CHAPTER V

TESTING AND RESULTS

5.1 Measuring Device

The longitudinal strain of the beams were measured by means of electrical resistance strain gage. At the midspan of each beam, nine KYOWA strain gages were attached.

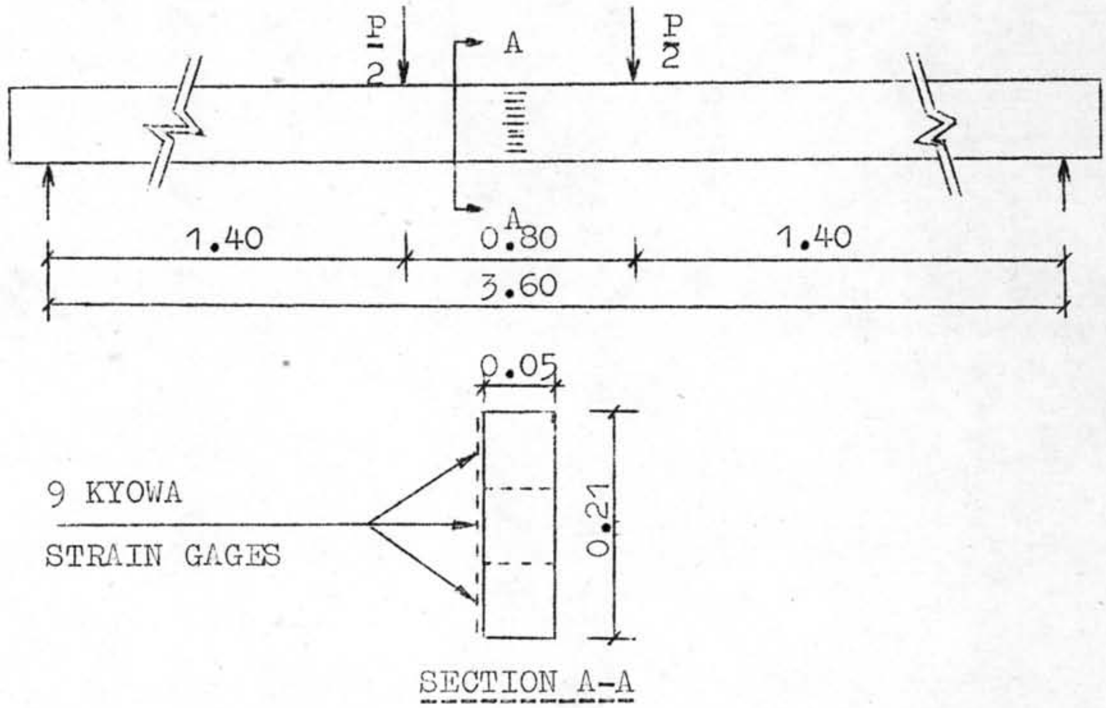


Fig. 5.1 Detail sketch of a typical beam specimen showing relative placement of strain gages.

The strain gage were of 1-inch gage length with an average gage factor of about 2.05. They were distributed at intervals across the face of beam, as shown in figure (5.1), and oriented to measure the longitudinal strain deformation of the beam. They were glued in place in accordance with standardized procedure.

The vertical deflection of beams at mid span were obtained by means of mechanical dial gage which was attached to the mid span of the beam.

5.2 Testing Procedure

The positioning of each beam specimen in the test is shown in figure (5.2). The beams were tested as simply supported beam having a span length of 3.60 m. and loaded with two concentrated loads symmetrically placed 80 cm. apart. The load was applied by the hand pump hydraulic jack, capacity of 60,000 lbs. loading, jacking against the steel frame.

Initial reading at zero load was recorded from each strain gage on the beam specimen using an electronic BLH SR-4 strain indicator. A dummy, consisting of a similar strain gage glue to small piece of wood, was used in conjunction with the bridge balancing unit. Its purpose was to compensate for any change in the resistance of the strain-measuring gage as a result of a change in temperature and moisture content of the specimen. The strains were recorded at 4,000, 6,000 and 8,000 lbs. loading, after that were recorded at every 1,000 lbs. of load increment.

Static bending was conducted by gradually loading the beam specimen at two points 80 cm. apart. The load was applied perpendicular to the longitudinal axis of the beam specimen at the rate of motion of the movable crosshead of the testing machine of about 0.25 cm. per minute. The continuity of the gradual application of load on the beam specimen was momentarily stopped for about 30 seconds at every predetermined load level to record longitudinal strain reading, and to read deflections from the dial gage. The vertical deflection was obtained at every 1,000 lbs. load increment until the deflection was reached 4 cm.

The test was carried out until the failure occured.

5.3 Test Results

The data of test results are presented in table (5.1). Load deflection curve of all main beams are shown in figure (5.3), (5.4) and (5.5). The strain distributions at the critical section of each beam under different loading are shown in figure (5.6), (5.7) and (5.8). Figure (5.9) to figure (5.14) show the mode of failure of each beam.

The strain measurements at gage numbers DB9, KB1 and TB1 were missing because the electrical strain gages at these location did not work.

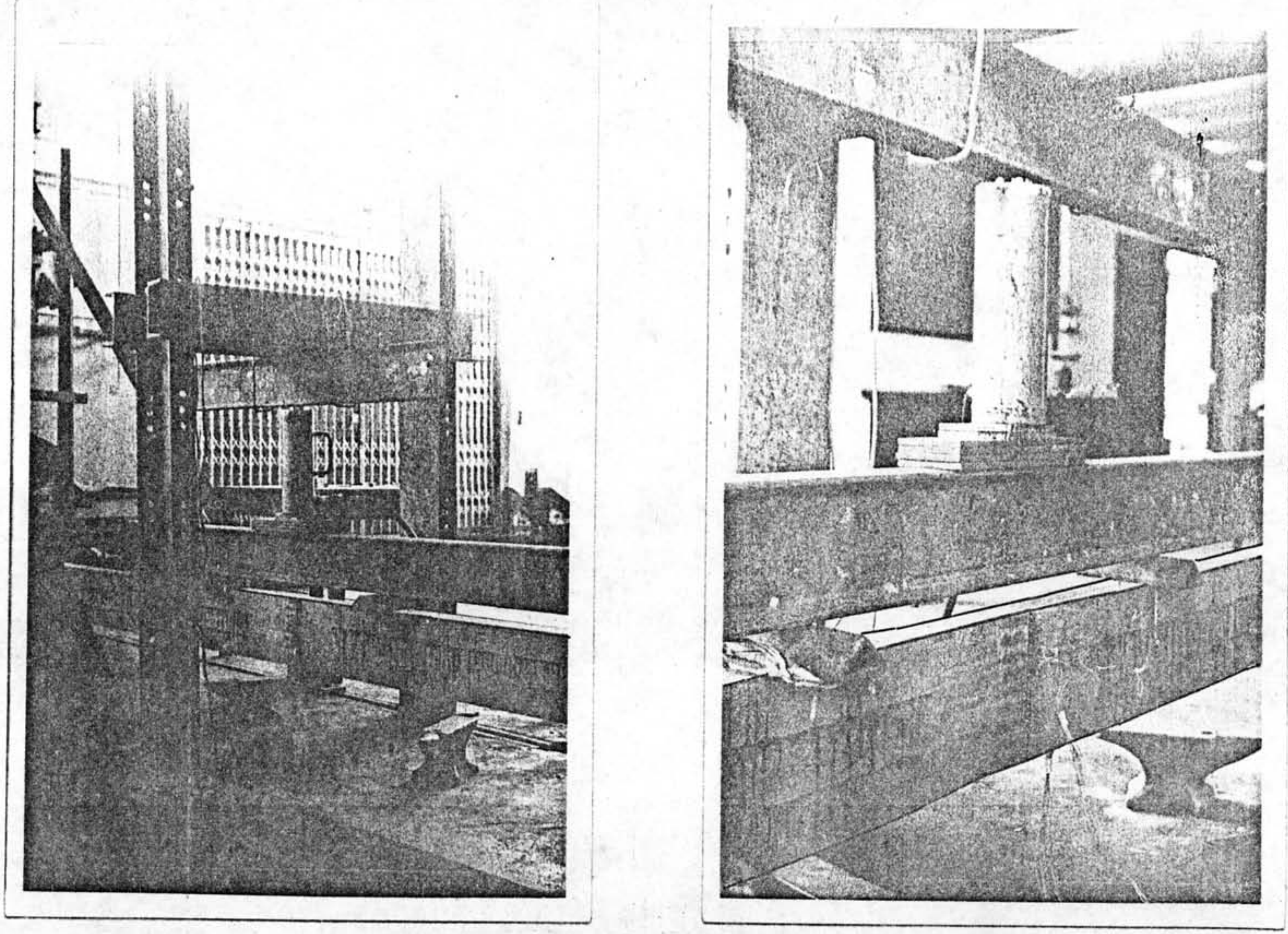


FIG. 5.2 MAIN BEAM UNDER LOADING.

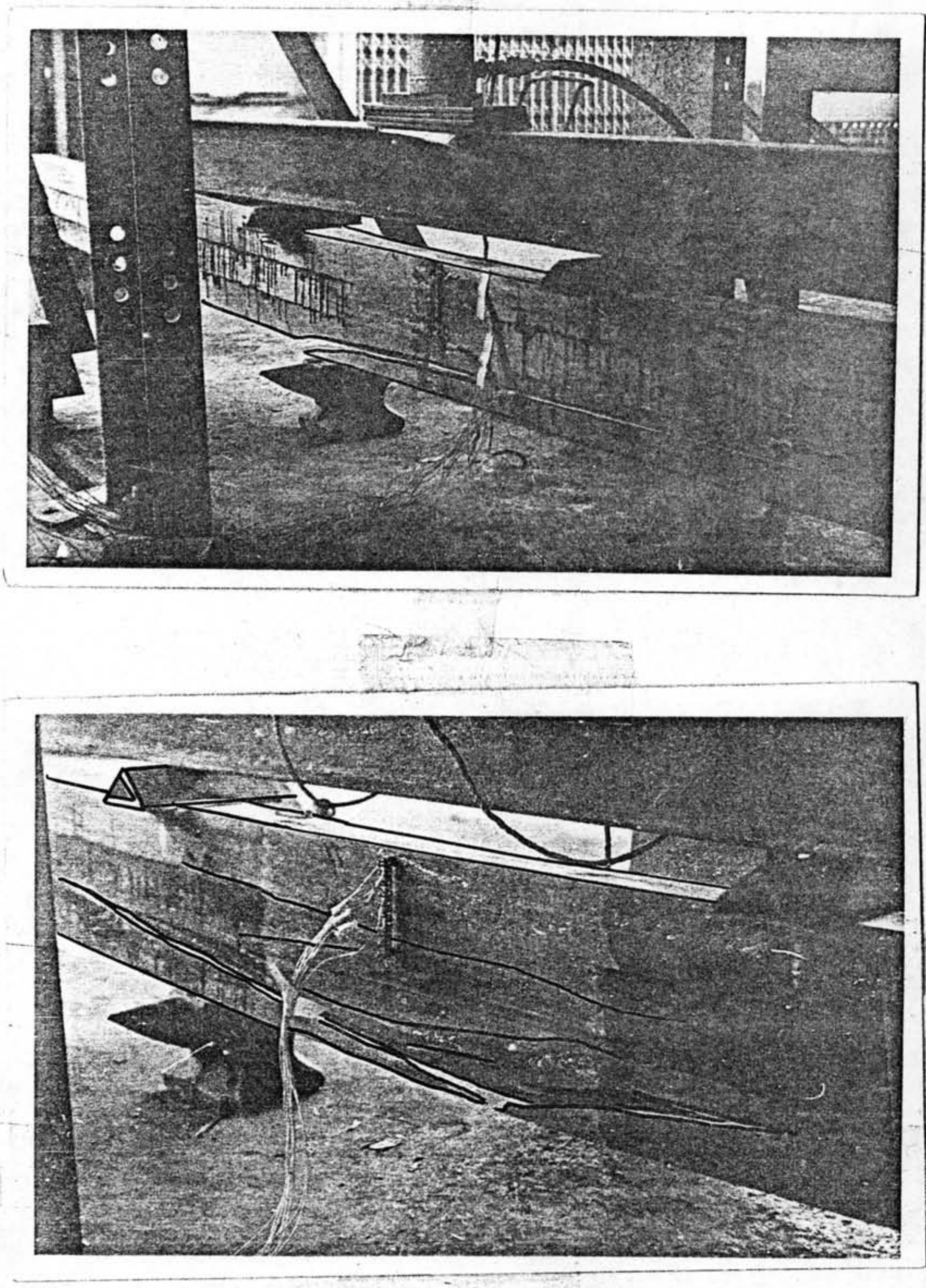


FIG. 5.2a MAIN BEAM AT FAILURE LOADING

TABLE 5.1 TEST RESULTS OF MAIN BEAMS

Load P	Deflection at Mid Span 0.01 mm					
Kilogram (Pound)	DA	DB	KA	KB	TA	TB
454 (1,000)	242	312	341	287	87	523
908 (2,000)	753	714	815	795	545	973
1,362 (3,000)	1,471	1,271	1,252	1,330	1,040	1,495
1,816 (4,000)	2,018	1,765	1,745	1,826	1,545	--
2,043 (4,500)	--	--	--	--	--	2,082
2,270 (5,000)	2,624	2,240	2,210	2,323	2,430	2,308
2,724 (6,000)	3,176	2,763	2,720	2,833	2,976	2,793
3,178 (7,000)	3,714	3,235	3,145	3,299	3,462	3,275
3,632 (8,000)	4,249	3,731	3,590	3,780	4,116	3,775
4,086 (9,000)	4,889	4,278	4,140	--	--	--

	DA	DB	KA	KB	TA	TB
Ultimate Load P, Lbs	13,800	10,200	11,000	12,000	9,100	12,000
Ultimate Load P, Kg.	6,265	4,630	4,994	5,448	4,131	5,448
$M_{UL} = \frac{P}{2} \times 140$ Kg-cm	438,550	324,100	349,580	381,360	289,170	381,360

TABLE 5.2 STRAIN DISTRIBUTION OF MAIN BEAM

DANG WOOD

MAIN BEAM DA ULTIMATE LOAD 13,800 Lbs.

LOAD	STRAIN (MICRO INCH PER INCH)								
Lbs	1	2	3	4	5	6	7	8	9
4,000	-780	-503	-325	-127	+58	+230	+440	+619	+790
6,000	-1231	-891	-521	-213	+79	+350	+679	+960	+1225
8,000	-1613	-1094	-709	-290	+100	+464	+909	+1282	+1644
9,000	-1942	-1252	-820	-334	+113	+530	+1038	+1462	+1876
10,000	-2285	-1526	-1025	-395	+119	+583	+1151	+1626	+2084
11,000	-2680	-1808	-1250	-542	+53	+586	+1153	+1731	+2365
12,000	-3125	-2232	-1492	-698	-127	+512	+1107	+1882	+2609
13,000	-4183	-2759	-1747	-989	-284	+391	+1065	+1952	+2896

MAIN BEAM DB ULTIMATE LOAD 10,200 Lbs.

LOAD	STRAIN (MICRO INCH PER INCH)								
Lbs	1	2	3	4	5	6	7	8	9
4,000	-1153	-782	-532	-310	-49	+189	+408	+673	-
6,000	-1783	-1208	-813	-468	-63	+313	+654	+1060	-
8,000	-2383	-1614	-1092	-616	-81	+423	+878	+1419	-
9,000	-2798	-1879	-1342	-714	-99	+476	+999	+1608	-
10,000	-3426	-2353	-1539	-828	-121	+529	+1182	+1840	-

TABLE 5.3 STRAIN DISTRIBUTION OF MAIN BEAM

KIEM WOOD

MAIN BEAM KA ULTIMATE LOAD 11,000 Lbs.

LOAD	STRAIN (MICRO INCH PER INCH)								
Lbs	1	2	3	4	5	6	7	8	9
4,000	-814	-572	-350	-125	-4	+117	+337	+575	+821
6,000	-1176	-860	-552	-290	-11	+224	+484	+826	+1235
8,000	-1682	-1238	-815	-435	-30	+322	+818	+1224	+1686
9,000	-2130	-1489	-965	-507	-71	+430	+987	+1492	+1932
10,000	-2952	-2074	-1601	-783	-197	+425	+1125	+1932	+2236
11,000	-4836	-3193	-2186	-1176	-384	+401	+1322	+2179	+2895

MAIN BEAM KB ULTIMATE LOAD 12,000 Lbs.

LOAD	STRAIN (MICRO INCH PER INCH)								
Lbs	1	2	3	4	5	6	7	8	9
4,000	-727	-541	-355	-179	+23	+238	+478	+677	+825
6,000	-	-856	-570	-294	+24	+355	+722	+1033	+1267
8,000	-	-1220	-807	-432	+08	+469	+976	+1404	+1732
9,000	-	-1495	-987	-533	-14	+514	+1098	+1598	+1978
10,000	-	-2495	-1337	-716	-85	+547	+1232	+1820	+2280
11,000	-	-4055	-2227	-1087	-235	+544	+1384	+2099	+2662
12,000	-	-6170	-3127	-1389	-384	+507	+1450	+2237	+3276

TABLE 5.4 STRAIN DISTRIBUTION OF MAIN BEAM

TENG WOOD

MAIN BEAM TA ULTIMATE LOAD 9,100 Lbs.

LOAD	STRAIN (MICRO INCH PER INCH)								
Lbs	1	2	3	4	5	6	7	8	9
4,000	-928	-700	-501	-314	-154	+32	+231	+389	+672
6,000	-1402	-1084	-807	-523	-243	+81	+418	+709	+1034
8,000	-2432	-1703	-1152	-709	-339	+187	+893	+1476	+2081
9,000	-4087	-2935	-1893	-1122	-495	+286	+1083	+1974	+2681

MAIN BEAM TB ULTIMATE LOAD 12,000 Lbs.

LOAD	STRAIN (MICRO INCH PER INCH)								
Lbs	1	2	3	4	5	6	7	8	9
4,500	-	-671	-426	-183	+22	+250	+506	+720	+850
6,000	-	-914	-584	-259	+14	+318	+662	+952	+1124
8,000	-	-1287	-834	-387	-17	+408	+876	+1264	+1607
9,000	-	-1521	-1000	-477	-50	+441	+985	+1435	+1927
10,000	-	-2240	-1334	-632	-117	+473	+1109	+1645	+2201
11,000	-	-3404	-2014	-937	-283	+463	+1234	+1890	+2542
12,000									

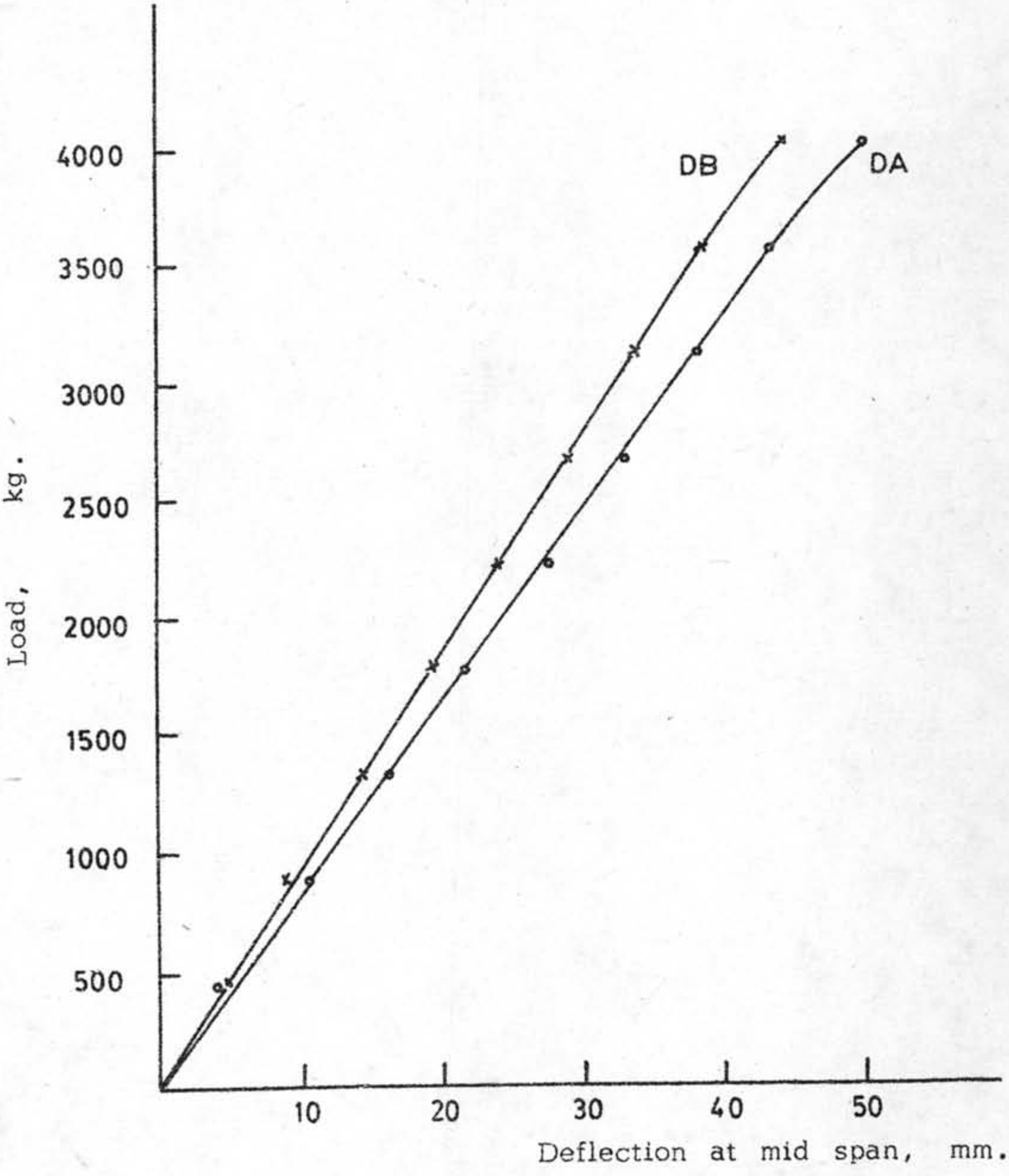


FIG. 5.3 LOAD DEFLECTION CURVE OF

MAIN BEAM DA, DB

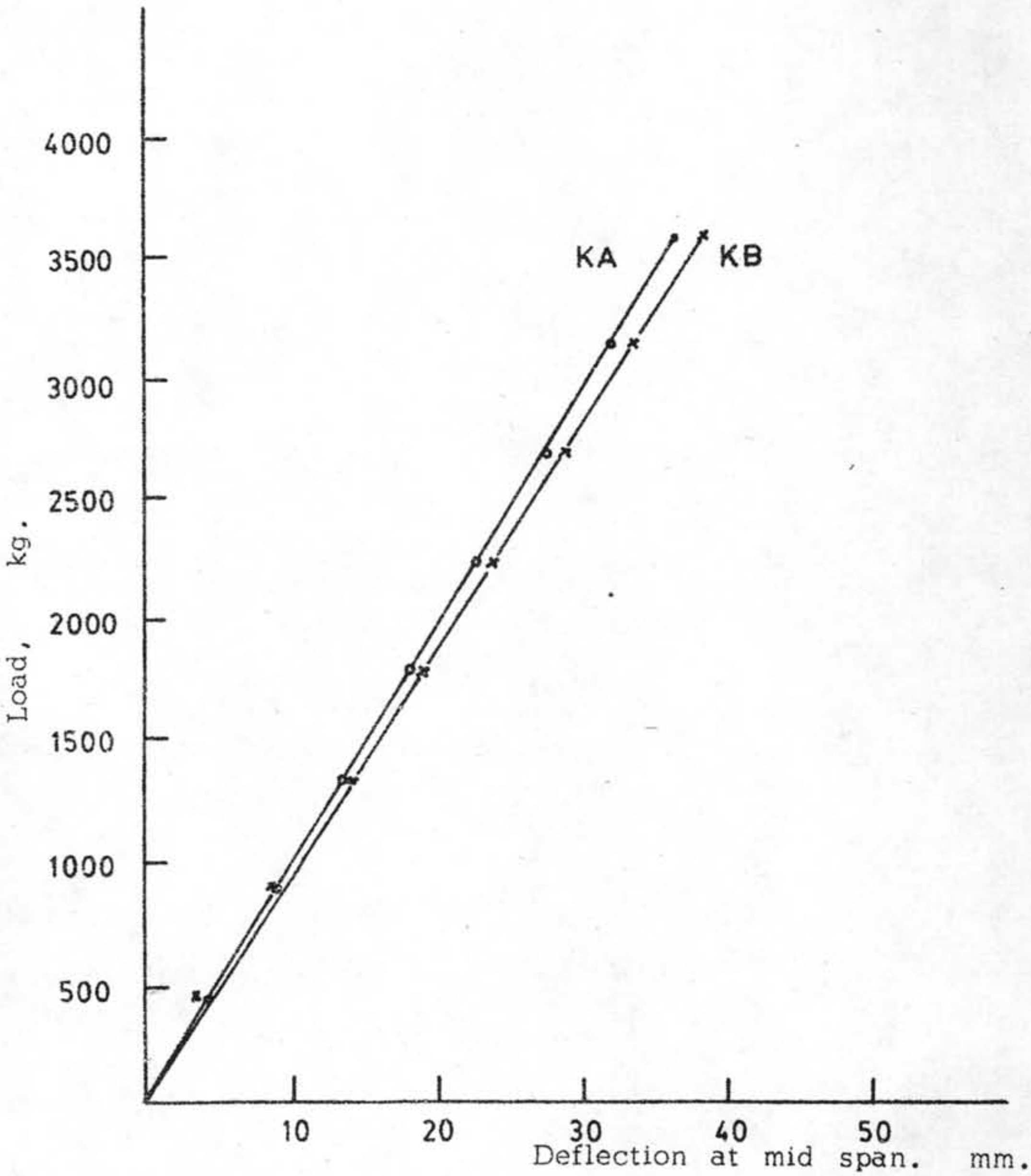


FIG. 5.4 LOAD DEFLECTION CURVE OF MAIN BEAM KA, KB.

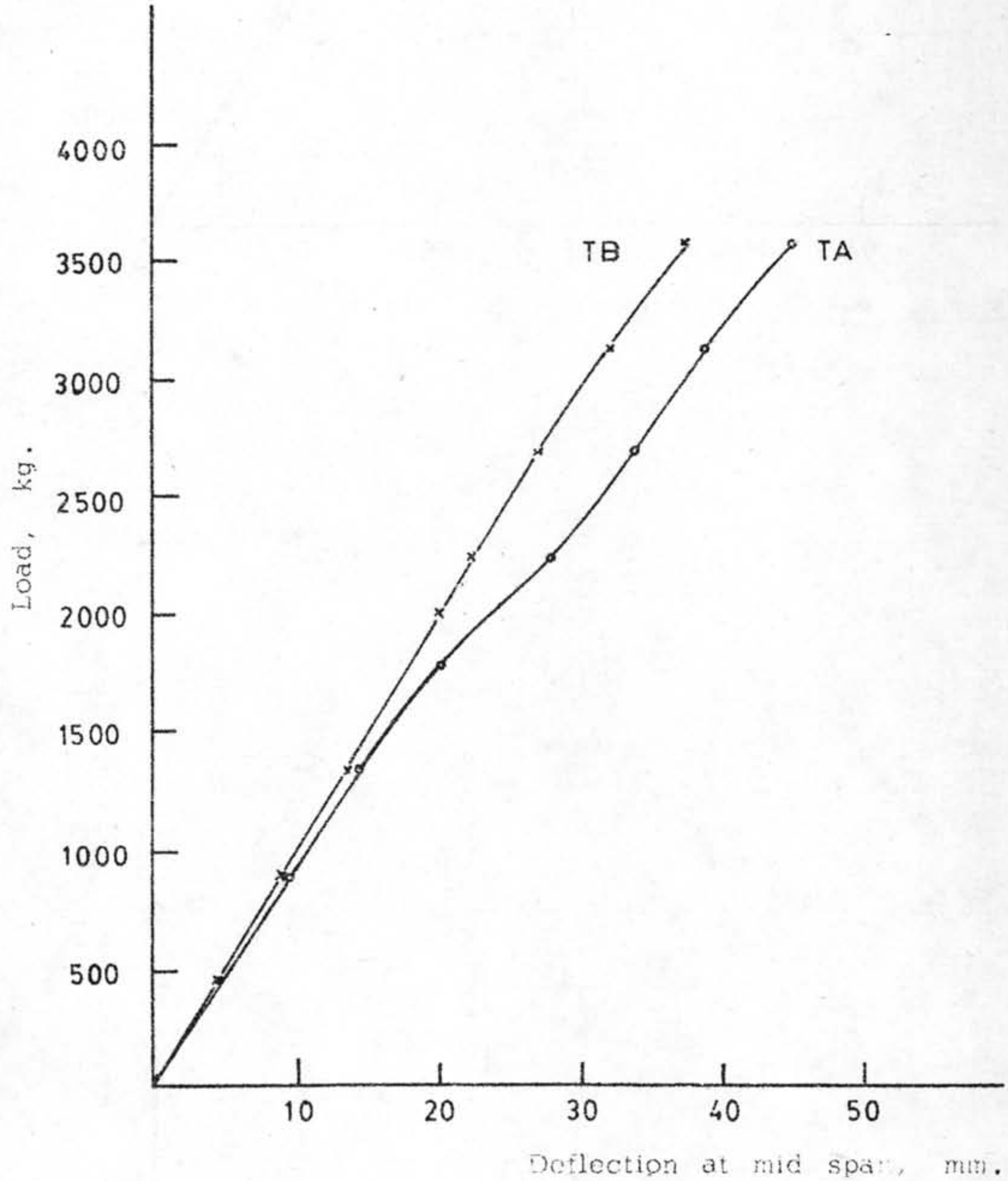


FIG. 5.5 LOAD DEFLECTION CURVE OF MAIN BEAM TA. TB.

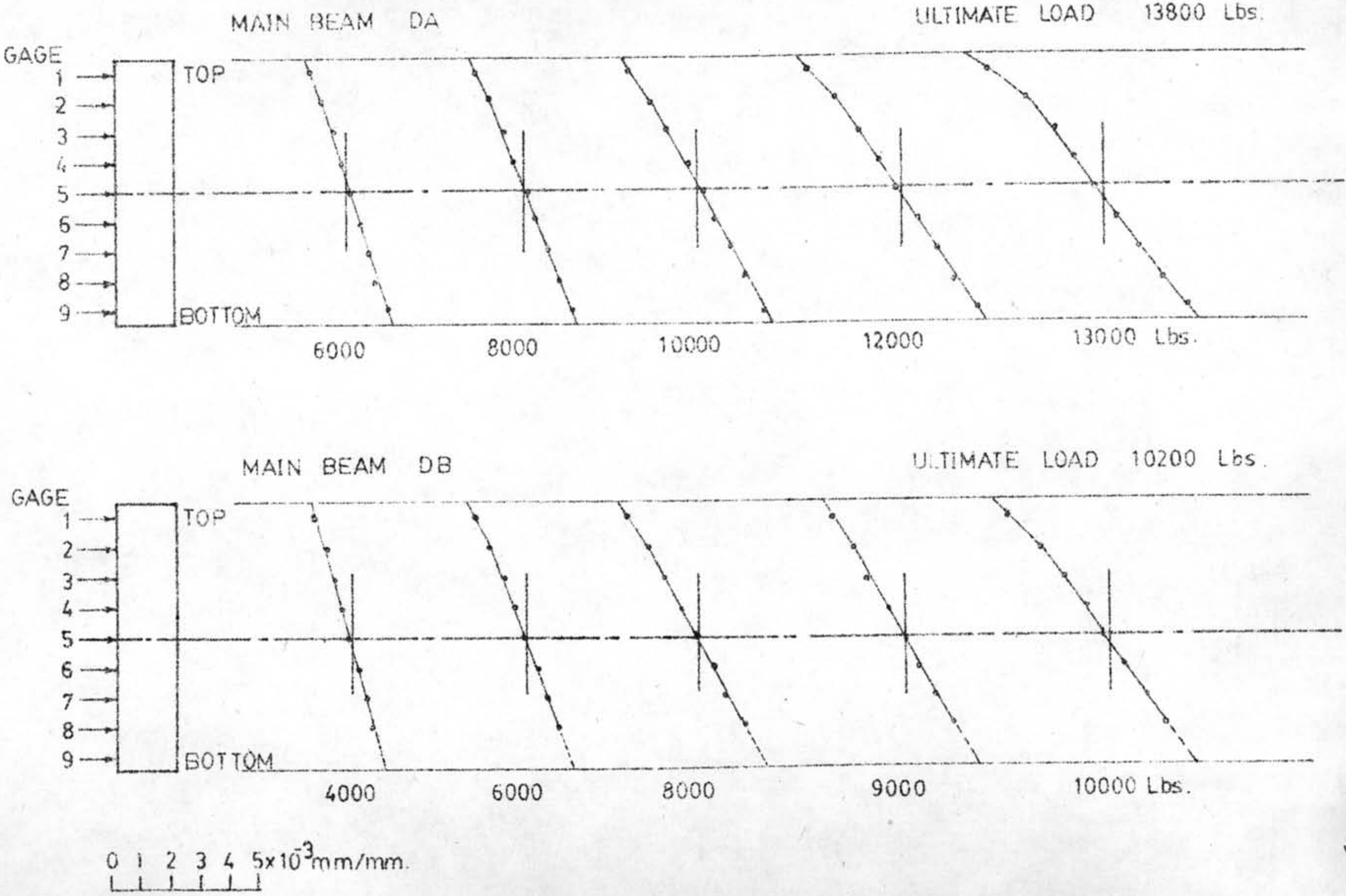


FIG. 5.6 STRAIN DISTRIBUTION AT VARIOUS LOADING

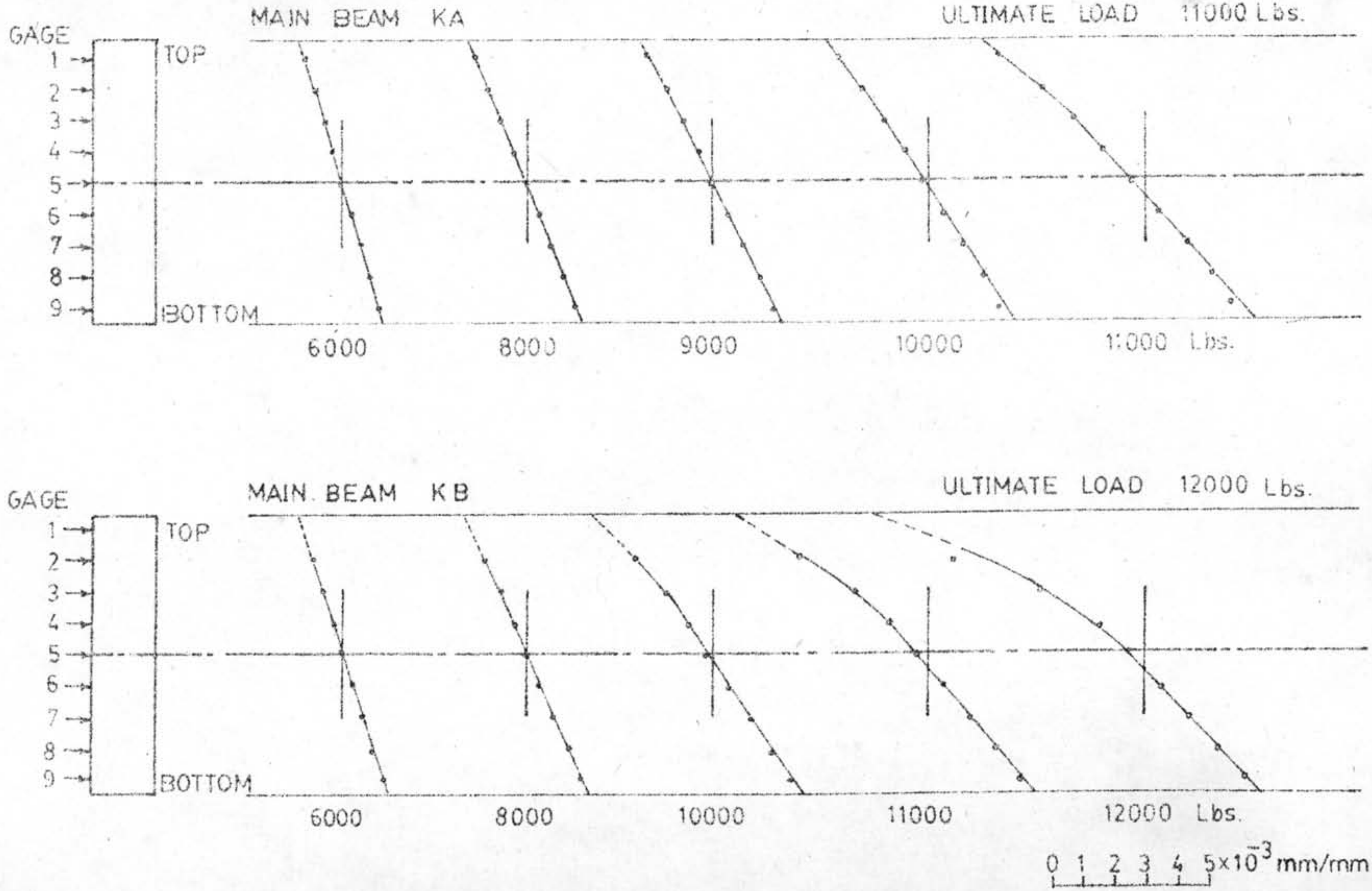


FIG 5.7 STRAIN DISTRIBUTION AT VARIOUS LOADING

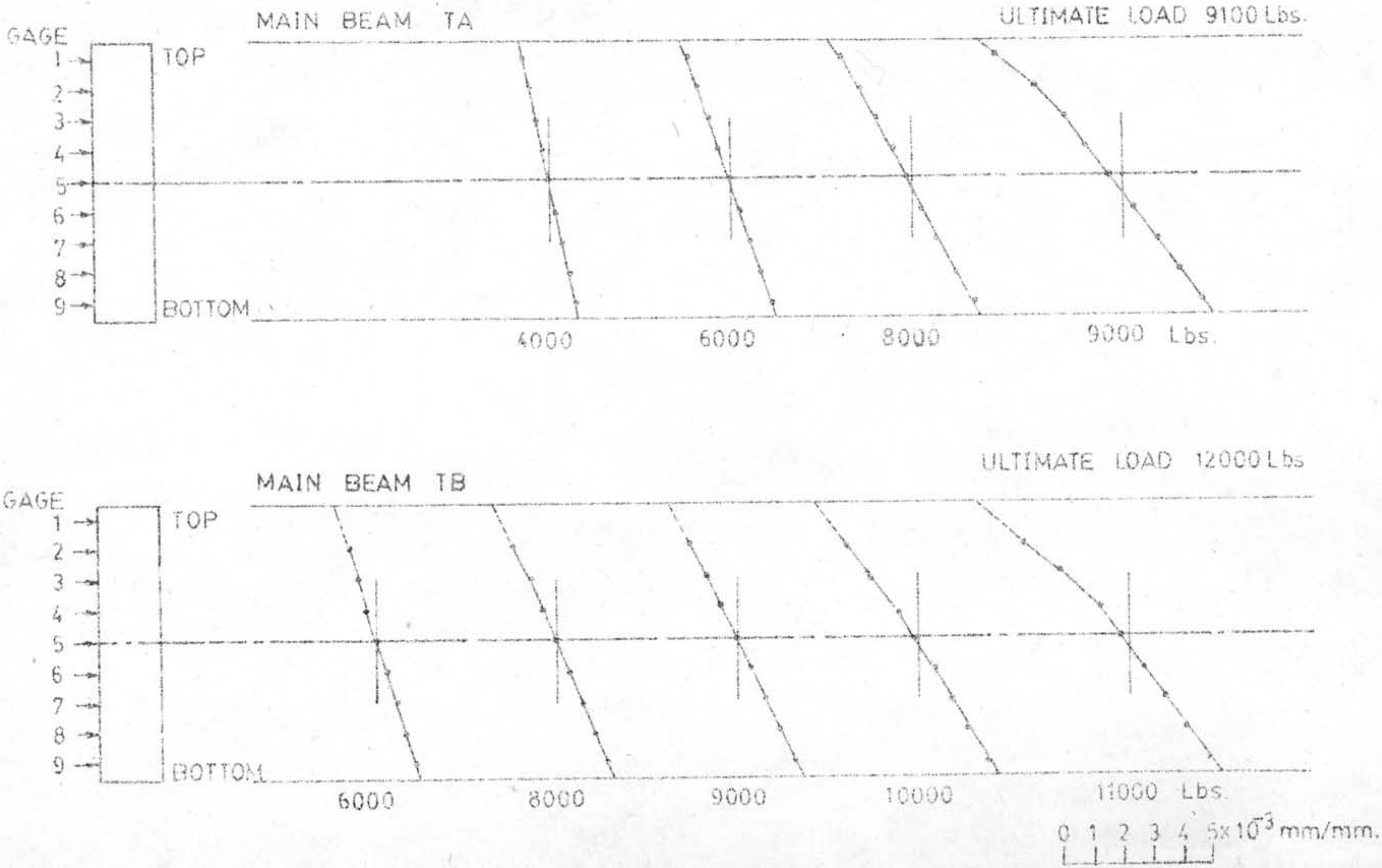
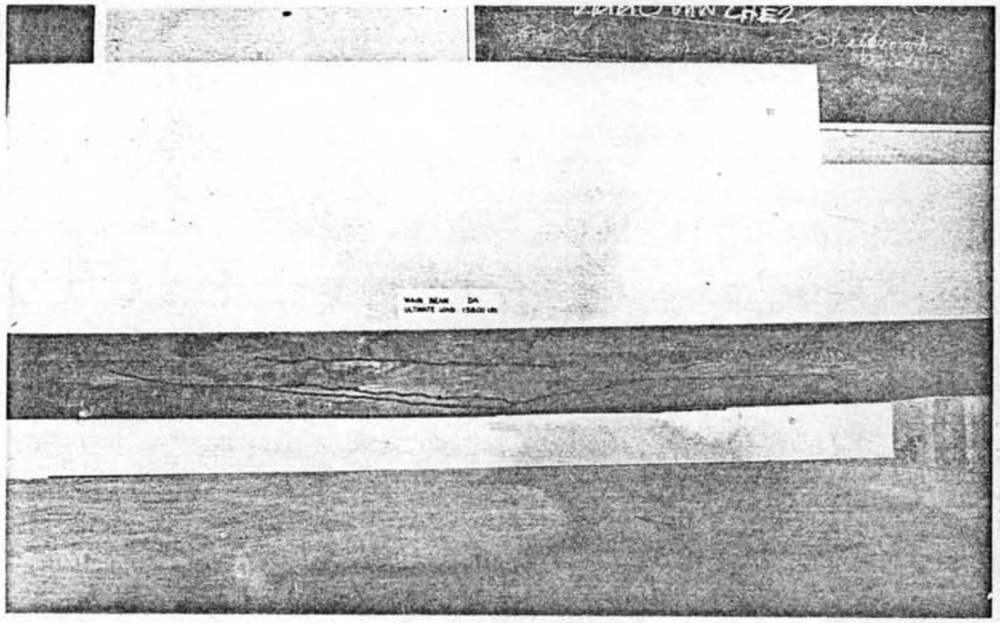


FIG 5.8 STRAIN DISTRIBUTION AT VARIOUS LOADING



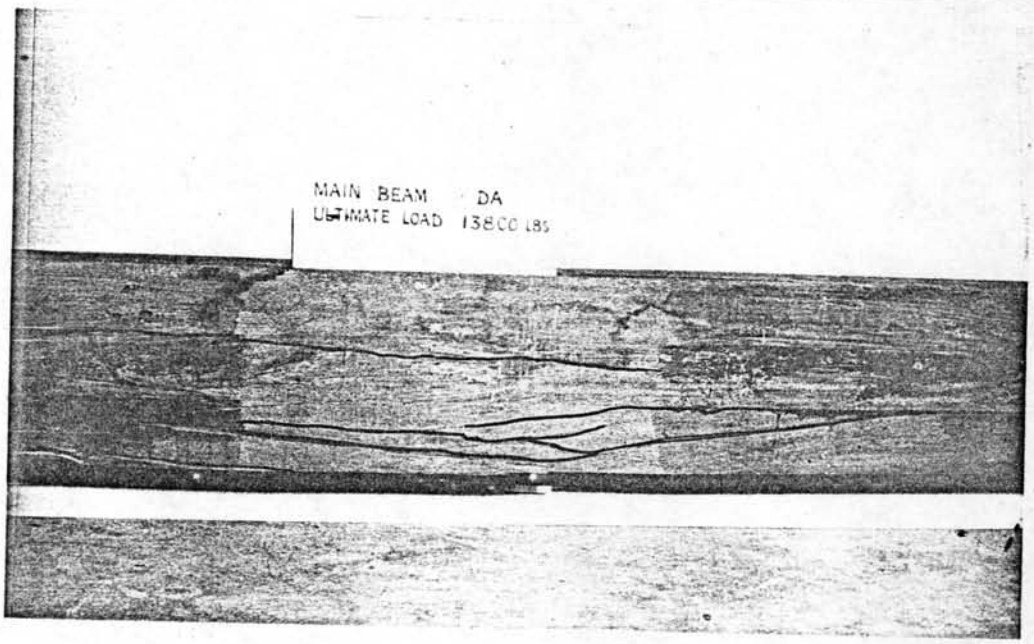
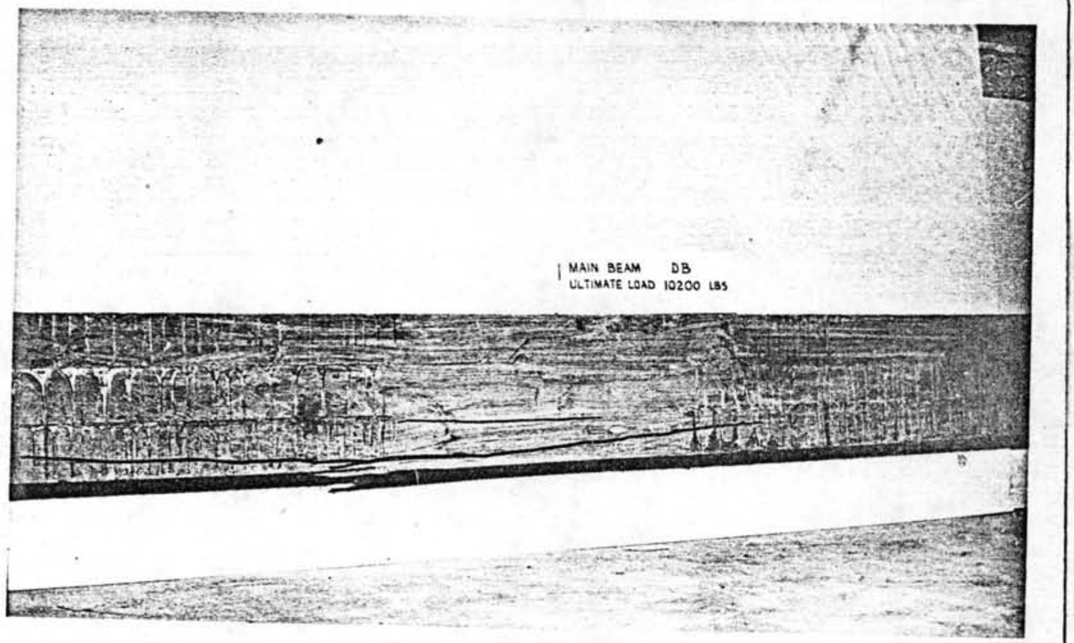


FIG. 5.9 MODE OF FAILURE OF MAIN BEAM DA



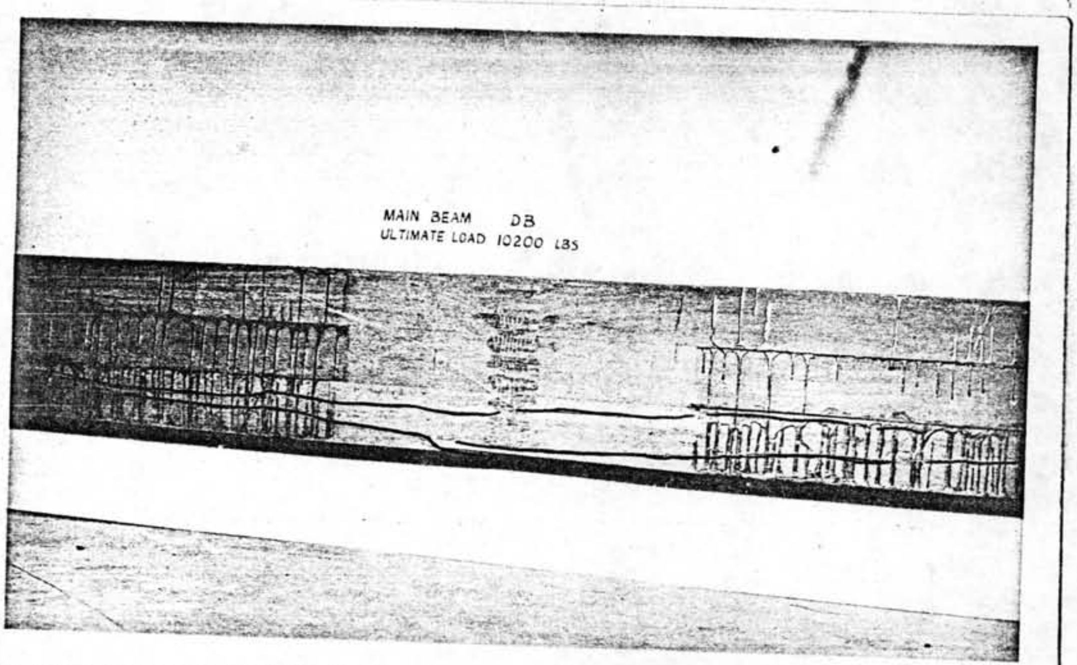
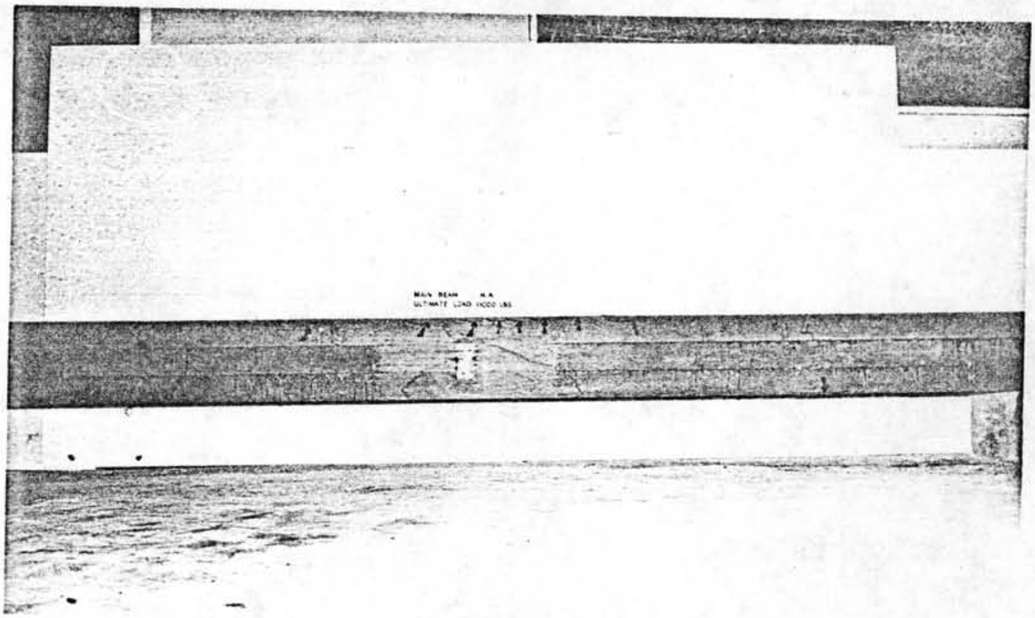


FIG. 5.10 MODE OF FAILURE OF MAIN BEAM DB



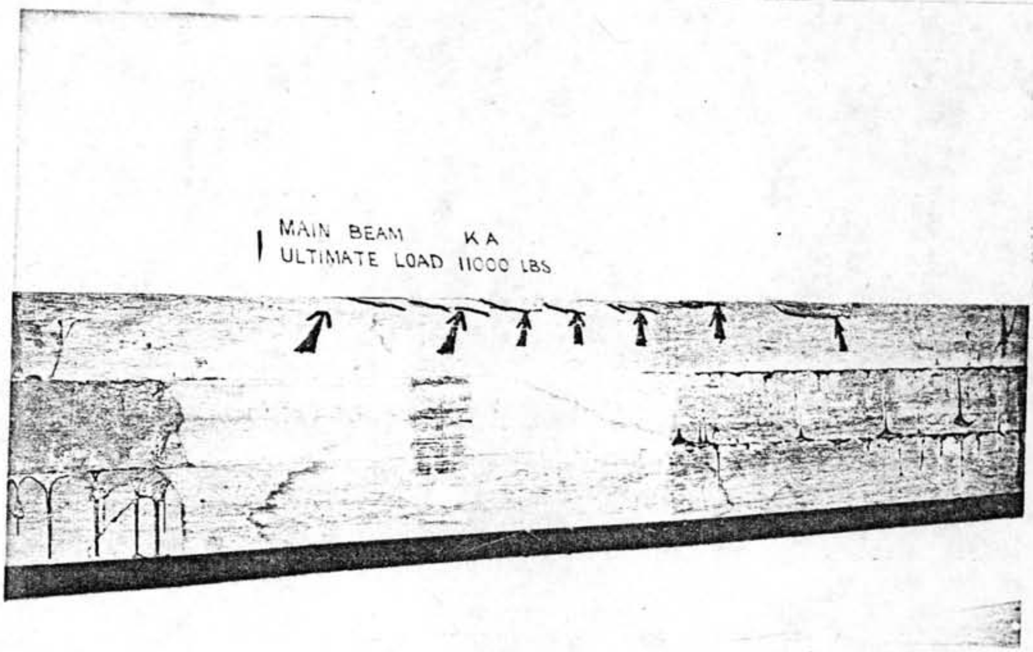
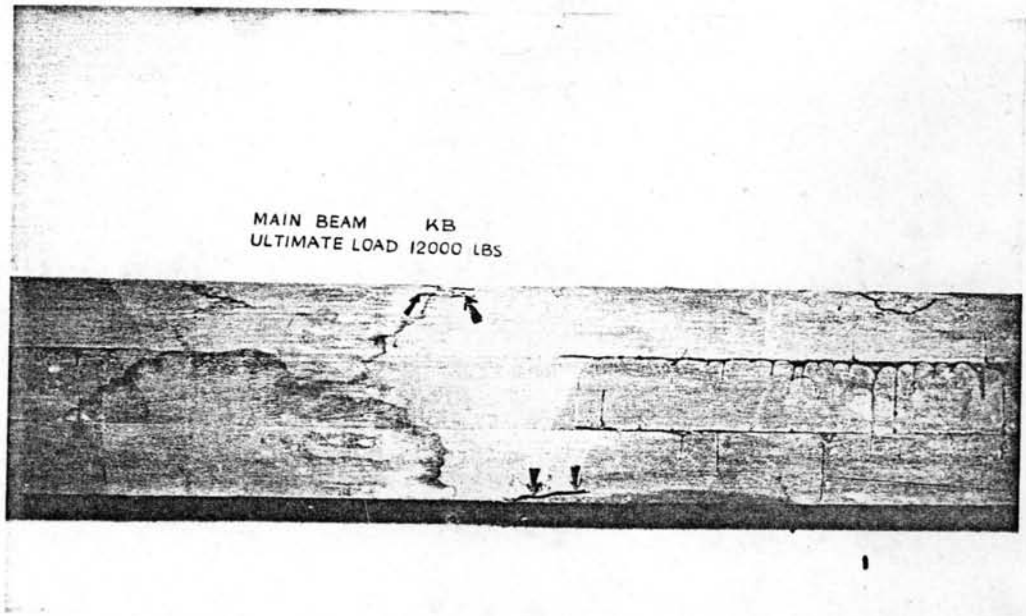


FIG. 5.11 MODE OF FAILURE OF MAIN BEAM KA



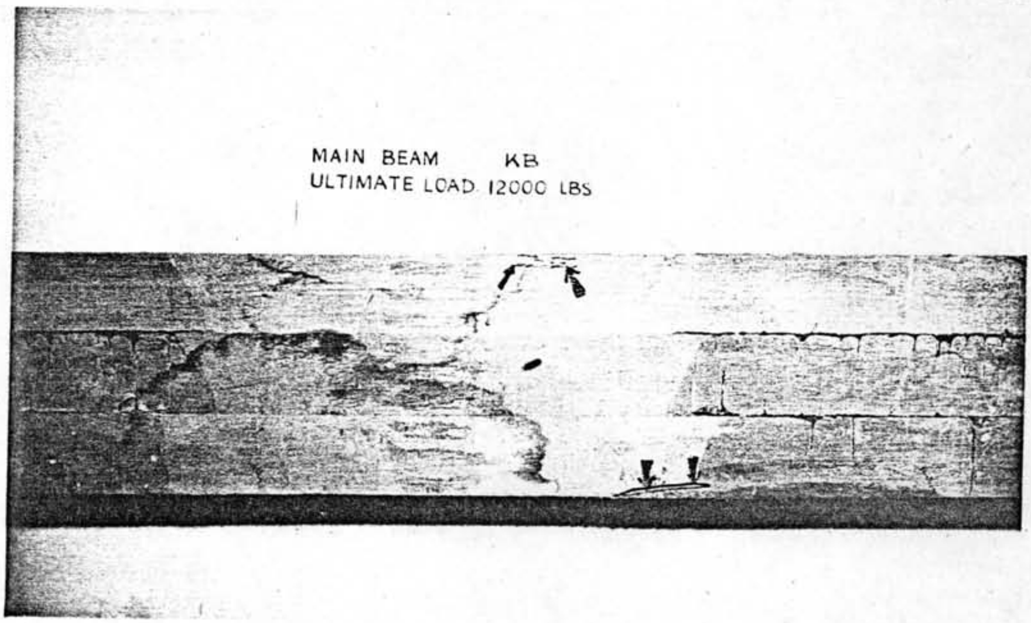
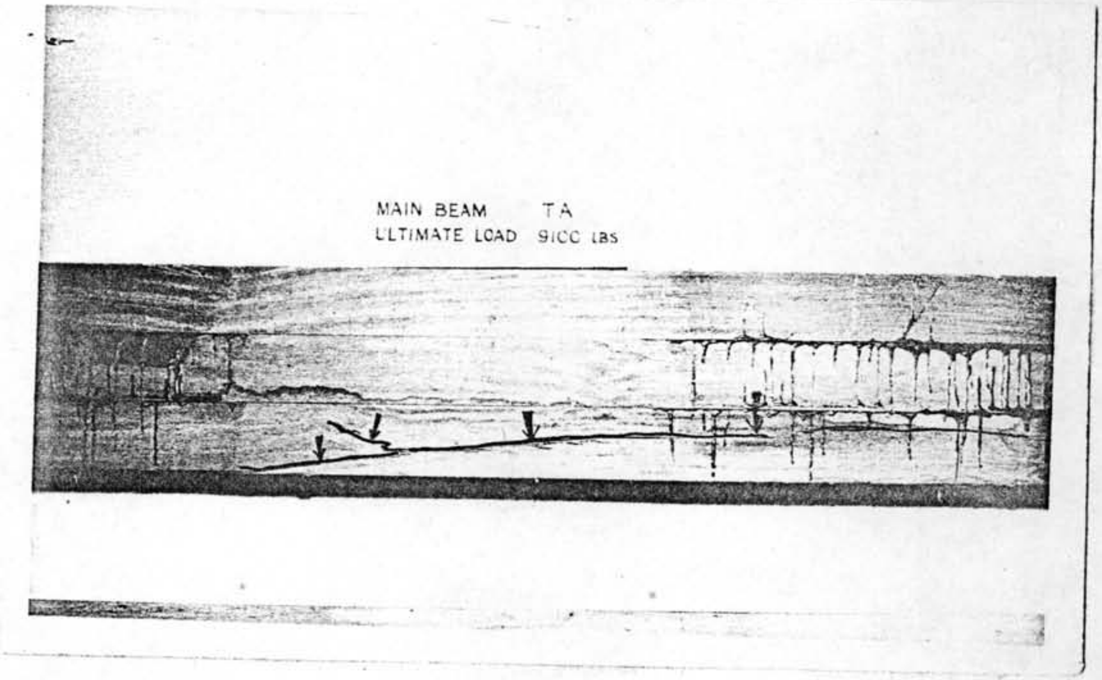


FIG. 5.12 MODE OF FAILURE OF MAIN BEAM KB



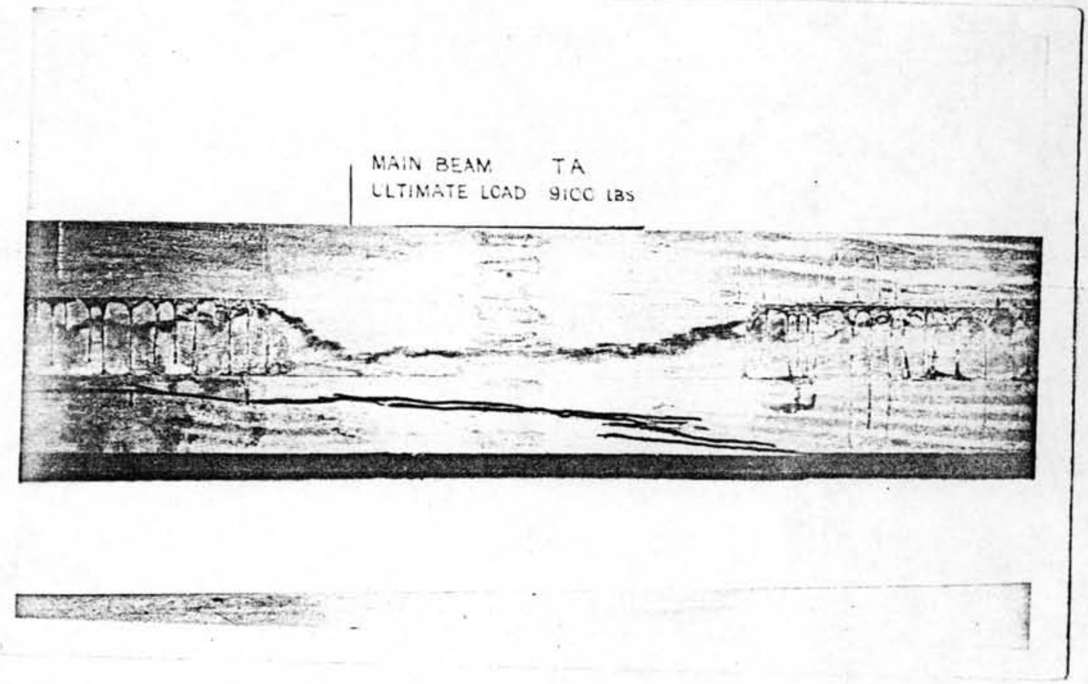
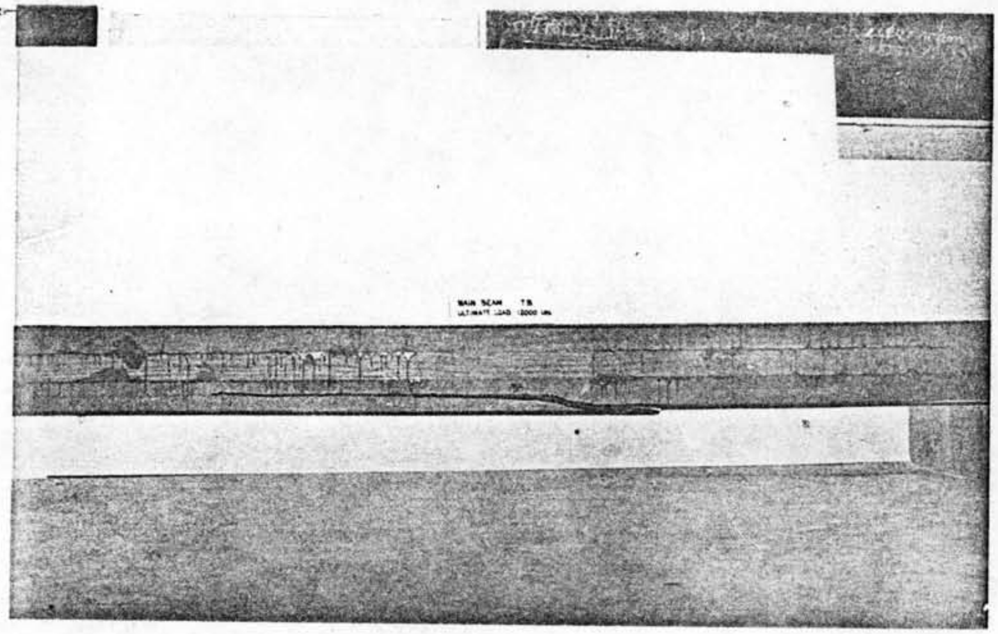


FIG. 5.13 MODE OF FAILURE OF MAIN BEAM TA



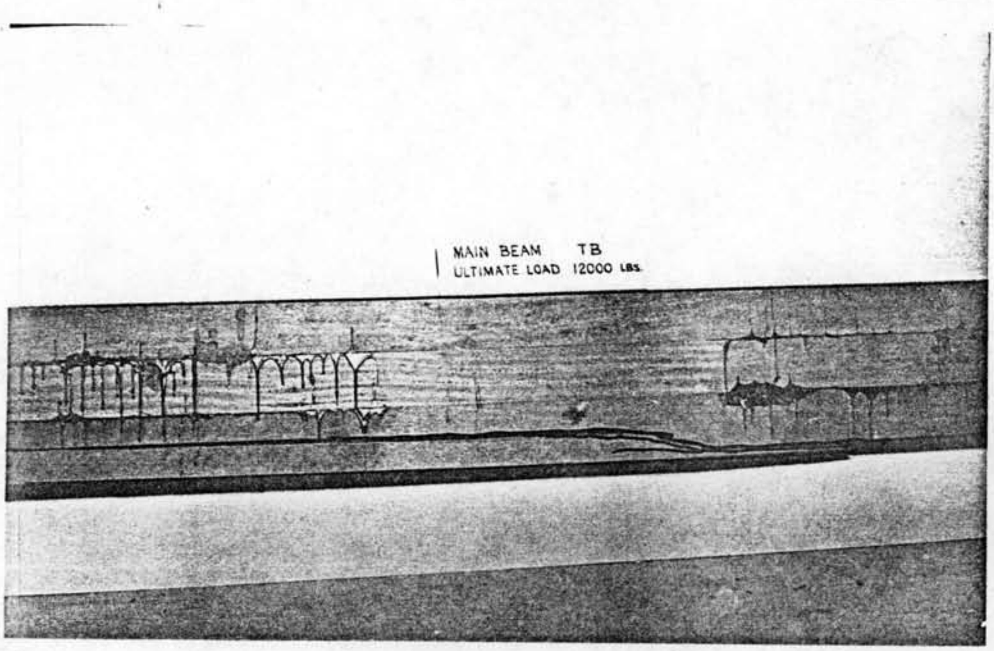


FIG. 5.14 MODE OF FAILURE OF MAIN BEAM TB