TORUS	Owner PIPE SUPPORT SPANS AND SUPPORT LOAD SCHEDULE				Document No.	MEC-CAL-005
					Revision / Date	A · September 29, 2026
					Issue purpose	Issued for Review
MECHANICAL · PIPE SUPPORT SPANS AND SUPPORT LOAD SCHEDULE						
Rev.	Date	Revision description	Prepared	Reviewed	Approved	
A	2026-09-29	Issued for Review				

REFERENCE DOCUMENTS

1. ASME B31.8-2022, Gas Transmission and Distribution Piping Systems, paragraphs 833.6 and 834.
2. ASCE/SEI 7-22, Minimum Design Loads and Associated Criteria for Buildings and Other Structures, Chapters 10, 13, 26 and 29.
3. MSS SP-58 (2018), Pipe Hangers and Supports.
4. GEN-DB-001, Basis of Design; GEN-RPT-002, Design Decisions Register.
5. MEC-CAL-004, Piping Flexibility and Stress Screening (support types, restraint loads, thermal reactions).
6. PIP-DWG-001, Piping General Arrangement Plan (support locations); PIP-DWG-006, Typical Pipe Support Details.
7. STR-CAL-002, Foundation Design (pier and footing design for these loads).

INPUTS

Table 1 lists the inputs. The support loads are unfactored service loads; the structural engineer applies the ASCE 7 load combinations.

Table 1: Inputs

Symbol	Description	Value	Unit	Source
V	Basic wind speed, Risk Category II, Exposure C	108	mph	GEN-DB-001 (HOLD H-06)
K_z	Velocity pressure exposure coefficient, $z \leq 15$ ft	0.85	-	ASCE 7-22 Table 26.10-1
K_{zt}	Topographic factor	1.0	-	Flat site
K_e	Ground elevation factor at 1,150 ft	0.959	-	ASCE 7-22 Table 26.9-1
K_d	Directionality factor, round members	0.95	-	ASCE 7-22 Table 26.6-1
G	Gust effect factor	0.85	-	ASCE 7-22 26.11
C_f	Force coefficient, round, $h/D \geq 25$	0.7 or 1.2	-	ASCE 7-22 Fig. 29.4-1, Note 2
t_i	Radial ice thickness	0.5	in	GEN-DB-001
S_{DS}	Design spectral acceleration, short period	0.128	g	GEN-DB-001 (HOLD H-06)
μ	Friction coefficient, shoe on isolating pad	0.30	-	MEC-CAL-004
ρ_g	Gas density, 1,440 psig and 45 °F	6.75	lb/ft ³	GERG-2008, design gas
ρ_w	Test water density	62.4	lb/ft ³	-
E	Elastic modulus, carbon steel / stainless	29.5 / 28.3	10 ⁶ psi	ASME II-D TM-1
δ_{op} , δ_t	Span deflection limit, operating / hydrotest	0.10 / 0.25	in	This sheet, Note 3

Note 1: $C_f = 0.7$ applies where $D\sqrt{q_z} > 2.5$ (pipe larger than 6.1 in OD); smaller pipe takes 1.2.

Note 2: Valve, actuator and equipment weights are typical values, to be confirmed with vendor data (HOLD H-15).

ALLOWABLE SPANS

Table 2 gives the allowable span of each pipe size and specification. Deflection governs every size. The piping general arrangement uses a smaller spacing than the allowable (20 ft on NPS 12) so that each span can carry a valve or fitting load without a special check.

Table 2: Allowable Spans

NPS	Spec	Wall	Operating weight	Test weight	Stress, operating	Deflection, operating	Deflection, test	Allowable	GA maximum
in		in	lb/ft	lb/ft	ft	ft	ft	ft	ft
			Eq. 1	Eq. 1	Eq. 2	Eq. 3	Eq. 3	min	
12	A6	0.375	54.9	98.6	133	35.6	38.7	35.6	20
10	A6	0.594	67.9	95.6	135	32.7	37.7	32.7	18
8	A6	0.500	45.6	63.2	121	29.3	33.9	29.3	17
8	A1	0.322	28.6	50.3	109	29.9	32.7	29.9	17
4	D1	0.337	15.0	20.0	77	21.2	24.8	21.2	13
3	A1	0.216	7.6	10.8	69	18.8	21.7	18.8	12
3	D1	0.300	10.3	13.1	68	18.6	22.0	18.6	12
2	A6	0.218	5.2	6.3	51	15.2	18.2	15.2	10
2	A1	0.218	5.0	6.3	56	15.3	18.2	15.3	10
1	A1	0.179	2.2	2.5	40	11.1	13.5	11.1	7
3/4	A1	0.219	1.9	2.1	33	9.6	11.9	9.6	6
8	S1	0.322	29.2	50.9	100	29.4	32.2	29.4	17
3	S1	0.216	7.8	11.0	63	18.5	21.4	18.5	12
2	S1	0.154	3.7	5.2	52	15.2	17.7	15.2	10
1	S1	0.179	2.2	2.5	36	11.0	13.3	11.0	7
3/4	S1	0.154	1.5	1.7	32	9.7	11.9	9.7	6

Note 1: S1 weights include the higher density of 304 stainless (501 against 490 lb/ft³).

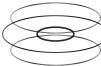
Note 2: Hydrotest pressures in the stress term are 2,160 psig for A6, 440 psig for A1 and D1, and 420 psig for S1.

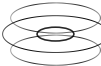
SUPPORT SCHEDULE, LOCATION AND TYPE

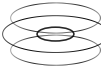
Table 3 locates every support shown on the piping general arrangement. CL EL is the absolute elevation of the pipe centerline; BOP is the bottom of pipe above the civil finished grade at the support.

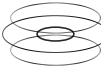
Table 3: Support Location and Type

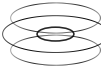
Support	Line	X	Y	CL EL	NPS	Type	BOP	Flag
		ft	ft	ft	in		in	
							Eq. 10	
PS-001	1001	29.5	8.0	1154.50	12	SR-1	28	
PS-002	1001	38.5	8.0	1154.50	12	SG-1	30	
PS-003	1001	49.5	8.0	1154.50	12	SR-1	31	
PS-004	1001	53.0	11.5	1154.50	12	SR-1	31	
PS-005	1001	53.0	24.0	1154.50	12	SL-1	30	
PS-006	1001	53.0	36.5	1154.50	12	SR-1	30	
PS-007	1001	49.5	40.0	1154.50	12	SR-1	29	
PS-008	1001	54.2	26.0	1154.50	12	SR-1	30	
PS-009	1001	63.4	26.0	1154.50	12	SG-1	31	
PS-010	1002	69.2	26.0	1154.50	12	SR-1	32	

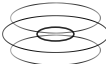
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MECHANICAL · PIPE SUPPORT SPANS AND SUPPORT LOAD SCHEDULE									
Support	Line	X	Y	CL EL	NPS	Type	BOP	Flag	
PS-011	1002	77.2	26.0	1154.50	12	SV-1	33		
PS-012	1002	87.5	26.0	1154.50	12	SR-1	34		
PS-013	1002	89.5	28.0	1163.75	12	ST-2	145	BOP > 36 in	
PS-014	1002	89.5	38.0	1163.75	12	ST-2	145	BOP > 36 in	
PS-015	1004	71.5	28.4	1154.50	12	SR-1	32		
PS-016	1004	71.5	30.8	1154.50	12	SV-1	32		
PS-017	1004	71.5	36.4	1154.50	12	SV-1	32		
PS-018	1004	71.5	54.0	1154.50	12	SG-1	31		
PS-019	1004	73.5	56.0	1154.50	12	SR-1	31		
PS-020	1004	75.7	56.0	1154.50	12	SR-1	31		
PS-021	1003	78.5	42.0	1163.75	12	ST-2	143	BOP > 36 in	
PS-022	1003	78.5	44.0	1163.75	12	ST-2	143	BOP > 36 in	
PS-023	1003	78.5	48.0	1154.50	12	SR-1	32		
PS-024	1003	78.5	50.2	1154.50	12	SV-1	32		
PS-025	1003	78.5	60.0	1154.50	12	SG-1	31		
PS-026	1003	78.5	64.9	1153.62	12	SR-1	20		
PS-027	1003	78.5	84.0	1153.62	12	SR-1	19		
PS-028	1003	76.5	86.0	1153.62	12	SR-1	19		
PS-029	1003	66.0	86.0	1153.62	12	SR-1	18	BOP < 18 in	
PS-030	1003	64.0	88.0	1153.62	12	SR-1	17	BOP < 18 in	
PS-031	1020	104.0	106.5	1153.62	12	SR-1	21		
PS-032	1020	104.0	126.2	1153.62	12	SG-1	20		
PS-033	1020	104.0	146.0	1153.62	12	SR-1	19		
PS-034	1020	106.0	148.0	1153.62	12	SR-1	19		
PS-035	1020	123.2	148.0	1153.62	12	SG-1	21		
PS-036	1020	140.3	148.0	1153.62	12	SG-1	23		
PS-037	1020	157.5	148.0	1153.62	12	SV-1	25		
PS-038	1020	166.0	148.0	1153.62	12	SR-1	26		
PS-039	1020	168.0	146.0	1153.62	12	SR-1	26		
PS-040	1020	168.0	143.5	1153.62	12	SR-1	26		
PS-041	1020	170.0	141.5	1153.62	12	SR-1	27		
PS-042	1020	172.0	141.5	1153.62	12	SR-1	27		
PS-043	1021	150.0	146.3	1153.62	12	SR-1	24		
PS-044	1021	150.0	143.9	1153.62	12	SV-1	24		
PS-045	1021	150.0	141.3	1153.62	12	SR-1	24		
PS-046	1022	172.0	138.5	1153.62	12	SR-1	27		
PS-047	1022	164.5	138.5	1153.62	12	SV-1	26		
PS-048	1022	153.2	138.5	1153.62	12	SG-1	25		
PS-049	1022	142.0	138.5	1153.62	12	SR-1	24		
PS-050	1022	140.0	136.5	1153.62	12	SR-1	23		

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MECHANICAL · PIPE SUPPORT SPANS AND SUPPORT LOAD SCHEDULE									
Support	Line	X	Y	CL EL	NPS	Type	BOP	Flag	
PS-051	1022	140.0	119.7	1153.62	12	SL-1	24		
PS-052	1022	140.0	102.9	1153.62	12	SR-1	25		
PS-053	1022	140.0	87.3	1153.62	12	SR-1	26		
PS-054	1031	145.6	94.0	1153.62	12	SR-1	27		
PS-055	1031	150.0	94.0	1153.62	12	SV-1	27		
PS-056	1031	156.8	94.0	1153.62	12	SV-1	28		
PS-057	1032	145.6	86.0	1153.62	12	SR-1	27		
PS-058	1032	150.0	86.0	1153.62	12	SV-1	28		
PS-059	1032	156.8	86.0	1153.62	12	SV-1	28		
PS-060	1033	160.0	92.7	1153.62	12	SR-1	28		
PS-061	1033	160.0	87.3	1153.62	12	SR-1	29		
PS-062	1033	162.8	90.0	1153.62	12	SR-1	29		
PS-063	1033	173.6	90.0	1153.62	12	SG-1	30		
PS-064	1033	182.6	90.0	1153.62	12	SL-1	31		
PS-065	1040	188.4	90.0	1153.62	12	SR-1	32		
PS-066	1040	200.0	90.0	1153.62	12	SV-1	33		
PS-067	1040	209.6	90.0	1153.62	12	SR-1	35		
PS-068	1041	215.4	90.0	1153.62	12	SR-1	35		
PS-069	1041	216.5	90.0	1153.62	12	SR-1	35		
PS-070	1041	220.0	93.5	1153.62	12	SR-1	36		
PS-071	1041	220.0	107.2	1153.62	12	SG-1	35		
PS-072	1041	220.0	122.5	1153.62	12	SG-1	34		
PS-073	1041	220.0	137.7	1153.62	12	SG-1	33		
PS-074	1041	220.0	149.5	1153.62	12	SG-1	32		
PS-075	1101	39.0	38.0	1160.00	8	ST-1	96	BOP > 36 in	
PS-076	1101	39.0	28.0	1160.00	8	ST-1	96	BOP > 36 in	
PS-077	1101	41.0	26.0	1160.00	8	ST-1	97	BOP > 36 in	
PS-078	1101	58.0	26.0	1160.00	8	ST-1	99	BOP > 36 in	
PS-079	1102	50.3	33.0	1154.50	2	SS-1	35		
PS-080	1102	46.0	33.0	1154.50	2	SS-1	34		
PS-081	1102	44.0	35.0	1154.50	2	SS-1	34		
PS-082	1050	81.4	58.6	1154.50	2	SS-1	37	BOP > 36 in	
PS-083	1050	86.0	58.6	1154.50	2	SS-1	37	BOP > 36 in	
PS-084	1050	88.0	57.3	1154.50	2	SS-1	38	BOP > 36 in	
PS-085	1050	89.5	56.0	1154.50	2	SS-1	38	BOP > 36 in	
PS-086	1051	100.4	55.0	1153.50	2	SS-1	27		
PS-087	1060	87.0	38.6	1152.11	2	SS-1	10	BOP < 18 in	
PS-088	1060	87.0	36.1	1153.25	2	SS-1	24		
PS-089	1060	85.4	35.0	1153.25	2	SS-1	24		
PS-090	1060	78.5	35.0	1153.25	2	SS-1	23		

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Support	Line	X	Y	CL EL	NPS	Type	BOP	Flag	
PS-091	1060	84.7	36.0	1153.25	2	SS-1	24		
PS-092	1060	82.7	36.7	1153.25	2	SS-1	23		
PS-093	1060	79.8	36.7	1153.25	2	SS-1	23		
PS-094	1060	77.8	36.0	1153.25	2	SS-1	23		
PS-095	1060D	73.5	35.0	1153.25	4	SR-1	21		
PS-096	1060D	63.2	35.0	1153.25	4	SG-1	20		
PS-097	1060D	52.5	35.0	1153.25	4	SG-1	19		
PS-098	1060D	41.8	35.0	1153.25	4	SG-1	17	BOP < 18 in	
PS-099	1060D	31.0	35.0	1153.25	4	SR-1	16	BOP < 18 in	
PS-100	1060D	29.0	37.0	1153.25	4	SR-1	16	BOP < 18 in	
PS-101	1060D	29.0	47.2	1153.25	4	SG-1	15	BOP < 18 in	
PS-102	1060D	29.0	57.5	1153.25	4	SG-1	15	BOP < 18 in	
PS-103	1060D	29.0	67.8	1153.25	4	SG-1	14	BOP < 18 in	
PS-104	1060D	29.0	78.0	1153.25	4	SR-1	13	BOP < 18 in	
PS-105	1110	92.5	38.6	1152.11	2	SS-1	11	BOP < 18 in	
PS-106	1110	92.5	34.4	1153.25	2	SS-1	25		
PS-107	1110	91.1	33.5	1153.25	2	SS-1	25		
PS-108	1110	83.4	33.5	1153.25	2	SS-1	24		
PS-109	1110	76.3	33.5	1153.25	2	SS-1	23		
PS-110	1110	74.3	34.1	1153.25	2	SS-1	22		
PS-111	1061	26.5	41.0	1153.25	2	SS-1	16	BOP < 18 in	
PS-112	1061	26.5	43.2	1153.25	2	SS-1	16	BOP < 18 in	
PS-113	1061	26.5	48.0	1153.25	2	SS-1	16	BOP < 18 in	
PS-114	1061	26.5	56.4	1153.25	2	SS-1	15	BOP < 18 in	
PS-115	1061	26.5	64.8	1153.25	2	SS-1	15	BOP < 18 in	
PS-116	1061	26.5	73.1	1153.25	2	SS-1	14	BOP < 18 in	
PS-117	1061	26.5	82.5	1153.25	2	SS-1	14	BOP < 18 in	
PS-118	1061	27.6	83.5	1153.25	2	SS-1	14	BOP < 18 in	
PS-119	1190	29.0	82.4	1153.25	4	SR-1	13	BOP < 18 in	
PS-120	1190	29.0	84.0	1153.25	4	SR-1	13	BOP < 18 in	
PS-121	1190	29.0	88.0	1161.80	4	ST-1	115	BOP > 36 in	
PS-122	1190	29.0	95.0	1161.80	4	ST-1	115	BOP > 36 in	
PS-123	1191	30.0	107.4	1153.00	3	SS-1	9	BOP < 18 in	
PS-124	1191	30.0	112.0	1156.00	3	SS-2	45	BOP > 36 in	
PS-125	1191	30.0	114.0	1156.00	3	SS-2	45	BOP > 36 in	
PS-126	1192	36.0	97.0	1152.60	2	SS-1	6	BOP < 18 in	
PS-127	1193	41.8	90.0	1152.00	4	SS-3	-1	BOP < 18 in	
PS-128	1193	45.6	90.0	1152.00	4	SS-3	-0	BOP < 18 in	
PS-129	1070	214.0	160.0	1154.96	8	SH-1	49	BOP > 36 in, loose U-bolt	
PS-130	1070	197.1	160.0	1154.88	8	SH-1	46	BOP > 36 in	

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Support	Line	X	Y	CL EL	NPS	Type	BOP	Flag	
PS-131	1070	180.1	160.0	1154.79	8	SH-1	43	BOP > 36 in	
PS-132	1070	163.2	160.0	1154.71	8	SH-1	40	BOP > 36 in, loose U-bolt	
PS-133	1070	146.2	160.0	1154.62	8	SH-1	37	BOP > 36 in, loose U-bolt	
PS-134	1070	129.3	160.0	1154.54	8	SH-1	34		
PS-135	1070	112.3	160.0	1154.45	8	SH-1	31		
PS-136	1070	95.4	160.0	1154.37	8	SH-1	28		
PS-137	1070	78.4	160.0	1154.28	8	SH-1	25	loose U-bolt	
PS-138	1070	61.5	160.0	1154.20	8	SH-1	22		
PS-139	1070	44.5	160.0	1154.12	8	SH-1	19		
PS-140	1070	50.0	46.0	1154.71	8	SH-1	33	loose U-bolt	
PS-141	1070	50.0	61.9	1154.63	8	SH-1	31	loose U-bolt	
PS-142	1070	50.0	77.8	1154.55	8	SH-1	29		
PS-143	1070	50.0	93.8	1154.47	8	SH-1	28		
PS-144	1070	50.0	109.7	1154.39	8	SH-1	26		
PS-145	1070	50.0	125.6	1154.31	8	SH-1	24		
PS-146	1070	50.0	141.5	1154.23	8	SH-1	22		
PS-147	1070	50.0	157.4	1154.15	8	SL-2	20		
PS-148	1071	84.8	42.4	1162.30	3	SS-2	131	BOP > 36 in	
PS-149	1071	82.8	44.0	1161.90	3	SS-2	126	BOP > 36 in	
PS-150	1071	72.9	44.2	1159.87	3	SS-2	101	BOP > 36 in	
PS-151	1071	62.9	44.3	1157.83	3	SS-2	75	BOP > 36 in, loose U-bolt	
PS-152	1071	53.0	44.5	1155.80	3	SS-2	49	BOP > 36 in, loose U-bolt	
PS-153	1071	50.5	44.5	1155.30	3	SS-2	43	BOP > 36 in, loose U-bolt	
PS-154	1072	68.6	29.0	1157.08	4	ST-1	67	BOP > 36 in	
PS-155	1072	68.6	36.8	1156.78	4	ST-1	63	BOP > 36 in	
PS-156	1072	68.6	44.5	1156.48	4	ST-1	59	BOP > 36 in	
PS-157	1072	66.6	46.5	1156.28	4	ST-1	56	BOP > 36 in, loose U-bolt	
PS-158	1072	59.4	46.5	1155.85	4	ST-1	50	BOP > 36 in, loose U-bolt	
PS-159	1072	52.2	46.5	1155.42	4	SR-1	44	BOP > 36 in, loose U-bolt	
PS-160	1075	30.0	43.0	1157.48	2	SS-2	67	BOP > 36 in	
PS-161	1075	30.0	45.5	1157.38	2	SS-2	66	BOP > 36 in	
PS-162	1075	32.0	47.5	1157.10	2	SS-2	63	BOP > 36 in	
PS-163	1075	40.0	47.5	1156.30	2	SS-2	54	BOP > 36 in, loose U-bolt	
PS-164	1075	48.0	47.5	1155.50	2	SS-2	46	BOP > 36 in, loose U-bolt	
PS-165	1077	97.0	59.8	1156.00	2	SS-2	57	BOP > 36 in	
PS-166	1077	95.0	61.5	1155.97	2	SS-2	56	BOP > 36 in	
PS-167	1077	86.4	61.5	1155.82	2	SS-2	53	BOP > 36 in	
PS-168	1077	77.9	61.5	1155.67	2	SS-2	50	BOP > 36 in	
PS-169	1077	69.3	61.5	1155.53	2	SS-2	48	BOP > 36 in	
PS-170	1077	60.8	61.5	1155.38	2	SS-2	45	BOP > 36 in, loose U-bolt	

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Support	Line	X	Y	CL EL	NPS	Type	BOP	Flag	
PS-171	1077	52.2	61.5	1155.23	2	SS-1	42	BOP > 36 in, loose U-bolt	
PS-172	1120	80.0	107.5	1155.94	1	SS-2	52	BOP > 36 in	
PS-173	1120	80.0	113.8	1155.82	1	SS-2	50	BOP > 36 in	
PS-174	1120	80.0	120.1	1155.69	1	SS-2	48	BOP > 36 in	
PS-175	1120	80.0	126.4	1155.57	1	SS-2	46	BOP > 36 in	
PS-176	1120	80.0	132.6	1155.44	1	SS-2	44	BOP > 36 in	
PS-177	1120	80.0	138.9	1155.31	1	SS-2	42	BOP > 36 in	
PS-178	1120	80.0	145.2	1155.19	1	SS-1	40	BOP > 36 in	
PS-179	1120	80.0	151.5	1155.06	1	SS-1	38	BOP > 36 in	
PS-180	1120	80.0	157.8	1154.94	1	SS-1	37	BOP > 36 in, loose U-bolt	
PS-181	1073	140.0	151.0	1156.97	4	ST-1	67	BOP > 36 in, loose U-bolt	
PS-182	1073	140.0	158.0	1156.90	4	ST-1	66	BOP > 36 in, loose U-bolt	
PS-183	1073	140.0	165.0	1156.83	4	ST-1	64	BOP > 36 in, loose U-bolt	
PS-184	1073	142.0	167.0	1156.79	4	ST-1	64	BOP > 36 in, loose U-bolt	
PS-185	1073	145.0	167.0	1156.76	4	ST-1	64	BOP > 36 in, loose U-bolt	
PS-186	1073	147.0	165.0	1156.72	4	ST-1	64	BOP > 36 in, loose U-bolt	
PS-187	1073	147.0	162.0	1156.69	4	ST-1	64	BOP > 36 in, loose U-bolt	
PS-188	1076	162.5	151.5	1157.17	2	SS-2	73	BOP > 36 in, loose U-bolt	
PS-189	1076	162.5	158.2	1157.11	2	SS-2	72	BOP > 36 in, loose U-bolt	
PS-190	1076	162.5	165.0	1157.04	2	SS-2	71	BOP > 36 in, loose U-bolt	
PS-191	1076	164.5	167.0	1157.00	2	SS-2	70	BOP > 36 in, loose U-bolt	
PS-192	1076	167.5	167.0	1156.97	2	SS-2	70	BOP > 36 in, loose U-bolt	
PS-193	1076	169.5	165.0	1156.93	2	SS-2	70	BOP > 36 in, loose U-bolt	
PS-194	1076	169.5	162.0	1156.90	2	SS-2	70	BOP > 36 in, loose U-bolt	
PS-195	1074	190.0	91.5	1156.95	2	SS-2	77	BOP > 36 in, loose U-bolt	
PS-196	1074	192.0	93.0	1156.88	2	SS-2	77	BOP > 36 in, loose U-bolt	
PS-197	1074	199.3	93.0	1156.83	2	SS-2	77	BOP > 36 in	
PS-198	1074	206.7	93.0	1156.77	2	SS-2	77	BOP > 36 in	
PS-199	1074	214.0	93.0	1156.72	2	SS-2	77	BOP > 36 in	
PS-200	1074	216.0	95.0	1156.69	2	SS-2	77	BOP > 36 in, loose U-bolt	
PS-201	1074	216.0	104.0	1156.62	2	SS-2	76	BOP > 36 in	
PS-202	1074	216.0	112.9	1156.55	2	SS-2	74	BOP > 36 in	
PS-203	1074	216.0	121.9	1156.48	2	SS-2	73	BOP > 36 in	
PS-204	1074	216.0	130.8	1156.42	2	SS-2	72	BOP > 36 in	
PS-205	1074	216.0	139.8	1156.35	2	SS-2	70	BOP > 36 in	
PS-206	1074	216.0	148.7	1156.28	2	SS-2	69	BOP > 36 in, loose U-bolt	
PS-207	1074	216.0	157.7	1156.22	2	SS-2	68	BOP > 36 in, loose U-bolt	
PS-208	1160	188.0	91.0	1156.45	3/4	SS-2	72	BOP > 36 in	
PS-209	1160	188.9	92.0	1156.40	3/4	SS-2	71	BOP > 36 in	
PS-210	1161	167.5	91.5	1157.00	1	SS-2	76	BOP > 36 in	

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Support	Line	X	Y	CL EL	NPS	Type	BOP	Flag	
PS-211	1161	169.5	93.0	1157.00	1	SS-2	76	BOP > 36 in	
PS-212	1161	176.3	93.0	1156.98	1	SS-2	77	BOP > 36 in	
PS-213	1161	183.1	93.0	1156.97	1	SS-2	77	BOP > 36 in	
PS-214	1161	189.9	93.0	1156.95	1	SS-2	78	BOP > 36 in	
PS-215	1170	217.7	96.5	1156.60	2	SS-2	76	BOP > 36 in	
PS-216	1103	63.5	27.7	1154.50	1	SS-1	37	BOP > 36 in	
PS-217	1103	65.5	28.5	1154.50	1	SS-1	37	BOP > 36 in	
PS-218	1103	68.1	27.6	1154.50	1	SS-1	38	BOP > 36 in	
PS-219	1162	182.6	91.4	1153.62	1	SS-1	37	BOP > 36 in	
PS-220	1162	184.6	92.0	1153.62	1	SS-1	37	BOP > 36 in	
PS-221	1162	187.3	91.4	1153.62	1	SS-1	38	BOP > 36 in	
PS-222	1171	209.3	88.5	1153.62	1	SS-1	40	BOP > 36 in	
PS-223	1171	211.3	87.7	1153.62	1	SS-1	41	BOP > 36 in	
PS-224	1171	212.9	87.7	1153.62	1	SS-1	41	BOP > 36 in	
PS-225	1171	214.9	88.5	1153.62	1	SS-1	41	BOP > 36 in	

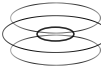
Note 1: 25 supports sit below the 18 in minimum BOP and 99 above the 36 in maximum. The low supports are mainly small drains set by nozzle elevations on the sloping pad, and the 4 in containment drain on grade blocks. The high ones are the tall posts under kicker 1101, the V-101 shell brackets, the vent header east end (its 1:200 fall runs against the pad slope) and elevated vent laterals. The NPS 8 and 12 lines on piers range from 17 to 36 in.

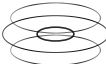
SUPPORT SCHEDULE, DESIGN LOADS

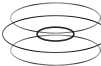
Table 4 gives the loads on each support. For supports in the stress model of MEC-CAL-004, the operating vertical load is the larger of the tributary load and the model reaction, which includes thermal redistribution.

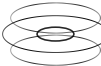
Table 4: Support Design Loads

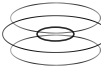
Support	Operating	Hydrotest	Ice	Wind	Friction	Seismic	Vertical	Lateral	Axial
	lb	lb	lb	lb	lb	lb	lb	lb	lb
	Eq. 4	Eq. 4	Eq. 6	Eq. 5	Eq. 7	Eq. 8	Eq. 9	Eq. 10	Eq. 11
PS-001	750	1,070	60	110	220	150	1,070	220	220
PS-002	610	1,090	80	150	180	120	1,090	3,090	180
PS-003	500	890	70	130	150	100	890	150	150
PS-004	640	1,170	80	140	190	130	1,170	190	190
PS-005	830	1,370	100	180	250	170	1,370	4,840	2,830
PS-006	570	990	80	140	170	120	990	170	170
PS-007	3,070	3,390	60	100	920	630	3,390	920	920
PS-008	3,630	4,410	40	70	1,090	740	4,410	1,090	1,090
PS-009	7,540	5,280	70	120	2,260	1,540	7,610	5,090	2,260
PS-010	2,120	2,440	60	110	640	430	2,440	640	640
PS-011	3,800	3,870	70	130	1,140	780	3,880	1,140	1,140
PS-012	650	1,200	100	140	190	130	1,200	190	190
PS-013	1,220	1,210	90	140	370	250	1,320	370	370
PS-014	400	810	60	100	120	80	810	120	120
PS-015	140	240	20	40	40	30	240	40	40

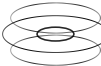
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Support	Operating	Hydrotest	Ice	Wind	Friction	Seismic	Vertical	Lateral	Axial
PS-016	3,350	3,310	30	60	1,010	690	3,390	1,010	1,010
PS-017	3,920	4,440	90	170	1,180	800	4,440	1,180	1,180
PS-018	600	1,690	90	160	180	120	1,690	6,770	180
PS-019	170	300	20	50	50	30	300	50	50
PS-020	1,710	2,290	20	40	510	350	2,290	510	510
PS-021	180	320	30	40	50	40	320	50	50
PS-022	3,930	1,290	60	80	1,180	800	3,990	1,180	1,180
PS-023	420	760	60	80	130	90	760	130	130
PS-024	3,320	3,580	50	90	1,000	680	3,580	1,000	1,000
PS-025	660	1,010	60	110	200	140	1,010	7,410	200
PS-026	1,210	1,950	100	170	360	250	1,950	360	360
PS-027	840	1,650	90	170	250	170	1,650	250	250
PS-028	400	720	60	110	120	80	720	120	120
PS-029	740	1,250	60	110	220	150	1,250	220	220
PS-030	140	250	20	40	40	30	250	40	40
PS-031	1,910	3,310	90	160	570	390	3,310	570	570
PS-032	1,260	2,220	160	290	380	260	2,220	2,920	380
PS-033	650	1,170	100	170	200	130	1,170	200	200
PS-034	580	1,040	90	150	170	120	1,040	170	170
PS-035	1,100	1,970	140	250	330	220	1,970	1,810	330
PS-036	1,190	1,940	140	250	360	240	1,940	3,980	360
PS-037	3,820	4,380	100	190	1,150	780	4,380	1,150	1,150
PS-038	580	890	50	90	170	120	890	170	170
PS-039	180	320	30	50	50	40	320	50	50
PS-040	260	460	30	50	80	50	460	80	80
PS-041	200	370	20	40	60	40	370	60	60
PS-042	140	250	20	40	40	30	250	40	40
PS-043	1,030	1,800	20	30	310	210	1,800	310	310
PS-044	3,050	3,150	20	40	910	620	3,150	910	910
PS-045	850	1,490	20	40	250	170	1,490	250	250
PS-046	340	580	40	80	100	70	580	100	100
PS-047	3,430	3,850	80	140	1,030	700	3,850	1,030	1,030
PS-048	760	1,270	90	170	230	160	1,270	620	230
PS-049	470	800	60	110	140	100	800	140	140
PS-050	740	1,320	80	150	220	150	1,320	220	220
PS-051	940	1,690	140	250	280	190	1,690	4,650	3,020
PS-052	1,190	2,060	130	240	360	240	2,060	360	360
PS-053	2,760	3,360	110	200	830	570	3,360	830	830
PS-054	3,880	4,260	50	90	1,160	790	4,260	1,160	1,160
PS-055	2,570	2,810	50	80	770	530	2,810	770	770

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Support	Operating	Hydrotest	Ice	Wind	Friction	Seismic	Vertical	Lateral	Axial
PS-056	3,610	3,870	40	80	1,080	740	3,870	1,080	1,080
PS-057	2,560	2,840	40	80	770	530	2,840	770	770
PS-058	2,570	2,810	50	80	770	530	2,810	770	770
PS-059	3,440	3,670	40	70	1,030	700	3,670	1,030	1,030
PS-060	640	930	50	100	190	130	930	190	190
PS-061	640	930	50	100	190	130	930	190	190
PS-062	750	1,230	60	110	220	150	1,230	220	220
PS-063	560	1,000	80	140	170	120	1,000	250	170
PS-064	3,010	3,360	60	110	900	620	3,360	2,430	900
PS-065	2,300	2,700	70	130	690	470	2,700	690	690
PS-066	3,180	3,640	90	160	950	650	3,640	950	950
PS-067	3,240	3,210	60	110	970	660	3,300	970	970
PS-068	1,800	4,230	30	50	540	370	4,230	540	540
PS-069	230	410	30	60	70	50	410	70	70
PS-070	590	1,130	80	150	180	120	1,130	180	180
PS-071	880	1,460	120	210	270	180	1,460	3,680	270
PS-072	840	1,620	120	220	250	170	1,620	2,030	250
PS-073	1,150	1,330	110	200	350	240	1,330	580	350
PS-074	810	2,340	70	130	240	170	2,340	240	240
PS-075	360	510	40	70	110	70	510	110	110
PS-076	320	440	40	70	100	70	440	100	100
PS-077	730	750	60	100	220	150	780	220	220
PS-078	1,310	1,870	70	120	390	270	1,870	390	390
PS-079	80	90	10	20	30	20	90	30	30
PS-080	90	100	10	20	30	20	100	30	30
PS-081	20	30	10	20	10	0	30	20	10
PS-082	90	100	10	20	30	20	100	30	30
PS-083	20	20	10	20	10	0	30	20	10
PS-084	20	20	10	10	0	0	20	10	0
PS-085	10	10	0	10	0	0	10	10	0
PS-086	700	840	190	500	210	140	900	500	210
PS-087	20	20	0	10	10	0	20	10	10
PS-088	50	50	10	10	10	10	50	10	10
PS-089	340	340	10	20	100	70	350	100	100
PS-090	340	340	10	30	100	70	350	100	100
PS-091	10	10	0	10	0	0	20	10	0
PS-092	90	90	0	10	30	20	90	30	30
PS-093	90	90	0	10	30	20	90	30	30
PS-094	10	10	0	10	0	0	20	10	0
PS-095	190	190	20	70	60	40	220	60	60

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Support	Operating	Hydrotest	Ice	Wind	Friction	Seismic	Vertical	Lateral	Axial
PS-096	210	210	30	90	60	40	240	90	60
PS-097	220	220	30	100	70	40	250	100	70
PS-098	210	210	30	100	60	40	250	100	60
PS-099	150	150	20	70	40	30	170	40	40
PS-100	140	140	20	60	40	30	160	40	40
PS-101	200	200	30	90	60	40	240	90	60
PS-102	210	210	30	90	60	40	240	90	60
PS-103	210	210	30	90	60	40	240	90	60
PS-104	170	170	20	60	50	40	200	50	50
PS-105	50	50	10	20	10	10	50	20	10
PS-106	110	110	10	20	30	20	110	30	30
PS-107	160	160	10	20	50	30	170	50	50
PS-108	80	80	10	40	20	20	90	40	20
PS-109	30	30	10	20	10	10	40	20	10
PS-110	10	10	0	10	0	0	10	10	0
PS-111	60	60	0	10	20	10	60	20	20
PS-112	200	200	10	20	60	40	210	60	60
PS-113	90	90	10	30	30	20	100	30	30
PS-114	50	50	10	40	20	10	70	40	20
PS-115	50	50	10	40	20	10	70	40	20
PS-116	60	60	20	40	20	10	80	40	20
PS-117	80	80	10	30	20	20	90	30	20
PS-118	10	10	0	10	0	0	10	10	0
PS-119	140	140	10	30	40	30	150	40	40
PS-120	160	160	20	50	50	30	190	50	50
PS-121	200	200	30	70	60	40	230	60	60
PS-122	100	100	20	40	30	20	110	30	30
PS-123	110	110	10	30	30	20	130	30	30
PS-124	70	70	10	30	20	10	80	30	20
PS-125	120	120	10	30	40	30	140	40	40
PS-126	70	70	0	10	20	10	70	20	20
PS-127	100	100	10	30	30	20	120	30	30
PS-128	120	120	10	20	40	20	130	40	40
PS-129	340	570	60	110	100	70	570	110	100
PS-130	500	860	90	170	150	100	860	170	150
PS-131	500	860	90	170	150	100	860	170	150
PS-132	500	870	100	170	150	100	870	170	150
PS-133	520	890	100	180	150	110	890	180	150
PS-134	500	860	90	170	150	100	860	170	150
PS-135	500	860	90	170	150	100	860	170	150

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Support	Operating	Hydrotest	Ice	Wind	Friction	Seismic	Vertical	Lateral	Axial
PS-136	500	860	90	170	150	100	860	170	150
PS-137	500	870	100	170	150	100	870	170	150
PS-138	520	890	90	170	160	110	890	170	160
PS-139	340	550	60	100	100	70	550	100	100
PS-140	340	560	60	110	100	70	560	110	100
PS-141	470	820	90	160	140	100	820	160	140
PS-142	470	810	90	160	140	100	810	160	140
PS-143	470	810	90	160	140	100	810	160	140
PS-144	470	810	90	160	140	100	810	160	140
PS-145	470	810	90	160	140	100	810	160	140
PS-146	470	810	90	160	140	100	810	160	140
PS-147	290	500	60	100	90	60	500	90	990
PS-148	20	30	10	20	10	0	30	20	10
PS-149	50	80	20	50	20	10	80	50	20
PS-150	80	110	20	70	20	20	110	70	20
PS-151	80	110	20	70	20	20	110	70	20
PS-152	50	70	20	40	10	10	70	40	10
PS-153	10	20	0	10	0	0	20	10	0
PS-154	60	90	20	50	20	10	90	20	20
PS-155	90	130	20	70	30	20	130	30	30
PS-156	60	100	20	50	20	10	100	20	20
PS-157	60	90	20	50	20	10	90	20	20
PS-158	80	120	20	60	20	20	120	20	20
PS-159	50	80	10	40	20	10	80	20	20
PS-160	10	10	0	10	0	0	20	10	0
PS-161	10	20	10	20	0	0	20	20	0
PS-162	20	30	10	30	10	0	30	30	10
PS-163	30	40	10	40	10	10	40	40	10
PS-164	20	30	10	30	10	0	30	30	10
PS-165	10	10	0	10	0	0	20	10	0
PS-166	20	30	10	30	10	0	30	30	10
PS-167	30	40	20	40	10	10	50	40	10
PS-168	30	40	20	40	10	10	50	40	10
PS-169	30	40	20	40	10	10	50	40	10
PS-170	30	40	20	40	10	10	50	40	10
PS-171	20	30	10	30	10	0	30	30	10
PS-172	10	10	10	10	0	0	20	10	0
PS-173	10	20	10	20	0	0	20	20	0
PS-174	10	20	10	20	0	0	20	20	0
PS-175	10	20	10	20	0	0	20	20	0

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							Revision / Date	A · September 29, 2026	
							Issue purpose	Issued for Review	
MECHANICAL · PIPE SUPPORT SPANS AND SUPPORT LOAD SCHEDULE									
Support	Operating	Hydrotest	Ice	Wind	Friction	Seismic	Vertical	Lateral	Axial
PS-176	10	20	10	20	0	0	20	20	0
PS-177	10	20	10	20	0	0	20	20	0
PS-178	10	20	10	20	0	0	20	20	0
PS-179	10	20	10	20	0	0	20	20	0
PS-180	10	10	10	10	0	0	20	10	0
PS-181	60	80	20	40	20	10	80	20	20
PS-182	80	120	20	60	20	20	120	20	20
PS-183	60	90	20	50	20	10	90	20	20
PS-184	40	60	10	30	10	10	60	10	10
PS-185	40	60	10	30	10	10	60	10	10
PS-186	40	60	10	30	10	10	60	10	10
PS-187	40	60	10	30	10	10	60	10	10
PS-188	20	30	10	20	10	0	30	20	10
PS-189	30	40	10	30	10	10	40	30	10
PS-190	20	30	10	30	10	0	30	30	10
PS-191	10	20	10	20	0	0	20	20	0
PS-192	10	20	10	20	0	0	20	20	0
PS-193	10	20	10	20	0	0	20	20	0
PS-194	20	20	10	20	10	0	20	20	10
PS-195	10	20	0	10	0	0	20	10	0
PS-196	30	30	10	30	10	10	40	30	10
PS-197	30	40	10	30	10	10	40	30	10
PS-198	30	40	10	30	10	10	40	30	10
PS-199	20	30	10	30	10	0	30	30	10
PS-200	30	40	10	30	10	10	40	30	10
PS-201	30	50	20	40	10	10	50	40	10
PS-202	30	50	20	40	10	10	50	40	10
PS-203	30	50	20	40	10	10	50	40	10
PS-204	30	50	20	40	10	10	50	40	10
PS-205	30	50	20	40	10	10	50	40	10
PS-206	30	50	20	40	10	10	50	40	10
PS-207	20	30	10	30	10	0	30	30	10
PS-208	0	0	0	0	0	0	0	0	0
PS-209	0	0	0	0	0	0	0	0	0
PS-210	30	30	10	10	10	10	40	10	10
PS-211	10	10	10	10	0	0	20	10	0
PS-212	20	20	10	20	0	0	20	20	0
PS-213	20	20	10	20	0	0	20	20	0
PS-214	10	10	0	10	0	0	10	10	0
PS-215	10	10	0	10	0	0	10	10	0

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MECHANICAL · PIPE SUPPORT SPANS AND SUPPORT LOAD SCHEDULE									
Support	Operating	Hydrotest	Ice	Wind	Friction	Seismic	Vertical	Lateral	Axial
PS-216	0	10	0	10	0	0	10	10	0
PS-217	40	40	0	10	10	10	50	10	10
PS-218	10	10	0	10	0	0	10	10	0
PS-219	0	0	0	0	0	0	10	0	0
PS-220	40	40	0	10	10	10	40	10	10
PS-221	10	10	0	10	0	0	10	10	0
PS-222	0	0	0	10	0	0	10	10	0
PS-223	30	30	0	10	10	10	30	10	10
PS-224	20	20	0	10	10	0	20	10	10
PS-225	0	0	0	10	0	0	10	10	0

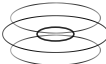
Note 1: Loads are rounded to the nearest 10 lb. The lateral load acts horizontally, perpendicular to the pipe; the axial load acts along it.

LOADS DELIVERED TO EQUIPMENT, SKID AND SOIL

Where a line ends at a nozzle, the meter skid, a buried riser or another line, the load between the last support and that end is carried by the end. Table 5 gives those loads.

Table 5: Loads at Line Ends

Line end	Operating	Hydrotest
	lb	lb
IJ-101 riser (Owner lateral)	560	680
V-101 inlet N1	120	220
V-101 outlet N2	120	220
SK-110 skid (vendor steel)	80	150
H-101 inlet N1	80	150
H-101 outlet N2	90	150
IJ-102 riser / buried 1042 (soil)	560	680
PR-101 barrel kicker nozzle	140	190
PR-101 barrel (equalizing)	10	10
FG-101 inlet (HV-161B)	0	0
FG-101 (header 1152) via HV-165A / SDV-165	20	20
H-101 burner train (1140 / 1141)	560	690
FG-101 (header 1152) via HV-165B	150	170
G-101 fuel inlet	140	150
V-101 barrel N5 via SDV-106 / LCV-104 / RO-104	10	10
V-101 barrel N6 (filter section drain)	10	10
PR-101 drain N4	0	0
T-101 roof inlet N1 (dip pipe)	30	30
T-101 loadout nozzle N3	40	40
T-101 bottom drain N4	30	30
VS-101 inlet N1	40	80
PSV-101 outlet	10	10

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MECHANICAL · PIPE SUPPORT SPANS AND SUPPORT LOAD SCHEDULE			
Line end		Operating	Hydrotest
BDV-181 / RO-181 outlet (2x4 expander at RO)		20	20
BDV-102 / RO-102 barrel vent		10	10
PSV-161 outlet (FG-101)		0	0
Skid DBB bleed collector (MOV body bleeds)		0	0
BDV-182 / RO-182 outlet (2x4 expander at RO)		20	20
PSV-157 outlet		10	10
BDV-183 / RO-183 outlet		0	0
TSV-136 outlet		0	0
HV-172A / RO-172B outlet		0	0

Note 1: The VS-101 foundation also carries 1,530 lb along the vent header axis, because the stack base anchors header 1070 ([redacted] MEC-CAL-004).

SUMMARY BY SUPPORT TYPE

Table 6 counts the supports by type and gives the foundation each type assumes.

Table 6: Supports by Type

Type	Description	Quantity	Maximum vertical, lb	Foundation
SR-1	Resting clamp shoe	49	4,410	Concrete pier 24 x 24 in
SG-1	Guided clamp shoe	19	7,610	Concrete pier 24 x 24 in
SL-1	Axial line stop with guides	3	3,360	Concrete pier 30 x 30 in, embed plate
SL-2	Axial line stop without guides	1	500	6 in pipe T-post, 24 in drilled pier
SV-1	Adjustable valve stand	12	4,440	Concrete pier 30 x 30 in
ST-1	Tall steel post	18	1,870	Spread footing 3 x 3 ft
ST-2	V-101 shell bracket	4	3,990	By the V-101 vendor
SS-1	Small-bore post, U-bolt	46	900	4 in pipe post, 18 in drilled pier
SS-2	Small-bore tall post, U-bolt	53	140	4 in pipe post, 18 in drilled pier
SS-3	Grade block or wall sleeve	2	130	Precast block
SH-1	Vent header T-post	18	890	6 in pipe post, 18 in drilled pier
Total		225		

EQUATIONS

Eq. 1, weight per foot:

$$w = 10.69 (D - t) t k_m + \frac{\pi}{4} \left(\frac{D - 2t}{12} \right)^2 \rho$$

Eq. 2, stress-limited span (continuous beam):

$$L = \frac{1}{12} \sqrt{\frac{10 Z (0.75 ST - PD/4t)}{w/12}}$$

Eq. 3, deflection-limited span:

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ASME B31.8, 833.6

$$L = \frac{1}{12} \left(\frac{185EI\delta}{w/12} \right)^{1/4}$$

Eq. 4, support reaction by the lever rule between adjacent supports a and b, for a load W at position s:

$$R_a = W \frac{s_b - s}{s_b - s_a}, \quad R_b = W \frac{s - s_a}{s_b - s_a}$$

Eq. 5, wind force per foot of pipe:

ASCE 7-22, 26.10-1 and 29.4-1

$$q_z = 0.00256 K_z K_{zt} K_e V^2 = 0.00256(0.85)(1.0)(0.959)(108)^2 = 24.35 \text{ psf}, \quad F = q_z K_d G C_f \frac{D}{12}$$

Eq. 6, ice weight per foot:

$$w_i = \frac{\pi(D + 2t_i)^2 - D^2}{4 \cdot 144} (56)$$

Eq. 7, friction:

$$F_f = \mu W_{op}$$

Eq. 8, seismic bound:

ASCE 7-22, 13.3

$$F_p = 1.6 S_{DS} I_p W_{op} = 0.205 W_{op}$$

Eq. 9, design vertical load:

$$V = \max(W_{op} + W_{ice}, W_{test})$$

Eq. 10, design lateral load (resting supports carry friction only; guides and stops carry the largest of wind, seismic, thermal reaction and friction), and bottom of pipe:

$$H = \max(F, F_p, R_{th}, F_f), \quad BOP = 12 \left(EL_{CL} - \frac{D}{24} - FG \right)$$

Eq. 11, design axial load (line stops add the thermal reaction and half the friction of the other supports on the run):

$$A = \max(F_f, R_{th} + 0.5 \sum \mu W_{op})$$

NOTES

- Support types were set in MEC-CAL-004 so that no guide or stop sits inside the length a leg needs to bend. Resting supports therefore carry lateral load by friction only, and the guides and stops are designed for wind and seismic load.
- The friction coefficient of 0.30 is for a steel shoe on the isolating pad required at every pipe contact. PTFE slide plates are not needed, because no friction load governs a foundation.
- Deflection limits of 0.10 in operating and 0.25 in hydrotest keep the piping free-draining and the flanges tight; the hydrotest is a temporary condition, so the larger sag is accepted.
- Drain lines are taken liquid-full in operation, because they can be.
- The seismic force is the upper bound of ASCE 7 Chapter 13, not a full component calculation. It is included in the design lateral load of guides and stops; the structural engineer shall confirm it.
- S1 stainless lines (1070 to 1077, 1120, 1160, 1161, 1170 and VS-101) shall bear only on stainless or on PTFE or G-10 isolating pads; no galvanized or carbon steel shall touch them (PIP-DWG-006).
- Supports on meter skid SK-110 are by the skid vendor; the piping loads at the skid flanges are in Table 5.
- Support numbers match the piping general arrangement. A support deleted or added on the drawing requires this schedule to be revised.