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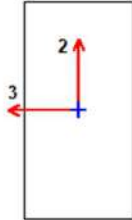
LAMPIRAN





ETABS 2016 Concrete Frame Design

ACI 318-14 Beam Section Design



Beam Element Details (Flexural Details) (Part 1 of 2)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)
b. Basement 04	B87	3386206	B.400x200	1,2 D + 1,2 SW + 0,5 L + 1 EQx	0	7030,6

Beam Element Details (Flexural Details) (Part 2 of 2)

LLRF	Type
1	Sway Special

Section Properties

b (mm)	h (mm)	b _f (mm)	d _s (mm)	d _{ct} (mm)	d _{cb} (mm)
200	400	200	0	50	50

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ _T	Φ _{CTied}	Φ _{CSpiral}	Φ _{Vns}	Φ _{Vs}	Φ _{Vjoint}
0,9	0,65	0,75	0,75	0,6	0,85

Flexural Reinforcement for Moment, M_{u3}

	Required Rebar mm ²	+Moment Rebar mm ²	-Moment Rebar mm ²	Minimum Rebar mm ²
Top (+2 Axis)	423	0	423	346
Bottom (-2 Axis)	279	210	0	279

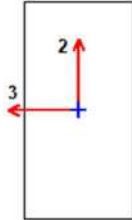
Design Moments, M_{u3}

Design +Moment kN-m	Design -Moment kN-m	Factored +Moment kN-m	Factored -Moment kN-m	Special +Moment kN-m	Special -Moment kN-m
36,1205	-72,2409	0	-72,2409	36,1205	-72,2409



ETABS 2016 Concrete Frame Design

ACI 318-14 Beam Section Design



Beam Element Details (Flexural Details)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF	Type
b. Basement 04	B30	3385777	B.600x300	1,2 D + 1,2 SW + 1,6 L	400,1	12366	0,778	Sway Special

Section Properties

b (mm)	h (mm)	b _f (mm)	d _s (mm)	d _{ct} (mm)	d _{cb} (mm)
304,8	609,6	304,8	0	50	50

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ _T	Φ _{CTied}	Φ _{CSpiral}	Φ _{Vns}	Φ _{Vs}	Φ _{Vjoint}
0,9	0,65	0,75	0,75	0,6	0,85

Flexural Reinforcement for Moment, M_{u3}

	Required Rebar mm ²	+Moment Rebar mm ²	-Moment Rebar mm ²	Minimum Rebar mm ²
Top (+2 Axis)	2891	0	2891	844
Bottom (-2 Axis)	1411	1411	0	844

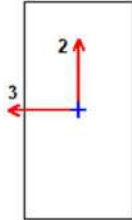
Design Moments, M_{u3}

Design +Moment kN-m	Design -Moment kN-m
383,1036	-766,2071



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ACI 318-14 Beam Section Design



Beam Element Details (Flexural Details)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF	Type
Level 26	B3361	3450099	B.600x300	1,4 D + 1,4 SW	490,8	9115,1	0,822	Sway Special

Section Properties

b (mm)	h (mm)	b _f (mm)	d _s (mm)	d _{ct} (mm)	d _{cb} (mm)
304,8	609,6	304,8	0	50	50

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ _T	Φ _{CTied}	Φ _{CSpiral}	Φ _{Vns}	Φ _{Vs}	Φ _{Vjoint}
0,9	0,65	0,75	0,75	0,6	0,85

Flexural Reinforcement for Moment, M_{u3}

	Required Rebar mm ²	+Moment Rebar mm ²	-Moment Rebar mm ²	Minimum Rebar mm ²
Top (+2 Axis)	984	0	984	844
Bottom (-2 Axis)	651	488	0	651

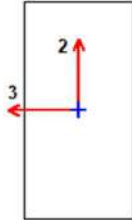
Design Moments, M_{u3}

Design +Moment kN-m	Design -Moment kN-m
134,4944	-268,9887



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ACI 318-14 Beam Section Design



Beam Element Details (Flexural Details)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF	Type
b. Basement 04	B32	3385789	B.800x400	1,2 D + 1,2 SW + 1,6 L	400,5	12470,3	0,655	Sway Special

Section Properties

b (mm)	h (mm)	b _f (mm)	d _s (mm)	d _{ct} (mm)	d _{cb} (mm)
406,4	812,8	406,4	0	50	50

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ_T	Φ_{CTied}	$\Phi_{CSpiral}$	Φ_{Vns}	Φ_{Vs}	Φ_{Vjoint}
0,9	0,65	0,75	0,75	0,6	0,85

Flexural Reinforcement for Moment, M_{u3}

	Required Rebar mm ²	+Moment Rebar mm ²	-Moment Rebar mm ²	Minimum Rebar mm ²
Top (+2 Axis)	3662	0	3662	1534
Bottom (-2 Axis)	1801	1801	0	1534

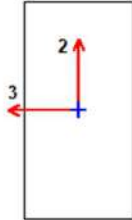
Design Moments, M_{u3}

Design +Moment kN-m	Design -Moment kN-m
671,2078	-1342,4156



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ACI 318-14 Beam Section Design



Beam Element Details (Flexural Details)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF	Type
Level 26	B3862	3449978	B.2000x1000	1,4 D + 1,4 SW	5243	13116,5	0,711	Sway Special

Section Properties

b (mm)	h (mm)	b _f (mm)	d _s (mm)	d _{ct} (mm)	d _{cb} (mm)
1000	2000	1000	0	50	50

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ_T	Φ_{CTied}	$\Phi_{CSpiral}$	Φ_{Vns}	Φ_{Vs}	Φ_{Vjoint}
0,9	0,65	0,75	0,75	0,6	0,85

Flexural Reinforcement for Moment, M_{u3}

	Required Rebar mm ²	+Moment Rebar mm ²	-Moment Rebar mm ²	Minimum Rebar mm ²
Top (+2 Axis)	539	0	405	539
Bottom (-2 Axis)	5045	3784	0	5045

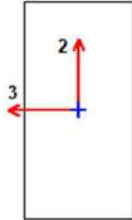
Design Moments, M_{u3}

Design +Moment kN-m	Design -Moment kN-m
3643,4266	-391,3783



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ACI 318-14 Beam Section Design



Beam Element Details (Flexural Details) (Part 1 of 2)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF
Level 12	B1920	3424323	B. 2200 x 1100	1,2 D + 1,2 SW + 0,5 L + 1 RSPx	1938,5	7441,1	1

Beam Element Details (Flexural Details) (Part 2 of 2)

Type

Sway Special

Section Properties

b (mm)	h (mm)	b _f (mm)	d _s (mm)	d _{ct} (mm)	d _{cb} (mm)
1100	2200	1100	0	50	50

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ _T	Φ _{CTied}	Φ _{CSpiral}	Φ _{Vns}	Φ _{Vs}	Φ _{Vjoint}
0,9	0,65	0,75	0,75	0,6	0,85

Flexural Reinforcement for Moment, M_{u3}

	Required Rebar mm ²	+Moment Rebar mm ²	-Moment Rebar mm ²	Minimum Rebar mm ²
Top (+2 Axis)	19366	0	19366	11700
Bottom (-2 Axis)	5928	4446	0	5928

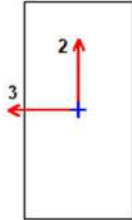
Design Moments, M_{u3}

Design +Moment kN-m	Design -Moment kN-m	Factored +Moment kN-m	Factored -Moment kN-m	Special +Moment kN-m	Special -Moment kN-m
4720,763	-20211,9233	0	-20211,9233	4720,763	-4720,763



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ACI 318-14 Beam Section Design



Beam Element Details (Flexural Details) (Part 1 of 2)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF
Level 5a	B603	32	B. 2200 x 1100	1,2 D + 1,2 SW + 0,5 L - 1 RSPy	9287,4	9287,4	1

Beam Element Details (Flexural Details) (Part 2 of 2)

Type

Sway Special

Section Properties

b (mm)	h (mm)	b _f (mm)	d _s (mm)	d _{ct} (mm)	d _{cb} (mm)
1100	2200	1100	0	50	50

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ _T	Φ _{CTied}	Φ _{CSpiral}	Φ _{Vns}	Φ _{Vs}	Φ _{Vjoint}
0,9	0,65	0,75	0,75	0,6	0,85

Flexural Reinforcement for Moment, M_{u3}

	Required Rebar mm ²	+Moment Rebar mm ²	-Moment Rebar mm ²	Minimum Rebar mm ²
Top (+2 Axis)	33639	4956	33639	11700
Bottom (-2 Axis)	24134	24134	0	11700

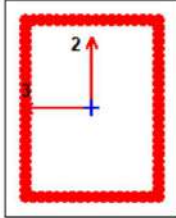
Design Moments, M_{u3}

Design +Moment kN-m	Design -Moment kN-m	Factored +Moment kN-m	Factored -Moment kN-m	Special +Moment kN-m	Special -Moment kN-m
9996,2853	-19993,6098	0	-19993,6098	9996,2853	-19993,6098



ETABS 2016 Concrete Frame Design

ACI 318-14 Column Section Design



Column Element Details (Flexural Details)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF	Type
Level 23	C112	1830849z	Col. 1000 x 800	1,4 D + 1,4 SW	0	6123,4	1	Sway Special

Section Properties

b (mm)	h (mm)	dc (mm)	Cover (Torsion) (mm)
800	1000	94	37,3

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ_T	Φ_{CTied}	$\Phi_{CSpiral}$	Φ_{Vns}	Φ_{Vs}	Φ_{Vjoint}	Ω_0
0,9	0,65	0,75	0,75	0,6	0,85	2

Axial Force and Biaxial Moment Design For P_u, M_{u2}, M_{u3}

Design P _u kN	Design M _{u2} kN-m	Design M _{u3} kN-m	Minimum M2 kN-m	Minimum M3 kN-m	Rebar Area mm ²	Rebar % %
-540,8597	802,6878	-3957,3724	21,2233	24,4685	28572	3,57

Factored & Minimum Biaxial Moments

	NonSway M _{ns} kN-m	Sway M _s kN-m	Factored M _u kN-m	Minimum M _{min} kN-m	Minimum Eccentricity mm
Major Bending(M _{u3})	-3957,3724	0	-3957,3724	24,4685	45,2
Minor Bending(M _{u2})	802,6878	0	802,6878	21,2233	39,2

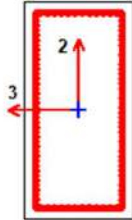
Axial Force and Biaxial Moment Factors

	C _m Factor Unitless	δ_{ns} Factor Unitless	δ_s Factor Unitless	K Factor Unitless	Effective Length mm
Major Bend(M3)	1	1	1	1	6128,5
Minor Bend(M2)	1	1	1	1	6128,5



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ACI 318-14 Column Section Design



Column Element Details (Flexural Details)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF	Type
Level 4	D968	3456815	Dia. 900 x 1800	1,4 D + 1,4 SW	0	7669,6	1	Sway Special

Section Properties

b (mm)	h (mm)	dc (mm)	Cover (Torsion) (mm)
900	1800	94	37,3

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ_T	Φ_{CTied}	$\Phi_{CSpiral}$	Φ_{Vns}	Φ_{Vs}	Φ_{Vjoint}	Ω_0
0,9	0,65	0,75	0,75	0,6	0,85	2

Axial Force and Biaxial Moment Design For P_u, M_{u2}, M_{u3}

Design P _u kN	Design M _{u2} kN-m	Design M _{u3} kN-m	Minimum M2 kN-m	Minimum M3 kN-m	Rebar Area mm ²	Rebar % %
-15722,6529	1356,7133	1088,6365	664,1249	1088,6365	52735	3,26

Factored & Minimum Biaxial Moments

	NonSway M _{ns} kN-m	Sway M _s kN-m	Factored M _u kN-m	Minimum M _{min} kN-m	Minimum Eccentricity mm
Major Bending(M _{u3})	461,5159	0	461,5159	1088,6365	69,2
Minor Bending(M _{u2})	1356,7133	0	1356,7133	664,1249	42,2

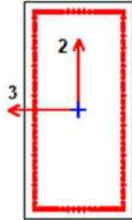
Axial Force and Biaxial Moment Factors

	C _m Factor Unitless	δ_{ns} Factor Unitless	δ_s Factor Unitless	K Factor Unitless	Effective Length mm
Major Bend(M3)	1	1	1	1	7668,4
Minor Bend(M2)	1	1	1	1	7668,4



ETABS 2016 Concrete Frame Design

ACI 318-14 Column Section Design



Column Element Details (Flexural Details) (Part 1 of 2)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF
Level 20	D1484	3457919	Dia. 1000 x 2000	1,2 D + 1,2 SW + 0,5 L - 1 RSPy	7073,1	7073,1	1

Column Element Details (Flexural Details) (Part 2 of 2)

Type

Sway Special

Section Properties

b (mm)	h (mm)	dc (mm)	Cover (Torsion) (mm)
1000	2000	93	37,3

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	1315

Design Code Parameters

Φ_T	Φ_{Tied}	Φ_{Spiral}	Φ_{Vns}	Φ_{Vs}	Φ_{Vjoint}	Ω_0
0,9	0,65	0,75	0,75	0,6	0,85	2

Axial Force and Biaxial Moment Design For P_u, M_{u2}, M_{u3}

Design P _u kN	Design M _{u2} kN-m	Design M _{u3} kN-m	Minimum M ₂ kN-m	Minimum M ₃ kN-m	Rebar % %	Capacity Ratio Unitless
-5191,865	517,5144	809,8647	234,88	390,6359	9,62	0,091

Factored & Minimum Biaxial Moments

	NonSway M _{ns} kN-m	Sway M _s kN-m	Factored M _u kN-m	Minimum M _{min} kN-m	Minimum Eccentricity mm
Major Bending(M _{u3})	809,8356	0,0291	809,8647	390,6359	75,2
Minor Bending(M _{u2})	517,4892	0,0251	517,5144	234,88	45,2

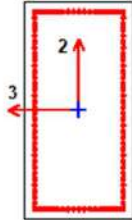
Axial Force and Biaxial Moment Factors

	C _m Factor Unitless	δ_{ns} Factor Unitless	δ_s Factor Unitless	K Factor Unitless	Effective Length mm
Major Bend(M3)	1	1	1	1	7073,1
Minor Bend(M2)	1	1	1	1	7073,1



ETABS 2016 Concrete Frame Design

ACI 318-14 Column Section Design



Column Element Details (Flexural Details) (Part 1 of 2)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF
Level 20	D1484	3457919	Dia. 1000 x 2000	1,2 D + 1,2 SW + 0,5 L - 1 RSPy	7073,1	7073,1	1

Column Element Details (Flexural Details) (Part 2 of 2)

Type

Sway Special

Section Properties

b (mm)	h (mm)	dc (mm)	Cover (Torsion) (mm)
1000	2000	93	37,3

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	1315

Design Code Parameters

Φ_T	Φ_{Tied}	Φ_{Spiral}	Φ_{Vns}	Φ_{Vs}	Φ_{Vjoint}	Ω_0
0,9	0,65	0,75	0,75	0,6	0,85	2

Axial Force and Biaxial Moment Design For P_u, M_{u2}, M_{u3}

Design P _u kN	Design M _{u2} kN-m	Design M _{u3} kN-m	Minimum M ₂ kN-m	Minimum M ₃ kN-m	Rebar % %	Capacity Ratio Unitless
-5191,865	517,5144	809,8647	234,88	390,6359	9,62	0,091

Factored & Minimum Biaxial Moments

	NonSway M _{ns} kN-m	Sway M _s kN-m	Factored M _u kN-m	Minimum M _{min} kN-m	Minimum Eccentricity mm
Major Bending(M _{u3})	809,8356	0,0291	809,8647	390,6359	75,2
Minor Bending(M _{u2})	517,4892	0,0251	517,5144	234,88	45,2

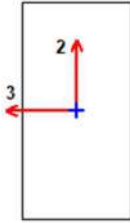
Axial Force and Biaxial Moment Factors

	C _m Factor Unitless	δ_{ns} Factor Unitless	δ_s Factor Unitless	K Factor Unitless	Effective Length mm
Major Bend(M3)	1	1	1	1	7073,1
Minor Bend(M2)	1	1	1	1	7073,1



ETABS 2016 Concrete Frame Design

ACI 318-14 Beam Section Design



Beam Element Details (Shear Details) (Part 1 of 2)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)
b. Basement 04	B87	3386206	B.400x200	1,2 D + 1,2 SW + 0,5 L + 1 EQx	0	7030,6

Beam Element Details (Shear Details) (Part 2 of 2)

LLRF	Type
1	Sway Special

Section Properties

b (mm)	h (mm)	b _f (mm)	d _s (mm)	d _{ct} (mm)	d _{cb} (mm)
200	400	200	0	50	50

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ _T	Φ _{CTied}	Φ _{CSpiral}	Φ _{Vns}	Φ _{Vs}	Φ _{Vjoint}
0,9	0,65	0,75	0,75	0,6	0,85

Shear/Torsion Design for V_{u2} and T_u

Rbar A _{vs} mm ² /m	Rbar A _t /S mm ² /m	Rbar A _t mm ²	Design V _{u2} kN	Design T _u kN-m	Design M _{u3} kN-m	Design P _u kN
1121,29	0	0	121,7637	6,4001	-72,2409	0

Design Forces

Factored V _{u2} kN	Factored M _{u3} kN-m	Design V _{u2} kN	Capacity V _p kN	Gravity V _g kN
53,8474	-72,2409	121,7637	67,9163	53,8474

Capacity Moment

	Long.Rebar A _s (Bottom) mm ²	Long.Rebar A _s (Top) mm ²	Capacity Moment M _{pos} kN-m	Capacity Moment M _{neg} kN-m
Left	355	721	196,0947	380,424
Right	172	346	97,0693	191,1418



Design Basis

Design	Conc.Area	Area	Tensn.Reinf	Strength	Strength	LtWt.Reduc
V_{u2}	A_c	A_g	A-st	f_{ys}	f_{cs}	Factor
kN	cm ²	cm ²	mm ²	MPa	MPa	Unitless
121,7637	700	800	721	413,69	120	1

Shear Rebar Design

Stress	Conc.Capacity	Uppr.Limit	Conc.Capacity	Uppr.Limit	RebarArea	Shear	Shear	Shear
v	v_c	v_{max}	Φv_c	Φv_{max}	A_v / s	Φv_c	Φv_s	Φv_n
MPa	MPa	MPa	MPa	MPa	mm ² /m	kN	kN	kN
1,74	1,82	7,28	1,36	5,46	1121,29	0	121,7637	121,7637

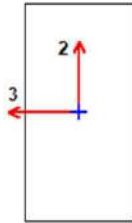
Torsion Capacity

Torsion	Threshold	Critical	Conc.Area	Conc.Area	Conc.Area	Perimeter	Perimeter
T_u	ΦT_{th}	ΦT_{cr}	A_{cp}	A_{oh}	A_o	P_{cp}	P_n
kN-m	kN-m	kN-m	cm ²	cm ²	cm ²	mm	mm
6,4001	2,7579	11,0316	800	345,6	293,8	1200	844,4



ETABS 2016 Concrete Frame Design

ACI 318-14 Beam Section Design



Beam Element Details (Shear Details)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF	Type
Level 26	B3903	3450428	B.400x200	1,4 D + 1,4 SW	9489,2	9489,2	1	Sway Special

Section Properties

b (mm)	h (mm)	b _f (mm)	d _s (mm)	d _{ct} (mm)	d _{cb} (mm)
200	400	200	0	50	50

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ _T	Φ _{Tied}	Φ _{Spiral}	Φ _{Vns}	Φ _{Vs}	Φ _{Joint}
0,9	0,65	0,75	0,75	0,6	0,85

Shear/Torsion Design for V_{u2} and T_u

Rbar A _{vs} mm ² /m	Rbar A _t /S mm ² /m	Rbar A _t mm ²	Design V _{u2} kN	Design T _u kN-m	Design M _{u3} kN-m	Design P _u kN
329,82	0	0	35,0736	3,5538	-47,0248	0

Design Forces

Design V _{u2} kN	Design M _{u3} kN-m
35,0736	-47,0248

Design Basis

Design V _{u2} kN	Conc.Area A _c cm ²	Area A _g cm ²	Tensn.Reinf A-st mm ²	Strength f _{ys} MPa	Strength f _{cs} MPa	LtWt.Reduc Factor Unitless
35,0736	700	800	346	413,69	120	1

Shear Rebar Design

Stress v MPa	Conc.Capacity v _c MPa	Uppr.Limit v _{max} MPa	Conc.Capacity Φv _c MPa	Uppr.Limit Φv _{max} MPa	RebarArea A _v /s mm ² /m	Shear ΦV _c kN	Shear ΦV _s kN	Shear ΦV _n kN
0,5	1,82	9,1	1,36	6,82	329,82	95,5079	35,8155	131,3234

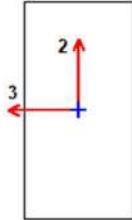
Torsion Capacity

Torsion T _u kN-m	Threshold ΦT _{th} kN-m	Critical ΦT _{cr} kN-m	Conc.Area A _{cp} cm ²	Conc.Area A _{oh} cm ²	Conc.Area A _o cm ²	Perimeter P _{cp} mm	Perimeter P _h mm
3,5538	2,7579	11,0316	800	345,6	293,8	1200	844,4



ETABS 2016 Concrete Frame Design

ACI 318-14 Beam Section Design



Beam Element Details (Shear Details) (Part 1 of 2)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)
b. Basement 04	B29	3385771	B.600x300	1,2 D + 1,2 SW + 0,5 L - 1 RSPy	11463,9	11865,1

Beam Element Details (Shear Details) (Part 2 of 2)

LLRF	Type
0,749	Sway Special

Section Properties

b (mm)	h (mm)	b _f (mm)	d _s (mm)	d _{ct} (mm)	d _{cb} (mm)
304,8	609,6	304,8	0	50	50

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ _T	Φ _{Tied}	Φ _{CSpiral}	Φ _{Vns}	Φ _{Vs}	Φ _{Joint}
0,9	0,65	0,75	0,75	0,6	0,85

Shear/Torsion Design for V_{u2} and T_u

Rbar A _{vs} mm ² /m	Rbar A _t /S mm ² /m	Rbar A _t mm ²	Design V _{u2} kN	Design T _u kN-m	Design M _{u3} kN-m	Design P _u kN
3218,99	0	0	558,8927	13,6522	-492,2414	0

Design Forces

Factored V _{u2} kN	Factored M _{u3} kN-m	Design V _{u2} kN	Capacity V _p kN	Gravity V _g kN
266,8064	-492,2414	558,8927	292,0863	266,8064

Capacity Moment

	Long.Rebar A _s (Bottom) mm ²	Long.Rebar A _s (Top) mm ²	Capacity Moment M _{pos} kN-m	Capacity Moment M _{neg} kN-m
Left	1221	2493	1058,3046	1983,8674
Right	1456	2987	1247,3642	2023,0468



Design Basis

Design V_{u2} kN	Conc.Area A_c cm ²	Area A_g cm ²	Tensn.Reinf A-st mm ²	Strength f_{ys} MPa	Strength f_{cs} MPa	LtWt.Reduc Factor Unitless
558,8927	1705,7	1858,1	2987	413,69	120	1

Shear Rebar Design

Stress v MPa	Conc.Capacity V_c MPa	Uppr.Limit V_{max} MPa	Conc.Capacity ΦV_c MPa	Uppr.Limit ΦV_{max} MPa	RebarArea A_v / s mm ² /m	Shear ΦV_c kN	Shear ΦV_s kN	Shear ΦV_n kN
3,28	1,82	7,28	1,36	5,46	3218,99	0	558,8927	558,8927

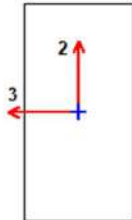
Torsion Capacity

Torsion T_u kN-m	Threshold ΦT_{th} kN-m	Critical ΦT_{cr} kN-m	Conc.Area A_{cp} cm ²	Conc.Area A_{oh} cm ²	Conc.Area A_o cm ²	Perimeter P_{cp} mm	Perimeter P_n mm
13,6522	9,7619	39,0476	1858,1	1124,2	955,6	1828,8	1473,2



ETABS 2016 Concrete Frame Design

ACI 318-14 Beam Section Design



Beam Element Details (Shear Details)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF	Type
Level 26	B3361	3450099	B.600x300	1,4 D + 1,4 SW	2000,7	9115,1	0,822	Sway Special

Section Properties

b (mm)	h (mm)	b _f (mm)	d _s (mm)	d _{ct} (mm)	d _{cb} (mm)
304,8	609,6	304,8	0	50	50

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ _T	Φ _{CTied}	Φ _{CSpiral}	Φ _{Vns}	Φ _{Vs}	Φ _{Vjoint}
0,9	0,65	0,75	0,75	0,6	0,85

Shear/Torsion Design for V_{u2} and T_u

Rbar A _{vs} mm ² /m	Rbar A _t /S mm ² /m	Rbar A _t mm ²	Design V _{u2} kN	Design T _u kN-m	Design M _{u3} kN-m	Design P _u kN
502,64	0	0	0,306	29,1927	-4,5701	0

Design Forces

Design V _{u2} kN	Design M _{u3} kN-m
0,306	-4,5701

Design Basis

Design V _{u2} kN	Conc.Area A _c cm ²	Area A _g cm ²	Tensn.Reinf A-st mm ²	Strength f _{ys} MPa	Strength f _{cs} MPa	LtWt.Reduc Factor Unitless
0,306	1705,7	1858,1	324	413,69	120	1

Shear Rebar Design

Stress v MPa	Conc.Capacity v _c MPa	Uppr.Limit v _{max} MPa	Conc.Capacity Φv _c MPa	Uppr.Limit Φv _{max} MPa	RebarArea A _v /s mm ² /m	Shear ΦV _c kN	Shear ΦV _s kN	Shear ΦV _n kN
1,794E-03	1,82	9,1	1,36	6,82	502,64	232,7202	87,2701	319,9903



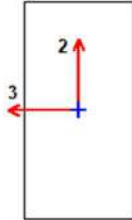
Torsion Capacity

Torsion	Threshold	Critical	Conc.Area	Conc.Area	Conc.Area	Perimeter	Perimeter
T_u	ΦT_{th}	ΦT_{cr}	A_{cp}	A_{oh}	A_o	P_{cp}	P_h
kN-m	kN-m	kN-m	cm²	cm²	cm²	mm	mm
29,1927	9,7619	39,0476	1858,1	1124,2	955,6	1828,8	1473,2



ETABS 2016 Concrete Frame Design

ACI 318-14 Beam Section Design



Beam Element Details (Shear Details) (Part 1 of 2)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF
b. Basement 04	B32	3385789	B.800x400	1,2 D + 1,2 SW + 0,5 L - 1 EQx	400,5	12470,3	0,655

Beam Element Details (Shear Details) (Part 2 of 2)

Type

Sway Special

Section Properties

b (mm)	h (mm)	b _f (mm)	d _s (mm)	d _{ct} (mm)	d _{cb} (mm)
406,4	812,8	406,4	0	50	50

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ _T	Φ _{CTied}	Φ _{CSpiral}	Φ _{Vns}	Φ _{Vs}	Φ _{Vjoint}
0,9	0,65	0,75	0,75	0,6	0,85

Shear/Torsion Design for V_{u2} and T_u

Rbar A _{vs} mm ² /m	Rbar A _t /S mm ² /m	Rbar A _t mm ²	Design V _{u2} kN	Design T _u kN-m	Design M _{u3} kN-m	Design P _u kN
3932,39	0	0	930,6774	21,4421	-850,406	0

Design Forces

Factored V _{u2} kN	Factored M _{u3} kN-m	Design V _{u2} kN	Capacity V _p kN	Gravity V _g kN
400,5959	-850,406	930,6774	530,0815	400,5959

Capacity Moment

	Long.Rebar A _s (Bottom) mm ²	Long.Rebar A _s (Top) mm ²	Capacity Moment M _{pos} kN-m	Capacity Moment M _{neg} kN-m
Left	1801	3662	2152,2739	4154,6011
Right	1649	3347	1978,5049	3832,0642



Design Basis

Design V_{u2} kN	Conc.Area A_c cm ²	Area A_g cm ²	Tensn.Reinf A-st mm ²	Strength f_{ys} MPa	Strength f_{cs} MPa	LtWt.Reduc Factor Unitless
930,6774	3100	3303,2	3662	413,69	120	1

Shear Rebar Design

Stress v MPa	Conc.Capacity V_c MPa	Uppr.Limit V_{max} MPa	Conc.Capacity ΦV_c MPa	Uppr.Limit ΦV_{max} MPa	RebarArea A_v / s mm ² /m	Shear ΦV_c kN	Shear ΦV_s kN	Shear ΦV_n kN
3	1,82	7,28	1,36	5,46	3932,39	0	930,6774	930,6774

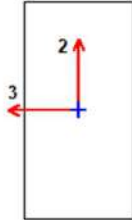
Torsion Capacity

Torsion T_u kN-m	Threshold ΦT_{th} kN-m	Critical ΦT_{cr} kN-m	Conc.Area A_{cp} cm ²	Conc.Area A_{oh} cm ²	Conc.Area A_o cm ²	Perimeter P_{cp} mm	Perimeter P_n mm
21,4421	23,1393	92,5572	3303,2	2298,4	1953,6	2438,4	2082,8



ETABS 2016 Concrete Frame Design

ACI 318-14 Beam Section Design



Beam Element Details (Shear Details) (Part 1 of 2)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)
b. Basement 04	B51	3385917	B.2000x1000	1,2 D + 1,2 SW + 0,5 L + 1 RSPy	4000,3	4002,8

Beam Element Details (Shear Details) (Part 2 of 2)

LLRF	Type
0,671	Sway Special

Section Properties

b (mm)	h (mm)	b _f (mm)	d _s (mm)	d _{ct} (mm)	d _{cb} (mm)
1000	2000	1000	0	50	50

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ _T	Φ _{CTied}	Φ _{CSpiral}	Φ _{Vns}	Φ _{Vs}	Φ _{Vjoint}
0,9	0,65	0,75	0,75	0,6	0,85

Shear/Torsion Design for V_{u2} and T_u

Rbar A _{vs} mm ² /m	Rbar A _t /S mm ² /m	Rbar A _t mm ²	Design V _{u2} kN	Design T _u kN-m	Design M _{u3} kN-m	Design P _u kN
677,2	0	0	2456,2332	10,5309	-225,6879	0

Design Forces

Factored V _{u2} kN	Factored M _{u3} kN-m	Design V _{u2} kN	Capacity V _p kN	Gravity V _g kN
2456,2332	-225,7009	2456,2332	573,5769	2456,0259

Capacity Moment

	Long.Rebar A _s (Bottom) mm ²	Long.Rebar A _s (Top) mm ²	Capacity Moment M _{pos} kN-m	Capacity Moment M _{neg} kN-m
Left	76	152	243,9894	487,8638
Right	175	351	562,018	1123,4252



Design Basis

Design V_{u2} kN	Conc.Area A_c cm ²	Area A_g cm ²	Tensn.Reinf A_{st} mm ²	Strength f_{ys} MPa	Strength f_{cs} MPa	LtWt.Reduc Factor Unitless
2456,2332	19500	20000	351	413,69	120	1

Shear Rebar Design

Stress v MPa	Conc.Capacity v_c MPa	Uppr.Limit v_{max} MPa	Conc.Capacity Φv_c MPa	Uppr.Limit Φv_{max} MPa	RebarArea A_v / s mm ² /m	Shear ΦV_c kN	Shear ΦV_s kN	Shear ΦV_n kN
1,26	1,82	9,1	1,09	5,46	677,2	2128,4624	327,7707	2456,2332

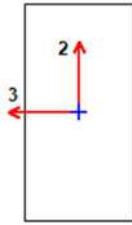
Torsion Capacity

Torsion T_u kN-m	Threshold ΦT_{th} kN-m	Critical ΦT_{cr} kN-m	Conc.Area A_{cp} cm ²	Conc.Area A_{oh} cm ²	Conc.Area A_o cm ²	Perimeter P_{cp} mm	Perimeter P_h mm
10,5309	344,7379	1378,9516	20000	17412	14800,2	6000	5644,4



ETABS 2016 Concrete Frame Design

ACI 318-14 Beam Section Design



Beam Element Details (Shear Details)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF	Type
Level 12	B2138	3424155	B.2000x1000	1,4 D + 1,4 SW	1717,7	19747,1	0,787	Sway Special

Section Properties

b (mm)	h (mm)	b _f (mm)	d _s (mm)	d _{ct} (mm)	d _{cb} (mm)
1000	2000	1000	0	50	50

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ _T	Φ _{CTied}	Φ _{CSpiral}	Φ _{Vns}	Φ _{Vs}	Φ _{Vjoint}
0,9	0,65	0,75	0,75	0,6	0,85

Shear/Torsion Design for V_{u2} and T_u

Rbar A _{vs} mm ² /m	Rbar A _t /S mm ² /m	Rbar A _l mm ²	Design V _{u2} kN	Design T _u kN-m	Design M _{u3} kN-m	Design P _u kN
1649,08	0	0	685,1877	1354,4017	-1557,7761	0

Design Forces

Design V _{u2} kN	Design M _{u3} kN-m
685,1877	-1557,7761

Design Basis

Design V _{u2} kN	Conc.Area A _c cm ²	Area A _g cm ²	Tensn.Reinf A-st mm ²	Strength f _{ys} MPa	Strength f _{cs} MPa	LtWt.Reduc Factor Unitless
685,1877	19500	20000	2150	413,69	120	1

Shear Rebar Design

Stress V MPa	Conc.Capacity V _c MPa	Uppr.Limit V _{max} MPa	Conc.Capacity ΦV _c MPa	Uppr.Limit ΦV _{max} MPa	RebarArea A _v /s mm ² /m	Shear ΦV _c kN	Shear ΦV _s kN	Shear ΦV _n kN
0,35	1,82	9,1	1,36	6,82	1649,08	2660,578	997,7168	3658,2948

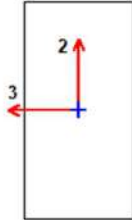
Torsion Capacity

Torsion T _u kN-m	Threshold Φ _{Tth} kN-m	Critical Φ _{Tcr} kN-m	Conc.Area A _{cp} cm ²	Conc.Area A _{oh} cm ²	Conc.Area A _o cm ²	Perimeter P _{cp} mm	Perimeter P _h mm
1354,4017	344,7379	1378,9516	20000	17412	14800,2	6000	5644,4



ETABS 2016 Concrete Frame Design

ACI 318-14 Beam Section Design



Beam Element Details (Shear Details) (Part 1 of 2)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF
Level 12	B1920	3424323	B. 2200 x 1100	1,2 D + 1,2 SW + 0,5 L + 1 RSPx	1938,5	7441,1	1

Beam Element Details (Shear Details) (Part 2 of 2)

Type

Sway Special

Section Properties

b (mm)	h (mm)	b _f (mm)	d _s (mm)	d _{ct} (mm)	d _{cb} (mm)
1100	2200	1100	0	50	50

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ _T	Φ _{CTied}	Φ _{CSpiral}	Φ _{Vns}	Φ _{Vs}	Φ _{Vjoint}
0,9	0,65	0,75	0,75	0,6	0,85

Shear/Torsion Design for V_{u2} and T_u

Rbar A _{vs} mm ² /m	Rbar A _t /S mm ² /m	Rbar A _t mm ²	Design V _{u2} kN	Design T _u kN-m	Design M _{u3} kN-m	Design P _u kN
16926,3	0	0	14517,797	217,6723	-20211,9233	0

Design Forces

Factored V _{u2} kN	Factored M _{u3} kN-m	Design V _{u2} kN	Capacity V _p kN	Gravity V _g kN
4235,2777	-20211,6305	14517,797	10282,5464	4235,2506

Capacity Moment

	Long.Rebar A _s (Bottom) mm ²	Long.Rebar A _s (Top) mm ²	Capacity Moment M _{pos} kN-m	Capacity Moment M _{neg} kN-m
Left	11700	20666	40387,6502	67893,5107
Right	2460	0	8619,8748	0



Design Basis

Design V_{u2} kN	Conc.Area A_c cm ²	Area A_g cm ²	Tensn.Reinf A-st mm ²	Strength f_{ys} MPa	Strength f_{cs} MPa	LtWt.Reduc Factor Unitless
14517,797	23650	24200	22148	413,69	120	1

Shear Rebar Design

Stress v MPa	Conc.Capacity v_c MPa	Uppr.Limit v_{max} MPa	Conc.Capacity Φv_c MPa	Uppr.Limit Φv_{max} MPa	RebarArea A_v / s mm ² /m	Shear ΦV_c kN	Shear ΦV_s kN	Shear ΦV_n kN
6,14	1,82	9,1	1,36	6,82	16926,3	3226,8036	11290,9933	14517,797

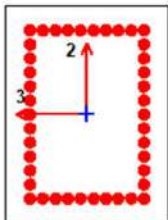
Torsion Capacity

Torsion T_u kN-m	Threshold ΦT_{th} kN-m	Critical ΦT_{cr} kN-m	Conc.Area A_{cp} cm ²	Conc.Area A_{oh} cm ²	Conc.Area A_o cm ²	Perimeter P_{cp} mm	Perimeter P_h mm
217,6723	458,8461	1835,3846	24200	21345,3	18143,5	6600	6244,4



ETABS 2016 Concrete Frame Design

ACI 318-14 Column Section Design



Column Element Details (Shear Details) (Part 1 of 2)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc
Level 26	C138	1881634 ₂	Col. 24 x 30	1,2 D + 1,2 SW + 0,5 L - 1 RSPy	6008,8

Column Element Details (Shear Details) (Part 2 of 2)

Length (mm)	LLRF	Type
7479,7	1	Sway Special

Section Properties

b (mm)	h (mm)	dc (mm)	Cover (Torsion) (mm)
600	800	90,5	37,3

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	413,69	413,69

Design Code Parameters

Φ _T	Φ _{CTied}	Φ _{CSpiral}	Φ _{Vns}	Φ _{Vs}	Φ _{Vjoint}	Ω ₀
0,9	0,65	0,75	0,75	0,6	0,85	2

Shear Design for V_{u2}, V_{u3} (Part 1 of 2)

	Rebar A _v /s mm ² /m	Design V _u kN	Design P _u kN	Design M _u kN-m	ΦV _c kN	ΦV _s kN
Major Shear(V2)	7034,34	1548,4714	252,5488	3143,1353	0	1548,4714
Minor Shear(V3)	4724,05	746,7659	252,5488	-704,1245	0	746,7659

Shear Design for V_{u2}, V_{u3} (Part 2 of 2)

ΦV _n kN
1548,4714
746,7659

Design Forces

	V _u kN	P _u kN	M _u kN-m	Capacity V _p kN
Major Shear(V2)	1188,6634	252,535	3143,1104	1548,4714
Minor Shear(V3)	265,9161	252,535	-704,1355	746,7659



Capacity Shear (Part 1 of 2)

	Shear V_p kN	Long.Rebar $A_{s(Bot)}$ %	Long.Rebar $A_{s(Top)}$ %
Major Shear(V2)	1548,4714	10,57	7,27
Minor Shear(V3)	746,7659	10,57	7,27

Capacity Shear (Part 2 of 2)

Cap.Moment M_{posBot} kN-m	Cap.Moment M_{negTop} kN-m	Cap.Moment M_{negBot} kN-m
6916,3382	5285,2055	6916,3382
5036,2737	3904,9386	5036,2737

Capacity Shear (Part 3 of 2)

**Cap.Moment M_{posTop}
kN-m**

5285,2055
3904,9386

Design Basis

Shr Reduc Factor Unitless	Strength f_{ys} MPa	Strength f_{cs} MPa	Area A_g cm ²
1	413,69	120	4800

Concrete Shear Capacity

	Design V_u kN	Conc.Area A_{cu} cm ²	Tensn.Rein A_{st} mm ²
Major Shear(V2)	1548,4714	4257	17446
Minor Shear(V3)	746,7659	4075,9	17446

Shear Rebar Design (Part 1 of 2)

	Stress v MPa	Conc.Cpcty v_c MPa	Uppr.Limit v_{max} MPa	Φv_c MPa	Φv_{max} MPa
Major Shear(V2)	3,64	1,89	7,28	1,42	0
Minor Shear(V3)	1,83	1,89	7,28	1,42	5,46

Shear Rebar Design (Part 2 of 2)

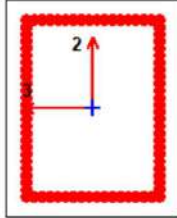
**RebarArea A_v / s
mm²/m**

7034,34
4724,05



ETABS 2016 Concrete Frame Design

ACI 318-14 Column Section Design



Column Element Details (Shear Details) (Part 1 of 2)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF
Level 26	C120	1881616z	Col. 1000 x 800	1,2 D + 1,2 SW + 0,5 L - 1 RSPy	5479,7	7479,7	0,547

Column Element Details (Shear Details) (Part 2 of 2)

Type

Sway Special

Section Properties

b (mm)	h (mm)	dc (mm)	Cover (Torsion) (mm)
800	1000	94	37,3

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ_T	Φ_{CTied}	$\Phi_{CSpiral}$	Φ_{Vns}	Φ_{Vs}	Φ_{Vjoint}	Ω_0
0,9	0,65	0,75	0,75	0,6	0,85	2

Shear Design for V_{u2}, V_{u3}

	Rebar A _v /s mm ² /m	Design V _u kN	Design P _u kN	Design M _u kN-m	ΦV_c kN	ΦV_s kN	ΦV_n kN
Major Shear(V2)	3246,89	912,6899	1367,0746	-447,128	0	912,6899	912,6899
Minor Shear(V3)	3313,75	725,8558	1367,0746	-717,8133	0	725,8558	725,8558

Design Forces

	V _u kN	P _u kN	M _u kN-m	Capacity V _p kN
Major Shear(V2)	165,6843	1367,0702	-447,1677	912,6899
Minor Shear(V3)	303,1377	1367,0702	-717,8294	725,8558

Capacity Shear (Part 1 of 2)

	Shear V _p kN	Long.Rebar A _{s(Bot)} %	Long.Rebar A _{s(Top)} %	Cap.Moment M _{posBot} kN-m
Major Shear(V2)	912,6899	1	1	2500,6337
Minor Shear(V3)	725,8558	1	1	1988,7361



Capacity Shear (Part 2 of 2)

Cap.Moment M_{negTop} kN-m	Cap.Moment M_{negBot} kN-m	Cap.Moment M_{posTop} kN-m
2500,6337	2500,6337	2500,6337
1988,7361	1988,7361	1988,7361

Design Basis

Shr Reduc Factor Unitless	Strength f_{ys} MPa	Strength f_{cs} MPa	Area A_g cm ²
1	413,69	120	8000

Concrete Shear Capacity

	Design V_u kN	Conc.Area A_{cu} cm ²	Tensn.Rein A_{st} mm ²
Major Shear(V2)	912,6899	7247,9	4000
Minor Shear(V3)	725,8558	7059,9	4000

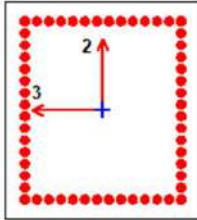
Shear Rebar Design

	Stress v MPa	Conc.Cpcty v_c MPa	Uppr.Limit v_{max} MPa	Φv_c MPa	Φv_{max} MPa	RebarArea A_v /s mm ² /m
Major Shear(V2)	1,26	2,04	7,28	1,53	0	3246,89
Minor Shear(V3)	1,03	2,04	7,28	1,53	5,46	3313,75



ETABS 2016 Concrete Frame Design

ACI 318-14 Column Section Design



Column Element Details (Shear Details) (Part 1 of 2)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc
Level 7	D1057	3457049	Dia. 900 x 1000	1,2 D + 1,2 SW + 0,5 L - 1 RSPy	5126,4

Column Element Details (Shear Details) (Part 2 of 2)

Length (mm)	LLRF	Type
5126,4	1	Sway Special

Section Properties

b (mm)	h (mm)	dc (mm)	Cover (Torsion) (mm)
900	1000	90,5	37,3

Material Properties

E_c (MPa)	f_c (MPa)	Lt.Wt Factor (Unitless)	f_y (MPa)	f_{ys} (MPa)
51485,92	120	1	413,69	413,69

Design Code Parameters

Φ_T	Φ_{CTied}	$\Phi_{CSpiral}$	Φ_{Vns}	Φ_{Vs}	Φ_{Vjoint}	Ω_0
0,9	0,65	0,75	0,75	0,6	0,85	2

Shear Design for V_{u2} , V_{u3} (Part 1 of 2)

	Rebar A_v /s mm ² /m	Design V_u kN	Design P_u kN	Design M_u kN-m	ΦV_c kN	ΦV_s kN
Major Shear(V2)	6334,92	2572,698	3460,9169	-9454,8512	1142,613	1430,0851
Minor Shear(V3)	13503,22	3843,1174	3460,9169	12464,2484	1129,979	2713,1384

Shear Design for V_{u2} , V_{u3} (Part 2 of 2)

ΦV_n
kN

2572,698

3843,1174

Design Forces

	V_u kN	P_u kN	M_u kN-m	Capacity V_p kN
Major Shear(V2)	2572,698	3460,9169	-9455,0598	0
Minor Shear(V3)	3843,1174	3460,9169	12463,9805	0



Capacity Shear (Part 1 of 2)

	Shear V_p kN	Long.Rebar $A_{s(Bot)}$ %	Long.Rebar $A_{s(Top)}$ %
Major Shear(V2)	0	8,1	15,73
Minor Shear(V3)	0	8,1	15,73

Capacity Shear (Part 2 of 2)

Cap.Moment M_{posBot} kN-m	Cap.Moment M_{negTop} kN-m	Cap.Moment M_{negBot} kN-m
15104,0537	17933,3077	15104,0537
13669,0922	16268,5986	13669,0922

Capacity Shear (Part 3 of 2)

**Cap.Moment M_{posTop}
kN-m**

17933,3077
16268,5986

Design Basis

Shr Reduc Factor Unitless	Strength f_{ys} MPa	Strength f_{cs} MPa	Area A_g cm ²
1	413,69	120	9000

Concrete Shear Capacity

	Design V_u kN	Conc.Area A_{cu} cm ²	Tensn.Rein A_{st} mm ²
Major Shear(V2)	2572,698	8185,4	70777
Minor Shear(V3)	3843,1174	8094,9	70777

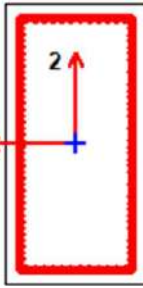
Shear Rebar Design (Part 1 of 2)

	Stress v MPa	Conc.Cpcty v_c MPa	Uppr.Limit v_{max} MPa	Φv_c MPa	Φv_{max} MPa
Major Shear(V2)	3,14	2,33	9,6	1,4	0
Minor Shear(V3)	4,75	2,33	9,6	1,4	5,76

Shear Rebar Design (Part 2 of 2)

**RebarArea A_v / s
mm²/m**

6334,92
13503,22



ETABS 2016 Concrete Frame Design

ACI 318-14 Column Section Design

Column Element Details (Shear Details)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF	Type
Level 23	D1460	3457869	Dia. 900 x 1800	1,4 D + 1,4 SW	9524,3	9524,3	1	Sway Special

Section Properties

b (mm)	h (mm)	dc (mm)	Cover (Torsion) (mm)
900	1800	94	37,3

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ_T	Φ_{CTied}	$\Phi_{CSpiral}$	Φ_{Vns}	Φ_{Vs}	Φ_{Vjoint}	Ω_0
0,9	0,65	0,75	0,75	0,6	0,85	2

Shear Design for V_{u2}, V_{u3}

	Rebar A _v /s mm ² /m	Design V _u kN	Design P _u kN	Design M _u kN-m	ΦV_c kN	ΦV_s kN	ΦV_n kN
Major Shear(V2)	2013,15	1065,5782	-32050,278	5947,3165	0	1065,5782	1065,5782
Minor Shear(V3)	2968,34	441,2042	-32050,278	-2308,4892	0	742,2936	742,2936

Design Forces

	V _u kN	P _u kN	M _u kN-m
Major Shear(V2)	1065,5782	-32050,278	5947,3165
Minor Shear(V3)	441,2042	-32050,278	-2308,4892

Design Basis

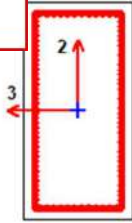
Shr Reduc Factor Unitless	Strength f _{ys} MPa	Strength f _{cs} MPa	Area A _g cm ²
1	413,69	120	16200

Concrete Shear Capacity

	Design V _u kN	Conc.Area A _{cu} cm ²	Tensn.Rein A _{st} mm ²
Major Shear(V2)	1065,5782	15353,9	54768
Minor Shear(V3)	441,2042	14507,9	54768

Shear Rebar Design

	Stress v MPa	Conc.Cpcty v _c MPa	Uppr.Limit v _{max} MPa	Φv_c MPa	Φv_{max} MPa	RebarArea A _v /s mm ² /m
Major Shear(V2)	0,69	0	7,28	0	0	2013,15
Minor Shear(V3)	0,3	0	7,28	0	5,46	2968,34



ETABS 2016 Concrete Frame Design ACI 318-14 Column Section Design

Column Element Details (Shear Details)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF	Type
Level 4	D968	3456815	Dia. 900 x 1800	1,4 D + 1,4 SW	0	7669,6	1	Sway Special

Section Properties

b (mm)	h (mm)	dc (mm)	Cover (Torsion) (mm)
900	1800	94	37,3

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	413,69

Design Code Parameters

Φ_T	Φ_{CTied}	$\Phi_{CSpiral}$	Φ_{Vns}	Φ_{Vs}	Φ_{Vjoint}	Ω_0
0,9	0,65	0,75	0,75	0,6	0,85	2

Shear Design for V_{u2}, V_{u3}

	Rebar A _v /s mm ² /m	Design V _u kN	Design P _u kN	Design M _u kN-m	ΦV_c kN	ΦV_s kN	ΦV_n kN
Major Shear(V2)	1484,17	158,5511	-15722,6529	461,5159	0	785,583	785,583
Minor Shear(V3)	2968,34	230,652	-15722,6529	1356,7133	0	742,2936	742,2936

Design Forces

	V _u kN	P _u kN	M _u kN-m
Major Shear(V2)	158,5511	-15722,6529	461,5159
Minor Shear(V3)	230,652	-15722,6529	1356,7133

Design Basis

Shr Reduc Factor Unitless	Strength f _{ys} MPa	Strength f _{cs} MPa	Area A _g cm ²
1	413,69	120	16200

Concrete Shear Capacity

	Design V _u kN	Conc.Area A _{cu} cm ²	Tensn.Rein A _{st} mm ²
Major Shear(V2)	158,5511	15353,9	26367
Minor Shear(V3)	230,652	14507,9	26367

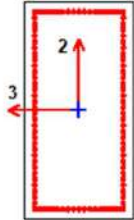
Shear Rebar Design

	Stress v MPa	Conc.Cpcty v _c MPa	Uppr.Limit v _{max} MPa	ΦV_c MPa	ΦV_{max} MPa	RebarArea A _v /s mm ² /m
Major Shear(V2)	0,1	0	7,28	0	0	1484,17
Minor Shear(V3)	0,16	0	7,28	0	5,46	2968,34



ETABS 2016 Concrete Frame Design

ACI 318-14 Column Section Design



Column Element Details (Shear Details) (Part 1 of 2)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF
Level 20	D1484	3457919	Dia. 1000 x 2000	1,2 D + 1,2 SW + 0,5 L - 1 RSPy	7073,1	7073,1	1

Column Element Details (Shear Details) (Part 2 of 2)

Type

Sway Special

Section Properties

b (mm)	h (mm)	dc (mm)	Cover (Torsion) (mm)
1000	2000	93	37,3

Material Properties

E _c (MPa)	f _c (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
51485,92	120	1	1315	1315

Design Code Parameters

Φ _T	Φ _{Tied}	Φ _{Spiral}	Φ _{Vns}	Φ _{Vs}	Φ _{Vjoint}	Ω ₀
0,9	0,65	0,75	0,75	0,6	0,85	2

Shear Design for V_{u2}, V_{u3}

	Rebar A _v /s mm ² /m	Design V _u kN	Design P _u kN	Design M _u kN-m	ΦV _c kN	ΦV _s kN	ΦV _n kN
Major Shear(V2)	O/S #3	31095,7688	-5191,5727	809,8647	514,1969	0	514,1969
Minor Shear(V3)	O/S #3	8817,7789	-5191,5727	517,5144	489,1263	0	489,1263

Design Forces

	V _u kN	P _u kN	M _u kN-m	Capacity V _p kN
Major Shear(V2)	31095,7688	-5191,865	809,8064	0
Minor Shear(V3)	8817,7789	-5191,865	517,4641	0

Capacity Shear (Part 1 of 2)

	Shear V _p kN	Long.Rebar A _{s(Bot)} %	Long.Rebar A _{s(Top)} %	Cap.Moment M _{posBot} kN-m
Major Shear(V2)	0	9,62	9,62	72505,0872
Minor Shear(V3)	0	9,62	9,62	37217,5918



Capacity Shear (Part 2 of 2)

Cap.Moment M_{negTop} kN-m	Cap.Moment M_{negBot} kN-m	Cap.Moment M_{posTop} kN-m
72505,0872	72505,0872	72505,0872
37217,5918	37217,5918	37217,5918

Design Basis

Shr Reduc Factor Unitless	Strength f_{ys} MPa	Strength f_{cs} MPa	Area A_g cm ²
1	413,69	120	20000

Concrete Shear Capacity

	Design V_u kN	Conc.Area A_{cu} cm ²	Tensn.Rein A_{st} mm ²
Major Shear(V2)	31095,7688	19070,2	96187
Minor Shear(V3)	8817,7789	18140,4	96187

Shear Rebar Design

	Stress v MPa	Conc.Cpcty v_c MPa	Uppr.Limit v_{max} MPa	Φv_c MPa	Φv_{max} MPa	RebarArea A_v / s mm ² /m
Major Shear(V2)	16,31	0,45	7,73	0,27	0	0
Minor Shear(V3)	4,86	0,45	7,73	0,27	4,64	0

O/S #3 Shear stress exceeds maximum allowed