

# Ductility design of earthquake resistant high-rise RC building

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## Ductility Design of Earthquake Resistant High-Rise RC Building

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### Summary

In the Large city that high-rise building are concentrated in China , the seismic intensity 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 hagarad protection is “not damaged in minor seismic , repairable in mdium seismic and no collapes 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 earthquake 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 capacity ,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:

$$\sum M_{ca} \geq \eta_r \sum M_{ba} \tag{1}$$

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 learning 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 :

$$\sum Mc = 1.1 \sum M_{ba} \tag{2}$$

$$\sum Mc = 1.1 \lambda_j \sum M_b \tag{3}$$

$$\sum Mc = \eta_m \sum M_b \tag{4}$$

In equation,  $\lambda_j$  — 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,  $\lambda_j$  calculate following:

$$\lambda_{j1} = 1.1 \frac{1964 + 1520}{1632.2 + 1411.7} = 1.26(\text{clockwise})$$

$$\lambda_{j2} = 1.1 \frac{1964 + 1520}{1691.9 + 891.4} = 1.48(\text{clockcounter})$$

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

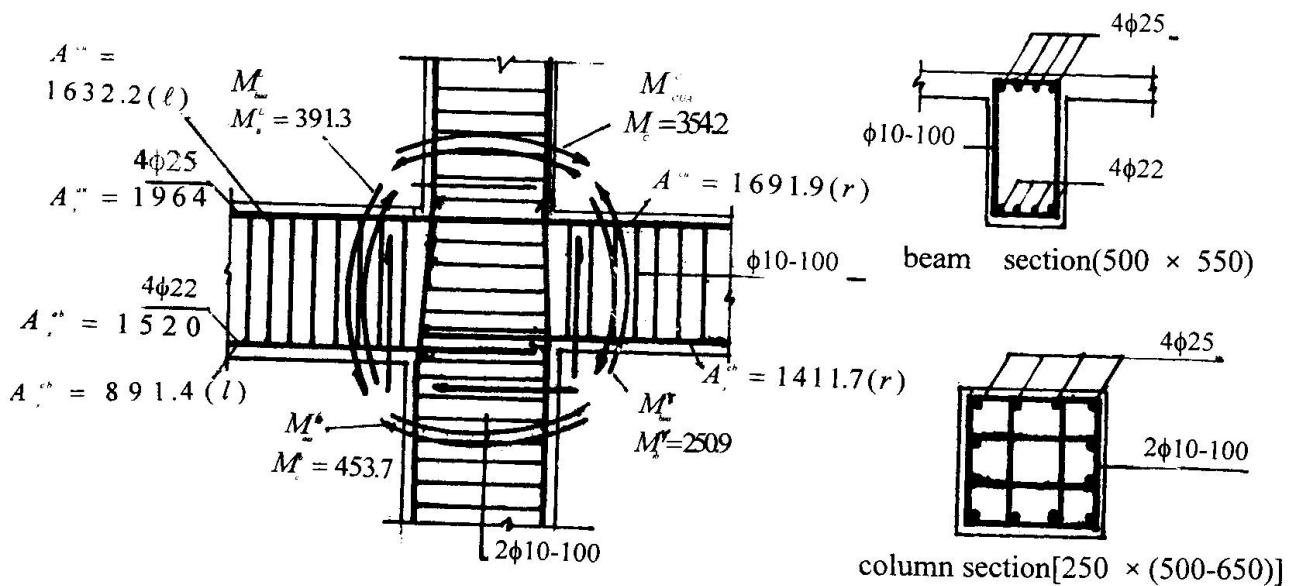


Fig1. Point of RC frame