Comparing the Scales

Intensity (Mercalli)	Observations (Mercalli)	Richter Scale Magnitude (approx. comparison)
I	No effect	1 to 2
II	Noticed only by sensitive people	2 to 3
III	Resembles vibrations caused by heavy traffic	3 to 4
IV	Felt by people walking; rocking of free standing objects	4
V	Sleepers awakened; bells ring	4 to 5
VI	Trees sway, some damage from falling objects	5 to 6
VII	General alarm, cracking of walls	6
VIII	Chimneys fall and some damage to building	6 to 7
IX	Ground crack, houses begin to collapse, pipes break	7
X	Ground badly cracked, many buildings destroyed. Some landslides	7 to 8
XI	Few buildings remain standing, bridges destroyed.	8
XII	Total destruction; objects thrown in air, shaking and distortion of ground	8 or greater

MATRICES FOR PREDICTING PERCENT OF UNITS MADE UNINHABITABLE

The final matrices used in this project for relating intensity and building construction to percent of dwelling units made uninhabitable are shown in the tables below, the first for red-tagged units and the second for yellow-tagged multi-family units. Prior to ABAG's work on housing habitability, the only published matrix for relating these variables was developed by Dunne and Sonnenfeld (1991). The matrices developed for ***red-tagged*** and ***yellow-tagged*** units in this project has been modified from this earlier matrix based on actual data from the Loma Prieta and Northridge earthquakes. The percentages are provided using two significant figures, with a the smallest unit equal to 0.01%.

TABLE: PERCENT OF DWELLING UNITS RED TAGGED

TYPE	INIENSITY					
Modified Mercalli Scale	V	VI	VII	VIII	IX	X+
Mobile Homes	0	0	0.87	40	90	100
Unreinforced Masomy	0	0.05	2.9	45	70	80
Non-Wood, 4-7 Stories, <1940	0	0.30	8.0	45	70	80
Non-Wood, 4-7 Stories, >1939	0	0	0	16	54	70
Non-Wood, 7+ Stories, <1940	0	0.30	8.0	45	70	80
Non-Wood, 7+ Stories, >1939	0	0	0	16	54	70
Wood-Frame, 4-7 Stories, <1940, Multi-Family	0	1.4	2.5	45	70	80
Wood-Frame, 4-7 Stories, >1939, Multi-Family	0	0	0.09	10	15	25
Wood-Frame, 1-3 Stories, <1940, Multi-Family	0	0.05	0.53	11	44	64
Wood-Frame, 1-3 Stories, >1939, Multi-Family	0	0.01	0.04	6.5	15	25
Wood-Frame, 1-3 Stories, <1940, Single Family	0.01	0.04	0.12	1.8	8.4	12
Wood-Frame, l-3 Stories, >1939, Single Family	0	0	0.02	0.18	0.69	1.8
"Other" (tents, caves, boats, etc.)	0	0	0	0	0	0

Percentage of Single Family Homes Red Tagged In Highest Shaking Zone = 13.8% (Deemed uninhabitable)

TABLE: PERCENT OF DWELLING UNITS YELLOW TAGGED (SINGLE FAMILY UNITS NOT RENDERED UNINHABITABLE)

TYPE Modified Mercalli Scale	INTENSITY					
	V	VI	VII	VIII	IX	X+
Mobile Homes	0	0	0	0	0	0
Unreinforced Masoruy	0	3.3	6.2	8.5	30	20
Non-Wood, 4-7 Stories, <1940	0.30	7.7	37	25	30	20
Non-Wood, 4-7 Stories, >1939	0	0	0	38	16	16
Non-Wood, 7+ Stories, <1940	0.30	7.7	37	25	30	20
Non-Wood, 7+ Stories, >1939	0	0	4	38	16	16
Wood-Frame, 4-7 Stories, <1940, Multi-Family	0	1.7	9.7	25	10	10
Wood-F rame, 4-7 Stories, >1939, Multi-Fami ly	0	0.05	2.6	**17**	25	25
Wood-Frame, 1-3 Stories, < I 940, Multi- Family	0	0. 15	0.94	6.6	20	20
Wood-F rame, 1-3 Stories, > I 939, Multi- Family	0. 01	0.02	0.10	**12**	13	22
Wood-Frame. 1-3 Stories, <1940, Sing le Family	0	0	0	0	0	0
Wood-Frame, 1-3 Stories, >1939. Sin g le Family	0	0	0	0	0	0
"Other" (te nts, caves, boats, etc.)	0	0	0	0	0	0

Small changes to the values in these matrices have a significant impact on estimates of uninhabitable units. In particular, damage to wood-frame dwellings is an extremely significant component of the dwelling losses. For example, the over 32,000 wood-frame dwelling units built after 1939 predicted to be uninhabitable in a southern Hayward scenario is 42% of the total uninhabitable units.

Note that the "0" values provided in these tables are actually greater than zero, but still quite small. Although occasional dwellings are "tagged" in these categories (as can be seen in Appendix B and C), there are also large numbers of dwellings exposed to these relatively low levels of shaking.

[2] Single family homes remain habitable if yellow-tagged. Yellow-tagging does not occur with mobile homes.