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

Final Project

By:

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International S1 Program
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APPROVAL

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has been approved

Yogyakarta, August 13, 2010

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Ir. Junaedi Utomo, M.Eng.

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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.**	.....	16/8/10

PREFACE

First and foremost, the author would like to thank Allah so that the author could prepare and finish the final project report. This report was arranged to finish the S1 degree at Faculty of Engineering, Department of Civil of Engineering, University of Atma Jaya Yogyakarta.

The author realized that there are still limitation and flaws in this final project report. However the author still hopes that this final project report might be useful for the readers and the author herself.

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Aditya Surya Prasetya

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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 ≤ Pu / Pe ≤ 4.8 for all columns on 9 stories of SCBF and 1.8 ≤ Pu / Pe ≤ 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 $\frac{kl}{r} \leq 4\sqrt{\frac{E}{Fy}}$ that used on the design (Ω_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 *overstrengh 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