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Autor: Men, Kai / Qiu, Maode
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Ductility Design of Earthquake Resistant High-Rise RC Building

Kai MEN

Prof.

Qingdao Inst. of Arch. Eng.
Qingdao, China

Maode QIU

Senior Eng.

Huiyang Building Design Inst.
Huiyang, China

Kai Men, born 1931, received his civil engineering degree from W-N-Indru. Inst. in 1955 and professor Qingdao Inst. of Arch. Eng.

Maode Qiu, born 1944 received his civil engineering degree from S-C. Univ. of Tech in 1968 and president, general Engineer of Huiyang Building Design Inst.

Summary

In the Large city that high-rise building are concentrated in China , the seismic intensety is height , the wind load is larger , the engineering geology is led , and building plan and elevation size and form is complex , high -width ratio larger , structural period long , some building is more towery , these privet more new and more high demand for resistance earthquake design .Regulated in national standard « The Resistance Earthquake Design Code of Building » in China , standard for Resistance earthquake hagard protection is “not damaged in minor seismic , repairable in mdium seismic and no collapses in major seismic”. How to ensure these demand ? code main adopt approximated and Practical method that regulated internal force of memler section.Based on summing-up the research results of resistance earthquake ductility design of high-rise RC building sturcture , this paper discusses ductility demand of resistance earthguake of high-rise RC building structure and regulated principle and method of interal force of memher section .

1.Ductility demand for resistance earthquake of high-rise RC building sturcture

Resistance earthquake design of high-rise RC building sturcture should ensure whole property resistance earthquake of sturcture,take in learing capaity ,rigity and ductility of sturcture each other coordinate, so that the focal point of resistance earthquake design of high-rise RC building sturcture is ductility design. Ductility demand of resistance earthquake of high-rise RC building structure is :

- Strong column and soft beam of RC frame
- Moment regulate in beam end of RC frame
- Shear-pressure ratio in beam of RC frame
- Stromg shear and soft curve in column of RC frame
- Strong connect and soft member of RC frame point
- Rigity discount of connecting beam of shear wall
- Shear-pressure ratio of shear wall
- Shear pressure ratio of connecting beam of shear wall
- Shear-pressure ratio in column of RC frame
- Shear-pressure ratio in point of RC frame
- Axial pressure ratio in column of RC frame
- Axial-pressure ratio of shear wall



- Strong shear and soft curve of connecting beam of shear wall
- Strong shear and soft curve of under strong area of shear wall
- Axial force increase for frame supported column
- Moment increase for column base in base story of column

2. Principle and method of regulation internal force of member section

For example strong column and soft beam of RC frame structure should be had follow requirement:

$$\Sigma M_u \geq \eta_s \Sigma M_b \quad (1)$$

Code comprehensive considered resistance earthquake safety, economic and design work possibility of structure, based on theory, test study and engineering design and economic etc condition, considered bearing capacity resistance earthquake regulate coefficient, difference not alike resistance earthquake degree of RC structure, adopt comprehensive method, for class 3 or class 4 of structure, not regulated internal force of member section, only adopt structural measure to ensure ductility of structure, for class 1 or class 2 of structure, adopt in regulated internal force of member section, code used method:

$$\Sigma M_c = 1.1 \Sigma M_{bu} \quad (2)$$

$$\Sigma M_c = 1.1 \lambda_j \Sigma M_b \quad (3)$$

$$\Sigma M_c = \eta_m \Sigma M_b \quad (4)$$

In equation, λ_j — Practical setting coefficient for class 2 of RC frame $\lambda_j=1.0$, for class 1 of RC frame, may be adopt 1.1 time of ratio of practical tension reinforcement total area and area of calculating reinforcement Increase coefficient of moment of column end $\eta_m=1.1\lambda_j$ or adopt 1.35 ~ 1.5 internal with building height.

For example resistance earthquake class 1 of RC frame, λ_j calculate following:

$$\lambda_j 1 = 1.1 \frac{1964 + 1520}{1632.2 + 1411.7} = 1.26 \text{ (clockwise)}$$

$$\lambda_j 2 = 1.1 \frac{1964 + 1520}{1691.9 + 891.4} = 1.48 \text{ (clockcounter)}$$

Point of RC frame and section of beam and column see Fig.1.

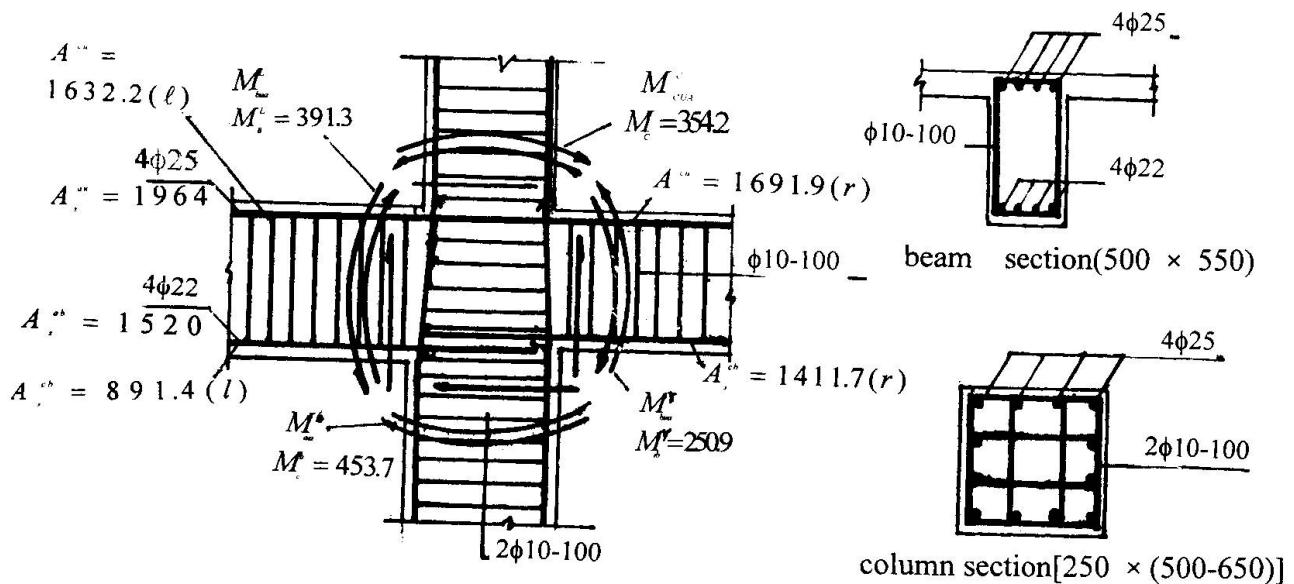


Fig.1. Point of RC frame