5.3 ANALYSIS DATA

TABLE: Frame Loads - Distributed								
Frame	**LoadCase**	**CoordSys**	**Type**	**Dir**	**FOverLA**	**FOverLB**	**MOverLA**	**MOverLB**
Text	Text	Text	Text	Text	KN/m	KN/m	KN-m/m	KN-m/m
DECK11	UDL1201	GLOBAL	Force	Gravity	88.59	88.59		
DECK11	UDL1202	GLOBAL	Force	Gravity	88.59	88.59		
DECK11	UDL11	GLOBAL	Force	Gravity	101.25	101.25		
DECK11	UDL12	GLOBAL	Force	Gravity	101.25	101.25		
DECK11	UDL11	Local	Moment	1			-12.15	-12.15
DECK11	UDL12	Local	Moment	1			12.15	12.15
DECK11	UDL1201	Local	Moment	1			-10.631	-10.631
DECK11	UDL1202	Local	Moment	1			10.631	10.631
DECK11	BRAKING1	Local	Force	1	5.06	5.06		
DECK11	BRAKING1	Local	Moment	3			-10.702	-10.702
DECK11	BRAKING2	Local	Force	1	-5.06	-5.06		
DECK11	BRAKING2	Local	Moment	3			10.702	10.702
DECK11	WIND1	Local	Force	3	-2.7	-2.7		
DECK11	WIND2	Local	Force	3	2.7	2.7		
DECK11	WIND3	Local	Force	3	-1.88	-1.88		
DECK11	WIND4	Local	Force	3	1.88	1.88		
DECK11	SUPERDEAD	GLOBAL	Force	Gravity	30.95	30.95		
DECK11	PED1	GLOBAL	Force	Gravity	3.33	3.33		
DECK11	PADALL	GLOBAL	Force	Gravity	3.33	3.33		
DECK21	UDL1201	GLOBAL	Force	Gravity	88.59	88.59		
DECK21	UDL1202	GLOBAL	Force	Gravity	88.59	88.59		
DECK21	UDL2302	GLOBAL	Force	Gravity	88.59	88.59		
DECK21	UDL21	GLOBAL	Force	Gravity	101.25	101.25		
DECK21	UDL22	GLOBAL	Force	Gravity	101.25	101.25		
DECK21	UDL21	Local	Moment	1			-12.15	-12.15
DECK21	UDL22	Local	Moment	1			12.15	12.15
DECK21	UDL1201	Local	Moment	1			-10.631	-10.631
DECK21	UDL2301	Local	Moment	1			-10.631	-10.631
DECK21	UDL2301	GLOBAL	Force	Gravity	88.59	88.59		
DECK21	UDL1202	Local	Moment	1			10.631	10.631
DECK21	UDL2302	Local	Moment	1			10.631	10.631
DECK21	BRAKING1	Local	Force	1	5.06	5.06		
DECK21	BRAKING1	Local	Moment	3			-10.702	-10.702
DECK21	BRAKING2	Local	Force	1	-5.06	-5.06		
DECK21	BRAKING2	Local	Moment	3			10.702	10.702
DECK21	WIND1	Local	Force	3	-2.7	-2.7		
DECK21	WIND2	Local	Force	3	2.7	2.7		
DECK21	WIND3	Local	Force	3	-1.88	-1.88		
DECK21	WIND4	Local	Force	3	1.88	1.88		
DECK21	SUPERDEAD	GLOBAL	Force	Gravity	30.95	30.95		
DECK21	PED2	GLOBAL	Force	Gravity	3.33	3.33		
DECK21	PADALL	GLOBAL	Force	Gravity	3.33	3.33		
DECK31	UDL2302	GLOBAL	Force	Gravity	88.59	88.59		
DECK31	UDL31	GLOBAL	Force	Gravity	101.25	101.25		
DECK31	UDL32	GLOBAL	Force	Gravity	101.25	101.25		
DECK31	UDL31	Local	Moment	1			-12.15	-12.15
DECK31	UDL32	Local	Moment	1			12.15	12.15
DECK31	UDL2302	Local	Moment	1			10.631	10.631
DECK31	UDL2301	GLOBAL	Force	Gravity	88.59	88.59		
DECK31	UDL2301	Local	Moment	1			-10.631	-10.631
DECK31	UDL3401	GLOBAL	Force	Gravity	84.38	84.38		
DECK31	UDL3401	Local	Moment	1			-10.125	-10.125
DECK31	UDL3402	GLOBAL	Force	Gravity	84.38	84.38		
DECK31	UDL3402	Local	Moment	1			10.125	10.125
DECK31	UHL31	GLOBAL	Force	Gravity	49.5	49.5		
DECK31	UHL32	GLOBAL	Force	Gravity	49.5	49.5		
DECK31	UHL31	Local	Moment	1			-148.5	-148.5
DECK31	UHL32	Local	Moment	1			148.5	148.5
DECK31	UHL3401	GLOBAL	Force	Gravity	41.25	41.25		

TABLE: Frame Loads - Distributed								
Frame	**LoadCase**	**CoordSys**	**Type**	**Dir**	**FOverLA**	**FOverLB**	**MOverLA**	**MOverLB**
Text	Text	Text	Text	Text	KN/m	KN/m	KN-m/m	KN-m/m
DECK31	UHL3402	GLOBAL	Force	Gravity	41.25	41.25		
DECK31	UHL3401	Local	Moment	1			-123.75	-123.75
DECK31	UHL3402	Local	Moment	1			123.75	123.75
DECK31	BRAKING1	Local	Force	1	5.06	5.06		
DECK31	BRAKING1	Local	Moment	3			-10.702	-10.702
DECK31	BRAKING2	Local	Force	1	-5.06	-5.06		
DECK31	BRAKING2	Local	Moment	3			10.702	10.702
DECK31	WIND1	Local	Force	3	-2.7	-2.7		
DECK31	WIND2	Local	Force	3	2.7	2.7		
DECK31	WIND3	Local	Force	3	-1.88	-1.88		
DECK31	WIND4	Local	Force	3	1.88	1.88		
DECK31	SUPERDEAD	GLOBAL	Force	Gravity	30.95	30.95		
DECK31	PED3	GLOBAL	Force	Gravity	3.33	3.33		
DECK31	PADALL	GLOBAL	Force	Gravity	3.33	3.33		
DECK41	UDL41	GLOBAL	Force	Gravity	101.25	101.25		
DECK41	UDL42	GLOBAL	Force	Gravity	101.25	101.25		
DECK41	UDL4502	GLOBAL	Force	Gravity	77.75	77.75		
DECK41	UDL41	Local	Moment	1			-12.15	-12.15
DECK41	UDL42	Local	Moment	1			12.15	12.15
DECK41	UDL3401	GLOBAL	Force	Gravity	84.38	84.38		
DECK41	UDL3401	Local	Moment	1			-10.125	-10.125
DECK41	UDL4501	GLOBAL	Force	Gravity	77.75	77.75		
DECK41	UDL4501	Local	Moment	1			-9.33	-9.33
DECK41	UDL4502	Local	Moment	1			9.33	9.33
DECK41	UDL3402	GLOBAL	Force	Gravity	84.38	84.38		
DECK41	UDL3402	Local	Moment	1			10.125	10.125
DECK41	UHL41	GLOBAL	Force	Gravity	49.5	49.5		
DECK41	UHL42	GLOBAL	Force	Gravity	49.5	49.5		
DECK41	UHL41	Local	Moment	1			-148.5	-148.5
DECK41	UHL42	Local	Moment	1			148.5	148.5
DECK41	UHL3401	GLOBAL	Force	Gravity	41.25	41.25		
DECK41	UHL3402	GLOBAL	Force	Gravity	41.25	41.25		
DECK41	UHL4501	GLOBAL	Force	Gravity	38.01	38.01		
DECK41	UHL4501	Local	Moment	1			-114.03	-114.03
DECK41	UHL4502	Local	Moment	1			114.03	114.03
DECK41	PED4	GLOBAL	Force	Gravity	2.63	2.63		
DECK41	UHL3401	Local	Moment	1			-123.75	-123.75
DECK41	UHL3402	Local	Moment	1			123.75	123.75
DECK41	UHL4502	GLOBAL	Force	Gravity	38.01	38.01		
DECK41	BRAKING1	Local	Force	1	5.06	5.06		
DECK41	BRAKING1	Local	Moment	3			-10.702	-10.702
DECK41	BRAKING2	Local	Force	1	-5.06	-5.06		
DECK41	BRAKING2	Local	Moment	3			10.702	10.702
DECK41	WIND1	Local	Force	3	-2.7	-2.7		
DECK41	WIND2	Local	Force	3	2.7	2.7		
DECK41	WIND3	Local	Force	3	-1.88	-1.88		
DECK41	WIND4	Local	Force	3	1.88	1.88		
DECK41	SUPERDEAD	GLOBAL	Force	Gravity	30.95	30.95		
DECK41	PADALL	GLOBAL	Force	Gravity	2.63	2.63		
DECK51	UDL4502	GLOBAL	Force	Gravity	77.75	77.75		
DECK51	UDL5601	GLOBAL	Force	Gravity	77.75	77.75		
DECK51	UDL5602	GLOBAL	Force	Gravity	77.75	77.75		
DECK51	UDL4501	GLOBAL	Force	Gravity	77.75	77.75		
DECK51	UDL4501	Local	Moment	1			-9.33	-9.33
DECK51	UDL4502	Local	Moment	1			9.33	9.33
DECK51	UDL5601	Local	Moment	1			-9.33	-9.33
DECK51	UDL5602	Local	Moment	1			9.33	9.33
DECK51	UHL4501	GLOBAL	Force	Gravity	38.01	38.01		
DECK51	UHL5601	GLOBAL	Force	Gravity	38.01	38.01		

TABLE: Frame Loads - Distributed								
Frame	LoadCase	CoordSys	Type	Dir	FOverLA	FOverLB	MOverLA	MOverLB
Text	Text	Text	Text	Text	KN/m	KN/m	KN-m/m	KN-m/m
DECK51	UHL5602	GLOBAL	Force	Gravity	38.01	38.01		
DECK51	UHL4501	Local	Moment	1			-114.03	-114.03
DECK51	UHL5601	Local	Moment	1			-114.03	-114.03
DECK51	UHL4502	Local	Moment	1			114.03	114.03
DECK51	UHL5602	Local	Moment	1			114.03	114.03
DECK51	PED5	GLOBAL	Force	Gravity	2.63	2.63		
DECK51	UHL4502	GLOBAL	Force	Gravity	38.01	38.01		
DECK51	BRAKING1	Local	Force	1	5.06	5.06		
DECK51	BRAKING1	Local	Moment	3			-10.702	-10.702
DECK51	BRAKING2	Local	Force	1	-5.06	-5.06		
DECK51	BRAKING2	Local	Moment	3			10.702	10.702
DECK51	WIND1	Local	Force	3	-2.7	-2.7		
DECK51	WIND2	Local	Force	3	2.7	2.7		
DECK51	WIND3	Local	Force	3	-1.88	-1.88		
DECK51	WIND4	Local	Force	3	1.88	1.88		
DECK51	SUPERDEAD	GLOBAL	Force	Gravity	30.95	30.95		
DECK51	PADALL	GLOBAL	Force	Gravity	2.63	2.63		
DECK51	UDL51	GLOBAL	Force	Gravity	99.62	99.62		
DECK51	UDL52	GLOBAL	Force	Gravity	99.62	99.62		
DECK51	UDL51	Local	Moment	1			-11.9543	-11.9543
DECK51	UDL52	Local	Moment	1			11.9543	11.9543
DECK51	UHL51	GLOBAL	Force	Gravity	48.72	48.72		
DECK51	UHL52	GLOBAL	Force	Gravity	48.72	48.72		
DECK51	UHL51	Local	Moment	1			-146.106	-146.106
DECK51	UHL52	Local	Moment	1			146.106	146.106
DECK61	UDL61	GLOBAL	Force	Gravity	101.25	101.25		
DECK61	UDL62	GLOBAL	Force	Gravity	101.25	101.25		
DECK61	UDL5601	GLOBAL	Force	Gravity	77.75	77.75		
DECK61	UDL5602	GLOBAL	Force	Gravity	77.75	77.75		
DECK61	UDL61	Local	Moment	1			-12.15	-12.15
DECK61	UDL62	Local	Moment	1			12.15	12.15
DECK61	UDL6701	Local	Moment	1			-10.125	-10.125
DECK61	UDL6701	GLOBAL	Force	Gravity	84.38	84.38		
DECK61	UDL6702	GLOBAL	Force	Gravity	84.38	84.38		
DECK61	UDL6702	Local	Moment	1			10.125	10.125
DECK61	UDL5601	Local	Moment	1			-9.33	-9.33
DECK61	UDL5602	Local	Moment	1			9.33	9.33
DECK61	UHL61	GLOBAL	Force	Gravity	49.5	49.5		
DECK61	UHL62	GLOBAL	Force	Gravity	49.5	49.5		
DECK61	UHL61	Local	Moment	1			-148.5	-148.5
DECK61	UHL62	Local	Moment	1			148.5	148.5
DECK61	UHL5601	GLOBAL	Force	Gravity	38.01	38.01		
DECK61	UHL5602	GLOBAL	Force	Gravity	38.01	38.01		
DECK61	UHL5601	Local	Moment	1			-114.03	-114.03
DECK61	UHL5602	Local	Moment	1			114.03	114.03
DECK61	PED6	GLOBAL	Force	Gravity	2.63	2.63		
DECK61	BRAKING1	Local	Force	1	5.06	5.06		
DECK61	BRAKING1	Local	Moment	3			-10.702	-10.702
DECK61	BRAKING2	Local	Force	1	-5.06	-5.06		
DECK61	BRAKING2	Local	Moment	3			10.702	10.702
DECK61	WIND1	Local	Force	3	-2.7	-2.7		
DECK61	WIND2	Local	Force	3	2.7	2.7		
DECK61	WIND3	Local	Force	3	-1.88	-1.88		
DECK61	WIND4	Local	Force	3	1.88	1.88		
DECK61	SUPERDEAD	GLOBAL	Force	Gravity	30.95	30.95		
DECK61	PADALL	GLOBAL	Force	Gravity	2.63	2.63		
DECK71	UDL72	GLOBAL	Force	Gravity	101.25	101.25		
DECK71	UDL7801	GLOBAL	Force	Gravity	88.59	88.59		
DECK71	UDL7802	GLOBAL	Force	Gravity	88.59	88.59		

TABLE: Frame Loads - Distributed								
Frame	LoadCase	CoordSys	Type	Dir	FOverLA	FOverLB	MOverLA	MOverLB
Text	Text	Text	Text	Text	KN/m	KN/m	KN-m/m	KN-m/m
DECK71	UDL72	Local	Moment	1			12.15	12.15
DECK71	UDL7801	Local	Moment	1			-10.631	-10.631
DECK71	UDL7802	Local	Moment	1			10.631	10.631
DECK71	UDL6701	Local	Moment	1			-10.125	-10.125
DECK71	UDL6701	GLOBAL	Force	Gravity	84.38	84.38		
DECK71	UDL6702	GLOBAL	Force	Gravity	84.38	84.38		
DECK71	UDL6702	Local	Moment	1			10.125	10.125
DECK71	UDL71	GLOBAL	Force	Gravity	101.25	101.25		
DECK71	UDL71	Local	Moment	1			-12.15	-12.15
DECK71	PED6	GLOBAL	Force	Gravity	2.63	2.63		
DECK71	BRAKING1	Local	Force	1	5.06	5.06		
DECK71	BRAKING1	Local	Moment	3			-10.702	-10.702
DECK71	BRAKING2	Local	Force	1	-5.06	-5.06		
DECK71	BRAKING2	Local	Moment	3			10.702	10.702
DECK71	WIND1	Local	Force	3	-2.7	-2.7		
DECK71	WIND2	Local	Force	3	2.7	2.7		
DECK71	WIND3	Local	Force	3	-1.88	-1.88		
DECK71	WIND4	Local	Force	3	1.88	1.88		
DECK71	SUPERDEAD	GLOBAL	Force	Gravity	30.95	30.95		
DECK71	PADALL	GLOBAL	Force	Gravity	2.63	2.63		
DECK71	PED7	GLOBAL	Force	Gravity	2.67	2.67		
DECK81	UDL82	GLOBAL	Force	Gravity	101.25	101.25		
DECK81	UDL7801	GLOBAL	Force	Gravity	88.59	88.59		
DECK81	UDL7802	GLOBAL	Force	Gravity	88.59	88.59		
DECK81	UDL8902	GLOBAL	Force	Gravity	88.59	88.59		
DECK81	UDL81	Local	Moment	1			-12.15	-12.15
DECK81	UDL82	Local	Moment	1			12.15	12.15
DECK81	UDL7801	Local	Moment	1			-10.631	-10.631
DECK81	UDL8901	Local	Moment	1			-10.631	-10.631
DECK81	UDL8901	GLOBAL	Force	Gravity	88.59	88.59		
DECK81	UDL7802	Local	Moment	1			10.631	10.631
DECK81	UDL8902	Local	Moment	1			10.631	10.631
DECK81	UDL81	GLOBAL	Force	Gravity	101.25	101.25		
DECK81	BRAKING1	Local	Force	1	5.06	5.06		
DECK81	BRAKING1	Local	Moment	3			-10.702	-10.702
DECK81	BRAKING2	Local	Force	1	-5.06	-5.06		
DECK81	BRAKING2	Local	Moment	3			10.702	10.702
DECK81	WIND1	Local	Force	3	-2.7	-2.7		
DECK81	WIND2	Local	Force	3	2.7	2.7		
DECK81	WIND3	Local	Force	3	-1.88	-1.88		
DECK81	WIND4	Local	Force	3	1.88	1.88		
DECK81	SUPERDEAD	GLOBAL	Force	Gravity	30.95	30.95		
DECK81	PED8	GLOBAL	Force	Gravity	2.67	2.67		
DECK81	PADALL	GLOBAL	Force	Gravity	2.67	2.67		
DECK91	UDL91	GLOBAL	Force	Gravity	101.25	101.25		
DECK91	UDL92	GLOBAL	Force	Gravity	101.25	101.25		
DECK91	UDL8902	GLOBAL	Force	Gravity	88.59	88.59		
DECK91	UDL91001	GLOBAL	Force	Gravity	88.59	88.59		
DECK91	UDL91002	GLOBAL	Force	Gravity	88.59	88.59		
DECK91	UDL91	Local	Moment	1			-12.15	-12.15
DECK91	UDL92	Local	Moment	1			12.15	12.15
DECK91	UDL8901	Local	Moment	1			-10.631	-10.631
DECK91	UDL8901	GLOBAL	Force	Gravity	88.59	88.59		
DECK91	UDL91001	Local	Moment	1			-10.631	-10.631
DECK91	UDL8902	Local	Moment	1			10.631	10.631
DECK91	UDL91002	Local	Moment	1			10.631	10.631
DECK91	BRAKING1	Local	Force	1	5.06	5.06		
DECK91	BRAKING1	Local	Moment	3			-10.702	-10.702
DECK91	BRAKING2	Local	Force	1	-5.06	-5.06		

TABLE: Frame Loads - Distributed								
Frame	**LoadCase**	**CoordSys**	**Type**	**Dir**	**FOverLA**	**FOverLB**	**MOverLA**	**MOverLB**
Text	Text	Text	Text	Text	KN/m	KN/m	KN-m/m	KN-m/m
DECK91	BRAKING2	Local	Moment	3			10.702	10.702
DECK91	WIND1	Local	Force	3	-2.7	-2.7		
DECK91	WIND2	Local	Force	3	2.7	2.7		
DECK91	WIND3	Local	Force	3	-1.88	-1.88		
DECK91	WIND4	Local	Force	3	1.88	1.88		
DECK91	SUPERDEAD	GLOBAL	Force	Gravity	30.95	30.95		
DECK91	PED9	GLOBAL	Force	Gravity	2.67	2.67		
DECK91	PADALL	GLOBAL	Force	Gravity	2.67	2.67		
DECK91	CFUGAL1DE(	Local	Moment	1			-20.52	-20.52
DECK91	CFUGAL1DE(	Local	Force	3	-9.75	-9.75		
DECK101	UDL101	GLOBAL	Force	Gravity	101.25	101.25		
DECK101	UDL102	GLOBAL	Force	Gravity	101.25	101.25		
DECK101	UDL91001	GLOBAL	Force	Gravity	88.59	88.59		
DECK101	UDL91002	GLOBAL	Force	Gravity	88.59	88.59		
DECK101	UDL101	Local	Moment	1			-12.15	-12.15
DECK101	UDL102	Local	Moment	1			12.15	12.15
DECK101	UDL91001	Local	Moment	1			-10.631	-10.631
DECK101	UDL91002	Local	Moment	1			10.631	10.631
DECK101	BRAKING1	Local	Force	1	5.06	5.06		
DECK101	BRAKING1	Local	Moment	3			-10.702	-10.702
DECK101	BRAKING2	Local	Force	1	-5.06	-5.06		
DECK101	BRAKING2	Local	Moment	3			10.702	10.702
DECK101	WIND1	Local	Force	3	-2.7	-2.7		
DECK101	WIND2	Local	Force	3	2.7	2.7		
DECK101	WIND3	Local	Force	3	-1.88	-1.88		
DECK101	WIND4	Local	Force	3	1.88	1.88		
DECK101	SUPERDEAD	GLOBAL	Force	Gravity	30.95	30.95		
DECK101	PED10	GLOBAL	Force	Gravity	2.67	2.67		
DECK101	PADALL	GLOBAL	Force	Gravity	2.67	2.67		
DECK101	CFUGAL1DE(	Local	Force	3	-18.5	-18.5		
DECK101	CFUGAL1DE(	Local	Moment	1			-39.13	-39.13

TABLE: Analysis Case Definitions				
Case	Type	InitialCond	ModalCase	RunCase
Text	Text	Text	Text	Yes/No
DEAD	NonStatic	Zero		Yes
MODAL	LinModal	20EQY		Yes
SUPERDEAD	NonStatic	Zero		No
DIFFSETA1	NonStatic	Zero		No
DIFFSETP1	NonStatic	Zero		No
DIFFSETP2	NonStatic	Zero		No
DIFFSETP3	NonStatic	Zero		No
DIFFSETP4	NonStatic	Zero		No
DIFFSETP5	NonStatic	Zero		No
DIFFSETP6	NonStatic	Zero		No
DIFFSETP7	NonStatic	Zero		No
DIFFSETP8	NonStatic	Zero		No
DIFFSETP9	NonStatic	Zero		No
DIFFSETA2	NonStatic	Zero		No
TRUCK11	LinMoving	Zero		No
TRUCK12	LinMoving	Zero		No
TRUCK21	LinMoving	Zero		No
TRUCK22	LinMoving	Zero		No
KEL1	LinMoving	Zero		No
KEL2	LinMoving	Zero		No
TRUCK51H	LinMoving	Zero		No
TRUCK52H	LinMoving	Zero		No
TRUCK61H	LinMoving	Zero		No
TRUCK62H	LinMoving	Zero		No
KELHALF1	LinMoving	Zero		No
KELHALF2	LinMoving	Zero		No
UDL11	LinStatic	Zero		No
UDL12	LinStatic	Zero		No
UDL21	LinStatic	Zero		No
UDL22	LinStatic	Zero		No
UDL31	LinStatic	Zero		No
UDL32	LinStatic	Zero		No
UDL41	LinStatic	Zero		No
UDL42	LinStatic	Zero		No
UDL51	LinStatic	Zero		No
UDL52	LinStatic	Zero		No
UDL61	LinStatic	Zero		No
UDL62	LinStatic	Zero		No
UDL71	LinStatic	Zero		No
UDL72	LinStatic	Zero		No
UDL81	LinStatic	Zero		No
UDL82	LinStatic	Zero		No
UDL91	LinStatic	Zero		No
UDL92	LinStatic	Zero		No
UDL101	LinStatic	Zero		No
UDL102	LinStatic	Zero		No
UDL1201	LinStatic	Zero		No
UDL1202	LinStatic	Zero		No
UDL2301	LinStatic	Zero		No
UDL2302	LinStatic	Zero		No
UDL3401	LinStatic	Zero		No
UDL3402	LinStatic	Zero		No
UDL4501	LinStatic	Zero		No
UDL4502	LinStatic	Zero		No
UDL5601	LinStatic	Zero		No
UDL5602	LinStatic	Zero		No

TABLE: Analysis Case Definitions				
Case	Type	InitialCond	ModalCase	RunCase
Text	Text	Text	Text	Yes/No
UDL6701	LinStatic	Zero		No
UDL6702	LinStatic	Zero		No
UDL7801	LinStatic	Zero		No
UDL7802	LinStatic	Zero		No
UDL8901	LinStatic	Zero		No
UDL8902	LinStatic	Zero		No
UDL91001	LinStatic	Zero		No
UDL91002	LinStatic	Zero		No
UHL31	LinStatic	Zero		No
UHL32	LinStatic	Zero		No
UHL41	LinStatic	Zero		No
UHL42	LinStatic	Zero		No
UHL51	LinStatic	Zero		No
UHL52	LinStatic	Zero		No
UHL61	LinStatic	Zero		No
UHL62	LinStatic	Zero		No
UHL3401	LinStatic	Zero		No
UHL3402	LinStatic	Zero		No
UHL4501	LinStatic	Zero		No
UHL4502	LinStatic	Zero		No
UHL5601	LinStatic	Zero		No
UHL5602	LinStatic	Zero		No
20EQX	NonStatic	Zero		Yes
20EQY	NonStatic	Zero		Yes
EQX1	LinRespSpec		MODAL	Yes
EQX2	LinRespSpec		MODAL	Yes
EQX3	LinRespSpec		MODAL	Yes
EQY1	LinRespSpec		MODAL	Yes
EQY2	LinRespSpec		MODAL	Yes
EQY3	LinRespSpec		MODAL	Yes
PED1	LinStatic	Zero		No
PED2	LinStatic	Zero		No
PED3	LinStatic	Zero		No
PED4	LinStatic	Zero		No
PED5	LinStatic	Zero		No
PED6	LinStatic	Zero		No
PED7	LinStatic	Zero		No
PED8	LinStatic	Zero		No
PED9	LinStatic	Zero		No
PED10	LinStatic	Zero		No
PADALL	LinStatic	Zero		No
BREAKING1	NonStatic	Zero		No
BREAKING2	NonStatic	Zero		No
CFUGAL1DEC	NonStatic	Zero		No
CFUGAL1DEC	NonStatic	Zero		No
TEMP1	NonStatic	Zero		No
TEMP2	NonStatic	Zero		No
WIND1	NonStatic	Zero		No
WIND2	NonStatic	Zero		No
WIND3	NonStatic	Zero		No
WIND4	NonStatic	Zero		No
SHCR	NonStatic	Zero		No
DEAD-COPIN(	NonStatic	Zero		No
EQX4	LinRespSpec		MODAL	No
EQY4	LinRespSpec		MODAL	No

TABLE: Case - Moving Load 1 - Lane Assignments						
Case	**AssignNum**	**VehClass**	**ScaleFactor**	**MinLoaded**	**MaxLoaded**	**NumLanes**
Text	Unitless	Text	Unitless	Unitless	Unitless	Unitless
TRUCK11	1	TRUCK1	1	1	1	1
TRUCK12	1	TRUCK2	1	1	1	1
TRUCK21	1	TRUCK1	1	1	1	1
TRUCK22	1	TRUCK2	1	1	1	1
KEL1	1	KEL	1	1	1	1
KEL2	1	KEL	1	1	1	1
TRUCK51H	1	TRUCK1	1	0	0	1
TRUCK52H	1	TRUCK2	1	0	0	1
TRUCK61H	1	TRUCK1	1	0	0	1
TRUCK62H	1	TRUCK2	1	0	0	1
KELHALF1	1	KELHALF	1	0	0	1
KELHALF2	1	KELHALF	1	0	0	1

TABLE: Combination Definitions				
ComboName	ComboType	CaseType	CaseName	ScaleFactor
Text	Text	Text	Text	Unitless
ENVDIFFSET	Envelope	NonLin Static	DIFFSETA1	1
ENVDIFFSET		NonLin Static	DIFFSETA2	1
ENVDIFFSET		NonLin Static	DIFFSETP1	1
ENVDIFFSET		NonLin Static	DIFFSETP2	1
ENVDIFFSET		NonLin Static	DIFFSETP3	1
ENVDIFFSET		NonLin Static	DIFFSETP4	1
ENVDIFFSET		NonLin Static	DIFFSETP5	1
ENVDIFFSET		NonLin Static	DIFFSETP6	1
ENVDIFFSET		NonLin Static	DIFFSETP7	1
ENVDIFFSET		NonLin Static	DIFFSETP8	1
ENVDIFFSET		NonLin Static	DIFFSETP9	1
COMBTRUCK	Envelope	Moving Load	TRUCK11	5.2
COMBTRUCK		Moving Load	TRUCK12	5.2
COMBTRUCK		Moving Load	TRUCK21	5.2
COMBTRUCK		Moving Load	TRUCK22	5.2
COMBTRUCKH	Envelope	Moving Load	TRUCK51H	2.6
COMBTRUCKH		Moving Load	TRUCK52H	2.6
COMBTRUCKH		Moving Load	TRUCK61H	2.6
COMBTRUCKH		Moving Load	TRUCK62H	2.6
FNDTRUCK	Envelope	Moving Load	TRUCK11	4
FNDTRUCK		Moving Load	TRUCK12	4
FNDTRUCK		Moving Load	TRUCK21	4
FNDTRUCK		Moving Load	TRUCK22	4
FNDTRUCKH	Envelope	Moving Load	TRUCK51H	2
FNDTRUCKH		Moving Load	TRUCK52H	2
FNDTRUCKH		Moving Load	TRUCK61H	2
FNDTRUCKH		Moving Load	TRUCK62H	2
COMBUDL	Envelope	Linear Static	UDL101	1
COMBUDL		Linear Static	UDL102	1
COMBUDL		Linear Static	UDL11	1
COMBUDL		Linear Static	UDL7801	1
COMBUDL		Linear Static	UDL7802	1
COMBUDL		Linear Static	UDL12	1
COMBUDL		Linear Static	UDL1201	1
COMBUDL		Linear Static	UDL1202	1
COMBUDL		Linear Static	UDL2301	1
COMBUDL		Linear Static	UDL2302	1
COMBUDL		Linear Static	UDL3401	1
COMBUDL		Linear Static	UDL3402	1
COMBUDL		Linear Static	UDL4501	1
COMBUDL		Linear Static	UDL4502	1
COMBUDL		Linear Static	UDL5601	1
COMBUDL		Linear Static	UDL5602	1
COMBUDL		Linear Static	UDL6701	1
COMBUDL		Linear Static	UDL6702	1
COMBUDL		Linear Static	UDL8901	1
COMBUDL		Linear Static	UDL8902	1
COMBUDL		Linear Static	UDL91001	1
COMBUDL		Linear Static	UDL91002	1
COMBUDL		Linear Static	UDL21	1
COMBUDL		Linear Static	UDL22	1
COMBUDL		Linear Static	UDL31	1
COMBUDL		Linear Static	UDL32	1
COMBUDL		Linear Static	UDL41	1

TABLE: Combination Definitions				
ComboName	ComboType	CaseType	CaseName	ScaleFactor
Text	Text	Text	Text	Unitless
COMBUDL		Linear Static	UDL42	1
COMBUDL		Linear Static	UDL51	1
COMBUDL		Linear Static	UDL52	1
COMBUDL		Linear Static	UDL61	1
COMBUDL		Linear Static	UDL62	1
COMBUDL		Linear Static	UDL71	1
COMBUDL		Linear Static	UDL72	1
COMBUDL		Linear Static	UDL81	1
COMBUDL		Linear Static	UDL82	1
COMBUDL		Linear Static	UDL91	1
COMBUDL		Linear Static	UDL92	1
COMBUDLH	Envelope	Linear Static	UHL31	1
COMBUDLH		Linear Static	UHL32	1
COMBUDLH		Linear Static	UHL3401	1
COMBUDLH		Linear Static	UHL3402	1
COMBUDLH		Linear Static	UHL41	1
COMBUDLH		Linear Static	UHL42	1
COMBUDLH		Linear Static	UHL4501	1
COMBUDLH		Linear Static	UHL4502	1
COMBUDLH		Linear Static	UHL51	1
COMBUDLH		Linear Static	UHL52	1
COMBUDLH		Linear Static	UHL5601	1
COMBUDLH		Linear Static	UHL5602	1
COMBUDLH		Linear Static	UHL61	1
COMBUDLH		Linear Static	UHL62	1
COMBKEL	Envelope	Moving Load	KEL1	1
COMBKEL		Moving Load	KEL2	1
COMBKELH	Envelope	Moving Load	KELHALF1	1
COMBKELH		Moving Load	KELHALF2	1
COMBUDLKEL	Linear Add	Response Combo	COMBUDL	1
COMBUDLKEL		Response Combo	COMBKEL	1.4
COMBLIVE	Envelope	Response Combo	COMBTRUCK	1
COMBLIVE		Response Combo	COMBUDLKEL	1
COMBUDLKELH	Linear Add	Response Combo	COMBUDLH	1
COMBUDLKELH		Response Combo	COMBKELH	1.4
COMBLIVEH	Envelope	Response Combo	COMBUDLKELH	1
COMBLIVEH		Response Combo	COMBTRUCKH	1
FNDUDLKEL	Envelope	Response Combo	COMBUDL	1
FNDUDLKEL		Response Combo	COMBKEL	1
FNDHUDLKEL	Envelope	Response Combo	COMBUDLH	1
FNDHUDLKEL		Response Combo	COMBKELH	1
FNDLIVE	Envelope	Response Combo	FNDUDLKEL	1
FNDLIVE		Response Combo	FNDTRUCK	1
FNDLIVEH	Linear Add	Response Combo	FNDHUDLKEL	1
FNDLIVEH		Response Combo	FNDTRUCKH	1
COMBPED	Envelope	Linear Static	PED1	1
COMBPED		Linear Static	PED2	1
COMBPED		Linear Static	PED3	1
COMBPED		Linear Static	PED4	1
COMBPED		Linear Static	PED5	1
COMBPED		Linear Static	PED6	1
COMBPED		Linear Static	PED7	1
COMBPED		Linear Static	PED8	1
COMBPED		Linear Static	PED9	1

TABLE: Combination Definitions				
ComboName	ComboType	CaseType	CaseName	ScaleFactor
Text	Text	Text	Text	Unitless
COMBPED		Linear Static	PED10	1
COMBPED		Linear Static	PADALL	1
COMBRAKE	Envelope	NonLin Static	BREAKING1	1
COMBRAKE		NonLin Static	BREAKING2	1
COMBCFUGAL	Envelope	NonLin Static	CFUGAL1DECK1	1
COMBCFUGAL		NonLin Static	CFUGAL1DECK9	1
COMBTEMP	Envelope	NonLin Static	TEMP1	1
COMBTEMP		NonLin Static	TEMP2	1
COMBWINULS	Envelope	NonLin Static	WIND1	1
COMBWINULS		NonLin Static	WIND2	1
COMBWINSLS	Envelope	NonLin Static	WIND3	1
COMBWINSLS		NonLin Static	WIND4	1
COMBCOLLISON	Envelope			

TABLE: Function - Response Spectrum - User			
Name	**Period**	**Accel**	**FuncDamp**
Text	Sec	Unitless	Unitless
UNIFRS	0	1	0
UNIFRS	1	1	
Zone3MedUpper	0	9.81	0.05
Zone3MedUpper	0.1	9.81	
Zone3MedUpper	0.2	9.81	
Zone3MedUpper	0.3	9.81	
Zone3MedUpper	0.4	9.81	
Zone3MedUpper	0.5	8.9697	
Zone3MedUpper	0.6	7.9431	
Zone3MedUpper	0.7	7.1674	
Zone3MedUpper	0.8	6.5569	
Zone3MedUpper	0.9	6.0617	
Zone3MedUpper	1	5.6506	
Zone3MedUpper	1.2	5.0038	
Zone3MedUpper	1.4	4.5152	
Zone3MedUpper	1.6	4.1306	
Zone3MedUpper	1.8	3.8186	
Zone3MedUpper	2	3.5596	
Zone3MedUpper	2.5	3.0676	
Zone3MedUpper	3	2.7165	
Zone3MedUpper	3.5	2.4512	
Zone3MedUpper	4	2.2424	
Zone3MedUpper	4.5	2.0731	
Zone3MedUpper	5	1.9325	

TABLE: Lane Definition Data				
Lane	LaneFrom	Frame	Width	Offset
Text	Text	Text	m	m
LANE1	Frame	DECK11	0	-0.25
LANE1	Frame	DECK12	0	-0.25
LANE1	Frame	DECK13	0	-0.25
LANE1	Frame	DECK14	0	-0.25
LANE1	Frame	DECK21	0	-0.25
LANE1	Frame	DECK22	0	-0.25
LANE1	Frame	DECK23	0	-0.25
LANE1	Frame	DECK24	0	-0.25
LANE1	Frame	DECK31	0	-0.25
LANE1	Frame	DECK32	0	-0.25
LANE1	Frame	DECK33	0	-0.25
LANE1	Frame	DECK34	0	-0.25
LANE1	Frame	DECK41	0	-0.25
LANE1	Frame	DECK42	0	-0.25
LANE1	Frame	DECK43	0	-0.25
LANE1	Frame	DECK44	0	-0.25
LANE1	Frame	DECK51	0	-0.25
LANE1	Frame	DECK52	0	-0.25
LANE1	Frame	DECK53	0	-0.25
LANE1	Frame	DECK54	0	-0.25
LANE1	Frame	DECK61	0	-0.25
LANE1	Frame	DECK62	0	-0.25
LANE1	Frame	DECK63	0	-0.25
LANE1	Frame	DECK64	0	-0.25
LANE1	Frame	DECK71	0	-0.25
LANE1	Frame	DECK72	0	-0.25
LANE1	Frame	DECK73	0	-0.25
LANE1	Frame	DECK74	0	-0.25
LANE1	Frame	DECK81	0	-0.25
LANE1	Frame	DECK82	0	-0.25
LANE1	Frame	DECK83	0	-0.25
LANE1	Frame	DECK84	0	-0.25
LANE1	Frame	DECK91	0	-0.25
LANE1	Frame	DECK92	0	-0.25
LANE1	Frame	DECK93	0	-0.25
LANE1	Frame	DECK94	0	-0.25
LANE1	Frame	DECK101	0	-0.25
LANE1	Frame	DECK102	0	-0.25
LANE1	Frame	DECK103	0	-0.25
LANE1	Frame	DECK104	0	-0.25
LANE2	Frame	DECK11	0	0.25
LANE2	Frame	DECK12	0	0.25
LANE2	Frame	DECK13	0	0.25
LANE2	Frame	DECK14	0	0.25
LANE2	Frame	DECK21	0	0.25
LANE2	Frame	DECK22	0	0.25
LANE2	Frame	DECK23	0	0.25
LANE2	Frame	DECK24	0	0.25
LANE2	Frame	DECK31	0	0.25
LANE2	Frame	DECK32	0	0.25
LANE2	Frame	DECK33	0	0.25
LANE2	Frame	DECK34	0	0.25
LANE2	Frame	DECK41	0	0.25
LANE2	Frame	DECK42	0	0.25
LANE2	Frame	DECK43	0	0.25

TABLE: Lane Definition Data				
Lane	LaneFrom	Frame	Width	Offset
Text	Text	Text	m	m
LANE2	Frame	DECK44	0	0.25
LANE2	Frame	DECK51	0	0.25
LANE2	Frame	DECK52	0	0.25
LANE2	Frame	DECK53	0	0.25
LANE2	Frame	DECK54	0	0.25
LANE2	Frame	DECK61	0	0.25
LANE2	Frame	DECK62	0	0.25
LANE2	Frame	DECK63	0	0.25
LANE2	Frame	DECK64	0	0.25
LANE2	Frame	DECK71	0	0.25
LANE2	Frame	DECK72	0	0.25
LANE2	Frame	DECK73	0	0.25
LANE2	Frame	DECK74	0	0.25
LANE2	Frame	DECK81	0	0.25
LANE2	Frame	DECK82	0	0.25
LANE2	Frame	DECK83	0	0.25
LANE2	Frame	DECK84	0	0.25
LANE2	Frame	DECK91	0	0.25
LANE2	Frame	DECK92	0	0.25
LANE2	Frame	DECK93	0	0.25
LANE2	Frame	DECK94	0	0.25
LANE2	Frame	DECK101	0	0.25
LANE2	Frame	DECK102	0	0.25
LANE2	Frame	DECK103	0	0.25
LANE2	Frame	DECK104	0	0.25
LANE3	Frame	DECK11	0	-0.12
LANE3	Frame	DECK12	0	-0.12
LANE3	Frame	DECK13	0	-0.12
LANE3	Frame	DECK14	0	-0.12
LANE3	Frame	DECK21	0	-0.12
LANE3	Frame	DECK22	0	-0.12
LANE3	Frame	DECK23	0	-0.12
LANE3	Frame	DECK24	0	-0.12
LANE3	Frame	DECK31	0	-0.12
LANE3	Frame	DECK32	0	-0.12
LANE3	Frame	DECK33	0	-0.12
LANE3	Frame	DECK34	0	-0.12
LANE3	Frame	DECK41	0	-0.12
LANE3	Frame	DECK42	0	-0.12
LANE3	Frame	DECK43	0	-0.12
LANE3	Frame	DECK44	0	-0.12
LANE3	Frame	DECK51	0	-0.12
LANE3	Frame	DECK52	0	-0.12
LANE3	Frame	DECK53	0	-0.12
LANE3	Frame	DECK54	0	-0.12
LANE3	Frame	DECK61	0	-0.12
LANE3	Frame	DECK62	0	-0.12
LANE3	Frame	DECK63	0	-0.12
LANE3	Frame	DECK64	0	-0.12
LANE3	Frame	DECK71	0	-0.12
LANE3	Frame	DECK72	0	-0.12
LANE3	Frame	DECK73	0	-0.12
LANE3	Frame	DECK74	0	-0.12

TABLE: Lane Definition Data				
Lane	LaneFrom	Frame	Width	Offset
Text	Text	Text	m	m
LANE3	Frame	DECK81	0	-0.12
LANE3	Frame	DECK82	0	-0.12
LANE3	Frame	DECK83	0	-0.12
LANE3	Frame	DECK84	0	-0.12
LANE3	Frame	DECK91	0	-0.12
LANE3	Frame	DECK92	0	-0.12
LANE3	Frame	DECK93	0	-0.12
LANE3	Frame	DECK94	0	-0.12
LANE3	Frame	DECK101	0	-0.12
LANE3	Frame	DECK102	0	-0.12
LANE3	Frame	DECK103	0	-0.12
LANE3	Frame	DECK104	0	-0.12
LANE4	Frame	DECK11	0	0.12
LANE4	Frame	DECK12	0	0.12
LANE4	Frame	DECK13	0	0.12
LANE4	Frame	DECK14	0	0.12
LANE4	Frame	DECK21	0	0.12
LANE4	Frame	DECK22	0	0.12
LANE4	Frame	DECK23	0	0.12
LANE4	Frame	DECK24	0	0.12
LANE4	Frame	DECK31	0	0.12
LANE4	Frame	DECK32	0	0.12
LANE4	Frame	DECK33	0	0.12
LANE4	Frame	DECK34	0	0.12
LANE4	Frame	DECK41	0	0.12
LANE4	Frame	DECK42	0	0.12
LANE4	Frame	DECK43	0	0.12
LANE4	Frame	DECK44	0	0.12
LANE4	Frame	DECK51	0	0.12
LANE4	Frame	DECK52	0	0.12
LANE4	Frame	DECK53	0	0.12
LANE4	Frame	DECK54	0	0.12
LANE4	Frame	DECK61	0	0.12
LANE4	Frame	DECK62	0	0.12
LANE4	Frame	DECK63	0	0.12
LANE4	Frame	DECK64	0	0.12
LANE4	Frame	DECK71	0	0.12
LANE4	Frame	DECK72	0	0.12
LANE4	Frame	DECK73	0	0.12
LANE4	Frame	DECK74	0	0.12
LANE4	Frame	DECK81	0	0.12
LANE4	Frame	DECK82	0	0.12
LANE4	Frame	DECK83	0	0.12
LANE4	Frame	DECK84	0	0.12
LANE4	Frame	DECK91	0	0.12
LANE4	Frame	DECK92	0	0.12
LANE4	Frame	DECK93	0	0.12
LANE4	Frame	DECK94	0	0.12
LANE4	Frame	DECK101	0	0.12
LANE4	Frame	DECK102	0	0.12
LANE4	Frame	DECK103	0	0.12
LANE4	Frame	DECK104	0	0.12
LANE5	Frame	DECK11	0	-3
LANE5	Frame	DECK12	0	-3

TABLE: Lane Definition Data				
Lane	LaneFrom	Frame	Width	Offset
Text	Text	Text	m	m
LANE5	Frame	DECK13	0	-3
LANE5	Frame	DECK14	0	-3
LANE5	Frame	DECK21	0	-3
LANE5	Frame	DECK22	0	-3
LANE5	Frame	DECK23	0	-3
LANE5	Frame	DECK24	0	-3
LANE5	Frame	DECK31	0	-3
LANE5	Frame	DECK32	0	-3
LANE5	Frame	DECK33	0	-3
LANE5	Frame	DECK34	0	-3
LANE5	Frame	DECK41	0	-3
LANE5	Frame	DECK42	0	-3
LANE5	Frame	DECK43	0	-3
LANE5	Frame	DECK44	0	-3
LANE5	Frame	DECK51	0	-3
LANE5	Frame	DECK52	0	-3
LANE5	Frame	DECK53	0	-3
LANE5	Frame	DECK54	0	-3
LANE5	Frame	DECK61	0	-3
LANE5	Frame	DECK62	0	-3
LANE5	Frame	DECK63	0	-3
LANE5	Frame	DECK64	0	-3
LANE5	Frame	DECK71	0	-3
LANE5	Frame	DECK72	0	-3
LANE5	Frame	DECK73	0	-3
LANE5	Frame	DECK74	0	-3
LANE5	Frame	DECK81	0	-3
LANE5	Frame	DECK82	0	-3
LANE5	Frame	DECK83	0	-3
LANE5	Frame	DECK84	0	-3
LANE5	Frame	DECK91	0	-3
LANE5	Frame	DECK92	0	-3
LANE5	Frame	DECK93	0	-3
LANE5	Frame	DECK94	0	-3
LANE5	Frame	DECK101	0	-3
LANE5	Frame	DECK102	0	-3
LANE5	Frame	DECK103	0	-3
LANE5	Frame	DECK104	0	-3
LANE6	Frame	DECK11	0	3
LANE6	Frame	DECK12	0	3
LANE6	Frame	DECK13	0	3
LANE6	Frame	DECK14	0	3
LANE6	Frame	DECK21	0	3
LANE6	Frame	DECK22	0	3
LANE6	Frame	DECK23	0	3
LANE6	Frame	DECK24	0	3
LANE6	Frame	DECK31	0	3
LANE6	Frame	DECK32	0	3
LANE6	Frame	DECK33	0	3
LANE6	Frame	DECK34	0	3
LANE6	Frame	DECK41	0	3
LANE6	Frame	DECK42	0	3
LANE6	Frame	DECK43	0	3
LANE6	Frame	DECK44	0	3

TABLE: Lane Definition Data				
Lane	LaneFrom	Frame	Width	Offset
Text	Text	Text	m	m
LANE6	Frame	DECK51	0	3
LANE6	Frame	DECK52	0	3
LANE6	Frame	DECK53	0	3
LANE6	Frame	DECK54	0	3
LANE6	Frame	DECK61	0	3
LANE6	Frame	DECK62	0	3
LANE6	Frame	DECK63	0	3
LANE6	Frame	DECK64	0	3
LANE6	Frame	DECK71	0	3
LANE6	Frame	DECK72	0	3
LANE6	Frame	DECK73	0	3
LANE6	Frame	DECK74	0	3
LANE6	Frame	DECK81	0	3
LANE6	Frame	DECK82	0	3
LANE6	Frame	DECK83	0	3
LANE6	Frame	DECK84	0	3
LANE6	Frame	DECK91	0	3
LANE6	Frame	DECK92	0	3
LANE6	Frame	DECK93	0	3
LANE6	Frame	DECK94	0	3
LANE6	Frame	DECK101	0	3
LANE6	Frame	DECK102	0	3
LANE6	Frame	DECK103	0	3
LANE6	Frame	DECK104	0	3

TABLE: Vehicles 2 - General Vehicles 1 - General					
VehName	SupportMom	IntSupport	OtherResp	AxleMom	AxleMType
Text	Yes/No	Yes/No	Yes/No	KN	Text
TRUCK1	Yes	Yes	Yes	0	One Point
TRUCK2	Yes	Yes	Yes	0	One Point
KEL	Yes	Yes	Yes	0	One Point
KELHALF	Yes	Yes	Yes	0	One Point

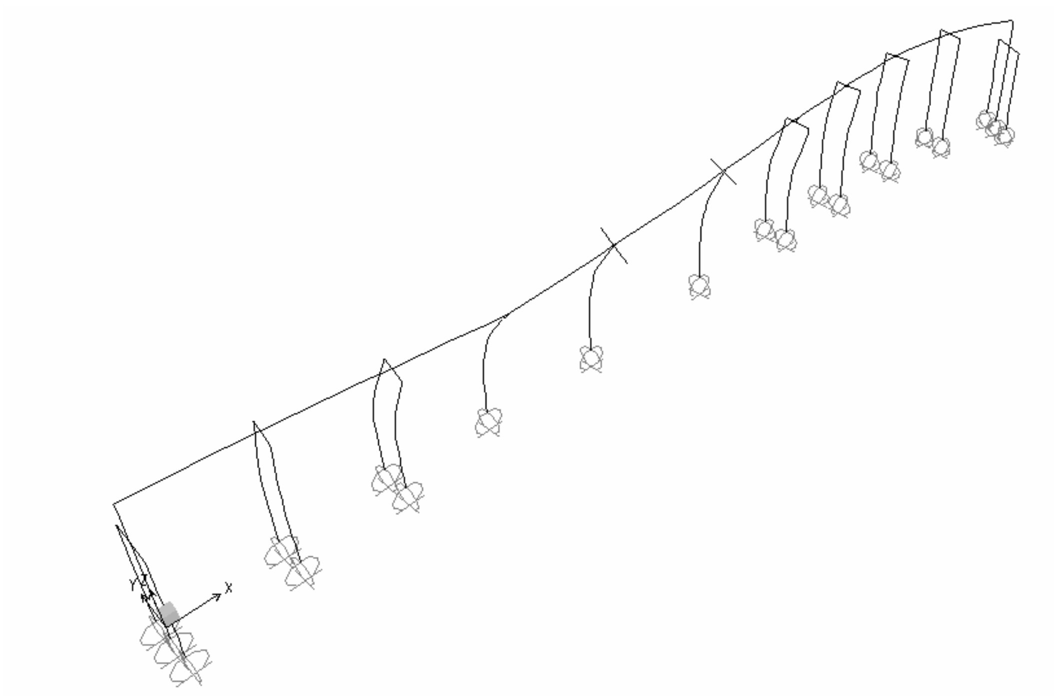
TABLE: Vehicles 3 - General Vehicles 2 - Loads

VehName	LoadType	UnifLoad	UnifType	AxleLoad	AxleType	MinDist	MaxDist
Text	Text	KN/m	Text	KN	Text	m	m
TRUCK1	Leading Load	0	Zero Width	50	One Point		
TRUCK1	Fixed Length	0	Zero Width	225	One Point	5	
TRUCK1	Variable Lengt	0	Zero Width	225	One Point	4	9
TRUCK2	Leading Load	0	Zero Width	225	One Point		
TRUCK2	Variable Lengt	0	Zero Width	225	One Point	4	9
TRUCK2	Fixed Length	0	Zero Width	50	One Point	5	
KEL	Leading Load	0	Zero Width	551.25	One Point		
KELHALF	Leading Load	0	Zero Width	269.5	One Point		

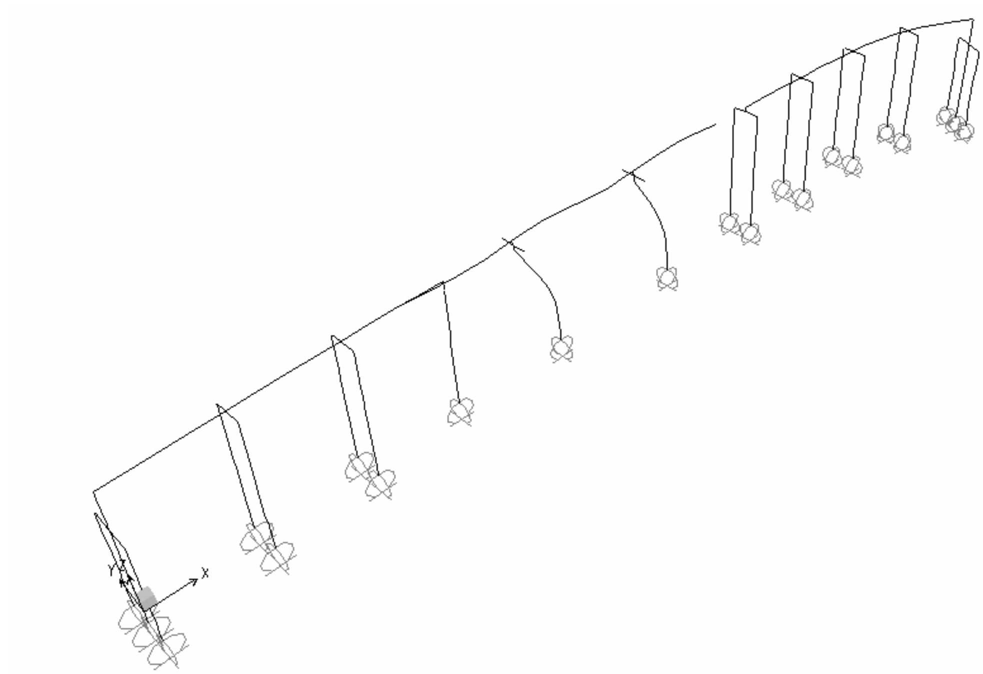
5.4 MODE SHAPES AND PERIODS

Mode Shapes

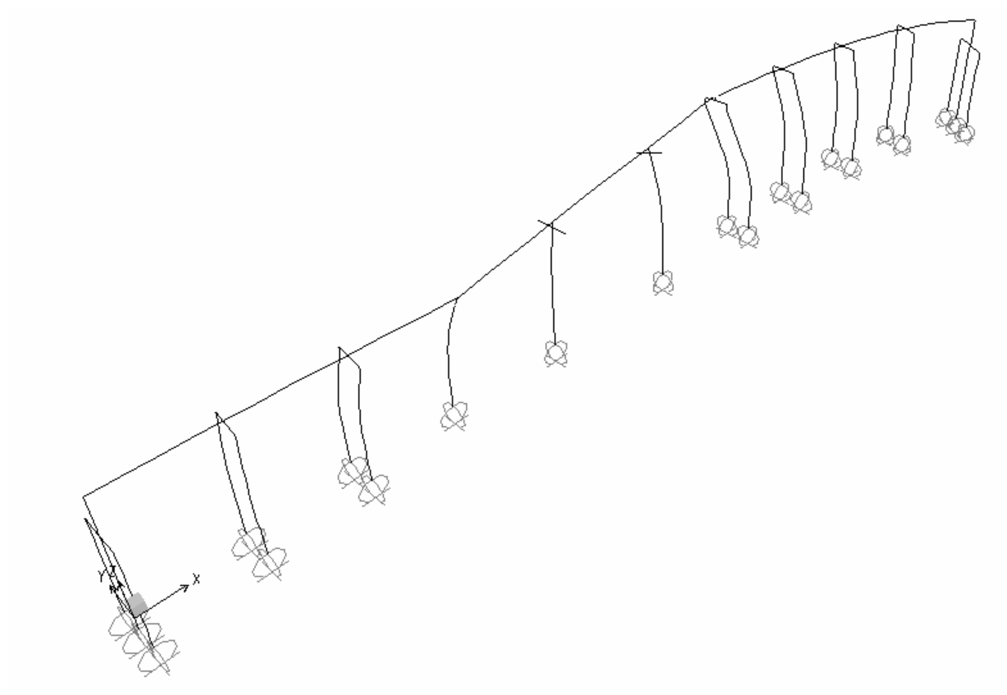
Longitudinal Expansion Case



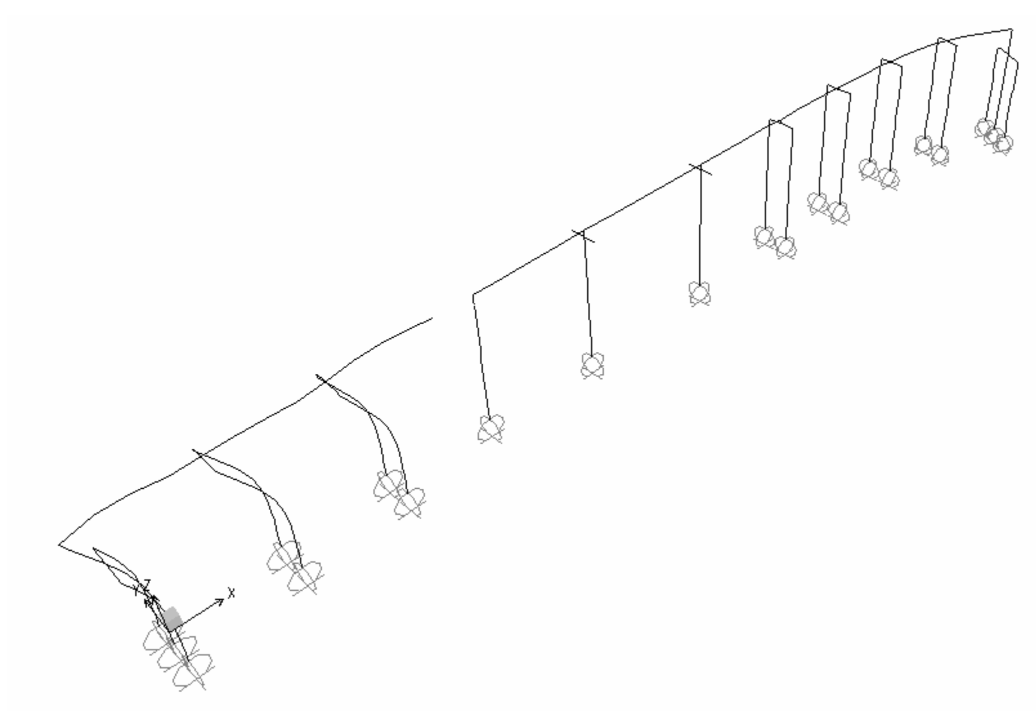
Mode 1 T=0.94686



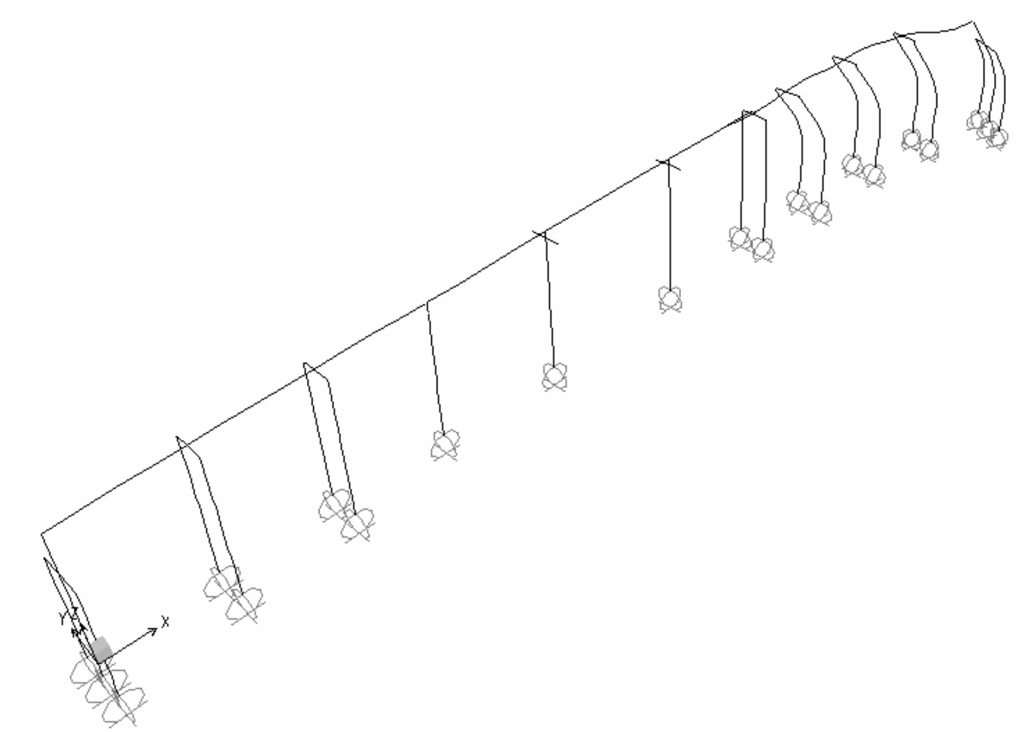
Mode 2 T=0.82886



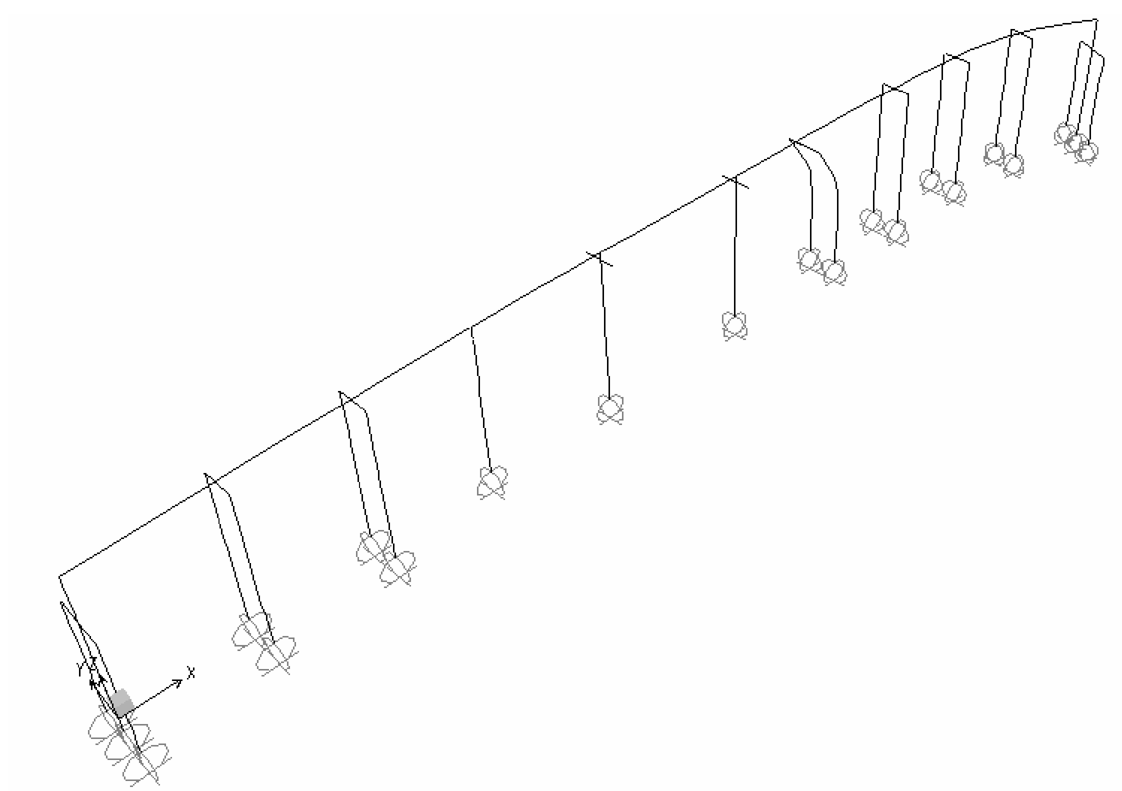
Mode 3 T=0.79764



Mode 4 T=0.70546



Mode 5 T=0.70401



Mode 6 T=0.62176

6. LOAD EFFECTS AND LOAD COMBINATIONS

6.1. LOAD EFFECTS

6.2. LOAD COMBINATIONS

6.1. LOAD EFFECTS

TABLE: Element Forces - Frames

Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
A1	0	DEAD	Max	-2449.4	-208.3	-0.3	0.5	-1.4	1680.1
A1	5.229	DEAD	Max	-1818.1	-208.3	-0.3	0.5	0	2769.1
A1	0	DEAD	Min	-2449.4	-208.3	-0.3	0.5	-1.4	1680.1
A1	5.229	DEAD	Min	-1818.1	-208.3	-0.3	0.5	0	2769.1
A2	0	DEAD	Max	-2364.9	236.7	37.6	34.4	346.6	-1867.3
A2	4.467	DEAD	Max	-1825.6	236.7	37.6	34.4	178.4	-2924.6
A2	0	DEAD	Min	-2364.9	236.7	37.6	34.4	346.6	-1867.3
A2	4.467	DEAD	Min	-1825.6	236.7	37.6	34.4	178.4	-2924.6
P11	0	DEAD	Max	-2122.9	92.9	0	0	0.3	179.7
P11	7.029	DEAD	Max	-1959.2	92.9	0	0	0.3	-473
P11	0	DEAD	Min	-2122.9	92.9	0	0	0.3	179.7
P11	7.029	DEAD	Min	-1959.2	92.9	0	0	0.3	-473
P12	0	DEAD	Max	-2123.3	92.8	0.2	0	0.3	179.6
P12	7.029	DEAD	Max	-1959.6	92.8	0.2	0	-1.1	-472.8
P12	0	DEAD	Min	-2123.3	92.8	0.2	0	0.3	179.6
P12	7.029	DEAD	Min	-1959.6	92.8	0.2	0	-1.1	-472.8
P21	0	DEAD	Max	-2302.5	11.3	0.1	0	0.6	144.9
P21	7.029	DEAD	Max	-2138.9	11.3	0.1	0	-0.4	65.5
P21	0	DEAD	Min	-2302.5	11.3	0.1	0	0.6	144.9
P21	7.029	DEAD	Min	-2138.9	11.3	0.1	0	-0.4	65.5
P22	0	DEAD	Max	-2303.4	11.2	0.3	0	0.5	144.8
P22	7.029	DEAD	Max	-2139.7	11.2	0.3	0	-1.6	65.7
P22	0	DEAD	Min	-2303.4	11.2	0.3	0	0.5	144.8
P22	7.029	DEAD	Min	-2139.7	11.2	0.3	0	-1.6	65.7
P30	0	DEAD	Max	-4162.7	0	0.7	0	2.8	0
P30	5.662	DEAD	Max	-3866.2	0	0.7	0	-0.8	0
P30	0	DEAD	Min	-4162.7	0	0.7	0	2.8	0
P30	5.662	DEAD	Min	-3866.2	0	0.7	0	-0.8	0
P40	0	DEAD	Max	-5639	-14.4	-0.6	0	-4.5	16.5
P40	6.9	DEAD	Max	-5277.6	-14.4	-0.6	0	-1	115.5
P40	0	DEAD	Min	-5639	-14.4	-0.6	0	-4.5	16.5
P40	6.9	DEAD	Min	-5277.6	-14.4	-0.6	0	-1	115.5
P50	0	DEAD	Max	-5642.9	14.4	-2.1	0	-14.2	-13.2
P50	6.9	DEAD	Max	-5281.5	14.4	-2.1	0	0.2	-112.3
P50	0	DEAD	Min	-5642.9	14.4	-2.1	0	-14.2	-13.2
P50	6.9	DEAD	Min	-5281.5	14.4	-2.1	0	0.2	-112.3
P61	0	DEAD	Max	-2033.3	0	-3.4	0	-5.9	0
P61	6.25	DEAD	Max	-1887.8	0	-3.4	0	15	0
P61	0	DEAD	Min	-2033.3	0	-3.4	0	-5.9	0
P61	6.25	DEAD	Min	-1887.8	0	-3.4	0	15	0
P62	0	DEAD	Max	-2017.1	0	-3.3	0	-5.9	0
P62	6.25	DEAD	Max	-1871.5	0	-3.3	0	14.8	0
P62	0	DEAD	Min	-2017.1	0	-3.3	0	-5.9	0
P62	6.25	DEAD	Min	-1871.5	0	-3.3	0	14.8	0
P71	0	DEAD	Max	-2328.4	1	4.4	0	13.3	-97.5
P71	8	DEAD	Max	-2142.2	1	4.4	0	-21.9	-105.6
P71	0	DEAD	Min	-2328.4	1	4.4	0	13.3	-97.5
P71	8	DEAD	Min	-2142.2	1	4.4	0	-21.9	-105.6
P72	0	DEAD	Max	-2351.5	-1.3	4.6	0	13.5	-104.3
P72	8	DEAD	Max	-2165.2	-1.3	4.6	0	-23.3	-93.3
P72	0	DEAD	Min	-2351.5	-1.3	4.6	0	13.5	-104.3
P72	8	DEAD	Min	-2165.2	-1.3	4.6	0	-23.3	-93.3

TABLE: Element Forces - Frames

Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
P81	0	DEAD	Max	-2003.5	-55.7	13.3	0	31.7	-131
P81	7	DEAD	Max	-1840.6	-55.7	13.3	0	-61.3	258.9
P81	0	DEAD	Min	-2003.5	-55.7	13.3	0	31.7	-131
P81	7	DEAD	Min	-1840.6	-55.7	13.3	0	-61.3	258.9
P82	0	DEAD	Max	-2036.8	-58.9	13.5	0	31.7	-138.3
P82	7	DEAD	Max	-1873.9	-58.9	13.5	0	-62.6	273.8
P82	0	DEAD	Min	-2036.8	-58.9	13.5	0	31.7	-138.3
P82	7	DEAD	Min	-1873.9	-58.9	13.5	0	-62.6	273.8
P91	0	DEAD	Max	-2166.5	-58.8	10.1	0	21.7	-104.8
P91	7	DEAD	Max	-2003.5	-58.8	10.1	0	-49.5	307.2
P91	0	DEAD	Min	-2166.5	-58.8	10.1	0	21.7	-104.8
P91	7	DEAD	Min	-2003.5	-58.8	10.1	0	-49.5	307.2
P92	0	DEAD	Max	-2176	-61.4	10.3	0	21.7	-110.2
P92	7	DEAD	Max	-2013	-61.4	10.3	0	-50.8	319.8
P92	0	DEAD	Min	-2176	-61.4	10.3	0	21.7	-110.2
P92	7	DEAD	Min	-2013	-61.4	10.3	0	-50.8	319.8

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
A1	0	SUPERDEAD	Max	-280.1	-37.9	0	0	-0.3	305.7
A1	5.229	SUPERDEAD	Max	-280.1	-37.9	0	0	0	503.9
A1	0	SUPERDEAD	Min	-280.1	-37.9	0	0	-0.3	305.7
A1	5.229	SUPERDEAD	Min	-280.1	-37.9	0	0	0	503.9
A2	0	SUPERDEAD	Max	-281.4	43.1	6.9	6.2	63.2	-339.6
A2	4.467	SUPERDEAD	Max	-281.4	43.1	6.9	6.2	32.5	-532.1
A2	0	SUPERDEAD	Min	-281.4	43.1	6.9	6.2	63.2	-339.6
A2	4.467	SUPERDEAD	Min	-281.4	43.1	6.9	6.2	32.5	-532.1
P11	0	SUPERDEAD	Max	-317	16.9	0	0	0	32.7
P11	7.029	SUPERDEAD	Max	-317	16.9	0	0	0	-86.1
P11	0	SUPERDEAD	Min	-317	16.9	0	0	0	32.7
P11	7.029	SUPERDEAD	Min	-317	16.9	0	0	0	-86.1
P12	0	SUPERDEAD	Max	-317	16.9	0	0	0	32.7
P12	7.029	SUPERDEAD	Max	-317	16.9	0	0	-0.2	-86.1
P12	0	SUPERDEAD	Min	-317	16.9	0	0	0	32.7
P12	7.029	SUPERDEAD	Min	-317	16.9	0	0	-0.2	-86.1
P21	0	SUPERDEAD	Max	-349.5	2.1	0	0	0	26.3
P21	7.029	SUPERDEAD	Max	-349.5	2.1	0	0	0	11.8
P21	0	SUPERDEAD	Min	-349.5	2.1	0	0	0	26.3
P21	7.029	SUPERDEAD	Min	-349.5	2.1	0	0	0	11.8
P22	0	SUPERDEAD	Max	-349.7	2.1	0	0	0	26.3
P22	7.029	SUPERDEAD	Max	-349.7	2.1	0	0	-0.3	11.8
P22	0	SUPERDEAD	Min	-349.7	2.1	0	0	0	26.3
P22	7.029	SUPERDEAD	Min	-349.7	2.1	0	0	-0.3	11.8
P30	0	SUPERDEAD	Max	-533.9	0	0.1	0	0.5	0
P30	5.662	SUPERDEAD	Max	-533.9	0	0.1	0	-0.2	0
P30	0	SUPERDEAD	Min	-533.9	0	0.1	0	0.5	0
P30	5.662	SUPERDEAD	Min	-533.9	0	0.1	0	-0.2	0
P40	0	SUPERDEAD	Max	-962.6	-3	0	0	-0.8	3.5
P40	6.9	SUPERDEAD	Max	-962.6	-3	0	0	-0.2	24.5
P40	0	SUPERDEAD	Min	-962.6	-3	0	0	-0.8	3.5
P40	6.9	SUPERDEAD	Min	-962.6	-3	0	0	-0.2	24.5
P50	0	SUPERDEAD	Max	-963.3	3	-0.4	0	-2.6	-2.9
P50	6.9	SUPERDEAD	Max	-963.3	3	-0.4	0	0	-23.9
P50	0	SUPERDEAD	Min	-963.3	3	-0.4	0	-2.6	-2.9
P50	6.9	SUPERDEAD	Min	-963.3	3	-0.4	0	0	-23.9
P61	0	SUPERDEAD	Max	-267.6	0	-0.6	0	-1.1	0
P61	6.25	SUPERDEAD	Max	-267.6	0	-0.6	0	2.7	0
P61	0	SUPERDEAD	Min	-267.6	0	-0.6	0	-1.1	0
P61	6.25	SUPERDEAD	Min	-267.6	0	-0.6	0	2.7	0
P62	0	SUPERDEAD	Max	-264.7	0	-0.6	0	-1.1	0
P62	6.25	SUPERDEAD	Max	-264.7	0	-0.6	0	2.7	0
P62	0	SUPERDEAD	Min	-264.7	0	-0.6	0	-1.1	0
P62	6.25	SUPERDEAD	Min	-264.7	0	-0.6	0	2.7	0
P71	0	SUPERDEAD	Max	-350.2	0.2	0.8	0	2.4	-17.7
P71	8	SUPERDEAD	Max	-350.2	0.2	0.8	0	-4	-19
P71	0	SUPERDEAD	Min	-350.2	0.2	0.8	0	2.4	-17.7
P71	8	SUPERDEAD	Min	-350.2	0.2	0.8	0	-4	-19
P72	0	SUPERDEAD	Max	-354.4	-0.3	0.8	0	2.4	-18.9
P72	8	SUPERDEAD	Max	-354.4	-0.3	0.8	0	-4.2	-16.8
P72	0	SUPERDEAD	Min	-354.4	-0.3	0.8	0	2.4	-18.9
P72	8	SUPERDEAD	Min	-354.4	-0.3	0.8	0	-4.2	-16.8

TABLE: Element Forces - Frames

Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
P81	0	SUPERDEAD	Max	-295.3	-10.1	2.4	0	5.8	-23.8
P81	7	SUPERDEAD	Max	-295.3	-10.1	2.4	0	-11.2	47.1
P81	0	SUPERDEAD	Min	-295.3	-10.1	2.4	0	5.8	-23.8
P81	7	SUPERDEAD	Min	-295.3	-10.1	2.4	0	-11.2	47.1
P82	0	SUPERDEAD	Max	-301.3	-10.7	2.4	0	5.8	-25.1
P82	7	SUPERDEAD	Max	-301.3	-10.7	2.4	0	-11.4	49.8
P82	0	SUPERDEAD	Min	-301.3	-10.7	2.4	0	5.8	-25.1
P82	7	SUPERDEAD	Min	-301.3	-10.7	2.4	0	-11.4	49.8
P91	0	SUPERDEAD	Max	-325	-10.7	1.9	0	4	-19
P91	7	SUPERDEAD	Max	-325	-10.7	1.9	0	-9	55.9
P91	0	SUPERDEAD	Min	-325	-10.7	1.9	0	4	-19
P91	7	SUPERDEAD	Min	-325	-10.7	1.9	0	-9	55.9
P92	0	SUPERDEAD	Max	-326.7	-11.2	1.9	0	4	-20
P92	7	SUPERDEAD	Max	-326.7	-11.2	1.9	0	-9.2	58.3
P92	0	SUPERDEAD	Min	-326.7	-11.2	1.9	0	4	-20
P92	7	SUPERDEAD	Min	-326.7	-11.2	1.9	0	-9.2	58.3

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
A1	0	ENVDIFFSET	Max	252.3	157	0.3	0.3	2.2	1375.6
A1	5.229	ENVDIFFSET	Max	252.3	157	0.3	0.3	0.4	2942.4
A1	0	ENVDIFFSET	Min	-406.3	-299.6	-0.2	-0.5	-1.4	-1364.1
A1	5.229	ENVDIFFSET	Min	-406.3	-299.6	-0.2	-0.5	-0.3	-2184.9
A2	0	ENVDIFFSET	Max	278.1	308.7	70.5	26.8	201.4	1465.3
A2	4.467	ENVDIFFSET	Max	278.1	308.7	70.5	26.8	153.4	2382.6
A2	0	ENVDIFFSET	Min	-418.4	-205.3	-50.7	-46.5	-120.4	-1648.4
A2	4.467	ENVDIFFSET	Min	-418.4	-205.3	-50.7	-46.5	-113.5	-3027.6
P11	0	ENVDIFFSET	Max	412	40.5	0	0	0.2	111.1
P11	7.029	ENVDIFFSET	Max	412	40.5	0	0	0.6	464.5
P11	0	ENVDIFFSET	Min	-256	-61.7	-0.1	0	-0.3	-177
P11	7.029	ENVDIFFSET	Min	-256	-61.7	-0.1	0	-0.4	-173.7
P12	0	ENVDIFFSET	Max	412	40.5	0	0	0.2	111.1
P12	7.029	ENVDIFFSET	Max	412	40.5	0	0	0.6	464.5
P12	0	ENVDIFFSET	Min	-256	-61.7	-0.1	0	-0.3	-177
P12	7.029	ENVDIFFSET	Min	-256	-61.7	-0.1	0	-0.4	-173.7
P21	0	ENVDIFFSET	Max	271.9	109.3	0.2	0	0.4	76.8
P21	7.029	ENVDIFFSET	Max	271.9	109.3	0.2	0	1.3	383.1
P21	0	ENVDIFFSET	Min	-256	-76.5	-0.3	0	-0.6	-154.4
P21	7.029	ENVDIFFSET	Min	-256	-76.5	-0.3	0	-0.8	-723.3
P22	0	ENVDIFFSET	Max	271.9	109.3	0.2	0	0.4	76.8
P22	7.029	ENVDIFFSET	Max	271.9	109.3	0.2	0	1.3	383.1
P22	0	ENVDIFFSET	Min	-256	-76.5	-0.3	0	-0.6	-154.4
P22	7.029	ENVDIFFSET	Min	-256	-76.5	-0.3	0	-0.8	-723.3
P30	0	ENVDIFFSET	Max	279.3	0	0.5	0	2.3	0
P30	5.662	ENVDIFFSET	Max	279.3	0	0.5	0	1.1	0
P30	0	ENVDIFFSET	Min	-328.2	0	-0.8	0	-3.6	0
P30	5.662	ENVDIFFSET	Min	-328.2	0	-0.8	0	-0.7	0
P40	0	ENVDIFFSET	Max	746.3	99.8	0.7	0	5.9	442.4
P40	6.9	ENVDIFFSET	Max	746.3	99.8	0.7	0	1.3	1113.7
P40	0	ENVDIFFSET	Min	-580.8	-102.4	-0.4	0	-3.8	-321.1
P40	6.9	ENVDIFFSET	Min	-580.8	-102.4	-0.4	0	-0.8	-1009.5
P50	0	ENVDIFFSET	Max	744.4	102.4	2.7	0	18.7	320.8
P50	6.9	ENVDIFFSET	Max	744.4	102.4	2.7	0	0.2	1008.8
P50	0	ENVDIFFSET	Min	-580.8	-99.8	-1.8	0	-12	-430.5
P50	6.9	ENVDIFFSET	Min	-580.8	-99.8	-1.8	0	-0.3	-1137
P61	0	ENVDIFFSET	Max	136.1	0	4.4	0	7.8	0
P61	6.25	ENVDIFFSET	Max	136.1	0	4.4	0	12.6	0
P61	0	ENVDIFFSET	Min	-163.6	0	-2.8	0	-5	0
P61	6.25	ENVDIFFSET	Min	-163.6	0	-2.8	0	-19.6	0
P62	0	ENVDIFFSET	Max	143.6	0	4.4	0	7.8	0
P62	6.25	ENVDIFFSET	Max	143.6	0	4.4	0	12.6	0
P62	0	ENVDIFFSET	Min	-163.5	0	-2.8	0	-5	0
P62	6.25	ENVDIFFSET	Min	-163.5	0	-2.8	0	-19.6	0
P71	0	ENVDIFFSET	Max	269.8	42.4	6.2	0	18.2	143.1
P71	8	ENVDIFFSET	Max	269.8	42.4	6.2	0	33.8	581.8
P71	0	ENVDIFFSET	Min	-242.7	-77.6	-6.7	0	-19.7	-70.6
P71	8	ENVDIFFSET	Min	-242.7	-77.6	-6.7	0	-31.5	-295.3
P72	0	ENVDIFFSET	Max	269.7	44.6	6.2	0	18.2	149.2
P72	8	ENVDIFFSET	Max	269.7	44.6	6.2	0	33.8	579.6
P72	0	ENVDIFFSET	Min	-253.9	-77.1	-6.7	0	-19.7	-71.7
P72	8	ENVDIFFSET	Min	-253.9	-77.1	-6.7	0	-31.5	-294.2

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
P81	0	ENVDIFFSET	Max	458.6	73.6	15.4	0	35.6	155
P81	7	ENVDIFFSET	Max	458.6	73.6	15.4	0	66.4	714.1
P81	0	ENVDIFFSET	Min	-275.5	-113.6	-14.4	0	-34.7	-81.4
P81	7	ENVDIFFSET	Min	-275.5	-113.6	-14.4	0	-72.5	-471.8
P82	0	ENVDIFFSET	Max	355.3	76.2	15.5	0	35.6	160.9
P82	7	ENVDIFFSET	Max	355.3	76.2	15.5	0	66.4	725.4
P82	0	ENVDIFFSET	Min	-273.8	-116.1	-14.4	0	-34.7	-87
P82	7	ENVDIFFSET	Min	-273.8	-116.1	-14.4	0	-72.7	-467.4
P91	0	ENVDIFFSET	Max	542.8	93.1	8	0	22.9	136.6
P91	7	ENVDIFFSET	Max	542.8	93.1	8	0	27.7	243.2
P91	0	ENVDIFFSET	Min	-328.3	-38.8	-6.3	0	-16.7	-96.7
P91	7	ENVDIFFSET	Min	-328.3	-38.8	-6.3	0	-33.1	-635.3
P92	0	ENVDIFFSET	Max	298.2	93.7	8	0	22.9	140.5
P92	7	ENVDIFFSET	Max	298.2	93.7	8	0	27.6	234.2
P92	0	ENVDIFFSET	Min	-220.9	-39.4	-6.3	0	-16.7	-98.1
P92	7	ENVDIFFSET	Min	-220.9	-39.4	-6.3	0	-32.8	-638.2

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
A1	0	SHCR	Max	88.4	270.4	-1	1.6	-6.3	655.6
A1	5.229	SHCR	Max	88.4	270.4	-1	1.6	-1.3	-758.5
A1	0	SHCR	Min	88.4	270.4	-1	1.6	-6.3	655.6
A1	5.229	SHCR	Min	88.4	270.4	-1	1.6	-1.3	-758.5
A2	0	SHCR	Max	152.6	-449	-165	52.8	-834	-860.5
A2	4.467	SHCR	Max	152.6	-449	-165	52.8	-96.9	1145.2
A2	0	SHCR	Min	152.6	-449	-165	52.8	-834	-860.5
A2	4.467	SHCR	Min	152.6	-449	-165	52.8	-96.9	1145.2
P11	0	SHCR	Max	-72.7	-14.7	0.4	0	0.9	-52.3
P11	7.029	SHCR	Max	-72.7	-14.7	0.4	0	-1.7	50.8
P11	0	SHCR	Min	-72.7	-14.7	0.4	0	0.9	-52.3
P11	7.029	SHCR	Min	-72.7	-14.7	0.4	0	-1.7	50.8
P12	0	SHCR	Max	-74	-14.8	0.4	0	0.9	-52.7
P12	7.029	SHCR	Max	-74	-14.8	0.4	0	-1.8	51.5
P12	0	SHCR	Min	-74	-14.8	0.4	0	0.9	-52.7
P12	7.029	SHCR	Min	-74	-14.8	0.4	0	-1.8	51.5
P21	0	SHCR	Max	17.4	-120.4	0.8	0	1.8	-308.4
P21	7.029	SHCR	Max	17.4	-120.4	0.8	0	-3.8	537.9
P21	0	SHCR	Min	17.4	-120.4	0.8	0	1.8	-308.4
P21	7.029	SHCR	Min	17.4	-120.4	0.8	0	-3.8	537.9
P22	0	SHCR	Max	13.9	-120.6	0.8	0	1.8	-308.8
P22	7.029	SHCR	Max	13.9	-120.6	0.8	0	-3.8	538.6
P22	0	SHCR	Min	13.9	-120.6	0.8	0	1.8	-308.8
P22	7.029	SHCR	Min	13.9	-120.6	0.8	0	-3.8	538.6
P30	0	SHCR	Max	27	0	2.5	0	10.8	0
P30	5.662	SHCR	Max	27	0	2.5	0	-3.4	0
P30	0	SHCR	Min	27	0	2.5	0	10.8	0
P30	5.662	SHCR	Min	27	0	2.5	0	-3.4	0
P40	0	SHCR	Max	0	0	-1.9	0	-17.3	0
P40	6.9	SHCR	Max	0	0	-1.9	0	-3.9	0.6
P40	0	SHCR	Min	0	0	-1.9	0	-17.3	0
P40	6.9	SHCR	Min	0	0	-1.9	0	-3.9	0.6
P50	0	SHCR	Max	0.1185	0	-8.1	0	-55.2	-0.1
P50	6.9	SHCR	Max	0.1185	0	-8.1	0	0.7	-0.6
P50	0	SHCR	Min	0.1185	0	-8.1	0	-55.2	-0.1
P50	6.9	SHCR	Min	0.1185	0	-8.1	0	0.7	-0.6
P61	0	SHCR	Max	-11.7	0	-12.9	0	-23.1	0
P61	6.25	SHCR	Max	-11.7	0	-12.9	0	57.8	0
P61	0	SHCR	Min	-11.7	0	-12.9	0	-23.1	0
P61	6.25	SHCR	Min	-11.7	0	-12.9	0	57.8	0
P62	0	SHCR	Max	51.9	0	-12.9	0	-23.1	0
P62	6.25	SHCR	Max	51.9	0	-12.9	0	57.8	0
P62	0	SHCR	Min	51.9	0	-12.9	0	-23.1	0
P62	6.25	SHCR	Min	51.9	0	-12.9	0	57.8	0

P71	0	SHCR	Max	-4.9	171.6	-13.4	0	-39.5	562.2
P71	8	SHCR	Max	-4.9	171.6	-13.4	0	67.6	-810.6
P71	0	SHCR	Min	-4.9	171.6	-13.4	0	-39.5	562.2
P71	8	SHCR	Min	-4.9	171.6	-13.4	0	67.6	-810.6
P72	0	SHCR	Max	50.7	172.1	-13.4	0	-39.5	563.7
P72	8	SHCR	Max	50.7	172.1	-13.4	0	67.7	-813.3
P72	0	SHCR	Min	50.7	172.1	-13.4	0	-39.5	563.7
P72	8	SHCR	Min	50.7	172.1	-13.4	0	67.7	-813.3
P81	0	SHCR	Max	-62	100.7	-11	0	-26.4	254.5
P81	7	SHCR	Max	-62	100.7	-11	0	50.4	-450.4
P81	0	SHCR	Min	-62	100.7	-11	0	-26.4	254.5
P81	7	SHCR	Min	-62	100.7	-11	0	50.4	-450.4
P82	0	SHCR	Max	-18.7	99.9	-11	0	-26.4	252.7
P82	7	SHCR	Max	-18.7	99.9	-11	0	50.3	-446.7
P82	0	SHCR	Min	-18.7	99.9	-11	0	-26.4	252.7
P82	7	SHCR	Min	-18.7	99.9	-11	0	50.3	-446.7
P91	0	SHCR	Max	-80.7	-35	1.8	0	3.6	-57.1
P91	7	SHCR	Max	-80.7	-35	1.8	0	-8.7	187.9
P91	0	SHCR	Min	-80.7	-35	1.8	0	3.6	-57.1
P91	7	SHCR	Min	-80.7	-35	1.8	0	-8.7	187.9
P92	0	SHCR	Max	-77.2	-37.7	1.8	0	3.6	-62.6
P92	7	SHCR	Max	-77.2	-37.7	1.8	0	-8.8	200.9
P92	0	SHCR	Min	-77.2	-37.7	1.8	0	3.6	-62.6
P92	7	SHCR	Min	-77.2	-37.7	1.8	0	-8.8	200.9

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
A1	0	EQX FINAL	Max	1601.1	4280.4	562.7	406.4	3659.8	9170.9
A1	5.229	EQX FINAL	Max	1601.1	4280.4	562.7	406.4	718.5	13303
A1	0	EQX FINAL	Min	-1601.1	-4280.4	-562.7	-406.4	-3659.8	-9170.9
A1	5.229	EQX FINAL	Min	-1601.1	-4280.4	-562.7	-406.4	-718.5	-13303
A2	0	EQX FINAL	Max	1699.3	4893	1332.2	911.2	6551.3	8528.2
A2	4.467	EQX FINAL	Max	1699.3	4893	1332.2	911.2	827.2	13447.6
A2	0	EQX FINAL	Min	-1699.3	-4893	-1332.2	-911.2	-6551.3	-8528.2
A2	4.467	EQX FINAL	Min	-1699.3	-4893	-1332.2	-911.2	-827.2	-13447.6
P11	0	EQX FINAL	Max	586	1831.7	130.6	0	313.3	4494.8
P11	7.029	EQX FINAL	Max	586	1831.7	130.6	0	604.9	8389
P11	0	EQX FINAL	Min	-586	-1831.7	-130.6	0	-313.3	-4494.8
P11	7.029	EQX FINAL	Min	-586	-1831.7	-130.6	0	-604.9	-8389
P12	0	EQX FINAL	Max	557.8	1837.5	130.6	0	313.3	4506.8
P12	7.029	EQX FINAL	Max	557.8	1837.5	130.6	0	604.9	8414.1
P12	0	EQX FINAL	Min	-557.8	-1837.5	-130.6	0	-313.3	-4506.8
P12	7.029	EQX FINAL	Min	-557.8	-1837.5	-130.6	0	-604.9	-8414.1
P21	0	EQX FINAL	Max	647.9	1407	205.7	0	453.2	3543.9
P21	7.029	EQX FINAL	Max	647.9	1407	205.7	0	993.8	6355.5
P21	0	EQX FINAL	Min	-647.9	-1407	-205.7	0	-453.2	-3543.9
P21	7.029	EQX FINAL	Min	-647.9	-1407	-205.7	0	-993.8	-6355.5
P22	0	EQX FINAL	Max	605.4	1413.3	205.8	0	453.1	3554.5
P22	7.029	EQX FINAL	Max	605.4	1413.3	205.8	0	993.8	6382.2
P22	0	EQX FINAL	Min	-605.4	-1413.3	-205.8	0	-453.1	-3554.5
P22	7.029	EQX FINAL	Min	-605.4	-1413.3	-205.8	0	-993.8	-6382.2
P30	0	EQX FINAL	Max	727.9	2033.8	478.5	0	2621.9	14872.5
P30	5.662	EQX FINAL	Max	727.9	2033.8	478.5	0	354	3376
P30	0	EQX FINAL	Min	-727.9	-2033.8	-478.5	0	-2621.9	-14872.5
P30	5.662	EQX FINAL	Min	-727.9	-2033.8	-478.5	0	-354	-3376
P40	0	EQX FINAL	Max	1076.8	5534.9	102	0	829	11679.2
P40	6.9	EQX FINAL	Max	1076.8	5534.9	102	0	179.8	26499.2
P40	0	EQX FINAL	Min	-1076.8	-5534.9	-102	0	-829	-11679.2
P40	6.9	EQX FINAL	Min	-1076.8	-5534.9	-102	0	-179.8	-26499.2
P50	0	EQX FINAL	Max	1078.4	5530.4	370.7	0	2357.6	11683.6
P50	6.9	EQX FINAL	Max	1078.4	5530.4	370.7	0	255	26490.2
P50	0	EQX FINAL	Min	-1078.4	-5530.4	-370.7	0	-2357.6	-11683.6
P50	6.9	EQX FINAL	Min	-1078.4	-5530.4	-370.7	0	-255	-26490.2
P61	0	EQX FINAL	Max	1360.2	451.7	576.7	0	1011.8	3488.1
P61	6.25	EQX FINAL	Max	1360.2	451.7	576.7	0	2592.3	706.6
P61	0	EQX FINAL	Min	-1360.2	-451.7	-576.7	0	-1011.8	-3488.1
P61	6.25	EQX FINAL	Min	-1360.2	-451.7	-576.7	0	-2592.3	-706.6
P62	0	EQX FINAL	Max	1365.4	451.8	576.5	0	1011.9	3489.6
P62	6.25	EQX FINAL	Max	1365.4	451.8	576.5	0	2592.2	702.9
P62	0	EQX FINAL	Min	-1365.4	-451.8	-576.5	0	-1011.9	-3489.6
P62	6.25	EQX FINAL	Min	-1365.4	-451.8	-576.5	0	-2592.2	-702.9
P71	0	EQX FINAL	Max	807.6	1342.8	379.5	0	1111.6	4299.6
P71	8	EQX FINAL	Max	807.6	1342.8	379.5	0	1922.4	6435.6
P71	0	EQX FINAL	Min	-807.6	-1342.8	-379.5	0	-1111.6	-4299.6
P71	8	EQX FINAL	Min	-807.6	-1342.8	-379.5	0	-1922.4	-6435.6
P72	0	EQX FINAL	Max	987.9	1389.8	379.5	0	1111.6	4433.3
P72	8	EQX FINAL	Max	987.9	1389.8	379.5	0	1922.5	6678.9
P72	0	EQX FINAL	Min	-987.9	-1389.8	-379.5	0	-1111.6	-4433.3
P72	8	EQX FINAL	Min	-987.9	-1389.8	-379.5	0	-1922.5	-6678.9

TABLE: Element Forces - Frames

Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
P81	0	EQX FINAL	Max	884.8	1701.7	437.7	0	1041	4419.9
P81	7	EQX FINAL	Max	935.2	1702.6	465.6	0	2152.5	7502.6
P81	0	EQX FINAL	Min	-884.8	-1701.7	-437.7	0	-1041	-4419.9
P81	7	EQX FINAL	Min	-935.2	-1702.6	-465.6	0	-2152.5	-7502.6
P82	0	EQX FINAL	Max	731.8	1770.8	437.8	0	1040.9	4577.6
P82	7	EQX FINAL	Max	731.8	1770.8	437.8	0	2023.7	7818.9
P82	0	EQX FINAL	Min	-731.8	-1770.8	-437.8	0	-1040.9	-4577.6
P82	7	EQX FINAL	Min	-731.8	-1770.8	-437.8	0	-2023.7	-7818.9
P91	0	EQX FINAL	Max	379.3	1616.3	205.4	0	443.5	3538.6
P91	7	EQX FINAL	Max	379.3	1616.3	205.4	0	993.6	7769.4
P91	0	EQX FINAL	Min	-379.3	-1616.3	-205.4	0	-443.5	-3538.6
P91	7	EQX FINAL	Min	-379.3	-1616.3	-205.4	0	-993.6	-7769.4
P92	0	EQX FINAL	Max	899.5	1669	240.8	0	516.8	3647.9
P92	7	EQX FINAL	Max	899.5	1669	240.8	0	1168	8030.9
P92	0	EQX FINAL	Min	-899.5	-1669	-240.8	0	-516.8	-3647.9
P92	7	EQX FINAL	Min	-899.5	-1669	-240.8	0	-1168	-8030.9

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
A1	0	EQY FINAL	Max	178.8	489.6	3557.4	4124.1	23058.8	1031.2
A1	5.229	EQY FINAL	Max	178.8	489.6	3557.4	4124.1	4464.8	1531.3
A1	0	EQX FINAL	Min	-178.8	-489.6	-3557.4	-4124.1	-23058.8	-1031.2
A1	5.229	EQX FINAL	Min	-178.8	-489.6	-3557.4	-4124.1	-4464.8	-1531.3
A2	0	EQY FINAL	Max	213.7	735	5189	2094.2	30242.8	1430.6
A2	4.467	EQY FINAL	Max	213.7	735	5189	2094.2	7069.5	1931.2
A2	0	EQX FINAL	Min	-213.7	-735	-5189	-2094.2	-30242.8	-1430.6
A2	4.467	EQX FINAL	Min	-213.7	-735	-5189	-2094.2	-7069.5	-1931.2
P11	0	EQY FINAL	Max	2181.4	341.2	1186.8	0	2844	812.2
P11	7.029	EQY FINAL	Max	2181.4	341.2	1186.8	0	5474.3	1579.6
P11	0	EQX FINAL	Min	-2181.4	-341.2	-1186.8	0	-2844	-812.2
P11	7.029	EQX FINAL	Min	-2181.4	-341.2	-1186.8	0	-5474.3	-1579.6
P12	0	EQY FINAL	Max	2213.4	228.4	1180.5	0	2848.7	546.9
P12	7.029	EQY FINAL	Max	2213.4	228.4	1180.5	0	5473.3	1064.2
P12	0	EQX FINAL	Min	-2213.4	-228.4	-1180.5	0	-2848.7	-546.9
P12	7.029	EQX FINAL	Min	-2213.4	-228.4	-1180.5	0	-5473.3	-1064.2
P21	0	EQY FINAL	Max	4758.9	288.2	2093.5	0	4597.7	652.7
P21	7.029	EQY FINAL	Max	4758.9	288.2	2093.5	0	10028.8	1362.2
P21	0	EQX FINAL	Min	-4758.9	-288.2	-2093.5	0	-4597.7	-652.7
P21	7.029	EQX FINAL	Min	-4758.9	-288.2	-2093.5	0	-10028.8	-1362.2
P22	0	EQY FINAL	Max	4770.7	191.2	2070	0	4614.9	444.2
P22	7.029	EQY FINAL	Max	4770.7	191.2	2070	0	10024.3	914.7
P22	0	EQX FINAL	Min	-4770.7	-191.2	-2070	0	-4614.9	-444.2
P22	7.029	EQX FINAL	Min	-4770.7	-191.2	-2070	0	-10024.3	-914.7
P30	0	EQY FINAL	Max	22.1	246.2	4581.3	0	29161.2	1686.3
P30	5.662	EQY FINAL	Max	22.1	246.2	4581.3	0	3459.4	345.5
P30	0	EQX FINAL	Min	-22.1	-246.2	-4581.3	0	-29161.2	-1686.3
P30	5.662	EQX FINAL	Min	-22.1	-246.2	-4581.3	0	-3459.4	-345.5
P40	0	EQY FINAL	Max	103.2	529.7	2822	0	24841.7	1109.9
P40	6.9	EQY FINAL	Max	103.2	529.7	2822	0	5378.9	2545.1
P40	0	EQX FINAL	Min	-103.2	-529.7	-2822	0	-24841.7	-1109.9
P40	6.9	EQX FINAL	Min	-103.2	-529.7	-2822	0	-5378.9	-2545.1
P50	0	EQY FINAL	Max	106.7	528.2	2614.6	0	19858.6	1111.7
P50	6.9	EQY FINAL	Max	106.7	528.2	2614.6	0	2089.1	2533.3
P50	0	EQX FINAL	Min	-106.7	-528.2	-2614.6	0	-19858.6	-1111.7
P50	6.9	EQX FINAL	Min	-106.7	-528.2	-2614.6	0	-2089.1	-2533.3
P61	0	EQY FINAL	Max	4854.8	50.2	1755.9	0	2409.7	387.8
P61	6.25	EQY FINAL	Max	4854.8	50.2	1755.9	0	8469.1	127.5
P61	0	EQX FINAL	Min	-4854.8	-50.2	-1755.9	0	-2409.7	-387.8
P61	6.25	EQX FINAL	Min	-4854.8	-50.2	-1755.9	0	-8469.1	-127.5
P62	0	EQY FINAL	Max	4850.2	50.5	1725.8	0	2424	394.5
P62	6.25	EQY FINAL	Max	4850.2	50.5	1725.8	0	8459.6	114.3
P62	0	EQX FINAL	Min	-4850.2	-50.5	-1725.8	0	-2424	-394.5
P62	6.25	EQX FINAL	Min	-4850.2	-50.5	-1725.8	0	-8459.6	-114.3
P71	0	EQY FINAL	Max	2636.8	367.6	1314.7	0	3835.4	1166
P71	8	EQY FINAL	Max	2636.8	367.6	1314.7	0	6628	1759.2
P71	0	EQX FINAL	Min	-2636.8	-367.6	-1314.7	0	-3835.4	-1166
P71	8	EQX FINAL	Min	-2636.8	-367.6	-1314.7	0	-6628	-1759.2
P72	0	EQY FINAL	Max	2615.3	397.3	1302.2	0	3846	1267.3
P72	8	EQY FINAL	Max	2615.3	397.3	1302.2	0	6625.2	1930.5
P72	0	EQX FINAL	Min	-2615.3	-397.3	-1302.2	0	-3846	-1267.3
P72	8	EQX FINAL	Min	-2615.3	-397.3	-1302.2	0	-6625.2	-1930.5

TABLE: Element Forces - Frames

Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
P81	0	EQY FINAL	Max	2198.8	450.2	1176.2	0	2791.5	1159.1
P81	7	EQY FINAL	Max	2205.1	206.6	1178.6	0	5422.9	903.1
P81	0	EQX FINAL	Min	-2198.8	-450.2	-1176.2	0	-2791.5	-1159.1
P81	7	EQX FINAL	Min	-2205.1	-206.6	-1178.6	0	-5422.9	-903.1
P82	0	EQY FINAL	Max	2205.6	487.1	1168.2	0	2797.6	1256.3
P82	7	EQY FINAL	Max	2205.6	487.1	1168.2	0	5410.5	2168.1
P82	0	EQX FINAL	Min	-2205.6	-487.1	-1168.2	0	-2797.6	-1256.3
P82	7	EQX FINAL	Min	-2205.6	-487.1	-1168.2	0	-5410.5	-2168.1
P91	0	EQY FINAL	Max	1292.1	213.1	693.4	0	1484.3	439
P91	7	EQY FINAL	Max	1292.1	213.1	693.4	0	3360.4	1053.3
P91	0	EQX FINAL	Min	-1292.1	-213.1	-693.4	0	-1484.3	-439
P91	7	EQX FINAL	Min	-1292.1	-213.1	-693.4	0	-3360.4	-1053.3
P92	0	EQY FINAL	Max	1570.7	429.2	674.3	0	1451.8	937.6
P92	7	EQY FINAL	Max	1570.7	429.2	674.3	0	3280	2075.6
P92	0	EQX FINAL	Min	-1570.7	-429.2	-674.3	0	-1451.8	-937.6
P92	7	EQX FINAL	Min	-1570.7	-429.2	-674.3	0	-3280	-2075.6

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
A1	0	COMBTRUCK	Max	185.4	86.7	15.1	22.2	556.5	1888.6
A1	5.229	COMBTRUCK	Max	185.4	86.7	15.1	22.2	560.3	3817.6
A1	0	COMBTRUCK	Min	-2286.6	-374	-15.1	-22.2	-556.2	-350.3
A1	5.229	COMBTRUCK	Min	-2286.6	-374	-15.1	-22.2	-559.9	-742
A2	0	COMBTRUCK	Max	193.2	406	71.8	26.6	1018.3	404.3
A2	4.467	COMBTRUCK	Max	193.2	406	71.8	26.6	724.1	797.2
A2	0	COMBTRUCK	Min	-2299.7	-91.8	-35.8	-16.6	-292.6	-2289.4
A2	4.467	COMBTRUCK	Min	-2299.7	-91.8	-35.8	-16.6	-419	-4087
P11	0	COMBTRUCK	Max	138.5	165.7	5.8	0	14.7	203.7
P11	7.029	COMBTRUCK	Max	138.5	165.7	5.8	0	26.3	864.8
P11	0	COMBTRUCK	Min	-1315.7	-135.1	-5.8	0	-14.7	-101.4
P11	7.029	COMBTRUCK	Min	-1315.7	-135.1	-5.8	0	-26.3	-985.1
P12	0	COMBTRUCK	Max	138.5	165.7	5.8	0	14.7	203.7
P12	7.029	COMBTRUCK	Max	138.5	165.7	5.8	0	26.3	864.8
P12	0	COMBTRUCK	Min	-1315.7	-135.1	-5.8	0	-14.7	-101.4
P12	7.029	COMBTRUCK	Min	-1315.7	-135.1	-5.8	0	-26.3	-985.1
P21	0	COMBTRUCK	Max	95.3	107.8	11.9	0	28.2	120.3
P21	7.029	COMBTRUCK	Max	95.3	107.8	11.9	0	55.5	862.4
P21	0	COMBTRUCK	Min	-1347.1	-113	-11.9	0	-28.2	-29.2
P21	7.029	COMBTRUCK	Min	-1347.1	-113	-11.9	0	-55.5	-777.5
P22	0	COMBTRUCK	Max	95.3	107.8	11.9	0	28.2	120.3
P22	7.029	COMBTRUCK	Max	95.3	107.8	11.9	0	55.5	862.4
P22	0	COMBTRUCK	Min	-1347.1	-113	-11.9	0	-28.2	-29.2
P22	7.029	COMBTRUCK	Min	-1347.1	-113	-11.9	0	-55.5	-777.5
P30	0	COMBTRUCK	Max	184.3	0	27.3	0	274.5	0
P30	5.662	COMBTRUCK	Max	184.3	0	27.3	0	423	0
P30	0	COMBTRUCK	Min	-2271.8	0	-27.3	0	-274.5	0
P30	5.662	COMBTRUCK	Min	-2271.8	0	-27.3	0	-423	0
P40	0	COMBTRUCK	Max	222.8	225	47.7	0	142.9	530.1
P40	6.9	COMBTRUCK	Max	222.8	225	47.7	0	426.8	2344.4
P40	0	COMBTRUCK	Min	-2528	-380.4	-47.7	0	-142.9	-419.9
P40	6.9	COMBTRUCK	Min	-2528	-380.4	-47.7	0	-426.8	-1715.4
P50	0	COMBTRUCK	Max	224.4	380.4	47.5	0	94.2	420.4
P50	6.9	COMBTRUCK	Max	224.4	380.4	47.5	0	401.6	1718.5
P50	0	COMBTRUCK	Min	-2528.2	-225	-47.5	0	-94.2	-528.9
P50	6.9	COMBTRUCK	Min	-2528.2	-225	-47.5	0	-401.6	-2344.5
P61	0	COMBTRUCK	Max	118.1	0	10	0	19.6	0
P61	6.25	COMBTRUCK	Max	118.1	0	10	0	43.1	0
P61	0	COMBTRUCK	Min	-1230.2	0	-10	0	-19.6	0
P61	6.25	COMBTRUCK	Min	-1230.2	0	-10	0	-43	0
P62	0	COMBTRUCK	Max	117.9	0	10	0	19.6	0
P62	6.25	COMBTRUCK	Max	117.9	0	10	0	43	0
P62	0	COMBTRUCK	Min	-1228.4	0	-10	0	-19.6	0
P62	6.25	COMBTRUCK	Min	-1228.4	0	-10	0	-43	0
P71	0	COMBTRUCK	Max	106.7	120.4	6	0	18.3	64
P71	8	COMBTRUCK	Max	106.7	120.4	6	0	25.5	817.5
P71	0	COMBTRUCK	Min	-1345.2	-115.1	-5.1	0	-15.7	-117.7
P71	8	COMBTRUCK	Min	-1345.2	-115.1	-5.1	0	-29.7	-899.2
P72	0	COMBTRUCK	Max	103.3	119.9	6	0	18.3	62.6
P72	8	COMBTRUCK	Max	103.3	119.9	6	0	25.5	818.3
P72	0	COMBTRUCK	Min	-1341.1	-115.1	-5.1	0	-15.7	-125.4
P72	8	COMBTRUCK	Min	-1341.1	-115.1	-5.1	0	-29.7	-896.8

TABLE: Element Forces - Frames

Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
P81	0	COMBTRUCK	Max	143.6	124.6	16.3	0	40.7	64.5
P81	7	COMBTRUCK	Max	143.6	124.6	16.3	0	14.5	791
P81	0	COMBTRUCK	Min	-1320.3	-117.2	-3.2	0	-8.1	-113.4
P81	7	COMBTRUCK	Min	-1320.3	-117.2	-3.2	0	-73.2	-821.6
P82	0	COMBTRUCK	Max	143.8	124.8	16.3	0	40.7	65.9
P82	7	COMBTRUCK	Max	143.8	124.8	16.3	0	14.5	790
P82	0	COMBTRUCK	Min	-1314.4	-117.1	-3.2	0	-8.1	-121.5
P82	7	COMBTRUCK	Min	-1314.4	-117.1	-3.2	0	-73.1	-822.4
P91	0	COMBTRUCK	Max	114.5	121.3	13.7	0	33.9	36.8
P91	7	COMBTRUCK	Max	114.5	121.3	13.7	0	12	939.1
P91	0	COMBTRUCK	Min	-1320	-146.5	-1.8	0	-4.2	-115.2
P91	7	COMBTRUCK	Min	-1320	-146.5	-1.8	0	-65.9	-826.1
P92	0	COMBTRUCK	Max	107	122.2	13.7	0	33.9	39.3
P92	7	COMBTRUCK	Max	107	122.2	13.7	0	11.2	949.3
P92	0	COMBTRUCK	Min	-1311.2	-148.6	-1.8	0	-4.2	-121.3
P92	7	COMBTRUCK	Min	-1311.2	-148.6	-1.8	0	-66.3	-830.4

TABLE: Element Forces - Frames

Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
A1	0	COMBUDLKEL	Max	156.5	100.9	9.6	14.5	216.6	1615
A1	5.229	COMBUDLKEL	Max	156.5	100.9	9.6	14.5	215.3	3343
A1	0	COMBUDLKEL	Min	-1780.3	-330.5	-9.6	-14.5	-216.3	-305.8
A1	5.229	COMBUDLKEL	Min	-1780.3	-330.5	-9.6	-14.5	-214.8	-621.7
A2	0	COMBUDLKEL	Max	163	355.1	63.3	23.3	694.9	355.9
A2	4.467	COMBUDLKEL	Max	163	355.1	63.3	23.3	424.3	663.2
A2	0	COMBUDLKEL	Min	-1792.6	-78.6	-31.3	-12.2	-197.9	-1955.5
A2	4.467	COMBUDLKEL	Min	-1792.6	-78.6	-31.3	-12.2	-113.8	-3541.9
P11	0	COMBUDLKEL	Max	119.4	148.6	3.8	0	9.6	174
P11	7.029	COMBUDLKEL	Max	119.4	148.6	3.8	0	17.1	762.2
P11	0	COMBUDLKEL	Min	-1401	-119.4	-3.8	0	-9.6	-86.7
P11	7.029	COMBUDLKEL	Min	-1401	-119.4	-3.8	0	-17.2	-877.7
P12	0	COMBUDLKEL	Max	119.4	148.6	3.8	0	9.6	174
P12	7.029	COMBUDLKEL	Max	119.4	148.6	3.8	0	17.2	762.2
P12	0	COMBUDLKEL	Min	-1401	-119.4	-3.8	0	-9.6	-86.7
P12	7.029	COMBUDLKEL	Min	-1401	-119.4	-3.8	0	-17.1	-877.7
P21	0	COMBUDLKEL	Max	80.2	96.5	7.6	0	18.3	96.9
P21	7.029	COMBUDLKEL	Max	80.2	96.5	7.6	0	35.3	759.5
P21	0	COMBUDLKEL	Min	-1479.5	-99.4	-7.6	0	-18.3	-17.8
P21	7.029	COMBUDLKEL	Min	-1479.5	-99.4	-7.6	0	-35.2	-684.2
P22	0	COMBUDLKEL	Max	80.2	96.5	7.6	0	18.3	96.9
P22	7.029	COMBUDLKEL	Max	80.2	96.5	7.6	0	35.3	759.5
P22	0	COMBUDLKEL	Min	-1479.5	-99.4	-7.6	0	-18.3	-17.8
P22	7.029	COMBUDLKEL	Min	-1479.5	-99.4	-7.6	0	-35.3	-684.2
P30	0	COMBUDLKEL	Max	194.2	0	12.3	0	176.6	0
P30	5.662	COMBUDLKEL	Max	194.2	0	12.3	0	240.5	0
P30	0	COMBUDLKEL	Min	-2377.6	0	-12.3	0	-176.6	0
P30	5.662	COMBUDLKEL	Min	-2377.6	0	-12.3	0	-240.5	0
P40	0	COMBUDLKEL	Max	218.3	221.7	24.6	0	108.1	524.1
P40	6.9	COMBUDLKEL	Max	218.3	221.7	24.6	0	270.3	2635.7
P40	0	COMBUDLKEL	Min	-3296.4	-431.6	-24.6	0	-108.1	-418.9
P40	6.9	COMBUDLKEL	Min	-3296.4	-431.6	-24.6	0	-270.3	-1690.5
P50	0	COMBUDLKEL	Max	219.7	431.6	26.3	0	77.7	418.8
P50	6.9	COMBUDLKEL	Max	219.7	431.6	26.3	0	245.1	1694.9
P50	0	COMBUDLKEL	Min	-3298.1	-221.7	-26.3	0	-77.7	-522.4
P50	6.9	COMBUDLKEL	Min	-3298.1	-221.7	-26.3	0	-245.2	-2635.8
P61	0	COMBUDLKEL	Max	113.8	0	6.3	0	13.3	0
P61	6.25	COMBUDLKEL	Max	113.8	0	6.3	0	26.6	0
P61	0	COMBUDLKEL	Min	-1249.9	0	-6.3	0	-13.5	0
P61	6.25	COMBUDLKEL	Min	-1249.9	0	-6.3	0	-25.9	0
P62	0	COMBUDLKEL	Max	113.7	0	6.3	0	13.3	0
P62	6.25	COMBUDLKEL	Max	113.7	0	6.3	0	26.6	0
P62	0	COMBUDLKEL	Min	-1239.1	0	-6.3	0	-13.5	0
P62	6.25	COMBUDLKEL	Min	-1239.1	0	-6.3	0	-25.9	0
P71	0	COMBUDLKEL	Max	91	106.2	5.4	0	16.4	56.2
P71	8	COMBUDLKEL	Max	91	106.2	5.4	0	17.9	719
P71	0	COMBUDLKEL	Min	-1474.4	-101.4	-3.5	0	-10.8	-100.7
P71	8	COMBUDLKEL	Min	-1474.4	-101.4	-3.5	0	-26.7	-793.1
P72	0	COMBUDLKEL	Max	88.8	105.7	5.4	0	16.4	54.8
P72	8	COMBUDLKEL	Max	88.8	105.7	5.4	0	17.7	719
P72	0	COMBUDLKEL	Min	-1475.4	-101.4	-3.5	0	-10.8	-103
P72	8	COMBUDLKEL	Min	-1475.4	-101.4	-3.5	0	-26.7	-790.7

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
A1	0	COMBLIVEH	Max	92.7	43.3	116.8	176.8	3338	944.3
A1	5.229	COMBLIVEH	Max	92.7	43.3	116.8	176.8	3360.7	1908.9
A1	0	COMBLIVEH	Min	-1143.3	-187	-116.8	-176.8	-3337.9	-175.2
A1	5.229	COMBLIVEH	Min	-1143.3	-187	-116.8	-176.8	-3360.6	-371
A2	0	COMBLIVEH	Max	109.7	229.8	61.1	48.1	3484.2	218
A2	4.467	COMBLIVEH	Max	109.7	229.8	61.1	48.1	3423.3	452.9
A2	0	COMBLIVEH	Min	-1154.6	-54.6	-61.2	-48.1	-3186.4	-1318.5
A2	4.467	COMBLIVEH	Min	-1154.6	-54.6	-61.2	-48.1	-3278	-2336.8
P11	0	COMBLIVEH	Max	127.5	83.4	46.6	0	117.8	103.1
P11	7.029	COMBLIVEH	Max	127.5	83.4	46.6	0	209.5	434.5
P11	0	COMBLIVEH	Min	-1146.6	-68	-46.6	0	-117.8	-52.1
P11	7.029	COMBLIVEH	Min	-1146.6	-68	-46.6	0	-209.5	-494.8
P12	0	COMBLIVEH	Max	127.5	83.4	46.6	0	117.8	103.1
P12	7.029	COMBLIVEH	Max	127.5	83.4	46.6	0	209.5	434.5
P12	0	COMBLIVEH	Min	-1146.6	-68	-46.6	0	-117.8	-52.1
P12	7.029	COMBLIVEH	Min	-1146.6	-68	-46.6	0	-209.5	-494.7
P21	0	COMBLIVEH	Max	232.9	54.5	92.3	0	223.3	60.9
P21	7.029	COMBLIVEH	Max	232.9	54.5	92.3	0	430.8	446.5
P21	0	COMBLIVEH	Min	-1186.7	-59.7	-92.3	0	-223.3	-21.9
P21	7.029	COMBLIVEH	Min	-1186.7	-59.7	-92.3	0	-430.8	-391.4
P22	0	COMBLIVEH	Max	232.9	54.5	92.3	0	223.3	60.9
P22	7.029	COMBLIVEH	Max	232.9	54.5	92.3	0	430.8	446.5
P22	0	COMBLIVEH	Min	-1186.7	-59.7	-92.3	0	-223.3	-21.9
P22	7.029	COMBLIVEH	Min	-1186.7	-59.7	-92.3	0	-430.8	-391.4
P30	0	COMBLIVEH	Max	95	0	164	0	2158.2	0
P30	5.662	COMBLIVEH	Max	95	0	164	0	2939.4	0
P30	0	COMBLIVEH	Min	-1162.4	0	-164	0	-2158.2	0
P30	5.662	COMBLIVEH	Min	-1162.4	0	-164	0	-2939.4	0
P40	0	COMBLIVEH	Max	111.4	112.5	300.1	0	1321	265.1
P40	6.9	COMBLIVEH	Max	111.4	112.5	300.1	0	3303.5	1288.9
P40	0	COMBLIVEH	Min	-1611.5	-211.1	-300.1	0	-1321	-210
P40	6.9	COMBLIVEH	Min	-1611.5	-211.1	-300.1	0	-3303.5	-857.7
P50	0	COMBLIVEH	Max	112.2	211.1	321.6	0	949.6	210.2
P50	6.9	COMBLIVEH	Max	112.2	211.1	321.6	0	2996	859.2
P50	0	COMBLIVEH	Min	-1612.4	-112.5	-321.6	0	-949.6	-264.4
P50	6.9	COMBLIVEH	Min	-1612.4	-112.5	-321.6	0	-2996	-1289
P61	0	COMBLIVEH	Max	308.7	0	76.8	0	162.7	0.3
P61	6.25	COMBLIVEH	Max	308.7	0	76.8	0	317.5	0.3
P61	0	COMBLIVEH	Min	-1133.6	0	-76.8	0	-162.7	-0.3
P61	6.25	COMBLIVEH	Min	-1133.6	0	-76.8	0	-317.4	-0.3
P62	0	COMBLIVEH	Max	307.8	0	76.8	0	162.7	0.3
P62	6.25	COMBLIVEH	Max	307.8	0	76.8	0	317.5	0.3
P62	0	COMBLIVEH	Min	-1132.5	0	-76.8	0	-162.7	-0.3
P62	6.25	COMBLIVEH	Min	-1132.5	0	-76.8	0	-317.4	-0.3
P71	0	COMBLIVEH	Max	87.6	60.4	42.8	0	130.7	34.3
P71	8	COMBLIVEH	Max	87.6	60.4	42.8	0	211.7	410.1
P71	0	COMBLIVEH	Min	-1166.8	-57.9	-42.8	0	-130.7	-65
P71	8	COMBLIVEH	Min	-1166.8	-57.9	-42.8	0	-211.6	-450.5
P72	0	COMBLIVEH	Max	83.2	60.7	42.8	0	130.7	33.8
P72	8	COMBLIVEH	Max	83.2	60.7	42.8	0	211.7	417.9
P72	0	COMBLIVEH	Min	-1164.9	-58.8	-42.8	0	-130.7	-70.6
P72	8	COMBLIVEH	Min	-1164.9	-58.8	-42.8	0	-211.6	-452

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
P81	0	COMBLIVEH	Max	82.8	64.2	26.8	0	67.2	33.4
P81	7	COMBLIVEH	Max	82.8	64.2	26.8	0	120.4	428
P81	0	COMBLIVEH	Min	-1149.5	-62.8	-26.8	0	-67.2	-62.5
P81	7	COMBLIVEH	Min	-1149.5	-62.8	-26.8	0	-120.4	-423
P82	0	COMBLIVEH	Max	82.2	65	26.8	0	67.2	36.1
P82	7	COMBLIVEH	Max	82.2	65	26.8	0	120.4	433.8
P82	0	COMBLIVEH	Min	-1155.1	-64.2	-26.8	0	-67.2	-68.7
P82	7	COMBLIVEH	Min	-1155.1	-64.2	-26.8	0	-120.4	-426.7
P91	0	COMBLIVEH	Max	67.2	66.4	10.8	0	27.8	18.8
P91	7	COMBLIVEH	Max	67.2	66.4	10.8	0	71.3	535
P91	0	COMBLIVEH	Min	-1144.3	-83.4	-9.4	0	-17.4	-64.8
P91	7	COMBLIVEH	Min	-1144.3	-83.4	-9.4	0	-78.2	-453.5
P92	0	COMBLIVEH	Max	60.7	67.8	10.8	0	27.8	22
P92	7	COMBLIVEH	Max	60.7	67.8	10.8	0	70.9	545
P92	0	COMBLIVEH	Min	-1156.5	-85.5	-9.4	0	-17.4	-70.1
P92	7	COMBLIVEH	Min	-1156.5	-85.5	-9.4	0	-78.6	-460.4

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
P81	0	COMBUDLKEL	Max	125.2	109.8	13.3	0	33.4	54.1
P81	7	COMBUDLKEL	Max	125.2	109.8	13.3	0	9.9	692.1
P81	0	COMBUDLKEL	Min	-1405.7	-102.9	-2.2	0	-5.5	-101.9
P81	7	COMBUDLKEL	Min	-1405.7	-102.9	-2.2	0	-59.9	-722.2
P82	0	COMBUDLKEL	Max	125.5	109.9	13.3	0	33.4	54.9
P82	7	COMBUDLKEL	Max	125.5	109.9	13.3	0	9.9	691
P82	0	COMBUDLKEL	Min	-1405.1	-103.7	-2.2	0	-5.5	-107.7
P82	7	COMBUDLKEL	Min	-1405.1	-103.7	-2.2	0	-59.9	-722.8
P91	0	COMBUDLKEL	Max	99	106.4	11.9	0	28.1	29.2
P91	7	COMBUDLKEL	Max	99	106.4	11.9	0	7.2	822.6
P91	0	COMBUDLKEL	Min	-1392.1	-130	-1.5	0	-3.6	-95.3
P91	7	COMBUDLKEL	Min	-1392.1	-130	-1.5	0	-56.8	-722.8
P92	0	COMBUDLKEL	Max	92.7	107.1	11.9	0	28.1	31.1
P92	7	COMBUDLKEL	Max	92.7	107.1	11.9	0	7.2	831.4
P92	0	COMBUDLKEL	Min	-1402.5	-132.1	-1.5	0	-3.6	-100.1
P92	7	COMBUDLKEL	Min	-1402.5	-132.1	-1.5	0	-57.3	-726.2

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
A1	0	FNDLIVE	Max	142.6	68.7	11.6	17.1	428	1452.7
A1	5.229	FNDLIVE	Max	142.6	68.7	11.6	17.1	431	2936.6
A1	0	FNDLIVE	Min	-1758.9	-287.7	-11.6	-17.1	-427.8	-269.5
A1	5.229	FNDLIVE	Min	-1758.9	-287.7	-11.6	-17.1	-430.7	-570.8
A2	0	FNDLIVE	Max	148.6	312.3	55.3	20.5	783.3	311
A2	4.467	FNDLIVE	Max	148.6	312.3	55.3	20.5	557	613.2
A2	0	FNDLIVE	Min	-1769	-70.6	-27.6	-12.8	-225	-1761.1
A2	4.467	FNDLIVE	Min	-1769	-70.6	-27.6	-12.8	-322.3	-3143.9
P11	0	FNDLIVE	Max	106.5	127.5	4.5	0	11.3	156.7
P11	7.029	FNDLIVE	Max	106.5	127.5	4.5	0	20.2	665.2
P11	0	FNDLIVE	Min	-1012.1	-103.9	-4.5	0	-11.3	-78
P11	7.029	FNDLIVE	Min	-1012.1	-103.9	-4.5	0	-20.2	-757.8
P12	0	FNDLIVE	Max	106.6	127.5	4.5	0	11.3	156.7
P12	7.029	FNDLIVE	Max	106.6	127.5	4.5	0	20.2	665.2
P12	0	FNDLIVE	Min	-1012.1	-103.9	-4.5	0	-11.3	-78
P12	7.029	FNDLIVE	Min	-1012.1	-103.9	-4.5	0	-20.2	-757.8
P21	0	FNDLIVE	Max	73.3	82.9	9.1	0	21.7	92.5
P21	7.029	FNDLIVE	Max	73.3	82.9	9.1	0	42.7	663.4
P21	0	FNDLIVE	Min	-1081.8	-86.9	-9.1	0	-21.7	-22.5
P21	7.029	FNDLIVE	Min	-1081.8	-86.9	-9.1	0	-42.7	-598.1
P22	0	FNDLIVE	Max	73.3	82.9	9.1	0	21.7	92.5
P22	7.029	FNDLIVE	Max	73.3	82.9	9.1	0	42.7	663.4
P22	0	FNDLIVE	Min	-1081.8	-86.9	-9.1	0	-21.7	-22.5
P22	7.029	FNDLIVE	Min	-1081.8	-86.9	-9.1	0	-42.7	-598.1
P30	0	FNDLIVE	Max	141.8	0	21	0	211.2	0
P30	5.662	FNDLIVE	Max	141.8	0	21	0	325.4	0
P30	0	FNDLIVE	Min	-1747.5	0	-21	0	-211.2	0
P30	5.662	FNDLIVE	Min	-1747.5	0	-21	0	-325.4	0
P40	0	FNDLIVE	Max	171.4	173.1	36.7	0	109.9	407.8
P40	6.9	FNDLIVE	Max	171.4	173.1	36.7	0	328.3	1914.5
P40	0	FNDLIVE	Min	-2530.7	-314.4	-36.7	0	-109.9	-323
P40	6.9	FNDLIVE	Min	-2530.7	-314.4	-36.7	0	-328.3	-1319.6
P50	0	FNDLIVE	Max	172.6	314.4	36.6	0	72.5	323.4
P50	6.9	FNDLIVE	Max	172.6	314.4	36.6	0	308.9	1321.9
P50	0	FNDLIVE	Min	-2532.4	-173.1	-36.6	0	-72.5	-406.8
P50	6.9	FNDLIVE	Min	-2532.4	-173.1	-36.6	0	-308.9	-1914.7
P61	0	FNDLIVE	Max	90.8	0	7.7	0	15.1	0
P61	6.25	FNDLIVE	Max	90.8	0	7.7	0	33.1	0
P61	0	FNDLIVE	Min	-946.3	0	-7.7	0	-15.1	0
P61	6.25	FNDLIVE	Min	-946.3	0	-7.7	0	-33.1	0
P62	0	FNDLIVE	Max	90.7	0	7.7	0	15.1	0
P62	6.25	FNDLIVE	Max	90.7	0	7.7	0	33.1	0
P62	0	FNDLIVE	Min	-944.9	0	-7.7	0	-15.1	0
P62	6.25	FNDLIVE	Min	-944.9	0	-7.7	0	-33.1	0
P71	0	FNDLIVE	Max	82.1	92.6	4.6	0	14.1	49.3
P71	8	FNDLIVE	Max	82.1	92.6	4.6	0	19.6	628.9
P71	0	FNDLIVE	Min	-1076.6	-88.5	-4	0	-12.1	-90.6
P71	8	FNDLIVE	Min	-1076.6	-88.5	-4	0	-22.8	-691.7
P72	0	FNDLIVE	Max	79.5	92.2	4.6	0	14.1	48.2
P72	8	FNDLIVE	Max	79.5	92.2	4.6	0	19.6	629.5
P72	0	FNDLIVE	Min	-1078	-88.6	-4	0	-12.1	-96.4
P72	8	FNDLIVE	Min	-1078	-88.6	-4	0	-22.8	-689.8

Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
P81	0	FNDLIVE	Max	110.4	95.8	12.5	0	31.3	49.6
P81	7	FNDLIVE	Max	110.4	95.8	12.5	0	11.1	608.5
P81	0	FNDLIVE	Min	-1015.6	-90.2	-2.5	0	-6.2	-87.2
P81	7	FNDLIVE	Min	-1015.6	-90.2	-2.5	0	-56.3	-632
P82	0	FNDLIVE	Max	110.6	96	12.5	0	31.3	50.7
P82	7	FNDLIVE	Max	110.6	96	12.5	0	11.1	607.7
P82	0	FNDLIVE	Min	-1011.1	-90	-2.5	0	-6.2	-93.5
P82	7	FNDLIVE	Min	-1011.1	-90	-2.5	0	-56.3	-632.6
P91	0	FNDLIVE	Max	88	93.3	10.5	0	26.1	28.3
P91	7	FNDLIVE	Max	88	93.3	10.5	0	9.3	722.4
P91	0	FNDLIVE	Min	-1015.4	-112.7	-1.4	0	-3.2	-88.6
P91	7	FNDLIVE	Min	-1015.4	-112.7	-1.4	0	-50.7	-635.5
P92	0	FNDLIVE	Max	82.3	94	10.6	0	26.1	30.2
P92	7	FNDLIVE	Max	82.3	94	10.6	0	8.6	730.2
P92	0	FNDLIVE	Min	-1008.6	-114.3	-1.4	0	-3.2	-93.3
P92	7	FNDLIVE	Min	-1008.6	-114.3	-1.4	0	-51	-638.7

TABLE: Element Forces - Frames

TABLE: Element Forces - Frames

Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
A1	0	COMBRAKE	Max	60.8	124.4	0.4	0.6	2.6	274.7
A1	5.229	COMBRAKE	Max	60.8	124.4	0.4	0.6	0.5	375.8
A1	0	COMBRAKE	Min	-60.8	-124.4	-0.4	-0.6	-2.6	-274.7
A1	5.229	COMBRAKE	Min	-60.8	-124.4	-0.4	-0.6	-0.5	-375.8
A2	0	COMBRAKE	Max	63.9	138.8	39.8	36.7	196.7	248.9
A2	4.467	COMBRAKE	Max	63.9	138.8	39.8	36.7	19	371.2
A2	0	COMBRAKE	Min	-63.9	-138.8	-39.8	-36.7	-196.7	-248.9
A2	4.467	COMBRAKE	Min	-63.9	-138.8	-39.8	-36.7	-19	-371.2
P11	0	COMBRAKE	Max	9	50.2	0.2	0	0.4	124.5
P11	7.029	COMBRAKE	Max	9	50.2	0.2	0	0.7	228.4
P11	0	COMBRAKE	Min	-9	-50.2	-0.2	0	-0.4	-124.5
P11	7.029	COMBRAKE	Min	-9	-50.2	-0.2	0	-0.7	-228.4
P12	0	COMBRAKE	Max	8.4	50.3	0.2	0	0.4	124.6
P12	7.029	COMBRAKE	Max	8.4	50.3	0.2	0	0.7	228.7
P12	0	COMBRAKE	Min	-8.4	-50.3	-0.2	0	-0.4	-124.6
P12	7.029	COMBRAKE	Min	-8.4	-50.3	-0.2	0	-0.7	-228.7
P21	0	COMBRAKE	Max	8	39.3	0.3	0	0.7	99
P21	7.029	COMBRAKE	Max	8	39.3	0.3	0	1.5	177
P21	0	COMBRAKE	Min	-8	-39.3	-0.3	0	-0.7	-99
P21	7.029	COMBRAKE	Min	-8	-39.3	-0.3	0	-1.5	-177
P22	0	COMBRAKE	Max	6.6	39.3	0.3	0	0.7	99.1
P22	7.029	COMBRAKE	Max	6.6	39.3	0.3	0	1.5	177.3
P22	0	COMBRAKE	Min	-6.6	-39.3	-0.3	0	-0.7	-99.1
P22	7.029	COMBRAKE	Min	-6.6	-39.3	-0.3	0	-1.5	-177.3
P30	0	COMBRAKE	Max	14.3	0	1	0	4.3	0
P30	5.662	COMBRAKE	Max	14.3	0	1	0	1.4	0
P30	0	COMBRAKE	Min	-14.3	0	-1	0	-4.3	0
P30	5.662	COMBRAKE	Min	-14.3	0	-1	0	-1.4	0
P40	0	COMBRAKE	Max	34.7	204.8	0.8	0	6.9	439.5
P40	6.9	COMBRAKE	Max	34.7	204.8	0.8	0	1.5	973.4
P40	0	COMBRAKE	Min	-34.7	-204.8	-0.8	0	-6.9	-439.5
P40	6.9	COMBRAKE	Min	-34.7	-204.8	-0.8	0	-1.5	-973.4
P50	0	COMBRAKE	Max	35.4	204.8	3.2	0	22.1	439.5
P50	6.9	COMBRAKE	Max	35.4	204.8	3.2	0	0.3	973.9
P50	0	COMBRAKE	Min	-35.4	-204.8	-3.2	0	-22.1	-439.5
P50	6.9	COMBRAKE	Min	-35.4	-204.8	-3.2	0	-0.3	-973.9
P61	0	COMBRAKE	Max	5.2	0	5.2	0	9.2	0
P61	6.25	COMBRAKE	Max	5.2	0	5.2	0	23.2	0
P61	0	COMBRAKE	Min	-5.2	0	-5.2	0	-9.2	0
P61	6.25	COMBRAKE	Min	-5.2	0	-5.2	0	-23.2	0
P62	0	COMBRAKE	Max	20.1	0	5.2	0	9.2	0
P62	6.25	COMBRAKE	Max	20.1	0	5.2	0	23.2	0
P62	0	COMBRAKE	Min	-20.1	0	-5.2	0	-9.2	0
P62	6.25	COMBRAKE	Min	-20.1	0	-5.2	0	-23.2	0
P71	0	COMBRAKE	Max	11.3	37	0.3	0	1	118.7
P71	8	COMBRAKE	Max	11.3	37	0.3	0	1.6	177.2
P71	0	COMBRAKE	Min	-11.3	-37	-0.3	0	-1	-118.7
P71	8	COMBRAKE	Min	-11.3	-37	-0.3	0	-1.6	-177.2
P72	0	COMBRAKE	Max	8.7	38.4	0.3	0	1	122.6
P72	8	COMBRAKE	Max	8.7	38.4	0.3	0	1.6	184.3
P72	0	COMBRAKE	Min	-8.7	-38.4	-0.3	0	-1	-122.6
P72	8	COMBRAKE	Min	-8.7	-38.4	-0.3	0	-1.6	-184.3

TABLE: Element Forces - Frames

Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
P81	0	COMBRAKE	Max	9.4	46.5	3.7	0	8.6	121.5
P81	7	COMBRAKE	Max	9.4	46.5	3.7	0	17	204.2
P81	0	COMBRAKE	Min	-9.4	-46.5	-3.7	0	-8.6	-121.5
P81	7	COMBRAKE	Min	-9.4	-46.5	-3.7	0	-17	-204.2
P82	0	COMBRAKE	Max	1.2	48.7	3.7	0	8.6	126.5
P82	7	COMBRAKE	Max	1.2	48.7	3.7	0	16.9	214.4
P82	0	COMBRAKE	Min	-1.2	-48.7	-3.7	0	-8.6	-126.5
P82	7	COMBRAKE	Min	-1.2	-48.7	-3.7	0	-16.9	-214.4
P91	0	COMBRAKE	Max	9.4	43	1.2	0	2.5	96
P91	7	COMBRAKE	Max	9.4	43	1.2	0	5.6	205
P91	0	COMBRAKE	Min	-9.4	-43	-1.2	0	-2.5	-96
P91	7	COMBRAKE	Min	-9.4	-43	-1.2	0	-5.6	-205
P92	0	COMBRAKE	Max	11.7	45.4	1.2	0	2.5	101
P92	7	COMBRAKE	Max	11.7	45.4	1.2	0	5.6	216.6
P92	0	COMBRAKE	Min	-11.7	-45.4	-1.2	0	-2.5	-101
P92	7	COMBRAKE	Min	-11.7	-45.4	-1.2	0	-5.6	-216.6

TABLE: Element Forces - Frames

Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
A1	0	COMBCFUGAL	Max	0	0	0.8	-0.2	5.3	0
A1	5.229	COMBCFUGAL	Max	0	0	0.8	-0.2	1	0
A1	0	COMBCFUGAL	Min	0	0	0.2	-1.3	1	0
A1	5.229	COMBCFUGAL	Min	0	0	0.2	-1.3	0.2	0
A2	0	COMBCFUGAL	Max	5.7	-14.5	273.7	-10.2	1989.5	-31
A2	4.467	COMBCFUGAL	Max	5.7	-14.5	273.7	-10.2	767	42.3
A2	0	COMBCFUGAL	Min	4	-16.4	75.2	-36.2	447.8	-66.7
A2	4.467	COMBCFUGAL	Min	4	-16.4	75.2	-36.2	111.8	-1.8
P11	0	COMBCFUGAL	Max	-0.1091	0	0	0	-0.1	0
P11	7.029	COMBCFUGAL	Max	-0.1091	0	0	0	1.5	0.3
P11	0	COMBCFUGAL	Min	-0.5703	0	-0.3	0	-0.8	-0.1
P11	7.029	COMBCFUGAL	Min	-0.5703	0	-0.3	0	0.3	0
P12	0	COMBCFUGAL	Max	0.5703	0	0	0	-0.1	0.1
P12	7.029	COMBCFUGAL	Max	0.5703	0	0	0	1.5	0
P12	0	COMBCFUGAL	Min	0.1091	0	-0.3	0	-0.8	0
P12	7.029	COMBCFUGAL	Min	0.1091	0	-0.3	0	0.3	-0.3
P21	0	COMBCFUGAL	Max	-0.2761	0	-0.1	0	-0.3	0
P21	7.029	COMBCFUGAL	Max	-0.2761	0	-0.1	0	3.1	0.3
P21	0	COMBCFUGAL	Min	-1.4	0	-0.7	0	-1.4	-0.1
P21	7.029	COMBCFUGAL	Min	-1.4	0	-0.7	0	0.6	0
P22	0	COMBCFUGAL	Max	1.4	0	-0.1	0	-0.3	0.1
P22	7.029	COMBCFUGAL	Max	1.4	0	-0.1	0	3.1	0
P22	0	COMBCFUGAL	Min	0.2761	0	-0.7	0	-1.4	0
P22	7.029	COMBCFUGAL	Min	0.2761	0	-0.7	0	0.6	-0.3
P30	0	COMBCFUGAL	Max	0	0	-0.4	0	-1.7	0
P30	5.662	COMBCFUGAL	Max	0	0	-0.4	0	2.8	0
P30	0	COMBCFUGAL	Min	0	0	-2.1	0	-8.9	0
P30	5.662	COMBCFUGAL	Min	0	0	-2.1	0	0.5	0
P40	0	COMBCFUGAL	Max	0	0	1.6	0	14.3	0
P40	6.9	COMBCFUGAL	Max	0	0	1.6	0	3.2	0
P40	0	COMBCFUGAL	Min	0	0	0.3	0	2.7	0
P40	6.9	COMBCFUGAL	Min	0	0	0.3	0	0.6	0
P50	0	COMBCFUGAL	Max	0	0	6.7	0	45.6	0
P50	6.9	COMBCFUGAL	Max	0	0	6.7	0	-0.1	0
P50	0	COMBCFUGAL	Min	0	0	1.3	0	8.7	0
P50	6.9	COMBCFUGAL	Min	0	0	1.3	0	-0.6	0
P61	0	COMBCFUGAL	Max	26.3	0	10.7	0	19	0
P61	6.25	COMBCFUGAL	Max	26.3	0	10.7	0	-9.1	0
P61	0	COMBCFUGAL	Min	5.4	0	2	0	3.6	0
P61	6.25	COMBCFUGAL	Min	5.4	0	2	0	-47.7	0
P62	0	COMBCFUGAL	Max	-4.9	0	10.7	0	19	0
P62	6.25	COMBCFUGAL	Max	-4.9	0	10.7	0	-9.1	0
P62	0	COMBCFUGAL	Min	-26.2	0	2	0	3.6	0
P62	6.25	COMBCFUGAL	Min	-26.2	0	2	0	-47.7	0
P71	0	COMBCFUGAL	Max	29.2	3.1	13.4	0	39.5	9.8
P71	8	COMBCFUGAL	Max	29.2	3.1	13.4	0	-42.4	-7.6
P71	0	COMBCFUGAL	Min	17.5	1.5	8.4	0	24.8	4.4
P71	8	COMBCFUGAL	Min	17.5	1.5	8.4	0	-67.5	-15.2
P72	0	COMBCFUGAL	Max	-17	1.1	13.4	0	39.5	3.9
P72	8	COMBCFUGAL	Max	-17	1.1	13.4	0	-42.4	-1.6
P72	0	COMBCFUGAL	Min	-28	0.3	8.4	0	24.8	1.1
P72	8	COMBCFUGAL	Min	-28	0.3	8.4	0	-67.5	-4.5

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
P81	0	COMBCFUGAL	Max	72	3.7	19.3	0	48.3	8.5
P81	7	COMBCFUGAL	Max	72	3.7	19.3	0	-84.6	0.7
P81	0	COMBCFUGAL	Min	37.4	0	18.4	0	44.3	1.3
P81	7	COMBCFUGAL	Min	37.4	0	18.4	0	-87.1	-17.2
P82	0	COMBCFUGAL	Max	-34.5	1.4	19.3	0	48.3	3.4
P82	7	COMBCFUGAL	Max	-34.5	1.4	19.3	0	-84.6	2
P82	0	COMBCFUGAL	Min	-72.2	-0.2	18.4	0	44.3	0.7
P82	7	COMBCFUGAL	Min	-72.2	-0.2	18.4	0	-87.1	-6.8
P91	0	COMBCFUGAL	Max	99.7	-2.7	19.5	0	46.1	-2.2
P91	7	COMBCFUGAL	Max	99.7	-2.7	19.5	0	-62.9	16.4
P91	0	COMBCFUGAL	Min	58.8	-3.4	13.5	0	31.4	-8.1
P91	7	COMBCFUGAL	Min	58.8	-3.4	13.5	0	-90.3	15.8
P92	0	COMBCFUGAL	Max	-65.6	-1.6	19.5	0	46.1	-4
P92	7	COMBCFUGAL	Max	-65.6	-1.6	19.5	0	-62.9	20.5
P92	0	COMBCFUGAL	Min	-107.5	-3.5	13.5	0	31.4	-4.3
P92	7	COMBCFUGAL	Min	-107.5	-3.5	13.5	0	-90.3	6.9

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
A1	0	COMBTEMP	Max	50.5	154.5	0.5	0.9	3.6	374.6
A1	5.229	COMBTEMP	Max	50.5	154.5	0.5	0.9	0.7	433.4
A1	0	COMBTEMP	Min	-50.5	-154.5	-0.5	-0.9	-3.6	-374.6
A1	5.229	COMBTEMP	Min	-50.5	-154.5	-0.5	-0.9	-0.7	-433.4
A2	0	COMBTEMP	Max	87.2	256.6	94.3	30.2	476.5	491.7
A2	4.467	COMBTEMP	Max	87.2	256.6	94.3	30.2	55.3	654.4
A2	0	COMBTEMP	Min	-87.2	-256.6	-94.3	-30.2	-476.5	-491.7
A2	4.467	COMBTEMP	Min	-87.2	-256.6	-94.3	-30.2	-55.3	-654.4
P11	0	COMBTEMP	Max	41.5	8.4	0.2	0	0.5	29.9
P11	7.029	COMBTEMP	Max	41.5	8.4	0.2	0	1	29
P11	0	COMBTEMP	Min	-41.5	-8.4	-0.2	0	-0.5	-29.9
P11	7.029	COMBTEMP	Min	-41.5	-8.4	-0.2	0	-1	-29
P12	0	COMBTEMP	Max	42.3	8.5	0.2	0	0.5	30.1
P12	7.029	COMBTEMP	Max	42.3	8.5	0.2	0	1	29.5
P12	0	COMBTEMP	Min	-42.3	-8.5	-0.2	0	-0.5	-30.1
P12	7.029	COMBTEMP	Min	-42.3	-8.5	-0.2	0	-1	-29.5
P21	0	COMBTEMP	Max	9.9	68.8	0.4	0	1	176.3
P21	7.029	COMBTEMP	Max	9.9	68.8	0.4	0	2.2	307.3
P21	0	COMBTEMP	Min	-9.9	-68.8	-0.4	0	-1	-176.3
P21	7.029	COMBTEMP	Min	-9.9	-68.8	-0.4	0	-2.2	-307.3
P22	0	COMBTEMP	Max	8	68.9	0.4	0	1	176.4
P22	7.029	COMBTEMP	Max	8	68.9	0.4	0	2.2	307.7
P22	0	COMBTEMP	Min	-8	-68.9	-0.4	0	-1	-176.4
P22	7.029	COMBTEMP	Min	-8	-68.9	-0.4	0	-2.2	-307.7
P30	0	COMBTEMP	Max	40.6	0	1.4	0	6.1	0
P30	5.662	COMBTEMP	Max	40.6	0	1.4	0	1.9	0
P30	0	COMBTEMP	Min	-40.6	0	-1.4	0	-6.1	0
P30	5.662	COMBTEMP	Min	-40.6	0	-1.4	0	-1.9	0
P40	0	COMBTEMP	Max	26.1	141.1	1.1	0	9.9	337.5
P40	6.9	COMBTEMP	Max	26.1	141.1	1.1	0	2.2	636.2
P40	0	COMBTEMP	Min	-26.1	-141.1	-1.1	0	-9.9	-337.5
P40	6.9	COMBTEMP	Min	-26.1	-141.1	-1.1	0	-2.2	-636.2
P50	0	COMBTEMP	Max	23.8	141.1	4.6	0	31.5	336.5
P50	6.9	COMBTEMP	Max	23.8	141.1	4.6	0	0.4	637.2
P50	0	COMBTEMP	Min	-23.8	-141.1	-4.6	0	-31.5	-336.5
P50	6.9	COMBTEMP	Min	-23.8	-141.1	-4.6	0	-0.4	-637.2
P61	0	COMBTEMP	Max	5.7	0	7.4	0	13.2	0
P61	6.25	COMBTEMP	Max	5.7	0	7.4	0	33	0
P61	0	COMBTEMP	Min	-5.7	0	-7.4	0	-13.2	0
P61	6.25	COMBTEMP	Min	-5.7	0	-7.4	0	-33	0
P62	0	COMBTEMP	Max	42	0	7.4	0	13.2	0
P62	6.25	COMBTEMP	Max	42	0	7.4	0	33	0
P62	0	COMBTEMP	Min	-42	0	-7.4	0	-13.2	0
P62	6.25	COMBTEMP	Min	-42	0	-7.4	0	-33	0
P71	0	COMBTEMP	Max	2.8	98.1	7.7	0	22.6	321.3
P71	8	COMBTEMP	Max	2.8	98.1	7.7	0	38.7	463.1
P71	0	COMBTEMP	Min	-2.8	-98.1	-7.7	0	-22.6	-321.3
P71	8	COMBTEMP	Min	-2.8	-98.1	-7.7	0	-38.7	-463.1
P72	0	COMBTEMP	Max	29	98.3	7.7	0	22.6	322.1
P72	8	COMBTEMP	Max	29	98.3	7.7	0	38.7	464.6
P72	0	COMBTEMP	Min	-29	-98.3	-7.7	0	-22.6	-322.1
P72	8	COMBTEMP	Min	-29	-98.3	-7.7	0	-38.7	-464.6

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
P81	0	COMBTEMP	Max	35.5	57.5	6.3	0	15.1	145.4
P81	7	COMBTEMP	Max	35.5	57.5	6.3	0	28.8	257.4
P81	0	COMBTEMP	Min	-35.5	-57.5	-6.3	0	-15.1	-145.4
P81	7	COMBTEMP	Min	-35.5	-57.5	-6.3	0	-28.8	-257.4
P82	0	COMBTEMP	Max	10.7	57.1	6.3	0	15.1	144.4
P82	7	COMBTEMP	Max	10.7	57.1	6.3	0	28.8	255.3
P82	0	COMBTEMP	Min	-10.7	-57.1	-6.3	0	-15.1	-144.4
P82	7	COMBTEMP	Min	-10.7	-57.1	-6.3	0	-28.8	-255.3
P91	0	COMBTEMP	Max	46.1	20	1	0	2.1	32.6
P91	7	COMBTEMP	Max	46.1	20	1	0	5	107.4
P91	0	COMBTEMP	Min	-46.1	-20	-1	0	-2.1	-32.6
P91	7	COMBTEMP	Min	-46.1	-20	-1	0	-5	-107.4
P92	0	COMBTEMP	Max	44.1	21.5	1	0	2.1	35.8
P92	7	COMBTEMP	Max	44.1	21.5	1	0	5	114.8
P92	0	COMBTEMP	Min	-44.1	-21.5	-1	0	-2.1	-35.8
P92	7	COMBTEMP	Min	-44.1	-21.5	-1	0	-5	-114.8

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
A1	0	COMBWINULS	Max	0	0	28	69.8	189.7	0
A1	5.229	COMBWINULS	Max	0	0	28	69.8	43	0
A1	0	COMBWINULS	Min	0	0	-28	-69.8	-189.7	0
A1	5.229	COMBWINULS	Min	0	0	-28	-69.8	-43	0
A2	0	COMBWINULS	Max	3.5	10.7	43.8	46	261.9	21.4
A2	4.467	COMBWINULS	Max	3.5	10.7	43.8	46	66.1	26.5
A2	0	COMBWINULS	Min	-3.5	-10.7	-43.8	-46	-261.9	-21.4
A2	4.467	COMBWINULS	Min	-3.5	-10.7	-43.8	-46	-66.1	-26.5
P11	0	COMBWINULS	Max	42.9	3.2	22.7	0	54.9	7.4
P11	7.029	COMBWINULS	Max	42.9	3.2	22.7	0	104.7	15
P11	0	COMBWINULS	Min	-42.9	-3.2	-22.7	0	-54.9	-7.4
P11	7.029	COMBWINULS	Min	-42.9	-3.2	-22.7	0	-104.7	-15
P12	0	COMBWINULS	Max	42.9	3.2	22.7	0	54.9	7.4
P12	7.029	COMBWINULS	Max	42.9	3.2	22.7	0	104.7	15
P12	0	COMBWINULS	Min	-42.9	-3.2	-22.7	0	-54.9	-7.4
P12	7.029	COMBWINULS	Min	-42.9	-3.2	-22.7	0	-104.7	-15
P21	0	COMBWINULS	Max	84.4	2.7	36.7	0	81.8	5.8
P21	7.029	COMBWINULS	Max	84.4	2.7	36.7	0	176.3	13.5
P21	0	COMBWINULS	Min	-84.4	-2.7	-36.7	0	-81.8	-5.8
P21	7.029	COMBWINULS	Min	-84.4	-2.7	-36.7	0	-176.3	-13.5
P22	0	COMBWINULS	Max	84.4	2.7	36.7	0	81.8	5.8
P22	7.029	COMBWINULS	Max	84.4	2.7	36.7	0	176.3	13.5
P22	0	COMBWINULS	Min	-84.4	-2.7	-36.7	0	-81.8	-5.8
P22	7.029	COMBWINULS	Min	-84.4	-2.7	-36.7	0	-176.3	-13.5
P30	0	COMBWINULS	Max	0	0	73.9	0	495.5	0
P30	5.662	COMBWINULS	Max	0	0	73.9	0	76.9	0
P30	0	COMBWINULS	Min	0	0	-73.9	0	-495.5	0
P30	5.662	COMBWINULS	Min	0	0	-73.9	0	-76.9	0
P40	0	COMBWINULS	Max	0	0	50.3	0	450.8	0
P40	6.9	COMBWINULS	Max	0	0	50.3	0	103.6	0
P40	0	COMBWINULS	Min	0	0	-50.3	0	-450.8	0
P40	6.9	COMBWINULS	Min	0	0	-50.3	0	-103.6	0
P50	0	COMBWINULS	Max	0	0	50.8	0	389.6	0
P50	6.9	COMBWINULS	Max	0	0	50.8	0	39.2	0
P50	0	COMBWINULS	Min	0	0	-50.8	0	-389.6	0
P50	6.9	COMBWINULS	Min	0	0	-50.8	0	-39.2	0
P61	0	COMBWINULS	Max	115.5	0	43.5	0	78	0
P61	6.25	COMBWINULS	Max	115.5	0	43.5	0	193.9	0
P61	0	COMBWINULS	Min	-115.5	0	-43.5	0	-78	0
P61	6.25	COMBWINULS	Min	-115.5	0	-43.5	0	-193.9	0
P62	0	COMBWINULS	Max	114.9	0	43.5	0	78	0
P62	6.25	COMBWINULS	Max	114.9	0	43.5	0	193.9	0
P62	0	COMBWINULS	Min	-114.9	0	-43.5	0	-78	0
P62	6.25	COMBWINULS	Min	-114.9	0	-43.5	0	-193.9	0
P71	0	COMBWINULS	Max	60.3	1.5	29.3	0	86.4	5.4
P71	8	COMBWINULS	Max	60.3	1.5	29.3	0	148.1	6.8
P71	0	COMBWINULS	Min	-60.3	-1.5	-29.3	0	-86.4	-5.4
P71	8	COMBWINULS	Min	-60.3	-1.5	-29.3	0	-148.1	-6.8
P72	0	COMBWINULS	Max	59.2	3.9	29.3	0	86.4	12
P72	8	COMBWINULS	Max	59.2	3.9	29.3	0	148.1	18.9
P72	0	COMBWINULS	Min	-59.2	-3.9	-29.3	0	-86.4	-12
P72	8	COMBWINULS	Min	-59.2	-3.9	-29.3	0	-148.1	-18.9

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
P81	0	COMBWINULS	Max	49.7	0.8	26.9	0	64.5	2.6
P81	7	COMBWINULS	Max	49.7	0.8	26.9	0	123.5	3.1
P81	0	COMBWINULS	Min	-49.7	-0.8	-26.9	0	-64.5	-2.6
P81	7	COMBWINULS	Min	-49.7	-0.8	-26.9	0	-123.5	-3.1
P82	0	COMBWINULS	Max	50.9	4	26.9	0	64.5	9.9
P82	7	COMBWINULS	Max	50.9	4	26.9	0	123.5	17.9
P82	0	COMBWINULS	Min	-50.9	-4	-26.9	0	-64.5	-9.9
P82	7	COMBWINULS	Min	-50.9	-4	-26.9	0	-123.5	-17.9
P91	0	COMBWINULS	Max	25.8	2.9	13.9	0	30.5	6.1
P91	7	COMBWINULS	Max	25.8	2.9	13.9	0	66.8	14.5
P91	0	COMBWINULS	Min	-25.8	-2.9	-13.9	0	-30.5	-6.1
P91	7	COMBWINULS	Min	-25.8	-2.9	-13.9	0	-66.8	-14.5
P92	0	COMBWINULS	Max	29.7	0	13.9	0	30.5	0.2
P92	7	COMBWINULS	Max	29.7	0	13.9	0	66.8	0.4
P92	0	COMBWINULS	Min	-29.7	0	-13.9	0	-30.5	-0.2
P92	7	COMBWINULS	Min	-29.7	0	-13.9	0	-66.8	-0.4

TABLE: Element Forces - Frames									
Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
A1	0	COMBWINSLS	Max	0	0	19.5	48.6	132.1	0
A1	5.229	COMBWINSLS	Max	0	0	19.5	48.6	30	0
A1	0	COMBWINSLS	Min	0	0	-19.5	-48.6	-132.1	0
A1	5.229	COMBWINSLS	Min	0	0	-19.5	-48.6	-30	0
A2	0	COMBWINSLS	Max	2.4	7.5	30.5	32	182.4	14.9
A2	4.467	COMBWINSLS	Max	2.4	7.5	30.5	32	46	18.5
A2	0	COMBWINSLS	Min	-2.4	-7.5	-30.5	-32	-182.4	-14.9
A2	4.467	COMBWINSLS	Min	-2.4	-7.5	-30.5	-32	-46	-18.5
P11	0	COMBWINSLS	Max	29.9	2.2	15.8	0	38.2	5.2
P11	7.029	COMBWINSLS	Max	29.9	2.2	15.8	0	72.9	10.5
P11	0	COMBWINSLS	Min	-29.9	-2.2	-15.8	0	-38.2	-5.2
P11	7.029	COMBWINSLS	Min	-29.9	-2.2	-15.8	0	-72.9	-10.5
P12	0	COMBWINSLS	Max	29.9	2.2	15.8	0	38.2	5.2
P12	7.029	COMBWINSLS	Max	29.9	2.2	15.8	0	72.9	10.5
P12	0	COMBWINSLS	Min	-29.9	-2.2	-15.8	0	-38.2	-5.2
P12	7.029	COMBWINSLS	Min	-29.9	-2.2	-15.8	0	-72.9	-10.5
P21	0	COMBWINSLS	Max	58.8	1.9	25.6	0	56.9	4
P21	7.029	COMBWINSLS	Max	58.8	1.9	25.6	0	122.8	9.4
P21	0	COMBWINSLS	Min	-58.8	-1.9	-25.6	0	-56.9	-4
P21	7.029	COMBWINSLS	Min	-58.8	-1.9	-25.6	0	-122.8	-9.4
P22	0	COMBWINSLS	Max	58.8	1.9	25.6	0	56.9	4
P22	7.029	COMBWINSLS	Max	58.8	1.9	25.6	0	122.8	9.4
P22	0	COMBWINSLS	Min	-58.8	-1.9	-25.6	0	-56.9	-4
P22	7.029	COMBWINSLS	Min	-58.8	-1.9	-25.6	0	-122.8	-9.4
P30	0	COMBWINSLS	Max	0	0	51.5	0	345	0
P30	5.662	COMBWINSLS	Max	0	0	51.5	0	53.5	0
P30	0	COMBWINSLS	Min	0	0	-51.5	0	-345	0
P30	5.662	COMBWINSLS	Min	0	0	-51.5	0	-53.5	0
P40	0	COMBWINSLS	Max	0	0	35	0	313.9	0
P40	6.9	COMBWINSLS	Max	0	0	35	0	72.2	0
P40	0	COMBWINSLS	Min	0	0	-35	0	-313.9	0
P40	6.9	COMBWINSLS	Min	0	0	-35	0	-72.2	0
P50	0	COMBWINSLS	Max	0	0	35.4	0	271.3	0
P50	6.9	COMBWINSLS	Max	0	0	35.4	0	27.3	0
P50	0	COMBWINSLS	Min	0	0	-35.4	0	-271.3	0
P50	6.9	COMBWINSLS	Min	0	0	-35.4	0	-27.3	0
P61	0	COMBWINSLS	Max	80.4	0	30.3	0	54.3	0
P61	6.25	COMBWINSLS	Max	80.4	0	30.3	0	135	0
P61	0	COMBWINSLS	Min	-80.4	0	-30.3	0	-54.3	0
P61	6.25	COMBWINSLS	Min	-80.4	0	-30.3	0	-135	0
P62	0	COMBWINSLS	Max	80	0	30.3	0	54.3	0
P62	6.25	COMBWINSLS	Max	80	0	30.3	0	135	0
P62	0	COMBWINSLS	Min	-80	0	-30.3	0	-54.3	0
P62	6.25	COMBWINSLS	Min	-80	0	-30.3	0	-135	0
P71	0	COMBWINSLS	Max	42	1.1	20.4	0	60.2	3.7
P71	8	COMBWINSLS	Max	42	1.1	20.4	0	103.1	4.7
P71	0	COMBWINSLS	Min	-42	-1.1	-20.4	0	-60.2	-3.7
P71	8	COMBWINSLS	Min	-42	-1.1	-20.4	0	-103.1	-4.7
P72	0	COMBWINSLS	Max	41.2	2.7	20.4	0	60.2	8.4
P72	8	COMBWINSLS	Max	41.2	2.7	20.4	0	103.1	13.2
P72	0	COMBWINSLS	Min	-41.2	-2.7	-20.4	0	-60.2	-8.4
P72	8	COMBWINSLS	Min	-41.2	-2.7	-20.4	0	-103.1	-13.2

TABLE: Element Forces - Frames

Frame	Station	OutputCase	StepType	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG
Text	m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
P81	0	COMBWINSLS	Max	34.6	0.6	18.7	0	44.9	1.8
P81	7	COMBWINSLS	Max	34.6	0.6	18.7	0	86	2.2
P81	0	COMBWINSLS	Min	-34.6	-0.6	-18.7	0	-44.9	-1.8
P81	7	COMBWINSLS	Min	-34.6	-0.6	-18.7	0	-86	-2.2
P82	0	COMBWINSLS	Max	35.5	2.8	18.7	0	44.9	6.9
P82	7	COMBWINSLS	Max	35.5	2.8	18.7	0	86	12.4
P82	0	COMBWINSLS	Min	-35.5	-2.8	-18.7	0	-44.9	-6.9
P82	7	COMBWINSLS	Min	-35.5	-2.8	-18.7	0	-86	-12.4
P91	0	COMBWINSLS	Max	18	2	9.7	0	21.3	4.3
P91	7	COMBWINSLS	Max	18	2	9.7	0	46.5	10.1
P91	0	COMBWINSLS	Min	-18	-2	-9.7	0	-21.3	-4.3
P91	7	COMBWINSLS	Min	-18	-2	-9.7	0	-46.5	-10.1
P92	0	COMBWINSLS	Max	20.7	0	9.7	0	21.3	0.2
P92	7	COMBWINSLS	Max	20.7	0	9.7	0	46.5	0.3
P92	0	COMBWINSLS	Min	-20.7	0	-9.7	0	-21.3	-0.2
P92	7	COMBWINSLS	Min	-20.7	0	-9.7	0	-46.5	-0.3

TABLE: Moment Magnification - Frames								ULS Comb 1	
Frame	Column Size	Moment of Inertia - Cracked Section	Radius of gyration r	Unsupptd length of column Lu	Effective length factor	KLu/r	Euler Buckling Load	Factored Axial Load	Mag Factor
Text	mm	m4	mm	m	K		KN	KN	
A1	1400	0.1886	350	5.229	1.5	22.4	777491	5163.8	1.010
A2	1400	0.1886	350	4.467	1.5	19.1	1065370	5051.7	1.007
P11	1100	0.0359	275	7.029	1.5	38.3	81992	4524.8	1.086
P12	1100	0.0359	275	7.029	1.5	38.3	81992	4526.7	1.086
P21	1100	0.0359	275	7.029	1.5	38.3	81992	4846.7	1.092
P22	1100	0.0359	275	7.029	1.5	38.3	81992	4851.7	1.092
P30	1700	0.5330	425	5.662	2.1	28.0	956232	8267.2	1.013
P40	1400	0.2451	350	6.900	2.1	41.4	296157	11857.3	1.061
P50	1400	0.2451	350	6.900	2.1	41.4	296157	11863.8	1.061
P61	1100	0.0359	275	6.250	1.5	34.1	103705	4116.3	1.060
P62	1100	0.0359	275	6.250	1.5	34.1	103705	4040.5	1.059
P71	1100	0.0359	275	8.000	1.5	43.6	63297	4851.6	1.123
P72	1100	0.0359	275	8.000	1.5	43.6	63297	4872.2	1.124
P81	1100	0.0359	275	7.000	1.5	38.2	82673	4251.9	1.079
P82	1100	0.0359	275	7.000	1.5	38.2	82673	4383.9	1.082
P91	1100	0.0359	275	7.000	1.5	38.2	82673	4533.5	1.085
P92	1100	0.0359	275	7.000	1.5	38.2	82673	4729.7	1.089

25700	MPa	Modulus of elasticity
0.7		Resistance factor for compression

For notes see next page:

Notes: (refer to AASHTO LRFD Article 4.5.3.2.2b)

1. Slenderness need not be considered if (KLu/r)< 22
2. The factored moments may be increased to reflect effects of deformations as follows:

$$M_C = \delta_b \cdot M_{2b} + \delta_s \cdot M_{2s}$$

in which:

$$\delta_b = \frac{C_m}{1 - \frac{P_u}{\phi P_e}} \geq 1.0 \qquad \delta_s = \frac{1}{1 - \frac{\sum P_u}{\phi \sum P_e}}$$

where:

P_u = factored axial load (kN)
P_e = Euler buckling load (kN)
ϕ = resistance factor for axial compression (=0.7)
M_{2b} = moment due to factored gravity loads that result in no sidesway
M_{2s} = moment due to factored lateral and gravity loads that result in sidesway

For members unbraced against sidesway C_m = 1.0.

The Euler buckling load is given by:

$$P_e = \frac{\pi^2 EI}{(K \cdot l_u)^2}$$

where:

l_u = unsupported length of member (mm)
K = effective length factor
E = modulus of elasticity (MPa)
I = moment of inertia (mm^4)
(cracked section – take 50% of uncracked section value for RC
- take 70% of uncracked section vale for composite column)

TABLE: Moment Magnification - Frames								ULS Comb 5	
Frame	Column Size	Moment of Inertia - Cracked Section	Radius of gyration r	Unsupptd length of column Lu	Effective length factor	KLu/r	Euler Buckling Load	Factored Axial Load	Mag Factor
Text	mm	m4	mm	m	K		KN	KN	
A1	1400	0.1886	350	5.229	1.5	22.4	777491	2729.5	1.005
A2	1400	0.1886	350	4.467	1.5	19.1	1065370	2646.3	1.004
P11	1100	0.0359	275	7.029	1.5	38.3	81992	2439.9	1.044
P12	1100	0.0359	275	7.029	1.5	38.3	81992	2440.3	1.044
P21	1100	0.0359	275	7.029	1.5	38.3	81992	2652.0	1.048
P22	1100	0.0359	275	7.029	1.5	38.3	81992	2653.1	1.048
P30	1700	0.5330	425	5.662	2.1	28.0	956232	4696.6	1.007
P40	1400	0.2451	350	6.900	2.1	41.4	296157	6601.6	1.033
P50	1400	0.2451	350	6.900	2.1	41.4	296157	6606.2	1.033
P61	1100	0.0359	275	6.250	1.5	34.1	103705	2300.9	1.033
P62	1100	0.0359	275	6.250	1.5	34.1	103705	2281.8	1.032
P71	1100	0.0359	275	8.000	1.5	43.6	63297	2678.6	1.064
P72	1100	0.0359	275	8.000	1.5	43.6	63297	2705.9	1.065
P81	1100	0.0359	275	7.000	1.5	38.2	82673	2298.8	1.041
P82	1100	0.0359	275	7.000	1.5	38.2	82673	2338.1	1.042
P91	1100	0.0359	275	7.000	1.5	38.2	82673	2491.5	1.045
P92	1100	0.0359	275	7.000	1.5	38.2	82673	2502.7	1.045

25700 MPa — Modulus of elasticity
0.7 — Resistance factor for compression

Notes:

See notes for Combination 1 case
"Push pull" loads on the columns due to earthquake are not considered. The magnification factors are based on average conditions in accordance with the provisions oF AASHTO LRFD.

6.2. LOAD COMBINATIONS

TABLE: Element Forces - Frames										
Frame	Station	Step Type	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
A1	0	Max	-3156.8	486.6	27.7	44.2	1006.1	7778.0	1.010	7917.9
A1	5.229	Max	-2336.1	486.6	27.7	44.2	1009.7	11953.8	1.010	12111.3
A1	0	Min	-7991.6	-1140.2	-29.8	-41.0	-1018.2	1940.2	1.010	-2212.1
A1	5.229	Min	-7170.9	-1140.2	-29.8	-41.0	-1010.7	1382.5	1.010	-1728.9
A2	0	Max	-2929.9	1192.8	615.7	255.0	5648.5	-2289.1	1.007	6136.2
A2	4.467	Max	-2228.8	1192.8	615.7	255.0	2945.8	-944.7	1.007	3114.7
A2	0	Min	-7874.7	-728.9	-333.6	-16.6	-1619.3	-9084.5	1.007	-9290.7
A2	4.467	Min	-7173.6	-728.9	-333.6	-16.6	-644.6	-12504.0	1.007	-12606.0
P11	0	Max	-3155.2	542.5	11.4	0.0	29.0	874.6	1.086	949.9
P11	7.029	Max	-2942.3	542.5	11.4	0.0	49.7	1288.9	1.086	1400.3
P11	0	Min	-6107.4	-206.6	-10.8	0.0	-27.1	-192.9	1.086	-211.4
P11	7.029	Min	-5894.5	-206.6	-10.8	0.0	-50.9	-2982.7	1.086	-3238.5
P12	0	Max	-3157.3	542.5	11.7	0.0	29.0	874.4	1.086	949.8
P12	7.029	Max	-2944.4	542.5	11.7	0.0	47.4	1290.9	1.086	1402.4
P12	0	Min	-6108.9	-207.1	-10.5	0.0	-27.1	-193.8	1.086	-212.4
P12	7.029	Min	-5896.1	-207.1	-10.5	0.0	-53.2	-2982.8	1.086	-3238.7
P21	0	Max	-3476.1	235.7	23.3	0.0	55.6	508.8	1.092	559.1
P21	7.029	Max	-3263.5	235.7	23.3	0.0	103.4	2853.3	1.092	3118.5
P21	0	Min	-6429.9	-448.2	-22.2	0.0	-51.7	-474.9	1.092	-521.7
P21	7.029	Min	-6217.3	-448.2	-22.2	0.0	-109.1	-1404.1	1.092	-1538.3
P22	0	Max	-3485.6	235.4	23.6	0.0	55.5	508.6	1.092	558.8
P22	7.029	Max	-3272.8	235.4	23.6	0.0	101.2	2855.2	1.092	3120.8
P22	0	Min	-6430.6	-448.7	-21.9	0.0	-51.8	-475.7	1.092	-522.7
P22	7.029	Min	-6217.8	-448.7	-21.9	0.0	-111.3	-1404.1	1.092	-1538.6
P30	0	Max	-6029.9	0.0	56.0	0.0	523.4	0.0	1.013	529.9
P30	5.662	Max	-5644.5	0.0	56.0	0.0	763.5	0.0	1.013	773.0
P30	0	Min	-10890.0	0.0	-50.7	0.0	-500.8	0.0	1.013	-507.0
P30	5.662	Min	-10504.5	0.0	-50.7	0.0	-770.7	0.0	1.013	-780.3
P40	0	Max	-8759.3	897.2	87.2	0.0	268.1	2128.2	1.061	2275.1
P40	6.9	Max	-8289.5	897.2	87.2	0.0	770.6	7423.2	1.061	7915.9
P40	0	Min	-15425.2	-1326.3	-91.1	0.0	-304.5	-1868.0	1.061	-2007.5
P40	6.9	Min	-14955.4	-1326.3	-91.1	0.0	-778.7	-5330.1	1.061	-5713.5
P50	0	Max	-8763.8	1326.3	90.5	0.0	204.6	1873.3	1.061	1998.9
P50	6.9	Max	-8294.0	1326.3	90.5	0.0	724.8	5343.7	1.061	5719.9
P50	0	Min	-15433.6	-897.2	-107.5	0.0	-320.4	-2119.4	1.061	-2273.6
P50	6.9	Min	-14963.8	-897.2	-107.5	0.0	-723.4	-7420.1	1.061	-7907.9
P61	0	Max	-2921.3	0.0	26.1	0.0	49.7	0.0	1.060	52.7
P61	6.25	Max	-2732.2	0.0	26.1	0.0	235.6	0.0	1.060	249.7
P61	0	Min	-5500.4	0.0	-53.3	0.0	-98.2	0.0	1.060	-104.1
P61	6.25	Min	-5311.3	0.0	-53.3	0.0	-113.7	0.0	1.060	-120.6
P62	0	Max	-2806.1	0.0	26.3	0.0	49.7	0.0	1.059	52.6
P62	6.25	Max	-2616.8	0.0	26.3	0.0	235.1	0.0	1.059	249.0
P62	0	Min	-5464.1	0.0	-53.2	0.0	-98.2	0.0	1.059	-104.0
P62	6.25	Min	-5274.8	0.0	-53.2	0.0	-114.0	0.0	1.059	-120.7
P71	0	Max	-3482.1	558.0	36.5	0.0	109.6	1051.8	1.123	1187.6
P71	8	Max	-3240.0	558.0	36.5	0.0	119.0	1289.1	1.123	1453.8
P71	0	Min	-6463.1	-201.6	-23.5	0.0	-70.3	-349.7	1.123	-400.5
P71	8	Min	-6221.0	-201.6	-23.5	0.0	-183.3	-3410.3	1.123	-3835.1
P72	0	Max	-3481.9	556.3	36.8	0.0	109.9	1047.4	1.124	1183.2
P72	8	Max	-3239.7	556.3	36.8	0.0	116.9	1322.5	1.124	1491.7
P72	0	Min	-6504.7	-207.9	-23.2	0.0	-70.0	-381.1	1.124	-435.3
P72	8	Min	-6262.5	-207.9	-23.2	0.0	-185.4	-3402.5	1.124	-3828.6
P81	0	Max	-2829.8	376.8	81.8	0.0	202.8	518.4	1.079	600.8
P81	7	Max	-2618.0	376.8	81.8	0.0	33.8	2049.7	1.079	2212.5
P81	0	Min	-5885.7	-347.1	-7.6	0.0	-18.8	-535.8	1.079	-578.6
P81	7	Min	-5674.0	-347.1	-7.6	0.0	-370.8	-2144.9	1.079	-2349.3

TABLE: Element Forces - Frames										
Frame	Station	Step Type	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
P82	0	Max	-2993.7	374.6	82.1	0.0	202.8	515.1	1.082	598.9
P82	7	Max	-2781.9	374.6	82.1	0.0	31.4	2092.4	1.082	2264.2
P82	0	Min	-5986.0	-356.7	-7.4	0.0	-18.8	-572.4	1.082	-619.7
P82	7	Min	-5774.2	-356.7	-7.4	0.0	-372.8	-2134.3	1.082	-2344.2
P91	0	Max	-3112.6	186.1	79.9	0.0	186.6	41.0	1.085	207.3
P91	7	Max	-2900.7	186.1	79.9	0.0	-54.2	2890.5	1.085	3136.7
P91	0	Min	-6166.4	-497.9	12.3	0.0	25.7	-647.5	1.085	-703.1
P91	7	Min	-5954.5	-497.9	12.3	0.0	-378.8	-1285.7	1.085	-1454.3
P92	0	Max	-3298.9	186.5	80.1	0.0	186.6	43.4	1.089	208.7
P92	7	Max	-3087.0	186.5	80.1	0.0	-57.8	2971.7	1.089	3236.8
P92	0	Min	-6372.3	-514.6	12.6	0.0	25.7	-685.4	1.089	-746.9
P92	7	Min	-6160.4	-514.6	12.6	0.0	-381.7	-1287.8	1.089	-1462.7

LOAD FACTORS

1.3	Dead Load
2.0	Superimposed Dead Load
0.0	Settlement
0.0	Earth Pressure
1.8	Traffic Load
1.8	Braking and Centrifugal Loads
1.8	Pedestrian Load
1.0	Temperature Effects
0.0	Wind Load
1.0	Creep & Shrinkage

Note: Station O is at the base for the Pier Columns

TABLE: Element Forces - Frames

Frame	Station	Step Type	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
A1	0	Max	-3378.4	270.9	210.1	321.9	6008.1	5831.0	1.010	8452.6
A1	5.229	Max	-2557.7	270.9	210.1	321.9	6049.6	8179.9	1.010	10271.3
A1	0	Min	-5878.9	-691.7	-212.5	-318.1	-6022.9	2502.6	1.010	-6584.6
A1	5.229	Min	-5058.3	-691.7	-212.5	-318.1	-6051.5	2388.5	1.010	-6568.1
A2	0	Max	-3137.7	750.7	350.1	260.6	8296.5	-2848.5	1.007	8831.7
A2	4.467	Max	-2436.6	750.7	350.1	260.6	7114.0	-1898.6	1.007	7413.2
A2	0	Min	-5756.0	-537.1	-343.5	-40.3	-6651.1	-7112.9	1.007	-9804.5
A2	4.467	Min	-5054.9	-537.1	-343.5	-40.3	-5773.7	-9019.6	1.007	-10782.3
P11	0	Max	-3183.1	349.2	84.7	0.0	214.2	581.4	1.086	672.7
P11	7.029	Max	-2970.2	349.2	84.7	0.0	378.1	308.8	1.086	530.0
P11	0	Min	-5641.3	-40.6	-84.0	0.0	-212.0	7.9	1.086	-230.3
P11	7.029	Min	-5428.5	-40.6	-84.0	0.0	-380.0	-1894.6	1.086	-2097.7
P12	0	Max	-3184.6	349.1	84.9	0.0	214.2	581.2	1.086	672.4
P12	7.029	Max	-2971.8	349.1	84.9	0.0	375.8	310.5	1.086	529.3
P12	0	Min	-5643.4	-41.0	-83.7	0.0	-212.0	7.1	1.086	-230.2
P12	7.029	Min	-5430.6	-41.0	-83.7	0.0	-382.4	-1894.3	1.086	-2097.9
P21	0	Max	-3235.7	104.4	167.7	0.0	406.2	312.8	1.092	559.9
P21	7.029	Max	-3023.0	104.4	167.7	0.0	776.1	1945.4	1.092	2287.7
P21	0	Min	-5895.7	-316.9	-166.2	0.0	-401.6	-372.6	1.092	-598.4
P21	7.029	Min	-5683.0	-316.9	-166.2	0.0	-783.3	-549.9	1.092	-1045.3
P22	0	Max	-3243.9	104.1	168.0	0.0	406.0	312.5	1.092	559.6
P22	7.029	Max	-3031.1	104.1	168.0	0.0	774.0	1947.0	1.092	2288.7
P22	0	Min	-5897.6	-317.4	-166.0	0.0	-401.8	-373.3	1.092	-599.1
P22	7.029	Min	-5684.8	-317.4	-166.0	0.0	-785.5	-549.6	1.092	-1047.2
P30	0	Max	-6221.4	0.0	301.1	0.0	3910.2	0.0	1.013	3959.1
P30	5.662	Max	-5835.9	0.0	301.1	0.0	5290.5	0.0	1.013	5356.7
P30	0	Min	-8689.7	0.0	-294.9	0.0	-3883.4	0.0	1.013	-3932.0
P30	5.662	Min	-8304.3	0.0	-294.9	0.0	-5298.9	0.0	1.013	-5365.2
P40	0	Max	-8991.0	510.4	540.0	0.0	2375.8	1255.6	1.061	2850.2
P40	6.9	Max	-8521.2	510.4	540.0	0.0	5945.8	4122.9	1.061	7674.3
P40	0	Min	-12361.2	-745.1	-544.7	0.0	-2418.8	-1094.7	1.061	-2816.1
P40	6.9	Min	-11891.4	-745.1	-544.7	0.0	-5955.5	-2910.2	1.061	-7030.6
P50	0	Max	-8997.6	745.1	577.9	0.0	1703.3	1099.4	1.061	2150.4
P50	6.9	Max	-8527.8	745.1	577.9	0.0	5394.4	2920.4	1.061	6506.6
P50	0	Min	-12367.5	-510.4	-598.0	0.0	-1840.3	-1247.8	1.061	-2358.3
P50	6.9	Min	-11897.7	-510.4	-598.0	0.0	-5392.8	-4119.4	1.061	-7198.0
P61	0	Max	-2601.9	0.0	136.8	0.0	290.2	0.5	1.060	307.6
P61	6.25	Max	-2412.8	0.0	136.8	0.0	708.6	0.5	1.060	751.2
P61	0	Min	-5286.4	0.0	-168.8	0.0	-347.5	-0.5	1.060	-368.4
P61	6.25	Min	-5097.3	0.0	-168.8	0.0	-564.7	-0.5	1.060	-598.7
P62	0	Max	-2482.4	0.0	136.9	0.0	290.2	0.5	1.059	307.3
P62	6.25	Max	-2293.1	0.0	136.9	0.0	708.4	0.5	1.059	750.1
P62	0	Min	-5248.6	0.0	-168.7	0.0	-347.5	-0.5	1.059	-368.0
P62	6.25	Min	-5059.4	0.0	-168.7	0.0	-565.0	-0.5	1.059	-598.3
P71	0	Max	-3542.8	416.7	90.7	0.0	276.4	891.5	1.123	1048.2
P71	8	Max	-3300.7	416.7	90.7	0.0	452.7	396.3	1.123	675.6
P71	0	Min	-5899.3	-65.4	-91.1	0.0	-276.4	-148.0	1.123	-352.0
P71	8	Min	-5657.2	-65.4	-91.1	0.0	-449.9	-2443.1	1.123	-2789.7
P72	0	Max	-3525.9	415.2	91.0	0.0	276.6	885.2	1.124	1042.0
P72	8	Max	-3283.8	415.2	91.0	0.0	450.6	435.9	1.124	704.4
P72	0	Min	-5920.6	-72.0	-90.8	0.0	-276.1	-172.1	1.124	-365.5
P72	8	Min	-5678.4	-72.0	-90.8	0.0	-452.0	-2436.0	1.124	-2783.7
P81	0	Max	-3004.0	226.2	83.4	0.0	207.0	353.1	1.079	441.8
P81	7	Max	-2792.3	226.2	83.4	0.0	209.1	1212.5	1.079	1327.9
P81	0	Min	-5416.1	-207.4	-46.8	0.0	-117.4	-334.8	1.079	-382.9
P81	7	Min	-5204.3	-207.4	-46.8	0.0	-377.4	-1243.6	1.079	-1402.7

TABLE: Element Forces - Frames

Frame	Station	Step Type	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
P82	0	Max	-3105.6	223.1	83.6	0.0	207.0	347.6	1.082	437.7
P82	7	Max	-2893.9	223.1	83.6	0.0	206.9	1258.3	1.082	1379.7
P82	0	Min	-5471.0	-217.6	-46.5	0.0	-117.4	-363.5	1.082	-413.3
P82	7	Min	-5259.2	-217.6	-46.5	0.0	-379.6	-1229.1	1.082	-1391.8
P91	0	Max	-3287.5	48.6	57.1	0.0	134.2	-77.8	1.085	168.3
P91	7	Max	-3075.6	48.6	57.1	0.0	47.5	1978.6	1.085	2147.4
P91	0	Min	-5711.9	-345.6	-0.3	0.0	4.1	-470.4	1.085	-510.4
P91	7	Min	-5500.0	-345.6	-0.3	0.0	-319.7	-430.6	1.085	-581.9
P92	0	Max	-3392.8	47.7	57.3	0.0	134.2	-78.7	1.089	169.4
P92	7	Max	-3180.9	47.7	57.3	0.0	44.6	2049.0	1.089	2231.9
P92	0	Min	-5832.7	-360.1	0.0	0.0	4.1	-502.3	1.089	-547.1
P92	7	Min	-5620.8	-360.1	0.0	0.0	-322.6	-426.8	1.089	-582.6

LOAD FACTORS

1.3	Dead Load
2.0	Superimposed Dead Load
0.0	Settlement
0.0	Earth Pressure
1.8	Traffic Load
0.9	Braking and Centrifugal Loads
1.8	Pedestrian Load
1.0	Temperature Effects
0.0	Wind Load
1.0	Creep & Shrinkage

Note: Station O is at the base for the Pier Columns

TABLE: Element Forces - Frames

Frame	Station	Step Type	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m		KN	KN	KN	KN-m	KN-m	KN-m		KN-m
A1	0	Max	-3239.4	425.9	292.8	27.1	774.8	6935.1	1.010	7045.0
A1	5.229	Max	-2418.7	425.9	292.8	32.1	777.0	10244.9	1.010	10372.7
A1	0	Min	-6982.0	-972.5	247.9	-39.7	-787.0	2097.0	1.010	-2261.3
A1	5.229	Min	-6161.3	-972.5	247.9	-34.7	-778.2	1711.9	1.010	-1898.4
A2	0	Max	-3014.9	1013.5	300.2	-643.7	5210.5	-2467.7	1.007	5804.6
A2	4.467	Max	-2313.8	1013.5	300.2	93.4	2638.5	-1294.7	1.007	2959.1
A2	0	Min	-6871.0	-688.6	-601.9	-896.2	-1492.6	-8076.9	1.007	-8269.7
A2	4.467	Min	-6169.9	-688.6	-601.9	-159.1	-469.6	-10702.6	1.007	-10785.9
P11	0	Max	-3217.1	468.1	-6.0	0.9	22.9	782.8	1.086	850.1
P11	7.029	Max	-3004.3	468.1	-6.0	-1.7	38.8	901.2	1.086	979.2
P11	0	Min	-5346.0	-145.9	-23.5	0.9	-21.0	-147.7	1.086	-161.9
P11	7.029	Min	-5133.1	-145.9	-23.5	-1.7	-39.9	-2540.5	1.086	-2758.2
P12	0	Max	-3219.0	468.2	-5.9	0.9	22.9	782.6	1.086	850.0
P12	7.029	Max	-3006.2	468.2	-5.9	-1.8	36.4	903.2	1.086	981.3
P12	0	Min	-5347.5	-146.4	-23.4	0.9	-21.0	-148.6	1.086	-162.9
P12	7.029	Min	-5134.7	-146.4	-23.4	-1.8	-42.3	-2540.5	1.086	-2758.4
P21	0	Max	-3518.6	187.3	-103.0	1.8	43.9	453.6	1.092	497.7
P21	7.029	Max	-3305.9	187.3	-103.0	-3.8	80.3	2466.7	1.092	2695.6
P21	0	Min	-5646.4	-397.5	-138.3	1.8	-40.0	-462.4	1.092	-507.0
P21	7.029	Min	-5433.7	-397.5	-138.3	-3.8	-86.1	-1055.8	1.092	-1157.0
P22	0	Max	-3528.1	187.0	-102.9	1.8	43.8	453.3	1.092	497.5
P22	7.029	Max	-3315.3	187.0	-102.9	-3.8	78.2	2468.6	1.092	2697.9
P22	0	Min	-5647.0	-397.9	-138.3	1.8	-40.1	-463.2	1.092	-507.9
P22	7.029	Min	-5434.2	-397.9	-138.3	-3.8	-88.2	-1055.8	1.092	-1157.3
P30	0	Max	-6130.7	0.0	42.1	10.8	409.4	0.0	1.013	414.6
P30	5.662	Max	-5745.3	0.0	42.1	-3.4	587.8	0.0	1.013	595.2
P30	0	Min	-9664.2	0.0	-41.9	10.8	-386.8	0.0	1.013	-391.7
P30	5.662	Min	-9278.7	0.0	-41.9	-3.4	-595.0	0.0	1.013	-602.4
P40	0	Max	-8858.8	796.6	69.3	-17.3	208.7	1891.1	1.061	2018.0
P40	6.9	Max	-8389.0	796.6	69.3	-3.9	593.3	6034.2	1.061	6431.1
P40	0	Min	-13899.7	-1100.4	-69.4	-17.3	-244.9	-1681.6	1.061	-1802.4
P40	6.9	Min	-13429.9	-1100.4	-69.4	-3.9	-601.4	-4563.9	1.061	-4882.6
P50	0	Max	-8864.1	1100.4	79.0	-55.2	165.2	1686.7	1.061	1797.6
P50	6.9	Max	-8394.2	1100.4	79.0	0.7	557.9	4575.3	1.061	4888.9
P50	0	Min	-13908.1	-796.6	-79.8	-55.2	-280.6	-1882.9	1.061	-2019.3
P50	6.9	Min	-13438.3	-796.6	-79.8	0.7	-556.5	-6031.1	1.061	-6424.3
P61	0	Max	-2973.7	0.0	34.9	-23.1	41.6	0.0	1.060	44.1
P61	6.25	Max	-2784.6	0.0	34.9	57.8	217.0	0.0	1.060	230.1
P61	0	Min	-4908.6	0.0	-36.2	-23.1	-89.9	0.0	1.060	-95.3
P61	6.25	Min	-4719.4	0.0	-36.2	57.8	-95.7	0.0	1.060	-101.5
P62	0	Max	-2858.3	0.0	35.0	-23.1	41.6	0.0	1.059	44.1
P62	6.25	Max	-2669.0	0.0	35.0	57.8	216.8	0.0	1.059	229.6
P62	0	Min	-4889.7	0.0	-36.1	-23.1	-89.9	0.0	1.059	-95.2
P62	6.25	Min	-4700.4	0.0	-36.1	57.8	-96.0	0.0	1.059	-101.7
P71	0	Max	-3529.1	504.7	219.0	-39.5	101.7	1023.8	1.123	1155.3
P71	8	Max	-3287.0	504.7	219.0	67.6	108.0	928.2	1.123	1049.4
P71	0	Min	-5693.2	-150.7	163.5	-39.5	-63.6	-298.0	1.123	-342.2
P71	8	Min	-5451.2	-150.7	163.5	67.6	-170.1	-3013.0	1.123	-3388.9
P72	0	Max	-3527.3	503.2	219.8	-39.5	101.9	1019.9	1.124	1151.6
P72	8	Max	-3285.1	503.2	219.8	67.7	105.9	961.3	1.124	1086.5
P72	0	Min	-5734.9	-157.1	164.2	-39.5	-63.3	-326.0	1.124	-373.1
P72	8	Min	-5492.7	-157.1	164.2	67.7	-172.2	-3006.2	1.124	-3383.1
P81	0	Max	-2893.3	321.7	186.3	-26.4	184.8	490.0	1.079	565.2
P81	7	Max	-2681.6	321.7	186.3	50.4	27.7	1700.6	1.079	1835.7
P81	0	Min	-5137.7	-295.5	105.3	-26.4	-15.3	-484.5	1.079	-523.1
P81	7	Min	-4925.9	-295.5	105.3	50.4	-338.6	-1782.2	1.079	-1957.9

TABLE: Element Forces - Frames										
Frame	Station	Step Type	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m		KN	KN	KN	KN-m	KN-m	KN-m		KN-m
P82	0	Max	-3057.2	319.5	185.8	-26.4	184.8	486.1	1.082	562.6
P82	7	Max	-2845.4	319.5	185.8	50.3	25.3	1743.9	1.082	1887.1
P82	0	Min	-5229.8	-304.8	104.8	-26.4	-15.3	-517.7	1.082	-560.4
P82	7	Min	-5018.0	-304.8	104.8	50.3	-340.8	-1771.1	1.082	-1951.4
P91	0	Max	-3163.2	132.5	36.9	3.6	171.9	25.0	1.085	188.4
P91	7	Max	-2951.3	132.5	36.9	-8.7	-59.2	2475.8	1.085	2687.0
P91	0	Min	-5437.9	-433.1	-23.8	3.6	27.5	-596.2	1.085	-647.6
P91	7	Min	-5226.0	-433.1	-23.8	-8.7	-349.9	-921.2	1.085	-1069.2
P92	0	Max	-3346.1	132.5	34.7	3.6	171.9	26.1	1.089	189.3
P92	7	Max	-3134.2	132.5	34.7	-8.8	-62.7	2552.3	1.089	2780.3
P92	0	Min	-5612.5	-448.9	-26.2	3.6	27.5	-631.4	1.089	-688.2
P92	7	Min	-5400.6	-448.9	-26.2	-8.8	-352.6	-921.1	1.089	-1074.1

LOAD FACTORS

1.3	Dead Load
2.0	Superimposed Dead Load
0.0	Settlement
0.0	Earth Pressure
1.8	Traffic Load
1.8	Braking + Centrifugal Loads
1.8	Pedestrian Load
1.0	Temperature Effects
0.0	Wind Load
1.0	Creep & Shrinkage

TABLE: Element Forces - Frames

Frame	Station	Step Type	Response Mod Factor	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	R	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
A1	0	Max	3	-2177.9	1229.6	543.0	822.3	5287.0	5145.9	1.01	7415.0
A1	5.229	Max	3	-1546.6	1229.6	543.0	822.3	1029.0	7860.5	1.01	7967.5
A1	0	Min	2	-3556.9	-2459.8	-815.3	-821.3	-5290.4	-1174.3	1.01	5446.5
A1	5.229	Min	2	-2925.6	-2459.8	-815.3	-821.3	-1029.0	-1314.5	1.01	1677.7
A2	0	Max	3	-2058.5	1984.3	1007.5	810.3	8221.9	778.9	1.00	8288.1
A2	4.467	Max	3	-1519.2	1984.3	1007.5	810.3	1684.9	1219.0	1.00	2087.0
A2	0	Min	2	-3528.0	-2277.0	-1400.0	-729.1	-7402.3	-5192.7	1.00	9074.2
A2	4.467	Min	2	-2988.7	-2277.0	-1400.0	-729.1	-1263.1	-8132.4	1.00	8259.2
P11	0	Max	5	-2191.8	496.6	97.3	0.0	233.6	1160.1	1.04	1235.9
P11	7.029	Max	5	-2028.1	496.6	97.3	0.0	449.7	1213.5	1.04	1351.6
P11	0	Min	5	-2688.0	-277.0	-97.3	0.0	-233.0	-735.3	1.04	805.6
P11	7.029	Min	5	-2524.3	-277.0	-97.3	0.0	-449.1	-2331.7	1.04	2480.0
P12	0	Max	5	-2195.9	490.9	97.2	0.0	233.9	1146.5	1.04	1222.0
P12	7.029	Max	5	-2032.2	490.9	97.2	0.0	448.1	1187.8	1.04	1325.9
P12	0	Min	5	-2684.7	-271.5	-96.8	0.0	-233.3	-721.9	1.04	792.3
P12	7.029	Min	5	-2521.0	-271.5	-96.8	0.0	-450.7	-2305.6	1.04	2453.5
P21	0	Max	5	-2236.9	312.1	166.9	0.0	367.1	919.1	1.05	1037.7
P21	7.029	Max	5	-2073.3	312.1	166.9	0.0	800.1	1430.1	1.05	1718.1
P21	0	Min	5	-3067.1	-285.3	-166.7	0.0	-365.9	-576.7	1.05	716.1
P21	7.029	Min	5	-2903.5	-285.3	-166.7	0.0	-800.9	-1275.5	1.05	1579.1
P22	0	Max	5	-2245.8	307.4	165.7	0.0	368.0	908.7	1.05	1027.9
P22	7.029	Max	5	-2082.1	307.4	165.7	0.0	798.3	1408.8	1.05	1697.8
P22	0	Min	5	-3060.4	-280.8	-165.1	0.0	-367.0	-566.5	1.05	707.7
P22	7.029	Min	5	-2896.7	-280.8	-165.1	0.0	-802.1	-1253.8	1.05	1560.6
P30	0	Max	3	-4451.8	702.6	618.4	0.0	3793.4	5126.1	1.01	6422.1
P30	5.662	Max	3	-4155.3	702.6	618.4	0.0	462.9	1159.9	1.01	1257.7
P30	0	Min	3	-4941.4	-702.6	-616.8	0.0	-3786.8	-5126.1	1.01	6418.2
P30	5.662	Min	3	-4644.9	-702.6	-616.8	0.0	-464.9	-1159.9	1.01	1258.4
P40	0	Max	3	-6232.3	1880.5	315.6	0.0	2755.2	4024.1	1.03	5037.3
P40	6.9	Max	3	-5870.9	1880.5	315.6	0.0	596.6	9227.6	1.03	9551.0
P40	0	Min	3	-6970.9	-1915.3	-316.8	0.0	-2765.8	-3984.1	1.03	5009.5
P40	6.9	Min	3	-6609.5	-1915.3	-316.8	0.0	-599.0	-8947.6	1.03	9262.6
P50	0	Max	3	-6236.1	1913.7	382.5	0.0	2754.9	3989.6	1.03	5007.9
P50	6.9	Max	3	-5874.7	1913.7	382.5	0.0	294.1	8947.2	1.03	9246.7
P50	0	Min	3	-6976.3	-1878.9	-387.5	0.0	-2788.5	-4021.8	1.03	5055.0
P50	6.9	Min	3	-6614.9	-1878.9	-387.5	0.0	-293.7	-9219.6	1.03	9527.9
P61	0	Max	5	-1737.6	93.4	216.7	0.0	339.9	720.9	1.03	823.1
P61	6.25	Max	5	-1592.1	93.4	216.7	0.0	1044.3	149.0	1.03	1089.4
P61	0	Min	5	-2864.2	-93.4	-224.7	0.0	-353.9	-720.9	1.03	829.4
P61	6.25	Min	5	-2718.7	-93.4	-224.7	0.0	-1008.9	-149.0	1.03	1053.2
P62	0	Max	5	-1717.7	93.4	214.9	0.0	340.8	721.6	1.03	823.9
P62	6.25	Max	5	-1572.1	93.4	214.9	0.0	1043.5	147.4	1.03	1088.1
P62	0	Min	5	-2845.9	-93.4	-222.7	0.0	-354.8	-721.6	1.03	830.2
P62	6.25	Min	5	-2700.3	-93.4	-222.7	0.0	-1008.5	-147.4	1.03	1052.3
P71	0	Max	5	-2358.9	291.8	160.0	0.0	468.1	814.7	1.06	1000.1
P71	8	Max	5	-2172.7	291.8	160.0	0.0	756.3	1268.1	1.06	1571.5
P71	0	Min	5	-2998.3	-289.4	-149.6	0.0	-436.7	-1045.1	1.06	1205.5
P71	8	Min	5	-2812.1	-289.4	-149.6	0.0	-808.1	-1517.3	1.06	1829.6
P72	0	Max	5	-2351.4	300.2	159.4	0.0	469.0	839.5	1.07	1024.2
P72	8	Max	5	-2165.1	300.2	159.4	0.0	754.5	1341.5	1.07	1639.2
P72	0	Min	5	-3060.4	-303.4	-148.6	0.0	-437.2	-1085.9	1.07	1246.7
P72	8	Min	5	-2874.1	-303.4	-148.6	0.0	-809.5	-1561.7	1.07	1873.5
P81	0	Max	5	-1989.9	301.6	173.8	0.0	413.2	798.7	1.04	936.5
P81	7	Max	5	-1816.6	287.1	179.5	0.0	683.4	1860.7	1.04	2064.2
P81	0	Min	5	-2607.7	-433.2	-142.4	0.0	-338.2	-1108.3	1.04	1206.7
P81	7	Min	5	-2455.2	-418.7	-148.1	0.0	-828.4	-1248.7	1.04	1560.5

TABLE: Element Forces - Frames

Frame	Station	Step Type	Response Mod Factor	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	R	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
P82	0	Max	5	-2059.4	313.8	173.6	0.0	413.5	827.5	1.04	964.0
P82	7	Max	5	-1896.5	313.8	173.6	0.0	655.4	2017.5	1.04	2210.6
P82	0	Min	5	-2616.8	-453.0	-141.8	0.0	-338.5	-1154.3	1.04	1253.6
P82	7	Min	5	-2453.9	-453.0	-141.8	0.0	-803.4	-1370.3	1.04	1655.3
P91	0	Max	5	-2338.1	266.5	94.7	0.0	203.5	610.3	1.04	672.2
P91	7	Max	5	-2175.1	266.5	94.7	0.0	341.8	1980.2	1.04	2099.9
P91	0	Min	5	-2644.9	-405.5	-70.7	0.0	-152.1	-857.9	1.04	910.4
P91	7	Min	5	-2481.9	-405.5	-70.7	0.0	-458.8	-1254.0	1.04	1395.4
P92	0	Max	5	-2228.6	287.0	100.8	0.0	216.2	655.6	1.05	721.6
P92	7	Max	5	-2065.6	287.0	100.8	0.0	370.4	2108.8	1.05	2237.9
P92	0	Min	5	-2776.8	-432.2	-76.4	0.0	-164.8	-916.0	1.05	972.8
P92	7	Min	5	-2613.8	-432.2	-76.4	0.0	-490.4	-1352.6	1.05	1503.8

LOAD FACTORS

1.0	Dead Load
1.0	Superimposed Dead Load
0.0	Earth Pressure
1.0	Longitudinal Earthquake (EQX)
0.3	Transverse Earthquake (EQY)

Note:
1. Station O is at the base for the Pier Columns
2. R= 2 applied at abutment for transverse case
3. R= 3 applied at abutment for longitudinal case
4. R= 2 applied at abutment for torsion case

TABLE: Element Forces - Frames

Frame	Station	Step Type	Response Mod Factor	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	R	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
A1	0	Max	1	-1074.8	4181.1	1629.6	1644.1	10575.7	11466.1	1.01	15677.2
A1	5.229	Max	1	-443.5	4181.1	1629.6	1644.1	2057.9	17035.4	1.01	17245.7
A1	0	Min	1	-4384.2	-4673.5	-1630.2	-1643.1	-10579.1	-7494.5	1.01	13030.1
A1	5.229	Min	1	-3752.9	-4673.5	-1630.2	-1643.1	-2057.9	-10489.4	1.01	10743.2
A2	0	Max	1	-882.9	5393.3	2933.4	1580.1	16033.9	6750.5	1.00	17459.0
A2	4.467	Max	1	-343.6	5393.3	2933.4	1580.1	3159.0	10570.3	1.00	11071.5
A2	0	Min	1	-4409.7	-4833.7	-2844.4	-1498.9	-15214.3	-11164.3	1.00	18938.3
A2	4.467	Min	1	-3870.4	-4833.7	-2844.4	-1498.9	-2737.2	-17483.7	1.00	17759.6
P11	0	Max	1	-1199.5	2043.9	486.6	0.0	1166.8	4950.9	1.04	5312.3
P11	7.029	Max	1	-1035.8	2043.9	486.6	0.0	2247.5	8303.8	1.04	8984.5
P11	0	Min	1	-3680.3	-1824.3	-486.6	0.0	-1166.2	-4526.1	1.04	4881.4
P11	7.029	Min	1	-3516.6	-1824.3	-486.6	0.0	-2246.9	-9422.0	1.04	10116.2
P12	0	Max	1	-1218.5	2015.7	485.0	0.0	1168.2	4883.2	1.04	5243.9
P12	7.029	Max	1	-1054.8	2015.7	485.0	0.0	2245.6	8174.5	1.04	8853.7
P12	0	Min	1	-3662.1	-1796.3	-484.6	0.0	-1167.6	-4458.6	1.04	4813.6
P12	7.029	Min	1	-3498.4	-1796.3	-484.6	0.0	-2248.2	-9292.3	1.04	9984.9
P21	0	Max	1	-576.4	1506.9	833.9	0.0	1833.1	3910.9	1.05	4528.4
P21	7.029	Max	1	-412.8	1506.9	833.9	0.0	4002.0	6841.5	1.05	8310.0
P21	0	Min	1	-4727.6	-1480.1	-833.7	0.0	-1831.9	-3568.5	1.05	4205.6
P21	7.029	Min	1	-4564.0	-1480.1	-833.7	0.0	-4002.8	-6686.9	1.05	8170.9
P22	0	Max	1	-616.5	1484.0	827.1	0.0	1838.1	3858.9	1.05	4481.4
P22	7.029	Max	1	-452.8	1484.0	827.1	0.0	3999.2	6734.1	1.05	8211.7
P22	0	Min	1	-4689.7	-1457.4	-826.5	0.0	-1837.1	-3516.7	1.05	4159.9
P22	7.029	Min	1	-4526.0	-1457.4	-826.5	0.0	-4003.0	-6579.1	1.05	8074.5
P30	0	Max	1	-3962.1	2107.7	1853.7	0.0	11373.6	15378.4	1.01	19262.4
P30	5.662	Max	1	-3665.6	2107.7	1853.7	0.0	1390.8	3479.7	1.01	3773.8
P30	0	Min	1	-5431.1	-2107.7	-1852.1	0.0	-11367.0	-15378.4	1.01	19258.5
P30	5.662	Min	1	-5134.6	-2107.7	-1852.1	0.0	-1392.8	-3479.7	1.01	3774.5
P40	0	Max	1	-5493.8	5676.4	948.0	0.0	8276.2	12032.2	1.03	15084.1
P40	6.9	Max	1	-5132.4	5676.4	948.0	0.0	1792.3	27402.7	1.03	28364.5
P40	0	Min	1	-7709.4	-5711.2	-949.2	0.0	-8286.8	-11992.2	1.03	15056.3
P40	6.9	Min	1	-7348.0	-5711.2	-949.2	0.0	-1794.7	-27122.7	1.03	28076.1
P50	0	Max	1	-5495.8	5706.3	1152.6	0.0	8298.4	12001.0	1.03	15070.9
P50	6.9	Max	1	-5134.4	5706.3	1152.6	0.0	881.9	27114.0	1.03	28021.3
P50	0	Min	1	-7716.6	-5671.5	-1157.6	0.0	-8332.0	-12033.2	1.03	15118.0
P50	6.9	Min	1	-7355.2	-5671.5	-1157.6	0.0	-881.5	-27386.4	1.03	28302.5
P61	0	Max	1	515.7	466.8	1099.5	0.0	1727.7	3604.4	1.03	4128.0
P61	6.25	Max	1	661.2	466.8	1099.5	0.0	5150.7	744.9	1.03	5374.7
P61	0	Min	1	-5117.5	-466.8	-1107.5	0.0	-1741.7	-3604.4	1.03	4134.2
P61	6.25	Min	1	-4972.0	-466.8	-1107.5	0.0	-5115.3	-744.9	1.03	5338.5
P62	0	Max	1	538.7	467.0	1090.3	0.0	1732.1	3608.0	1.03	4132.1
P62	6.25	Max	1	684.3	467.0	1090.3	0.0	5147.6	737.2	1.03	5368.9
P62	0	Min	1	-5102.3	-467.0	-1098.1	0.0	-1746.1	-3608.0	1.03	4138.3
P62	6.25	Min	1	-4956.7	-467.0	-1098.1	0.0	-5112.6	-737.2	1.03	5333.1
P71	0	Max	1	-1080.0	1454.3	779.1	0.0	2277.9	4534.2	1.06	5400.7
P71	8	Max	1	-893.8	1454.3	779.1	0.0	3884.9	6838.8	1.06	8371.3
P71	0	Min	1	-4277.2	-1451.9	-768.7	0.0	-2246.5	-4764.6	1.06	5606.6
P71	8	Min	1	-4091.0	-1451.9	-768.7	0.0	-3936.7	-7088.0	1.06	8629.5
P72	0	Max	1	-933.4	1507.4	775.6	0.0	2281.3	4690.3	1.07	5554.9
P72	8	Max	1	-747.1	1507.4	775.6	0.0	3882.6	7148.0	1.07	8663.4
P72	0	Min	1	-4478.4	-1510.6	-764.8	0.0	-2249.5	-4936.7	1.07	5777.9
P72	8	Min	1	-4292.1	-1510.6	-764.8	0.0	-3937.6	-7368.2	1.07	8897.7
P81	0	Max	1	-754.4	1771.0	806.3	0.0	1916.0	4612.8	1.04	5201.5
P81	7	Max	1	-539.2	1698.8	834.9	0.0	3706.9	8079.5	1.04	9257.0
P81	0	Min	1	-3843.2	-1902.6	-774.9	0.0	-1841.0	-4922.4	1.04	5472.8
P81	7	Min	1	-3732.6	-1830.4	-803.5	0.0	-3851.9	-7467.5	1.04	8750.0

TABLE: Element Forces - Frames

Frame	Station	Step Type	Response Mod Factor	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	R	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
P82	0	Max	1	-944.6	1847.3	804.2	0.0	1917.7	4791.1	1.04	5377.9
P82	7	Max	1	-781.7	1847.3	804.2	0.0	3572.9	8792.9	1.04	9890.7
P82	0	Min	1	-3731.6	-1986.5	-772.4	0.0	-1842.7	-5117.9	1.04	5668.5
P82	7	Min	1	-3568.7	-1986.5	-772.4	0.0	-3720.9	-8145.7	1.04	9332.4
P91	0	Max	1	-1724.6	1610.7	425.4	0.0	914.5	3546.5	1.04	3827.3
P91	7	Max	1	-1561.6	1610.7	425.4	0.0	1943.2	8448.5	1.04	9059.1
P91	0	Min	1	-3258.4	-1749.7	-401.4	0.0	-863.1	-3794.1	1.04	4066.1
P91	7	Min	1	-3095.4	-1749.7	-401.4	0.0	-2060.2	-7722.3	1.04	8352.0
P92	0	Max	1	-1132.0	1725.2	455.3	0.0	978.0	3799.0	1.05	4100.2
P92	7	Max	1	-969.0	1725.2	455.3	0.0	2092.0	9031.7	1.05	9689.8
P92	0	Min	1	-3873.4	-1870.4	-430.9	0.0	-926.6	-4059.4	1.05	4352.0
P92	7	Min	1	-3710.4	-1870.4	-430.9	0.0	-2212.0	-8275.5	1.05	8953.2

LOAD FACTORS

1.0	Dead Load
1.0	Superimposed Dead Load
0.0	Earth Pressure
1.0	Longitudinal Earthquake (EQX)
0.3	Transverse Earthquake (EQY)

Note: Station O is at the base for the Pier Columns

TABLE: Element Forces - Frames

Frame	Station	Step Type	Response Mod Factor	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	R	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
A1	0	Max	3	-2509.8	345.0	1241.8	2123.5	12076.7	3246.6	1.01	12568.5
A1	5.229	Max	3	-1878.5	345.0	1241.8	2123.5	2340.2	5113.7	1.01	5652.1
A1	0	Min	2	-3059.1	-1133.1	-1863.4	-2122.5	-12080.1	725.0	1.01	12162.8
A1	5.229	Min	2	-2427.8	-1133.1	-1863.4	-2122.5	-2340.2	1432.3	1.01	2757.5
A2	0	Max	3	-2405.1	1014.1	1907.4	1224.4	16513.9	-877.2	1.00	16596.1
A2	4.467	Max	3	-1865.8	1014.1	1907.4	1224.4	3869.7	-1468.2	1.00	4153.6
A2	0	Min	2	-3008.0	-821.7	-2749.8	-1143.2	-15694.3	-3536.6	1.00	16145.1
A2	4.467	Min	2	-2468.7	-821.7	-2749.8	-1143.2	-3447.9	-5445.2	1.00	6468.0
P11	0	Max	5	-1968.5	287.9	245.2	0.0	587.9	644.5	1.044	911.1
P11	7.029	Max	5	-1804.8	287.9	245.2	0.0	1131.5	260.2	1.04	1212.5
P11	0	Min	5	-2911.3	-68.3	-245.2	0.0	-587.3	-219.7	1.04	654.9
P11	7.029	Min	5	-2747.6	-68.3	-245.2	0.0	-1130.9	-1378.4	1.04	1862.1
P12	0	Max	5	-1964.2	265.6	244.1	0.0	588.8	592.1	1.04	872.1
P12	7.029	Max	5	-1800.5	265.6	244.1	0.0	1129.7	158.8	1.04	1191.4
P12	0	Min	5	-2916.4	-46.2	-243.7	0.0	-588.2	-167.5	1.04	638.8
P12	7.029	Min	5	-2752.7	-46.2	-243.7	0.0	-1132.3	-1276.6	1.04	1782.1
P21	0	Max	5	-1661.3	155.5	431.1	0.0	947.3	514.4	1.05	1130.2
P21	7.029	Max	5	-1497.7	155.5	431.1	0.0	2065.0	731.1	1.05	2296.7
P21	0	Min	5	-3642.7	-128.7	-430.9	0.0	-946.1	-172.0	1.05	1008.2
P21	7.029	Min	5	-3479.1	-128.7	-430.9	0.0	-2065.8	-576.5	1.05	2248.6
P22	0	Max	5	-1662.6	136.3	426.6	0.0	950.7	473.2	1.05	1113.4
P22	7.029	Max	5	-1498.9	136.3	426.6	0.0	2062.6	643.4	1.05	2265.3
P22	0	Min	5	-3643.6	-109.7	-426.0	0.0	-949.7	-131.0	1.05	1005.1
P22	7.029	Min	5	-3479.9	-109.7	-426.0	0.0	-2066.4	-488.4	1.05	2226.2
P30	0	Max	3	-4616.4	285.4	1575.8	0.0	9985.9	2049.4	1.01	10266.0
P30	5.662	Max	3	-4319.9	285.4	1575.8	0.0	1187.5	452.8	1.01	1279.9
P30	0	Min	3	-4776.8	-285.4	-1574.2	0.0	-9979.3	-2049.4	1.01	10259.5
P30	5.662	Min	3	-4480.3	-285.4	-1574.2	0.0	-1189.5	-452.8	1.01	1281.8
P40	0	Max	3	-6459.5	712.7	950.3	0.0	8358.2	1557.9	1.03	8781.8
P40	6.9	Max	3	-6098.1	712.7	950.3	0.0	1809.7	3638.3	1.03	4197.2
P40	0	Min	3	-6743.7	-747.5	-951.5	0.0	-8368.8	-1517.9	1.03	8785.1
P40	6.9	Min	3	-6382.3	-747.5	-951.5	0.0	-1812.1	-3358.3	1.03	3941.5
P50	0	Max	3	-6462.8	746.5	906.1	0.0	6838.5	1522.8	1.03	7236.6
P50	6.9	Max	3	-6101.4	746.5	906.1	0.0	722.1	3357.3	1.03	3547.1
P50	0	Min	3	-6749.6	-711.7	-911.1	0.0	-6872.1	-1555.0	1.03	7277.7
P50	6.9	Min	3	-6388.2	-711.7	-911.1	0.0	-721.7	-3629.7	1.03	3822.5
P61	0	Max	5	-1248.3	37.1	381.8	0.0	535.6	286.8	1.03	627.5
P61	6.25	Max	5	-1102.8	37.1	381.8	0.0	1867.1	67.9	1.03	1929.4
P61	0	Min	5	-3353.5	-37.1	-389.8	0.0	-549.6	-286.8	1.03	640.3
P61	6.25	Min	5	-3208.0	-37.1	-389.8	0.0	-1831.7	-67.9	1.03	1892.9
P62	0	Max	5	-1229.8	37.2	375.9	0.0	538.5	288.3	1.03	630.6
P62	6.25	Max	5	-1084.2	37.2	375.9	0.0	1865.0	65.0	1.03	1926.6
P62	0	Min	5	-3333.8	-37.2	-383.7	0.0	-552.5	-288.3	1.03	643.4
P62	6.25	Min	5	-3188.2	-37.2	-383.7	0.0	-1830.0	-65.0	1.03	1890.5
P71	0	Max	5	-2102.8	155.3	290.9	0.0	849.5	376.0	1.06	988.7
P71	8	Max	5	-1916.6	155.3	290.9	0.0	1415.0	613.4	1.06	1641.5
P71	0	Min	5	-3254.4	-152.9	-280.5	0.0	-818.1	-606.4	1.06	1083.8
P71	8	Min	5	-3068.2	-152.9	-280.5	0.0	-1466.8	-862.6	1.06	1811.2
P72	0	Max	5	-2123.6	161.2	288.6	0.0	851.8	396.3	1.07	1000.6
P72	8	Max	5	-1937.3	161.2	288.6	0.0	1412.9	676.7	1.07	1668.5
P72	0	Min	5	-3288.2	-164.4	-277.8	0.0	-820.0	-642.7	1.07	1109.6
P72	8	Min	5	-3101.9	-164.4	-277.8	0.0	-1467.9	-896.9	1.07	1832.1
P81	0	Max	5	-1806.0	126.3	277.2	0.0	658.3	342.2	1.04	772.6
P81	7	Max	5	-1638.8	77.7	279.4	0.0	1141.2	936.8	1.04	1537.5
P81	0	Min	5	-2791.6	-257.9	-245.8	0.0	-583.3	-651.8	1.04	910.9
P81	7	Min	5	-2633.0	-209.3	-248.0	0.0	-1286.2	-324.8	1.04	1381.5

TABLE: Element Forces - Frames

Frame	Station	Step Type	Response Mod Factor	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	R	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
P82	0	Max	5	-1853.1	134.1	275.8	0.0	659.5	362.5	1.04	784.2
P82	7	Max	5	-1690.2	134.1	275.8	0.0	1129.5	1226.4	1.04	1737.5
P82	0	Min	5	-2823.1	-273.3	-244.0	0.0	-584.5	-689.3	1.04	941.8
P82	7	Min	5	-2660.2	-273.3	-244.0	0.0	-1277.5	-579.2	1.04	1461.7
P91	0	Max	5	-2210.3	70.1	163.0	0.0	349.2	176.3	1.04	408.8
P91	7	Max	5	-2047.3	70.1	163.0	0.0	673.2	1039.9	1.04	1294.5
P91	0	Min	5	-2772.7	-209.1	-139.0	0.0	-297.8	-423.9	1.04	541.4
P91	7	Min	5	-2609.7	-209.1	-139.0	0.0	-790.2	-313.7	1.04	888.4
P92	0	Max	5	-2134.6	113.4	161.5	0.0	347.1	276.2	1.05	463.6
P92	7	Max	5	-1971.6	113.4	161.5	0.0	666.1	1275.1	1.05	1503.6
P92	0	Min	5	-2870.8	-258.6	-137.1	0.0	-295.7	-536.6	1.05	640.4
P92	7	Min	5	-2707.8	-258.6	-137.1	0.0	-786.1	-518.9	1.05	984.5

LOAD FACTORS

1.0	Dead Load
1.0	Superimposed Dead Load
0.0	Earth Pressure
0.3	Longitudinal Earthquake (EQX)
1.0	Transverse Earthquake (EQY)

Note:
1. Station O is at the base for the Pier Columns
2. R= 2 applied at abutment for transverse case
3. R= 3 applied at abutment for longitudinal case
4. R= 2 applied at abutment for torsion case

TABLE: Element Forces - Frames

Frame	Station	Step Type	Response Mod Factor	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	R	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
A1	0	Max	1	-2070.4	1527.5	3725.9	4246.5	24155.0	5768.3	1.01	24155.0
A1	5.229	Max	1	-1439.1	1527.5	3725.9	4246.5	4680.4	8795.2	1.01	4680.4
A1	0	Min	1	-3388.6	-2019.9	-3726.5	-4245.5	-24158.4	-1796.7	1.01	-24158.4
A1	5.229	Min	1	-2757.3	-2019.9	-3726.5	-4245.5	-4680.4	-2249.2	1.01	-4680.4
A2	0	Max	1	-1922.8	2482.7	5633.2	2408.2	32618.0	1782.2	1.00	32618.0
A2	4.467	Max	1	-1383.5	2482.7	5633.2	2408.2	7528.6	2508.8	1.00	7528.6
A2	0	Min	1	-3369.8	-1923.1	-5544.2	-2327.0	-31798.4	-6196.0	1.00	-31798.4
A2	4.467	Min	1	-2830.5	-1923.1	-5544.2	-2327.0	-7106.8	-9422.2	1.00	-7106.8
P11	0	Max	1	-82.7	1000.5	1226.0	0.0	2938.3	2373.0	1.04	3944.6
P11	7.029	Max	1	81.0	1000.5	1226.0	0.0	5656.1	3537.2	1.04	6967.2
P11	0	Min	1	-4797.1	-780.9	-1226.0	0.0	-2937.7	-1948.2	1.04	-3681.5
P11	7.029	Min	1	-4633.4	-780.9	-1226.0	0.0	-5655.5	-4655.4	1.04	-7650.3
P12	0	Max	1	-59.6	889.4	1219.9	0.0	2943.0	2111.2	1.04	3782.8
P12	7.029	Max	1	104.1	889.4	1219.9	0.0	5653.5	3029.5	1.04	6698.9
P12	0	Min	1	-4821.0	-670.0	-1219.5	0.0	-2942.4	-1686.6	1.04	-3542.1
P12	7.029	Min	1	-4657.3	-670.0	-1219.5	0.0	-5656.1	-4147.3	1.04	-7325.1
P21	0	Max	1	2301.3	723.7	2155.3	0.0	4734.3	1887.1	1.05	5343.4
P21	7.029	Max	1	2464.9	723.7	2155.3	0.0	10326.5	3346.2	1.05	11381.0
P21	0	Min	1	-7605.3	-696.9	-2155.1	0.0	-4733.1	-1544.7	1.05	-5219.9
P21	7.029	Min	1	-7441.7	-696.9	-2155.1	0.0	-10327.3	-3191.6	1.05	-11332.9
P22	0	Max	1	2299.2	628.5	2132.0	0.0	4751.3	1681.7	1.05	5284.4
P22	7.029	Max	1	2462.9	628.5	2132.0	0.0	10320.5	2906.9	1.05	11241.8
P22	0	Min	1	-7605.4	-601.9	-2131.4	0.0	-4750.3	-1339.5	1.05	-5174.8
P22	7.029	Min	1	-7441.7	-601.9	-2131.4	0.0	-10324.3	-2751.9	1.05	-11202.6
P30	0	Max	1	-4456.1	856.3	4725.7	0.0	29951.1	6148.1	1.01	30791.6
P30	5.662	Max	1	-4159.6	856.3	4725.7	0.0	3564.6	1358.3	1.01	3841.6
P30	0	Min	1	-4937.1	-856.3	-4724.1	0.0	-29944.5	-6148.1	1.01	-30785.1
P30	5.662	Min	1	-4640.6	-856.3	-4724.1	0.0	-3566.6	-1358.3	1.01	-3843.5
P40	0	Max	1	-6175.4	2172.8	2852.0	0.0	25085.1	4633.7	1.03	26348.5
P40	6.9	Max	1	-5814.0	2172.8	2852.0	0.0	5431.6	10634.9	1.03	12334.4
P40	0	Min	1	-7027.8	-2207.6	-2853.2	0.0	-25095.7	-4593.7	1.03	-26351.8
P40	6.9	Min	1	-6666.4	-2207.6	-2853.2	0.0	-5434.0	-10354.9	1.03	-12078.7
P50	0	Max	1	-6176.0	2204.7	2723.3	0.0	20549.1	4600.7	1.03	21750.9
P50	6.9	Max	1	-5814.6	2204.7	2723.3	0.0	2165.8	10344.2	1.03	10916.3
P50	0	Min	1	-7036.4	-2169.9	-2728.3	0.0	-20582.7	-4632.9	1.03	-21792.1
P50	6.9	Min	1	-6675.0	-2169.9	-2728.3	0.0	-2165.4	-10616.6	1.03	-11191.8
P61	0	Max	1	2962.0	185.7	1924.9	0.0	2706.2	1434.2	1.03	3163.1
P61	6.25	Max	1	3107.5	185.7	1924.9	0.0	9264.5	339.5	1.03	9574.2
P61	0	Min	1	-7563.8	-185.7	-1932.9	0.0	-2720.2	-1434.2	1.03	-3175.8
P61	6.25	Min	1	-7418.3	-185.7	-1932.9	0.0	-9229.1	-339.5	1.03	-9537.6
P62	0	Max	1	2978.0	186.0	1894.9	0.0	2720.6	1441.4	1.03	3178.7
P62	6.25	Max	1	3123.6	186.0	1894.9	0.0	9254.8	325.2	1.03	9561.0
P62	0	Min	1	-7541.6	-186.0	-1902.7	0.0	-2734.6	-1441.4	1.03	-3191.5
P62	6.25	Min	1	-7396.0	-186.0	-1902.7	0.0	-9219.8	-325.2	1.03	-9524.9
P71	0	Max	1	200.5	771.6	1433.8	0.0	4184.6	2340.7	1.06	5103.3
P71	8	Max	1	386.7	771.6	1433.8	0.0	7178.8	3565.3	1.06	8531.1
P71	0	Min	1	-5557.7	-769.2	-1423.4	0.0	-4153.2	-2571.1	1.06	-5198.9
P71	8	Min	1	-5371.5	-769.2	-1423.4	0.0	-7230.6	-3814.5	1.06	-8701.1
P72	0	Max	1	205.8	812.6	1421.5	0.0	4195.4	2474.1	1.07	5187.4
P72	8	Max	1	392.1	812.6	1421.5	0.0	7174.5	3824.1	1.07	8658.8
P72	0	Min	1	-5617.6	-815.8	-1410.7	0.0	-4163.6	-2720.5	1.07	-5297.1
P72	8	Min	1	-5431.3	-815.8	-1410.7	0.0	-7229.5	-4044.3	1.07	-8822.6

TABLE: Element Forces - Frames											
Frame	Station	Step Type	Response Mod Factor	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	R	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
P81	0	Max	1	165.4	894.9	1323.2	0.0	3141.3	2330.3	1.04	4073.0
P81	7	Max	1	349.8	651.6	1334.0	0.0	5996.2	3459.9	1.04	7209.1
P81	0	Min	1	-4763.0	-1026.5	-1291.8	0.0	-3066.3	-2639.9	1.04	-4213.5
P81	7	Min	1	-4621.6	-783.2	-1302.6	0.0	-6141.2	-2847.9	1.04	-7049.4
P82	0	Max	1	87.0	948.7	1315.4	0.0	3147.4	2466.2	1.04	4166.8
P82	7	Max	1	249.9	948.7	1315.4	0.0	5943.6	4837.4	1.04	7986.0
P82	0	Min	1	-4763.2	-1087.9	-1283.6	0.0	-3072.4	-2793.0	1.04	-4326.9
P82	7	Min	1	-4600.3	-1087.9	-1283.6	0.0	-6091.6	-4190.2	1.04	-7704.9
P91	0	Max	1	-1085.6	628.5	767.0	0.0	1643.1	1376.8	1.04	2240.1
P91	7	Max	1	-922.6	628.5	767.0	0.0	3600.0	3747.2	1.04	5430.1
P91	0	Min	1	-3897.4	-767.5	-743.0	0.0	-1591.7	-1624.4	1.04	-2376.5
P91	7	Min	1	-3734.4	-767.5	-743.0	0.0	-3717.0	-3021.0	1.04	-5005.3
P92	0	Max	1	-662.2	857.3	758.7	0.0	1632.5	1901.8	1.05	2619.7
P92	7	Max	1	-499.2	857.3	758.7	0.0	3570.4	4863.0	1.05	6305.6
P92	0	Min	1	-4343.3	-1002.5	-734.3	0.0	-1581.1	-2162.2	1.05	-2799.7
P92	7	Min	1	-4180.3	-1002.5	-734.3	0.0	-3690.4	-4106.8	1.05	-5770.9

LOAD FACTORS

1.0	Dead Load
1.0	Superimposed Dead Load
0.0	Earth Pressure
0.3	Longitudinal Earthquake (EQX)
1.0	Transverse Earthquake (EQY)

Note: Station O is at the base for the Pier Columns

TABLE: Element Forces - Frames

Frame	Station	Step Type	Response Mod Factor	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	R	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
A1	0	Max	1	-2070.4	1527.5	3725.9	4246.5	24155.0	5768.3	1.01	24155.0
A1	5.229	Max	1	-1439.1	1527.5	3725.9	4246.5	4680.4	8795.2	1.01	4680.4
A1	0	Min	1	-3388.6	-2019.9	-3726.5	-4245.5	-24158.4	-1796.7	1.01	-24158.4
A1	5.229	Min	1	-2757.3	-2019.9	-3726.5	-4245.5	-4680.4	-2249.2	1.01	-4680.4
A2	0	Max	1	-1922.8	2482.7	5633.2	2408.2	32618.0	1782.2	1.00	32618.0
A2	4.467	Max	1	-1383.5	2482.7	5633.2	2408.2	7528.6	2508.8	1.00	7528.6
A2	0	Min	1	-3369.8	-1923.1	-5544.2	-2327.0	-31798.4	-6196.0	1.00	-31798.4
A2	4.467	Min	1	-2830.5	-1923.1	-5544.2	-2327.0	-7106.8	-9422.2	1.00	-7106.8
P11	0	Max	1	-82.7	1000.5	1226.0	0.0	2938.3	2373.0	1.04	3944.6
P11	7.029	Max	1	81.0	1000.5	1226.0	0.0	5656.1	3537.2	1.04	6967.2
P11	0	Min	1	-4797.1	-780.9	-1226.0	0.0	-2937.7	-1948.2	1.04	-3681.5
P11	7.029	Min	1	-4633.4	-780.9	-1226.0	0.0	-5655.5	-4655.4	1.04	-7650.3
P12	0	Max	1	-59.6	889.4	1219.9	0.0	2943.0	2111.2	1.04	3782.8
P12	7.029	Max	1	104.1	889.4	1219.9	0.0	5653.5	3029.5	1.04	6698.9
P12	0	Min	1	-4821.0	-670.0	-1219.5	0.0	-2942.4	-1686.6	1.04	-3542.1
P12	7.029	Min	1	-4657.3	-670.0	-1219.5	0.0	-5656.1	-4147.3	1.04	-7325.1
P21	0	Max	1	2301.3	723.7	2155.3	0.0	4734.3	1887.1	1.05	5343.4
P21	7.029	Max	1	2464.9	723.7	2155.3	0.0	10326.5	3346.2	1.05	11381.0
P21	0	Min	1	-7605.3	-696.9	-2155.1	0.0	-4733.1	-1544.7	1.05	-5219.9
P21	7.029	Min	1	-7441.7	-696.9	-2155.1	0.0	-10327.3	-3191.6	1.05	-11332.9
P22	0	Max	1	2299.2	628.5	2132.0	0.0	4751.3	1681.7	1.05	5284.4
P22	7.029	Max	1	2462.9	628.5	2132.0	0.0	10320.5	2906.9	1.05	11241.8
P22	0	Min	1	-7605.4	-601.9	-2131.4	0.0	-4750.3	-1339.5	1.05	-5174.8
P22	7.029	Min	1	-7441.7	-601.9	-2131.4	0.0	-10324.3	-2751.9	1.05	-11202.6
P30	0	Max	1	-4456.1	856.3	4725.7	0.0	29951.1	6148.1	1.01	30791.6
P30	5.662	Max	1	-4159.6	856.3	4725.7	0.0	3564.6	1358.3	1.01	3841.6
P30	0	Min	1	-4937.1	-856.3	-4724.1	0.0	-29944.5	-6148.1	1.01	-30785.1
P30	5.662	Min	1	-4640.6	-856.3	-4724.1	0.0	-3566.6	-1358.3	1.01	-3843.5
P40	0	Max	1	-6175.4	2172.8	2852.0	0.0	25085.1	4633.7	1.03	26348.5
P40	6.9	Max	1	-5814.0	2172.8	2852.0	0.0	5431.6	10634.9	1.03	12334.4
P40	0	Min	1	-7027.8	-2207.6	-2853.2	0.0	-25095.7	-4593.7	1.03	-26351.8
P40	6.9	Min	1	-6666.4	-2207.6	-2853.2	0.0	-5434.0	-10354.9	1.03	-12078.7
P50	0	Max	1	-6176.0	2204.7	2723.3	0.0	20549.1	4600.7	1.03	21750.9
P50	6.9	Max	1	-5814.6	2204.7	2723.3	0.0	2165.8	10344.2	1.03	10916.3
P50	0	Min	1	-7036.4	-2169.9	-2728.3	0.0	-20582.7	-4632.9	1.03	-21792.1
P50	6.9	Min	1	-6675.0	-2169.9	-2728.3	0.0	-2165.4	-10616.6	1.03	-11191.8
P61	0	Max	1	2962.0	185.7	1924.9	0.0	2706.2	1434.2	1.03	3163.1
P61	6.25	Max	1	3107.5	185.7	1924.9	0.0	9264.5	339.5	1.03	9574.2
P61	0	Min	1	-7563.8	-185.7	-1932.9	0.0	-2720.2	-1434.2	1.03	-3175.8
P61	6.25	Min	1	-7418.3	-185.7	-1932.9	0.0	-9229.1	-339.5	1.03	-9537.6
P62	0	Max	1	2978.0	186.0	1894.9	0.0	2720.6	1441.4	1.03	3178.7
P62	6.25	Max	1	3123.6	186.0	1894.9	0.0	9254.8	325.2	1.03	9561.0
P62	0	Min	1	-7541.6	-186.0	-1902.7	0.0	-2734.6	-1441.4	1.03	-3191.5
P62	6.25	Min	1	-7396.0	-186.0	-1902.7	0.0	-9219.8	-325.2	1.03	-9524.9
P71	0	Max	1	200.5	771.6	1433.8	0.0	4184.6	2340.7	1.06	5103.3
P71	8	Max	1	386.7	771.6	1433.8	0.0	7178.8	3565.3	1.06	8531.1
P71	0	Min	1	-5557.7	-769.2	-1423.4	0.0	-4153.2	-2571.1	1.06	-5198.9
P71	8	Min	1	-5371.5	-769.2	-1423.4	0.0	-7230.6	-3814.5	1.06	-8701.1
P72	0	Max	1	205.8	812.6	1421.5	0.0	4195.4	2474.1	1.07	5187.4
P72	8	Max	1	392.1	812.6	1421.5	0.0	7174.5	3824.1	1.07	8658.8
P72	0	Min	1	-5617.6	-815.8	-1410.7	0.0	-4163.6	-2720.5	1.07	-5297.1
P72	8	Min	1	-5431.3	-815.8	-1410.7	0.0	-7229.5	-4044.3	1.07	-8822.6

TABLE: Element Forces - Frames

Frame	Station	Step Type	Response Mod Factor	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	R	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
P81	0	Max	1	165.4	894.9	1323.2	0.0	3141.3	2330.3	1.04	4073.0
P81	7	Max	1	349.8	651.6	1334.0	0.0	5996.2	3459.9	1.04	7209.1
P81	0	Min	1	-4763.0	-1026.5	-1291.8	0.0	-3066.3	-2639.9	1.04	-4213.5
P81	7	Min	1	-4621.6	-783.2	-1302.6	0.0	-6141.2	-2847.9	1.04	-7049.4
P82	0	Max	1	87.0	948.7	1315.4	0.0	3147.4	2466.2	1.04	4166.8
P82	7	Max	1	249.9	948.7	1315.4	0.0	5943.6	4837.4	1.04	7986.0
P82	0	Min	1	-4763.2	-1087.9	-1283.6	0.0	-3072.4	-2793.0	1.04	-4326.9
P82	7	Min	1	-4600.3	-1087.9	-1283.6	0.0	-6091.6	-4190.2	1.04	-7704.9
P91	0	Max	1	-1085.6	628.5	767.0	0.0	1643.1	1376.8	1.04	2240.1
P91	7	Max	1	-922.6	628.5	767.0	0.0	3600.0	3747.2	1.04	5430.1
P91	0	Min	1	-3897.4	-767.5	-743.0	0.0	-1591.7	-1624.4	1.04	-2376.5
P91	7	Min	1	-3734.4	-767.5	-743.0	0.0	-3717.0	-3021.0	1.04	-5005.3
P92	0	Max	1	-662.2	857.3	758.7	0.0	1632.5	1901.8	1.05	2619.7
P92	7	Max	1	-499.2	857.3	758.7	0.0	3570.4	4863.0	1.05	6305.6
P92	0	Min	1	-4343.3	-1002.5	-734.3	0.0	-1581.1	-2162.2	1.05	-2799.7
P92	7	Min	1	-4180.3	-1002.5	-734.3	0.0	-3690.4	-4106.8	1.05	-5770.9

LOAD FACTORS

1.0	Dead Load
1.0	Superimposed Dead Load
0.0	Earth Pressure
0.3	Longitudinal Earthquake (EQX)
1.0	Transverse Earthquake (EQY)

Note: Station O is at the base for the Pier Columns

TABLE: Element Forces - Frames										
Frame	Station	Step Type	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
A1	0	Max	-2104.2	516.2	15.3	25.8	558.5	6474.9	1.00	6499.0
A1	5.229	Max	-1472.9	516.2	15.3	25.8	560.9	10022.1	1.00	10037.8
A1	0	Min	-5463.4	-888.9	-17.4	-22.5	-570.7	383.8	1.00	-687.8
A1	5.229	Min	-4832.1	-888.9	-17.4	-22.5	-562.5	-1103.4	1.00	-1238.5
A2	0	Max	-1894.9	869.8	362.5	205.1	3126.9	-598.8	1.00	3183.7
A2	4.467	Max	-1355.6	869.8	362.5	205.1	1800.8	1708.0	1.00	2482.0
A2	0	Min	-5363.6	-785.9	-313.3	-27.7	-1370.3	-7629.8	1.00	-7751.9
A2	4.467	Min	-4824.3	-785.9	-313.3	-27.7	-476.7	-10313.1	1.00	-10324.1
P11	0	Max	-1921.7	360.5	6.5	0.0	16.9	624.3	1.00	624.6
P11	7.029	Max	-1758.0	360.5	6.5	0.0	27.7	1085.5	1.00	1085.9
P11	0	Min	-4241.8	-160.3	-5.9	0.0	-15.0	-265.4	1.00	-265.9
P11	7.029	Min	-4078.1	-160.3	-5.9	0.0	-29.5	-1934.2	1.00	-1934.4
P12	0	Max	-1923.4	360.5	6.7	0.0	16.9	624.1	1.00	624.3
P12	7.029	Max	-1759.7	360.5	6.7	0.0	26.0	1087.1	1.00	1087.4
P12	0	Min	-4243.4	-160.7	-5.7	0.0	-15.0	-266.2	1.00	-266.6
P12	7.029	Min	-4079.7	-160.7	-5.7	0.0	-31.2	-1934.0	1.00	-1934.2
P21	0	Max	-2250.9	199.6	13.6	0.0	32.4	285.2	1.00	287.0
P21	7.029	Max	-2087.3	199.6	13.6	0.0	57.2	2268.6	1.00	2269.3
P21	0	Min	-4422.6	-386.1	-12.3	0.0	-28.5	-543.4	1.00	-544.2
P21	7.029	Min	-4259.0	-386.1	-12.3	0.0	-63.5	-1291.8	1.00	-1293.4
P22	0	Max	-2258.2	199.3	13.8	0.0	32.3	284.9	1.00	286.7
P22	7.029	Max	-2094.5	199.3	13.8	0.0	55.7	2270.1	1.00	2270.8
P22	0	Min	-4424.5	-386.4	-12.1	0.0	-28.6	-544.1	1.00	-544.8
P22	7.029	Min	-4260.8	-386.4	-12.1	0.0	-65.0	-1291.5	1.00	-1293.1
P30	0	Max	-4149.8	0.0	33.1	0.0	299.5	0.0	1.00	299.5
P30	5.662	Max	-3853.3	0.0	33.1	0.0	423.8	0.0	1.00	423.8
P30	0	Min	-7469.0	0.0	-27.9	0.0	-277.2	0.0	1.00	-277.2
P30	5.662	Min	-7172.5	0.0	-27.9	0.0	-430.8	0.0	1.00	-430.8
P40	0	Max	-5575.6	615.0	48.3	0.0	147.4	1677.7	1.00	1684.1
P40	6.9	Max	-5214.2	615.0	48.3	0.0	427.7	5359.2	1.00	5376.3
P40	0	Min	-10613.6	-863.3	-52.2	0.0	-183.2	-1403.5	1.00	-1415.4
P40	6.9	Min	-10252.2	-863.3	-52.2	0.0	-435.7	-4032.9	1.00	-4056.4
P50	0	Max	-5581.3	863.3	49.5	0.0	108.8	1406.8	1.00	1410.9
P50	6.9	Max	-5219.9	863.3	49.5	0.0	403.3	4040.7	1.00	4060.8
P50	0	Min	-10618.8	-615.0	-66.3	0.0	-222.8	-1660.0	1.00	-1674.8
P50	6.9	Min	-10257.4	-615.0	-66.3	0.0	-401.9	-5380.1	1.00	-5395.1
P61	0	Max	-2026.3	0.0	13.4	0.0	25.5	0.0	1.00	25.5
P61	6.25	Max	-1880.8	0.0	13.4	0.0	177.8	0.0	1.00	177.8
P61	0	Min	-3760.5	0.0	-40.1	0.0	-73.2	0.0	1.00	-73.2
P61	6.25	Min	-3615.0	0.0	-40.1	0.0	-58.0	0.0	1.00	-58.0
P62	0	Max	-1917.1	0.0	13.5	0.0	25.5	0.0	1.00	25.5
P62	6.25	Max	-1771.5	0.0	13.5	0.0	177.5	0.0	1.00	177.5
P62	0	Min	-3713.0	0.0	-40.0	0.0	-73.2	0.0	1.00	-73.2
P62	6.25	Min	-3567.4	0.0	-40.0	0.0	-58.2	0.0	1.00	-58.2
P71	0	Max	-2274.3	443.1	22.8	0.0	68.2	998.6	1.00	1000.9
P71	8	Max	-2088.1	443.1	22.8	0.0	129.9	977.4	1.00	986.0
P71	0	Min	-4443.8	-127.3	-25.7	0.0	-76.1	-86.5	1.00	-115.2
P71	8	Min	-4257.6	-127.3	-25.7	0.0	-114.5	-2644.3	1.00	-2646.7

TABLE: Element Forces - Frames

Frame	Station	Step Type	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
P72	0	Max	-2251.8	444.0	23.0	0.0	68.4	1001.3	1.00	1003.6
P72	8	Max	-2065.5	444.0	23.0	0.0	128.4	995.9	1.00	1004.2
P72	0	Min	-4463.1	-130.6	-25.5	0.0	-75.9	-106.3	1.00	-130.6
P72	8	Min	-4276.8	-130.6	-25.5	0.0	-116.0	-2637.1	1.00	-2639.7
P81	0	Max	-1659.7	321.7	60.3	0.0	146.9	543.4	1.00	562.9
P81	7	Max	-1496.8	321.7	60.3	0.0	96.0	1756.5	1.00	1759.1
P81	0	Min	-4101.8	-284.4	-21.0	0.0	-50.9	-320.7	1.00	-324.7
P81	7	Min	-3938.9	-284.4	-21.0	0.0	-276.1	-1834.1	1.00	-1854.7
P82	0	Max	-1846.9	321.8	60.6	0.0	146.9	544.6	1.00	564.0
P82	7	Max	-1684.0	321.8	60.6	0.0	94.3	1796.7	1.00	1799.2
P82	0	Min	-4141.5	-293.3	-20.8	0.0	-50.9	-349.2	1.00	-352.9
P82	7	Min	-3978.6	-293.3	-20.8	0.0	-277.8	-1818.0	1.00	-1839.1
P91	0	Max	-1781.3	168.7	55.9	0.0	134.1	111.7	1.00	174.5
P91	7	Max	-1618.3	168.7	55.9	0.0	-18.3	2027.2	1.00	2027.3
P91	0	Min	-4362.3	-349.0	3.8	0.0	4.4	-513.5	1.00	-513.5
P91	7	Min	-4199.3	-349.0	3.8	0.0	-260.9	-1202.5	1.00	-1230.5
P92	0	Max	-2130.6	167.9	56.1	0.0	134.1	113.6	1.00	175.7
P92	7	Max	-1967.6	167.9	56.1	0.0	-20.8	2073.4	1.00	2073.5
P92	0	Min	-4369.9	-361.0	4.0	0.0	4.4	-540.3	1.00	-540.3
P92	7	Min	-4206.9	-361.0	4.0	0.0	-262.6	-1198.6	1.00	-1227.0

LOAD FACTORS

1.00	Dead Load
1.00	Superimposed Dead Load
1.00	Settlement
0.00	Earth Pressure
1.00	Traffic Load
1.00	Braking and Centrifugal Loads
1.00	Pedestrian Load
0.70	Temperature Effects
0.00	Wind Load
1.00	Creep & Shrinkage

TABLE: Element Forces - Frames										
Frame	Station	Step Type	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
A1	0	Max	-2200.3	283.6	14.1	24.6	550.7	5938.0	1.00	5963.5
A1	5.229	Max	-1569.0	283.6	14.1	24.6	559.4	9342.9	1.00	9359.6
A1	0	Min	-5367.2	-656.3	-16.6	-20.6	-565.6	920.7	1.00	-1080.6
A1	5.229	Min	-4735.9	-656.3	-16.6	-20.6	-561.5	-424.2	1.00	-703.7
A2	0	Max	-2019.8	551.4	22.8	147.3	803.8	-1191.9	1.00	1437.6
A2	4.467	Max	-1480.5	551.4	22.8	147.3	995.1	878.7	1.00	1327.5
A2	0	Min	-5238.7	-467.5	-207.5	30.1	-840.0	-7036.7	1.00	-7086.7
A2	4.467	Min	-4699.4	-467.5	-207.5	30.1	-419.0	-9483.8	1.00	-9493.1
P11	0	Max	-1959.7	304.4	6.2	0.0	16.1	478.9	1.00	479.2
P11	7.029	Max	-1796.0	304.4	6.2	0.0	25.5	836.8	1.00	837.2
P11	0	Min	-4203.7	-104.2	-5.5	0.0	-13.8	-120.0	1.00	-120.8
P11	7.029	Min	-4040.0	-104.2	-5.5	0.0	-28.1	-1685.5	1.00	-1685.7
P12	0	Max	-1961.4	304.2	6.4	0.0	16.1	478.4	1.00	478.7
P12	7.029	Max	-1797.7	304.2	6.4	0.0	23.8	837.7	1.00	838.0
P12	0	Min	-4205.4	-104.4	-5.3	0.0	-13.8	-120.5	1.00	-121.3
P12	7.029	Min	-4041.7	-104.4	-5.3	0.0	-29.8	-1684.6	1.00	-1684.9
P21	0	Max	-2265.8	112.1	13.0	0.0	31.0	62.8	1.00	70.0
P21	7.029	Max	-2102.2	112.1	13.0	0.0	52.6	1876.5	1.00	1877.2
P21	0	Min	-4407.7	-298.6	-11.3	0.0	-26.4	-321.0	1.00	-322.1
P21	7.029	Min	-4244.1	-298.6	-11.3	0.0	-60.5	-899.7	1.00	-901.7
P22	0	Max	-2270.4	111.8	13.2	0.0	30.9	62.3	1.00	69.5
P22	7.029	Max	-2106.7	111.8	13.2	0.0	51.1	1877.4	1.00	1878.1
P22	0	Min	-4412.3	-298.9	-11.1	0.0	-26.5	-321.5	1.00	-322.6
P22	7.029	Min	-4248.6	-298.9	-11.1	0.0	-62.0	-898.8	1.00	-900.9
P30	0	Max	-4192.5	0.0	31.1	0.0	290.9	0.0	1.00	290.9
P30	5.662	Max	-3896.0	0.0	31.1	0.0	419.7	0.0	1.00	419.7
P30	0	Min	-7426.3	0.0	-24.8	0.0	-264.0	0.0	1.00	-264.0
P30	5.662	Min	-7129.8	0.0	-24.8	0.0	-428.1	0.0	1.00	-428.1
P40	0	Max	-5628.6	311.4	45.9	0.0	126.2	1001.9	1.00	1009.8
P40	6.9	Max	-5267.2	311.4	45.9	0.0	423.0	3940.5	1.00	3963.1
P40	0	Min	-10560.6	-559.7	-50.6	0.0	-169.4	-727.7	1.00	-747.2
P40	6.9	Min	-10199.2	-559.7	-50.6	0.0	-432.7	-2614.2	1.00	-2649.8
P50	0	Max	-5633.4	559.7	39.6	0.0	41.1	731.7	1.00	732.9
P50	6.9	Max	-5272.0	559.7	39.6	0.0	402.7	2620.8	1.00	2651.6
P50	0	Min	-10566.8	-311.4	-59.9	0.0	-178.6	-984.9	1.00	-1001.0
P50	6.9	Min	-10205.4	-311.4	-59.9	0.0	-401.0	-3960.2	1.00	-3980.5
P61	0	Max	-2056.6	0.0	-2.5	0.0	-2.7	0.0	1.00	2.7
P61	6.25	Max	-1911.1	0.0	-2.5	0.0	131.5	0.0	1.00	131.5
P61	0	Min	-3751.3	0.0	-29.7	0.0	-54.8	0.0	1.00	-54.8
P61	6.25	Min	-3605.8	0.0	-29.7	0.0	12.8	0.0	1.00	-12.8
P62	0	Max	-1966.6	0.0	-2.4	0.0	-2.7	0.0	1.00	2.7
P62	6.25	Max	-1821.0	0.0	-2.4	0.0	131.2	0.0	1.00	131.2
P62	0	Min	-3657.4	0.0	-29.6	0.0	-54.8	0.0	1.00	-54.8
P62	6.25	Min	-3511.8	0.0	-29.6	0.0	12.6	0.0	1.00	-12.6
P71	0	Max	-2305.5	337.4	4.0	0.0	12.9	655.0	1.00	655.1
P71	8	Max	-2119.3	337.4	4.0	0.0	101.2	476.0	1.00	486.6
P71	0	Min	-4430.5	-21.6	-20.0	0.0	-59.3	257.1	1.00	-263.9
P71	8	Min	-4244.3	-21.6	-20.0	0.0	-19.9	-2142.9	1.00	-2143.0
P72	0	Max	-2280.8	336.8	4.2	0.0	13.1	653.2	1.00	653.3
P72	8	Max	-2094.5	336.8	4.2	0.0	99.7	486.4	1.00	496.5

TABLE: Element Forces - Frames										
Frame	Station	Step Type	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
P72	0	Min	-4414.8	-23.4	-19.8	0.0	-59.1	241.8	1.00	-248.9
P72	8	Min	-4228.5	-23.4	-19.8	0.0	-21.4	-2127.6	1.00	-2127.7
P81	0	Max	-1756.5	234.9	36.6	0.0	88.0	320.1	1.00	332.0
P81	7	Max	-1593.6	234.9	36.6	0.0	58.8	1372.1	1.00	1373.4
P81	0	Min	-4067.5	-197.6	-12.9	0.0	-31.7	-97.4	1.00	-102.4
P81	7	Min	-3904.6	-197.6	-12.9	0.0	-168.8	-1449.7	1.00	-1459.5
P82	0	Max	-1855.6	233.1	36.9	0.0	88.0	317.0	1.00	329.0
P82	7	Max	-1692.7	233.1	36.9	0.0	57.2	1403.6	1.00	1404.8
P82	0	Min	-4061.8	-204.6	-12.7	0.0	-31.7	-121.6	1.00	-125.7
P82	7	Min	-3898.9	-204.6	-12.7	0.0	-170.5	-1424.9	1.00	-1435.1
P91	0	Max	-1913.3	111.7	35.7	0.0	86.5	-7.1	1.00	86.8
P91	7	Max	-1750.3	111.7	35.7	0.0	-27.4	1747.0	1.00	1747.2
P91	0	Min	-4320.6	-292.0	5.7	0.0	8.4	-394.7	1.00	-394.8
P91	7	Min	-4157.6	-292.0	5.7	0.0	-167.1	-922.3	1.00	-937.3
P92	0	Max	-2173.2	107.4	35.9	0.0	86.5	-12.5	1.00	87.4
P92	7	Max	-2010.2	107.4	35.9	0.0	-29.9	1776.4	1.00	1776.7
P92	0	Min	-4231.5	-300.5	5.9	0.0	8.4	-414.2	1.00	-414.3
P92	7	Min	-4068.5	-300.5	5.9	0.0	-168.8	-901.6	1.00	-917.3

LOAD FACTORS

1.00 Dead Load
1.00 Superimposed Dead Load
1.00 Settlement
0.00 Earth Pressure
1.00 Traffic Load
0.00 Braking and Centrifugal Loads
1.00 Pedestrian Load
0.00 Temperature Effects
0.00 Wind Load
1.00 Creep & Shrinkage

TABLE: Element Forces - Frames										
Frame	Station	Step Type	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
A1	0	Max	-2293.0	226.0	387.4	179.2	3332.1	4993.7	1.00	6003.3
A1	5.229	Max	-1661.7	226.0	387.4	179.2	3359.8	7434.2	1.00	8158.2
A1	0	Min	-4223.9	-469.3	152.9	-175.2	-3347.2	1095.8	1.00	-3522.0
A1	5.229	Min	-3592.6	-469.3	152.9	-175.2	-3362.2	-53.2	1.00	-3362.6
A2	0	Max	-2093.9	380.3	-289.2	166.2	3228.2	-1408.7	1.00	3522.2
A2	4.467	Max	-1554.6	380.3	-289.2	166.2	3683.7	598.3	1.00	3732.0
A2	0	Min	-4091.6	-451.4	-538.7	9.1	-3774.1	-6040.4	1.00	-7122.5
A2	4.467	Min	-3552.3	-451.4	-538.7	9.1	-3286.8	-7731.7	1.00	-8401.3
P11	0	Max	-1970.7	222.1	31.9	0.0	119.2	378.3	1.00	396.6
P11	7.029	Max	-1807.0	222.1	31.9	0.0	208.6	406.5	1.00	456.9
P11	0	Min	-3949.3	-37.1	-61.4	0.0	-116.9	-70.7	1.00	-136.6
P11	7.029	Min	-3785.6	-37.1	-61.4	0.0	-211.4	-1195.2	1.00	-1213.8
P12	0	Max	-1972.4	221.9	32.0	0.0	119.2	377.8	1.00	396.2
P12	7.029	Max	-1808.7	221.9	32.0	0.0	207.0	407.4	1.00	457.0
P12	0	Min	-3951.0	-37.3	-61.3	0.0	-116.9	-71.2	1.00	-136.9
P12	7.029	Min	-3787.3	-37.3	-61.3	0.0	-213.0	-1194.2	1.00	-1213.0
P21	0	Max	-2127.9	58.8	-27.7	0.0	226.0	3.4	1.00	226.0
P21	7.029	Max	-1964.3	58.8	-27.7	0.0	428.5	1460.6	1.00	1522.2
P21	0	Min	-4114.9	-245.3	-213.0	0.0	-221.4	-313.7	1.00	-384.0
P21	7.029	Min	-3951.3	-245.3	-213.0	0.0	-436.4	-513.6	1.00	-674.0
P22	0	Max	-2132.5	58.5	-27.6	0.0	225.9	2.9	1.00	225.9
P22	7.029	Max	-1968.9	58.5	-27.6	0.0	426.9	1461.5	1.00	1522.6
P22	0	Min	-4119.5	-245.6	-212.9	0.0	-221.5	-314.2	1.00	-384.4
P22	7.029	Min	-3955.9	-245.6	-212.9	0.0	-438.0	-512.7	1.00	-674.3
P30	0	Max	-4291.7	0.0	165.5	0.0	2174.0	0.0	1.00	2174.0
P30	5.662	Max	-3995.2	0.0	165.5	0.0	2936.1	0.0	1.00	2936.1
P30	0	Min	-6211.1	0.0	-164.2	0.0	-2147.2	0.0	1.00	-2147.2
P30	5.662	Min	-5914.6	0.0	-164.2	0.0	-2944.7	0.0	1.00	-2944.7
P40	0	Max	-5740.2	198.8	300.6	0.0	1300.7	736.8	1.00	1494.9
P40	6.9	Max	-5378.8	198.8	300.6	0.0	3298.7	2594.3	1.00	4196.6
P40	0	Min	-8875.9	-339.3	-301.6	0.0	-1343.9	-517.9	1.00	-1440.2
P40	6.9	Min	-8514.5	-339.3	-301.6	0.0	-3308.4	-1755.9	1.00	-3745.5
P50	0	Max	-5745.3	339.3	325.7	0.0	880.1	521.3	1.00	1022.9
P50	6.9	Max	-5383.9	339.3	325.7	0.0	2996.0	1760.5	1.00	3475.0
P50	0	Min	-8880.8	-198.8	-329.7	0.0	-1018.0	-720.7	1.00	-1247.3
P50	6.9	Min	-8519.4	-198.8	-329.7	0.0	-2994.3	-2614.3	1.00	-3975.0
P61	0	Max	-1864.9	0.0	76.7	0.0	129.4	0.3	1.00	129.4
P61	6	Max	-1725.2	0.0	76.7	0.0	397.4	0.3	1.00	397.4
P61	0	Min	-3629.0	0.0	-83.4	0.0	-185.3	-0.3	1.00	-185.3
P61	6	Min	-3489.3	0.0	-83.4	0.0	-248.7	-0.3	1.00	-248.7
P62	0	Max	-1771.9	0.0	76.7	0.0	129.4	0.3	1.00	129.4
P62	6	Max	-1632.2	0.0	76.7	0.0	397.1	0.3	1.00	397.1
P62	0	Min	-3541.4	0.0	-83.4	0.0	-185.3	-0.3	1.00	-185.3
P62	6	Min	-3401.7	0.0	-83.4	0.0	-249.0	-0.3	1.00	-249.0
P71	0	Max	-2311.0	303.1	247.0	0.0	116.3	605.3	1.00	616.4
P71	7.366	Max	-2139.5	303.1	247.0	0.0	293.5	58.5	1.00	299.3
P71	0	Min	-4111.0	43.6	141.9	0.0	-167.5	294.9	1.00	-339.1
P71	7.366	Min	-3939.5	43.6	141.9	0.0	-198.0	-1749.2	1.00	-1760.4
P72	0	Max	-2282.6	303.3	247.8	0.0	116.4	603.4	1.00	614.5
P72	7.366	Max	-2111.1	303.3	247.8	0.0	291.8	77.3	1.00	301.9
P72	0	Min	-4089.4	40.6	142.7	0.0	-167.4	281.8	1.00	-327.8
P72	7.366	Min	-3917.9	40.6	142.7	0.0	-199.6	-1736.9	1.00	-1748.3

TABLE: Element Forces - Frames										
Frame	Station	Step Type	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
P81	0	Max	-1809.3	182.1	162.9	0.0	103.8	259.4	1.00	279.4
P81	6.549	Max	-1656.8	182.1	162.9	0.0	160.0	1030.3	1.00	1042.6
P81	0	Min	-3805.9	-151.2	78.0	0.0	-83.2	-22.6	1.00	-86.2
P81	6.549	Min	-3653.4	-151.2	78.0	0.0	-209.1	-1064.3	1.00	-1084.6
P82	0	Max	-1908.7	180.6	162.1	0.0	103.7	257.3	1.00	277.4
P82	6.549	Max	-1756.2	180.6	162.1	0.0	158.5	1070.8	1.00	1082.5
P82	0	Min	-3805.1	-160.5	77.2	0.0	-83.3	-44.4	1.00	-94.4
P82	6.549	Min	-3652.6	-160.5	77.2	0.0	-210.9	-1041.1	1.00	-1062.2
P91	0	Max	-1948.7	53.7	-12.1	0.0	77.1	-18.6	1.00	79.3
P91	6.549	Max	-1796.3	53.7	-12.1	0.0	31.4	1395.1	1.00	1395.5
P91	0	Min	-4063.7	-244.8	-47.8	0.0	-4.0	-315.0	1.00	-315.0
P91	6.549	Min	-3911.3	-244.8	-47.8	0.0	-180.1	-538.7	1.00	-568.0
P92	0	Max	-2208.5	49.5	-15.1	0.0	77.1	-27.2	1.00	81.8
P92	6.549	Max	-2056.0	49.5	-15.1	0.0	29.2	1427.1	1.00	1427.4
P92	0	Min	-3976.5	-254.3	-50.7	0.0	-4.1	-333.1	1.00	-333.1
P92	6.549	Min	-3824.0	-254.3	-50.7	0.0	-181.9	-518.5	1.00	-549.5

LOAD FACTORS

1.00	Dead Load
1.00	Superimposed Dead Load
1.00	Settlement
0.00	Earth Pressure
1.00	Traffic Load
0.00	Braking and Centrifugal Loads
1.00	Pedestrian Load
0.00	Temperature Effects
0.00	Wind Load
1.00	Creep & Shrinkage

TABLE: Element Forces - Frames										
Frame	Station	Step Type	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
A1	0	Max	-2227.3	396.4	116.7	180.1	3337.0	5393.3	1.00	6342.1
A1	5.229	Max	-1684.4	396.4	116.7	180.1	3360.7	7925.5	1.00	8608.6
A1	0	Min	-4378.1	-639.7	-119.1	-176.4	-3350.9	696.2	1.00	-3422.5
A1	5.229	Min	-3746.8	-639.7	-119.1	-176.4	-3362.9	-544.5	1.00	-3406.7
A2	0	Max	-2160.1	633.0	210.7	206.5	4567.1	-935.8	1.00	4662.0
A2	4.467	Max	-1620.8	633.0	210.7	206.5	4106.8	1254.0	1.00	4294.0
A2	0	Min	-4347.8	-704.1	-332.0	-31.2	-4218.5	-6513.3	1.00	-7760.1
A2	4.467	Min	-3808.5	-704.1	-332.0	-31.2	-3337.4	-8387.4	1.00	-9027.0
P11	0	Max	-1864.5	253.1	47.2	0.0	119.7	461.5	1.00	476.8
P11	7.029	Max	-1700.8	253.1	47.2	0.0	210.0	541.0	1.00	580.3
P11	0	Min	-3910.1	-68.1	-46.6	0.0	-117.6	-153.9	1.00	-193.7
P11	7.029	Min	-3746.4	-68.1	-46.6	0.0	-212.5	-1329.7	1.00	-1346.6
P12	0	Max	-1864.6	253.0	47.4	0.0	119.7	461.2	1.00	476.5
P12	7.029	Max	-1700.9	253.0	47.4	0.0	208.4	542.4	1.00	581.0
P12	0	Min	-3910.8	-68.4	-46.4	0.0	-117.6	-154.6	1.00	-194.2
P12	7.029	Min	-3747.1	-68.4	-46.4	0.0	-214.1	-1329.2	1.00	-1346.3
P21	0	Max	-2134.4	126.6	93.9	0.0	227.0	176.3	1.00	287.4
P21	7.029	Max	-1970.8	126.6	93.9	0.0	431.4	1764.2	1.00	1816.2
P21	0	Min	-4143.2	-313.1	-92.4	0.0	-222.8	-486.6	1.00	-535.2
P21	7.029	Min	-3979.6	-313.1	-92.4	0.0	-438.6	-817.2	1.00	-927.5
P22	0	Max	-2137.5	126.4	94.2	0.0	226.9	175.9	1.00	287.1
P22	7.029	Max	-1973.9	126.4	94.2	0.0	429.8	1765.5	1.00	1817.1
P22	0	Min	-4142.4	-313.5	-92.1	0.0	-222.9	-487.2	1.00	-535.8
P22	7.029	Min	-3978.8	-313.5	-92.1	0.0	-440.2	-816.7	1.00	-927.8
P30	0	Max	-4283.1	0.0	169.4	0.0	2180.2	0.0	1.00	2180.2
P30	5.662	Max	-3986.6	0.0	169.4	0.0	2938.7	0.0	1.00	2938.7
P30	0	Min	-6273.7	0.0	-163.6	0.0	-2155.4	0.0	1.00	-2155.4
P30	5.662	Min	-5977.2	0.0	-163.6	0.0	-2946.6	0.0	1.00	-2946.6
P40	0	Max	-5704.6	400.0	300.2	0.0	1313.9	1192.8	1.00	1774.6
P40	6.9	Max	-5343.2	400.0	300.2	0.0	3301.6	3526.3	1.00	4830.7
P40	0	Min	-8911.5	-540.5	-304.6	0.0	-1354.0	-973.9	1.00	-1667.9
P40	6.9	Min	-8550.1	-540.5	-304.6	0.0	-3310.6	-2687.9	1.00	-4264.4
P50	0	Max	-5711.0	540.5	323.8	0.0	922.2	976.6	1.00	1343.2
P50	6.9	Max	-5349.6	540.5	323.8	0.0	2996.4	2693.5	1.00	4029.1
P50	0	Min	-8915.3	-400.0	-342.5	0.0	-1050.1	-1176.0	1.00	-1576.6
P50	6.9	Min	-8553.9	-400.0	-342.5	0.0	-2994.8	-3547.3	1.00	-4642.4
P61	0	Max	-1837.1	0.0	73.5	0.0	146.5	0.3	1.00	146.5
P61	6	Max	-1697.4	0.0	73.5	0.0	432.1	0.3	1.00	432.1
P61	0	Min	-3623.4	0.0	-105.0	0.0	-198.3	-0.3	1.00	-198.3
P61	6	Min	-3483.7	0.0	-105.0	0.0	-294.1	-0.3	1.00	-294.1
P62	0	Max	-1785.9	0.0	73.5	0.0	146.5	0.3	1.00	146.5
P62	6	Max	-1646.2	0.0	73.5	0.0	431.8	0.3	1.00	431.8
P62	0	Min	-3637.7	0.0	-105.0	0.0	-198.3	-0.3	1.00	-198.3
P62	6	Min	-3498.0	0.0	-105.0	0.0	-294.4	-0.3	1.00	-294.4
P71	0	Max	-2286.9	398.5	55.7	0.0	150.4	884.7	1.00	897.4
P71	7.366	Max	-2115.4	398.5	55.7	0.0	322.9	482.0	1.00	580.1
P71	0	Min	-4112.4	-51.8	-68.7	0.0	-183.5	15.5	1.00	-184.2
P71	7.366	Min	-3940.9	-51.8	-68.7	0.0	-260.3	-2172.7	1.00	-2188.2
P72	0	Max	-2309.7	399.7	55.9	0.0	150.5	885.1	1.00	897.8
P72	7.366	Max	-2138.2	399.7	55.9	0.0	321.2	505.2	1.00	598.7
P72	0	Min	-4177.0	-55.8	-68.5	0.0	-183.4	0.1	1.00	-183.4
P72	7.366	Min	-4005.5	-55.8	-68.5	0.0	-261.9	-2164.8	1.00	-2180.6

TABLE: Element Forces - Frames											
Frame	Station	Step Type	P AXIAL	V2 SHEAR LONG	V3 SHEAR TRANS	T TORSION	M2 MOMENT TRANS	M3 MOMENT LONG	Mag Factor	MD design moment
Text	m	Text	KN	KN	KN	KN-m	KN-m	KN-m		KN-m
P81	0	Max	-1680.7	247.5	62.4	0.0	136.5	410.3	1.00	432.4
P81	6.549	Max	-1528.2	247.5	62.4	0.0	188.8	1307.8	1.00	1321.3
P81	0	Min	-3771.1	-216.6	-43.7	0.0	-97.3	-173.5	1.00	-198.9
P81	6.549	Min	-3618.6	-216.6	-43.7	0.0	-272.8	-1341.8	1.00	-1369.2
P82	0	Max	-1878.1	246.7	62.7	0.0	136.4	409.6	1.00	431.7
P82	6.549	Max	-1725.6	246.7	62.7	0.0	187.3	1351.4	1.00	1364.3
P82	0	Min	-3828.5	-226.6	-43.4	0.0	-97.4	-196.7	1.00	-219.5
P82	6.549	Min	-3676.0	-226.6	-43.4	0.0	-274.6	-1321.7	1.00	-1349.9
P91	0	Max	-1782.2	93.4	45.4	0.0	100.3	51.8	1.00	112.9
P91	6.549	Max	-1629.8	93.4	45.4	0.0	37.8	1584.4	1.00	1584.8
P91	0	Min	-4018.0	-284.5	-2.9	0.0	-6.5	-385.4	1.00	-385.4
P91	6.549	Min	-3865.6	-284.5	-2.9	0.0	-229.8	-728.0	1.00	-763.4
P92	0	Max	-2092.8	91.6	45.7	0.0	100.3	47.8	1.00	111.1
P92	6.549	Max	-1940.3	91.6	45.7	0.0	35.6	1628.3	1.00	1628.6
P92	0	Min	-3983.4	-296.4	-2.5	0.0	-6.6	-408.1	1.00	-408.2
P92	6.549	Min	-3830.9	-296.4	-2.5	0.0	-231.7	-719.7	1.00	-756.0

LOAD FACTORS

1.00	Dead Load
1.00	Superimposed Dead Load
1.00	Settlement
0.00	Earth Pressure
1.00	Traffic Load
0.50	Braking and Centrifugal Loads (Half load)
1.00	Pedestrian Load
0.70	Temperature Effects
0.00	Wind Load
1.00	Creep & Shrinkage

7. DETAILED DESIGN OF COLUMNS and ABUTMENTS

REINFORCING DETAILING

REINFORCING DETAILING

KATAHIRA & ENGINEERS
INTERNATIONAL

Project: **Detailed Design Study of North Java Corridor Flyover Project**

Calculation: **Reinforcement Detailing - Substructure**

Reference: **AASHTO LRFD Bridge Design Specifications, Third Edition, 2004**

Initial Data

Compressive Strength of Concrete $f_c := 30MPa$

Yield Strength of Rebar $f_y := 400MPa$

Available bar sizes

Nominal area of reinforcing bars

$j := 1..6$

$d_{b_j} :=$

10mm
13mm
16mm
19mm
25mm
32mm

$A_{b_j} :=$

$78.5mm^2$
$132.7 \cdot mm^2$
$201.0 \cdot mm^2$
$283.5 \cdot mm^2$
$491.0 \cdot mm^2$
$804.0 \cdot mm^2$

Details of Reinforcement (Article 5.10)

Concrete Cover

Refer to the Design Criteria for concrete cover requirements.

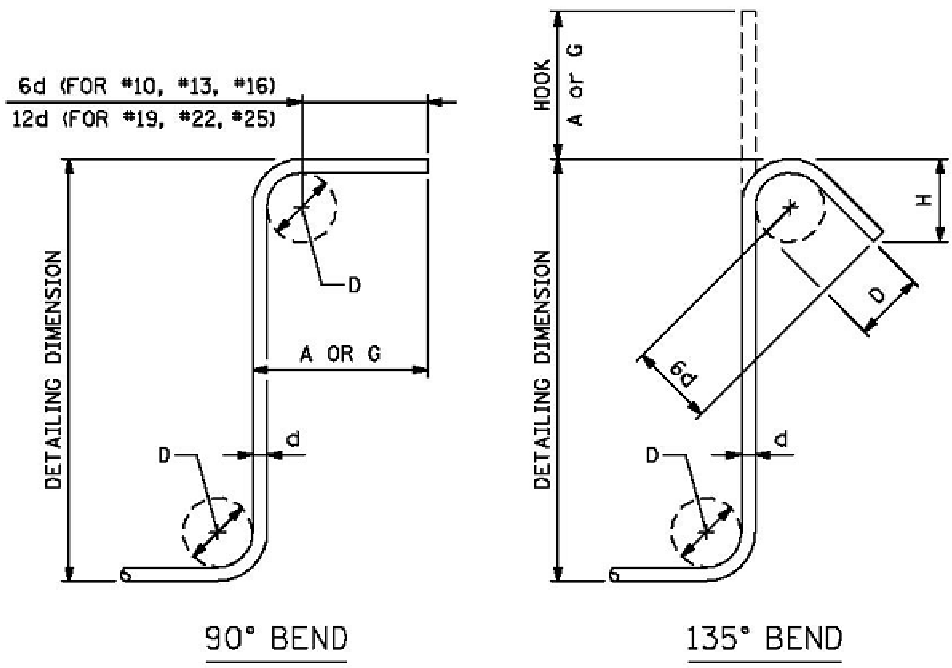
Hooks and Bends

Standard hooks for **LONGITUDINAL REINFORCEMENT** shall be as follows:

- 180^o bend plus a $4.0d_b$ extension but not less than 65mm at the free end of the bar
- 90^o bend plus a $12.0d_b$ extension at the free end of the bar

Standard hooks for **TRANSVERSE REINFORCEMENT** shall be as follows:

- 16mm diameter bars and smaller - 90^{o} bend plus a 6.0d_b extension at the free end of the bar
- 19 to 25mm diameter bars - 90^{o} bend plus a 12.0d_b extension at the free end of the bar
- 25m bars and smaller - 135^{o} bend plus a 6.0d_b extension at the free end of the bar



Seismic Hooks

Seismic hooks shall consist of 135^{o} bend plus a 6.0d_b extension, but not less than 75mm, at the free end of the bar.

Seismic hooks shall be used for transverse reinforcement in regions of expected plastic hinges.

Minimum Bend Diameters

The diameter of a bar bend, D, measured on the inside of the bar, shall not be less than:

- 10mm to 16mm bars - general..6.0d_b
- 10mm to 16mm bars - stirrups and ties...4.0d_b
- 19mm to 25mm bars - general ....6.0d_b
- 32mm dia bars..8.0d_b

Spacing of Reinforcement

For cast-in-place concrete, the clear distance between parallel bars in a layer shall not be less than:

- 1.5 times the nominal dameter of the bars
- 1.5 times the maximum size of the aggregate
- 38mm

For multilayers the clear distance between layers shall not be less than 25mm or the nominal diameter of the bars.

The clear disance limitations above shall also apply to the clear distance between a contact lap splice and adjacent splices or bars.

Bundled Bars

The number of parallel reinforcing bars bundled in contact to act as a unit shall not exceed four (4) in any one bundle.

Bundled bars shall be enclosed within stirrups or ties.

Individual bars in a bundle shall be terminated at different points with at least a 40-bar diameter stagger.

Where spacing limitations are based on bar size, a unit of bundled bars shall be treated as a single bar of a diameter derived from the equivalent total area.

Maximum Spacing of Bars

The spacing of longitudinal reinforcement shall not exceed 450mm.

The maximum spacing of spirals, ties and temperature/shrinkage reinforcement shall follow the provisions of AASHTO LRFD.

Transverse Reinforcement for Compression Members

Refer to **Notes on Shear Design - Reinforced Concrete** for design and detailing for seismic resistance.

The clear spacing between the bars of spirals shall not be less than 25mm or 1.33 times the maximum size of the aggregate. The center-center spacing shall not exceed 6.0 times the diameter of the longitudinal bars or 150mm.

Splices in spiral reinforcement may be one of the following:

- lap splices of 48.0 bar diameters
- approved welded splices

Ties

In tied compession members all longitudinal bars shall be enclosed by lateral ties that shall be equivalent to:

- 10mm bars for 32mm diameter bars or smaller

The spacing of ties shall not exceed the least dimension of the member or 300mm.

Ties shall be so arranged that every corner and alternate longitudinal bar has lateral support provided by the corner of a tie having an included angle of not more than 135^{o}.

Except as provided herein, no bar shall be farther than 610mm center-to-center on each side along the tie from such a laterally supported bar.

Where the column design is based on plastic hinging capability, no longitudinal bar shall be further than 150mm clear on each side along the tie from a laterally supported bar.

Where the bars are located around the periphery of a circle, a complete circular tie may be used if the splices of the ties are staggered.

Ties shall be located vertically not more than half a tie spacing above the footing and not more than half a tie spacing below the lowest horizontal reinforcement in the supported member.

Shrinkage and Temperature Reinforcement

Reinforcement for temperature and shrinkage stress shall be provided near surfaces of concrete exposed to daily temperature changes.

The area of reinforcement bars in each direction shall satisfy:

$A_s \geq 0.11A_g / f_y$

where:

A_g = gross area of section (mm^2)

f_y = specified yield strength of reinforcing bars (MPa)

Steel shall be equally distributed on both faces.

Shrinkage and temperature reinforcement shall not be spaced further apart than 3.0 times the component thickness or 450mm.

For solid concrete walls and footings, bar spacing shall not exceed 300mm in each direction on all faces, and the area of shrinkage and temperature steel need not exceed:

$\sum A_b = 0.0015A_g$

Development of Reinforcement (Article 5.11.2)

Deformed Bars in Tension

The develpment length in tension, $\ell_{\mathbf{d}}$, shall not be less than the product of the basic tension develpment length, $\ell_{\mathbf{db}}$, and the modification factors specified below. The tension development length shall not be less than 300mm.

For 36mm diameter bars and smaller the basic development length, $\ell_{\mathbf{db}}$, in mm shall be taken as:

$$l_{db_j} := \left| \begin{array}{l} l_{db1_j} \leftarrow \dfrac{0.02 \cdot A_{b_j} \cdot \dfrac{f_y}{MPa}}{\sqrt{\dfrac{f_c}{MPa}} \cdot mm} \\ l_{db2_j} \leftarrow 0.06 \cdot d_{b_j} \cdot \dfrac{f_y}{MPa} \\ l_{db1_j} \ \text{if} \ \left(l_{db1_j} > l_{db2_j}\right) \cdot \left(l_{db1_j} > 300mm\right) \\ l_{db2_j} \ \text{if} \ \left(l_{db2_j} > l_{db1_j}\right) \cdot \left(l_{db2_j} > 300mm\right) \\ 300mm \ \ \text{otherwise} \end{array} \right.$$

where:

A_b	=	area of bar (mm2)
f_y	=	yield strength of reinforcing bar (MPa)
f_c	=	compressive strength of concrete (MPa)
d_b	=	diameter of bar (mm)

Modification factors that increase $\ell_{\mathbf{d}}$:

- For top horizontal or nearly horizontal reinforcement, so placed that more than 300mm of fresh concrete is cast below the reinforcement...1.4

Modification factors that decrease $\ell_{\mathbf{d}}$:

- Reinforcement being developed in the length under consideration is spaced laterally not less than 150mm center-to-center, with not less than 75mm clear cover measured in the direction of the spacing.. 0.8
- Anchorage or development for the full yield strength of reinforcement is not required, or where reinforcement in flexural members is in excess of that reqired by analysis. ....(A_s required)/(A_s provided)
- Reinforcement is enclosed within a spiral composed of bars not less than 6mm in diameter and spaced at not more than a 100mm pitch..0.75

Deformed Bars in Compression

The development length, L_d, for deformed bars in compression shall not be less than the product of the basic develpment length, L_{db}, and the modification factors specified below or 200mm.

For 36mm diameter bars and smaller the basic development length, L_{db}, in mm shall be aken as:

$$L_{db_j} := \begin{vmatrix} l_{db1_j} \leftarrow \dfrac{0.24 \cdot d_{b_j} \cdot \dfrac{f_y}{MPa}}{\sqrt{\dfrac{f_c}{MPa}}} \\ l_{db2_j} \leftarrow 0.044 \cdot d_{b_j} \cdot \dfrac{f_y}{MPa} \\ l_{db1_j} \;\text{ if } \left(l_{db1_j} > l_{db2_j}\right) \cdot \left(l_{db1_j} > 200mm\right) \\ l_{db2_j} \;\text{ if } \left(l_{db2_j} > l_{db1_j}\right) \cdot \left(l_{db2_j} > 200mm\right) \\ 200mm \;\; \text{otherwise} \end{vmatrix}$$

where:

f_y	=	yield strength of reinforcing bar (MPa)
f_c	=	compressive strength of concrete (MPa)
d_b	=	diameter of bar (mm)

The basic development length, $\mathbf{L_{db}}$, may be multiplied by the applicable factors where:

- Anchorage or development for the full yield strength of reinforcement is not required or where reinforcement in flexural members is in excess of that reqired by analysis. ………………………………………………………………………………………………(A_s required)/(A_s provided)

- Reinforcement is enclosed within a spiral composed of bars not less than 6mm in diameter and spaced at not more than a 100mm pitch……………………………………………………………0.75

Bundled Bars

The development length of individual bars within a bundle, in tension or compression, shall be that for the individual bar, increased by 20% for a three-bar bundle and by 33% for a four-bar bundle.

For determining modification factors given above a unit of bundled bars shall be treated as a single bar of a diameter determined from the equivalent total area.

Standard Hooks in Tension

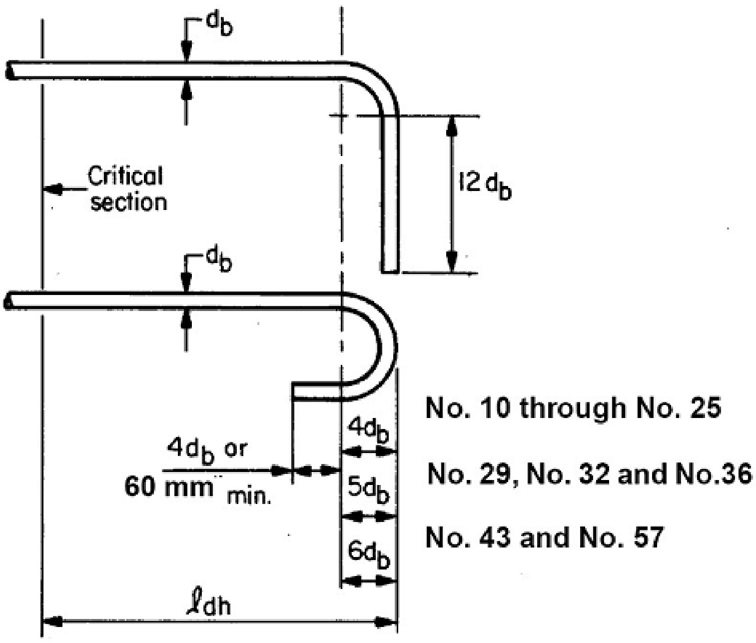
The development length , ℓ_{dh}, in mm, for deformed bars in tension terminating in a standard hook shall not be less than than:

- The product of the basic development length ℓ_{hb} specified below with the applicable modification factors also specfied below;
- 8.0 bar diameters; or
- 150mm

$$l_{hb_j} := \begin{array}{|l} l_{hb1_j} \leftarrow \dfrac{100 \cdot d_{b_j}}{\sqrt{\dfrac{f_c}{MPa}}} \\ l_{hb2_j} \leftarrow 8 \cdot d_{b_j} \\ l_{hb1_j} \ \text{if} \ \left(l_{hb1_j} > l_{hb2_j}\right) \cdot \left(l_{hb1_j} > 150mm\right) \\ l_{hb2_j} \ \text{if} \ \left(l_{hb2_j} > l_{hb1_j}\right) \cdot \left(l_{hb2_j} > 150mm\right) \\ 150mm \ \ \text{otherwise} \end{array}$$

where:

f_c	=	compressive strength of concrete
d_b	=	diameter of bar (mm)



The basic hook development length, ℓ_{hb}, shall be multiplied by the following factors as applicable where:

- Reinforcement has a yield strength exceeding 420MPa ....$f_y/420$
- Side cover for 36mm diameter bars and smaller, normal to plane of hook, is not less than 64mm, and for 90^o hook, cover on bar extension beyond hook not less than 50mm............................0.7
- Hooks for 36mm diameter bar and smaller enclosed vertically or horizontally within ties which are spaced along the full development length, ℓ_{dh} , at a spacing not exceeding $3d_b$ 0.8
- Anchorage or development for the full yield strength of reinforcement is not required or where reinforcement in flexural members is in excess of that reqired by analysis. ....(A_s required)/(A_s provided)

Shear Reinforcement

Shear reinforcement shall be located as close to the surfaces of members as cover requirements and proximity of other reinforcement permit.

Between anchored ends, each bend in the continuous portion of a simple U-stirrup or multiple U-stirrup shall enclose a longitudinal bar.

Ends of single-leg, simple U-, or multiple U-stirrups shall be anchored as follows:

- For 16mm diameter bars and smaller, and for 19mm and 25mm diameter bars of 275MPa or less:

  A standard hook around longitudinal reinforcement

- For 19mm and 25mm diameter bars with f_y greater than 275MPa

  A standard stirrup hook around a longitudinal bar, plus one embedment length between midheight of the member and the outside end of the hook, ℓ_e, shall satisy:

$j := 1..5$

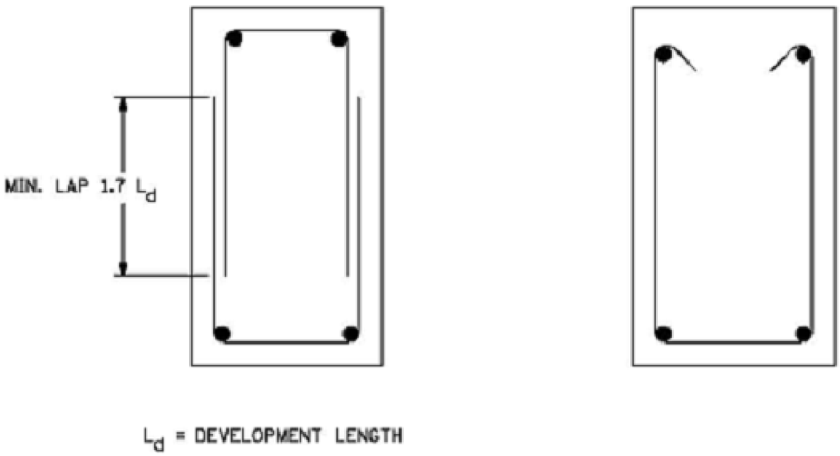
$$l_{e_j} := \frac{0.17 \cdot d_{b_j} \cdot \frac{f_y}{MPa}}{\sqrt{\frac{f_c}{MPa}}} \qquad l_e = \begin{pmatrix} 0.124 \\ 0.161 \\ 0.199 \\ 0.236 \\ 0.310 \end{pmatrix} m$$

Note that most of the provisions of AASHTO LRFD are based on ACI-89 and its attendant commentary.

ACI-89 requires that stirrups must be carried as close to the compression face of the member as possible. A calculated straight embedment length in addition to the hook for 16mm diameter bars and smaller, and for bars up to 25mm in diameter of 275MPa, is not required

However for larger bars with f_y greater than 275MPa a check on embedment as given above is required.

Pairs of U-stirrups or ties that are placed to form a closed unit shall be considered properly anchored and spliced where length of laps are not less than 1.7 ℓ_d, where ℓ_d in this case is the development length for bars in tension.



METHODS FOR ANCHORAGE OF SHEAR REINFORCEMENT

SEE AASHTO LRFD 5.11.2.6.2 AND 5.11.2.6.4

Splices of Bar Reinforcement (Article 5.11.5)

General

The lengths of lap for lap splices shall be as specfied below.

Individual bar splices within a bundle shall not overlap. Entire bundles shall not be lap spliced.

Bars spliced by non contact lap splices in flexural members shall not be spaced father apart transversely than one-fifth the required lap splice length or 150mm.

Welded Splices

Welding for welded splices shall conform to the current edition of **Structural Welding Code - Reinforcing Steel of AWS (D1.4).**

A full-welded splice shall be required to develop, in tension, at least 125% of the specified yield strength of the bar.

Splices of Reinforcement in Tension

The length of lap for tension splices shall not be less than either 300mm or the following for Class A, B or C splices:

- CLASS A SPLICE......................$1.0\ell_d$
- CLASS B SPLICE......................$1.3\ell_d$
- CLASS C SPLICE......................$1.7\ell_d$

The class of lap splice required for defomed bars in tension shall be as specified below.

Ratio of (A_s as provided) / (A_s as required)	Percent of A_s Spliced with Required Lap Length		
	50	75	100
≥ 2	A	A	B
< 2	B	C	C

Welded tension splices, used where the area of reinforcement provided is less than twice that required, shall meet the requirements for full-welded splices.

Welded splices, used where the area of renforcement is at least twice that required by analysis and where splices are staggered at least 600mm, may be designed to develop not less than twice the tensile force effect in the bar or half the minimum yield strength of the reinforcement.

NOTE!! INDONESIAN STANDARDS REQUIRE:

- **Splice length shall not be less than 400mm or 60 bar diameters**
- **The distance between splices of adjacent bars shall be greater than 600mm**

Splices of Reinforcement in Compression

The length of lap, ℓ_c , for compression lap splices shall not be less than either 300mm or as follows:

- If $f_y \leq 420\text{MPa}$, then:

$$j := 1..6 \qquad m_c := 0.75 \qquad l_{c_j} := \begin{cases} l_{c_j} \leftarrow 0.073 \cdot m_c \cdot \dfrac{f_y}{\text{MPa}} \cdot d_{b_j} \\ l_{c_j} \ \text{if} \ l_{c_j} \geq 300\text{mm} \\ 300\text{mm} \ \ \text{otherwise} \end{cases}$$

where:

m_c = 0.75 for spirals and 1.0 in all other cases (with $f_c \geq$ 21MPa)

f_y = yield strength of reinforcing bar (MPa)

d_b = diameter of bar (mm)

Where bars of different sizes are lap spliced in compression, the splice length shall not be less than the development length of the larger bar or the splice length of the smaller bar.

SUMMARY OF DEVELOPMENT LENGTH AND SPLICE LENGTH FOR REBAR

Development Length/ Splice Length (mm)	Bar Diameter d_b (mm)					
	10	**13**	**16**	**19**	**25**	**32**
Basic Development Length in Tension	300	312	384	456	717	1174
Basic Development Length in Tension - Plastic Hinge	375	390	480	570	896	1468
Basic Development Length in Compression	200	229	282	334	440	563
Basic Hook Development Length	183	237	292	347	456	584
Basic Hook Development Length - Plastic Hinge	228	297	365	434	571	730
Basic Tension Lap Splice - Class A	300	312	384	456	717	1174
Basic Tension Lap Splice - Class B	390	406	499	593	932	1527
Basic Tension Lap Splice - Class C	510	530	653	775	1219	1996
Compression Lap Splice (spiral links)	300	300	350	416	548	701

- This table does not include modification factors for development length
- See above for applicable modification factors

NOTE!! INDONESIAN STANDARDS REQUIRE:

- **Splice length shall not be less than 400mm or 60 bar diameters**
- **The distance between splices of adjacent bars shall be greater than 600mm**

7.1 FLEXURAL DESIGN OF COLUMNS

Notes on Flexural Design

(1) Loads and Load Combinations

The loads and load combinations are taken from Section 6 and summarized in the following pages. Both ultimate limit state and serviceability limit state combinations were included in the design in accordance with the Design Criteria.

By inspection of the demands from the loads applied, the following load combinations are determined to be critical:

- **Ultimate Limit State**

  Combination 1: Full Live Load

  Dead Load x 1.3 + Superimposed Dead Load x 2.0 + Full Traffic Load x 1.8 + Full Braking or Centrifugal Load x 1.8 + Pedestrian Load x 1.8 + Temperature Effects x 1.0

  Combination 1: Half Live Load (occupying 2 lanes on one side only)

  Dead Load x 1.3 + Superimposed Dead Load x 2.0 + Half Traffic Load x 1.8 + Half Braking or Centrifugal Load x 1.8 + Pedestrian Load x 1.8 + Temperature Effects x 1.0

  Combination 5: Longitudinal Effects of Earthquake + 30% of Transverse Effects of Earthquake

  Dead Load x 1.0 + Superimposed Dead Load x 1.0 + EQX x 1.0 + EQY x 0.3

  Combination 5: 30% of Longitudinal Effects of Earthquake + Transverse Effects of Earthquake

  Dead Load x 1.0 + Superimposed Dead Load x 1.0 + EQX x 0.3 + EQY x 1.0

- **Serviceability Limit State**

  Combination 1: Traffic Load Only

  Dead Load x 1.0 + Superimposed Dead Load x 1.0 + Differential Settlement x 1.0 + Full Traffic Load x 1.0 + Pedestrian Load x 1.0

  Combination 1: Full Live Load

  Dead Load x 1.0 + Superimposed Dead Load x 1.0 + Differential Settlement x 1.0 + Full Traffic Load x 1.0 + Full Braking or Centrifugal Load x 1.0 + Pedestrian Load x 1.0 + Temperature Effects x 0.7

  Combination 1: Half Traffic Load Only (occupying 2 lanes on one side only)

  Dead Load x 1.0 + Superimposed Dead Load x 1.0 + Differential Settlement x 1.0 + Half Traffic Load x 1.0 + Pedestrian Load x 1.0

  Combination 1: Half Live Load (occupying 2 lanes on one side only)

  Dead Load x 1.0 + Superimposed Dead Load x 1.0 + Differential Settlement x 1.0 + Half Traffic Load x 1.0 + Half Braking or Centrifugal Load x 1.0 + Pedestrian Load x 1.0 + Temperature Effects x 0.7

  Collision Load Combination: (1000kN Vehicle Impact Load on 1.1m Diameter Column)

  Dead Load x 1.0 + Superimposed Dead Load x 1.0 + Collision Load x 1.0

The separate combinations at serviceability limit state for (i) traffic load only and (ii) full live load are required to investigate allowable overstress as follows:

- Nil (i.e 100% allowable tensile stress) for traffic load only case
- 40% (i.e 140% allowable tensile stress) for full live load case

Differential settlement is not required to be investigated at ultimate limit state.

The abutments will be protected from the effects of earth pressure and therefore earth pressure forces are not included in the load combinations.

(2) Column Slenderness

The effect of column slenderness is taken into account in the design. The magnification factors on factored bending moment at ultimate limit state are determined in accordance with the requirements of AASHTO LRFD (Article 4.5.3.2.2b). Refer to Section 6 for the results of the calculation.

(3) Design Moment MD

The design moment, MD, for a circular column under biaxial flexure is determined as follows:

$$MD = \sqrt{Mux^2 + Muy^2}$$

where:

Mux = factored applied moment about the X-axis

Muy = factored applied moment about the Y-axis

Note that AASHTO LRFD requires a separate check on capacities in each principal direction for non-circular columns only (refer AASHTO LRFD Article 5.7.4.5).

(4) Ultimate Moment Capacity

The Ultimate Moment Capacity of reinforced concrete columns is determined using the computer program PCACOL. This is based on ACI-95 and is consistent with the requirements of AASHTO LRFD.

See separate design notes on Ultimate Moment Capacity of composite columns.

(5) Service Moment Capacity

See separate design notes on Service Moment Capacity of both RC columns and composite columns.

(6) Limits for Reinforcement (AASHTO LRFD Article 5.7.4.2)

The maximum area of longitudinal reinforcement for RC columns shall be such that:

$$\frac{A_s}{A_g} \leq 0.08$$

The minimum area of longitudinal reinforcement for RC columns shall be such that:

$\frac{A_s \cdot f_y}{A_g \cdot f_c} \geq 0.135$ which gives $\frac{A_s}{A_g} \geq 0.010$ for f_y =400MPa and f_c = 30MPa.

where:

A_s = area of reinforcement (mm^2)

A_g = gross area of section (mm^2)

The minimum number of longitudinal reinforcing bars shall be six (6) in a circular arrangement and four (4) in a rectangular arrangement. The minimum size of bar shall be 16mm diameter.

(7) Spirals and Ties (AASHTO LRFD Article 5.7.4.6)

Where the area of spiral and tie reinforcement is not controlled by:

- Seismic requirements
- Shear or torsion
- Minimum requirements

the ratio of spiral reinforcement to total volume of concrete core, measured out-to-out of spirals, shall satisfy:

$$\rho_s = 0.45\left(\frac{A_g}{A_c} - 1\right)\frac{f_c^{'}}{f_{yh}}$$

where:

A_c = area of column core measured to the outside of the transverse spiral reinforcement (mm^2)

A_g = gross area of concrete section (mm^2)

f_c' = specified compressive strength of concrete (MPa)

f_{yh} = yields strength of hoop or spiral reinforcement (MPa)

ρ_s = ratio at volume of spiral reinforcement to total volume of concrete core.

Frame	Location	Comb 1				Comb 1 - 1/2 Live				Comb 5 EQX				Comb 5 EQY			
		P AXIAL	M2 MOMENT TRANS	M3 MOMENT LONG	MD design moment	P AXIAL	M2 MOMENT TRANS	M3 MOMENT LONG	MD design moment	P AXIAL	M2 MOMENT TRANS	M3 MOMENT LONG	MD design moment	P AXIAL	M2 MOMENT TRANS	M3 MOMENT LONG	MD design moment
Text	m	KN	KN-m	KN-m	KN-m	KN	KN-m	KN-m	KN-m	KN	KN-m	KN-m	KN-m	KN	KN-m	KN-m	KN-m
A1	BASE X	-7991.6		7778.0	7778.0	-5878.9		5831.0	5831.0	-2177.9		5145.9	5145.9	-2509.8		3246.6	3246.6
	BASE Y	-7991.6	1006.1		1006.1	-5878.9	6008.1		6008.1	-2177.9	5287.0		5287.0	-2509.8	12076.7		12076.7
	TOP X	-7170.9		11953.8	11953.8	-5058.3		8179.9	8179.9	-1546.6		7860.5	7860.5	-1878.5		5113.7	5113.7
	TOP Y	-7170.9	1009.7		1009.7	-5058.3	6049.6		6049.6	-1546.6	1029.0		1029.0	-1878.5	2340.2		2340.2
A2	BASE X	-7874.7		-9084.5	-9084.5	-5756.0		-7112.9	-7112.9	-2058.5		-5192.7	-5192.7	-2405.1		-3536.6	-3536.6
	BASE Y	-7874.7	-1619.3		-1619.3	-5756.0	-6651.1		-6651.1	-2058.5	-7402.3		-7402.3	-2405.1	-15694.3		-15694.3
	TOP X	-7173.6		-12504.0	-12504.0	-5054.9		-9019.6	-9019.6	-1519.2		-8132.4	-8132.4	-1865.8		-5445.2	-5445.2
	TOP Y	-7173.6	-644.6		-644.6	-5054.9	-5773.7		-5773.7	-1519.2	-1263.1		-1263.1	-1865.8	-3447.9		-3447.9
P11	BASE	-3155.2	31.4	949.4	949.9	-3183.1	232.5	631.2	672.7	-2191.8	244.0	1211.6	1235.9	-1968.5	614.0	673.1	911.1
	BASE	-6107.4	-29.4	-209.4	-211.4	-5641.3	-230.1	8.6	-230.3	-2688.0	-243.3	-767.9	805.6	-2911.3	-613.4	-229.5	654.9
	TOP	-2942.3	54.0	1399.2	1400.3	-2970.2	410.5	335.2	530.0	-2028.1	469.7	1267.4	1351.6	-1804.8	1181.7	271.7	1212.5
	TOP	-5894.5	-55.3	-3238.0	-3238.5	-5428.5	-412.6	-2056.8	-2097.7	-2524.3	-469.1	-2435.2	2480.0	-2747.6	-1181.1	-1439.6	1862.1
P12	BASE	-3157.3	31.5	949.3	949.8	-3184.6	232.5	631.0	672.4	-2195.9	244.3	1197.4	1222.0	-1964.2	615.0	618.4	872.1
	BASE	-6108.9	-29.4	-210.4	-212.4	-5643.4	-230.1	7.7	-230.2	-2684.7	-243.6	-753.9	792.3	-2916.4	-614.4	-174.9	638.8
	TOP	-2944.4	51.5	1401.4	1402.4	-2971.8	408.0	337.1	529.3	-2032.2	468.0	1240.5	1325.9	-1800.5	1179.8	165.8	1191.4
	TOP	-5896.1	-57.8	-3238.2	-3238.7	-5430.6	-415.1	-2056.4	-2097.9	-2521.0	-470.7	-2408.0	2453.5	-2752.7	-1182.5	-1333.3	1782.1
P21	BASE	-3476.1	60.7	555.8	559.1	-3235.7	443.6	341.7	559.9	-2236.9	384.9	963.7	1037.7	-1661.3	993.2	539.3	1130.2
	BASE	-6429.9	-56.5	-518.6	-521.7	-5895.7	-438.7	-407.0	-598.4	-3067.1	-383.6	-604.7	716.1	-3642.7	-992.0	-180.3	1008.2
	TOP	-3263.5	112.9	3116.5	3118.5	-3023.0	847.7	2124.8	2287.7	-2073.3	838.8	1499.4	1718.1	-1497.7	2165.0	766.5	2296.7
	TOP	-6217.3	-119.2	-1533.6	-1538.3	-5683.0	-855.6	-600.6	-1045.3	-2903.5	-839.7	-1337.3	1579.1	-3479.1	-2165.9	-604.4	2248.6
P22	BASE	-3485.6	60.6	555.5	558.8	-3243.9	443.5	341.3	559.6	-2245.8	385.9	952.7	1027.9	-1662.6	996.7	496.1	1113.4
	BASE	-6430.6	-56.6	-519.6	-522.7	-5897.6	-438.8	-407.8	-599.1	-3060.4	-384.8	-593.9	707.7	-3643.6	-995.7	-137.4	1005.1
	TOP	-3272.8	110.5	3118.9	3120.8	-3031.1	845.4	2126.8	2288.7	-2082.1	837.0	1477.1	1697.8	-1498.9	2162.6	674.6	2265.3
	TOP	-6217.8	-121.6	-1533.8	-1538.6	-5684.8	-858.0	-600.3	-1047.2	-2896.7	-841.0	-1314.6	1560.6	-3479.9	-2166.5	-512.0	2226.2
P30	BASE	-6029.9	529.9	0.0	529.9	-6221.4	3959.1	0.0	3959.1	-4451.8	3820.2	5162.4	6422.1	-4616.4	10056.5	2063.8	10266.0
	BASE	-10890.0	-507.0	0.0	-507.0	-8689.7	-3932.0	0.0	-3932.0	-4941.4	-3813.5	-5162.4	6418.2	-4776.8	-10049.8	-2063.8	10259.5
	TOP	-5644.5	773.0	0.0	773.0	-5835.9	5356.7	0.0	5356.7	-4155.3	466.2	1168.1	1257.7	-4319.9	1195.9	456.0	1279.9
	TOP	-10504.5	-780.3	0.0	-780.3	-8304.3	-5365.2	0.0	-5365.2	-4644.9	-468.2	-1168.1	1258.4	-4480.3	-1197.9	-456.0	1281.8
P40	BASE	-8759.3	284.4	2257.3	2275.1	-8991.0	2520.0	1331.8	2850.2	-6232.3	2845.8	4156.4	5037.3	-6459.5	8633.1	1609.1	8781.8
	BASE	-15425.2	-322.9	-1981.4	-2007.5	-12361.2	-2565.6	-1161.1	-2816.1	-6970.9	-2856.8	-4115.1	5009.5	-6743.7	-8644.0	-1567.8	8785.1
	TOP	-8289.5	817.3	7873.6	7915.9	-8521.2	6306.5	4373.1	7674.3	-5870.9	616.2	9531.1	9551.0	-6098.1	1869.3	3758.0	4197.2
	TOP	-14955.4	-826.0	-5653.5	-5713.5	-11891.4	-6316.7	-3086.7	-7030.6	-6609.5	-618.7	-9241.9	9262.6	-6382.3	-1871.8	-3468.7	3941.5
P50	BASE	-8763.8	217.1	1987.0	1998.9	-8997.6	1806.7	1166.1	2150.4	-6236.1	2845.6	4120.9	5007.9	-6462.8	7063.6	1573.0	7236.6
	BASE	-15433.6	-339.9	-2248.1	-2273.6	-12367.5	-1952.0	-1323.5	-2358.3	-6976.3	-2880.3	-4154.2	5055.0	-6749.6	-7098.3	-1606.2	7277.7
	TOP	-8294.0	768.8	5668.0	5719.9	-8527.8	5721.9	3097.7	6506.6	-5874.7	303.8	9241.7	9246.7	-6101.4	745.8	3467.8	3547.1
	TOP	-14963.8	-767.3	-7870.5	-7907.9	-11897.7	-5720.1	-4369.4	-7198.0	-6614.9	-303.4	-9523.1	9527.9	-6388.2	-745.4	-3749.1	3822.5
P61	BASE	-2921.3	52.7	0.0	52.7	-2601.9	307.6	0.6	307.6	-1737.6	351.1	744.5	823.1	-1248.3	553.2	296.2	627.5
	BASE	-5500.4	-104.1	0.0	-104.1	-5286.4	-368.4	-0.6	-368.4	-2864.2	-365.5	-744.5	829.4	-3353.5	-567.6	-296.2	640.3
	TOP	-2732.2	249.7	0.0	249.7	-2412.8	751.2	0.6	751.2	-1592.1	1078.5	153.8	1089.4	-1102.8	1928.2	70.1	1929.4
	TOP	-5311.3	-120.6	0.0	-120.6	-5097.3	-598.7	-0.6	-598.7	-2718.7	-1041.9	-153.8	1053.2	-3208.0	-1891.6	-70.1	1892.9

Frame	Location	Comb 1				Comb 1 - 1/2 Live				Comb 5 EQX				Comb 5 EQY			
		P AXIAL	M2 MOMENT TRANS	M3 MOMENT LONG	MD design moment	P AXIAL	M2 MOMENT TRANS	M3 MOMENT LONG	MD design moment	P AXIAL	M2 MOMENT TRANS	M3 MOMENT LONG	MD design moment	P AXIAL	M2 MOMENT TRANS	M3 MOMENT LONG	MD design moment
Text	m	KN	KN-m	KN-m	KN-m	KN	KN-m	KN-m	KN-m	KN	KN-m	KN-m	KN-m	KN	KN-m	KN-m	KN-m
P62	BASE	-2806.1	52.6	0.0	52.6	-2482.4	307.3	0.6	307.3	-1717.7	351.9	745.0	823.9	-1229.8	556.0	297.6	630.6
	BASE	-5464.1	-104.0	0.0	-104.0	-5248.6	-368.0	-0.6	-368.0	-2845.9	-366.3	-745.0	830.2	-3333.8	-570.4	-297.6	643.4
	TOP	-2616.8	249.0	0.0	249.0	-2293.1	750.1	0.6	750.1	-1572.1	1077.4	152.2	1088.1	-1084.2	1925.5	67.1	1926.6
	TOP	-5274.8	-120.7	0.0	-120.7	-5059.4	-598.3	-0.6	-598.3	-2700.3	-1041.2	-152.2	1052.3	-3188.2	-1889.3	-67.1	1890.5
P71	BASE	-3482.1	123.1	1181.2	1187.6	-3542.8	310.3	1001.2	1048.2	-2358.9	498.3	867.1	1000.1	-2102.8	904.1	400.2	988.7
	BASE	-6463.1	-78.9	-392.6	-400.5	-5899.3	-310.3	-166.2	-352.0	-2998.3	-464.8	-1112.3	1205.5	-3254.4	-870.7	-645.4	1083.8
	TOP	-3240.0	133.6	1447.6	1453.8	-3300.7	508.4	445.0	675.6	-2172.7	804.9	1349.7	1571.5	-1916.6	1506.1	652.8	1641.5
	TOP	-6221.0	-205.8	-3829.6	-3835.1	-5657.2	-505.2	-2743.5	-2789.7	-2812.1	-860.1	-1614.9	1829.6	-3068.2	-1561.2	-918.1	1811.2
P72	BASE	-3481.9	123.4	1176.8	1183.2	-3525.9	310.8	994.6	1042.0	-2351.4	499.5	894.1	1024.2	-2123.6	907.2	422.0	1000.6
	BASE	-6504.7	-78.6	-428.2	-435.3	-5920.6	-310.2	-193.4	-365.5	-3060.4	-465.6	-1156.5	1246.7	-3288.2	-873.3	-684.5	1109.6
	TOP	-3239.7	131.3	1485.9	1491.7	-3283.8	506.2	489.8	704.4	-2165.1	803.6	1428.8	1639.2	-1937.3	1504.8	720.8	1668.5
	TOP	-6262.5	-208.3	-3822.9	-3828.6	-5678.4	-507.9	-2737.0	-2783.7	-2874.1	-862.2	-1663.3	1873.5	-3101.9	-1563.4	-955.3	1832.1
P81	BASE	-2829.8	218.9	559.5	600.8	-3004.0	223.4	381.1	441.8	-1989.9	430.3	831.8	936.5	-1806.0	685.5	356.4	772.6
	BASE	-5885.7	-20.2	-578.2	-578.6	-5416.1	-126.7	-361.3	-382.9	-2607.7	-352.2	-1154.2	1206.7	-2791.6	-607.4	-678.8	910.9
	TOP	-2618.0	36.5	2212.2	2212.5	-2792.3	225.7	1308.6	1327.9	-1816.6	711.6	1937.7	2064.2	-1638.8	1188.4	975.5	1537.5
	TOP	-5674.0	-400.2	-2315.0	-2349.3	-5204.3	-407.3	-1342.2	-1402.7	-2455.2	-862.6	-1300.4	1560.5	-2633.0	-1339.4	-338.2	1381.5
P82	BASE	-2993.7	219.4	557.3	598.9	-3105.6	224.0	376.0	437.7	-2059.4	430.9	862.3	964.0	-1853.1	687.2	377.8	784.2
	BASE	-5986.0	-20.3	-619.3	-619.7	-5471.0	-127.0	-393.3	-413.3	-2616.8	-352.8	-1202.9	1253.6	-2823.1	-609.1	-718.3	941.8
	TOP	-2781.9	34.0	2263.9	2264.2	-2893.9	223.8	1361.4	1379.7	-1896.5	683.0	2102.4	2210.6	-1690.2	1177.1	1278.0	1737.5
	TOP	-5774.2	-403.4	-2309.2	-2344.2	-5259.2	-410.7	-1329.8	-1391.8	-2453.9	-837.2	-1428.0	1655.3	-2660.2	-1331.3	-603.5	1461.7
P91	BASE	-3112.6	202.5	44.5	207.3	-3287.5	145.6	-84.4	168.3	-2338.1	212.6	637.7	672.2	-2210.3	364.9	184.2	408.8
	BASE	-6166.4	27.8	-702.6	-703.1	-5711.9	4.5	-510.4	-510.4	-2644.9	-158.9	-896.5	910.4	-2772.7	-311.2	-443.0	541.4
	TOP	-2900.7	-58.8	3136.2	3136.7	-3075.6	51.5	2146.8	2147.4	-2175.1	357.2	2069.3	2099.9	-2047.3	703.5	1086.7	1294.5
	TOP	-5954.5	-411.0	-1395.0	-1454.3	-5500.0	-346.9	-467.2	-581.9	-2481.9	-479.5	-1310.4	1395.4	-2609.7	-825.7	-327.8	888.4
P92	BASE	-3298.9	203.2	47.2	208.7	-3392.8	146.1	-85.7	169.4	-2228.6	225.9	685.3	721.6	-2134.6	362.8	288.7	463.6
	BASE	-6372.3	27.9	-746.4	-746.9	-5832.7	4.5	-547.0	-547.1	-2776.8	-172.2	-957.4	972.8	-2870.8	-309.0	-560.8	640.4
	TOP	-3087.0	-63.0	3236.2	3236.8	-3180.9	48.6	2231.4	2231.9	-2065.6	387.1	2204.1	2237.9	-1971.6	696.2	1332.7	1503.6
	TOP	-6160.4	-415.7	-1402.4	-1462.7	-5620.8	-351.3	-464.8	-582.6	-2613.8	-512.6	-1413.8	1503.8	-2707.8	-821.6	-542.3	984.5

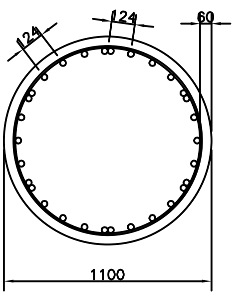
Note:

TOP X	Longitudinal effects at top of abutment	BASE X	Longitudinal effects at base of abutment
TOP Y	Transverse effects at top of abutment	BASE Y	Transverse effects at base of abutment

SUMMARY REBAR LAYOUT

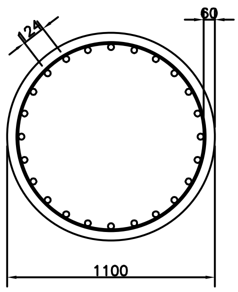
Balaraja Flyover
Pier Column Reinforcement

Pier P1,P2,P9 Columns
Position : Top



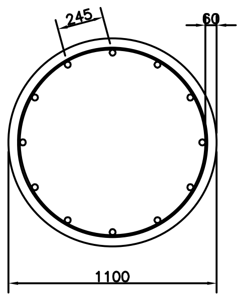
30Ø32mm bars
Rebar : 2.5%

Pier P6 & P8 Columns
Position : Top



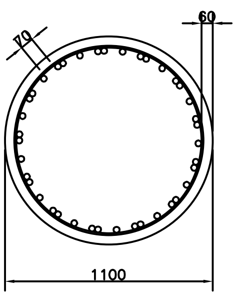
24Ø32mm bars
Rebar : 2%

Pier P1,P2,P6,P8,P9 Columns
Position : Base



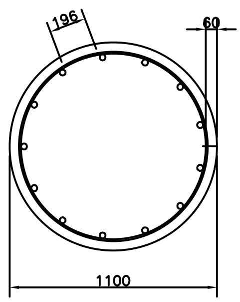
12Ø32mm bars
Rebar : 1%

Pier P7 Columns
Position : Top



39Ø32mm bars
Rebar : 3.25%

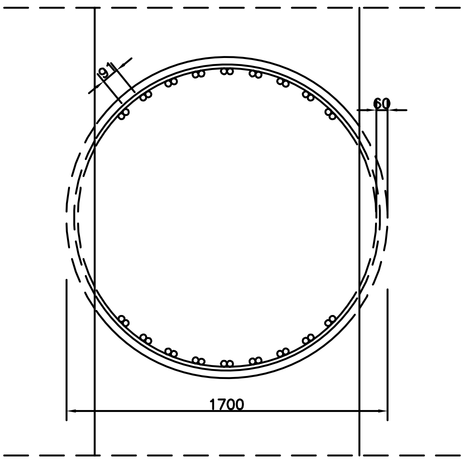
Pier P7 Columns
Position : Base



13Ø32mm bars
Rebar : 1.08%

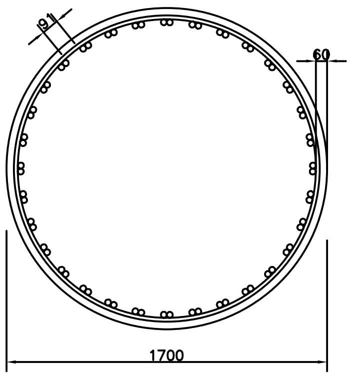
Balaraja Flyover
Pier Column Reinforcement

Pier P3 Columns
Position : Top



64Ø32mm bars
Rebar : 2.26%

Pier P3 Columns
Position : Base

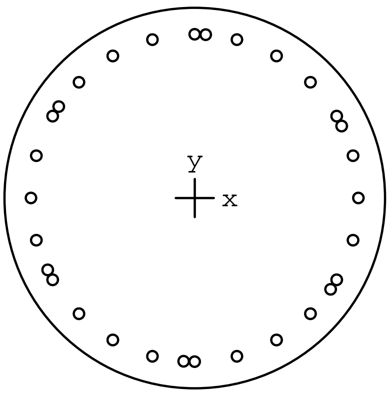


64Ø32mm bars
Rebar : 2.26%

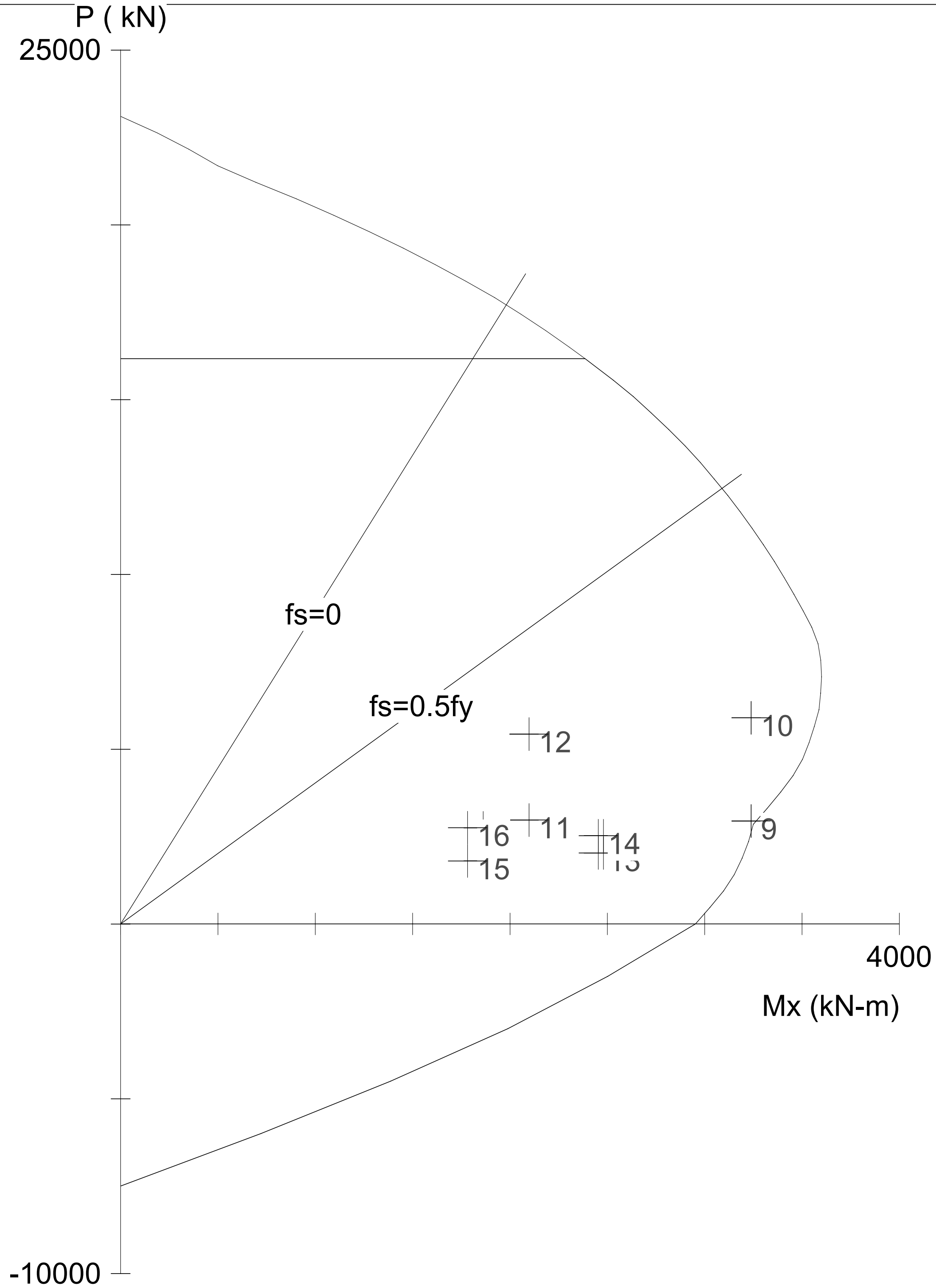
Ultimate Design

P1 PORTAL COLUMN 1.1 M DIAMETER

TOP



1100 mm diam.



Code: ACI 318-95

Units: Metric

Run axis: About X-axis

Run option: Investigation

Slenderness: Not considered

Column type: Structural

Bars: prEN 10080

Date: 08/17/06

Time: 09:36:20

PCACOL V3.00 (PCA 1999) - Licensed to: KEI, MANILA, ST

File: C:\0-BALA~1\RC-DES~1\COLUMN\P1\P1T\P1T.COL

Project: BALARAJA FLYOVER

Column: P1T		Engineer:	
f'c = 30 MPa	fy = 390 MPa	Ag = 950332 mm^2	30 #32 bars
Ec = 25743 MPa	Es = 200000 MPa	As = 24030 mm^2	Rho = 2.53%
fc = 25.5 MPa	e_rup = Infinity	Xo = 0 mm	Iy = 7.19e+010 mm^4
e_u = 0.003 mm/mm		Yo = 0 mm	Iy = 7.19e+010 mm^4
Beta1 = 0.83245		Clear spacing = 0 mm	Clear cover = 60 mm
Confinement: Other	phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7		

```
0000000    00000    00000    00000    00000   00
00    00  00   00  00   00  00   00  00   00  00
00    00  00   00  00   00  00   00  00   00  00
00    00  00        00   00  00       00   00  00
00    00  00       0000000  00       00   00  00
0000000   00   00  00   00  00   00  00   00  00
00        00   00  00   00  00   00  00   00  00
00         00000   00   00   00000    00000   00000  (TM)
```

===
Computer program for the Strength Design of Reinforced Concrete Sections
===

General Information:
====================

File Name: C:\0-BALA~1\RC-DES~1\COLUMN\P1\P1T\P1T.COL
Project: BALARAJA FLYOVER
Column: P1T   Engineer:
Code: ACI 318-95   Units: Metric

Run Option: Investigation   Slenderness: Not considered
Run Axis: X-axis   Column Type: Structural

Material Properties:
====================

f'c = 30 MPa   fy = 390 MPa
Ec = 25743 MPa   Es = 200000 MPa
fc = 25.5 MPa   Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:
========

Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4   Iy = 7.18688e+010 mm^4
Xo = 0 mm   Yo = 0 mm

Reinforcement:
==============

Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7

Pattern: Irregular

Total steel area, As = 24030 mm^2 at 2.53%

Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)
801	0	474	801	123	458	801	237	410
801	335	335	801	410	237	801	458	123
801	474	-0	801	458	-123	801	410	-237
801	335	-335	801	237	-410	801	123	-458
801	-0	-474	801	-123	-458	801	-237	-410
801	-335	-335	801	-410	-237	801	-458	-123
801	-474	0	801	-458	123	801	-410	237
801	-335	335	801	-237	410	801	-123	458

801	32	473	801	426	209	801	394	-264
801	-32	-473	801	-426	-209	801	-394	264

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	2942.3	3238.5	3265.9	1.008
2	5894.5	3238.5	3576.3	1.104
3	2970.2	2097.7	3270.3	1.559
4	5428.5	2097.7	3551.0	1.693
5	2028.1	2480.0	3203.5	1.292
6	2524.3	2480.0	3235.6	1.305
7	1804.8	1862.1	3186.2	1.711
8	2747.6	1862.1	3246.5	1.743
9	2944.4	3238.7	3266.3	1.009
10	5896.1	3238.7	3576.4	1.104
11	2971.8	2097.9	3270.5	1.559
12	5430.6	2097.9	3551.1	1.693
13	2032.2	2453.5	3203.8	1.306
14	2521.0	2453.5	3235.5	1.319
15	1800.5	1782.1	3185.8	1.788
16	2752.7	1782.1	3246.7	1.822

*** Program completed as requested! ***

General Information:
====================
File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P1\P1T\P1T-1.COL
Project: BALARAJA FLYOVER
Column: P1T Engineer:
Code: ACI 318-95 Units: Metric

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:
====================
f'c = 30 MPa fy = 390 MPa
Ec = 25743 MPa Es = 200000 MPa
fc = 25.5 MPa Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:
========
Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 Iy = 7.18688e+010 mm^4
Xo = 0 mm Yo = 0 mm

Reinforcement:
==============
Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 1, phi(c) = 1

Pattern: Irregular

Total steel area, As = 24030 mm^2 at 2.53%

Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)
801	0	474	801	123	458	801	237	410
801	335	335	801	410	237	801	458	123
801	474	-0	801	458	-123	801	410	-237
801	335	-335	801	237	-410	801	123	-458
801	-0	-474	801	-123	-458	801	-237	-410
801	-335	-335	801	-410	-237	801	-458	-123
801	-474	0	801	-458	123	801	-410	237
801	-335	335	801	-237	410	801	-123	458
801	32	473	801	426	209	801	394	-264
801	-32	-473	801	-426	-209	801	-394	264

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
==

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	2439.9	0.0	4305.2	999.999
2	2440.3	0.0	4305.3	999.999

*** Program completed as requested! ***

General Information:
====================
File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P1\P1T\P1T-2.COL
Project: BALARAJA FLYOVER
Column: P1T Engineer:
Code: ACI 318-95 Units: Metric

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:
====================
f'c = 30 MPa fy = 390 MPa
Ec = 25743 MPa Es = 200000 MPa
fc = 25.5 MPa Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:
========
Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 Iy = 7.18688e+010 mm^4
Xo = 0 mm Yo = 0 mm

Reinforcement:
==============
Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 1, phi(c) = 1

Pattern: Irregular

Total steel area, As = 24030 mm^2 at 2.53%

Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)
801	0	474	801	123	458	801	237	410
801	335	335	801	410	237	801	458	123
801	474	-0	801	458	-123	801	410	-237
801	335	-335	801	237	-410	801	123	-458
801	-0	-474	801	-123	-458	801	-237	-410
801	-335	-335	801	-410	-237	801	-458	-123
801	-474	0	801	-458	123	801	-410	237
801	-335	335	801	-237	410	801	-123	458
801	32	473	801	426	209	801	394	-264
801	-32	-473	801	-426	-209	801	-394	264

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
===

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	5742.8	0.0	4894.2	999.999
2	-862.6	0.0	3449.7	999.999

*** Program completed as requested! ***

```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P1\P1T\P1T-3.COL
   Project:  BALARAJA FLYOVER
   Column:   P1T                           Engineer:
   Code:     ACI 318-95                    Units: Metric

   Run Option: Investigation               Slenderness: Not considered
   Run Axis:   X-axis                      Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                          fy   = 390 MPa
   Ec    = 25743 MPa                       Es   = 200000 MPa
   fc    = 25.5 MPa                        Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4                 Iy =  7.18688e+010 mm^4
   Xo =  0 mm                              Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
```

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

```
   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Pattern: Irregular

   Total steel area, As = 24030 mm^2 at 2.53%
```

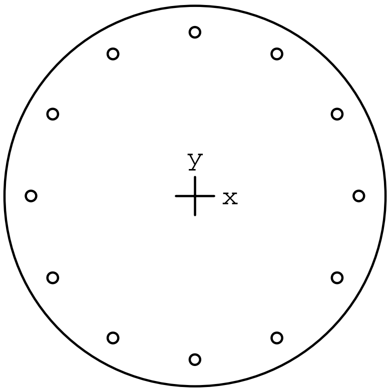
Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)
801	0	474	801	123	458	801	237	410
801	335	335	801	410	237	801	458	123
801	474	-0	801	458	-123	801	410	-237
801	335	-335	801	237	-410	801	123	-458
801	-0	-474	801	-123	-458	801	-237	-410
801	-335	-335	801	-410	-237	801	-458	-123
801	-474	0	801	-458	123	801	-410	237
801	-335	335	801	-237	410	801	-123	458
801	32	473	801	426	209	801	394	-264
801	-32	-473	801	-426	-209	801	-394	264

```
Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
=========================================================
```

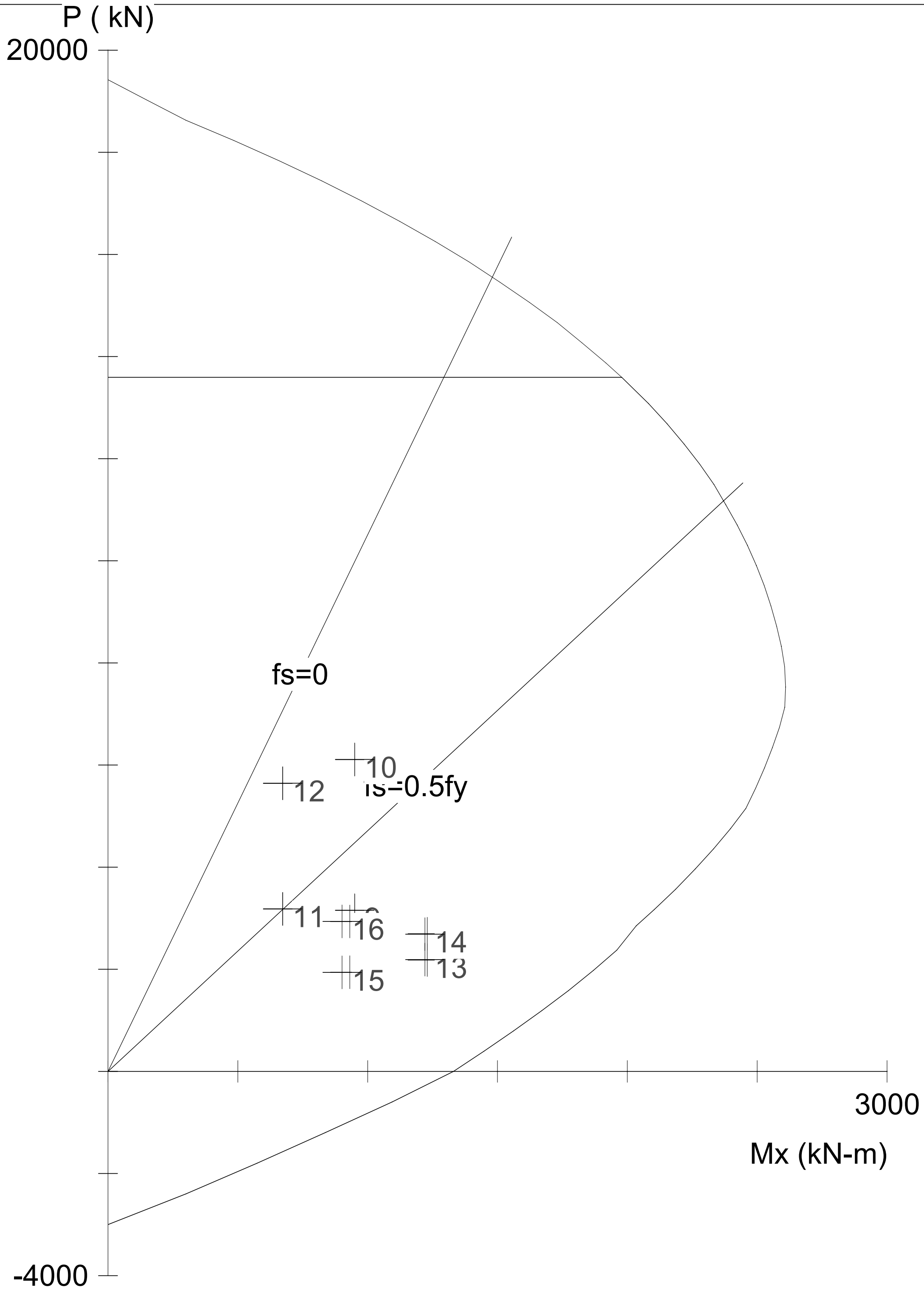
No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	5586.8	0.0	4872.5	999.999
2	-706.6	0.0	3493.8	999.999

```
   *** Program completed as requested! ***
```

BASE



1100 mm diam.



Code: ACI 318-95

Units: Metric

Run axis: About X-axis

Run option: Investigation

Slenderness: Not considered

Column type: Structural

Bars: prEN 10080

Date: 08/17/06

Time: 09:38:31

PCACOL V3.00 (PCA 1999) - Licensed to: KEI, MANILA, ST

File: C:\0-BALA~1\RC-DES~1\COLUMN\P1\P1B\P1B.COL

Project: BALARAJA FLYOVER

Column: P1		Engineer:	
f'c = 30 MPa	fy = 390 MPa	Ag = 950332 mm^2	12 #32 bars
Ec = 25743 MPa	Es = 200000 MPa	As = 9612 mm^2	Rho = 1.01%
fc = 25.5 MPa	e_rup = Infinity	Xo = 0 mm	Iy = 7.19e+010 mm^4
e_u = 0.003 mm/mm		Yo = 0 mm	Iy = 7.19e+010 mm^4
Beta1 = 0.83245		Clear spacing = 213 mm	Clear cover = 60 mm
Confinement: Other	phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7		

General Information:
====================
File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P1\P1T\P1T-3.COL
Project: BALARAJA FLYOVER
Column: P1T   Engineer:
Code: ACI 318-95   Units: Metric

Run Option: Investigation   Slenderness: Not considered
Run Axis: X-axis   Column Type: Structural

Material Properties:
====================
f'c = 30 MPa   fy = 390 MPa
Ec = 25743 MPa   Es = 200000 MPa
fc = 25.5 MPa   Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:
========
Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4   Iy = 7.18688e+010 mm^4
Xo = 0 mm   Yo = 0 mm

Reinforcement:
==============
Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 1, phi(c) = 1

Pattern: Irregular

Total steel area, As = 24030 mm^2 at 2.53%

Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)
801	0	474	801	123	458	801	237	410
801	335	335	801	410	237	801	458	123
801	474	-0	801	458	-123	801	410	-237
801	335	-335	801	237	-410	801	123	-458
801	-0	-474	801	-123	-458	801	-237	-410
801	-335	-335	801	-410	-237	801	-458	-123
801	-474	0	801	-458	123	801	-410	237
801	-335	335	801	-237	410	801	-123	458
801	32	473	801	426	209	801	394	-264
801	-32	-473	801	-426	-209	801	-394	264

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
===

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	5586.8	0.0	4872.5	999.999
2	-706.6	0.0	3493.8	999.999

*** Program completed as requested! ***

General Information:
====================
File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P1\P1B\P1B-1.COL
Project: BALARAJA FLYOVER
Column: P1 Engineer:
Code: ACI 318-95 Units: Metric

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:
====================
f'c = 30 MPa fy = 390 MPa
Ec = 25743 MPa Es = 200000 MPa
fc = 25.5 MPa Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:
========
Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 Iy = 7.18688e+010 mm^4
Xo = 0 mm Yo = 0 mm

Reinforcement:
==============
Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 1, phi(c) = 1

Layout: Circular
Pattern: All Sides Equal (Cover to longitudinal reinforcement)
Total steel area, As = 9612 mm^2 at 1.01%
12 #32 Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
==

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	2439.9	0.0	2469.3	999.999
2	2440.3	0.0	2469.4	999.999

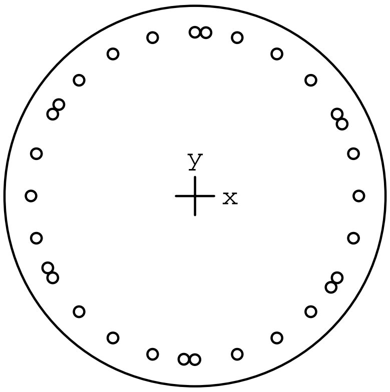
*** Program completed as requested! ***

```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P1\P1B\P1B-2.COL
   Project:  BALARAJA FLYOVER
   Column:   P1                           Engineer:
   Code:     ACI 318-95                   Units: Metric

   Run Option: Investigation              Slenderness: Not considered
   Run Axis:   X-axis                     Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                         fy   = 390 MPa
   Ec    = 25743 MPa                      Es   = 200000 MPa
   fc    = 25.5 MPa                       Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4                Iy =  7.18688e+010 mm^4
   Xo =  0 mm                             Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6         6          28   #  8         8          50   # 10        10          79
   # 12        12         113   # 14        14         154   # 16        16         201
   # 20        20         314   # 25        25         491   # 28        28         616
   # 32        32         801   # 40        40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 9612 mm^2 at 1.01%
   12 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
=========================================================
                 Pu          Mux         fMnx
   No.           kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       5742.8          0.0       3245.2  999.999
     2       -862.6          0.0       1319.4  999.999

   *** Program completed as requested! ***
```

```
  General Information:
  ====================
     File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P1\P1B\P1B-3.COL
     Project:  BALARAJA FLYOVER
     Column:   P1                      Engineer:
     Code:     ACI 318-95              Units: Metric

     Run Option: Investigation         Slenderness: Not considered
     Run Axis:   X-axis                Column Type: Structural

  Material Properties:
  ====================
     f'c   = 30 MPa                    fy   = 390 MPa
     Ec    = 25743 MPa                 Es   = 200000 MPa
     fc    = 25.5 MPa                  Rupture strain = Infinity
     Ultimate strain = 0.003 mm/mm
     Beta1 = 0.83245

  Section:
  ========
     Circular:    Diameter = 1100 mm

     Gross section area, Ag =  950332 mm^2
     Ix =  7.18688e+010 mm^4           Iy =  7.18688e+010 mm^4
     Xo =  0 mm                        Yo =  0 mm

  Reinforcement:
  ==============
     Rebar Database: prEN 10080
     Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
     ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
     #  6        6          28   #  8        8          50   # 10       10          79
     # 12       12         113   # 14       14         154   # 16       16         201
     # 20       20         314   # 25       25         491   # 28       28         616
     # 32       32         801   # 40       40        1256

     Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
     phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

     Layout: Circular
     Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
     Total steel area, As = 9612 mm^2 at 1.01%
     12 #32   Cover = 60 mm

  Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
  =========================================================
                 Pu          Mux         fMnx
     No.         kN         kN-m         kN-m   fMn/Mu
     --- ------------ ------------ ------------ --------
       1       5586.8          0.0       3216.5  999.999
       2       -706.6          0.0       1384.6  999.999

     *** Program completed as requested! ***
```

P2 PORTAL COLUMN 1.1 M DIAMETER

TOP



1100 mm diam.

Code: ACI 318-95

Units: Metric

Run axis: About X-axis

Run option: Investigation

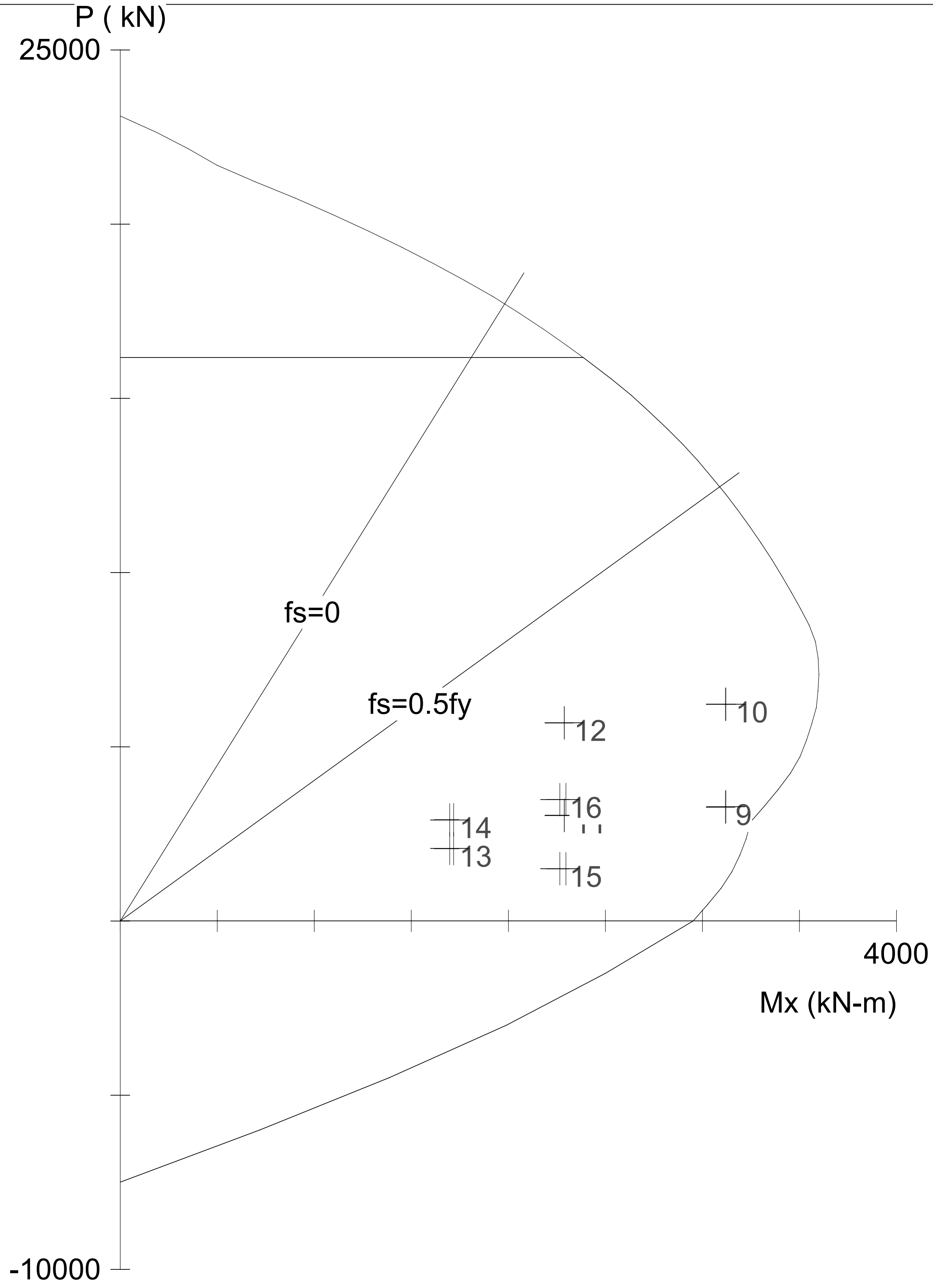
Slenderness: Not considered

Column type: Structural

Bars: prEN 10080

Date: 08/17/06

Time: 09:38:57



PCACOL V3.00 (PCA 1999) - Licensed to: KEI, MANILA, ST

File: C:\0-BALA~1\RC-DES~1\COLUMN\P2\P2T\P2T.COL

Project: BALARAJA FLYOVER

Column: P1T		Engineer:	
f'c = 30 MPa	fy = 390 MPa	Ag = 950332 mm^2	30 #32 bars
Ec = 25743 MPa	Es = 200000 MPa	As = 24030 mm^2	Rho = 2.53%
fc = 25.5 MPa	e_rup = Infinity	Xo = 0 mm	Iy = 7.19e+010 mm^4
e_u = 0.003 mm/mm		Yo = 0 mm	Iy = 7.19e+010 mm^4
Beta1 = 0.83245		Clear spacing = 0 mm	Clear cover = 60 mm
Confinement: Other	phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7		

```
OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO       OO   OO  OO       OO   OO  OO
OO    OO  OO       OOOOOOO  OO       OO   OO  OO
OOOOOOO   OO   OO  OO   OO  OO   OO  OO   OO  OO
OO        OO   OO  OO   OO  OO   OO  OO   OO  OO
OO         OOOOO   OO   OO   OOOOO    OOOOO   OOOOO  (TM)
```

==

Computer program for the Strength Design of Reinforced Concrete Sections

==

General Information:

File Name: C:\0-BALA~1\RC-DES~1\COLUMN\P1\P1T\P1T.COL
Project: BALARAJA FLYOVER
Column: P1T Engineer:
Code: ACI 318-95 Units: Metric

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:

f'c = 30 MPa fy = 390 MPa
Ec = 25743 MPa Es = 200000 MPa
fc = 25.5 MPa Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:

Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 Iy = 7.18688e+010 mm^4
Xo = 0 mm Yo = 0 mm

Reinforcement:

Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7

Pattern: Irregular

Total steel area, As = 24030 mm^2 at 2.53%

Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)
801	0	474	801	123	458	801	237	410
801	335	335	801	410	237	801	458	123
801	474	-0	801	458	-123	801	410	-237
801	335	-335	801	237	-410	801	123	-458
801	-0	-474	801	-123	-458	801	-237	-410
801	-335	-335	801	-410	-237	801	-458	-123
801	-474	0	801	-458	123	801	-410	237
801	-335	335	801	-237	410	801	-123	458

801	32	473	801	426	209	801	394	-264
801	-32	-473	801	-426	-209	801	-394	264

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	2942.3	3238.5	3265.9	1.008
2	5894.5	3238.5	3576.3	1.104
3	2970.2	2097.7	3270.3	1.559
4	5428.5	2097.7	3551.0	1.693
5	2028.1	2480.0	3203.5	1.292
6	2524.3	2480.0	3235.6	1.305
7	1804.8	1862.1	3186.2	1.711
8	2747.6	1862.1	3246.5	1.743
9	2944.4	3238.7	3266.3	1.009
10	5896.1	3238.7	3576.4	1.104
11	2971.8	2097.9	3270.5	1.559
12	5430.6	2097.9	3551.1	1.693
13	2032.2	2453.5	3203.8	1.306
14	2521.0	2453.5	3235.5	1.319
15	1800.5	1782.1	3185.8	1.788
16	2752.7	1782.1	3246.7	1.822

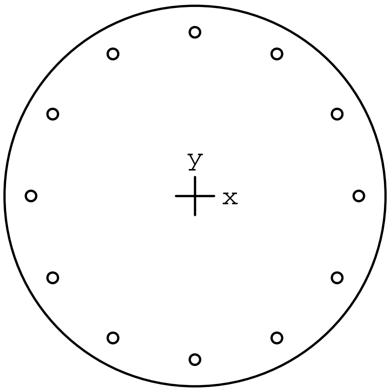
*** Program completed as requested! ***

```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P2\P2T\P2T-1.COL
   Project:  BALARAJA FLYOVER
   Column:   P2T                          Engineer:
   Code:     ACI 318-95                   Units: Metric

   Run Option: Investigation              Slenderness: Not considered
   Run Axis:   X-axis                     Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                         fy   = 390 MPa
   Ec    = 25743 MPa                      Es   = 200000 MPa
   fc    = 25.5 MPa                       Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4                Iy =  7.18688e+010 mm^4
   Xo =  0 mm                             Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6         6          28   #  8         8          50   # 10        10          79
   # 12        12         113   # 14        14         154   # 16        16         201
   # 20        20         314   # 25        25         491   # 28        28         616
   # 32        32         801   # 40        40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Pattern: Irregular

   Total steel area, As = 24030 mm^2 at 2.53%

   Area mm^2   X (mm)   Y (mm)  Area mm^2   X (mm)   Y (mm)  Area mm^2   X (mm)   Y (mm)
   --------- -------- --------  --------- -------- --------  --------- -------- --------
         801        0      474        801      123      458        801      237      410
         801      335      335        801      410      237        801      458      123
         801      474       -0        801      458     -123        801      410     -237
         801      335     -335        801      237     -410        801      123     -458
         801       -0     -474        801     -123     -458        801     -237     -410
         801     -335     -335        801     -410     -237        801     -458     -123
         801     -474        0        801     -458      123        801     -410      237
         801     -335      335        801     -237      410        801     -123      458
         801       32      473        801      426      209        801      394     -264
         801      -32     -473        801     -426     -209        801     -394      264

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
=========================================================
                 Pu          Mux         fMnx
   No.           kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       2652.0          0.0       4351.1  999.999
     2       2653.1          0.0       4351.3  999.999

   *** Program completed as requested! ***
```

```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P2\P2B\P2B-1.COL
   Project:  BALARAJA FLYOVER
   Column:   P2                          Engineer:
   Code:     ACI 318-95                  Units: Metric

   Run Option: Investigation             Slenderness: Not considered
   Run Axis:   X-axis                    Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                        fy   = 390 MPa
   Ec    = 25743 MPa                     Es   = 200000 MPa
   fc    = 25.5 MPa                      Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4               Iy =  7.18688e+010 mm^4
   Xo =  0 mm                            Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6        6           28   #  8        8           50   # 10       10           79
   # 12       12          113   # 14       14          154   # 16       16          201
   # 20       20          314   # 25       25          491   # 28       28          616
   # 32       32          801   # 40       40         1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 9612 mm^2 at 1.01%
   12 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
=========================================================
                 Pu          Mux         fMnx
   No.           kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       2652.0          0.0       2533.3  999.999
     2       2653.1          0.0       2533.6  999.999

   *** Program completed as requested! ***
```

```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P2\P2T\P2T-2.COL
   Project:  BALARAJA FLYOVER
   Column:   P2T                          Engineer:
   Code:     ACI 318-95                   Units: Metric

   Run Option: Investigation              Slenderness: Not considered
   Run Axis:   X-axis                     Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                         fy   = 390 MPa
   Ec    = 25743 MPa                      Es   = 200000 MPa
   fc    = 25.5 MPa                       Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4                Iy =  7.18688e+010 mm^4
   Xo =  0 mm                             Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6         6          28   #  8         8          50   # 10        10          79
   # 12        12         113   # 14        14         154   # 16        16         201
   # 20        20         314   # 25        25         491   # 28        28         616
   # 32        32         801   # 40        40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Pattern: Irregular

   Total steel area, As = 24030 mm^2 at 2.53%

   Area mm^2   X (mm)   Y (mm)  Area mm^2   X (mm)   Y (mm)  Area mm^2   X (mm)   Y (mm)
   --------- -------- --------  --------- -------- --------  --------- -------- --------
         801        0      474        801      123      458        801      237      410
         801      335      335        801      410      237        801      458      123
         801      474       -0        801      458     -123        801      410     -237
         801      335     -335        801      237     -410        801      123     -458
         801       -0     -474        801     -123     -458        801     -237     -410
         801     -335     -335        801     -410     -237        801     -458     -123
         801     -474        0        801     -458      123        801     -410      237
         801     -335      335        801     -237      410        801     -123      458
         801       32      473        801      426      209        801      394     -264
         801      -32     -473        801     -426     -209        801     -394      264

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
========================================================
                 Pu          Mux         fMnx
   No.           kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       6008.8          0.0       4928.8  999.999
     2       -703.7          0.0       3494.6  999.999
   *** Program completed as requested! ***
```

BASE



Code: ACI 318-95

Units: Metric

Run axis: About X-axis

Run option: Investigation

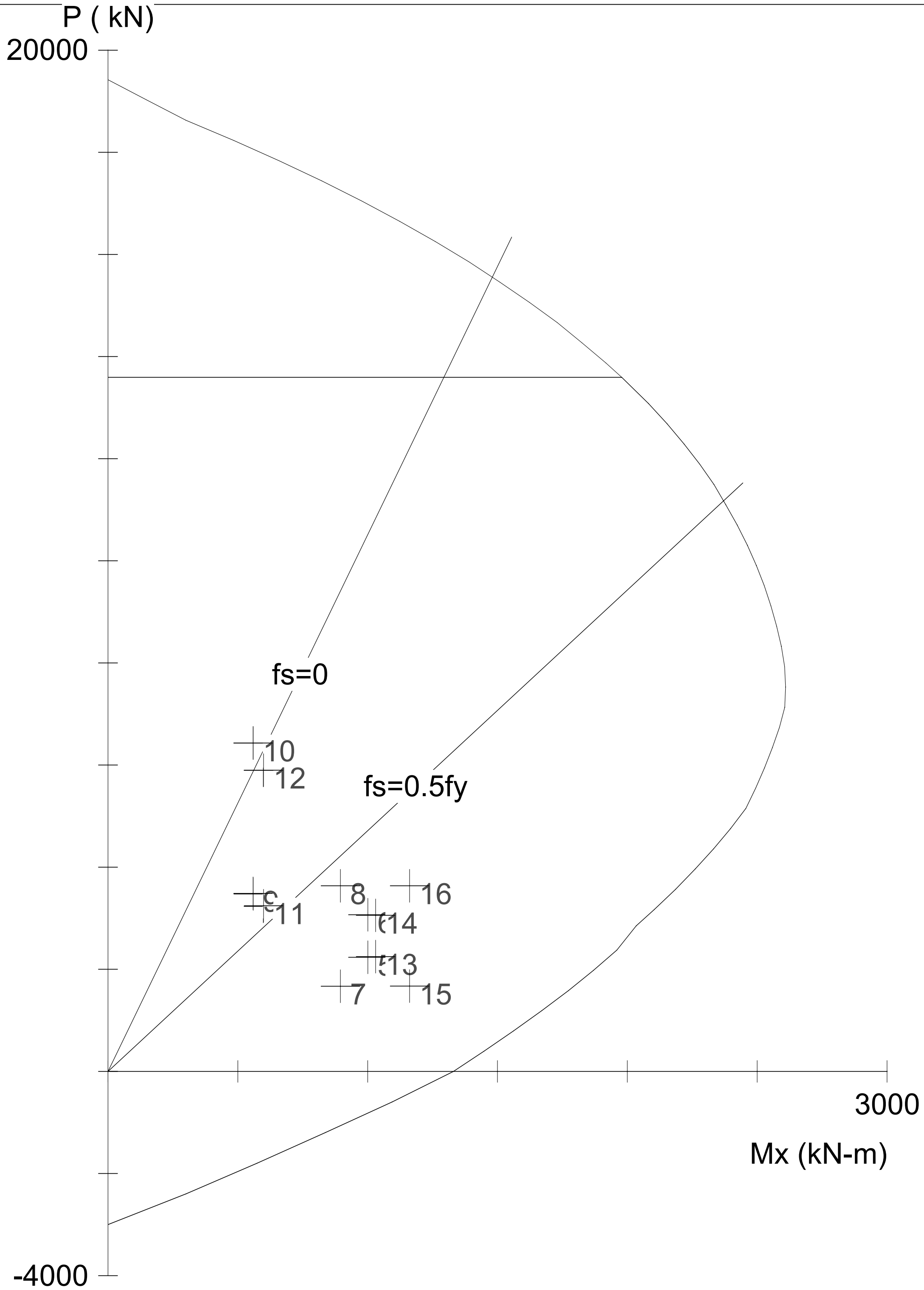
Slenderness: Not considered

Column type: Structural

Bars: prEN 10080

Date: 08/17/06

Time: 09:39:24



PCACOL V3.00 (PCA 1999) - Licensed to: KEI, MANILA, ST

File: C:\0-BALA~1\RC-DES~1\COLUMN\P2\P2B\P2B.COL

Project: BALARAJA FLYOVER

Column: P2B		Engineer:	
f'c = 30 MPa	fy = 390 MPa	Ag = 950332 mm^2	12 #32 bars
Ec = 25743 MPa	Es = 200000 MPa	As = 9612 mm^2	Rho = 1.01%
fc = 25.5 MPa	e_rup = Infinity	Xo = 0 mm	Iy = 7.19e+010 mm^4
e_u = 0.003 mm/mm		Yo = 0 mm	Iy = 7.19e+010 mm^4
Beta1 = 0.83245		Clear spacing = 213 mm	Clear cover = 60 mm
Confinement: Other	phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7		

```
OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO       OO   OO  OO       OO   OO  OO
OO    OO  OO       OOOOOOO  OO       OO   OO  OO
OOOOOOO   OO   OO  OO   OO  OO   OO  OO   OO  OO
OO        OO   OO  OO   OO  OO   OO  OO   OO  OO
OO         OOOOO   OO   OO   OOOOO    OOOOO   OOOOO  (TM)
```

==
Computer program for the Strength Design of Reinforced Concrete Sections
==

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General Information:
====================

File Name: C:\1-BALA~1\RC-DES~1\COLUMN\P2\P2B\P2B.COL
Project: BALARAJA FLYOVER
Column: P2B Engineer:
Code: ACI 318-95 Units: Metric

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:
====================

f'c = 30 MPa fy = 390 MPa
Ec = 25743 MPa Es = 200000 MPa
fc = 25.5 MPa Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:
========

Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 Iy = 7.18688e+010 mm^4
Xo = 0 mm Yo = 0 mm

Reinforcement:
==============

Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7

Layout: Circular
Pattern: All Sides Equal (Cover to longitudinal reinforcement)
Total steel area, As = 9612 mm^2 at 1.01%
12 #32 Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
===

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	3476.3	559.0	2166.6	3.876
2	6429.8	559.0	2563.9	4.587
3	3235.2	598.2	2116.3	3.538
4	5895.6	598.2	2523.8	4.219
5	2235.1	1000.6	1928.2	1.927
6	3068.9	1000.6	2080.8	2.080
7	1668.1	894.7	1793.8	2.005
8	3636.0	894.7	2199.0	2.458
9	3485.4	558.8	2168.5	3.881
10	6430.8	558.8	2564.0	4.588
11	3243.3	598.9	2118.1	3.537
12	5897.7	598.9	2524.0	4.214
13	2250.0	1030.5	1931.5	1.874
14	3056.2	1030.5	2078.0	2.017
15	1672.5	1160.8	1794.9	1.546

16	3633.7	1160.8	2198.5	1.894

*** Program completed as requested! ***

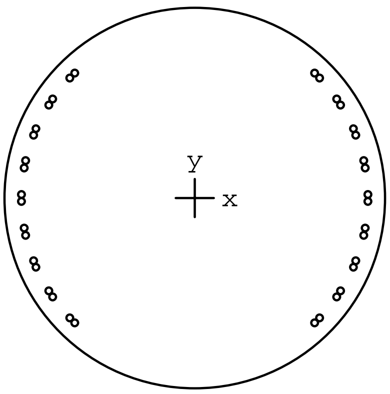
```
  General Information:
  ====================
     File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P2\P2B\P2B-2.COL
     Project:  BALARAJA FLYOVER
     Column:   P2                           Engineer:
     Code:     ACI 318-95                   Units: Metric

     Run Option: Investigation              Slenderness: Not considered
     Run Axis:   X-axis                     Column Type: Structural

  Material Properties:
  ====================
     f'c   = 30 MPa                         fy   = 390 MPa
     Ec    = 25743 MPa                      Es   = 200000 MPa
     fc    = 25.5 MPa                       Rupture strain = Infinity
     Ultimate strain = 0.003 mm/mm
     Beta1 = 0.83245

  Section:
  ========
     Circular:    Diameter = 1100 mm

     Gross section area, Ag =  950332 mm^2
     Ix =  7.18688e+010 mm^4                Iy =  7.18688e+010 mm^4
     Xo =  0 mm                             Yo =  0 mm

  Reinforcement:
  ==============
     Rebar Database: prEN 10080
     Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
     ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
     #  6         6          28   #  8         8          50   # 10        10          79
     # 12        12         113   # 14        14         154   # 16        16         201
     # 20        20         314   # 25        25         491   # 28        28         616
     # 32        32         801   # 40        40        1256

     Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
     phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

     Layout: Circular
     Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
     Total steel area, As = 9612 mm^2 at 1.01%
     12 #32   Cover = 60 mm

  Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
  =========================================================
                  Pu          Mux         fMnx
     No.          kN         kN-m         kN-m   fMn/Mu
     --- ------------ ------------ ------------ --------
       1       6008.8          0.0       3292.9  999.999
       2       -703.7          0.0       1385.8  999.999

     *** Program completed as requested! ***
```

```
  General Information:
  ====================
     File Name: C:\0-BALA~1\RC-DES~1\COLUMN\P2\P2T\P2T-3.COL
     Project:  BALARAJA FLYOVER
     Column:   P2T                         Engineer:
     Code:     ACI 318-95                  Units: Metric

     Run Option: Investigation             Slenderness: Not considered
     Run Axis:   X-axis                    Column Type: Structural

  Material Properties:
  ====================
     f'c   = 30 MPa                        fy   = 390 MPa
     Ec    = 25743 MPa                     Es   = 200000 MPa
     fc    = 25.5 MPa                      Rupture strain = Infinity
     Ultimate strain = 0.003 mm/mm
     Beta1 = 0.83245

  Section:
  ========
     Circular:    Diameter = 1100 mm

     Gross section area, Ag =  950332 mm^2
     Ix =  7.18688e+010 mm^4               Iy =  7.18688e+010 mm^4
     Xo =  0 mm                            Yo =  0 mm

  Reinforcement:
  ==============
     Rebar Database: prEN 10080
     Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
     ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
     #  6        6           28   #  8        8           50   # 10       10           79
     # 12       12          113   # 14       14          154   # 16       16          201
     # 20       20          314   # 25       25          491   # 28       28          616
     # 32       32          801   # 40       40         1256

     Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
     phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

     Pattern: Irregular

     Total steel area, As = 24030 mm^2 at 2.53%

     Area mm^2   X (mm)   Y (mm)  Area mm^2   X (mm)   Y (mm)  Area mm^2   X (mm)   Y (mm)
     --------- -------- --------  --------- -------- --------  --------- -------- --------
           801        0      474        801      123      458        801      237      410
           801      335      335        801      410      237        801      458      123
           801      474       -0        801      458     -123        801      410     -237
           801      335     -335        801      237     -410        801      123     -458
           801       -0     -474        801     -123     -458        801     -237     -410
           801     -335     -335        801     -410     -237        801     -458     -123
           801     -474        0        801     -458      123        801     -410      237
           801     -335      335        801     -237      410        801     -123      458
           801       32      473        801      426      209        801      394     -264
           801      -32     -473        801     -426     -209        801     -394      264

  Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
  ========================================================
                 Pu          Mux         fMnx
     No.         kN         kN-m         kN-m   fMn/Mu
     --- ------------ ------------ ------------ --------
       1       5846.4          0.0       4908.5  999.999
       2       -541.3          0.0       3540.1  999.999

     *** Program completed as requested! ***
```

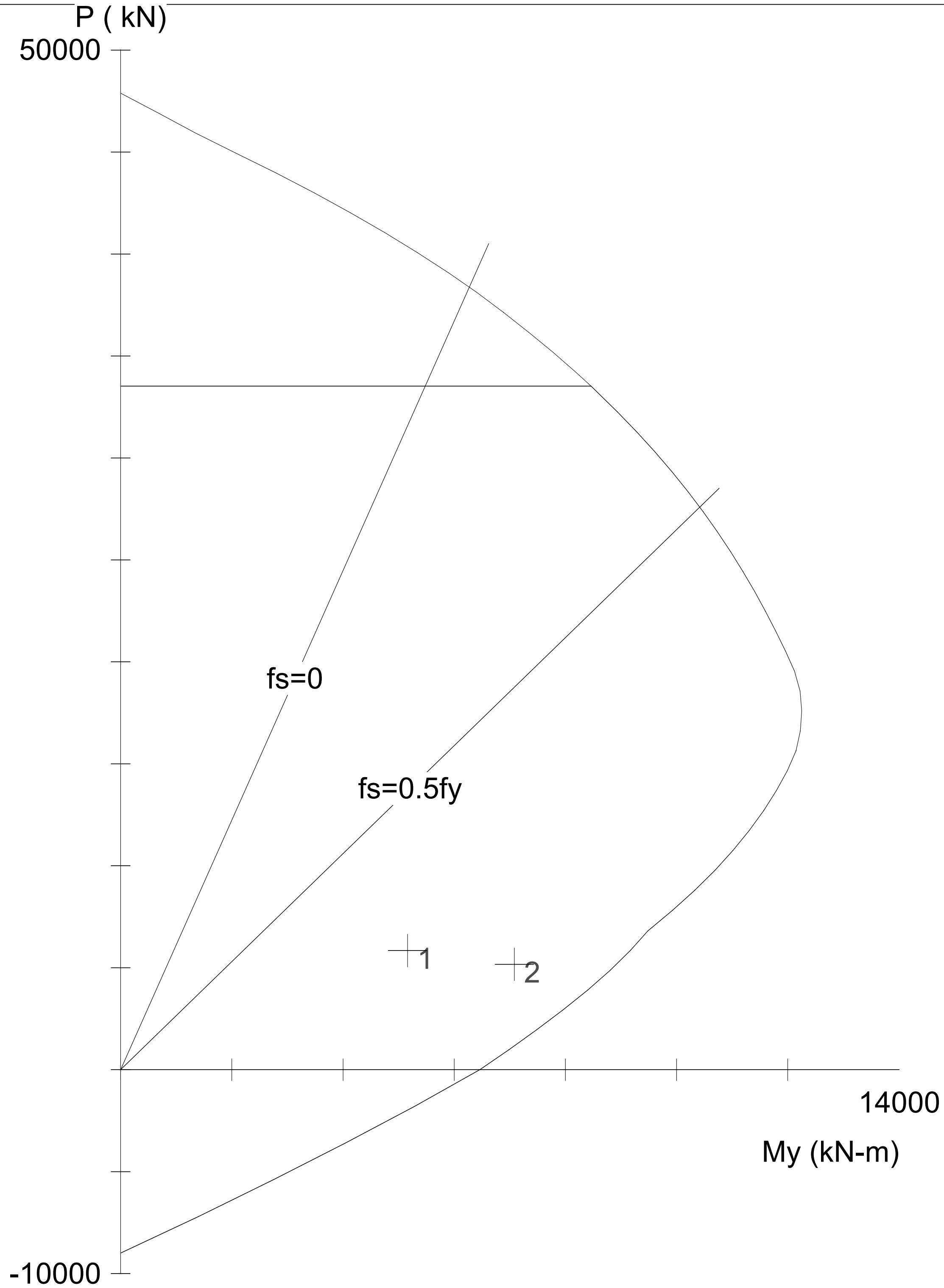
```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P2\P2B\P2B-3.COL
   Project:  BALARAJA FLYOVER
   Column:   P2                            Engineer:
   Code:     ACI 318-95                    Units: Metric

   Run Option: Investigation               Slenderness: Not considered
   Run Axis:   X-axis                      Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                          fy   = 390 MPa
   Ec    = 25743 MPa                       Es   = 200000 MPa
   fc    = 25.5 MPa                        Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4                 Iy =  7.18688e+010 mm^4
   Xo =  0 mm                              Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6         6          28   #  8         8          50   # 10        10          79
   # 12        12         113   # 14        14         154   # 16        16         201
   # 20        20         314   # 25        25         491   # 28        28         616
   # 32        32         801   # 40        40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 9612 mm^2 at 1.01%
   12 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
========================================================
                 Pu          Mux         fMnx
   No.           kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       5846.4          0.0       3264.0  999.999
     2       -541.3          0.0       1452.9  999.999

   *** Program completed as requested! ***
```

P3 SINGLE COLUMN 1.7 M DIAMETER

TOP



1700 mm diam.



Code: ACI 318-95

Units: Metric

Run axis: About Y-axis

Run option: Investigation

Slenderness: Not considered

Column type: Structural

Bars: prEN 10080

Date: 09/11/06

Time: 19:30:41

PCACOL V3.00 (PCA 1999) - Licensed to: KEI, MANILA, ST

File: C:\1-BALA~1\RC-DES~1\COLUMN\P3-SIN~1\P3CONECT.COL

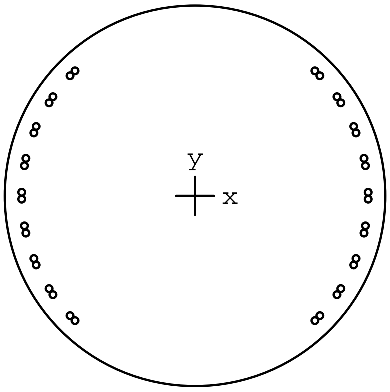
Project: BALARAJA FLYOVER

Column: P8B

Engineer:

f'c = 30 MPa	fy = 390 MPa	Ag = 2.2698e+006 mm^2	36 #32 bars
Ec = 25743 MPa	Es = 200000 MPa	As = 28836 mm^2	Rho = 1.27%
fc = 25.5 MPa	e_rup = Infinity	Xo = 0 mm	Iy = 4.1e+011 mm^4
e_u = 0.003 mm/mm		Yo = 0 mm	Iy = 4.1e+011 mm^4
Beta1 = 0.83245		Clear spacing = 0 mm	Clear cover = 60 mm

Confinement: Other phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7



1700 mm diam.

Code: ACI 318-95

Units: Metric

Run axis: About Y-axis

Run option: Investigation

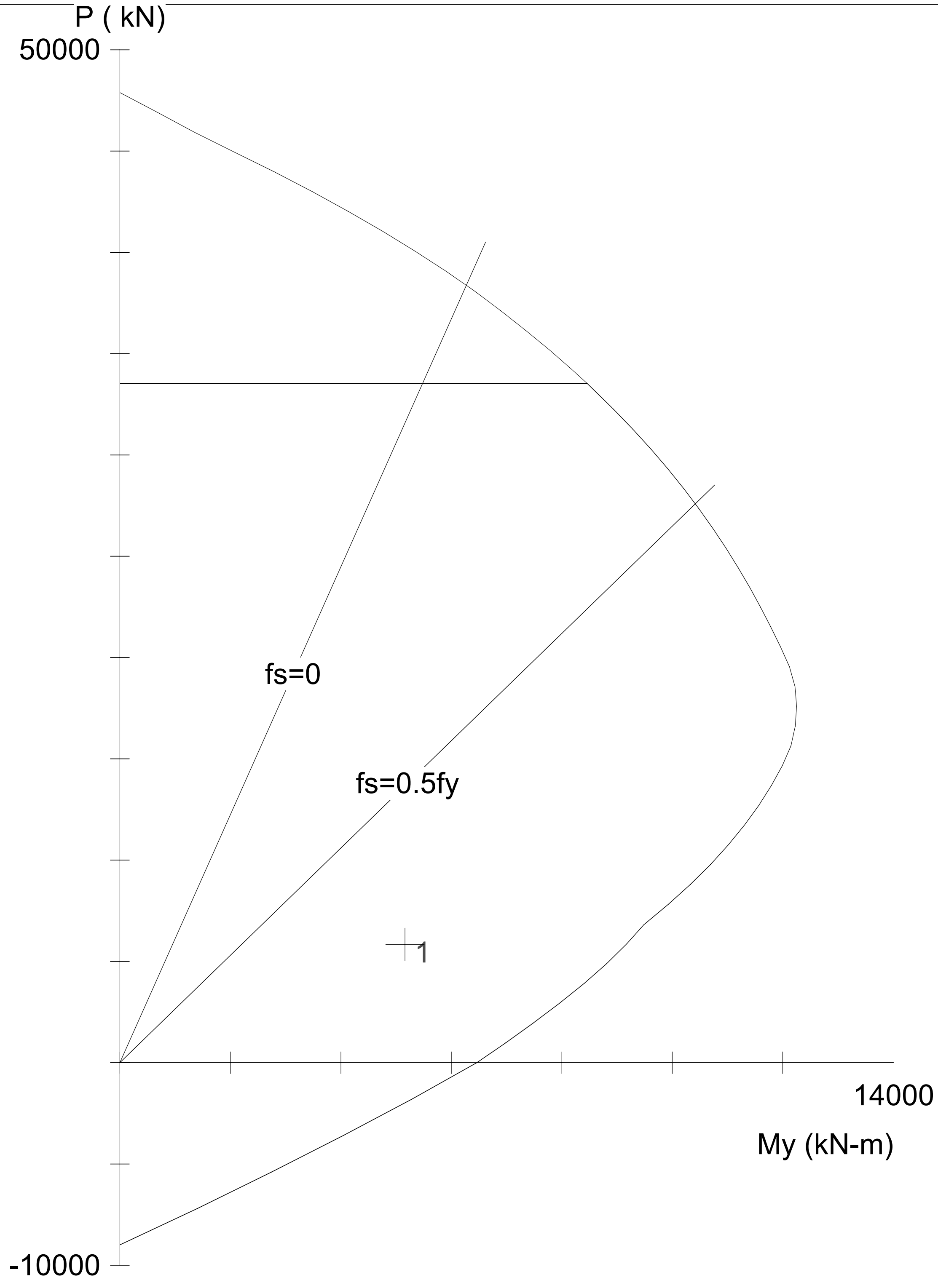
Slenderness: Not considered

Column type: Structural

Bars: prEN 10080

Date: 08/17/06

Time: 09:41:12



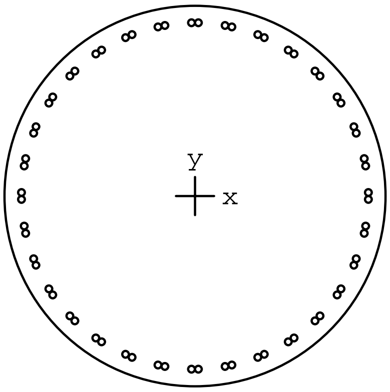
PCACOL V3.00 (PCA 1999) - Licensed to: KEI, MANILA, ST

File: C:\0-BALA~1\RC-DES~1\COLUMN\P3-SIN~1\P3CONECT.COL

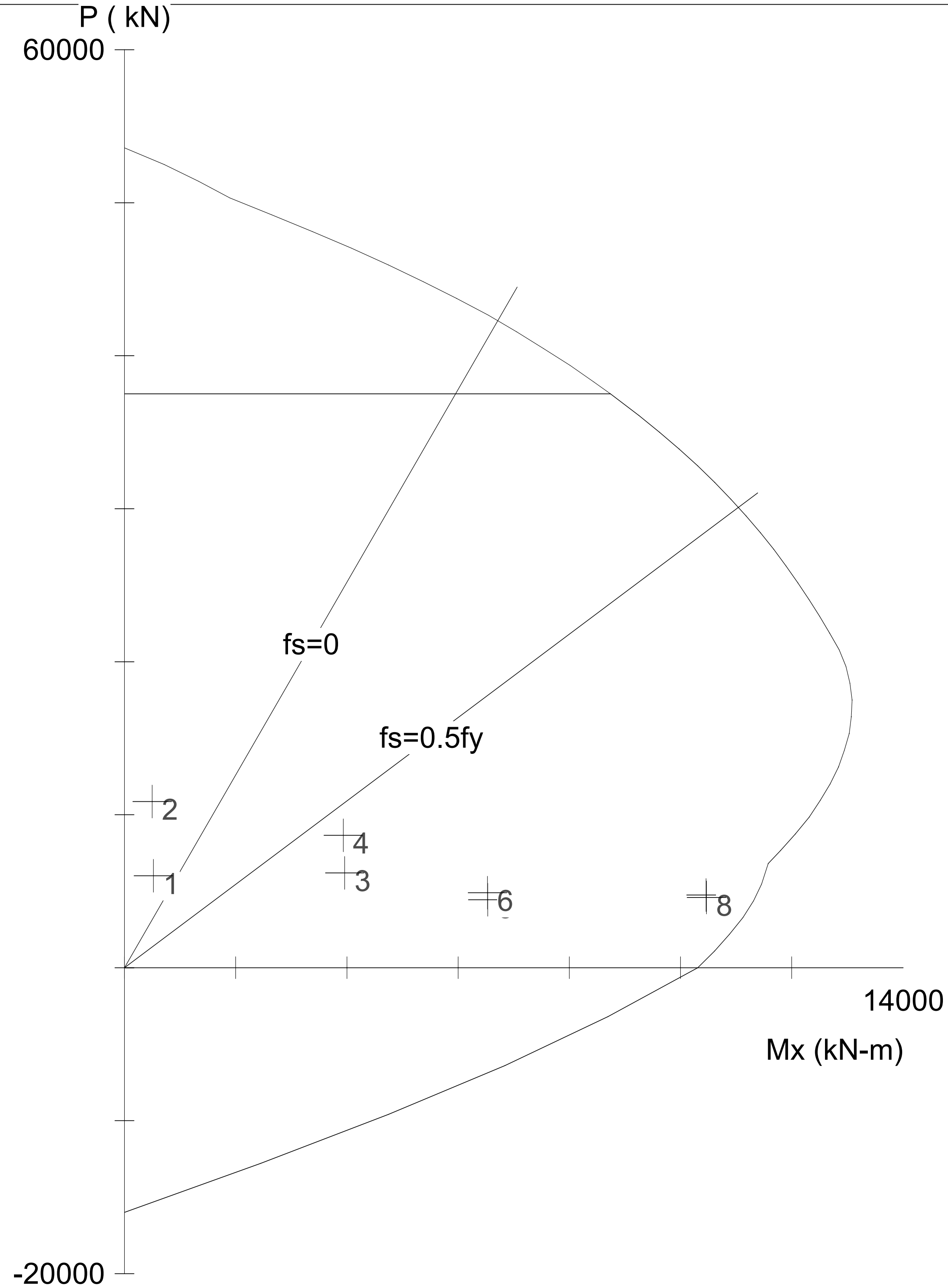
Project: BALARAJA FLYOVER

Column: P8B		Engineer:	
f'c = 30 MPa	fy = 390 MPa	Ag = 2.2698e+006 mm^2	36 #32 bars
Ec = 25743 MPa	Es = 200000 MPa	As = 28836 mm^2	Rho = 1.27%
fc = 25.5 MPa	e_rup = Infinity	Xo = 0 mm	Iy = 4.1e+011 mm^4
e_u = 0.003 mm/mm		Yo = 0 mm	Iy = 4.1e+011 mm^4
Beta1 = 0.83245		Clear spacing = 0 mm	Clear cover = 60 mm
Confinement: Other	phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7		

BASE



1700 mm diam.



Code: ACI 318-95

Units: Metric

Run axis: About X-axis

Run option: Investigation

Slenderness: Not considered

Column type: Structural

Bars: prEN 10080

Date: 08/17/06

Time: 09:40:34

PCACOL V3.00 (PCA 1999) - Licensed to: KEI, MANILA, ST

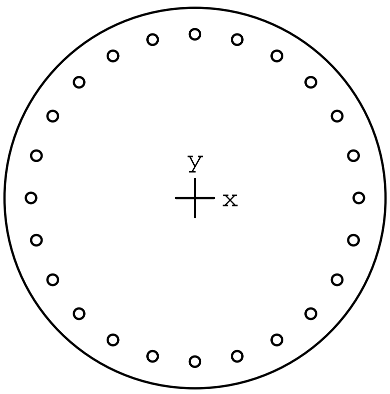
File: C:\0-BALA~1\RC-DES~1\COLUMN\P3-SIN~1\P3.COL

Project: BALARAJA FLYOVER

Column: P8B		Engineer:	
f'c = 30 MPa	fy = 390 MPa	Ag = 2.2698e+006 mm^2	64 #32 bars
Ec = 25743 MPa	Es = 200000 MPa	As = 51264 mm^2	Rho = 2.26%
fc = 25.5 MPa	e_rup = Infinity	Xo = 0 mm	Iy = 4.1e+011 mm^4
e_u = 0.003 mm/mm		Yo = 0 mm	Iy = 4.1e+011 mm^4
Beta1 = 0.83245		Clear spacing = 0 mm	Clear cover = 60 mm
Confinement: Other	phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7		

P6 PORTAL COLUMN 1.1 M DIAMETER

TOP



1100 mm diam.

Code: ACI 318-95

Units: Metric

Run axis: About X-axis

Run option: Investigation

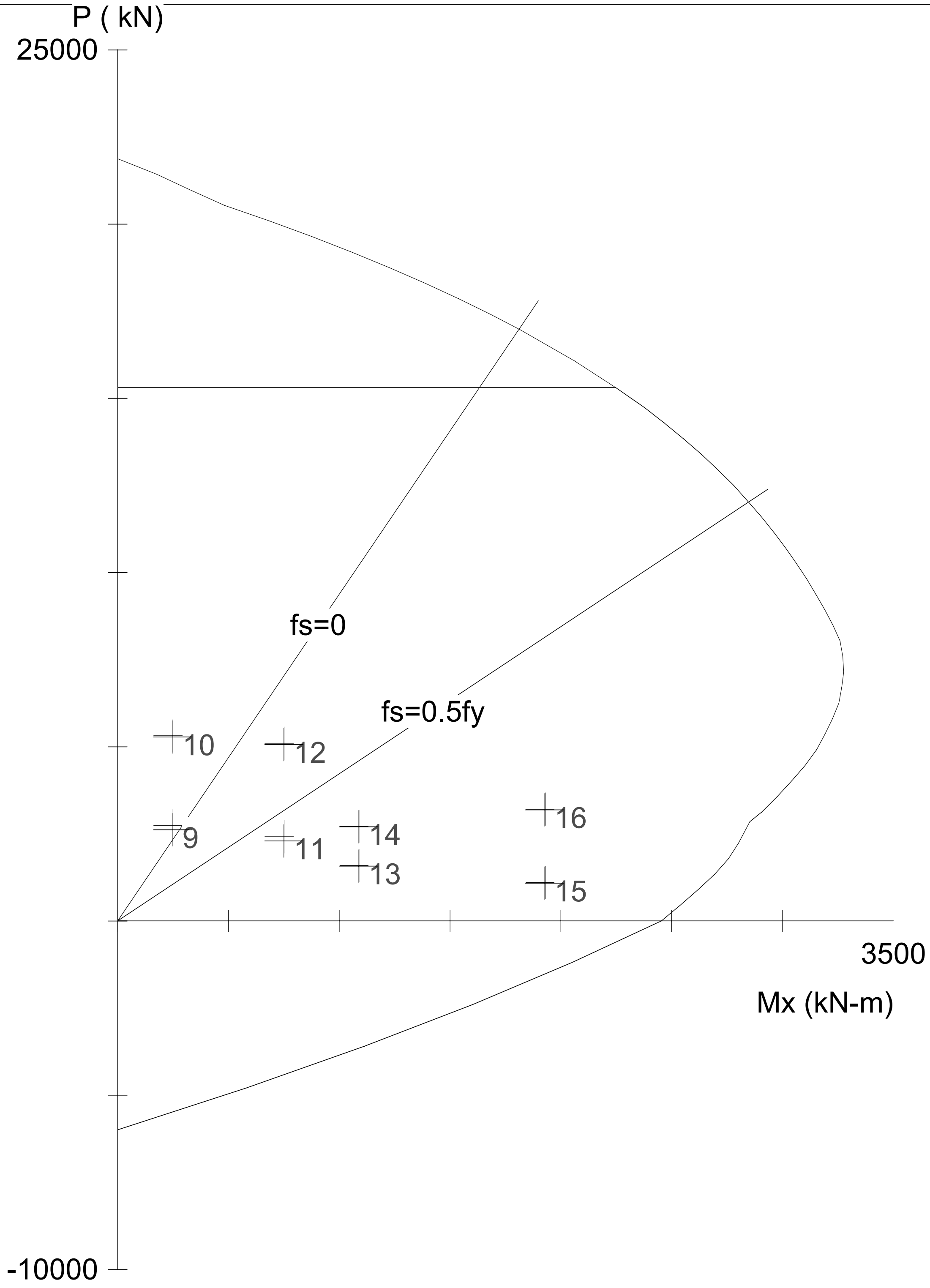
Slenderness: Not considered

Column type: Structural

Bars: prEN 10080

Date: 08/17/06

Time: 09:41:57



PCACOL V3.00 (PCA 1999) - Licensed to: KEI, MANILA, ST

File: C:\0-BALA~1\RC-DES~1\COLUMN\P6\P6T\P6T.COL

Project: BALARAJA FLYOVER

Column: P6T		Engineer:	
f'c = 30 MPa	fy = 390 MPa	Ag = 950332 mm^2	24 #32 bars
Ec = 25743 MPa	Es = 200000 MPa	As = 19224 mm^2	Rho = 2.02%
fc = 25.5 MPa	e_rup = Infinity	Xo = 0 mm	Iy = 7.19e+010 mm^4
e_u = 0.003 mm/mm		Yo = 0 mm	Iy = 7.19e+010 mm^4
Beta1 = 0.83245		Clear spacing = 92 mm	Clear cover = 60 mm
Confinement: Other	phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7		

```
OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO       OO   OO  OO       OO   OO  OO
OO    OO  OO       OOOOOOO  OO       OO   OO  OO
OOOOOOO   OO   OO  OO   OO  OO   OO  OO   OO  OO
OO        OO   OO  OO   OO  OO   OO  OO   OO  OO
OO         OOOOO   OO   OO   OOOOO    OOOOO   OOOOO  (TM)
```

==
Computer program for the Strength Design of Reinforced Concrete Sections
==

General Information:

File Name: C:\1-BALA~1\RC-DES~1\COLUMN\P6\P6T\P6T.COL
Project: BALARAJA FLYOVER
Column: P6T Engineer:
Code: ACI 318-95 Units: Metric

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:

f'c = 30 MPa fy = 390 MPa
Ec = 25743 MPa Es = 200000 MPa
fc = 25.5 MPa Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:

Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 Iy = 7.18688e+010 mm^4
Xo = 0 mm Yo = 0 mm

Reinforcement:

Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7

Layout: Circular
Pattern: All Sides Equal (Cover to longitudinal reinforcement)
Total steel area, As = 19224 mm^2 at 2.02%
24 #32 Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	2732.2	249.7	2843.5	11.388
2	5311.3	249.7	3187.2	12.764
3	2412.8	751.2	2817.6	3.751
4	5097.3	751.2	3169.4	4.219
5	1592.1	1089.4	2733.5	2.509
6	2718.7	1089.4	2842.5	2.609
7	1102.8	1929.4	2654.1	1.376
8	3208.0	1929.4	2921.7	1.514
9	2616.8	249.0	2834.6	11.384
10	5274.8	249.0	3184.2	12.788
11	2293.1	750.1	2806.9	3.742
12	5059.4	750.1	3166.2	4.221
13	1572.1	1088.1	2730.4	2.509
14	2700.3	1088.1	2841.1	2.611
15	1084.2	1926.6	2650.9	1.376

```
   16       3188.2       1926.6       2918.0    1.515
```

*** Program completed as requested! ***

General Information:
====================

File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P6\P6T\P6T-1.COL
Project: BALARAJA FLYOVER
Column: P6T Engineer:
Code: ACI 318-95 Units: Metric

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:
====================

f'c = 30 MPa fy = 390 MPa
Ec = 25743 MPa Es = 200000 MPa
fc = 25.5 MPa Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:
========

Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 Iy = 7.18688e+010 mm^4
Xo = 0 mm Yo = 0 mm

Reinforcement:
==============

Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 1, phi(c) = 1

Layout: Circular
Pattern: All Sides Equal (Cover to longitudinal reinforcement)
Total steel area, As = 19224 mm^2 at 2.02%
24 #32 Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
===

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	2300.9	0.0	3695.9	999.999
2	2281.8	0.0	3691.7	999.999

*** Program completed as requested! ***

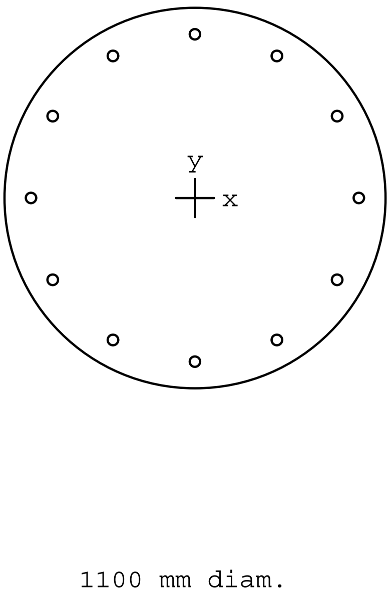
08/12/06 PCACOL V3.00 - PORTLAND CEMENT ASSOCIATION - Page 1
16:16:03 Licensed to: KEI, MANILA, ST P6B-1

```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P6\P6T\P6T-2.COL
   Project:  BALARAJA FLYOVER
   Column:   P6T                        Engineer:
   Code:     ACI 318-95                 Units: Metric

   Run Option: Investigation            Slenderness: Not considered
   Run Axis:   X-axis                   Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                       fy   = 390 MPa
   Ec    = 25743 MPa                    Es   = 200000 MPa
   fc    = 25.5 MPa                     Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4              Iy =  7.18688e+010 mm^4
   Xo =  0 mm                           Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6         6          28   #  8         8          50   # 10        10          79
   # 12        12         113   # 14        14         154   # 16        16         201
   # 20        20         314   # 25        25         491   # 28        28         616
   # 32        32         801   # 40        40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 19224 mm^2 at 2.02%
   24 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
========================================================
                 Pu          Mux         fMnx
   No.           kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       5588.3          0.0       4323.4  999.999
     2      -1005.6          0.0       2733.4  999.999

   *** Program completed as requested! ***
```

```
  General Information:
  ====================
     File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P6\P6T\P6T-3.COL
     Project:  BALARAJA FLYOVER
     Column:   P6T                           Engineer:
     Code:     ACI 318-95                    Units: Metric

     Run Option: Investigation               Slenderness: Not considered
     Run Axis:   X-axis                      Column Type: Structural

  Material Properties:
  ====================
     f'c   = 30 MPa                          fy   = 390 MPa
     Ec    = 25743 MPa                       Es   = 200000 MPa
     fc    = 25.5 MPa                        Rupture strain = Infinity
     Ultimate strain = 0.003 mm/mm
     Beta1 = 0.83245

  Section:
  ========
     Circular:    Diameter = 1100 mm

     Gross section area, Ag =  950332 mm^2
     Ix =  7.18688e+010 mm^4                 Iy =  7.18688e+010 mm^4
     Xo =  0 mm                              Yo =  0 mm

  Reinforcement:
  ==============
     Rebar Database: prEN 10080
     Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
     ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
     #  6        6          28   #  8        8          50   # 10       10          79
     # 12       12         113   # 14       14         154   # 16       16         201
     # 20       20         314   # 25       25         491   # 28       28         616
     # 32       32         801   # 40       40        1256

     Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
     phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

     Layout: Circular
     Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
     Total steel area, As = 19224 mm^2 at 2.02%
     24 #32   Cover = 60 mm

  Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
  ========================================================
                   Pu          Mux         fMnx
     No.           kN         kN-m         kN-m   fMn/Mu
     --- ------------ ------------ ------------ --------
       1       5399.2          0.0       4296.4  999.999
       2       -816.5          0.0       2798.1  999.999

     *** Program completed as requested! ***
```

08/12/06 PCACOL V3.00 - PORTLAND CEMENT ASSOCIATION - Page 1
16:21:37 Licensed to: KEI, MANILA, ST P6B-3

BASE



Code: ACI 318-95

Units: Metric

Run axis: About X-axis

Run option: Investigation

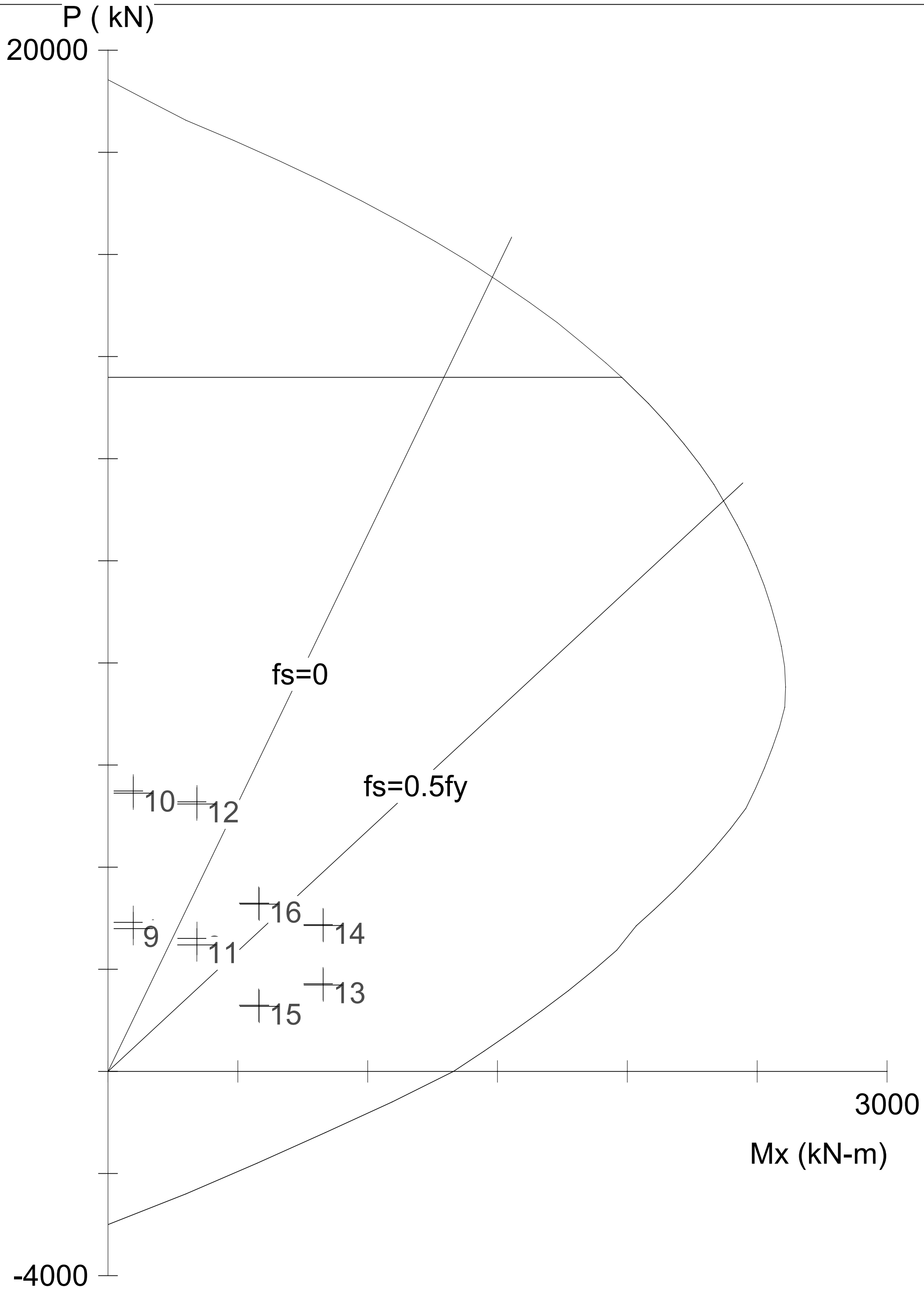
Slenderness: Not considered

Column type: Structural

Bars: prEN 10080

Date: 08/17/06

Time: 09:42:18



PCACOL V3.00 (PCA 1999) - Licensed to: KEI, MANILA, ST

File: C:\0-BALA~1\RC-DES~1\COLUMN\P6\P6B\P6B.COL

Project: BALARAJA FLYOVER

Column: P6B | Engineer:

f'c = 30 MPa	fy = 390 MPa	Ag = 950332 mm^2	12 #32 bars
Ec = 25743 MPa	Es = 200000 MPa	As = 9612 mm^2	Rho = 1.01%
fc = 25.5 MPa	e_rup = Infinity	Xo = 0 mm	Iy = 7.19e+010 mm^4
e_u = 0.003 mm/mm		Yo = 0 mm	Iy = 7.19e+010 mm^4
Beta1 = 0.83245		Clear spacing = 213 mm	Clear cover = 60 mm

Confinement: Other phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7

```
0000000   00000   00000   00000   00000  00
00    00 00   00 00   00 00   00 00   00 00
00    00 00   00 00   00 00   00 00   00 00
00    00 00      00   00 00      00   00 00
00    00 00      0000000 00      00   00 00
0000000  00   00 00   00 00   00 00   00 00
00       00   00 00   00 00   00 00   00 00
00        00000  00   00  00000   00000  00000  (TM)
```

==

Computer program for the Strength Design of Reinforced Concrete Sections

==

General Information:
====================

File Name: C:\1-BALA~1\RC-DES~1\COLUMN\P6\P6B\P6B.COL
Project: BALARAJA FLYOVER
Column: P6B Engineer:
Code: ACI 318-95 Units: Metric

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:
====================

f'c = 30 MPa fy = 390 MPa
Ec = 25743 MPa Es = 200000 MPa
fc = 25.5 MPa Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:
========

Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 Iy = 7.18688e+010 mm^4
Xo = 0 mm Yo = 0 mm

Reinforcement:
==============

Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7

Layout: Circular
Pattern: All Sides Equal (Cover to longitudinal reinforcement)
Total steel area, As = 9612 mm^2 at 1.01%
12 #32 Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
===

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	2919.4	97.4	2048.3	21.029
2	5491.5	97.4	2488.4	25.549
3	2605.1	342.6	1997.8	5.831
4	5277.7	342.6	2468.2	7.204
5	1716.6	828.2	1805.8	2.180
6	2874.2	828.2	2038.3	2.461
7	1297.1	580.2	1698.6	2.928
8	3293.7	580.2	2128.7	3.669
9	2796.1	97.3	2025.5	20.817
10	5449.5	97.3	2484.5	25.535
11	2478.8	342.3	1978.8	5.781
12	5235.9	342.3	2464.1	7.199
13	1693.6	828.9	1800.1	2.172
14	2856.6	828.9	2034.4	2.454
15	1276.4	582.7	1693.2	2.906

16	3273.8	582.7	2124.5	3.646

*** Program completed as requested! ***

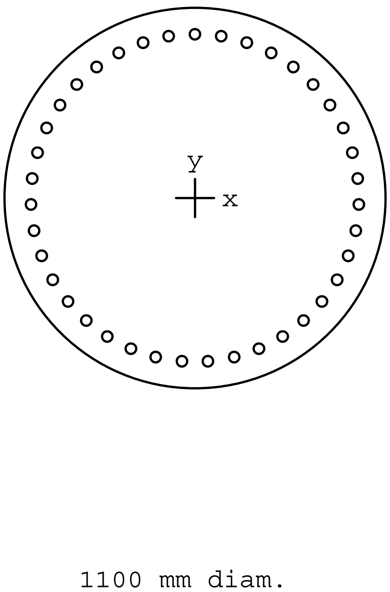
```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P6\P6B\P6B-1.COL
   Project:  BALARAJA FLYOVER
   Column:   P6B                          Engineer:
   Code:     ACI 318-95                   Units: Metric

   Run Option: Investigation              Slenderness: Not considered
   Run Axis:   X-axis                     Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                         fy   = 390 MPa
   Ec    = 25743 MPa                      Es   = 200000 MPa
   fc    = 25.5 MPa                       Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4                Iy =  7.18688e+010 mm^4
   Xo =  0 mm                             Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6         6          28   #  8         8          50   # 10        10          79
   # 12        12         113   # 14        14         154   # 16        16         201
   # 20        20         314   # 25        25         491   # 28        28         616
   # 32        32         801   # 40        40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 9612 mm^2 at 1.01%
   12 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
=======================================================
                 Pu          Mux         fMnx
   No.           kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       2300.9          0.0       2426.7  999.999
     2       2281.8          0.0       2420.8  999.999

   *** Program completed as requested! ***
```

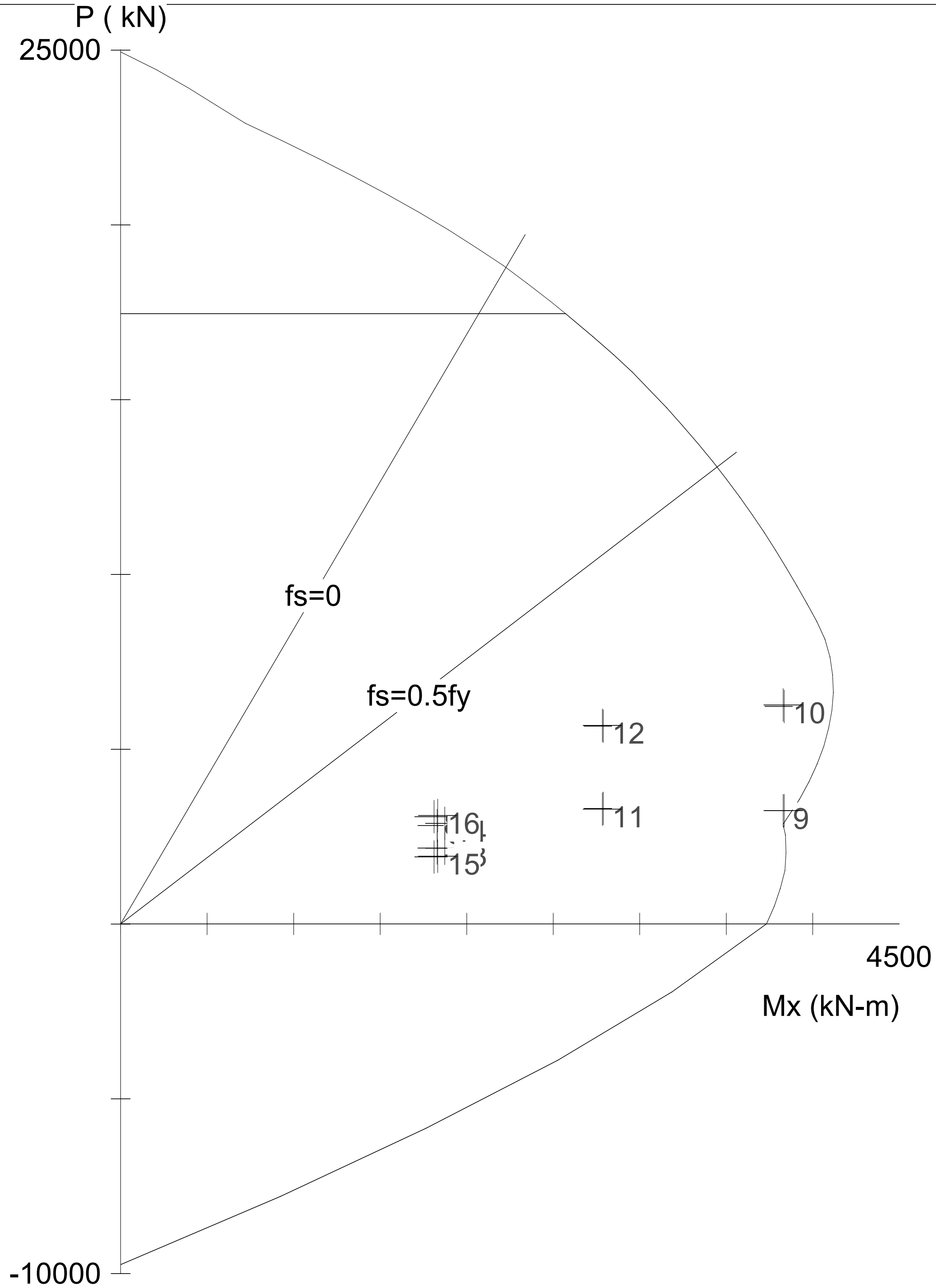
```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P6\P6B\P6B-2.COL
   Project:  BALARAJA FLYOVER
   Column:   P6B                        Engineer:
   Code:     ACI 318-95                 Units: Metric

   Run Option: Investigation            Slenderness: Not considered
   Run Axis:   X-axis                   Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                       fy   = 390 MPa
   Ec    = 25743 MPa                    Es   = 200000 MPa
   fc    = 25.5 MPa                     Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4              Iy =  7.18688e+010 mm^4
   Xo =  0 mm                           Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6        6          28   #  8        8          50   # 10       10          79
   # 12       12         113   # 14       14         154   # 16       16         201
   # 20       20         314   # 25       25         491   # 28       28         616
   # 32       32         801   # 40       40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 9612 mm^2 at 1.01%
   12 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
========================================================
              Pu          Mux         fMnx
   No.        kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       5588.3          0.0       3216.8  999.999
     2      -1005.6          0.0       1259.1  999.999

   *** Program completed as requested! ***
```

```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P6\P6B\P6B-3.COL
   Project:  BALARAJA FLYOVER
   Column:   P6B                          Engineer:
   Code:     ACI 318-95                   Units: Metric

   Run Option: Investigation              Slenderness: Not considered
   Run Axis:   X-axis                     Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                         fy   = 390 MPa
   Ec    = 25743 MPa                      Es   = 200000 MPa
   fc    = 25.5 MPa                       Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4                Iy =  7.18688e+010 mm^4
   Xo =  0 mm                             Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6         6          28   #  8         8          50   # 10        10          79
   # 12        12         113   # 14        14         154   # 16        16         201
   # 20        20         314   # 25        25         491   # 28        28         616
   # 32        32         801   # 40        40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 9612 mm^2 at 1.01%
   12 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
========================================================
                 Pu          Mux         fMnx
   No.           kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       5399.2          0.0       3181.3  999.999
     2       -816.5          0.0       1338.8  999.999

   *** Program completed as requested! ***
```

P7 PORTAL COLUMN 1.1 M DIAMETER

TOP





Code: ACI 318-95

Units: Metric

Run axis: About X-axis

Run option: Investigation

Slenderness: Not considered

Column type: Structural

Bars: prEN 10080

Date: 08/17/06

Time: 09:43:21

PCACOL V3.00 (PCA 1999) - Licensed to: KEI, MANILA, ST

File: C:\0-BALA~1\RC-DES~1\COLUMN\P7\P7T\P7T.COL

Project: BALARAJA FLYOVER

Column: P7T		Engineer:	
f'c = 30 MPa	fy = 390 MPa	Ag = 950332 mm^2	39 #32 bars
Ec = 25743 MPa	Es = 200000 MPa	As = 31239 mm^2	Rho = 3.29%
fc = 25.5 MPa	e_rup = Infinity	Xo = 0 mm	Iy = 7.19e+010 mm^4
e_u = 0.003 mm/mm		Yo = 0 mm	Iy = 7.19e+010 mm^4
Beta1 = 0.83245		Clear spacing = 44 mm	Clear cover = 60 mm

Confinement: Other

phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7

```
OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO       OO   OO  OO       OO   OO  OO
OO    OO  OO       OOOOOOO  OO       OO   OO  OO
OOOOOOO   OO   OO  OO   OO  OO   OO  OO   OO  OO
OO        OO   OO  OO   OO  OO   OO  OO   OO  OO
OO         OOOOO   OO   OO   OOOOO    OOOOO   OOOOO  (TM)
```

===
Computer program for the Strength Design of Reinforced Concrete Sections
===

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General Information:

File Name: C:\1-BALA~1\RC-DES~1\COLUMN\P7\P7T\P7T.COL
Project: BALARAJA FLYOVER
Column: P7T — Engineer:
Code: ACI 318-95 — Units: Metric

Run Option: Investigation — Slenderness: Not considered
Run Axis: X-axis — Column Type: Structural

Material Properties:

f'c = 30 MPa — fy = 390 MPa
Ec = 25743 MPa — Es = 200000 MPa
fc = 25.5 MPa — Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:

Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 — Iy = 7.18688e+010 mm^4
Xo = 0 mm — Yo = 0 mm

Reinforcement:

Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7

Layout: Circular
Pattern: All Sides Equal (Cover to longitudinal reinforcement)
Total steel area, As = 31239 mm^2 at 3.29%
39 #32 Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	3240.0	3835.1	3881.0	1.012
2	6221.0	3835.1	4112.8	1.072
3	3300.7	2789.7	3889.0	1.394
4	5657.2	2789.7	4094.3	1.468
5	2172.7	1829.6	3845.1	2.102
6	2812.1	1829.6	3830.5	2.094
7	1916.6	1811.2	3844.3	2.123
8	3068.2	1811.2	3858.2	2.130
9	3239.7	3828.6	3881.0	1.014
10	6262.5	3828.6	4113.6	1.074
11	3283.8	2783.7	3886.8	1.396
12	5678.4	2783.7	4095.3	1.471
13	2165.1	1873.5	3845.1	2.052
14	2874.1	1873.5	3831.5	2.045
15	1937.3	1832.1	3844.4	2.098

```
      16       3101.9       1832.1       3862.7    2.108

     *** Program completed as requested! ***
```

General Information:
====================
File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P7\P7T\P7T-1.COL
Project: BALARAJA FLYOVER
Column: P7T Engineer:
Code: ACI 318-95 Units: Metric

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:
====================
f'c = 30 MPa fy = 390 MPa
Ec = 25743 MPa Es = 200000 MPa
fc = 25.5 MPa Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:
========
Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 Iy = 7.18688e+010 mm^4
Xo = 0 mm Yo = 0 mm

Reinforcement:
==============
Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 1, phi(c) = 1

Layout: Circular
Pattern: All Sides Equal (Cover to longitudinal reinforcement)
Total steel area, As = 31239 mm^2 at 3.29%
39 #32 Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
===

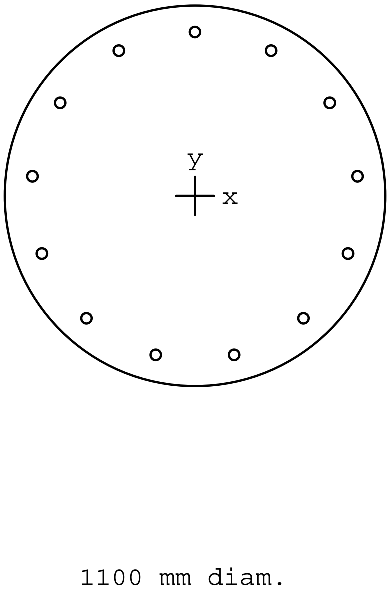
No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	2678.6	0.0	5236.2	999.999
2	2281.8	0.0	5163.6	999.999

*** Program completed as requested! ***

```
  General Information:
  ====================
     File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P7\P7T\P7T-2.COL
     Project:  BALARAJA FLYOVER
     Column:   P7T                         Engineer:
     Code:     ACI 318-95                  Units: Metric

     Run Option: Investigation             Slenderness: Not considered
     Run Axis:   X-axis                    Column Type: Structural

  Material Properties:
  ====================
     f'c   = 30 MPa                        fy   = 390 MPa
     Ec    = 25743 MPa                     Es   = 200000 MPa
     fc    = 25.5 MPa                      Rupture strain = Infinity
     Ultimate strain = 0.003 mm/mm
     Beta1 = 0.83245

  Section:
  ========
     Circular:    Diameter = 1100 mm

     Gross section area, Ag =  950332 mm^2
     Ix =  7.18688e+010 mm^4               Iy =  7.18688e+010 mm^4
     Xo =  0 mm                            Yo =  0 mm

  Reinforcement:
  ==============
     Rebar Database: prEN 10080
     Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
     ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
     #  6        6          28    #  8        8          50    # 10       10          79
     # 12       12         113    # 14       14         154    # 16       16         201
     # 20       20         314    # 25       25         491    # 28       28         616
     # 32       32         801    # 40       40        1256

     Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
     phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

     Layout: Circular
     Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
     Total steel area, As = 31239 mm^2 at 3.29%
     39 #32   Cover = 60 mm

  Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
  =========================================================
                 Pu          Mux         fMnx
     No.         kN         kN-m         kN-m   fMn/Mu
     --- ------------ ------------ ------------ --------
       1      6421.7          0.0       5739.9  999.999
       2     -1461.3          0.0       4274.1  999.999

     *** Program completed as requested! ***
```

```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P7\P7T\P7T-3.COL
   Project:  BALARAJA FLYOVER
   Column:   P7T                          Engineer:
   Code:     ACI 318-95                   Units: Metric

   Run Option: Investigation              Slenderness: Not considered
   Run Axis:   X-axis                     Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                         fy   = 390 MPa
   Ec    = 25743 MPa                      Es   = 200000 MPa
   fc    = 25.5 MPa                       Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4                Iy =  7.18688e+010 mm^4
   Xo =  0 mm                             Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6         6          28   #  8         8          50   # 10        10          79
   # 12        12         113   # 14        14         154   # 16        16         201
   # 20        20         314   # 25        25         491   # 28        28         616
   # 32        32         801   # 40        40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 31239 mm^2 at 3.29%
   39 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
=========================================================
                 Pu          Mux         fMnx
   No.           kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       6203.4          0.0       5720.0  999.999
     2      -1243.0          0.0       4333.3  999.999

   *** Program completed as requested! ***
```

BASE



Code: ACI 318-95

Units: Metric

Run axis: About X-axis

Run option: Investigation

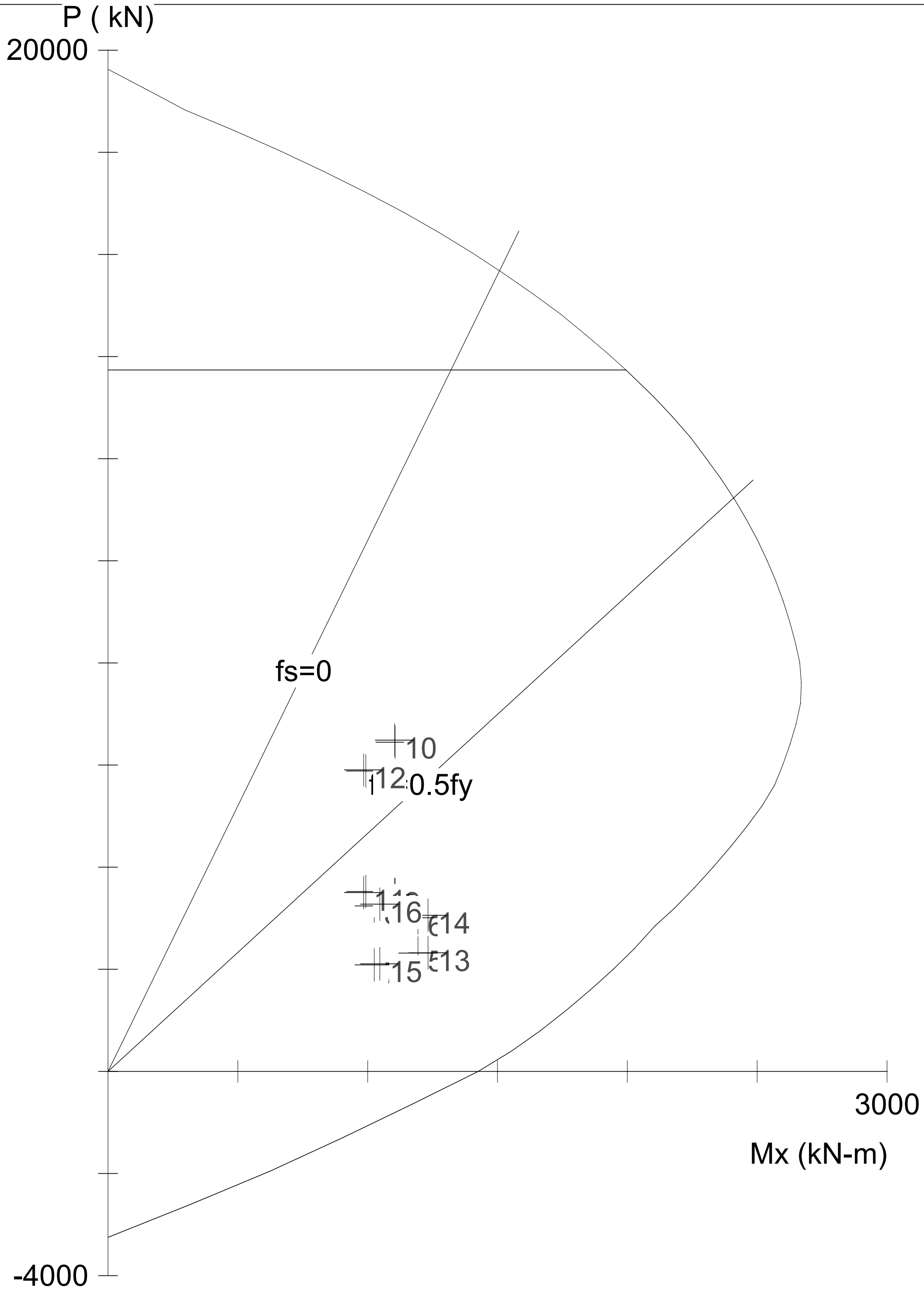
Slenderness: Not considered

Column type: Structural

Bars: prEN 10080

Date: 08/17/06

Time: 09:45:22



PCACOL V3.00 (PCA 1999) - Licensed to: KEI, MANILA, ST

File: C:\0-BALA~1\RC-DES~1\COLUMN\P7\P7B\P7B.COL

Project: BALARAJA FLYOVER

Column: P7B		Engineer:	
f'c = 30 MPa	fy = 390 MPa	Ag = 950332 mm^2	13 #32 bars
Ec = 25743 MPa	Es = 200000 MPa	As = 10413 mm^2	Rho = 1.10%
fc = 25.5 MPa	e_rup = Infinity	Xo = 0 mm	Iy = 7.19e+010 mm^4
e_u = 0.003 mm/mm		Yo = 0 mm	Iy = 7.19e+010 mm^4
Beta1 = 0.83245		Clear spacing = 195 mm	Clear cover = 60 mm
Confinement: Other	phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7		

```
OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO     OO  OO    OO  OO    OO  OO    OO  OO    OO  OO
OO     OO  OO    OO  OO    OO  OO    OO  OO    OO  OO
OO     OO  OO        OO    OO  OO        OO    OO  OO
OO     OO  OO        OOOOOOO   OO        OO    OO  OO
OOOOOOO    OO    OO  OO    OO  OO    OO  OO    OO  OO
OO         OO    OO  OO    OO  OO    OO  OO    OO  OO
OO          OOOOO    OO    OO   OOOOO    OOOOO    OOOOO  (TM)
```

==
Computer program for the Strength Design of Reinforced Concrete Sections
==

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General Information:

File Name: C:\1-BALA~1\RC-DES~1\COLUMN\P7\P7B\P7B.COL
Project: BALARAJA FLYOVER
Column: P7B — Engineer:
Code: ACI 318-95 — Units: Metric

Run Option: Investigation — Slenderness: Not considered
Run Axis: X-axis — Column Type: Structural

Material Properties:

f'c = 30 MPa — fy = 390 MPa
Ec = 25743 MPa — Es = 200000 MPa
fc = 25.5 MPa — Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:

Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 — Iy = 7.18688e+010 mm^4
Xo = 0 mm — Yo = 0 mm

Reinforcement:

Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7

Layout: Circular
Pattern: All Sides Equal (Cover to longitudinal reinforcement)
Total steel area, As = 10413 mm^2 at 1.10%
13 #32 Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	3465.7	1105.6	2233.0	2.020
2	6447.3	1105.6	2628.3	2.377
3	3523.9	992.5	2243.9	2.261
4	5884.4	992.5	2588.6	2.608
5	2318.4	1193.2	2009.7	1.684
6	3010.0	1193.2	2144.5	1.797
7	2086.1	1025.2	1963.0	1.915
8	3242.3	1025.2	2189.9	2.136
9	3462.1	1103.6	2232.3	2.023
10	6484.9	1103.6	2630.7	2.384
11	3502.0	984.2	2239.8	2.276
12	5901.9	984.2	2590.0	2.632
13	2323.6	1232.2	2010.7	1.632
14	3058.8	1232.2	2154.1	1.748
15	2108.3	1046.7	1967.5	1.880

```
      16       3274.1       1046.7       2196.0    2.098
```

*** Program completed as requested! ***

General Information:

File Name: C:\0-BALA~1\RC-DES~1\COLUMN\P7\P7B\P7B-1.COL
Project: BALARAJA FLYOVER
Column: P7B Engineer:
Code: ACI 318-95 Units: Metric

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:

f'c = 30 MPa fy = 390 MPa
Ec = 25743 MPa Es = 200000 MPa
fc = 25.5 MPa Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:

Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 Iy = 7.18688e+010 mm^4
Xo = 0 mm Yo = 0 mm

Reinforcement:

Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 1, phi(c) = 1

Layout: Circular
Pattern: All Sides Equal (Cover to longitudinal reinforcement)
Total steel area, As = 10413 mm^2 at 1.10%
13 #32 Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	2679.0	0.0	2639.5	999.999
2	2275.6	0.0	2524.4	999.999

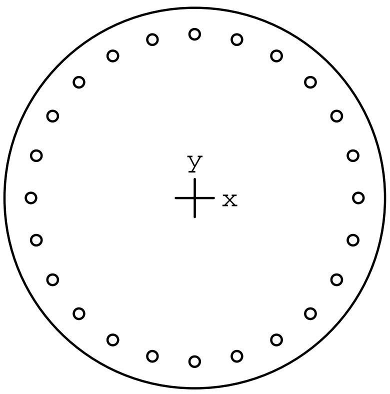
*** Program completed as requested! ***

```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P7\P7B\P7B-2.COL
   Project:  BALARAJA FLYOVER
   Column:   P7B                           Engineer:
   Code:     ACI 318-95                    Units: Metric

   Run Option: Investigation               Slenderness: Not considered
   Run Axis:   X-axis                      Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                          fy   = 390 MPa
   Ec    = 25743 MPa                       Es   = 200000 MPa
   fc    = 25.5 MPa                        Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4                 Iy =  7.18688e+010 mm^4
   Xo =  0 mm                              Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6         6          28   #  8         8          50   # 10        10          79
   # 12        12         113   # 14        14         154   # 16        16         201
   # 20        20         314   # 25        25         491   # 28        28         616
   # 32        32         801   # 40        40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 10413 mm^2 at 1.10%
   13 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
=========================================================
                 Pu          Mux         fMnx
   No.           kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       6421.7          0.0       3446.3  999.999
     2      -1461.3          0.0       1195.9  999.999

   *** Program completed as requested! ***
```

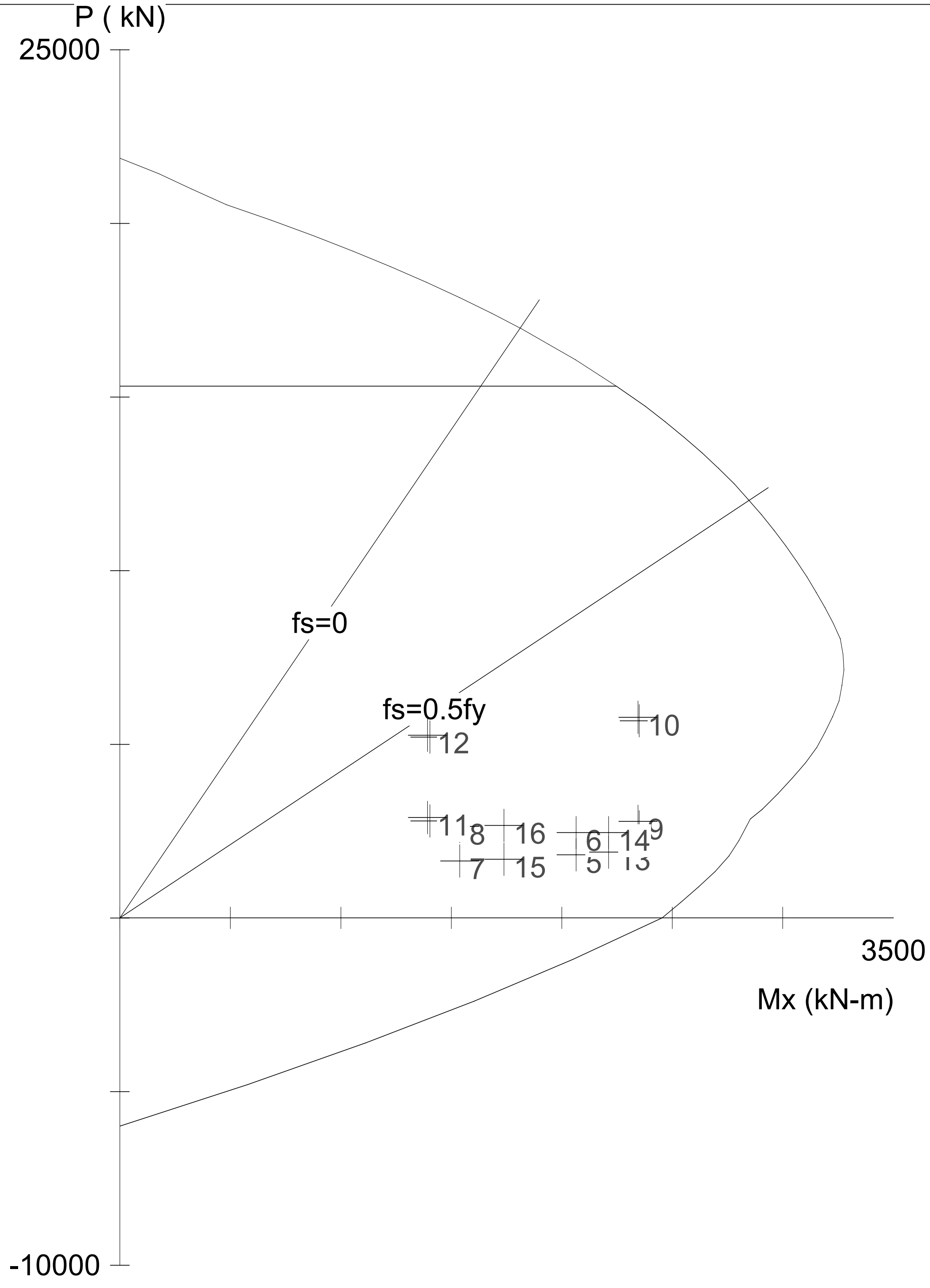
```
  General Information:
  ====================
     File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P7\P7B\P7B-3.COL
     Project:  BALARAJA FLYOVER
     Column:   P7B                         Engineer:
     Code:     ACI 318-95                  Units: Metric

     Run Option: Investigation             Slenderness: Not considered
     Run Axis:   X-axis                    Column Type: Structural

  Material Properties:
  ====================
     f'c   = 30 MPa                        fy   = 390 MPa
     Ec    = 25743 MPa                     Es   = 200000 MPa
     fc    = 25.5 MPa                      Rupture strain = Infinity
     Ultimate strain = 0.003 mm/mm
     Beta1 = 0.83245

  Section:
  ========
     Circular:    Diameter = 1100 mm

     Gross section area, Ag =  950332 mm^2
     Ix =  7.18688e+010 mm^4               Iy =  7.18688e+010 mm^4
     Xo =  0 mm                            Yo =  0 mm

  Reinforcement:
  ==============
     Rebar Database: prEN 10080
     Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
     ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
     #  6        6          28   #  8        8          50   # 10       10          79
     # 12       12         113   # 14       14         154   # 16       16         201
     # 20       20         314   # 25       25         491   # 28       28         616
     # 32       32         801   # 40       40        1256

     Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
     phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

     Layout: Circular
     Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
     Total steel area, As = 10413 mm^2 at 1.10%
     13 #32   Cover = 60 mm

  Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
  =========================================================
                  Pu          Mux         fMnx
     No.          kN         kN-m         kN-m   fMn/Mu
     --- ------------ ------------ ------------ --------
       1       6203.4          0.0       3410.9  999.999
       2      -1243.0          0.0       1285.3  999.999

     *** Program completed as requested! ***
```

P8 PORTAL COLUMN 1.1 M DIAMETER

TOP



1100 mm diam.



Code: ACI 318-95

Units: Metric

Run axis: About X-axis

Run option: Investigation

Slenderness: Not considered

Column type: Structural

Bars: prEN 10080

Date: 08/17/06

Time: 09:46:20

PCACOL V3.00 (PCA 1999) - Licensed to: KEI, MANILA, ST

File: C:\0-BALA~1\RC-DES~1\COLUMN\P8\P8T\P8T.COL

Project: BALARAJA FLYOVER

Column: P8T		Engineer:	
f'c = 30 MPa	fy = 390 MPa	Ag = 950332 mm^2	24 #32 bars
Ec = 25743 MPa	Es = 200000 MPa	As = 19224 mm^2	Rho = 2.02%
fc = 25.5 MPa	e_rup = Infinity	Xo = 0 mm	Iy = 7.19e+010 mm^4
e_u = 0.003 mm/mm		Yo = 0 mm	Iy = 7.19e+010 mm^4
Beta1 = 0.83245		Clear spacing = 92 mm	Clear cover = 60 mm
Confinement: Other	phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7		

```
OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO       OO   OO  OO       OO   OO  OO
OO    OO  OO       OOOOOOO  OO       OO   OO  OO
OOOOOOO   OO   OO  OO   OO  OO   OO  OO   OO  OO
OO        OO   OO  OO   OO  OO   OO  OO   OO  OO
OO         OOOOO   OO   OO   OOOOO    OOOOO   OOOOO  (TM)
```

==
Computer program for the Strength Design of Reinforced Concrete Sections
==

General Information:

File Name: C:\1-BALA~1\RC-DES~1\COLUMN\P8\P8T\P8T.COL
Project: BALARAJA FLYOVER
Column: P8T Engineer:
Code: ACI 318-95 Units: Metric

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:

f'c = 30 MPa fy = 390 MPa
Ec = 25743 MPa Es = 200000 MPa
fc = 25.5 MPa Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:

Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 Iy = 7.18688e+010 mm^4
Xo = 0 mm Yo = 0 mm

Reinforcement:

Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7

Layout: Circular
Pattern: All Sides Equal (Cover to longitudinal reinforcement)
Total steel area, As = 19224 mm^2 at 2.02%
24 #32 Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	2618.0	2349.3	2834.7	1.207
2	5674.0	2349.3	3215.6	1.369
3	2792.3	1402.7	2847.9	2.030
4	5204.3	1402.7	3178.4	2.266
5	1816.6	2064.2	2759.4	1.337
6	2455.2	2064.2	2821.3	1.367
7	1638.8	1537.5	2740.0	1.782
8	2633.0	1537.5	2835.9	1.844
9	2781.9	2344.2	2847.2	1.215
10	5774.2	2344.2	3223.0	1.375
11	2893.9	1391.8	2860.7	2.055
12	5259.2	1391.8	3182.9	2.287
13	1896.5	2210.6	2767.8	1.252
14	2453.9	2210.6	2821.1	1.276
15	1690.2	1737.5	2745.7	1.580

16	2660.2	1737.5	2838.0	1.633

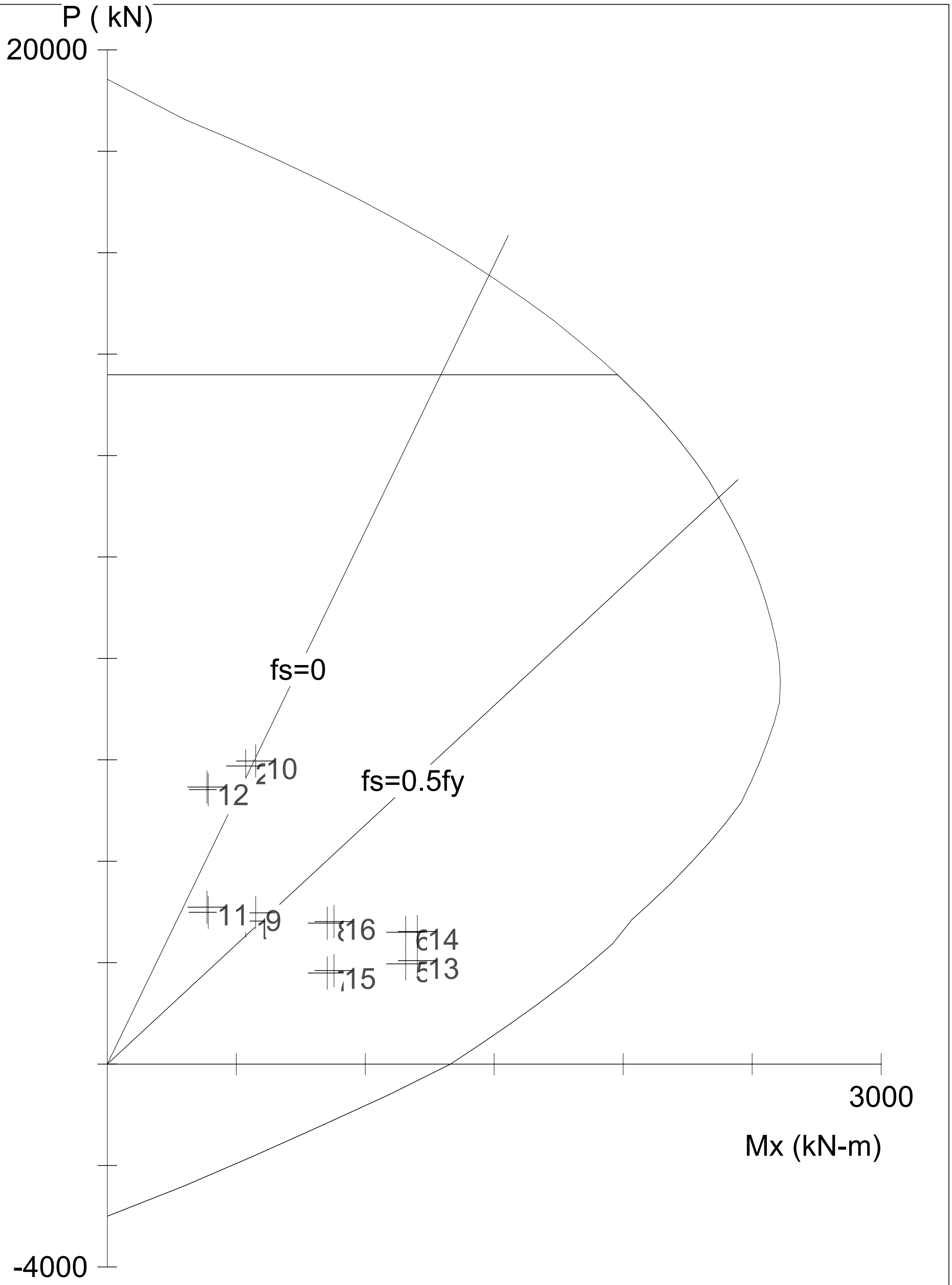
*** Program completed as requested! ***

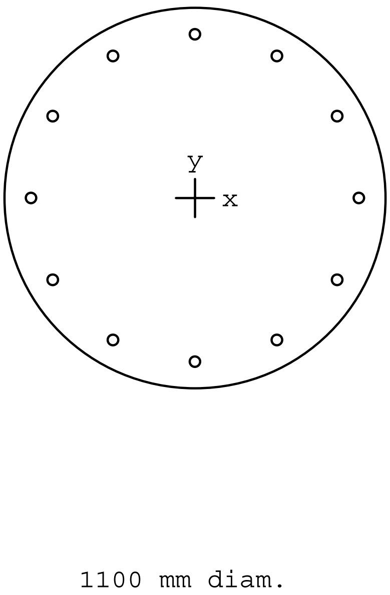
```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P8\P8T\P8T-1.COL
   Project:  BALARAJA FLYOVER
   Column:   P8T-Redesign                    Engineer:
   Code:     ACI 318-95                      Units: Metric

   Run Option: Investigation                 Slenderness: Not considered
   Run Axis:   X-axis                        Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                            fy   = 390 MPa
   Ec    = 25743 MPa                         Es   = 200000 MPa
   fc    = 25.5 MPa                          Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4                   Iy =  7.18688e+010 mm^4
   Xo =  0 mm                                Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6        6          28    #  8        8          50    # 10       10          79
   # 12       12         113    # 14       14         154    # 16       16         201
   # 20       20         314    # 25       25         491    # 28       28         616
   # 32       32         801    # 40       40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 19224 mm^2 at 2.02%
   24 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
=========================================================
                Pu          Mux         fMnx
   No.          kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       2298.8          0.0       3695.5  999.999
     2       2338.1          0.0       3704.2  999.999

   *** Program completed as requested! ***
```

```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P8\P8T\P8T-2.COL
   Project:  BALARAJA FLYOVER
   Column:   P8T                          Engineer:
   Code:     ACI 318-95                   Units: Metric

   Run Option: Investigation              Slenderness: Not considered
   Run Axis:   X-axis                     Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                         fy   = 390 MPa
   Ec    = 25743 MPa                      Es   = 200000 MPa
   fc    = 25.5 MPa                       Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4                Iy =  7.18688e+010 mm^4
   Xo =  0 mm                             Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6         6          28   #  8         8          50   # 10        10          79
   # 12        12         113   # 14        14         154   # 16        16         201
   # 20        20         314   # 25        25         491   # 28        28         616
   # 32        32         801   # 40        40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 19224 mm^2 at 2.02%
   24 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
=========================================================
                Pu          Mux         fMnx
   No.          kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       5290.0          0.0       4280.7  999.999
     2       -653.1          0.0       2853.5  999.999

   *** Program completed as requested! ***
```

```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P8\P8T\P8T-3.COL
   Project:  BALARAJA FLYOVER
   Column:   P8T                            Engineer:
   Code:     ACI 318-95                     Units: Metric

   Run Option: Investigation               Slenderness: Not considered
   Run Axis:   X-axis                      Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                          fy   = 390 MPa
   Ec    = 25743 MPa                       Es   = 200000 MPa
   fc    = 25.5 MPa                        Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4                 Iy =  7.18688e+010 mm^4
   Xo =  0 mm                              Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6        6          28   #  8        8          50   # 10       10          79
   # 12       12         113   # 14       14         154   # 16       16         201
   # 20       20         314   # 25       25         491   # 28       28         616
   # 32       32         801   # 40       40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 19224 mm^2 at 2.02%
   24 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
=========================================================
                Pu          Mux         fMnx
   No.           kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       5153.0          0.0       4259.7  999.999
     2       -516.1          0.0       2899.8  999.999

   *** Program completed as requested! ***
```

BASE





Code: ACI 318-95

Units: Metric

Run axis: About X-axis

Run option: Investigation

Slenderness: Not considered

Column type: Structural

Bars: prEN 10080

Date: 08/17/06

Time: 09:45:53

PCACOL V3.00 (PCA 1999) - Licensed to: KEI, MANILA, ST

File: C:\0-BALA~1\RC-DES~1\COLUMN\P8\P8B\P8B.COL

Project: BALARAJA FLYOVER

Column: P8B		Engineer:	
f'c = 30 MPa	fy = 390 MPa	Ag = 950332 mm^2	12 #32 bars
Ec = 25743 MPa	Es = 200000 MPa	As = 9612 mm^2	Rho = 1.01%
fc = 25.5 MPa	e_rup = Infinity	Xo = 0 mm	Iy = 7.19e+010 mm^4
e_u = 0.003 mm/mm		Yo = 0 mm	Iy = 7.19e+010 mm^4
Beta1 = 0.83245		Clear spacing = 213 mm	Clear cover = 60 mm

Confinement: Other phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7

```
0000000    00000    00000    00000    00000   00
00    00  00   00  00   00  00   00  00   00  00
00    00  00   00  00   00  00   00  00   00  00
00    00  00       00   00  00       00   00  00
00    00  00       0000000  00       00   00  00
0000000   00   00  00   00  00   00  00   00  00
00        00   00  00   00  00   00  00   00  00
00         00000   00   00   00000    00000   00000  (TM)
```

===

Computer program for the Strength Design of Reinforced Concrete Sections

===

General Information:

File Name: C:\1-BALA~1\RC-DES~1\COLUMN\P8\P8B\P8B.COL
Project: BALARAJA FLYOVER
Column: P8B Engineer:
Code: ACI 318-95 Units: Metric

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:

f'c = 30 MPa fy = 390 MPa
Ec = 25743 MPa Es = 200000 MPa
fc = 25.5 MPa Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:

Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 Iy = 7.18688e+010 mm^4
Xo = 0 mm Yo = 0 mm

Reinforcement:

Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7

Layout: Circular
Pattern: All Sides Equal (Cover to longitudinal reinforcement)
Total steel area, As = 9612 mm^2 at 1.01%
12 #32 Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	2821.3	536.7	2029.0	3.781
2	5877.3	536.7	2522.3	4.700
3	2993.9	391.4	2064.5	5.275
4	5409.8	391.4	2480.8	6.338
5	1976.1	1157.0	1868.0	1.615
6	2600.9	1157.0	1997.2	1.726
7	1796.8	852.5	1825.4	2.141
8	2780.2	852.5	2023.2	2.373
9	2983.6	575.2	2062.3	3.585
10	5976.4	575.2	2530.3	4.399
11	3094.7	386.6	2086.4	5.397
12	5462.7	386.6	2485.8	6.430
13	2042.1	1201.6	1883.3	1.567
14	2613.7	1201.6	1999.1	1.664
15	1843.6	878.7	1836.7	2.090

```
  16       2812.2        878.7       2027.8    2.308

 *** Program completed as requested! ***
```

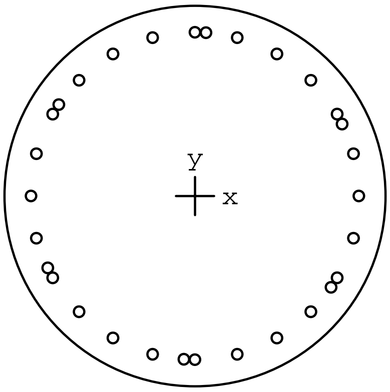
```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P8\P8B\P8B-1.COL
   Project:  BALARAJA FLYOVER
   Column:   P8B                            Engineer:
   Code:     ACI 318-95                     Units: Metric

   Run Option: Investigation                Slenderness: Not considered
   Run Axis:   X-axis                       Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                           fy   = 390 MPa
   Ec    = 25743 MPa                        Es   = 200000 MPa
   fc    = 25.5 MPa                         Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4                  Iy =  7.18688e+010 mm^4
   Xo =  0 mm                               Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6        6           28   #  8        8           50   # 10       10           79
   # 12       12          113   # 14       14          154   # 16       16          201
   # 20       20          314   # 25       25          491   # 28       28          616
   # 32       32          801   # 40       40         1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 9612 mm^2 at 1.01%
   12 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
=========================================================
                 Pu          Mux         fMnx
   No.           kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       2298.8          0.0       2426.1  999.999
     2       2338.1          0.0       2438.2  999.999

   *** Program completed as requested! ***
```

```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P8\P8B\P8B-2.COL
   Project:  BALARAJA FLYOVER
   Column:   P8B                       Engineer:
   Code:     ACI 318-95                Units: Metric

   Run Option: Investigation           Slenderness: Not considered
   Run Axis:   X-axis                  Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                      fy   = 390 MPa
   Ec    = 25743 MPa                   Es   = 200000 MPa
   fc    = 25.5 MPa                    Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4             Iy =  7.18688e+010 mm^4
   Xo =  0 mm                          Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6         6          28   #  8         8          50   # 10        10          79
   # 12        12         113   # 14        14         154   # 16        16         201
   # 20        20         314   # 25        25         491   # 28        28         616
   # 32        32         801   # 40        40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 9612 mm^2 at 1.01%
   12 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
=========================================================
                 Pu          Mux         fMnx
   No.           kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       5290.0          0.0       3160.4  999.999
     2       -653.1          0.0       1406.8  999.999

   *** Program completed as requested! ***
```

```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P8\P8B\P8B-3.COL
   Project:  BALARAJA FLYOVER
   Column:   P1                            Engineer:
   Code:     ACI 318-95                    Units: Metric

   Run Option: Investigation               Slenderness: Not considered
   Run Axis:   X-axis                      Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                          fy   = 390 MPa
   Ec    = 25743 MPa                       Es   = 200000 MPa
   fc    = 25.5 MPa                        Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4                 Iy =  7.18688e+010 mm^4
   Xo =  0 mm                              Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6         6          28   #  8         8          50   # 10        10          79
   # 12        12         113   # 14        14         154   # 16        16         201
   # 20        20         314   # 25        25         491   # 28        28         616
   # 32        32         801   # 40        40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 9612 mm^2 at 1.01%
   12 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
=========================================================
                 Pu          Mux         fMnx
   No.           kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       5153.0          0.0       3133.1  999.999
     2       -516.1          0.0       1463.2  999.999

   *** Program completed as requested! ***
```

P9 PORTAL COLUMN 1.1 M DIAMETER

TOP



1100 mm diam.

Code: ACI 318-95

Units: Metric

Run axis: About X-axis

Run option: Investigation

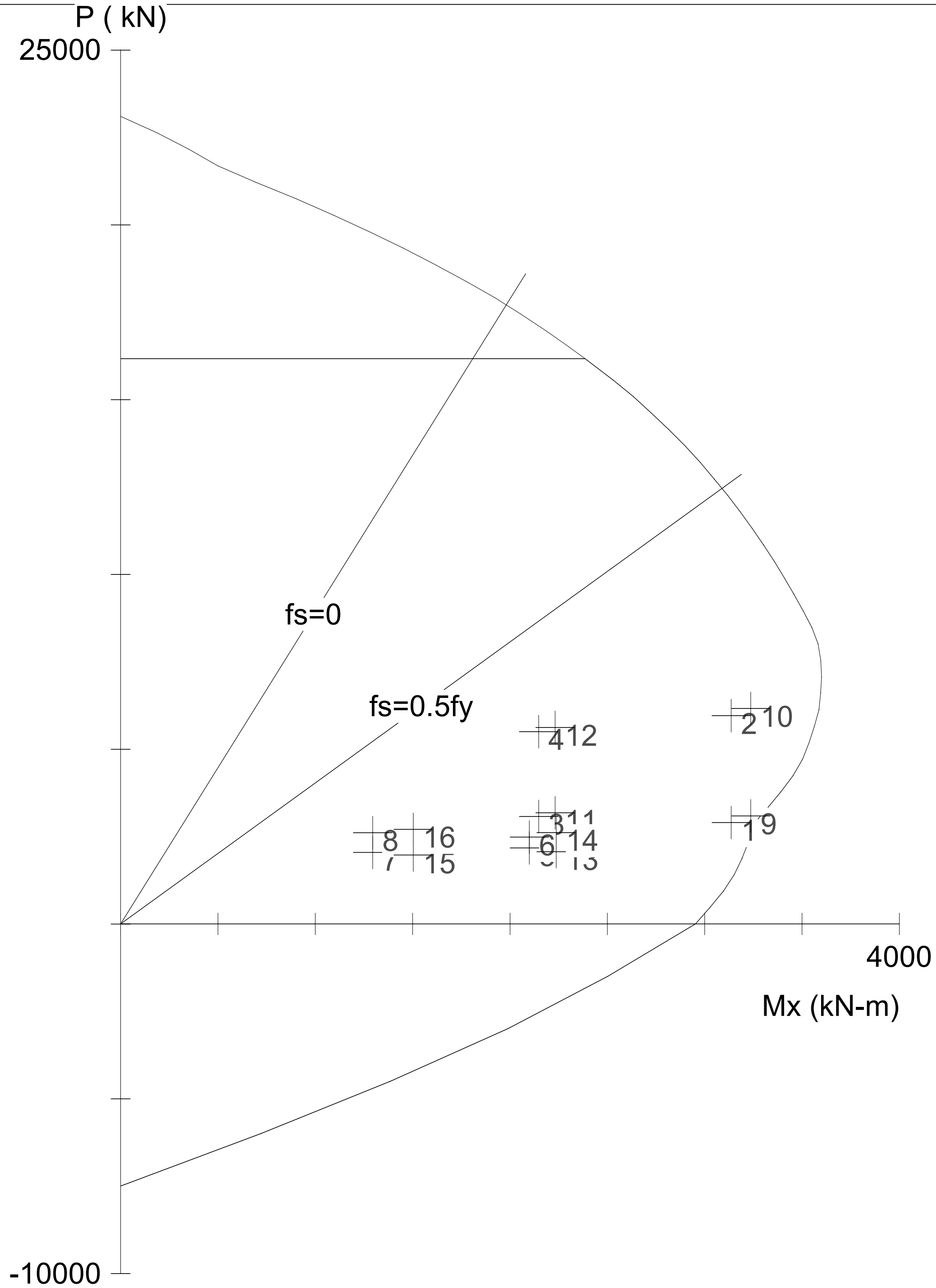
Slenderness: Not considered

Column type: Structural

Bars: prEN 10080

Date: 08/17/06

Time: 09:46:51



PCACOL V3.00 (PCA 1999) - Licensed to: KEI, MANILA, ST

File: C:\0-BALA~1\RC-DES~1\COLUMN\P9\P9T\P9T.COL

Project: BALARAJA FLYOVER

Column: P9T		Engineer:	
f'c = 30 MPa	fy = 390 MPa	Ag = 950332 mm^2	30 #32 bars
Ec = 25743 MPa	Es = 200000 MPa	As = 24030 mm^2	Rho = 2.53%
fc = 25.5 MPa	e_rup = Infinity	Xo = 0 mm	Iy = 7.19e+010 mm^4
e_u = 0.003 mm/mm		Yo = 0 mm	Iy = 7.19e+010 mm^4
Beta1 = 0.83245		Clear spacing = 0 mm	Clear cover = 60 mm
Confinement: Other	phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7		

```
OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO       OO   OO  OO       OO   OO  OO
OO    OO  OO       OOOOOOO  OO       OO   OO  OO
OOOOOOO   OO   OO  OO   OO  OO   OO  OO   OO  OO
OO        OO   OO  OO   OO  OO   OO  OO   OO  OO
OO         OOOOO   OO   OO   OOOOO    OOOOO   OOOOO  (TM)
```

==
Computer program for the Strength Design of Reinforced Concrete Sections
==

General Information:

File Name: C:\1-BALA~1\RC-DES~1\COLUMN\P9\P9T\P9T.COL
Project: BALARAJA FLYOVER
Column: P9T Engineer:
Code: ACI 318-95 Units: Metric

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:

f'c = 30 MPa fy = 390 MPa
Ec = 25743 MPa Es = 200000 MPa
fc = 25.5 MPa Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:

Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 Iy = 7.18688e+010 mm^4
Xo = 0 mm Yo = 0 mm

Reinforcement:

Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7

Pattern: Irregular

Total steel area, As = 24030 mm^2 at 2.53%

Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)
801	0	474	801	123	458	801	237	410
801	335	335	801	410	237	801	458	123
801	474	-0	801	458	-123	801	410	-237
801	335	-335	801	237	-410	801	123	-458
801	-0	-474	801	-123	-458	801	-237	-410
801	-335	-335	801	-410	-237	801	-458	-123
801	-474	0	801	-458	123	801	-410	237
801	-335	335	801	-237	410	801	-123	458
801	32	473	801	426	209	801	394	-264
801	-32	-473	801	-426	-209	801	-394	264

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	2900.7	3136.7	3259.4	1.039
2	5954.5	3136.7	3579.4	1.141
3	3075.6	2147.4	3286.6	1.531
4	5500.0	2147.4	3555.0	1.656
5	2175.1	2099.9	3214.0	1.531

6	2481.9	2099.9	3233.3	1.540
7	2047.3	1294.5	3204.9	2.476
8	2609.7	1294.5	3240.2	2.503
9	3087.0	3236.8	3288.4	1.016
10	6160.4	3236.8	3588.0	1.109
11	3180.9	2231.9	3302.8	1.480
12	5620.8	2231.9	3561.8	1.596
13	2065.6	2237.9	3206.2	1.433
14	2613.8	2237.9	3240.4	1.448
15	1971.6	1503.6	3199.3	2.128
16	2707.8	1503.6	3245.0	2.158

*** Program completed as requested! ***

General Information:

File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P9\P9T\P9T-1.COL
Project: BALARAJA FLYOVER
Column: P9T Engineer:
Code: ACI 318-95 Units: Metric

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:

f'c = 30 MPa fy = 390 MPa
Ec = 25743 MPa Es = 200000 MPa
fc = 25.5 MPa Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:

Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 Iy = 7.18688e+010 mm^4
Xo = 0 mm Yo = 0 mm

Reinforcement:

Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 1, phi(c) = 1

Pattern: Irregular

Total steel area, As = 24030 mm^2 at 2.53%

Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)
801	0	474	801	123	458	801	237	410
801	335	335	801	410	237	801	458	123
801	474	-0	801	458	-123	801	410	-237
801	335	-335	801	237	-410	801	123	-458
801	-0	-474	801	-123	-458	801	-237	-410
801	-335	-335	801	-410	-237	801	-458	-123
801	-474	0	801	-458	123	801	-410	237
801	-335	335	801	-237	410	801	-123	458
801	32	473	801	426	209	801	394	-264
801	-32	-473	801	-426	-209	801	-394	264

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	2491.5	0.0	4316.4	999.999
2	2502.7	0.0	4318.8	999.999

*** Program completed as requested! ***

General Information:
====================
File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P9\P9T\P9T-2.COL
Project: BALARAJA FLYOVER
Column: P9T Engineer:
Code: ACI 318-95 Units: Metric

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:
====================
f'c = 30 MPa fy = 390 MPa
Ec = 25743 MPa Es = 200000 MPa
fc = 25.5 MPa Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:
========
Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 Iy = 7.18688e+010 mm^4
Xo = 0 mm Yo = 0 mm

Reinforcement:
==============
Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 1, phi(c) = 1

Pattern: Irregular

Total steel area, As = 24030 mm^2 at 2.53%

Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)
801	0	474	801	123	458	801	237	410
801	335	335	801	410	237	801	458	123
801	474	-0	801	458	-123	801	410	-237
801	335	-335	801	237	-410	801	123	-458
801	-0	-474	801	-123	-458	801	-237	-410
801	-335	-335	801	-410	-237	801	-458	-123
801	-474	0	801	-458	123	801	-410	237
801	-335	335	801	-237	410	801	-123	458
801	32	473	801	426	209	801	394	-264
801	-32	-473	801	-426	-209	801	-394	264

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
===

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	5810.6	0.0	4903.6	999.999
2	-816.4	0.0	3463.0	999.999

*** Program completed as requested! ***

```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P9\P9T\P9T-3.COL
   Project:  BALARAJA FLYOVER
   Column:   P9T                        Engineer:
   Code:     ACI 318-95                 Units: Metric

   Run Option: Investigation            Slenderness: Not considered
   Run Axis:   X-axis                   Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                       fy   = 390 MPa
   Ec    = 25743 MPa                    Es   = 200000 MPa
   fc    = 25.5 MPa                     Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4              Iy =  7.18688e+010 mm^4
   Xo =  0 mm                           Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
```

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

```
   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Pattern: Irregular

   Total steel area, As = 24030 mm^2 at 2.53%
```

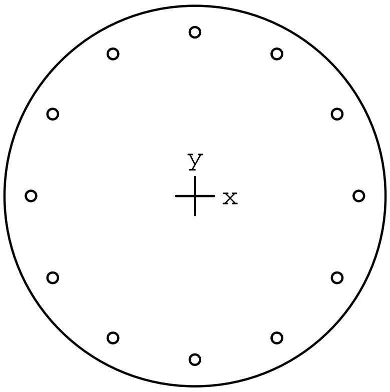
Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)	Area mm^2	X (mm)	Y (mm)
801	0	474	801	123	458	801	237	410
801	335	335	801	410	237	801	458	123
801	474	-0	801	458	-123	801	410	-237
801	335	-335	801	237	-410	801	123	-458
801	-0	-474	801	-123	-458	801	-237	-410
801	-335	-335	801	-410	-237	801	-458	-123
801	-474	0	801	-458	123	801	-410	237
801	-335	335	801	-237	410	801	-123	458
801	32	473	801	426	209	801	394	-264
801	-32	-473	801	-426	-209	801	-394	264

```
Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
=========================================================
```

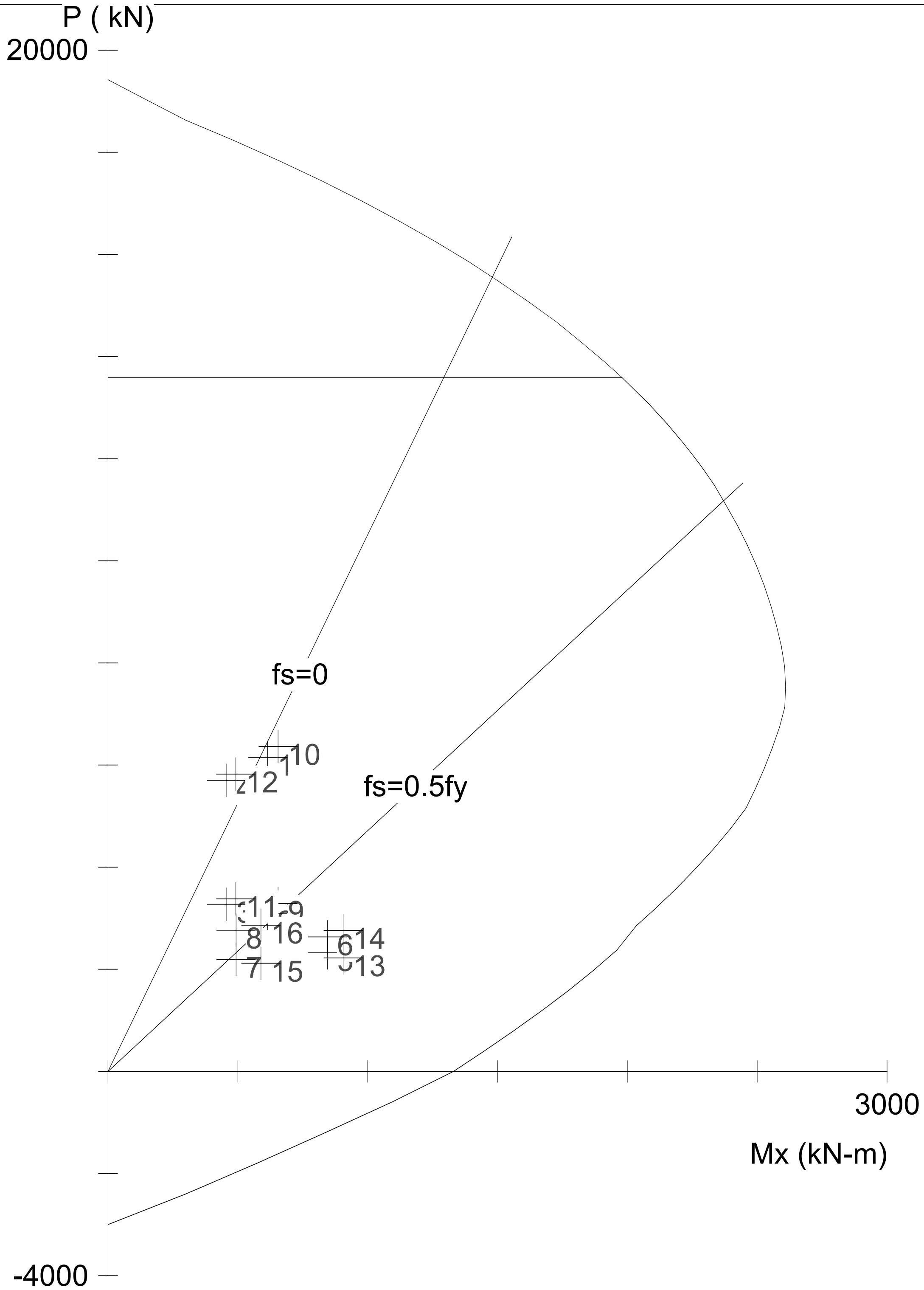
No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	5653.5	0.0	4881.8	999.999
2	-659.3	0.0	3507.1	999.999

*** Program completed as requested! ***

BASE



1100 mm diam.



Code: ACI 318-95

Units: Metric

Run axis: About X-axis

Run option: Investigation

Slenderness: Not considered

Column type: Structural

Bars: prEN 10080

Date: 08/17/06

Time: 09:47:14

PCACOL V3.00 (PCA 1999) - Licensed to: KEI, MANILA, ST

File: C:\0-BALA~1\RC-DES~1\COLUMN\P9\P9B\P9B.COL

Project: BALARAJA FLYOVER

Column: P9B		Engineer:	
f'c = 30 MPa	fy = 390 MPa	Ag = 950332 mm^2	12 #32 bars
Ec = 25743 MPa	Es = 200000 MPa	As = 9612 mm^2	Rho = 1.01%
fc = 25.5 MPa	e_rup = Infinity	Xo = 0 mm	Iy = 7.19e+010 mm^4
e_u = 0.003 mm/mm		Yo = 0 mm	Iy = 7.19e+010 mm^4
Beta1 = 0.83245		Clear spacing = 213 mm	Clear cover = 60 mm
Confinement: Other	phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7		

```
OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO       OO   OO  OO       OO   OO  OO
OO    OO  OO       OOOOOOO  OO       OO   OO  OO
OOOOOOO   OO   OO  OO   OO  OO   OO  OO   OO  OO
OO        OO   OO  OO   OO  OO   OO  OO   OO  OO
OO         OOOOO   OO   OO   OOOOO    OOOOO   OOOOO  (TM)
```

===
Computer program for the Strength Design of Reinforced Concrete Sections
===

General Information:

File Name: C:\1-BALA~1\RC-DES~1\COLUMN\P9\P9B\P9B.COL
Project: BALARAJA FLYOVER
Column: P9B Engineer:
Code: ACI 318-95 Units: Metric

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:

f'c = 30 MPa fy = 390 MPa
Ec = 25743 MPa Es = 200000 MPa
fc = 25.5 MPa Rupture strain = Infinity
Ultimate strain = 0.003 mm/mm
Beta1 = 0.83245

Section:

Circular: Diameter = 1100 mm

Gross section area, Ag = 950332 mm^2
Ix = 7.18688e+010 mm^4 Iy = 7.18688e+010 mm^4
Xo = 0 mm Yo = 0 mm

Reinforcement:

Rebar Database: prEN 10080

Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)	Size	Diam (mm)	Area (mm^2)
# 6	6	28	# 8	8	50	# 10	10	79
# 12	12	113	# 14	14	154	# 16	16	201
# 20	20	314	# 25	25	491	# 28	28	616
# 32	32	801	# 40	40	1256			

Confinement: User-defined; #6 ties with #25 bars, #6 with larger bars.
phi(a) = 0.7, phi(b) = 0.8, phi(c) = 0.7

Layout: Circular
Pattern: All Sides Equal (Cover to longitudinal reinforcement)
Total steel area, As = 9612 mm^2 at 1.01%
12 #32 Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)

No.	Pu kN	Mux kN-m	fMnx kN-m	fMn/Mu
1	6150.0	614.6	2543.9	4.139
2	3097.3	614.6	2086.9	3.396
3	3272.2	457.5	2124.1	4.643
4	5699.0	457.5	2507.1	5.480
5	2324.3	845.3	1947.5	2.304
6	2634.5	845.3	2002.1	2.369
7	2191.7	493.1	1918.7	3.891
8	2767.1	493.1	2021.4	4.099
9	3288.2	655.0	2127.5	3.248
10	6360.3	655.0	2559.1	3.907
11	3380.3	492.3	2146.8	4.361
12	5821.2	492.3	2517.6	5.114
13	2223.1	905.5	1925.6	2.127
14	2759.1	905.5	2020.2	2.231
15	2118.3	589.1	1900.7	3.226

```
      16       2863.9        589.1       2036.0    3.456

     *** Program completed as requested! ***
```

```
  General Information:
  ====================
     File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P9\P9B\P9B-1.COL
     Project:  BALARAJA FLYOVER
     Column:   P9B                           Engineer:
     Code:     ACI 318-95                    Units: Metric

     Run Option: Investigation               Slenderness: Not considered
     Run Axis:   X-axis                      Column Type: Structural

  Material Properties:
  ====================
     f'c   = 30 MPa                          fy   = 390 MPa
     Ec    = 25743 MPa                       Es   = 200000 MPa
     fc    = 25.5 MPa                        Rupture strain = Infinity
     Ultimate strain = 0.003 mm/mm
     Beta1 = 0.83245

  Section:
  ========
     Circular:    Diameter = 1100 mm

     Gross section area, Ag =  950332 mm^2
     Ix =  7.18688e+010 mm^4                 Iy =  7.18688e+010 mm^4
     Xo =  0 mm                              Yo =  0 mm

  Reinforcement:
  ==============
     Rebar Database: prEN 10080
     Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
     ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
     #  6        6          28    #  8        8          50    # 10       10          79
     # 12       12         113    # 14       14         154    # 16       16         201
     # 20       20         314    # 25       25         491    # 28       28         616
     # 32       32         801    # 40       40        1256

     Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
     phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

     Layout: Circular
     Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
     Total steel area, As = 9612 mm^2 at 1.01%
     12 #32   Cover = 60 mm

  Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
  ========================================================
                   Pu          Mux         fMnx
     No.           kN         kN-m         kN-m   fMn/Mu
     --- ------------ ------------ ------------ --------
       1       2491.5          0.0       2485.0  999.999
       2       2502.7          0.0       2488.4  999.999

     *** Program completed as requested! ***
```

```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P9\P9B\P9B-2.COL
   Project:  BALARAJA FLYOVER
   Column:   P9B                         Engineer:
   Code:     ACI 318-95                  Units: Metric

   Run Option: Investigation             Slenderness: Not considered
   Run Axis:   X-axis                    Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                        fy   = 390 MPa
   Ec    = 25743 MPa                     Es   = 200000 MPa
   fc    = 25.5 MPa                      Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4               Iy =  7.18688e+010 mm^4
   Xo =  0 mm                            Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6         6          28   #  8         8          50   # 10        10          79
   # 12        12         113   # 14        14         154   # 16        16         201
   # 20        20         314   # 25        25         491   # 28        28         616
   # 32        32         801   # 40        40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 9612 mm^2 at 1.01%
   12 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
========================================================
                 Pu          Mux         fMnx
   No.           kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1       5810.6          0.0       3257.5  999.999
     2       -816.4          0.0       1338.8  999.999

   *** Program completed as requested! ***
```

```
General Information:
====================
   File Name: D:\SHARE\0-BALA~1\RC-DES~1\COLUMN\P9\P9B\P9B-3.COL
   Project:  BALARAJA FLYOVER
   Column:   P9B                         Engineer:
   Code:     ACI 318-95                  Units: Metric

   Run Option: Investigation             Slenderness: Not considered
   Run Axis:   X-axis                    Column Type: Structural

Material Properties:
====================
   f'c   = 30 MPa                        fy   = 390 MPa
   Ec    = 25743 MPa                     Es   = 200000 MPa
   fc    = 25.5 MPa                      Rupture strain = Infinity
   Ultimate strain = 0.003 mm/mm
   Beta1 = 0.83245

Section:
========
   Circular:    Diameter = 1100 mm

   Gross section area, Ag =  950332 mm^2
   Ix =  7.18688e+010 mm^4               Iy =  7.18688e+010 mm^4
   Xo =  0 mm                            Yo =  0 mm

Reinforcement:
==============
   Rebar Database: prEN 10080
   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)   Size Diam (mm) Area (mm^2)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  6        6          28    #  8        8          50    # 10       10          79
   # 12       12         113    # 14       14         154    # 16       16         201
   # 20       20         314    # 25       25         491    # 28       28         616
   # 32       32         801    # 40       40        1256

   Confinement: User-defined; #6 ties with #25 bars,  #6 with larger bars.
   phi(a) = 0.7,  phi(b) = 1,  phi(c) = 1

   Layout: Circular
   Pattern: All Sides Equal  (Cover to longitudinal reinforcement)
   Total steel area, As = 9612 mm^2 at 1.01%
   12 #32   Cover = 60 mm

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
========================================================
               Pu          Mux         fMnx
   No.          kN         kN-m         kN-m   fMn/Mu
   --- ------------ ------------ ------------ --------
     1      5653.5          0.0       3228.8  999.999
     2      -659.3          0.0       1404.2  999.999

   *** Program completed as requested! ***
```

Serviceability Check

Notes on Serviceability Check for RC Columns

For reinforced concrete, AASHTO LRFD requires the following checks (refer Article 5.5.2):

- Control of cracking by distribution of reinforcement (Article 5.7.3.4)

  This article requires, for closely spaced reinforcement, that the tensile stress in the reinforcement is limited to $0.6f_y$.

  The Design Criteria established for the project (based on current Indonesian Standards and BMS) specifies that the allowable stress of reinforcing bars in tension shall be $0.5f_y$ or 170MPa, whichever is smaller. (Table 2.4.2-2)

  Given that for Grade 40 reinforcement f_y = 390MPa, the 170MPa allowable stress implies a limit of $0.43f_y$.

  The Design Criteria are therefore considered more onerous and will be applied for the serviceability checks on the columns.

- Control of deformations

  Deflection criteria for bridge decks are specified (Article 2.5.2.6)

  Deck joints and bearings shall accommodate dimensional changes.

No reference is made to the control of concrete or steel compressive stresses of reinforced concrete elements. For beams this is covered by the limits on reinforcement allowed to resist flexure, placing a corresponding limit on neutral axis depth and therefore adequately limiting compressive stresses given the strain compatibility requirements of the analysis and the limit on tensile stress given above.

For columns however the neutral axis depth depends upon the applied axial load. Compressive stresses are therefore not directly controlled by limits placed on tensile stress in reinforcement. For the serviceability checks on reinforced concrete columns the following has therefore been assumed:

- Allowable compressive stress in reinforcement is taken as the yield stress of the reinforcement
- A linear stress-strain relation is assumed for the concrete up to the characteristic stress of the concrete with a limiting strain in the order of 0.002 used in the analysis.

Two (2) cases have been considered:

1. Analysis of section under full load, including braking and centrifugal forces and temperature effects, with an allowable overstress of 40% i.e. 140% allowable stress limit
2. Analysis of section under vertical live load and pedestrian loads only, with an allowable overstress of nil i.e. 100% allowable stress limit.

The above overstress allowance is given in the Design Criteria (Table 2.4.6-1)

P1&P9 PORTAL COLUMN 1.1 M DIAMETER

TOP

Serviceability Check - Traffic Load Only

KATAHIRA & ENGINEERS INTERNATIONAL

Project: Detailed Design Study of North Java Corridor Flyover Project

Calculation: Balaraja Flyover
Serviceability Check - Traffic Load Only
1100 mm Dia Circular RC Column - P1 & P9 Top Section

Reference: Project Specific Design Criteria

Section Data

$MPa := 1000000 \cdot Pa$ $kN := 1000 \cdot N$

Input Item			
Concrete Compressive Strength	fc	30	MPa
Structural Steel Yield Strength	fys	250	MPa
Rebar Yield Strength	fy	390	MPa
Diameter of reinforced concrete section	D	1100	mm
Thickness of CHS section	t	0	mm
Diameter of rebar - layer 1	dia1	32	mm
Diameter of rebar - layer 2	dia2	0	mm
Number bars - layer 1 (max 100)	n1	30	
Number bars - layer 2 (max 100)	n2	0	
Cover from face of section - layer 1	cov1	60	mm
Cover from face of section - layer 2	cov2	115	mm

Load Data

Ref	Pier	Load Case	P	M	Stress
			kN	kNm	Allowance
1	P11	Combination 1 - P + Traffic Load Only	2918.0	837.2	100%
2	P11	Combination 1 - P + Traffic Load Only	2918.0	1685.7	100%
3	P12	Combination 1 - P + Traffic Load Only	2919.7	838.0	100%
4	P12	Combination 1 - P + Traffic Load Only	2919.7	1684.9	100%
5	P91	Combination 1 - P + Traffic Load Only	2954.0	1747.2	100%
6	P91	Combination 1 - P + Traffic Load Only	2954.0	937.3	100%
7	P92	Combination 1 - P + Traffic Load Only	3039.4	1776.7	100%
8	P92	Combination 1 - P + Traffic Load Only	3039.4	917.3	100%

$f_c := f_c \cdot MPa$ $f_{ys} := f_{ys} \cdot MPa$ $f_y := f_y \cdot MPa$ $D := D \cdot mm$ $ts := ts \cdot mm$

$dia1 := dia1 \cdot mm$ $dia2 := dia2 \cdot mm$ $cov1 := cov1 \cdot mm$ $cov2 := cov2 \cdot mm$

$P := P \cdot kN$ $M := M \cdot kN \cdot m$

$E_S := 200000 \cdot MPa$ $E_C := 4700 \sqrt{\frac{f_c}{MPa}} \cdot MPa$ Modular ratio $\alpha := \begin{cases} \frac{E_S}{E_C} & \text{if } E_C > 0 \\ 1 & \text{otherwise} \end{cases}$ $\alpha = 7.77$

$E_C = 25743\,MPa$

Calculate Basic Allowable Stresses

Calculate rupture stress: $\sigma_{ct} := 0.5 \cdot \left(\frac{f_c}{MPa}\right)^{\frac{2}{3}} \cdot MPa$ $\sigma_{ct} = 4.8\,MPa$

Calculate basic allowable stress of concrete $\sigma_{cc} := 1.0 \cdot f_c$ $\sigma_{cc} = 30.0\,MPa$

Calculate basic allowable tensile stress of rebar $\sigma_{rs} := \begin{cases} 0.5 \cdot f_y & \text{if } 0.5 \cdot f_y \le 170MPa \\ 170MPa & \text{otherwise} \end{cases}$ $\sigma_{rs} = 170\,MPa$

Calculate basic allowable compressive stress of rebar $\sigma_{rc} := \begin{cases} 0.5 \cdot f_y & \text{if } 0.5 \cdot f_y \le 110MPa \\ f_y & \text{otherwise} \end{cases}$ $\sigma_{rc} = 390\,MPa$

Calculate basic allowable stress of structural steel $\sigma_{ts} := -0.6 f_{ys}$ $\sigma_{ts} = -150\,MPa$

$\sigma_{tc} := 1 f_{ys}$ $\sigma_{tc} = 250\,MPa$

Limiting strain of rebar $\varepsilon_{rs} := -\frac{\sigma_{rs}}{E_S}$ $\varepsilon_{rs} = -0.000850$

$\varepsilon_{rc} := \frac{\sigma_{rc}}{E_S}$ $\varepsilon_{rc} = 0.001950$

Limiting strain of structural steel $\varepsilon_{ts} := \frac{\sigma_{ts}}{E_S}$ $\varepsilon_{ts} = -0.000750$

$\varepsilon_{tc} := \frac{\sigma_{tc}}{E_S}$ $\varepsilon_{tc} = 0.001250$

Concrete Cross Section Data - generated

$n := 50$ Number of Points - 50 points maximum

$i := 1..n+1$ Range from 1 to n+1

Ref.	X	Y	Ref.	X	Y
	mm	mm		mm	mm
1	0	-550	**26**	0	550
2	-69	-546	**27**	69	546
3	-137	-533	**28**	137	533
4	-202	-511	**29**	202	511
5	-265	-482	**30**	265	482
6	-323	-445	**31**	323	445
7	-377	-401	**32**	377	401
8	-424	-351	**33**	424	351
9	-464	-295	**34**	464	295
10	-498	-234	**35**	498	234
11	-523	-170	**36**	523	170
12	-540	-103	**37**	540	103
13	-549	-35	**38**	549	35
14	-549	35	**39**	549	-35
15	-540	103	**40**	540	-103
16	-523	170	**41**	523	-170
17	-498	234	**42**	498	-234
18	-464	295	**43**	464	-295
19	-424	351	**44**	424	-351
20	-377	401	**45**	377	-401
21	-323	445	**46**	323	-445
22	-265	482	**47**	265	-482
23	-202	511	**48**	202	-511
24	-137	533	**49**	137	-533
25	-69	546	**50**	69	-546

$k := 1..25$ $XS1 := XS1 \cdot mm$ $XS2 := XS2 \cdot mm$ $YS1 := YS1 \cdot mm$ $YS2 := YS2 \cdot mm$

$x_k := XS1_k$ $y_k := YS1_k$ $x_{k+25} := XS2_k$ $y_{k+25} := YS2_k$ $x_{n+1} := XS1_1$ $y_{n+1} := YS1_1$

Calculate Section Properties of Concrete Section

$$A_C := -\sum_{i=1}^{n} \left[\left(y_{i+1} - y_i\right) \cdot \frac{x_{i+1} + x_i}{2} \right]$$ $A_C = 0.94783\ m^2$

$$x_C := -\frac{1}{A_C} \cdot \sum_{i=1}^{n} \left[\frac{y_{i+1} - y_i}{8} \cdot \left[\left(x_{i+1} + x_i\right)^2 + \frac{\left(x_{i+1} - x_i\right)^2}{3} \right] \right]$$ $x_C = 0\ m$

$$y_C := \frac{1}{A_C} \cdot \sum_{i=1}^{n} \left[\frac{x_{i+1} - x_i}{8} \cdot \left[\left(y_{i+1} + y_i\right)^2 + \frac{\left(y_{i+1} - y_i\right)^2}{3} \right] \right]$$ $y_C = 0\ m$

$$I_x := \sum_{i=1}^{n} \left[\left[\left(x_{i+1} - x_i\right) \cdot \frac{y_{i+1} + y_i}{24} \right] \cdot \left[\left(y_{i+1} + y_i\right)^2 + \left(y_{i+1} - y_i\right)^2 \right] \right]$$ $I_x = 0.07149\ m^4$

$$I_y := -\sum_{i=1}^{n} \left[\left[\left(y_{i+1} - y_i\right) \cdot \frac{x_{i+1} + x_i}{24} \right] \cdot \left[\left(x_{i+1} + x_i\right)^2 + \left(x_{i+1} - x_i\right)^2 \right] \right]$$ $I_y = 0.07149\ m^4$

$$I_{xC} := I_x - A_C \cdot x_C^{\,2}$$ $I_{xC} = 0.07149\ m^4$

$$I_{yC} := I_y - A_C \cdot y_C^{\,2}$$ $I_{yC} = 0.07149\ m^4$

Steel Tube Cross Section Data - generated from input

$ns := 50$ Number of Points - 50 points maximum

$ps := 1 .. ns + 1$ Range from 1 to ns+1

Ref.	X	Y	Ref.	X	Y
	mm	mm		mm	mm
1	0	-550	**26**	0	-550
2	-142	-531	**27**	142	-531
3	-275	-476	**28**	275	-476
4	-389	-389	**29**	389	-389
5	-476	-275	**30**	476	-275
6	-531	-142	**31**	531	-142
7	-550	0	**32**	550	0
8	-531	142	**33**	531	142
9	-476	275	**34**	476	275
10	-389	389	**35**	389	389
11	-275	476	**36**	275	476
12	-142	531	**37**	142	531
13	0	550	**38**	0	550
14	142	531	**39**	-142	531
15	275	476	**40**	-275	476
16	389	389	**41**	-389	389
17	476	275	**42**	-476	275
18	531	142	**43**	-531	142
19	550	0	**44**	-550	0
20	531	-142	**45**	-531	-142
21	476	-275	**46**	-476	-275
22	389	-389	**47**	-389	-389
23	275	-476	**48**	-275	-476
24	142	-531	**49**	-142	-531
25	0	-550	**50**	0	-550

$XSS1 := XSS1 \cdot mm$ $XSS2 := XSS2 \cdot mm$ $YSS1 := YSS1 \cdot mm$ $YSS2 := YSS2 \cdot mm$

$z := 1 .. 25$ $xs_z := XSS1_z$ $ys_z := YSS1_z$

$z := 26 .. 50$ $xs_z := XSS2_{z-25}$ $ys_z := YSS2_{z-25}$

$xs_{ns+1} := XSS1_1$ $ys_{ns+1} := YSS1_1$

Calculate Section Properties of Steel Tube Section

$$A_{ST} := -\sum_{ps=1}^{ns}\left[\left(ys_{ps+1} - ys_{ps}\right)\cdot\frac{xs_{ps+1} + xs_{ps}}{2}\right] \qquad A_{ST} = 0\ m^2$$

$$x_{ST} := -\frac{1}{A_{ST}}\cdot\sum_{ps=1}^{ns}\left[\frac{ys_{ps+1} - ys_{ps}}{8}\cdot\left[\left(xs_{ps+1} + xs_{ps}\right)^2 + \frac{\left(xs_{ps+1} - xs_{ps}\right)^2}{3}\right]\right] \qquad x_{ST} = 0.2\ m$$

$$y_{ST} := \frac{1}{A_{ST}}\cdot\sum_{ps=1}^{ns}\left[\frac{xs_{ps+1} - xs_{ps}}{8}\cdot\left[\left(ys_{ps+1} + ys_{ps}\right)^2 + \frac{\left(ys_{ps+1} - ys_{ps}\right)^2}{3}\right]\right] \qquad y_{ST} = -0.011\ m$$

$$I_{xS} := \sum_{ps=1}^{ns}\left[\left[\left(xs_{ps+1} - xs_{ps}\right)\cdot\frac{ys_{ps+1} + ys_{ps}}{24}\right]\cdot\left[\left(ys_{ps+1} + ys_{ps}\right)^2 + \left(ys_{ps+1} - ys_{ps}\right)^2\right]\right]$$

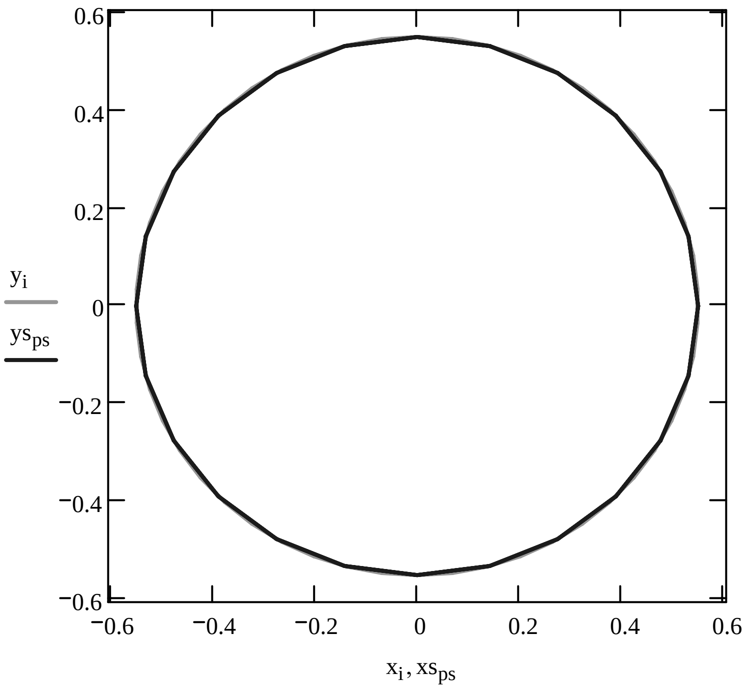
$$I_{xS} = 0\ m^4$$

$$I_{yS} := -\sum_{ps=1}^{ns}\left[\left[\left(ys_{ps+1} - ys_{ps}\right)\cdot\frac{xs_{ps+1} + xs_{ps}}{24}\right]\cdot\left[\left(xs_{ps+1} + xs_{ps}\right)^2 + \left(xs_{ps+1} - xs_{ps}\right)^2\right]\right]$$

$$I_{yS} = 0\ m^4$$

$$I_{xS} := I_{xS} - A_{ST}\cdot x_{ST}^2 \qquad I_{xS} = 0\ m^4$$

$$I_{yS} := I_{yS} - A_{ST}\cdot y_{ST}^2 \qquad I_{yS} = 0.00000\ m^4$$



Rebar Data Layer 1 - generated from input

Ref	Area mm2	X mm	Y mm	Ref	Area mm2	X mm	Y mm
1	804	0	-474	51	0	0	0
2	804	-99	-464	52	0	0	0
3	804	-193	-433	53	0	0	0
4	804	-279	-383	54	0	0	0
5	804	-352	-317	55	0	0	0
6	804	-410	-237	56	0	0	0
7	804	-451	-146	57	0	0	0
8	804	-471	-50	58	0	0	0
9	804	-471	50	59	0	0	0
10	804	-451	146	60	0	0	0
11	804	-410	237	61	0	0	0
12	804	-352	317	62	0	0	0
13	804	-279	383	63	0	0	0
14	804	-193	433	64	0	0	0
15	804	-99	464	65	0	0	0
16	804	0	474	66	0	0	0
17	804	99	464	67	0	0	0
18	804	193	433	68	0	0	0
19	804	279	383	69	0	0	0
20	804	352	317	70	0	0	0
21	804	410	237	71	0	0	0
22	804	451	146	72	0	0	0
23	804	471	50	73	0	0	0
24	804	471	-50	74	0	0	0
25	804	451	-146	75	0	0	0
26	804	410	-237	76	0	0	0
27	804	352	-317	77	0	0	0
28	804	279	-383	78	0	0	0
29	804	193	-433	79	0	0	0
30	804	99	-464	80	0	0	0
31	0	0	0	81	0	0	0
32	0	0	0	82	0	0	0
33	0	0	0	83	0	0	0
34	0	0	0	84	0	0	0
35	0	0	0	85	0	0	0
36	0	0	0	86	0	0	0
37	0	0	0	87	0	0	0
38	0	0	0	88	0	0	0
39	0	0	0	89	0	0	0
40	0	0	0	90	0	0	0
41	0	0	0	91	0	0	0
42	0	0	0	92	0	0	0
43	0	0	0	93	0	0	0
44	0	0	0	94	0	0	0
45	0	0	0	95	0	0	0
46	0	0	0	96	0	0	0
47	0	0	0	97	0	0	0
48	0	0	0	98	0	0	0
49	0	0	0	99	0	0	0
50	0	0	0	100	0	0	0

Rebar Data Layer 2 - generated from input

Ref	Area mm2	X mm	Y mm	Ref	Area mm2	X mm	Y mm
1	0	0	0	51	0	0	0
2	0	0	0	52	0	0	0
3	0	0	0	53	0	0	0
4	0	0	0	54	0	0	0
5	0	0	0	55	0	0	0
6	0	0	0	56	0	0	0
7	0	0	0	57	0	0	0
8	0	0	0	58	0	0	0
9	0	0	0	59	0	0	0
10	0	0	0	60	0	0	0
11	0	0	0	61	0	0	0
12	0	0	0	62	0	0	0
13	0	0	0	63	0	0	0
14	0	0	0	64	0	0	0
15	0	0	0	65	0	0	0
16	0	0	0	66	0	0	0
17	0	0	0	67	0	0	0
18	0	0	0	68	0	0	0
19	0	0	0	69	0	0	0
20	0	0	0	70	0	0	0
21	0	0	0	71	0	0	0
22	0	0	0	72	0	0	0
23	0	0	0	73	0	0	0
24	0	0	0	74	0	0	0
25	0	0	0	75	0	0	0
26	0	0	0	76	0	0	0
27	0	0	0	77	0	0	0
28	0	0	0	78	0	0	0
29	0	0	0	79	0	0	0
30	0	0	0	80	0	0	0
31	0	0	0	81	0	0	0
32	0	0	0	82	0	0	0
33	0	0	0	83	0	0	0
34	0	0	0	84	0	0	0
35	0	0	0	85	0	0	0
36	0	0	0	86	0	0	0
37	0	0	0	87	0	0	0
38	0	0	0	88	0	0	0
39	0	0	0	89	0	0	0
40	0	0	0	90	0	0	0
41	0	0	0	91	0	0	0
42	0	0	0	92	0	0	0
43	0	0	0	93	0	0	0
44	0	0	0	94	0	0	0
45	0	0	0	95	0	0	0
46	0	0	0	96	0	0	0
47	0	0	0	97	0	0	0
48	0	0	0	98	0	0	0
49	0	0	0	99	0	0	0
50	0	0	0	100	0	0	0

$A1 := A1 \cdot mm^2$ $\quad A2 := A2 \cdot mm^2$ $\quad A3 := A3 \cdot mm^2$ $\quad A4 := A4 \cdot mm^2$

$X1 := X1 \cdot mm$ $\quad X2 := X2 \cdot mm$ $\quad X3 := X3 \cdot mm$ $\quad X4 := X4 \cdot mm$

$Y1 := Y1 \cdot mm$ $\quad Y2 := Y2 \cdot mm$ $\quad Y3 := Y3 \cdot mm$ $\quad Y4 := Y4 \cdot mm$

$k := 1 .. 50$ $\quad A_{bar_k} := A1_k$ $\quad x_{bar_k} := X1_k$ $\quad y_{bar_k} := Y1_k$

$A_{bar_{k+50}} := A2_k$ $\quad x_{bar_{k+50}} := X2_k$ $\quad y_{bar_{k+50}} := Y2_k$

$A_{bar_{k+100}} := A3_k$ $\quad x_{bar_{k+100}} := X3_k$ $\quad y_{bar_{k+100}} := Y3_k$

$A_{bar_{k+150}} := A4_k$ $\quad x_{bar_{k+150}} := X4_k$ $\quad y_{bar_{k+150}} := Y4_k$

Calculate Section Properties of Reinforcement

$$A_{BAR} := \sum_{j=1}^{200} A_{bar_j} \qquad A_{BAR} = 24127\,mm^2$$

$$\rho := \frac{A_{BAR}}{A_C} \qquad \rho = 0.0255$$

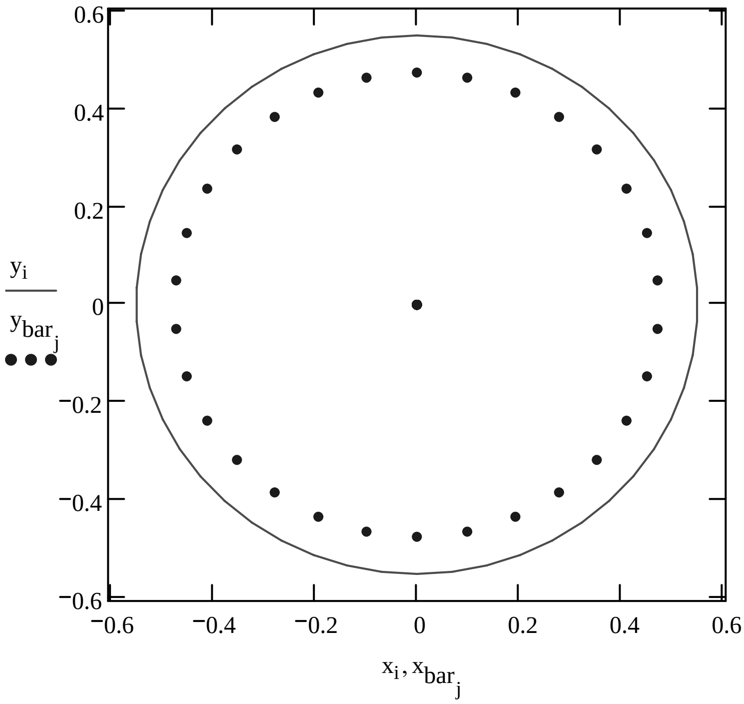
$$x_b := \begin{cases} \left[\sum_{j=1}^{200} \left(A_{bar_j} \cdot x_{bar_j}\right)\right] \cdot \dfrac{1}{A_{BAR}} & \text{if } A_{BAR} > 0 \\ 0m & \text{otherwise} \end{cases} \qquad x_b = 0\ m$$

$$y_b := \begin{cases} \left[\sum_{j=1}^{200} \left(A_{bar_j} \cdot y_{bar_j}\right)\right] \cdot \dfrac{1}{A_{BAR}} & \text{if } A_{BAR} > 0 \\ 0m & \text{otherwise} \end{cases} \qquad y_b = 0\ m$$

$$I_{xb} := \sum_{j=1}^{200} \left[A_{bar_j} \cdot \left(x_{bar_j}\right)^2\right] + A_{BAR} \cdot x_b^2 \qquad I_{xb} = 0.00271\,m^4$$

$$I_{yb} := \sum_{j=1}^{200} \left[A_{bar_j} \cdot \left(y_{bar_j}\right)^2\right] + A_{BAR} \cdot y_b^2 \qquad I_{yb} = 0.00271\,m^4$$

$j := 1 .. 200$



Calculate Composite Section Properties (before cracking)

Effective area $A_E := A_C \cdot [1 + \rho \cdot (\alpha - 1)] + A_{ST} \cdot \alpha$ $\qquad A_E = 1111154\,mm^2$

Effective centroid $x_E := \dfrac{A_C \cdot [(1-\rho) \cdot x_C + \rho \cdot x_b \cdot \alpha] + A_{ST} \cdot \alpha \cdot x_{ST}}{A_E}$ $\qquad x_E = 0.000\,m$

$y_E := \dfrac{A_C \cdot [(1-\rho) \cdot y_C + \rho \cdot y_b \cdot \alpha] + A_{ST} \cdot \alpha \cdot x_{ST}}{A_E}$ $\qquad y_E = 0.000\,m$

Effective stiffness $I_{EX} := I_{xC} + I_{xb} \cdot (\alpha - 1) + A_C \cdot \left[(1-\rho) \cdot x_C^2 + \rho \cdot x_b^2 \cdot \alpha\right] + \left(I_{xS} + A_{ST} \cdot x_{ST}^2\right) \cdot \alpha$

$I_{EX} = 0\ m^4$

$I_{EY} := I_{yC} + I_{yb} \cdot (\alpha - 1) + A_C \cdot \left[(1-\rho) \cdot y_C^2 + \rho \cdot y_b^2 \cdot \alpha\right] + \left(I_{yS} + A_{ST} \cdot y_{ST}^2\right) \cdot \alpha$

$I_{EY} = 0\ m^4$

Distance from extreme concrete fiber to centroid

$xF_{pos} := \max(x - x_E)$ $\qquad xF_{neg} := \min(x - x_E)$

$yF_{pos} := \max(y - y_E)$ $\qquad yF_{neg} := \min(y - y_E)$

Total depth of concrete section

$H_{CX} := xF_{pos} - xF_{neg}$ $\qquad H_{CX} = 1\ m$

$H_{CY} := yF_{pos} - yF_{neg}$ $\qquad H_{CY} = 1\ m$

Section modulus

$$Z_{Xpos} := \frac{I_{EX}}{xF_{pos}} \qquad Z_{Xneg} := \frac{I_{EX}}{xF_{neg}}$$

$$Z_{Ypos} := \frac{I_{EY}}{yF_{pos}} \qquad Z_{Yneg} := \frac{I_{EY}}{yF_{neg}}$$

Thickness of steel tube:

$ts := y_1 - ys_1$ $\qquad ts = 0\,mm$

Establish Section Dimensions

Positive case - determine coord of extreme concrete fiber $\quad y_{Epos} := max(y) \quad y_{Epos} = 550\,mm$

Negative case - determine coord of extreme concrete fiber $\quad y_{Eneg} := min(y) \quad y_{Eneg} = -550\,mm$

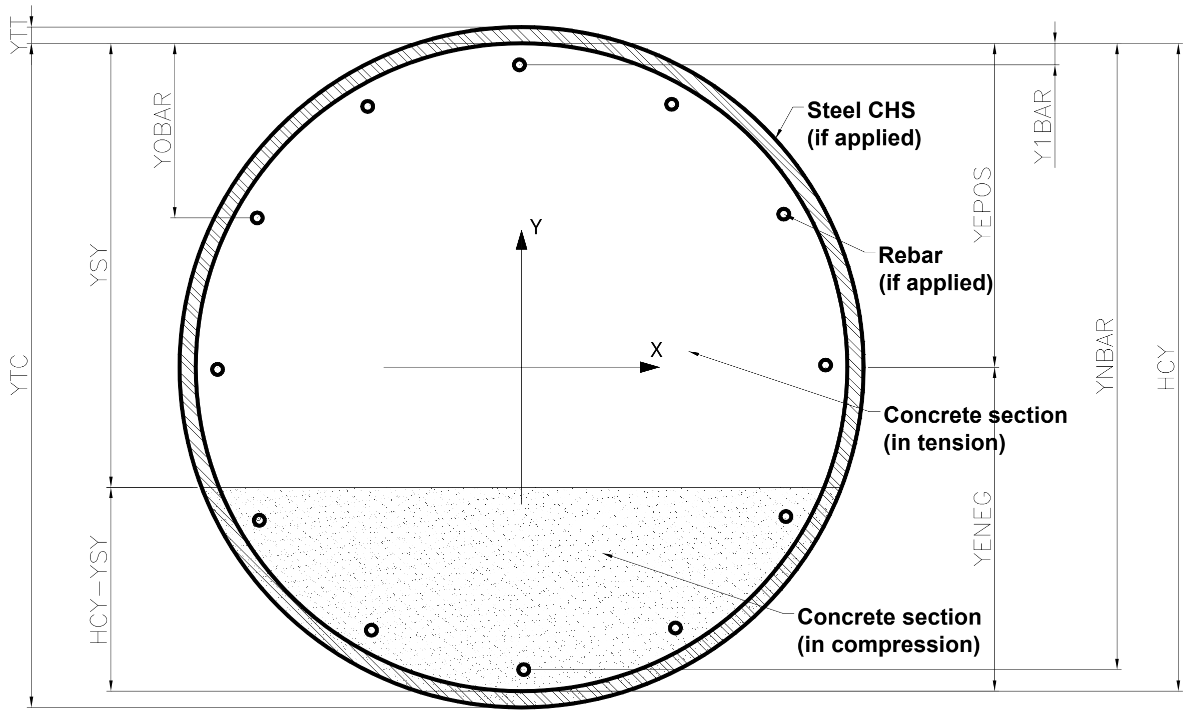
Offsets of rebar from extreme fiber $\quad y_{Obar} := y_{Epos} - y_{bar}$

Determine most extreme rebar (minimum offset) $\quad y_{1bar} := min(y_{Epos} - y_{bar}) \quad y_{1bar} = 76\,mm$

Determine most extreme rebar (maximum offset) $\quad y_{nbar} := max(y_{Epos} - y_{bar}) \quad y_{nbar} = 1024\,mm$

Offsets of extreme steel tube fiber from extreme concrete fiber $\quad y_{tt} := ts \quad y_{tt} = 0\,mm$

$y_{tc} := H_{CY} + ts \quad y_{tc} = 1100\,mm$



ASSIGN NEUTRAL AXIS VALUES

Number of sections to analysed $ns := 500$

$q := 2..ns$

Distance of neutral axis from extreme fiber in tension $y_{SY_q} := H_{CY} \cdot \frac{q}{ns + 1}$

Calculate stresses and strains in reinforcement and concrete at extreme fibers

Calculate strain at extreme compression fiber assuming max allowable stress in concrete:

Trial value of concrete strain

$$\varepsilon cc := \frac{\sigma_{cc}}{E_C} \cdot 2 \qquad \frac{\sigma_{cc}}{E_C} = 0.001165$$

Given

$$\sigma_{cc} = \varepsilon cc \cdot \left(4700 \sqrt{\frac{f_c \cdot 2}{MPa}} - \frac{4700^2}{2.68} \cdot \varepsilon cc\right) \cdot MPa$$

$$\varepsilon_{cc} := Find(\varepsilon cc) \qquad \varepsilon_{cc} = 0.003321$$

$$\varepsilon_{cc} := \begin{cases} \varepsilon_{tc} & \text{if } (f_c = 0) \cdot (A_{BAR} = 0) \\ \varepsilon_{rc} & \text{if } (f_c = 0) \cdot (ts = 0) \\ \varepsilon_{cc} & \text{otherwise} \end{cases} \qquad \varepsilon_{cc} = 0.003321$$

Strain at other stresses taken to be linear:

$$\varepsilon cc(f_c, \sigma_{cd}) := \begin{cases} \frac{\sigma_{cd}}{\sigma_{tc}} \cdot \varepsilon_{tc} & \text{if } (f_c = 0) \cdot (A_{BAR} = 0) \\ \frac{\sigma_{cd}}{\sigma_{rc}} \cdot \varepsilon_{rc} & \text{if } (f_c = 0) \cdot (ts = 0) \\ \frac{\sigma_{cd}}{\sigma_{cc}} \cdot \varepsilon_{cc} & \text{otherwise} \end{cases}$$

Calculate strain in steel tube assuming max allowable stress in concrete:

In compression $$\varepsilon_{tcc_q} := \varepsilon_{cc} \cdot \frac{y_{tc} - y_{SY_q}}{H_{CY} - y_{SY_q}}$$

In tension $$\varepsilon_{tct_q} := \varepsilon_{cc} \cdot \frac{-\left(y_{SY_q} + y_{tt}\right)}{H_{CY} - y_{SY_q}}$$

Calculate strain in rebar assuming max allowable stress in concrete:

In compression $\varepsilon_{rcc_q} := \varepsilon_{cc} \cdot \dfrac{y_{nbar} - y_{SY_q}}{H_{CY} - y_{SY_q}}$

In tension $\varepsilon_{rct_q} := \varepsilon_{cc} \cdot \dfrac{y_{1bar} - y_{SY_q}}{H_{CY} - y_{SY_q}}$

Calculate design max stress in compression taking account of other limits:

$$
\sigma cd(\varepsilon_{tcc}, q) := \left|
\begin{array}{l}
\sigma_{cd} \leftarrow \sigma_{cc} \ \text{ if } \ f_c > 0 \\
\sigma_{cd} \leftarrow \sigma_{tc} \ \text{ if } \ (f_c = 0)\cdot(A_{BAR} = 0) \\
\sigma_{cd} \leftarrow \sigma_{rc} \ \text{ if } \ (f_c = 0)\cdot(ts = 0) \\
\sigma_{cd} \leftarrow \sigma_{cd} \cdot \dfrac{\varepsilon_{tc}}{\varepsilon_{tcc}} \ \text{ if } \ (\varepsilon_{tcc} > \varepsilon_{tc})\cdot(ts > 0) \\
\sigma_{cd} \leftarrow \sigma_{cd} \cdot \dfrac{\varepsilon_{rc}}{\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{y_{nbar} - y_{SY_q}}{H_{CY} - y_{SY_q}}} \ \text{ if } \ \left(\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{y_{nbar} - y_{SY_q}}{H_{CY} - y_{SY_q}} > \varepsilon_{rc}\right)\cdot(A_{BAR} > 0) \\
\sigma_{cd} \leftarrow \sigma_{cd} \cdot \dfrac{\varepsilon_{ts}}{\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{-(y_{SY_q} + y_{tt})}{H_{CY} - y_{SY_q}}} \ \text{ if } \ \left[\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{-(y_{SY_q} + y_{tt})}{H_{CY} - y_{SY_q}} < \varepsilon_{ts}\right]\cdot(ts > 0) \\
\sigma_{cd} \leftarrow \sigma_{cd} \cdot \dfrac{\varepsilon_{rs}}{\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{-(y_{SY_q} - y_{1bar})}{H_{CY} - y_{SY_q}}} \ \text{ if } \ \left[\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{-(y_{SY_q} - y_{1bar})}{H_{CY} - y_{SY_q}} < \varepsilon_{rs}\right]\cdot(A_{BAR} > 0) \\
\sigma_{cc} \ \text{ otherwise}
\end{array}
\right.
$$

$\sigma_{cd_q} := \sigma cd(\varepsilon_{tcc_q}, q)$

CALCULATE FORCES AND MOMENTS AT EACH NEUTRAL AXIS LOCATION

Calculate force in concrete:

$$F_{C_q} := \begin{cases} \displaystyle\int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot(1-\rho)\cdot\left[\frac{\sigma_{cd_q}\cdot\left[y+\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{H_{CY}-y_{SY_q}}\right] dy & \text{if } f_c > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate moment from concrete about column centroid:

$$M_{C_q} := \begin{cases} \displaystyle\int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot(1-\rho)\cdot\left[\frac{\sigma_{cd_q}\cdot\left[y+\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{H_{CY}-y_{SY_q}}\right]\cdot y\, dy & \text{if } f_c > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate strain in rebar assuming design max stress in concrete:

$$y_{SY_q} := \begin{cases} y_{nbar}\cdot\frac{q}{ns+1} & \text{if } (f_c = 0)\cdot(A_{BAR} > 0) \\ y_{SY_q} & \text{otherwise} \end{cases}$$

$$\varepsilon_{S_{j,q}} := \begin{cases} -\frac{y_{SY_q} - y_{Obar_j}}{y_{nbar} - y_{SY_q}}\cdot\varepsilon cc\left(f_c, \sigma_{cd_q}\right) & \text{if } f_c = 0 \\ -\frac{y_{SY_q} - y_{Obar_j}}{H_{CY} - y_{SY_q}}\cdot\varepsilon cc\left(f_c, \sigma_{cd_q}\right) & \text{otherwise} \end{cases}$$

Calculate force in each rebar:

$$F_{S_{j,q}} := \begin{cases} \varepsilon_{S_{j,q}} E_S\cdot A_{bar_j} & \text{if } A_{BAR} > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate total force in reinforcement:

$$F_{R_q} := \sum_j F_{S_{j,q}}$$

Calculate moment from reinforcement about section centroid:

$$M_{R_q} := \begin{cases} \sum_j -\left(\varepsilon_{S_{j,q}} E_S \cdot A_{bar_j} \cdot y_{bar_j}\right) & \text{if } A_{BAR} > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate strain in steel tube at extreme tension fiber:

$$\varepsilon_{tds_q} := \frac{-\left(y_{SY_q} + y_{tt}\right)}{H_{CY} - y_{SY_q}} \varepsilon cc\left(f_c, \sigma_{cd_q}\right)$$

Calculate strain in steel tube at extreme compression fiber:

$$\varepsilon_{tdc_q} := \frac{y_{tc} - y_{SY_q}}{H_{CY} - y_{SY_q}} \varepsilon cc\left(f_c, \sigma_{cd_q}\right)$$

Calculate tensile force in steel tube:

$$F_{TS1_q} := \int_{\left(\frac{H_{CY}}{2} - y_{SY_q}\right)}^{\frac{H_{CY}}{2} + y_{tt}} 2\sqrt{\left(\frac{H_{CY}}{2} + y_{tt}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tds_q} \cdot E_S \cdot \left[y - \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{y_{SY_q} + y_{tt}}\right] dy$$

$$F_{TS2_q} := \int_{\left(\frac{H_{CY}}{2} - y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tds_q} \cdot E_S \cdot \left[y - \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{y_{SY_q} + y_{tt}}\right] dy$$

$$F_{TS} := \begin{cases} F_{TS1} - F_{TS2} & \text{if } ts > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate compressive force in steel tube:

$$F_{TC1_q} := \int_{-\left(\frac{H_{CY}}{2} - y_{SY_q}\right)}^{\frac{H_{CY}}{2} + y_{tt}} 2\sqrt{\left(\frac{H_{CY}}{2} + y_{tt}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tdc_q} \cdot E_S \cdot \left[y + \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{H_{CY} - y_{SY_q} + y_{tt}}\right] dy$$

$$F_{TC2_q} := \int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot\left[\frac{\varepsilon_{tdc_q}\cdot E_S\cdot\left[y+\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{H_{CY}-y_{SY_q}+y_{tt}}\right] dy$$

$$F_{TC} := \begin{cases} F_{TC1} - F_{TC2} & \text{if } ts > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate moment from tensile force in steel tube:

$$M_{TS1_q} := \int_{\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}+y_{tt}} -2\sqrt{\left(\frac{H_{CY}}{2}+y_{tt}\right)^2 - y^2}\cdot\left[\frac{\varepsilon_{tds_q}\cdot E_S\cdot\left[y-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{y_{SY_q}+y_{tt}}\right]\cdot y\, dy$$

$$M_{TS2_q} := \int_{\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} -2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot\left[\frac{\varepsilon_{tds_q}\cdot E_S\cdot\left[y-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{y_{SY_q}+y_{tt}}\right]\cdot y\, dy$$

$$M_{TS} := \begin{cases} M_{TS1} - M_{TS2} & \text{if } ts > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate moment from compressive force in steel tube:

$$M_{TC1_q} := \int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}+y_{tt}} 2\sqrt{\left(\frac{H_{CY}}{2}+y_{tt}\right)^2 - y^2}\cdot\left[\frac{\varepsilon_{tdc_q}\cdot E_S\cdot\left[y+\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{H_{CY}-y_{SY_q}+y_{tt}}\right]\cdot y\, dy$$

$$M_{TC2_q} := \int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot\left[\frac{\varepsilon_{tdc_q}\cdot E_S\cdot\left[y+\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{H_{CY}-y_{SY_q}+y_{tt}}\right]\cdot y\, dy$$

$$M_{TC} := \begin{cases} M_{TC1} - M_{TC2} & \text{if } ts > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calate total axial response from section:

$$F_T := F_C + F_R + F_{TS} + F_{TC}$$

$$F_{TC} := F_C$$

Calculate total moment response from section:

$$M_T := M_C + M_R + M_{TS} + M_{TC}$$

$$M_{TC} := M_C$$

CALCULATE MAXIMUM ALLOWABLE AXIAL FORCE IN SECTION

Limiting strain in axial compression:

$$\varepsilon_{cL} := \begin{cases} \min(\varepsilon_{cc},\varepsilon_{tc}) & \text{if } (A_{BAR} = 0)\cdot(ts \neq 0)\cdot(f_c \neq 0) \\ \min(\varepsilon_{cc},\varepsilon_{rc}) & \text{if } (ts = 0)\cdot(A_{BAR} \neq 0)\cdot(f_c \neq 0) \\ \varepsilon_{tc} & \text{if } (A_{BAR} = 0)\cdot(f_c = 0) \\ \varepsilon_{rc} & \text{if } (ts = 0)\cdot(f_c = 0) \\ \min(\varepsilon_{cc},\varepsilon_{rc},\varepsilon_{tc}) & \text{otherwise} \end{cases}$$

$\varepsilon_{cL} = 0.001950$

Limiting concrete stress in axial compression

$$\sigma_{cL} := \begin{cases} \sigma_{cd_2} & \text{if } f_c > 0 \\ 0 & \text{otherwise} \end{cases}$$

$\sigma_{cL} = 18.93\,MPa$

$$P_{MAX} := \sigma_{cL}\cdot A_C(1-\rho) + \varepsilon_{cL}\cdot E_S(A_{BAR} + A_{ST})$$

$P_{MAX} = 26894.6\,kN$ $\quad F_{T_1} := P_{MAX}$ $\quad M_{T_1} := 0\cdot kN\cdot m$

$$P_{MAXC} := \sigma_{cL}\cdot A_C\cdot(1-\rho)$$

$P_{MAXC} = 17484.9\,kN$ $\quad F_{TC_1} := P_{MAXC}$ $\quad M_{TC_1} := 0\cdot kN\cdot m$

CALCULATE MINIMUM ALLOWABLE AXIAL FORCE IN SECTION

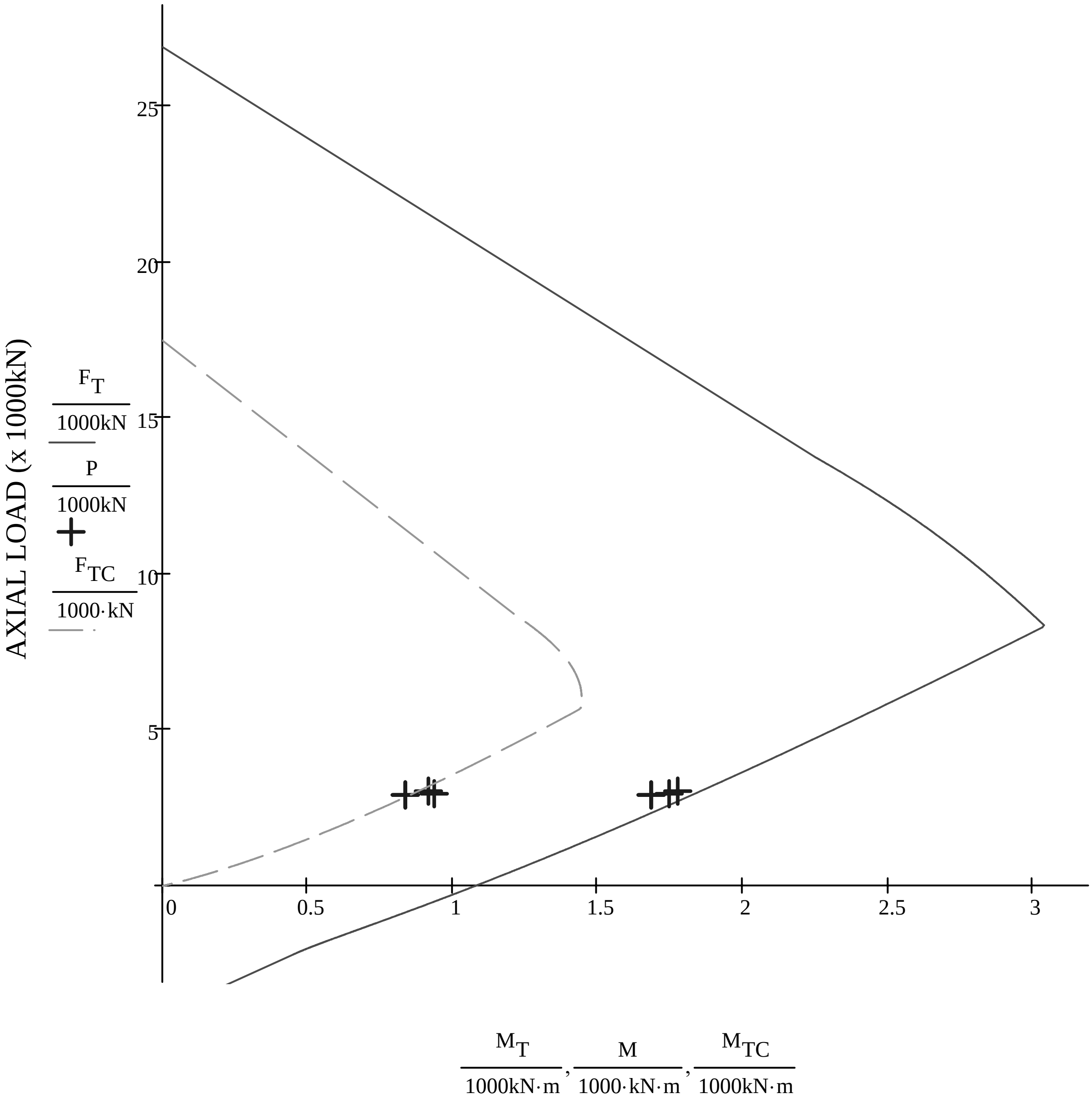
$$P_{MIN} := \begin{cases} \varepsilon_{rs}\cdot E_S(A_{BAR}) & \text{if } ts = 0 \\ \varepsilon_{ts}\cdot E_S(A_{ST}) & \text{if } A_{BAR} = 0 \\ \max(\varepsilon_{ts},\varepsilon_{rs})\cdot E_S(A_{BAR} + A_{ST}) & \text{otherwise} \end{cases}$$

$P_{MIN} = -4101.7\,kN$ $\quad F_{T_{ns+1}} := P_{MIN}$ $\quad M_{T_{ns+1}} := 0\cdot kN\cdot m$

$$Limit := \begin{cases} \min(P,F_T)\cdot 0.75 & \text{if } \min(P) > 0 \\ \min(P,F_T)\cdot 1.25 & \text{otherwise} \end{cases}$$

$P_{MINC} := 0kN$ $\quad M_{TC_{ns+1}} := 0\cdot kN\cdot m$

Diameter of Column	$D = 1100\,mm$	Characteristic strength of concrete	$f_c = 30\,MPa$
Percentage reinforcement	$\rho = 2.55\,\%$	Yield Strength of Rebar	$f_y = 390\,MPa$
Thickness of CHS	$ts = 0\,mm$	Yield Strength of CHS	$f_{ys} = 250\,MPa$



INTERACTION CURVE AT SERVICEABILITY LIMIT STATE

Equation of interaction line - upper region (between 1 and 2 calculation points)

$$m1 := \frac{M_{T_2} - M_{T_1}}{F_{T_2} - F_{T_1}} \qquad c1 := F_{T_1}$$

Equation of interaction line - lower region (between ns and ns+1 calculation points)

$$m2 := \frac{M_{T_{ns}} - M_{T_{ns+1}}}{F_{T_{ns}} - F_{T_{ns+1}}} \qquad c2 := F_{T_{ns+1}}$$

$r := 1 .. 8$

$$M_{SLS_r} := \begin{cases} 0.000000000000000001 \cdot kN \cdot m & \text{if } P_r > F_{T_1} \\ 0.000000000000000001 \cdot kN \cdot m & \text{if } P_r < F_{T_{ns+1}} \\ (P_r - c1) \cdot m1 & \text{if } (P_r > F_{T_2}) \cdot (P_r \le F_{T_1}) \\ (P_r - c2) \cdot m2 & \text{if } (P_r \ge F_{T_{ns+1}}) \cdot (P_r < F_{T_{ns}}) \\ \text{otherwise} & \\ \quad j \leftarrow 1 & \\ \quad \text{while } F_{T_j} > P_r & \\ \quad\quad j \leftarrow j + 1 & \\ \quad M_{T_j} & \end{cases}$$

$$StressFactor_r := \begin{cases} \text{"No Result"} & \text{if } M_{SLS_r} < 0.00000000000000001 \cdot kN \cdot m \\ \dfrac{M_r}{M_{SLS_r}} & \text{otherwise} \end{cases}$$

$$P = \begin{pmatrix} 2918 \\ 2918 \\ 2920 \\ 2920 \\ 2954 \\ 2954 \\ 3039 \\ 3039 \end{pmatrix} kN \quad M = \begin{pmatrix} 837 \\ 1686 \\ 838 \\ 1685 \\ 1747 \\ 937 \\ 1777 \\ 917 \end{pmatrix} kN \cdot m \quad M_{SLS} = \begin{pmatrix} 1814.7 \\ 1814.7 \\ 1814.7 \\ 1814.7 \\ 1828.4 \\ 1828.4 \\ 1842.2 \\ 1842.2 \end{pmatrix} kN \cdot m \quad StressFactor = \begin{pmatrix} 0.461 \\ 0.929 \\ 0.462 \\ 0.928 \\ 0.956 \\ 0.513 \\ 0.964 \\ 0.498 \end{pmatrix}$$

RESULTS SUMMARY
SERVICEABILITY LIMIT STATE ANALYSIS OF CIRCULAR BEAM COLUMN

Diameter of Column			1100	mm			
Percentage of rebar			2.55	%			
Load Case Ref	**Pier**	**Applied Service Axial Load kN**	**Applied Service Bending Moment kNm**	**Service Limit State Bending Moment kNm**	**Allowable Stress Factor**	**Applied Stress Factor**	**Serviceability Limit State Design Result**
1	**P11**	**2918**	**837**	**1814.7**	**100%**	**46%**	OK
2	**P11**	**2918**	**1686**	**1814.7**	**100%**	**93%**	OK
3	**P12**	**2920**	**838**	**1814.7**	**100%**	**46%**	OK
4	**P12**	**2920**	**1685**	**1814.7**	**100%**	**93%**	OK
5	**P91**	**2954**	**1747**	**1828.4**	**100%**	**96%**	OK
6	**P91**	**2954**	**937**	**1828.4**	**100%**	**51%**	OK
7	**P92**	**3039**	**1777**	**1842.2**	**100%**	**96%**	OK
8	**P92**	**3039**	**917**	**1842.2**	**100%**	**50%**	OK

Serviceability Check - Full Live Load

KATAHIRA & ENGINEERS INTERNATIONAL

Project: **Detailed Design Study of North Java Corridor Flyover Project**

Calculation: **Balaraja Flyover**
Serviceability Check - Full Live Load
1100 mm Dia Circular RC Column - P1 & P9 Top Section

Reference: **Project Specific Design Criteria**

Section Data

$MPa := 1000000 \cdot Pa$ $kN := 1000 \cdot N$

Input Item			
Concrete Compressive Strength	fc	30	MPa
Structural Steel Yield Strength	fys	250	MPa
Rebar Yield Strength	fy	390	MPa
Diameter of reinforced concrete section	D	1100	mm
Thickness of CHS section	t	0	mm
Diameter of rebar - layer 1	dia1	32	mm
Diameter of rebar - layer 2	dia2	0	mm
Number bars - layer 1 (max 100)	n1	30	
Number bars - layer 2 (max 100)	n2	0	
Cover from face of section - layer 1	cov1	60	mm
Cover from face of section - layer 2	cov2	115	mm

Load Data

Ref	Pier	Load Case	P	M	Stress
			kN	kNm	Allowance
1	P11	Combination 1 - P + (TTD OR TTT) + (TTB or TTR) + Temp+CRSH	2918.0	1085.9	140%
2	P11	Combination 1 - P + (TTD OR TTT) + (TTB or TTR) + Temp+CRSH	2918.0	1934.4	140%
3	P12	Combination 1 - P + (TTD OR TTT) + (TTB or TTR) + Temp+CRSH	2919.7	1087.4	140%
4	P12	Combination 1 - P + (TTD OR TTT) + (TTB or TTR) + Temp+CRSH	2919.7	1934.2	140%
5	P91	Combination 1 - P + (TTD OR TTT) + (TTB or TTR) + Temp+CRSH	2908.8	2027.3	140%
6	P91	Combination 1 - P + (TTD OR TTT) + (TTB or TTR) + Temp+CRSH	2908.8	1230.5	140%
7	P92	Combination 1 - P + (TTD OR TTT) + (TTB or TTR) + Temp+CRSH	3087.3	2073.5	140%
8	P92	Combination 1 - P + (TTD OR TTT) + (TTB or TTR) + Temp+CRSH	3087.3	1227.0	140%

$f_c := f_c \cdot MPa \quad f_{ys} := f_{ys} \cdot MPa \quad f_y := f_y \cdot MPa \qquad D := D \cdot mm \qquad ts := ts \cdot mm$

$dia1 := dia1 \cdot mm \qquad dia2 := dia2 \cdot mm \qquad cov1 := cov1 \cdot mm \qquad cov2 := cov2 \cdot mm$

$P := P \cdot kN \qquad M := M \cdot kN \cdot m$

$E_S := 200000 \cdot MPa \qquad E_C := 4700 \sqrt{\frac{f_c}{MPa}} \cdot MPa$ Modular ratio $\alpha := \begin{cases} \frac{E_S}{E_C} & \text{if } E_C > 0 \\ 1 & \text{otherwise} \end{cases} \qquad \alpha = 7.77$

$E_C = 25743\,MPa$

Calculate Basic Allowable Stresses

Calculate rupture stress: $\sigma_{ct} := 0.5 \cdot \left(\frac{f_c}{MPa}\right)^{\frac{2}{3}} \cdot MPa \qquad \sigma_{ct} = 4.8\,MPa$

Calculate basic allowable stress of concrete $\sigma_{cc} := 1.0 \cdot f_c \qquad \sigma_{cc} = 30.0\,MPa$

Calculate basic allowable tensile stress of rebar $\sigma_{rs} := \begin{cases} 0.5 \cdot f_y & \text{if } 0.5 \cdot f_y \le 170MPa \\ 170MPa & \text{otherwise} \end{cases} \qquad \sigma_{rs} = 170\,MPa$

Calculate basic allowable compressive stress of rebar $\sigma_{rc} := \begin{cases} 0.5 \cdot f_y & \text{if } 0.5 \cdot f_y \le 110MPa \\ f_y & \text{otherwise} \end{cases} \qquad \sigma_{rc} = 390\,MPa$

Calculate basic allowable stress of structural steel $\sigma_{ts} := -0.6 f_{ys} \qquad \sigma_{ts} = -150\,MPa$

$\sigma_{tc} := 1 f_{ys} \qquad \sigma_{tc} = 250\,MPa$

Limiting strain of rebar $\varepsilon_{rs} := -\frac{\sigma_{rs}}{E_S} \qquad \varepsilon_{rs} = -0.000850$

$\varepsilon_{rc} := \frac{\sigma_{rc}}{E_S} \qquad \varepsilon_{rc} = 0.001950$

Limiting strain of structural steel $\varepsilon_{ts} := \frac{\sigma_{ts}}{E_S} \qquad \varepsilon_{ts} = -0.000750$

$\varepsilon_{tc} := \frac{\sigma_{tc}}{E_S} \qquad \varepsilon_{tc} = 0.001250$

Concrete Cross Section Data - generated

$n := 50$ Number of Points - 50 points maximum

$i := 1..n+1$ Range from 1 to n+1

Ref.	X	Y	Ref.	X	Y
	mm	mm		mm	mm
1	0	-550	**26**	0	550
2	-69	-546	**27**	69	546
3	-137	-533	**28**	137	533
4	-202	-511	**29**	202	511
5	-265	-482	**30**	265	482
6	-323	-445	**31**	323	445
7	-377	-401	**32**	377	401
8	-424	-351	**33**	424	351
9	-464	-295	**34**	464	295
10	-498	-234	**35**	498	234
11	-523	-170	**36**	523	170
12	-540	-103	**37**	540	103
13	-549	-35	**38**	549	35
14	-549	35	**39**	549	-35
15	-540	103	**40**	540	-103
16	-523	170	**41**	523	-170
17	-498	234	**42**	498	-234
18	-464	295	**43**	464	-295
19	-424	351	**44**	424	-351
20	-377	401	**45**	377	-401
21	-323	445	**46**	323	-445
22	-265	482	**47**	265	-482
23	-202	511	**48**	202	-511
24	-137	533	**49**	137	-533
25	-69	546	**50**	69	-546

$k := 1..25$ $XS1 := XS1 \cdot mm$ $XS2 := XS2 \cdot mm$ $YS1 := YS1 \cdot mm$ $YS2 := YS2 \cdot mm$

$x_k := XS1_k$ $y_k := YS1_k$ $x_{k+25} := XS2_k$ $y_{k+25} := YS2_k$ $x_{n+1} := XS1_1$ $y_{n+1} := YS1_1$

Calculate Section Properties of Concrete Section

$$A_C := -\sum_{i=1}^{n}\left[\left(y_{i+1} - y_i\right)\cdot\frac{x_{i+1} + x_i}{2}\right]$$ $A_C = 0.94783\ m^2$

$$x_C := -\frac{1}{A_C}\cdot\sum_{i=1}^{n}\left[\frac{y_{i+1} - y_i}{8}\cdot\left[\left(x_{i+1} + x_i\right)^2 + \frac{\left(x_{i+1} - x_i\right)^2}{3}\right]\right]$$ $x_C = 0\ m$

$$y_C := \frac{1}{A_C}\cdot\sum_{i=1}^{n}\left[\frac{x_{i+1} - x_i}{8}\cdot\left[\left(y_{i+1} + y_i\right)^2 + \frac{\left(y_{i+1} - y_i\right)^2}{3}\right]\right]$$ $y_C = 0\ m$

$$I_x := \sum_{i=1}^{n}\left[\left[\left(x_{i+1} - x_i\right)\cdot\frac{y_{i+1} + y_i}{24}\right]\cdot\left[\left(y_{i+1} + y_i\right)^2 + \left(y_{i+1} - y_i\right)^2\right]\right]$$ $I_x = 0.07149\ m^4$

$$I_y := -\sum_{i=1}^{n}\left[\left[\left(y_{i+1} - y_i\right)\cdot\frac{x_{i+1} + x_i}{24}\right]\cdot\left[\left(x_{i+1} + x_i\right)^2 + \left(x_{i+1} - x_i\right)^2\right]\right]$$ $I_y = 0.07149\ m^4$

$$I_{xC} := I_x - A_C\cdot x_C^{\,2}$$ $I_{xC} = 0.07149\ m^4$

$$I_{yC} := I_y - A_C\cdot y_C^{\,2}$$ $I_{yC} = 0.07149\ m^4$

Steel Tube Cross Section Data - generated from input

$ns := 50$ Number of Points - 50 points maximum

$ps := 1 .. ns + 1$ Range from 1 to ns+1

Ref.	X	Y	Ref.	X	Y
	mm	mm		mm	mm
1	0	-550	**26**	0	-550
2	-142	-531	**27**	142	-531
3	-275	-476	**28**	275	-476
4	-389	-389	**29**	389	-389
5	-476	-275	**30**	476	-275
6	-531	-142	**31**	531	-142
7	-550	0	**32**	550	0
8	-531	142	**33**	531	142
9	-476	275	**34**	476	275
10	-389	389	**35**	389	389
11	-275	476	**36**	275	476
12	-142	531	**37**	142	531
13	0	550	**38**	0	550
14	142	531	**39**	-142	531
15	275	476	**40**	-275	476
16	389	389	**41**	-389	389
17	476	275	**42**	-476	275
18	531	142	**43**	-531	142
19	550	0	**44**	-550	0
20	531	-142	**45**	-531	-142
21	476	-275	**46**	-476	-275
22	389	-389	**47**	-389	-389
23	275	-476	**48**	-275	-476
24	142	-531	**49**	-142	-531
25	0	-550	**50**	0	-550

$XSS1 := XSS1 \cdot mm$ $XSS2 := XSS2 \cdot mm$ $YSS1 := YSS1 \cdot mm$ $YSS2 := YSS2 \cdot mm$

$z := 1 .. 25$ $xs_z := XSS1_z$ $ys_z := YSS1_z$

$z := 26 .. 50$ $xs_z := XSS2_{z-25}$ $ys_z := YSS2_{z-25}$

$xs_{ns+1} := XSS1_1$ $ys_{ns+1} := YSS1_1$

Calculate Section Properties of Steel Tube Section

$$A_{ST} := -\sum_{ps=1}^{ns}\left[\left(ys_{ps+1} - ys_{ps}\right)\cdot\frac{xs_{ps+1} + xs_{ps}}{2}\right]$$ $A_{ST} = 0\ m^2$

$$x_{ST} := -\frac{1}{A_{ST}}\cdot\sum_{ps=1}^{ns}\left[\frac{ys_{ps+1} - ys_{ps}}{8}\cdot\left[\left(xs_{ps+1} + xs_{ps}\right)^2 + \frac{\left(xs_{ps+1} - xs_{ps}\right)^2}{3}\right]\right]$$ $x_{ST} = 0.2\ m$

$$y_{ST} := \frac{1}{A_{ST}}\cdot\sum_{ps=1}^{ns}\left[\frac{xs_{ps+1} - xs_{ps}}{8}\cdot\left[\left(ys_{ps+1} + ys_{ps}\right)^2 + \frac{\left(ys_{ps+1} - ys_{ps}\right)^2}{3}\right]\right]$$ $y_{ST} = -0.011\ m$

$$I_{xS} := \sum_{ps=1}^{ns}\left[\left[\left(xs_{ps+1} - xs_{ps}\right)\cdot\frac{ys_{ps+1} + ys_{ps}}{24}\right]\cdot\left[\left(ys_{ps+1} + ys_{ps}\right)^2 + \left(ys_{ps+1} - ys_{ps}\right)^2\right]\right]$$

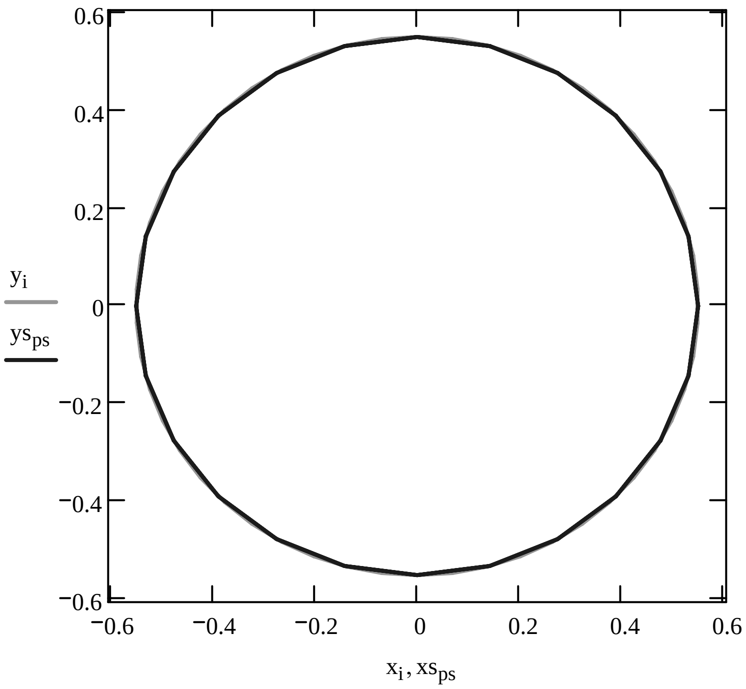
$I_{xS} = 0\ m^4$

$$I_{yS} := -\sum_{ps=1}^{ns}\left[\left[\left(ys_{ps+1} - ys_{ps}\right)\cdot\frac{xs_{ps+1} + xs_{ps}}{24}\right]\cdot\left[\left(xs_{ps+1} + xs_{ps}\right)^2 + \left(xs_{ps+1} - xs_{ps}\right)^2\right]\right]$$

$I_{yS} = 0\ m^4$

$I_{xS} := I_{xS} - A_{ST}\cdot x_{ST}^2$ $I_{xS} = 0\ m^4$

$I_{yS} := I_{yS} - A_{ST}\cdot y_{ST}^2$ $I_{yS} = 0.00000\ m^4$



Rebar Data Layer 1 - generated from input

Ref	Area mm2	X mm	Y mm	Ref	Area mm2	X mm	Y mm
1	804	0	-474	51	0	0	0
2	804	-99	-464	52	0	0	0
3	804	-193	-433	53	0	0	0
4	804	-279	-383	54	0	0	0
5	804	-352	-317	55	0	0	0
6	804	-410	-237	56	0	0	0
7	804	-451	-146	57	0	0	0
8	804	-471	-50	58	0	0	0
9	804	-471	50	59	0	0	0
10	804	-451	146	60	0	0	0
11	804	-410	237	61	0	0	0
12	804	-352	317	62	0	0	0
13	804	-279	383	63	0	0	0
14	804	-193	433	64	0	0	0
15	804	-99	464	65	0	0	0
16	804	0	474	66	0	0	0
17	804	99	464	67	0	0	0
18	804	193	433	68	0	0	0
19	804	279	383	69	0	0	0
20	804	352	317	70	0	0	0
21	804	410	237	71	0	0	0
22	804	451	146	72	0	0	0
23	804	471	50	73	0	0	0
24	804	471	-50	74	0	0	0
25	804	451	-146	75	0	0	0
26	804	410	-237	76	0	0	0
27	804	352	-317	77	0	0	0
28	804	279	-383	78	0	0	0
29	804	193	-433	79	0	0	0
30	804	99	-464	80	0	0	0
31	0	0	0	81	0	0	0
32	0	0	0	82	0	0	0
33	0	0	0	83	0	0	0
34	0	0	0	84	0	0	0
35	0	0	0	85	0	0	0
36	0	0	0	86	0	0	0
37	0	0	0	87	0	0	0
38	0	0	0	88	0	0	0
39	0	0	0	89	0	0	0
40	0	0	0	90	0	0	0
41	0	0	0	91	0	0	0
42	0	0	0	92	0	0	0
43	0	0	0	93	0	0	0
44	0	0	0	94	0	0	0
45	0	0	0	95	0	0	0
46	0	0	0	96	0	0	0
47	0	0	0	97	0	0	0
48	0	0	0	98	0	0	0
49	0	0	0	99	0	0	0
50	0	0	0	100	0	0	0

Rebar Data Layer 2 - generated from input

Ref	Area mm2	X mm	Y mm	Ref	Area mm2	X mm	Y mm
1	0	0	0	51	0	0	0
2	0	0	0	52	0	0	0
3	0	0	0	53	0	0	0
4	0	0	0	54	0	0	0
5	0	0	0	55	0	0	0
6	0	0	0	56	0	0	0
7	0	0	0	57	0	0	0
8	0	0	0	58	0	0	0
9	0	0	0	59	0	0	0
10	0	0	0	60	0	0	0
11	0	0	0	61	0	0	0
12	0	0	0	62	0	0	0
13	0	0	0	63	0	0	0
14	0	0	0	64	0	0	0
15	0	0	0	65	0	0	0
16	0	0	0	66	0	0	0
17	0	0	0	67	0	0	0
18	0	0	0	68	0	0	0
19	0	0	0	69	0	0	0
20	0	0	0	70	0	0	0
21	0	0	0	71	0	0	0
22	0	0	0	72	0	0	0
23	0	0	0	73	0	0	0
24	0	0	0	74	0	0	0
25	0	0	0	75	0	0	0
26	0	0	0	76	0	0	0
27	0	0	0	77	0	0	0
28	0	0	0	78	0	0	0
29	0	0	0	79	0	0	0
30	0	0	0	80	0	0	0
31	0	0	0	81	0	0	0
32	0	0	0	82	0	0	0
33	0	0	0	83	0	0	0
34	0	0	0	84	0	0	0
35	0	0	0	85	0	0	0
36	0	0	0	86	0	0	0
37	0	0	0	87	0	0	0
38	0	0	0	88	0	0	0
39	0	0	0	89	0	0	0
40	0	0	0	90	0	0	0
41	0	0	0	91	0	0	0
42	0	0	0	92	0	0	0
43	0	0	0	93	0	0	0
44	0	0	0	94	0	0	0
45	0	0	0	95	0	0	0
46	0	0	0	96	0	0	0
47	0	0	0	97	0	0	0
48	0	0	0	98	0	0	0
49	0	0	0	99	0	0	0
50	0	0	0	100	0	0	0

$A1 := A1 \cdot mm^2 \qquad A2 := A2 \cdot mm^2 \qquad A3 := A3 \cdot mm^2 \qquad A4 := A4 \cdot mm^2$

$X1 := X1 \cdot mm \qquad X2 := X2 \cdot mm \qquad X3 := X3 \cdot mm \qquad X4 := X4 \cdot mm$

$Y1 := Y1 \cdot mm \qquad Y2 := Y2 \cdot mm \qquad Y3 := Y3 \cdot mm \qquad Y4 := Y4 \cdot mm$

$k := 1 .. 50 \qquad A_{bar_k} := A1_k \qquad x_{bar_k} := X1_k \qquad y_{bar_k} := Y1_k$

$A_{bar_{k+50}} := A2_k \qquad x_{bar_{k+50}} := X2_k \qquad y_{bar_{k+50}} := Y2_k$

$A_{bar_{k+100}} := A3_k \qquad x_{bar_{k+100}} := X3_k \qquad y_{bar_{k+100}} := Y3_k$

$A_{bar_{k+150}} := A4_k \qquad x_{bar_{k+150}} := X4_k \qquad y_{bar_{k+150}} := Y4_k$

Calculate Section Properties of Reinforcement

$$A_{BAR} := \sum_{j=1}^{200} A_{bar_j} \qquad A_{BAR} = 24127\,mm^2$$

$$\rho := \frac{A_{BAR}}{A_C} \qquad \rho = 0.0255$$

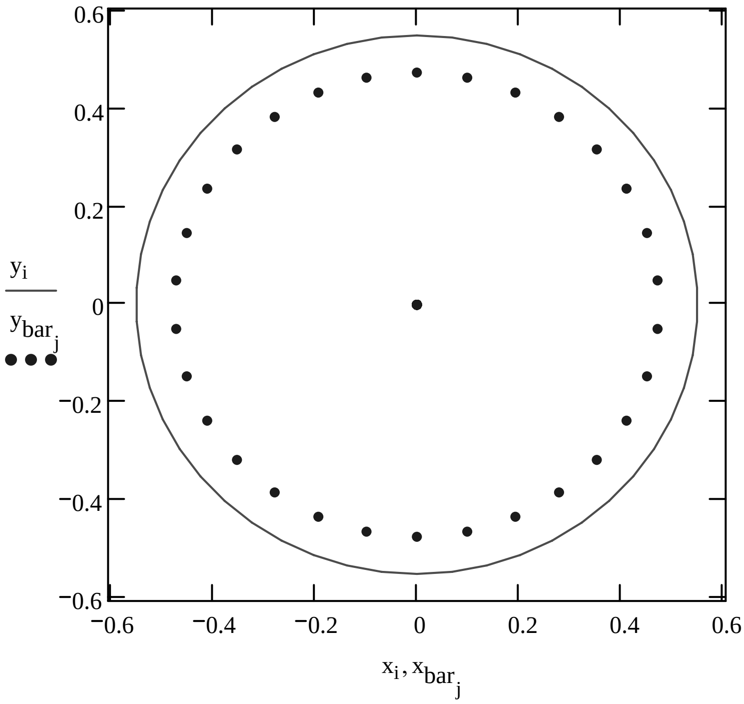
$$x_b := \begin{cases} \left[\sum_{j=1}^{200} \left(A_{bar_j} \cdot x_{bar_j}\right)\right] \cdot \frac{1}{A_{BAR}} & \text{if } A_{BAR} > 0 \\ 0m & \text{otherwise} \end{cases} \qquad x_b = 0\ m$$

$$y_b := \begin{cases} \left[\sum_{j=1}^{200} \left(A_{bar_j} \cdot y_{bar_j}\right)\right] \cdot \frac{1}{A_{BAR}} & \text{if } A_{BAR} > 0 \\ 0m & \text{otherwise} \end{cases} \qquad y_b = 0\ m$$

$$I_{xb} := \sum_{j=1}^{200} \left[A_{bar_j} \cdot \left(x_{bar_j}\right)^2\right] + A_{BAR} \cdot x_b^2 \qquad I_{xb} = 0.00271\,m^4$$

$$I_{yb} := \sum_{j=1}^{200} \left[A_{bar_j} \cdot \left(y_{bar_j}\right)^2\right] + A_{BAR} \cdot y_b^2 \qquad I_{yb} = 0.00271\,m^4$$

$j := 1 .. 200$



Calculate Composite Section Properties (before cracking)

Effective area $A_E := A_C \cdot [1 + \rho \cdot (\alpha - 1)] + A_{ST} \cdot \alpha$ $\qquad A_E = 1111154\ mm^2$

Effective centroid $x_E := \dfrac{A_C \cdot [(1 - \rho) \cdot x_C + \rho \cdot x_b \cdot \alpha] + A_{ST} \cdot \alpha \cdot x_{ST}}{A_E}$ $\qquad x_E = 0.000\ m$

$y_E := \dfrac{A_C \cdot [(1 - \rho) \cdot y_C + \rho \cdot y_b \cdot \alpha] + A_{ST} \cdot \alpha \cdot x_{ST}}{A_E}$ $\qquad y_E = 0.000\ m$

Effective stiffness $I_{EX} := I_{xC} + I_{xb} \cdot (\alpha - 1) + A_C \cdot \left[(1 - \rho) \cdot x_C^2 + \rho \cdot x_b^2 \cdot \alpha\right] + \left(I_{xS} + A_{ST} \cdot x_{ST}^2\right) \cdot \alpha$

$I_{EX} = 0\ m^4$

$I_{EY} := I_{yC} + I_{yb} \cdot (\alpha - 1) + A_C \cdot \left[(1 - \rho) \cdot y_C^2 + \rho \cdot y_b^2 \cdot \alpha\right] + \left(I_{yS} + A_{ST} \cdot y_{ST}^2\right) \cdot \alpha$

$I_{EY} = 0\ m^4$

Distance from extreme concrete fiber to centroid

$xF_{pos} := \max(x - x_E)$ $\qquad xF_{neg} := \min(x - x_E)$

$yF_{pos} := \max(y - y_E)$ $\qquad yF_{neg} := \min(y - y_E)$

Total depth of concrete section

$H_{CX} := xF_{pos} - xF_{neg}$ $\qquad H_{CX} = 1\ m$

$H_{CY} := yF_{pos} - yF_{neg}$ $\qquad H_{CY} = 1\ m$

Section modulus

$Z_{Xpos} := \frac{I_{EX}}{xF_{pos}}$ $\quad Z_{Xneg} := \frac{I_{EX}}{xF_{neg}}$

$Z_{Ypos} := \frac{I_{EY}}{yF_{pos}}$ $\quad Z_{Yneg} := \frac{I_{EY}}{yF_{neg}}$

Thickness of steel tube:

$ts := y_1 - ys_1$ $\quad ts = 0\,mm$

Establish Section Dimensions

Positive case - determine coord of extreme concrete fiber $\quad y_{Epos} := \max(y)$ $\quad y_{Epos} = 550\,mm$

Negative case - determine coord of extreme concrete fiber $\quad y_{Eneg} := \min(y)$ $\quad y_{Eneg} = -550\,mm$

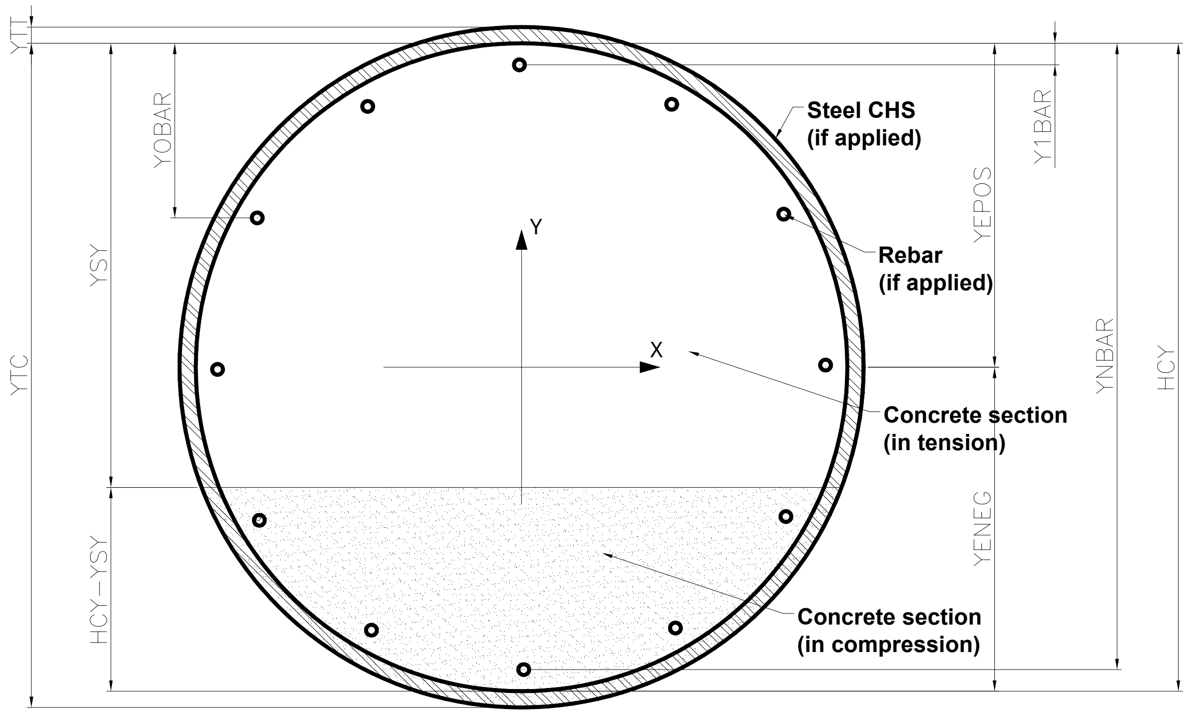
Offsets of rebar from extreme fiber $\quad y_{Obar} := y_{Epos} - y_{bar}$

Determine most extreme rebar (minimum offset) $\quad y_{1bar} := \min(y_{Epos} - y_{bar})$ $\quad y_{1bar} = 76\,mm$

Determine most extreme rebar (maximum offset) $\quad y_{nbar} := \max(y_{Epos} - y_{bar})$ $\quad y_{nbar} = 1024\,mm$

Offsets of extreme steel tube fiber from extreme concrete fiber $\quad y_{tt} := ts$ $\quad y_{tt} = 0\,mm$

$y_{tc} := H_{CY} + ts$ $\quad y_{tc} = 1100\,mm$



ASSIGN NEUTRAL AXIS VALUES

Number of sections to analysed $ns := 500$

$q := 2 .. ns$

Distance of neutral axis from extreme fiber in tension $y_{SY_q} := H_{CY} \cdot \frac{q}{ns + 1}$

Calculate stresses and strains in reinforcement and concrete at extreme fibers

Calculate strain at extreme compression fiber assuming max allowable stress in concrete:

Trial value of concrete strain

$\varepsilon cc := \frac{\sigma_{cc}}{E_C} \cdot 2$ $\frac{\sigma_{cc}}{E_C} = 0.001165$

Given

$$\sigma_{cc} = \varepsilon cc \cdot \left(4700 \sqrt{\frac{f_c \cdot 2}{MPa}} - \frac{4700^2}{2.68} \cdot \varepsilon cc \right) \cdot MPa$$

$\varepsilon_{cc} := \text{Find}(\varepsilon cc)$ $\varepsilon_{cc} = 0.003321$

$$\varepsilon_{cc} := \begin{cases} \varepsilon_{tc} & \text{if } (f_c = 0) \cdot (A_{BAR} = 0) \\ \varepsilon_{rc} & \text{if } (f_c = 0) \cdot (ts = 0) \\ \varepsilon_{cc} & \text{otherwise} \end{cases}$$

$\varepsilon_{cc} = 0.003321$

Strain at other stresses taken to be linear:

$$\varepsilon cc(f_c, \sigma_{cd}) := \begin{cases} \frac{\sigma_{cd}}{\sigma_{tc}} \cdot \varepsilon_{tc} & \text{if } (f_c = 0) \cdot (A_{BAR} = 0) \\ \frac{\sigma_{cd}}{\sigma_{rc}} \cdot \varepsilon_{rc} & \text{if } (f_c = 0) \cdot (ts = 0) \\ \frac{\sigma_{cd}}{\sigma_{cc}} \cdot \varepsilon_{cc} & \text{otherwise} \end{cases}$$

Calculate strain in steel tube assuming max allowable stress in concrete:

In compression $\varepsilon_{tcc_q} := \varepsilon_{cc} \cdot \frac{y_{tc} - y_{SY_q}}{H_{CY} - y_{SY_q}}$

In tension $\varepsilon_{tct_q} := \varepsilon_{cc} \cdot \frac{-\left(y_{SY_q} + y_{tt}\right)}{H_{CY} - y_{SY_q}}$

Calculate strain in rebar assuming max allowable stress in concrete:

In compression $\varepsilon_{rcc_q} := \varepsilon_{cc} \cdot \dfrac{y_{nbar} - y_{SY_q}}{H_{CY} - y_{SY_q}}$

In tension $\varepsilon_{rct_q} := \varepsilon_{cc} \cdot \dfrac{y_{1bar} - y_{SY_q}}{H_{CY} - y_{SY_q}}$

Calculate design max stress in compression taking account of other limits:

$$
\sigma cd(\varepsilon_{tcc}, q) := \left|
\begin{array}{l}
\sigma_{cd} \leftarrow \sigma_{cc} \text{ if } f_c > 0 \\
\sigma_{cd} \leftarrow \sigma_{tc} \text{ if } (f_c = 0) \cdot (A_{BAR} = 0) \\
\sigma_{cd} \leftarrow \sigma_{rc} \text{ if } (f_c = 0) \cdot (ts = 0) \\
\sigma_{cd} \leftarrow \sigma_{cd} \cdot \dfrac{\varepsilon_{tc}}{\varepsilon_{tcc}} \text{ if } (\varepsilon_{tcc} > \varepsilon_{tc}) \cdot (ts > 0) \\
\sigma_{cd} \leftarrow \sigma_{cd} \cdot \dfrac{\varepsilon_{rc}}{\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{y_{nbar} - y_{SY_q}}{H_{CY} - y_{SY_q}}} \text{ if } \left(\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{y_{nbar} - y_{SY_q}}{H_{CY} - y_{SY_q}} > \varepsilon_{rc}\right) \cdot (A_{BAR} > 0) \\
\sigma_{cd} \leftarrow \sigma_{cd} \cdot \dfrac{\varepsilon_{ts}}{\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{-(y_{SY_q} + y_{tt})}{H_{CY} - y_{SY_q}}} \text{ if } \left[\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{-(y_{SY_q} + y_{tt})}{H_{CY} - y_{SY_q}} < \varepsilon_{ts}\right] \cdot (ts > 0) \\
\sigma_{cd} \leftarrow \sigma_{cd} \cdot \dfrac{\varepsilon_{rs}}{\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{-(y_{SY_q} - y_{1bar})}{H_{CY} - y_{SY_q}}} \text{ if } \left[\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{-(y_{SY_q} - y_{1bar})}{H_{CY} - y_{SY_q}} < \varepsilon_{rs}\right] \cdot (A_{BAR} > 0) \\
\sigma_{cc} \text{ otherwise}
\end{array}
\right.
$$

$\sigma_{cd_q} := \sigma cd(\varepsilon_{tcc_q}, q)$

CALCULATE FORCES AND MOMENTS AT EACH NEUTRAL AXIS LOCATION

Calculate force in concrete:

$$F_{C_q} := \begin{cases} \displaystyle\int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot(1-\rho)\cdot\left[\frac{\sigma_{cd_q}\cdot\left[y+\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{H_{CY}-y_{SY_q}}\right] dy & \text{if } f_c > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate moment from concrete about column centroid:

$$M_{C_q} := \begin{cases} \displaystyle\int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot(1-\rho)\cdot\left[\frac{\sigma_{cd_q}\cdot\left[y+\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{H_{CY}-y_{SY_q}}\right]\cdot y\, dy & \text{if } f_c > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate strain in rebar assuming design max stress in concrete:

$$y_{SY_q} := \begin{cases} y_{nbar}\cdot\frac{q}{ns+1} & \text{if } (f_c = 0)\cdot(A_{BAR} > 0) \\ y_{SY_q} & \text{otherwise} \end{cases}$$

$$\varepsilon_{S_{j,q}} := \begin{cases} -\frac{y_{SY_q} - y_{Obar_j}}{y_{nbar} - y_{SY_q}}\cdot\varepsilon cc\left(f_c, \sigma_{cd_q}\right) & \text{if } f_c = 0 \\ -\frac{y_{SY_q} - y_{Obar_j}}{H_{CY} - y_{SY_q}}\cdot\varepsilon cc\left(f_c, \sigma_{cd_q}\right) & \text{otherwise} \end{cases}$$

Calculate force in each rebar:

$$F_{S_{j,q}} := \begin{cases} \varepsilon_{S_{j,q}} E_S\cdot A_{bar_j} & \text{if } A_{BAR} > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate total force in reinforcement:

$$F_{R_q} := \sum_j F_{S_{j,q}}$$

Calculate moment from reinforcement about section centroid:

$$M_{R_q} := \begin{cases} \sum_j -\left(\varepsilon_{S_{j,q}} E_S \cdot A_{bar_j} \cdot y_{bar_j}\right) & \text{if } A_{BAR} > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate strain in steel tube at extreme tension fiber:

$$\varepsilon_{tds_q} := \frac{-\left(y_{SY_q} + y_{tt}\right)}{H_{CY} - y_{SY_q}} \varepsilon cc\left(f_c, \sigma_{cd_q}\right)$$

Calculate strain in steel tube at extreme compression fiber:

$$\varepsilon_{tdc_q} := \frac{y_{tc} - y_{SY_q}}{H_{CY} - y_{SY_q}} \varepsilon cc\left(f_c, \sigma_{cd_q}\right)$$

Calculate tensile force in steel tube:

$$F_{TS1_q} := \int_{\left(\frac{H_{CY}}{2} - y_{SY_q}\right)}^{\frac{H_{CY}}{2} + y_{tt}} 2\sqrt{\left(\frac{H_{CY}}{2} + y_{tt}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tds_q} \cdot E_S \cdot \left[y - \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{y_{SY_q} + y_{tt}}\right] dy$$

$$F_{TS2_q} := \int_{\left(\frac{H_{CY}}{2} - y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tds_q} \cdot E_S \cdot \left[y - \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{y_{SY_q} + y_{tt}}\right] dy$$

$$F_{TS} := \begin{cases} F_{TS1} - F_{TS2} & \text{if } ts > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate compressive force in steel tube:

$$F_{TC1_q} := \int_{-\left(\frac{H_{CY}}{2} - y_{SY_q}\right)}^{\frac{H_{CY}}{2} + y_{tt}} 2\sqrt{\left(\frac{H_{CY}}{2} + y_{tt}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tdc_q} \cdot E_S \cdot \left[y + \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{H_{CY} - y_{SY_q} + y_{tt}}\right] dy$$

$$F_{TC2_q} := \int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot\left[\frac{\varepsilon_{tdc_q}\cdot E_S\cdot\left[y+\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{H_{CY}-y_{SY_q}+y_{tt}}\right] dy$$

$$F_{TC} := \begin{cases} F_{TC1} - F_{TC2} & \text{if } ts > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate moment from tensile force in steel tube:

$$M_{TS1_q} := \int_{\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}+y_{tt}} -2\sqrt{\left(\frac{H_{CY}}{2}+y_{tt}\right)^2 - y^2}\cdot\left[\frac{\varepsilon_{tds_q}\cdot E_S\cdot\left[y-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{y_{SY_q}+y_{tt}}\right]\cdot y\, dy$$

$$M_{TS2_q} := \int_{\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} -2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot\left[\frac{\varepsilon_{tds_q}\cdot E_S\cdot\left[y-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{y_{SY_q}+y_{tt}}\right]\cdot y\, dy$$

$$M_{TS} := \begin{cases} M_{TS1} - M_{TS2} & \text{if } ts > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate moment from compressive force in steel tube:

$$M_{TC1_q} := \int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}+y_{tt}} 2\sqrt{\left(\frac{H_{CY}}{2}+y_{tt}\right)^2 - y^2}\cdot\left[\frac{\varepsilon_{tdc_q}\cdot E_S\cdot\left[y+\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{H_{CY}-y_{SY_q}+y_{tt}}\right]\cdot y\, dy$$

$$M_{TC2_q} := \int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot\left[\frac{\varepsilon_{tdc_q}\cdot E_S\cdot\left[y+\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{H_{CY}-y_{SY_q}+y_{tt}}\right]\cdot y\, dy$$

$$M_{TC} := \begin{cases} M_{TC1} - M_{TC2} & \text{if } ts > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calate total axial response from section:

$$F_T := F_C + F_R + F_{TS} + F_{TC} \qquad F_{TC} := F_C$$

Calculate total moment response from section:

$$M_T := M_C + M_R + M_{TS} + M_{TC} \qquad M_{TC} := M_C$$

CALCULATE MAXIMUM ALLOWABLE AXIAL FORCE IN SECTION

Limiting strain in axial compression:

$$\varepsilon_{cL} := \begin{cases} \min(\varepsilon_{cc}, \varepsilon_{tc}) & \text{if } (A_{BAR} = 0)\cdot(ts \neq 0)\cdot(f_c \neq 0) \\ \min(\varepsilon_{cc}, \varepsilon_{rc}) & \text{if } (ts = 0)\cdot(A_{BAR} \neq 0)\cdot(f_c \neq 0) \\ \varepsilon_{tc} & \text{if } (A_{BAR} = 0)\cdot(f_c = 0) \\ \varepsilon_{rc} & \text{if } (ts = 0)\cdot(f_c = 0) \\ \min(\varepsilon_{cc}, \varepsilon_{rc}, \varepsilon_{tc}) & \text{otherwise} \end{cases} \qquad \varepsilon_{cL} = 0.001950$$

Limiting concrete stress in axial compression

$$\sigma_{cL} := \begin{cases} \sigma_{cd_2} & \text{if } f_c > 0 \\ 0 & \text{otherwise} \end{cases} \qquad \sigma_{cL} = 18.93\,\text{MPa}$$

$$P_{MAX} := \sigma_{cL}\cdot A_C(1-\rho) + \varepsilon_{cL}\cdot E_S(A_{BAR} + A_{ST})$$

$P_{MAX} = 26894.6\,\text{kN}$ $\quad F_{T_1} := P_{MAX}$ $\quad M_{T_1} := 0\cdot\text{kN}\cdot\text{m}$

$$P_{MAXC} := \sigma_{cL}\cdot A_C\cdot(1-\rho)$$

$P_{MAXC} = 17484.9\,\text{kN}$ $\quad F_{TC_1} := P_{MAXC}$ $\quad M_{TC_1} := 0\cdot\text{kN}\cdot\text{m}$

CALCULATE MINIMUM ALLOWABLE AXIAL FORCE IN SECTION

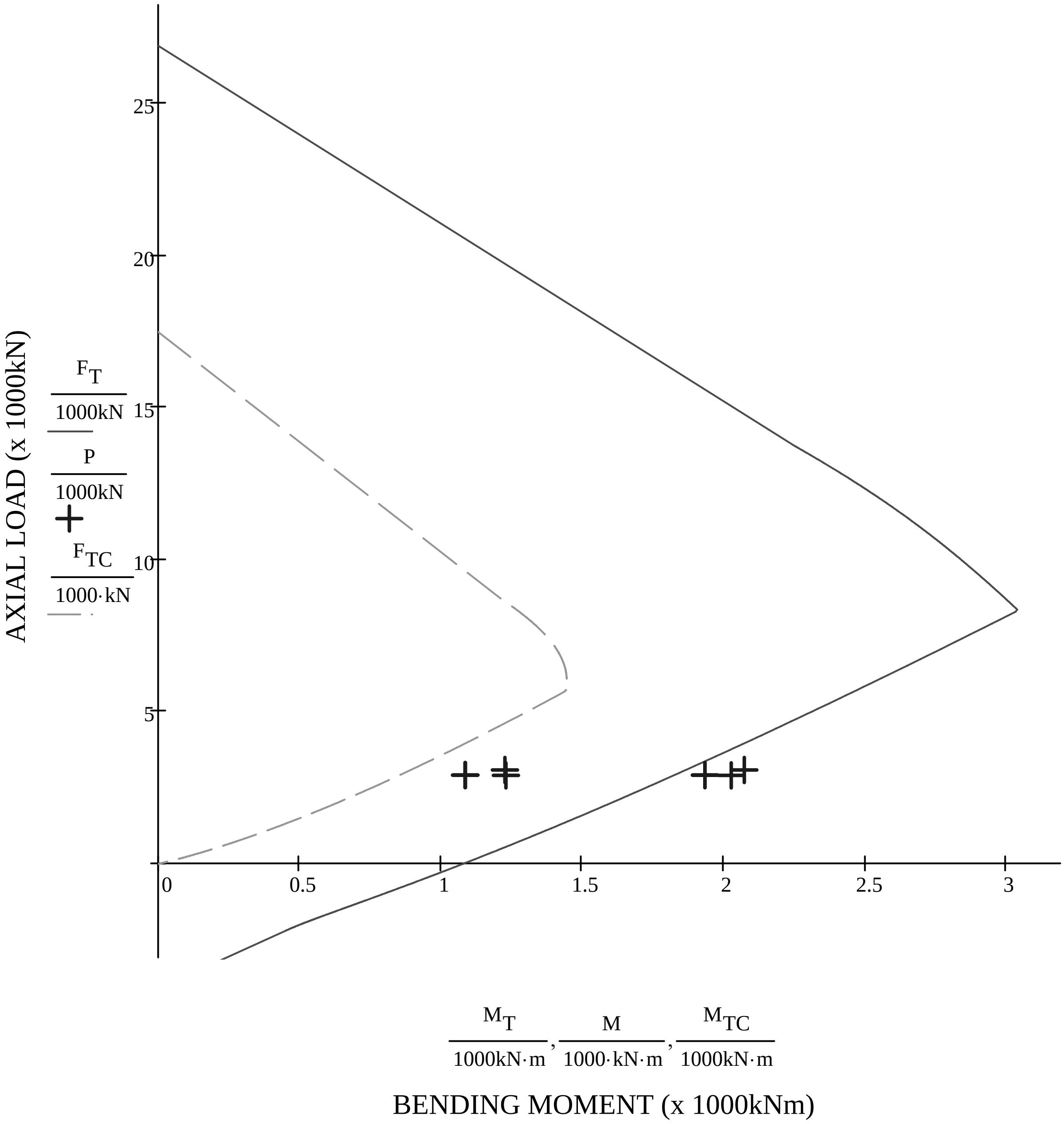
$$P_{MIN} := \begin{cases} \varepsilon_{rs}\cdot E_S(A_{BAR}) & \text{if } ts = 0 \\ \varepsilon_{ts}\cdot E_S(A_{ST}) & \text{if } A_{BAR} = 0 \\ \max(\varepsilon_{ts}, \varepsilon_{rs})\cdot E_S(A_{BAR} + A_{ST}) & \text{otherwise} \end{cases}$$

$P_{MIN} = -4101.7\,\text{kN}$ $\quad F_{T_{ns+1}} := P_{MIN}$ $\quad M_{T_{ns+1}} := 0\cdot\text{kN}\cdot\text{m}$

$$\text{Limit} := \begin{cases} \min(P, F_T)\cdot 0.75 & \text{if } \min(P) > 0 \\ \min(P, F_T)\cdot 1.25 & \text{otherwise} \end{cases}$$

$P_{MINC} := 0\text{kN}$ $\quad M_{TC_{ns+1}} := 0\cdot\text{kN}\cdot\text{m}$

Diameter of Column	$D = 1100\,mm$	Characteristic strength of concrete	$f_c = 30\,MPa$
Percentage reinforcement	$\rho = 2.55\,\%$	Yield Strength of Rebar	$f_y = 390\,MPa$
Thickness of CHS	$ts = 0\,mm$	Yield Strength of CHS	$f_{ys} = 250\,MPa$



INTERACTION CURVE AT SERVICEABILITY LIMIT STATE

Equation of interaction line - upper region (between 1 and 2 calculation points)

$$m1 := \frac{M_{T_2} - M_{T_1}}{F_{T_2} - F_{T_1}} \qquad c1 := F_{T_1}$$

Equation of interaction line - lower region (between ns and ns+1 calculation points)

$$m2 := \frac{M_{T_{ns}} - M_{T_{ns+1}}}{F_{T_{ns}} - F_{T_{ns+1}}} \qquad c2 := F_{T_{ns+1}}$$

$r := 1 .. 8$

$$M_{SLS_r} := \begin{array}{|l} 0.000000000000000001 \cdot kN \cdot m \ \text{ if } \ P_r > F_{T_1} \\ 0.000000000000000001 \cdot kN \cdot m \ \text{ if } \ P_r < F_{T_{ns+1}} \\ (P_r - c1) \cdot m1 \ \text{ if } \ (P_r > F_{T_2}) \cdot (P_r \le F_{T_1}) \\ (P_r - c2) \cdot m2 \ \text{ if } \ (P_r \ge F_{T_{ns+1}}) \cdot (P_r < F_{T_{ns}}) \\ \text{otherwise} \\ \quad \begin{array}{|l} j \leftarrow 1 \\ \text{while } F_{T_j} > P_r \\ \quad j \leftarrow j + 1 \\ M_{T_j} \end{array} \end{array}$$

$$StressFactor_r := \begin{array}{|l} \text{"No Result"} \ \text{ if } \ M_{SLS_r} < 0.00000000000000001 \cdot kN \cdot m \\ \dfrac{M_r}{M_{SLS_r}} \ \text{ otherwise} \end{array}$$

$$P = \begin{pmatrix} 2918 \\ 2918 \\ 2920 \\ 2920 \\ 2909 \\ 2909 \\ 3087 \\ 3087 \end{pmatrix} kN \qquad M = \begin{pmatrix} 1086 \\ 1934 \\ 1087 \\ 1934 \\ 2027 \\ 1230 \\ 2073 \\ 1227 \end{pmatrix} kN \cdot m \qquad M_{SLS} = \begin{pmatrix} 1814.7 \\ 1814.7 \\ 1814.7 \\ 1814.7 \\ 1814.7 \\ 1814.7 \\ 1856.2 \\ 1856.2 \end{pmatrix} kN \cdot m \qquad StressFactor = \begin{pmatrix} 0.598 \\ 1.066 \\ 0.599 \\ 1.066 \\ 1.117 \\ 0.678 \\ 1.117 \\ 0.661 \end{pmatrix}$$

RESULTS SUMMARY
SERVICEABILITY LIMIT STATE ANALYSIS OF CIRCULAR BEAM COLUMN

Diameter of Column	1100 mm
Percentage of rebar	2.55 %

Load Case Ref	Pier	Applied Service Axial Load kN	Applied Service Bending Moment kNm	Service Limit State Bending Moment kNm	Allowable Stress Factor	Applied Stress Factor	Serviceability Limit State Design Result
1	**P11**	**2918**	**1086**	**1814.7**	**140%**	**60%**	OK
2	**P11**	**2918**	**1934**	**1814.7**	**140%**	**107%**	OK
3	**P12**	**2920**	**1087**	**1814.7**	**140%**	**60%**	OK
4	**P12**	**2920**	**1934**	**1814.7**	**140%**	**107%**	OK
5	**P91**	**2909**	**2027**	**1814.7**	**140%**	**112%**	OK
6	**P91**	**2909**	**1230**	**1814.7**	**140%**	**68%**	OK
7	**P92**	**3087**	**2073**	**1856.2**	**140%**	**112%**	OK
8	**P92**	**3087**	**1227**	**1856.2**	**140%**	**66%**	OK

BASE

Serviceability Check - Traffic Load Only

KATAHIRA & ENGINEERS INTERNATIONAL

Project: Detailed Design Study of North Java Corridor Flyover Project

Calculation: Balaraja Flyover
Serviceability Check - Traffic Load Only
1100 mm Dia Circular RC Column - P1 & P9 Base Section

Reference: Project Specific Design Criteria

Section Data

$MPa := 1000000 \cdot Pa$ $kN := 1000 \cdot N$

Input Item			
Concrete Compressive Strength	fc	30	MPa
Structural Steel Yield Strength	fys	250	MPa
Rebar Yield Strength	fy	390	MPa
Diameter of reinforced concrete section	D	1100	mm
Thickness of CHS section	t	0	mm
Diameter of rebar - layer 1	dia1	32	mm
Diameter of rebar - layer 2	dia2	0	mm
Number bars - layer 1 (max 100)	n1	12	
Number bars - layer 2 (max 100)	n2	0	
Cover from face of section - layer 1	cov1	60	mm
Cover from face of section - layer 2	cov2	115	mm

Load Data

Ref	Pier	Load Case	P	M	Stress
			kN	kNm	Allowance
1	P11	Combination 1 - P + Traffic Load Only	3081.7	479.2	100%
2	P11	Combination 1 - P + Traffic Load Only	3081.7	120.8	100%
3	P12	Combination 1 - P + Traffic Load Only	3083.4	478.7	100%
4	P12	Combination 1 - P + Traffic Load Only	3083.4	121.3	100%
5	P91	Combination 1 - P + Traffic Load Only	3117.0	86.8	100%
6	P91	Combination 1 - P + Traffic Load Only	3117.0	394.8	100%
7	P92	Combination 1 - P + Traffic Load Only	3202.4	87.4	100%
8	P92	Combination 1 - P + Traffic Load Only	3202.4	414.3	100%

$f_c := f_c \cdot MPa \quad f_{ys} := f_{ys} \cdot MPa \quad f_y := f_y \cdot MPa \qquad D := D \cdot mm \qquad ts := ts \cdot mm$

$dia1 := dia1 \cdot mm \qquad dia2 := dia2 \cdot mm \qquad cov1 := cov1 \cdot mm \qquad cov2 := cov2 \cdot mm$

$P := P \cdot kN \qquad M := M \cdot kN \cdot m$

$E_S := 200000 \cdot MPa \qquad E_C := 4700 \sqrt{\frac{f_c}{MPa}} \cdot MPa$ Modular ratio $\alpha := \begin{cases} \frac{E_S}{E_C} & \text{if } E_C > 0 \\ 1 & \text{otherwise} \end{cases} \qquad \alpha = 7.77$

$E_C = 25743\, MPa$

Calculate Basic Allowable Stresses

Calculate rupture stress: $\sigma_{ct} := 0.5 \cdot \left(\frac{f_c}{MPa}\right)^{\frac{2}{3}} \cdot MPa \qquad \sigma_{ct} = 4.8\, MPa$

Calculate basic allowable stress of concrete $\sigma_{cc} := 1.0 \cdot f_c \qquad \sigma_{cc} = 30.0\, MPa$

Calculate basic allowable tensile stress of rebar $\sigma_{rs} := \begin{cases} 0.5 \cdot f_y & \text{if } 0.5 \cdot f_y \le 170MPa \\ 170MPa & \text{otherwise} \end{cases} \qquad \sigma_{rs} = 170\, MPa$

Calculate basic allowable compressive stress of rebar $\sigma_{rc} := \begin{cases} 0.5 \cdot f_y & \text{if } 0.5 \cdot f_y \le 110MPa \\ f_y & \text{otherwise} \end{cases} \qquad \sigma_{rc} = 390\, MPa$

Calculate basic allowable stress of structural steel $\sigma_{ts} := -0.6 f_{ys} \qquad \sigma_{ts} = -150\, MPa$

$\sigma_{tc} := 1 f_{ys} \qquad \sigma_{tc} = 250\, MPa$

Limiting strain of rebar $\varepsilon_{rs} := -\frac{\sigma_{rs}}{E_S} \qquad \varepsilon_{rs} = -0.000850$

$\varepsilon_{rc} := \frac{\sigma_{rc}}{E_S} \qquad \varepsilon_{rc} = 0.001950$

Limiting strain of structural steel $\varepsilon_{ts} := \frac{\sigma_{ts}}{E_S} \qquad \varepsilon_{ts} = -0.000750$

$\varepsilon_{tc} := \frac{\sigma_{tc}}{E_S} \qquad \varepsilon_{tc} = 0.001250$

Concrete Cross Section Data - generated

$n := 50$ Number of Points - 50 points maximum

$i := 1 .. n + 1$ Range from 1 to n+1

Ref.	X	Y	Ref.	X	Y
	mm	mm		mm	mm
1	0	-550	**26**	0	550
2	-69	-546	**27**	69	546
3	-137	-533	**28**	137	533
4	-202	-511	**29**	202	511
5	-265	-482	**30**	265	482
6	-323	-445	**31**	323	445
7	-377	-401	**32**	377	401
8	-424	-351	**33**	424	351
9	-464	-295	**34**	464	295
10	-498	-234	**35**	498	234
11	-523	-170	**36**	523	170
12	-540	-103	**37**	540	103
13	-549	-35	**38**	549	35
14	-549	35	**39**	549	-35
15	-540	103	**40**	540	-103
16	-523	170	**41**	523	-170
17	-498	234	**42**	498	-234
18	-464	295	**43**	464	-295
19	-424	351	**44**	424	-351
20	-377	401	**45**	377	-401
21	-323	445	**46**	323	-445
22	-265	482	**47**	265	-482
23	-202	511	**48**	202	-511
24	-137	533	**49**	137	-533
25	-69	546	**50**	69	-546

$k := 1 .. 25$ $XS1 := XS1 \cdot mm$ $XS2 := XS2 \cdot mm$ $YS1 := YS1 \cdot mm$ $YS2 := YS2 \cdot mm$

$x_k := XS1_k$ $y_k := YS1_k$ $x_{k+25} := XS2_k$ $y_{k+25} := YS2_k$ $x_{n+1} := XS1_1$ $y_{n+1} := YS1_1$

Calculate Section Properties of Concrete Section

$$A_C := -\sum_{i=1}^{n}\left[\left(y_{i+1}-y_i\right)\cdot\frac{x_{i+1}+x_i}{2}\right]$$ $A_C = 0.94783\ m^2$

$$x_C := -\frac{1}{A_C}\cdot\sum_{i=1}^{n}\left[\frac{y_{i+1}-y_i}{8}\cdot\left[\left(x_{i+1}+x_i\right)^2+\frac{\left(x_{i+1}-x_i\right)^2}{3}\right]\right]$$ $x_C = 0\ m$

$$y_C := \frac{1}{A_C}\cdot\sum_{i=1}^{n}\left[\frac{x_{i+1}-x_i}{8}\cdot\left[\left(y_{i+1}+y_i\right)^2+\frac{\left(y_{i+1}-y_i\right)^2}{3}\right]\right]$$ $y_C = 0\ m$

$$I_x := \sum_{i=1}^{n}\left[\left[\left(x_{i+1}-x_i\right)\cdot\frac{y_{i+1}+y_i}{24}\right]\cdot\left[\left(y_{i+1}+y_i\right)^2+\left(y_{i+1}-y_i\right)^2\right]\right]$$ $I_x = 0.07149\ m^4$

$$I_y := -\sum_{i=1}^{n}\left[\left[\left(y_{i+1}-y_i\right)\cdot\frac{x_{i+1}+x_i}{24}\right]\cdot\left[\left(x_{i+1}+x_i\right)^2+\left(x_{i+1}-x_i\right)^2\right]\right]$$ $I_y = 0.07149\ m^4$

$$I_{xC} := I_x - A_C\cdot x_C^{\,2}$$ $I_{xC} = 0.07149\ m^4$

$$I_{yC} := I_y - A_C\cdot y_C^{\,2}$$ $I_{yC} = 0.07149\ m^4$

Steel Tube Cross Section Data - generated from input

$ns := 50$ Number of Points - 50 points maximum

$ps := 1..ns + 1$ Range from 1 to ns+1

Ref.	X	Y	Ref.	X	Y
	mm	mm		mm	mm
1	0	-550	**26**	0	-550
2	-142	-531	**27**	142	-531
3	-275	-476	**28**	275	-476
4	-389	-389	**29**	389	-389
5	-476	-275	**30**	476	-275
6	-531	-142	**31**	531	-142
7	-550	0	**32**	550	0
8	-531	142	**33**	531	142
9	-476	275	**34**	476	275
10	-389	389	**35**	389	389
11	-275	476	**36**	275	476
12	-142	531	**37**	142	531
13	0	550	**38**	0	550
14	142	531	**39**	-142	531
15	275	476	**40**	-275	476
16	389	389	**41**	-389	389
17	476	275	**42**	-476	275
18	531	142	**43**	-531	142
19	550	0	**44**	-550	0
20	531	-142	**45**	-531	-142
21	476	-275	**46**	-476	-275
22	389	-389	**47**	-389	-389
23	275	-476	**48**	-275	-476
24	142	-531	**49**	-142	-531
25	0	-550	**50**	0	-550

$XSS1 := XSS1 \cdot mm$ $XSS2 := XSS2 \cdot mm$ $YSS1 := YSS1 \cdot mm$ $YSS2 := YSS2 \cdot mm$

$z := 1..25$ $xs_z := XSS1_z$ $ys_z := YSS1_z$

$z := 26..50$ $xs_z := XSS2_{z-25}$ $ys_z := YSS2_{z-25}$

$xs_{ns+1} := XSS1_1$ $ys_{ns+1} := YSS1_1$

Calculate Section Properties of Steel Tube Section

$$A_{ST} := -\sum_{ps=1}^{ns}\left[\left(ys_{ps+1}-ys_{ps}\right)\cdot\frac{xs_{ps+1}+xs_{ps}}{2}\right]$$ $A_{ST} = 0\ m^2$

$$x_{ST} := -\frac{1}{A_{ST}}\cdot\sum_{ps=1}^{ns}\left[\frac{ys_{ps+1}-ys_{ps}}{8}\cdot\left[\left(xs_{ps+1}+xs_{ps}\right)^2+\frac{\left(xs_{ps+1}-xs_{ps}\right)^2}{3}\right]\right]$$ $x_{ST} = 0.2\ m$

$$y_{ST} := \frac{1}{A_{ST}}\cdot\sum_{ps=1}^{ns}\left[\frac{xs_{ps+1}-xs_{ps}}{8}\cdot\left[\left(ys_{ps+1}+ys_{ps}\right)^2+\frac{\left(ys_{ps+1}-ys_{ps}\right)^2}{3}\right]\right]$$ $y_{ST} = -0.011\ m$

$$I_{xS} := \sum_{ps=1}^{ns}\left[\left[\left(xs_{ps+1}-xs_{ps}\right)\cdot\frac{ys_{ps+1}+ys_{ps}}{24}\right]\cdot\left[\left(ys_{ps+1}+ys_{ps}\right)^2+\left(ys_{ps+1}-ys_{ps}\right)^2\right]\right]$$

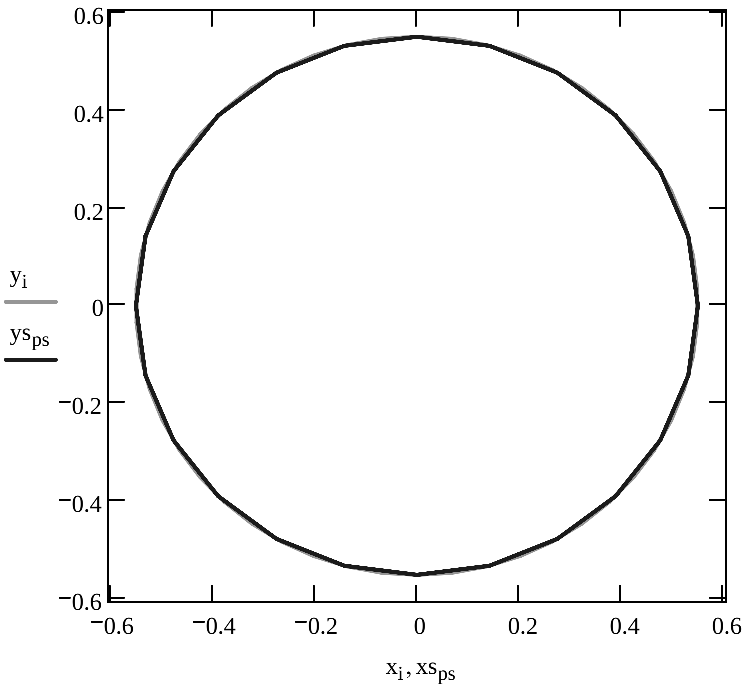
$I_{xS} = 0\ m^4$

$$I_{yS} := -\sum_{ps=1}^{ns}\left[\left[\left(ys_{ps+1}-ys_{ps}\right)\cdot\frac{xs_{ps+1}+xs_{ps}}{24}\right]\cdot\left[\left(xs_{ps+1}+xs_{ps}\right)^2+\left(xs_{ps+1}-xs_{ps}\right)^2\right]\right]$$

$I_{yS} = 0\ m^4$

$I_{xS} := I_{xS} - A_{ST}\cdot x_{ST}^2$ $I_{xS} = 0\ m^4$

$I_{yS} := I_{yS} - A_{ST}\cdot y_{ST}^2$ $I_{yS} = 0.00000\ m^4$



Rebar Data Layer 1 - generated from input

Ref	Area mm2	X mm	Y mm	Ref	Area mm2	X mm	Y mm
1	804	0	-474	51	0	0	0
2	804	-237	-410	52	0	0	0
3	804	-410	-237	53	0	0	0
4	804	-474	0	54	0	0	0
5	804	-410	237	55	0	0	0
6	804	-237	410	56	0	0	0
7	804	0	474	57	0	0	0
8	804	237	410	58	0	0	0
9	804	410	237	59	0	0	0
10	804	474	0	60	0	0	0
11	804	410	-237	61	0	0	0
12	804	237	-410	62	0	0	0
13	0	0	0	63	0	0	0
14	0	0	0	64	0	0	0
15	0	0	0	65	0	0	0
16	0	0	0	66	0	0	0
17	0	0	0	67	0	0	0
18	0	0	0	68	0	0	0
19	0	0	0	69	0	0	0
20	0	0	0	70	0	0	0
21	0	0	0	71	0	0	0
22	0	0	0	72	0	0	0
23	0	0	0	73	0	0	0
24	0	0	0	74	0	0	0
25	0	0	0	75	0	0	0
26	0	0	0	76	0	0	0
27	0	0	0	77	0	0	0
28	0	0	0	78	0	0	0
29	0	0	0	79	0	0	0
30	0	0	0	80	0	0	0
31	0	0	0	81	0	0	0
32	0	0	0	82	0	0	0
33	0	0	0	83	0	0	0
34	0	0	0	84	0	0	0
35	0	0	0	85	0	0	0
36	0	0	0	86	0	0	0
37	0	0	0	87	0	0	0
38	0	0	0	88	0	0	0
39	0	0	0	89	0	0	0
40	0	0	0	90	0	0	0
41	0	0	0	91	0	0	0
42	0	0	0	92	0	0	0
43	0	0	0	93	0	0	0
44	0	0	0	94	0	0	0
45	0	0	0	95	0	0	0
46	0	0	0	96	0	0	0
47	0	0	0	97	0	0	0
48	0	0	0	98	0	0	0
49	0	0	0	99	0	0	0
50	0	0	0	100	0	0	0

Rebar Data Layer 2 - generated from input

Ref	Area mm2	X mm	Y mm	Ref	Area mm2	X mm	Y mm
1	0	0	0	51	0	0	0
2	0	0	0	52	0	0	0
3	0	0	0	53	0	0	0
4	0	0	0	54	0	0	0
5	0	0	0	55	0	0	0
6	0	0	0	56	0	0	0
7	0	0	0	57	0	0	0
8	0	0	0	58	0	0	0
9	0	0	0	59	0	0	0
10	0	0	0	60	0	0	0
11	0	0	0	61	0	0	0
12	0	0	0	62	0	0	0
13	0	0	0	63	0	0	0
14	0	0	0	64	0	0	0
15	0	0	0	65	0	0	0
16	0	0	0	66	0	0	0
17	0	0	0	67	0	0	0
18	0	0	0	68	0	0	0
19	0	0	0	69	0	0	0
20	0	0	0	70	0	0	0
21	0	0	0	71	0	0	0
22	0	0	0	72	0	0	0
23	0	0	0	73	0	0	0
24	0	0	0	74	0	0	0
25	0	0	0	75	0	0	0
26	0	0	0	76	0	0	0
27	0	0	0	77	0	0	0
28	0	0	0	78	0	0	0
29	0	0	0	79	0	0	0
30	0	0	0	80	0	0	0
31	0	0	0	81	0	0	0
32	0	0	0	82	0	0	0
33	0	0	0	83	0	0	0
34	0	0	0	84	0	0	0
35	0	0	0	85	0	0	0
36	0	0	0	86	0	0	0
37	0	0	0	87	0	0	0
38	0	0	0	88	0	0	0
39	0	0	0	89	0	0	0
40	0	0	0	90	0	0	0
41	0	0	0	91	0	0	0
42	0	0	0	92	0	0	0
43	0	0	0	93	0	0	0
44	0	0	0	94	0	0	0
45	0	0	0	95	0	0	0
46	0	0	0	96	0	0	0
47	0	0	0	97	0	0	0
48	0	0	0	98	0	0	0
49	0	0	0	99	0	0	0
50	0	0	0	100	0	0	0

$A1 := A1 \cdot mm^2 \quad A2 := A2 \cdot mm^2 \quad A3 := A3 \cdot mm^2 \quad A4 := A4 \cdot mm^2$

$X1 := X1 \cdot mm \quad X2 := X2 \cdot mm \quad X3 := X3 \cdot mm \quad X4 := X4 \cdot mm$

$Y1 := Y1 \cdot mm \quad Y2 := Y2 \cdot mm \quad Y3 := Y3 \cdot mm \quad Y4 := Y4 \cdot mm$

$k := 1..50 \quad A_{bar_k} := A1_k \quad x_{bar_k} := X1_k \quad y_{bar_k} := Y1_k$

$A_{bar_{k+50}} := A2_k \quad x_{bar_{k+50}} := X2_k \quad y_{bar_{k+50}} := Y2_k$

$A_{bar_{k+100}} := A3_k \quad x_{bar_{k+100}} := X3_k \quad y_{bar_{k+100}} := Y3_k$

$A_{bar_{k+150}} := A4_k \quad x_{bar_{k+150}} := X4_k \quad y_{bar_{k+150}} := Y4_k$

Calculate Section Properties of Reinforcement

$$A_{BAR} := \sum_{j=1}^{200} A_{bar_j} \qquad A_{BAR} = 9651\,mm^2$$

$$\rho := \frac{A_{BAR}}{A_C} \qquad \rho = 0.0102$$

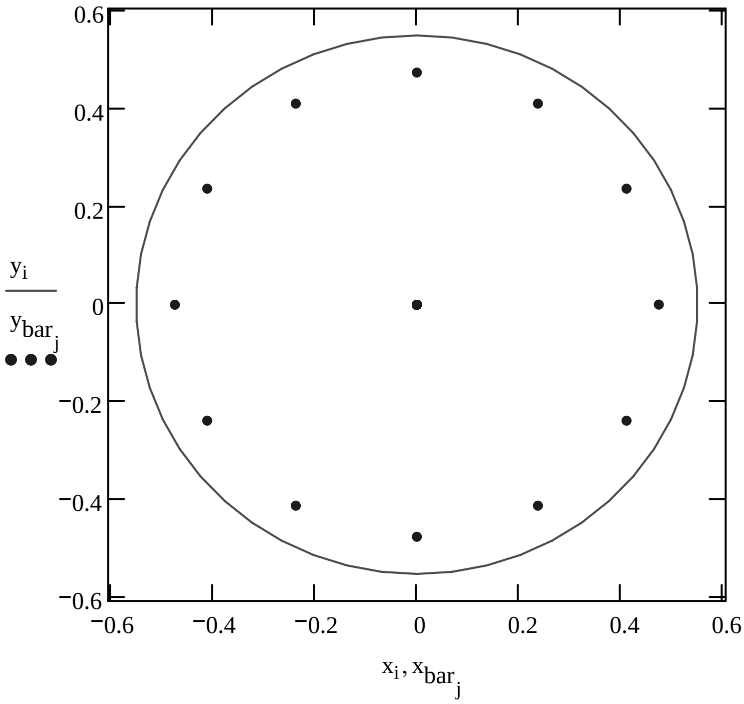
$$x_b := \begin{cases} \left[\sum_{j=1}^{200} \left(A_{bar_j} \cdot x_{bar_j}\right)\right] \cdot \frac{1}{A_{BAR}} & \text{if } A_{BAR} > 0 \\ 0m & \text{otherwise} \end{cases} \qquad x_b = 0\ m$$

$$y_b := \begin{cases} \left[\sum_{j=1}^{200} \left(A_{bar_j} \cdot y_{bar_j}\right)\right] \cdot \frac{1}{A_{BAR}} & \text{if } A_{BAR} > 0 \\ 0m & \text{otherwise} \end{cases} \qquad y_b = 0\ m$$

$$I_{xb} := \sum_{j=1}^{200} \left[A_{bar_j} \cdot \left(x_{bar_j}\right)^2\right] + A_{BAR} \cdot x_b^2 \qquad I_{xb} = 0.00108\,m^4$$

$$I_{yb} := \sum_{j=1}^{200} \left[A_{bar_j} \cdot \left(y_{bar_j}\right)^2\right] + A_{BAR} \cdot y_b^2 \qquad I_{yb} = 0.00108\,m^4$$

$j := 1 .. 200$



Calculate Composite Section Properties (before cracking)

Effective area $A_E := A_C \cdot [1 + \rho \cdot (\alpha - 1)] + A_{ST} \cdot \alpha$ $\qquad A_E = 1013161\ mm^2$

Effective centroid $x_E := \dfrac{A_C \cdot [(1-\rho) \cdot x_C + \rho \cdot x_b \cdot \alpha] + A_{ST} \cdot \alpha \cdot x_{ST}}{A_E}$ $\qquad x_E = 0.000\ m$

$y_E := \dfrac{A_C \cdot [(1-\rho) \cdot y_C + \rho \cdot y_b \cdot \alpha] + A_{ST} \cdot \alpha \cdot x_{ST}}{A_E}$ $\qquad y_E = 0.000\ m$

Effective stiffness $I_{EX} := I_{xC} + I_{xb} \cdot (\alpha - 1) + A_C \cdot \left[(1-\rho) \cdot x_C{}^2 + \rho \cdot x_b{}^2 \cdot \alpha\right] + \left(I_{xS} + A_{ST} \cdot x_{ST}{}^2\right) \cdot \alpha$

$I_{EX} = 0\ m^4$

$I_{EY} := I_{yC} + I_{yb} \cdot (\alpha - 1) + A_C \cdot \left[(1-\rho) \cdot y_C{}^2 + \rho \cdot y_b{}^2 \cdot \alpha\right] + \left(I_{yS} + A_{ST} \cdot y_{ST}{}^2\right) \cdot \alpha$

$I_{EY} = 0\ m^4$

Distance from extreme concrete fiber to centroid

$xF_{pos} := \max(x - x_E)$ $\qquad xF_{neg} := \min(x - x_E)$

$yF_{pos} := \max(y - y_E)$ $\qquad yF_{neg} := \min(y - y_E)$

Total depth of concrete section

$H_{CX} := xF_{pos} - xF_{neg}$ $\qquad H_{CX} = 1\ m$

$H_{CY} := yF_{pos} - yF_{neg}$ $\qquad H_{CY} = 1\ m$

Section modulus

$$Z_{Xpos} := \frac{I_{EX}}{xF_{pos}} \qquad Z_{Xneg} := \frac{I_{EX}}{xF_{neg}}$$

$$Z_{Ypos} := \frac{I_{EY}}{yF_{pos}} \qquad Z_{Yneg} := \frac{I_{EY}}{yF_{neg}}$$

Thickness of steel tube:

$$ts := y_1 - ys_1 \qquad ts = 0\,mm$$

Establish Section Dimensions

Positive case - determine coord of extreme concrete fiber $y_{Epos} := \max(y)$ $y_{Epos} = 550\,mm$

Negative case - determine coord of extreme concrete fiber $y_{Eneg} := \min(y)$ $y_{Eneg} = -550\,mm$

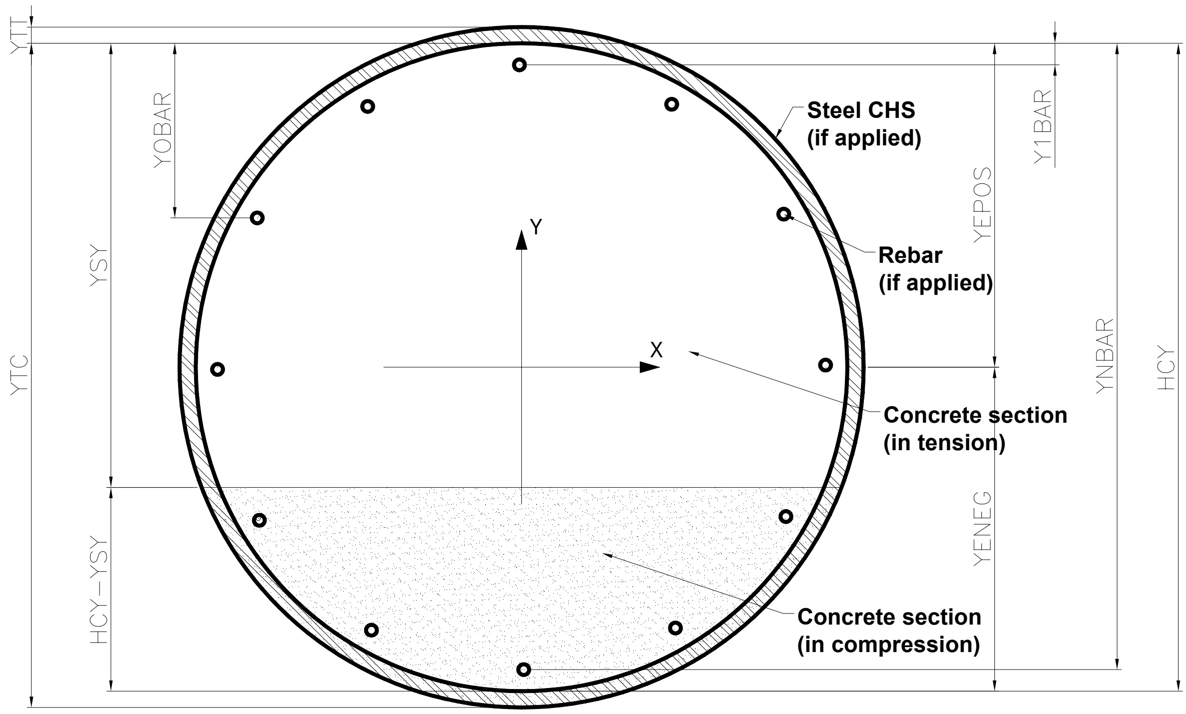
Offsets of rebar from extreme fiber $y_{Obar} := y_{Epos} - y_{bar}$

Determine most extreme rebar (minimum offset) $y_{1bar} := \min(y_{Epos} - y_{bar})$ $y_{1bar} = 76\,mm$

Determine most extreme rebar (maximum offset) $y_{nbar} := \max(y_{Epos} - y_{bar})$ $y_{nbar} = 1024\,mm$

Offsets of extreme steel tube fiber from extreme concrete fiber $y_{tt} := ts$ $y_{tt} = 0\,mm$

$y_{tc} := H_{CY} + ts$ $y_{tc} = 1100\,mm$



ASSIGN NEUTRAL AXIS VALUES

Number of sections to analysed $ns := 500$

$q := 2 .. ns$

Distance of neutral axis from extreme fiber in tension $y_{SY_q} := H_{CY} \cdot \frac{q}{ns + 1}$

Calculate stresses and strains in reinforcement and concrete at extreme fibers

Calculate strain at extreme compression fiber assuming max allowable stress in concrete:

Trial value of concrete strain

$$\varepsilon cc := \frac{\sigma_{cc}}{E_C} \cdot 2 \qquad \frac{\sigma_{cc}}{E_C} = 0.001165$$

Given

$$\sigma_{cc} = \varepsilon cc \cdot \left(4700 \sqrt{\frac{f_c \cdot 2}{MPa}} - \frac{4700^2}{2.68} \cdot \varepsilon cc\right) \cdot MPa$$

$$\varepsilon_{cc} := \text{Find}(\varepsilon cc) \qquad \varepsilon_{cc} = 0.003321$$

$$\varepsilon_{cc} := \begin{cases} \varepsilon_{tc} & \text{if } (f_c = 0) \cdot (A_{BAR} = 0) \\ \varepsilon_{rc} & \text{if } (f_c = 0) \cdot (ts = 0) \\ \varepsilon_{cc} & \text{otherwise} \end{cases} \qquad \varepsilon_{cc} = 0.003321$$

Strain at other stresses taken to be linear:

$$\varepsilon cc(f_c, \sigma_{cd}) := \begin{cases} \frac{\sigma_{cd}}{\sigma_{tc}} \cdot \varepsilon_{tc} & \text{if } (f_c = 0) \cdot (A_{BAR} = 0) \\ \frac{\sigma_{cd}}{\sigma_{rc}} \cdot \varepsilon_{rc} & \text{if } (f_c = 0) \cdot (ts = 0) \\ \frac{\sigma_{cd}}{\sigma_{cc}} \cdot \varepsilon_{cc} & \text{otherwise} \end{cases}$$

Calculate strain in steel tube assuming max allowable stress in concrete:

In compression $$\varepsilon_{tcc_q} := \varepsilon_{cc} \cdot \frac{y_{tc} - y_{SY_q}}{H_{CY} - y_{SY_q}}$$

In tension $$\varepsilon_{tct_q} := \varepsilon_{cc} \cdot \frac{-\left(y_{SY_q} + y_{tt}\right)}{H_{CY} - y_{SY_q}}$$

Calculate strain in rebar assuming max allowable stress in concrete:

In compression $\varepsilon_{rcc_q} := \varepsilon_{cc} \cdot \frac{y_{nbar} - y_{SY_q}}{H_{CY} - y_{SY_q}}$

In tension $\varepsilon_{rct_q} := \varepsilon_{cc} \cdot \frac{y_{1bar} - y_{SY_q}}{H_{CY} - y_{SY_q}}$

Calculate design max stress in compression taking account of other limits:

$$\sigma cd(\varepsilon_{tcc}, q) := \begin{array}{|l} \sigma_{cd} \leftarrow \sigma_{cc} \text{ if } f_c > 0 \\ \sigma_{cd} \leftarrow \sigma_{tc} \text{ if } (f_c = 0) \cdot (A_{BAR} = 0) \\ \sigma_{cd} \leftarrow \sigma_{rc} \text{ if } (f_c = 0) \cdot (ts = 0) \\ \sigma_{cd} \leftarrow \sigma_{cd} \cdot \frac{\varepsilon_{tc}}{\varepsilon_{tcc}} \text{ if } (\varepsilon_{tcc} > \varepsilon_{tc}) \cdot (ts > 0) \\ \sigma_{cd} \leftarrow \sigma_{cd} \cdot \frac{\varepsilon_{rc}}{\varepsilon cc(f_c, \sigma_{cd}) \cdot \frac{y_{nbar} - y_{SY_q}}{H_{CY} - y_{SY_q}}} \text{ if } \left(\varepsilon cc(f_c, \sigma_{cd}) \cdot \frac{y_{nbar} - y_{SY_q}}{H_{CY} - y_{SY_q}} > \varepsilon_{rc} \right) \cdot (A_{BAR} > 0) \\ \sigma_{cd} \leftarrow \sigma_{cd} \cdot \frac{\varepsilon_{ts}}{\varepsilon cc(f_c, \sigma_{cd}) \cdot \frac{-(y_{SY_q} + y_{tt})}{H_{CY} - y_{SY_q}}} \text{ if } \left[\varepsilon cc(f_c, \sigma_{cd}) \cdot \frac{-(y_{SY_q} + y_{tt})}{H_{CY} - y_{SY_q}} < \varepsilon_{ts} \right] \cdot (ts > 0) \\ \sigma_{cd} \leftarrow \sigma_{cd} \cdot \frac{\varepsilon_{rs}}{\varepsilon cc(f_c, \sigma_{cd}) \cdot \frac{-(y_{SY_q} - y_{1bar})}{H_{CY} - y_{SY_q}}} \text{ if } \left[\varepsilon cc(f_c, \sigma_{cd}) \cdot \frac{-(y_{SY_q} - y_{1bar})}{H_{CY} - y_{SY_q}} < \varepsilon_{rs} \right] \cdot (A_{BAR} > 0) \\ \sigma_{cc} \text{ otherwise} \end{array}$$

$$\sigma_{cd_q} := \sigma cd(\varepsilon_{tcc_q}, q)$$

CALCULATE FORCES AND MOMENTS AT EACH NEUTRAL AXIS LOCATION

Calculate force in concrete:

$$F_{C_q} := \begin{cases} \displaystyle\int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot(1-\rho)\cdot\left[\frac{\sigma_{cd_q}\cdot\left[y+\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{H_{CY}-y_{SY_q}}\right] dy & \text{if } f_c > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate moment from concrete about column centroid:

$$M_{C_q} := \begin{cases} \displaystyle\int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot(1-\rho)\cdot\left[\frac{\sigma_{cd_q}\cdot\left[y+\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{H_{CY}-y_{SY_q}}\right]\cdot y\, dy & \text{if } f_c > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate strain in rebar assuming design max stress in concrete:

$$y_{SY_q} := \begin{cases} y_{nbar}\cdot\frac{q}{ns+1} & \text{if } (f_c = 0)\cdot(A_{BAR} > 0) \\ y_{SY_q} & \text{otherwise} \end{cases}$$

$$\varepsilon_{S_{j,q}} := \begin{cases} -\frac{y_{SY_q} - y_{Obar_j}}{y_{nbar} - y_{SY_q}}\cdot\varepsilon cc\left(f_c, \sigma_{cd_q}\right) & \text{if } f_c = 0 \\ -\frac{y_{SY_q} - y_{Obar_j}}{H_{CY} - y_{SY_q}}\cdot\varepsilon cc\left(f_c, \sigma_{cd_q}\right) & \text{otherwise} \end{cases}$$

Calculate force in each rebar:

$$F_{S_{j,q}} := \begin{cases} \varepsilon_{S_{j,q}} E_S\cdot A_{bar_j} & \text{if } A_{BAR} > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate total force in reinforcement:

$$F_{R_q} := \sum_j F_{S_{j,q}}$$

Calculate moment from reinforcement about section centroid:

$$M_{R_q} := \begin{cases} \sum_j -\left(\varepsilon_{S_{j,q}} E_S \cdot A_{bar_j} \cdot y_{bar_j}\right) & \text{if } A_{BAR} > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate strain in steel tube at extreme tension fiber:

$$\varepsilon_{tds_q} := \frac{-\left(y_{SY_q} + y_{tt}\right)}{H_{CY} - y_{SY_q}} \varepsilon cc\left(f_c, \sigma_{cd_q}\right)$$

Calculate strain in steel tube at extreme compression fiber:

$$\varepsilon_{tdc_q} := \frac{y_{tc} - y_{SY_q}}{H_{CY} - y_{SY_q}} \varepsilon cc\left(f_c, \sigma_{cd_q}\right)$$

Calculate tensile force in steel tube:

$$F_{TS1_q} := \int_{\left(\frac{H_{CY}}{2} - y_{SY_q}\right)}^{\frac{H_{CY}}{2} + y_{tt}} 2\sqrt{\left(\frac{H_{CY}}{2} + y_{tt}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tds_q} \cdot E_S \cdot \left[y - \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{y_{SY_q} + y_{tt}}\right] dy$$

$$F_{TS2_q} := \int_{\left(\frac{H_{CY}}{2} - y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tds_q} \cdot E_S \cdot \left[y - \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{y_{SY_q} + y_{tt}}\right] dy$$

$$F_{TS} := \begin{cases} F_{TS1} - F_{TS2} & \text{if } ts > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate compressive force in steel tube:

$$F_{TC1_q} := \int_{-\left(\frac{H_{CY}}{2} - y_{SY_q}\right)}^{\frac{H_{CY}}{2} + y_{tt}} 2\sqrt{\left(\frac{H_{CY}}{2} + y_{tt}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tdc_q} \cdot E_S \cdot \left[y + \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{H_{CY} - y_{SY_q} + y_{tt}}\right] dy$$

$$F_{TC2_q} := \int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot\left[\frac{\varepsilon_{tdc_q}\cdot E_S\cdot\left[y+\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{H_{CY}-y_{SY_q}+y_{tt}}\right] dy$$

$$F_{TC} := \begin{cases} F_{TC1} - F_{TC2} & \text{if } ts > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate moment from tensile force in steel tube:

$$M_{TS1_q} := \int_{\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}+y_{tt}} -2\sqrt{\left(\frac{H_{CY}}{2}+y_{tt}\right)^2 - y^2}\cdot\left[\frac{\varepsilon_{tds_q}\cdot E_S\cdot\left[y-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{y_{SY_q}+y_{tt}}\right]\cdot y\, dy$$

$$M_{TS2_q} := \int_{\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} -2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot\left[\frac{\varepsilon_{tds_q}\cdot E_S\cdot\left[y-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{y_{SY_q}+y_{tt}}\right]\cdot y\, dy$$

$$M_{TS} := \begin{cases} M_{TS1} - M_{TS2} & \text{if } ts > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate moment from compressive force in steel tube:

$$M_{TC1_q} := \int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}+y_{tt}} 2\sqrt{\left(\frac{H_{CY}}{2}+y_{tt}\right)^2 - y^2}\cdot\left[\frac{\varepsilon_{tdc_q}\cdot E_S\cdot\left[y+\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{H_{CY}-y_{SY_q}+y_{tt}}\right]\cdot y\, dy$$

$$M_{TC2_q} := \int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot\left[\frac{\varepsilon_{tdc_q}\cdot E_S\cdot\left[y+\left(\frac{H_{CY}}{2}-y_{SY_q}\right)\right]}{H_{CY}-y_{SY_q}+y_{tt}}\right]\cdot y\, dy$$

$$M_{TC} := \begin{cases} M_{TC1} - M_{TC2} & \text{if } ts > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calate total axial response from section:

$$F_T := F_C + F_R + F_{TS} + F_{TC}$$

$$F_{TC} := F_C$$

Calculate total moment response from section:

$$M_T := M_C + M_R + M_{TS} + M_{TC}$$

$$M_{TC} := M_C$$

CALCULATE MAXIMUM ALLOWABLE AXIAL FORCE IN SECTION

Limiting strain in axial compression:

$$\varepsilon_{cL} := \begin{cases} \min(\varepsilon_{cc}, \varepsilon_{tc}) & \text{if } (A_{BAR} = 0)\cdot(ts \neq 0)\cdot(f_c \neq 0) \\ \min(\varepsilon_{cc}, \varepsilon_{rc}) & \text{if } (ts = 0)\cdot(A_{BAR} \neq 0)\cdot(f_c \neq 0) \\ \varepsilon_{tc} & \text{if } (A_{BAR} = 0)\cdot(f_c = 0) \\ \varepsilon_{rc} & \text{if } (ts = 0)\cdot(f_c = 0) \\ \min(\varepsilon_{cc}, \varepsilon_{rc}, \varepsilon_{tc}) & \text{otherwise} \end{cases}$$

$\varepsilon_{cL} = 0.001950$

Limiting concrete stress in axial compression

$$\sigma_{cL} := \begin{cases} \sigma_{cd_2} & \text{if } f_c > 0 \\ 0 & \text{otherwise} \end{cases}$$

$\sigma_{cL} = 18.93\,\text{MPa}$

$$P_{MAX} := \sigma_{cL}\cdot A_C(1-\rho) + \varepsilon_{cL}\cdot E_S(A_{BAR} + A_{ST})$$

$P_{MAX} = 21522.8\,\text{kN}$ $\quad F_{T_1} := P_{MAX}$ $\quad M_{T_1} := 0\cdot\text{kN}\cdot\text{m}$

$$P_{MAXC} := \sigma_{cL}\cdot A_C\cdot(1-\rho)$$

$P_{MAXC} = 17758.9\,\text{kN}$ $\quad F_{TC_1} := P_{MAXC}$ $\quad M_{TC_1} := 0\cdot\text{kN}\cdot\text{m}$

CALCULATE MINIMUM ALLOWABLE AXIAL FORCE IN SECTION

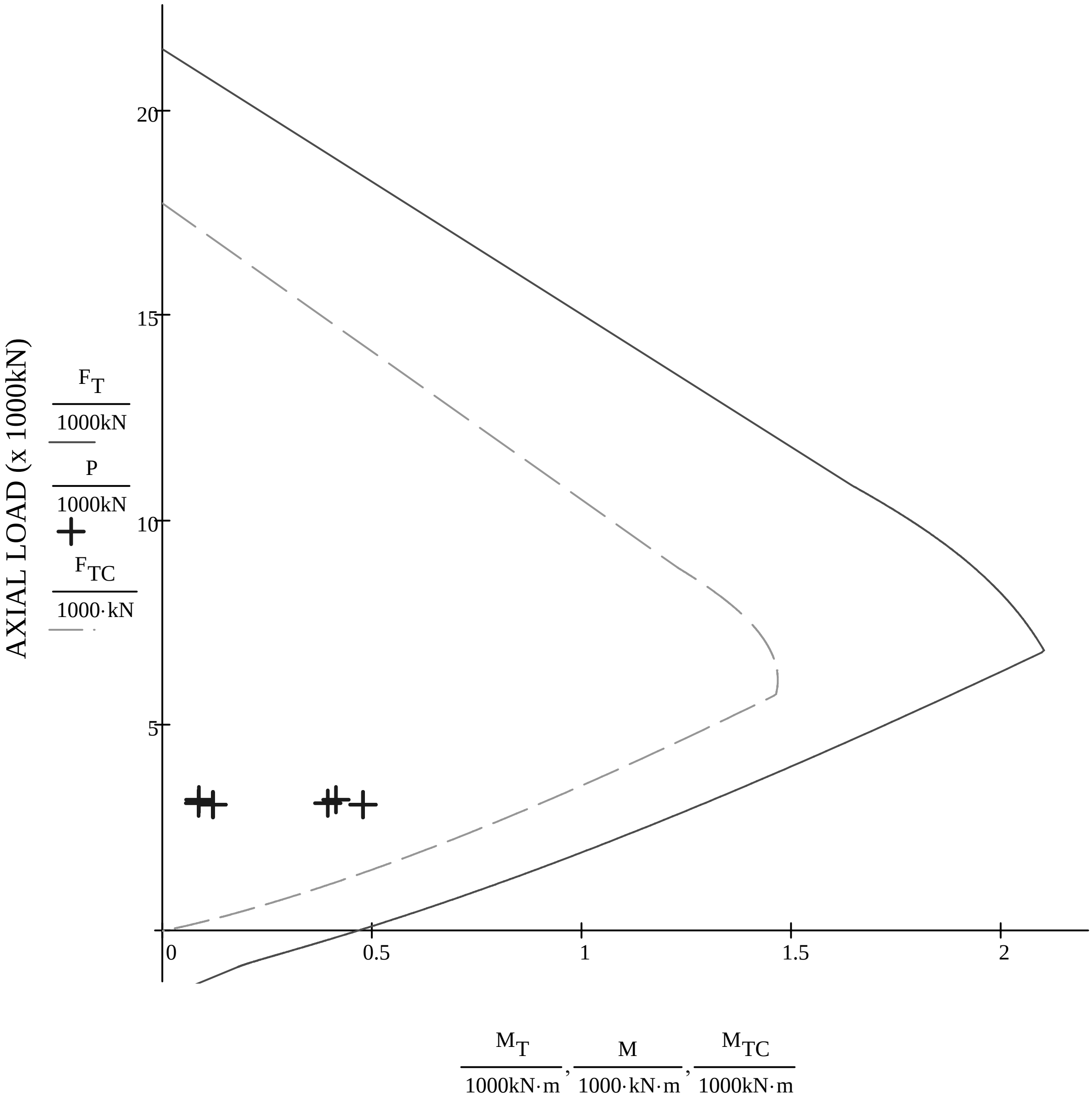
$$P_{MIN} := \begin{cases} \varepsilon_{rs}\cdot E_S(A_{BAR}) & \text{if } ts = 0 \\ \varepsilon_{ts}\cdot E_S(A_{ST}) & \text{if } A_{BAR} = 0 \\ \max(\varepsilon_{ts}, \varepsilon_{rs})\cdot E_S(A_{BAR} + A_{ST}) & \text{otherwise} \end{cases}$$

$P_{MIN} = -1640.7\,\text{kN}$ $\quad F_{T_{ns+1}} := P_{MIN}$ $\quad M_{T_{ns+1}} := 0\cdot\text{kN}\cdot\text{m}$

$$\text{Limit} := \begin{cases} \min(P, F_T)\cdot 0.75 & \text{if } \min(P) > 0 \\ \min(P, F_T)\cdot 1.25 & \text{otherwise} \end{cases}$$

$P_{MINC} := 0\text{kN}$ $\quad M_{TC_{ns+1}} := 0\cdot\text{kN}\cdot\text{m}$

Diameter of Column	$D = 1100\,mm$	Characteristic strength of concrete	$f_c = 30\,MPa$
Percentage reinforcement	$\rho = 1.02\,\%$	Yield Strength of Rebar	$f_y = 390\,MPa$
Thickness of CHS	$ts = 0\,mm$	Yield Strength of CHS	$f_{ys} = 250\,MPa$



INTERACTION CURVE AT SERVICEABILITY LIMIT STATE

Equation of interaction line - upper region (between 1 and 2 calculation points)

$$m1 := \frac{M_{T_2} - M_{T_1}}{F_{T_2} - F_{T_1}} \qquad c1 := F_{T_1}$$

Equation of interaction line - lower region (between ns and ns+1 calculation points)

$$m2 := \frac{M_{T_{ns}} - M_{T_{ns+1}}}{F_{T_{ns}} - F_{T_{ns+1}}} \qquad c2 := F_{T_{ns+1}}$$

$r := 1 .. 8$

$$M_{SLS_r} := \left| \begin{array}{l} 0.000000000000000001 \cdot kN \cdot m \ \text{ if } \ P_r > F_{T_1} \\ 0.000000000000000001 \cdot kN \cdot m \ \text{ if } \ P_r < F_{T_{ns+1}} \\ (P_r - c1) \cdot m1 \ \text{ if } \ (P_r > F_{T_2}) \cdot (P_r \le F_{T_1}) \\ (P_r - c2) \cdot m2 \ \text{ if } \ (P_r \ge F_{T_{ns+1}}) \cdot (P_r < F_{T_{ns}}) \\ \text{otherwise} \\ \quad \left| \begin{array}{l} j \leftarrow 1 \\ \text{while } F_{T_j} > P_r \\ \quad j \leftarrow j + 1 \\ M_{T_j} \end{array} \right. \end{array} \right.$$

$$StressFactor_r := \left| \begin{array}{l} \text{"No Result"} \ \text{ if } \ M_{SLS_r} < 0.00000000000000001 \cdot kN \cdot m \\ \dfrac{M_r}{M_{SLS_r}} \ \text{ otherwise} \end{array} \right.$$

$$P = \begin{pmatrix} 3082 \\ 3082 \\ 3083 \\ 3083 \\ 3117 \\ 3117 \\ 3202 \\ 3202 \end{pmatrix} kN \qquad M = \begin{pmatrix} 479 \\ 121 \\ 479 \\ 121 \\ 87 \\ 395 \\ 87 \\ 414 \end{pmatrix} kN \cdot m \qquad M_{SLS} = \begin{pmatrix} 1284.2 \\ 1284.2 \\ 1284.2 \\ 1284.2 \\ 1284.2 \\ 1284.2 \\ 1307.4 \\ 1307.4 \end{pmatrix} kN \cdot m \qquad StressFactor = \begin{pmatrix} 0.373 \\ 0.094 \\ 0.373 \\ 0.094 \\ 0.068 \\ 0.307 \\ 0.067 \\ 0.317 \end{pmatrix}$$

RESULTS SUMMARY
SERVICEABILITY LIMIT STATE ANALYSIS OF CIRCULAR BEAM COLUMN

Diameter of Column			1100	mm			
Percentage of rebar			1.02	%			
Load Case Ref	**Pier**	**Applied Service Axial Load kN**	**Applied Service Bending Moment kNm**	**Service Limit State Bending Moment kNm**	**Allowable Stress Factor**	**Applied Stress Factor**	**Serviceability Limit State Design Result**
1	**P11**	**3082**	**479**	**1284.2**	**100%**	**37%**	OK
2	**P11**	**3082**	**121**	**1284.2**	**100%**	**9%**	OK
3	**P12**	**3083**	**479**	**1284.2**	**100%**	**37%**	OK
4	**P12**	**3083**	**121**	**1284.2**	**100%**	**9%**	OK
5	**P91**	**3117**	**87**	**1284.2**	**100%**	**7%**	OK
6	**P91**	**3117**	**395**	**1284.2**	**100%**	**31%**	OK
7	**P92**	**3202**	**87**	**1307.4**	**100%**	**7%**	OK
8	**P92**	**3202**	**414**	**1307.4**	**100%**	**32%**	OK

Serviceability Check - Full Live Load

KATAHIRA & ENGINEERS INTERNATIONAL

Project: Detailed Design Study of North Java Corridor Flyover Project

Calculation: Balaraja Flyover
Serviceability Check - Full Live Load
1100 mm Dia Circular RC Column - P1 & P9 Base Section

Reference: Project Specific Design Criteria

Section Data

$MPa := 1000000 \cdot Pa$ $kN := 1000 \cdot N$

Input Item			
Concrete Compressive Strength	fc	30	MPa
Structural Steel Yield Strength	fys	250	MPa
Rebar Yield Strength	fy	390	MPa
Diameter of reinforced concrete section	D	1100	mm
Thickness of CHS section	t	0	mm
Diameter of rebar - layer 1	dia1	32	mm
Diameter of rebar - layer 2	dia2	0	mm
Number bars - layer 1 (max 100)	n1	12	
Number bars - layer 2 (max 100)	n2	0	
Cover from face of section - layer 1	cov1	60	mm
Cover from face of section - layer 2	cov2	115	mm

Load Data

Ref	Pier	Load Case	P	M	Stress
			kN	kNm	Allowance
1	P11	Combination 1 - P + (TTD OR TTT) + (TTB or TTR) + Temp+CRSH	3081.7	624.6	140%
2	P11	Combination 1 - P + (TTD OR TTT) + (TTB or TTR) + Temp+CRSH	3081.7	265.9	140%
3	P12	Combination 1 - P + (TTD OR TTT) + (TTB or TTR) + Temp+CRSH	3083.4	624.3	140%
4	P12	Combination 1 - P + (TTD OR TTT) + (TTB or TTR) + Temp+CRSH	3083.4	266.6	140%
5	P91	Combination 1 - P + (TTD OR TTT) + (TTB or TTR) + Temp+CRSH	3071.8	174.5	140%
6	P91	Combination 1 - P + (TTD OR TTT) + (TTB or TTR) + Temp+CRSH	3071.8	513.5	140%
7	P92	Combination 1 - P + (TTD OR TTT) + (TTB or TTR) + Temp+CRSH	3250.3	175.7	140%
8	P92	Combination 1 - P + (TTD OR TTT) + (TTB or TTR) + Temp+CRSH	3250.3	540.3	140%

$f_c := f_c \cdot MPa \quad f_{ys} := f_{ys} \cdot MPa \quad f_y := f_y \cdot MPa \quad D := D \cdot mm \quad ts := ts \cdot mm$

$dia1 := dia1 \cdot mm \quad dia2 := dia2 \cdot mm \quad cov1 := cov1 \cdot mm \quad cov2 := cov2 \cdot mm$

$P := P \cdot kN \quad M := M \cdot kN \cdot m$

$E_S := 200000 \cdot MPa \quad E_C := 4700\sqrt{\frac{f_c}{MPa}} \cdot MPa$ Modular ratio $\alpha := \begin{cases} \frac{E_S}{E_C} & \text{if } E_C > 0 \\ 1 & \text{otherwise} \end{cases} \quad \alpha = 7.77$

$E_C = 25743\,MPa$

<u>Calculate Basic Allowable Stresses</u>

Calculate rupture stress: $\sigma_{ct} := 0.5 \cdot \left(\frac{f_c}{MPa}\right)^{\frac{2}{3}} \cdot MPa \qquad \sigma_{ct} = 4.8\,MPa$

Calculate basic allowable stress of concrete $\sigma_{cc} := 1.0 \cdot f_c \qquad \sigma_{cc} = 30.0\,MPa$

Calculate basic allowable tensile stress of rebar $\sigma_{rs} := \begin{cases} 0.5 \cdot f_y & \text{if } 0.5 \cdot f_y \le 170MPa \\ 170MPa & \text{otherwise} \end{cases} \qquad \sigma_{rs} = 170\,MPa$

Calculate basic allowable compressive stress of rebar $\sigma_{rc} := \begin{cases} 0.5 \cdot f_y & \text{if } 0.5 \cdot f_y \le 110MPa \\ f_y & \text{otherwise} \end{cases} \qquad \sigma_{rc} = 390\,MPa$

Calculate basic allowable stress of structural steel $\sigma_{ts} := -0.6 f_{ys} \qquad \sigma_{ts} = -150\,MPa$

$\sigma_{tc} := 1 f_{ys} \qquad \sigma_{tc} = 250\,MPa$

Limiting strain of rebar $\varepsilon_{rs} := -\frac{\sigma_{rs}}{E_S} \qquad \varepsilon_{rs} = -0.000850$

$\varepsilon_{rc} := \frac{\sigma_{rc}}{E_S} \qquad \varepsilon_{rc} = 0.001950$

Limiting strain of structural steel $\varepsilon_{ts} := \frac{\sigma_{ts}}{E_S} \qquad \varepsilon_{ts} = -0.000750$

$\varepsilon_{tc} := \frac{\sigma_{tc}}{E_S} \qquad \varepsilon_{tc} = 0.001250$

Concrete Cross Section Data - generated

$n := 50$ Number of Points - 50 points maximum

$i := 1 .. n + 1$ Range from 1 to n+1

Ref.	X	Y	Ref.	X	Y
	mm	mm		mm	mm
1	0	-550	**26**	0	550
2	-69	-546	**27**	69	546
3	-137	-533	**28**	137	533
4	-202	-511	**29**	202	511
5	-265	-482	**30**	265	482
6	-323	-445	**31**	323	445
7	-377	-401	**32**	377	401
8	-424	-351	**33**	424	351
9	-464	-295	**34**	464	295
10	-498	-234	**35**	498	234
11	-523	-170	**36**	523	170
12	-540	-103	**37**	540	103
13	-549	-35	**38**	549	35
14	-549	35	**39**	549	-35
15	-540	103	**40**	540	-103
16	-523	170	**41**	523	-170
17	-498	234	**42**	498	-234
18	-464	295	**43**	464	-295
19	-424	351	**44**	424	-351
20	-377	401	**45**	377	-401
21	-323	445	**46**	323	-445
22	-265	482	**47**	265	-482
23	-202	511	**48**	202	-511
24	-137	533	**49**	137	-533
25	-69	546	**50**	69	-546

$k := 1 .. 25$ $XS1 := XS1 \cdot mm$ $XS2 := XS2 \cdot mm$ $YS1 := YS1 \cdot mm$ $YS2 := YS2 \cdot mm$

$x_k := XS1_k$ $y_k := YS1_k$ $x_{k+25} := XS2_k$ $y_{k+25} := YS2_k$ $x_{n+1} := XS1_1$ $y_{n+1} := YS1_1$

Calculate Section Properties of Concrete Section

$$A_C := -\sum_{i=1}^{n} \left[\left(y_{i+1} - y_i\right) \cdot \frac{x_{i+1} + x_i}{2} \right]$$

$A_C = 0.94783\ m^2$

$$x_C := -\frac{1}{A_C} \cdot \sum_{i=1}^{n} \left[\frac{y_{i+1} - y_i}{8} \cdot \left[\left(x_{i+1} + x_i\right)^2 + \frac{\left(x_{i+1} - x_i\right)^2}{3} \right] \right]$$

$x_C = 0\ m$

$$y_C := \frac{1}{A_C} \cdot \sum_{i=1}^{n} \left[\frac{x_{i+1} - x_i}{8} \cdot \left[\left(y_{i+1} + y_i\right)^2 + \frac{\left(y_{i+1} - y_i\right)^2}{3} \right] \right]$$

$y_C = 0\ m$

$$I_x := \sum_{i=1}^{n} \left[\left[\left(x_{i+1} - x_i\right) \cdot \frac{y_{i+1} + y_i}{24} \right] \cdot \left[\left(y_{i+1} + y_i\right)^2 + \left(y_{i+1} - y_i\right)^2 \right] \right]$$

$I_x = 0.07149\ m^4$

$$I_y := -\sum_{i=1}^{n} \left[\left[\left(y_{i+1} - y_i\right) \cdot \frac{x_{i+1} + x_i}{24} \right] \cdot \left[\left(x_{i+1} + x_i\right)^2 + \left(x_{i+1} - x_i\right)^2 \right] \right]$$

$I_y = 0.07149\ m^4$

$$I_{xC} := I_x - A_C \cdot x_C^2$$

$I_{xC} = 0.07149\ m^4$

$$I_{yC} := I_y - A_C \cdot y_C^2$$

$I_{yC} = 0.07149\ m^4$

Steel Tube Cross Section Data - generated from input

$ns := 50$ Number of Points - 50 points maximum

$ps := 1 .. ns + 1$ Range from 1 to ns+1

Ref.	X	Y	Ref.	X	Y
	mm	mm		mm	mm
1	0	-550	**26**	0	-550
2	-142	-531	**27**	142	-531
3	-275	-476	**28**	275	-476
4	-389	-389	**29**	389	-389
5	-476	-275	**30**	476	-275
6	-531	-142	**31**	531	-142
7	-550	0	**32**	550	0
8	-531	142	**33**	531	142
9	-476	275	**34**	476	275
10	-389	389	**35**	389	389
11	-275	476	**36**	275	476
12	-142	531	**37**	142	531
13	0	550	**38**	0	550
14	142	531	**39**	-142	531
15	275	476	**40**	-275	476
16	389	389	**41**	-389	389
17	476	275	**42**	-476	275
18	531	142	**43**	-531	142
19	550	0	**44**	-550	0
20	531	-142	**45**	-531	-142
21	476	-275	**46**	-476	-275
22	389	-389	**47**	-389	-389
23	275	-476	**48**	-275	-476
24	142	-531	**49**	-142	-531
25	0	-550	**50**	0	-550

$XSS1 := XSS1 \cdot mm$ $XSS2 := XSS2 \cdot mm$ $YSS1 := YSS1 \cdot mm$ $YSS2 := YSS2 \cdot mm$

$z := 1 .. 25$ $xs_z := XSS1_z$ $ys_z := YSS1_z$

$z := 26 .. 50$ $xs_z := XSS2_{z-25}$ $ys_z := YSS2_{z-25}$

$xs_{ns+1} := XSS1_1$ $ys_{ns+1} := YSS1_1$

Calculate Section Properties of Steel Tube Section

$$A_{ST} := -\sum_{ps=1}^{ns}\left[\left(ys_{ps+1} - ys_{ps}\right)\cdot\frac{xs_{ps+1} + xs_{ps}}{2}\right]$$ $A_{ST} = 0\ m^2$

$$x_{ST} := -\frac{1}{A_{ST}}\cdot\sum_{ps=1}^{ns}\left[\frac{ys_{ps+1} - ys_{ps}}{8}\cdot\left[\left(xs_{ps+1} + xs_{ps}\right)^2 + \frac{\left(xs_{ps+1} - xs_{ps}\right)^2}{3}\right]\right]$$ $x_{ST} = 0.2\ m$

$$y_{ST} := \frac{1}{A_{ST}}\cdot\sum_{ps=1}^{ns}\left[\frac{xs_{ps+1} - xs_{ps}}{8}\cdot\left[\left(ys_{ps+1} + ys_{ps}\right)^2 + \frac{\left(ys_{ps+1} - ys_{ps}\right)^2}{3}\right]\right]$$ $y_{ST} = -0.011\ m$

$$I_{xS} := \sum_{ps=1}^{ns}\left[\left[\left(xs_{ps+1} - xs_{ps}\right)\cdot\frac{ys_{ps+1} + ys_{ps}}{24}\right]\cdot\left[\left(ys_{ps+1} + ys_{ps}\right)^2 + \left(ys_{ps+1} - ys_{ps}\right)^2\right]\right]$$

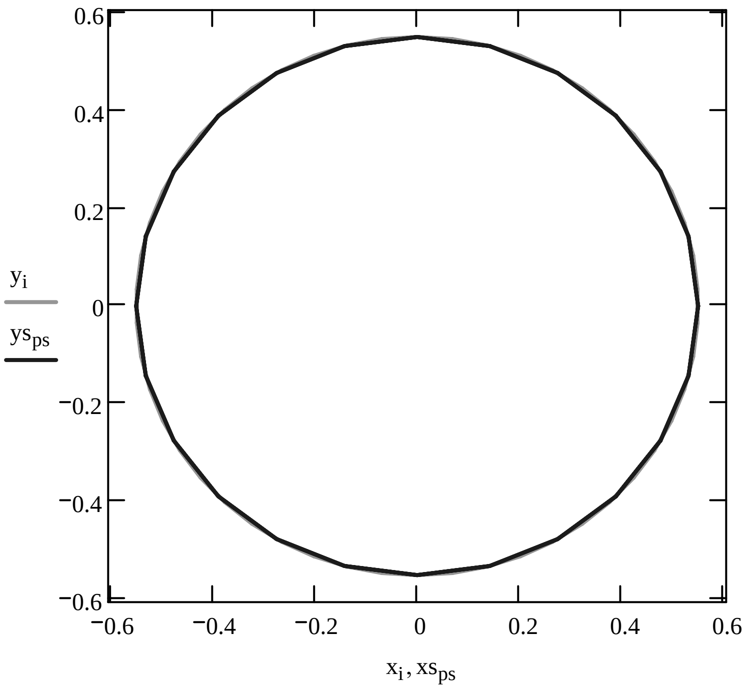
$I_{xS} = 0\ m^4$

$$I_{yS} := -\sum_{ps=1}^{ns}\left[\left[\left(ys_{ps+1} - ys_{ps}\right)\cdot\frac{xs_{ps+1} + xs_{ps}}{24}\right]\cdot\left[\left(xs_{ps+1} + xs_{ps}\right)^2 + \left(xs_{ps+1} - xs_{ps}\right)^2\right]\right]$$

$I_{yS} = 0\ m^4$

$I_{xS} := I_{xS} - A_{ST}\cdot x_{ST}^2$ $I_{xS} = 0\ m^4$

$I_{yS} := I_{yS} - A_{ST}\cdot y_{ST}^2$ $I_{yS} = 0.00000\ m^4$



Rebar Data Layer 1 - generated from input

Ref	Area mm2	X mm	Y mm	Ref	Area mm2	X mm	Y mm
1	804	0	-474	51	0	0	0
2	804	-237	-410	52	0	0	0
3	804	-410	-237	53	0	0	0
4	804	-474	0	54	0	0	0
5	804	-410	237	55	0	0	0
6	804	-237	410	56	0	0	0
7	804	0	474	57	0	0	0
8	804	237	410	58	0	0	0
9	804	410	237	59	0	0	0
10	804	474	0	60	0	0	0
11	804	410	-237	61	0	0	0
12	804	237	-410	62	0	0	0
13	0	0	0	63	0	0	0
14	0	0	0	64	0	0	0
15	0	0	0	65	0	0	0
16	0	0	0	66	0	0	0
17	0	0	0	67	0	0	0
18	0	0	0	68	0	0	0
19	0	0	0	69	0	0	0
20	0	0	0	70	0	0	0
21	0	0	0	71	0	0	0
22	0	0	0	72	0	0	0
23	0	0	0	73	0	0	0
24	0	0	0	74	0	0	0
25	0	0	0	75	0	0	0
26	0	0	0	76	0	0	0
27	0	0	0	77	0	0	0
28	0	0	0	78	0	0	0
29	0	0	0	79	0	0	0
30	0	0	0	80	0	0	0
31	0	0	0	81	0	0	0
32	0	0	0	82	0	0	0
33	0	0	0	83	0	0	0
34	0	0	0	84	0	0	0
35	0	0	0	85	0	0	0
36	0	0	0	86	0	0	0
37	0	0	0	87	0	0	0
38	0	0	0	88	0	0	0
39	0	0	0	89	0	0	0
40	0	0	0	90	0	0	0
41	0	0	0	91	0	0	0
42	0	0	0	92	0	0	0
43	0	0	0	93	0	0	0
44	0	0	0	94	0	0	0
45	0	0	0	95	0	0	0
46	0	0	0	96	0	0	0
47	0	0	0	97	0	0	0
48	0	0	0	98	0	0	0
49	0	0	0	99	0	0	0
50	0	0	0	100	0	0	0

Rebar Data Layer 2 - generated from input

Ref	Area mm2	X mm	Y mm	Ref	Area mm2	X mm	Y mm
1	0	0	0	51	0	0	0
2	0	0	0	52	0	0	0
3	0	0	0	53	0	0	0
4	0	0	0	54	0	0	0
5	0	0	0	55	0	0	0
6	0	0	0	56	0	0	0
7	0	0	0	57	0	0	0
8	0	0	0	58	0	0	0
9	0	0	0	59	0	0	0
10	0	0	0	60	0	0	0
11	0	0	0	61	0	0	0
12	0	0	0	62	0	0	0
13	0	0	0	63	0	0	0
14	0	0	0	64	0	0	0
15	0	0	0	65	0	0	0
16	0	0	0	66	0	0	0
17	0	0	0	67	0	0	0
18	0	0	0	68	0	0	0
19	0	0	0	69	0	0	0
20	0	0	0	70	0	0	0
21	0	0	0	71	0	0	0
22	0	0	0	72	0	0	0
23	0	0	0	73	0	0	0
24	0	0	0	74	0	0	0
25	0	0	0	75	0	0	0
26	0	0	0	76	0	0	0
27	0	0	0	77	0	0	0
28	0	0	0	78	0	0	0
29	0	0	0	79	0	0	0
30	0	0	0	80	0	0	0
31	0	0	0	81	0	0	0
32	0	0	0	82	0	0	0
33	0	0	0	83	0	0	0
34	0	0	0	84	0	0	0
35	0	0	0	85	0	0	0
36	0	0	0	86	0	0	0
37	0	0	0	87	0	0	0
38	0	0	0	88	0	0	0
39	0	0	0	89	0	0	0
40	0	0	0	90	0	0	0
41	0	0	0	91	0	0	0
42	0	0	0	92	0	0	0
43	0	0	0	93	0	0	0
44	0	0	0	94	0	0	0
45	0	0	0	95	0	0	0
46	0	0	0	96	0	0	0
47	0	0	0	97	0	0	0
48	0	0	0	98	0	0	0
49	0	0	0	99	0	0	0
50	0	0	0	100	0	0	0

$A1 := A1 \cdot mm^2$ $A2 := A2 \cdot mm^2$ $A3 := A3 \cdot mm^2$ $A4 := A4 \cdot mm^2$

$X1 := X1 \cdot mm$ $X2 := X2 \cdot mm$ $X3 := X3 \cdot mm$ $X4 := X4 \cdot mm$

$Y1 := Y1 \cdot mm$ $Y2 := Y2 \cdot mm$ $Y3 := Y3 \cdot mm$ $Y4 := Y4 \cdot mm$

$k := 1..50$

$A_{bar_k} := A1_k$ $x_{bar_k} := X1_k$ $y_{bar_k} := Y1_k$

$A_{bar_{k+50}} := A2_k$ $x_{bar_{k+50}} := X2_k$ $y_{bar_{k+50}} := Y2_k$

$A_{bar_{k+100}} := A3_k$ $x_{bar_{k+100}} := X3_k$ $y_{bar_{k+100}} := Y3_k$

$A_{bar_{k+150}} := A4_k$ $x_{bar_{k+150}} := X4_k$ $y_{bar_{k+150}} := Y4_k$

Calculate Section Properties of Reinforcement

$$A_{BAR} := \sum_{j=1}^{200} A_{bar_j}$$ $A_{BAR} = 9651\, mm^2$

$$\rho := \frac{A_{BAR}}{A_C}$$ $\rho = 0.0102$

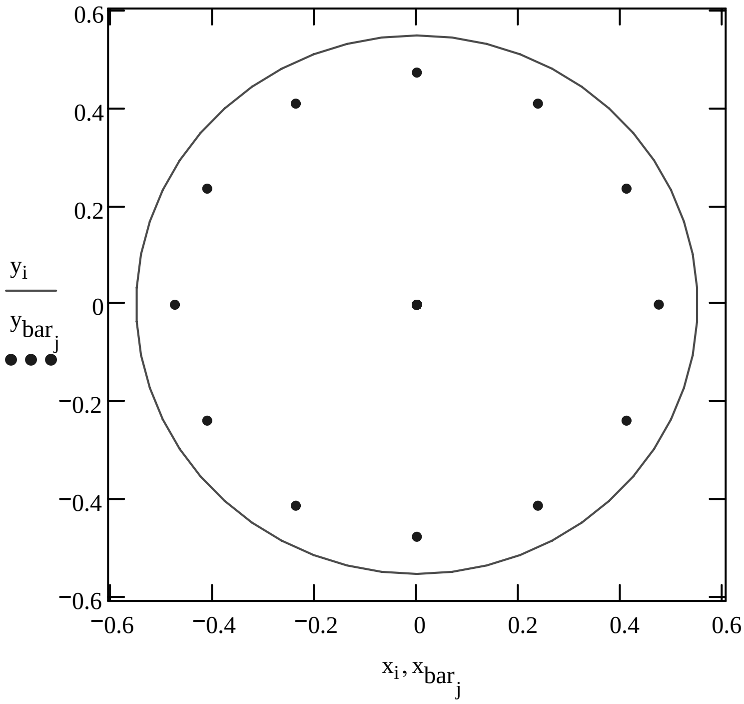
$$x_b := \begin{cases} \left[\sum_{j=1}^{200} \left(A_{bar_j} \cdot x_{bar_j}\right)\right] \cdot \frac{1}{A_{BAR}} & \text{if } A_{BAR} > 0 \\ 0m & \text{otherwise} \end{cases}$$ $x_b = 0\ m$

$$y_b := \begin{cases} \left[\sum_{j=1}^{200} \left(A_{bar_j} \cdot y_{bar_j}\right)\right] \cdot \frac{1}{A_{BAR}} & \text{if } A_{BAR} > 0 \\ 0m & \text{otherwise} \end{cases}$$ $y_b = 0\ m$

$$I_{xb} := \sum_{j=1}^{200} \left[A_{bar_j} \cdot \left(x_{bar_j}\right)^2\right] + A_{BAR} \cdot x_b^2$$ $I_{xb} = 0.00108\, m^4$

$$I_{yb} := \sum_{j=1}^{200} \left[A_{bar_j} \cdot \left(y_{bar_j}\right)^2\right] + A_{BAR} \cdot y_b^2$$ $I_{yb} = 0.00108\, m^4$

$j := 1..200$



Calculate Composite Section Properties (before cracking)

Effective area $A_E := A_C \cdot [1 + \rho \cdot (\alpha - 1)] + A_{ST} \cdot \alpha$ $A_E = 1013161\ mm^2$

Effective centroid $x_E := \dfrac{A_C \cdot [(1-\rho) \cdot x_C + \rho \cdot x_b \cdot \alpha] + A_{ST} \cdot \alpha \cdot x_{ST}}{A_E}$ $x_E = 0.000\ m$

$y_E := \dfrac{A_C \cdot [(1-\rho) \cdot y_C + \rho \cdot y_b \cdot \alpha] + A_{ST} \cdot \alpha \cdot x_{ST}}{A_E}$ $y_E = 0.000\ m$

Effective stiffness $I_{EX} := I_{xC} + I_{xb} \cdot (\alpha - 1) + A_C \cdot \left[(1-\rho) \cdot x_C^2 + \rho \cdot x_b^2 \cdot \alpha\right] + \left(I_{xS} + A_{ST} \cdot x_{ST}^2\right) \cdot \alpha$

$I_{EX} = 0\ m^4$

$I_{EY} := I_{yC} + I_{yb} \cdot (\alpha - 1) + A_C \cdot \left[(1-\rho) \cdot y_C^2 + \rho \cdot y_b^2 \cdot \alpha\right] + \left(I_{yS} + A_{ST} \cdot y_{ST}^2\right) \cdot \alpha$

$I_{EY} = 0\ m^4$

Distance from extreme concrete fiber to centroid

$xF_{pos} := \max(x - x_E)$ $xF_{neg} := \min(x - x_E)$

$yF_{pos} := \max(y - y_E)$ $yF_{neg} := \min(y - y_E)$

Total depth of concrete section

$H_{CX} := xF_{pos} - xF_{neg}$ $H_{CX} = 1\ m$

$H_{CY} := yF_{pos} - yF_{neg}$ $H_{CY} = 1\ m$

Section modulus

$$Z_{Xpos} := \frac{I_{EX}}{xF_{pos}} \qquad Z_{Xneg} := \frac{I_{EX}}{xF_{neg}}$$

$$Z_{Ypos} := \frac{I_{EY}}{yF_{pos}} \qquad Z_{Yneg} := \frac{I_{EY}}{yF_{neg}}$$

Thickness of steel tube:

$$ts := y_1 - ys_1 \qquad ts = 0\,\mathrm{mm}$$

Establish Section Dimensions

Positive case - determine coord of extreme concrete fiber $y_{Epos} := \max(y)$ $y_{Epos} = 550\,\mathrm{mm}$

Negative case - determine coord of extreme concrete fiber $y_{Eneg} := \min(y)$ $y_{Eneg} = -550\,\mathrm{mm}$

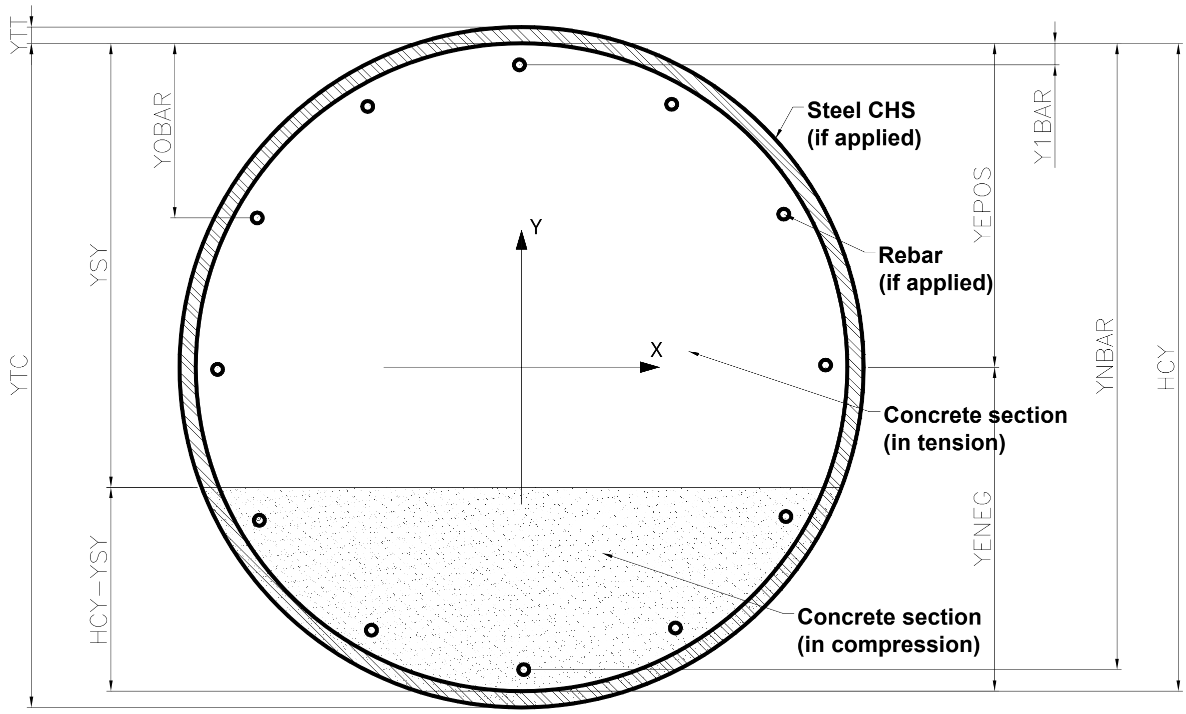
Offsets of rebar from extreme fiber $y_{Obar} := y_{Epos} - y_{bar}$

Determine most extreme rebar (minimum offset) $y_{1bar} := \min(y_{Epos} - y_{bar})$ $y_{1bar} = 76\,\mathrm{mm}$

Determine most extreme rebar (maximum offset) $y_{nbar} := \max(y_{Epos} - y_{bar})$ $y_{nbar} = 1024\,\mathrm{mm}$

Offsets of extreme steel tube fiber from extreme concrete fiber $y_{tt} := ts$ $y_{tt} = 0\,\mathrm{mm}$

$y_{tc} := H_{CY} + ts$ $y_{tc} = 1100\,\mathrm{mm}$



ASSIGN NEUTRAL AXIS VALUES

Number of sections to analysed $ns := 500$

$q := 2 .. ns$

Distance of neutral axis from extreme fiber in tension $y_{SY_q} := H_{CY} \cdot \frac{q}{ns + 1}$

Calculate stresses and strains in reinforcement and concrete at extreme fibers

Calculate strain at extreme compression fiber assuming max allowable stress in concrete:

Trial value of concrete strain

$$\varepsilon cc := \frac{\sigma_{cc}}{E_C} \cdot 2 \qquad \frac{\sigma_{cc}}{E_C} = 0.001165$$

Given

$$\sigma_{cc} = \varepsilon cc \cdot \left(4700 \sqrt{\frac{f_c \cdot 2}{MPa}} - \frac{4700^2}{2.68} \cdot \varepsilon cc\right) \cdot MPa$$

$$\varepsilon_{cc} := \text{Find}(\varepsilon cc) \qquad \varepsilon_{cc} = 0.003321$$

$$\varepsilon_{cc} := \begin{cases} \varepsilon_{tc} & \text{if } (f_c = 0) \cdot (A_{BAR} = 0) \\ \varepsilon_{rc} & \text{if } (f_c = 0) \cdot (ts = 0) \\ \varepsilon_{cc} & \text{otherwise} \end{cases} \qquad \varepsilon_{cc} = 0.003321$$

Strain at other stresses taken to be linear:

$$\varepsilon cc(f_c, \sigma_{cd}) := \begin{cases} \frac{\sigma_{cd}}{\sigma_{tc}} \cdot \varepsilon_{tc} & \text{if } (f_c = 0) \cdot (A_{BAR} = 0) \\ \frac{\sigma_{cd}}{\sigma_{rc}} \cdot \varepsilon_{rc} & \text{if } (f_c = 0) \cdot (ts = 0) \\ \frac{\sigma_{cd}}{\sigma_{cc}} \cdot \varepsilon_{cc} & \text{otherwise} \end{cases}$$

Calculate strain in steel tube assuming max allowable stress in concrete:

In compression $\varepsilon_{tcc_q} := \varepsilon_{cc} \cdot \frac{y_{tc} - y_{SY_q}}{H_{CY} - y_{SY_q}}$

In tension $\varepsilon_{tct_q} := \varepsilon_{cc} \cdot \frac{-(y_{SY_q} + y_{tt})}{H_{CY} - y_{SY_q}}$

Calculate strain in rebar assuming max allowable stress in concrete:

In compression $\varepsilon_{rcc_q} := \varepsilon_{cc} \cdot \dfrac{y_{nbar} - y_{SY_q}}{H_{CY} - y_{SY_q}}$

In tension $\varepsilon_{rct_q} := \varepsilon_{cc} \cdot \dfrac{y_{1bar} - y_{SY_q}}{H_{CY} - y_{SY_q}}$

Calculate design max stress in compression taking account of other limits:

$$
\sigma cd(\varepsilon_{tcc}, q) := \left|
\begin{array}{l}
\sigma_{cd} \leftarrow \sigma_{cc} \ \text{ if } \ f_c > 0 \\
\sigma_{cd} \leftarrow \sigma_{tc} \ \text{ if } \ (f_c = 0)\cdot(A_{BAR} = 0) \\
\sigma_{cd} \leftarrow \sigma_{rc} \ \text{ if } \ (f_c = 0)\cdot(ts = 0) \\
\sigma_{cd} \leftarrow \sigma_{cd} \cdot \dfrac{\varepsilon_{tc}}{\varepsilon_{tcc}} \ \text{ if } \ (\varepsilon_{tcc} > \varepsilon_{tc})\cdot(ts > 0) \\
\sigma_{cd} \leftarrow \sigma_{cd} \cdot \dfrac{\varepsilon_{rc}}{\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{y_{nbar} - y_{SY_q}}{H_{CY} - y_{SY_q}}} \ \text{ if } \ \left(\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{y_{nbar} - y_{SY_q}}{H_{CY} - y_{SY_q}} > \varepsilon_{rc}\right)\cdot(A_{BAR} > 0) \\
\sigma_{cd} \leftarrow \sigma_{cd} \cdot \dfrac{\varepsilon_{ts}}{\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{-(y_{SY_q} + y_{tt})}{H_{CY} - y_{SY_q}}} \ \text{ if } \ \left[\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{-(y_{SY_q} + y_{tt})}{H_{CY} - y_{SY_q}} < \varepsilon_{ts}\right]\cdot(ts > 0) \\
\sigma_{cd} \leftarrow \sigma_{cd} \cdot \dfrac{\varepsilon_{rs}}{\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{-(y_{SY_q} - y_{1bar})}{H_{CY} - y_{SY_q}}} \ \text{ if } \ \left[\varepsilon cc(f_c, \sigma_{cd}) \cdot \dfrac{-(y_{SY_q} - y_{1bar})}{H_{CY} - y_{SY_q}} < \varepsilon_{rs}\right]\cdot(A_{BAR} > 0) \\
\sigma_{cc} \ \text{ otherwise}
\end{array}
\right.
$$

$\sigma_{cd_q} := \sigma cd(\varepsilon_{tcc_q}, q)$

CALCULATE FORCES AND MOMENTS AT EACH NEUTRAL AXIS LOCATION

Calculate force in concrete:

$$F_{C_q} := \begin{cases} \displaystyle\int_{-\left(\frac{H_{CY}}{2} - y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot(1-\rho)\cdot\left[\frac{\sigma_{cd_q}\cdot\left[y + \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{H_{CY} - y_{SY_q}}\right] dy & \text{if } f_c > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate moment from concrete about column centroid:

$$M_{C_q} := \begin{cases} \displaystyle\int_{-\left(\frac{H_{CY}}{2} - y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2}\cdot(1-\rho)\cdot\left[\frac{\sigma_{cd_q}\cdot\left[y + \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{H_{CY} - y_{SY_q}}\right]\cdot y\, dy & \text{if } f_c > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate strain in rebar assuming design max stress in concrete:

$$y_{SY_q} := \begin{cases} y_{nbar}\cdot\frac{q}{ns+1} & \text{if } (f_c = 0)\cdot(A_{BAR} > 0) \\ y_{SY_q} & \text{otherwise} \end{cases}$$

$$\varepsilon_{S_{j,q}} := \begin{cases} -\frac{y_{SY_q} - y_{Obar_j}}{y_{nbar} - y_{SY_q}}\cdot\varepsilon cc\left(f_c, \sigma_{cd_q}\right) & \text{if } f_c = 0 \\ -\frac{y_{SY_q} - y_{Obar_j}}{H_{CY} - y_{SY_q}}\cdot\varepsilon cc\left(f_c, \sigma_{cd_q}\right) & \text{otherwise} \end{cases}$$

Calculate force in each rebar:

$$F_{S_{j,q}} := \begin{cases} \varepsilon_{S_{j,q}} E_S\cdot A_{bar_j} & \text{if } A_{BAR} > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate total force in reinforcement:

$$F_{R_q} := \sum_j F_{S_{j,q}}$$

Calculate moment from reinforcement about section centroid:

$$M_{R_q} := \begin{cases} \sum_j -\left(\varepsilon_{S_{j,q}} E_S \cdot A_{bar_j} \cdot y_{bar_j}\right) & \text{if } A_{BAR} > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate strain in steel tube at extreme tension fiber:

$$\varepsilon_{tds_q} := \frac{-\left(y_{SY_q} + y_{tt}\right)}{H_{CY} - y_{SY_q}} \varepsilon cc\left(f_c, \sigma_{cd_q}\right)$$

Calculate strain in steel tube at extreme compression fiber:

$$\varepsilon_{tdc_q} := \frac{y_{tc} - y_{SY_q}}{H_{CY} - y_{SY_q}} \varepsilon cc\left(f_c, \sigma_{cd_q}\right)$$

Calculate tensile force in steel tube:

$$F_{TS1_q} := \int_{\left(\frac{H_{CY}}{2} - y_{SY_q}\right)}^{\frac{H_{CY}}{2} + y_{tt}} 2\sqrt{\left(\frac{H_{CY}}{2} + y_{tt}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tds_q} \cdot E_S \cdot \left[y - \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{y_{SY_q} + y_{tt}}\right] dy$$

$$F_{TS2_q} := \int_{\left(\frac{H_{CY}}{2} - y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tds_q} \cdot E_S \cdot \left[y - \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{y_{SY_q} + y_{tt}}\right] dy$$

$$F_{TS} := \begin{cases} F_{TS1} - F_{TS2} & \text{if } ts > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate compressive force in steel tube:

$$F_{TC1_q} := \int_{-\left(\frac{H_{CY}}{2} - y_{SY_q}\right)}^{\frac{H_{CY}}{2} + y_{tt}} 2\sqrt{\left(\frac{H_{CY}}{2} + y_{tt}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tdc_q} \cdot E_S \cdot \left[y + \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{H_{CY} - y_{SY_q} + y_{tt}}\right] dy$$

$$F_{TC2_q} := \int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tdc_q} \cdot E_S \cdot \left[y + \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{H_{CY} - y_{SY_q} + y_{tt}}\right] dy$$

$$F_{TC} := \begin{cases} F_{TC1} - F_{TC2} & \text{if } ts > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate moment from tensile force in steel tube:

$$M_{TS1_q} := \int_{\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}+y_{tt}} -2\sqrt{\left(\frac{H_{CY}}{2} + y_{tt}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tds_q} \cdot E_S \cdot \left[y - \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{y_{SY_q} + y_{tt}}\right] \cdot y\, dy$$

$$M_{TS2_q} := \int_{\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} -2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tds_q} \cdot E_S \cdot \left[y - \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{y_{SY_q} + y_{tt}}\right] \cdot y\, dy$$

$$M_{TS} := \begin{cases} M_{TS1} - M_{TS2} & \text{if } ts > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate moment from compressive force in steel tube:

$$M_{TC1_q} := \int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}+y_{tt}} 2\sqrt{\left(\frac{H_{CY}}{2} + y_{tt}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tdc_q} \cdot E_S \cdot \left[y + \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{H_{CY} - y_{SY_q} + y_{tt}}\right] \cdot y\, dy$$

$$M_{TC2_q} := \int_{-\left(\frac{H_{CY}}{2}-y_{SY_q}\right)}^{\frac{H_{CY}}{2}} 2\sqrt{\left(\frac{H_{CY}}{2}\right)^2 - y^2} \cdot \left[\frac{\varepsilon_{tdc_q} \cdot E_S \cdot \left[y + \left(\frac{H_{CY}}{2} - y_{SY_q}\right)\right]}{H_{CY} - y_{SY_q} + y_{tt}}\right] \cdot y\, dy$$

$$M_{TC} := \begin{cases} M_{TC1} - M_{TC2} & \text{if } ts > 0 \\ 0 & \text{otherwise} \end{cases}$$

Calate total axial response from section:

$$F_T := F_C + F_R + F_{TS} + F_{TC}$$

$$F_{TC} := F_C$$

Calculate total moment response from section:

$$M_T := M_C + M_R + M_{TS} + M_{TC}$$

$$M_{TC} := M_C$$

CALCULATE MAXIMUM ALLOWABLE AXIAL FORCE IN SECTION

Limiting strain in axial compression:

$$\varepsilon_{cL} := \begin{cases} \min(\varepsilon_{cc}, \varepsilon_{tc}) & \text{if } (A_{BAR} = 0)\cdot(ts \neq 0)\cdot(f_c \neq 0) \\ \min(\varepsilon_{cc}, \varepsilon_{rc}) & \text{if } (ts = 0)\cdot(A_{BAR} \neq 0)\cdot(f_c \neq 0) \\ \varepsilon_{tc} & \text{if } (A_{BAR} = 0)\cdot(f_c = 0) \\ \varepsilon_{rc} & \text{if } (ts = 0)\cdot(f_c = 0) \\ \min(\varepsilon_{cc}, \varepsilon_{rc}, \varepsilon_{tc}) & \text{otherwise} \end{cases} \qquad \varepsilon_{cL} = 0.001950$$

Limiting concrete stress in axial compression

$$\sigma_{cL} := \begin{cases} \sigma_{cd_2} & \text{if } f_c > 0 \\ 0 & \text{otherwise} \end{cases} \qquad \sigma_{cL} = 18.93\,\text{MPa}$$

$$P_{MAX} := \sigma_{cL}\cdot A_C(1-\rho) + \varepsilon_{cL}\cdot E_S(A_{BAR} + A_{ST})$$

$P_{MAX} = 21522.8\,\text{kN}$ $\quad F_{T_1} := P_{MAX}$ $\quad M_{T_1} := 0\cdot\text{kN}\cdot\text{m}$

$$P_{MAXC} := \sigma_{cL}\cdot A_C\cdot(1-\rho)$$

$P_{MAXC} = 17758.9\,\text{kN}$ $\quad F_{TC_1} := P_{MAXC}$ $\quad M_{TC_1} := 0\cdot\text{kN}\cdot\text{m}$

CALCULATE MINIMUM ALLOWABLE AXIAL FORCE IN SECTION

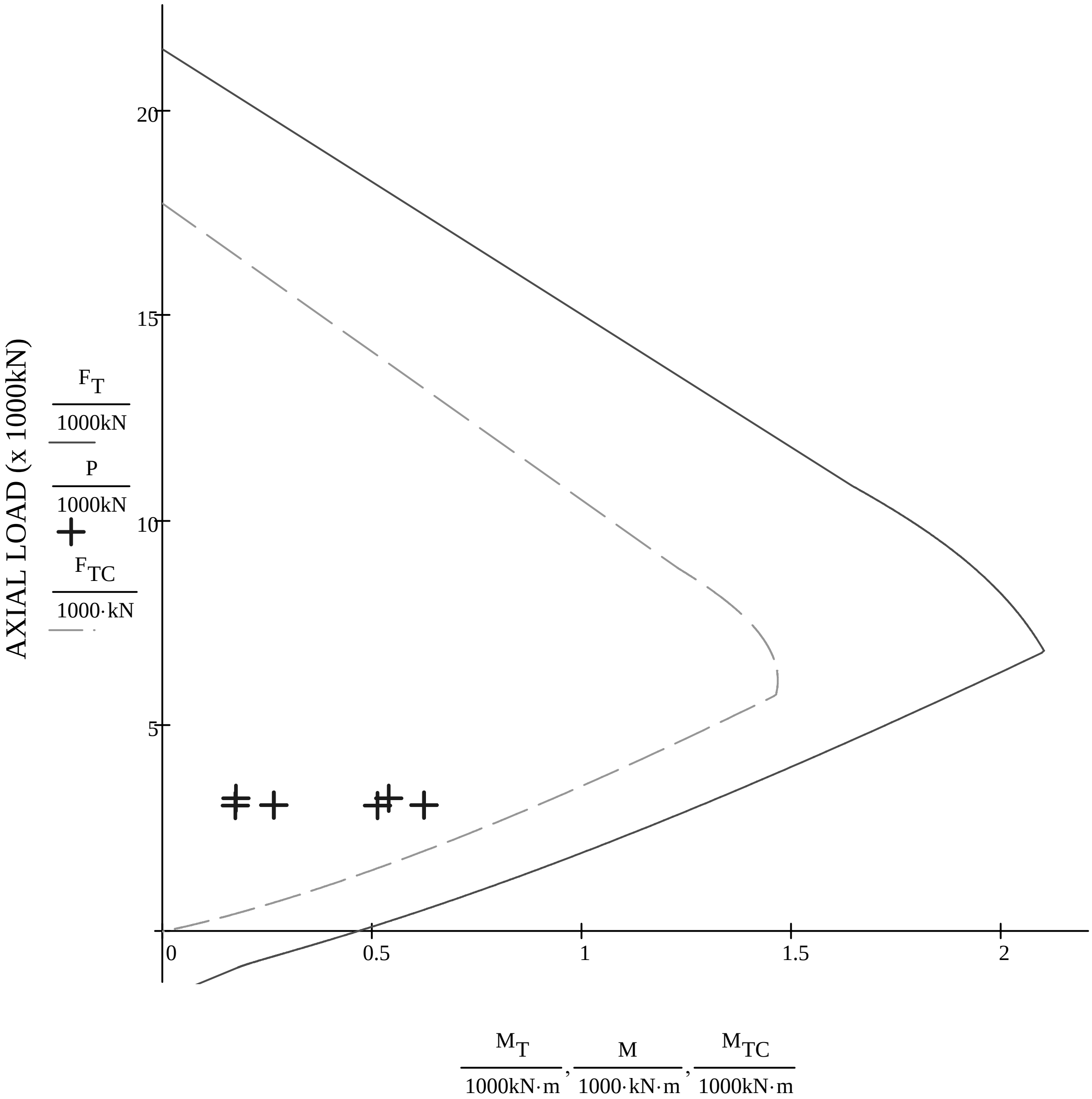
$$P_{MIN} := \begin{cases} \varepsilon_{rs}\cdot E_S(A_{BAR}) & \text{if } ts = 0 \\ \varepsilon_{ts}\cdot E_S(A_{ST}) & \text{if } A_{BAR} = 0 \\ \max(\varepsilon_{ts}, \varepsilon_{rs})\cdot E_S(A_{BAR} + A_{ST}) & \text{otherwise} \end{cases}$$

$P_{MIN} = -1640.7\,\text{kN}$ $\quad F_{T_{ns+1}} := P_{MIN}$ $\quad M_{T_{ns+1}} := 0\cdot\text{kN}\cdot\text{m}$

$$\text{Limit} := \begin{cases} \min(P, F_T)\cdot 0.75 & \text{if } \min(P) > 0 \\ \min(P, F_T)\cdot 1.25 & \text{otherwise} \end{cases}$$

$P_{MINC} := 0\text{kN}$ $\quad M_{TC_{ns+1}} := 0\cdot\text{kN}\cdot\text{m}$

Diameter of Column	$D = 1100\,mm$	Characteristic strength of concrete	$f_c = 30\,MPa$
Percentage reinforcement	$\rho = 1.02\,\%$	Yield Strength of Rebar	$f_y = 390\,MPa$
Thickness of CHS	$ts = 0\,mm$	Yield Strength of CHS	$f_{ys} = 250\,MPa$



INTERACTION CURVE AT SERVICEABILITY LIMIT STATE

Equation of interaction line - upper region (between 1 and 2 calculation points)

$$m1 := \frac{M_{T_2} - M_{T_1}}{F_{T_2} - F_{T_1}} \qquad c1 := F_{T_1}$$

Equation of interaction line - lower region (between ns and ns+1 calculation points)

$$m2 := \frac{M_{T_{ns}} - M_{T_{ns+1}}}{F_{T_{ns}} - F_{T_{ns+1}}} \qquad c2 := F_{T_{ns+1}}$$

$r := 1 .. 8$

$$M_{SLS_r} := \begin{cases} 0.000000000000000001 \cdot kN \cdot m & \text{if } P_r > F_{T_1} \\ 0.000000000000000001 \cdot kN \cdot m & \text{if } P_r < F_{T_{ns+1}} \\ (P_r - c1) \cdot m1 & \text{if } (P_r > F_{T_2}) \cdot (P_r \le F_{T_1}) \\ (P_r - c2) \cdot m2 & \text{if } (P_r \ge F_{T_{ns+1}}) \cdot (P_r < F_{T_{ns}}) \\ \text{otherwise} & \\ \quad j \leftarrow 1 & \\ \quad \text{while } F_{T_j} > P_r & \\ \quad \quad j \leftarrow j + 1 & \\ \quad M_{T_j} & \end{cases}$$

$$StressFactor_r := \begin{cases} \text{"No Result"} & \text{if } M_{SLS_r} < 0.00000000000000001 \cdot kN \cdot m \\ \dfrac{M_r}{M_{SLS_r}} & \text{otherwise} \end{cases}$$

$$P = \begin{pmatrix} 3082 \\ 3082 \\ 3083 \\ 3083 \\ 3072 \\ 3072 \\ 3250 \\ 3250 \end{pmatrix} kN \quad M = \begin{pmatrix} 625 \\ 266 \\ 624 \\ 267 \\ 175 \\ 514 \\ 176 \\ 540 \end{pmatrix} kN \cdot m \quad M_{SLS} = \begin{pmatrix} 1284.2 \\ 1284.2 \\ 1284.2 \\ 1284.2 \\ 1272.8 \\ 1272.8 \\ 1319.2 \\ 1319.2 \end{pmatrix} kN \cdot m \quad StressFactor = \begin{pmatrix} 0.486 \\ 0.207 \\ 0.486 \\ 0.208 \\ 0.137 \\ 0.403 \\ 0.133 \\ 0.410 \end{pmatrix}$$

RESULTS SUMMARY
SERVICEABILITY LIMIT STATE ANALYSIS OF CIRCULAR BEAM COLUMN

Diameter of Column			1100	mm			
Percentage of rebar			1.02	%			
Load Case Ref	**Pier**	**Applied Service Axial Load kN**	**Applied Service Bending Moment kNm**	**Service Limit State Bending Moment kNm**	**Allowable Stress Factor**	**Applied Stress Factor**	**Serviceability Limit State Design Result**
1	**P11**	**3082**	**625**	**1284.2**	**140%**	**49%**	OK
2	**P11**	**3082**	**266**	**1284.2**	**140%**	**21%**	OK
3	**P12**	**3083**	**624**	**1284.2**	**140%**	**49%**	OK
4	**P12**	**3083**	**267**	**1284.2**	**140%**	**21%**	OK
5	**P91**	**3072**	**175**	**1272.8**	**140%**	**14%**	OK
6	**P91**	**3072**	**514**	**1272.8**	**140%**	**40%**	OK
7	**P92**	**3250**	**176**	**1319.2**	**140%**	**13%**	OK
8	**P92**	**3250**	**540**	**1319.2**	**140%**	**41%**	OK