

**DESIGN OF SPECIAL CONCENTRICALLY BRACED FRAME
USING TWO-STORY X BRACING**

Final Project

By:

**ADITYA SURYA PRASETYA
Student Number: 05 13 12394**



**ATMA JAYA YOGYAKARTA UNIVERSITY
Faculty of Engineering
Department of Civil Engineering
International S1 Program
AUGUST 2010**

APPROVAL

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ADITYA SURYA PRASETYA
Student Number: 05 13 12394

has been approved

Yogyakarta, August 13, 2020

Advisor



Ir. Junaedi Utomo, M.Eng.

**Department of Civil Engineering
Head**

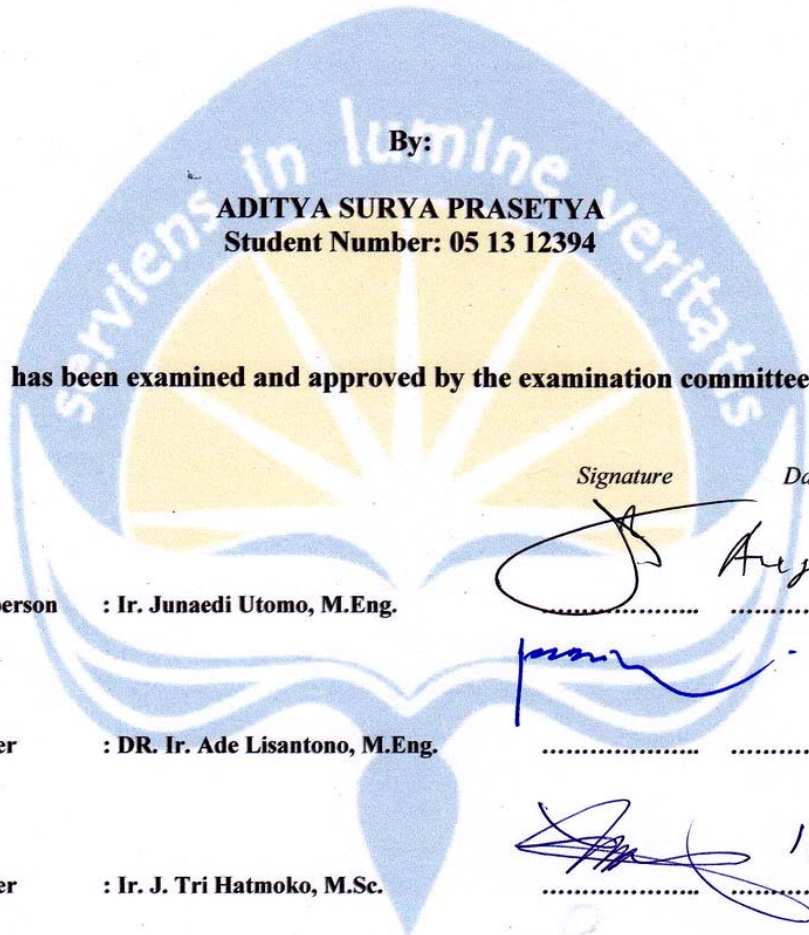


Ir. Junaedi Utomo, M.Eng.

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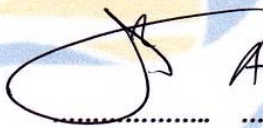


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has been examined and approved by the examination committee

	<i>Signature</i>	<i>Date</i>
Chairperson : Ir. Junaedi Utomo, M.Eng.		August 13, 2010
Member : DR. Ir. Ade Lisantono, M.Eng.		16/08/2010
Member : Ir. J. Tri Hatmoko, M.Sc.		16/08/10

PREFACE

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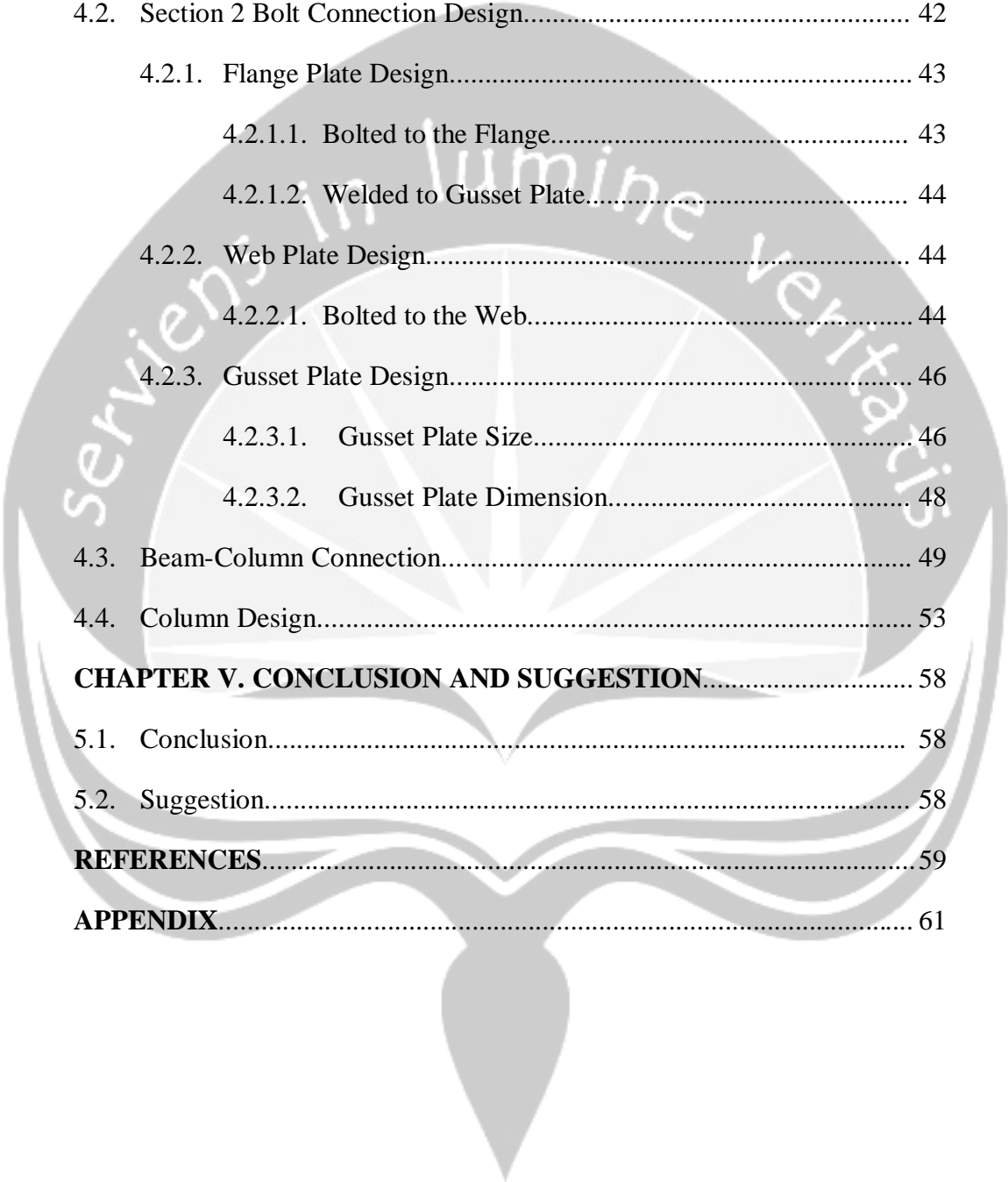
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Aditya Surya Prasetya

CONTENTS

COVER	i
LEGALIZATION SHEET	ii
PREFACE	iv
CONTENTS	vi
FIGURES CONTENTS	ix
TABLES CONTENTS	xi
ABSTRACT	xii
CHAPTER I. INTRODUCTION	1
1.1. General Background.....	1
1.2. Problem Statement.....	2
1.3. Problem Limitation.....	2
1.4. Objectives.....	4
CHAPTER II. LITERATURE REVIEW	5
2.1. Buckling on Bracing.....	6
2.2. Special Concentrically Braced Frame (SCBF).....	8
2.2.1. The Bracing Design.....	9
2.3. Bracing Connection.....	11
2.3.1. Connection Design.....	11
2.4. Basic Theory.....	12
2.4.1. Loading Analysis.....	12
2.4.2. Connection.....	12

2.4.2.1. Bolted Connection using High Strength Bolt.....	12
2.4.2.2. Welded Connection.....	13
2.4.3. Tension Member.....	16
2.5.3.1. Tension Design.....	16
2.5.3.2. Block Shear.....	18
2.4.4. Compression Member.....	20
2.5.4.1. Compression Design.....	20
2.5. Gusset Plate.....	21
CHAPTER III. COLUMN.....	24
3.1. Column on Special Concentrically Braced Frame (SCBF).....	24
3.2. Prediction of the Column Axial Forces Need on Special Concentrically Braced Frame (SCBF) Two-Story X Bracing.....	24
3.2.1. Prediction with Over Strength Factor (Ω_o).....	25
3.2.2. Column Axial Force Needs from Research Result of Richard (2009).....	26
CHAPTER IV. A WORKED EXAMPLE.....	31
4.1. Section 1 Bolt Connection Design.....	32
4.1.1. Flange Plate Design.....	33
4.1.1.1. Bolted to the Flange.....	33
4.1.1.2. Welded to Gusset Plate.....	34
4.1.2. Web Plate Design.....	34
4.1.2.1. Bolted to the Web.....	34
4.1.3. Gusset Plate Design.....	36



4.1.3.1. Gusset Plate Size.....	37
4.1.3.2. Gusset Plate Dimension.....	39
4.2. Section 2 Bolt Connection Design.....	42
4.2.1. Flange Plate Design.....	43
4.2.1.1. Bolted to the Flange.....	43
4.2.1.2. Welded to Gusset Plate.....	44
4.2.2. Web Plate Design.....	44
4.2.2.1. Bolted to the Web.....	44
4.2.3. Gusset Plate Design.....	46
4.2.3.1. Gusset Plate Size.....	46
4.2.3.2. Gusset Plate Dimension.....	48
4.3. Beam-Column Connection.....	49
4.4. Column Design.....	53
CHAPTER V. CONCLUSION AND SUGGESTION.....	58
5.1. Conclusion.....	58
5.2. Suggestion.....	58
REFERENCES.....	59
APPENDIX.....	61

FIGURES CONTENTS

Figure 1.1	Elevation View.....	3
Figure 1.2	Plan View.....	3
Figure 2.1	Comparison between unbalanced vs balanced Chevron connection.....	5
Figure 2.2	Chevron and X-Bracing Postbuckling Stage.....	6
Figure 2.3	Out-of-Plane Buckling.....	8
Figure 2.4	Throat and Failure Plane on Fillet Weld.....	14
Figure 2.5	Fillet Weld.....	16
Figure 2.6	Block Shear.....	19
Figure 2.7	Schematic of SCBF gusset plate connection and design checks.....	22
Figure 3.1	Forces on SCBF two-story X bracing.....	24
Figure 3.2	Hysteretic response bracing.....	25
Figure 3.3	Plan and elevation view on SCBF and BRBF.....	27
Figure 3.4	Normalized capacity of ductile element.....	27
Figure 3.5	Pushover analysis result.....	28
Figure 3.6	Normalized column demand.....	28
Figure 3.7	Column rotation demands.....	29
Figure 4.1	Diagonal Bracing Connection and External Forces.....	32
Figure 4.2	Brace to Girder Gusset Plate.....	42
Figure 4.3	Plan View.....	53

Figure 4.4 Elevation View..... 54



TABLES CONTENTS

Table 2.1	R_y and R_t Values for Different Member Types.....	10
Table 2.2	Nominal Stress of Fasteners and Threaded Parts.....	13
Table 2.3	Minimum Size of Fillet Weld.....	16
Table 4.1	Horizontal distribution of story shear.....	50
Table 4.2	Summary of Seismic Force Distribution.....	51
Table 4.3	Diaphragm Drag Force.....	51
Table 4.4	WF profile that fulfill the requirement, tensile and compression capacity.....	56
Table 4.5	Column Axial Strength and Ductility Design.....	57

ABSTRACT

DESIGN OF SPECIAL CONCENTRICALLY BRACED FRAME USING TWO-STORY X BRACING, prepared by Aditya Surya Prasetya, SN: 05 13 12394, year of 2010, Civil Engineering, Engineering Faculty, University of Atma Jaya Yogyakarta.

The advantage of Special Concentrically Braced Frame (SCBF) in the seismic steel design is high R factor. Currently, the usage of Chevron bracing is much avoided because it requires the beam to be designed due to unbalanced forces which exist because of the redistribution forces in the bracing that withstand the compression force is buckle. The alternative beside Chevron bracing is two-story X-bracing that can withstand the unbalance forces on the beam so that the beam cross section becomes smaller. But research results in three SCBF (3, 9 and 18 stories) by Richards (2009) using static pushover analysis and non-linear dynamic analysis with 10 earthquake records show that the *normalized column demands* which is the ratio between the maximum axial force (P_u) to axial force elastic lateral load equivalent (P_e) reached $P_u / P_e = 4.2$ for the first and second story columns on 3 stories of SCBF, $2.2 \leq P_u / P_e \leq 4.8$ for all columns on 9 stories of SCBF and $1.8 \leq P_u / P_e \leq 5.0$ for the fifth story column upward on 18 stories of SCBF. The results of this study show the seismic column demands (P_u) in CBF with low and moderate levels could exceed $\Omega_o P_e = 2 P_e$ for $\frac{kl}{r} \leq 4\sqrt{\frac{E}{F_y}}$ that used on the design ($\Omega_o = 2$ in the ICC 2006). These research results show the buckling on the bracing make the redistribution forces drastically increase the column axial load, much greater than the *overstreng factor* static analysis. So the SCBF column design using two story X bracing should pay attention on the redistribution forces after the compression bracing is buckle, just like the design of the beam with the Chevron bracing, the column should be designed based on the maximum axial force whose magnitude depends on the tensile capacity of the bracing. The principle of capacity planning is used to determine the maximum column axial force.

Keywords : Special Concentrically Braced Frame, two-story X Bracing, Chevron Bracing