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ON CONVENTIONAL AND ATC-6 ASEISMIC BRIDGE DESIGN

THE SEISMIC DESIGN OF BRIDGES IN TAIWAN HAS BEEN BASED ON THE STATIC SEISMIC COEFFICIENT METHOD. ALTHOUGH SIMPLE, BUT THE METHOD DOES NOT CONSIDER THE EFFECTS OF BRIDGE DYNAMIC BEHAVIOR AND LOCAL SOIL CONDITION. THE MAIN OBJECTIVE OF THIS PAPER IS TO ASSESS THE ADEQUACY OF THE BRIDGE DESIGN METHOD.

BASED ON THE NEW ATC-6 SEISMIC DESIGN PREVISION PROPOSED BY THE U.S. APPLIED TECHNOLOGY COUNCIL, SIX SELECTED BOX-GIRDER R/C BRIDGES HAVE BEEN ANALYZED. THE RESULTING MEMBER FORCES AND THE REQUIRED PIER REINFORCEMENTS ARE COMPARED WITH THOSE OBTAINED BY USING THE CONVENTIONAL DESIGN METHOD. THE RESULTS INDICATE THAT THE DEGREE OF SEISMIC SAFETY (EVALUATED IN TERMS OF THE ATC-6 COMPATIBLE EQUIVALENT ACCELERATION COEFFICIENT) PROVIDED BY THE TRADITIONAL STATIC SEISMIC DESIGN METHOD VARIES SIGNIFICANTLY W.R.T. THE BRIDGE TYPES AND SOIL CHARACTERISTICS. THIS TENDS TO SUGGEST THAT THE CONVENTIONAL METHOD USED IN TAIWAN IS INADEQUATE FOR ASEISMIC BRIDGE DESIGN.

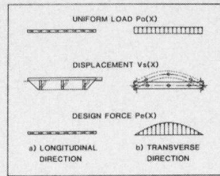


FIG 2 COMPUTATION ILLUSTRATION OF ATC6 SEISMIC DESIGN FORCE

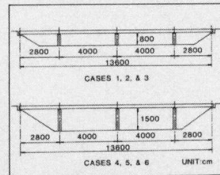


FIG 3 ELEVATIONS OF EXAMPLE FOUR-SPAN BOX-GIRDER BRIDGES

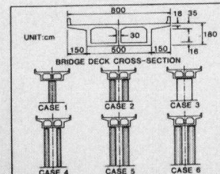


FIG 4 CROSS-SECTIONS OF EXAMPLE FOUR-SPAN BOX-GIRDER BRIDGES

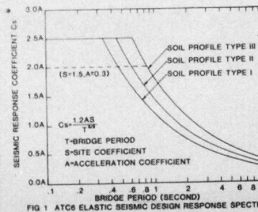


FIG 1 ATC6 ELASTIC SEISMIC DESIGN RESPONSE SPECTRA FOR BRIDGES

CASE NO.	1	2	3	4	5	6
DESCRIPTION	102m 63m	100m 60m	100m 60m	100m 60m	100m 60m	100m 60m
L	107	107	202	202	202	202
B	20.4	20.3	20.9	43.5	11.7	69.4
F	23.2	30.5	50.2	108.9	69.3	29.7
PERIOD(sec)	0.774	0.809	0.809	0.388	1.011	1.428
Cd(AAS)	1.43	1.39	1.39	0.511	0.809	0.809
Pa(T/m, AAS)	185	1767	1636	666	125	1241
a	1214	1145	114	752	3901	2723
b	1315	1428	648	3762	5140	2623
c	119	152	01	683	1038	973
PERIOD(sec)	0.898	0.791	0.227	1.096	1.307	1.136
Cd(AAS)	1.54	1.478	1.236	0.786	1.034	1.123
Pa(T/m, AAS)	2468	2377	2354	1291	16	1904

TABLE 1 COMPUTATION OF ATC6 SEISMIC DESIGN FORCES FOR DIFFERENT CASES

CASE NO.	1	2	3	4	5	6
Mx(t-m)	—	—	—	—	—	—
My(t-m)	22528	8113	17960	4075	4271	52079
RESP MODE	3	3	3	3	3	3
Mx(t-m)	1387	6773	2063	2242	5014	738
My(t-m)	—	303	—	101	256	343
RESP MODE	3	3	2	3	3	3
Mx(t-m)	4423	2281	12282	734	1038	2464
My(t-m)	2013	1052	177	711	1156	1392
V(t)	5479	2821	5715	2829	3101	327
Mx(t-m)	1307	827	3884	29	251	734
My(t-m)	6759	2253	2565	2255	1566	428
V(t)	5479	2821	5715	2829	3101	327
REINFORCE (cm)	884	451	904	432	423	432

TABLE 2 COMPUTATION OF REQUIRED PIER REINFORCEMENTS UNDER 0.3g ACCELERATION (S=1.0)

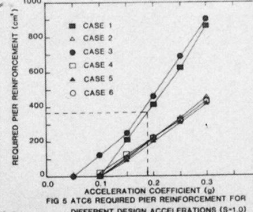


FIG 5 ATC6 REQUIRED PIER REINFORCEMENT FOR DIFFERENT DESIGN ACCELERATIONS (S=1.0)

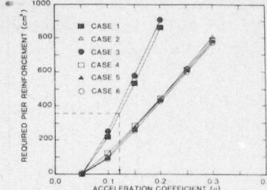


FIG 6 ATC6 REQUIRED PIER REINFORCEMENT FOR DIFFERENT DESIGN ACCELERATIONS (S=1.5)

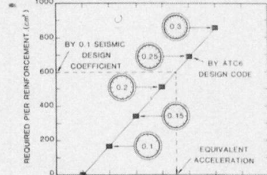


FIG 7 COMPUTATION ILLUSTRATION OF EQUIVALENT ACCELERATION COEFFICIENT

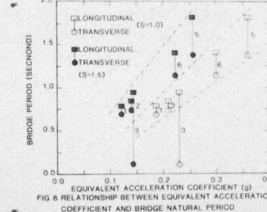


FIG 8 RELATIONSHIP BETWEEN EQUIVALENT ACCELERATION COEFFICIENT AND BRIDGE NATURAL PERIOD