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N. KANAGAVEL M.E., M.B.A., MIE., FIV.,
Chartered Engineer, Registered Structural Engineer Grade-I
CA-12, Tarangini Complex, Ambattur Industrial Estate,
(Mugappair West,) Chennai - 600 058.
Mobile : 94440 - 61295
E-mail : kanagavelchennai@gmail.com

27.11.2024

STABILITY CERTIFICATE

For the proposed construction of residential apartments of stilt + five floors @ No: 18 &19, 1st Street, Kamatchipuram, West Mambalam, Chennai, the structural design is done. I am enclosing the analysis and design calculations for critical members for reference.

The modeling and analysis is done using STAAD PRO software and the designing part by manual calculations. The member loads are taken as per IS 875 and IS 1893 – 2016 and the designing is done based on IS 456 and SP-16.

Based on the analysis and design I certify that the structure is **SAFE and SOUND** if the recommendations are followed during construction.

N. KANAGAVEL M.E, M.B.A., MIE., FIV
Registered Structural Engineer Grade-I
CMDA Reg.No. SE/GR-I/19/03/049
GCC Reg.No.RSE100022019
CA-12, Tarangani Complex,
Ambattur Industrial Estate
Mogappair West, Chennai-600 058

Design Specifications:

The proposed structure are to be designed for stilt + five floors and to be of framed structure to resist the seismic effect of zone III as per IS 1893 – 2016. The usage of the building is for residential purpose.

Soil:

As per Nagadi Consultants (P) Ltd., geo technical report G(C) 9416 dated 26.12.2019, the foundation recommendations are:

(i) type of foundation	=	Isolated / combined
(ii) Depth of foundation	=	2.00 m
(ii) SBC @ 2.00 m depth	=	110 kn/m^2

Floor Heights Considered:

Foundation depth	=	2.00m
Car parking level	=	0.60m
Stilt and typical floors height	=	3.05m

Analysis and Design:

Analysis part is done using STAAD PRO software and the designing part by manual calculations in accordance with IS 456 – 2000, IS 1893 - 2016 and SP – 16.

Materials:

The following recommendations of materials are to be used

(i) Grade of concrete : M25 grade for all RCC members

(ii) Grade of steel : Fe 500 for all diameter

(iii) Potable quality of water to be used for all construction activities including curing.

1. STAAD SPACE

INPUT FILE: D:\staad\keecee\west mambalam\stilt + 5 floors.STD

2. START JOB INFORMATION

3. ENGINEER DATE 28-FEB-20

4. END JOB INFORMATION

5. INPUT WIDTH 79

6. UNIT METER KN

7. JOINT COORDINATES

8. 1 3.16 0 0; 2 6.89 0 0; 3 13.33 0 0; 4 16.15 0 0; 6 13.33 0 0.91

9. 7 9.25 0 0.91; 8 3.16 0 0.91; 9 0 0 0.91; 10 6.89 0 4.69; 11 9.25 0 6.43

10. 12 13.33 0 6.43; 13 16.15 0 6.43; 14 0 0 6.43; 15 3.16 0 6.43; 16 0 0 9.78

11. 17 3.16 0 9.78; 18 6.89 0 9.78; 19 9.25 0 9.78; 20 6.89 0 8.03; 21 9.25 0 8.03

12. 22 13.33 0 9.78; 23 16.15 0 9.78; 24 0 0 13.67; 25 6.89 0 13.67

13. 26 9.25 0 13.67; 27 16.15 0 13.67; 28 6.89 0 16.34; 29 9.25 0 16.34

14. 30 0 0 18.05; 31 16.15 0 18.05; 33 11.84 0 18.05; 34 4.31 0 18.05

15. 35 4.31 0 13.67; 36 11.84 0 13.67; 37 3.16 0 4.69; 38 3.16 -2 0; 39 6.89 -2 0

16. 40 13.33 -2 0; 41 16.15 -2 0; 42 9.25 -2 0.91; 43 0 -2 0.91; 44 6.89 -2 4.69

17. 45 9.25 -2 6.43; 46 13.33 -2 6.43; 47 16.15 -2 6.43; 48 0 -2 6.43

18. 49 3.16 -2 6.43; 50 0 -2 9.78; 51 3.16 -2 9.78; 52 6.89 -2 9.78

19. 53 9.25 -2 9.78; 54 6.89 -2 8.03; 55 9.25 -2 8.03; 56 13.33 -2 9.78

20. 57 16.15 -2 9.78; 58 0 -2 13.67; 59 6.89 -2 13.67; 60 9.25 -2 13.67

21. 61 16.15 -2 13.67; 62 6.89 -2 16.34; 63 9.25 -2 16.34; 64 0 -2 18.05

22. 65 16.15 -2 18.05; 66 11.84 -2 18.05; 67 4.31 -2 18.05; 68 4.31 -2 13.67

23. 69 11.84 -2 13.67; 70 3.16 3.8 0; 71 6.89 3.8 0; 72 13.33 3.8 0

24. 73 16.15 3.8 0; 74 13.33 3.8 0.91; 75 9.25 3.8 0.91; 76 3.16 3.8 0.91

25. 77 0 3.8 0.91; 78 6.89 3.8 4.69; 79 9.25 3.8 6.43; 80 13.33 3.8 6.43

26. 81 16.15 3.8 6.43; 82 0 3.8 6.43; 83 3.16 3.8 6.43; 84 0 3.8 9.78

27. 85 3.16 3.8 9.78; 86 6.89 3.8 9.78; 87 9.25 3.8 9.78; 88 6.89 3.8 8.03

28. 89 9.25 3.8 8.03; 90 13.33 3.8 9.78; 91 16.15 3.8 9.78; 92 0 3.8 13.67

29. 93 6.89 3.8 13.67; 94 9.25 3.8 13.67; 95 16.15 3.8 13.67; 96 6.89 3.8 16.34

30. 97 9.25 3.8 16.34; 98 0 3.8 18.05; 99 16.15 3.8 18.05; 100 11.84 3.8 18.05

31. 101 4.31 3.8 18.05; 102 4.31 3.8 13.67; 103 11.84 3.8 13.67; 104 3.16 3.8 4.69

32. 105 3.16 3.8 -1.52; 106 6.89 3.8 -1.52; 107 13.33 3.8 -1.52

33. 109 -0.91 3.8 0.91; 110 -0.91 3.8 6.43; 111 -0.91 3.8 9.78

34. 112 -0.91 3.8 13.67; 113 -0.91 3.8 18.05; 114 17.06 3.8 0; 115 17.06 3.8 6.43

35. 116 17.06 3.8 9.78; 117 17.06 3.8 13.67; 118 17.06 3.8 18.05

36. 119 13.44 3.8 18.05; 120 13.44 3.8 13.67; 121 2.81 3.8 18.05

37. 122 2.81 3.8 13.67; 123 10.77 3.8 6.43; 125 0.61 3.8 6.43; 126 0.61 3.8 9.78

38. 127 10.77 3.8 9.78; 128 -0.91 3.8 4.69; 129 9.25 3.8 4.69; 130 13.33 3.8 4.69

39. 131 17.06 3.8 4.69; 132 6.89 3.8 15.32; 133 9.25 3.8 15.32; 134 4.31 3.8 15.32

40. 135 11.84 3.8 15.32; 136 3.16 7 0; 137 6.89 7 0; 138 13.33 7 0; 139 16.15 7 0

41. 140 13.33 7 0.91; 141 9.25 7 0.91; 142 3.16 7 0.91; 143 0 7 0.91

42. 144 6.89 7 4.69; 145 9.25 7 6.43; 146 13.33 7 6.43; 147 16.15 7 6.43

43. 148 0 7 6.43; 149 3.16 7 6.43; 150 0 7 9.78; 151 3.16 7 9.78; 152 6.89 7 9.78

44. 153 9.25 7 9.78; 154 6.89 7 8.03; 155 9.25 7 8.03; 156 13.33 7 9.78

45. 157 16.15 7 9.78; 158 0 7 13.67; 159 6.89 7 13.67; 160 9.25 7 13.67

46. 161 16.15 7 13.67; 162 6.89 7 16.34; 163 9.25 7 16.34; 164 0 7 18.05

47. 165 16.15 7 18.05; 166 11.84 7 18.05; 167 4.31 7 18.05; 168 4.31 7 13.67

48. 169 11.84 7 13.67; 170 3.16 7 4.69; 171 3.16 7 -1.52; 172 6.89 7 -1.52

49. 173 13.33 7 -1.52; 175 -0.91 7 0.91; 176 -0.91 7 6.43; 177 -0.91 7 9.78

50. 178 -0.91 7 13.67; 179 -0.91 7 18.05; 180 17.06 7 0; 181 17.06 7 6.43

51. 182 17.06 7 9.78; 183 17.06 7 13.67; 184 17.06 7 18.05; 185 13.44 7 18.05

52. 186 13.44 7 13.67; 187 2.81 7 18.05; 188 2.81 7 13.67; 189 10.77 7 6.43

53. 190 0.61 7 6.43; 191 0.61 7 9.78; 192 10.77 7 9.78; 193 -0.91 7 4.69

54. 194 9.25 7 4.69; 195 13.33 7 4.69; 196 17.06 7 4.69; 197 6.89 7 15.32

55. 198 9.25 7 15.32; 199 4.31 7 15.32; 200 11.84 7 15.32; 201 3.16 10.2 0

56. 202 6.89 10.2 0; 203 13.33 10.2 0; 204 16.15 10.2 0; 205 13.33 10.2 0.91

57. 206 9.25 10.2 0.91; 207 3.16 10.2 0.91; 208 0 10.2 0.91; 209 6.89 10.2 4.69

58. 210 9.25 10.2 6.43; 211 13.33 10.2 6.43; 212 16.15 10.2 6.43; 213 0 10.2 6.43

59. 214 3.16 10.2 6.43; 215 0 10.2 9.78; 216 3.16 10.2 9.78; 217 6.89 10.2 9.78

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61. 221 13.33 10.2 9.78; 222 16.15 10.2 9.78; 223 0 10.2 13.67

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63. 227 6.89 10.2 16.34; 228 9.25 10.2 16.34; 229 0 10.2 18.05

64. 230 16.15 10.2 18.05; 231 11.84 10.2 18.05; 232 4.31 10.2 18.05

65. 233 4.31 10.2 13.67; 234 11.84 10.2 13.67; 235 3.16 10.2 4.69

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74. 261 17.06 10.2 4.69; 262 6.89 10.2 15.32; 263 9.25 10.2 15.32

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137. 470 17.06 13.4 -1.52; 471 17.06 3.8 -1.52; 472 17.06 7 -1.52

138. 473 17.06 16.6 -1.52; 474 6.89 19.8 12.78; 475 9.25 19.8 12.78

139. 476 6.89 16.6 12.78; 477 9.25 16.6 12.78; 478 17.06 19.8 -1.52

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143. 489 6.89 10.2 6.43; 490 6.89 7 6.43; 491 6.89 3.8 6.43; 492 6.89 19.8 6.43

144. MEMBER INCIDENCES

145. 1 1 2; 2 3 4; 3 3 6; 4 6 7; 5 1 8; 6 8 9; 7 2 10; 8 7 11; 9 11 12; 10 12 13

146. 11 6 12; 12 4 13; 13 9 14; 14 14 15; 15 14 16; 16 15 17; 17 17 18; 18 18 19

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158. 108 28 96; 109 29 97; 110 30 98; 111 31 99; 112 33 100; 113 34 101; 117 70 71

159. 118 72 73; 119 72 74; 120 74 75; 121 70 76; 122 76 77; 123 71 78; 124 75 129

160. 125 79 123; 126 80 81; 127 74 130; 130 82 125; 132 83 85; 133 85 86; 134 86 87

161. 135 86 88; 136 87 89; 137 78 491; 138 79 89; 139 88 89; 140 84 126; 141 76 104

162. 142 87 127; 143 90 91; 144 80 90; 147 86 463; 148 87 464; 150 93 132

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183. 312 158 188; 313 160 169; 314 162 163; 315 168 159; 316 167 199; 317 169 186

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194. 382 148 213; 383 149 214; 384 150 215; 385 151 216; 386 152 217; 387 153 218

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201. 457 218 257; 458 221 222; 459 211 221; 460 217 465; 461 218 466; 462 224 262

202. 463 225 263; 464 230 250; 465 229 252; 466 223 253; 467 225 234; 468 227 228

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208. 501 250 251; 502 252 232; 503 253 233; 504 252 253; 505 254 211; 506 255 214

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210. 513 259 210; 514 260 211; 515 259 260; 516 261 246; 517 260 261; 518 262 227

211. 519 263 228; 520 264 233; 521 265 234; 522 263 265; 523 264 262; 524 201 266

212. 525 202 267; 526 203 268; 527 204 269; 529 206 271; 531 208 273; 532 209 274

213. 533 210 275; 534 211 276; 535 212 277; 536 213 278; 537 214 279; 538 215 280

214. 539 216 281; 540 217 282; 541 218 283; 542 219 284; 543 220 285; 544 221 286

215. 545 222 287; 546 223 288; 547 224 289; 548 225 290; 549 226 291; 550 227 292

216. 551 228 293; 552 229 294; 553 230 295; 554 231 296; 555 232 297; 589 266 267

217. 590 268 269; 591 268 270; 592 270 271; 593 266 272; 594 272 273; 595 267 274

218. 596 271 324; 597 275 319; 598 276 277; 599 270 325; 600 278 320; 601 279 281

219. 602 281 282; 603 282 283; 604 282 284; 605 283 285; 606 274 469; 607 275 285

220. 608 284 285; 609 280 321; 610 272 300; 611 283 322; 612 286 287; 613 276 286

221. 614 282 467; 615 283 468; 616 289 327; 617 290 328; 618 295 315; 619 294 317

222. 620 288 318; 621 290 299; 622 292 293; 623 298 289; 624 297 329; 625 299 316

223. 626 296 330; 627 300 279; 628 274 300; 629 266 301; 630 267 302; 631 268 303

224. 633 301 302; 635 273 305; 636 278 306; 637 280 307; 638 288 308; 639 294 309

225. 640 305 323; 641 306 307; 642 307 308; 643 308 309; 644 269 310; 645 277 311

226. 646 287 312; 647 291 313; 648 295 314; 649 310 326; 650 311 312; 651 312 313

227. 652 313 314; 653 315 296; 654 316 291; 655 315 316; 656 317 297; 657 318 298

228. 658 317 318; 659 319 276; 660 320 279; 661 321 281; 662 320 321; 663 322 286

229. 664 319 322; 665 323 306; 666 300 323; 667 324 275; 668 325 276; 669 324 325

230. 670 326 311; 671 325 326; 672 327 292; 673 328 293; 674 329 298; 675 330 299

231. 676 328 330; 677 329 327; 678 266 331; 679 267 332; 680 268 333; 681 269 334

232. 683 271 336; 685 273 338; 686 274 339; 687 275 340; 688 276 341; 689 277 342

233. 690 278 343; 691 279 344; 692 280 345; 693 281 346; 694 282 347; 695 283 348

234. 696 284 349; 697 285 350; 698 286 351; 699 287 352; 700 288 353; 701 289 354

235. 702 290 355; 703 291 356; 704 292 357; 705 293 358; 706 294 359; 707 295 360

236. 708 296 361; 709 297 362; 743 331 332; 744 333 334; 745 333 335; 746 335 336

237. 747 331 337; 748 337 338; 749 332 339; 750 336 389; 751 340 384; 752 341 342

238. 753 335 390; 754 343 385; 755 344 346; 756 346 347; 757 347 348; 758 347 349

239. 759 348 350; 760 339 488; 761 340 350; 762 349 350; 763 345 386; 764 337 365

240. 765 348 387; 766 351 352; 767 341 351; 768 347 476; 769 348 477; 770 354 392

241. 771 355 393; 772 360 380; 773 359 382; 774 353 383; 775 355 364; 776 357 358

242. 777 363 354; 778 362 394; 779 364 381; 780 361 395; 781 365 344; 782 339 365

243. 783 331 366; 784 332 367; 785 333 368; 787 366 367; 789 338 370; 790 343 371

244. 791 345 372; 792 353 373; 793 359 374; 794 370 388; 795 371 372; 796 372 373

245. 797 373 374; 798 334 375; 799 342 376; 800 352 377; 801 356 378; 802 360 379

246. 803 375 391; 804 376 377; 805 377 378; 806 378 379; 807 380 361; 808 381 356

247. 809 380 381; 810 382 362; 811 383 363; 812 382 383; 813 384 341; 814 385 344

248. 815 386 346; 816 385 386; 817 387 351; 818 384 387; 819 388 371; 820 365 388

249. 821 389 340; 822 390 341; 823 389 390; 824 391 376; 825 390 391; 826 392 357

250. 827 393 358; 828 394 363; 829 395 364; 830 393 395; 831 394 392; 832 331 396

251. 833 332 397; 834 333 398; 835 334 399; 837 336 401; 839 338 403; 840 339 404

252. 841 340 405; 842 341 406; 843 342 407; 844 343 408; 845 344 409; 846 345 410

253. 847 346 411; 848 347 412; 849 348 413; 850 349 414; 851 350 415; 852 351 416

254. 853 352 417; 854 353 418; 855 354 419; 856 355 420; 857 356 421; 858 357 422

255. 859 358 423; 860 359 424; 861 360 425; 862 361 426; 863 362 427; 897 396 397

256. 898 398 399; 899 398 400; 900 400 401; 901 396 402; 902 402 403; 903 397 404

257. 904 401 454; 905 405 449; 906 406 407; 907 400 455; 908 408 450; 909 409 411

258. 910 411 412; 911 412 413; 912 412 414; 913 413 415; 914 404 492; 915 405 415

259. 916 414 415; 917 410 451; 918 402 430; 919 413 452; 920 416 417; 921 406 416

260. 922 412 474; 923 413 475; 924 419 457; 925 420 458; 926 425 445; 927 424 447

261. 928 418 448; 929 420 429; 930 422 423; 931 428 419; 932 427 459; 933 429 446

262. 934 426 460; 935 430 409; 936 404 430; 937 396 431; 938 397 432; 939 398 433

263. 941 431 432; 943 403 435; 944 408 436; 945 410 437; 946 418 438; 947 424 439

264. 948 435 453; 949 436 437; 950 437 438; 951 438 439; 952 399 440; 953 407 441

265. 954 417 442; 955 421 443; 956 425 444; 957 440 456; 958 441 442; 959 442 443

266. 960 443 444; 961 445 426; 962 446 421; 963 445 446; 964 447 427; 965 448 428

267. 966 447 448; 967 449 406; 968 450 409; 969 451 411; 970 450 451; 971 452 416

268. 972 449 452; 973 453 436; 974 430 453; 975 454 405; 976 455 406; 977 454 455

269. 978 456 441; 979 455 456; 980 457 422; 981 458 423; 982 459 428; 983 460 429

270. 984 458 460; 985 459 457; 986 461 159; 987 462 160; 988 461 462; 989 463 93

271. 990 464 94; 991 463 464; 992 465 224; 993 466 225; 994 465 466; 995 467 289

272. 996 468 290; 997 467 468; 998 469 284; 999 279 469; 1000 310 470; 1001 303 470

273. 1002 114 471; 1003 107 471; 1004 180 472; 1005 173 472; 1006 375 473

274. 1007 368 473; 1008 474 419; 1009 475 420; 1010 474 475; 1011 476 354

275. 1012 477 355; 1013 476 477; 1014 440 478; 1015 433 478; 1016 412 479

276. 1017 413 480; 1018 414 481; 1019 415 482; 1020 419 483; 1021 420 484

277. 1022 422 485; 1023 423 486; 1024 481 482; 1025 482 480; 1026 480 484

278. 1027 484 486; 1028 486 485; 1029 485 483; 1030 483 479; 1031 479 481

279. 1032 479 480; 1033 483 484; 1034 245 487; 1035 238 487; 1036 488 349

280. 1037 344 488; 1038 489 219; 1039 214 489; 1040 490 154; 1041 149 490

281. 1042 491 88; 1043 83 491; 1044 492 414; 1045 409 492

282. DEFINE MATERIAL START

283. ISOTROPIC CONCRETE

288. DAMP 0.05

289. TYPE CONCRETE

290. STRENGTH FCU 25000

291. END DEFINE MATERIAL

292. MEMBER PROPERTY INDIAN

293. 80 81 PRIS YD 0.23 ZD 0.23

294. 1 TO 37 39 TO 49 164 191 194 199 203 207 209 320 347 350 354 358 361 363 474 -

295. 501 504 508 512 515 517 628 655 658 662 666 669 671 782 809 812 816 820 823 -

296. 825 936 963 966 970 974 977 979 988 991 994 997 999 1010 1013 1037 1039 1041 -

297. 1043 1045 PRIS YD 0.38 ZD 0.23

298. 53 55 58 TO 63 68 TO 70 73 76 77 97 102 103 117 TO 127 130 132 TO 144 147 -

299. 148 150 151 154 TO 163 165 TO 167 171 TO 190 192 193 195 TO 197 200 TO 202 -

300. 204 206 208 210 TO 213 219 223 226 TO 231 236 TO 238 241 244 245 281 TO 319 -

301. 321 TO 323 327 TO 346 348 349 351 TO 353 355 TO 357 359 360 362 364 TO 367 -

302. 373 377 380 TO 385 390 TO 392 395 398 399 435 TO 473 475 TO 477 481 TO 500 -

303. 502 503 505 TO 507 509 TO 511 513 514 516 518 TO 521 527 531 534 TO 539 544 -

304. 545 TO 546 549 552 553 589 TO 627 629 TO 631 635 TO 654 656 657 659 TO 661 -

305. 663 TO 665 667 668 670 672 TO 675 681 685 688 TO 693 698 TO 700 703 706 707 -

306. 743 TO 781 783 TO 785 789 TO 808 810 811 813 TO 815 817 TO 819 821 822 824 -

307. 826 TO 829 835 839 842 TO 847 852 TO 854 857 860 861 897 TO 935 937 TO 939 -

308. 943 TO 962 964 965 967 TO 969 971 TO 973 975 976 978 980 TO 983 986 987 989 -

309. 990 992 993 995 996 998 1000 1002 1004 1006 1008 1009 1011 1012 1014 1024 -

310. 1025 TO 1034 1036 1038 1040 1042 1044 PRIS YD 0.525 ZD 0.23

311. 50 TO 52 54 56 57 64 TO 67 71 72 74 75 78 79 83 87 90 98 TO 101 108 109 216 -

312. 217 TO 218 221 224 225 232 TO 235 239 240 242 243 246 247 370 TO 372 375 378 -

313. 379 386 TO 389 393 394 396 397 400 401 524 TO 526 529 532 533 540 TO 543 -

314. 547 548 550 551 554 555 678 TO 680 683 686 687 694 TO 697 701 702 704 705 -

315. 708 709 832 TO 834 837 840 841 848 TO 851 855 856 858 859 862 863 -

316. 1016 TO 1023 PRIS YD 0.23 ZD 0.525

317. 169 214 215 325 368 369 479 522 523 633 676 677 787 830 831 941 984 985 1001 -

318. 1003 1005 1007 1015 1035 PRIS YD 0.125 ZD 0.23

319. MEMBER PROPERTY INDIAN

320. 85 89 92 93 95 96 104 107 110 111 PRIS YD 0.525 ZD 0.3

321. 94 PRIS YD 0.6 ZD 0.3

322. 82 84 91 105 106 112 113 PRIS YD 0.3 ZD 0.525

323. CONSTANTS

324. MATERIAL CONCRETE ALL

325. SUPPORTS

326. 38 TO 69 FIXED

327. DEFINE 1893 LOAD

328. ZONE 0.16 RF 5 I 1 SS 2 ST 1 DM 0.1 DT 2

329. SELFWEIGHT 1

330. MEMBER WEIGHT

331. 18 TO 20 23 31 32 34 35 43 117 TO 124 134 TO 139 147 148 150 151 154 155 158 -

332. 160 162 165 TO 167 171 175 TO 180 184 TO 189 192 199 201 202 204 208 210 -

333. 211 TO 213 281 TO 288 295 TO 300 306 TO 311 314 316 318 321 TO 323 327 331 -

334. 332 TO 336 340 TO 345 348 354 356 357 359 362 364 TO 367 435 TO 442 -

335. 449 TO 454 460 TO 465 468 470 472 475 TO 477 481 485 TO 490 494 TO 499 502 -

336. 508 510 511 513 516 518 TO 521 589 TO 596 603 TO 608 614 TO 619 622 624 626 -

337. 629 TO 631 635 639 TO 644 648 TO 653 656 662 664 665 667 670 672 TO 675 743 -

338. 744 TO 750 757 TO 762 768 TO 773 776 778 780 783 TO 785 789 793 TO 798 802 -

339. 803 TO 807 810 816 818 819 821 824 826 TO 829 986 987 989 990 992 993 995 -

340. 996 998 1000 1002 1004 1006 1011 1012 1034 1036 1038 1040 1042 UNI 12.5

341. 126 127 130 132 133 140 TO 144 156 157 159 161 163 164 172 TO 174 181 TO 183 -

342. 190 191 193 TO 197 200 203 206 207 209 290 TO 294 301 TO 305 312 313 315 -

343. 317 319 320 328 TO 330 337 TO 339 346 347 349 TO 353 355 358 360 361 363 -

344. 444 TO 448 455 TO 459 466 467 469 471 473 474 482 TO 484 491 TO 493 500 501 -

345. 503 TO 507 509 512 514 515 517 598 TO 602 609 TO 613 620 621 623 625 627 -

346. 628 636 TO 638 645 TO 647 654 655 657 TO 661 663 666 668 669 671 752 TO 756 -

347. 763 TO 767 774 775 777 779 781 782 790 TO 792 799 TO 801 808 809 811 TO 815 -

348. 817 820 822 823 825 912 913 916 922 TO 925 930 980 981 999 1008 1009 1024 -

349. 1025 TO 1033 1037 1039 1041 1043 UNI 6.5

350. 1 TO 17 21 22 24 TO 30 33 36 37 39 TO 42 44 TO 49 169 214 215 325 368 369 -

351. 479 522 523 633 676 677 787 830 831 899 TO 904 914 915 926 927 932 934 937 -

352. 938 TO 939 941 943 947 TO 951 956 TO 961 964 973 975 978 984 985 1001 1003 -

353. 1005 1007 1014 1015 1035 1044 UNI 4.4

354. FLOOR WEIGHT

355. YRANGE 3 20 FLOAD 6

356. YRANGE 3 20 FLOAD 0.5

357. YRANGE 22 23 FLOAD 6

358. YRANGE 22 23 FLOAD 6

359. YRANGE 3 17 FLOAD 5 XRANGE -0.91 3.16 ZRANGE 4.69 6.43

360. YRANGE 3 17 FLOAD 5 XRANGE 3.16 6.89 ZRANGE 4.69 6.43

361. YRANGE 3 17 FLOAD 5 XRANGE 9.25 13.33 ZRANGE 4.69 6.43

362. YRANGE 3 17 FLOAD 5 XRANGE 13.33 17.06 ZRANGE 4.69 6.43

363. YRANGE 3 17 FLOAD 5 XRANGE -0.91 0.61 ZRANGE 6.43 9.78

364. YRANGE 3 17 FLOAD 5 XRANGE 9.25 10.77 ZRANGE 6.43 9.78

365. YRANGE 3 17 FLOAD 5 XRANGE 2.81 4.31 ZRANGE 13.67 18.05

366. YRANGE 3 17 FLOAD 5 XRANGE 11.84 13.44 ZRANGE 13.67 18.05

367. LOAD 1 LOADTYPE SEISMIC TITLE LOAD CASE 1 -EQX

368. 1893 LOAD X 1

369. PERFORM ANALYSIS

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS 483 NUMBER OF MEMBERS 842

NUMBER OF PLATES 0 NUMBER OF SOLIDS 0

NUMBER OF SURFACES 0 NUMBER OF SUPPORTS 32

SOLVER USED IS THE IN-CORE ADVANCED MATH SOLVER

TOTAL PRIMARY LOAD CASES = 1, TOTAL DEGREES OF FREEDOM = 2706

TOTAL LOAD COMBINATION CASES = 0 SO FAR.

****

*

* TIME PERIOD FOR X 1893 LOADING = 0.81832 SEC *

* SA/G PER 1893= 1.330, LOAD FACTOR= 1.000 *

* FACTOR V PER 1893 AT GL= 0.0213 X 31303.44 *

* FACTOR V PER 1893 AT 30 M= 0.0107 X 31303.44 *

* FACTOR V PER 1893= 0.0206 X 31303.44 *

*

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370. CHANGE

371. LOAD 2 LOADTYPE SEISMIC TITLE LOAD CASE 2 - EQZ

372. 1893 LOAD Z 1

373. PERFORM ANALYSIS

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*********************************************************
*                                 *
* TIME PERIOD FOR Z 1893 LOADING =    0.81832 SEC      *
* SA/G PER 1893=    1.330, LOAD FACTOR= 1.000          *
* FACTOR V  PER 1893 AT GL=    0.0213 X  31303.44      *
* FACTOR V  PER 1893 AT 30 M=    0.0107 X  31303.44    *
*     FACTOR V  PER 1893=    0.0206 X  31303.44       *
*                                 *
*********************************************************
```

374. CHANGE

375. LOAD 3 LOADTYPE DEAD TITLE SELF WEIGHT

376. SELFWEIGHT Y -1

377. LOAD 4 LOADTYPE DEAD TITLE WALL LOAD

378. MEMBER LOAD

379. 19 20 23 31 32 34 35 43 117 TO 124 134 TO 139 147 148 150 151 154 155 158 -

380. 160 162 165 TO 167 171 175 TO 180 184 TO 189 192 199 201 202 204 208 210 -

381. 211 TO 213 281 TO 288 295 TO 300 306 TO 311 314 316 318 321 TO 323 327 331 -

382. 332 TO 336 340 TO 345 348 354 356 357 359 362 364 TO 367 435 TO 442 -

383. 449 TO 454 460 TO 465 468 470 472 475 TO 477 481 485 TO 490 494 TO 499 502 -

384. 508 510 511 513 516 518 TO 521 589 TO 596 603 TO 608 614 TO 619 622 624 626 -

385. 629 TO 631 635 639 TO 644 648 TO 653 656 662 664 665 667 670 672 TO 675 743 -

386. 744 TO 750 757 TO 762 768 TO 773 776 778 780 783 TO 785 789 793 TO 798 802 -

387. 803 TO 807 810 816 818 819 821 824 826 TO 829 986 987 989 990 992 993 995 -

388. 996 998 1000 1002 1004 1006 1011 1012 1034 1036 1038 1040 -

389. 1042 UNI GY -12.5

390. 125 TO 127 130 132 133 140 TO 144 156 157 159 161 163 164 172 TO 174 -

391. 181 TO 183 190 191 193 TO 197 200 203 206 207 209 289 TO 294 301 TO 305 312 -

392. 313 315 317 319 320 328 TO 330 337 TO 339 346 347 349 TO 353 355 358 360 -

393. 361 363 443 TO 448 455 TO 459 466 467 469 471 473 474 482 TO 484 491 TO 493 -

394. 500 501 503 TO 507 509 512 514 515 517 597 TO 602 609 TO 613 620 621 623 -

395. 625 627 628 636 TO 638 645 TO 647 654 655 657 TO 661 663 666 668 669 671 -

396. 751 TO 756 763 TO 767 774 775 777 779 781 782 790 TO 792 799 TO 801 808 809 -

397. 811 TO 815 817 820 822 823 825 911 TO 913 916 922 TO 925 930 980 981 999 -

398. 1008 TO 1010 1024 TO 1033 1037 1039 1041 1043 UNI GY -6.5

399. 1 TO 18 21 22 24 TO 30 33 36 37 39 TO 42 44 TO 49 169 214 215 325 368 369 -

400. 479 522 523 633 676 677 787 830 831 899 TO 904 914 915 926 927 932 934 937 -

401. 938 TO 939 941 943 947 TO 951 956 TO 961 964 973 975 978 984 985 988 991 994 -

402. 997 1001 1003 1005 1007 1013 TO 1015 1035 1044 UNI GY -4.4

403. LOAD 5 LOADTYPE DEAD TITLE SLAB DEAD LOAD

404. FLOOR LOAD

405. YRANGE 3 20 FLOAD -6 GY

406. YRANGE 22 23 FLOAD -6 GY

407. YRANGE 3 17 FLOAD -5 XRANGE -0.91 3.16 ZRANGE 4.69 6.43 GY

408. YRANGE 3 17 FLOAD -5 XRANGE 3.16 6.89 ZRANGE 4.69 6.43 GY

409. YRANGE 3 17 FLOAD -5 XRANGE 9.25 13.33 ZRANGE 4.69 6.43 GY

410. YRANGE 3 17 FLOAD -5 XRANGE 13.33 17.06 ZRANGE 4.69 6.43 GY

411. YRANGE 3 17 FLOAD -5 XRANGE -0.91 0.61 ZRANGE 6.43 9.78 GY

412. YRANGE 3 17 FLOAD -5 XRANGE 9.25 10.77 ZRANGE 6.43 9.78 GY

413. YRANGE 3 17 FLOAD -5 XRANGE 2.81 4.31 ZRANGE 13.67 18.05 GY

414. YRANGE 3 17 FLOAD -5 XRANGE 11.84 13.44 ZRANGE 13.67 18.05 GY

415. LOAD 6 LOADTYPE LIVE TITLE SLAB LIVE LOAD

416. FLOOR LOAD

417. YRANGE 3 20 FLOAD -2 GY

418. YRANGE 22 23 FLOAD -18 GY

419. LOAD COMB 7 (DL + LL)

420. 3 1.0 4 1.0 5 1.0 6 1.0

421. LOAD COMB 8 1.5 (DL + LL)

422. 3 1.5 4 1.5 5 1.5 6 1.5

423. LOAD COMB 9 1.2 (DL + LL + EQX)

424. 3 1.2 4 1.2 5 1.2 6 1.2 1 1.2

425. LOAD COMB 10 1.2 (DL + LL - EQX)

426. 3 1.2 4 1.2 5 1.2 6 1.2 1 -1.2

427. LOAD COMB 11 1.2 (DL + LL + EQZ)

428. 3 1.2 4 1.2 5 1.2 6 1.2 2 1.2

429. LOAD COMB 12 1.2 (DL + LL - EQZ)

430. 3 1.2 4 1.2 5 1.2 6 1.2 2 -1.2

431. LOAD COMB 13 1.5 (DL + EQX)

432. 3 1.5 4 1.5 5 1.5 1 1.5

433. LOAD COMB 14 1.5 (DL - EQX)

434. 3 1.5 4 1.5 5 1.5 1 -1.5

435. LOAD COMB 15 1.5 (DL + EQZ)

436. 3 1.5 4 1.5 5 1.5 2 1.5

437. LOAD COMB 16 1.5 (DL - EQZ)

438. 3 1.5 4 1.5 5 1.5 2 -1.5

439. LOAD COMB 17 (0.9 DL + 1.5 EQX)

440. 3 0.9 4 0.9 5 0.9 1 1.5

441. LOAD COMB 18 (0.9 DL - 1.5 EQX)

442. 3 0.9 4 0.9 5 0.9 1 -1.5

443. LOAD COMB 19 (0.9 DL + 1.5 EQZ)

444. 3 0.9 4 0.9 5 0.9 2 1.5

445. LOAD COMB 20 (0.9 DL - 1.5 EQZ)

446. 3 0.9 4 0.9 5 0.9 2 -1.5

447. LOAD COMB 21 (DL + 0.8 LL + 0.8 EQX)

448. 3 1.0 4 1.0 5 1.0 6 0.8 1 0.8

449. LOAD COMB 22 (DL + 0.8 LL - 0.8 EQX)

450. 3 1.0 4 1.0 5 1.0 6 0.8 1 -0.8

451. LOAD COMB 23 (DL + 0.8 LL + 0.8 EQZ)

452. 3 1.0 4 1.0 5 1.0 6 0.8 2 0.8

453. LOAD COMB 24 (DL + 0.8 LL - 0.8 EQZ)

454. 3 1.0 4 1.0 5 1.0 6 0.8 2 -0.8

455. LOAD COMB 25 (DL + EQX)

456. 3 1.0 4 1.0 5 1.0 1 1.0

457. LOAD COMB 26 (DL - EQX)

458. 3 1.0 4 1.0 5 1.0 1 -1.0

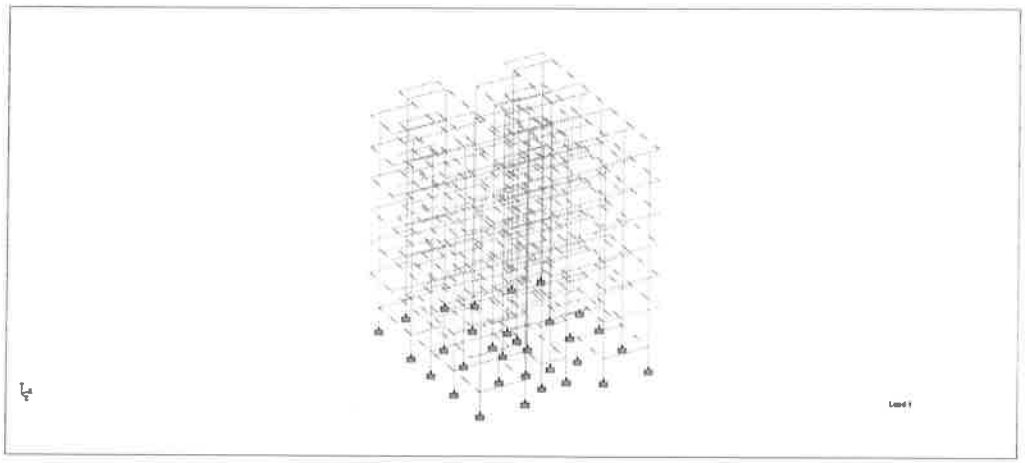
459. LOAD COMB 27 (DL + EQZ)

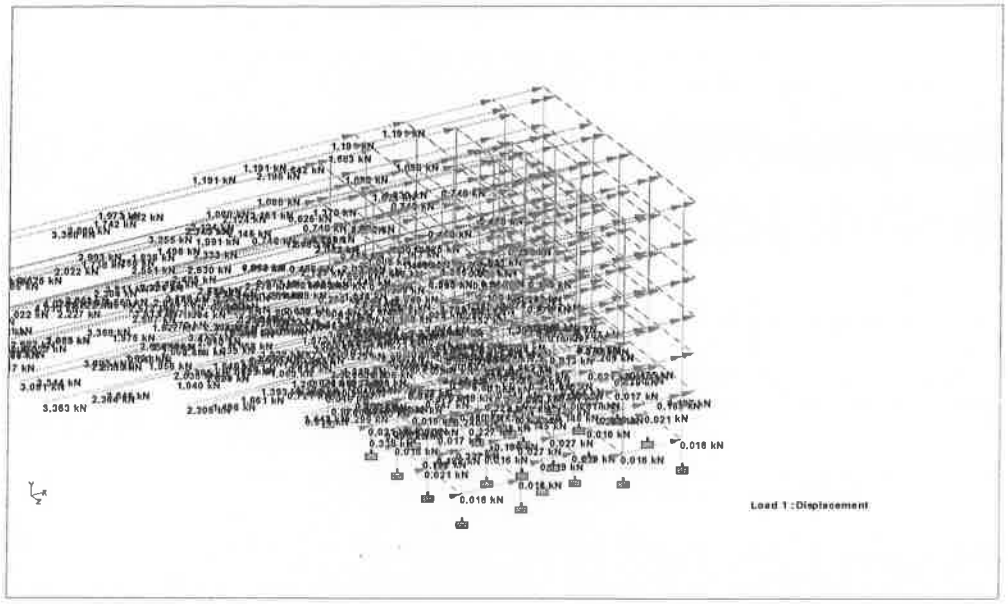
460. 3 1.0 4 1.0 5 1.0 2 1.0

461. LOAD COMB 28 (DL - EQZ)

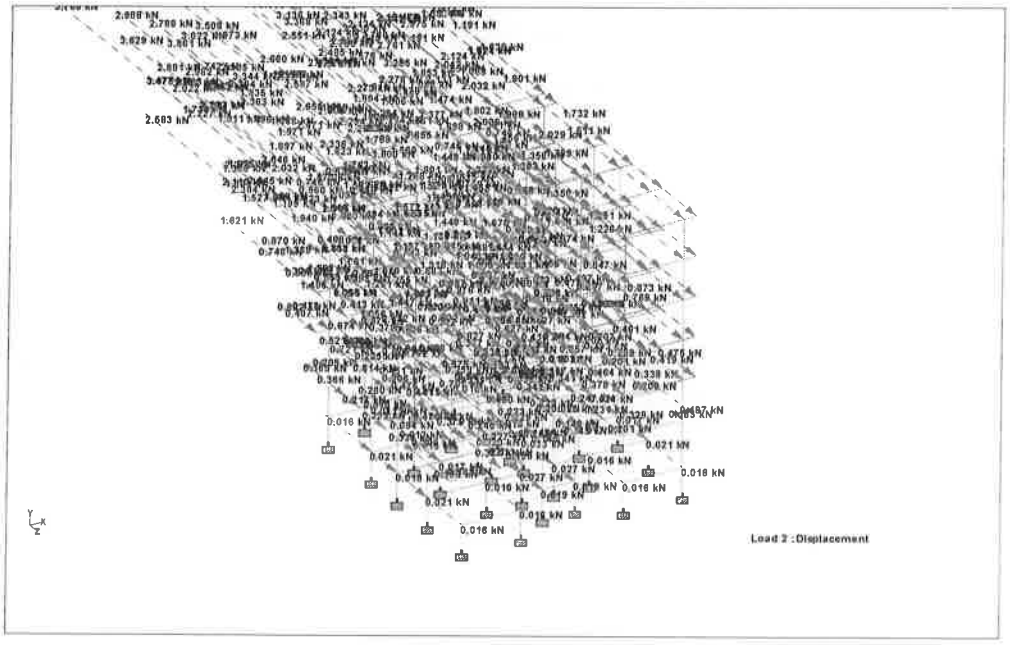
462. 3 1.0 4 1.0 5 1.0 2 -1.0

463. PERFORM ANALYSIS





Seismic in X-direction



Seismic in Z-direction

DESIGN OF ISOLATED SQUARE FOOTING: C21 & C24

Load in kn (P)	1630	Size of pedestal	375
SBC in kn/m^2	110	Free end thickness	230
Size of the footing required (B)	3.8494	Size provided	3.9
Net upward pressure (Po)	107.166	Size in feet	12.79
Maximum bending moment @ face of the column (Mu)	973.738	eff. Width	815.62
Depth required (d)	759.435	Depth provided (d)	775
K	4.3232		
Pt	1.311		
Ast in mm^2	3810.093		
Spacing of 10mm dia	80.393		
Spacing of 12mm dia	115.768		
Spacing of 16mm dia	205.804		

Check for one way shear:

Shear force (V)	462.330
Eff. Depth (d')	535.354
Top width	1925
Tv	0.4486
Pt	0.4333
Ast in mm^2	4465.406
Spacing of 10mm dia	68.595
Spacing of 12mm dia	98.779
Spacing of 16mm dia	175.601

Check for two way shear:

Punching shear (F)	1488.272
Eff. Depth (d')	655.177
Tv	0.7407
Tc	0.9682

Check for transfer of load @ the column base:

Permissible bearing stress	13.5
Actual bearing stress	11.591

Design of short column with uni axial bending C21 & C24

Description	GF
Axial Load (P) in Kn	2380
Moment (M) in Knm	66
Assumed column length in mm (D)	525
Assumed column breadth in mm (B)	300
Grade of Concrete	25
d' / D	0.095238095
Pu / (fck*B*D)	0.604444444
Mu / (fck*B*D^2)	0.031927438
Referring to chart in SP-16	Chart-45
p/fck	0.07
p in %	1.75
Ast in mm^2	2756.25
Provided steel	10nos 20mm
Dia of lateral ties:	
Dia of main rod provided	20
6mm	6mm
1/4 times Dia of main rod	05-Jan
Dia of lateral ties choosen	8mm
Spacing of lateral ties:	
16 times the dia of main rod	320
Least lateral dimension of column	300
Provide 8mm dia 2 legged lateral ties @	175 mm c/c

Design of Floor Slab:

Assume the slab thickness as 150 mm

Dead load of slab (0.15 x 25)	=	3.75 kn/m^2
Live load	=	2.00 kn/m^2
Partition wall load	=	1.00 kn/m^2
Floor finish load	=	1.00 kn/m^2
		7.75 kn/m^2

Say w = 8.0 kn/m^2

Long span L_y = 4.40 m

Short span L_x = 3.65 m

L_y / L_x = 1.20 < 2.0

To design as two way slab with one short edge as continuous & slab thickness as 125mm

Positive moment @ mid span = $0.059 \times 1.5 \times 8 \times 3.65^2$

= 9.43knm

Negative moment @ edges = $0.057 \times 1.5 \times 8 \times 3.65^2$

= 9.11knm

Referring to the table – 37 of SP – 16 and assuming the slab thickness as 125mm

Provide 8mm dia @ 140mm c/c along shorter span and 8mm dia @ 160mm c/c along the longer span with alternate rods cranked @ 0.2 times of respective span

Check for deflection:

Permissible span / depth = 26 x 1.3 (referring to chart 22)

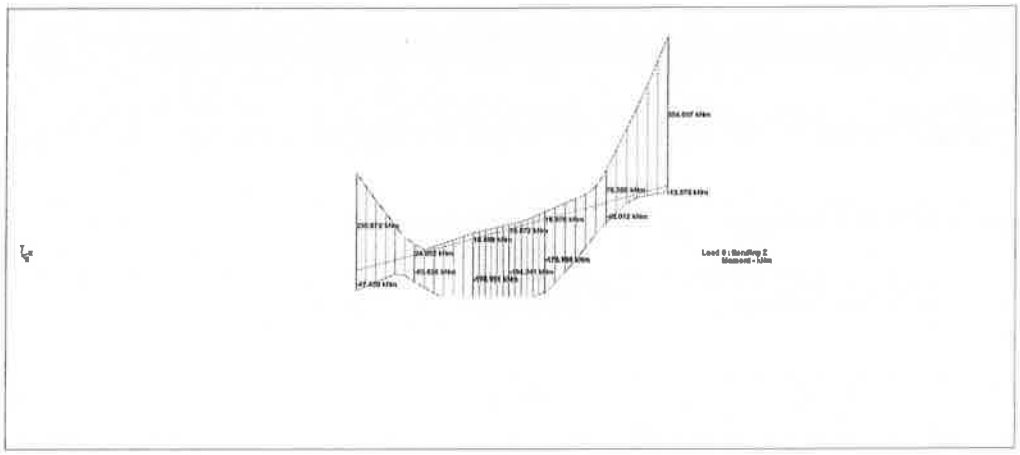
= 33.8

Actual deflection = 3650 / 110

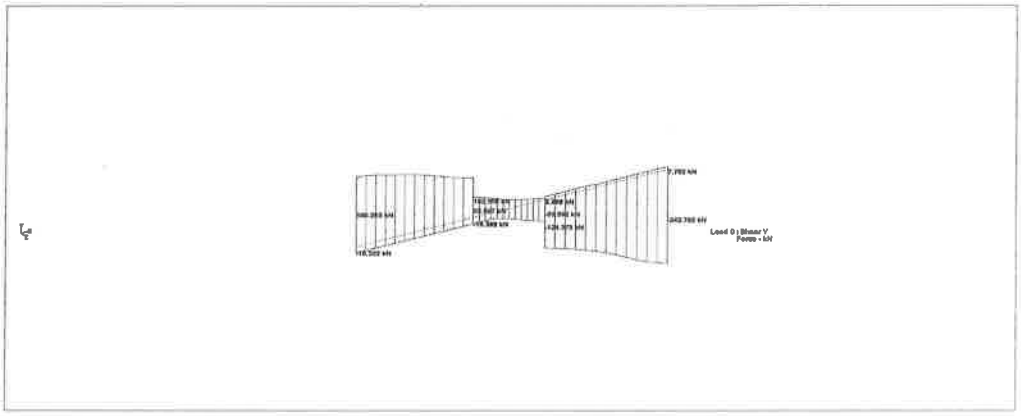
= 33.2

Hence safe

Design of critical floor beam:



Critical Bending Moment Diagram



Critical Shear Force Diagram

Assume beam size as 230mm x 600mm

Max factored B.M @ top of support = 355knm

K = 5.10, Pt= 1.374, Pc = 0.453

A_{st} = 1738 mm^2 A_{sc} = 574 mm^2

Therefore provide 3-20+3-20mm dia@ top of support

Max factored moment @ bottom = 185knm

K = 2.65, Pt = 0.711

A_{st} = 900 mm^2

Therefore provide 3-20mm dia @ bottom

Factored shear force @ support = 243kn

V_{us} = 243000 – (0.71 x 230 x 550)

V_{us}/d = 2.79kn/cm

Referring to Table – 62 of SP-16, provide 8mm dia stirrups @ 125mm c/c

end of report

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