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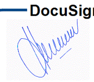
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Confinement hoops of compression zone in beam under cyclic loading

Priastiwi Y.A.[a], Imran I.[b], Nuroji[a], Hidayat A.[a]

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[a] Civil Engineering Department, Faculty of Engineering, Diponegoro University, Semarang, Indonesia

[b] Structural Engineering Research Group, Civil Engineering Department, Faculty of Engineering, Bandung Intitute of Technology, Bandung, Indonesia

Abstract

This paper explain the behavior of beam with the confinement hoops in compression zone subjected to cyclic loading. The experimental study aims to determine the ductility and energy dissipation of beam with hoops confinement in compression zone at the plastic hinge region under cyclic loading. Two half-scale beam specimens that conducted as a simplification model of beam plastic hinge region at column face were tested. The one specimen was confined with hoops and would be compared by un-confinement beam in compression zone. The beam will be loaded with load centered on the middle of the span so it will receive the greatest moment and shear. The cyclic loading system by using displacement control with the static squasi loading gradually reaches the ultimate state. The experimental test shows that confining with hoops in the compression zone of beam's section increases up to 50 percent in displacement of ductility, and around 65 percent in curvature of ductility. Further, the cumulative index of energy dissipation of beam increase up to 2 times compared with un-confinement beam in compression zone. The confinement hoops of compression zone insignificant increase in terms of strength capacity and moments as well as in monotonic loading test. © 2017 Author(s).

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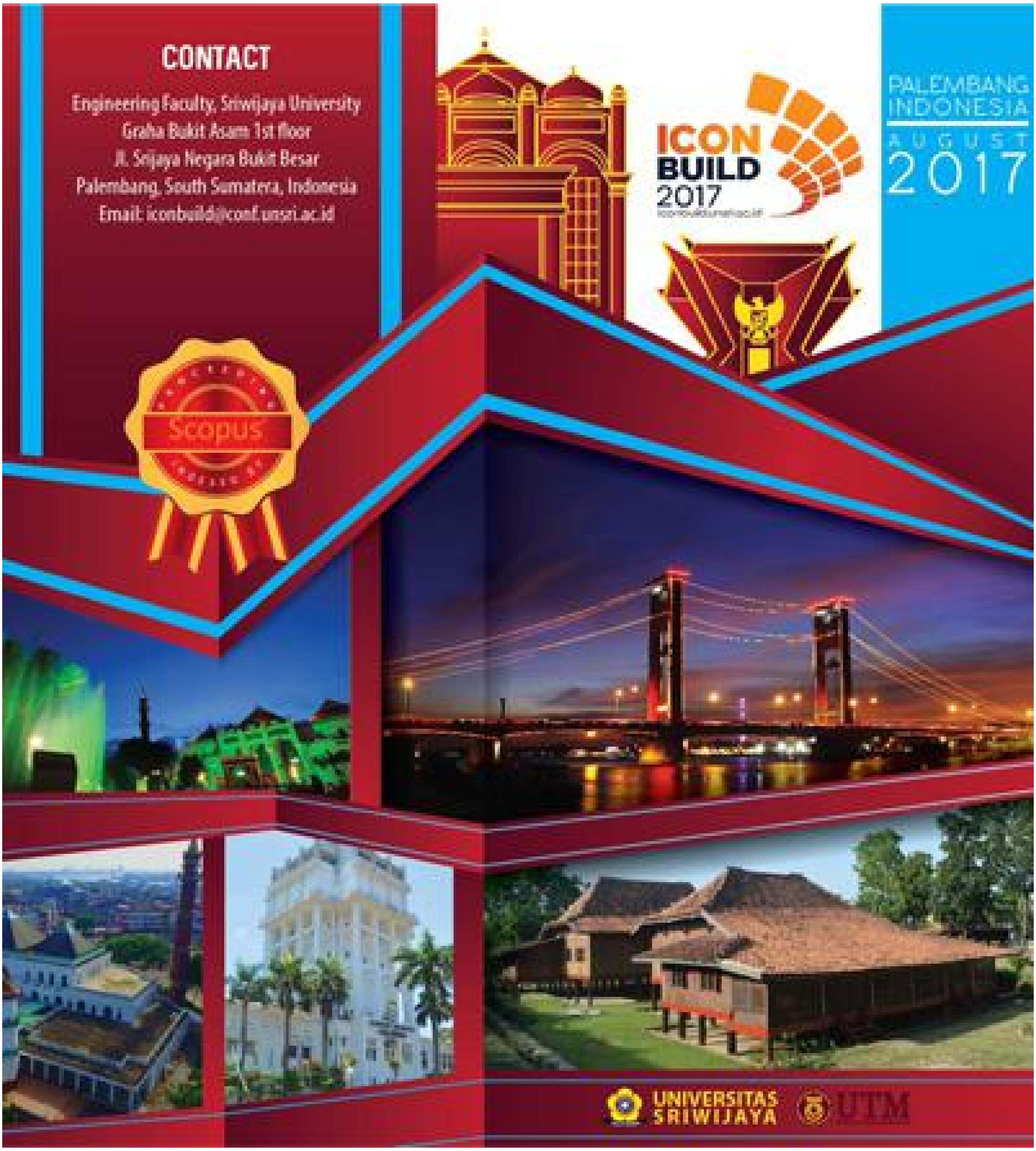
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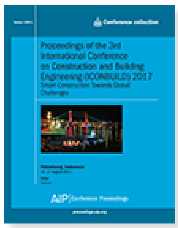

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Experimental Behaviour of Beam-Column Connection using Cold-Formed Steel Sections with Rectangular Gusset-Plate

K. M. Aminuddin [1,a)] , Anis Saggaff [2,b)] and Mahmood Md Tahir [3,c)]

[1] Civil Engineering Department, Faculty of Engineering, Universitas Sriwijaya, Indonesia
[2] *Civil Engineering Department, Faculty of Engineering, Universitas Sriwijaya, Indonesia*
[3] *UTM Construction Research Centre, Faculty of Engineering, UniversitiTeknologi Malaysia, 81310 Skudai, Johor Bahru, Malaysia*

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Abstract. Beam-to-column connections setting up as isolated joint of cold-formed steel sections were tested up to failure. This experiment was conducted to observe the behaviour of connection in term of strength, stiffness and ductility. The type of connection used was rectangular gusset plate which stiffen the beam-to-column connection. The behaviour of the proposed connection was expressed with Moment-Rotation curves plotted from the experiment test results. The capacity of connections on this research were done in two ways: theoretical calculation by adopting Eurocode 3 BS EN 1993-1-8:2005 and experimental test results. The theoretical calculation of the moment capacity of the proposed connection has found (Mj) to be 10.78 kNm with joint stiffness (Sj) amount to 458.53 kNm/rad. The experimental test results has recorded that the Moment capacity (Mj) of 15.68 kNm with joint stiffness (Sj) of 1948.06 kNm/rad. The moment ratio of theoretical to experimental amount to 0.69. The joint stiffness ratio of theoretical to experimental amount to 0.24.

INTRODUCTION

Gusset-plate connections are the easiest connections used for beam-to-column connection [1]. Gusset-plate connections have advantages than other connections that are easy to install and maintain. Gusset-plate connections contain various shape such as haunch and rectangular. Rectangular gusset-plate connection is compared to haunch gusset-plate has advantage that is due to its shape adjusted with beam and column height so there is no excess of gusset-plate. If it is applied to building system for wall's erection method, rectangular gusset-plate connection is easier to install compare to haunch gusset-plate connection.

Tan was conducted the research of double lipped C-Channel (DLC) with non-composite connection by applying gusset plate [2] and flange cleats [3]. The dimension of the beam varies, ie DLC150, 200, and 250, while the column dimension remains the same i.e. DLC250. From the research result it can be concluded that the gusset plate connection has better connection capacity compared to flange cleat. This means by using the same beam, the gusset plate connection configuration can be more applied to larger loads compare to the flange cleats. The use of cold-formed steel as part of the main construction can provide advantages due to having a highest strength-to-weight ratios. Nevertheless, the innovations concerning of cold-formed steel is remain. such as the research conducted by Sabbagh ([4]; [5]) proposing the use of a curved flange section of cold-formed steel, with the aim of increasing the moment resistant with the same weight profile.

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Analysis of Rotational and Sliding Collapse Modes of Masonry Arches via Durand-Claye's Method

Riccardo Barsotti[1, a)], Danila Aita[1, b)] and Stefano Bennati[1, c)]

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Abstract. In this paper the mechanical behavior of circular and pointed masonry arches subject to their own weight is examined in order to determine their collapse modes. Different arch's shapes and thicknesses are considered; the influence of the friction coefficient on the arch collapse is analyzed as well. The safety level of arches is investigated by suitably reworking in semi-analytical form the stability area graphical method proposed by a renowned 19th century French scholar, Durand-Claye. Our analysis enables accounting for any given eccentricity of the thrust at the crown; furthermore, also the strength of masonry is taken into account. According to Durand-Claye's method, the arch is safe if along any given joint both the bending moment and the shear force do not exceed some given limit values. It is shown that attainment of a limit condition according to Durand-Claye corresponds to the onset of a collapse mechanism characterized by either relative rotation or sliding between masonry units. All possible symmetric collapse modes for an arch are thoroughly described. As it was expected, pointed and circular arches show different collapse behaviors. Limit values of arch thickness and friction coefficient are assessed. The results obtained are compared with those given by Michon in 1857.

INTRODUCTION

As is well known, the set of collapse modes for a masonry arch determined by Michon [1] is not comprehensive, as in his analysis the thrust at the crown section is applied by hypothesis at the arch intrados or extrados only. In the present contribution, by relaxing Michon's restrictive assumption, and by allowing for any given thrust eccentricity between the intrados or extrados, the arch safety level is investigated by suitably reworking the stability area method proposed by another French scholar, Durand-Claye [2, 3]; furthermore, also the masonry nonlinear response in compression is taken explicitly into account.

According to Durand-Claye's method, the arch is safe if along any given joint both the bending moment and shear force do not exceed the values defined by some limit conditions; the arch collapse is thus characterized by either relative rotation or sliding between some masonry units. In modern terms, the contribution by Durand-Claye, and those by Coulomb and other authors as well [4], prefigures some sort of 'safe theorem' for masonry arches.

Paraphrasing Durand-Claye, it could be said that from the possibility of equilibrium Coulomb deduces the stability of the structure. This statement - in itself reasonable - has been stated in more formal terms and included in the context of the modern theory of plasticity during the last century. In this regard, it should be observed that, if it is assumed that any two adjacent masonry units may slide with friction with respect to one another, plastic non-standard materials should be taken into consideration. In such cases, neither the uniqueness of the collapse load nor the validity of the static or kinematic theorem is assured in the general case. However, it could be shown that for symmetric masonry arches the problem can be solved as if the material were standard.

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Prediction of Shear Critical Behavior of High-Strength Reinforced Concrete Columns Using Finite Element Methods

Harun Alrasyid[1,a)], Fahrudin Safi[1], Data Iranata[1] , and Yu Chen-Ou[2]

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[2]*Civil Engineering Department, National Taiwan University, Taipei, Taiwan*

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Abstract. This research shows the prediction of shear behavior of High-Strength Reinforced Concrete Columns using Finite-Element Method. The experimental data of nine half scale high-strength reinforced concrete were selected. These columns using specified concrete compressive strength of 70 MPa, specified yield strength of longitudinal and transverse reinforcement of 685 and 785 MPa, respectively. The VecTor2 finite element software was used to simulate the shear critical behavior of these columns. The combination axial compression load and monotonic loading were applied at this prediction. It is demonstrated that VecTor2 finite element software provides accurate prediction of load-deflection up to peak at applied load, but provide similar behavior at post peak load. The shear strength prediction provide by VecTor 2 are slightly conservative compare to test result.

INTRODUCTION

In the last decade, structural design of high-rise building has been more challenging than traditional low-rise buildings. The selection of materials, structure system, location and architecture design influenced the building construction cost. The utilization of normal strength reinforced concrete (RC) in buildings provided some advantages such as fire resistance, durability, higher stiffness, low-cost and easy maintenance. When applied in high-rise building, the normal strength RC will produce large column size in lower stories. This is due to combination of gravity and lateral load that imply to the building. This problem can be solved by using high-strength materials.

In Asian, particularly in Japan, the use of normal strength RC has suspended to high-rise buildings. This due to normal strength of RC could not provide high degree protection for high seismic hazard at high-rise buildings. To address this issue, in 1998, the research project of the utilization of high-strength concrete and high-strength reinforcement was initiated at Japan under supervision of Ministry of Construction. This project was called New-RC [1]. This project started to develop high strength and high quality material of reinforced concrete. The range of high compressive strength concrete was from 30 to 120 MPa, and high strength and quality of steel reinforcing bars with specified yield strength from 400 to 1200 MPa. After several years of intensive research, in 1995, high-strength concrete with concrete compressive strength from 40 MPa to 100 MPa has been reached. At this time, Japan also can manufacture high-strength longitudinal bar with specified yield strength range from 685 MPa to 980 MPa and high-strength transverse reinforcement with specified yield strength range from 785 MPa to 1275 MPa.

High-strength RC columns at high-rise building generally have small ratio of height to depth. With this ratio, RC columns tend to dominate by shear behavior rather than flexure behavior. At the earthquake condition, shear failure of column should be avoided. The shear failure of high-strength RC column caused loss of the lateral strength quickly. The experimental tests to observe the behavior of shear failure at High-Strength RC Columns have been performed by Aoyama [1], Maruta [2], Sakaguchi et al. [3], Kuramoto and Minami [4], Watanabe and Kabeyasawa [5], Jin et al. [6], Ou and Kurniawan [7-8], Harun Alrasyid [9]. The result from this study showed that (1) Increasing

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Development of Stiffer and Ductile Glulam Portal Frame

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Abstract. Portal frame structures, which are constituted of straight glulam beams and columns connected semi-rigidly by steel insert gusset plate with a lot of drift pins, were the first successful glulam structures widely used in Japan. In addition to this connection system, the author invented also a new type of jointing devise for glulam structures named as "Lagscrewbolt" which had a full threaded portion at inner part to grip wooden member as well as another thread part at the end of shank to connect with other member. The initial type of "Lagscrewbolt" was successfully applied to a various types of glulam buildings which could be rapidly built-up on construction site. Its strength performance, however, was rather brittle therefore the improvement of the ductility was a crucial research subject. In order to give a sufficient ductility on the "Lagscrewbolted joint system", so-called "Slotted Bolted Connection" concept was adopted for making use of large energy dissipation characteristics due to high-tension bolted steel connection with slotted bolt holes. Static & dynamic performance of glulam portal frame specimens was evaluated by static cyclic loading test as well as shaking table test. Current latest form of the jointing system can show very high ductility as well as stable hysteretic cyclic loops by inserting brass-shim between steel-to-steel friction interfaces

FIRST GLULAM MOMENT-RESISTING JOINT

So far as I know, the first effective glulam moment-resisting joint was developed by Dr. Bryan Walford at NZ Forest Research Institute in 1970 by employing multiple nails with steel side plates.(Fig.1) This fact was also confirmed by a few researchers of Auckland University, NZ. Dr.Walford continued try & error for developing effective moment-resisting joint for the portal frame of school class room and after a few unsatisfactory proto-type experiments, he finally reached to this successful joint configuration.

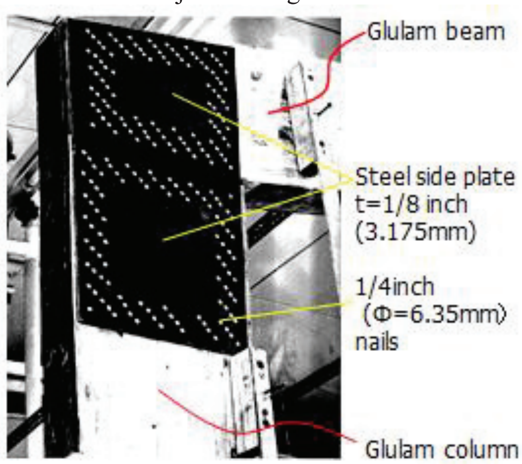

FIGURE 1. First effective glulam moment-resisting joint [1]

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