RC Building Analysis and Design

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Dimensions

- 78 ft
- 250 ft
- 126 ft
- 171 ft
- 16 ft
- 10 ft
- 14 ft
- 16 ft

Unit System

- Length:
  - m
  - cm
  - mm
  - ft
  - in

- Force (Mass):
  - N (kg)
  - kN (ton)
  - kgf (kg)
  - tonf (ton)
  - lbf (lb)
  - kips (kips/g)
Materials and Sections

• Define Material
  - Concrete ASTM C7000

• Define 4 Sections as shown

<table>
<thead>
<tr>
<th></th>
<th>H</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Column</td>
<td>2 ft</td>
<td>2 ft</td>
</tr>
<tr>
<td>Beam</td>
<td>1 ft</td>
<td>1 ft</td>
</tr>
<tr>
<td>Balcony Beam</td>
<td>1.5 ft</td>
<td>1 ft</td>
</tr>
<tr>
<td>Pile</td>
<td>D = 2 ft</td>
<td></td>
</tr>
</tbody>
</table>
Import DXF CAD

- Import Hotel DXF
- Select CENTER Layers
- Section Beam
Create Columns

Extrude columns
Assign Element Type: General beam
Section: Column
Select all nodes
Extrude: -16ft
Create Walls

**Draw 2 walls**
Assign Element Type: Wall
Thickness: 1.5

Connect 4 corners to close face and create wall
(64, 57, 2, 9)
(63, 64, 9, 10)
Create Walls

**Draw other 6 walls**

Assign Element Type: Wall

Thickness: 1.5

Connect 4 corners to close face and create rest of walls

(101, 100, 45, 46)
(104, 100, 45, 49)
(81, 104, 49, 26)
(82, 81, 26, 27)
(82, 105, 50, 27)
(105, 101, 46, 50)
Static Load Cases

Create 4 load cases
Assign Self Weight to dead load case
Define Floor Loads

Assign floor loads to hotel

Define Floor loads >> Add
Dead = -0.5 kips/ft^2
Live = -0.2 kips/ft^2
Assign Floor Loads

Assign floor loads to hotel

Assign as **two way** to each half by drawing outline on outer border
Make copies of the first floor
Select All
Copy 5 times at 14ft
Click Add
Click Apply
Delete Sections

Change view to Front View
Select top left row as shown and delete

Change view to Right View
Select top left row as shown and delete
Import DXF CAD for Balcony

- Import Balcony DXF
- Select CENTER Layers
- Section Balcony Beam
Assign Upper Floor Loads

Assign floor loads to hotel

Assign as **two way** to each half by drawing outline on outer border (exclude balcony)
Building Generation

Make copies of the top floor only
Select top floor
Copy 4 times at 10 ft
Click Add
Click Apply
Generate story data

Auto Generate Story Data

Convert Self weight into Masses
**Seismic Load X**

**Add Seismic Load**

Load Case: Earthquake X
Wind Load Code: IBC 2012
Exposure: B
Period 1
X Direction 1 Scale Factor
Accidental Eccentricity X Direction Positive
Add Seismic Load
Load Case: Earthquake Y
Wind Load Code: IBC 2012
Exposure: B
Period 1
Y Direction 1 Scale Factor
Accidental Eccentricity Y Positive
Boundary Condition

Add Supports
Fix bottom nodes
Create Load to Masses
Dead Scale Factor: 1
Live Scale Factor: 0.8
Perform Analysis
Results: Deformations
Results: Axial Forces

AXIAL

ST: LIVE
MAX : 1
MIN : 127
FILE: START FILE TU
UNIT: kips

0.00
-138.57
-277.14
-415.71
-554.28
-692.85
-831.42
-969.99
-1108.56
-1247.13
-1385.70
-1524.27
Results: Moments Y

MOMENT-y

1653.86
1226.55
889.24
551.93
214.62
0.00
-460.00
-797.31
-1134.62
-1471.93
-1809.24
-2146.55

MAX: 713
MIN: 469

UNIT: ft*kips
Results: Wall Forces

Wall Forces/Moments

Load Cases/Combinations
ST: live
Step

Components
Fx, Fy, Fz, Mx, My, Mz

Type of Display
Contour, Deform
Values, Legend
Animate, Undeformed
Mirrored

Output Location
Top, Bot., Max, All

WALL FORCE
AXIAL
-99.40
-276.13
-452.86
-629.58
-806.31
-983.04
-1159.76
-1336.49
-1513.22
-1689.95
-1866.67
-2043.40

ST: LIVE
MAX : 1373
MIN : 150
FILE: PRACTICE RC
UNIT: kips
Load combination

Generate Load Combo
Select Concrete and Footing Design
Auto Generation
Design Code: ACI318-14
Define Column Rebar Data

Add Column Rebar Data
Specify rebar #3 as shown
Run Code Check

Select corner columns as shown
Column Design

Run Design
Specify Design Criteria for Rebar

For Column Design:
Main Rebar
Section:
Rebar:
Arrangement:
No.
2
2

AC318-11 RC-Column Design Result Dialog

P-M Interaction Curve Dialog

1. Design Condition
Design Code: AC318-11
Member Number: 729 (Phip, Phip)
Material Data:
f_c = 1.05f_c, f_y = 60ksi
Column Height:
Lateral Property:
Rebar Pattern:
20 - 8 - 40

2. Applied Loads
Load Combination: 2
Axial Load:
Axial End Moment:

3. Axial Forces and Moments Capacity Check
Concentrated Load:
Axial Load:
Axial End Moment:

4. P-M Interaction Diagram

P-M Interaction Diagram

Unit: kips, ft
Member:
Section:

Print
Print All
Close
Save
Run Check on section
Run Design on section
Create Piles

Delete Fixed Boundary

**Extrude piles**
- Assign Element Type: General beam
- Section: pile
- **Select all bottom nodes**
- Extrude: -10ft 2 times
Add Pile Springs
Activate Only Piles
Apply Spring as Shown
Update story data

Auto Generate Story Data
Re-Perform Analysis

YOUR MIDAS JOB IS SUCCESSFULLY COMPLETED.......C: \Users\a.martinez\Desktop\hotel RC model\practice rc
TOTAL SOLUTION TIME..:  20.11 [SEC]
Results: Moments
Thanks!