Comparative Study of Behaviour of Reinforced Concrete Beam-column Joints with Reference to Monolithic and Non-monolithic Connection

Presented by : NINIK CATUR E.Y
University of Merdeka Malang

TABLE CONTENT

INTRODUCTION

method of implementation of RC constr has progressed very rapidly ➔ to speed up time and reduce costs.

based on the principle of slipforming method, semi-precast method is used in beam column connection

One of them is the precast method, but less popular to used for simple storey buildings.

the connection becomes non-monolithic➔ reduced stiffness ➔decreased strength and performance of RC.

RESEARCH PURPOSE :

to improve the performance and strength of the non-monolithic joint due to separate casting.

SUPPORTING RESEARCH

Zayed et al; Khalek et al, productivity of slipforming method up to 99%

Breccoletti et al; precast behave as expected both in terms of strength and ductility

Ghayeb et al ; decrease of strength in non monolith connection should not exceed 20%

Pauletta et al; In precast, horizontal shear reinf. more effective than vertical reinf.

Material and Experimental Program

Table. 1. Description of beam-column connection specimens.

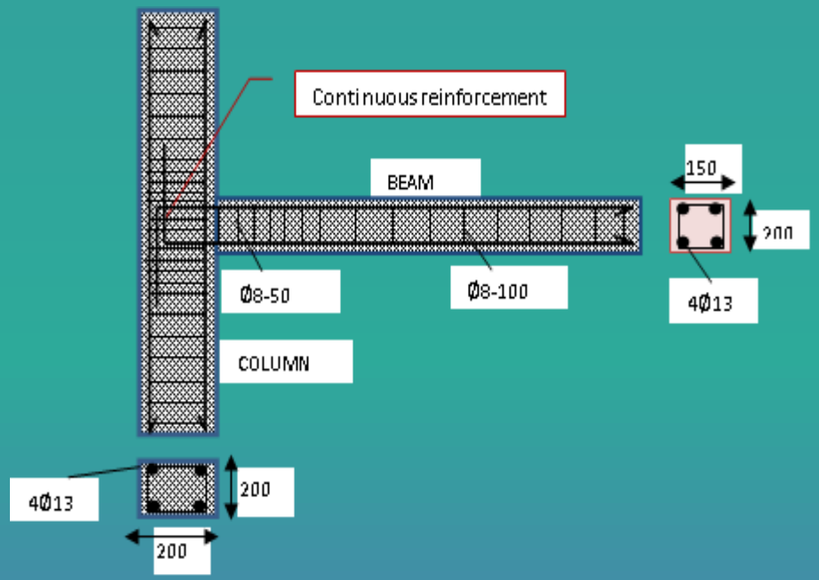
Description	Beam	Column
Dimensions (mm)	150 x 200 x 1000	200 x 200 x 750
f'c (MPa)	21	21
Longitudinal reinforcement	4 Ø 13	4 Ø 13
Stirrup	Ø 8 – 100	Ø 10 - 100
	Ø 8 – 50	Ø 10 - 50

Test Set up :

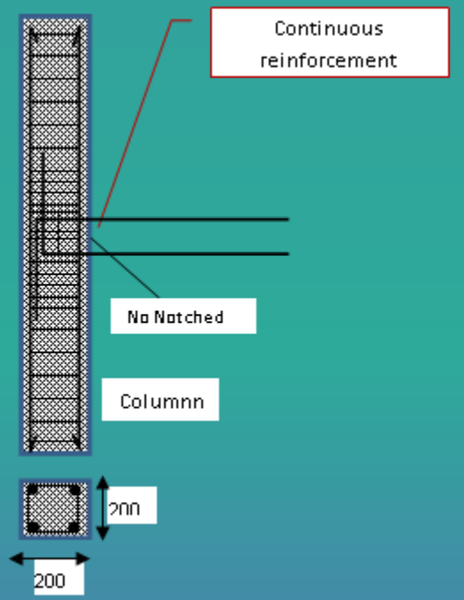
- The test specimen is based on design criteria according to SNI 2847-2013 [9] and ACI 318-14
- Each specimen was tested by providing a static load with a 50 kg load interval until it reached collapse.
- The deflection occurring on the beam is measured by installing LVDT at a distance of 200 mm and 1000 mm.
- Strain due to the bending stress and shear stresses that occur in the concrete is measured by installing a dial gauge.
- Strain occurring on longitudinal reinforcement and stirrups is measured by installing a steel strain gauge on longitudinal reinforcement and stirrups.

Material and Experimental Program

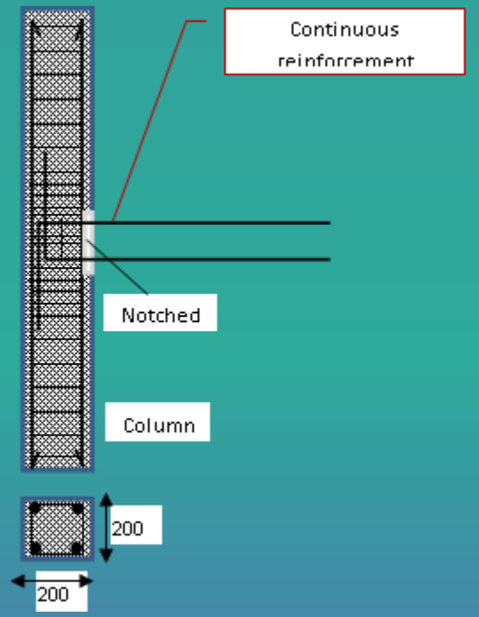
Reinforcement of specimens



Reinforcement of monolithic specimen



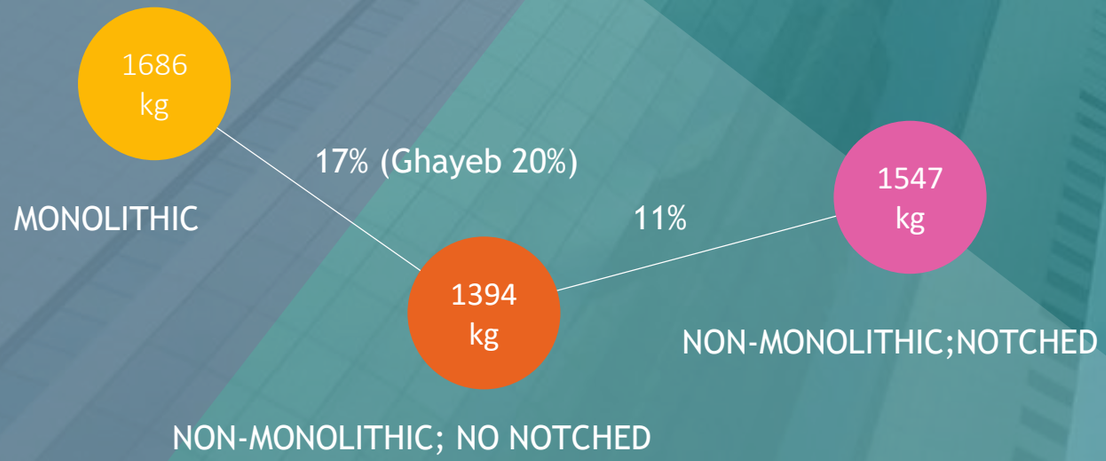
Reinforcement of Non-monolithic specimen without notched



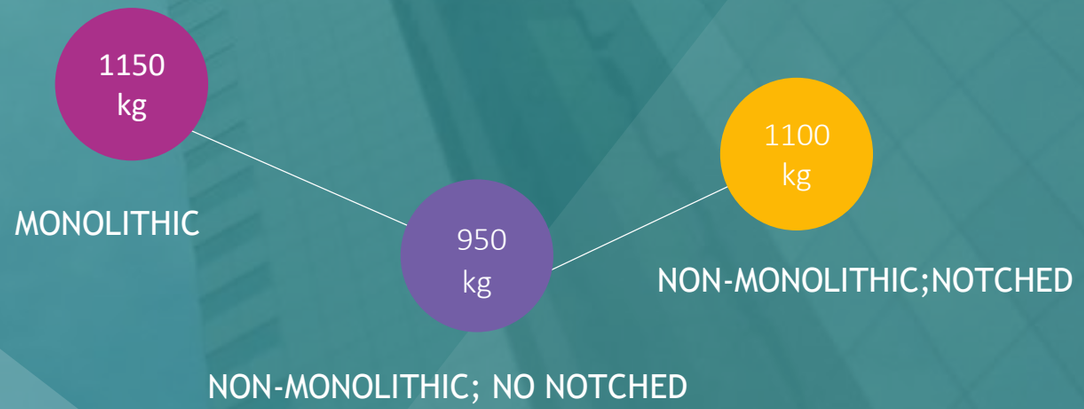
Reinforcement of Non-monolithic specimen with notched

LOAD CAPACITY

- non-monolithic beam-column joint connection without notched, the maximum acceptable load capacity decreased compared to the monolithic (17%)
- given a notch that can serve as an additional shear field can increase the load capacity of the acceptable up to 11%



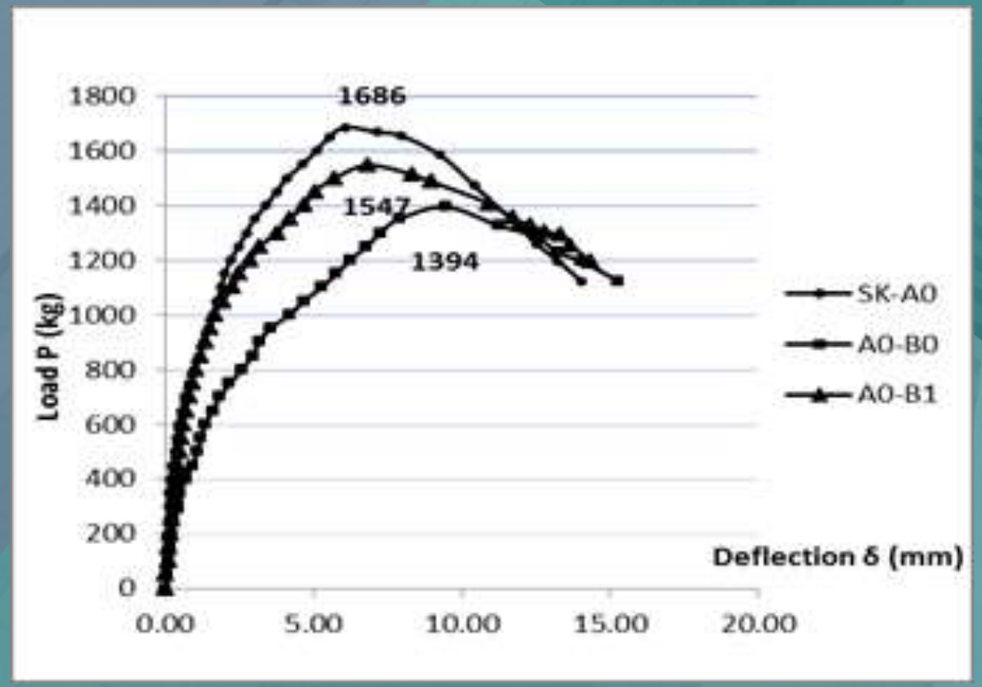
MAX LOAD CAPACITY



LOAD AT FIRST CRACK

LOAD-DEFLECTION ; DUCTILITY

- deflection that occurs in non-monolithic connection without notches has a considerable increase compared to the monolithic connection.
- This indicates that monolithic connections are more rigid than non-monolithic connections.
- The presence of notch given to the non-monolithic connection has an effect on the increase in the visible connection stiffness of the deflection



LOAD AND DEFLECTION

DUCTILITY

CRACK PATERN

MONOLITHIC

the crack propagation occurs slowly until the peak load and collapse occur

Crack propagation on the beam stops when cracking occurs at the interface of the beam and the column causing the opening

The collapse occurs when the crack is very large and towards the column area and there is considerable damage to the beam compression area

VS

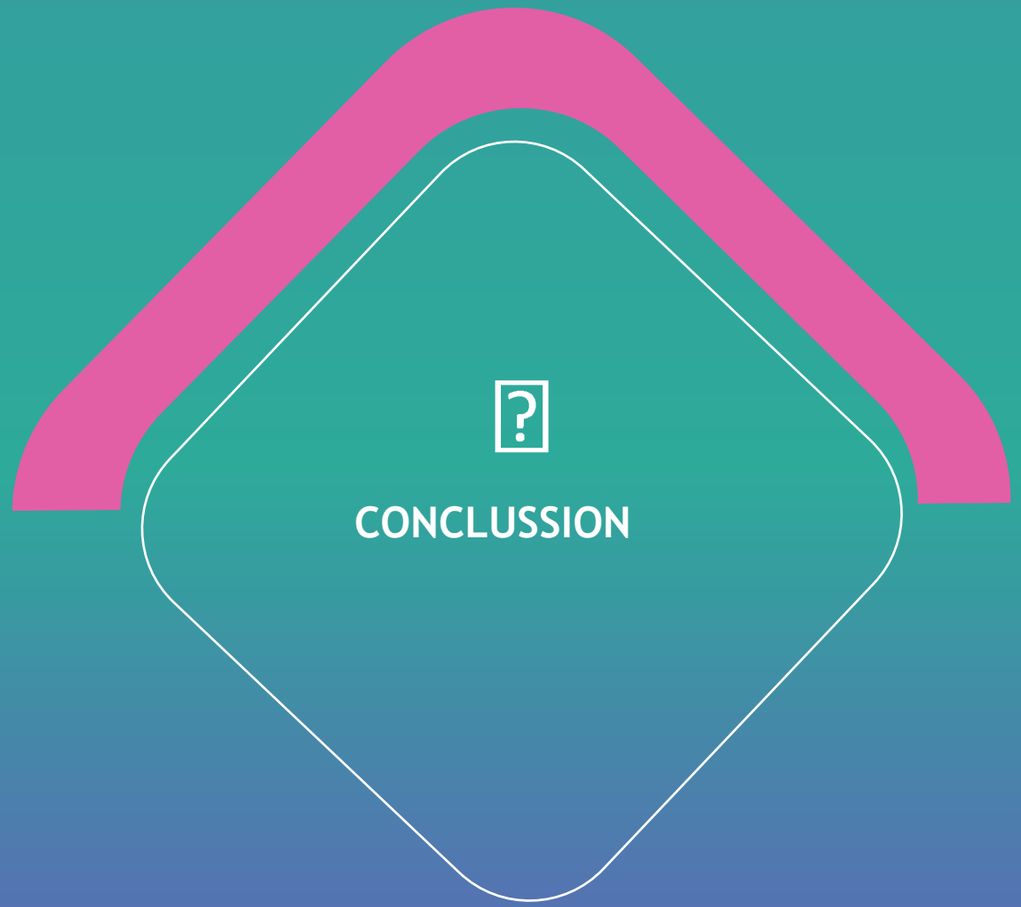
NON MONOLITHIC

Without Notced

quickly propagation of crack, stops when cracking occurs at the interface of the beam and the column causing the opening, no damage on the compression area,

With Notced

As same as monolithic connection



- connection of beams and columns in simple-storey building structures can be done by casting in a separate place
- The decrease in the performance of the non-monolith beam-column joint can be improved by providing a notch in the column.
- This notch has a function as an addition to the shear area that can improve the performance of the joint , ie increased load capacity, stiffness, and structural ductility compared with non-monolithic joint without notch
- strength and performance of structural non-monolithic connections with notch are as good as those of monolithic beam-column joints.

THANK YOU

ninikcatur@gmail.com
08123355145