

**10. Earthquake Damages in Yokohama City Due to the
Great Kwanto Earthquake of September 1, 1923.**

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(Read April 19, 1949. — Received Nov. 30, 1949.)

1. On the extensive damages done by the Great Kwanto Earthquake of 1923, detailed investigations have been made over the wide area of the affected regions and voluminous reports have been published. But, strangely enough, the city of Yokohama remained an exception among these regions, and precise aspects of the earthquake damages within the city are scarcely known. No map of Yokohama City showing the distribution of damaged houses within the city has yet been published.

This is not without reason, for although the destroyed houses in Yokohama were so numerous, the fire that broke out soon after the shock burnt down almost eighty per cent of the whole city, so that sufficient materials could not be collected to make possible the investigation of the distribution of destroyed houses, and accordingly no careful study of the damages in the city has ever been carried out.

2. But recently a new interest is being entertained by seismologists as to whether there is any close relation between earthquake damages and the condition of the ground of the place, and it is being earnestly desired that details should be made clear about the distribution of the damages in Yokohama City at the time of the Kwanto Earthquake.

With a view to providing an answer to these demands the present writer collected as many materials as possible that are likely to throw light on the study of earthquake damages in Yokohama, and attempted from them to draw a map to show how the damages were distributed in the city. As some of these materials were reliable enough while others were not, we examined them minutely and came to the conclusion that the numbers of the totally destroyed wooden houses were the most dependable indices to represent the degree of earthquake damages objectively and accurately.

For convenience sake we divided the city into small portions following the administrative division and we took each "cho" (an area bound-

ed by streets) as the unit area of the division. There existed about 150 cho's at the time of the Kwanto Earthquake, their average area was about (500 m)², and the average number of wooden houses in each cho was assumed to be about three hundred. In these respects, cho has been considered the most suitable unit division in calculating the percentage of destroyed houses.

3. We have looked up as many materials as possible and worked out the numbers of totally destroyed wooden houses in each of the unit areas. As the total numbers of the wooden houses in the respective unit areas are to be known from the statistical reports published before the earthquake by the prefectural authorities, the percentage of the totally destroyed houses in each unit area can also be easily calculated. We will call this percentage the "seismic damage rate". It is tabulated in Table I. The figures in brackets in column A are the presumed numbers of the totally destroyed houses where only the ratios of the destroyed houses instead of their real numbers had been given in the literature consulted. Materials used for the preparation of Table I are listed after the table.

Table I.

Seismic damage rate in Yokohama due to the Kwanto Earthquake of 1923.

- A; Numbers of totally destroyed houses.
 B; Numbers of half destroyed houses.
 C; Total numbers of wooden houses.
 D; Percentag of totally destroyed houses.
 L; Literatures refered to.

Name of unit area	A	B	C	D	L
Isezaki	(69)		106	65	C
Tan-machi	(180)	Ca 20	261	70	C
Sueyoshi 2	(415)		61	90	C
Hisakata	(42)		65	70	C
Naniwa, Umegae	(92)		02	90	C
Sugatami	(66)		83	80	C
Wakatake	(48)		53	90	C
Ashibiki	155		178	88	C
Yoshioka	400		450	89	C
Suruga	(64)		81	80	C
Kumoi	(198)		248	80	C
Horai	(196)		207	95	C
Chojamachi 1-4	(442)		525	85	C
" 6	(45)		50	90	C
" 8	(262)		291	90	C
Fukutomi	(646)		808	80	C
Takasago, Futaba	—		—	75	C

(to be continued)

Table I. (continued.)

Name of unit area	A	B	C	D	L
Sakuragi	(123)		130	95	C
Hidemachi 1-3	(84)		120	70	C
South-Ota Azuma-kôchi	2		561	0.4	C
" Kasumiya, Hara-Kôchi	43	270	789	5.5	C
" Yaichi-Buraku	(300)		600	50	B
Kumyoji	(60)		180	33	C
Tobe 1	(40)		80	50	C
" 2	(151)		171	90	C
" 3	(192)		383	50	C
" 4	(360)		400	90	C
" 5	(151)		216	70	C
Takashima 1-10, Ura-Takashima	(420)		478	90	C
South Sengencho	(175)	(400)	700	90	C
" Shimonoshita Gyoyunagaya	(83)		93	25	C
" Sanshu-nagaya	—		—	90	C
Okano	(721)		1044	70	G
South Saiwaicho	(1800)		2000	90	C
Hiranuma	(1010)		1122	90	C
Okano, Hiranuma	—		—	90	H
Oimatsu	3		61	1	B
Hanasaki	1		10	10	B
Nishitobe	(495)		9810	50	C
" Oogida, Uzawa	(109)		1389	8	C
Sannô-yama	70		772	9	C
Tidesman's hous group.	21		25	84	B
Prefectural officer's hous group	(130)		146	90	B
Nishi Tobe-Furuido	20		830	24	C
Kubo	(650)	(650)	1300	50	C
Masago	(140)		201	70	C
Sumiyoshi	(315)		396	80	C
Aioi	(281)		296	95	C
Oota	(175)		250	70	C
Benten	(150)		166	90	C
South-Nakatôri	(115)		128	90	C
North Nakatôri	21		24	87	B
Hommachi	(124)		155	80	C
Motohamachi	(103)		129	80	C
Kaigan-dôri 1	21		27	78	B
Sakai	(48)		53	90	C
Yoshihama	(260)		323	80	C
Matsukage	(352)		705	50	C
Kotôbuki	(322)		460	70	C
Oogi	225		145	50	C
Okina	(231)		298	80	C
Furo	(445)		557	80	C
Banda	(124)		155	80	C
Sankichi	(574)		820	70	C
Chitose	(276)		345	80	C
Yamada	—		—	60	C
Fujimi	(222)		370	60	C
Hagoromo	(296)		448	60	G
Yamabuki-front street	(122)		153	80	C
" -back street	(30)		76	40	C
Magane, Eiraku	(398)		419	95	B
Magane	(75)		83	90	E
South-Yoshida 4-7	(4900)		5439	90	C
" East part	(2080)		2600	80	C
" West part	(2340)		2600	90	C
" South part	(126)		139	93	C

(to be continued.)

Table I. (Continued.)

Name of unit area	A	B	C	D	L
Ryuzu-Hama, Kamie	(133)		404	33	C
Isogo-hama	150	200	500	30	C
Maita; Enoki-Tsubo	(40)		50	80	G
" other	0		223	0	G
Ooka	(344)		688	50	C
" Nakano, Kunôshita	2	32	62	6	B
Kitagata; Chiyozaiki Izumi	(1442)		2060	70	C
" Nishinoya level part	180	400	580	30	C
" " hill	7	80	204	7	C
" Kominato	(67)		222	30	C
Amanuma and Suwa	—		—	30	C
Hommoku; level land	—		—	80	B
" hill	—		830	40	B
" 1	(291)		970	30	C
" 2	(975)		1300	75	C
Negishi; Mugita and others	(1560)	(660)	2224	70	C
" northern part	(1110)	(660)	1850	60	C
" Southern part	(80)		800	10	C
Nakamura; Western part	(640)		1600	40	C
" Nakai-Yamaya	(1110)		3700	30	C
" Yamate Nakamura	(73)		1462	5	C, B
Ishikawa, Nakamachi	(400)	(1190)	1973	20	C
Aoki; Takinoshita, Takara	0		190	0	C
" Miyanosu, Ono	(81)		163	50	C
" Hichikencho	153		219	70	C
" Hichikencho 3610	—		—	95	C
" " 2	40		147	17	C
" Upper Daimachi	1	8	160	0.3	C
" Lower Daimachi	(19)		192	10	C
" Tsuruya	6	(274)	280	2	C
" Motomachi	1		147	0.7	C
" Kôgaya, Iwasaki	0	(100)	340	0	C
" Miya, Taki, Yoko	0		317	0	C
" Uperp Tammachi and other	0	23	780	0	C
" Lower Tammachi	6		350	2	C
" Tammachi 1	40		500	8	B
" Hinodai	17		236	7	C
" Oota	4	20	210	2	C
" Karuisawa	Ca 50	Ca 250	570	9	C
Aoki; Matsumoto and other	4	20	290	2	C
" " "	3		163	3	C
Takashima 9-10	(75)		107	70	C
Kanagawa; Shimmachi	28		650	4	C
" Urashima	7	5	339	2	C
" Myojin Chiwaka	26		74	35	C
" Inaricho	(144)		160	90	C
" " "	(80)		160	50	G
" Tate, Saito-bun	0		246	0	C
" Urashimaoka	41		173	24	C
" Yanagi	40	50	400	10	C
" Hakuraku	3		100	3	C
" Nakagawa	34	60	170	22	C
" Hiraomae N-E port.	12	100	440	3	C
" Nishinomachi	1		83	1	C
" Goten	10		315	3	C
" Ryôshi, Kotemma	0	30	355	0	C
West Koyasu	50		1300	4	C
East Koyasu	200	150	700	29	C
Hodogaya	1429	1979	4086	30	C
Ohokagawa-mura	383		508	75	E
Byobuga-mura	103		478	22	E

Literatures for Table I.

- A : Imperial Earthq. Inv. Comm. : Reports of the Imperial Earthquake Investigation Committee in Japanese Language. No. 100. (1925). (in Japanese)
- B : Police Department, Kanagawa Prefecture : Report of the Great Earthquake Disasters in Taisho Era. 1926. (*do.*)
- C : Yokohama City : Earthquake Disasters in Yokohama City. Nos. 1-5. (1925) (*do.*)
- D : Yokohama City : Report on the Reconstruction Works in Yokohama. (1929) (*do.*)
- E : Kanagawa Prefecture : Earthquake Disasters in Kanagawa Prefecture. (1927) (*do.*)
- F : Central Meteorological Observatory : Report of the Investigations of the Great Kwantō Earthquakes. (1926) (*do.*)
- G : K. Nishizaka : Great Earthquake Disasters and Activities of Police in Kanagawa Prefecture. (1926) (*do.*)
- H : T. Koike ; A Note of the Reconstructions in Yokohama. 1927 (*do.*)
- I : Yokohama Municipal Office ; The 18th Statistical Report of Yokohama City. (1921) (*do.*)
- J : Kanagawa Prefecture ; Statistical Report of Kanagawa Prefecture in 1923. (*do.*)

4. Geographic distribution of damage rates is shown in Fig. 1. In this Figure we notice at once that the area within which the damage rate exceeded 90% occupies a no small portion of the city. Now, when we compare this with the case of Tokyo City¹⁾ where nowhere the percentage was as high as 90% in the same earthquake, we are struck by the difference. However, if we take into consideration the distribution of the damage rates in the recent Mikawa²⁾ or Fukui³⁾ Earthquake, it will be easily recognized that the difference noticed in these two maps means nothing contradictory, as Yokohama was situated much nearer the epicenter of the Kwantō Earthquake than Tokyo.

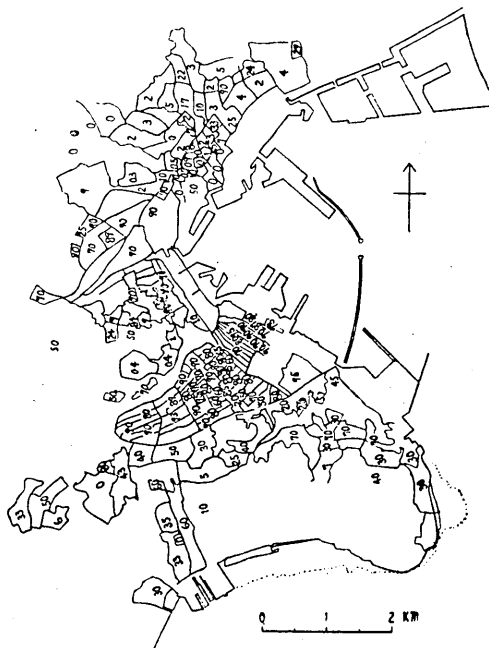


Fig. 1. Distributions of the damage rate in Yokohama.

1) H. KAWASUMI, "The Earthquake Damages and the Structure of Ground in Tokyo" Paper read at the meeting of the Earthq. Res. Inst., on Apr. 19, 1949.

2) S. OMOTE, *Bull. Earthq. Res. Inst.*, **21** (1946), 87.

3) H. KAWASUMI, *Advanced Report of the Fukui Earthquake of 1948*, 1.

5. Before concluding we wish to add a few words on the damage rates in the districts under the jurisdiction of the respective police stations. Though they are given in tables in several reports, some figures in such reports are evidently incorrect. Especially those figures arranged in the column headed "destroyed houses" in these reports apparently do not include the houses that first collapsed under the shock and then were burnt down. According to his study the author believes the figures in the Table below show the most reasonable estimates for the destroyed houses.

Table II.

Revised Table for the number of presumed destroyed houses in the district under the jurisdictions of the respective police stations.

Police Station	Totally destroyed houses	Percentage of totally destroyed houses.	Total number*
Yokohama	(10605)	68.8%	15414
Kagachô	(4957)	81.9	6053
Tobe	(7578)	37.1	22222
Kotobuki	(10027)	44.7	22431
Kanagawa	(1450)	11.9	12240
Yamate-honchô	(6252)	42.3	14781
Hachiman-bashi	(926)	30.0	3087

* The Total number refers to the number of all the houses under the jurisdiction.

6. The author expresses his hearty thanks to Mr. Hirotada Sudo, the Chief of Defence of the City Police, and the members of the municipal office of Yokohama. He also expresses his gratefulness for financial indebtedness to the Institute of Architecture of the Construction Department and the Funds for the Scientific Research of the Education Department.