تمرین ۵ پروژه بتن

استاد:

آقای دکتر ماهینی

اعضای گروه:

سعید زارعی(۹۵۰۲۱۲٤۲٦)

محمد برزگر(۹۵۰۲۱۲٤۰۲)

نگار سنگری(۹۵۰۲۱۲٤٤۳)

تاریخ تحویل تکلیف: ۱٤۰۰/۱۰/۰۵

شماره گروه: A6

دانشکده فنی مهندسی، گروه مهندسی عمران

۱-مشخصات پروژه:

شهر: کرمانشاه

ارتفاع طبقات

سیستم سقف: دال دوطرفه

سیستم باربری جانبی در راستای X و Y: قاب خمشی بتنی متوسط

مقاومت فشاری بتن مصرفی پروژه: 32 MPa

تنش تسلیم فولاد مصرفی پروژه: 420 MPa

مقاومت فشاری مجاز خاک q_{all} : 0.8 Kg/Cm^2

ضریب عکس العمل بستر خاک k_s: 0.45 Kg/Cm^3

نوع زمین: I

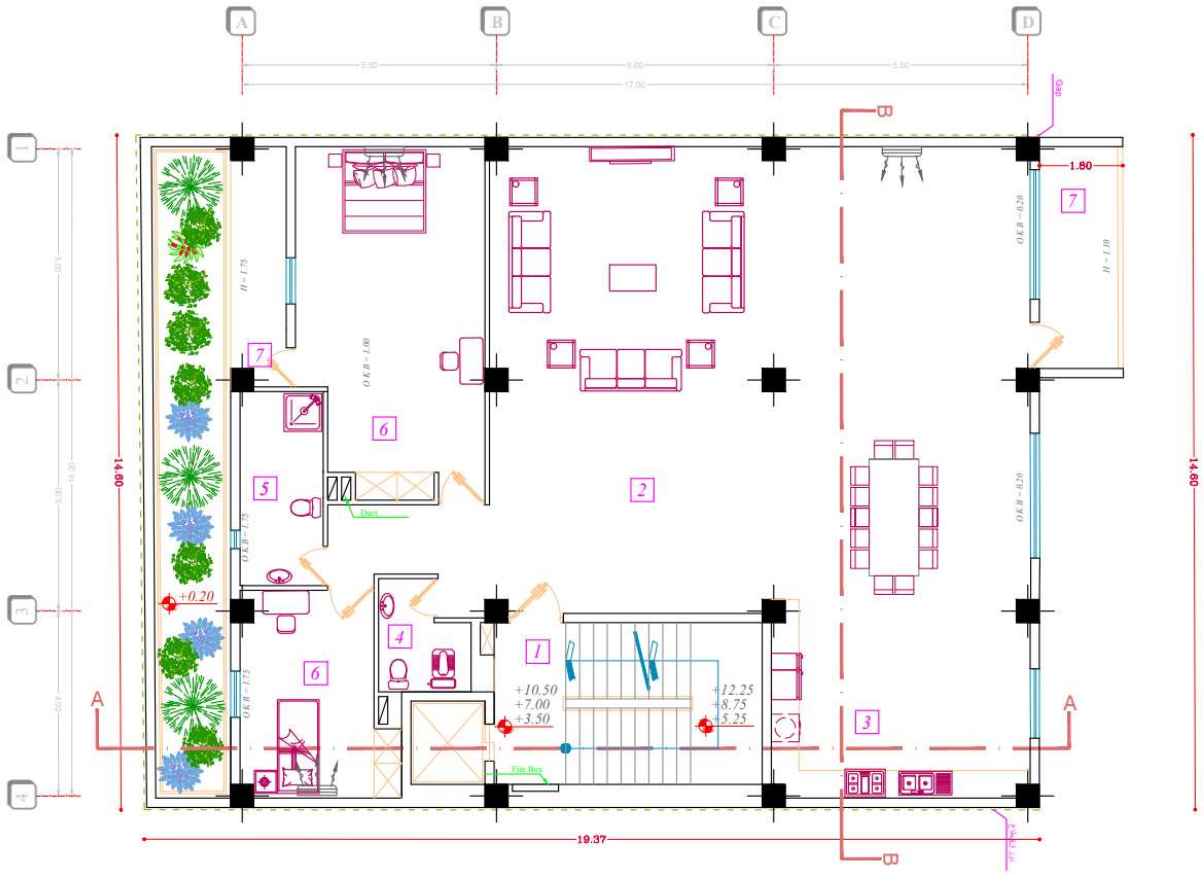
کف سازی: موزائیک

پله و راه پله: سنگ گرانیت

دیوارها: هبلکس

نما: سنگ تراورتن

۲-پلان تیپ طبقات:



محور B - بام													
			D	L	Ey		1.4D	1.2D+1.6L	1.2D+L+Ey	0.9D+Ey	0.9D-Ey	MIN(t.m)	MAX(t.m)
-2.96	تیر B1-B2	M ext-	-1.84436	-0.46674	5.712		-2.5821	-2.9600081	3.0320348	4.05208	-7.37192	-7.37192	4.05208
10.57		M+	6.586095	1.666697	0		9.220533	10.5700288	9.5700108	5.927486	5.927486	5.927486	10.57003
-12.98		M in-	-8.08775	-2.04671	5.712		-11.3228	-12.980035	-6.040009	-1.56697	-12.991	-12.991	-1.56697
-12.05	تیر B2-B3	M ext-	-7.50827	-1.90007	11.424		-10.5116	-12.050033	0.5140066	4.666554	-18.1814	-18.1814	4.666554
6.49		M+	4.043875	1.023355	0		5.661425	6.49001771	5.8760047	3.639487	3.639487	3.639487	6.490018
-12.02		M in-	-7.48958	-1.89534	11.424		-10.4854	-12.020033	0.5411684	4.683378	-18.1646	-18.1646	4.683378
-7.9	تیر B3-B4	M in-	-4.92244	-1.24569	10.281		-6.89141	-7.9000216	3.1283902	5.850807	-14.7112	-14.7112	5.850807
6.42		M+	4.000258	1.012317	0		5.600362	6.42001752	5.8126272	3.600232	3.600232	3.600232	6.420018
-1.8		M ext-	-1.12157	-0.28383	10.281		-1.57019	-1.8000049	8.6512914	9.271589	-11.2904	-11.2904	9.271589

محور B - طبقه سوم													
			D	L	Ey		1.4D	1.2D+1.6L	1.2D+L+Ey	0.9D+Ey	0.9D-Ey	MIN(t.m)	MAX(t.m)
-2.96	تیر B1-B2	M ext-	-1.84436	-0.46674	10.99		-2.5821	-2.9600081	8.3100348	9.33008	-12.6499	-12.6499	9.33008
10.57		M+	6.586095	1.666697	0		9.220533	10.5700288	9.5700108	5.927486	5.927486	5.927486	10.57003
-12.98		M in-	-8.08775	-2.04671	10.99		-11.3228	-12.980035	-0.762009	3.711025	-18.269	-18.269	3.711025
-12.05	تیر B2-B3	M ext-	-7.50827	-1.90007	21.99		-10.5116	-12.050033	11.080007	15.23255	-28.7474	-28.7474	15.23255
6.49		M+	4.043875	1.023355	0		5.661425	6.49001771	5.8760047	3.639487	3.639487	3.639487	6.490018
-12.02		M in-	-7.48958	-1.89534	21.99		-10.4854	-12.020033	11.107168	15.24938	-28.7306	-28.7306	15.24938
-7.9	تیر B3-B4	M in-	-4.92244	-1.24569	19.799		-6.89141	-7.9000216	12.64639	15.36881	-24.2292	-24.2292	15.36881
6.42		M+	4.000258	1.012317	0		5.600362	6.42001752	5.8126272	3.600232	3.600232	3.600232	6.420018
-1.8		M ext-	-1.12157	-0.28383	19.799		-1.57019	-1.8000049	18.169291	18.78959	-20.8084	-20.8084	18.78959

محور B - طبقه دوم													
			D	L	Ey		1.4D	1.2D+1.6L	1.2D+L+Ey	0.9D+Ey	0.9D-Ey	MIN(t.m)	MAX(t.m)
-2.96	تیر B1-B2	M ext-	-1.84436	-0.46674	14.192		-2.5821	-2.9600081	11.512035	12.53208	-15.8519	-15.8519	12.53208
10.57		M+	6.586095	1.666697	0		9.220533	10.5700288	9.5700108	5.927486	5.927486	5.927486	10.57003
-12.98		M in-	-8.08775	-2.04671	14.192		-11.3228	-12.980035	2.4399905	6.913025	-21.471	-21.471	6.913025
-12.05	تیر B2-B3	M ext-	-7.50827	-1.90007	28.383		-10.5116	-12.050033	17.473007	21.62555	-35.1404	-35.1404	21.62555
6.49		M+	4.043875	1.023355	0		5.661425	6.49001771	5.8760047	3.639487	3.639487	3.639487	6.490018
-12.02		M in-	-7.48958	-1.89534	28.383		-10.4854	-12.020033	17.500168	21.64238	-35.1236	-35.1236	21.64238
-7.9	تیر B3-B4	M in-	-4.92244	-1.24569	25.546		-6.89141	-7.9000216	18.39339	21.11581	-29.9762	-29.9762	21.11581
6.42		M+	4.000258	1.012317	0		5.600362	6.42001752	5.8126272	3.600232	3.600232	3.600232	6.420018
-1.8		M ext-	-1.12157	-0.28383	25.546		-1.57019	-1.8000049	23.916291	24.53659	-26.5554	-26.5554	24.53659

محور B - طبقه اول													
			D	L	Ey		1.4D	1.2D+1.6L	1.2D+L+Ey	0.9D+Ey	0.9D-Ey	MIN(t.m)	MAX(t.m)
-2.96	تیر B1-B2	M ext-	-1.84436	-0.46674	15.372		-2.5821	-2.9600081	12.692035	13.71208	-17.0319	-17.0319	13.71208
10.57		M+	6.586095	1.666697	0		9.220533	10.5700288	9.5700108	5.927486	5.927486	5.927486	10.57003
-12.98		M in-	-8.08775	-2.04671	15.372		-11.3228	-12.980035	3.6199905	8.093025	-22.651	-22.651	8.093025
-12.05	تیر B2-B3	M ext-	-7.50827	-1.90007	30.745		-10.5116	-12.050033	19.835007	23.98755	-37.5024	-37.5024	23.98755
6.49		M+	4.043875	1.023355	0		5.661425	6.49001771	5.8760047	3.639487	3.639487	3.639487	6.490018
-12.02		M in-	-7.48958	-1.89534	30.745		-10.4854	-12.020033	19.862168	24.00438	-37.4856	-37.4856	24.00438
-7.9	تیر B3-B4	M in-	-4.92244	-1.24569	27.671		-6.89141	-7.9000216	20.51839	23.24081	-32.1012	-32.1012	23.24081
6.42		M+	4.000258	1.012317	0		5.600362	6.42001752	5.8126272	3.600232	3.600232	3.600232	6.420018
-1.8		M ext-	-1.12157	-0.28383	27.671		-1.57019	-1.8000049	26.041291	26.66159	-28.6804	-28.6804	26.66159

محور B - بام												
		D	L	Ey		1.4D	1.2D+1.6L	1.2D+L+Ey	0.9D+Ey	0.9D-Ey	MIN(t.m)	MAX(t.m)
تیر B1-B2	Vu	11.46491	2.901345	3.264		16.05088	18.4000502	19.923243	13.58242	7.054423	7.054423	19.92324
تیر B2-B3	Vu	11.46491	2.901345	6.528		16.05088	18.4000502	23.187243	16.84642	3.790423	3.790423	23.18724
تیر B3-B4	Vu	7.178034	1.816494	5.875		10.04925	11.5200314	16.305135	12.33523	0.58523	0.58523	16.30513

محور B - طبقه ۳												
		D	L	Ey		1.4D	1.2D+1.6L	1.2D+L+Ey	0.9D+Ey	0.9D-Ey	MIN(t.m)	MAX(t.m)
تیر B1-B2	Vu	11.46491	2.901345	6.285		16.05088	18.4000502	22.944243	16.60342	4.033423	4.033423	22.94424
تیر B2-B3	Vu	11.46491	2.901345	12.571		16.05088	18.4000502	29.230243	22.88942	-2.25258	-2.25258	29.23024
تیر B3-B4	Vu	7.178034	1.816494	11.313		10.04925	11.5200314	21.743135	17.77323	-4.85277	-4.85277	21.74313

محور B - طبقه ۲												
		D	L	Ey		1.4D	1.2D+1.6L	1.2D+L+Ey	0.9D+Ey	0.9D-Ey	MIN(t.m)	MAX(t.m)
تیر B1-B2	Vu	11.46491	2.901345	8.109		16.05088	18.4000502	24.768243	18.42742	2.209423	2.209423	24.76824
تیر B2-B3	Vu	11.46491	2.901345	16.219		16.05088	18.4000502	32.878243	26.53742	-5.90058	-5.90058	32.87824
تیر B3-B4	Vu	7.178034	1.816494	14.597		10.04925	11.5200314	25.027135	21.05723	-8.13677	-8.13677	25.02713

محور B - طبقه ۱												
		D	L	Ey		1.4D	1.2D+1.6L	1.2D+L+Ey	0.9D+Ey	0.9D-Ey	MIN(t.m)	MAX(t.m)
تیر B1-B2	Vu	11.46491	2.901345	8.784		16.05088	18.4000502	25.443243	19.10242	1.534423	1.534423	25.44324
تیر B2-B3	Vu	11.46491	2.901345	17.569		16.05088	18.4000502	34.228243	27.88742	-7.25058	-7.25058	34.22824
تیر B3-B4	Vu	7.178034	1.816494	15.812		10.04925	11.5200314	26.242135	22.27223	-9.35177	-9.35177	26.24213

محور ۲ - بام												
			D	L	Ex		1.4D	1.2D+1.6L	1.2D+L+Ey	0.9D+Ey	0.9D-Ey	MIN(t.m)	MAX(t.m)
-3.17	تیر A2-B2	M ext-	-1.97521	-0.49985	4.794		-2.76529	-3.17001	1.923902	3.016315	-6.57168	-6.57168	3.016315
11.32		M+	7.053415	1.784958	0		9.874781	11.32003	10.24906	6.348073	6.348073	6.348073	11.32003
-13.9		M in-	-8.661	-2.19178	4.794		-12.1254	-13.9	-7.79097	-3.0009	-12.5889	-13.9	-3.0009
-15.59	تیر B2-C2	M ext-	-9.71402	-2.45826	10.024		-13.5996	-15.59	-4.09109	1.281379	-18.7666	-18.7666	1.281379
8.39		M+	5.227752	1.32295	0		7.318853	8.390023	7.596253	4.704977	4.704977	4.704977	8.390023
-15.59		M in-	-9.71402	-2.45826	10.024		-13.5996	-15.59	-4.09109	1.281379	-18.7666	-18.7666	1.281379
-19.94	تیر C2-D2	M ext-	-12.4245	-3.14418	10.024		-17.3943	-19.9401	-8.02955	-1.15803	-21.206	-21.206	-1.15803
16.24		M+	10.11903	2.560753	0		14.16665	16.24004	14.70359	9.10713	9.10713	9.10713	16.24004
-4.56		M in-	-2.8413	-0.71903	10.024		-3.97783	-4.56001	5.895405	7.466826	-12.5812	-12.5812	7.466826

محور ۲ - طبقه سوم												
			D	L	Ex		1.4D	1.2D+1.6L	1.2D+L+Ey	0.9D+Ey	0.9D-Ey	MIN(t.m)	MAX(t.m)
-3.17	تیر A2-B2	M ext-	-1.97521	-0.49985	8.834		-2.76529	-3.17001	5.963902	7.056315	-10.6117	-10.6117	7.056315
11.32		M+	7.053415	1.784958	0		9.874781	11.32003	10.24906	6.348073	6.348073	6.348073	11.32003
-13.9		M in-	-8.661	-2.19178	8.834		-12.1254	-13.9	-3.75097	1.039104	-16.6289	-16.6289	1.039104
-15.59	تیر B2-C2	M ext-	-9.71402	-2.45826	18.472		-13.5996	-15.59	4.356913	9.729379	-27.2146	-27.2146	9.729379
8.39		M+	5.227752	1.32295	0		7.318853	8.390023	7.596253	4.704977	4.704977	4.704977	8.390023
-15.59		M in-	-9.71402	-2.45826	18.472		-13.5996	-15.59	4.356913	9.729379	-27.2146	-27.2146	9.729379
-19.94	تیر C2-D2	M in-	-12.4245	-3.14418	18.472		-17.3943	-19.9401	0.418451	7.28997	-29.654	-29.654	7.28997
16.24		M+	10.11903	2.560753	0		14.16665	16.24004	14.70359	9.10713	9.10713	9.10713	16.24004
-4.56		M ext-	-2.8413	-0.71903	18.472		-3.97783	-4.56001	14.3434	15.91483	-21.0292	-21.0292	15.91483

محور ۲ - طبقه دوم												
			D	L	Ex		1.4D	1.2D+1.6L	1.2D+L+Ey	0.9D+Ey	0.9D-Ey	MIN(t.m)	MAX(t.m)
-3.17	تیر A2-B2	M ext-	-1.97521	-0.49985	10.731		-2.76529	-3.17001	7.860902	8.953315	-12.5087	-12.5087	8.953315
11.32		M+	7.053415	1.784958	0		9.874781	11.32003	10.24906	6.348073	6.348073	6.348073	11.32003
-13.9		M in-	-8.661	-2.19178	10.731		-12.1254	-13.9	-1.85397	2.936104	-18.5259	-18.5259	2.936104
-15.59	تیر B2-C2	M ext-	-9.71402	-2.45826	22.437		-13.5996	-15.59	8.321913	13.69438	-31.1796	-31.1796	13.69438
8.39		M+	5.227752	1.32295	0		7.318853	8.390023	7.596253	4.704977	4.704977	4.704977	8.390023
-15.59		M in-	-9.71402	-2.45826	22.437		-13.5996	-15.59	8.321913	13.69438	-31.1796	-31.1796	13.69438
-19.94	تیر C2-D2	M in-	-12.4245	-3.14418	22.437		-17.3943	-19.9401	4.383451	11.25497	-33.619	-33.619	11.25497
16.24		M+	10.11903	2.560753	0		14.16665	16.24004	14.70359	9.10713	9.10713	9.10713	16.24004
-4.56		M ext-	-2.8413	-0.71903	22.437		-3.97783	-4.56001	18.3084	19.87983	-24.9942	-24.9942	19.87983

محور ۲ - طبقه اول												
			D	L	Ex		1.4D	1.2D+1.6L	1.2D+L+Ey	0.9D+Ey	0.9D-Ey	MIN(t.m)	MAX(t.m)
-3.17	تیر A2-B2	M ext-	-1.97521	-0.49985	10.681		-2.76529	-3.17001	7.810902	8.903315	-12.4587	-12.4587	8.903315
11.32		M+	7.053415	1.784958	0		9.874781	11.32003	10.24906	6.348073	6.348073	6.348073	11.32003
-13.9		M in-	-8.661	-2.19178	10.681		-12.1254	-13.9	-1.90397	2.886104	-18.4759	-18.4759	2.886104
-15.59	تیر B2-C2	M ext-	-9.71402	-2.45826	22.335		-13.5996	-15.59	8.219913	13.59238	-31.0776	-31.0776	13.59238
8.39		M+	5.227752	1.32295	0		7.318853	8.390023	7.596253	4.704977	4.704977	4.704977	8.390023
-15.59		M in-	-9.71402	-2.45826	22.335		-13.5996	-15.59	8.219913	13.59238	-31.0776	-31.0776	13.59238
-19.94	تیر C2-D2	M in-	-12.4245	-3.14418	22.335		-17.3943	-19.9401	4.281451	11.15297	-33.517	-33.517	11.15297
16.24		M+	10.11903	2.560753	0		14.16665	16.24004	14.70359	9.10713	9.10713	9.10713	16.24004
-4.56		M ext-	-2.8413	-0.71903	22.335		-3.97783	-4.56001	18.2064	19.77783	-24.8922	-24.8922	19.77783

محور ۲ - بام												
		D	L	Ex		1.4D	1.2D+1.6L	1.2D+L+Ey	0.9D+Ey	0.9D-Ey	MIN(t.m)	MAX(t.m)
تیر A2-B2	Vu	11.46491	2.901345	2.739		16.05088	18.40005	19.39824	13.05742	7.579423	7.579423	19.39824
تیر B2-C2	Vu	11.46491	2.901345	5.728		16.05088	18.40005	22.38724	16.04642	4.590423	4.590423	22.38724
تیر C2-D2	Vu	7.178034	1.816494	5.728		10.04925	11.52003	16.15813	12.18823	0.73223	0.73223	16.15813

محور ۲ - طبقه ۳												
		D	L	Ex		1.4D	1.2D+1.6L	1.2D+L+Ey	0.9D+Ey	0.9D-Ey	MIN(t.m)	MAX(t.m)
تیر B1-B2	Vu	11.46491	2.901345	5.048		16.05088	18.40005	21.70724	15.36642	5.270423	5.270423	21.70724
تیر B2-B3	Vu	11.46491	2.901345	10.555		16.05088	18.40005	27.21424	20.87342	-0.23658	-0.23658	27.21424
تیر B3-B4	Vu	7.178034	1.816494	10.555		10.04925	11.52003	20.98513	17.01523	-4.09477	-4.09477	20.98513

محور ۲ - طبقه ۲												
		D	L	Ex		1.4D	1.2D+1.6L	1.2D+L+Ey	0.9D+Ey	0.9D-Ey	MIN(t.m)	MAX(t.m)
تیر B1-B2	Vu	11.46491	2.901345	6.132		16.05088	18.40005	22.79124	16.45042	4.186423	4.186423	22.79124
تیر B2-B3	Vu	11.46491	2.901345	12.821		16.05088	18.40005	29.48024	23.13942	-2.50258	-2.50258	29.48024
تیر B3-B4	Vu	7.178034	1.816494	12.821		10.04925	11.52003	23.25113	19.28123	-6.36077	-6.36077	23.25113

محور ۲ - طبقه ۱												
		D	L	Ex		1.4D	1.2D+1.6L	1.2D+L+Ey	0.9D+Ey	0.9D-Ey	MIN(t.m)	MAX(t.m)
تیر B1-B2	Vu	11.46491	2.901345	6.103		16.05088	18.40005	22.76224	16.42142	4.215423	4.215423	22.76224
تیر B2-B3	Vu	11.46491	2.901345	12.762		16.05088	18.40005	29.42124	23.08042	-2.44358	-2.44358	29.42124
تیر B3-B4	Vu	7.178034	1.816494	12.762		10.04925	11.52003	23.19213	19.22223	-6.30177	-6.30177	23.19213

محور۲		فواصل آماتور عرضی در وسط تیر	فواصل آماتور عرضی در کنار تیر	سایز آرماتور عرضی	Vc	Vu	d	b	h
بام	تیر A2-B2	15	8	10	12.88631	19.39824	33.5	40	40
	تیر B2-C2	10	8	10	12.88631	22.38724	33.5	40	40
	تیر C2-D2	25	8	10	12.88631	16.15813	33.5	40	40
طبقه ۳	تیر A2-B2	30	10	10	20.91622	21.70724	43.5	50	50
	تیر B2-C2	15	10	10	20.91622	27.21424	43.5	50	50
	تیر C2-D2	40	10	10	20.91622	20.98513	43.5	50	50
طبقه ۲	تیر A2-B2	30	10	10	20.91622	22.79124	43.5	50	50
	تیر B2-C2	15	10	10	20.91622	29.48024	43.5	50	50
	تیر C2-D2	25	10	10	20.91622	23.25113	43.5	50	50
طبقه ۱	تیر A2-B2	30	10	10	20.91622	22.76224	43.5	50	50
	تیر B2-C2	15	10	10	20.91622	29.42124	43.5	50	50
	تیر C2-D2	25	10	10	20.91622	23.19213	43.5	50	50

محور B		فواصل آماتور عرضی در وسط تیر	فواصل آماتور عرضی در کنار تیر	سایز آرماتور عرضی	Vc	Vu	d	b	h
بام	تیر B1-B2	15	8	10	12.8863139	19.9232430	33.5	40	40
	تیر B2-B3	10	8	10	12.8863139	23.1872430	33.5	40	40
	تیر B3-B4	20	8	10	12.8863139	16.305134	33.5	40	40
طبقه ۳	تیر B1-B2	25	10	10	20.9162185	22.9442430	43.5	50	50
	تیر B2-B3	15	10	10	20.9162185	29.2302430	43.5	50	50
	تیر B3-B4	30	10	10	20.9162185	21.7431347	43.5	50	50
طبقه ۲	تیر B1-B2	20	10	10	20.9162185	24.7682430	43.5	50	50
	تیر B2-B3	10	10	10	20.9162185	32.8782430	43.5	50	50
	تیر B3-B4	20	10	10	20.9162185	25.0271347	43.5	50	50
طبقه ۱	تیر B1-B2	20	10	10	20.9162185	25.4432430	43.5	50	50
	تیر B2-B3	10	10	10	20.9162185	34.2282430	43.5	50	50
	تیر B3-B4	20	10	10	20.9162185	26.2421347	43.5	50	50

Mu	h	b	d	تعداد آرماتور	قطر آرماتور	0.9Mn			
-7.371920262	40	40	33.5	5	1.4	9.314357794	تیر B1-B2	M ext-	محور B بام
10.57002884	40	40	33.5	5	1.6	11.99287214		M+	
-12.99097466	40	40	33.5	5	1.8	14.93059058		M in-	
-18.18144566	50	50	43.5	6	1.6	18.9869246	تیر B2-B3	M ext-	
6.49001771	50	50	43.5	6	1.4	14.6892911		M+	
-18.16462214	50	50	43.5	6	1.6	18.9869246		M in-	
-17.43360977	50	50	43.5	6	1.6	18.9869246	تیر B3-B4	M ext-	
6.420017519	50	50	43.5	6	1.4	14.6892911		M+	
-11.29041097	50	50	43.5	6	1.4	14.6892911		M in-	
-12.64992026	50	50	43.5	6	1.4	14.6892911	تیر B1-B2	M ext-	محور B طبقه سوم
10.57002884	50	50	43.5	6	1.4	14.6892911		M+	
-18.26897466	50	50	43.5	6	1.6	18.9869246		M in-	
-28.74744566	50	50	43.5	6	2	28.92048869	تیر B2-B3	M ext-	
3.639487331	50	50	43.5	6	1.4	14.6892911		M+	
-28.73062214	50	50	43.5	6	2	28.92048869		M in-	
-26.95160977	50	50	43.5	6	2	28.92048869	تیر B3-B4	M ext-	
6.420017519	50	50	43.5	6	1.4	14.6892911		M+	
-20.80841097	50	50	43.5	6	1.8	23.74475922		M in-	
-15.85192026	50	50	43.5	6	1.6	18.9869246	تیر B1-B2	M ext-	محور B طبقه دوم
10.57002884	50	50	43.5	6	1.4	14.6892911		M+	
-21.47097466	50	50	43.5	6	1.8	23.74475922		M in-	
-35.14044566	50	50	43.5	7	2.2	39.62090882	تیر B2-B3	M ext-	
3.639487331	50	50	43.5	6	1.4	14.6892911		M+	
-35.12362214	50	50	43.5	7	2.2	39.62090882		M in-	
-32.69860977	50	50	43.5	6	2.2	34.46682956	تیر B3-B4	M ext-	
6.420017519	50	50	43.5	6	1.4	14.6892911		M+	
-26.55541097	50	50	43.5	6	2	28.92048869		M in-	
-17.03192026	50	50	43.5	6	1.8	23.74475922	تیر B1-B2	M ext-	محور B طبقه همکف
10.57002884	50	50	43.5	6	1.4	14.6892911		M+	
-22.65097466	50	50	43.5	6	1.8	23.74475922		M in-	

-37.50244566	50	50	43.5	6	2.2	34.46682956		M ext-	
6.49001771	50	50	43.5	6	1.4	14.6892911	تیر B2-B3	M+	
-37.48562214	50	50	43.5	6	2.5	43.36555606		M in-	
-34.82360977	50	50	43.5	7	2.2	39.62090882		M ext-	
6.420017519	50	50	43.5	6	1.4	14.6892911	تیر B3-B4	M+	
-28.68041097	50	50	43.5	6	2.2	34.46682956		M in-	
-6.571684875	40	40	33.5	5	1.4	9.314357794		M ext-	
11.32003089	40	40	33.5	5	1.6	11.99287214	تیر A2-B2	M+	
-13.90003793	40	40	33.5	5	1.8	14.93059058		M in-	
-18.76662057	50	50	43.5	6	1.6	18.9869246		M ext-	محور ۲ طبقه بام
8.390022895	50	50	43.5	6	1.4	14.6892911	تیر B2-C2	M+	
-18.76662057	50	50	43.5	6	1.6	18.9869246		M in-	
-21.20603041	50	50	43.5	6	1.8	23.74475922		M ext-	
16.24004432	50	50	43.5	6	1.6	18.9869246	تیر C2-D2	M+	
-12.58117446	50	50	43.5	6	1.4	14.6892911		M in-	
-10.61168488	50	50	43.5	6	1.4	14.6892911		M ext-	
11.32003089	50	50	43.5	6	1.4	14.6892911	تیر A2-B2	M+	
-16.62889582	50	50	43.5	6	1.6	18.9869246		M in-	
-27.21462057	50	50	43.5	6	1.8	23.74475922		M ext-	محور ۲ طبقه سوم
8.390022895	50	50	43.5	6	1.4	14.6892911	تیر B2-C2	M+	
-27.21462057	50	50	43.5	6	2	28.92048869		M in-	
-29.65403041	50	50	43.5	6	2	28.92048869		M ext-	
16.24004432	50	50	43.5	6	1.8	23.74475922	تیر C2-D2	M+	
-21.02917446	50	50	43.5	6	1.8	23.74475922		M in-	
-12.50868488	50	50	43.5	6	1.4	14.6892911		M ext-	
11.32003089	50	50	43.5	6	1.4	14.6892911	تیر A2-B2	M+	
-18.52589582	50	50	43.5	6	1.6	18.9869246		M in-	
-31.17962057	50	50	43.5	6	2.2	34.46682956		M ext-	محور ۲ طبقه دوم
8.390022895	50	50	43.5	6	1.4	14.6892911	تیر B2-C2	M+	
-31.17962057	50	50	43.5	6	2.2	34.46682956		M in-	
-33.61903041	50	50	43.5	6	2.2	34.46682956	تیر C2-D2	M ext-	

16.24004432	50	50	43.5	6	1.6	18.9869246		M+	
-24.99417446	50	50	43.5	6	2	28.92048869		M in-	
-12.45868488	50	50	43.5	6	1.4	14.6892911	تیر A2-B2	M ext-	محور ۲ طبقه همکف
11.32003089	50	50	43.5	6	1.4	14.6892911		M+	
-18.47589582	50	50	43.5	6	1.6	18.9869246		M in-	
-31.07762057	50	50	43.5	6	2.2	34.46682956	تیر B2-C2	M ext-	
8.390022895	50	50	43.5	6	1.4	14.6892911		M+	
-31.07762057	50	50	43.5	6	2.2	34.46682956		M in-	
-33.51703041	50	50	43.5	6	2.2	34.46682956	تیر C2-D2	M ext-	
16.24004432	50	50	43.5	6	1.6	18.9869246		M+	
-24.89217446	50	50	43.5	6	2	28.92048869		M in-	

بررسی پاسخگو بودن تیر طره بالکن

نیروی زلزله قائم:

$$W_p = D + L = 913.33 + 300 = 1213.33 \frac{Kg}{m^2}$$

$$F_v = 0.6 * A * I * W_p = 0.6 * 0.30 * 1 * 1213.33 = 218.4 \frac{Kg}{m^2}$$

$$1.2D + 1.6\,L = 1.2 * 913.33 + 1.6 * (218.4 + 300) = 2085.44 \frac{Kg}{m^2}$$

$$A_T = 1.8 * 5.2 = 9.36\, m^2$$

$$q = 2085.44 * \frac{9.36}{2} = 9759.86\, Kg\ (for\ each\ beam)$$

$$M_u = \frac{9759.86 * 1.8^2}{2} = 15810.97\, Kg - m$$

مقدار M_U برای هر تیر طره، از مقدار لنگر قابل تحمل تیر کمتر است پس مقطع پاسخگو می باشد.

طراحی ستون

ستون B2

محاسبه چشمه باربر طبقات

$$\frac{(5.5+6)(5+5)}{4} = 28.78\, m^2$$

بار گسترده معادل طبقات=$14.38\ \frac{\text{KN}}{\text{m}^2}$

بار گسترده معادل بام=$11.58\frac{\text{KN}}{\text{m}^2}$

بار محوری ستون:

$$P_u = (14.38 * 3 * 28.78) + (11.58 * 28.78) = 1574.84\, KN$$

طراحی ستون ها

ترکیب بار ها:

Table 5.3.1—Load combinations

Load combination	Equation	Primary load
$U = 1.4D$	(5.3.1a)	D
$U = 1.2D + 1.6L + 0.5(L_r \text{ or } S \text{ or } R)$	(5.3.1b)	L
$U = 1.2D + 1.6(L_r \text{ or } S \text{ or } R) + (1.0L \text{ or } 0.5W)$	(5.3.1c)	L_r or S or R
$U = 1.2D + 1.0W + 1.0L + 0.5(L_r \text{ or } S \text{ or } R)$	(5.3.1d)	W
$U = 1.2D + 1.0E + 1.0L + 0.2S$	(5.3.1e)	E
$U = 0.9D + 1.0W$	(5.3.1f)	W
$U = 0.9D + 1.0E$	(5.3.1g)	E

Column B2	AT (m^2)	28.78	
	Combination	1.2D + 1.6L	
Load / Story	D (KN)	L (KN)	P (KN)
Roof	213.5476	48.3504	333.61776
3	729.2852	113.681	1057.03184
2	729.2852	179.0116	1161.5608
1	987.154	244.3422	1575.53232

Column B2	AT (m^2)	28.78			
	Combination	1.2D + 1.0L + 1.0Ex + 0.3Ey + 0.2S			
Load / Story	D (KN)	L (KN)	P (KN)	Mx (KN-m)	My (KN-m)
Roof	213.5476	48.3504	304.60752	99.365	51.25
3	729.2852	113.681	988.82324	184.28	117.125
2	729.2852	179.0116	1054.15384	225.955	182.12
1	987.154	244.3422	1428.927	228.12	240.95

Column B2	AT (m^2)	28.78			
	Combination	1.2D + 1.0L + 1.0Ey + 0.3Ex + 0.2S			
Load / Story	D (KN)	L (KN)	P (KN)	Mx (KN-m)	My (KN-m)
Roof	213.5476	48.3504	304.60752	33.04	117.295
3	729.2852	113.681	988.82324	64.93	231.47
2	729.2852	179.0116	1054.15384	85.85	307.98
1	987.154	244.3422	1428.927	96.009	346.65

Column B2	AT (m^2)	28.78			
	Combination	0.9D + 1.0Ey + 0.3Ex			
Load / Story	D (KN)	L (KN)	P (KN)	Mx (KN-m)	My (KN-m)
Roof	213.5476	48.3504	192.19284	33.04	117.295
3	729.2852	113.681	656.35668	64.93	231.47
2	729.2852	179.0116	656.35668	85.85	307.98
1	987.154	244.3422	888.4386	96.009	346.65

Column B2	AT (m^2)	28.78			
	Combination	0.9D + 1.0Ex + 0.3Ey			
Load / Story	D (KN)	L (KN)	P (KN)	Mx (KN-m)	My (KN-m)
Roof	213.5476	48.3504	192.19284	99.365	51.25
3	729.2852	113.681	656.35668	184.28	117.125
2	729.2852	179.0116	656.35668	225.955	182.12
1	987.154	244.3422	888.4386	228.12	240.95

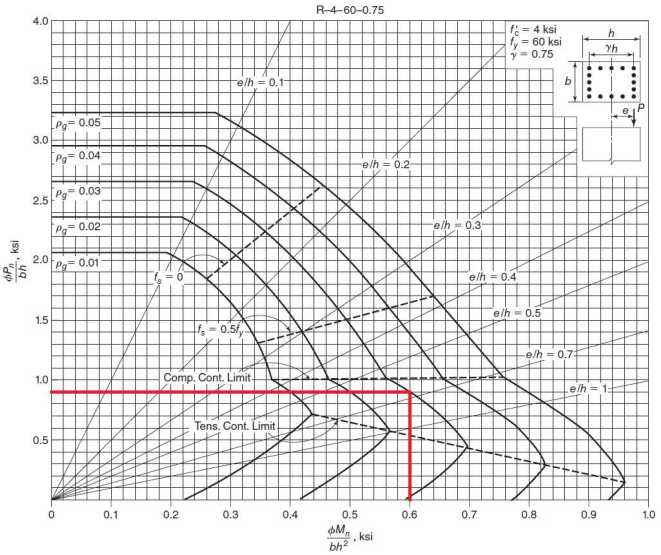
Column B2 Design Loads			
Load / Story	P (KN)	Mx (KN-m)	My (KN-m)
Roof	333.61	99.36	117.29
3	1057.03	184.28	231.47
2	1161.56	225.95	307.98
1	1575.53	228.12	346.65

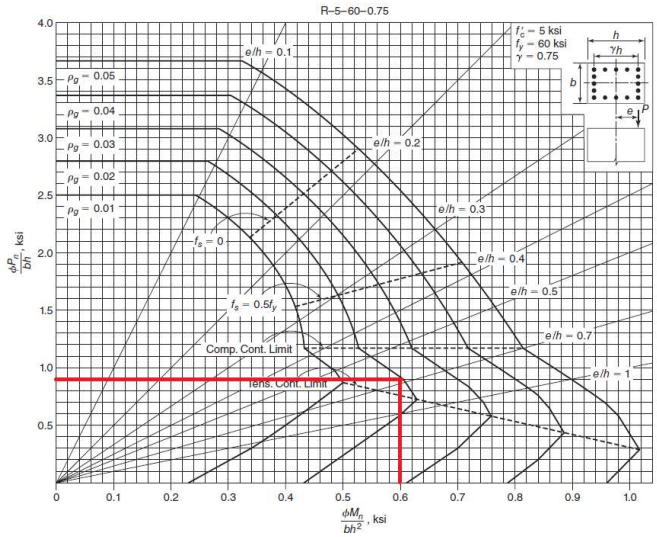
طراحی ستون طبقه اول

f'c (Mpa)	b (cm)	h (cm)	Pu (KN)	Mx (KN.m)	My (KN.m)	Lx (cm)	Ly (cm)	ex	ey	alpha
32	50	50	1575.53	228.12	346.65	50	50	0.2200	0.1448	0.716854

fy (Mpa)
420
Cover from rebar center (cm)
6.5

ex/Lx>ey/Ly	ex/Lx<ey/Ly	eoy,x	gamma	M	P/bh (Mpa)	M/bh^2(Mpa)
Yes	No	0.3238	0.7400	510.1787	6.30	4.08
eox (m)	eoy (m)				P/bh (ksi)	M/bh^2 (ksi)
0.3238	0.3025				0.91	0.59





$$\rho_g = 0.02\ ;\ \mathrm{A_{st}} = 0.02 * 500 * 500 = 5000\ mm^2$$

$$if\ \varphi 25: \frac{5000}{\frac{\pi}{4} * 25^2} = 10.18 \rightarrow \boldsymbol{USE\ 12\varphi 25}$$

آرماتور عرضی:

$$\frac{A_{v\,min}}{s} = \max\{0.062\sqrt{f'c}\frac{b_w}{f_{yt}} \quad , \quad \frac{0.35b_w}{f_{yt}}\}$$

$$\frac{A_{v\,min}}{s} = \max\left\{0.062 * \sqrt{32} * \frac{500}{420} \quad , \quad \frac{0.35 * 500}{420}\right\} = 0.4175\frac{mm^2}{mm} = 417.5\frac{mm^2}{m}$$

$$s_{max} = \min\{16d_b\,, 48d_b\,, 500\,mm\}$$

$$s_{max} = \min\{16 * 25\,, 48 * 10\,, 500\,mm\}$$

$$s_{max} = 400 \rightarrow s = 30\,cm$$

$$\rightarrow \boldsymbol{USE\ \emptyset 10@300mm}$$

25.7.2 *Ties*

25.7.2.1 Ties shall consist of a closed loop of deformed bar with spacing in accordance with (a) and (b):

(a) Clear spacing of at least $\mathbf{(4/3)}d_{agg}$
(b) Center-to-center spacing shall not exceed the least of $\mathbf{16}d_b$ of longitudinal bar, $\mathbf{48}d_b$ of tie bar, and smallest dimension of member

25.7.2.2 Diameter of tie bar shall be at least (a) or (b):

(a) No. 3 enclosing No. 10 or smaller longitudinal bars
(b) No. 4 enclosing No. 11 or larger longitudinal bars or bundled longitudinal bars

18.4.3.2 Columns shall be spirally reinforced in accordance with Chapter 10 or shall be in accordance with 18.4.3.3 through 18.4.3.5. Provision 18.4.3.6 shall apply to all columns supporting discontinuous stiff members.

18.4.3.3 At both ends of the column, hoops shall be provided at spacing s_o over a length ℓ_o measured from the joint face. Spacing s_o shall not exceed the smallest of (a) through (d):

(a) 8 times the diameter of the smallest longitudinal bar enclosed
(b) 24 times the diameter of the hoop bar
(c) One-half of the smallest cross-sectional dimension of the column
(d) 12 in.

Length ℓ_o shall not be less than the greatest of (e), (f), and (g):

(e) One-sixth of the clear span of the column
(f) Maximum cross-sectional dimension of the column
(g) 18 in.

$$s_{0,max} = \min\left\{8\emptyset_l\,, 24\emptyset_t\,, \frac{500}{2}\,, 300\,mm\right\}$$

$$s_{0,max} = \min\{8 * 25, 24 * 10\,, 250\,, 300\} = 200\,mm$$

$$l_0 = \min\left\{\frac{3350}{6}\,, 500\,, 457\right\} = 457\,mm$$

USE* Ø10@150 *mm* *in the first* 500 *mm* *of both ends of the column

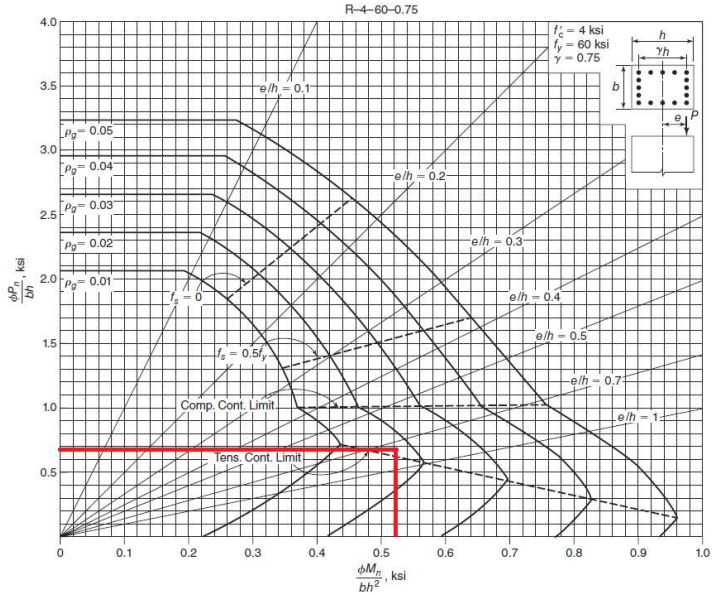
طراحی ستون طبقه دوم

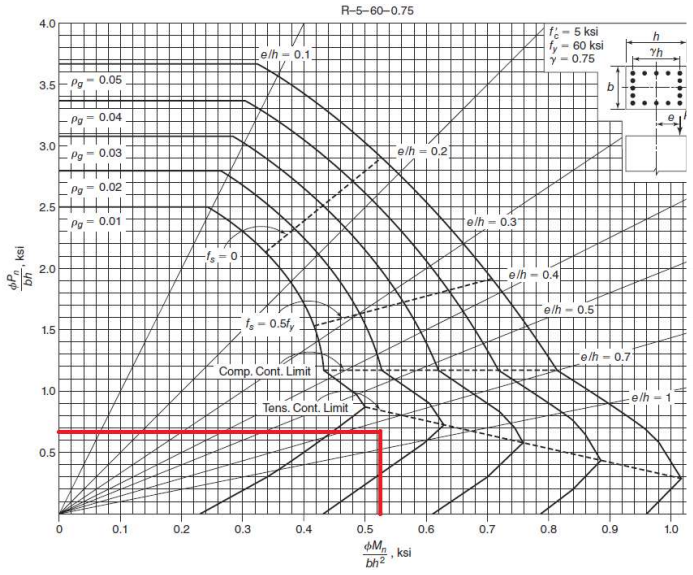
f'c (Mpa)	b (cm)	h (cm)	Pu (KN)	Mx (KN.m)	My (KN.m)	Lx (cm)	Ly (cm)	ex	ey	alpha
32	50	50	1161.56	225.95	307.98	50	50	0.2651	0.1945	0.663629

fy (Mpa)
420

Cover from rebar center (cm)
6.5

ex/Lx>ey/Ly	ex/Lx<ey/Ly	eoy,x	gamma	M	P/bh (Mpa)	M/bh^2 (Mpa)
Yes	No	0.3942	0.7400	457.927	4.65	3.66
eox (m)	eoy (m)				P/bh (ksi)	M/bh^2 (ksi)
0.3942	0.3705				0.67	0.53





$$\rho_g = 0.02\ ;\ \mathrm{A_{st}} = 0.02 * 500 * 500 = 5000\ mm^2$$

$$if\ \varphi 25: \frac{5000}{\frac{\pi}{4} * 25^2} = 10.18 \rightarrow \boldsymbol{USE\ 12\varphi 25}$$

آرماتور عرضی:

$$\frac{A_{v\,min}}{s} = \max\{0.062\sqrt{f'c}\frac{b_w}{f_{yt}} \quad , \quad \frac{0.35b_w}{f_{yt}}\}$$

$$\frac{A_{v\,min}}{s} = \max\left\{0.062 * \sqrt{32} * \frac{500}{420} \quad , \quad \frac{0.35 * 500}{420}\right\} = 0.4175\frac{mm^2}{mm} = 417.5\frac{mm^2}{m}$$

$$s_{max} = \min\{16d_b\,, 48d_b\,, 500\,mm\}$$

$$s_{max} = \min\{16 * 25\,, 48 * 10\,, 500\,mm\}$$

$$s_{max} = 400 \rightarrow s = 30\,cm$$

$$\rightarrow \boldsymbol{USE\ \emptyset 10@300mm}$$

25.7.2 *Ties*

25.7.2.1 Ties shall consist of a closed loop of deformed bar with spacing in accordance with (a) and (b):

(a) Clear spacing of at least $\mathbf{(4/3)}d_{agg}$
(b) Center-to-center spacing shall not exceed the least of $\mathbf{16}d_b$ of longitudinal bar, $\mathbf{48}d_b$ of tie bar, and smallest dimension of member

25.7.2.2 Diameter of tie bar shall be at least (a) or (b):

(a) No. 3 enclosing No. 10 or smaller longitudinal bars
(b) No. 4 enclosing No. 11 or larger longitudinal bars or bundled longitudinal bars

18.4.3.2 Columns shall be spirally reinforced in accordance with Chapter 10 or shall be in accordance with 18.4.3.3 through 18.4.3.5. Provision 18.4.3.6 shall apply to all columns supporting discontinuous stiff members.

18.4.3.3 At both ends of the column, hoops shall be provided at spacing s_o over a length ℓ_o measured from the joint face. Spacing s_o shall not exceed the smallest of (a) through (d):

(a) 8 times the diameter of the smallest longitudinal bar enclosed
(b) 24 times the diameter of the hoop bar
(c) One-half of the smallest cross-sectional dimension of the column
(d) 12 in.

Length ℓ_o shall not be less than the greatest of (e), (f), and (g):

(e) One-sixth of the clear span of the column
(f) Maximum cross-sectional dimension of the column
(g) 18 in.

$$s_{0,max} = \min\left\{8\emptyset_l\,, 24\emptyset_t\,, \frac{500}{2}\,, 300\,mm\right\}$$

$$s_{0,max} = \min\{8 * 25, 24 * 10\,, 250\,, 300\} = 200\,mm$$

$$l_0 = \min\left\{\frac{3350}{6}\,, 500\,, 457\right\} = 457\,mm$$

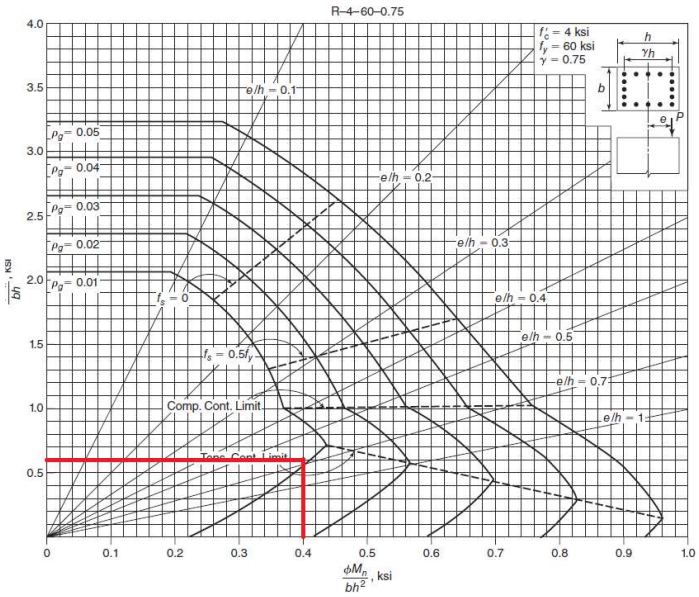
USE* Ø10@150 *mm* *in the first* 500 *mm* *of both ends of the column

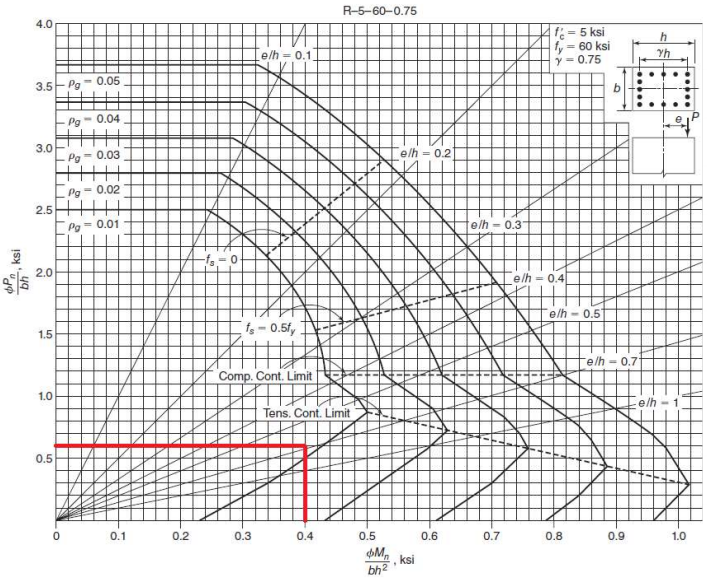
طراحی ستون طبقه سوم

f'c (Mpa)	b (cm)	h (cm)	Pu (KN)	Mx (KN.m)	My (KN.m)	Lx (cm)	Ly (cm)	ex	ey	alpha
32	50	50	1057.03	184.28	231.47	50	50	0.2190	0.1743	0.65019

fy (Mpa)
420
Cover from rebar center (cm)
6.5

ex/Lx>ey/Ly	ex/Lx<ey/Ly	eoy,x	gamma	M	P/bh (Mpa)	M/bh^2 (Mpa)
Yes	No	0.3323	0.7400	351.2869	4.23	2.81
eox (m)	eoy (m)				P/bh (ksi)	M/bh^2 (ksi)
0.3323	0.3167				0.61	0.41





$$\rho_g = 0.01\ ;\ A_{st} = 0.01 * 500 * 500 = 2500\ mm^2$$

$$if\ \varphi 18: \frac{2500}{\frac{\pi}{4} * 18} = 9.8 \rightarrow \boldsymbol{USE\ 12\varphi 18}$$

آرماتور عرضی:

$$\frac{A_{v\,min}}{s} = \max\{0.062\sqrt{f'c}\frac{b_w}{f_{yt}} \quad , \quad \frac{0.35b_w}{f_{yt}}\}$$

$$\frac{A_{v\,min}}{s} = \max\left\{0.062 * \sqrt{32} * \frac{500}{420} \quad , \quad \frac{0.35 * 500}{420}\right\} = 0.4175\frac{mm^2}{mm} = 417.5\frac{mm^2}{m}$$

$$s_{max} = \min\{16d_b\,, 48d_b\,, 500\,mm\}$$

$$s_{max} = \min\{16 * 18\,, 48 * 10\,, 500\,mm\}$$

$$s_{max} = 288 \rightarrow s = 30\,cm$$

$$\rightarrow \boldsymbol{USE\ \emptyset 10@300mm}$$

25.7.2 *Ties*

25.7.2.1 Ties shall consist of a closed loop of deformed bar with spacing in accordance with (a) and (b):

(a) Clear spacing of at least $\mathbf{(4/3)}d_{agg}$
(b) Center-to-center spacing shall not exceed the least of $\mathbf{16}d_b$ of longitudinal bar, $\mathbf{48}d_b$ of tie bar, and smallest dimension of member

25.7.2.2 Diameter of tie bar shall be at least (a) or (b):

(a) No. 3 enclosing No. 10 or smaller longitudinal bars
(b) No. 4 enclosing No. 11 or larger longitudinal bars or bundled longitudinal bars

18.4.3.2 Columns shall be spirally reinforced in accordance with Chapter 10 or shall be in accordance with 18.4.3.3 through 18.4.3.5. Provision 18.4.3.6 shall apply to all columns supporting discontinuous stiff members.

18.4.3.3 At both ends of the column, hoops shall be provided at spacing s_o over a length ℓ_o measured from the joint face. Spacing s_o shall not exceed the smallest of (a) through (d):

(a) 8 times the diameter of the smallest longitudinal bar enclosed
(b) 24 times the diameter of the hoop bar
(c) One-half of the smallest cross-sectional dimension of the column
(d) 12 in.

Length ℓ_o shall not be less than the greatest of (e), (f), and (g):

(e) One-sixth of the clear span of the column
(f) Maximum cross-sectional dimension of the column
(g) 18 in.

$$s_{0,max} = \min\left\{8\emptyset_l\,, 24\emptyset_t\,, \frac{500}{2}\,, 300\,mm\right\}$$

$$s_{0,max} = \min\{8 * 18, 24 * 10\,, 250\,, 300\} = 144\,mm$$

$$l_0 = \min\left\{\frac{3350}{6}\,, 500\,, 457\right\} = 457\,mm$$

USE* Ø10@150 *mm* *in the first* 500 *mm* *of both ends of the column

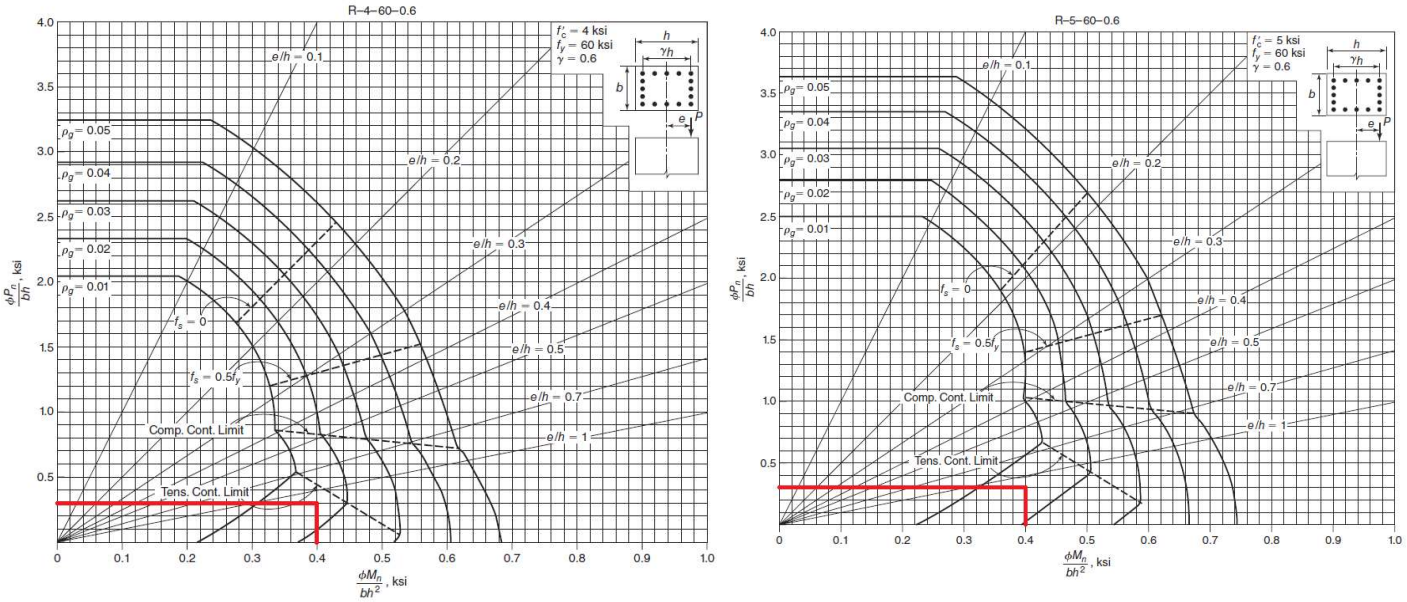
طراحی ستون طبقه بام

f'c (Mpa)	b (cm)	h (cm)	Pu (KN)	Mx (KN.m)	My (KN.m)	Lx (cm)	Ly (cm)	ex	ey	alpha
32	40	40	333.61	99.36	117.29	40	40	0.3516	0.2978	0.581306

fy (Mpa)
420

Cover from rebar center (cm)
6.5

ex/Lx>ey/Ly	ex/Lx<ey/Ly	eoy,x	gamma	M	P/bh (Mpa)	M/bh^2 (Mpa)
Yes	No	0.5247	0.6750	175.0485	2.09	2.74
eox (m)	eoy (m)				P/bh (ksi)	M/bh^2 (ksi)
0.5247	0.5022				0.30	0.40



$$\rho_g = 0.015\ ;\ A_{st} = 0.015 * 400 * 400 = 2400\ mm^2$$

$$if\ \varphi 16: \frac{2400}{\frac{\pi}{4} * 16} = 11.9 \rightarrow \boldsymbol{USE\ 12\varphi 16}$$

آرماتور عرضی:

$$\frac{A_{v\,min}}{s} = \max\{0.062\sqrt{f'c}\frac{b_w}{f_{yt}} \quad , \quad \frac{0.35b_w}{f_{yt}}\}$$

$$\frac{A_{v\,min}}{s} = \max\left\{0.062 * \sqrt{32} * \frac{400}{420} \quad , \quad \frac{0.35 * 400}{420}\right\} = 0.34\frac{mm^2}{mm} = 340\frac{mm^2}{m}$$

$$s_{max} = \min\{16d_b\,, 48d_b\,, 500\,mm\}$$

$$s_{max} = \min\{16 * 16\,, 48 * 10\,, 500\,mm\}$$

$$s_{max} = 256 \rightarrow s = 28\,cm$$

$$\rightarrow \boldsymbol{USE\ \emptyset 10@280mm}$$

25.7.2 *Ties*

25.7.2.1 Ties shall consist of a closed loop of deformed bar with spacing in accordance with (a) and (b):

(a) Clear spacing of at least $\mathbf{(4/3)}d_{agg}$
(b) Center-to-center spacing shall not exceed the least of $\mathbf{16}d_b$ of longitudinal bar, $\mathbf{48}d_b$ of tie bar, and smallest dimension of member

25.7.2.2 Diameter of tie bar shall be at least (a) or (b):

(a) No. 3 enclosing No. 10 or smaller longitudinal bars
(b) No. 4 enclosing No. 11 or larger longitudinal bars or bundled longitudinal bars

18.4.3.2 Columns shall be spirally reinforced in accordance with Chapter 10 or shall be in accordance with 18.4.3.3 through 18.4.3.5. Provision 18.4.3.6 shall apply to all columns supporting discontinuous stiff members.

18.4.3.3 At both ends of the column, hoops shall be provided at spacing s_o over a length ℓ_o measured from the joint face. Spacing s_o shall not exceed the smallest of (a) through (d):

(a) 8 times the diameter of the smallest longitudinal bar enclosed
(b) 24 times the diameter of the hoop bar
(c) One-half of the smallest cross-sectional dimension of the column
(d) 12 in.

Length ℓ_o shall not be less than the greatest of (e), (f), and (g):

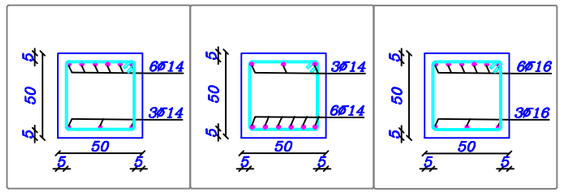
(e) One-sixth of the clear span of the column
(f) Maximum cross-sectional dimension of the column
(g) 18 in.

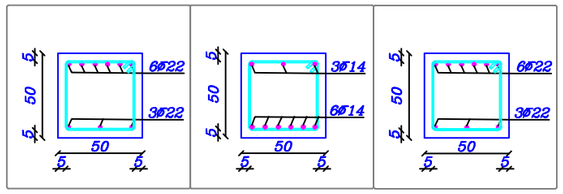
$$s_{0,max} = \min\left\{8\emptyset_l\,, 24\emptyset_t\,, \frac{500}{2}\,, 300\,mm\right\}$$

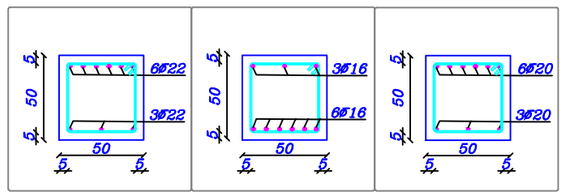
$$s_{0,max} = \min\{8 * 16, 24 * 10\,, 250\,, 300\} = 128\,mm$$

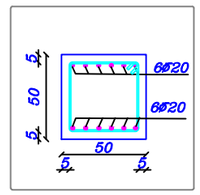
$$l_0 = \min\left\{\frac{3350}{6}\,, 500\,, 457\right\} = 457\,mm$$

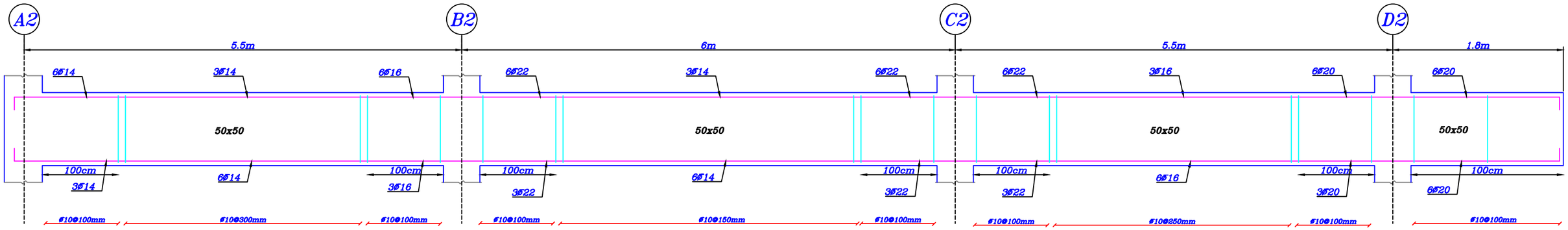
USE* Ø10@120 *mm* *in the first* 500 *mm* *of both ends of the column



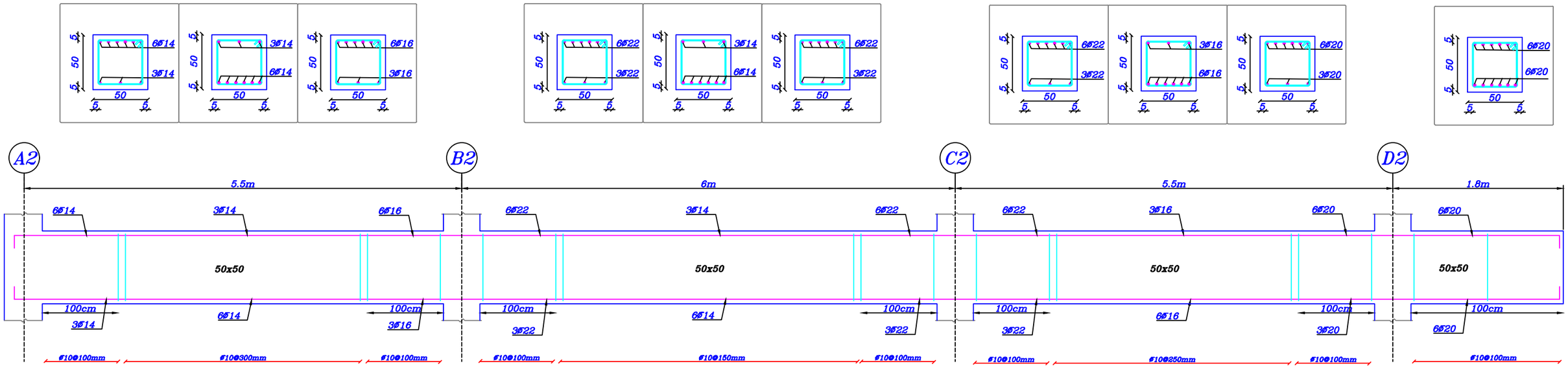




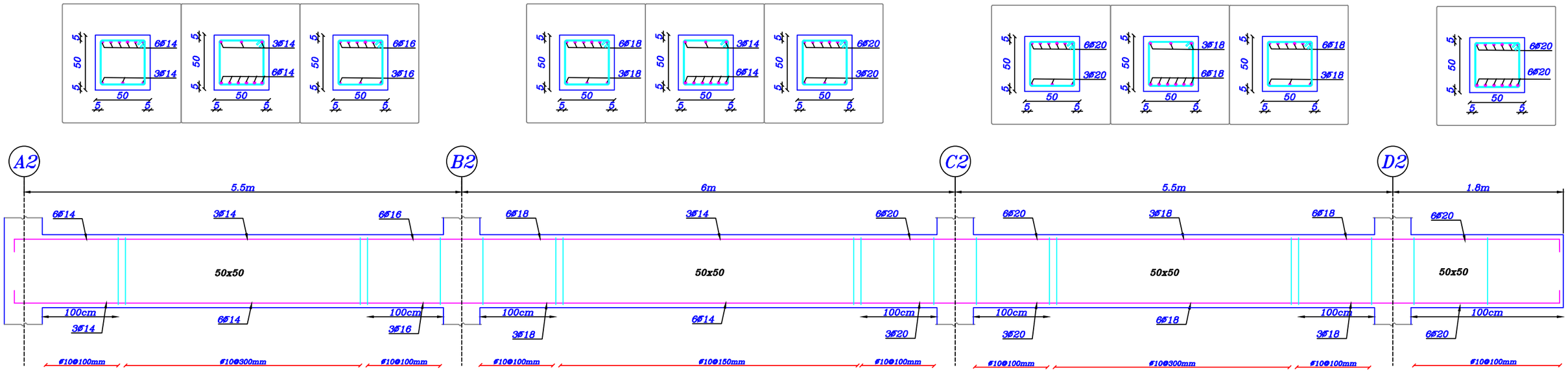




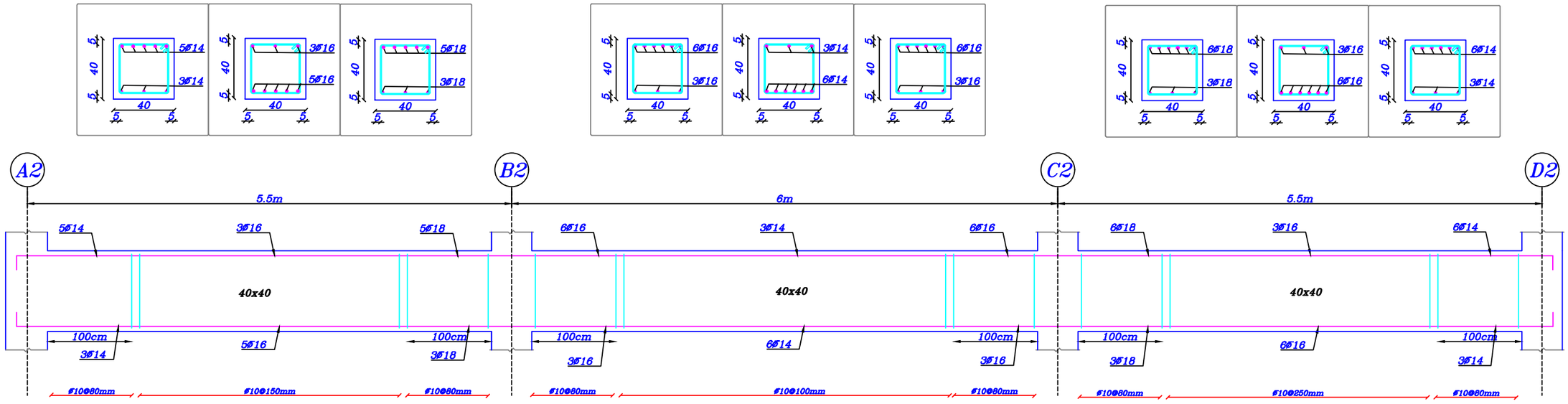
Beam: Axis 2 - Story 1



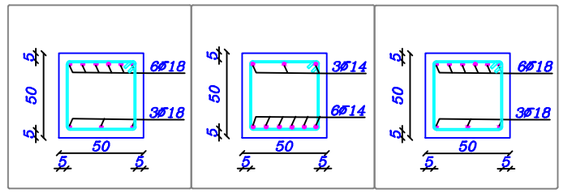
Beam: Axis 2 - Story 2

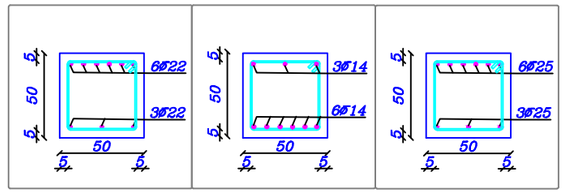


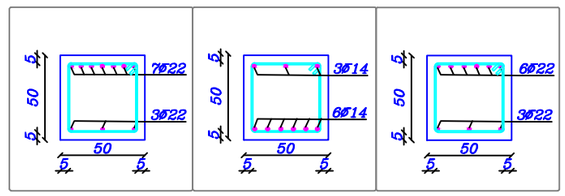
Beam: Axis 2 - Story 3

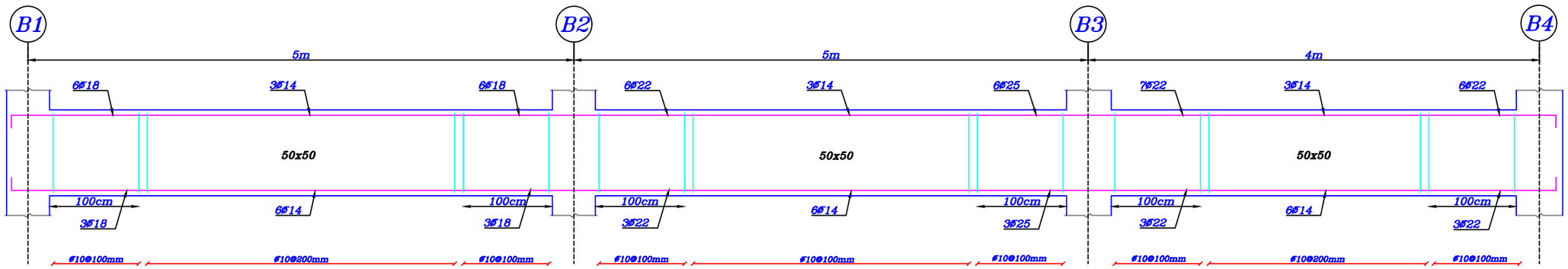


Beam: Axis 2 - Roof

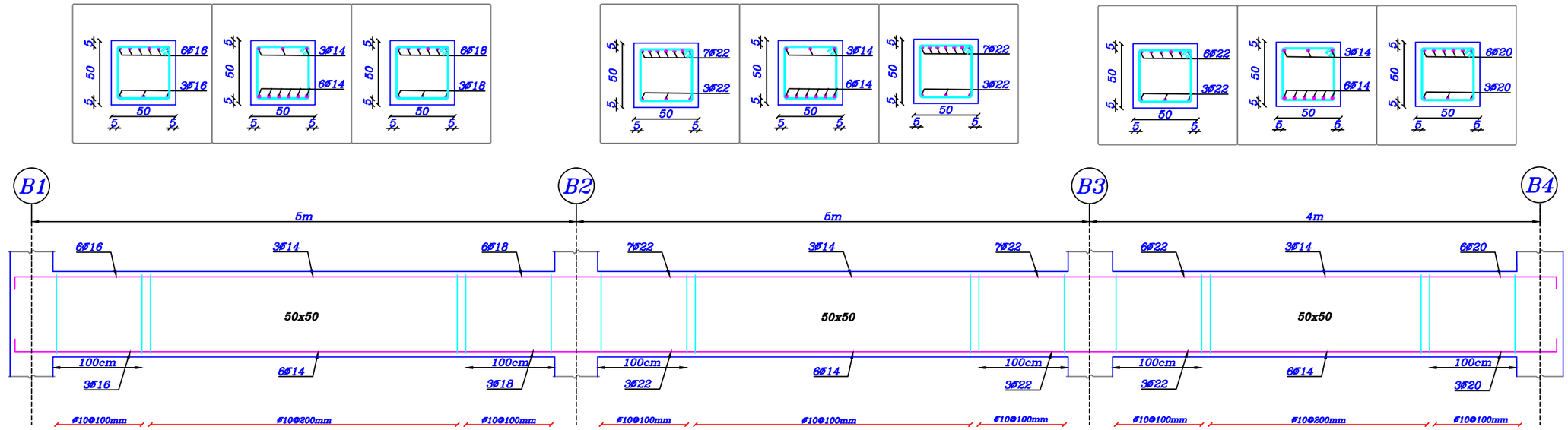




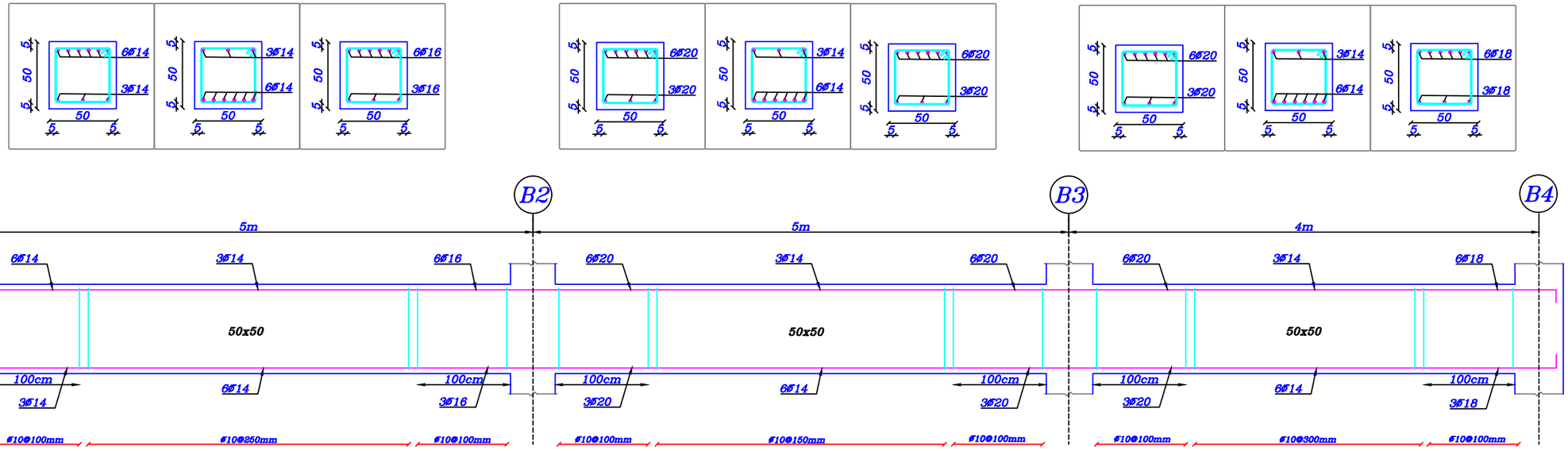




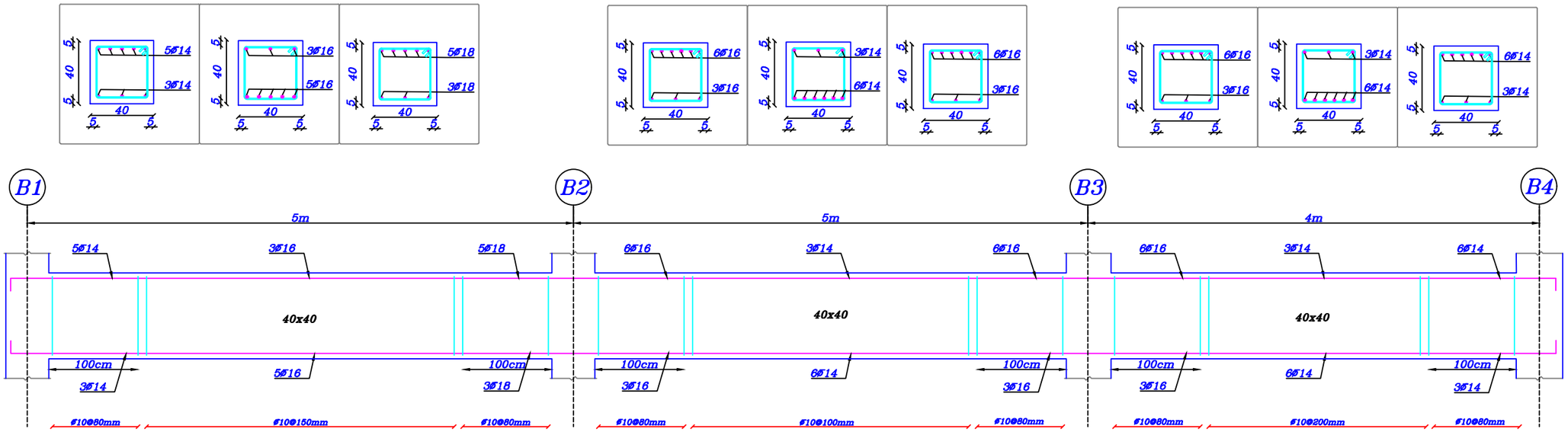
Beam: Axis B - Story 1



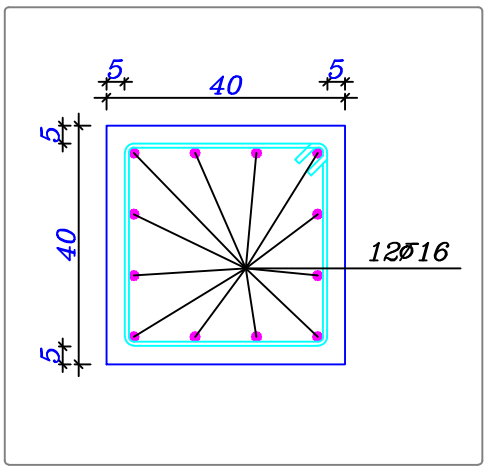
Beam: Axis B - Story 2



Beam: Axis B - Story 3



Beam: Axis B - Roof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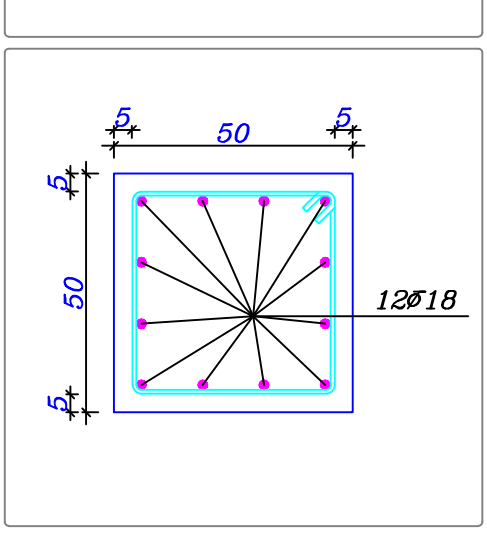
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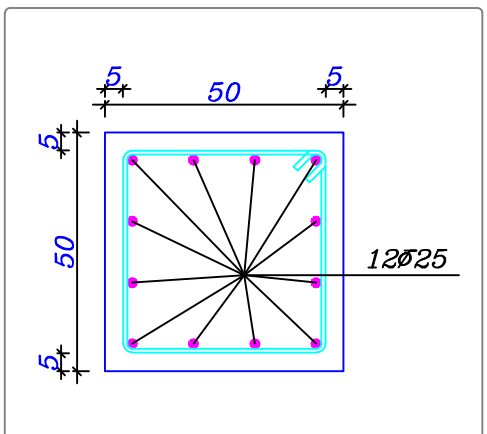
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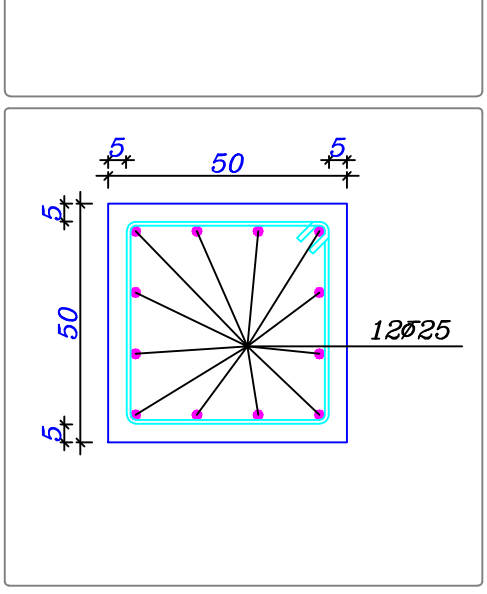
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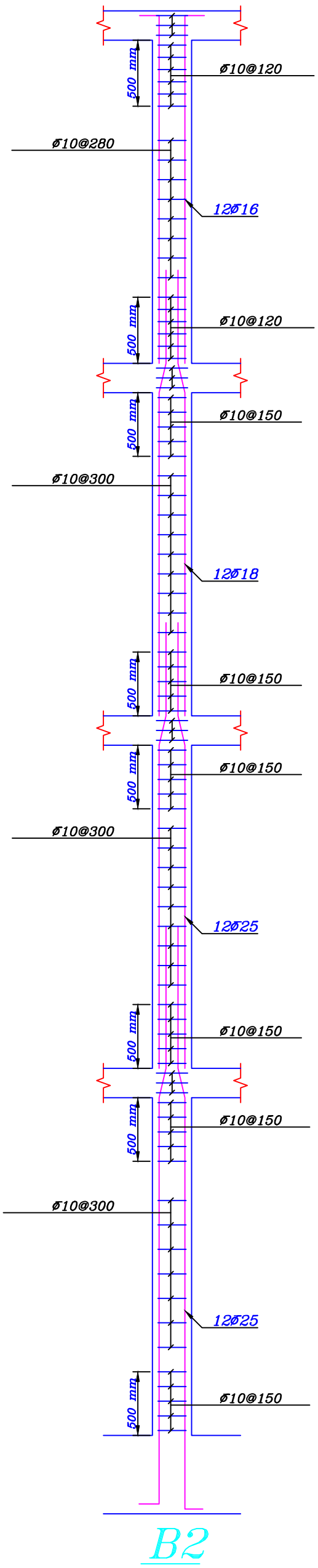
B2


500 mm
Ø10@120
Ø10@280
12Ø16
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Ø10@120
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Ø10@150

B2