



Welcome to ARPN Journal of Engineering and Applied Sciences

**JUNI 2016 VOL. 11 ISSUE. 11**



[Home](#)

[Archive](#)

[Submit Paper](#)

[Author Guidelines](#)

[Editorial Board](#)

[Publication Fee](#)

## Editorial Board

**Editor-in-Chief:** Eng. I. K. Lakzai (PAKISTAN)

#	Editors	Country
1	Prof. Dr. K. L. Gowin	UNITED KINGDOM
2	Prof. Dr. Erik Valdimar Cuevas Jimenez	GERMANY
3	Prof. Dr. Hamou SADAT	FRANCE
4	Dr. Mohammad Aminul Islam	JAPAN
5	Prof. Dr. Kai Fu Chen	CHINA
6	Prof. Dr. M. Ashraf Chaudhry	NEW ZEALAND
7	Prof. Dr. A. Sermet Anagun	TURKEY
8	Prof. Dr. Ashraf Mohamed Elmaghrabi	Saudi Arabia
9	Prof. Dr. Krishna Murari Pandey	INDIA
10	Prof. Dr. Magdy A. Ezzat	EGYPT
11	Prof. Dr. Roberto Triguero	ITALY
12	Dr. Anurag Mishra	INDIA
13	Prof. Dr. Adel M. ALMI	TUNISIA
14	Prof. Dr. Anil Kumar Gupta	INDIA
15	Prof. Demetrios V. Bantekas	GREECE
16	Prof. Dr. Bensafi Abd-El-Hamid	ALGERIA
17	Dr. Rajarish K. Kamal	INDIA
18	Prof. Dr. Asma Thamer Ibraheem	IRAQ
19	Prof. Dr. Sylejman Hyseni	KOSOVO
20	PROF. DR. HAIDER ZAMAN	SAUDI ARABIA
21	Prof. Dr. Parimal Amaradul Parikh	INDIA
22	Prof. Dr. Debajyoti Mitra	INDIA
23	Prof. Dr. Pandan VASANT	MALAYSIA
24	Prof. Dr. Prakash MMS Kirthada	INDIA

## Associate Editors

1	Dr. Dongning Li	USA
2	Dr. Suheyla Yozel	TURKEY
3	Dr. Guoxiang Liu	USA
4	Dr. Nadeem Anjum	PAKISTAN
5	Engr. Mallini Sarah Pillai	NORWAY
6	Dr. K.V.L.N. Acharyulu	INDIA
7	Engr. Mohammad Khalil Darmany	IRAN
8	Dr. Lamiya- Gamal Eldeen Taha	EGYPT
9	Dr. OM Prakash Singh	INDIA
10	Engr. Seyyed Mohammad Reza Farshchi	IRAN
11	Dr. Muhammad Imran Din	PAKISTAN
12	Dr. José Carlos Pascoa Marques	PORTUGAL
13	Engr. Fawwaz Tinnan Albrazi Jabal	IRAQ
14	Dr. Karan Ray	INDIA
15	Dr. Shamsuddin Shahid	MALAYSIA
16	Engr. Naveenji Arun	INDIA

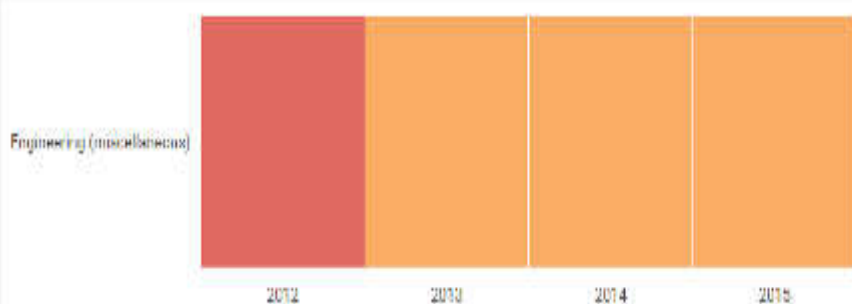
# ARPN Journal of Engineering and Applied Sciences

Country [Pakistan](#)  
Subject Area [Engineering](#)  
Subject Category [Engineering \(miscellaneous\)](#)  
Publisher [Asian Research Publishing Network \(ARPN\)](#)  
Publication type [Journals](#)  
ISSN [18196608](#)  
Coverage [2011-ongoing](#)

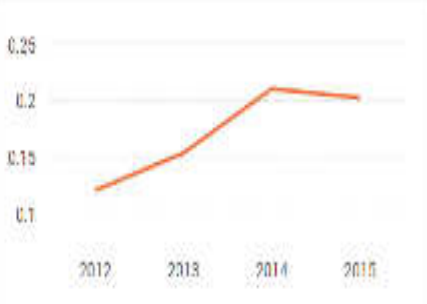
# 12

H Index

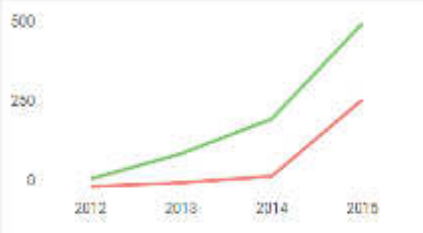
Quartiles



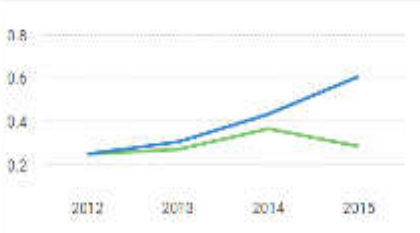
SJR



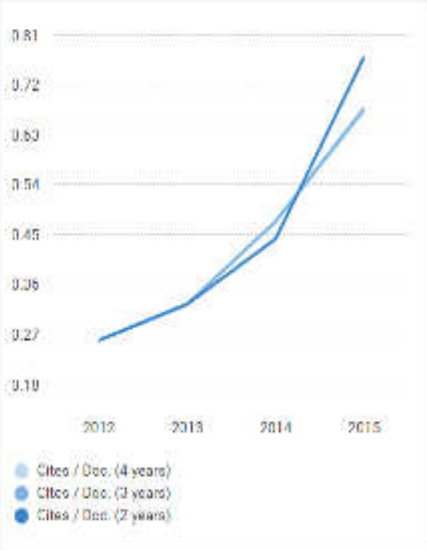
Total Cites Self Cites



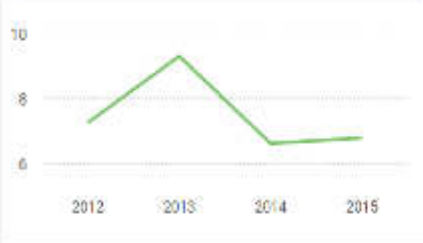
External Cites per Doc Cites per Doc



Citations per document

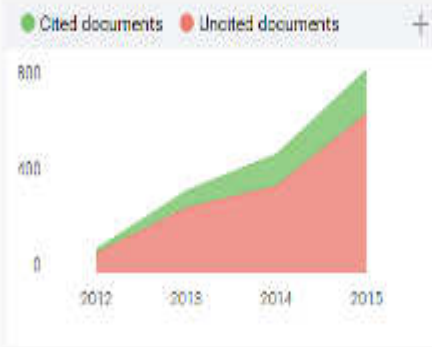


% International Collaboration



Citable documents Non-citable documents





Show this widget in your own website

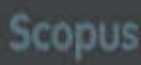
Just copy the code below and paste within your html code:

```
<a href="http://www.scimag
```

Developed by:



Powered by:



Follow us on [Twitter](#)

Scimago Lab. Copyright: 2007-2016. Data Source: Scopus®

- [Home](#)
- [Archive](#)
- [Submit Paper](#)
- [Author Guidelines](#)
- [Editorial Board](#)
- [Publication Fee](#)

ARPJ Journal of Engineering and Applied Sciences June 2016 | Vol. 11 No. 11

**Title:** Influence of Ni(OH)<sub>2</sub> nanoparticles on insulin sensor sensitivity

**Author (s):** Zulkarnain, Fredy Kurniawan, Taslim Ersam and Supropto

**Abstract:** The influence of nickel hydroxide (Ni(OH)<sub>2</sub>) nanoparticles on sensitivity of insulin sensor was investigated. Ni(OH)<sub>2</sub> nanoparticles that have an average diameters of 50 nm was characterized by Transmission Electron Microscopy (TEM). Insulin sensor was fabricated from silica gel/chitosan (SiO<sub>2</sub>/Chit) electrode that was modified with Ni(OH)<sub>2</sub> nanoparticles. A mixture of silica gel and chitosan in weight ratio of 4 : 6 was prepared. This mixture was heated at 65 oC and stirred, then Ni(OH)<sub>2</sub> nanoparticles solution (2 mL/100 mg of the mixture) and paraffin (15 % from the mixture weight) were added. The mixture was stirred continuously until the mixture becomes solid (paste). The paste was inserted in the bottom of glass tube and connected to Ag wire from the other side of the glass tube. The surface of the electrode was polished by abrasion paper grade 2000. The response of SiO<sub>2</sub>/Chit modified by Ni(OH)<sub>2</sub> nanoparticles (SiO<sub>2</sub>/Chit/Ni(OH)<sub>2</sub>)ps electrode to insulin concentration was observed. The addition of 2 mL Ni(OH)<sub>2</sub> nanoparticles could increase the sensitivity of the insulin sensor as much as sixfold compared to the electrode that was not modified by Ni(OH)<sub>2</sub> nanoparticles. A linear graph was obtained when anodic (ipa) and cathodic (ipc) current were plotted at varied scan rate.

[Full Text](#)

**Title:** Grains segmentation on uranium dioxide thin section images

**Author (s):** Dmitry Potapov, Alexey Modyaev and Natalia Leonova

**Abstract:** A technique of computer grains segmentation on uranium dioxide thin section images is described. An algorithm of image preprocessing is developed, allowing to achieve more accurate results in grains boundary detection when using the watershed marker method. The usage of gray-level morphological operations instead of binary results in information losses reduction on image processing. The developed algorithm can be used for quality control processes automation in metallurgy industrial organizations.

[Full Text](#)

**Title:** Automated dispatching control system of the mobile concrete batching plants

**Author (s):** Andrey Osbroukh, Yashar Nuruev, Dmitry Ephimenko, Sultan Zhankaziev and Dmitry Moroz



**Abstract:** The article deals with mathematical model of forecasting of towing indicators of tractors with four wheel formula which take into account geometric parameters of tractor's driving wheel tire, physical and mechanical attributes of soil, and constructive peculiarities of AWD tractor. The offered mathematical model allows automat zing calculation of forecasting evaluations for towing and energy indicators of tractor in machine-tractor aggregates.

[Full Text](#)

**Title:** Restoration of hazy data based on spectral and statistical methods

**Author (s):** Nurul Iman Saiful Bahari, Asmala Ahmad, Burhanuddin Mohd, Aboobaider, Muhammad Fahmi Razali, Hamzah Sakidin and Mohd. Saari Mohamad Isa

**Abstract:** Remote sensing data recorded from passive satellite system tend to be degraded by attenuation of solar radiation due to haze. Haze is capable of modifying the spectral and statistical properties of remote sensing data and consequently causes problem in data analysis and interpretation. Haze need to be removed or reduced in order to restore the quality of the data. In this study, initially, haze radiances due to radiation attenuation are removed by making use of pseudo invariant features (PIFs) selected among reflective objects within the study area. Spatial filters are subsequently used to remove the remaining noise causes by haze variability. The performance of hazy data restoration technique was evaluated by means of Support Vector Machine (SVM) classification. It is revealed that, the technique is able to improve the classification accuracy to the acceptable levels for data with moderate visibilities. Nevertheless, the technique is unable to do so for data with very low visibilities.

[Full Text](#)

**Title:** Flexural capacity and ductility of castella beam due to cyclic load

**Author (s):** Mara Junus

**Abstract:** The purpose of this study was to determine the flexure capacity and ductility of the castella beam due to cyclic load. This research was carried out through testing castella beams in the form of a portal with cyclic loading. Solid beams steel used is profiles IWF 200 100 5.5 8 fabricated became castella beam. Test beam consists of a solid beam (NB) as a comparison and castella beams (CB). The test results show increase 1.6 H of the high of CB beam, will affect to increase of the section modulus ( $S_x$ ) and moment of inertia ( $I_x$ ) respectively by 76.41% and 173.43% compared to NB beam. This increase is affect the increased flexure capacity castela beam of 82.5% compared to the beam NB Besides that, increases in the beam high will increase the slenderness cross section (H/B) and lower radius of inertia ( $r_y$ ) on the y-axis. This causes the transverse displacement of the CB beam is greater than NB beam. This condition causes the beam CB is less deformed in the vertical direction. This is shown by the ductility of the CB beam decreased by 46, 92 % compared to NB beams. Resistance is proportional to ductility, if the increased load will be followed by an increase in ductility. This relationship is shown by both of the beam test.

[Full Text](#)

**Title:** Quantum cells based memory design using multiplexed power gating technique

**Author (s):** C. John Manoj and C. Karthick

**Abstract:** QCA technology as an alternative to CMOS technology on the nanoscale has a hopeful future; QCA is an interesting tools for produce memory. This paper presents a novel design for quantum cells based memory design for low power system on chip. However the memory modules are partitioned into 32bit depth and 16bit width, every cell consumes power even at idle mode. Here a new technique called multiplexed power technique to scan currently activated cell and gating should applied to idle mode. This approach will reduces overall power dissipation when compared to existing scheme.

[Full Text](#)

**Title:** HGD: A rescue system for an alive human gesture detection in disasters management-an experimental study

**Author (s):** Ajay V. K. and R. K. Nadesh

**Abstract:** With the technology comes the threats and the natural disasters like bomb blasts, landslides, forest fires, floods, earth





## FLEXURAL CAPACITY AND DUCTILITY OF CASTELLA BEAM DUE TO CYCLIC LOAD

Mara Junus

Department of Civil Engineering, Paulus Christian University of Indonesia, Makassar, Indonesia

E-Mail: [mara.junus@gmail.com](mailto:mara.junus@gmail.com)

### ABSTRACT

The purpose of this study was to determine the flexure capacity and ductility of the castella beam due to cyclic load. This research was carried out through testing castella beams in the form of a portal with cyclic loading. Solid beams steel used is profiles IWF 200 100 5.5 8 fabricated became castella beam. Test beam consists of a solid beam (NB) as a comparison and castella beams (CB). The test results show increase 1.6 H of the high of CB beam, will affect to increase of the section modulus ( $S_x$ ) and moment of inertia ( $I_x$ ) respectively by 76.41% and 173.43% compared to NB beam. This increase is affect the increased flexure capacity castella beam of 82.5% compared to the beam NB Besides that, increases in the beam high will increase the slenderness cross section ( $H/B$ ) and lower radius of inertia ( $r_y$ ) on the y-axis. This causes the transverse displacement of the CB beam is greater than NB beam. This condition causes the beam CB is less deformed in the vertical direction. This is shown by the ductility of the CB beam decreased by 46, 92 % compared to NB beams. Resistance is proportional to ductility, if the increased load will be followed by an increase in ductility. This relationship is shown by both of the beam test.

**Keywords:** castella, flexure, ductility, cyclic load.

### 1. INTRODUCTION

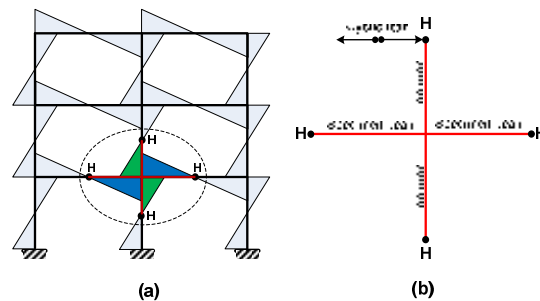
The need for shelter is increasingly rising day by day in Indonesia in line with population growth. Besides, the land for the construction of buildings or other buildings is more difficult to obtain and the price is higher, especially in urban areas. To save the land, then the solution is to build a multi-storey building for office buildings, dwellings or other buildings. Most of the building structure with steel material uses solid steel profiles as advantageous solution in terms of strength and material usage. Experts are trying to structure how to increase the strength of steel elements without an increase in self-weight of steel in order to obtain some new methods that beams with openings entity known as castella beam.

One form of the body opening is hexagon shape. Research on this openings has been done by Wakchaure MR, Sagade AV, Auti V. [2012] and the results showed that the openings with 0.6 of the beam height is the possible maximum openings, or in other words the maximum eligible beam height of the castella beam that can be fabricated. Research on the angle and length of exposure to a high of 0.60 to a high aperture solid beam has been carried out by Parung Herman *et al* [2013] are given monotonic load. Solid steel profiles fabricated into castella beam is IWF 200 100 5.5 8. Research results show the opening angle of  $60^\circ$  and aperture length  $e = 3b = 9$  cm gives the best result of the angle and length of openings for openings hexagon. Mara Junus [2016] continue this research by testing Castella beams with the concrete filled between the flange and burdened with cyclic loading. The results showed flexure capacity of the castella beams with concrete filled between the flange increased by 187.34% compared to normal beam. This study aims to determine the flexure capacity and ductility of the castella beam due to cyclic loading.

### 2. TESTING PROGRAM

#### 2.1 Testing principle

The principle of the test is based on the structure of the framework that burdened earthquake load as in Figure-1. The zero moment on the beams and columns are considered as the hinge (H).



**Figure-1.** (a) The moment area of a frame due to earthquake loads, (b) Principle of the test beam-column element.

#### 2.2 Test beams

Specimens, a steel beam used is a profile IWF 200 x 100 x 8 x 5.5 with hexagon shaped openings. High aperture 0.6 H, a distance of 9 cm and the aperture opening angle  $60^\circ$ . The fabrication process of castella beam as in Figure-2.

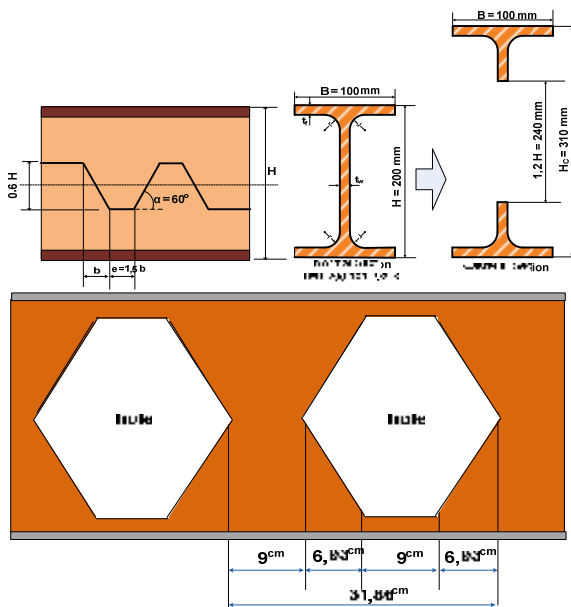


Figure-2. Pabrication process of castellan beam.

Test beam consists of a normal beam (NB) as the comparison and castella beam (CB).

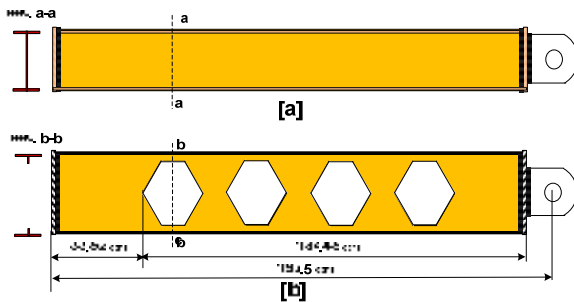
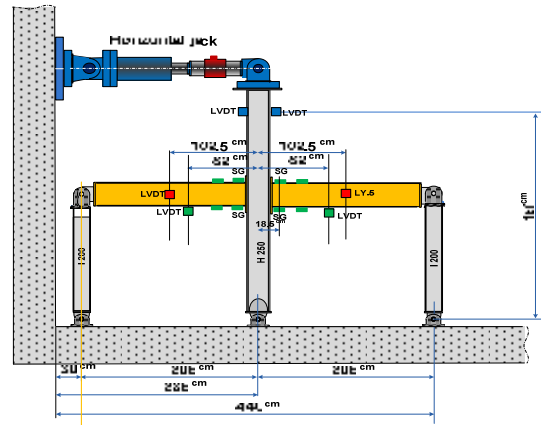


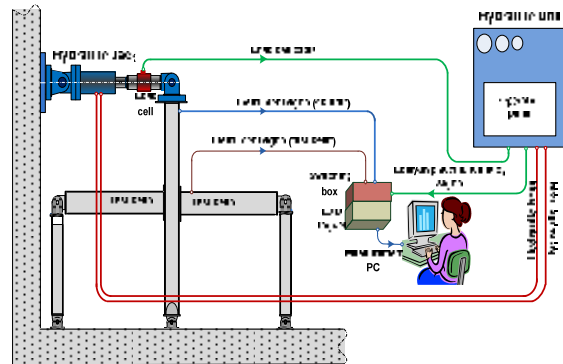
Figure-3. Beam test for the: (a) normal beam [NB], (b) castella beam [CB].

2.3. Testing frame

The testing requires testing framework. Testing framework is designed based on the principle of test as in Figure-1. Equipment and testing instruments required are: crane, strain gauge FLK 2.12, LVDT (Linear Variable Displacement Transducer) with a precision of 0.005 and 0.01, actuator (horizontal jack) with a capacity of 1200 KN, logger data and switching box. Testing framework, instrument placement and installation of the test are presented in Figure-4.



Source: Mara Junus (2016)  
 (a)



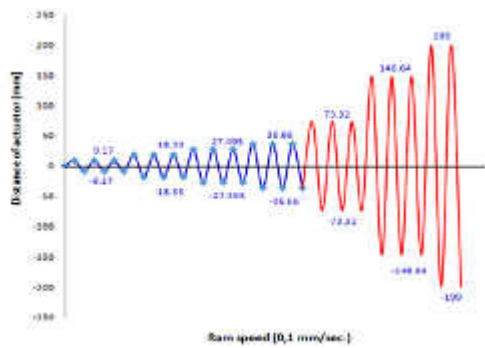
Source: Mara Junus (2016)  
 (b)

Figure-4. (a) Framework for testing and placement of testing instruments, (b) testing installation.

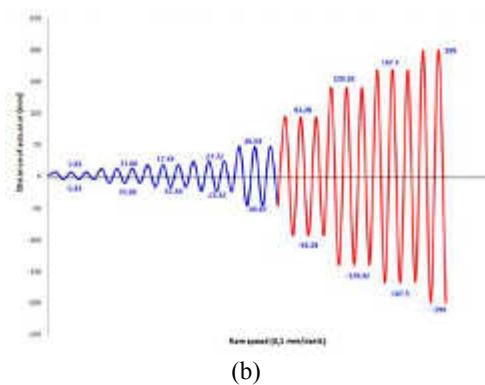
2.4. Testing implementation

The cyclic loading is given in the form of displacement-controlled at the upper end of the column. Method of loading each cycle based on the "Recommended Testing Procedure for Assessing the Behavior of Structural Elements under Cyclic Loads issued by the European Convention for Constructional steelwork (ECCS)". The testing stopped when loading cycles plans reached  $P_{failure} = 0.80 P_{max}$ . (Recommendation by ASTM international, designation: E 2126-02a year 2002). Displacement load-ram speed relationship that has been done as shown in Figure-5.





Source: Mara Junus (2016)  
 (a)



(b)

Figure-5. Displacement-ram speed relationship for the, (a) NB test beam, (b) CB test beam.

Termination of loading of each beam test after the ability of each beam decreases  $\pm 20\%$ , expressed as the limit load termination in accordance ASTM *international, designation: E 2126-02a* year 2002. On termination of loading, the final load for NB and CB respectively of 21.3 KN and 41.23 KN. Documentation pictures of the testing are presented in Figure-6.



Source : Mara Junus (2016)

(a)

(b)

Figure-6. Testing documentation for the, (a) NB test beam, (b) CCB test beam.

### 3. TEST RESULTS AND DISCUSSIONS

#### 3.1 Section properties

Table-1 shows the section modulus and inertia moment data of the NB and CB test beam. Cross section data of the CB test beam calculated on a solid cross-section close to the column as a section that receives the greatest moment.

Table-1. Section properties of the test beam.

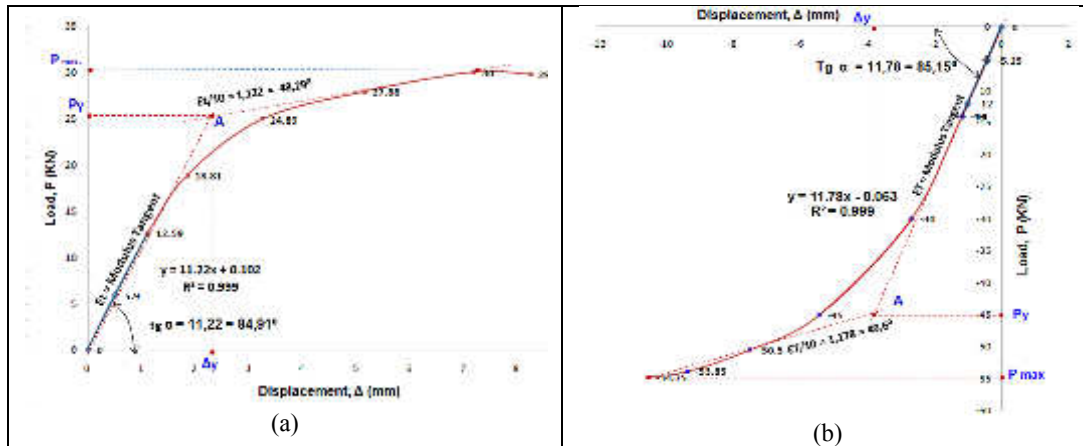
Test beam	$S_x \times 10^3 (\text{mm}^3)$	$I_x \times 10^3 (\text{mm}^4)$	Enhancement $S_x$ against NB (%)	Enhancement $I_x$ against NB (%)
NB	184	18,400		
CB	324,59	50,311,55	76,41	173,43

Based on the data above, section modulus ( $S_x$ ) and the moment of inertia ( $I_x$ ) CB beam test increased respectively 76.41% and 173.43% when compared to the NB beam. This is caused by the addition of CB test beam high of 1.6 H. The magnitude of the increase in section modulus ( $S_x$ ) will affect the increased the bending moment capability of the CB beam.

When compared to normal profile, the CB beam test similar to the IWF 250 125 5 8 with the section

modulus is 285,000  $\text{mm}^3$  and profiles weight 25.70  $\text{kg/m}'$ . When compared to the NB test beam with profile weight is 21.3  $\text{kg/m}'$ , then there is efficiency in the steel use by 20.66%

#### 3.2 The determination of the yield point and yield load



**Figure-7.** The determining of yield point, yield load and yield displacement for, (a) NB test beam, (b) CB test beam.

Determination of yield point and yield load of the beam NB and CB test beam based on Recommended Testing Procedure for Assessing the Behavior of Structural Elements under Cyclic Loads issued by the European Convention for Constructional steelwork (ECCS). The process of determining the yield point, yield load ( $P_y$ ) and the yield displacement ( $\Delta_y$ ) are presented in Figure-7.

NB test beam:

Modulus tangent (ET):  $y = 11.22x + 0.102$   
 $Tg \alpha = y' = 11.22 = 84.91^\circ$ ,  $ET/10 = 1.122 = 48.29^\circ$

CB test beam:

Modulus tangent (ET):  $y = 11.78x - 0.063$   
 $Tg \alpha = y' = 11.78 = 85.15^\circ$ ,  $ET/10 = 1.178 = 49.60^\circ$

The results of the calculation are presented in Table-2.

**Table-2.** Yield load and yield displacement of the test beam.

Test beam	$P_y$ (KN)	$\Delta_y$ (mm)
NB	25.02	2.12
CB	-46.00	-3.90

**3.3 Flexural Capacity**

Flexure capability data of the test beam are presented in Table-3.

**Table-3.** Flexural capacity of the test beam.

Test beam	$P_y$ (KN)	$P_{max.}$ (KN)	$e$ (m)	$M_y$ (KN-m)	$M_{max.}$ (KN-m)	$\epsilon = \frac{M_{max.}}{M_y}$
NB	25.02	30.00	1.65	41.283	49.500	1.199
CB	-46.00	-54.75	1.65	-75.900	-90.338	1.190

The table data above shows that the flexure capacity of the CB beam test until the yielding occurrence increased 83.85% compared to the NB beam. Resistance of the NB and CB beam test to reach maximum load after the yield condition respectively 1.199 and 1.190. This data shows the resistance of the both test beam after the yielding are almost same with a very small deviation is 0.75%. From the maximum load that can be achieved by both the beam test shows the CB test beam capacity increased 82.5% compared to the test beam NB.

The conditions above are caused by the increased section modulus ( $S_x$ ) and the inertia moment ( $I_x$ ) of the CB test beam respectively by 76.41% and 173.43% compared to beam NB.

**3.4. Ductility**

**a. Vertical displacement**

Determination Process of the ultimate displacement vertical test beam are presented in Figure-8.

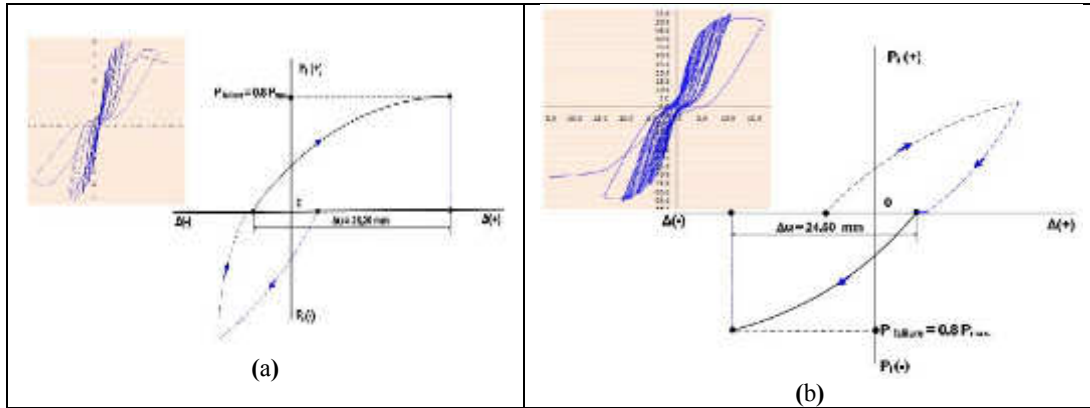


Figure-8. The determining of ultimate displacement for, (a) NB test beam, (b) CB test beam.

**b. The transverse displacement**

The transverse displacement data for the PB and CB beams test are presented in the chart of Figure-9.

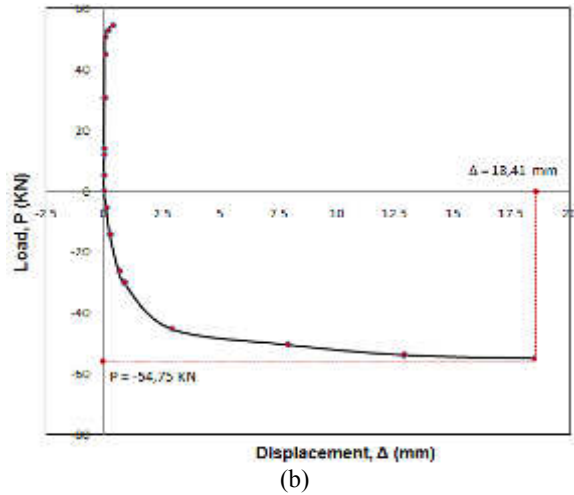
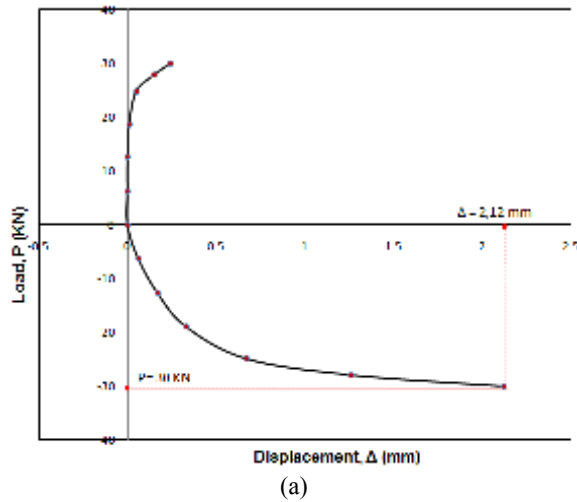


Figure-9. Transverse displacement of the, (a) NB test beam, (b) CB test beam.

The transverse displacement obtained from Figure-9 and section properties related to the transverse displacement are presented in Table-4 below.

Table-4. Section properties and transverse displacement of the test beam.

Test beam	H (mm)	B (mm)	H/B	r <sub>y</sub> (mm)	Transverse displacement (mm)
NB	200	100	2.00	22.2	2.12
CB	310	100	3.1	20.09	18.41

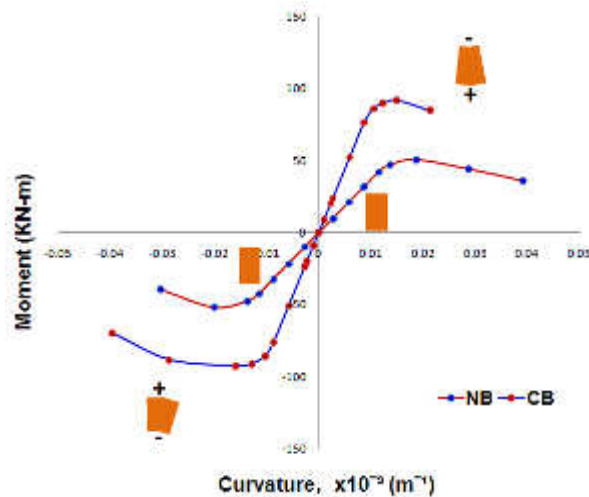
From Table-4 shows ductility ( $\mu$ ) of NB and CB test beam respectively 10.72 and 6.31. This data shows the ductility of the beam CB decreased by 46.92% against the NB beam. This is influenced by large transverse displacement of the CB beam that affect to the vertical deformation ability of the beams.

The transverse displacement of the CB beam test greater than the NB beam. This is caused by the addition of CB beam high is causing increasing slenderness (H/B)

and the declining value of the radius of inertia ( $r_y$ ) for the y-axis which is the weakest of the beam axis

**3.5. Moment-curvature relationship**

The moment(M)-curvature (M/EI) relationship of the test beams area presented in Figure-10.



**Figure-10.** Moment-curvature relationship curve of the test beam.

The curve of the figure shows several things as follows:

- NB test beam ; moment with the curvature linear relationship until the cycle IV. Starting from cycle V to ultimate load, moment-curvature relationship is not linear anymore. This is affected by the stiffness degradation ( $\xi$ ) that occur from cycle V which gradually decreases until the ultimate load.
- CB test beam : moment with the curvature linear relationship until the cycle V. Starting from cycle VI to ultimate load, moment-curvature relationship is not linear anymore. This is affected by the stiffness degradation ( $\xi$ ) that occur from cycle VI which gradually decreases until the ultimate load.

### 3.6 The resistance-ductility relationship

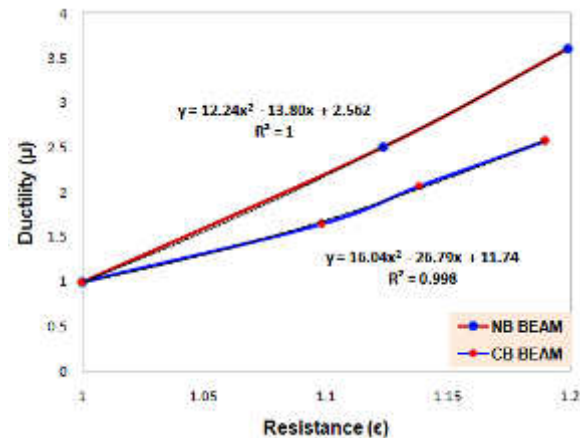
Increased loading after yield conditions will be followed by an increase of displacement and rotation. Displacement and rotation directly influence the increase in ductility and a decrease of stiffness. Resistance ( $\epsilon$ ) - ductility ( $\mu$ ) relationship of NB and CB beams test are presented in the form of curves in Figure-11.

Resistance-ductility relationship of the NB test beam expressed in the equation:  $\mu = 12.24 \epsilon^2 - 13.8 \epsilon + 2.562$ . [1]

$$1 \leq \epsilon \leq 1.199$$

Resistance-ductility relationship of the CB test beam expressed in the equation:  $\mu = 10.04 \epsilon^2 - 26.79 \epsilon + 11.74$ . [2]

$$1 \leq \epsilon \leq 1.190$$



**Figure-11.** Resistance-ductility relationship curve of the test beam.

The chart of Figure-11 and equations [1] [2] indicates that resistance is proportional to ductility. Any increase in load will be followed by an increase in ductility.

### 4. CONCLUSIONS

From the discussion above, a number of conclusions as follow:

- Fabrication normal beam (NB) into castella beam (CB) can increase the section modulus ( $S_x$ ) and moment of inertia ( $I_x$ ) respectively by 76.41 % and 173.43 %. It becomes the cause of increasing the flexure capacity of the CB beam by 82.5 % compared to NB beam.
- High-profile additions of the CB beam, causes increased in cross-section slenderness ( $H / B$ ) and lower the value of the radius of inertia ( $i_y$ ) on the y-axis. This condition causes the beam CB is not stable in the loading and reduce the ability of the beam deforms. Transverse displacement that occurred so large that affect the ductility of the beam. This is evident from the decrease in CB beam ductility by 46.92 % against the NB beam.
- Resistance is proportional to ductility, if the increased load will be followed by an increase in ductility. This is shown by the equation:  $\mu = 12.24 \epsilon^2 - 13.8 \epsilon + 2.562$  for NB beam,  $\mu = 10.04 \epsilon^2 - 26.79 \epsilon + 11.74$  for CB beam.
- Flexural capacity of castella beam is greatly increased compared with the normal beam, but need reinforcement or support at the web when it is used as a structural element for receiving seismic load



**REFERENCES**

- [1] Anonym. ASTM international designation: E 2126-02a. Standard Test Method for Cyclic (Reversed) Load Test for Shear Resistance of Walls for Building. Copyright @ ASTM International, 100 Barr Harbor Drive. PO Box C 700, West Conshohocken, PA 19428-2959, United States, 2002.
- [2] Anonym. Recommended Testing Procedure for Assessing the Behavior of Structural Steel Elements under Cyclic Loads. European Convention for Constructional Steelwork.
- [3] Anonym. Earthquake Planning Procedures for Building. SNI 03-1726-2003. Department of Public Works, Indonesia, 2003.
- [4] Chung, K.F., Liu, T.C.H. and Ko, A. C. H. 2000. Investigation on Vierendeel Mechanism in Steel Beams with Circular Web Opening. Department of Civil and Structural Engineering, the Hong Kong Polytechnic University, Hong Kong. Journal of Construction Steel Research. 57: 467-490.
- [5] Mara Junus. 2016. Castella Composite Beam Testing to be used as a Structural Element of Multistorey Buildings in Eastern Indonesian Region. ARPJN Journal of Engineering and Applied Sciences. 11(1).
- [6] Showkati H. 2002. Theoretical and numerical buckling study of CPE castellated beams. Final report of NRCI1437, Iran.
- [7] Sonck D., Vanlaere W. and Van Impe R. 2002. Buckling of Cellular Members loaded by an Axial Force. Proc. Int. Symp. of the International Association for Shell and Spatial Structures (IASS). pp. 1464-1471.
- [8] Sonck D., Vanlaere W. and Van Impe R. 2001. Influence of Plasticity on the Lateral-torsional Buckling Behaviour of Cellular Beams. Materials Research Innovations. 16 S1: 158-161.
- [9] Wakchaure M.R, Sagade A.V and Auti V.A. 2012. Parametric Study of Castellated Beam with Varying Depth of Web Opening. International Journal of Scientific and Research Publications. 2(8).
- [10] Parung *et al.* 2013. Experimental Study on Castellated Steel Beam Using Monotonic Loading, ITB Bandung, KNPTS.

**LEMBAR  
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU PEER REVIEW  
KARYA ILMIAH : JURNAL ILMIAH**

- Judul Makalah : *Flexural Capacity and Ductility of Castella Beam Due to Cyclic Load.*
- Penulis Makalah : Junus Mara
- Identitas Jurnal Ilmiah : a. Nama Jurnal : *ARNP Journal of Engineering and Applied Sciences (JEAS)*  
 b. Nomor/Volume : Vol.11. No.11. ISSN: 1819-6608  
 c. Edisi (bulan/tahun) : Juni 2016  
 d. Penerbit : *Asian Research Publishing Network (ARNP). All rights reserved.*  
 e. Jumlah halaman : 7 halaman
- Kategori Publikasi Jurnal Ilmiah (beri ✓ pada kategori yang tepat) :  Jurnal Ilmiah Internasional  
 Jurnal Ilmiah Nasional Terakreditasi  
 Jurnal Ilmiah Nasional Tidak Terakreditasi

Hasil Penilaian *Peer Review* :

Komponen Yang Dinilai	Nilai Maksimal Jurnal		Nilai Akhir Yang Diperoleh
	Internasional <input checked="" type="checkbox"/>	Nasional <input type="checkbox"/>	
a. Kelengkapan unsur isi buku (10%)	4,0		4,0
b. Ruang lingkup dan kedalaman pembahasan (30%)	12,0		12,0
c. Kecukupan dan kemutakhiran data/informasi dan metodologi (30%)	12,0		12,0
d. Kelengkapan unsur dan kualitas penerbit (30%)	12,0		12,0
<b>Total = (100%)</b>			<b>40,0</b>

Makassar , 15 Agustus 2016

Reviewer 1



**Prof. Dr. Ir. T. Harlim**

Unit kerja : Fakultas Teknik UKI Paulus

**LEMBAR  
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU PEER REVIEW  
KARYA ILMIAH : JURNAL ILMIAH**

Judul Makalah : *Flexural Capacity and Ductility of Castella Beam Due to Cyclic Load.*

Penulis Makalah : Junus Mara

Identitas Jurnal Ilmiah : a. Nama Jurnal : *ARPN Journal of Engineering and Applied Sciences (JEAS)*  
 b. Nomor/Volume : Vol.11, No.11, ISSN: 1819-6608  
 c. Edisi (bulan/tahun) : Juni 2016  
 d. Penerbit : *Asian Research Publishing Network (ARPN). All rights reserved.*  
 e. Jumlah halaman : 7 halaman

Kategori Publikasi Jurnal Ilmiah (beri ✓ pada kategori yang tepat) :  Jurnal Ilmiah Internasional  
 Jurnal Ilmiah Nasional Terakreditasi  
 Jurnal Ilmiah Nasional Tidak Terakreditasi

Hasil Penilaian *Peer Review* :

Komponen Yang Dinilai	Nilai Maksimal Jurnal		Nilai Akhir Yang Diperoleh
	Internasional <input checked="" type="checkbox"/>	Nasional <input type="checkbox"/>	
a. Kelengkapan unsur isi buku (10%)	4,0		4,0
b. Ruang lingkup dan kedalaman pembahasan (30%)	12,0		12,0
c. Kecukupan dan kemutakhiran data/informasi dan metodologi (30%)	12,0		12,0
d. Kelengkapan unsur dan kualitas penerbit (30%)	12,0		12,0
<b>Total = (100%)</b>			<b>40,0</b>

Makassar, 9 Agustus 2016

Reviewer 2

**Prof. Dr. Ir. Mary Selintung, M.Sc**

Unit kerja : Fakultas Teknik UKI Paulus