

ภาคผนวก 8

รายการคำนวณโครงสร้างอาคารรองรับแผ่นดินไหว

รายการคำนวณแผ่นดินไหว

โครงการ

แมริออท เขาหลัก บีช คลับ

(Marriott's Khao Lak Beach Club)

คำนวณโดย



นายพิเชฐ บุญยไวยโรจน์ สย.5654

EMS
ENGINEERING & MANAGEMENT SERVICES

บริษัท อีเอ็มเอส คอนสตรัคชั่น จำกัด

การออกแบบตามมยผ 1302 การออกแบบอาคารด้านการสั่นสะเทือนของแผ่นดินไหว ดังนี้
อาคารตั้งอยู่ที่ อำเภอ ตะกั่วป่า จังหวัด พังงา

ค่าความเร่งตอบสนอง $S_s = 0.261$ $S_1 = 0.109$ (มยผ 1302)

ประเภทของดิน D (ดินปรกติ) จากผลทดสอบ Soil test

$F_a = 1.6$ $F_v = 2.4$ (มยผ 1302)

$S_{MS} = F_a * S_s = 0.417$

$S_{M1} = F_v * S_1 = 0.261$

ปรับค่าตอบสนองสเปกตรัมการออกแบบ

$S_{DS} = 2/3 S_{MS} = 0.278$

$S_{D1} = 2/3 S_{M1} = 0.179$

ตัวประกอบปรับผลตอบสนอง $R = 5$ (มยผ 1302)

ตัวประกอบสำคัญอาคาร $I = 1$ (มยผ 1302)

คาบการสั่นพื้นฐาน $T = 0.02H$ อาคารคอนกรีตเสริมเหล็ก (มยผ 1302)

$T = 0.4$

วิธีแรงสถิตเทียบเท่า

ความเร่งตอบสนองเชิงสเปกตรัมสำหรับการออกแบบด้วยวิธีแรงสถิตเทียบเท่า

สำหรับพื้นที่ทั่วประเทศ (ยกเว้นแอ่งกรุงเทพ) ที่มีค่า $S_1 < S_s$

$S_a = S_{D1} / T = 0.447$

สัมประสิทธิ์ผลตอบสนองแผ่นดินไหว

$C_s = S_a (I / R) = 0.089$



นายพิเชฐ บุญยไวยโรจน์

สถ.5654

* STAAD.Pro V8i SELECTseries6
* Version 20.07.11.33
* Proprietary Program of
* Bentley Systems, Inc.
* Date- JAN 26, 2017
* Time- 17: 3: 5
*
* USER ID:

1. STAAD SPACE
INPUT FILE: D:\LEK\MCV\staad\EQ.STD

2. START JOB INFORMATION

3. ENGINEER DATE 28-JAN-17

4. END JOB INFORMATION

5. INPUT WIDTH 79

6. UNIT METER KG

7. JOINT COORDINATES

8. 2 0 0 0; 3 0 0 4.2; 4 0 0 9.7; 5 0 0 13.9; 6 4 0 13.9; 7 8 0 13.9; 8 12 0 13.9
9. 15 0 13.9; 10 20 0 13.9; 11 24 0 13.9; 12 4 0 0; 13 4 0 4.2; 14 4 0 9.7
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11. 22 0 4.2; 23 20 0 9.7; 24 16 0 4.2; 25 16 0 9.7; 26 12 0 4.2; 27 12 0 9.7
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13. 35 12 0 20.35; 36 15 0 20.35; 37 17 5 0 20.35; 38 9 0 13.9; 39 17 5 0 13.9
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32. 136 4 0 4.2; 137 4 0 9.7; 138 8 0 6 9.7; 139 12 0 6 9.7; 140 16 0 6 9.7
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38. 165 0 9 9.7; 166 0 9 13.9; 167 4 0 13.9; 168 8 0 13.9; 169 12 0 13.9

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STAND SPACE

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 213. 898 874 874; 899 875 875; 900 876 876; 901 877 877; 902 878 878; 903 879 879
 214. 904 880 880; 905 881 881; 906 882 882; 907 883 883; 908 884 884; 909 885 885
 215. 910 886 886; 911 887 887; 912 888 888; 913 889 889; 914 890 890; 915 891 891
 216. 916 892 892; 917 893 893; 918 894 894; 919 895 895; 920 896 896; 921 897 897
 217. 922 898 898; 923 899 899; 924 900 900; 925 901 901; 926 902 902; 927 903 903
 218. 928 904 904; 929 905 905; 930 906 906; 931 907 907; 932 908 908; 933 909 909
 219. 934 910 910; 935 911 911; 936 912 912; 937 913 913; 938 914 914; 939 915 915
 220. 940 916 916; 941 917 917; 942 918 918; 943 919 919; 944 920 920; 945 921 921
 221. 946 922 922; 947 923 923; 948 924 924; 949 925 925; 950 926 926; 951 927 927
 222. 952 928 928; 953 929 929; 954 930 930; 955 931 931; 956 932 932; 957 933 933
 223. 958 934 934; 959 935 935; 960 936 936; 961 937 937; 962 938 938; 963 939 939
 224. 964 940 940; 965 941 941; 966 942 942; 967 943 943; 968 944 944; 969 945 945
 225. 970 946 946; 971 947 947; 972 948 948; 973 949 949; 974 950 950; 975 951 951
 226. 976 952 952; 977 953 953; 978 954 954; 979 955 955; 980 956 956; 981 957 957
 227. 982 958 958; 983 959 959; 984 960 960; 985 961 961; 986 962 962; 987 963 963
 228. 988 964 964; 989 965 965; 990 966 966; 991 967 967; 992 968 968; 993 969 969
 229. 994 970 970; 995 971 971; 996 972 972; 997 973 973; 998 974 974; 999 975 975
 230. 1000 976 976; 1001 977 977; 1002 978 978; 1003 979 979; 1004 980 980; 1005 981 981
 231. 1006 982 982; 1007 983 983; 1008 984 984; 1009 985 985; 1010 986 986; 1011 987 987
 232. 1012 988 988; 1013 989 989; 1014 990 990; 1015 991 991; 1016 992 992; 1017 993 993
 233. 1018 994 994; 1019 995 995; 1020 996 996; 1021 997 997; 1022 998 998; 1023 999 999
 234. 1024 1000 1000; 1025 1001 1001; 1026 1002 1002; 1027 1003 1003; 1028 1004 1004; 1029 1005 1005
 235. 1030 1006 1006; 1031 1007 1007; 1032 1008 1008; 1033 1009 1009; 1034 1010 1010; 1035 1011 1011
 236. 1036 1012 1012; 1037 1013 1013;

207. DEFINE IBC 2006
 208. SS 0.261 S1 0.103 I 1 RX 3 RZ 3 SCLASS 4 TL 12 FA 1.6 FV 2.4

 * EOTIV. SEISMIC LOADS AS PER IBC
 * PARAMETERS CONSIDERED FOR SUBSEQUENT LOAD GENERATION
 * SS = 0.261 S1 = 0.103 FA = 1.600 FV = 2.400
 * SDS = 0.278 SD1 = 0.174

209. SELFWEIGHT 1
 210. LOAD 1 LOADTYPE SEISMIC TITLE EQ2
 211. IBC LOAD 2 1
 212. PERFORM ANALYSIS PRINT STATICS CHECK

PROBLEM STATISTICS

NUMBER OF JOINTS 290 NUMBER OF MEMBERS 454
 NUMBER OF PLATES 138 NUMBER OF SOLIDS 0
 NUMBER OF SURFACES 0 NUMBER OF SUPPORTS 38

SOLVER USED IS THE OUT-OF-CORE BASIC SOLVER

ORIGINAL/FINAL BAND-WIDTH- 187/ 53/ 282 DOF
 TOTAL PRIMARY LOAD CASES = 1, TOTAL DEGREES OF FREEDOM = 1512
 TOTAL LOAD COMBINATION CASES = 0 80 PAR.
 SIZE OF STIFFNESS MATRIX = 427 DOUBLE KILO-WORDS
 REQD/AVAIL. DISK SPACE = 17.9/ 529311.2 MB

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 * IBC 2006 SEISMIC LOAD ALONG Z :
 * CT = 0.047 Cu = 1.551 X = 0.9000
 * TIME PERIODS :
 * Ta = 0.552 T = 0.518 Tuser = 0.000
 * TIME PERIOD USED (T) = 0.518
 * Cb LIMITS : LOWER = 0.012 UPPER = 0.112
 * LOAD FACTOR = 1.000
 * DESIGN BASE SHEAR = 1.000 X 0.093 Z 1476296.12
 *

*** LOADING 1 : ADDITIONAL APPLIED FORCES AND MOMENTS ABOUT ORIGIN
 DUE TO SEISMIC LOADS (KG ,METS)

FORCE-X = 0.00 FORCE-Y = 0.00 FORCE-Z = 137000.23
 MOM-X = 1294806.12 MOM-Y = -1632584.88 MOM-Z = 0.00

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 1
 LOADTYPE SEISMIC TITLE EQ2

CENTER OF FORCE BASED ON Z FORCES ONLY (METS).
 (FORCES IN NON-GLOBAL DIRECTIONS WILL INVALIDATE RESULTS)

X = 0.119166556E+02
 Y = 0.945112468E+01
 Z = 0.936793668E+01

***TOTAL APPLIED LOAD (KG METS) SUMMARY (LOADING 1)
 SUMMATION FORCE-X = 0.00
 SUMMATION FORCE-Y = 0.00
 SUMMATION FORCE-Z = 137000.28

SUMMATION OF MOMENTS ABOUT THE ORIGIN-
 MX= 1294806.66 MY= -1632585.08 MZ= 0.00

***TOTAL REACTION LOAD (KG METS) SUMMARY (LOADING 1)
 SUMMATION FORCE-X = 0.00
 SUMMATION FORCE-Y = 0.00
 SUMMATION FORCE-Z = -137000.28

SUMMATION OF MOMENTS ABOUT THE ORIGIN-
 MX= -1294806.71 MY= 1632585.08 MZ= -0.01

STAND SPACE

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 1)

MAXIMUMS AT NODE
 X = 1.58008E-02 267
 Y = 3.38769E-02 249
 Z = 1.11463E+00 267
 RX= 8.26083E-04 87
 RY= -1.08993E-04 243
 RZ= 3.50788E-04 87

***** END OF DATA FROM INTERNAL STORAGE *****

213. PRINT STORY DRIFT

STORY	HEIGHT (METS)	LOAD	DRIFT (CM) X Z	ECCENTRICITY Z (METS)	RATIO
BASE=	-1.00				
1	0.00	1	-0.0000	0.0275	0.0000 L / 3640
2	3.00	1	0.0000	0.3348	0.0000 L / 1194
3	6.00	1	0.0001	0.6304	0.0000 L / 1110
4	9.00	1	0.0001	0.8716	0.0000 L / 1147
5	12.00	1	0.0001	1.0328	0.0000 L / 1259
6	14.60	1	-0.0001	1.0911	0.0000 L / 1430

214. PRINT BUCKLING SHAPES

WARNING PRINT MODES or BUCKLE COMMAND
 IGNORED, NO SHAPES EXIST.

215. FINISH

[Handwritten Signature]

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Section Properties

Prop	Section	Area (cm ²)	I _{yy} (cm ⁴)	I _{zz} (cm ⁴)	J (cm ⁴)	Material
3	Rect 0.25x0.50	1.25E+3	260E+3	65.1E+3	179E+3	CONCRETE
4	Rect 0.30x0.30	900.000	67.5E+3	67.5E+3	114E+3	CONCRETE
5	Rect 0.50x0.25	1.25E+3	65.1E+3	260E+3	179E+3	CONCRETE

Plate Thickness

Prop	Node A (cm)	Node B (cm)	Node C (cm)	Node D (cm)	Material
1	25.000	25.000	25.000	25.000	CONCRETE
2	15.000	15.000	15.000	15.000	CONCRETE

Primary Load Cases

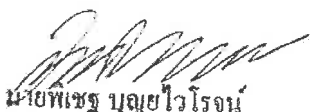
Number	Name	Type
1	EQZ	Seismic

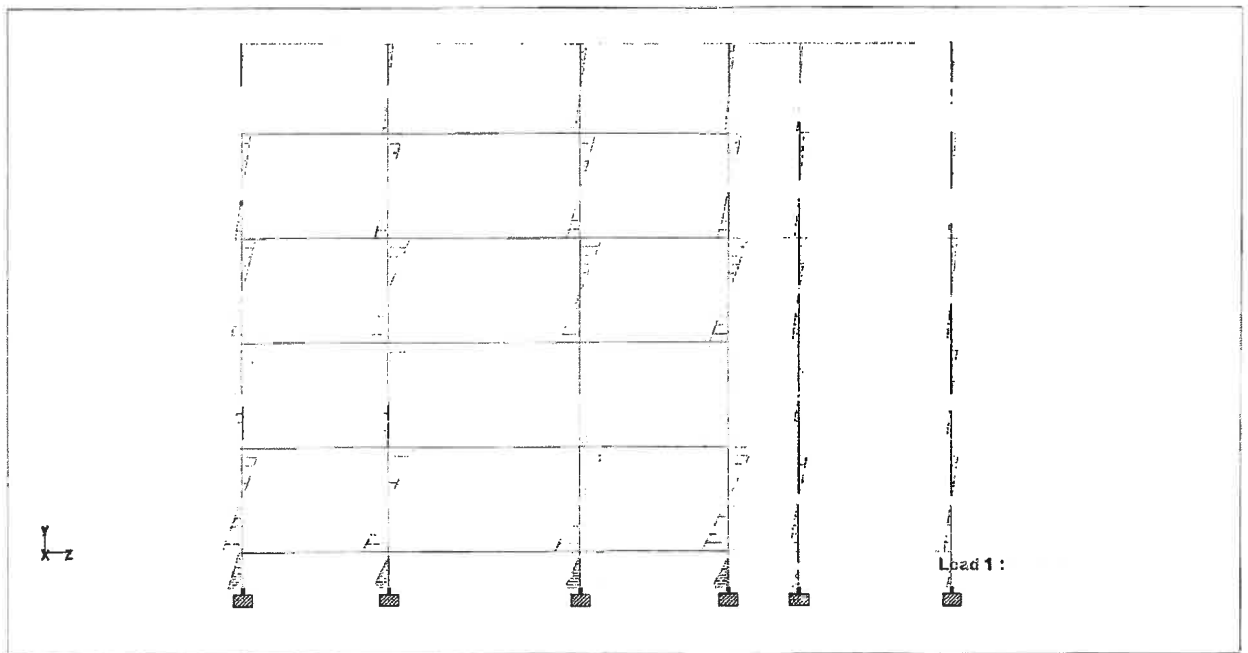
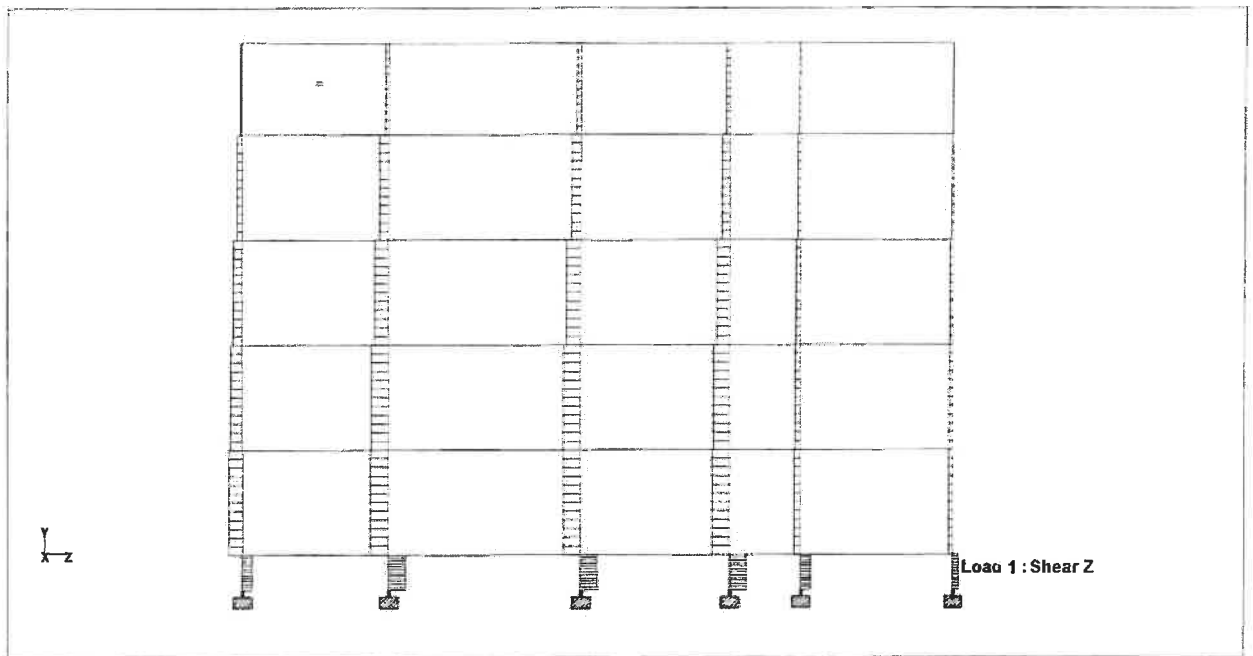
Materials

Mat	Name	E (kN/mm ²)	v	Density (kg/m ³)	α (/°C)
1	STEEL	205.000	0.300	7.83E+3	12E -6
2	STAINLESSSTEEL	197.930	0.300	7.83E+3	18E -6
3	ALUMINUM	68.948	0.330	2.71E+3	23E -6
4	CONCRETE	21.718	0.170	2.4E+3	10E -6

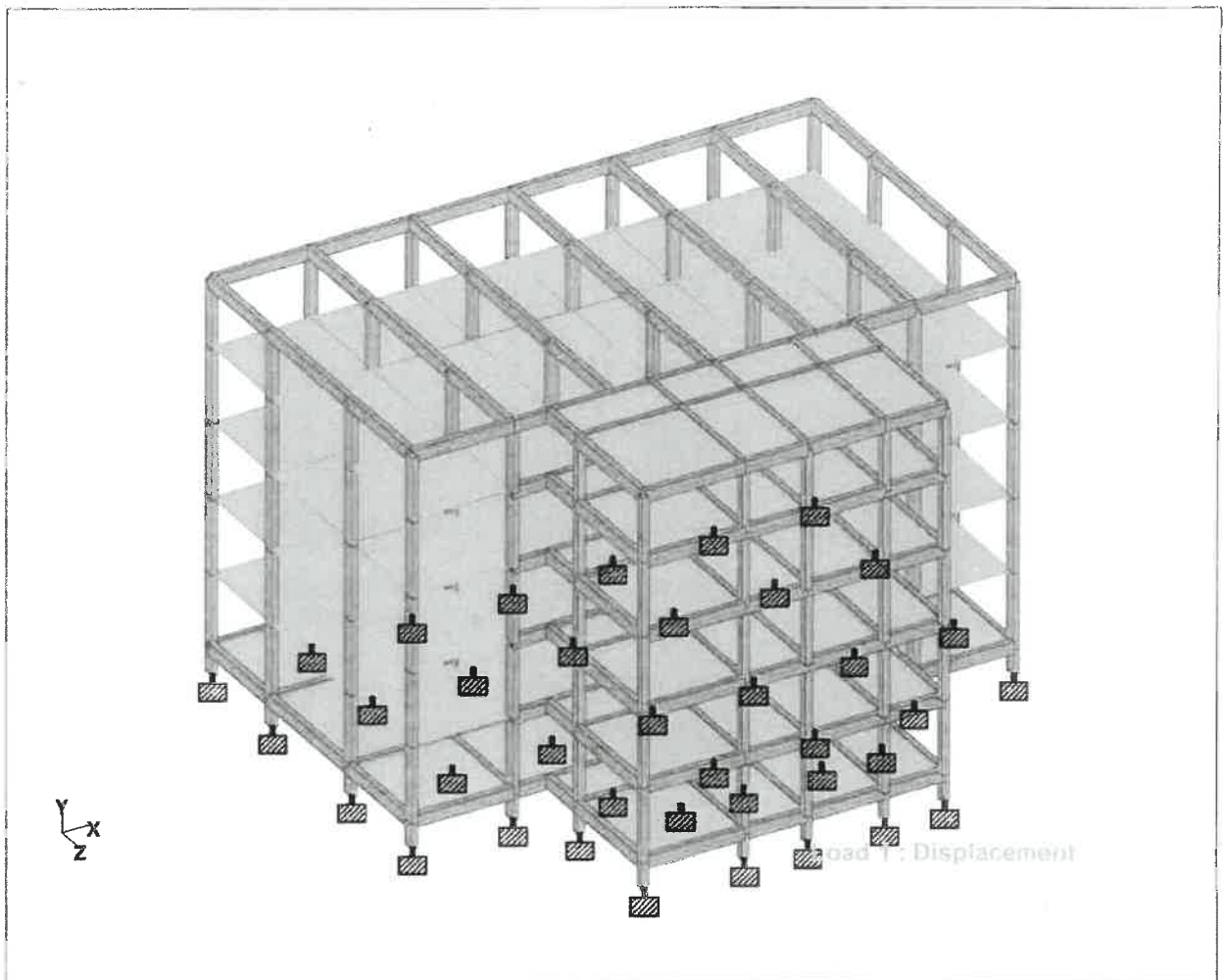
Beam Maximum Forces by Section Property

		Axial	Shear		Torsion	Bending	
Section		Max Fx (kg)	Max Fy (kg)	Max Fz (kg)	Max Mx (kg·m)	Max My (kg·m)	Max Mz (kg·m)
Rect 0.25x0.50	Max +ve	12.9E+3	544.425	5.15E+3	75.624	7.92E+3	861.516
	Max -ve	-15.3E+3	-550.478	-5.3E+3	-23.815	-7.99E+3	-872.640
Rect 0.30x0.30	Max +ve	5.8E+3	111.241	3.17E+3	1.618	2.75E+3	84.284
	Max -ve	-203.648	-150.037	-1.83E+3	-3.074	-2.73E+3	-102.979
Rect 0.50x0.25	Max +ve	1.34E+3	2.76E+3	918.784	607.795	426.028	3.11E+3
	Max -ve	-1.57E+3	-2.37E+3	-613.160	-948.493	-554.941	-3.61E+3


นายพชร บุญไวโรจน์
ตบ.5654



[Signature]
 นายพิเชฐ บุญขำไวโรจน์



Whole Structure Displacements 1000mm:1m 1 EQZ

[Signature]
นายพิเชฐ บุญยไวยโรจน์

สอ.5654

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ใบประกอบวิชาชีพ

(ข้อมูลส่วนบุคคล ได้รับการคุ้มครองไม่ต้อง
เปิดเผยตามกฎหมาย)

ใบประกอบวิชาชีพ

(ข้อมูลส่วนบุคคล ได้รับการคุ้มครองไม่ต้อง
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