								
Tu, ton-m:	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03		
0.03	0.03	0.03								
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3		
#3	#3	#3								
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00		
19.00	9.00	9.00	9.00							

DESIGN

D-2 C-2 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

BEAM: 2(D-E) FLOOR: 3

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Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45

Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71		
3.07	3.42	3.78								
Mu(-), ton-m:	-2.45	-1.43	-0.63	-0.61	-0.61	-0.61	-0.61	-0.61		
-0.61	-0.61	-1.21	-2.19							
Mu(+), ton-m:	1.22	0.61	0.61	0.71	0.90	0.95	0.86	0.86		
0.70	0.61	0.61	1.10							
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92		
3.92	3.92	3.92								
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92		
3.92	3.92	3.92	3.92							
Vu, ton:	3.31	3.31	2.88	2.40	1.92	1.44	1.82	2.30		
2.78	3.21	3.21								
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
0.00	0.00	0.00								

DESIGN

E-2 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

F-2

BEAM: 3(A-B) FLOOR: 3

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BEAM: 3(D-E) FLOOR: 3

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Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -2.42 -1.40 -0.61 -0.60 -0.60 -0.60 -0.60
-0.60 -0.60 -1.19 -2.17
Mu(+), ton-m: 1.21 0.60 0.60 0.69 0.89 0.95 0.86
0.70 0.60 0.60 1.08
As(-), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 3.30 3.30 2.86 2.38 1.90 1.42 1.80 2.28
2.76 3.20 3.20
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

DESIGN

D-3 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
E-3

BEAM: 3(E-F) FLOOR: 3

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Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -2.44 -1.39 -0.85 -0.85 -0.85 -0.85 -0.85
-0.85 -1.30 -2.24 -3.39
Mu(+), ton-m: 1.22 0.85 0.85 0.85 0.85 0.95 1.02
0.90 0.85 0.85 1.70

As(-), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 3.52 3.52 3.09 2.61 2.12 1.97 2.45 2.93
3.41 3.85 3.85
Tu, ton-m: 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
0.03 0.03 0.03
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

DESIGN

E-3 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
F-3

BEAM: 4(A-B) FLOOR: 3

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Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -3.39 -2.24 -1.30 -0.85 -0.85 -0.85 -0.85
-0.85 -0.85 -1.39 -2.44
Mu(+), ton-m: 1.70 0.85 0.85 0.90 1.02 0.95 0.85
0.85 0.85 0.85 1.22
As(-), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 3.85 3.85 3.41 2.93 2.45 1.97 2.12 2.61
3.09 3.52 3.52
Tu, ton-m: 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
0.03 0.03 0.03
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

DESIGN

B-4	A-4	11 #3 @ 9	8 #3 @ 19	11 #3 @ 9	Mu(-), ton-m:	-2.45	-1.44	-0.64	-0.61	-0.61	-0.61	-0.61
					-0.61	-0.64	-1.44	-2.45				
					Mu(+), ton-m:	1.23	0.61	0.61	0.68	0.84	0.90	0.84
					0.68	0.61	0.61	1.23				
					As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92
					3.92	3.92	3.92					
					As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92
					3.92	3.92	3.92	3.92				
					Vu, ton:	3.32	3.32	2.88	2.40	1.92	1.44	1.92
					2.88	3.32	3.32					
					Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00					
					Stirrup:	#3	#3	#3	#3	#3	#3	#3
					#3	#3	#3					
					Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00
					19.00	9.00	9.00	9.00				

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-2.17	-1.19	-0.60	-0.60	-0.60	-0.60	-0.60	-0.60
-0.60	-0.61	-1.40	-2.42					
Mu(+), ton-m:	1.08	0.60	0.60	0.70	0.86	0.95	0.89	
0.69	0.60	0.60	1.21					
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92						
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	3.92	3.92					
Vu, ton:	3.20	3.20	2.76	2.28	1.80	1.42	1.90	2.38
2.86	3.30	3.30						
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00
19.00	9.00	9.00	9.00					

DESIGN

C-4	B-4	11 #3 @ 9	8 #3 @ 19	11 #3 @ 9	Mu(-), ton-m:	-2.42	-1.40	-0.61	-0.60	-0.60	-0.60	-0.60
					-0.60	-0.60	-1.19	-2.17				
					Mu(+), ton-m:	1.21	0.60	0.60	0.69	0.89	0.95	0.86
					0.70	0.60	0.60	1.08				
					As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92
					3.92	3.92	3.92					
					As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92
					3.92	3.92	3.92	3.92				
					Vu, ton:	3.30	3.30	2.86	2.38	1.90	1.42	1.80
					2.76	3.20	3.20					
					Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00					
					Stirrup:	#3	#3	#3	#3	#3	#3	#3
					#3	#3	#3					
					Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00
					19.00	9.00	9.00	9.00				

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm

Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat: 4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						

DESIGN

DESIGN									

E-4	D-4	11 #3 @ 9 8 #3 @ 19 11 #3 @ 9							
BEAM: 4(E-F) FLOOR: 3									
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Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm									
Sec: V30X45									
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:									
4000PSI									

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71	
3.07	3.42	3.78							
Mu(-), ton-m:	-2.44	-1.39	-0.85	-0.85	-0.85	-0.85	-0.85	-0.85	
-0.85	-1.30	-2.24	-3.39						
Mu(+), ton-m:	1.22	0.85	0.85	0.85	0.85	0.95	1.02		
0.90	0.85	0.85	1.70						
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	3.92							
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	3.92	3.92						
Vu, ton:	3.52	3.52	3.09	2.61	2.12	1.97	2.45	2.93	
3.41	3.85	3.85							
Tu, ton-m:	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	
0.03	0.03	0.03							
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3	
#3	#3	#3							
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	19.00	
19.00	9.00	9.00	9.00						

DESIGN									

F-4	E-4	11 #3 @ 9 8 #3 @ 19 11 #3 @ 9							
BEAM: 5(A-B) FLOOR: 3									
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Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm									
Sec: V30X45									
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:									
4000PSI									

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71	
3.07	3.42	3.78							
Mu(-), ton-m:	-2.19	-1.21	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	
-0.61	-0.63	-1.43	-2.45						
Mu(+), ton-m:	1.10	0.61	0.61	0.70	0.86	0.95	0.90		
0.71	0.61	0.61	1.22						
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	3.92							
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	3.92	3.92						
Vu, ton:	3.21	3.21	2.78	2.30	1.82	1.44	1.92	2.40	
2.88	3.31	3.31							
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.00	0.00	0.00							
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3	
#3	#3	#3							

Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00 Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
19.00 9.00 9.00 9.00
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

DESIGN

C-5 B-5 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
BEAM: 5(C-D) FLOOR: 3
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X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-2.45	-1.43	-0.63	-0.61	-0.61	-0.61	-0.61	-0.61
-0.61	-0.61	-1.21	-2.19					
Mu(+), ton-m:	1.22	0.61	0.61	0.71	0.90	0.95	0.86	
0.70	0.61	0.61	1.10					
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
3.92	3.92	3.92						
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	3.92	3.92					
Vu, ton:	3.31	3.31	2.88	2.40	1.92	1.44	1.82	2.30
2.78	3.21	3.21						
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	
19.00	9.00	9.00	9.00					

Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-2.49	-1.47	-0.67	-0.62	-0.62	-0.62	-0.62	
-0.62	-0.67	-1.47	-2.49					
Mu(+), ton-m:	1.25	0.62	0.62	0.71	0.86	0.90	0.86	
0.71	0.62	0.62	1.24					
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	3.92						
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	3.92	3.92					
Vu, ton:	3.34	3.34	2.91	2.42	1.94	1.46	1.94	2.42
2.91	3.34	3.34						
Tu, ton-m:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.00	0.00	0.00						
Stirrup:	#3	#3	#3	#3	#3	#3	#3	#3
#3	#3	#3						
Spacing, cm:	9.00	9.00	9.00	19.00	19.00	19.00	19.00	
19.00	9.00	9.00	9.00					

DESIGN

E-5 D-5 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
BEAM: 5(E-F) FLOOR: 3
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Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

DESIGN

D-5 C-5 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
BEAM: 5(D-E) FLOOR: 3
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X, m:	0.23	0.58	0.93	1.29	1.65	2.00	2.36	2.71
3.07	3.42	3.78						
Mu(-), ton-m:	-2.53	-1.46	-0.88	-0.88	-0.88	-0.88	-0.88	
-0.88	-1.37	-2.33	-3.51					
Mu(+), ton-m:	1.26	0.88	0.88	0.88	0.88	0.97	1.06	
0.96	0.88	0.88	1.76					
As(-), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	3.92						
As(+), cm2:	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
3.92	3.92	3.92	3.92					
Vu, ton:	3.58	3.58	3.15	2.67	2.19	2.03	2.51	2.99
3.47	3.91	3.91						

Tu, ton-m: 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
0.03 0.03 0.03
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

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Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

DESIGN

E-5 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
F-5

BEAM: 6(A-B) FLOOR: 3

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Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -2.14 -1.38 -0.76 -0.56 -0.56 -0.56 -0.56
-0.56 -0.81 -1.45 -2.23
Mu(+), ton-m: 1.07 0.66 0.71 0.73 0.69 0.57 0.67
0.70 0.67 0.61 1.11
As(-), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
Vu, ton: 2.44 2.44 2.17 1.87 1.57 1.32 1.62 1.92
2.22 2.49 2.49
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -1.71 -1.02 -0.60 -0.60 -0.60 -0.60 -0.60
-0.60 -0.87 -1.58 -2.41
Mu(+), ton-m: 0.86 0.91 0.95 0.96 0.86 0.68 0.71
0.67 0.60 0.60 1.21
As(-), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 2.26 2.26 1.99 1.68 1.38 1.48 1.78 2.08
2.38 2.66 2.66
Tu, ton-m: 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02
0.02 0.02 0.02
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

DESIGN

A-6 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
B-6

BEAM: 6(B-C) FLOOR: 3

B-6 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
C-6

BEAM: 6(C-D) FLOOR: 3

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Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45
Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

DESIGN

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -2.20 -1.44 -0.81 -0.55 -0.55 -0.55 -0.55
-0.55 -0.80 -1.43 -2.20
Mu(+), ton-m: 1.10 0.64 0.70 0.73 0.70 0.62 0.70
0.73 0.69 0.64 1.10
As(-), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92

As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 2.47 2.47 2.20 1.90 1.59 1.29 1.59 1.90
2.20 2.47 2.47
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

BEAM: 6(E-F) FLOOR: 3

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Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

DESIGN

D-6 C-6 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9

BEAM: 6(D-E) FLOOR: 3

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Length: L = 4.00 m a = 0.23 m Section: b = 30.0 cm
Sec: V30X45 Lu = 3.55 m c = 0.23 m h = 45.0 cm Mat:
4000PSI

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -2.41 -1.58 -0.87 -0.60 -0.60 -0.60 -0.60
-0.60 -1.02 -1.71
Mu(+), ton-m: 1.21 0.60 0.60 0.67 0.71 0.68 0.86
0.96 0.95 0.91 0.86
As(-), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92 3.92
Vu, ton: 2.66 2.66 2.38 2.08 1.78 1.48 1.38 1.68
3.92 3.92
1.99 2.26 2.26
Tu, ton-m: 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02
0.02 0.02
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

X, m: 0.23 0.58 0.93 1.29 1.65 2.00 2.36 2.71
3.07 3.42 3.78
Mu(-), ton-m: -2.23 -1.45 -0.81 -0.56 -0.56 -0.56 -0.56
-0.56 -0.76 -1.38 -2.14
Mu(+), ton-m: 1.11 0.61 0.67 0.70 0.67 0.57 0.69
0.73 0.71 0.66 1.07
As(-), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
As(+), cm2: 3.92 3.92 3.92 3.92 3.92 3.92 3.92 3.92
3.92 3.92 3.92
Vu, ton: 2.49 2.49 2.22 1.92 1.62 1.32 1.57 1.87
2.17 2.44 2.44
Tu, ton-m: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Stirrup: #3 #3 #3 #3 #3 #3 #3 #3
#3 #3 #3
Spacing, cm: 9.00 9.00 9.00 19.00 19.00 19.00 19.00
19.00 9.00 9.00 9.00

DESIGN

E-6 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
F-6

LONG-TERM BEAM DEFLECTIONS

PERMISSIBLE DEFLECTIONS

Immediate deflection due to Live Load = L/360
Long-term deflection due to Sustained loads . . = L/480

TYPE OF DEFLECTION	LOAD COMBINATION
Immediate due to Dead load (DLs)	DO + DL
Immediate due to Live load (LLs)*	LL
Immediate due to Sus. load (SLDs)	DO + DL + .25LL
Long-term due to Sus. load (SLDs)	DO + DL + .25LL

* Computed as Defl(DLS + LLs) - Defl(DLS)

Units: Defl: Max. deflection (cm), L: Beam length

(m), h: Beam depth (cm)

DESIGN

D-6 11 #3 @ 9 8 #3 @ 19 11 #3 @ 9
E-6

LONG-TERM DEFLEC. Sus.Lds		IMMEDIATE DEFLECTIONS		ADDITIONAL		F(1-2)		F(2-3)		F(3-4)		F(4-5)		F(5-6)								
		DLs	Live	Sut.Lds	6 months	1-year	0.054	0.077	2	45	4.00	9	EndJContn	0.045	0.002	0.045	0.046					
5-years	Beam	Floor	h	L	L/h	Beam Type	Deflc	Deflc	Deflc	Deflc	Deflc	Deflc	Deflc	Deflc	Deflc	Deflc	Deflc					
Deflc	Deflc																					
0.054	A(1-2)	2	45	4.00	9	EndJContn	0.045	0.002	0.045	0.046	0.054	0.077	A(1-2)	3	45	4.00	9	BothEndCnt	0.026	0.005	0.027	0.028
0.046	A(2-3)	2	45	4.00	9	BothEndCnt	0.038	0.002	0.039	0.040	0.033	0.047	A(2-3)	3	45	4.00	9	BothEndCnt	0.018	0.005	0.019	0.019
0.046	A(3-4)	2	45	4.00	9	BothEndCnt	0.038	0.002	0.038	0.039	0.023	0.032	A(3-4)	3	45	4.00	9	BothEndCnt	0.017	0.005	0.018	0.019
0.046	A(4-5)	2	45	4.00	9	BothEndCnt	0.038	0.002	0.039	0.040	0.022	0.031	A(4-5)	3	45	4.00	9	BothEndCnt	0.018	0.005	0.019	0.019
0.054	A(5-6)	2	45	4.00	9	EndJContn	0.045	0.002	0.045	0.046	0.023	0.032	A(5-6)	3	45	4.00	9	BothEndCnt	0.026	0.005	0.027	0.028
0.235	B(1-2)	2	45	4.00	9	EndJContn	0.190	0.021	0.196	0.201	0.033	0.047	B(1-2)	3	45	4.00	9	EndJContn	0.005	0.005	0.008	0.008
0.155	B(2-3)	2	45	4.00	9	BothEndCnt	0.125	0.017	0.129	0.133	0.009	0.013	B(2-3)	3	45	4.00	9	BothEndCnt	0.010	0.003	0.011	0.011
0.161	B(3-4)	2	45	4.00	9	BothEndCnt	0.130	0.017	0.134	0.138	0.013	0.019	B(3-4)	3	45	4.00	9	BothEndCnt	0.009	0.003	0.009	0.010
0.155	B(4-5)	2	45	4.00	9	BothEndCnt	0.125	0.017	0.129	0.133	0.011	0.016	B(4-5)	3	45	4.00	9	BothEndCnt	0.010	0.003	0.011	0.011
0.235	B(5-6)	2	45	4.00	9	EndJContn	0.190	0.021	0.196	0.201	0.013	0.019	B(5-6)	3	45	4.00	9	EndJContn	0.005	0.005	0.008	0.008
0.235	C(1-2)	2	45	4.00	9	EndJContn	0.190	0.021	0.196	0.201	0.009	0.013	C(1-2)	3	45	4.00	9	EndJContn	0.005	0.005	0.008	0.008
0.155	C(2-3)	2	45	4.00	9	BothEndCnt	0.125	0.017	0.129	0.132	0.009	0.013	C(2-3)	3	45	4.00	9	BothEndCnt	0.010	0.003	0.011	0.011
0.161	C(3-4)	2	45	4.00	9	BothEndCnt	0.130	0.017	0.134	0.138	0.013	0.019	C(3-4)	3	45	4.00	9	BothEndCnt	0.009	0.003	0.009	0.010
0.155	C(4-5)	2	45	4.00	9	BothEndCnt	0.125	0.017	0.129	0.132	0.011	0.016	C(4-5)	3	45	4.00	9	BothEndCnt	0.010	0.003	0.011	0.011
0.235	C(5-6)	2	45	4.00	9	EndJContn	0.190	0.021	0.196	0.201	0.013	0.019	C(5-6)	3	45	4.00	9	EndJContn	0.005	0.005	0.008	0.008
0.235	D(1-2)	2	45	4.00	9	EndJContn	0.190	0.021	0.196	0.201	0.009	0.013	D(1-2)	3	45	4.00	9	EndJContn	0.005	0.005	0.008	0.008
0.155	D(2-3)	2	45	4.00	9	BothEndCnt	0.125	0.017	0.129	0.132	0.009	0.013	D(2-3)	3	45	4.00	9	BothEndCnt	0.010	0.003	0.011	0.011
0.161	D(3-4)	2	45	4.00	9	BothEndCnt	0.130	0.017	0.134	0.138	0.013	0.019	D(3-4)	3	45	4.00	9	BothEndCnt	0.009	0.003	0.009	0.010
0.155	D(4-5)	2	45	4.00	9	BothEndCnt	0.125	0.017	0.129	0.132	0.011	0.016	D(4-5)	3	45	4.00	9	BothEndCnt	0.010	0.003	0.011	0.011
0.235	D(5-6)	2	45	4.00	9	EndJContn	0.190	0.021	0.196	0.201	0.013	0.019	D(5-6)	3	45	4.00	9	EndJContn	0.005	0.005	0.008	0.008
0.235	E(1-2)	2	45	4.00	9	EndJContn	0.190	0.021	0.196	0.201	0.009	0.013	E(1-2)	3	45	4.00	9	EndJContn	0.005	0.005	0.008	0.008
0.155	E(2-3)	2	45	4.00	9	BothEndCnt	0.125	0.017	0.129	0.133	0.009	0.013	E(2-3)	3	45	4.00	9	BothEndCnt	0.010	0.003	0.011	0.011
0.161	E(3-4)	2	45	4.00	9	BothEndCnt	0.130	0.017	0.134	0.138	0.013	0.019	E(3-4)	3	45	4.00	9	BothEndCnt	0.009	0.003	0.009	0.010
0.155	E(4-5)	2	45	4.00	9	BothEndCnt	0.125	0.017	0.129	0.133	0.011	0.016	E(4-5)	3	45	4.00	9	BothEndCnt	0.010	0.003	0.011	0.011
0.235	E(5-6)	2	45	4.00	9	EndJContn	0.190	0.021	0.196	0.201	0.013	0.019	E(5-6)	3	45	4.00	9	EndJContn	0.005	0.005	0.008	0.008
										0.009	0.013											

0.033	F(1-2) 0.047	3	45	4.00	9	BothEndCnt	0.026	0.005	0.027	0.028	0.051	0.074	6(A-B)	2	45	4.00	9	EndJContin	0.042	0.002	0.043	0.044
0.023	F(2-3) 0.032	3	45	4.00	9	BothEndCnt	0.018	0.005	0.019	0.019	0.044	0.063	6(B-C)	2	45	4.00	9	BothEndCnt	0.036	0.002	0.037	0.038
0.022	F(3-4) 0.031	3	45	4.00	9	BothEndCnt	0.017	0.005	0.018	0.019	0.044	0.062	6(C-D)	2	45	4.00	9	BothEndCnt	0.036	0.002	0.036	0.037
0.023	F(4-5) 0.032	3	45	4.00	9	BothEndCnt	0.018	0.005	0.019	0.019	0.044	0.063	6(D-E)	2	45	4.00	9	BothEndCnt	0.036	0.002	0.037	0.038
0.033	F(5-6) 0.047	3	45	4.00	9	BothEndCnt	0.026	0.005	0.027	0.028	0.051	0.074	6(E-F)	2	45	4.00	9	EndIContin	0.042	0.002	0.043	0.044
0.051	1(A-B) 0.074	2	45	4.00	9	EndJContin	0.042	0.002	0.043	0.044	0.032	0.046	1(A-B)	3	45	4.00	9	BothEndCnt	0.026	0.005	0.027	0.028
0.044	1(B-C) 0.063	2	45	4.00	9	BothEndCnt	0.036	0.002	0.037	0.038	0.022	0.031	1(B-C)	3	45	4.00	9	BothEndCnt	0.017	0.004	0.018	0.019
0.044	1(C-D) 0.062	2	45	4.00	9	BothEndCnt	0.036	0.002	0.036	0.037	0.021	0.030	1(C-D)	3	45	4.00	9	BothEndCnt	0.017	0.004	0.018	0.018
0.044	1(D-E) 0.063	2	45	4.00	9	BothEndCnt	0.036	0.002	0.037	0.038	0.022	0.031	1(D-E)	3	45	4.00	9	BothEndCnt	0.017	0.004	0.018	0.019
0.051	1(E-F) 0.074	2	45	4.00	9	EndIContin	0.042	0.002	0.043	0.044	0.032	0.046	1(E-F)	3	45	4.00	9	BothEndCnt	0.026	0.005	0.027	0.028
0.206	2(A-B) 0.295	2	45	4.00	9	EndJContin	0.167	0.020	0.172	0.177	0.009	0.013	2(A-B)	3	45	4.00	9	EndJContin	0.005	0.005	0.007	0.008
0.133	2(B-C) 0.190	2	45	4.00	9	BothEndCnt	0.107	0.015	0.111	0.114	0.013	0.018	2(B-C)	3	45	4.00	9	BothEndCnt	0.010	0.003	0.011	0.011
0.138	2(C-D) 0.198	2	45	4.00	9	BothEndCnt	0.112	0.016	0.115	0.119	0.011	0.015	2(C-D)	3	45	4.00	9	BothEndCnt	0.008	0.003	0.009	0.009
0.133	2(D-E) 0.190	2	45	4.00	9	BothEndCnt	0.107	0.015	0.111	0.114	0.013	0.018	2(D-E)	3	45	4.00	9	BothEndCnt	0.010	0.003	0.011	0.011
0.206	2(E-F) 0.295	2	45	4.00	9	EndIContin	0.167	0.020	0.172	0.177	0.009	0.013	2(E-F)	3	45	4.00	9	EndIContin	0.005	0.005	0.007	0.008
0.206	3(A-B) 0.295	2	45	4.00	9	EndJContin	0.167	0.020	0.172	0.177	0.009	0.013	3(A-B)	3	45	4.00	9	EndJContin	0.005	0.005	0.007	0.008
0.133	3(B-C) 0.190	2	45	4.00	9	BothEndCnt	0.107	0.015	0.111	0.114	0.013	0.018	3(B-C)	3	45	4.00	9	BothEndCnt	0.010	0.003	0.011	0.011
0.138	3(C-D) 0.198	2	45	4.00	9	BothEndCnt	0.112	0.016	0.115	0.119	0.011	0.015	3(C-D)	3	45	4.00	9	BothEndCnt	0.008	0.003	0.009	0.009
0.133	3(D-E) 0.190	2	45	4.00	9	BothEndCnt	0.107	0.015	0.111	0.114	0.013	0.018	3(D-E)	3	45	4.00	9	BothEndCnt	0.010	0.003	0.011	0.011
0.206	3(E-F) 0.295	2	45	4.00	9	EndIContin	0.167	0.020	0.172	0.177	0.009	0.013	3(E-F)	3	45	4.00	9	EndIContin	0.005	0.005	0.007	0.008
0.206	4(A-B) 0.295	2	45	4.00	9	EndJContin	0.167	0.020	0.172	0.177	0.009	0.013	4(A-B)	3	45	4.00	9	EndJContin	0.005	0.005	0.007	0.008
0.133	4(B-C) 0.190	2	45	4.00	9	BothEndCnt	0.107	0.015	0.111	0.114	0.013	0.018	4(B-C)	3	45	4.00	9	BothEndCnt	0.010	0.003	0.011	0.011
0.138	4(C-D) 0.198	2	45	4.00	9	BothEndCnt	0.112	0.016	0.115	0.119	0.011	0.015	4(C-D)	3	45	4.00	9	BothEndCnt	0.008	0.003	0.009	0.009
0.133	4(D-E) 0.190	2	45	4.00	9	BothEndCnt	0.107	0.015	0.111	0.114	0.013	0.018	4(D-E)	3	45	4.00	9	BothEndCnt	0.010	0.003	0.011	0.011
0.206	4(E-F) 0.295	2	45	4.00	9	EndIContin	0.167	0.020	0.172	0.177	0.009	0.013	4(E-F)	3	45	4.00	9	EndIContin	0.005	0.005	0.007	0.008
0.206	5(A-B) 0.295	2	45	4.00	9	EndJContin	0.167	0.020	0.172	0.177	0.009	0.013	5(A-B)	3	45	4.00	9	EndJContin	0.005	0.005	0.007	0.008
0.133	5(B-C) 0.190	2	45	4.00	9	BothEndCnt	0.107	0.015	0.111	0.114	0.013	0.018	5(B-C)	3	45	4.00	9	BothEndCnt	0.010	0.003	0.011	0.011
0.138	5(C-D) 0.198	2	45	4.00	9	BothEndCnt	0.112	0.016	0.115	0.119	0.011	0.015	5(C-D)	3	45	4.00	9	BothEndCnt	0.008	0.003	0.009	0.009
0.133	5(D-E) 0.190	2	45	4.00	9	BothEndCnt	0.107	0.015	0.111	0.114	0.013	0.018	5(D-E)	3	45	4.00	9	BothEndCnt	0.010	0.003	0.011	0.011
0.206	5(E-F) 0.295	2	45	4.00	9	EndIContin	0.167	0.020	0.172	0.177	0.009	0.013	5(E-F)	3	45	4.00	9	EndIContin	0.005	0.005	0.007	0.008

6(A-B)	3	45	4.00	9	BothEndCnl	0.026	0.005	0.027	0.028	0.032	0.046
6(B-C)	3	45	4.00	9	BothEndCnl	0.017	0.004	0.018	0.019	0.022	0.031
6(C-D)	3	45	4.00	9	BothEndCnl	0.017	0.004	0.018	0.018	0.021	0.030
6(D-E)	3	45	4.00	9	BothEndCnl	0.017	0.004	0.018	0.019	0.022	0.031
6(E-F)	3	45	4.00	9	BothEndCnl	0.026	0.005	0.027	0.028	0.032	0.046

NOTE: All beam deflections are smaller than maximum permissible deflection
 Depth, H, of all beams is larger than that recommended in Table 9.5(a)

Immediate deflections are computed according to 9.5.2.3 with:

Effective stiffness: $E I = E_c \cdot I_e$

$$I_e = (Mcr/Ma)^2 I_g + [1 - (Mcr/Ma)^2] Icr$$

$$Mcr = I_r I_g / \lambda^2$$

$$Icr = b(kd)^3 / 3 + n A_s(d-kd)^2 + (n-1) A_s'(kd-d)'^2$$

$$n = E_s / E_c$$

Long-term deflections are computed according to 9.5.2.5

12.3.3 DISEÑO DE MUROS

MATERIALS

Number of materials = 1

REINFORCED CONCRETE

Mat	Name	f'c Kg/cm2	fy Kg/cm2	fys1 Kg/cm2	fys2 Kg/cm2	E	G	w
						Kg/cm2	Kg/cm2	Kg/m3
1	4000PSI	210	4200	4200	4200	178720	87430	2400.0

f'c: Compressive strength of concrete

fy: Yield strength of longitudinal reinforcement

fys1: Yield strength of shear reinforcement, bar sizes $\leq 3/8"$

fys2: Yield strength of shear reinforcement, bar sizes $> 3/8"$

Design Results - Walls (DES)

NOTE: Shear Walls are designed according to NSR-10

Method selected for design of boundary elements: Displacement-based method

Height of plastic zone: Larger of L_w and $M_u/4V_u$ (L_w : Individual wall length)

Provisions for confinement above plastic zone to prevent compression failure are considered

Boundary elements are extended vertically above hinge area until $c/L_w < 0.3$

HORIZONTAL REINFORCEMENT

VERTICAL REINFORCEMENT

Wall	Story	B	H	t	Mat	LCmb	Vu	Reinforcement	LCmb	Pu	Mu2	As tot	As ctr	As end	Ends
	(m)	(m)	(cm)	-	crit	(ton)		crit (ton)	(ton-m)	(cm2)	(cm2)	(cm2)	(cm2)	(cm2)	
6(E-F)	2	4.45	3.50	20.0	1	26	15.31	2Ly#3@35.0020	26	31.87	18.47	54.70	14.19	20.25	45x45
								*26 Confine 0 cm each end		Est #3 @11.5 cm		XTies: T: 1 X: 1			
6(D-E)	2	4.45	3.50	20.0	1	25	17.64	2Ly#3@35.0020	25	31.29	28.81	54.70	14.19	20.25	45x45
								*25 Confine 0 cm each end		Est #3 @11.5 cm		XTies: T: 1 X: 1			
5x45	6(C-D)	2	4.45	3.50	20.0	1	23	17.79	2Ly#3@35.0020	23	31.77	28.97	54.70	14.19	20.25
								*23 Confine 0 cm each end		Est #3 @11.5 cm		XTies: T: 1 X: 1			
45x45	6(B-C)	2	4.45	3.50	20.0	1	24	17.64	2Ly#3@35.0020	24	31.29	28.81	54.70	14.19	20.25
								*24 Confine 0 cm each end		Est #3 @11.5 cm		XTies: T: 1 X: 1			
45x45	6(A-B)	2	4.45	3.50	20.0	1	23	15.31	2Ly#3@35.0020	23	31.87	18.47	54.70	14.19	20.25
								*23 Confine 0 cm each end		Est #3 @11.5 cm		XTies: T: 1 X: 1			
45x45	1(E-F)	2	4.45	3.50	20.0	1	24	15.31	2Ly#3@35.0020	24	31.87	18.47	54.70	14.19	20.25
								*24 Confine 0 cm each end		Est #3 @11.5 cm		XTies: T: 1 X: 1			
45x45	1(D-E)	2	4.45	3.50	20.0	1	23	17.64	2Ly#3@35.0020	23	31.29	28.81	54.70	14.19	20.25
								*23 Confine 0 cm each end		Est #3 @11.5 cm		XTies: T: 1 X: 1			
45x45	1(C-D)	2	4.45	3.50	20.0	1	23	17.79	2Ly#3@35.0020	23	32.45	28.97	54.70	14.19	20.25
								*23 Confine 0 cm each end		Est #3 @11.5 cm		XTies: T: 1 X: 1			
45x45	1(B-C)	2	4.45	3.50	20.0	1	26	17.64	2Ly#3@35.0020	26	31.29	28.81	54.70	14.19	20.25
								*26 Confine 0 cm each end		Est #3 @11.5 cm		XTies: T: 1 X: 1			
45x45	1(A-B)	2	4.45	3.50	20.0	1	25	15.31	2Ly#3@35.0020	25	31.87	18.47	54.70	14.19	20.25
								*25 Confine 0 cm each end		Est #3 @11.5 cm		XTies: T: 1 X: 1			
45x45	F(5-6)	2	4.45	3.50	20.0	1	22	15.31	2Ly#3@35.0020	22	31.85	18.47	54.70	14.19	20.25
								*22 Confine 0 cm each end		Est #3 @11.5 cm		XTies: T: 1 X: 1			
45x45	F(4-5)	2	4.45	3.50	20.0	1	21	17.64	2Ly#3@35.0020	21	31.29	28.79	54.70	14.19	20.25
								*21 Confine 0 cm each end		Est #3 @11.5 cm		XTies: T: 1 X: 1			
45x45	F(3-4)	2	4.45	3.50	20.0	1	19	17.79	2Ly#3@35.0020	19	31.76	28.97	54.70	14.19	20.25

SOLICITACIONES		Carga nominal	Carga última para diseño
Vu (kN)	85.75		
Mu (kN-m)		20.01	
Mu (kN-m)	30.01		Cortante último
DISEÑO A FLEXIÓN			Momento último en la parte superior
			Momento último en la parte inferior
ϕ	0.90		
ρ_{min}		0.0018	
ρ_{max}	0.0100		Coeficiente de reducción de resistencia para esfuerzos de flexión
ρ_{cal}	0.0040		Cuantía mínima
As (mm ²)	572.88		Cuantía máxima
N	5		Cuantía calculada
N	5		Área de acero necesaria según diseño
As (mm ²)	633.38		Cantidad de barras necesarias según diseño
α (mm)	11.18		Número de varillas suministradas
ϕM_n (kN-m)	33.05		Área de acero suministrada
s (mm)	200		Altura del bloque de compresiones de Whitney

12.3.4 VERIFICACION DE CORTANTE EN EL NODO

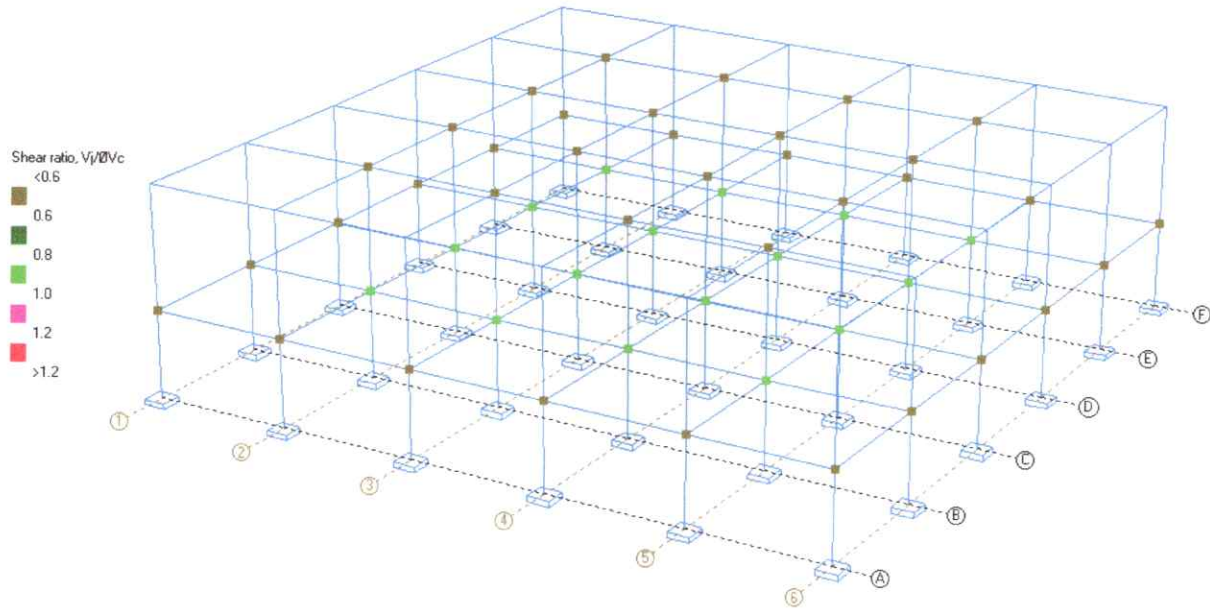


Ilustración 1. Vista 3D nodos

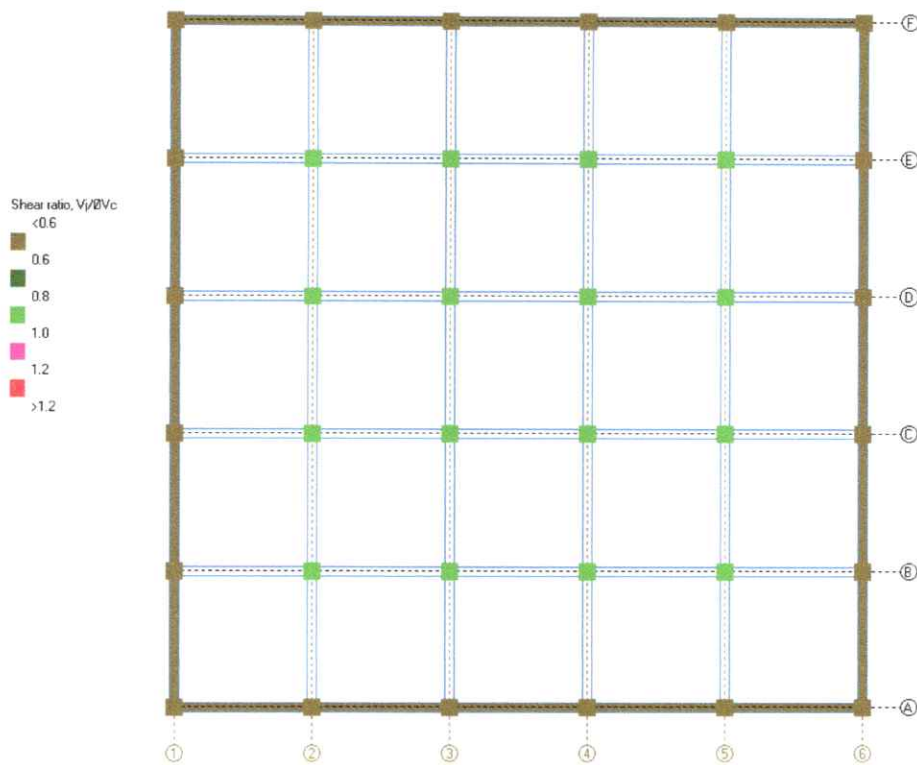


Ilustración 2 Vista en planta nodos

NODE SHEAR DESIGN CHECK

Units: cm2, ton

Axis	Floor	Direction 2					Direction 3				
		Area	$\emptyset V_c$	$V_j \rightarrow$	$V_j \leftarrow$	$V_j / \emptyset V_c$	Area	$\emptyset V_c$	$V_j \rightarrow$	$V_j \leftarrow$	$V_j / \emptyset V_c$
A-1	2	2025	79.4	18.2	22.6	0.3	2025	79.4	23.4	18.2	0.3
B-1	2	2025	79.4	44.4	44.4	0.6	2025	79.4	44.1	20.2	0.6
C-1	2	2025	79.4	43.5	43.5	0.5	2025	79.4	43.5	19.9	0.5
D-1	2	2025	79.4	43.4	43.4	0.5	2025	79.4	43.5	19.9	0.5
E-1	2	2025	79.4	44.4	44.4	0.6	2025	79.4	44.1	20.2	0.6
F-1	2	2025	79.4	22.6	18.2	0.3	2025	79.4	23.4	18.2	0.3
A-2	2	2025	79.4	19.5	42.4	0.5	2025	79.4	45.5	45.5	0.6
B-2	2	2025	79.4	75.5	75.5	1.0	2025	79.4	79.3	79.3	1.0
B-2	3	2025	79.4	36.4	36.4	0.5	2025	79.4	36.4	36.4	0.5
C-2	2	2025	79.4	70.6	70.6	0.9	2025	79.4	78.4	78.4	1.0
C-2	3	2025	79.4	36.4	36.4	0.5	2025	79.4	36.4	36.4	0.5
D-2	2	2025	79.4	70.6	70.6	0.9	2025	79.4	78.4	78.4	1.0
D-2	3	2025	79.4	36.4	36.4	0.5	2025	79.4	36.4	36.4	0.5
E-2	2	2025	79.4	75.5	75.5	1.0	2025	79.4	79.3	79.3	1.0
E-2	3	2025	79.4	36.4	36.4	0.5	2025	79.4	36.4	36.4	0.5
F-2	2	2025	79.4	42.4	19.5	0.5	2025	79.4	45.5	45.5	0.6
A-3	2	2025	79.4	19.2	41.7	0.5	2025	79.4	44.5	44.5	0.6
B-3	2	2025	79.4	74.7	74.7	0.9	2025	79.4	73.9	73.9	0.9
B-3	3	2025	79.4	36.4	36.4	0.5	2025	79.4	36.4	36.4	0.5
C-3	2	2025	79.4	69.7	69.7	0.9	2025	79.4	73.0	73.0	0.9
C-3	3	2025	79.4	36.4	36.4	0.5	2025	79.4	36.4	36.4	0.5
D-3	2	2025	79.4	69.7	69.7	0.9	2025	79.4	73.0	73.0	0.9
D-3	3	2025	79.4	36.4	36.4	0.5	2025	79.4	36.4	36.4	0.5
E-3	2	2025	79.4	74.7	74.7	0.9	2025	79.4	73.9	73.9	0.9
E-3	3	2025	79.4	36.4	36.4	0.5	2025	79.4	36.4	36.4	0.5
F-3	2	2025	79.4	41.7	19.2	0.5	2025	79.4	44.5	44.5	0.6
A-4	2	2025	79.4	19.2	41.7	0.5	2025	79.4	44.4	44.4	0.6
B-4	2	2025	79.4	74.7	74.7	0.9	2025	79.4	73.9	73.9	0.9
B-4	3	2025	79.4	36.4	36.4	0.5	2025	79.4	36.4	36.4	0.5
C-4	2	2025	79.4	69.7	69.7	0.9	2025	79.4	73.0	73.0	0.9
C-4	3	2025	79.4	36.4	36.4	0.5	2025	79.4	36.4	36.4	0.5
D-4	2	2025	79.4	69.7	69.7	0.9	2025	79.4	73.0	73.0	0.9
D-4	3	2025	79.4	36.4	36.4	0.5	2025	79.4	36.4	36.4	0.5
E-4	2	2025	79.4	74.7	74.7	0.9	2025	79.4	73.9	73.9	0.9
E-4	3	2025	79.4	36.4	36.4	0.5	2025	79.4	36.4	36.4	0.5
F-4	2	2025	79.4	41.7	19.2	0.5	2025	79.4	44.4	44.4	0.6
A-5	2	2025	79.4	19.5	42.4	0.5	2025	79.4	45.5	45.5	0.6
B-5	2	2025	79.4	75.5	75.5	1.0	2025	79.4	79.3	79.3	1.0
B-5	3	2025	79.4	36.4	36.4	0.5	2025	79.4	36.4	36.4	0.5
C-5	2	2025	79.4	70.6	70.6	0.9	2025	79.4	78.4	78.4	1.0
C-5	3	2025	79.4	36.4	36.4	0.5	2025	79.4	36.4	36.4	0.5
D-5	2	2025	79.4	70.6	70.6	0.9	2025	79.4	78.4	78.4	1.0
D-5	3	2025	79.4	36.4	36.4	0.5	2025	79.4	36.4	36.4	0.5
E-5	2	2025	79.4	75.5	75.5	1.0	2025	79.4	79.3	79.3	1.0
E-5	3	2025	79.4	36.4	36.4	0.5	2025	79.4	36.4	36.4	0.5
F-5	2	2025	79.4	42.4	19.5	0.5	2025	79.4	45.5	45.5	0.6
A-6	2	2025	79.4	18.2	22.6	0.3	2025	79.4	18.2	23.4	0.3
B-6	2	2025	79.4	44.4	44.4	0.6	2025	79.4	20.2	44.1	0.6
C-6	2	2025	79.4	43.5	43.5	0.5	2025	79.4	19.9	43.5	0.5
D-6	2	2025	79.4	43.4	43.4	0.5	2025	79.4	19.9	43.5	0.5
E-6	2	2025	79.4	44.4	44.4	0.6	2025	79.4	20.2	44.1	0.6
F-6	2	2025	79.4	22.6	18.2	0.3	2025	79.4	18.2	23.4	0.3

Vj-> : Joint shear, Drift +
Vj<- : Joint shear, Drift -
Vj : Max (Vj->, Vj<-)
ØVc : Design joint shear strength
Check: OK If Vj/ØVc < 1.0
X If Vj/ØVc > 1.0 *

AXIS: D-3 FLOOR: 2 BEAM - COLUMN JOINT SHEAR CHECK UNITS: ton, cm, cm²



Mat: 3000PSI
Sec: C45X45

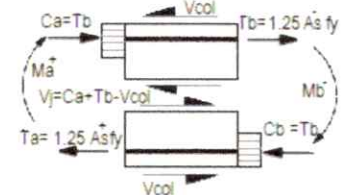
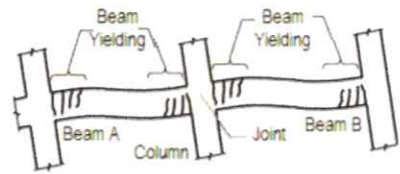
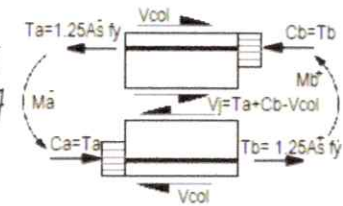
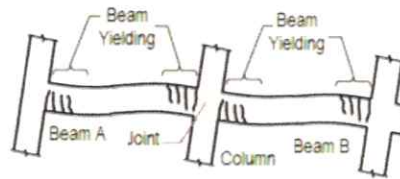
	Dir. 2	Dir. 3
Effective width, be =	45	45
Effective area, Ae =	2025	2025
Confined faces =	0	0
ØVc =	79.4	79.4

SWAY	Dir. 2+	Dir. 3+
Ta = 1.25 fy As- =	53.2	55.7
Cb = 1.25 fy As+ =	25.1	26.2
Vcol =	8.5	8.9
Joint shear Vj --> =	69.7	73.0
Shear ratio Vj/ØVc =	0.88	0.92
SHEAR CHECK -----> =	OK	OK

SWAY	Dir. 2-	Dir. 3-
Tb = 1.25 fy As- =	53.2	55.7
Ca = 1.25 fy As+ =	25.1	26.2
Vcol =	8.5	8.9
Joint shear Vj <-- =	69.7	73.0
Shear ratio Vj/ØVc =	0.88	0.92
SHEAR CHECK <----- =	OK	OK

MAX. SHEAR RATIO, Vj/ØVc = 0.92

Beam	Section	Col. Face	As (top)	As (bot)
D(2-3)	V30X45	2	10.6	5.0
D(3-4)	V30X45	4	10.6	5.0
3(C-D)	V30X45	3	10.1	4.8
3(D-E)	V30X45	1	10.1	4.8



12.3.5 VERIFICACION DE JERARQUIA C.21.6 NSR10

STRONG COLUMN WEAK BEAM CHECK

Units: ton-m

Axis	Floor	Direction 2					Direction 3				
		S.Mnc->	S.Mnb->	S.Mnc<-	S.Mnb<-	Ratio	S.Mnc->	S.Mnb->	S.Mnc<-	S.Mnb<-	Ratio
A-1	2	64.7	8.6	68.5	17.3	4.0	69.2	9.5	63.9	6.2	7.3
B-1	2	58.9	28.5	62.3	27.4	2.1	62.8	16.1	58.3	8.1	3.9
C-1	2	59.1	28.6	62.0	27.5	2.1	62.4	15.5	58.6	7.8	4.0
D-1	2	60.7	28.6	63.2	27.5	2.1	61.0	15.2	63.0	7.6	4.0
E-1	2	61.2	30.5	62.9	29.1	2.0	61.3	15.0	62.7	7.5	4.1
F-1	2	44.4	6.2	42.1	8.4	5.0	44.4	7.9	42.1	6.2	5.6
A-2	2	50.3	12.7	52.9	25.3	2.1	52.9	16.6	50.1	16.6	3.0
B-2	2	49.8	39.0	50.8	36.9	1.3	50.9	26.7	49.7	26.7	1.9
C-2	2	48.3	39.3	49.3	37.2	1.2	49.4	26.9	48.3	26.9	1.8
D-2	2	48.3	38.9	49.4	36.8	1.2	48.4	27.5	49.3	27.4	1.8
E-2	2	51.5	42.8	52.3	40.3	1.2	51.5	28.4	52.3	28.3	1.8
F-2	2	43.7	6.6	45.0	6.6	6.6	43.5	17.0	45.2	16.9	2.6
A-3	2	51.9	12.7	54.6	25.5	2.1	54.6	16.6	52.1	16.7	3.1
B-3	2	51.6	39.2	52.6	37.1	1.3	52.6	26.6	51.6	26.7	1.9
C-3	2	47.0	39.5	48.1	37.3	1.2 *	48.1	25.8	47.0	25.8	1.8
D-3	2	47.0	39.1	48.1	37.0	1.2	47.0	25.6	48.1	25.6	1.8
E-3	2	55.0	43.1	55.7	40.5	1.3	55.0	26.5	55.8	26.4	2.1
F-3	2	41.6	6.7	43.7	6.7	6.3	41.4	16.7	43.9	16.6	2.5
A-4	2	55.0	12.9	58.1	25.8	2.2	58.1	16.6	55.4	16.7	3.3
B-4	2	49.8	39.8	50.9	37.5	1.3	50.9	26.4	49.8	26.5	1.9
C-4	2	48.3	40.1	49.4	37.8	1.2	49.4	25.6	48.3	25.6	1.9
D-4	2	48.4	39.7	49.4	37.5	1.2	48.4	25.8	49.4	25.8	1.9
E-4	2	53.3	43.8	54.1	41.0	1.2	53.2	26.7	54.1	26.6	2.0
F-4	2	39.7	6.7	41.7	6.8	5.9	39.2	16.7	42.2	16.6	2.3
A-5	2	56.4	13.2	60.1	26.4	2.3	60.0	17.0	57.2	17.1	3.3
B-5	2	58.8	40.8	59.5	38.4	1.4	59.5	28.3	58.8	28.4	2.1
C-5	2	53.3	41.1	54.1	38.7	1.3	54.1	27.4	53.3	27.5	1.9
D-5	2	51.6	40.7	52.5	38.3	1.3	51.5	26.9	52.5	26.9	1.9
E-5	2	58.7	44.9	59.3	41.9	1.3	58.7	26.7	59.4	26.7	2.2
F-5	2	40.0	6.9	41.3	7.4	5.6	38.8	16.6	42.5	16.6	2.3
A-6	2	60.1	9.9	64.0	19.8	3.2	62.3	6.2	61.8	7.8	7.9
B-6	2	63.2	31.1	66.5	29.6	2.0	65.8	7.5	63.9	15.0	4.2
C-6	2	65.0	31.1	67.7	29.7	2.1	67.4	7.6	65.3	15.2	4.3
D-6	2	68.2	31.2	70.5	29.8	2.2	67.6	7.8	71.0	15.5	4.6
E-6	2	68.7	34.0	70.3	32.2	2.0	67.6	8.1	71.3	16.1	4.4
F-6	2	49.2	6.2	47.1	10.9	4.3	46.4	6.2	49.9	9.6	5.2

S.Mnc: Sum of nominal flexural strengths of columns framing into the joint

S.Mnb: Sum of nominal flexural strengths of beams framing into the joint

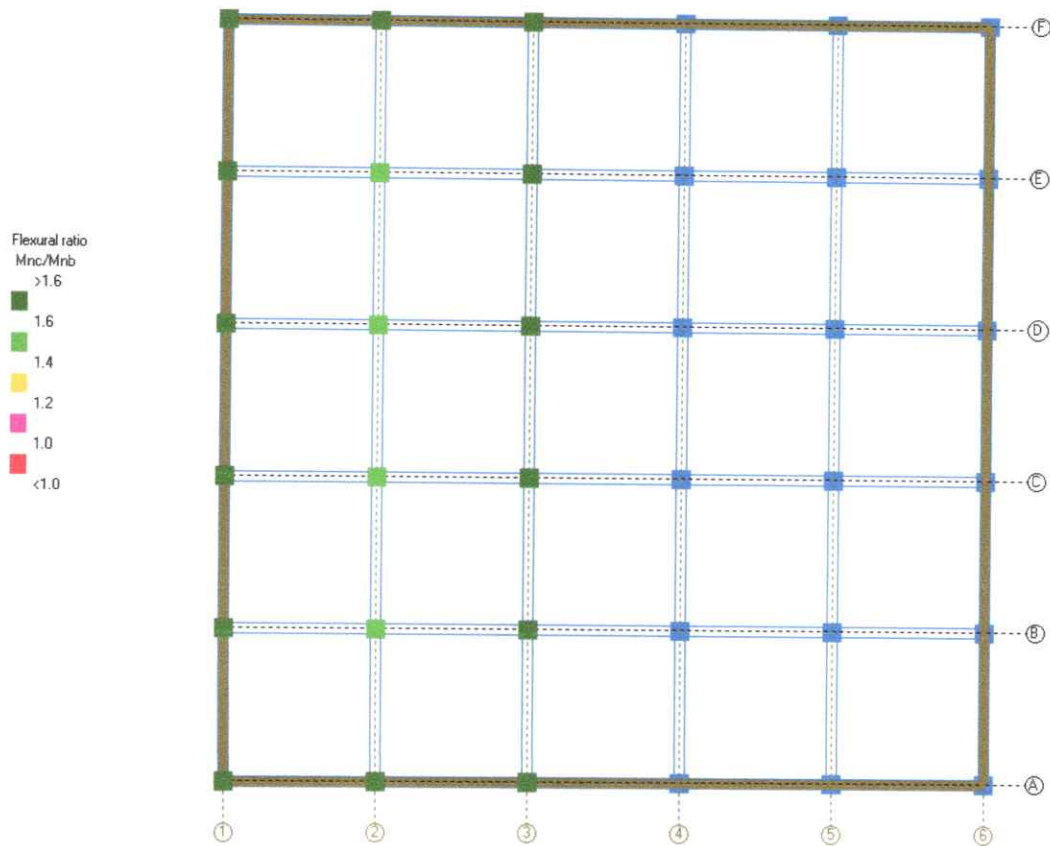
--> : Drift +

<-- : Drift -

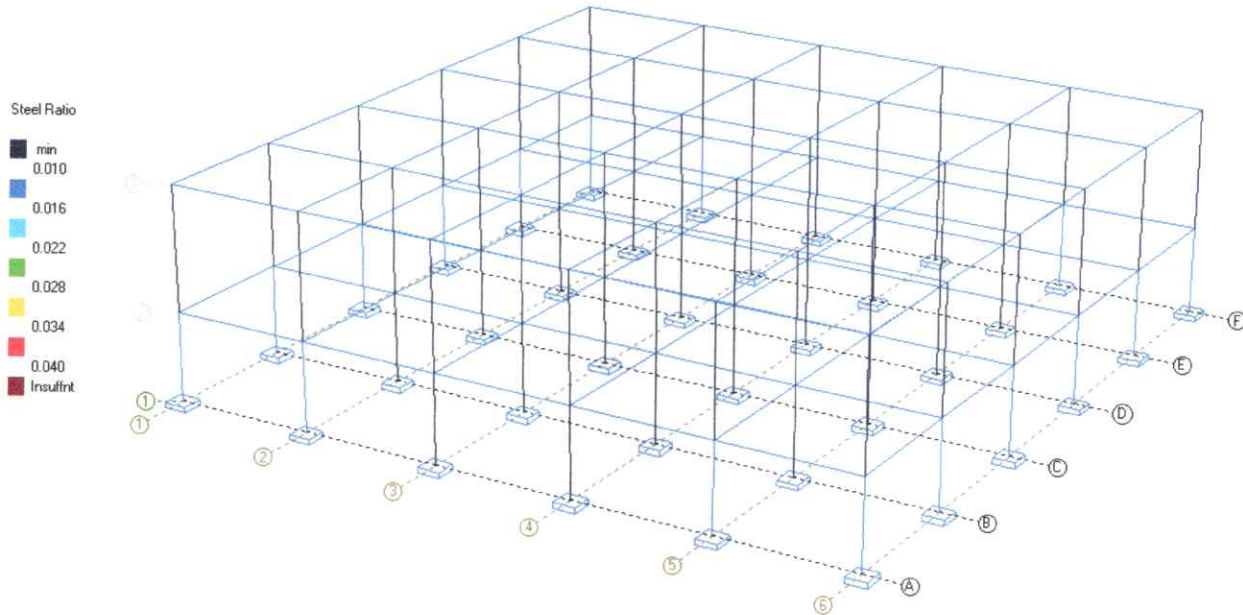
Ratio: MIN (S.Mnc/SMnb -->, S.Mnc/SMnb <--)

Check: OK If Ratio > 1.2

X If Ratio < 1.2 *



12.3.6 DISEÑO DE COLUMNAS



MATERIALS
Number of materials = 1

REINFORCED CONCRETE

Mat	Name	f _c	f _y	f _{ys1}	f _{ys2}	E	G	w
	Kg/cm2	Kg/cm2	Kg/cm2	Kg/cm2	Kg/cm2	Kg/cm2	Kg/cm2	Kg/m3
1	4000PSI	280	4200	4200	4200	206368	87430	2400.0

f_c: Compressive strength of concrete

f_y: Yield strength of longitudinal reinforcement

f_{ys1}: Yiel strength of shear reinforcement, bar sizes ≤ 3/8"

f_{ys2}: Yiel strength of shear reinforcement, bar sizes > 3/8"

COLUMN SECTIONS

Number of prismatic sections = 1

Sec	Name	Shape	b	h	tw	tf	P1	P2	A	I ₂	I ₃	J
	(cm)	(cm)	(cm)	(cm)	(cm)	(cm)	(cm2)	(cm4)	(cm4)	(cm4)	(cm4)	(cm4)
1	C45X45	Rectang	45.00	45.00	-	-	-	-	2025.0	341719	341719	505744

Design Results - Columns (DES)

Column	Story	L (m)	Lu (m)	TRANSVERSE REINFORCEMENT				LONGITUDINAL REINFORCEMENT					RHO	As (cm ²)
				Sec	b _{xh} (cm)	TIES	XTIES	Sec	LdCmb	Pu (ton-m)	Mu ₂ (ton-m)	Mu ₃ (ton-m)		
F-6	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	21	11.46	8.04	5.12	0.0100	20.25
						13 #3 @ 15 cm (ctr)	2 (h)	Bot	19	11.07	9.58	4.76	0.0100	20.25
F-6	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	20	35.50	20.50	7.58	0.0142	28.79
						10 #3 @ 11 cm (ctr)	2 (h)	Bot	25	17.53	6.11	24.30	0.0195	39.47
E-6	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	24	17.36	1.95	11.27	0.0100	20.25
						13 #3 @ 15 cm (ctr)	2 (h)	Bot	21	17.00	9.69	4.99	0.0100	20.25
E-6	1	2.50	2.13	1	45x45	26 #3 @ 8 cm	2 (b)	Top	25	58.05	12.34	25.57	0.0207	41.84
						---	2 (h)	Bot	25	58.05	8.90	30.18	0.0224	45.40
D-6	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	24	16.55	1.85	11.08	0.0100	20.25
						13 #3 @ 15 cm (ctr)	2 (h)	Bot	26	16.57	6.24	9.10	0.0100	20.25
D-6	1	2.50	2.13	1	45x45	26 #3 @ 8 cm	2 (b)	Top	25	58.98	11.56	26.13	0.0207	41.84
						---	2 (h)	Bot	25	58.98	7.81	29.59	0.0213	43.03
C-6	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	24	16.37	1.75	10.82	0.0100	20.25
						13 #3 @ 15 cm (ctr)	2 (h)	Bot	21	16.43	9.64	6.00	0.0100	20.25
C-6	1	2.50	2.13	1	45x45	26 #3 @ 8 cm	2 (b)	Top	25	60.18	10.90	25.17	0.0195	39.47
						---	2 (h)	Bot	25	60.18	6.86	29.59	0.0207	41.84
B-6	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	24	16.16	1.66	10.96	0.0100	20.25
						13 #3 @ 15 cm (ctr)	2 (h)	Bot	21	15.98	9.87	6.10	0.0100	20.25
B-6	1	2.50	2.13	1	45x45	26 #3 @ 8 cm	2 (b)	Top	25	62.61	10.32	25.14	0.0189	38.29
						---	2 (h)	Bot	25	62.61	6.03	29.58	0.0201	40.66
A-6	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	21	14.52	8.01	9.53	0.0100	20.25
						13 #3 @ 15 cm (ctr)	2 (h)	Bot	26	14.52	6.24	10.28	0.0100	20.25
A-6	1	2.50	2.13	1	45x45	26 #3 @ 8 cm	2 (b)	Top	25	58.31	8.73	26.00	0.0183	37.10
						---	2 (h)	Bot	25	58.31	6.09	30.38	0.0207	41.84
F-5	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	19	14.75	4.89	4.58	0.0100	20.25
						13 #3 @ 15 cm (ctr)	2 (h)	Bot	23	14.70	2.49	8.33	0.0100	20.25
F-5	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	20	56.42	16.62	6.73	0.0100	20.25
						7 #3 @ 15 cm (ctr)	2 (h)	Bot	22	53.72	16.86	12.33	0.0130	26.42
E-5	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	12.07	0.52	6.90	0.0100	20.25
						13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	13.66	1.58	9.52	0.0100	20.25
E-5	1	2.50	2.13	1	45x45	26 #3 @ 8 cm	2 (b)	Top	25	97.78	4.40	25.29	0.0160	32.35
						---	2 (h)	Bot	25	97.78	5.22	29.33	0.0218	44.22
D-5	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	13.18	0.38	7.51	0.0100	20.25
						13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	14.23	1.47	9.04	0.0100	20.25
D-5	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	23	96.82	3.59	23.59	0.0136	27.61
						10 #3 @ 11 cm (ctr)	2 (h)	Bot	23	96.82	3.47	28.54	0.0195	39.47
C-5	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	12.91	0.37	7.41	0.0100	20.25
						13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	14.11	1.42	9.19	0.0100	20.25
C-5	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	23	96.80	4.51	23.72	0.0142	28.79
						10 #3 @ 11 cm (ctr)	2 (h)	Bot	23	96.80	4.54	28.60	0.0201	40.66
B-5	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	13.33	0.38	7.26	0.0100	20.25
						13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	14.18	1.42	9.07	0.0100	20.25

B-5	1	2.50	2.13	1	45x45	26 #3 @ 8 cm	2 (b)	Top	23	97.03	5.57	24.21	0.0160	32.35
					---	2 (h)	Bot	23	97.03	5.76	28.83	0.0218	44.22	
A-5	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	20	17.93	4.11	8.36	0.0100	20.25
					13 #3 @ 15 cm (ctr)	2 (h)	Bot	26	17.61	2.11	10.94	0.0100	20.25	
A-5	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	19	64.19	17.39	15.08	0.0160	32.35
					10 #3 @ 11 cm (ctr)	2 (h)	Bot	19	64.19	16.83	19.74	0.0195	39.47	
F-4	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	27	10.27	4.55	3.59	0.0100	20.25
					13 #3 @ 15 cm (ctr)	2 (h)	Bot	23	15.10	2.27	8.10	0.0100	20.25	
F-4	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	20	53.76	16.59	7.29	0.0100	20.25
					7 #3 @ 15 cm (ctr)	2 (h)	Bot	22	51.89	16.85	11.24	0.0125	25.23	
E-4	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	12.43	0.36	6.66	0.0100	20.25
					13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	13.80	0.89	9.15	0.0100	20.25	
E-4	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	23	97.19	3.44	24.11	0.0142	28.79
					10 #3 @ 11 cm (ctr)	2 (h)	Bot	25	97.18	4.04	28.12	0.0195	39.47	
D-4	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	13.55	0.39	7.28	0.0100	20.25
					13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	14.43	1.13	8.80	0.0100	20.25	
D-4	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	23	96.22	3.32	22.56	0.0125	25.23
					10 #3 @ 11 cm (ctr)	2 (h)	Bot	23	96.22	3.61	27.34	0.0177	35.91	
C-4	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	13.27	0.38	7.18	0.0100	20.25
					13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	14.28	1.43	8.85	0.0100	20.25	
C-4	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	23	96.16	3.34	22.69	0.0125	25.23
					10 #3 @ 11 cm (ctr)	2 (h)	Bot	23	96.16	3.72	27.39	0.0183	37.10	
B-4	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	13.69	0.40	7.02	0.0100	20.25
					13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	14.37	1.77	8.82	0.0100	20.25	
B-4	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	23	96.36	3.49	23.15	0.0130	26.42
					10 #3 @ 11 cm (ctr)	2 (h)	Bot	23	96.36	3.97	27.61	0.0183	37.10	
A-4	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	20	17.81	4.33	8.26	0.0100	20.25
					13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	17.81	1.27	10.65	0.0100	20.25	
A-4	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	19	65.50	17.47	14.30	0.0154	31.17
					9 #3 @ 12 cm (ctr)	2 (h)	Bot	19	65.50	16.87	18.64	0.0183	37.10	
F-3	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	29	10.36	4.51	3.68	0.0100	20.25
					13 #3 @ 15 cm (ctr)	2 (h)	Bot	23	15.19	1.27	8.04	0.0100	20.25	
F-3	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	20	52.53	17.46	7.96	0.0107	21.67
					7 #3 @ 15 cm (ctr)	2 (h)	Bot	22	50.66	16.05	10.29	0.0107	21.67	

E-3	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	12.42	0.39	6.43	0.0100	20.25
				1	13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	13.83	1.41	8.97	0.0100	20.25	
E-3	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	25	97.16	4.81	23.64	0.0148	29.98
				1	10 #3 @ 11 cm (ctr)	2 (h)	Bot	25	97.16	5.40	27.38	0.0195	39.47	
D-3	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	13.55	0.39	7.05	0.0100	20.25
				1	13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	14.45	1.31	8.73	0.0100	20.25	
D-3	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	25	96.22	3.78	22.11	0.0119	24.05
				1	9 #3 @ 12 cm (ctr)	2 (h)	Bot	25	96.22	4.20	26.75	0.0177	35.91	
C-3	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	13.27	0.38	6.95	0.0100	20.25
				1	13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	14.31	1.26	8.68	0.0100	20.25	
C-3	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	23	96.15	3.91	22.10	0.0119	24.05
				1	9 #3 @ 12 cm (ctr)	2 (h)	Bot	23	96.15	4.26	26.67	0.0177	35.91	
B-3	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	13.70	0.39	6.78	0.0100	20.25
				1	13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	14.41	1.26	8.74	0.0100	20.25	
B-3	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	23	96.38	4.94	22.55	0.0136	27.61
				1	10 #3 @ 11 cm (ctr)	2 (h)	Bot	23	96.38	5.47	26.88	0.0189	38.29	
A-3	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	20	17.69	4.61	8.16	0.0100	20.25
				1	13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	17.73	2.27	10.71	0.0100	20.25	
A-3	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	19	66.73	16.59	13.63	0.0142	28.79
				1	9 #3 @ 12 cm (ctr)	2 (h)	Bot	19	66.73	16.05	17.69	0.0171	34.73	
F-2	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	16.12	0.46	5.37	0.0100	20.25
				1	13 #3 @ 15 cm (ctr)	2 (h)	Bot	25	14.92	2.14	8.33	0.0100	20.25	
F-2	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	28	35.72	17.05	7.28	0.0113	22.86
				1	7 #3 @ 15 cm (ctr)	2 (h)	Bot	30	33.02	15.63	7.90	0.0107	21.67	
E-2	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	12.07	0.35	6.20	0.0100	20.25
				1	13 #3 @ 15 cm (ctr)	2 (h)	Bot	26	13.66	1.97	9.13	0.0100	20.25	
E-2	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	23	97.78	3.00	23.89	0.0136	27.61
				1	10 #3 @ 11 cm (ctr)	2 (h)	Bot	23	97.78	3.44	27.56	0.0183	37.10	
D-2	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	13.19	0.38	6.83	0.0100	20.25
				1	13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	14.09	0.98	8.84	0.0100	20.25	
D-2	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	25	96.85	4.06	22.23	0.0125	25.23
				1	9 #3 @ 12 cm (ctr)	2 (h)	Bot	25	96.85	4.06	26.79	0.0177	35.91	
C-2	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	12.90	0.37	6.73	0.0100	20.25
				1	13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	13.95	1.28	8.68	0.0100	20.25	
C-2	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	25	96.77	4.05	22.35	0.0125	25.23

	1				9 #3 @ 12 cm (ctr)	2 (h)	Bot	25	96.77	3.95	26.85	0.0177	35.91	
B-2	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	1	13.33	0.53	6.55	0.0100	20.25
	1				13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	14.01	1.65	8.85	0.0100	20.25	
B-2	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	25	97.03	4.17	22.80	0.0130	26.42
	1				10 #3 @ 11 cm (ctr)	2 (h)	Bot	25	97.03	3.99	27.06	0.0177	35.91	
A-2	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	20	17.43	4.86	8.06	0.0100	20.25
	1				13 #3 @ 15 cm (ctr)	2 (h)	Bot	24	17.38	2.45	10.94	0.0100	20.25	
A-2	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	19	69.56	16.58	13.07	0.0136	27.61
	1				9 #3 @ 12 cm (ctr)	2 (h)	Bot	19	69.56	16.04	16.87	0.0166	33.54	
F-1	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	20	10.50	7.84	3.01	0.0100	20.25
	1				13 #3 @ 15 cm (ctr)	2 (h)	Bot	22	10.11	9.71	4.91	0.0100	20.25	
F-1	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	21	35.60	18.70	7.02	0.0125	25.23
	1				9 #3 @ 12 cm (ctr)	2 (h)	Bot	25	12.24	5.52	23.50	0.0189	38.29	
E-1	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	24	16.71	1.75	10.25	0.0100	20.25
	1				13 #3 @ 15 cm (ctr)	2 (h)	Bot	20	16.47	9.69	4.50	0.0100	20.25	
E-1	1	2.50	2.13	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	23	57.15	11.45	23.26	0.0177	35.91
	1				10 #3 @ 11 cm (ctr)	2 (h)	Bot	23	57.15	7.37	27.25	0.0183	37.10	
D-1	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	24	16.48	1.89	10.33	0.0100	20.25
	1				13 #3 @ 15 cm (ctr)	2 (h)	Bot	20	16.48	9.59	4.67	0.0100	20.25	
D-1	1	2.50	2.13	1	45x45	26 #3 @ 8 cm	2 (b)	Top	23	58.74	11.27	23.66	0.0177	35.91
	1				---	2 (h)	Bot	23	58.74	7.30	26.57	0.0177	35.91	
C-1	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	24	16.48	2.03	10.54	0.0100	20.25
	1				13 #3 @ 15 cm (ctr)	2 (h)	Bot	20	16.52	9.64	5.63	0.0100	20.25	
C-1	1	2.50	2.13	1	45x45	26 #3 @ 8 cm	2 (b)	Top	23	60.42	11.19	22.70	0.0171	34.73
	1				---	2 (h)	Bot	23	60.42	7.37	26.58	0.0183	37.10	
B-1	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	24	16.56	2.17	10.40	0.0100	20.25
	1				13 #3 @ 15 cm (ctr)	2 (h)	Bot	20	16.51	9.87	5.62	0.0100	20.25	
B-1	1	2.50	2.13	1	45x45	26 #3 @ 8 cm	2 (b)	Top	23	63.52	11.21	22.83	0.0171	34.73
	1				---	2 (h)	Bot	23	63.52	7.56	26.64	0.0183	37.10	
A-1	2	3.50	3.05	1	45x45	7 #3 @ 8 cm (end)	2 (b)	Top	24	15.48	5.50	10.13	0.0100	20.25
	1				13 #3 @ 15 cm (ctr)	2 (h)	Bot	20	15.48	9.53	6.71	0.0100	20.25	
A-1	1	2.50	2.13	1	45x45	26 #3 @ 8 cm	2 (b)	Top	23	58.21	10.54	26.55	0.0201	40.66
	1				---	2 (h)	Bot	23	58.21	8.79	28.78	0.0213	43.03	



CARTILLA DE ACEROS TANQUE ELEVADO

ESTRUCTURA TANQUE ELEVADO
CANTIDADES DE OBRA
RESUMEN TOTAL DE TODOS LOS ELEMENTOS

RESUMEN DE PESOS BARRAS FIGURADAS

DIAMETRO	Fy (Mpa)	LONGITUD (m)	PESO (kg)
3/4"	420	5,541.80	12385.92
5/8"	420	2,304.00	3575.81
3/8"	420	26,892.08	15059.56
TOTAL BARRAS FIGURADAS			31021.30

PESO TOTAL PLACA CIMENTACION = 31021.30 kg

RESUMEN DE PESOS BARRAS FIGURADAS

DIAMETRO	Fy (Mpa)	LONGITUD (m)	PESO (kg)
1"	420	1,260.00	5005.98
7/8"	420	1,245.60	3789.12
3/8"	420	20,295.18	11365.30
TOTAL BARRAS FIGURADAS			20160.40

PESO TOTAL COLUMNAS Y MUROS = 20160.40 kg

RESUMEN DE PESOS BARRAS FIGURADAS

DIAMETRO	Fy (Mpa)	LONGITUD (m)	PESO (kg)
3/4"	420	2,949.20	6591.46
3/8"	420	13,815.16	7736.49
TOTAL BARRAS FIGURADAS			14327.95

PESO TOTAL PLACA DE FONDO TANQUE = 14327.95 kg

RESUMEN DE PESOS BARRAS FIGURADAS

DIAMETRO	Fy (Mpa)	LONGITUD (m)	PESO (kg)
3/4"	420	4,267.20	9537.19
3/8"	420	14,738.56	8253.59
TOTAL BARRAS FIGURADAS			17790.79

PESO TOTAL PLACA DE FONDO = 17790.79 kg

PESO TOTAL DE TODOS LOS ELEMENTOS = 83300.43 kg

ESTRUCTURA TANQUE ELEVADO

PLACA DE CIMENTACION

CANTIDADES DE OBRA

RESUMEN TOTAL



PazdelRío

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PÁGINA: 1 de 1

RESUMEN DE PESOS BARRAS FIGURADAS

DIAMETRO	Fy (Mpa)	LONGITUD (m)	PESO (kg)
3/4"	420	5,541.80	12385.92
5/8"	420	2,304.00	3575.81
3/8"	420	26,892.08	15059.56
TOTAL BARRAS FIGURADAS			31021.29

PESO TOTAL DEL PEDIDO = 31021.29 kg

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO







PazdelRío

Votorantim
Siderurgia

PÁGINA: 1 de 32

VIGA CIM (45X60) 01 (Es 1) Peso/Elemento= 1158.25Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[1] 	8	5/8"	7.25	90.0	
[2] 	8	5/8"	8.50	105.5	
[3] 	8	5/8"	8.25	102.4	
[4] 	12	3/4"	11.15	299.0	

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



PazdelRío

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PÁGINA: 2 de 32

[5]					
		12	3/4"	8.75	234.7
[6]					
		12	3/4"	4.40	118.0
[7]					
		152	3/8"	1.78	151.5
[8]					
		152	3/8"	0.67	57.0

VIGA CIM (45X60) 02 (Es 1) Peso/Elemento= 1158.25Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón






ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



PazdelRío

Votorantim
Siderurgia

PÁGINA: 3 de 32

[9]		8	5/8"	7.25	90.0
[10]		8	5/8"	8.50	105.5
[11]		8	5/8"	8.25	102.4
[12]		12	3/4"	11.15	299.0
[13]		12	3/4"	8.75	234.7

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



Paz del Río

Votorantim
Siderurgia

PÁGINA: 4 de 32

[14]					
		12	3/4"	4.40	118.0
[15]					
		152	3/8"	1.78	151.5
[16]					
		152	3/8"	0.67	57.0

VIGA CIM (45X60) 03 (Es 1) Peso/Elemento= 1158.25Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[17]						
		8	5/8"	7.25	90.0	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



PazdelRío

Votorantim
Siderurgia

PÁGINA: 5 de 32

[18]		8	5/8"	8.50	105.5
[19]		8	5/8"	8.25	102.4
[20]		12	3/4"	11.15	299.0
[21]		12	3/4"	8.75	234.7
[22]		12	3/4"	4.40	118.0

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
PLACA DE CIMENTACION
CANTIDADES DE OBRA
ELEMENTO POR ELEMENTO



PazdelRío

Votorantim
Siderurgia

PÁGINA: 6 de 32

[23]	<p>b=0.32 h=0.47 g=0.10</p>	152	3/8"	1.78	151.5
[24]	<p>G1(180°)=0.10m G2(180°)=0.10m</p>	152	3/8"	0.67	57.0

VIGA CIM (45X60) 04 (Es 1) Peso/Elemento= 1158.25Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[25]	<p>G2(90°)=0.25m</p>	8	5/8"	7.25	90.0	
[26]		8	5/8"	8.50	105.5	

Acero colombiano hecho con el corazón


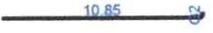


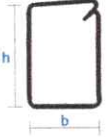
ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



PazdelRío

Votorantim
Siderurgia

PÁGINA: 7 de 32

[27]		G2(90°)=0.25m	8	5/8"	8.25	102.4
[28]		G2(90°)=0.30m	12	3/4"	11.15	299.0
[29]			12	3/4"	8.75	234.7
[30]		G2(90°)=0.30m	12	3/4"	4.40	118.0
[31]		b=0.32 h=0.47 g=0.10	152	3/8"	1.78	151.5

ESTRUCTURA TANQUE ELEVADO
PLACA DE CIMENTACION
CANTIDADES DE OBRA
ELEMENTO POR ELEMENTO



PazdelRío

Votorantim
Siderurgia

PÁGINA: 8 de 32

[32]		152	3/8"	0.67	57.0
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VIGA CIM (45X60) 05 (Es 1) Peso/Elemento= 1158.25Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[33]		8	5/8"	7.25	90.0	
[34]		8	5/8"	8.50	105.5	
[35]		8	5/8"	8.25	102.4	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



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Siderurgia

PÁGINA: 9 de 32

[36]		12	3/4"	11.15	299.0
[37]		12	3/4"	8.75	234.7
[38]		12	3/4"	4.40	118.0
[39]		152	3/8"	1.78	151.5
[40]		152	3/8"	0.67	57.0

VIGA CIM (45X60) 06 (Es 1) Peso/Elemento= 1158.25Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón






ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



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PÁGINA: 10 de 32

[41]		8	5/8"	7.25	90.0
[42]		8	5/8"	8.50	105.5
[43]		8	5/8"	8.25	102.4
[44]		12	3/4"	11.15	299.0
[45]		12	3/4"	8.75	234.7

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



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Siderurgia

PÁGINA: 11 de 32

[46]					
		12	3/4"	4.40	118.0
[47]					
		152	3/8"	1.78	151.5
[48]					
		152	3/8"	0.67	57.0

VIGA CIM (45X60) A (Es 1) Peso/Elemento= 1158.25Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[49]						
		8	5/8"	7.25	90.0	

Acero colombiano hecho con el corazón






ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



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PÁGINA: 12 de 32

[50]						
		8	5/8"	8.50	105.5	
[51]						
		8	5/8"	8.25	102.4	
[52]						
		12	3/4"	11.15	299.0	
[53]						
		12	3/4"	8.75	234.7	
[54]						
		12	3/4"	4.40	118.0	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
PLACA DE CIMENTACION
CANTIDADES DE OBRA

ELEMENTO POR ELEMENTO



PazdelRío

Votorantim
Siderurgia

PÁGINA: 13 de 32

[55]	<p>b=0.32 h=0.47 g=0.10</p>	152	3/8"	1.78	151.5
[56]	<p>G1(180°)=0.10m G2(180°)=0.10m</p>	152	3/8"	0.67	57.0

VIGA CIM (45X60) B (Es 1) Peso/Elemento= 1158.25Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[57]	<p>G2(90°)=0.25m</p>	8	5/8"	7.25	90.0	
[58]		8	5/8"	8.50	105.5	





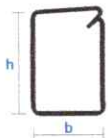
ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



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Siderurgia

PÁGINA: 14 de 32

[59]		G2(90°)=0.25m	8	5/8"	8.25	102.4
[60]		G2(90°)=0.30m	12	3/4"	11.15	299.0
[61]			12	3/4"	8.75	234.7
[62]		G2(90°)=0.30m	12	3/4"	4.40	118.0
[63]		b=0.32 h=0.47 g=0.10	152	3/8"	1.78	151.5

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



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PÁGINA: 15 de 32

[64]					
		152	3/8"	0.67	57.0

VIGA CIM (45X60) C (Es 1) Peso/Elemento= 1158.25Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[65]		8	5/8"	7.25	90.0	
[66]		8	5/8"	8.50	105.5	
[67]		8	5/8"	8.25	102.4	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



Paz del Río

Votorantim
Siderurgia

PÁGINA: 16 de 32

[68]		12	3/4"	11.15	299.0	
[69]		12	3/4"	8.75	234.7	
[70]		12	3/4"	4.40	118.0	
[71]		152	3/8"	1.78	151.5	
[72]		152	3/8"	0.67	57.0	

VIGA CIM (45X60) D (Es 1) Peso/Elemento= 1158.25Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA








PazdelRío

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Siderurgia

PÁGINA: 17 de 32

ELEMENTO POR ELEMENTO

[73]		8	5/8"	7.25	90.0
[74]		8	5/8"	8.50	105.5
[75]		8	5/8"	8.25	102.4
[76]		12	3/4"	11.15	299.0
[77]		12	3/4"	8.75	234.7

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA


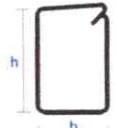



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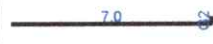
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Siderurgia

PÁGINA: 18 de 32

ELEMENTO POR ELEMENTO

[78]		G2(90°)=0.30m				
			12	3/4"	4.40	118.0
[79]		b=0.32 h=0.47 g=0.10				
			152	3/8"	1.78	151.5
[80]		G1(180°)=0.10m G2(180°)=0.10m				
			152	3/8"	0.67	57.0

VIGA CIM (45X60) E (Es 1) Peso/Elemento= 1158.25Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[81]						
		8	5/8"	7.25	90.0	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA








Paz del Río

Votorantim
 Siderurgia

PÁGINA: 19 de 32

ELEMENTO POR ELEMENTO

[82]					
		8	5/8"	8.50	105.5
[83]					
		8	5/8"	8.25	102.4
[84]					
		12	3/4"	11.15	299.0
[85]					
		12	3/4"	8.75	234.7
[86]					
		12	3/4"	4.40	118.0

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



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PÁGINA: 20 de 32

[87]	<p>$b=0.32$ $h=0.47$ $g=0.10$</p>	152	3/8"	1.78	151.5	
[88]	<p>$G1(180^\circ)=0.10m$ $G2(180^\circ)=0.10m$</p>	152	3/8"	0.67	57.0	

VIGA CIM (45X60) F (Es 1) Peso/Elemento= 1158.25Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[89]	<p>$G2(90^\circ)=0.25m$</p>	8	5/8"	7.25	90.0	
[90]		8	5/8"	8.50	105.5	





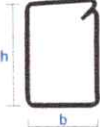
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 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



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Siderurgia

PÁGINA: 21 de 32

[91]		G2(90°)=0.25m	8	5/8"	8.25	102.4
[92]		G2(90°)=0.30m	12	3/4"	11.15	299.0
[93]			12	3/4"	8.75	234.7
[94]		G2(90°)=0.30m	12	3/4"	4.40	118.0
[95]		b=0.32 h=0.47 g=0.10	152	3/8"	1.78	151.5

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
PLACA DE CIMENTACION
CANTIDADES DE OBRA



Paz del Río

Votorantim
Siderurgia

PÁGINA: 22 de 32

ELEMENTO POR ELEMENTO

[96]		152	3/8"	0.67	57.0
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REFUERZO SUPERIOR TORTA SUPERIOR N-2.00m (Es 1) Peso/Elemento= 2247.17Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[97]		88	3/8"	4.65	229.2	
[98]		88	3/8"	9.00	443.5	
[99]		88	3/8"	9.15	450.9	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
PLACA DE CIMENTACION
CANTIDADES DE OBRA



Paz del Río

Votorantim
Siderurgia

PÁGINA: 23 de 32

ELEMENTO POR ELEMENTO

[100]		88	3/8"	4.65	229.2
[101]		88	3/8"	9.00	443.5
[102]		88	3/8"	9.15	450.9

REFUERZO INFERIOR TORTA SUPERIOR N-2.00m (Es 1) Peso/Elemento= 2247.17Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[103]	88	3/8"	4.65	229.2	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA






ELEMENTO POR ELEMENTO



PazdelRío

Votorantim
Siderurgia

PÁGINA: 24 de 32

[104]									
		88	3/8"	9.00	443.5				
[105]									
		88	3/8"	9.15	450.9				
[106]									
		88	3/8"	4.65	229.2				
[107]									
		88	3/8"	9.00	443.5				
[108]									
		88	3/8"	9.15	450.9				

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO







Paz del Río

Votorantim
Siderurgia

PÁGINA: 25 de 32

REFUERZO SUPERIOR TORTA INFERIOR N-2.00m (Es 1) Peso/Elemento= 2247.17Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[109]		88	3/8"	4.65	229.2	
[110]		88	3/8"	9.00	443.5	
[111]		88	3/8"	9.15	450.9	
[112]		88	3/8"	4.65	229.2	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
PLACA DE CIMENTACION
CANTIDADES DE OBRA



Paz del Río

Votorantim
Siderurgia

PÁGINA: 26 de 32

ELEMENTO POR ELEMENTO

[113]		88	3/8"	9.00	443.5	
[114]		88	3/8"	9.15	450.9	

REFUERZO INFERIOR TORTA INFERIOR N-2.00m (Es 1) Peso/Elemento= 2247.17Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[115]		88	3/8"	4.65	229.2	
[116]		88	3/8"	9.00	443.5	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA



PazdelRío

Votorantim
Siderurgia

PÁGINA: 27 de 32

ELEMENTO POR ELEMENTO

[117]		88	3/8"	9.15	450.9
[118]		88	3/8"	4.65	229.2
[119]		88	3/8"	9.00	443.5
[120]		88	3/8"	9.15	450.9

REFUERZO PLACA DE CONTRAPISO N+0.00m (Es 1) Peso/Elemento= 2748.93Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón






ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



Paz del Río

Votorantim
Siderurgia

PÁGINA: 28 de 32

[121]		118	3/8"	5.65	373.4
[122]		118	3/8"	6.00	396.5
[123]		118	3/8"	9.15	604.6
[124]		118	3/8"	5.65	373.4
[125]		118	3/8"	6.00	396.5

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
PLACA DE CIMENTACION
CANTIDADES DE OBRA



PazdelRío

Votorantim
Siderurgia

PÁGINA: 29 de 32

ELEMENTO POR ELEMENTO

[126]		118	3/8"	9.15	604.6	
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VIGUETA CIM (20X60) (Son 10) Peso/Elemento= 384.62Kg Peso 10 elementos=3846.18Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[127]		2	3/4"	7.80	34.9	(Total =20)
[128]		2	3/4"	8.65	38.7	(Total =20)
[129]		2	3/4"	7.90	35.3	(Total =20)

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
PLACA DE CIMENTACION
CANTIDADES DE OBRA



PazdelRío

Votorantim
Siderurgia

PÁGINA: 30 de 32

ELEMENTO POR ELEMENTO

[130]		4	3/4"	11.65	104.2	(Total =40)
[131]		4	3/4"	8.75	78.2	(Total =40)
[132]		4	3/4"	3.90	34.9	(Total =40)
[133]		78	3/8"	1.34	58.5	(Total =780)

VIGUETA DE BORDE CIM (20X60) (Son 4) Peso/Elemento= 384.62Kg Peso 4 elementos=1538.47Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA



PazdelRío

Votorantim
Siderurgia

PÁGINA: 31 de 32

ELEMENTO POR ELEMENTO

[134]		2	3/4"	7.80	34.9	(Total =8)
[135]		2	3/4"	8.65	38.7	(Total =8)
[136]		2	3/4"	7.90	35.3	(Total =8)
[137]		4	3/4"	11.65	104.2	(Total =16)
[138]		4	3/4"	8.75	78.2	(Total =16)

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE CIMENTACION
 CANTIDADES DE OBRA



ELEMENTO POR ELEMENTO



PazdelRío

Votorantim
Siderurgia

PÁGINA: 32 de 32

[139]						
		4	3/4"	3.90	34.9	(Total =16)
[140]						
		78	3/8"	1.34	58.5	(Total =312)

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO

PLACA DE CIMENTACION

CANTIDADES DE OBRA

LISTADO PARA ESTRIBADORA



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Votorantim
Siderurgia

PÁGINA: 1 de 5

Lista de barras 3/4"

	DIAGRAMA	CANTIDAD	DIAM.	LONG. (m)	PESO	UBICACION
1		56	3/4"	11.65	1458.11	[40 En VIGUETA CIM (20X60)] [16 En VIGUETA DE BORDE CIM (20X60)].
2		144	3/4"	11.15	3588.52	[12 En VIGA CIM (45X60) 01] [12 En VIGA CIM (45X60) 02] [12 En VIGA CIM (45X60) 03] [12 En VIGA CIM (45X60) 04] [12 En VIGA CIM (45X60) 05] [12 En VIGA CIM (45X60) 06] [12 En VIGA CIM (45X60) A] [12 En VIGA CIM (45X60) B] [12 En VIGA CIM (45X60) C] [12 En VIGA CIM (45X60) D] [12 En VIGA CIM (45X60) E] [12 En VIGA CIM (45X60) F] [12 En VIGA CIM (45X60) 02] [12 En VIGA CIM (45X60) 03] [12 En VIGA CIM (45X60) 04] [12 En VIGA CIM (45X60) 05] [12 En VIGA CIM (45X60) 06] [12 En VIGA CIM (45X60) A] [12 En VIGA CIM (45X60) B] [12 En VIGA CIM (45X60) C] [12 En VIGA CIM (45X60) D] [12 En VIGA CIM (45X60) E] [12 En VIGA CIM (45X60) F] [40 En VIGUETA CIM (20X60)] [16 En VIGUETA DE BORDE CIM (20X60)] [8 En VIGUETA DE BORDE CIM (20X60)].
3		200	3/4"	8.75	3911.25	[12 En VIGA CIM (45X60) 01] [12 En VIGA CIM (45X60) 02] [12 En VIGA CIM (45X60) 03] [12 En VIGA CIM (45X60) 04] [12 En VIGA CIM (45X60) 05] [12 En VIGA CIM (45X60) 06] [12 En VIGA CIM (45X60) A] [12 En VIGA CIM (45X60) B] [12 En VIGA CIM (45X60) C] [12 En VIGA CIM (45X60) D] [12 En VIGA CIM (45X60) E] [12 En VIGA CIM (45X60) F] [40 En VIGUETA CIM (20X60)] [16 En VIGUETA DE BORDE CIM (20X60)] [8 En VIGUETA DE BORDE CIM (20X60)].
4		28	3/4"	8.65	541.32	[12 En VIGA CIM (45X60) 01] [12 En VIGA CIM (45X60) 02] [12 En VIGA CIM (45X60) 03] [12 En VIGA CIM (45X60) 04] [12 En VIGA CIM (45X60) 05] [12 En VIGA CIM (45X60) 06] [12 En VIGA CIM (45X60) A] [12 En VIGA CIM (45X60) B] [12 En VIGA CIM (45X60) C] [12 En VIGA CIM (45X60) D] [12 En VIGA CIM (45X60) E] [12 En VIGA CIM (45X60) F] [40 En VIGUETA CIM (20X60)] [16 En VIGUETA DE BORDE CIM (20X60)] [8 En VIGUETA DE BORDE CIM (20X60)].

ESTRUCTURA TANQUE ELEVADO
PLACA DE CIMENTACION
CANTIDADES DE OBRA



PazdelRío

Votorantim
Siderurgia

PÁGINA: 2 de 5

LISTADO PARA ESTRIBADORA

	DIAGRAMA	CANTIDAD	DIAM.	LONG. (m)	PESO	UBICACION
5		28	3/4"	7.90	494.38	[20 En VIGUETA CIM (20X60)] [8 En VIGUETA DE BORDE CIM (20X60)].
6		28	3/4"	7.80	488.12	[20 En VIGUETA CIM (20X60)] [8 En VIGUETA DE BORDE CIM (20X60)].
7		144	3/4"	4.40	1416.10	[12 En VIGA CIM (45X60) 01] [12 En VIGA CIM (45X60) 02] [12 En VIGA CIM (45X60) 03] [12 En VIGA CIM (45X60) 04] [12 En VIGA CIM (45X60) 05] [12 En VIGA CIM (45X60) 06] [12 En VIGA CIM (45X60) A] [12 En VIGA CIM (45X60) B] [12 En VIGA CIM (45X60) C] [12 En VIGA CIM (45X60) D] [12 En VIGA CIM (45X60) E] [12 En VIGA CIM (45X60) F].
8		56	3/4"	3.90	488.12	[40 En VIGUETA CIM (20X60)] [16 En VIGUETA DE BORDE CIM (20X60)].

Peso total barras 3/4" =12385.92 kg

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO

PLACA DE CIMENTACION

CANTIDADES DE OBRA

LISTADO PARA ESTRIBADORA



PazdelRío

Votorantim
Siderurgia

PÁGINA: 3 de 5

Lista de barras 5/8"

DIAGRAMA	CANTIDAD	DIAM.	LONG. (m)	PESO	UBICACION
<p>8.5</p>	96	5/8"	8.50	1266.43	[8 En VIGA CIM (45X60) 01] [8 En VIGA CIM (45X60) 02] [8 En VIGA CIM (45X60) 03] [8 En VIGA CIM (45X60) 04] [8 En VIGA CIM (45X60) 05] [8 En VIGA CIM (45X60) 06] [8 En VIGA CIM (45X60) A] [8 En VIGA CIM (45X60) B] [8 En VIGA CIM (45X60) C] [8 En VIGA CIM (45X60) D] [8 En VIGA CIM (45X60) E] [8 En VIGA CIM (45X60) F] [8 En VIGA CIM (45X60) 01] [8 En VIGA CIM (45X60) 02] [8 En VIGA CIM (45X60) 03] [8 En VIGA CIM (45X60) 04] [8 En VIGA CIM (45X60) 05] [8 En VIGA CIM (45X60) 06] [8 En VIGA CIM (45X60) A] [8 En VIGA CIM (45X60) B] [8 En VIGA CIM (45X60) C] [8 En VIGA CIM (45X60) D] [8 En VIGA CIM (45X60) E] [8 En VIGA CIM (45X60) F]
<p>8.0</p> <p>G2(90°)=0.25m</p>	96	5/8"	8.25	1229.18	[8 En VIGA CIM (45X60) 01] [8 En VIGA CIM (45X60) 02] [8 En VIGA CIM (45X60) 03] [8 En VIGA CIM (45X60) 04] [8 En VIGA CIM (45X60) 05] [8 En VIGA CIM (45X60) 06] [8 En VIGA CIM (45X60) A] [8 En VIGA CIM (45X60) B] [8 En VIGA CIM (45X60) C] [8 En VIGA CIM (45X60) D] [8 En VIGA CIM (45X60) E] [8 En VIGA CIM (45X60) F]
<p>7.0</p> <p>G2(90°)=0.25m</p>	96	5/8"	7.25	1080.19	[8 En VIGA CIM (45X60) 01] [8 En VIGA CIM (45X60) 02] [8 En VIGA CIM (45X60) 03] [8 En VIGA CIM (45X60) 04] [8 En VIGA CIM (45X60) 05] [8 En VIGA CIM (45X60) 06] [8 En VIGA CIM (45X60) A] [8 En VIGA CIM (45X60) B] [8 En VIGA CIM (45X60) C] [8 En VIGA CIM (45X60) D] [8 En VIGA CIM (45X60) E] [8 En VIGA CIM (45X60) F]

Peso total barras 5/8" =3575.81 kg

Lista de barras 3/8"

<p>9.0</p> <p>G2(90°)=0.15m</p>	940	3/8"	9.15	4816.56	[176 En REFUERZO SUPERIOR TORTA SUPERIOR N-2.00m] [176 En REFUERZO INFERIOR TORTA SUPERIOR N-2.00m] [176 En REFUERZO SUPERIOR TORTA INFERIOR N-2.00m] [176 En REFUERZO INFERIOR TORTA INFERIOR N-2.00m] [236 En REFUERZO PLACA DE CONTRAPISO N+0.00m]
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Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO

PLACA DE CIMENTACION

CANTIDADES DE OBRA





LISTADO PARA ESTRIBADORA



PazdelRío

Votorantim
Siderurgia

PÁGINA: 4 de 5

	DIAGRAMA	CANTIDAD	DIAM.	LONG. (m)	PESO	UBICACION
13		704	3/8"	9.00	3548.16	[176 En REFUERZO SUPERIOR TORTA SUPERIOR N-2.00m][176 En REFUERZO INFERIOR TORTA SUPERIOR N-2.00m][176 En REFUERZO SUPERIOR TORTA INFERIOR N-2.00m][176 En REFUERZO INFERIOR TORTA INFERIOR N-2.00m].
14		236	3/8"	6.00	792.96	[236 En REFUERZO PLACA DE CONTRAPISO N+0.00m].
15		236	3/8"	5.65	746.70	[236 En REFUERZO PLACA DE CONTRAPISO N+0.00m].
16		704	3/8"	4.65	1833.22	[176 En REFUERZO SUPERIOR TORTA SUPERIOR N-2.00m][176 En REFUERZO INFERIOR TORTA SUPERIOR N-2.00m][176 En REFUERZO SUPERIOR TORTA INFERIOR N-2.00m][176 En REFUERZO INFERIOR TORTA INFERIOR N-2.00m].

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO

PLACA DE CIMENTACION

CANTIDADES DE OBRA

LISTADO PARA ESTRIBADORA



PazdelRío

Votorantim
Siderurgia

PÁGINA: 5 de 5

	DIAGRAMA	CANTIDAD	DIAM.	LONG. (m)	PESO	UBICACION
17	<p>b=0.32 h=0.47 g=0.10</p>	1824	3/8"	1.78	1818.16	[152 En VIGA CIM (45X60) 01] [152 En VIGA CIM (45X60) 02] [152 En VIGA CIM (45X60) 03] [152 En VIGA CIM (45X60) 04] [152 En VIGA CIM (45X60) 05] [152 En VIGA CIM (45X60) 06] [152 En VIGA CIM (45X60) A] [152 En VIGA CIM (45X60) B] [152 En VIGA CIM (45X60) C] [152 En VIGA CIM (45X60) D] [152 En VIGA CIM (45X60) E] [152 En VIGA CIM (45X60) F] [ETA DE BORDE CIM (20X60)]
18	<p>b=0.10 h=0.47 g=0.10</p>	1092	3/8"	1.34	819.44	
19	<p>G1(180°)=0.10m G2(180°)=0.10m</p>	1824	3/8"	0.67	684.36	[152 En VIGA CIM (45X60) 01] [152 En VIGA CIM (45X60) 02] [152 En VIGA CIM (45X60) 03] [152 En VIGA CIM (45X60) 04] [152 En VIGA CIM (45X60) 05] [152 En VIGA CIM (45X60) 06] [152 En VIGA CIM (45X60) A] [152 En VIGA CIM (45X60) B] [152 En VIGA CIM (45X60) C] [152 En VIGA CIM (45X60) D] [152 En VIGA CIM (45X60) E] [152 En VIGA CIM (45X60) F]

Peso total barras 3/8" =15059.56 kg

PESO TOTAL = 31021.30 kg

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO

COLUMNAS Y MUROS

CANTIDADES DE OBRA

RESUMEN TOTAL



PazdelRío

Votorantim
Siderurgia

PÁGINA: 1 de 1

RESUMEN DE PESOS BARRAS FIGURADAS

DIAMETRO	Fy (Mpa)	LONGITUD (m)	PESO (kg)
1"	420	1,260.00	5005.98
7/8"	420	1,245.60	3789.12
3/8"	420	20,295.18	11365.30
TOTAL BARRAS FIGURADAS			20160.40

PESO TOTAL DEL PEDIDO = 20160.40 kg

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
COLUMNAS Y MUROS
CANTIDADES DE OBRA





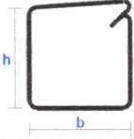
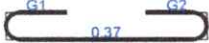
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Votorantim
Siderurgia

PÁGINA: 1 de 9

ELEMENTO POR ELEMENTO

COLUMNA TIPO 1 (A1, A2, A3, A4, A5 Y A6) (45X45) (Son 6) Peso/Elemento= 470.54Kg Peso 6 elementos=2823.22Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
<p>[1] </p>	4	7/8"	8.65	105.3	(Total =24)
<p>[2] </p>	4	1"	8.75	139.1	(Total =24)
<p>[3] </p>	176	3/8"	1.68	165.6	(Total =1056)
<p>[4] </p>	190	3/8"	0.57	60.6	(Total =1140)

COLUMNA TIPO 2 (B1, B2, B3, B4, B5 Y B6) (45X45) (Son 6) Peso/Elemento= 470.54Kg Peso 6 elementos=2823.22Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
COLUMNAS Y MUROS
CANTIDADES DE OBRA



PazdelRío

Votorantim
Siderurgia

PÁGINA: 2 de 9

ELEMENTO POR ELEMENTO

<p>[5]</p>  <p>G1(90°)=0.35m G2(90°)=0.35m</p>	4	7/8"	8.65	105.3	(Total =24)
<p>[6]</p>  <p>G1(90°)=0.40m G2(90°)=0.40m</p>	4	1"	8.75	139.1	(Total =24)
<p>[7]</p>  <p>b=0.37 h=0.37 g=0.10</p>	176	3/8"	1.68	165.6	(Total =1056)
<p>[8]</p>  <p>G1(180°)=0.10m G2(180°)=0.10m</p>	190	3/8"	0.57	60.6	(Total =1140)

COLUMNA TIPO 3 (C1, C2, C3, C4, C5 Y C6) (45X45) (Son 6) Peso/Elemento= 470.54Kg Peso 6 elementos=2823.22Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
COLUMNAS Y MUROS
CANTIDADES DE OBRA



PazdelRío

Votorantim
Siderurgia

PÁGINA: 3 de 9

ELEMENTO POR ELEMENTO

[9]		4	7/8"	8.65	105.3	(Total =24)
[10]		4	1"	8.75	139.1	(Total =24)
[11]		176	3/8"	1.68	165.6	(Total =1056)
[12]		190	3/8"	0.57	60.6	(Total =1140)

COLUMNA TIPO 4 (D1, D2, D3, D4, D5 Y D6) (45X45) (Son 6) Peso/Elemento= 470.54Kg Peso 6 elementos=2823.22Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
COLUMNAS Y MUROS
CANTIDADES DE OBRA




PazdelRío

Votorantim
Siderurgia

PÁGINA: 4 de 9

ELEMENTO POR ELEMENTO

[13]		G1(90°)=0.35m G2(90°)=0.35m	4	7/8"	8.65	105.3	(Total =24)
[14]		G1(90°)=0.40m G2(90°)=0.40m	4	1"	8.75	139.1	(Total =24)
[15]		b=0.37 h=0.37 g=0.10	176	3/8"	1.68	165.6	(Total =1056)
[16]		G1(180°)=0.10m G2(180°)=0.10m	190	3/8"	0.57	60.6	(Total =1140)

COLUMNA TIPO 5 (E1, E2, E3, E4, E5 Y E6) (45X45) (Son 6) Peso/Elemento= 470.54Kg Peso 6 elementos=2823.22Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
COLUMNAS Y MUROS
CANTIDADES DE OBRA



PazdelRio

Votorantim
Siderurgia

PÁGINA: 5 de 9

ELEMENTO POR ELEMENTO

[17]		4	7/8"	8.65	105.3	(Total =24)
[18]		4	1"	8.75	139.1	(Total =24)
[19]		176	3/8"	1.68	165.6	(Total =1056)
[20]		190	3/8"	0.57	60.6	(Total =1140)

COLUMNA TIPO 6 (F1, F2, F3, F4, F5 Y F6) (45X45) (Son 6) Peso/Elemento= 470.54Kg Peso 6 elementos=2823.22Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
COLUMNAS Y MUROS
CANTIDADES DE OBRA



PazdelRío

Votorantim
Siderurgia

PÁGINA: 6 de 9

ELEMENTO POR ELEMENTO

[21]	 G1(90°)=0.35m G2(90°)=0.35m	4	7/8"	8.65	105.3	(Total =24)
[22]	 G1(90°)=0.40m G2(90°)=0.40m	4	1"	8.75	139.1	(Total =24)
[23]	 b=0.37 h=0.37 g=0.10	176	3/8"	1.68	165.6	(Total =1056)
[24]	 G1(180°)=0.10m G2(180°)=0.10m	190	3/8"	0.57	60.6	(Total =1140)

MURO EJE 01 (Es 1) Peso/Elemento= 857.05Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
COLUMNAS Y MUROS
CANTIDADES DE OBRA






PazdelRío


Votorantim
Siderurgia

PÁGINA: 7 de 9

ELEMENTO POR ELEMENTO

[25]					
		199	3/8"	4.45	495.9
[26]					
		30	3/8"	11.15	187.3
[27]					
		32	3/8"	9.70	173.8

MURO EJE 06 (Es 1) Peso/Elemento= 857.05Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[28]						
		199	3/8"	4.45	495.9	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
COLUMNAS Y MUROS
CANTIDADES DE OBRA



ELEMENTO POR ELEMENTO





PazdelRío

Votorantim
Siderurgia

PÁGINA: 8 de 9

[29]					
		30	3/8"	11.15	187.3
[30]					
		32	3/8"	9.70	173.8

MURO EJE A (Es 1) Peso/Elemento= 781.48Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[31]					
	200	3/8"	3.85	431.2	
[32]					
	30	3/8"	11.15	187.3	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
COLUMNAS Y MUROS
CANTIDADES DE OBRA



PazdelRío

Votorantim
Siderurgia

PÁGINA: 9 de 9

ELEMENTO POR ELEMENTO

[33]		30	3/8"	9.70	163.0	
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MURO EJE B (Es 1) Peso/Elemento= 725.48Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[34]		200	3/8"	3.35	375.2	
[35]		30	3/8"	11.15	187.3	
[36]		30	3/8"	9.70	163.0	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO

COLUMNAS Y MUROS

CANTIDADES DE OBRA

LISTADO PARA ESTRIBADORA



PazdelRío

Votorantim
Siderurgia

PÁGINA: 1 de 3

Lista de barras 1"

DIAGRAMA	CANTIDAD	DIAM.	LONG. (m)	PESO	UBICACION
<p>G1(90°)=0.40m G2(90°)=0.40m</p>	144	1"	8.75	5005.98	[24 En COLUMNA TIPO 1 (A1, A2, A3, A4, A5 Y A6) (45X45)] [24 En COLUMNA TIPO 2 (B1, B2, B3, B4, B5 Y B6) (45X45)] [24 En COLUMNA TIPO 3 (C1, C2, C3, C4, C5 Y C6) (45X45)] [24 En COLUMNA TIPO 4 (D1, D2, D3, D4, D5 Y D6) (45X45)] [24 En COLUMNA TIPO 5 (E1, E2, E3, E4, E5 Y E6) (45X45)] [24 En COLUMNA TIPO 6 (F1, F2, F3, F4, F5 Y F6) (45X45)].

Peso total barras 1" =5005.98 kg

Lista de barras 7/8"

<p>G1(90°)=0.35m G2(90°)=0.35m</p>	144	7/8"	8.65	3789.12	[24 En COLUMNA TIPO 1 (A1, A2, A3, A4, A5 Y A6) (45X45)] [24 En COLUMNA TIPO 2 (B1, B2, B3, B4, B5 Y B6) (45X45)] [24 En COLUMNA TIPO 3 (C1, C2, C3, C4, C5 Y C6) (45X45)] [24 En COLUMNA TIPO 4 (D1, D2, D3, D4, D5 Y D6) (45X45)] [24 En COLUMNA TIPO 5 (E1, E2, E3, E4, E5 Y E6) (45X45)] [24 En COLUMNA TIPO 6 (F1, F2, F3, F4, F5 Y F6) (45X45)].
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Peso total barras 7/8" =3789.12 kg

Lista de barras 3/8"

<p>G2(90°)=0.30m</p>	120	3/8"	11.15	749.28	[30 En MURO EJE 01] [30 En MURO EJE 06] [30 En MURO EJE A] [30 En MURO EJE B].
<p>G2(90°)=0.30m</p>	124	3/8"	9.70	673.57	[32 En MURO EJE 01] [32 En MURO EJE 06] [30 En MURO EJE A] [30 En MURO EJE B].

ESTRUCTURA TANQUE ELEVADO
COLUMNAS Y MUROS
CANTIDADES DE OBRA



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Votorantim
Siderurgia

PÁGINA: 2 de 3

LISTADO PARA ESTRIBADORA

	DIAGRAMA	CANTIDAD	DIAM.	LONG. (m)	PESO	UBICACION
5		398	3/8"	4.45	991.82	[199 En MURO EJE 01] [199 En MURO EJE 06].
6		200	3/8"	3.85	431.20	[200 En MURO EJE A].
7		200	3/8"	3.35	375.20	[200 En MURO EJE B].
8		6336	3/8"	1.68	5960.91	[1056 En COLUMNA TIPO 1 (A1, A2, A3, A4, A5 Y A6) (45X45)] [1056 En COLUMNA TIPO 2 (B1, B2, B3, B4, B5 Y B6) (45X45)] [1056 En COLUMNA TIPO 3 (C1, C2, C3, C4, C5 Y C6) (45X45)] [1056 En COLUMNA TIPO 4 (D1, D2, D3, D4, D5 Y D6) (45X45)] [1056 En COLUMNA TIPO 5 (E1, E2, E3, E4, E5 Y E6) (45X45)] [1056 En COLUMNA TIPO 6 (F1, F2, F3, F4, F5 Y F6) (45X45)].

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
COLUMNAS Y MUROS
CANTIDADES DE OBRA

LISTADO PARA ESTRIBADORA



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PÁGINA: 3 de 3

DIAGRAMA	CANTIDAD	DIAM.	LONG. (m)	PESO	UBICACION
	6840	3/8"	0.57	2183.33	[1140 En COLUMNA TIPO 1 (A1, A2, A3, A4, A5 Y A6) (45X45)] [1140 En COLUMNA TIPO 2 (B1, B2, B3, B4, B5 Y B6) (45X45)] [1140 En COLUMNA TIPO 3 (C1, C2, C3, C4, C5 Y C6) (45X45)] [1140 En COLUMNA TIPO 4 (D1, D2, D3, D4, D5 Y D6) (45X45)] [1140 En COLUMNA TIPO 5 (E1, E2, E3, E4, E5 Y E6) (45X45)] [1140 En COLUMNA TIPO 6 (F1, F2, F3, F4, F5 Y F6) (45X45)]].

Peso total barras 3/8" = 11365.30 kg

PESO TOTAL = 20160.40 kg

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
PLACA DE FONDO TANQUE N+2.50m
CANTIDADES DE OBRA

RESUMEN TOTAL



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PÁGINA: 1 de 1

RESUMEN DE PESOS BARRAS FIGURADAS

DIAMETRO	Fy (Mpa)	LONGITUD (m)	PESO (kg)
3/4"	420	2.949.20	6591.46
3/8"	420	13.815.16	7736.49
TOTAL BARRAS FIGURADAS			14327.95

PESO TOTAL DEL PEDIDO = 14327.95 kg

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA

ELEMENTO POR ELEMENTO







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PÁGINA: 1 de 21

VIGA AEREA (30X45) 01 (Es 1) Peso/Elemento= 434.05Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[1] 	3	3/4"	6.90	46.3	
[2] 	3	3/4"	9.25	62.0	
[3] 	3	3/4"	6.85	45.9	
[4] 	3	3/4"	10.75	72.1	

Acero colombiano hecho con el corazón


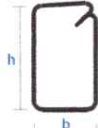


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PÁGINA: 2 de 21

ESTRUCTURA TANQUE ELEVADO
PLACA DE FONDO TANQUE N+2.50m
CANTIDADES DE OBRA
ELEMENTO POR ELEMENTO

[5]					
		3	3/4"	10.70	71.7
[6]					
	b=0.22 h=0.37 g=0.10	176	3/8"	1.38	136.0

VIGA AEREA (30X45) 02 (Es 1) Peso/Elemento= 434.05Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[7]						
		3	3/4"	6.90	46.3	
[8]						
		3	3/4"	9.25	62.0	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA



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Siderurgia

PÁGINA: 3 de 21

ELEMENTO POR ELEMENTO

[9]		3	3/4"	6.85	45.9
[10]		3	3/4"	10.75	72.1
[11]		3	3/4"	10.70	71.7
[12]		176	3/8"	1.38	136.0

VIGA AEREA (30X45) 03 (Es 1) Peso/Elemento= 434.05Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA



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Siderurgia

PÁGINA: 4 de 21

ELEMENTO POR ELEMENTO

[13]		3	3/4"	6.90	46.3
[14]		3	3/4"	9.25	62.0
[15]		3	3/4"	6.85	45.9
[16]		3	3/4"	10.75	72.1
[17]		3	3/4"	10.70	71.7

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



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Siderurgia

PÁGINA: 5 de 21

[18]	<p>b=0.22 h=0.37 g=0.10</p>	176	3/8"	1.38	136.0	
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VIGA AEREA (30X45) 04 (Es 1) Peso/Elemento= 434.05Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[19]	<p>6.6 G2(90°)=0.30m</p>	3	3/4"	6.90	46.3	
[20]	<p>9.25</p>	3	3/4"	9.25	62.0	
[21]	<p>6.55 G2(90°)=0.30m</p>	3	3/4"	6.85	45.9	





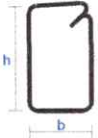
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Siderurgia


PÁGINA: 6 de 21

ESTRUCTURA TANQUE ELEVADO
PLACA DE FONDO TANQUE N+2.50m
CANTIDADES DE OBRA

ELEMENTO POR ELEMENTO

[22]					
		3	3/4"	10.75	72.1
[23]					
		3	3/4"	10.70	71.7
[24]					
	b=0.22 h=0.37 g=0.10	176	3/8"	1.38	136.0

VIGA AEREA (30X45) 05 (Es 1) Peso/Elemento= 434.05Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[25]						
		3	3/4"	6.90	46.3	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA



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Siderurgia

PÁGINA: 7 de 21

ELEMENTO POR ELEMENTO

[26]					
		3	3/4"	9.25	62.0
[27]					
		3	3/4"	6.85	45.9
[28]					
		3	3/4"	10.75	72.1
[29]					
		3	3/4"	10.70	71.7
[30]					
		176	3/8"	1.38	136.0

VIGA AEREA (30X45) 06 (Es 1) Peso/Elemento= 434.05Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA



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Siderurgia

PÁGINA: 8 de 21

ELEMENTO POR ELEMENTO

[31]		3	3/4"	6.90	46.3
[32]		3	3/4"	9.25	62.0
[33]		3	3/4"	6.85	45.9
[34]		3	3/4"	10.75	72.1
[35]		3	3/4"	10.70	71.7

Acero colombiano hecho con el corazón

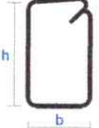
ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO






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PÁGINA: 9 de 21

[36]	 <p style="margin-left: 20px;">b=0.22 h=0.37 g=0.10</p>						
		176	3/8"	1.38	136.0		

VIGA AEREA (30X45) A (Es 1) Peso/Elemento= 434.05Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[37]		3	3/4"	6.90	46.3	
[38]		3	3/4"	9.25	62.0	
[39]		3	3/4"	6.85	45.9	

Acero colombiano hecho con el corazón



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Votorantim
Siderurgia

PÁGINA: 10 de 21

ESTRUCTURA TANQUE ELEVADO
PLACA DE FONDO TANQUE N+2.50m
CANTIDADES DE OBRA






ELEMENTO POR ELEMENTO

[40]					
		3	3/4"	10.75	72.1
[41]					
		3	3/4"	10.70	71.7
[42]					
		176	3/8"	1.38	136.0

VIGA AEREA (30X45) B (Es 1) Peso/Elemento= 434.05Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[43]					
	3	3/4"	6.90	46.3	

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO

[44]					
		3	3/4"	9.25	62.0
[45]					
		3	3/4"	6.85	45.9
[46]					
		3	3/4"	10.75	72.1
[47]					
		3	3/4"	10.70	71.7
[48]					
		176	3/8"	1.38	136.0

VIGA AEREA (30X45) C (Es 1) Peso/Elemento= 434.05Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA



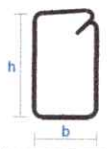
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ELEMENTO POR ELEMENTO

[49]		3	3/4"	6.90	46.3
[50]		3	3/4"	9.25	62.0
[51]		3	3/4"	6.85	45.9
[52]		3	3/4"	10.75	72.1
[53]		3	3/4"	10.70	71.7

ESTRUCTURA TANQUE ELEVADO
PLACA DE FONDO TANQUE N+2.50m
CANTIDADES DE OBRA
ELEMENTO POR ELEMENTO

[54]		$b=0.22$ $h=0.37$ $g=0.10$				
			176	3/8"	1.38	136.0

VIGA AEREA (30X45) D (Es 1) Peso/Elemento= 434.05Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[55]		3	3/4"	6.90	46.3	
[56]		3	3/4"	9.25	62.0	
[57]		3	3/4"	6.85	45.9	

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA




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Siderurgia

PÁGINA: 14 de 21

ELEMENTO POR ELEMENTO

[58]		3	3/4"	10.75	72.1
[59]		3	3/4"	10.70	71.7
[60]		176	3/8"	1.38	136.0

VIGA AEREA (30X45) E (Es 1) Peso/Elemento= 434.05Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[61]		3	3/4"	6.90	46.3	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



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Votorantim
Siderurgia

[62]					
		3	3/4"	9.25	62.0
[63]					
		3	3/4"	6.85	45.9
[64]					
		3	3/4"	10.75	72.1
[65]					
		3	3/4"	10.70	71.7
[66]					
		176	3/8"	1.38	136.0

VIGA AEREA (30X45) F (Es 1) Peso/Elemento= 434.05Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



Paz del Río

Votorantim
Siderurgia

PÁGINA: 16 de 21

[67]		3	3/4"	6.90	46.3
[68]		3	3/4"	9.25	62.0
[69]		3	3/4"	6.85	45.9
[70]		3	3/4"	10.75	72.1
[71]		3	3/4"	10.70	71.7

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
PLACA DE FONDO TANQUE N+2.50m
CANTIDADES DE OBRA
ELEMENTO POR ELEMENTO



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Votorantim
Siderurgia

PÁGINA: 17 de 21

[72]		b=0.22 h=0.37 g=0.10					
			176	3/8"	1.38	136.0	

VIGUETA (10X45) (Son 20) Peso/Elemento= 181.07Kg Peso 20 elementos=3621.50Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[73]		2	3/4"	6.90	30.8	(Total =40)
[74]		2	3/4"	9.25	41.3	(Total =40)
[75]		2	3/4"	6.85	30.6	(Total =40)

Acero colombiano hecho con el corazón






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Siderurgia


PÁGINA: 18 de 21

ESTRUCTURA TANQUE ELEVADO
PLACA DE FONDO TANQUE N+2.50m
CANTIDADES DE OBRA

ELEMENTO POR ELEMENTO

[76]		G2(90°)=0.30m	1	3/4"	10.75	24.0	(Total =20)
[77]		G2(90°)=0.30m	1	3/4"	10.70	23.9	(Total =20)
[78]		G1(180°)=0.10m G2(180°)=0.10m	95	3/8"	0.57	30.3	(Total =1900)

REFUERZO SUPERIOR PLACA FONDO TANQUE N+2.00m (Es 1) Peso/Elemento= 2748.93Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS	
[79]		G2(90°)=0.15m	118	3/8"	5.65	373.4

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA



Paz del Río

Votorantim
Siderurgia

PÁGINA: 19 de 21

ELEMENTO POR ELEMENTO

[80]					
		118	3/8"	6.00	396.5
[81]					
		118	3/8"	9.15	604.6
[82]					
		118	3/8"	5.65	373.4
[83]					
		118	3/8"	6.00	396.5
[84]					
		118	3/8"	9.15	604.6

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA

ELEMENTO POR ELEMENTO



PazdelRío

Votorantim
Siderurgia

PÁGINA: 20 de 21

REFUERZO INFERIOR PLACA FONDO TANQUE N+2.00m (Es 1) Peso/Elemento= 2748.93Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[85] G2(90°)=0.15m	118	3/8"	5.65	373.4	
[86] 6.0	118	3/8"	6.00	396.5	
[87] 9.0 G2(90°)=0.15m	118	3/8"	9.15	604.6	
[88] 5.5 G2(90°)=0.15m	118	3/8"	5.65	373.4	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA

ELEMENTO POR ELEMENTO



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Votorantim
Siderurgia

PÁGINA: 21 de 21

[89]					
		118	3/8"	6.00	396.5
[90]					
		118	3/8"	9.15	604.6

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA

LISTADO PARA ESTRIBADORA



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Siderurgia

PÁGINA: 1 de 3

Lista de barras 3/4"

	DIAGRAMA	CANTIDAD	DIAM.	LONG. (m)	PESO	UBICACION
1		56	3/4"	10.75	1345.47	[3 En VIGA AEREA (30X45) 01] [3 En VIGA AEREA (30X45) 02] [3 En VIGA AEREA (30X45) 03] [3 En VIGA AEREA (30X45) 04] [3 En VIGA AEREA (30X45) 05] [3 En VIGA AEREA (30X45) 06] [3 En VIGA AEREA (30X45) A] [3 En VIGA AEREA (30X45) B] [3 En VIGA AEREA (30X45) C] [3 En VIGA AEREA (30X45) D] [3 En VIGA AEREA (30X45) E] [3 En VIGA AEREA (30X45) F] [40 En VIGUETA (10X45)]
2		56	3/4"	10.70	1339.21	
3		76	3/4"	9.25	1571.20	
4		76	3/4"	6.90	1172.03	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA

LISTADO PARA ESTRIBADORA



PazdelRío

Votorantim
Siderurgia

PÁGINA: 2 de 3

DIAGRAMA	CANTIDAD	DIAM.	LONG. (m)	PESO	UBICACION
<p>5</p>	76	3/4"	6.85	1163.54	[3 En VIGA AEREA (30X45) 01][3 En VIGA AEREA (30X45) 02][3 En VIGA AEREA (30X45) 03][3 En VIGA AEREA (30X45) 04][3 En VIGA AEREA (30X45) 05][3 En VIGA AEREA (30X45) 06][3 En VIGA AEREA (30X45) A][3 En VIGA AEREA (30X45) B][3 En VIGA AEREA (30X45) C][3 En VIGA AEREA (30X45) D][3 En VIGA AEREA (30X45) E][3 En VIGA AEREA (30X45) F][40 En VIGUETA (10X45)].
Peso total barras 3/4" =6591.46 kg Lista de barras 3/8"					
<p>6</p>	472	3/8"	9.15	2418.53	[236 En REFUERZO SUPERIOR PLACA FONDO TANQUE N+2.00m][236 En REFUERZO INFERIOR PLACA FONDO TANQUE N+2.00m].
<p>7</p>	472	3/8"	6.00	1585.92	[236 En REFUERZO SUPERIOR PLACA FONDO TANQUE N+2.00m][236 En REFUERZO INFERIOR PLACA FONDO TANQUE N+2.00m].
<p>8</p>	472	3/8"	5.65	1493.41	[236 En REFUERZO SUPERIOR PLACA FONDO TANQUE N+2.00m][236 En REFUERZO INFERIOR PLACA FONDO TANQUE N+2.00m].

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA

LISTADO PARA ESTRIBADORA



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Siderurgia

PÁGINA: 3 de 3

	DIAGRAMA	CANTIDAD	DIAM.	LONG. (m)	PESO	UBICACION
9	<p style="text-align: right;">b=0.22 h=0.37 g=0.10</p>	2112	3/8"	1.38	1632.15	[176 En VIGA AEREA (30X45) 01] [176 En VIGA AEREA (30X45) 02] [176 En VIGA AEREA (30X45) 03] [176 En VIGA AEREA (30X45) 04] [176 En VIGA AEREA (30X45) 05] [176 En VIGA AEREA (30X45) 06] [176 En VIGA AEREA (30X45) A] [176 En VIGA AEREA (30X45) B] [176 En VIGA AEREA (30X45) C] [176 En VIGA AEREA (30X45) D] [176 En VIGA AEREA (30X45) E] [176 En VIGA AEREA (30X45) F]
10	<p style="text-align: right;">G1(180°)=0.10m G2(180°)=0.10m</p>	1900	3/8"	0.57	606.48	

Peso total barras 3/8" =7736.49 kg

PESO TOTAL = 14327.95 kg

ESTRUCTURA TANQUE ELEVADO
PLACA DE FONDO TANQUE N+2.50m
CANTIDADES DE OBRA

RESUMEN TOTAL



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PÁGINA: 1 de 1

RESUMEN DE PESOS BARRAS FIGURADAS

DIAMETRO	Fy (Mpa)	LONGITUD (m)	PESO (kg)
3/4"	420	4.267.20	9537.19
3/8"	420	14.738.56	8253.59
TOTAL BARRAS FIGURADAS			17790.79

PESO TOTAL DEL PEDIDO = 17790.79 kg

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA

ELEMENTO POR ELEMENTO







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PÁGINA: 1 de 21

VIGA AEREA (30X45) 01 (Es 1) Peso/Elemento= 434.05Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[1]		3	3/4"	6.90	46.3	
[2]		3	3/4"	9.25	62.0	
[3]		3	3/4"	6.85	45.9	
[4]		3	3/4"	10.75	72.1	

Acero colombiano hecho con el corazón



ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO





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PÁGINA: 2 de 21

[5]					
		3	3/4"	10.70	71.7
[6]					
		176	3/8"	1.38	136.0

VIGA AEREA (30X45) 02 (Es 1) Peso/Elemento= 434.05Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[7]						
		3	3/4"	6.90	46.3	
[8]						
		3	3/4"	9.25	62.0	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
PLACA DE FONDO TANQUE N+2.50m
CANTIDADES DE OBRA
ELEMENTO POR ELEMENTO



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Siderurgia

PÁGINA: 3 de 21

[9]		3	3/4"	6.85	45.9
[10]		3	3/4"	10.75	72.1
[11]		3	3/4"	10.70	71.7
[12]		176	3/8"	1.38	136.0

VIGA AEREA (30X45) 03 (Es 1) Peso/Elemento= 434.05Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA



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Siderurgia

PÁGINA: 4 de 21

ELEMENTO POR ELEMENTO

[13]		3	3/4"	6.90	46.3
[14]		3	3/4"	9.25	62.0
[15]		3	3/4"	6.85	45.9
[16]		3	3/4"	10.75	72.1
[17]		3	3/4"	10.70	71.7

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



Paz del Río

Votorantim
Siderurgia

PÁGINA: 5 de 21

[18]		b=0.22 h=0.37 g=0.10					
			176	3/8"	1.38	136.0	

VIGA AEREA (30X45) 04 (Es 1) Peso/Elemento= 434.05Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[19]		3	3/4"	6.90	46.3	
[20]		3	3/4"	9.25	62.0	
[21]		3	3/4"	6.85	45.9	

Acero colombiano hecho con el corazón



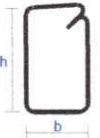
ESTRUCTURA TANQUE ELEVADO
PLACA DE FONDO TANQUE N+2.50m
CANTIDADES DE OBRA
ELEMENTO POR ELEMENTO



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Votorantim
Siderurgia

PÁGINA: 6 de 21

[22]		G2(90°)=0.30m	3	3/4"	10.75	72.1
[23]		G2(90°)=0.30m	3	3/4"	10.70	71.7
[24]		b=0.22 h=0.37 g=0.10	176	3/8"	1.38	136.0

VIGA AEREA (30X45) 05 (Es 1) Peso/Elemento= 434.05Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[25]		3	3/4"	6.90	46.3	

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA

ELEMENTO POR ELEMENTO



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Siderurgia

PÁGINA: 7 de 21

[26]					
		3	3/4"	9.25	62.0
[27]					
		3	3/4"	6.85	45.9
[28]					
		3	3/4"	10.75	72.1
[29]					
		3	3/4"	10.70	71.7
[30]					
		176	3/8"	1.38	136.0

VIGA AEREA (30X45) 06 (Es 1) Peso/Elemento= 434.05Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA






ELEMENTO POR ELEMENTO



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Siderurgia

PÁGINA: 8 de 21

[31]		3	3/4"	6.90	46.3
[32]		3	3/4"	9.25	62.0
[33]		3	3/4"	6.85	45.9
[34]		3	3/4"	10.75	72.1
[35]		3	3/4"	10.70	71.7

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



PazdelRío

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Siderurgia

PÁGINA: 9 de 21

[36]		b=0.22 h=0.37 g=0.10					
			176	3/8"	1.38	136.0	

VIGA AEREA (30X45) A (Es 1) Peso/Elemento= 434.05Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[37]		3	3/4"	6.90	46.3	
[38]		3	3/4"	9.25	62.0	
[39]		3	3/4"	6.85	45.9	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA


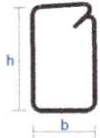
ELEMENTO POR ELEMENTO




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PÁGINA: 10 de 21

[40]		G2(90°)=0.30m				
			3	3/4"	10.75	72.1
[41]		G2(90°)=0.30m				
			3	3/4"	10.70	71.7
[42]		b=0.22 h=0.37 g=0.10				
			176	3/8"	1.38	136.0

VIGA AEREA (30X45) B (Es 1) Peso/Elemento= 434.05Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[43]						
		3	3/4"	6.90	46.3	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



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Votorantim
Siderurgia

PÁGINA: 11 de 21

[44]					
		3	3/4"	9.25	62.0
[45]					
		3	3/4"	6.85	45.9
[46]					
		3	3/4"	10.75	72.1
[47]					
		3	3/4"	10.70	71.7
[48]					
		176	3/8"	1.38	136.0

VIGA AEREA (30X45) C (Es 1) Peso/Elemento= 434.05Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón






ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



PazdelRío

Votorantim
Siderurgia

PÁGINA: 12 de 21

[49]		3	3/4"	6.90	46.3
[50]		3	3/4"	9.25	62.0
[51]		3	3/4"	6.85	45.9
[52]		3	3/4"	10.75	72.1
[53]		3	3/4"	10.70	71.7

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
PLACA DE FONDO TANQUE N+2.50m
CANTIDADES DE OBRA
ELEMENTO POR ELEMENTO



PazdelRío

Votorantim
Siderurgia

PÁGINA: 13 de 21

[54]		b=0.22 h=0.37 g=0.10					
			176	3/8"	1.38	136.0	

VIGA AEREA (30X45) D (Es 1) Peso/Elemento= 434.05Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[55]		3	3/4"	6.90	46.3	
[56]		3	3/4"	9.25	62.0	
[57]		3	3/4"	6.85	45.9	

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA



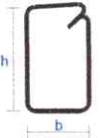
ELEMENTO POR ELEMENTO



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Votorantim
Siderurgia

PÁGINA: 14 de 21

[58]					
		3	3/4"	10.75	72.1
[59]					
		3	3/4"	10.70	71.7
[60]					
	b=0.22 h=0.37 g=0.10	176	3/8"	1.38	136.0

VIGA AEREA (30X45) E (Es 1) Peso/Elemento= 434.05Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[61]						
		3	3/4"	6.90	46.3	

ESTRUCTURA TANQUE ELEVADO
PLACA DE FONDO TANQUE N+2.50m
CANTIDADES DE OBRA
ELEMENTO POR ELEMENTO



PazdelRío

Votorantim
Siderurgia

PÁGINA: 15 de 21

[62]					
		3	3/4"	9.25	62.0
[63]					
		3	3/4"	6.85	45.9
[64]					
		3	3/4"	10.75	72.1
[65]					
		3	3/4"	10.70	71.7
[66]					
		176	3/8"	1.38	136.0

VIGA AEREA (30X45) F (Es 1) Peso/Elemento= 434.05Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
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Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



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Siderurgia

PÁGINA: 16 de 21

[67]		3	3/4"	6.90	46.3
[68]		3	3/4"	9.25	62.0
[69]		3	3/4"	6.85	45.9
[70]		3	3/4"	10.75	72.1
[71]		3	3/4"	10.70	71.7

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA



PazdelRío

Votorantim
Siderurgia

PÁGINA: 17 de 21

ELEMENTO POR ELEMENTO

[72]		b=0.22 h=0.37 g=0.10					
			176	3/8"	1.38	136.0	

REFUERZO SUPERIOR PLACA FONDO TANQUE N+6.00m (Es 1) Peso/Elemento= 2748.93Kg

	DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[73]		118	3/8"	5.65	373.4	
[74]		118	3/8"	6.00	396.5	
[75]		118	3/8"	9.15	604.6	

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA

ELEMENTO POR ELEMENTO



PazdelRío

Votorantim
Siderurgia

PÁGINA: 18 de 21

[76]		118	3/8"	5.65	373.4
[77]		118	3/8"	6.00	396.5
[78]		118	3/8"	9.15	604.6

REFUERZO INFERIOR PLACA FONDO TANQUE N+6.00m (Es 1) Peso/Elemento= 2748.93Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[79]	118	3/8"	5.65	373.4	

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA
 ELEMENTO POR ELEMENTO



PazdelRío

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[80]					
		118	3/8"	6.00	396.5
[81]					
		118	3/8"	9.15	604.6
[82]					
		118	3/8"	5.65	373.4
[83]					
		118	3/8"	6.00	396.5
[84]					
		118	3/8"	9.15	604.6

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA

ELEMENTO POR ELEMENTO







Paz del Río

Votorantim
Siderurgia

PÁGINA: 20 de 21

VIGUETA (10X45) (Son 20) Peso/Elemento= 354.22Kg Peso 20 elementos=7084.33Kg

DIAGRAMA	CANTIDAD	DIAMETRO	LONGITUD	PESO T	NOTAS
[85]  6.6 G2(90°)=0.30m	3	3/4"	6.90	46.3	(Total =60)
[86]  9.25	3	3/4"	9.25	62.0	(Total =60)
[87]  6.55 G2(90°)=0.30m	3	3/4"	6.85	45.9	(Total =60)
[88]  10.45 G2(90°)=0.30m	3	3/4"	10.75	72.1	(Total =60)

Acero colombiano hecho con el corazón



ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA

ELEMENTO POR ELEMENTO



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[89]		G2(90°)=0.30m					
			3	3/4"	10.70	71.7	(Total =60)
[90]		G1(180°)=0.10m G2(180°)=0.10m					
			176	3/8"	0.57	56.2	(Total =3520)

ESTRUCTURA TANQUE ELEVADO
PLACA DE FONDO TANQUE N+2.50m
CANTIDADES DE OBRA

LISTADO PARA ESTRIBADORA







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PÁGINA: 1 de 3

Lista de barras 3/4"

	DIAGRAMA	CANTIDAD	DIAM.	LONG. (m)	PESO	UBICACION
1		96	3/4"	10.75	2306.52	[3 En VIGA AEREA (30X45) 01] [3 En VIGA AEREA (30X45) 02] [3 En VIGA AEREA (30X45) 03] [3 En VIGA AEREA (30X45) 04] [3 En VIGA AEREA (30X45) 05] [3 En VIGA AEREA (30X45) 06] [3 En VIGA AEREA (30X45) A] [3 En VIGA AEREA (30X45) B] [3 En VIGA AEREA (30X45) C] [3 En VIGA AEREA (30X45) D] [3 En VIGA AEREA (30X45) E] [3 En VIGA AEREA (30X45) F] [60 En VIGUETA (10X45)]
2		96	3/4"	10.70	2295.79	
3		96	3/4"	9.25	1984.68	
4		96	3/4"	6.90	1480.46	

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
PLACA DE FONDO TANQUE N+2.50m
CANTIDADES DE OBRA

LISTADO PARA ESTRIBADORA



PazdelRío

Votorantim
Siderurgia

PÁGINA: 2 de 3

DIAGRAMA	CANTIDAD	DIAM.	LONG. (m)	PESO	UBICACION
<p>5</p> <p>6.55 G2(90°)=0.30m</p>	96	3/4"	6.85	1469.74	[3 En VIGA AEREA (30X45) 01][3 En VIGA AEREA (30X45) 02][3 En VIGA AEREA (30X45) 03][3 En VIGA AEREA (30X45) 04][3 En VIGA AEREA (30X45) 05][3 En VIGA AEREA (30X45) 06][3 En VIGA AEREA (30X45) A][3 En VIGA AEREA (30X45) B][3 En VIGA AEREA (30X45) C][3 En VIGA AEREA (30X45) D][3 En VIGA AEREA (30X45) E][3 En VIGA AEREA (30X45) F][60 En VIGUETA (10X45)].
<p>Peso total barras 3/4" =9537.19 kg</p> <p>Lista de barras 3/8"</p>					
<p>6</p> <p>9.0 G2(90°)=0.15m</p>	472	3/8"	9.15	2418.53	[236 En REFUERZO SUPERIOR PLACA FONDO TANQUE N+6.00m][236 En REFUERZO INFERIOR PLACA FONDO TANQUE N+6.00m].
<p>7</p> <p>6.0</p>	472	3/8"	6.00	1585.92	[236 En REFUERZO SUPERIOR PLACA FONDO TANQUE N+6.00m][236 En REFUERZO INFERIOR PLACA FONDO TANQUE N+6.00m].
<p>8</p> <p>5.5 G2(90°)=0.15m</p>	472	3/8"	5.65	1493.41	[236 En REFUERZO SUPERIOR PLACA FONDO TANQUE N+6.00m][236 En REFUERZO INFERIOR PLACA FONDO TANQUE N+6.00m].

Acero colombiano hecho con el corazón

ESTRUCTURA TANQUE ELEVADO
 PLACA DE FONDO TANQUE N+2.50m
 CANTIDADES DE OBRA

LISTADO PARA ESTRIBADORA



PazdelRío



PÁGINA: 3 de 3

	DIAGRAMA	CANTIDAD	DIAM.	LONG. (m)	PESO	UBICACION
9	<p style="margin-left: 20px;">b=0.22 h=0.37 g=0.10</p>	2112	3/8"	1.38	1632.15	[176 En VIGA AEREA (30X45) 01] [176 En VIGA AEREA (30X45) 02] [176 En VIGA AEREA (30X45) 03] [176 En VIGA AEREA (30X45) 04] [176 En VIGA AEREA (30X45) 05] [176 En VIGA AEREA (30X45) 06] [176 En VIGA AEREA (30X45) A] [176 En VIGA AEREA (30X45) B] [176 En VIGA AEREA (30X45) C] [176 En VIGA AEREA (30X45) D] [176 En VIGA AEREA (30X45) E] [176 En VIGA AEREA (30X45) F]
10	<p style="margin-left: 20px;">G1(180°)=0.10m G2(180°)=0.10m</p>	3520	3/8"	0.57	1123.58	

Peso total barras 3/8" =8253.59 kg

PESO TOTAL = 17790.79 kg

Villavicencio, octubre de 2022

MEMORIAL DE RESPONSABILIDAD

Yo, **JUAN FERNANDO LOZANO SEPULVEDA**, ingeniero civil; con matrícula profesional vigente 25202-323109 CND, e identificado con C.C. N° 1.121.865.618 de Villavicencio - Meta, hago constar que el **DISEÑO ESTRUCTURAL**, fue elaborado en cumplimiento a los requisitos y normas aplicados a este tipo de actividades, para el proyecto **“ESTUDIOS Y DISEÑOS PARA LA OPTIMIZACIÓN DEL SISTEMA DESARENADOR Y LA LINEA DE CONDUCCION UBICADO EN LA QUEBRADA LAS BLANCAS DEL MUNICIPIO DE ACACIAS META”**

En consecuencia, asumo la responsabilidad del presente estudio, en cualquier tipo de caso, situación o eventualidad que pudiera presentarse, en que la obra a que hace referencia el proyecto no se ejecute conforme a lo estipulado por el estudio, no asumiré responsabilidad civil ni penal alguna.

Atentamente,



JUAN FERNANDO LOZANO SEPULVEDA
ING. CIVIL ESP. EN ESTRUCTURAS
M.P. 25202-323109 CND

REPUBLICA DE COLOMBIA
IDENTIFICACION PERSONAL
CEDULA DE CIUDADANIA

NUMERO **1.121.865.618**

LOZANO SEPULVEDA

APELLIDO **JUAN FERNANDO**

NOMBRES

FIRMA



REPUBLICA DE COLOMBIA



INDICE DERECHO

FECHA DE NACIMIENTO **28-MAY-1990**

VILLAVICENCIO
(META)

LUGAR DE NACIMIENTO

1.72 **O+** **M**

ESTATURA G.S. RH SEXO

07-JUL-2008 VILLAVICENCIO

FECHA Y LUGAR DE EXPEDICION

Carlos Ariel Sánchez Torres
REGISTRADOR NACIONAL
CARLOS ARIEL SÁNCHEZ TORRES



P-5200100-00091984-M-1121865618-20081010 0004164895A 1 24839359



REPÚBLICA DE COLOMBIA
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Matrícula Profesional No.
25202-323109 CND
Fecha de Expedición: **12/02/2016**

Nombre:

**JUAN FERNANDO
LOZANO SEPULVEDA**

Cédula:

C.C. 1121865618

Profesión:

INGENIERO CIVIL

Institución:

**CORPORACION UNIVERSITARIA
DEL META**





**CONSEJO PROFESIONAL NACIONAL DE INGENIERÍA
COPNIA**

EL DIRECTOR GENERAL

CERTIFICA:

1. Que JUAN FERNANDO LOZANO SEPULVEDA, identificado(a) con CEDULA DE CIUDADANIA 1121865618, se encuentra inscrito(a) en el Registro Profesional Nacional que lleva esta entidad, en la profesión de INGENIERIA CIVIL con MATRICULA PROFESIONAL 25202-323109 desde el 12 de Febrero de 2016, otorgado(a) mediante Resolución Nacional 171.
2. Que el(la) MATRICULA PROFESIONAL es la autorización que expide el Estado para que el titular ejerza su profesión en todo el territorio de la República de Colombia, de conformidad con lo dispuesto en la Ley 842 de 2003.
3. Que el(la) referido(a) MATRICULA PROFESIONAL se encuentra **VIGENTE**
4. Que el profesional no tiene antecedentes disciplinarios ético-profesionales.
5. Que la presente certificación se expide en Bogotá, D.C., a los siete (07) días del mes de Marzo del año dos mil veintitres (2023).

Rubén Dario Ochoa Arbeláez

Firmal del titular (*)

(*)Con el fin de verificar que el titular autoriza su participación en procesos estatales de selección de contratistas. La falta de firma del titular no invalida el Certificado

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No. 4947

CORPORACION UNIVERSITARIA DEL META

Acta de Grado N° 4947

El Consejo Superior de la Corporación Universitaria del Meta, en su sesión ordinaria del día 11 de Diciembre de 2015, Acta N° 083, considerando que:

JUAN FERNANDO LOZANO SEPÚLVEDA

Con cédula de ciudadanía No. 1.121.865.618 de Villavicencio y natural de Villavicencio (Meta)

Cumplió satisfactoriamente todos los requisitos exigidos por la Ley, los estatutos y los reglamentos de la Universidad, resuelve otorgarle el título de:

INGENIERO CIVIL

En nombre y representación de la CORPORACIÓN UNIVERSITARIA DEL META y previo juramento de rigor, el Rector hizo entrega del DIPLOMA correspondiente registrado en el folio N° 4947 del libro N° 1 de Diplomas.

En testimonio de lo anterior se firma la presente Acta de Grado, en la ciudad de Villavicencio, el día 11 de Diciembre de 2015.

Opción de Grado: Tesis Manual de Análisis Sísmico para Edificaciones en Concreto Reforzado

El Rector,

Doy Fe,

Secretario General

El Decano,

ACARON DA



UNIVERSIDAD NACIONAL DE COLOMBIA
SEDE MANIZALES

FACULTAD DE
Ingeniería y Arquitectura

ACTA DE GRADO NÚMERO 1674

El Consejo de Facultad en su sesión del día 25 de julio de 2018 - Acta No. 24

CONSIDERANDO QUE

Juan Fernando Lozano Sepúlveda

C.C. 1.121.865.618 de Villavicencio

Cumplió satisfactoriamente con los requisitos exigidos por los Acuerdos y Reglamentos de la Universidad, resuelve otorgarle el título de

Especialista en Estructuras

en convenio con la Universidad de los Llanos

En nombre y representación de la República de Colombia y de la Universidad Nacional de Colombia se expide el Diploma Número 54115 consignado en el Registro No. 1676, Folio 12 del Libro No. 3

En testimonio de lo anterior se firma la presente Acta de Grado en la ciudad de Manizales, a los 25 días del mes de julio de 2018


PRESIDENCIA
Consejo de Facultad


SECRETARÍA
Consejo de Facultad