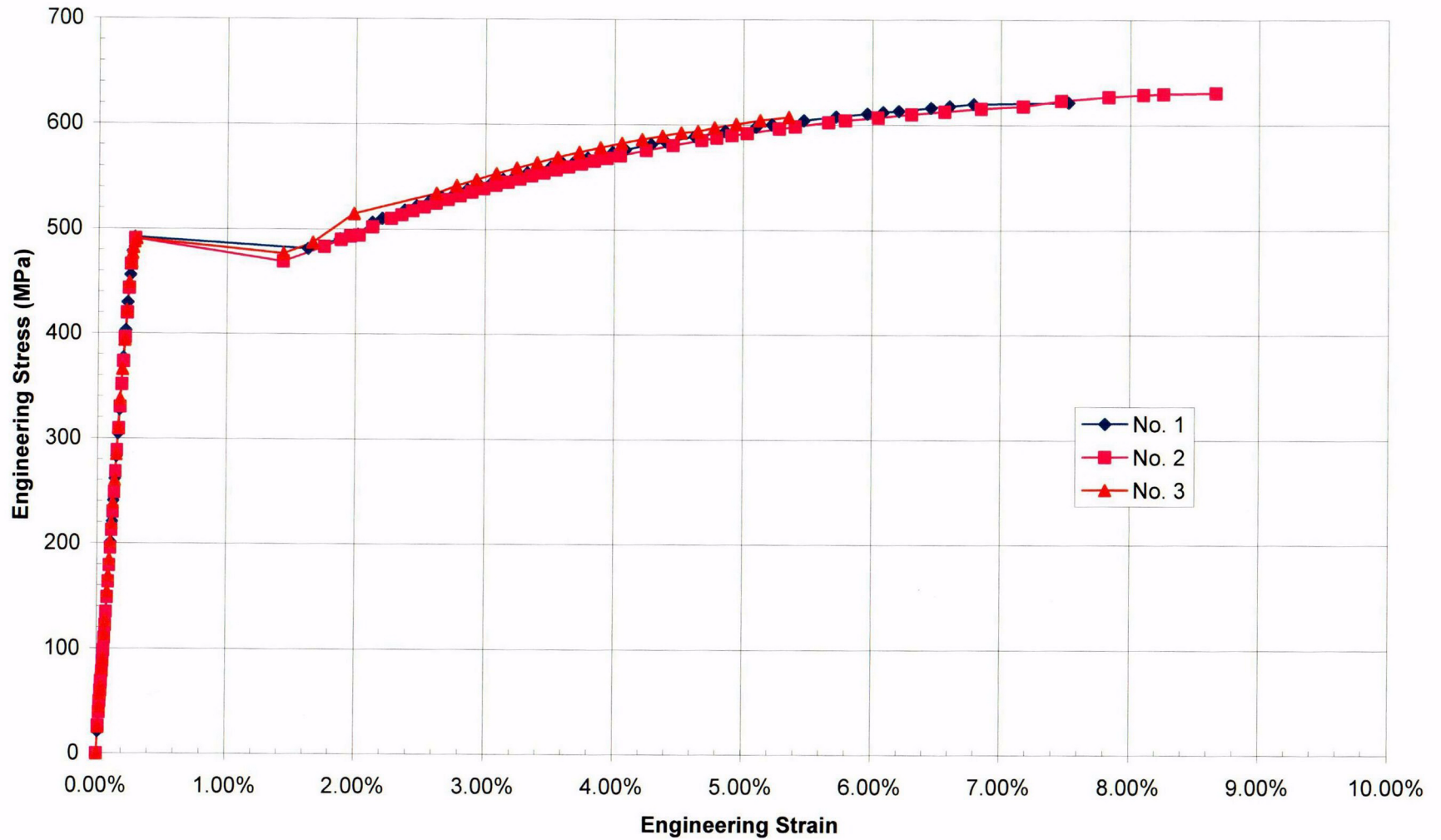
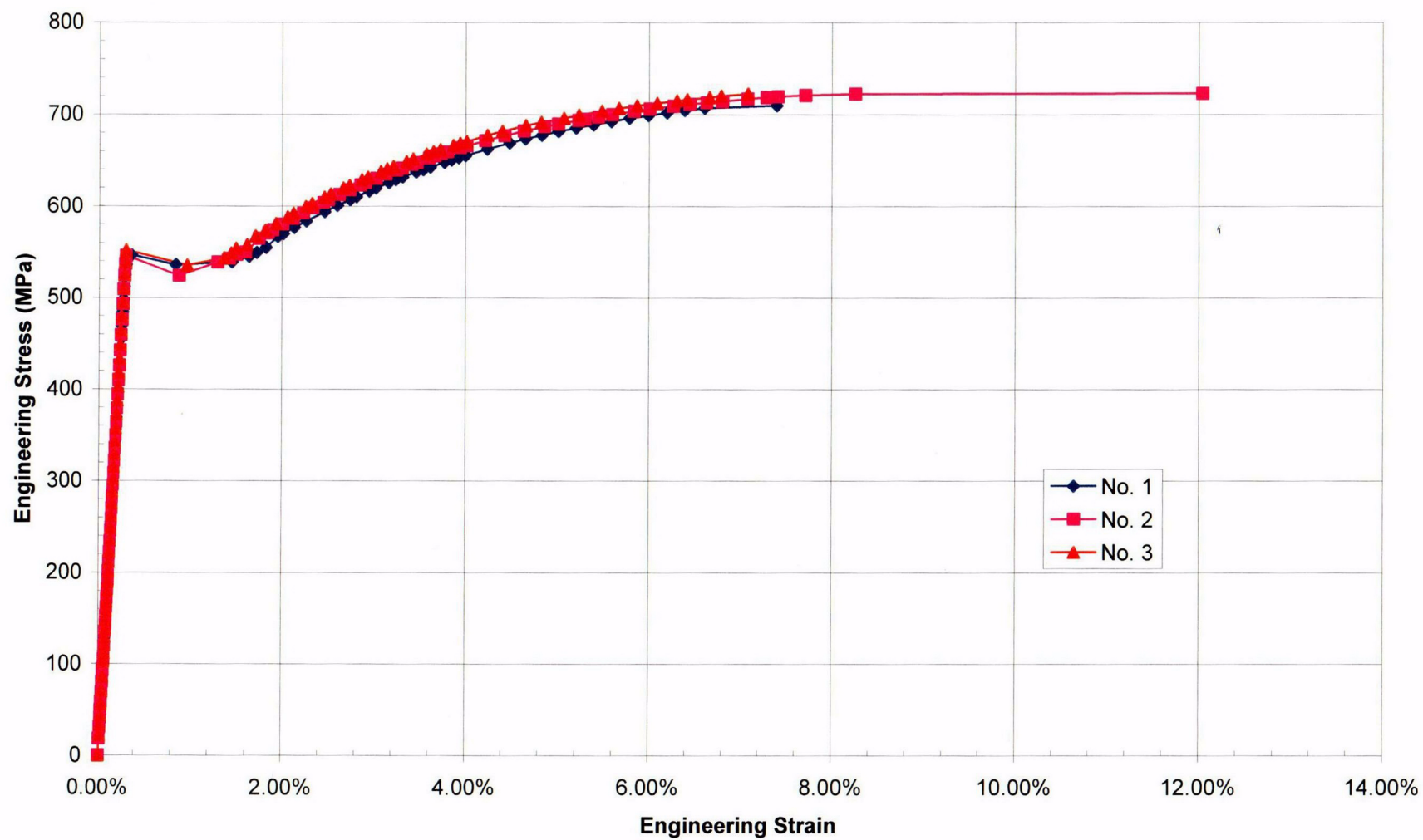


# SD490, D10 (#3) Stress-Strain

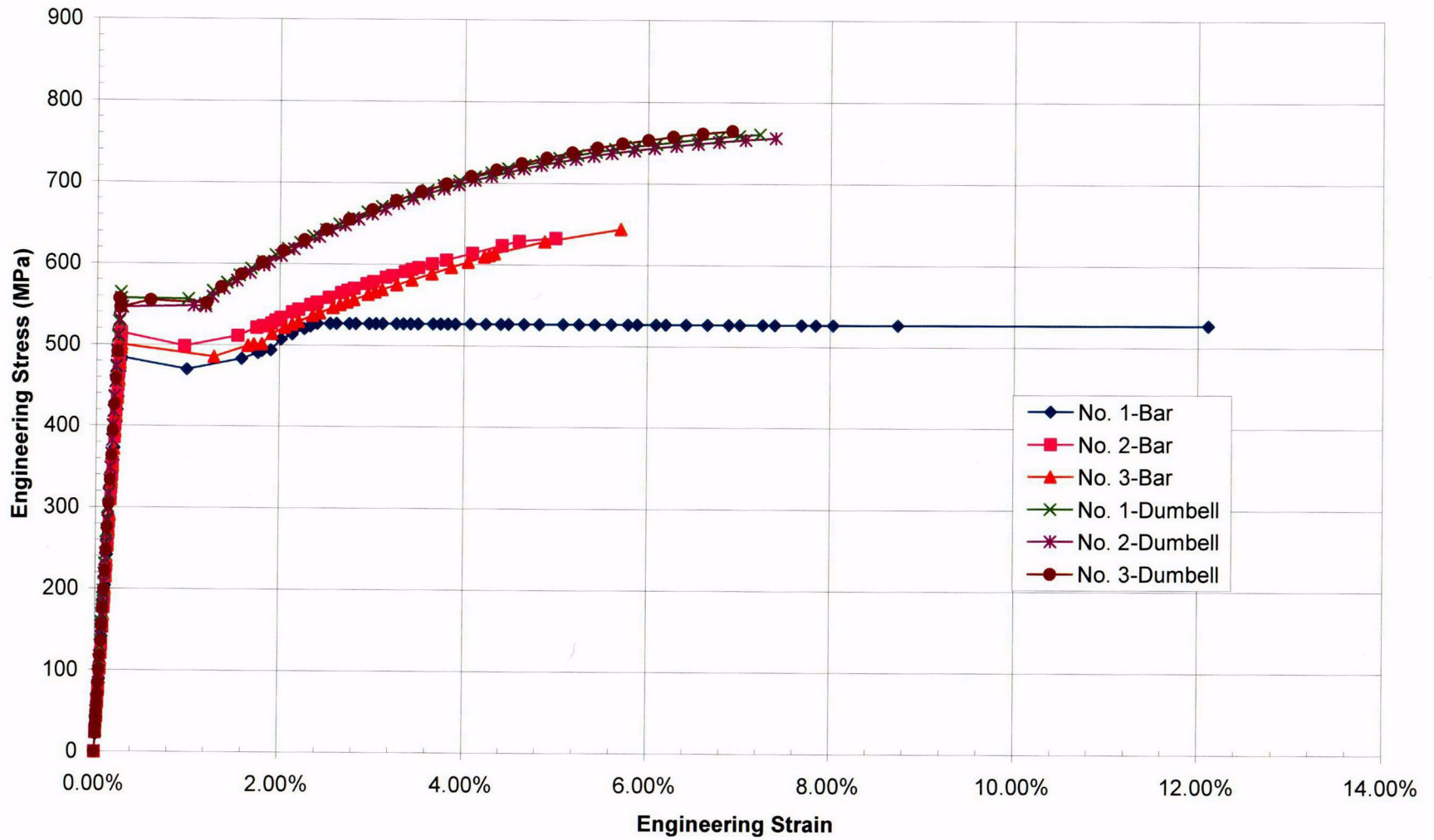


SD490, D13 (#4) Stress-Strain

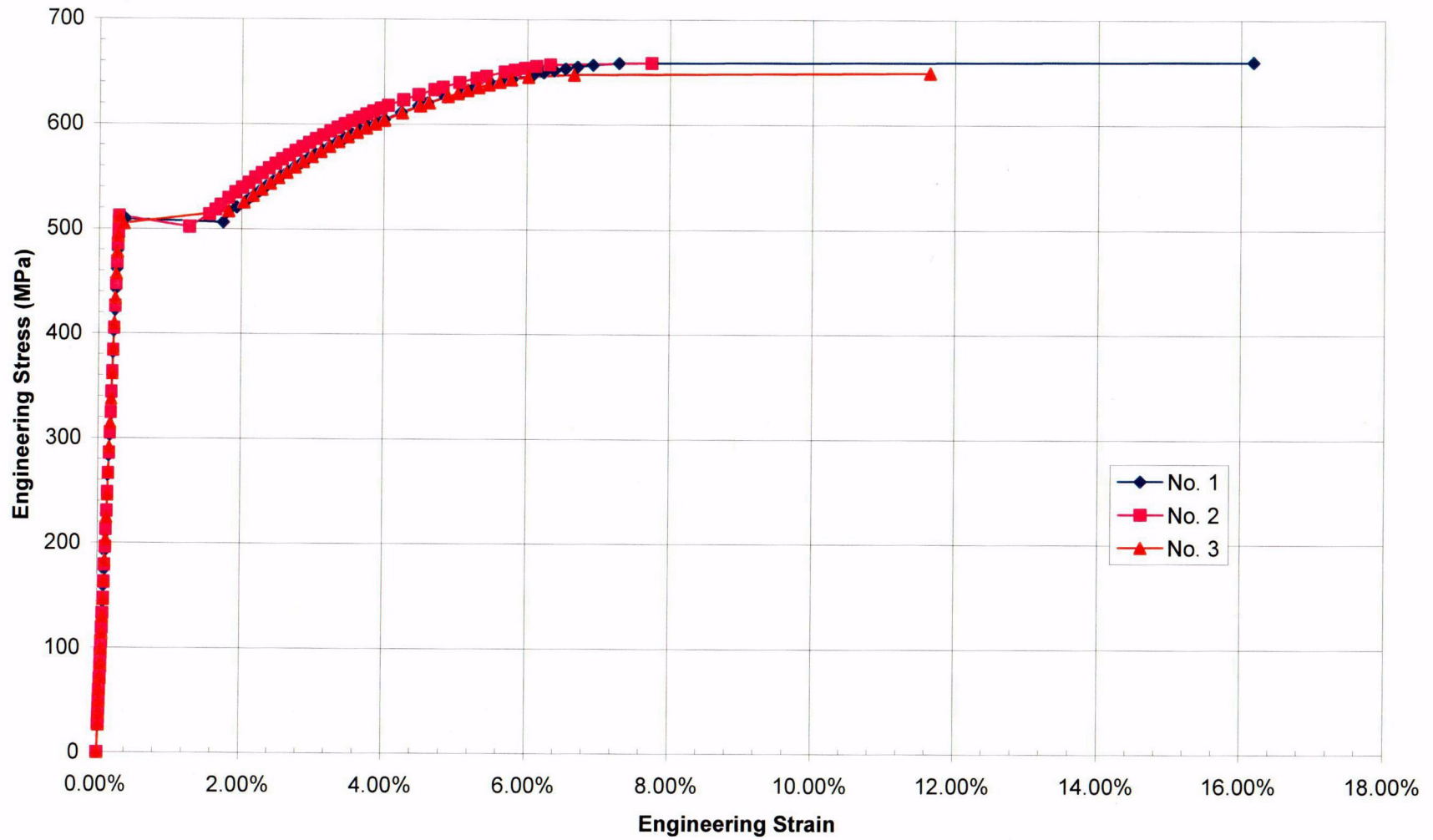


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# SD490, D16 (#5) Stress-Strain



SD490, D19 (#6) Stress-Strain





**Section v. Tendons**



PCCV Tendon Material Tests (METRIC)											
Procedures & Specifications						Data & Test Reports					
1. JPN-12-T-2: Outline of Ancillary Tests						(A) JPN-12-T-3: "The Result of Trial Manufacturing of Tendon System" Electronic Data on the Server					
2. JPN-14-T-1-5; Tendon Material Test Procedure; Rev.1; 9/30/96						(B) JPN-18-T-4; Tendon Friction Coefficient and Set Loss Verification Test; 5/14/96					
3. JPN-14-T-1-7; Prestressing Tendon Tensile Test Procedure; Rev.1; 9/30/96						(C) MH-K10-26 Tendon Material Test Report; June 1998					
4. Spec.-T-05-2(E), Rev.1; Specification for PC Materials						(D) MH-K10-40, Tendon System Test Report					
Component	Material Specifications										
			Diameter (mm)	Pitch	Dia. Diff. (mm)	Weight (kg)	Yield <sup>1</sup> (kN)	Ultimate (kN)	Elongation <sup>2</sup> (%)	Relaxation (% per 1000 hr)	
Raw Material:	SWRS82B per JIS G3502	min.	13.5	12	0.08		190	210	4.50%		
Strand:	SWPR7BL per JIS G3536	nom.	13.7								
		max.	14.1	18						1.50%	
Sample Tendon System Test (1, A)										Load-Elong. <sup>3</sup>	
										Stress-Strain	
Tendon Strand Material Test (2, C)											
JIS G 3536 (G=600mm)		8022530	13.62	14.1	0.10	2565	197	213	8.4%	Elong. Only	
		8022531	13.60	14.1	0.10	2561					
		8022532	13.60	14.1	0.09	2561	196	214	8.0%	Elong. Only	
		8022533	13.61	14.0	0.11	2563	195	214	8.3%	Elong. & Strain	
		8022534	13.60	14.1	0.10	2553					
		8022535	13.61	14.2	0.10	2565	197	214	8.3%	Elong. Only	
		8022536	13.60	14.2	0.11	2561					
		8022537	13.60	14.0	0.10	2564	199	214	8.3%	Elong. & Strain	
		8022538	13.60	14.1	0.10	2559	198	214	8.3%	Elong. Only	
<sup>1</sup> Load at 0.2% permanent Elongation											
<sup>2</sup> [(Stroke @ breakage - Stroke @ 10% Min. Strength)/Initial Distance bet. Grips]+0.1%											
<sup>3</sup> Elongation determined from stroke of testing machine(?); Strain from strain gages mounted on individual wires.											
Tendon Sytem Test (3, D)						Ultimate		Displacement		Elongation <sup>1</sup>	
Anchorhead:	S55CN per JIS G4051		Diameter	Pitch	Dia. Diff.	Jack	Load Cell	Load End	Fixed End		Elastic Modulus
Bearing Plate	SS400 per JIS G3101		(mm)		(mm)	(kN)	(kN)	(mm)	(mm)	(%)	(kN/mm2)
Sheath:	SGCC per JIS G3302	min.	13.5	12	0.08		210			4.50%	
Wedge:	SCM415 per JIS G4105	nom.	13.7								
Strand:	SWPR7BL per JIS G3536	max.	14.1	18							
Strand:	JIS G 3536 (G=600mm)		13.6	14.2	0.11		215			7.7%	191
Tendon:		min.				630	630			2.0%	
											Load-Elong. <sup>2</sup>
											Stress-Strain
	1					653	641	286.49	5.02	3.94%	Elong. & Strain
	2					647	637	281.27	4.92	3.87%	Elong. & Strain
	3					647	637	267.25	4.98	3.67%	Elong. & Strain
	Avg.					649	638	278.34	4.97	3.83%	
<sup>1</sup> Elongation = (Load End Displacement - Fixed End Displacement)/(7150mm)											
<sup>2</sup> Strain measured using three strain gages each on wires of three strands, not corrected for pitch of wire.											

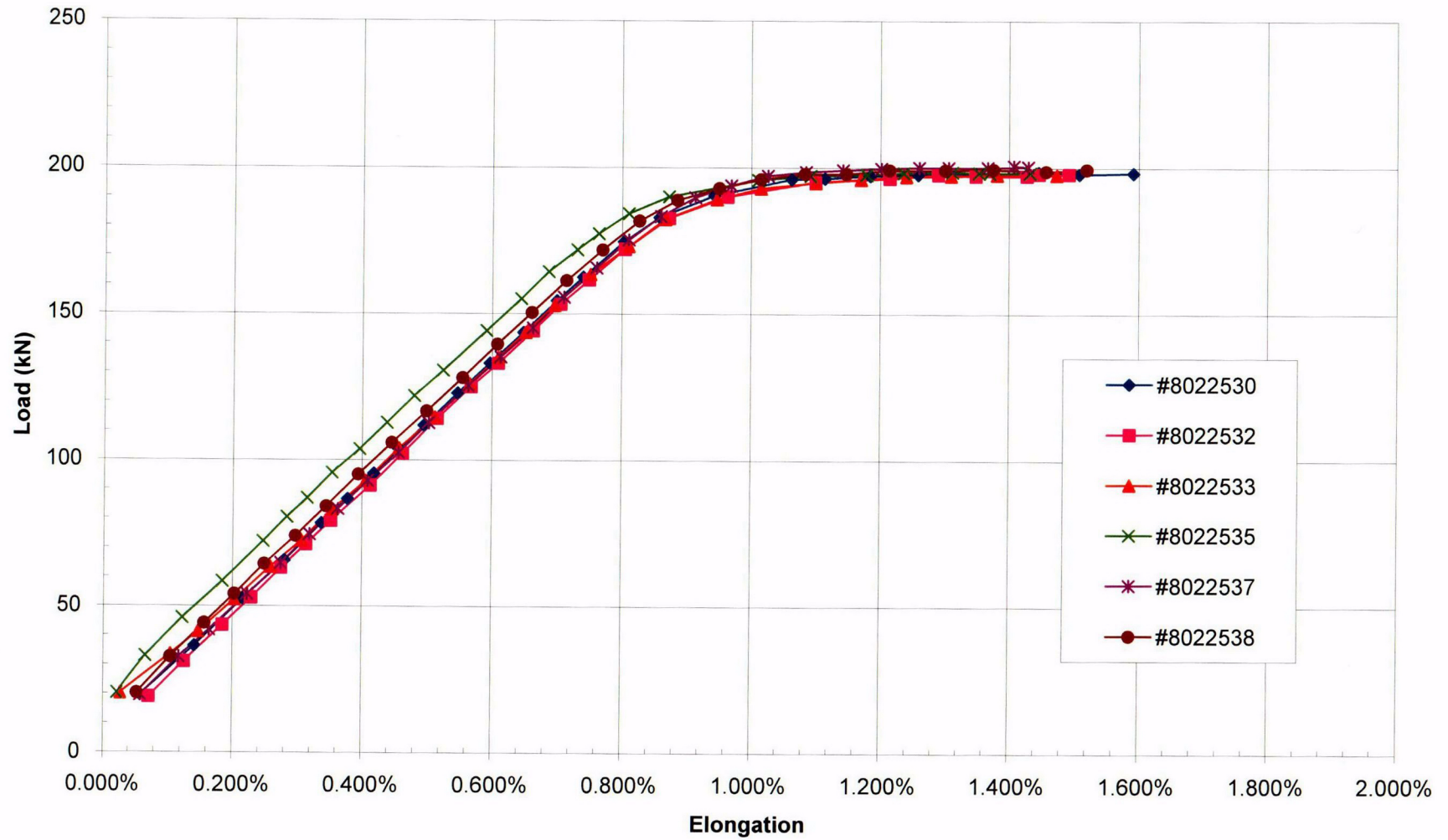
Tendon Friction and Set Loss Test (B)											
Average Friction Coefficient:		0.21									
Setting Loss		Anchor Force			Set						
		Tendon	Before	After	Loss	Strand 1	Strand 2	Strand 3	Avg.		
			(kN)	(kN)	(kN)	(mm)	(mm)	(mm)	(mm)		
		#1	481.4	383.2	98.2	4.7	5.1	4.1	4.6		
		#2	464.5	374.2	90.3	4.7	4.9	4.7	4.8		
		#3	473.8	385.9	87.9	4.8	4.4	4.9	4.7		
Average:				92.1				4.7			
Tendon Strand Calibration Tests											
JIS G 3536 (G=600mm)			Diameter	Yield <sup>1</sup>	Ultimate	Elongation			Elastic Modulus <sup>5</sup>		
			(mm)	(kN)	(kN)	Stroke <sup>2</sup>	Tensmeg <sup>3</sup>	WSG <sup>4</sup>	(N/mm2)		
					(%)	(%)	(%)				
Strand:	SWPR7BL per JIS G3536	min.	13.5	190	210	4.50%					
		nom.	13.7								
		max.	14.1								
		1		191.3	208.4	5.6%	4.2%	4.2%	203448		
		2 <sup>7</sup>		189.9	192.5	3.6%	1.5%	1.6%	193103		
		3		191.7	209.7	6.1%	4.4%	4.5%	200000		
		4		191.3	210.8	6.6%	4.5%	4.9%	197931		
		5 <sup>8</sup>	13.6								
		6 <sup>8</sup>	13.6								
		7		191.3	210.7	6.5%	4.9%	5.0%	200000		
		8		190.8	210.0	5.8%	4.5%	4.5%	195172		
		9		191.3	210.5	6.4%	na	4.9%	195862		
		10		191.3	209.1	5.7%	na	4.3%	201379		
		Average	13.6	191.3	209.9	6.1%	4.5%	4.6%	199113		
		<sup>1</sup> Load at 0.2% permanent Elongation using Offset Method									
		<sup>2</sup> [(Stroke @ breakage - Stroke @10%Min. Strength)/Initial Distance bet. Grips]+0.1%									
		<sup>3</sup> Final Tensmeg reading									
<sup>4</sup> Final average wire strain gage (WSG) reading											
<sup>5</sup> Slope of Stress versus Extensometer Strain between 140 MPa and 1400 MPa											
<sup>6</sup> Elongation & Strain determined from calibrated extensometer											
<sup>7</sup> Strand #2 experienced some grip slippage causing premature failure (data not included in averages)											
<sup>8</sup> Strands #5 and #6 will be tested just prior to PCCV pressure testing											

PCCV Tendon Material Tests (ENGLISH)											
Procedures & Specifications						Data & Test Reports					
1. JPN-12-T-2: Outline of Ancillary Tests						(A) JPN-12-T-3: "The Result of Trial Manufacturing of Tendon System" Electronic Data on the Server					
2. JPN-14-T-1-5; Tendon Material Test Procedure;Rev.1:9/30/96						(B) JPN-18-T-4; Tendon Friction Coefficient and Set Loss Verification Test; 5/14/96					
3. JPN-14-T-1-7; Prestressing Tendon Tensile Test Procedure;Rev.1: 9/30/96						(C)MH-K10-26 Tendon Material Test Report; June 1998					
4. Spec.-T-05-2(E), Rev.1; Specification for PC Materials						(D) MH-K10-40, Tendon System Test Report					
Component	Material Specifications										
			Diameter (in)	Pitch	Dia. Diff. (in)	Weight (lbs)	Yield <sup>1</sup> (kips)	Ultimate (kips)	Elongation <sup>2</sup> (%)	Relaxation (% per 1000 hr)	
Raw Material:	SWRS82B per JIS G3502	min.	0.531	12	0.003		42.7	47.2	4.50%		
Strand:	SWPR7BL per JIS G3536	nom.	0.539								
		max.	14.1	0.555	18					1.50%	
Sample Tendon System Test (1, A)										Load-Elong. <sup>3</sup>	
										Stress-Strain	
Tendon Strand Material Test (2, C)											
JIS G 3536 (G=600mm)		8022530	0.536	14.1	0.004	5655	44.3	47.9	8.4%	Elong. Only	
		8022531	0.535	14.1	0.004	5646					
		8022532	0.535	14.1	0.004	5646	44.1	48.1	8.0%	Elong. Only	
		8022533	0.536	14.0	0.004	5650	43.8	48.1	8.3%	Elong. & Strain	
		8022534	0.535	14.1	0.004	5628					
		8022535	0.536	14.2	0.004	5655	44.3	48.1	8.3%	Elong. Only	
		8022536	0.535	14.2	0.004	5646					
		8022537	0.535	14.0	0.004	5653	44.7	48.1	8.3%	Elong. & Strain	
		8022538	0.535	14.1	0.004	5642	44.5	48.1	8.3%	Elong. Only	
<sup>1</sup> Load at 0.2% permanent Elongation											
<sup>2</sup> [(Stroke @ breakage - Stroke @10%Min. Strength)/Initial Distance bet. Grips]+0.1%											
<sup>3</sup> Elongation determined from stroke of testing machine(?); Strain from strain gages mounted on individual wires.											
Tendon Sytem Test (3, D)											
Anchorhead:	S55CN per JIS G4051		Diameter (in)	Pitch	Dia. Diff. (in)	Ultimate		Displacement		Elongation <sup>1</sup>	Elastic Modulus (kN/mm2)
Bearing Plate	SS400 per JIS G3101					Jack (kips)	Load Cell (kips)	Load End (in)	Fixed End (in)	(%)	
Sheath:	SGCC per JIS G3302	min.	0.531	12	0.003		47.2			4.50%	
Wedge:	SCM415 per JIS G4105	nom.	0.539								
Strand:	SWPR7BL per JIS G3536	max.	0.555	18							
Strand:	JIS G 3536 (G=600mm)		0.535	14.2	0.004		48.3			7.7%	27695
Tendon:		min.				141.6	141.6			2.0%	
											Load-Elong. <sup>2</sup>
											Stress-Strain
	1					146.8	144.1	11.279	0.198	3.94%	Elong. & Strain
	2					145.4	143.2	11.074	0.194	3.87%	Elong. & Strain
	3					145.4	143.2	10.522	0.196	3.67%	Elong. & Strain
	Avg.					145.9	143.5	10.958	0.196	3.83%	
<sup>1</sup> Elongation = (Load End Displacement - Fixed End Displacement)/(7150mm)											
<sup>2</sup> Strain measured using three strain gages each on wires of three strands, not corrected for pitch of wire.											

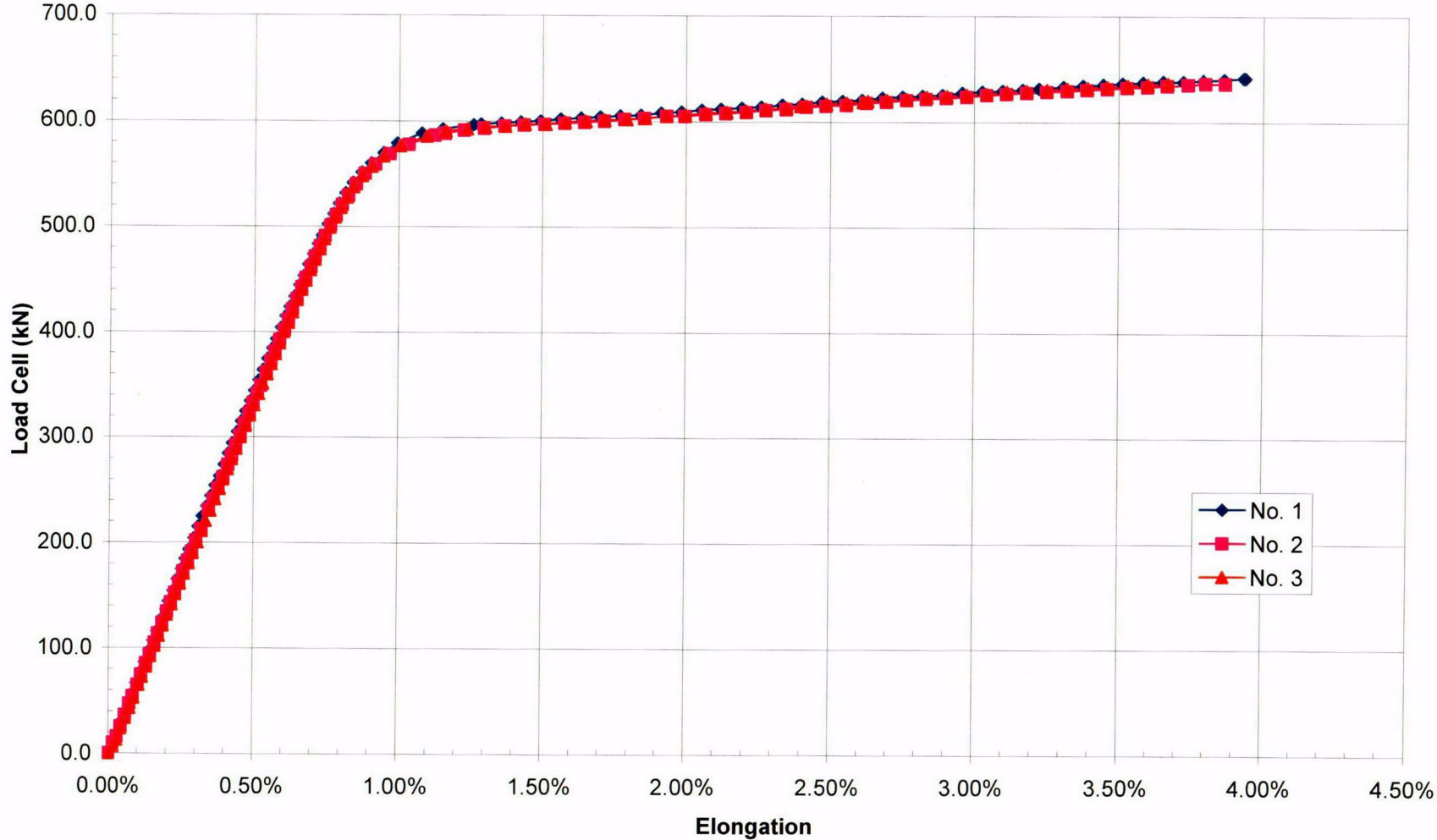
Tendon Friction and Set Loss Test (B)										
Average Friction Coefficient:		0.21								
Setting Loss		Anchor Force			Set					
		Tendon	Before	After	Loss	Strand 1	Strand 2	Strand 3	Avg.	
			(kips)	(kips)	(kips)	(in)	(in)	(in)	(in)	
		#1	108.2	86.1	22.1	0.184	0.200	0.162	0.182	
		#2	104.4	84.1	20.3	0.186	0.193	0.187	0.189	
		#3	106.5	86.8	19.8	0.187	0.174	0.191	0.184	
		Average:			20.7				0.185	
Tendon Strand Calibration Tests										
JIS G 3536 (G=600mm)		Diameter	Yield <sup>1</sup>	Ultimate	Elongation			Elastic Modulus <sup>5</sup>		
		(in)	(kips)	(kips)	Stroke <sup>2</sup>	Tensmeg <sup>3</sup>	WSG <sup>4</sup>	(ksi)		
					(%)	(%)	(%)			
Strand:	SWPR7BL per JIS G3536	min.	0.531	42.7	47.2	4.50%				
		nom.	0.539							
		max.	0.555							
		1		43.0	46.85	5.6%	4.2%	4.2%	29500	
		2 <sup>7</sup>		42.7	43.27	3.6%	1.5%	1.6%	28000	
		3		43.1	47.14	6.1%	4.4%	4.5%	29000	
		4		43.0	47.38	6.6%	4.5%	4.9%	28700	
		5 <sup>8</sup>	0.535							
		6 <sup>8</sup>	0.535							
		7		43.0	47.36	6.5%	4.9%	5.0%	29000	
		8		42.9	47.21	5.8%	4.5%	4.5%	28300	
		9		43.0	47.31	6.4%	na	4.9%	28400	
		10		43.0	47.00	5.7%	na	4.3%	29200	
		Average	0.535	43.0	47.18	6.1%	4.5%	4.6%	28871	
		<sup>1</sup> Load at 0.2% permanent Elongation using Offset Method								
		<sup>2</sup> (Stroke @ breakage - Stroke @10%Min. Strength)/Initial Distance bet. Grips)+0.1%								
<sup>3</sup> Final Tensmeg reading										
<sup>4</sup> Final average wire strain gage (WSG) reading										
<sup>5</sup> Slope of Stress versus Extensometer Strain between 140 MPa and 1400 MPa										
<sup>6</sup> Elongation & Strain determined from calibrated extensometer										
<sup>7</sup> Strand #2 experienced some grip slippage causing premature failure (data not included in averages)										
<sup>8</sup> Strands #5 and #6 will be tested just prior to PCCV pressure testing										



# Tendon Strand (SWPR7BL), Load-Elongation

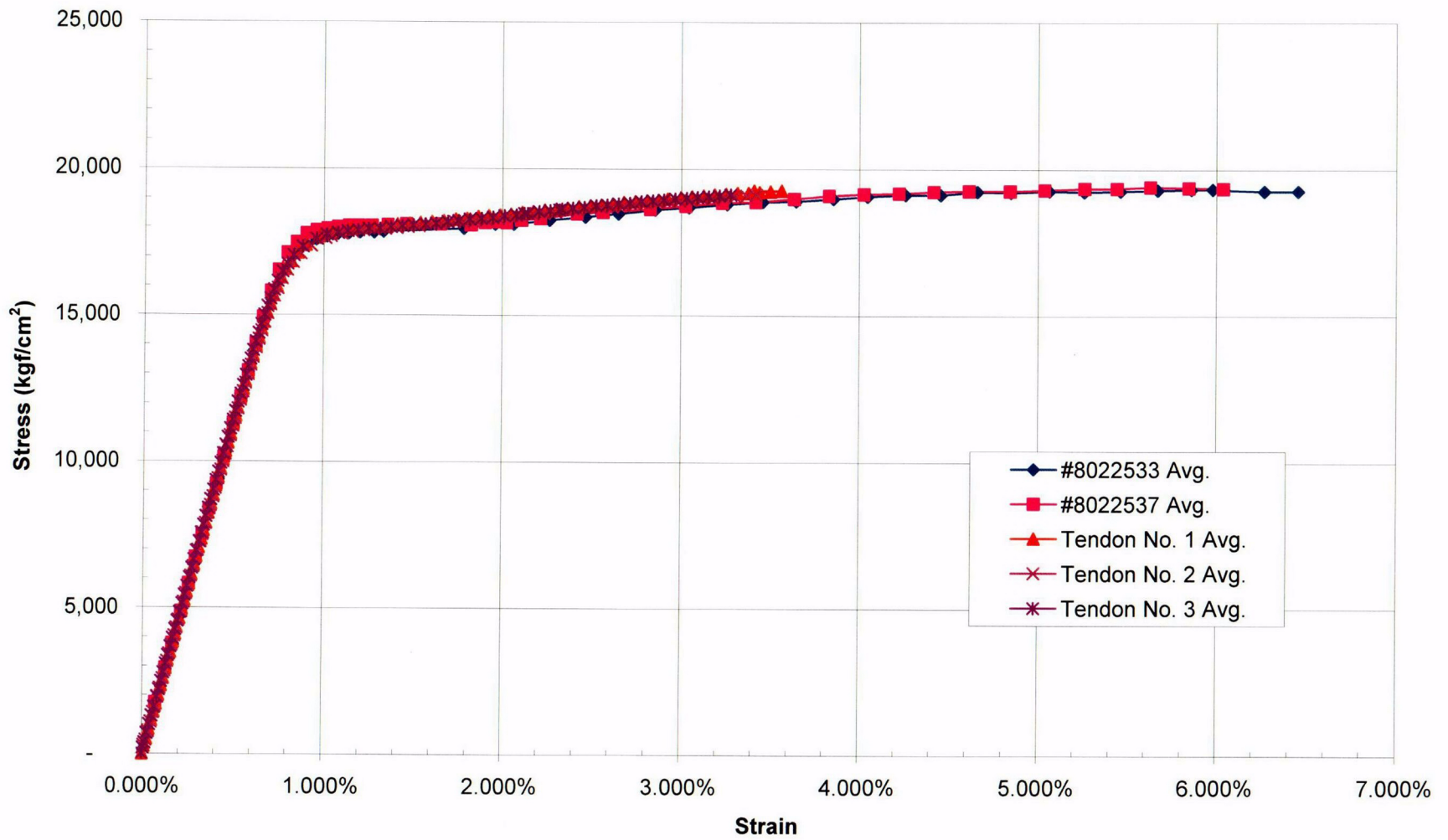


Tendon System Load-Elongation



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# Strand & Tendon Stress-Strain





## **Appendix C: As-Built Model Survey Data**





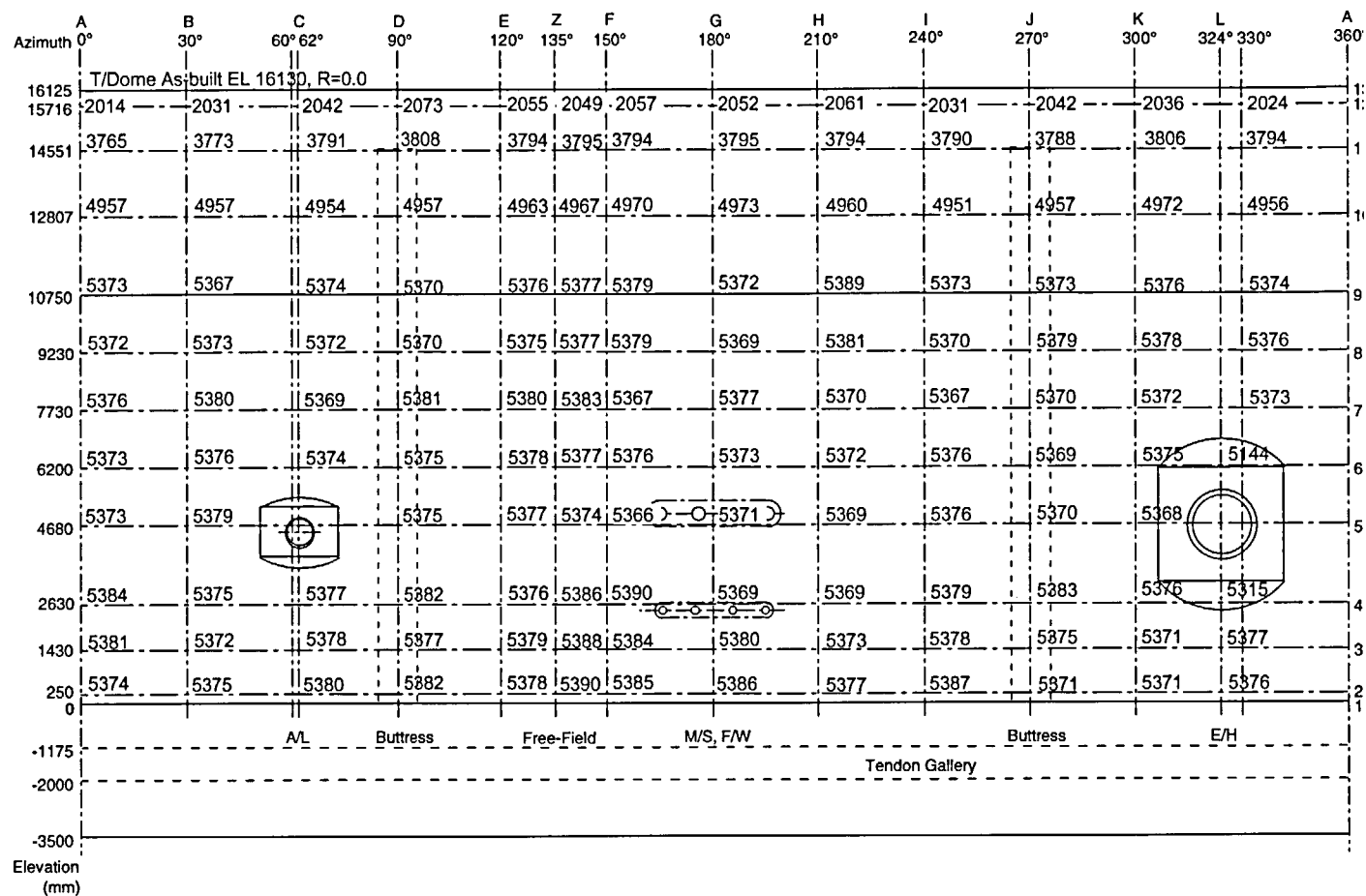


Figure C.1. As-Built Inside Radius of Cardinal Points, July 1999.

PNO	NORTHING	EASTING	STATION ELEV.	RAD. DIST FROM C/L	DESCRIPTION	NAME / LOCATION
1	838.102	299.999	-4.506		CONCRETE CONTROL TRIANGLES	CP-1
2	804.615	296.647	5.421	5.705	EQUIP. HATCH, TOP OUTSIDE	E-2
3	804.617	296.646	3.904	5.707	EQUIP. HATCH, BOTTOM OUTSIDE	E-3
4	799.993	261.886	-3.337		CONCRETE CONTROL TRIANGLES	CP-4
5	804.031	297.071	5.410	4.983	EQUIP. HATCH, TOP INSIDE	E-5
6	804.032	297.070	3.912	4.984	EQUIP. HATCH, BOTTOM INSIDE	E-6
7			-3.414		CONC. BASE 324 LIGHTNING POLE	BM-1
8			3.642		"SQUARE" PEN MARK ON STEEL	TBM @ LEVEL "C"
9			-0.003		OUTSIDE COLLAR	0-00
10			0.001		OUTSIDE COLLAR	0-90
11			-0.003		OUTSIDE COLLAR	0-180
12			0.005		OUTSIDE COLLAR	0-270
13			0.001		OUTSIDE COLLAR	0-324
14	887.561	236.383	-3.059		#5 REBAR WALUM. CAP	HATCHLINE SOUTH
15	829.197	278.787	-3.995		#5 REBAR WALUM. CAP	HATCHLINE NORTH
16	800.000	300.000	0.131	0.000	CONCRETE BASE MARK	RADIUS PT. CENTERLINE MODEL
17	*****					
18	*****					
19	*****					
20	*****					
21			-0.005		STEEL PLATE, 0.6m x 0.6m	1 -- 130
22			-0.004		STEEL PLATE, 0.6m x 0.6m	1 -- 0
23			-0.003		STEEL RIM	1 -- 30
24			0.002		STEEL RIM	1 -- 62
25			-0.004		STEEL PLATE, 0.6m x 0.6m	1 -- 90
26			-0.004		STEEL RIM	1 -- 120
27			-0.005		STEEL RIM	1 -- 135
28			-0.005		STEEL RIM	1 -- 150
29			0.001		STEEL RIM	1 -- 180
30			-0.002		STEEL RIM	1 -- 210
31			0.001		STEEL PLATE, 0.6m x 0.6m	1 -- 240
32			-0.003		STEEL RIM	1 -- 270
33			0.004		STEEL RIM	1 -- 300
34			0.000		STEEL PLATE, 0.6m x 0.6m	1 -- 324
35	805.374	300.000	0.250	5.374	2'x2' "+" ON INSIDE STEEL WALL	2 -- 0
36	804.655	302.688	0.250	5.375	2'x2' "+" ON INSIDE STEEL WALL	2 -- 30
37	802.526	304.750	0.250	5.380	2'x2' "+" ON INSIDE STEEL WALL	2 -- 62
38	800.000	305.382	0.250	5.382	2'x2' "+" ON INSIDE STEEL WALL	2 -- 90
39	797.311	304.657	0.250	5.378	2'x2' "+" ON INSIDE STEEL WALL	2 -- 120
40	796.188	303.811	0.250	5.390	2'x2' "+" ON INSIDE STEEL WALL	2 -- 135
41	795.336	302.693	0.250	5.385	2'x2' "+" ON INSIDE STEEL WALL	2 -- 150
42	794.614	300.000	0.250	5.386	2'x2' "+" ON INSIDE STEEL WALL	2 -- 180
43	795.343	297.312	0.250	5.377	2'x2' "+" ON INSIDE STEEL WALL	2 -- 210
44	797.307	295.335	0.250	5.387	2'x2' "+" ON INSIDE STEEL WALL	2 -- 240
45	800.000	294.629	0.250	5.371	2'x2' "+" ON INSIDE STEEL WALL	2 -- 270
46	802.686	295.349	0.250	5.371	2'x2' "+" ON INSIDE STEEL WALL	2 -- 300
47	804.349	296.840	0.250	5.376	2'x2' "+" ON INSIDE STEEL WALL	2 -- 324
48	805.381	300.000	1.430	5.381	2'x2' "+" ON INSIDE STEEL WALL	3 -- 0
49	804.652	302.686	1.430	5.372	2'x2' "+" ON INSIDE STEEL WALL	3 -- 30
50	802.525	304.748	1.430	5.378	2'x2' "+" ON INSIDE STEEL WALL	3 -- 62
51	800.000	305.377	1.430	5.377	2'x2' "+" ON INSIDE STEEL WALL	3 -- 90
52	797.311	304.658	1.430	5.379	2'x2' "+" ON INSIDE STEEL WALL	3 -- 120
53	796.190	303.810	1.430	5.388	2'x2' "+" ON INSIDE STEEL WALL	3 -- 135
54	795.337	302.691	1.430	5.384	2'x2' "+" ON INSIDE STEEL WALL	3 -- 150
55	794.620	300.000	1.430	5.380	2'x2' "+" ON INSIDE STEEL WALL	3 -- 180
56	795.347	297.314	1.430	5.373	2'x2' "+" ON INSIDE STEEL WALL	3 -- 210
57	797.311	295.343	1.430	5.378	2'x2' "+" ON INSIDE STEEL WALL	3 -- 240
58	800.000	294.625	1.430	5.375	2'x2' "+" ON INSIDE STEEL WALL	3 -- 270
59	802.686	295.349	1.430	5.371	2'x2' "+" ON INSIDE STEEL WALL	3 -- 300
60	804.350	296.839	1.430	5.377	2'x2' "+" ON INSIDE STEEL WALL	3 -- 324
61	805.384	300.000	2.630	5.384	2'x2' "+" ON INSIDE STEEL WALL	4 -- 0
62	804.655	302.688	2.630	5.375	2'x2' "+" ON INSIDE STEEL WALL	4 -- 30
63	802.524	304.748	2.630	5.377	2'x2' "+" ON INSIDE STEEL WALL	4 -- 62
64	800.000	305.382	2.630	5.382	2'x2' "+" ON INSIDE STEEL WALL	4 -- 90
65	797.311	304.656	2.630	5.376	2'x2' "+" ON INSIDE STEEL WALL	4 -- 120
66	796.192	303.808	2.630	5.386	2'x2' "+" ON INSIDE STEEL WALL	4 -- 135
67	795.332	302.695	2.630	5.390	2'x2' "+" ON INSIDE STEEL WALL	4 -- 150
68	794.631	300.000	2.630	5.369	2'x2' "+" ON INSIDE STEEL WALL	4 -- 180
69	795.350	297.316	2.630	5.369	2'x2' "+" ON INSIDE STEEL WALL	4 -- 210
70	797.311	295.342	2.630	5.379	2'x2' "+" ON INSIDE STEEL WALL	4 -- 240
71	800.000	294.617	2.630	5.383	2'x2' "+" ON INSIDE STEEL WALL	4 -- 270
72	802.688	295.344	2.630	5.376	2'x2' "+" ON INSIDE STEEL WALL	4 -- 300
73	804.300	296.876	2.630	5.315	2'x2' "+" ON INSIDE STEEL WALL	4 -- 324
74	805.373	300.000	4.680	5.373	2'x2' "+" ON INSIDE STEEL WALL	5 -- 0
75	804.658	302.690	4.680	5.379	2'x2' "+" ON INSIDE STEEL WALL	5 -- 30
76					"+" FALLS IN HATCH OPENING	5 -- 62 @ PERSONEL HATCH
77	800.000	305.375	4.680	5.375	2'x2' "+" ON INSIDE STEEL WALL	5 -- 90

PNO	NORTHING	EASTING	STATION ELEV.	RAD. DIST FROM C/L	DESCRIPTION	NAME / LOCATION
78	797.312	304.657	4.680	5.377	2'x2' "+" ON INSIDE STEEL WALL	5 -- 120
79	796.200	303.800	4.680	5.374	2'x2' "+" ON INSIDE STEEL WALL	5 -- 135
80	795.352	302.681	4.680	5.366	2'x2' "+" ON INSIDE STEEL WALL	5 -- 150
81	794.629	300.000	4.680	5.371	2'x2' "+" ON INSIDE STEEL WALL	5 -- 180
82	795.350	297.316	4.680	5.369	2'x2' "+" ON INSIDE STEEL WALL	5 -- 210
83	797.312	295.344	4.680	5.376	2'x2' "+" ON INSIDE STEEL WALL	5 -- 240
84	800.000	294.630	4.680	5.370	2'x2' "+" ON INSIDE STEEL WALL	5 -- 270
85	802.684	295.351	4.680	5.368	2'x2' "+" ON INSIDE STEEL WALL	5 -- 300
86					"+" FALLS IN HATCH OPENING	5 -- 324 @ EQUIPMENT HATCH
87	805.373	300.000	6.200	5.373	2'x2' "+" ON INSIDE STEEL WALL	6 -- 0
88	804.656	302.688	6.200	5.376	2'x2' "+" ON INSIDE STEEL WALL	6 -- 30
89	802.523	304.745	6.200	5.374	2'x2' "+" ON INSIDE STEEL WALL	6 -- 62
90	800.000	305.375	6.200	5.375	2'x2' "+" ON INSIDE STEEL WALL	6 -- 90
91	797.311	304.657	6.200	5.378	2'x2' "+" ON INSIDE STEEL WALL	6 -- 120
92	796.198	303.802	6.200	5.377	2'x2' "+" ON INSIDE STEEL WALL	6 -- 135
93	795.344	302.688	6.200	5.376	2'x2' "+" ON INSIDE STEEL WALL	6 -- 150
94	794.627	300.000	6.200	5.373	2'x2' "+" ON INSIDE STEEL WALL	6 -- 180
95	795.348	297.314	6.200	5.372	2'x2' "+" ON INSIDE STEEL WALL	6 -- 210
96	797.312	295.344	6.200	5.376	2'x2' "+" ON INSIDE STEEL WALL	6 -- 240
97	800.000	294.631	6.200	5.369	2'x2' "+" ON INSIDE STEEL WALL	6 -- 270
98	802.688	295.345	6.200	5.375	2'x2' "+" ON INSIDE STEEL WALL	6 -- 300
99	804.162	296.976	6.200	5.144	2'x2' "+" ON INSIDE STEEL WALL	6 -- 324
100	805.376	300.000	7.730	5.376	2'x2' "+" ON INSIDE STEEL WALL	7 -- 0
101	804.659	302.690	7.730	5.380	2'x2' "+" ON INSIDE STEEL WALL	7 -- 30
102	802.521	304.740	7.730	5.369	2'x2' "+" ON INSIDE STEEL WALL	7 -- 62
103	800.000	305.381	7.730	5.381	2'x2' "+" ON INSIDE STEEL WALL	7 -- 90
104	797.310	304.659	7.730	5.380	2'x2' "+" ON INSIDE STEEL WALL	7 -- 120
105	796.194	303.806	7.730	5.383	2'x2' "+" ON INSIDE STEEL WALL	7 -- 135
106	795.352	302.684	7.730	5.367	2'x2' "+" ON INSIDE STEEL WALL	7 -- 150
107	794.623	300.000	7.730	5.377	2'x2' "+" ON INSIDE STEEL WALL	7 -- 180
108	795.350	297.315	7.730	5.370	2'x2' "+" ON INSIDE STEEL WALL	7 -- 210
109	797.317	295.352	7.730	5.367	2'x2' "+" ON INSIDE STEEL WALL	7 -- 240
110	800.000	294.630	7.730	5.370	2'x2' "+" ON INSIDE STEEL WALL	7 -- 270
111	802.686	295.348	7.730	5.372	2'x2' "+" ON INSIDE STEEL WALL	7 -- 300
112	804.347	296.842	7.730	5.373	2'x2' "+" ON INSIDE STEEL WALL	7 -- 324
113	805.372	300.000	9.230	5.372	2'x2' "+" ON INSIDE STEEL WALL	8 -- 0
114	804.654	302.687	9.230	5.374	2'x2' "+" ON INSIDE STEEL WALL	8 -- 30
115	802.522	304.743	9.230	5.372	2'x2' "+" ON INSIDE STEEL WALL	8 -- 62
116	800.000	305.370	9.230	5.370	2'x2' "+" ON INSIDE STEEL WALL	8 -- 90
117	797.313	304.655	9.230	5.375	2'x2' "+" ON INSIDE STEEL WALL	8 -- 120
118	796.198	303.802	9.230	5.377	2'x2' "+" ON INSIDE STEEL WALL	8 -- 135
119	795.342	302.689	9.230	5.379	2'x2' "+" ON INSIDE STEEL WALL	8 -- 150
120	794.631	300.001	9.230	5.369	2'x2' "+" ON INSIDE STEEL WALL	8 -- 180
121	795.340	297.310	9.230	5.381	2'x2' "+" ON INSIDE STEEL WALL	8 -- 210
122	797.315	295.349	9.230	5.370	2'x2' "+" ON INSIDE STEEL WALL	8 -- 240
123	800.000	294.621	9.230	5.379	2'x2' "+" ON INSIDE STEEL WALL	8 -- 270
124	802.689	295.343	9.230	5.378	2'x2' "+" ON INSIDE STEEL WALL	8 -- 300
125	804.349	296.840	9.230	5.376	2'x2' "+" ON INSIDE STEEL WALL	8 -- 324
126	805.373	300.000	10.750	5.373	2'x2' "+" ON INSIDE STEEL WALL	9 -- 0
127	804.648	302.684	10.750	5.367	2'x2' "+" ON INSIDE STEEL WALL	9 -- 30
128	802.523	304.745	10.750	5.374	2'x2' "+" ON INSIDE STEEL WALL	9 -- 62
129	800.000	305.370	10.750	5.370	2'x2' "+" ON INSIDE STEEL WALL	9 -- 90
130	797.312	304.656	10.750	5.376	2'x2' "+" ON INSIDE STEEL WALL	9 -- 120
131	796.198	303.802	10.750	5.377	2'x2' "+" ON INSIDE STEEL WALL	9 -- 135
132	795.342	302.689	10.750	5.379	2'x2' "+" ON INSIDE STEEL WALL	9 -- 150
133	794.628	300.000	10.750	5.372	2'x2' "+" ON INSIDE STEEL WALL	9 -- 180
134	795.333	297.306	10.750	5.389	2'x2' "+" ON INSIDE STEEL WALL	9 -- 210
135	797.314	295.347	10.750	5.373	2'x2' "+" ON INSIDE STEEL WALL	9 -- 240
136	800.000	294.627	10.750	5.373	2'x2' "+" ON INSIDE STEEL WALL	9 -- 270
137	802.688	295.344	10.750	5.376	2'x2' "+" ON INSIDE STEEL WALL	9 -- 300
138	804.348	296.841	10.750	5.374	2'x2' "+" ON INSIDE STEEL WALL	9 -- 324
139	804.957	300.000	12.807	4.957	2'x2' "+" ON INSIDE STEEL WALL	10 -- 0
140	804.294	302.478	12.807	4.957	2'x2' "+" ON INSIDE STEEL WALL	10 -- 30
141	802.326	304.374	12.807	4.954	2'x2' "+" ON INSIDE STEEL WALL	10 -- 62
142	800.002	304.957	12.807	4.957	2'x2' "+" ON INSIDE STEEL WALL	10 -- 90
143	797.518	304.298	12.807	4.963	2'x2' "+" ON INSIDE STEEL WALL	10 -- 120
144	796.488	303.512	12.807	4.967	2'x2' "+" ON INSIDE STEEL WALL	10 -- 135
145	795.696	302.485	12.807	4.970	2'x2' "+" ON INSIDE STEEL WALL	10 -- 150
146	795.027	300.000	12.807	4.973	2'x2' "+" ON INSIDE STEEL WALL	10 -- 180
147	795.705	297.519	12.807	4.960	2'x2' "+" ON INSIDE STEEL WALL	10 -- 210
148	797.525	295.712	12.807	4.951	2'x2' "+" ON INSIDE STEEL WALL	10 -- 240
149	800.004	295.043	12.807	4.957	2'x2' "+" ON INSIDE STEEL WALL	10 -- 270
150	802.486	295.694	12.807	4.972	2'x2' "+" ON INSIDE STEEL WALL	10 -- 300
151	804.009	297.087	12.807	4.956	2'x2' "+" ON INSIDE STEEL WALL	10 -- 324
152	803.765	300.000	14.511	3.765	2'x2' "+" ON INSIDE STEEL WALL	11 -- 0
153	803.266	301.888	14.511	3.773	2'x2' "+" ON INSIDE STEEL WALL	11 -- 30
154	801.777	303.349	14.511	3.791	2'x2' "+" ON INSIDE STEEL WALL	11 -- 62

PNO	NORTHING	EASTING	STATION ELEV.	RAD. DIST FROM C/L	DESCRIPTION	NAME / LOCATION
155	799.997	303.808	14.511	3.808	2"x2' "+" ON INSIDE STEEL WALL	11 -- 90
156	798.103	303.286	14.511	3.794	2"x2' "+" ON INSIDE STEEL WALL	11 -- 120
157	797.316	302.682	14.511	3.795	2"x2' "+" ON INSIDE STEEL WALL	11 -- 135
158	796.714	301.896	14.511	3.794	2"x2' "+" ON INSIDE STEEL WALL	11 -- 150
159	796.205	300.000	14.511	3.795	2"x2' "+" ON INSIDE STEEL WALL	11 -- 180
160	796.713	298.106	14.511	3.794	2"x2' "+" ON INSIDE STEEL WALL	11 -- 210
161	798.102	296.720	14.511	3.790	2"x2' "+" ON INSIDE STEEL WALL	11 -- 240
162	799.997	296.212	14.511	3.788	2"x2' "+" ON INSIDE STEEL WALL	11 -- 270
163	801.903	296.704	14.511	3.806	2"x2' "+" ON INSIDE STEEL WALL	11 -- 300
164	803.069	297.770	14.511	3.794	2"x2' "+" ON INSIDE STEEL WALL	11 -- 324
165	802.014	300.000	15.716	2.014	2"x2' "+" ON INSIDE STEEL WALL	12 -- 0
166	801.759	301.016	15.716	2.031	2"x2' "+" ON INSIDE STEEL WALL	12 -- 30
167	800.959	301.803	15.716	2.042	2"x2' "+" ON INSIDE STEEL WALL	12 -- 62
168	800.000	302.073	15.716	2.073	2"x2' "+" ON INSIDE STEEL WALL	12 -- 90
169	798.973	301.780	15.716	2.055	2"x2' "+" ON INSIDE STEEL WALL	12 -- 120
170	798.551	301.449	15.716	2.049	2"x2' "+" ON INSIDE STEEL WALL	12 -- 135
171	798.219	301.029	15.716	2.057	2"x2' "+" ON INSIDE STEEL WALL	12 -- 150
172	797.948	300.000	15.716	2.052	2"x2' "+" ON INSIDE STEEL WALL	12 -- 180
173	798.215	298.970	15.716	2.061	2"x2' "+" ON INSIDE STEEL WALL	12 -- 210
174	798.985	298.241	15.716	2.031	2"x2' "+" ON INSIDE STEEL WALL	12 -- 240
175	800.000	297.958	15.716	2.042	2"x2' "+" ON INSIDE STEEL WALL	12 -- 270
176	801.018	298.237	15.716	2.036	2"x2' "+" ON INSIDE STEEL WALL	12 -- 300
177	801.637	298.810	15.716	2.024	2"x2' "+" ON INSIDE STEEL WALL	12 -- 324
178	800.000	300.000	16.130	0.000	DOME TOP CENTERLINE MARK	RADIUS PT.- CENTERLINE MODE
179	794.813	301.330	2.545	5.355	TOP OF PIPE @ WALL- LEVEL"B"	ACCESS PIPE
180	794.671	300.507	2.544	5.353	TOP OF PIPE @ WALL- LEVEL"B"	ACCESS PIPE
181	794.671	299.507	2.544	5.352	TOP OF PIPE @ WALL- LEVEL"B"	ACCESS PIPE
182	794.821	298.682	2.544	5.344	TOP OF PIPE @ WALL- LEVEL"B"	ACCESS PIPE
183	794.852	301.396	5.134	5.334	TOP OF PIPE @ WALL- LEVEL"C"	ACCESS PIPE
184	794.682	300.407	5.131	5.333	TOP OF PIPE @ WALL- LEVEL"C"	ACCESS PIPE
185	794.677	299.580	5.131	5.340	TOP OF PIPE @ WALL- LEVEL"C"	ACCESS PIPE
186	794.851	298.599	5.130	5.336	TOP OF PIPE @ WALL- LEVEL"C"	ACCESS PIPE
187	802.432	304.590	4.193	5.195	INSIDE INVERT OF PIPE	CL. PERSONEL HATCH

## **Appendix D: Final PCCV Instrumentation List**





## Rebar Strain Instrumentation List

Labeling I D (name)	Azimuthal Angle (deg)	Vertical Elevation (in)	Radial Distance (in)	Transducer Designation	Location Drawing #	Details Drawing #	Basic Mark #	Modified Mark #	Comnts	Calibration
RS-R-A0-01	0	-135.0	48.0	EP-08-250BF-350	D-SN-P-127		F1XY063	F1XY063A	(basemat	NoCal
RS-R-A0-02	0	-135.0	168.0	EP-08-250BF-350	D-SN-P-127		F1XY063	F1XY063A	bottom)	NoCal
RS-R-D0-01	90	-135.0	48.0	EP-08-250BF-350	D-SN-P-127		F1XYA63	F1XYA63A		NoCal
RS-R-D0-02	90	-135.0	168.0	EP-08-250BF-350	D-SN-P-127		F1XYA63	F1XYA63A		NoCal
RS-R-A0-03	0	-4.0	48.0	EP-08-250BF-350	D-SN-P-127		F8R012	F8R012A	(basemat	NoCal
RS-R-A0-04	0	-4.0	168.0	EP-08-250BF-350	D-SN-P-127		F8R016	F8R016A	top)	NoCal
RS-R-A0-05	0	-4.0	206.0	EP-08-250BF-350	D-SN-P-127		F8R016	F8R016A		NoCal
RS-R-A0-06	0	-4.0	218.0	EP-08-250BF-350	D-SN-P-127		F8R016	F8R016A		NoCal
RS-R-D0-03	90	-4.0	48.0	EP-08-250BF-350	D-SN-P-127		F8R001	F8R001A		NoCal
RS-R-D0-04	90	-4.0	168.0	EP-08-250BF-350	D-SN-P-127		F8R015	F8R015A		NoCal
RS-R-D0-05	90	-4.0	206.0	EP-08-250BF-350	D-SN-P-127		F8R015	F8R015A		NoCal
RS-R-D0-06	90	-4.0	218.0	EP-08-250BF-350	D-SN-P-127		F8R015	F8R015A		NoCal
RS-R-Z0-01	135	-4.0	48.0	EP-08-250BF-350	D-SN-P-127		F8R006	F8R006A		NoCal
RS-R-Z0-02	135	-4.0	168.0	EP-08-250BF-350	D-SN-P-127		F8R016	F8R016B		NoCal
RS-R-Z0-03	135	-4.0	206.0	EP-08-250BF-350	D-SN-P-127		F8R016	F8R016B		NoCal
RS-R-Z0-04	135	-4.0	218.0	EP-08-250BF-350	D-SN-P-127		F8R016	F8R016B		NoCal
RS-C-D0-07	90	-47.0	202.0	EP-08-250BF-350	D-SN-P-127		F3C001	F3C001A	(tendon	NoCal
RS-C-D0-08	90	-47.0	231.0	EP-08-250BF-350	D-SN-P-127		F3C003	F3C003A	gallery)	NoCal
RS-R-D0-09	90	-44.0	197.0	EP-08-250BF-350	D-SN-P-127		F4R001	F4R001A		NoCal
RS-R-D0-10	90	-44.0	235.0	EP-08-250BF-350	D-SN-P-127		F4R001	F4R001A		NoCal
RS-R-D0-11	90	-28.0	205.0	EP-08-250BF-350	D-SN-P-127		F5R002	F5R002A		NoCal
RS-M-D0-12	90	-40.0	201.0	EP-08-250BF-350	D-SN-P-127		F3Z002	F3Z002A		NoCal
RS-M-D0-13	90	-23.0	201.0	EP-08-250BF-350	D-SN-P-127		F3Z002	F3Z002A		NoCal
RS-M-D0-14	90	-40.0	232.0	EP-08-250BF-350	D-SN-P-127		F3Z004	F3Z004A		NoCal
RS-C-Z0-05	135	-47.0	202.0	EP-08-250BF-350	D-SN-P-127		F3C001	F3C001A		NoCal
RS-C-Z0-06	135	-47.0	231.0	EP-08-250BF-350	D-SN-P-127		F3C003	F3C003A		NoCal
RS-R-Z0-07	135	-44.0	197.0	EP-08-250BF-350	D-SN-P-127		F4R001	F4R001B		NoCal
RS-R-Z0-08	135	-44.0	235.0	EP-08-250BF-350	D-SN-P-127		F4R001	F4R001B		NoCal
RS-R-Z0-09	135	-28.0	205.0	EP-08-250BF-350	D-SN-P-127		F5R002	F5R002B		NoCal
RS-M-Z0-10	135	-40.0	201.0	EP-08-250BF-350	D-SN-P-127		F3Z002	F3Z002B		NoCal
RS-M-Z0-11	135	-23.0	201.0	EP-08-250BF-350	D-SN-P-127		F3Z002	F3Z002B		NoCal
RS-M-Z0-12	135	-40.0	232.0	EP-08-250BF-350	D-SN-P-127		F3Z004	F3Z004B		NoCal
GB-D-D0-01	90	-40.0	198.0	EP-08-250BF-350	D-SN-P-127		-	G13D0A	(Inclined	NoCal
GB-D-D0-02	90	-31.5	206.5	EP-08-250BF-350	D-SN-P-127		-	G13D0A	gage bars	NoCal
GB-D-D0-03	90	-23.0	215.0	EP-08-250BF-350	D-SN-P-127		-	G13D0A	above	NoCal
GB-D-D0-04	90	-40.0	238.0	EP-08-250BF-350	D-SN-P-127		-	G13D0B	gallery)	NoCal
GB-D-D0-05	90	-31.5	229.5	EP-08-250BF-350	D-SN-P-127		-	G13D0B		NoCal
GB-D-D0-06	90	-23.0	221.0	EP-08-250BF-350	D-SN-P-127		-	G13D0B		NoCal
GB-D-D0-07	90	-39.0	189.0	EP-08-250BF-350	D-SN-P-127		-	G14D0A		NoCal
GB-D-D0-08	90	-30.5	197.5	EP-08-250BF-350	D-SN-P-127		-	G14D0A		NoCal
GB-D-D0-09	90	-22.0	206.0	EP-08-250BF-350	D-SN-P-127		-	G14D0A		NoCal
GB-D-D0-10	90	-13.5	214.5	EP-08-250BF-350	D-SN-P-127		-	G14D0A		NoCal
GB-D-Z0-01	135	-40.0	198.0	EP-08-250BF-350	D-SN-P-127		-	G13Z0A		NoCal
GB-D-Z0-02	135	-31.5	206.5	EP-08-250BF-350	D-SN-P-127		-	G13Z0A		NoCal
GB-D-Z0-03	135	-23.0	215.0	EP-08-250BF-350	D-SN-P-127		-	G13Z0A		NoCal
GB-D-Z0-04	135	-40.0	238.0	EP-08-250BF-350	D-SN-P-127		-	G13Z0B		NoCal
GB-D-Z0-05	135	-31.5	229.5	EP-08-250BF-350	D-SN-P-127		-	G13Z0B		NoCal
GB-D-Z0-06	135	-23.0	221.0	EP-08-250BF-350	D-SN-P-127		-	G13Z0B		NoCal
GB-D-Z0-07	135	-39.0	189.0	EP-08-250BF-350	D-SN-P-127		-	G14Z0A		NoCal
GB-D-Z0-08	135	-30.5	197.5	EP-08-250BF-350	D-SN-P-127		-	G14Z0A		NoCal
GB-D-Z0-09	135	-22.0	206.0	EP-08-250BF-350	D-SN-P-127		-	G14Z0A		NoCal
GB-D-Z0-10	135	-13.5	214.5	EP-08-250BF-350	D-SN-P-127		-	G14Z0A		NoCal



## Rebar Strain Instrumentation List

Labeling	Azimuthal	Vertical	Radial	Transducer	Location	Details	Basic	Modified	Comnts	Calibration
I D	Angle	Elevation	Distance	Designation	Drawing #	Drawing #	Mark #	Mark #		
(name)	(deg)	(in)	(in)							
GB-M-A1-01	350	-1.0	214.0	EP-08-062AQ-350	D-SN-P-125		-	G15A1A	(vertical	NoCal
GB-M-A1-02	350	3.4	214.0	EP-08-062AQ-350	D-SN-P-125		-	G15A1A	gage bars	NoCal
GB-M-A1-03	350	7.9	214.0	EP-08-062AQ-350	D-SN-P-125		-	G15A1A	at wall	NoCal
GB-M-A1-04	350	12.3	214.0	EP-08-062AQ-350	D-SN-P-125		-	G15A1A	basemat	NoCal
GB-M-A1-05	350	16.8	214.0	EP-08-062AQ-350	D-SN-P-125		-	G15A1A	junction)	NoCal
GB-M-A1-06	350	-1.0	217.2	EP-08-062AQ-350	D-SN-P-125		-	G15A1B		NoCal
GB-M-A1-07	350	3.4	217.2	EP-08-062AQ-350	D-SN-P-125		-	G15A1B		NoCal
GB-M-A1-08	350	7.9	217.2	EP-08-062AQ-350	D-SN-P-125		-	G15A1B		NoCal
GB-M-A1-09	350	12.3	217.2	EP-08-062AQ-350	D-SN-P-125		-	G15A1B		NoCal
GB-M-A1-10	350	16.8	217.2	EP-08-062AQ-350	D-SN-P-125		-	G15A1B		NoCal
GB-M-A1-11	350	-1.0	220.4	EP-08-062AQ-350	D-SN-P-126		-	G15A1C		NoCal
GB-M-A1-12	350	3.4	220.4	EP-08-062AQ-350	D-SN-P-126		-	G15A1C		NoCal
GB-M-A1-13	350	7.9	220.4	EP-08-062AQ-350	D-SN-P-126		-	G15A1C		NoCal
GB-M-A1-14	350	12.3	220.4	EP-08-062AQ-350	D-SN-P-126		-	G15A1C		NoCal
GB-M-A1-15	350	16.8	220.4	EP-08-062AQ-350	D-SN-P-126		-	G15A1C		NoCal
GB-M-A1-16	350	-1.0	223.6	EP-08-062AQ-350	D-SN-P-126		-	G15A1D		NoCal
GB-M-A1-17	350	3.4	223.6	EP-08-062AQ-350	D-SN-P-126		-	G15A1D		NoCal
GB-M-A1-18	350	7.9	223.6	EP-08-062AQ-350	D-SN-P-126		-	G15A1D		NoCal
GB-M-A1-19	350	12.3	223.6	EP-08-062AQ-350	D-SN-P-126		-	G15A1D		NoCal
GB-M-A1-20	350	16.8	223.6	EP-08-062AQ-350	D-SN-P-126		-	G15A1D		NoCal
GB-M-A1-21	351	-1.0	223.6	EP-08-062AQ-350	D-SN-P-126		-	G15A1E	Added	NoCal
GB-M-A1-22	351	3.4	223.6	EP-08-062AQ-350	D-SN-P-126		-	G15A1E	Added	NoCal
GB-M-D1-01	90	-1.0	214.0	EP-08-062AQ-350	D-SN-P-125		-	G15D1A		NoCal
GB-M-D1-02	90	3.4	214.0	EP-08-062AQ-350	D-SN-P-125		-	G15D1A		NoCal
GB-M-D1-03	90	7.9	214.0	EP-08-062AQ-350	D-SN-P-125		-	G15D1A		NoCal
GB-M-D1-04	90	12.3	214.0	EP-08-062AQ-350	D-SN-P-125		-	G15D1A		NoCal
GB-M-D1-05	90	16.8	214.0	EP-08-062AQ-350	D-SN-P-125		-	G15D1A		NoCal
GB-M-D1-06	90	-1.0	220.0	EP-08-062AQ-350	D-SN-P-125		-	G15D1B		NoCal
GB-M-D1-07	90	3.4	220.0	EP-08-062AQ-350	D-SN-P-125		-	G15D1B		NoCal
GB-M-D1-08	90	7.9	220.0	EP-08-062AQ-350	D-SN-P-125		-	G15D1B		NoCal
GB-M-D1-09	90	12.3	220.0	EP-08-062AQ-350	D-SN-P-125		-	G15D1B		NoCal
GB-M-D1-10	90	16.8	220.0	EP-08-062AQ-350	D-SN-P-125		-	G15D1B		NoCal
GB-M-D1-11	90	-1.0	226.0	EP-08-062AQ-350	D-SN-P-126		-	G15D1C		NoCal
GB-M-D1-12	90	3.4	226.0	EP-08-062AQ-350	D-SN-P-126		-	G15D1C		NoCal
GB-M-D1-13	90	7.9	226.0	EP-08-062AQ-350	D-SN-P-126		-	G15D1C		NoCal
GB-M-D1-14	90	12.3	226.0	EP-08-062AQ-350	D-SN-P-126		-	G15D1C		NoCal
GB-M-D1-15	90	16.8	226.0	EP-08-062AQ-350	D-SN-P-126		-	G15D1C		NoCal
GB-M-D1-16	90	-1.0	232.0	EP-08-062AQ-350	D-SN-P-126		-	G15D1D		NoCal
GB-M-D1-17	90	3.4	232.0	EP-08-062AQ-350	D-SN-P-126		-	G15D1D		NoCal
GB-M-D1-18	90	7.9	232.0	EP-08-062AQ-350	D-SN-P-126		-	G15D1D		NoCal
GB-M-D1-19	90	12.3	232.0	EP-08-062AQ-350	D-SN-P-126		-	G15D1D		NoCal
GB-M-D1-20	90	16.8	232.0	EP-08-062AQ-350	D-SN-P-126		-	G15D1D		NoCal
GB-M-Z1-01	135	-1.0	214.0	EP-08-062AQ-350	D-SN-P-125		-	G15Z1A		NoCal
GB-M-Z1-02	135	3.4	214.0	EP-08-062AQ-350	D-SN-P-125		-	G15Z1A		NoCal
GB-M-Z1-03	135	7.9	214.0	EP-08-062AQ-350	D-SN-P-125		-	G15Z1A		NoCal
GB-M-Z1-04	135	12.3	214.0	EP-08-062AQ-350	D-SN-P-125		-	G15Z1A		NoCal
GB-M-Z1-05	135	16.8	214.0	EP-08-062AQ-350	D-SN-P-125		-	G15Z1A		NoCal
GB-M-Z1-06	135	-1.0	217.2	EP-08-062AQ-350	D-SN-P-125		-	G15Z1B		NoCal
GB-M-Z1-07	135	3.4	217.2	EP-08-062AQ-350	D-SN-P-125		-	G15Z1B		NoCal
GB-M-Z1-08	135	7.9	217.2	EP-08-062AQ-350	D-SN-P-125		-	G15Z1B		NoCal
GB-M-Z1-09	135	12.3	217.2	EP-08-062AQ-350	D-SN-P-125		-	G15Z1B		NoCal
GB-M-Z1-10	135	16.8	217.2	EP-08-062AQ-350	D-SN-P-125		-	G15Z1B		NoCal
GB-M-Z1-11	135	-1.0	220.4	EP-08-062AQ-350	D-SN-P-126		-	G15Z1C		NoCal
GB-M-Z1-12	135	3.4	220.4	EP-08-062AQ-350	D-SN-P-126		-	G15Z1C		NoCal
GB-M-Z1-13	135	7.9	220.4	EP-08-062AQ-350	D-SN-P-126		-	G15Z1C		NoCal