



# Technical Bulletin #11

## TILE ROOFS IN SEISMIC ZONE 4

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The earthquake of 1994 in Northridge, California occurred in the densely populated San Fernando Valley that, as is typical of Southern California, has thousands of homes with clay and concrete tile roofs. Despite the severity of the temblor, a relatively small percentage of homes experienced significant damage to their roofs and those that did were generally attributed to improper installation.

Manufacturers of competing products attempted to exaggerate the extents of problems with tile roofs and even tried to promote building code changes that would have favored their products and harmed the tile roof industry. Fortunately, their sleazy tactics were easily recognized by knowledgeable building officials and their efforts to affect changes at the code level failed. Despite this, they continued to foist their propaganda onto impressionable consumers who do not have the facts or expertise of the code officials.

Because this campaign has created considerable confusion in the roofing industry, the National Tile Roofing Manufacturers Association (NTRMA) commissioned the University of Southern California (USC) to conduct a study on the performance of clay and concrete roof tiles in highly active seismic regions. The results of this test have been published as the Experimental Studies on Seismic Performance of Concrete and Clay Roofing Tiles and summarized in a separate document produced by the NTRMA.

The purpose of this study was to determine if additional fastening requirements should be recommended for earthquake prone areas and the tests were performed to measure the effectiveness of the current Uniform Building Code requirements. All tiles were attached to the experimental roof decks in accordance with Tables 15-D-1 and 15-D-2 of the UBC which prescribe various attachments depending on roof slope. Both clay and concrete tile were installed at roof slopes of 5:12, 12:12 and 24:12 and tested at forces in excess of 1.4g in both parallel and perpendicular direction.

Results of the tests proved that current fastening requirements are adequate to resist tile displacement for forces twice as strong as those generated by the Northridge earthquake. For concrete tiles installed on battens, this means that only perimeter tiles require fastening on slopes below 5:12 and only alternate courses and perimeter on slopes between 5:12 and 12:12. Above 12:12, all tiles must be fastened. In all cases, fasteners are corrosion-resistant steel or better.

Based on the results of the USC testing and field observations following the Northridge, Whittier Narrows and Loma Prieta earthquakes, the focus of the NTRMA and its members will be to promote compliance to existing codes and standards rather than the creation of new ones that we do not feel are warranted at this time.