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FACULTY OF ENGINEERING
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THE EFFECT OF TRSNSVERSE CONFINMENT ON THE BEHAVIOR OF CIRCULAR COLUMNS UNDER CYCLIC LOADS

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B.Sc. Civil Engineering
Zagazig University, 1992

A Thesis
Submitted in Partial Fulfillment for the Requirements of the Degree of Master of Science in Structural Engineering

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Statement

This thesis is submitted to Ain Shams University for the degree of Master of Science in Structural Engineering.

No part of this thesis has been previously submitted for obtaining a degree or a qualification before.

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أسم الكليــــة : كلية الهندسـة بشبرا
الجامعــــــة : الزقازيق- فـــرع بنهــا
سنة التخـــرج: ١٩٩٢
ســـة المنــح: ٢٠١٠

ABSTRACT

Circular columns have been widely used in various types of reinforced concrete structures such as bridges piers. The normal compression capacity of the reinforced concrete circular column depends on the confinement shape. The main purpose of this study is to investigate the influence of the lateral confinement type on the behavior and capacity of the circular columns subjected to lateral cyclic loads. The concrete strength and main reinforcement ratio are additional factors were taken into consideration. Six small scaled columns divided into two categories according to the stirrups type were chosen to represent the effect of the mentioned factors. For category one, the circular hoops were used and spiral reinforcement was used in the second category. The tested specimens were subjected to top displacement saw-tooth acting lateral force.

The study has reached to some major conclusions such as:-

1- The main failure mode was similar in all specimens.

2-Using spiral stirrups with the same volumetric ratio increase the failure strength of the columns by about 15% and the cycles required for failure is increased accordingly.

3- The circular reinforced concrete columns casted with high strength concrete (60Mpa) has an increased failure strength value (about 50%) compared with the same columns casted with normal concrete strength (25Mpa).

4- Increasing the ratio of the main reinforcement improve the ductility in addition to the failure strength of columns to resist cyclic loads.

5- Using spirall stirrups eliminate the tendency of the local buckling of main rebars which decrease the strains on these rebars and delay the time required for the concrete cover spalling.

6-Strength losses in reinforced concrete columns casted by using normal concrete strength is much more these ones casted by using high strength concrete,

Finally, the study has highlighted that, The circular column laterally confined with spirally circular stirrups, casted with high concrete strength and longitudinally reinforced by about 2.5% has a much more improved behavior than that for the column with the circular hoops; this behavior appeared in the capacity of columns and the strength losses, the maximum drift ratio, the energy dissipation and stiffness degradation.

ACKNOWLEDGEMENTS

All praise belongs to God, Most Gracious, and Most Merciful. Only Through His Grace and Guidance, This Work was Completed.

I wish to express my deepest appreciation to Dr. Osama Hamdy Abd El-Wahed for enlightening, direction and supporting me at all times.

All appreciation and gratefulness to Dr. Ayman H.H.Khalil who provided, support, enlightening, direction, and supervision without which this work would have not been present as such.

I wish to express my gratitude to Dr. Haddad Sayied Haddad . I can not find the suitable words to express my respect, I thank him for his guidance and support, providing me all information I need, enlightening me to finish this research.

I am deeply indebted to my Family, Friends and Work's Mates for their help patience and support at all times.

بسم الله الرحمن الرحيم

رَبَّنَا لاَ تُزِغْ قُلُوبَنَا بَعْدَ إِذْ هَدَيْتَنَا وَهَبْ لَنَا مِن لَّدُنكَ رَحْمَةً إِنَّكَ أَنتَ الْوَهَّابُ

صدق الله العظيم

detecated

To my father's and mother's souls……..;

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