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Rehabilitation of Load Bearing Structures without Dismantle by providing New R.C.C. Basement

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Abstract: Civil engineering is one of the oldest industries that provide basic infrastructure for all human beings. Structures can be any kind, it can be a historical, heritage structure, residential building, commercial construction or industrial building. Each structure has its lifetime, and within that lifetime it must firmly stand on its position. Aix-Taj Mahal in Agra in India, which is one of the oldest structures and wonders of the world, and still stand in its position very effectively. But this is not a condition for today's structures. The collapsed mechanism has increased, and modern structures are becoming collapsed until the service life ends. Therefore, it is advisable to monitor it periodically, taking a professional opinion. This is usually initiated as a first step to repair. In the present work the load bearing structure is constructed with the basement without dismantling it. The strip foundation with 1m strip is provided for the construction.
Keywords: Rehabilitation, RCC, foundation & dismantle

I. INTRODUCTION

The need to improve the ability of an existing building to withstand seismic forces arises usually from evidence of damage and bad behavior during the recent earthquake. It can also occur with calculations or comparisons with similar buildings that have been damaged elsewhere. While in the first case the owner can be fairly easily convinced to take measures to improve the strength of his building, in the second case residents who have much stricter day-to-day needs tend to want to invest money in improving seismic security. Briefly outlines the problems of repair, restoration and seismic strengthening of buildings:

1) Before the occurrence of the probable earthquake, the necessary strengthening of the seismically weak buildings is determined by the research and analysis of structures.
2) Immediately after earthquake damage, temporary support and emergency repairs have to be carried out so that the dangerously standing buildings may not fall during aftershocks and less damaged ones can be quickly brought back to use.
3) The real repair and strengthening problems are faced on stage after the earthquake, when things begin to calm down. At this point the distinction has to be done in the type of action required, that is, repair, recovery and hardening, since the cost, time and skill required in the three may be completely different.

The decision whether the construction should be strengthened and to what extent, should be based on the calculations that show if the security levels demanded of the current codes and recommendations. Difficulties in establishing actual strength arise from significant uncertainties associated with material properties and with the amount of strength deterioration due to age or damage affected by previous earthquakes.

II. REVIEW OF LITERATURE

According to the analysis of the revolving structure, it can be concluded that the method, which followed the rehabilitation of a typical brick historical building, was effective. The type and degree of repairs and interventions seems to lead to the safe behaviour of renewable structures to future seismic activities, without changing the architectural aspect of the historical building. While substantial efforts have been made in recent decades, in order to improve knowledge in this particular area of structural engineering, more experimental research is still needed in order to obtain the data for a robust assessment of the seismic resistance of historical buildings, either existing or strengthened (p. G. Asters et al. 2005).

The state of the building seems to be rather poor and the large structural disaster observed in some of the columns and rays of the exterior walls. Micro Concrete repair R.C.C. column, beam, etc.: In terms of restoring large damage to R.C.C. micro concrete: Micro concrete is a very high strength concrete design, its factory made a product. Its dry powder in a gray color more like cement is a cement as a single component. Another graded fine aggregate, additive in the form of powder free agent because this micro concrete can be placed in a smaller thickness Mix. The material may travel in a narrow gape have self-aligning properties, so it provides a very smooth uniform finish. Durability equivalent to 35 m of concrete can only be achieved in three days of installation/placing time (Rohit Newale et al 2017).

The findings of the presented study on the strengthening and rehabilitation of brick construction are that typical repairs can be classified according to their effects. They are divided into three categories as follows: a) redecorating, which improves the appearance, restores non-structural properties and weather protection, damaged component; For example, reguiding, pinning. b) The structural repairs that intend to restore the structural properties of the components, namely injection of cracks, structural reindication. A) structural reinforcement consisting of repairs of some parts of the structure or whole structure with results of restoration of load capacity or additional durability, or removal and replacement of the existing damaged components. The main objective is to replace the structural corrupted components, rather than restore them by adding new components such as strips, overlapping, etc. (Raluca Pleşu et al 2011).

III. METHODOLOGY

The whole building should not collapse is the main objectives the present work. The whole building is sustained on the natural soil. However this basement through construction near to the internal face of the wall will act at the foundation of existing structure. The risk will be there when to construct the basement without taking consideration of the load bearing structure.

The load bearing building is around 60 years old and it was constructed with the load bearing foundation. The building is to provide the new RCC basement under the load bearing structure as per the demand from the owner. The soil under the load bearing structure is of semi hard murum with bearing capacity of not less than 40 Ton/m^2.

The foundation is to be constructed with consideration of the strip foundation with strip size of 1 m X 1 m in both direction so that the load bearing structure shall not collapse and the safety shall be achieved. The detailed design was carried out and then the procedure of construction will play into picture and therefore the present work is to make safe load bearing structure without dismantling it.

The already constructed load bearing structure of age 60 years is to be provided with the basement floor without dismantling the structure. The owner need it to provide rental arrangement basis to the bank. The basement should of RCC so that the dismantling is not needed. The wall at the foundation level of 350 mm width as per the available information.

In the present work the G+3 building is analyzed using STAAD-PRO and then the reaction are used to design the strip foundation so that the structure shall be safe under the new RCC foundation. The foundation is to be designed considering the strip foundation preferably 1m x 1m. The results are also compared with the strip foundation of 2m X 2m with strip foundation of 1m X 1m.

The detailed drawings of foundation, scheduled drawing and GA drawing are obtained so that the detailed construction procedure is adopted at the actual site. These drawings are presented in this work and the detailed design documents is also obtained so the in future there shall be no objection on the further procedure.

IV. MODELING

The modeling of the structure is carried out in the STAAD-PRO so that the results of the reactions shall be used for the strip foundation design. The model considered in the present work is mentioned as follows.

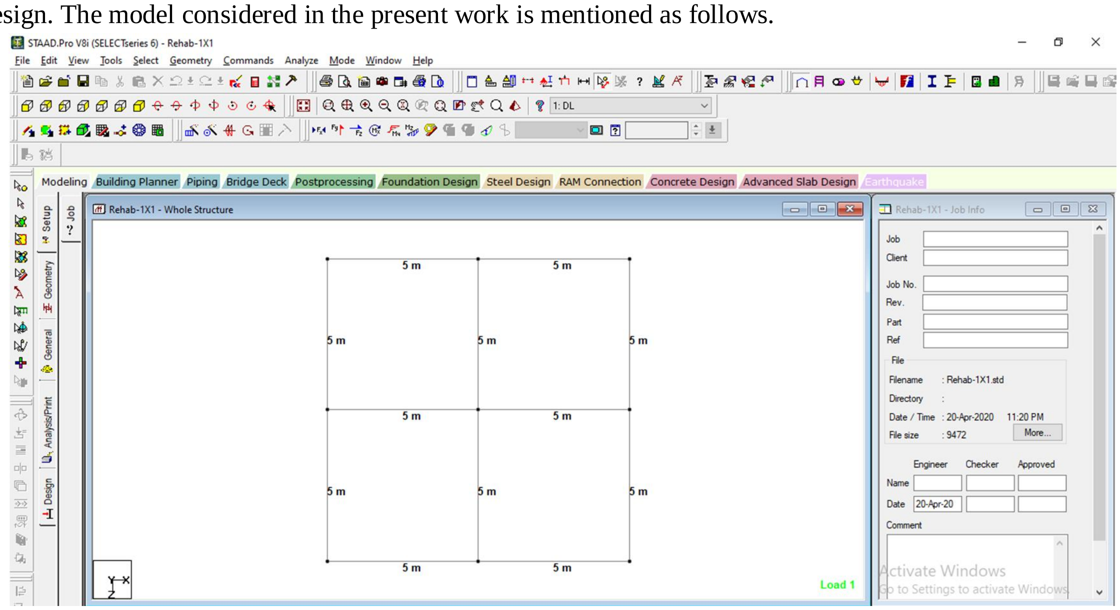

Fig.1: plan of the building

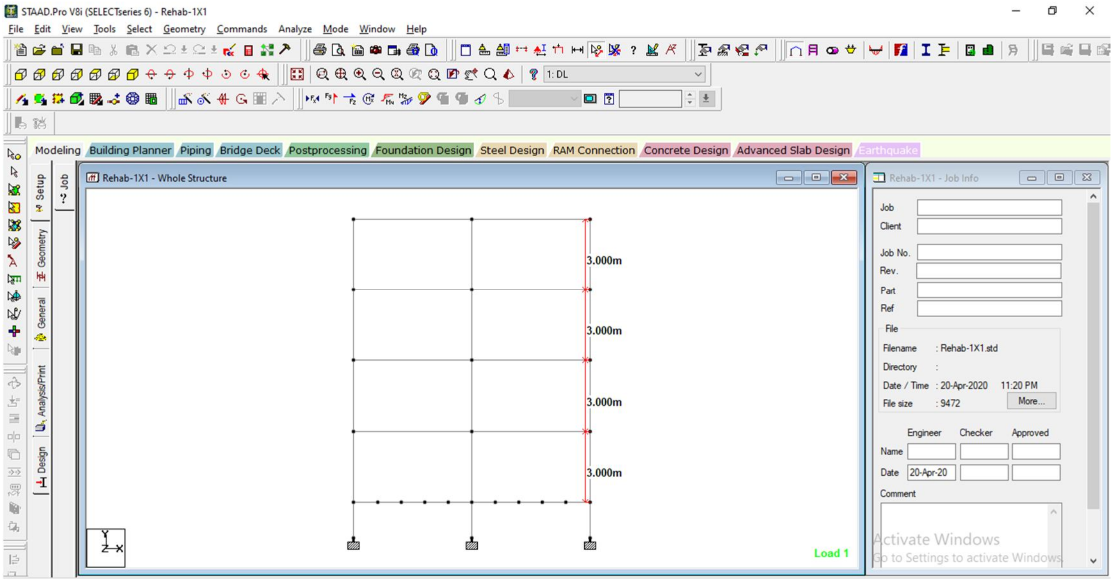

Fig.2: Elevation of the building

V. RESULTS

The results are obtained in STAAD-PRO in terms of the displacement and the reaction which shall be used to design the strip foundation.

Table 1: Displacement for 1 m X 1m strip model

		Horizontal	Vertical	Horizontal	Resultant	Rotational		
	Node	X mm	Y mm	Z mm	mm	rX rad	rY rad	rZ rad
Max X	152	0.035	-1.069	0	1.069	0	0	-0.001
Min X	154	-0.035	-1.069	0	1.069	0	0	0.001
Max Y	118	0.002	0	0	0.002	0	0	0
Min Y	153	0	-1.596	0	1.596	0	0	0
Max Z	150	0	-1.091	0.04	1.091	0	0	0
Min Z	156	0	-1.091	-0.04	1.091	0	0	0
Max rX	150	0	-1.091	0.04	1.091	0	0	0
Min rX	156	0	-1.091	-0.04	1.091	0	0	0
Max rY	9	-0.001	-0.014	-0.004	0.014	0	0	0
Min rY	13	0.001	-0.014	-0.004	0.014	0	0	0
Max rZ	154	-0.035	-1.069	0	1.069	0	0	0.001
Min rZ	152	0.035	-1.069	0	1.069	0	0	-0.001
Max Rst	153	0	-1.596	0	1.596	0	0	0

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Table 2: Displacement for 2 m X 2m strip model

		Horizontal	Vertical	Horizontal	Resultant	Rotational		
	Node	X mm	Y mm	Z mm	mm	rX rad	rY rad	rZ rad
Max X	152	0.139	-3.548	0	3.55	0	0	-0.003
Min X	154	-0.139	-3.548	0	3.55	0	0	0.003
Max Y	15	-0.019	0.274	0.004	0.275	0	0	0
Min Y	61	0	-33.062	0	33.062	0	0	0
Max Z	150	0	-3.938	0.158	3.941	0.001	0	0
Min Z	156	0	-3.938	-0.158	3.941	-0.001	0	0
Max rX	150	0	-3.938	0.158	3.941	0.001	0	0
Min rX	156	0	-3.938	-0.158	3.941	-0.001	0	0
Max rY	9	0.028	-0.142	-0.023	0.146	0	0	-0.001
Min rY	13	-0.028	-0.142	-0.023	0.146	0	0	0.001
Max rZ	154	-0.139	-3.548	0	3.55	0	0	0.003
Min rZ	152	0.139	-3.548	0	3.55	0	0	-0.003
Max Rst	61	0	-33.062	0	33.062	0	0	0

Table 3: Reactions for 1 m X 1m strip model

		Horizontal	Vertical	Horizontal	Moment		
	Node	Fx kN	Fy kN	Fz kN	Mx kNm	My kNm	Mz kNm
Max Fx	217	5.447	42.66	0	0	0	-2.582
Min Fx	219	-5.447	42.66	0	0	0	2.582
Max Fy	218	0	517.607	0	0	0	0
Min Fy	275	0.015	-0.503	-0.088	-0.05	-0.013	0.028
Max Fz	207	0	43.532	8.407	3.528	0	0
Min Fz	229	0	43.532	-8.407	-3.528	0	0
Max Mx	207	0	43.532	8.407	3.528	0	0
Min Mx	229	0	43.532	-8.407	-3.528	0	0
Max My	170	-4.197	33.882	0	0.255	0.107	2.002
Min My	166	4.197	33.882	0	0.255	-0.107	-2.002
Max Mz	219	-5.447	42.66	0	0	0	2.582
Min Mz	217	5.447	42.66	0	0	0	-2.582

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Table 4: Reactions for 2 m X 2m strip model

		Horizontal	Vertical	Horizontal	Moment		
	Node	Fx kN	Fy kN	Fz kN	Mx kNm	My kNm	Mz kNm
Max Fx	166	74.577	311.625	-0.192	1.334	-0.915	-34.62
Min Fx	274	-74.577	311.626	0.192	-1.334	-0.915	34.62
Max Fy	158	-2.985	311.856	-4.821	-2.397	-0.016	1.431
Min Fy	276	3.506	-6.51	-0.291	-0.023	0.023	-1.74
Max Fz	202	-1.775	295.63	91.544	36.576	0.878	0.262
Min Fz	224	-1.775	295.63	-91.544	-36.576	-0.878	0.262
Max Mx	202	-1.775	295.63	91.544	36.576	0.878	0.262
Min Mx	224	-1.775	295.63	-91.544	-36.576	-0.878	0.262
Max My	170	-74.577	311.626	-0.192	1.334	0.915	34.62
Min My	166	74.577	311.625	-0.192	1.334	-0.915	-34.62
Max Mz	170	-74.577	311.626	-0.192	1.334	0.915	34.62
Min Mz	272	74.577	311.625	0.192	-1.334	0.915	-34.62

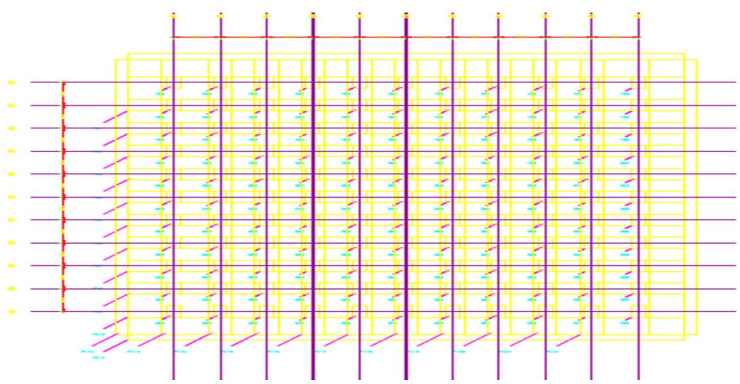

Fig. 3: Plan of strip foundation

Table 5: Strip Foundation details (1m strip)

MARK	SIZE	Column Nos.
MARK	SIZE	Column Nos.
FC1	12.000 X 2.500 X 0.500	158 159 162 164 166 168 170 172 174 176 178
FC2	12.000 X 2.500 X 0.500	160 161 163 165 167 169 171 173 175 177 179
FC3	12.000 X 2.500 X 0.500	180 181 182 183 184 185 186 187 188 189 190
FC4	12.000 X 2.500 X 0.500	191 192 193 194 195 196 197 198 199 200 201
FC5	12.000 X 2.500 X 0.500	202 203 204 205 206 207 208 209 210 211 212
FC6	12.000 X 2.500 X 0.500	213 214 215 216 217 218 219 220 221 222 223
FC7	12.000 X 2.500 X 0.500	224 225 226 227 228 229 230 231 232 233 234
FC8	12.000 X 2.500 X 0.500	235 236 237 238 239 240 241 242 243 244 245
FC9	12.000 X 2.500 X 0.500	246 247 248 249 250 251 252 253 254 255 256
FC10	12.000 X 2.500 X 0.500	257 258 259 260 261 262 263 264 265 266 267
FC11	12.000 X 2.500 X 0.500	268 269 270 271 272 273 274 275 276 277 278
FC12	2.500 X 12.000 X 0.500	158 160 180 191 202 213 224 235 246 257 268
FC13	2.500 X 12.000 X 0.500	159 161 181 192 203 214 225 236 247 258 269
FC14	2.500 X 12.000 X 0.500	162 163 182 193 204 215 226 237 248 259 270
FC15	2.500 X 12.000 X 0.500	164 165 183 194 205 216 227 238 249 260 271
FC16	2.500 X 12.000 X 0.500	166 167 184 195 206 217 228 239 250 261 272
FC17	2.500 X 12.000 X 0.500	168 169 185 196 207 218 229 240 251 262 273
FC18	2.500 X 12.000 X 0.500	170 171 186 197 208 219 230 241 252 263 274
FC19	2.500 X 12.000 X 0.500	172 173 187 198 209 220 231 242 253 264 275
FC20	2.500 X 12.000 X 0.500	174 175 188 199 210 221 232 243 254 265 276
FC21	2.500 X 12.000 X 0.500	176 177 189 200 211 222 233 244 255 266 277
FC22	2.500 X 12.000 X 0.500	178 179 190 201 212 223 234 245 256 267 278

Table 6: Strip Foundation details (2m strip)

MARK	SIZE	Column Nos.
MARK	SIZE	Column Nos.
MARK	SIZE	Column Nos.
FC1	12.000 X 2.500 X 0.500	158 162 166 170 174 178
FC2	12.000 X 2.500 X 0.500	180 182 184 186 188 190
FC3	12.000 X 2.500 X 0.500	202 204 206 208 210 212
FC4	12.000 X 2.500 X 0.500	224 226 228 230 232 234
FC5	12.000 X 2.500 X 0.500	246 248 250 252 254 256
FC6	12.000 X 2.500 X 0.500	268 270 272 274 276 278
FC7	2.500 X 12.000 X 0.500	158 180 202 224 246 268
FC8	2.500 X 12.000 X 0.500	162 182 204 226 248 270
FC9	2.500 X 12.000 X 0.500	166 184 206 228 250 272
FC10	2.500 X 12.000 X 0.500	170 186 208 230 252 274
FC11	2.500 X 12.000 X 0.500	174 188 210 232 254 276
FC12	2.500 X 12.000 X 0.500	178 190 212 234 256 278

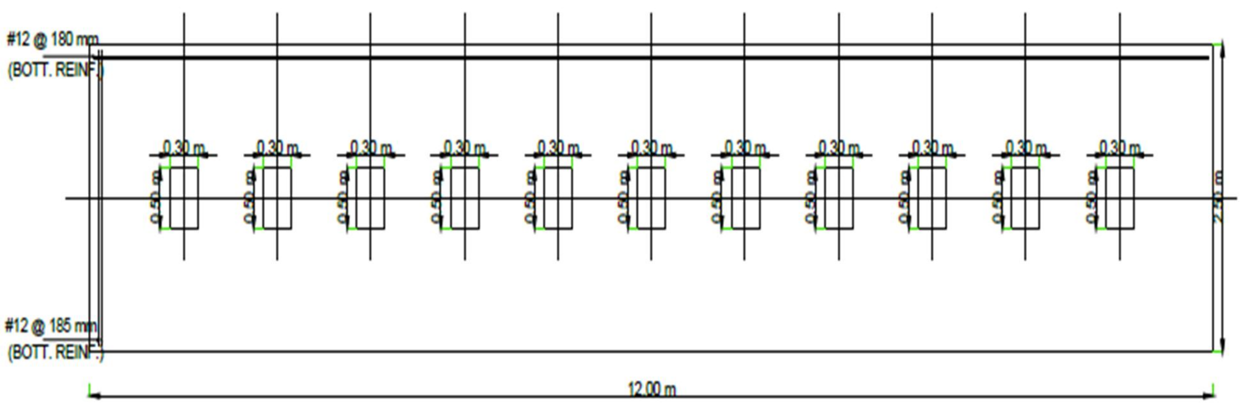

Fig.4: Plan of Strip Foundation -C1

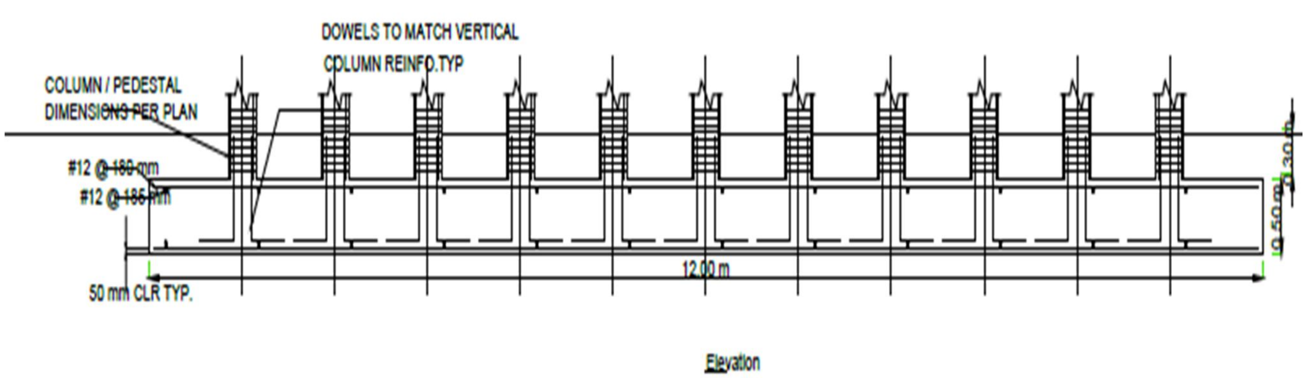

Fig.5: Elevation of Strip Foundation -C1

VI. CONCLUSION

From the above study following conclusion can be drawn:

A. The construction of the basement is possible without dismantling the load bearing structure.
B. The strip foundation of 1m strip is suitable for the construction
C. The strip foundation of 1m strip gives better results than the 2m strip foundation and therefore recommended.
D. Proper care should be taken while excavation at the site
E. The soil properties are very important in such type of construction

REFERENCES

[1] Jorge Miguel Proença, António Sousa Gago & Ana V. Costa, "Strengthening of masonry wall load bearing structures with reinforced plastering mortar solution", WCEE, LISBOA, 2012.
[2] BHAVAR DADASAHEB "Retrofitting of Existing RCC Buildings by Method of Jacketing" Vol. 1, Issue: 5, June: 2013 (IJRMEET) ISSN: 2320-6586
[3] P. B. Oni "Performance Based Evaluation of Shear Walled RCC Building by Pushover Analysis" International Journal of Modern Engineering Research (IJMER).
[4] Krish R. Villaitramani" PREFABRICATED CONSTRUCTION FOR MASS HOUSING IN MUMBAI" International Journal of Innovative Research in Advanced Engineering (IJIRAE) ISSN: 2349-2163 Volume 1 Issue 9 (October 2014)
[5] Guney OZCEBE "REHABILITATION OF EXISTING REINFORCED CONCRETE STRUCTURES USING CFRP FABRICS" 13th World Conference on Earthquake Engineering Vancouver, B.C., Canada August 1-6, 2004 Paper No. 1393
[6] J. Bhattacharjee "REPAIR, REHABILITATION &RETROFITTING OF RCC FOR SUSTAINABLE DEVELOPMENT WITH CASE STUDIES" Civil Engineering and Urban Planning: An International Journal (CiVEJ) Vol.3, No.2, June 2016
[7] S. Sorace and G. Terenzi "Advanced Seismic Retrofit of a Low-Rise R/C Building" IACSIT International Journal of Engineering and Technology, Vol. 5, No. 3, June 2013
[8] Mahmoudi M., Ebadi F., Seismic Rehabilitation of Unreinforced Masonry Buildings Using Pipe Bracing System. Proc. of the 14th Europ. Conf. on Earthquake Engng., Ohrid, Rep. of Macedonia, 5, 2010, 1-5.
[9] Kaya S.M., Inventory of Repair and Strengthening Methods with Iron and Steel. M.Sc. Diss. in Adv. Masters in Structural Anal. of Monum. and Histor. Constr. at Techn. Univ. of Catalonia, 10, 2009, 79-89.
[10] El Gawady M., Lestuzzi P., Badoux M., A Review of Conventional Seismic Retrofitting Techniques for URM. 13th Internat. Brick a. Block Masonry Conf., Amsterdam, July 4-7, 9, 2004, 1-9.
[11] Singh Y., Paul D.K., Retrofitting of Masonry Buildings. Lecture Notes for National Progr. for Capac. Build. for Engs. in Earthqueake Risk Manag., India, 2006, 219-232.
[12] Taghidi M., Seismic Retrofit of Low-Rise Masonry and Concrete Walls by Steel Strips. Ph. D. Diss., Dept. of Civil Engng., Univ. of Ottawa, Canada, 2000.