

# Plastic Analysis and Design

**Final Project 2018**



# Groups

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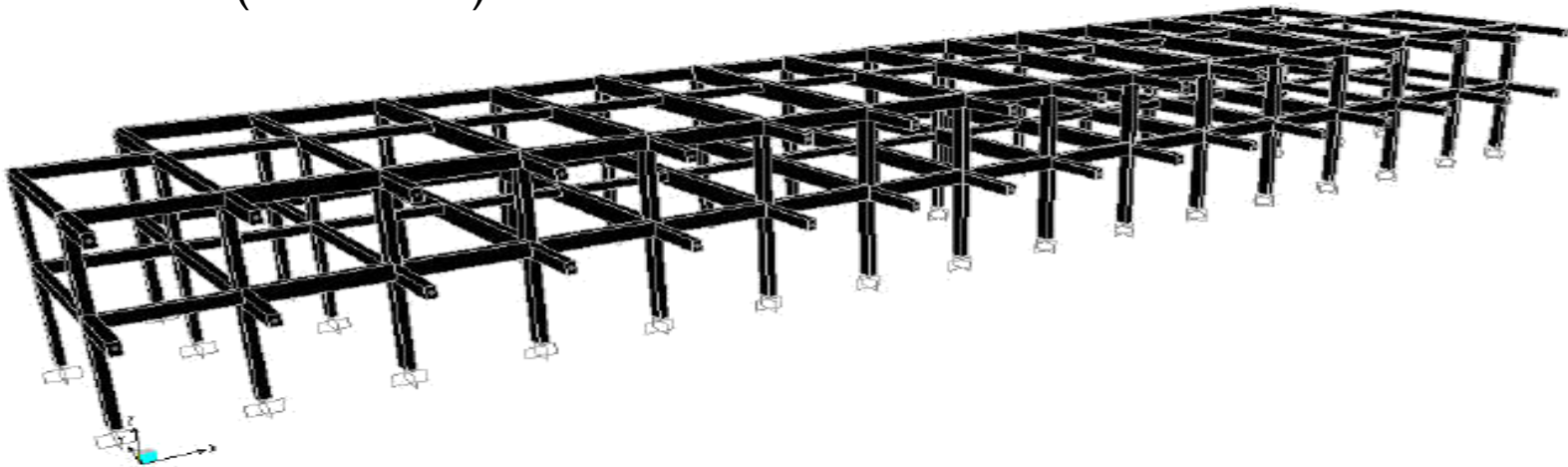
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# Structure Model

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3D Model (Bare Frame)



# Real Structure (Before Collapse)

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# Real Structure (After Collapse)

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# Details

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- » Building Name : 嘉義民雄農工實習工廠
- » Soil Type : Type 2
- » Building Function : Schoolhouse
- » Structure System : RC MRF
- » Structure Size : 2 floors without basement
- » Plan Dimensions : Long Dir. 48.4 m Short Dir. 12.5 m
- » Materials : Concrete  $f'_c = 280 \text{ kgf/cm}^2$   
Rebar  $f_y = 2800 \text{ kgf/cm}^2$
- » Loadings : Dead load  $850 \text{ kg/m}^2$  Including all members  
Live load  $250 \text{ kg/m}^2$







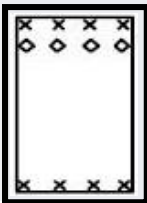

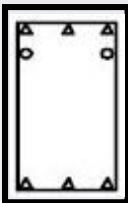

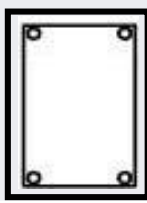

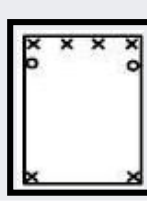
[illegible]

## Elevation C

Unit: cm



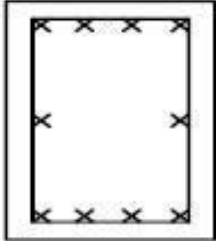
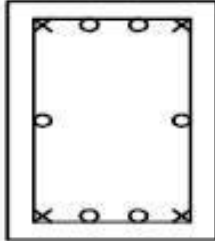
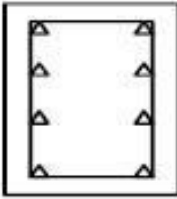
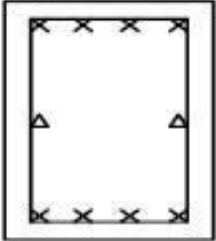
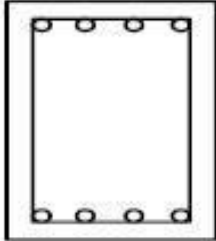
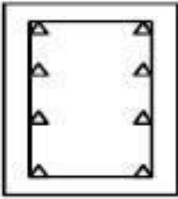
# Beam Cross Section

	IB1	IB2,2B2	IB3,2B3	2B1	2B4	IB4	CB
	30*80	25*50	25*65	38*80	25*40	25*40	30*50
							
Top Rebar	◇ 4-D25 X 4-D22	X 2-D22 ○ 2-D19	○ 2-D19 △ 3-D16	◇ 2-D25 X 4-D22	○ 2-D19	○ 3-D19	X 4-D22 ○ 2-D19
Bottom Rebar	X 4-D22	○ 2-D19	△ 3-D16	◇ 3-D25	○ 2-D19	○ 3-D19	X 2-D22
Stirrup	D10@15	D10@10	D10@15	D10@10	D10@15	D10@20	D10@10

Clear cover: 4 cm



# Column Cross Section

1C1	1C2	1C3	2C1	2C2	2C3
30*50	30*50	25*40	30*50	30*50	25*40
					
× 10-D22 ○ △	× 4-D22 ○ 6-D19 △	× ○ △ 8-D16	× 8-D22 ○ △ 2-D16	× ○ 8-D19 △	× ○ △ 8-D16
Details about the stirrup refer to Study cases					

Clear cover: 4 cm



# Project Assignment

Team	Stirrups for Columns (cm)	Analysis Cases		
1	D10 @ 10	Small to moderate seismic response spectrum (30-year return period)	Design seismic response spectrum (475-year return period)	1022CHY037 30%&100%
2	D10 @ 30			1022CHY037 30%&100%
3	D10 @ 10			921TCU068 30%&100%
4	D10 @ 30			921TCU068 30%&100%
5	D10 @ 10			921TCU052 30%&100%

Note :

- Software used : ETABS & TEASPA
- Analysis Direction : Long Direction
- consider walls as rigid members
- The units of time history data are sec. and gal



# Suggested Report Outline

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Section 1. Introduction

Section 2. Cross Section Properties and Analytical Model

Section 3. Seismic Evaluation (NCREE)

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Section 4. ATC-40

Section 5. FEMA273

Section 6. Mechanism Method (Upper Bound Method)

Section 7. Summary and Remarks



**Retrofit !**



# Suggested Report Outline

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## Section I. Introduction

*1.1 Purposes*

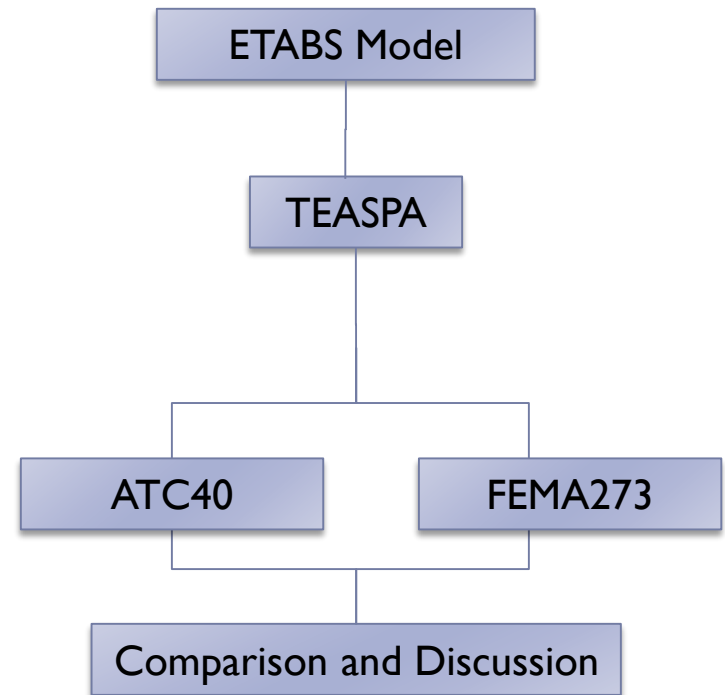
*1.2 Basic Information*

*1.3 Seismic Records*

*1.4 Flow Chart*

*1.5 Job Assignment*

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***For reference only***



# Suggested Report Outline

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## Section 2. Cross Section Properties and Analytical Model

### 2.1 Cross Section Analyses

#### 2.1.1 Yield Moment/Yield Curvature

#### 2.1.2 Ratio of $M_u/M_y$ and $\varphi_u/\varphi_y$

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### 2.2 ETABS Model

#### 2.2.1 Define Material

#### 2.2.2 Define Section

#### 2.2.3 Define Plastic Hinge Property (TEASPA)

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**For reference only**





# Suggested Report Outline

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## Section 3. Seismic Evaluation

### 3.1 Bare Frame

#### 3.1.1 Linear Static Procedure, LSP

#### 3.1.2 Linear Dynamic Procedure, LDP

#### 3.1.3 Nonlinear Static Procedure, NSP

#### (3.1.4 Nonlinear Dynamic Procedure, NDP) *optional*

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***For reference only***



# Suggested Report Outline

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## Section 4. ATC-40

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## Section 5. FEMA273

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## Section 6. Mechanism Method (Upper Bound Method)

### 6.1 Upper Bound Method

You will know where the plastic hinges form by using pushover method and also failure mechanism, so you can calculate the ultimate lateral force by hand. Then you could compare with the lateral load gotten from pushover analysis.

***For reference only***



# Suggested Report Outline

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## Section 7. Summary and Remarks

*7.1 Discussions and Conclusions*

*7.2 Comments*

*7.3 Appendix*

*7.4 Reference*

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***For reference only***

