LINEAR EVALUATION OF IMPROVING PERFORMANCE LEVEL OF EBF STEEL STRUCTURES USING IMPORTANCE FACTOR

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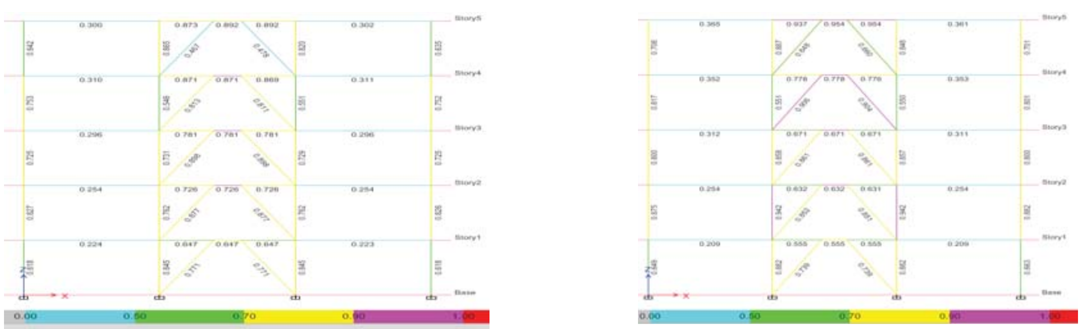
The past earthquakes have shown the vulnerability of many of the existing buildings in Iran and other countries of the world, and sometimes even caused a general deterioration of the cities. These events clearly show the importance of observing the special seismic rules in designing new buildings, as well as assessing seismic vulnerability and improving existing buildings. For this reason, pre-standards and guidelines for seismic evaluation of existing buildings in different countries have been prepared and are currently being used (Mohajer & Shafaei, 2016). In This paper, the performance of two types (five story) of steel structures with divergent bracing system in both direction x and y have been evaluated by the fourth edition of the Iranian Seismic Design Code (Standard 2800, 1393) and the Instruction for Seismic Rehabilitation of Existing Buildings (code 360, 1392). Also, the seismic performance of the structure in the field of linear behavior is investigated. For this purpose, the building was originally constructed according to Iran's earthquake regulations (Standard 2800) with moderate and very important coefficients, in the high seismic zone, type 3 soil and the coefficient of behavior equal to R = 7 with the composition of load in the sixth chapter of the national regulations of Iran designed (BHRC, 2014; MHUD, 2013). Also for analyzing and designing this model, ETABS software has been used, according to Figure 1 the demand capacity ratio of the elements is obtained. Then, according to the seismic correction instruction, under optimal and special improvement, is evaluated by linear static methods (Management and Planning Organization, 2013). Also, the effective seismic components in this building are calculated and compared with the values set forth in Standard 2800.



a) Frame 1 with intermediate importance factor *b) Frame 1 with very intermediate importance facto*

Figure 1. Demand capacity ratio.

According to Seismic Rehabilitation Instruction in this project (steel structure with divergent bracing system) member of displacement-control include link beams and member of fore-control include other beams and columns and braces. According to Seismic Rehabilitation Instruction value of M in link beams for Immediate Occupancy (IO) performance is 1.5 and for life safety performance is 9. The results of the displacement-control's members in the buildings under study are in Table 1. According to the results of this research, the performance of the designed components satisfy life-safety performance with intermediate importance factor but will not be satisfied immediately occupancy (IO) performance. Besides, the results of Mahmudi-Sahebi and Ghobadi's research in 2011 indicate that buildings do not meet the 2800 standard objectives for uninterrupted operation against severe earthquakes. In general, it can be said that very important buildings, which are designed according to the Standard 2800, are vulnerable according to Seismic Rehabilitation Instruction and need to be retrofitted to achieve the goals (Sahebi Mahmoudi & Ghobadi, 2011).

Table 1. Evaluation of the link beam by linear static method.

The evaluation of the link beam at the LS performance								
Story	**Design Type**	**Design Section**	**PMM Combo**	**PMM Ratio**	**V Major Combo**	**V Major Ratio**	**M(LS)**	**CHECK**
Story 5 Beam		IPE240	QUD(T)	6.442	QUD	5.29	9	OK
Story 4	Beam	IPE330	QUD-1(T)	6.101	QUD-1	6.598	9	OK
Story 3	Beam	IPE400	QUD(T)	5.427	QUD	6.84	9	OK
Story 2	Beam	IPE450	QUD-1(T)	5.025	QUD-1	6.701	9	OK
Story 1	Beam	IPE450	QUD(T)	4.382	QUD	5.84	9	OK
The evaluation of the link beam at the IO performance								
Story	**Design Type**	**Design Section**	**PMM Combo**	**PMM Ratio**	**V Major Combo**	**V Major Ratio**	**M(IO)**	**CHECK**
Story 5	Beam	IPE270	QUD(T)	4.939	QUD	4.464	1.5	NOT OK
Story 4	Beam	IPE400	QUD-1(T)	3.936	QUD-1	4.971	1.5	NOT OK
Story 3	Beam	IPE500	QUD-1(T)	3.325	QUD	4.723	1.5	NOT OK
Story 2	Beam	IPE550	QUD-1(T)	3.121	QUD-1	4.699	1.5	NOT OK
Story 1	Beam	IPE550	QUD-1(T)	2.76	QUD	4.164	1.5	NOT OK

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