CYGNA

Memorandum

NRC DOCKET NOS. 50-445/446

To: N. Williams

Date: 12/3/84

From: L. J. Weingart

Job No: 8402

Subject: CPSES IAP - Phase 3
Mass Participation Review

Copies: See Distribution

Attached is the trip report for the review performed at Gibbs & Hill's office in New York, November 26 through 30, 1984. The purpose of this review was to spot check the analyses performed as part of the Gibbs & Hill study on mass participation.

Attachment

Distribution: N. Williams, D. Wade, J. vanAmerongen, G. Bjorkman, J. Minichiello, S. Treby, J. Ellis, S. Burwell, Project File

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Trip Report, Job No. 84042
Gibbs & Hill, New York November 26-30, 1984
Submitted by L. J. Weingart

Purpose

The purpose of this trip was to spot check the reanalyses performed by Gibbs & Hill in response to Cygna's Phase 3 Potential Finding on mass participation (PFR-01) and the Observation concerning missing mass points (PI-09-01).

Background

For a Detailed explanation of the PFR and Observation refer to Appendices F and G, respectively, of the Cygna Phase 3 Final Report No. TR-84042-01.

In response to the initial finding on mass participation, Gibbs & Hill performed a study of 35 problems to determine if the added effects of higher order modes would have an adverse affect on support designs. An evaluation of these problems identified the need to analyze additional stress problems based on the percent mass participation achieved in the original analyses. At the conclusion of the reanalysis effort, 205 of the 271 large bore piping problems at CPSES, Unit 1 were rerun. The problems selected were those which exhibited less than 30% of the total mass participating or those which were subjected to steam/water hammer loads. Attachment A is a Gibbs & Hill listing of each problem and its associated mass fraction for the three principal directions.

In response to the Phase 3 Observation (PI-09-01) on missing mass points, Gibbs & Hill surveyed 10% of the large bore piping problems in order to determine extent of this error. As a result of this survey, Gibbs & Hill decided to review all of the remaining problems. This review considered the following three categories of mass point problems:

1. Missing mass point between same direction supports (this category was identified in PI-09-01).

2. Mass points located at support locations.

3. Inclusion of concentrated weights in dynamic analyses performed on ADLPIPE Version C.

The mass point reanalyses were performed in conjunction with the reanalyses performed as part of the mass participation study. Attachment B is a Gibbs & Hill listing of all problems which were reanalysed with a notation indicating the 141 which had one or more of the mass point problems described above. Once the reanalyses were complete, Gibbs & Hill ran a post processor program which listed the as-built loads, the new loads and the percentage difference. This program also combined the new loads (OBE and SSE) with the other as-built loads and compared the new upset and emergency combinations with the as-built combinations. The information was forwarded to the site for use in evaluating pipe supports and nozzle loads.

Review of Attachment A shows that there were 34 problems with mass point

problems which were not reanalyzed (1-23B and 1-23D were rerun by the site group in response to a separate issue). Gibbs & Hill did not rerun these problems because they either exhibited mass participation greater than 30% or they were not subjected to steam/water hammer loads. Gibbs & Hill used judgment based on reanalyses of similar configurations to justify not reanalyzing these systems.

Methodology

The sample size chosen for the spot check of the 207 problems was determined to be 32. This was based on Military Standard MIL-STD-105D. The selection of problems was weighted so that the majority of problems reviewed had low mass participation. The problems selected and their grouping is shown in Table 1.

TABLE 1

% Participation in As-Built Analysis	Problems Reviewed	
0 - 10	1) 1-12A	7) 1-135D
	2) 1-29V	8) 1-156
	3) 1-63C/B	9) 1-167B
	4) 1-71B	10) 1-171
	5) 1-72	11) 1-178B
	6) 1-88X	12) 2-52U
11 - 20	1) 1-19A	6) 1-67Z
	2) 1-34A	7) 1-68Y
	3) 1-42B	8) 1-86A
	4) 1-61A	9) 1-95
	5) 1-61B	
21 - 30	1) 1-10C	4) 1-66B
	2) 1-28	5) 1-67V
	3) 1-36	6) 1-79A
31 - 40	1) 1-64D	3) 1-79F
	2) 1-68T	
41 - 50	1) 1-6	
51 - 70	1) 1-1	

Trip Report, Job No. 84042
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Cygna reviewed the following items for each of the selected problems:

1. Was a mass point missing between the same direction supports?

2. Was a mass point located at a support?

3. Did the ADLPIPE Version C dynamic analysis have any concentrated weights?

4. Did the reanalysis incorporate the missing mass option of ADLPIPE Version D?

5. Were any required geometry changes made?

6. Was equation 9 combination below Code allowables for both upset and emergency in the reanalysis?

7. Did the loads from the reanalysis match those listed in the post processor output?

Results

Review of the 32 selected problems yielded the following results in answer to the seven questions posed in the previous section:

1. Two of the 32 problems contained in oversight in which a required mass point was not added (1-19A & 1-66B). Both were identical situations, i.e., no mass point between an anchor and an adjacent support. Although further review by Cygna and discussions with Gibbs & Hill indicate no potential design impact due to these oversights, this represents a statistical failure per MIL-STD-105D.

2. The inclusions of mass points at restraint locations was not part of Cygna's original concern. This is due to Cygna's belief that this will have insignificant impact on the results due to Gibbs & Hill's use of flexible supports in the ALDPIPE analyses. By doing this, the mass is not eliminated. In addition, when the missing mass option of ALDPIPE Version D is invoked, this mass is picked up as a static load on the supports. However, Cygna did identify two problems of the total of 32 reviewed in which the analyst failed to move the mass point from the support location (1-19A and 1-36).

3. Gibbs & Hill categorized concentrated weights as a mass point problem because they had independently discovered that ADLPIPE Version C did not lump these properly in dynamic analyses. This program error was

corrected in Version D and thus was automatically accounted for in all reanalyses.

4. The version of ADLPIPE used by Gibbs & Hill for the reanalyses performed in this study automatically invoked the missing mass option. Cygna's review of the outputs confirmed this fact.

5. This review noted two situations in which corrections noted by the analyst were not incorporated into the reanalysis. The first, in problem 1-29V, was a situation in which a mass point was not added between supports on the containment spray ring. This was determined not to have any impact on the design due to the symetrical configuration and the uniformity of loads on the remaining supports. The second case, problem 1-36, was identified above in Item 2. Cygna reviewed the adjacent supports and determined that there was sufficient margin in the support design to accommodate any possible increases in loads.

6. Review of the 32 problems showed that in all cases the equation 9 combination was below Code allowables for both upset and emergency conditions.

7. One analysis was identified (1-63CB) in which the post processor loads did not match the loads in the reanalysis. This was due to the fact that the analysis had been rerun with a lower localized spectra in order to lower some of the support loads.

The completed checklists used in this review are provided as Attachment C.

Discussions with Henry Mentel of Gibbs & Hill revealed that the evaluation of the mass point problems which were not rerun was not documented. Further review revealed that of the 34 problems, 13 were problems in which a mass point was required between restraints. A listing of these problem numbers follows:

1) 1-12B
2) 1-31
3) 1-46A
4) 1-52U
5) 1-57
6) 1-62B
7) 1-63A
8) 1-77
9) 1-92B
10) 1-93A
11) 1-94
12) 1-151C
13) 2-68X

Attachment A

6614 PROBLEM NO VS. MASS FRACTION

PROBLEM	P_E	MASS FRACTIONS X	Y	Z	HOW DETERMINED VERS. D.	HAND	P_A
1	8	.921	.663	.711	X		8
2	8	.824	.924	.795	X		9
3	10	.861	.933	.828	X		10
4	8	.928	.920	.732	X		9
5	4	.787	.674	.297	X		4
6	6 ~~UNC~~	.591	.467	.577	X		6
7	6? UNC	.680	.736	.503	X		7
8	6? UNC	.505	.482	.700	X		6
9A	6	.369	.462	.947		X	5
9B	4 ~~5~~	.287	.272	.061	X		2
9C	5	.302	.309	.945		X	5
9D	6	.376	.466	.949		X	5
10A	4	.597	.226	.275	X		4
10B	4	.461	.183	.480	X		3
10C	5	.472	(.294 ~~.244~~)	.498	X		6
10D	4	.633	.261	.365	X		4
11A	4	.570	.267	.410	X		4
11B	3 ~~6~~	.569	.163	.449	X		3
11C	3	.253	.130	.615	X		3
12A	3	.269	.442	.061	X		2
12B	6 ~~UNC~~	.548	.415	.891		X	6
12D	5	.475	.298	.406	X		4
12E	4	.617	.239	.489	X		4
19A	4	.490	.152	.364	X		3
19B	2	.474	.049	.284	X		2
19C	4	.430	.152	.200	X		3
21	6	.549	.408	.756		X	6
23A	2				—	—	2
23B	2				—	—	2
23C	2 ~~UNC~~				—	—	2
23D	2				—	—	2
24	3	.489	.514	.531	X		6
27	2	.56	.016	.489	X		2
28	4 ~~6~~	.429	.284	.663	X		4
29K	3	.182	.568	.188	X		3
29L	3	.159	.551	.215	X		3
29M	4	.246	.466	.247	X		4
29N	2	.085	.635	.176	X		2
29Q	3	.312	.180	.316	X		3
29P	4	.275	.023	.276	X		2
29S	UNC	STATIC			—	—	—

PROBLEM	P_E	MASS FRACTIONS X	Y	Z	HOW DETERMINED VERS. D.	HAND	P_A
29U	2	.168	0.0	.322	X		2
29V	2 ~~UNC~~	.160	.000	.310	X		2
29W	2	.216	.004	.287	X		2
29X	2	.213	.000	.297	X		2
29Y	2	.264	.01	.237	X		2
29Z	2	.237	.000	.224	X		2
30	4 ~~&~~	.739	.566	.238	X		4
31	5	.616	.416	.699		X	6
32	4	.589	.251	.413	X		4
33	4	.503	.374	.209	X		4
34A	3	.498	.306	.202	X		4
34B	4 ~~5~~	.467	.251	.416	X		4
34C	4	.420	.248	.308	X		4
35A	4	.345	.468	.162	X		3
35B	5	.499	.544	.374		X	5
35C	4	.367	.473	.290	X		4
35D	5 ~~UNC~~	.543	.572	.339		X	5
35E	3	.303	.120	.261	X		3
35F	4 ~~5~~	.505	.227	.514	X		4
36	4 ~~UNC~~	.295	.239	.268	X		4
37B	3	.620	.188	.589	X		3
37W	4 ~~5~~	.293	.360	.269	X		4
37X	2	.270	.056	.306	X		2
37Y	4	.234	.451	.258	X		4
37Z	5	.389	.354	.426		X	5
40	7	.512	.393	.474		X	5
42A	5	.300	.187	.288	X		3
42B	3	.347	.188	.335	X		3
45Q	3	.200	.125	.304	X		3
45R	3	.200	.237	.295	X		3
45S	4 ~~UNC~~	.161	.105	.224	X		3
45T	7	.411	.434	.744		X	6
46A	7	.562	.443	.634		X	6
46B	3	.742	.046	.539	X		2
47B	4 ~~UNC~~	.625	.222	.418	X		4
51A	4 ~~5~~	.387	.212	.355	X		4
51C	2	.410	.134	.216	X		3
51D	4 ~~UNC~~	.259	.203	.397	X		4
52U	7	.582	.523	.511		X	7
52V	4	.304	.227	.384	X		4
52W	5	.286	.300	.336	X		4

PROBLEM	P_E	MASS FRACTIONS X	Y	Z	HOW DETERMINED VERS. D.	HAND	P_A
52Y	7	.422	.359	.377		X	5
52Z	3	.388	.083	.097	X		2
55A	3	.235	.198	.185	X		3
55B	4	.187	.284	.282	X		3
65C	3	.231	.150	.262	X		3
55D	3	.204	.207	.310	X		4
57	5	.468	.30004	.505		X	5
58	6	.751	.415	.386		X	5
59A	5	.434	.335	.361		X	5
59B	4	.265	.262	.428	X		4
59C	3	.279	.134	.319	X		3
59D	3	.090	.379	.625	X		2
60	7	.498	.464	.488		X	6
61A	3	.502	.203	.277	X		4
61B	4	.490	.167	.355	X		3
61C	4	.232	.230	.360	X		4
61D	4	.535	.186	.360	X		3
61E	5	.410	.351	.356		X	5
61F	2	.021	.349	.208	X		2
62A	4	.429	.253	.748	X		4
62B	7	.686	.563	.671		X	7
62C	3	.491	.471	.281	X		4
62D	5	.506	.353	.611	X		5
62E	6	.659	.498	.577		X	6
62F	7	.559	.667	.564		X	7
62G	5	.652	.586	.329		X	5
62X	4	.243	.417	.375	X		4
62Y	4	.232	.325	.411	X		4
62Z	3	.299	.284	.682	X		4
63A	5	.543	.344	.715		X	5
63C/B	4	.469	.002	.112	X		2
63D	4	.328	.291	.586	X		4
64A	3	.364	.094	.157	X		2
64B	4	.708	.215	.321	X		4
64C	3	.060	.545	.276	X		2
64D	4	.48	.352	.817	X		5
64E	2	.794	.880	.037	X		2
64F	4	.324	.286	.467	X		4
65	3	.371	.147	.525	X		3
66A	3	.493	.171	.410	X		3
66B	4	.487	.24	.524	X		4

PROBLEM	P_E	MASS FRACTIONS X	Y	Z	HOW DETERMINED VERS. D.	HAND	P_A
G7T	4	.572	.482	.492	X		6
G7U	6	.601	.447	.565		X	6
G7V	4	.448	.270	.786	X		4
G7X	7	.546	.524	.555		X	7
G7Y	7	.631	.579	.589		X	7
G7Z	3	.326	.146	.290	X		3
G8T	5	.342	.352	.462	X		5
G8U	5	.605	.318	.487	X		5
G8V	3	.124	.533	.468	X		3
G8X	6	.426	.369	.494	X		5
G8Y	3	.540	.160	.290	X		3
G8Z	4	.476	.615	.534	X		6
69	5	.505	.265	.263	X		4
70	4	.454	.313	.478	X		5
71A	6	.496	.317	.702		X	5
71B	2	.378	.095	.596	X		2
72	2	.627	.250	.045	X		2
73	4	.680	.112	.110	X		3
74	3	.333	.156	.217	X		3
75	4 5	.595	.294	.493	X		4
76A	5	.568	.388	.604		X	5
76B	6	.396	.714	.451		X	5
77	6	.622	.463	.510		X	6
78	2	.504	.435	.624	X		6
79A	4 X	.359	.504	.260	X		4
79B	4 X	.393	.493	.241	X		4
79C	4 X	.377	.512	.227	X		4
79D	4 X	.348	.476	.255	X		4
79E	3	.241	.196	.118	X		3
79F	4 one	.308	.423	.715	X		5
80A	4	.29	.32	.503	X		4
80B	4	.742	.435	.209	X		4
80C	8	.707	.634	.786	X		8
80D	7	.341	.316	.491	X		5
81	4	.328	.21	.365	X		4
86A	3	.492	.143	.228	X		3
86B	3	.509	.127	.159	X		3
86C	3 one	.509	.127	.159	X		3
87A	5 one	.494	.436	.313		X	5
87B	4 one	.464	.624	.289	X		4
87C	2	.571	.102	.115	X		3

PROBLEM		MASS FRACTIONS			HOW DETERMINED		PA
		X	Y	Z	VERS. D.	HAND	
88D	2	.015	.708	.670	X		2
88E	4 X	.259	.314	.582	X		4
88W	2	.408	.732	.066	X		2
88X	2	.387	.003	.562	X		2
88Y	3 ~~UNC~~	.730	.161	.619	X		3
88Z	UNC	STATIC			—	—	—
89	4	.226	.357	.271	X		4
90	3	.580	.183	.153	X		3
91	4	.361	.225	.233	X		4
92A	3	.215	.126	.192	X		3
92B	5	.331	.328	.329		X	5
93A	7	.545	.667	.682		X	7
93B	5	.466	.441	.445	X		6
94	6	.618	.397	.515		X	5
95	3 ~~UNC~~	.352	.194	.380	X		3
96A	2	.139	.012	.063	X		2
96B	2	.03	.017	.198	X		2
96C	2	.126	.137	.024	X		2
96D	2 ~~UNC~~	.117	.115	.075	X		2
97A	3	.115	.125	.240	X		3
97B	3 X	.752	.118	.143	X		3
97C	4	.736	.276	.393	X		4
97D	3	.817	.184	.247	X		3
135A	3	.249	.324	.813	X		4
135B	6	.303	.335	.637		X	5
135C	2 ~~UNC~~	.472	.064	.407	X		2
135D	2	.525	.003	.602	X		2
135E	UNC.	NO SEISMIC.			—	—	—
135F	8 ~~UNC~~	1.278	.687	.813		X	8
150F	2	.618	.107	.230	X		3
150G	3	.451	.155	.187	X		3
150H	3	.465	.152	.188	X		3
150I	3	.494	.121	.193	X		3
150J	3	.498	.168	.183	X		3
151A	11	.64	.837	.575		X	7
151B	9	.804	.689	.524		X	7
151C	7	.773	.528	.36		X	5
151D	3	.137	.193	.349	X		3
152	4	.324	.172	.612	X		3
153	4	.197	.206	.273	X		3
154	5	.30	.217	.237	X		4
155	3	.40	.14	.48	X		3

PROBLEM	P_E	MASS FRACTIONS X	Y	Z	HOW DETERMINED VERS. D.	HAND	P_A
156	2	.362	.027	.289	X		2
157A	9	.801	.806	.886		X	10
157B	4	.223	.234	.301	X		4
* 157C	6	.459	.459	.516		X	6
158A	5	.323	.529	.677	X		5
158B	4 ~~8~~	.379	.288	.348	X		4
158C	6 ~~UNC~~	.461	.724	.549		X	6
163	3	SUBMERGED			—	—	—
165A	2	.575	.410	.087	X		2
165B	3	.575	.410	.087	X		2
165C	3 ~~UNC~~	.220	.250	.184	X		3
165D	3 ~~UNC~~	.154	.205	.137	X		3
165E	11	.443	.810	.554		X	6
165F	2	.088	0.0	.100	X		2
165G	2 ~~UNC~~	SUBMERGED			—	—	—
165H	3 ~~UNC~~	.107	.158	.421	X		3
166A	2 ~~UNC~~	.077	.022	.098	X		2
166B	2	.099	.001	.225	X		2
166C	2	.086	.001	.219	X		2
166D	2	.082	.001	.232	X		2
167A	3	.165	.334	.370	X		3
167B	3	.014	.242	.266	X		2
167C	5	.355	.366	.243	X		4
167D	2	.111	.105	.414	X		3
167E	3	.014	.239	.261	X		2
167F	3	.42	.339	.117	X		3
168	4	.465	.299	.707	X		4
169	2	.141	.025	.793	X		2
170	2	.146	.032	.77	X		2
171	2	.146	.014	.824	X		2
172	2	.176	.019	.786	X		2
174	3	.436	.018	.239	X		2
175	4	.590	.279	.244	X		4
178A	7	.571	.476	.601		X	6
178B	2	.435	.055	.256	X		2
179	4 ~~8~~	.250	.034	.568	X		2
180	5	.390	.459	.373		X	5
186	2	SUBMERGED			—	—	—
188	4	.371	.210	.607	X		4
189	4 ~~6~~	.439	.236	.485	X		4
2-51A	4	.422	.189	.403	X		3

PROBLEM	P_E	MASS FRACTIONS X	Y	Z	HOW DETERMINED VERS. D.	HAND	P_A
2-52B	5	.308	.32	.481		X	5
2-52U	2	.048	.068	.634	X		2
2-61B	3	.539	.187	.662	X		3
2-61E	5 ~~WRONG~~	.489	.371	.622		X	5
2-62D	5	.364	.52	.661		X	5
2-63B	7	.766	.568	.772		X	7
2-67T	5 ~~WRONG~~	.567	.364	.479		X	5
2-67X	8	.708	.551	.741		X	7
2-68T	7	.592	.442	.659		X	6
2-68X	7	.806	.452	.561		X	6
2-97D	7	.624	.555	.852		X	7
2-99A	5	.576	.350	.353		X	5
2-99B	4	.246	.235	.300	X		4
2-150F	3	.437	.168	.188	X		3
2-150G	3	.451	.155	.187	BY X COMBINATION		3
2-150H	3 ~~WRONG~~	.465	.152	.188	BY X COMBINATION		3
2-150I	3	.530	.158	.206	X		3
2-150J	3	.508	.184	.203	X		3
2-181	3	.349	.181	.541	X		3
					203	57	
					260		
					4	[illegible]	
					3	[illegible]	
					1	[illegible]	
					2	[illegible]	

Attachment B

TO: NANCY WILLIAMS
CYGNA ENERGY SERVICES.
CAMB.

FROM: HENRY MENTEL
GIBBS & HILL INC. N.Y.

11/21/84

271 PROBLEMS TOTAL

* = PROBLEMS REANALYZED IN GLN N.Y. (203)

M = PROBLEMS WITH MASS POINT SPACING OR CONCENTRATED WT. DISCREPANCIES (141)

* M = REANALYZED WITH MODIFICATIONS TO MP AND OR CONC WT. (105)

1 * M	29N *	46A M	62Y * M	77 M	96C * M	165E	2-67X M
2 * M	29Q *	46B *	62Z * M	78 * M	96D *	165F *	2-68T
3 * M	29P *	47B * M	63A M	79A * M	97A *	165G	2-68X M
4 * M	29S	51A *	63C/B * M	79B * M	97B *	165H *	2-47D M
5 * M	29T	61C * M	63D * M	79C *	97C *	166A *	2-99A M
6 * M	29U *	51D * M	64A * M	79D *	97D *	166B *	2-99B * M
7 * M	29V * M	52U M	64B * M	79E * M	136A *	166C *	2-150F *
8 * M	29W *	62V * M	64C *	79F * M	135B	166D *	2-150G *
9A	29X *	52W * M	64D * M	80A * M	135C *	167A * M	2-150H *
9B *	29Y *	52X *	64E *	80B * M	135D * M	167B * M	2-150I * M
9C	29Z *	52Y M	64F *	80C *	135E	167C *	2-150J *
9D	30 *	52Z *	65 * M	80D * M	135F	167D * M	2-181 *
10A * M	31 M	55A * M	66A * M	81 *	150F *	167E * M	
10B * M	32 * M	55B *	66B * M	86A * M	150G *	167F * M	
10C * M	33 * M	55C * M	66C M	86B *	150H *	168 * M	
10D *	34A * M	55D * M	67T * M	86C *	150I *	169 * M	
11A * M	34B * M	57 M	67U M	87A M	150J *	170 * M	
11B * M	34C * M	58	67V * M	87B *	151A	171 * M	
11C * M	35A * M	59A M	67X	87C *	151B	172 * M	
12A * M	35B	59B * M	67Y M	88C *	151C M	174 *	
12B M	35C *	59C * M	67Z * M	88D *	151D *	175 *	
12D * M	35D	59D *	68T * M	88E *	152 * M	178A	
12E * M	35E *	60	68U * M	88W *	153 *	178B * M	
19A * M	35F *	61A * M	68V *	88X * M	154 *	179 *	
19B *	36 * M	61B * M	68X * M	88Y * M	155 *	180 M	
19C *	37B *	61C * M	68Y * M	88Z	156 * M	186	
21 M	37W * M	61D * M	68Z *	89 * M	167A	188 *	
23A M	37X *	61E M	69 *	90 *	157B * M	189 *	
23B M	37Y *	61F * M	70 * M	91 * M	157C M	2-51A * M	
23C M	37Z	62A *	71A	92A * M	158A *	2-61D *	
23D M	40	62B M	71B * M	92B M	158B * M	2-52B	
24 *	42A * M	62C * M	72 *	93A M	158C	2-52U *	
27 * M	42B * M	62D *	73 *	93B * M	163	2-61B * M	
28 * M	45Q * M	62E M	74 *	94 M	165A *	2-61E	
29K *	45R * M	62F	75 *	95 * M	165B *	2-62D	
29L *	46S *	62G M	76A M	96A *	165C *	2-63B M	
29M *	45T	62X *	76B M	96B *	165D *	2-67T M	

Attachment C

Prob No.	Mass Pt Spacing		Mass Pt. @ Support		Conc. Wt.		Missing Mass Option		Geometry Corrected			New Output Matches Post P		Eqn. 9 Check		Remarks
	Y	N	Y	N	Y	N	Y	N	Y	N	N/A	Y	N	Y	N	
1		X		X	X		X				X	X		X		
6	X		X		X		X		X			X		X		- No mass point input between supports @ 111 & 1111-OK 111 skewed.
10C		X		X		X	X				X	X		X		- Originally thought to be mass point problem, but configuration is OK:
12A	X			X	X		X		X			X		X		
19A	X		X		X		X		X			X		X		- Mass point @ 1519 (X-rigid) New loads decreased (62 lbs. for 4" pipe) - No mass point between 518 & 7661
29V	X			X		X	X			X		X		X		- Inertia card was not added between noted supports - Post proc output does not match ADLPIPE output - OK loads were factored - Second output combination has matching loads
42B		X		X	X		X				X	X		X		- σ_{ratio} = .93 upset - Did not add mass points between restraints. OK - Distance < 1.0 OD

Prob No.	Mass Pt Spacing		Mass Pt. @ Support		Conc. Wt.		Missing Mass Option		Geometry Corrected			New Output Matches Post P		Eqn. 9 Check		Remarks
	Y	N	Y	N	Y	N	Y	N	Y	N	N/A	Y	N	Y	N	
34A		X		X	X		X				X	X		X		- Original mass point problem OK - small piping (1/2" ϕ) branch line - Small nozzle overload noted by G&H
28		X	X			X	X		X			X		X		
36		X	X			X	X			X		X		X		- No mass point between 2161 & 1161 2165 & 3165 OK, Distance between supports < 1.0 OD - Mass point not removed @ 2053
61B		X	X			X	X		X			X		X		- Mass point spacing errors noted by G&H analyst not really errors - supports ~ 90° apart.
63C/B		X		X		X	X				X		X	X		- Original mass point error is OK - restraints on value and on either side of valve. - Reran with lower localized ARS.
64D		X		X	X		X				X	X		X		
61A	X			X	X		X		X			X		X		- Original as-built combination incorrect for upset minimum. Only affects rigid supports. Recombined by G&H.

Prob No.	Mass Pt Spacing		Mass Pt. @ Support		Conc. Wt.		Missing Mass Option		Geometry Corrected			New Output Matches Post P		Eqn. 9 Check		Remarks
	Y	N	Y	N	Y	N	Y	N	Y	N	N/A	Y	N	Y	N	
66B	X			X	X		X		X			X		X		- No mass point between 2888 & 1888.
67V		X		X	X		X				X	X		X		
67Z		X	X		X		X		X			X		X		
68T		X		X	X		X				X	X		X		
68Y		X		X	X		X				X	X		X		
71B		X		X	X		X				X	X		X		
72		X		X		X	X				X	X		X		
79A	X			X		X	X		X			X		X		- No mass point @ free end (as noted by G&H) - $\sigma_{ratio_{upset}} = 0.95$
79F	X			X	X		X			X		X		X		- Corrections noted by G&H not incorporation into MF run - OK anchor to anchor in turb bldg. (intentional by G&H).
86A		X	X			X	X		X			X		X		- Very low A/B seismic loads @ anchors @ 169, 410 & 196 (i.e., 0 lbs.).

Prob No.	Mass Pt Spacing		Mass Pt. @ Support		Conc. Wt.		Missing Mass Option		Geometry Corrected			New Output Matches Post P		Eqn. 9 Check		Remarks
	Y	N	Y	N	Y	N	Y	N	Y	N	N/A	Y	N	Y	N	
88X		X		X	X		X				X	X		X		- Two restraints skewed by 68° with no intermediate mass point OK (also distance < 1 OD).
95		X		X	X		X				X	X		X		
135D	X		X			X	X		X			X		X		
156		X		X	X		X				X	X		X		
167B		X		X	X		X				X	X		X		- Expansion joints on both ends.
171		X		X	X		X				X	X		X		
178B		X		X	X		X				X	X		X		
2-52U		X		X		X	X				X	X		X		