Comparisons Between Eurocode and Bs8110 on Reinforced Concrete Flexural and Shear Member Design

Prepared by: Puah Edence

ABSTRACT

This project compares reinforce concrete flexural and shear member design for BS 8110 and EC2 based on 12 different cases generated by Microsoft Excel's spread sheets. It aims to discover the similarity and differences of these 2 codes, investigate which code brings more benefits in designing, and to familiarize engineers with EC2.

Only main reinforcement and vertical shear link of continuous beams and slabs will be designed at ultimate limit state, without considering lateral and notional load, axial load, torsional moment, earthquake, no pre-stressed concrete is used, column is not analysed, and steel Grade 460 will be used for BS and EC.

The 12 cases vary from each other by span lengths and imposed load or variable actions. Generally, the imposed load stays within the range of 2.5 to 7.5kN/m^2, while the span length of beams varies from 8 to 9 metres.

After obtaining the design results of 12 cases, Tables and graphs are produced to compares the results of BS 8110 and EC2. The value of moment and shear are always lower for EC2 due to the partial safety factors which are lower than the one used by BS 8110. Material safety factor for EC2 is lower as well.

For flexural design, the required steel ratio of EC2 is slightly higher than that required by BS 8110. After some studies, it was discovered that Grade 500 steel should be used for EC2, only then the steel ratio for both codes will be even more similar, with the steel ratio of EC2 being slightly lower than BS 8110. This agrees with the studies from literature review whereby design based on EC2 are supposed to be more economical. Steel ratio for both codes increased as the span length of beams or slabs increased.

For the design of shear, BS 8110 takes into account the concrete shear resistance but EC2 doesn't, and the strut angle of EC2 is 22° which is lower than BS 8110 strut angle of 45°. Table below shows the formula for shear design for EC2 and BS 8110.

	EC2	BS 8110
A_{sv}/s_v	$\frac{V}{0.78 f_y d \cot 22°}$	$\frac{V - V_c}{0.95 f_y d \cot 45°}$

Table: Shear design formula for BS 8110 and EC2.

After some studies, it was realized that when the design shear force of BS 8110 is lesser than EC2 for more than 50%, EC2 will be more conservative in providing As_v/s_v. When further study is carried out by adopting steel Grade 500 for EC2, the percentage difference before EC2 becomes more conservative increase to 52.5%. Which means BS 8110 will required a higher concrete shear resistance to stay being less conservative.

Cases whereby the shear force is lower than the concrete shear resistance, BS 8110 will provide a minimum links and assume a shear stress of 0.4MPa, here BS 8110 will shows a more conservative As_v/s_v ratio than EC2.

When comparing the relationship between shear force and As_v/s_v ratio for BS 8110 and EC2, the graph of EC2 is less steep, which indicates the shear link of EC2 increase lesser than BS 8110's when the shear increase.

Conclusion, the flexural and shear design results of EC2 is more economical than BS 8110.