CHAPTER II

LITERATURE REVIEW

2.1 Concrete Encased Steel Composite Column

Steel encased composite column is a hot rolled steel section that cover or encased with concrete. Encased composite column section has high bearing resistance, high fire resistance and economical solution with regard to material cost. Encased composite column is better than shear wall in hazards seismic zone and it reduces the construction cost and save time. It proves to be more economical where area is restricted, and load is heavy because section size is reduced. The concrete filled steel tubular have many advantages than conventional reinforced column which make them better in strength and economical term. In concrete encased composite column the steel ratio is higher, it will provide more ductility to the structure, according to (Yuvaraj & Jamal, 2018).

Soliman K. Z. et al. (2012) in their research about review design of concrete encased short columns under axial compression stated that encased composite column offer high strength and ductility, fire protection for the steel section and simplified beam to column joint connection.

Table 2.1 Experiment results of the tested columns. (Soliman, Arafa, & Elrakib, 2013)

Column No.	P_u (KN)
C1	815
C2	1080
C3	794
C4	1050
C5	726
C6	895
C7	1273
C8	910
C9	1170
C10	854

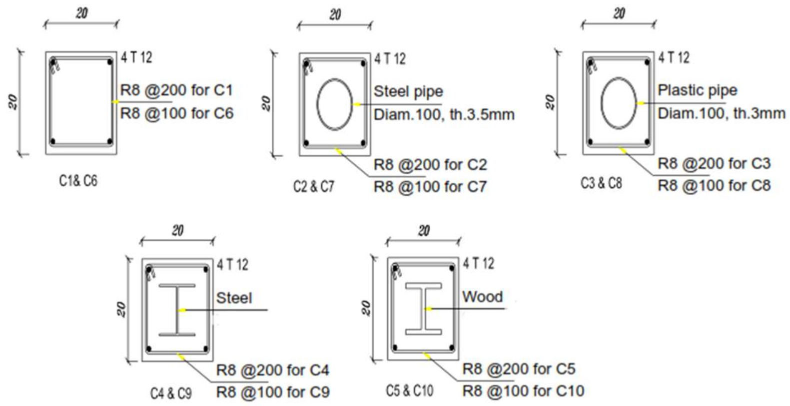

Figure 2.1 Concrete encased composite column cross section (Soliman et al., 2013)

Figure 2.2. Specimen C4 failure in experiment.

C1 and C6 is normal reinforce concrete, C2 and C7 is concrete encased steel tubular, C3 and C8 is concrete encased plastic tubular, C4 and C9 is concrete encased I-section steel, and C5 and C10 is concrete encased I-section wood. This final project is using the C4 column from (Soliman et al., 2013) because from the previous experiment C4 is concrete encased I-section steel composite column.

2.2 Design Codes

Different methods for the design of composite column exist in code of practice. Based on the experiment abut review of design codes of concrete encased steel short column under axial compression that conducted by K. Z. Soliman et al. (2012), where they used five different design codes to predict the axial compression capacity of the composite column, the ECP 203-2007, ECP-Sc-LRFD-2012, ACI-318-08, AISC-LRFD-2010 and BS 5400-Part 5, they reported that ACI-318 gives the closest prediction with an average of 4% lower than the test result and ECP-SC-LRFD-2012 gives the most conservative result with an average of 29% lower than the test result.

Table 2.2 Comparison between calculated axial capacities of the tested columns and the experimental result (P_u/P_{calc}). (Soliman et al., 2013)

Column No.	ECP203-2007	ECP-SC-LRFD-2012	ACI-318	AISC-LRFD-2010	BS-5400-5
C1	0.937	-	1.076	1.057	1.105
C2	0.894	1.25	0.975	1.016	0.997
C3	0.943	-	1.072	1.054	1.111
C4	0.957	1.33	1.055	1.131	1.083
C5	0.878	-	0.998	0.981	1.033
C6	1.032	-	1.186	1.165	1.218
C7	1.054	1.47	1.149	1.197	1.176
C8	1.08	-	1.229	1.208	1.273
C9	1.067	1.49	1.176	1.26	1.207
C10	1.032	-	1.174	1.153	1.215

(Ellobody & Young, 2011) conducted a research about numerical simulation of concrete encased steel column composite column, where they use Eurocode 4 (EC4) and AISC 360-10, they reported that in general EC4 give more accurate prediction. EC4 accurately predicted the design strength of the concrete composite column within its limit of structural steel yield stress of 275 and 460 MPa.