BOMBARDIER

Chicago Transit Authority

5000 Series Cars

Carbody Static Structural Qualification Test Results

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APPENDIX:

1 GENERAL

This report presents the CTA carbody static structural qualification test results as per the requirements of Section 3.01C of the CTA 5000 Series Rapid Transit Cars Technical Specification (ref. 1). The tests were performed on carbody # 6 at La Pocatière, Quebec, Canada on the 15th of October 2008.

The tests were conducted in accordance with document 076-BTP-3001 Carbody Static Structural Qualification Test Procedure rev. 1 (ref. 2) and the following revisions to the procedure described in section 2 of this document.

The tests were witnessed by:

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2 REVISIONS TO THE TEST PROCEDURE

The test procedure was revised for the following points (the changes are shown in Appendix B):

- Strain gauges addition, elimination and relocation due to accessibility. The complete list of strain gauges, related channels and figures are shown in Appendix B.
- Updated list of load cell, deflection gauges and channels.
- The secondary air duct behind the bolster at end # 1 was modified to the new design as can be seen on figure B.6. The initial design of the secondary air duct was kept at end # 2 (figure B.6-C). Both configurations were strain gauged.
- Modification of the weight distribution for AW3 due to pallet accessibility during loading.
- Reduced list of test steps to simplify the vertical and compression loading (mutually agreed with CTA during the test).

The Test set up and above changes were reviewed and approved by CTA.

3 ACCEPTANCE CRITERIA

The acceptance criteria was described in paragraph 1.3 of the test procedure (ref. 2) and is repeated here for convenience.

The requirements of the CTA Specification 6900-04 (ref. 1) paragraph 3.01,C form the basis for the acceptability criteria's which are as follows:

1. Under vertical loads only (phase 1 & phase 3), the stress shall not exceed 50% of the material yield stress.
2. Under combined vertical and compressive end loads (phase 2 & phase 4) the stress levels shall not exceed 90% of the material yield stress.
3. That there is no permanent deformation, fracture, crack, or non-elastic buckling remaining after the loads are removed. Broken welds shall be jointly inspected by CTA and Bombardier to determine if the failure is the result of the weld quality or stress.
4. The camber, measured at the side sill between bolsters, shall not be negative (sagging) under vertical loads.

Mechanical properties of the carbody materials from table 2 of the Carbody Stress Analysis and Test Plan (ref. 3) and are repeated here for convenience:

- The tension versus compression yield capacity of stainless steel is accounted for in the results review.
- The transverse yield is also used wherever applicable.

Table 2 - Mechanical Properties of Carbody Materials for Stress Analysis

			Base Metal Mechanical Properties						
		Thickness	Tension		Compression **			Elongation	R_{min}-angl
Grade	ASTM specification	"t"	Yield strength	Ultimate strength	Yield Long.	Yield Trans.	Ultimate strength		
		Inch	ksi	ksi	ksi	ksi	ksi	% @ 2in.	t/angle
HSLA 80 Sheets	ASTM A 1011-06 HSLAS-F Gr. 80	0.125	80	90	80	80	90	20	2t/180°
HSLA 80 Plates	ASTM A 656 Gr 80 *	0.1875	80	90	80	80	90	20	2t/180°
		0.25	80	90	80	80	90	20	2t/180°
		0.375	80	90	80	80	90	20	2t/180°
		0.5	80	90	80	80	90	20	2t/180°
201LN "Deadlight"	ASTM A 666-03 Gr. 201LN 1/16 hard	0.05	50	100	42	54	82	40	t/180°
201LN MT	ASTM A 666-03 Gr. 201LN 1/4 hard	0.026	75	120	62	80	86	25	1.5t/135°
		0.03	75	120	62	80	86	25	1.5t/135°
		0.050 to 0.1875	75	120	62	80	86	25	1.5t/135°
201LN-LT	ASTM A666-03, Annealed	0.02 & 0.05	45	95	38	48	80	25	1.5t/135°

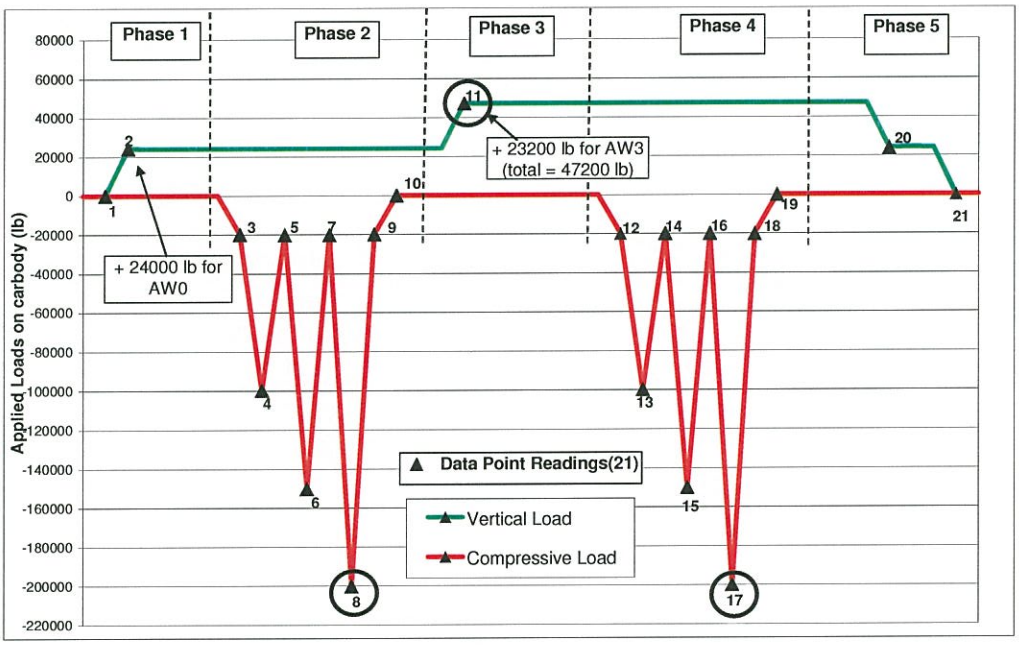
* with Bombardier's supplementary requirements to meet contract specifications
** Longitudinal & transverse Yield compression strength for 201LN 1/16 hard & 201LN MT 1/4 hard material are based on Watter & Lincoln Stainless Steel Structural Members"

4 RESULTS

This section gives a summary of the highest stressed areas and strain gauges with the lowest margins of safety. The complete list of results per strain gauge is presented in appendix D. An electronic XL file of the raw data for all data points and stress calculations is also provided to CTA.

Results are presented for the maximum vertical load at AW3, the compression load at AW0 (ready to run carbody empty weight) and the compression load at AW3 (full passenger weight).

The following figure is a duplication of the test load schematic of ref. 2 which is included here for convenience.



- Data point 11 is used for the maximum vertical load test results.
- Data point 8 is used for the 200000 lb compression test at AW0.
- Data point 17 is used for the 200000 lb compression test at AW3.

4.1 Vertical Load Test (AW3)

Table 4.1 presents the results of the gauges with the lowest margins of safety for the vertical load test. The complete list of results per strain gauge number is presented in Appendix D.

The weight of the carbody bareshell is factored in the calculation of the stresses in table 4.1. The factor is 21% which represents the weight of the bareshell with respect to the total weight of the carbody at AW3.
The factored stress calculated in table 4.1 is the measured stress multiplied by 1.21 (21%).

Vertical at AW3 (Data point 11, Allowable = yield x 0.5):
(sorted by Margin of safety) (factor for bareshell weight in table is applied on factored stress only = ÷ 21%)

SG	Material	Figure (App. B)	SG installed on	Allow. yieldx0.5	Factored Stress (psi)	Margin Safety	Measured Strain	Measured Stress	
SG184	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(top)	-31000	-30724	0.01	-914	-25392	
SG60	201LN-MT-1/4hard	Fig. B.10	Door mask gusset	40000	38721	0.03	1143	32001	*Trans. All.
SG160	201LN-MT-1/4hard	Fig. B.10	Door mask gusset	40000	38111	0.05	1125	31497	*Trans. All.
SG52	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (sec.D-D)	37500	35200	0.07	1039	29091	
SG81	201LN-MT-1/4hard	Fig. B.14	Top outer door mask radius	-31000	-26088	0.19	-770	-21560	
SG71	201LN-MT-1/4hard	Fig. B.11	Door mask gusset	-40000	-33304	0.20	-983	-27524	*Trans. All.
SG27	HSLA 80	Fig. B.5	Bolster web around hole	-40000	-32774	0.22	-934	-27086	
SG68	201LN-MT-1/4hard	Fig. B.11	Bottom door mask (sec.G-G)	-31000	-24427	0.27	-721	-20188	
SG84	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(top)	-31000	-24258	0.28	-716	-20048	
SG127	HSLA 80	Fig. B.5	Bolster web around hole	-40000	-30774	0.30	-877	-25433	
SG129	HSLA 80	Fig. B.5	Bolster web around hole	40000	30634	0.31	873	25317	
SG29	HSLA 80	Fig. B.5	Bolster web around hole	40000	29756	0.34	848	24592	
SG85	201LN-MT-1/4hard	Fig. B.15	Top outer door mask radius	37500	27409	0.37	809	22652	
SG88	201LN-MT-1/4hard	Fig. B.15	Top door mask radius(top)	37500	26799	0.40	791	22148	
SG21	HSLA 80	Fig. B.4	Bolster bottom plate	40000	24890	0.61	rosette	20570	**Von Mises
SG82	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(bot.)	-31000	-18498	0.68	-546	-15288	
SG182	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(bot.)	-31000	-17211	0.80	-508	-14224	

* Transverse allowable is applied on SG60, SG160 & SG71 due to material rolling/grain direction.
** Von Mises stress is calculated directly by the system 5000 and can be found in the raw data file.

Table 4.1: Minimum margins of safety for the vertical load

- All stress levels are below 50% of yield strength in compliance with CTA Specification 6900-04, 3.01C (ref. 1).
- For gauges SG60, SG160 and SG71 the transverse allowable stress is used because the strain gauges are installed transverse to the rolling direction of the grain as can be seen in the pictures of Appendix H.
- For this load condition, the skin at the outboard door top corners exhibited elastic buckling (see picture in Appendix H). After relief of the load, the structure returned to it's original position showing elastic behaviour.
- No gauge recorded any significant residual strain.

4.1.1 Discussion on Vertical Deflection and Camber

Figure 4.1.1.1 presents the measured vertical deflections of the displacement gauges installed under the LH side sill. The net vertical displacement of the LH side sill with respect to the bolster gauges (G13 and G19) is -0.322 in.

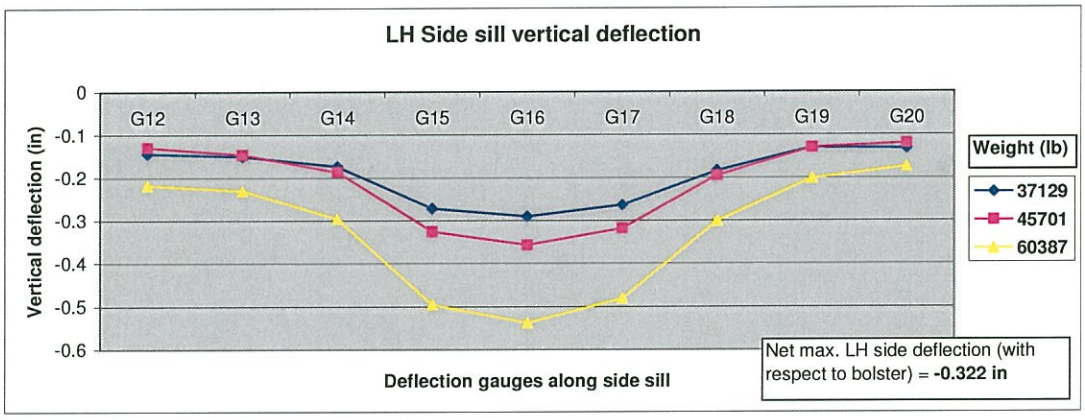


Figure 4.1.1.1: Vertical deflection of the LH side sill for the vertical load.

Figure 4.1.2 presents the measured deflections of the displacement gauges installed under the RH side sill. The net vertical displacement of the RH side sill with respect to the bolster gauges (G2 and G8) is -0.328 in.

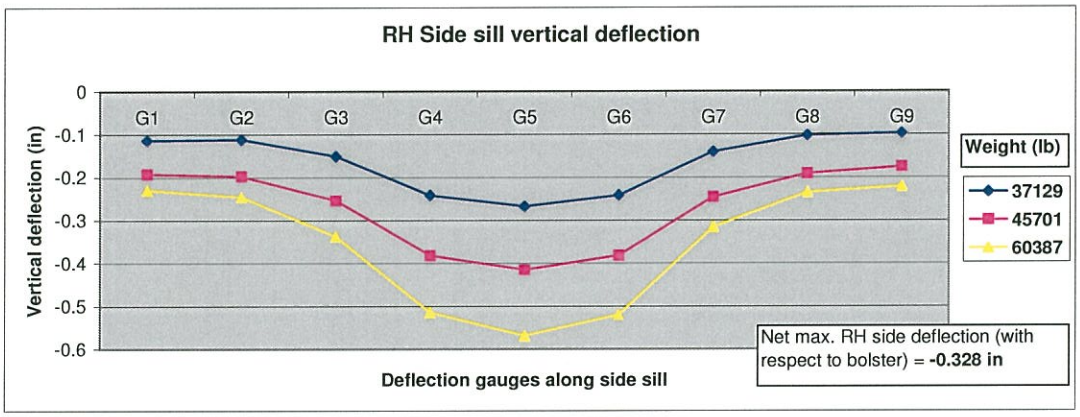


Figure 4.1.1.2: Vertical deflection of the RH side sill for the vertical load.

- The above average vertical displacement at the side sills measured with the displacement gauges is 0.325 in.
- The displacement measured manually (see Carbody Camber Measurement Sheet in appendix E) show an average displacement of 0.33 in. The initial measured camber is 0.56 in.
- Test results show a positive residual camber of 0.23 in = (0.56 - 0.33).
- The nominal carshell camber is 0.44 in.

4.1.2 Discussion on the linearity of the strain readings

The following graph shows the linearity of the critical strain gauges readings during the vertical test. An intermediate reading identified as data point reading '10(b)' was added during the test, it can be found in the raw data.

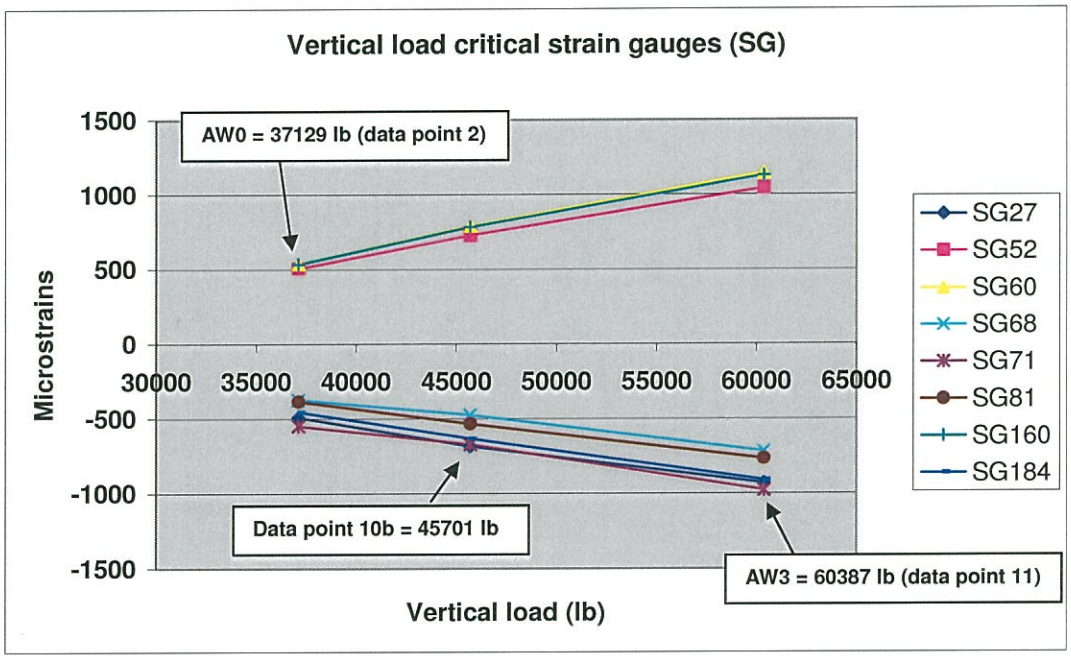


Figure 4.1.2.1: Critical strain gauges readings with respect to the vertical load.

The linearity of the above critical strain gauges is good.

4.1.3 Discussion on the skin buckling behavior (oil canning)

The side skin oil canning behaviour, in the door pocket regions of the test car, was monitored under the vertical load tests. Visual inspection of the skin panels were performed as per the procedure described in Reference 8. The inspection consisted of applying hand pressure on the panels and checking for panel movement and/or observance of panel popping sound.

The objective of this panel inspection was to confirm the need to continue or not with the addition of skin stiffeners and doublers at the door pocket regions of the side frames.

At the completion of the vertical load tests, it was concluded to continue the addition of the stiffeners and doublers as shown in dwg A-319-0008-10 rev. C in the door pocket regions except for the stiffeners identified in figure G.1 of Appendix G (stiffeners to be removed). It was mutually agreed between CTA and Bombardier, to remove the above stiffeners.

4.2 200000 lb Compression at AW0 Test (empty weight)

Table 4.2 presents the results of the gauges with the lowest margins of safety for the Compression load of 200000 lb @ AW0 test. The complete list of results per strain gauge number is presented in Appendix D.

200000 lb compression at AW0 (Data point 8, Allowable = yield x 0.9):
(sorted by Margin of safety)

SG	Material	Figure	SG installed on	Allow.	Stress (psi)	M.S.	Strain	
SG49	HSLA 80	Fig. B.9	Side sill at end sill connec.	-72000	-62780	0.15	-2165	
SG164	201LN-MT-1/4hard	Fig. B.11	Side sill top flange (sec.F-F)	-55800	-47866	0.17	-1740	
SG64	201LN-MT-1/4hard	Fig. B.11	Side sill top flange (sec.F-F)	-55800	-46552	0.20	-1682	
SG57	201LN-MT-1/4hard	Fig. B.10	Side sill bot flange (sec.C-C)	-55800	-43156	0.29	-1547	
SG11	HSLA 80	Fig. B.2	End sill back vertical doubler	72000	52171	0.38	1799	
SG143	201LN-MT-1/4hard	Fig. B.9	Side sill top flange (sec.B-B)	-55800	-38946	0.43	-1392	
SG43	201LN-MT-1/4hard	Fig. B.9	Side sill top flange (sec.B-B)	-55800	-36027	0.55	-1287	
SG157	201LN-MT-1/4hard	Fig. B.10	Side sill bot flange (sec.C-C)	-55800	-35776	0.56	-1278	
SG33	HSLA 80	Fig. B.6	Bolster top plate	72000	44660	0.61	1540	
SG71	201LN-MT-1/4hard	Fig. B.11	Door mask gusset	-72000	-43419	0.66	-1557	*Trans. All.
SG99i	HSLA 80	Fig. B.17	Back of bolster at side sill (in	-72000	-41789	0.72	-1441	
SG17	HSLA 80	Fig. B.3	End sill top plate under gusse	72000	41760	0.72	1440	
SG55	201LN-MT-1/4hard	Fig. B.10	Side sill top flange (sec.C-C)	-55800	-31133	0.79	-1112	
SG199	HSLA 80	Fig. B.17	Back of bolster at side sill	-72000	-39498	0.82	-1362	
SG10	HSLA 80	Fig. B.2	End sill bottom plate	-72000	-39092	0.84	-1348	
SG42	201LN-MT-1/4hard	Fig. B.8	Side sill at bolster connect.	-55800	-30211	0.85	-1079	
SG110	HSLA 80	Fig. B.2	End sill bottom plate	-72000	-38599	0.87	-1331	

* Transverse allowable is applied on SG60, SG160 & SG71 due to material rolling/grain direction.

Table 4.2: Minimum margins of safety for Compression load of 200000 lb @ AW0.

- All stress levels are below 90% of yield strength in compliance with CTA Specification 6900-04, 3.01C (ref. 1).
- No permanent deformation was identified in any part of the carshell structure.
- No rupture of any spotweld was observed.
- No visible buckling of the side corrugation was seen.
- No gauge recorded any significant residual strain.

4.3 200000 lb Compression at AW3 Test (full weight)

Table 4.3 presents the results of the gauges with the lowest margins of safety for the Compression load of 200000 lb @ AW3 test. The complete list of results per strain gauge number is presented in Appendix D.

These results are also used to review the compression test stress distribution as discussed in Appendix F

200000 lb oompression at AW3 (Data point 17, Allowable = yield x 0.9):
(sorted by Margin of Safety, MS)

SG	Material	Figure	SG installed on	Allow.	Stress (psi)	M.S.	Strain	
SG164	201LN-MT-1/4hard	Fig. B.11	Side sill top flange (sec.F-F)	-55800	-51591	0.08	-1945	
SG64	201LN-MT-1/4hard	Fig. B.11	Side sill top flange (sec.F-F)	-55800	-50549	0.10	-1879	
SG49	HSLA 80	Fig. B.9	Side sill at end sill connec.	-72000	-63705	0.13	-2197	
SG57	201LN-MT-1/4hard	Fig. B.10	Side sill bot flange (sec.C-C)	-55800	-48378	0.15	-1764	
SG11	HSLA 80	Fig. B.2	End sill back vertical doubler	72000	52432	0.37	1808	
SG157	201LN-MT-1/4hard	Fig. B.10	Side sill bot flange (sec.C-C)	-55800	-40021	0.39	-1431	
SG143	201LN-MT-1/4hard	Fig. B.9	Side sill top flange (sec.B-B)	-55800	-38807	0.44	-1387	
SG71	201LN-MT-1/4hard	Fig. B.11	Door mask gusset	-76000	-52553	0.45	-2015	*Trans. All.
SG43	201LN-MT-1/4hard	Fig. B.9	Side sill top flange (sec.B-B)	-55800	-36585	0.53	-1307	
SG52	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (sec.D-D)	67500	43067	0.57	1542	
SG42	201LN-MT-1/4hard	Fig. B.8	Side sill at bolster connect.	-55800	-34631	0.61	-1237	
SG17	HSLA 80	Fig. B.3	End sill top plate under gusse	72000	43123	0.67	1487	
SG99i	HSLA 80	Fig. B.17	Back of bolster at side sill (in	-72000	-42920	0.68	-1480	
SG56	201LN-MT-1/4hard	Fig. B.10	Side sill web (sec. C-C)	-55800	-32283	0.73	-1153	
SG10	HSLA 80	Fig. B.2	End sill bottom plate	-72000	-40629	0.77	-1401	
SG199	HSLA 80	Fig. B.17	Back of bolster at side sill	-72000	-40368	0.78	-1392	
SG110	HSLA 80	Fig. B.2	End sill bottom plate	-72000	-40165	0.79	-1385	
SG40	201LN-MT-1/4hard	Fig. B.8	Side sill at bolster connect.	-55800	-30911	0.81	-1104	
SG41	201LN-MT-1/4hard	Fig. B.8	Side sill at bolster connect.	-55800	-30771	0.81	-1099	
SG156	201LN-MT-1/4hard	Fig. B.10	Side sill web (sec. C-C)	-55800	-29428	0.90	-1051	
SG184	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(top)	-55800	-29036	0.92	-1037	
SG80	201LN-MT-1/4hard	Fig. B.13	Side sill at inside gusset	-55800	-28896	0.93	-1032	
SG46	201LN-MT-1/4hard	Fig. B.9	Side sill bot flange (sec.B-B)	-55800	-28672	0.95	-1024	
SG33	HSLA 80	Fig. B.6	Bolster top plate	72000	36772	0.96	1268	

* Transverse allowable is applied on SG60, SG160 & SG71 due to material rolling/grain direction.

Table 4.3: Minimum margins of safety for the Compression 200000 lb @ AW3.

- All stress levels are below 90% of yield strength in compliance with CTA Specification 6900-04, 3.01C (ref. 1).
- No permanent deformation was identified in any part of the carshell structure.
- No rupture of any spotweld was observed.
- No visible buckling of the side corrugation was seen.
- Elastic buckling of the bolster top plate (SG32) was identified (see section 4.3.1 discussion on the linearity of the strain readings).
- No gauge recorded any significant residual strain.

4.3.1 Discussion on the linearity of the Strain Readings

The following graph shows the linearity of the critical strain gauges readings during the compression test @ AW3.

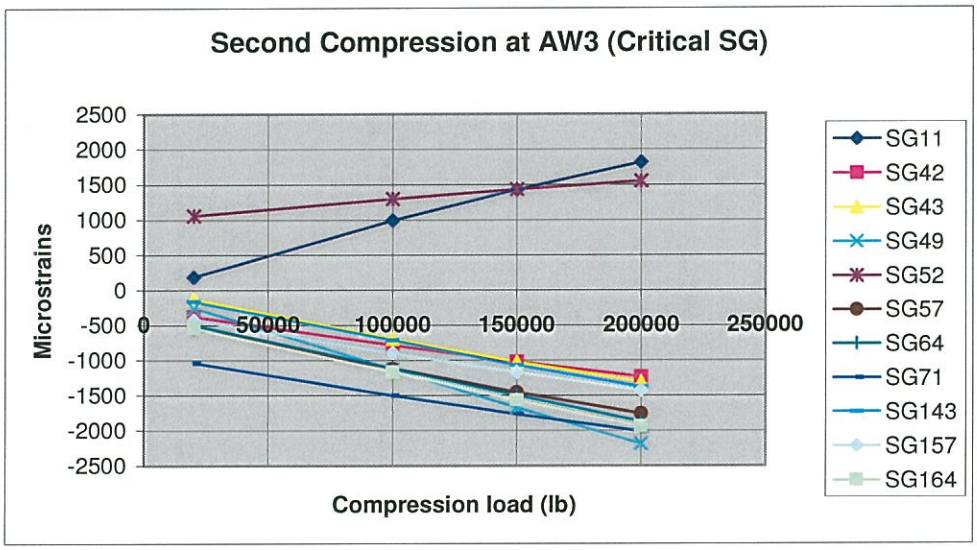
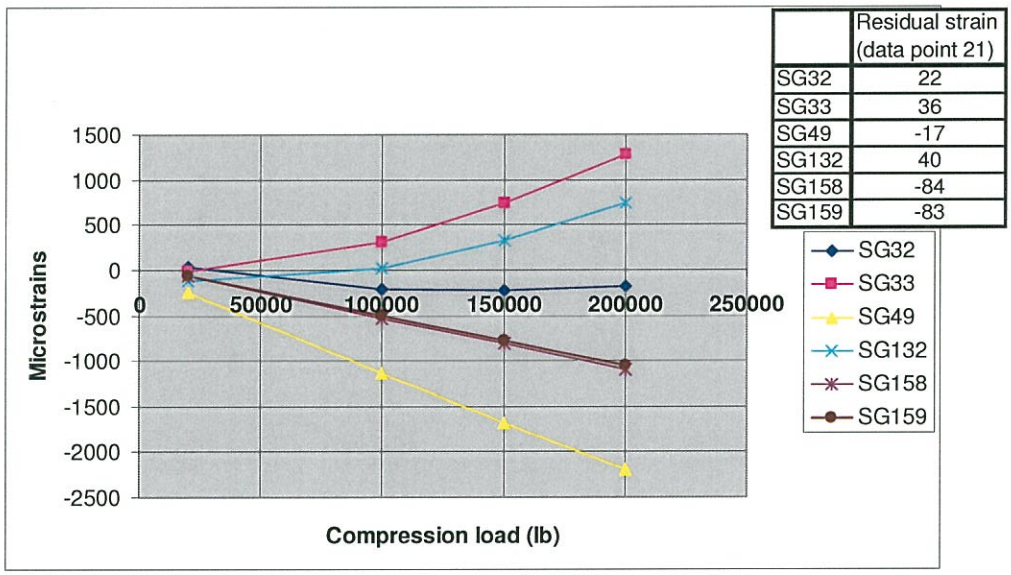


Figure 4.3.1.1: Critical strain gauges readings with respect to compression.

The linearity of the above critical strain gauges is good.



	Residual strain (data point 21)
SG32	22
SG33	36
SG49	-17
SG132	40
SG158	-84
SG159	-83

Figure 4.3.1.2: Other strain gauges and residual strain readings review.

- All residual strains values are small (less than 100 microstrain) which typically indicates elastic behaviour.
- SG158 and SG159 (fig. B.2) have the highest residual strains. Their curves are linear and their highest recorded stress is -32000 psi which is below the yield.
- SG32, SG33 and SG132 (figure B.6) curves are non-linear and typically show buckling. The low strains of these gauges as well as the very low residual strains indicate elastic buckling behaviour.

4.3.2 Discussion on car shortening during the compression test

Figure 4.3.2.1 presents the measured shortening of the carbody from the displacement gauges installed in front of the car at the anticlimbers (G10, G11 and G21, G22).

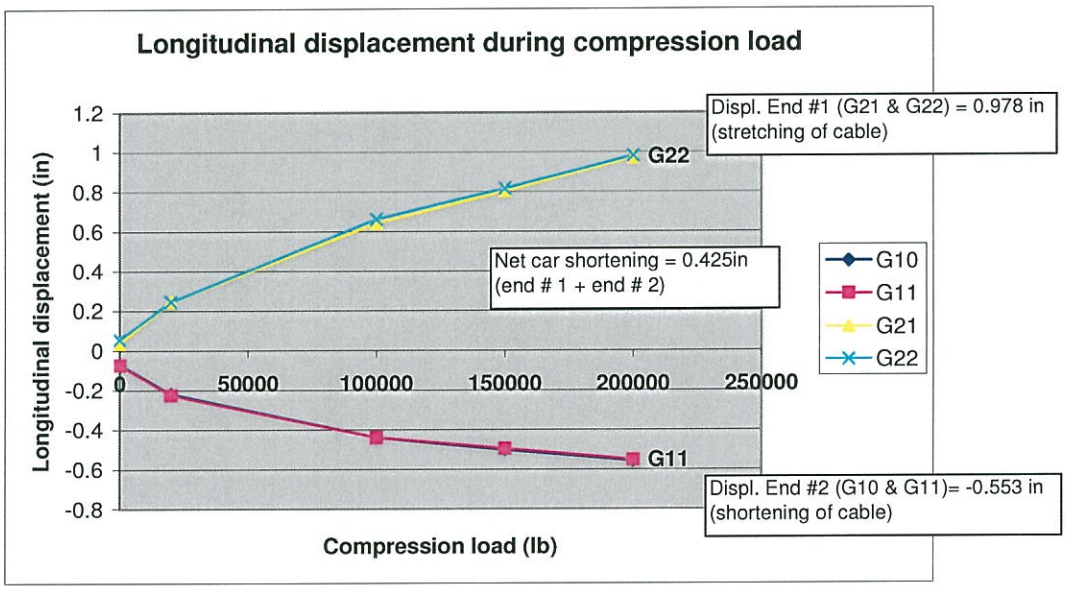


Figure 4.3.2.1: Car shortening longitudinal deflection during the compression test.

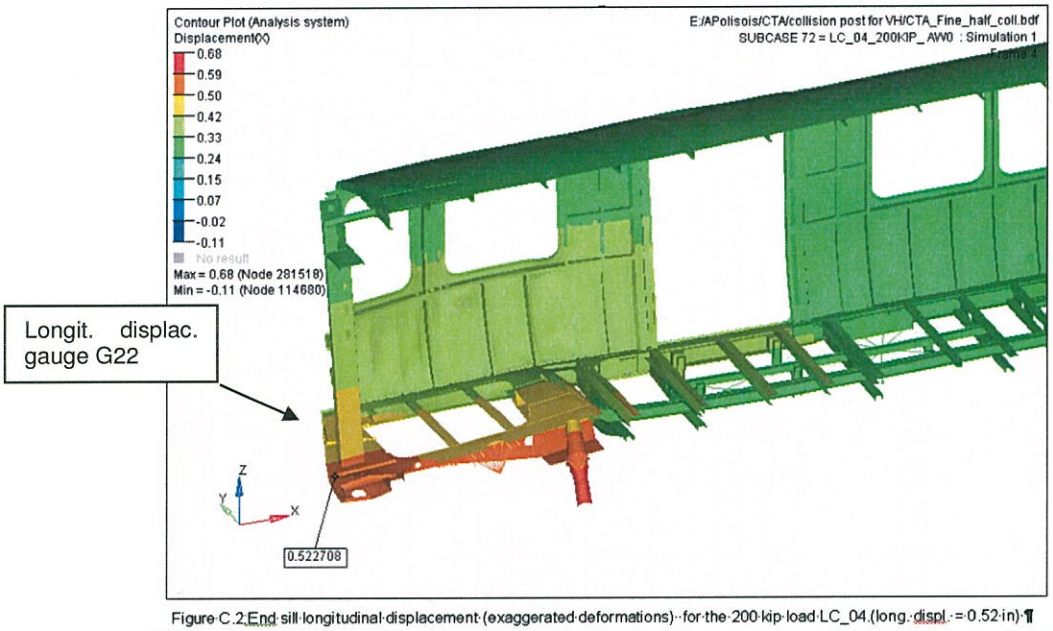


Figure C.2 End sill longitudinal displacement (exaggerated deformations) for the 200 kip load LC_04 (long. displ. = 0.52 in)

Figure 4.3.2.2: FEA carbody longitudinal deflection (fig. C.2 of ref. 5).

- The above FEA calculated longitudinal deflection at the car corner is around 0.4 inch which shows good correlation with the above test results of 0.425 in.

4.3.3 Discussion on the projected crushing behavior of the car

- Figure F.1 of Appendix F shows the compression test data stress distribution. The stress distribution progressively increases from the end sill towards the center of the car.
- The FEA analysis as presented in the Carbody Structural Analysis Report (ref.5).correlates well with the actual compression test data (see figures F.2 to F.7 of Appendix F).
- Figure F.4 shows the FEA compression load maximum stress which is -71 ksi and is in the end sill rib. It was not possible to install a gauge at this location.
- Figure F.8 of Appendix F shows the differences between the test applied loads and that of a typical crash scenario as reviewed in the crash Analysis (ref.4).
- Figure F.9 shows the crash analysis end sill trigger mechanism.
- Based upon the review of the test stresses and the correlation of the test and FEA stresses, and considering the inherent design of collapse triggers in the end sill and draft sill, the expected collision behaviour of the carbody is the crushing from the extreme ends progressing towards the center of the car.

5 CONCLUSION

Stress levels in the carbody structure under every test load and combination are below the allowable limits.

There is no permanent deformation, fractures, cracks, or non-elastic buckling remaining in any part of the structure after the loads are removed.

A positive camber of 0.23 inch remains under the maximum vertical load condition.

Based on test results in combination with FEA static and crash analysis it was demonstrated (section 4.3.3) that the carbody will crush from the extreme ends first in a progressive manner towards the center of the car.

The carshell structure met all the acceptance requirements as described in the CTA Specification 6900-04 (ref. 1) paragraph 3.01,C.

6 REFERENCES

1) CTA-6900-04 Rapid Transit Passenger Cars Technical Specification sect 3.01C.
2) 076-BTP-3001 Carbody Static Structural Qualification Test Procedure, rev. 1
3) 076-PLA-0012 Carbody Stress Analysis and Test Plan, rev. 0
4) 076-BRA-0017, Carbody Crash Analysis Report', rev. 0'
5) 076-BRA-0016 Carbody Structural Analysis Report, rev 1.
6) Association of American Railroads, Manual of Standards and Recommended Practices, Section C- Part II, M-1001, Vol. 1.
7) WATTER and LINCOLN, Strength of Stainless Steel Structural Members as Function of Design, Allegheny Ludlum Steel Corporation, First Edition, Pittsburgh, Pa, 1950.
8) BT CTA-0805/-0872 & CTA BT-0635/0687 Subject: Side skin oil canning behavior.

APPENDIX A

Calculation of Stresses

The measured strains have been converted to stress according to the idealized "true" stress-strain curves based on minimum material properties as defined by the AAR Manual of Standards and Recommended Practices, Section C- Part II, M-1001, Vol.1 (ref. 6).

These curves are used to translate the measured strain of the material to stress. The stresses calculated in appendix D are derived from these curves.

The curves for stainless steel are different for tension and compression since their yield limits are not the same (as per ref. 7 Watter and Lincoln) and as defined in the table 2 of ref. 3, (Mechanical Properties of the Carbody Materials, also shown in section 3)

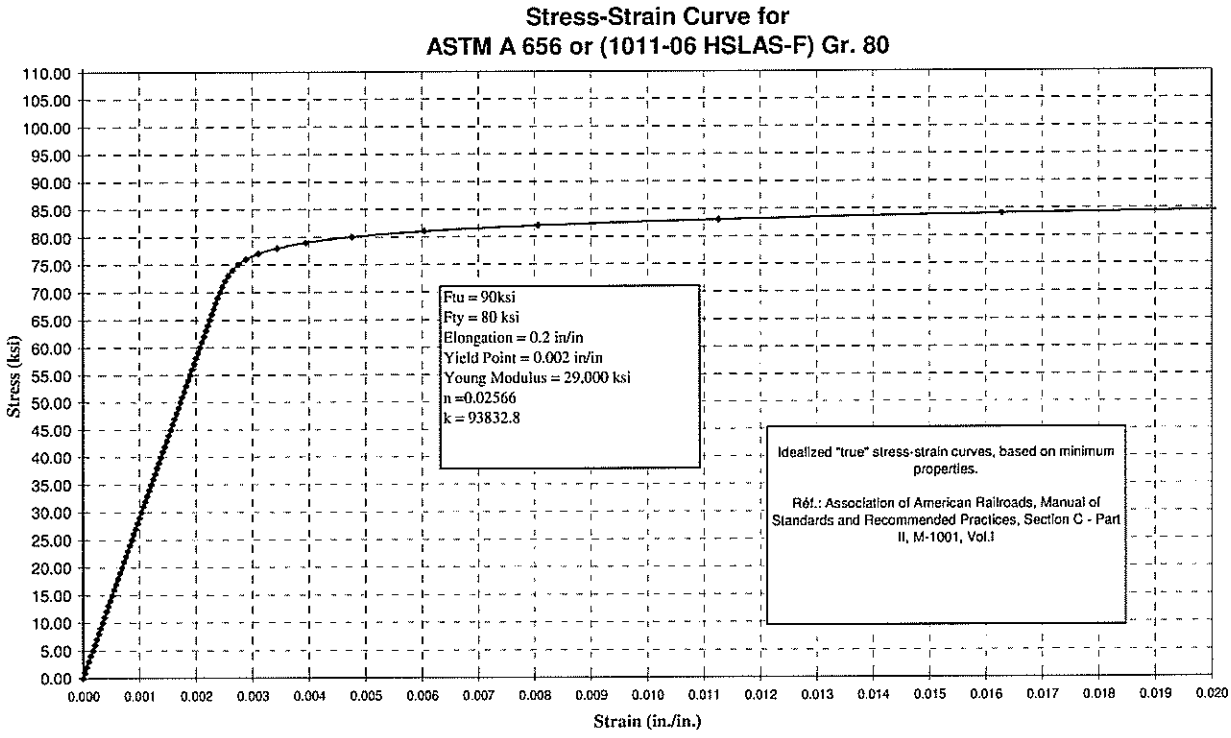


Figure A.1: Stress strain curve for HSLA 80

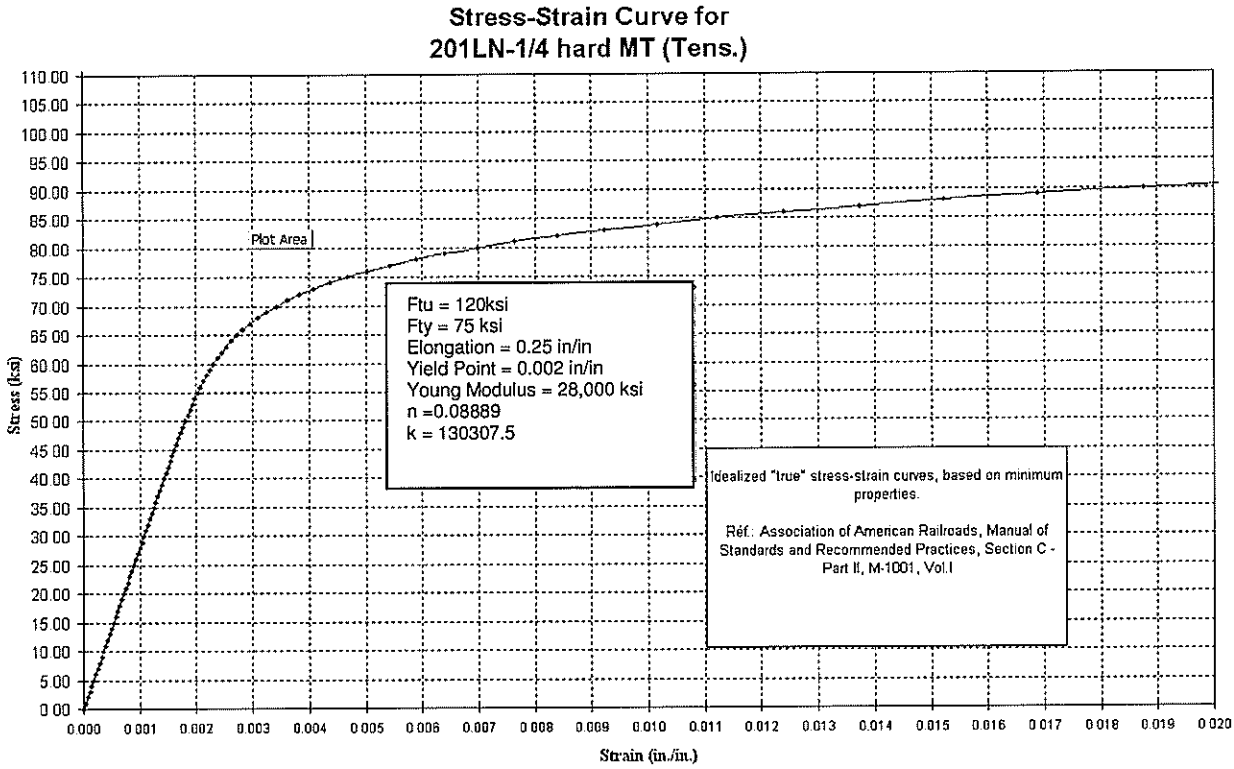


Figure A.2: Stress strain curve for 201LN-MT in tension

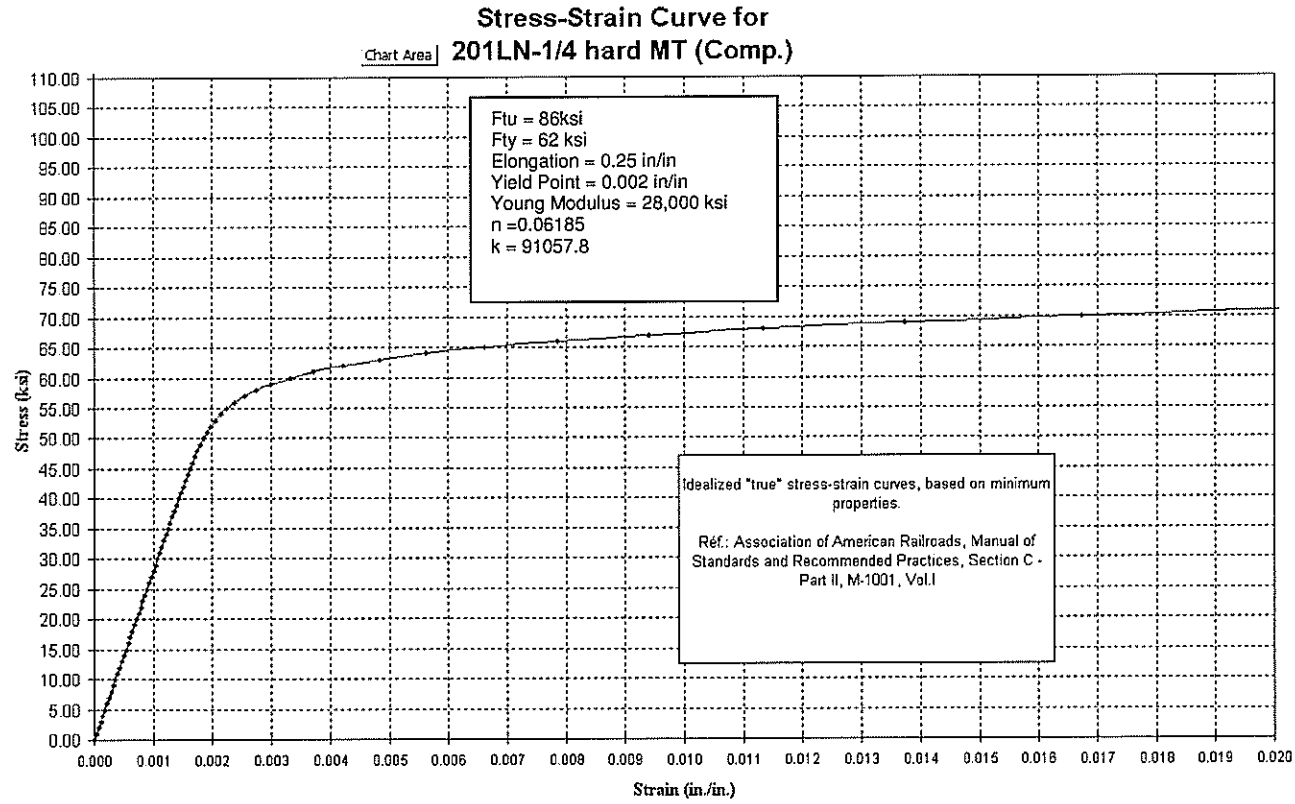


Figure A.3: Stress strain curve for 201LN-MT in compression.

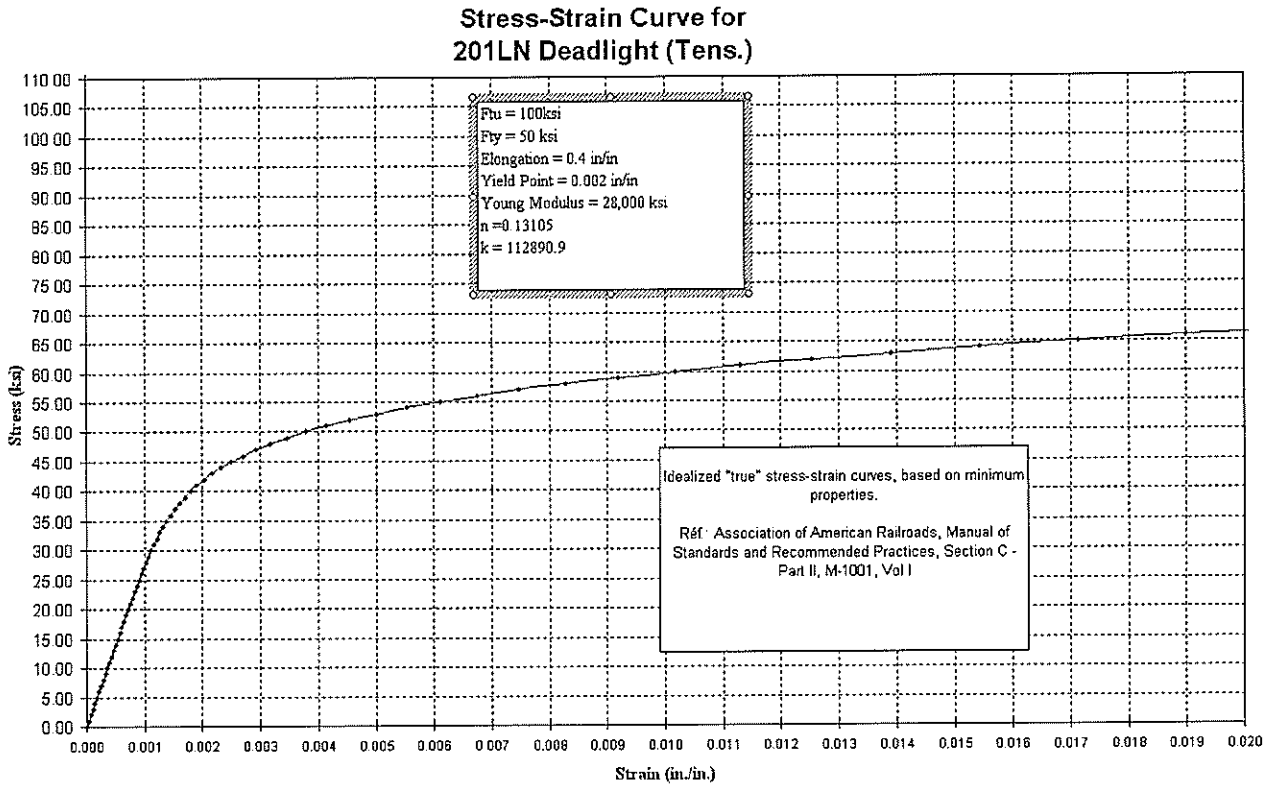


Figure A.4: Stress strain curve for 201LN-deadlight in tension.

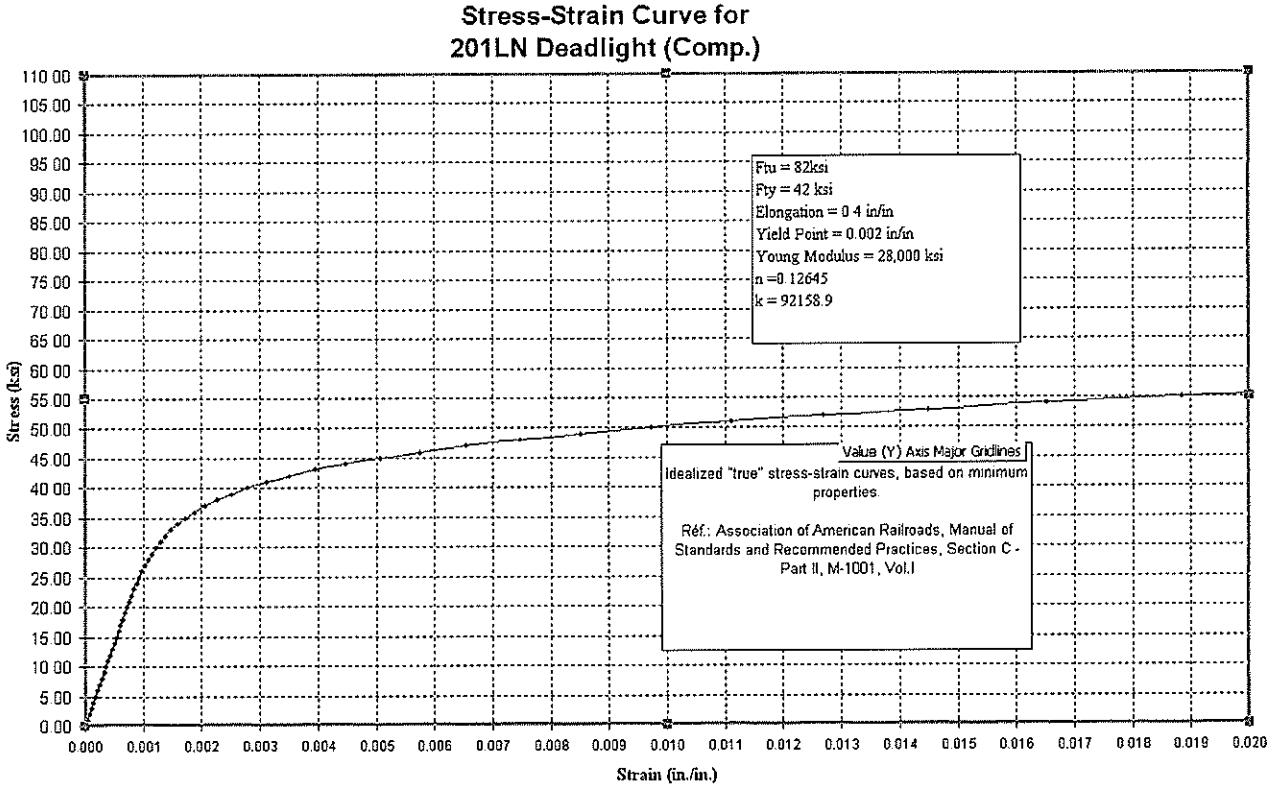


Figure A.5: Stress strain curve for 201LN Deadlight in compression.

APPENDIX B

Revision of Test Procedure

- **Updated list of strain gauges, channel numbers and related figures.**
- **Updated list of load cells, deflections gauges and channels (figure C.1).**
- **Updated figure D.2 Lead blocks distribution diagrams for AW3.**
- **Updated test steps index description.**

Updated list of strain gauges, channel numbers and related figures (212 uniaxial and 1 rosette):

Gauge number	Channel	Location	Ref. Figure	Material	Material yield (psi) tens.	Material yield (psi) comp.
1	1	Anticlimber bottom rib	Fig. B.1	HSLA 80	80000	80000
2	2	Anticlimber bottom web	Fig. B.1	HSLA 80	80000	80000
3	3	Anticlimber top web	Fig. B.1	HSLA 80	80000	80000
4	4	Anticlimber top rib	Fig. B.1	HSLA 80	80000	80000
5	5	End sill top plate	Fig. B.1	HSLA 80	80000	80000
6	6	End sill top plate	Fig. B.1	HSLA 80	80000	80000
7	7	End sill top plate	Fig. B.1	HSLA 80	80000	80000
8	8	End sill top plate	Fig. B.1	HSLA 80	80000	80000
9	9	End sill bottom plate	Fig. B.1	HSLA 80	80000	80000
10	10	End sill bottom plate	Fig. B.2	HSLA 80	80000	80000
11	11	End sill back vertical doubler	Fig. B.2	HSLA 80	80000	80000
12	12	Draft sill under bottom lip	Fig. B.2	HSLA 80	80000	80000
13	13	End sill bottom plate	Fig. B.2	HSLA 80	80000	80000
14	14	End sill bottom plate	Fig. B.2	HSLA 80	80000	80000
15	15	End sill bottom plate	Fig. B.2	HSLA 80	80000	80000
16	16	End sill top plate under gusset	Fig. B.3	HSLA 80	80000	80000
17	17	End sill top plate under gusset	Fig. B.3	HSLA 80	80000	80000
18	18	Draft sill top plate at hole	Fig. B.3	HSLA 80	80000	80000
19	19	Bolster bottom plate	Fig. B.4	HSLA 80	80000	80000
20	20	Bolster bottom plate	Fig. B.4	HSLA 80	80000	80000
21-A	113	Bolster bottom plate	Fig. B.4	HSLA 80	80000	80000
21-B	114	Bolster bottom plate	Fig. B.4	HSLA 80	80000	80000
21-C	115	Bolster bottom plate	Fig. B.4	HSLA 80	80000	80000
CT SS	21	TEMP COMP SS-201		201LN-MT-1/4hard	75000	62000
22	22	Bolster gusset	Fig. B.4	HSLA 80	80000	80000
23	23	Draft sill web at hole	Fig. B.4	HSLA 80	80000	80000
24	24	Bolster bottom plate	Fig. B.4	HSLA 80	80000	80000
25	25	Bolster bottom plate	Fig. B.4	HSLA 80	80000	80000
26	26	Bolster bottom plate	Fig. B.4	HSLA 80	80000	80000
27	27	Bolster web around hole	Fig. B.5	HSLA 80	80000	80000
28	28	Bolster web around hole	Fig. B.5	HSLA 80	80000	80000
29	29	Bolster web around hole	Fig. B.5	HSLA 80	80000	80000
30	30	Bolster web around hole	Fig. B.5	HSLA 80	80000	80000
31	31	Draft sill flange around hole	Fig. B.6	HSLA 80	80000	80000
32	32	Bolster draft sill merge	Fig. B.6	HSLA 80	80000	80000
33	33	Bolster top plate	Fig. B.6	HSLA 80	80000	80000
34	34	Air duct top beam	Fig. B.6	201LN-MT-1/4hard	75000	62000
35	35	Bolster top plate back	Fig. B.7	HSLA 80	80000	80000
36	36	Bolster top plate back	Fig. B.7	HSLA 80	80000	80000
CT HSLA	37	TEMP COMP HSLA		HSLA 80	80000	80000
38	38	Bolster bottom plate	Fig. B.8	HSLA 80	80000	80000
39	39	Side sill at bolster connect.	Fig. B.8	201LN-MT-1/4hard	75000	62000
40	40	Side sill at bolster connect.	Fig. B.8	201LN-MT-1/4hard	75000	62000
41	41	Side sill at bolster connect.	Fig. B.8	201LN-MT-1/4hard	75000	62000
42	42	Side sill at bolster connect.	Fig. B.8	201LN-MT-1/4hard	75000	62000
43	43	Side sill top flange (sec.B-B)	Fig. B.9	201LN-MT-1/4hard	75000	62000
44	44	Side sill top flange (sec.B-B)	Fig. B.9	201LN-MT-1/4hard	75000	62000
45	45	Side sill web (sec. B-B)	Fig. B.9	201LN-MT-1/4hard	75000	62000
46	46	Side sill bot flange (sec.B-B)	Fig. B.9	201LN-MT-1/4hard	75000	62000
47	47	Side sill at end sill connec.	Fig. B.9	201LN-MT-1/4hard	75000	62000
48	48	Side sill at end sill connec.	Fig. B.9	HSLA 80	80000	80000
49	49	Side sill at end sill connec.	Fig. B.9	HSLA 80	80000	80000
50	50	Side sill at end sill connec.	Fig. B.9	HSLA 80	80000	80000
51	51	Bottom door mask (sec.D-D)	Fig. B.10	201LN-MT-1/4hard	75000	62000
52	52	Bottom door mask (sec.D-D)	Fig. B.10	201LN-MT-1/4hard	75000	62000
53	53	Bottom door mask (sec.D-D)	Fig. B.10	201LN-MT-1/4hard	75000	62000
54	54	Bottom door mask (sec.D-D)	Fig. B.10	201LN-MT-1/4hard	75000	62000
55	55	Side sill top flange (sec.C-C)	Fig. B.10	201LN-MT-1/4hard	75000	62000
56	56	Side sill web (sec. C-C)	Fig. B.10	201LN-MT-1/4hard	75000	62000
57	57	Side sill bot flange (sec.C-C)	Fig. B.10	201LN-MT-1/4hard	75000	62000
58	58	Side sill top flange (sec.C-C)	Fig. B.10	201LN-MT-1/4hard	75000	62000
59	59	Side sill web (sec. C-C)	Fig. B.10	201LN-MT-1/4hard	75000	62000

Gauge number	Channel	Location	Ref. Figure	Material	Material yield (psi) tens.	Material yield (psi) comp.
60	60	Door mask gusset	Fig. B.10	201LN-MT-1/4hard	75000	62000
61	61	Side sill top flange (sec.E-E)	Fig. B.11	201LN-MT-1/4hard	75000	62000
62	62	Side sill web (sec. E-E)	Fig. B.11	201LN-MT-1/4hard	75000	62000
63	63	Side sill bot flange (sec.E-E)	Fig. B.11	201LN-MT-1/4hard	75000	62000
64	64	Side sill top flange (sec.F-F)	Fig. B.11	201LN-MT-1/4hard	75000	62000
65	65	Side sill web (sec. F-F)	Fig. B.11	201LN-MT-1/4hard	75000	62000
66	66	Side sill bot flange (sec.F-F)	Fig. B.11	201LN-MT-1/4hard	75000	62000
67	67	Bottom door mask (sec.G-G)	Fig. B.11	201LN-MT-1/4hard	75000	62000
68	68	Bottom door mask (sec.G-G)	Fig. B.11	201LN-MT-1/4hard	75000	62000
69	69	Bottom door mask (sec.G-G)	Fig. B.11	201LN-MT-1/4hard	75000	62000
70	70	Bottom door mask (sec.G-G)	Fig. B.11	201LN-MT-1/4hard	75000	62000
71	71	Door mask gusset	Fig. B.11	201LN-MT-1/4hard	75000	62000
72	72	Bottom of door post	Fig. B.12	201LN-MT-1/4hard	75000	62000
73	73	Bottom of door post	Fig. B.12	201LN-MT-1/4hard	75000	62000
74	74	Door mask inside gusset	Fig. B.12	201LN-MT-1/4hard	75000	62000
75	75	Side sill at inside gusset	Fig. B.12	201LN-MT-1/4hard	75000	62000
76	76	Bottom of skin inside car	Fig. B.12	201LN-MT-1/4hard	75000	62000
77	77	Bottom of door post	Fig. B.13	201LN-MT-1/4hard	75000	62000
78	78	Bottom of door post	Fig. B.13	201LN-MT-1/4hard	75000	62000
79	79	Door mask inside gusset	Fig. B.13	201LN-MT-1/4hard	75000	62000
80	80	Side sill at inside gusset	Fig. B.13	201LN-MT-1/4hard	75000	62000
81	81	Top outer door mask radius	Fig. B.14	201LN-MT-1/4hard	75000	62000
82	82	Top door mask radius(bot.)	Fig. B.14	201LN-MT-1/4hard	75000	62000
83	83	Top door mask radius(cent.)	Fig. B.14	201LN-MT-1/4hard	75000	62000
84	84	Top door mask radius(top)	Fig. B.14	201LN-MT-1/4hard	75000	62000
85	85	Top outer door mask radius	Fig. B.15	201LN-MT-1/4hard	75000	62000
86	86	Top door mask radius(bot.)	Fig. B.15	201LN-MT-1/4hard	75000	62000
87	87	Top door mask radius(cent.)	Fig. B.15	201LN-MT-1/4hard	75000	62000
88	88	Top door mask radius(top)	Fig. B.15	201LN-MT-1/4hard	75000	62000
89	89	Inside roof gutter at door	Fig. B.16	201LN-MT-1/4hard	75000	62000
90	90	Inside roof at door	Fig. B.16	201LN-MT-1/4hard	75000	62000
91	91	Inside roof gutter at door	Fig. B.16	201LN-MT-1/4hard	75000	62000
92	92	Inside roof at door	Fig. B.16	201LN-MT-1/4hard	75000	62000
93	93	Side sill top flange (sec.H-H)	Fig. B.17	201LN-MT-1/4hard	75000	62000
95	95	Side sill bot flange (sec.H-H)	Fig. B.17	201LN-MT-1/4hard	75000	62000
96	96	Side sill top flange (sec.J-J)	Fig. B.17	201LN-MT-1/4hard	75000	62000
97	97	Side sill web (sec.J-J)	Fig. B.17	201LN-MT-1/4hard	75000	62000
98	98	Side sill bot flange (sec.J-J)	Fig. B.17	201LN-MT-1/4hard	75000	62000
99i	94	Back of bolster at side sill (in)	Fig. B.17	HSLA 80	80000	80000
99u	99	Back of bolster at side sill (out)	Fig. B.17	HSLA 80	80000	80000
100	100	Front of bolster at side sill	Fig. B.17	HSLA 80	80000	80000
101	101	Anticlimber bottom rib	Fig. B.1	HSLA 80	80000	80000
102	102	Anticlimber bottom web	Fig. B.1	HSLA 80	80000	80000
103	103	Anticlimber top web	Fig. B.1	HSLA 80	80000	80000
104	104	Anticlimber top rib	Fig. B.1	HSLA 80	80000	80000
105	105	End sill top plate	Fig. B.1	HSLA 80	80000	80000
106	106	End sill top plate	Fig. B.1	HSLA 80	80000	80000
107	107	End sill top plate	Fig. B.1	HSLA 80	80000	80000
110	110	End sill bottom plate	Fig. B.2	HSLA 80	80000	80000
112	112	Draft sill under bottom lip	Fig. B.2	HSLA 80	80000	80000
118	118	Draft sill top plate at hole	Fig. B.3	HSLA 80	80000	80000
119	119	Bolster bottom plate	Fig. B.4	HSLA 80	80000	80000
120	120	Bolster bottom plate	Fig. B.4	HSLA 80	80000	80000
122	122	Bolster gusset	Fig. B.4	HSLA 80	80000	80000
124	124	Bolster bottom plate	Fig. B.4	HSLA 80	80000	80000
125	125	Bolster bottom plate	Fig. B.4	HSLA 80	80000	80000
127	127	Bolster web around hole	Fig. B.5	HSLA 80	80000	80000
128	128	Bolster web around hole	Fig. B.5	HSLA 80	80000	80000
129	129	Bolster web around hole	Fig. B.5	HSLA 80	80000	80000

Gauge number	Channel	Location	Ref. Figure	Material	Material yield (psi) tens.	Material yield (psi) comp.
130	130	Bolster web around hole	Fig. B.5	HSLA 80	80000	80000
131	131	Draft sill flange around hole	Fig. B.6	HSLA 80	80000	80000
132	132	Bolster draft sill merge	Fig. B.6	HSLA 80	80000	80000
134	134	Air duct top beam	Fig. B.6.b	201LN-MT-1/4hard	75000	62000
136	136	Bolster top plate back	Fig. B.7	HSLA 80	80000	80000
137	137	secondary air duct	Fig.B.9	201LN-MT-1/4hard	75000	62000
139	139	Side sill at end sill connec.	Fig.B.9	HSLA 80	80000	80000
140	140	secondary air duct(137)	Fig.b 6 c	201LN-MT-1/4hard	75000	62000
141	141	secondary air duct(34)	Fig.b 6 c	201LN-MT-1/4hard	75000	62000
143	143	Side sill top flange (sec.B-B)	Fig. B.9	201LN-MT-1/4hard	75000	62000
144	144	Side sill top flange (sec.B-B)	Fig. B.9	201LN-MT-1/4hard	75000	62000
145	145	Side sill web (sec. B-B)	Fig. B.9	201LN-MT-1/4hard	75000	62000
146	146	Side sill bot flange (sec.B-B)	Fig. B.9	201LN-MT-1/4hard	75000	62000
150	150	Skin (for buckling) End #1 LH side	Fig. B.25	201LN-deadlight	50000	42000
151	151	Skin (for buckling) End #1 LH side	Fig. B.25	201LN-deadlight	50000	42000
152	152	Skin (for buckling) End #2 LH side	Fig. B.25	201LN-deadlight	50000	42000
153	153	Skin (for buckling) End #2 LH side	Fig. B.25	201LN-deadlight	50000	42000
154	154	Bottom door mask (in line with 52)	Fig. B.10	201LN-MT-1/4hard	75000	62000
155	155	Side sill top flange (sec.C-C)	Fig. B.10	201LN-MT-1/4hard	75000	62000
156	156	Side sill web (sec. C-C)	Fig. B.10	201LN-MT-1/4hard	75000	62000
157	157	Side sill bot flange (sec.C-C)	Fig. B.10	201LN-MT-1/4hard	75000	62000
158	158	draft sill web at hole	Fig.B.2	HSLA 80	80000	80000
159	159	draft sill web at hole	Fig.B.2	HSLA 80	80000	80000
160	160	Door mask gusset	Fig. B.10	201LN-MT-1/4hard	75000	62000
164	164	Side sill top flange (sec.F-F)	Fig. B.11	201LN-MT-1/4hard	75000	62000
165	165	Side sill web (sec. F-F)	Fig. B.11	201LN-MT-1/4hard	75000	62000
166	166	Side sill bot flange (sec.F-F)	Fig. B.11	201LN-MT-1/4hard	75000	62000
167	167	draft sill web at tampon	Fig.B.2	HSLA 80	80000	80000
168	168	draft sill web at tampon	Fig.B.2	HSLA 80	80000	80000
169	169	side corrugation at seam weld	Fig.b.21	201LN-MT-1/4hard	75000	62000
170	170	side corrugation at seam weld	Fig.b.21	201LN-MT-1/4hard	75000	62000
171	171	back bolster at side sill (200)	Fig.b.6-c	HSLA 80	80000	80000
172	172	side sill at bolster (203)	Fig.b.6-c	201LN-MT-1/4hard	75000	62000
182	182	Top door mask radius(bot.)	Fig. B.14	201LN-MT-1/4hard	75000	62000
183	183	Top door mask radius(cent.)	Fig. B.14	201LN-MT-1/4hard	75000	62000
184	184	Top door mask radius(top)	Fig. B.14	201LN-MT-1/4hard	75000	62000
193	193	Side sill top flange (sec.H-H)	Fig. B.17	201LN-MT-1/4hard	75000	62000
195	195	Side sill bot flange (sec.H-H)	Fig. B.17	201LN-MT-1/4hard	75000	62000
199	199	Back of bolster at side sill	Fig. B.17	HSLA 80	80000	80000
200	200	Back of bolster at side sill	Fig. B.17	HSLA 80	80000	80000
201	201	Window post gusset at bolst.	Fig. B.17	201LN-MT-1/4hard	75000	62000
202	202	Window post gusset at bolst.	Fig. B.17	201LN-MT-1/4hard	75000	62000
203	203	Side sill at bolst.	Fig. B.17	201LN-MT-1/4hard	75000	62000
204	204	1st crossbeam flange at center	Fig. B.18	201LN-MT-1/4hard	75000	62000
205	205	2nd crossbeam flange at center	Fig. B.18	201LN-MT-1/4hard	75000	62000
206	206	2nd crossbeam bottom flange	Fig. B.19	201LN-MT-1/4hard	75000	62000
207	207	1st crossbeam flange at center	Fig. B.19	201LN-MT-1/4hard	75000	62000
209	209	Side sill top flange (sec.K-K)	Fig. B.20	201LN-MT-1/4hard	75000	62000
210	210	Side sill bot flange (sec.K-K)	Fig. B.20	201LN-MT-1/4hard	75000	62000
211	211	Window rail at 1st hole (sash)	Fig. B.21	201LN-MT-1/4hard	75000	62000
212	212	Sash window post	Fig. B.21	201LN-MT-1/4hard	75000	62000
213	213	Sash window at skin side	Fig. B.21	201LN-MT-1/4hard	75000	62000
214	214	Sash window post	Fig. B.21	201LN-MT-1/4hard	75000	62000
215	215	Sash window 2nd post	Fig. B.21	201LN-MT-1/4hard	75000	62000
216	216	Window rail at 2nd hole (sash)	Fig. B.21	201LN-MT-1/4hard	75000	62000

Gauge number	Channel	Location	Ref. Figure	Material	Material yield (psi) tens.	Material yield (psi) comp.
217	217	Window rail	Fig. B.21	201LN-MT-1/4hard	75000	62000
218	218	Window rail	Fig. B.21	201LN-MT-1/4hard	75000	62000
219	219	Window rail	Fig. B.21	201LN-MT-1/4hard	75000	62000
220	220	Window post web	Fig. B.21	201LN-MT-1/4hard	75000	62000
221	221	At window bot. inside radius	Fig. B.21	201LN-deadlight	50000	42000
222	222	At window bot. inside radius	Fig. B.21	201LN-deadlight	50000	42000
223	223	At window top inside radius	Fig. B.21	201LN-deadlight	50000	42000
224	224	At window top inside radius	Fig. B.21	201LN-deadlight	50000	42000
225	225	At window radius (center area)	Fig. B.22	201LN-deadlight	50000	42000
226	226	At window radius (center area)	Fig. B.22	201LN-deadlight	50000	42000
227	227	At window radius (center area)	Fig. B.22	201LN-deadlight	50000	42000
228	228	At window radius (center area)	Fig. B.22	201LN-deadlight	50000	42000
229	229	Roof rail at door carline clip	Fig. B.23	201LN-MT-1/4hard	75000	62000
230	230	Door carline clip (x= -96.438)	Fig. B.23	201LN-MT-1/4hard	75000	62000
231	231	Door carline clip (x= -96.438)	Fig. B.23	201LN-MT-1/4hard	75000	62000
232	232	Roof carline web (x= -96.438)	Fig. B.23	201LN-MT-1/4hard	75000	62000
233	233	Roof carline bottom flange	Fig. B.23	201LN-MT-1/4hard	75000	62000
234	234	Roof carline flange at center	Fig. B.23	201LN-MT-1/4hard	75000	62000
235	235	Roof carline web at center	Fig. B.23	201LN-MT-1/4hard	75000	62000
236	236	Roof carline flange at center	Fig. B.23	201LN-MT-1/4hard	75000	62000
237	237	Roof rail at door carline clip	Fig. B.24	201LN-MT-1/4hard	75000	62000
238	238	Door carline clip (x= -151.97)	Fig. B.24	201LN-MT-1/4hard	75000	62000
239	239	Door carline clip (x= -151.97)	Fig. B.24	201LN-MT-1/4hard	75000	62000
240	240	Roof carline web (x= -151.97)	Fig. B.24	201LN-MT-1/4hard	75000	62000
241	241	Roof carline bottom flange	Fig. B.24	201LN-MT-1/4hard	75000	62000
242	242	Roof carline flange at center	Fig. B.24	201LN-MT-1/4hard	75000	62000
243	243	Roof carline web at center	Fig. B.24	201LN-MT-1/4hard	75000	62000
244	244	Roof carline flange at center	Fig. B.24	201LN-MT-1/4hard	75000	62000
245	245	Side sill web (sec.K-K)	Fig. B.20	201LN-MT-1/4hard	75000	62000
309	250	Side sill top flange (sec.K-K)	Fig. B.20	201LN-MT-1/4hard	75000	62000
310	251	Side sill bot flange (sec.K-K)	Fig. B.20	201LN-MT-1/4hard	75000	62000
329	252	Roof rail at door carline clip	Fig. B.23	201LN-MT-1/4hard	75000	62000
330	253	Door carline clip (x= -96.438)	Fig. B.23	201LN-MT-1/4hard	75000	62000
331	254	Door carline clip (x= -96.438)	Fig. B.23	201LN-MT-1/4hard	75000	62000
337	255	Roof rail at door carline clip	Fig. B.24	201LN-MT-1/4hard	75000	62000
338	256	Door carline clip (x= -151.97)	Fig. B.24	201LN-MT-1/4hard	75000	62000
339	257	Door carline clip (x= -151.97)	Fig. B.24	201LN-MT-1/4hard	75000	62000
345	258	Side sill web (sec.K-K)	Fig. B.20	201LN-MT-1/4hard	75000	62000
346	259	Roof ream weld	Fig. B.25	201LN-MT-1/4hard	75000	62000
347	246	Roof ream weld	Fig.B.25	201LN-MT-1/4hard	75000	62000
349	247	Window rail	Fig.B.21	201LN-MT-1/4hard	75000	62000
350	248	Bolster ss connect plate	Fig.B.17	HSLA 80	80000	80000

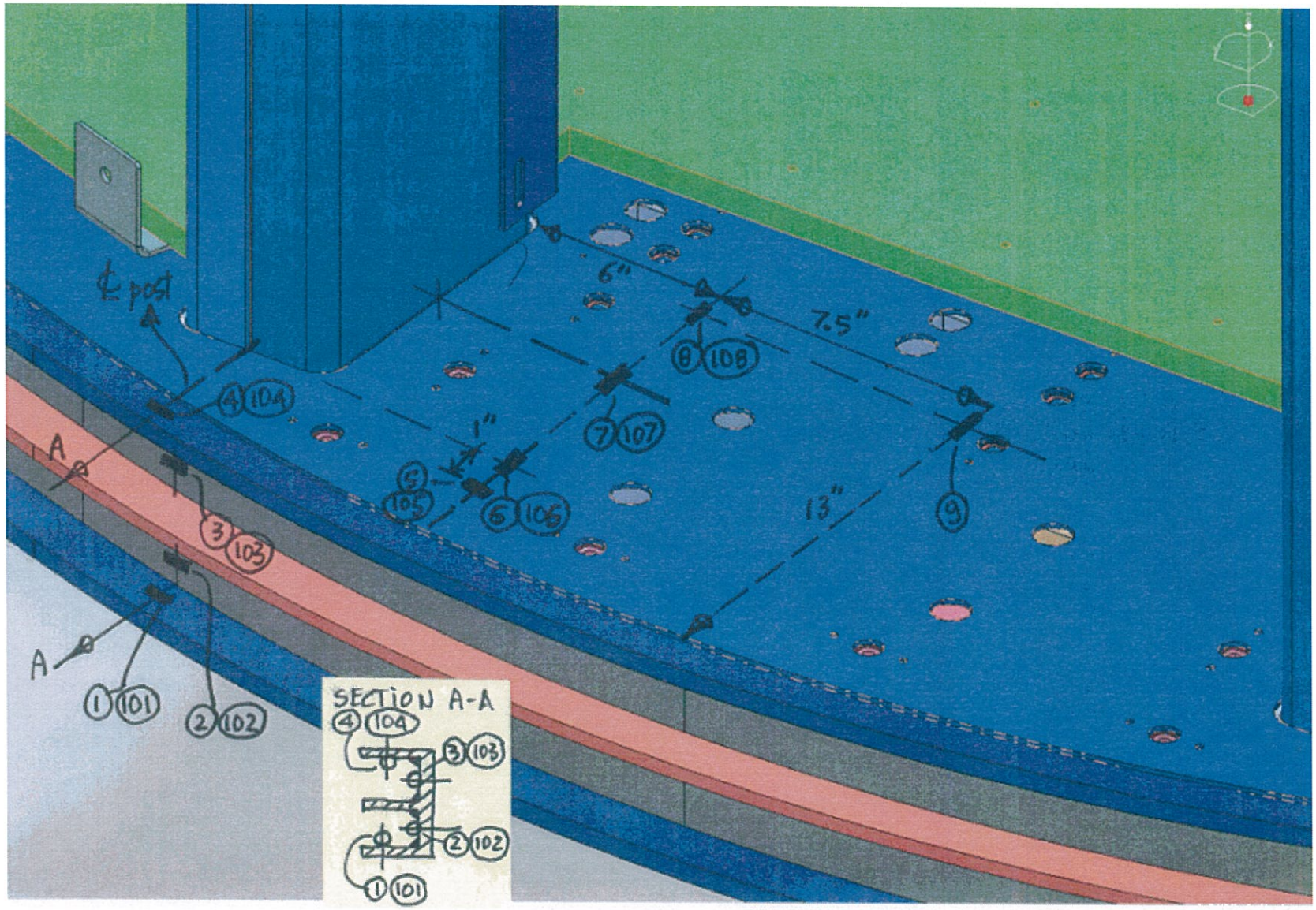


Figure B.1, Strain gauges diagram – End sill, end #1

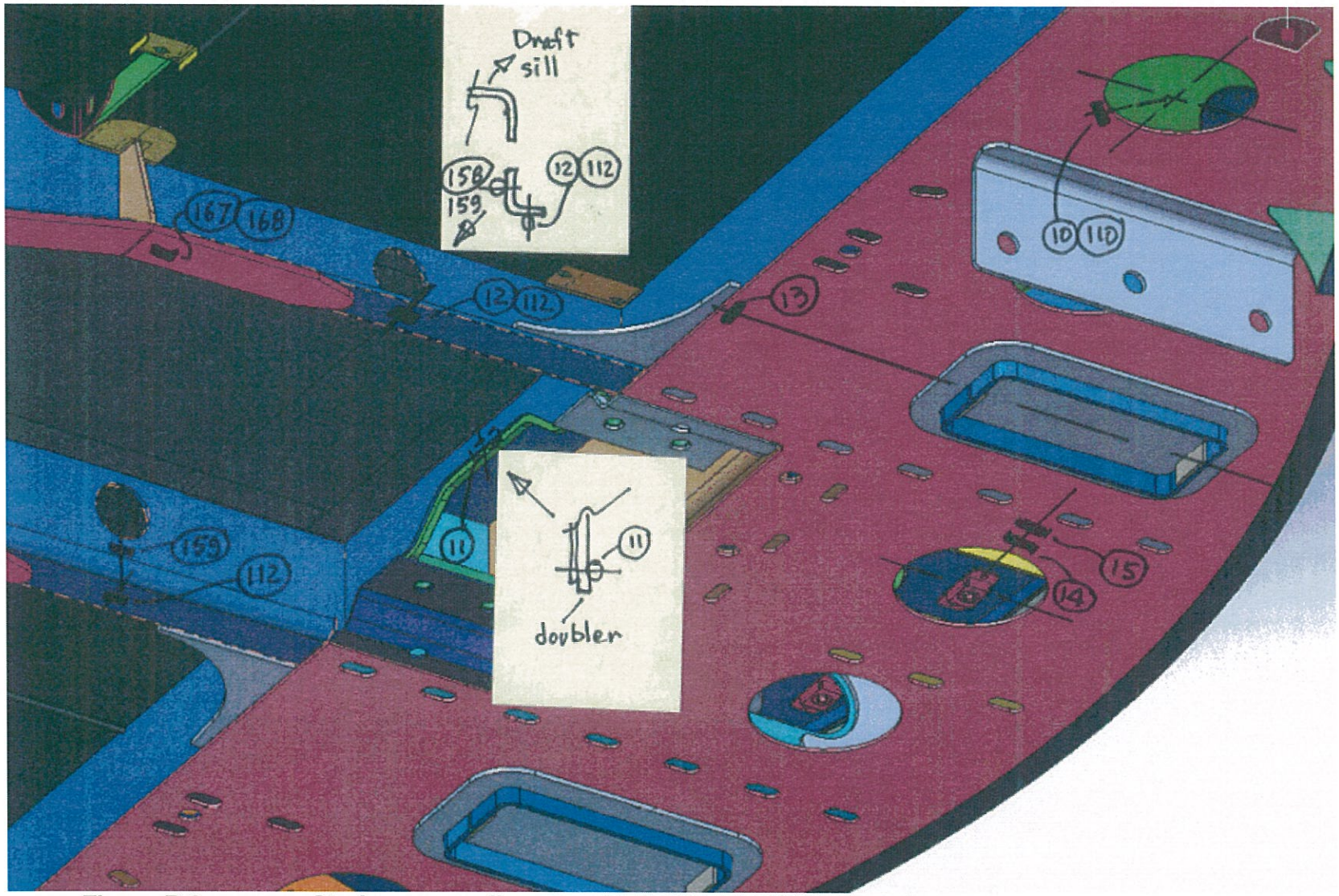


Figure B.2, Strain gauges diagram – End sill end #1(view from bottom)

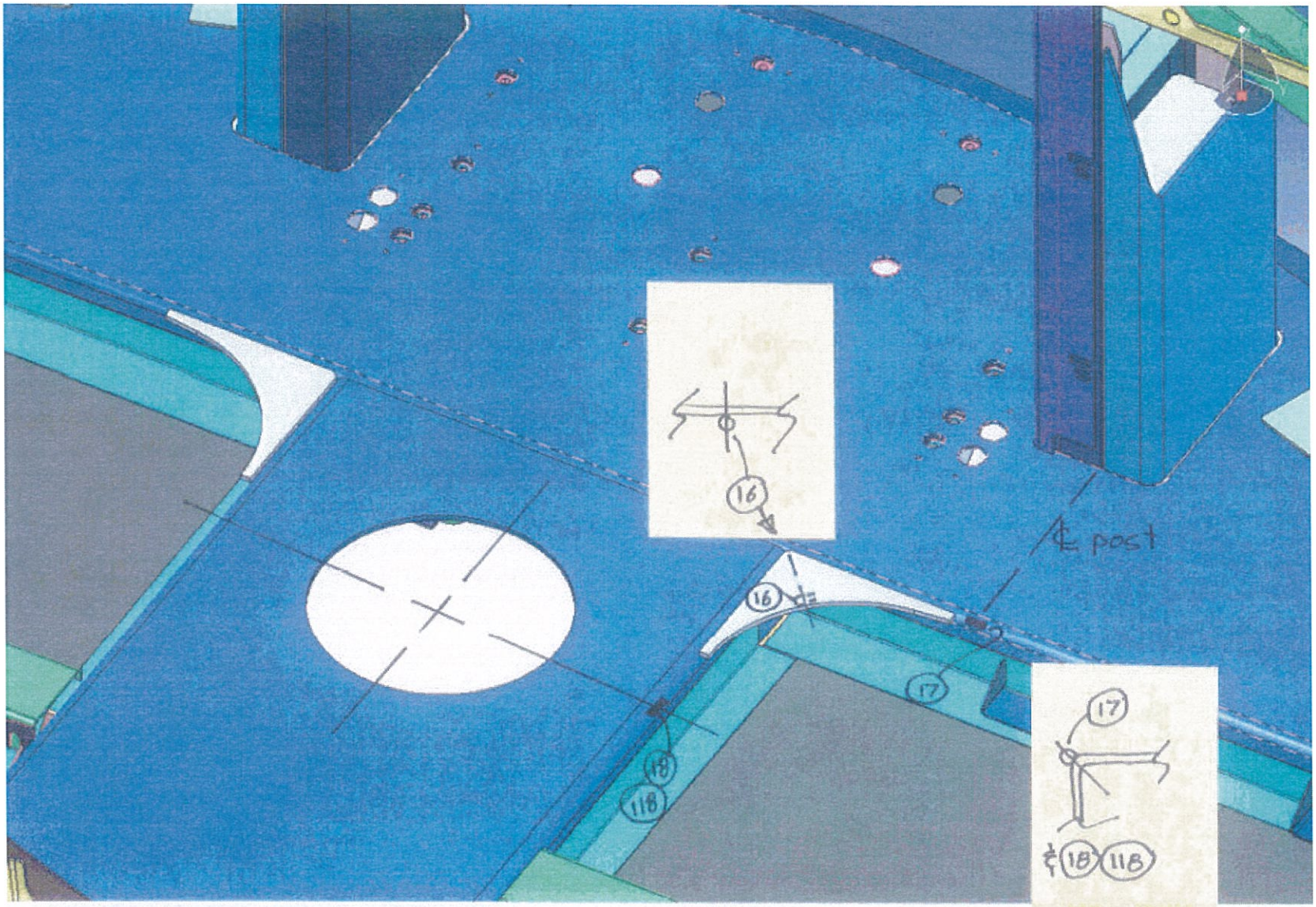


Figure B.3, Strain gauges diagram – End sill, draft sill, end #1

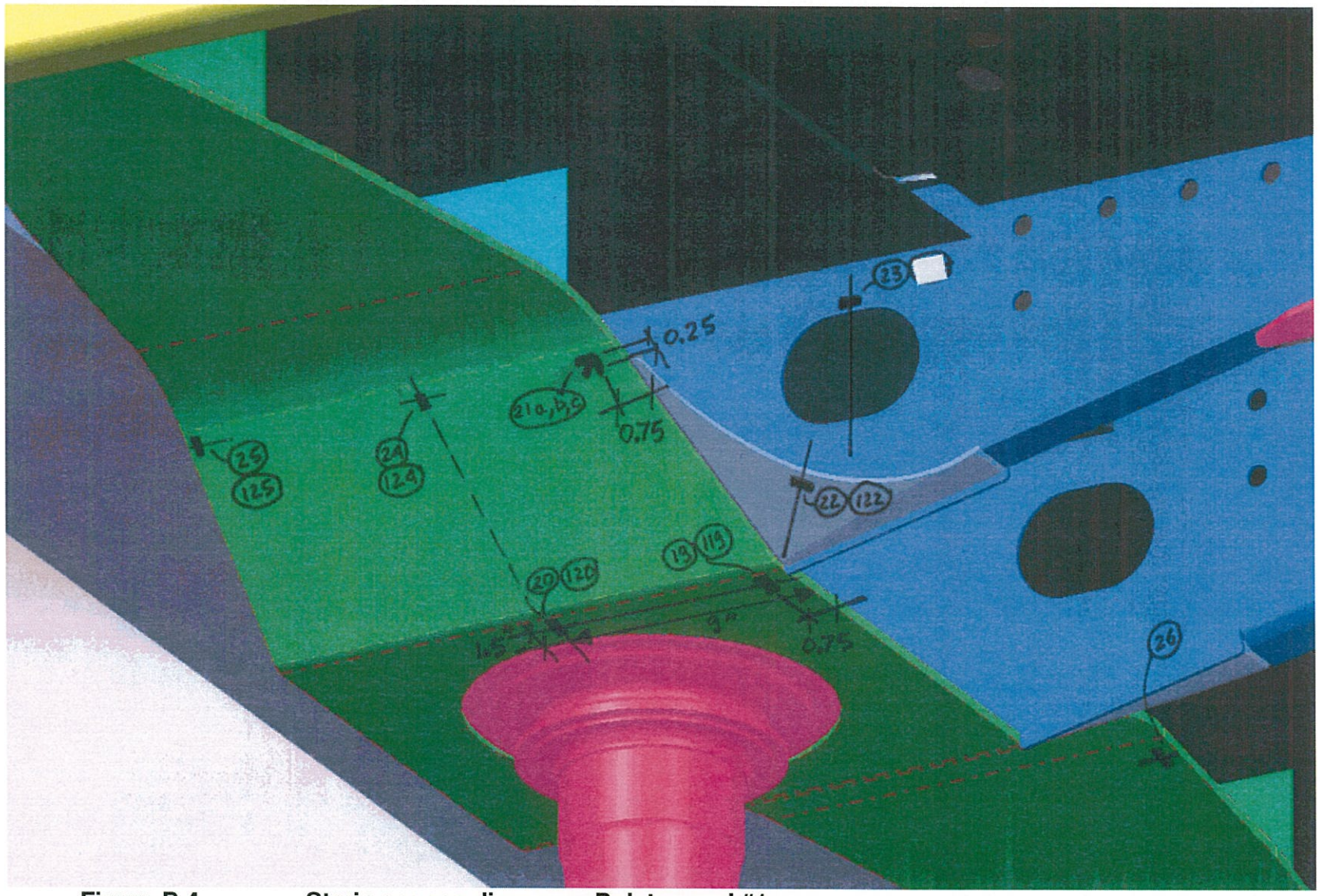


Figure B.4, Strain gauges diagram – Bolster, end #1

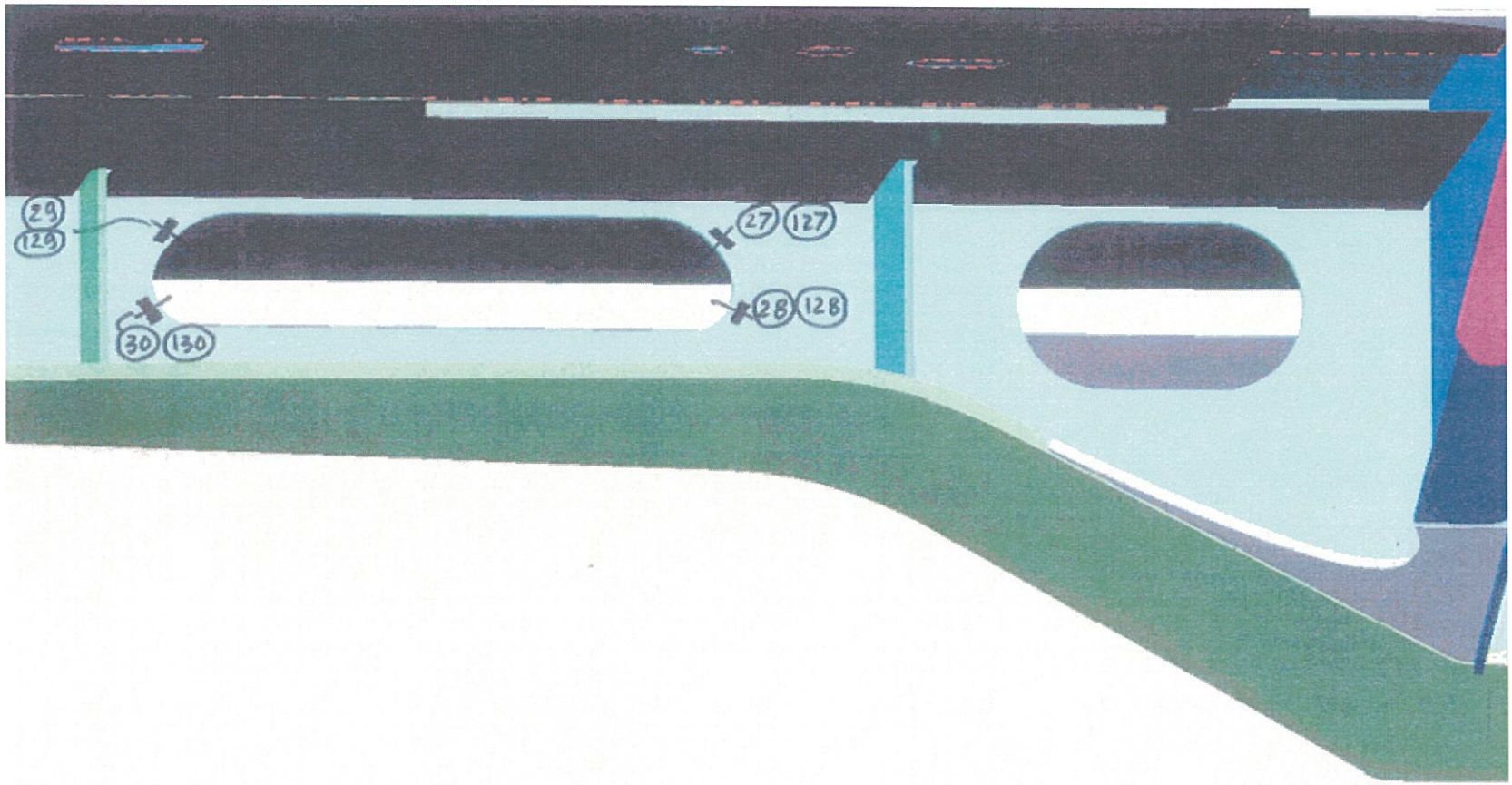


Figure B.5, Strain gauges diagram – Bolster, end #1.

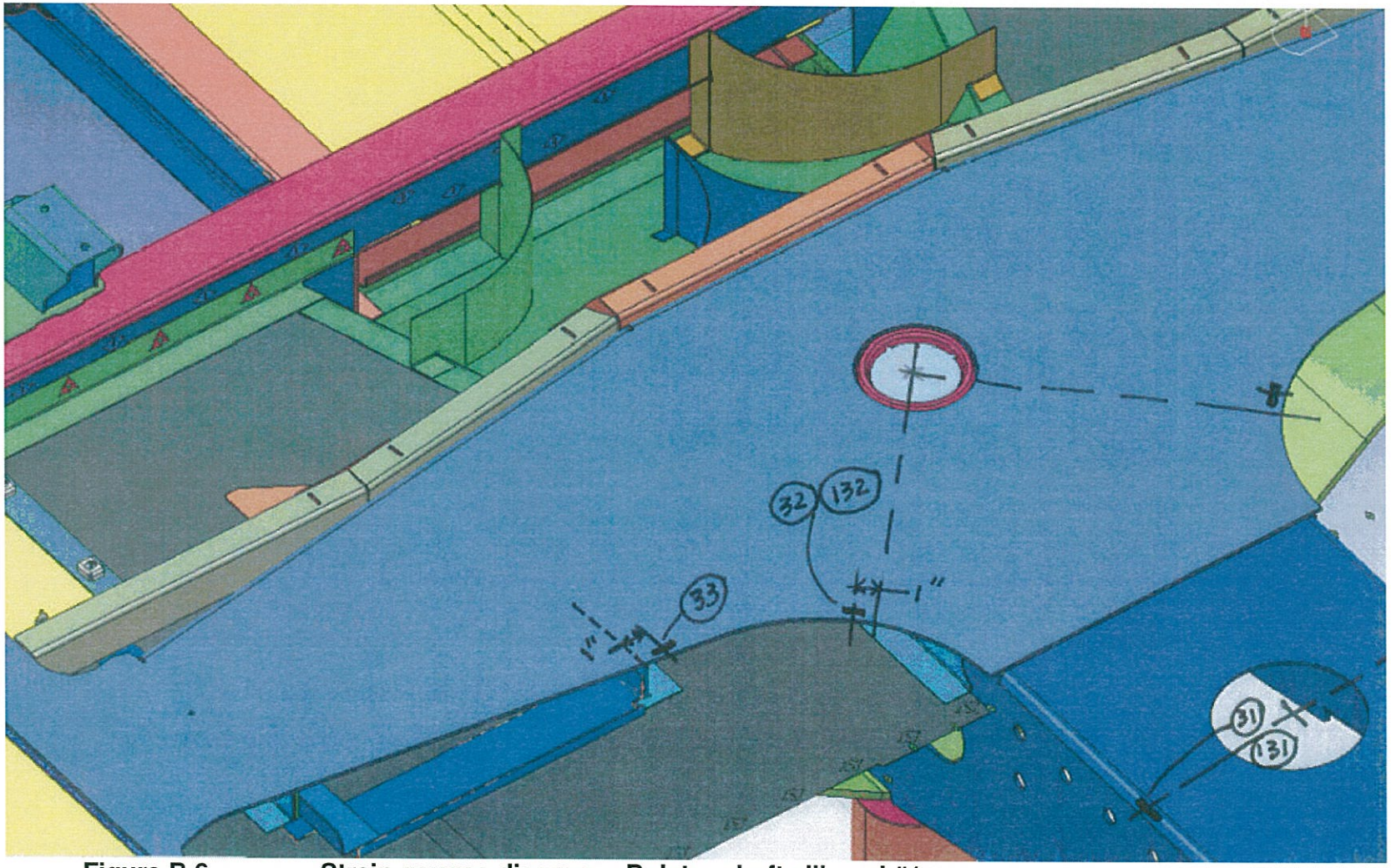


Figure B.6, Strain gauges diagram – Bolster, draft sill, end #1

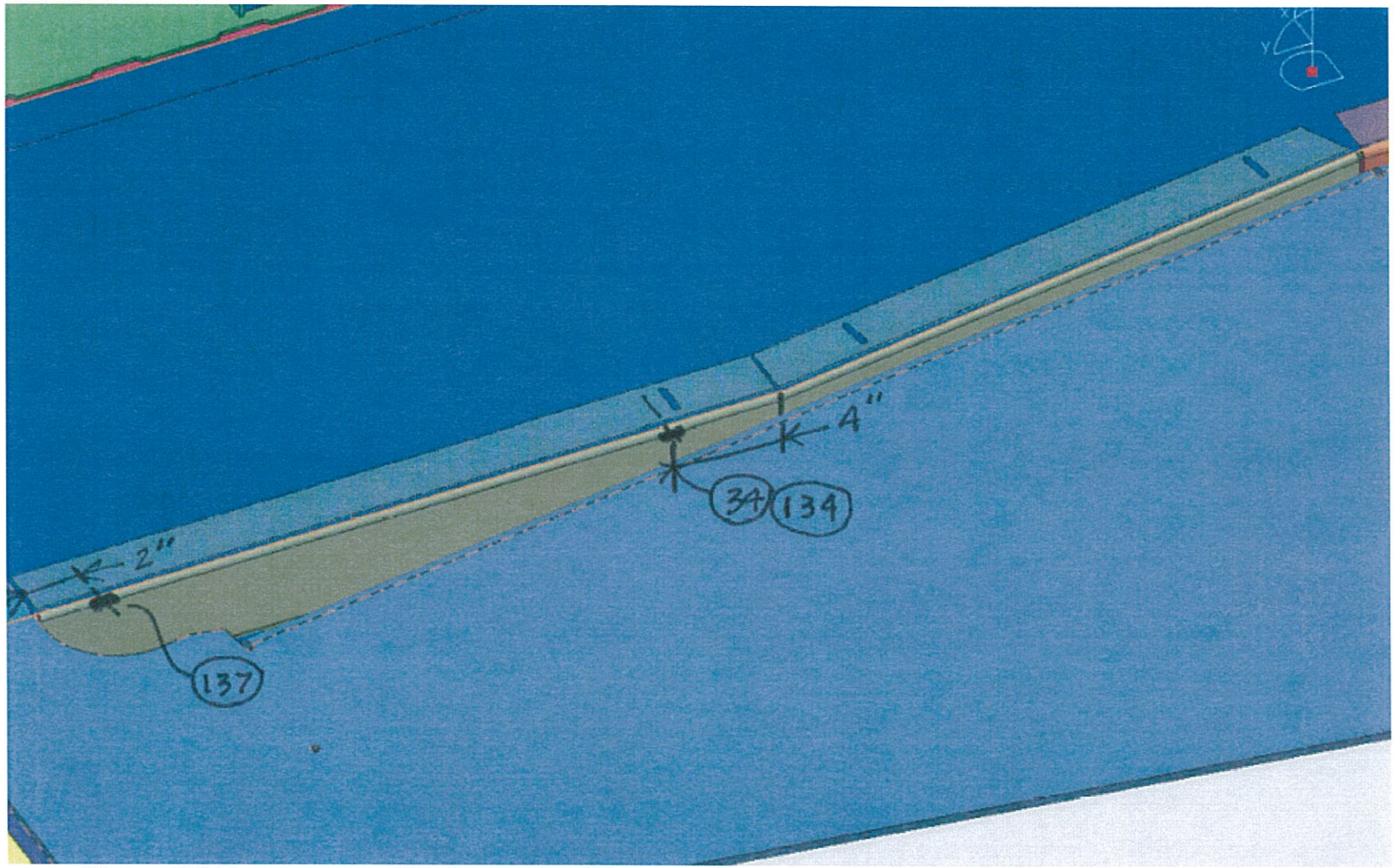


Figure B.6-B, Strain gauges diagram – Secondary air duct end #1

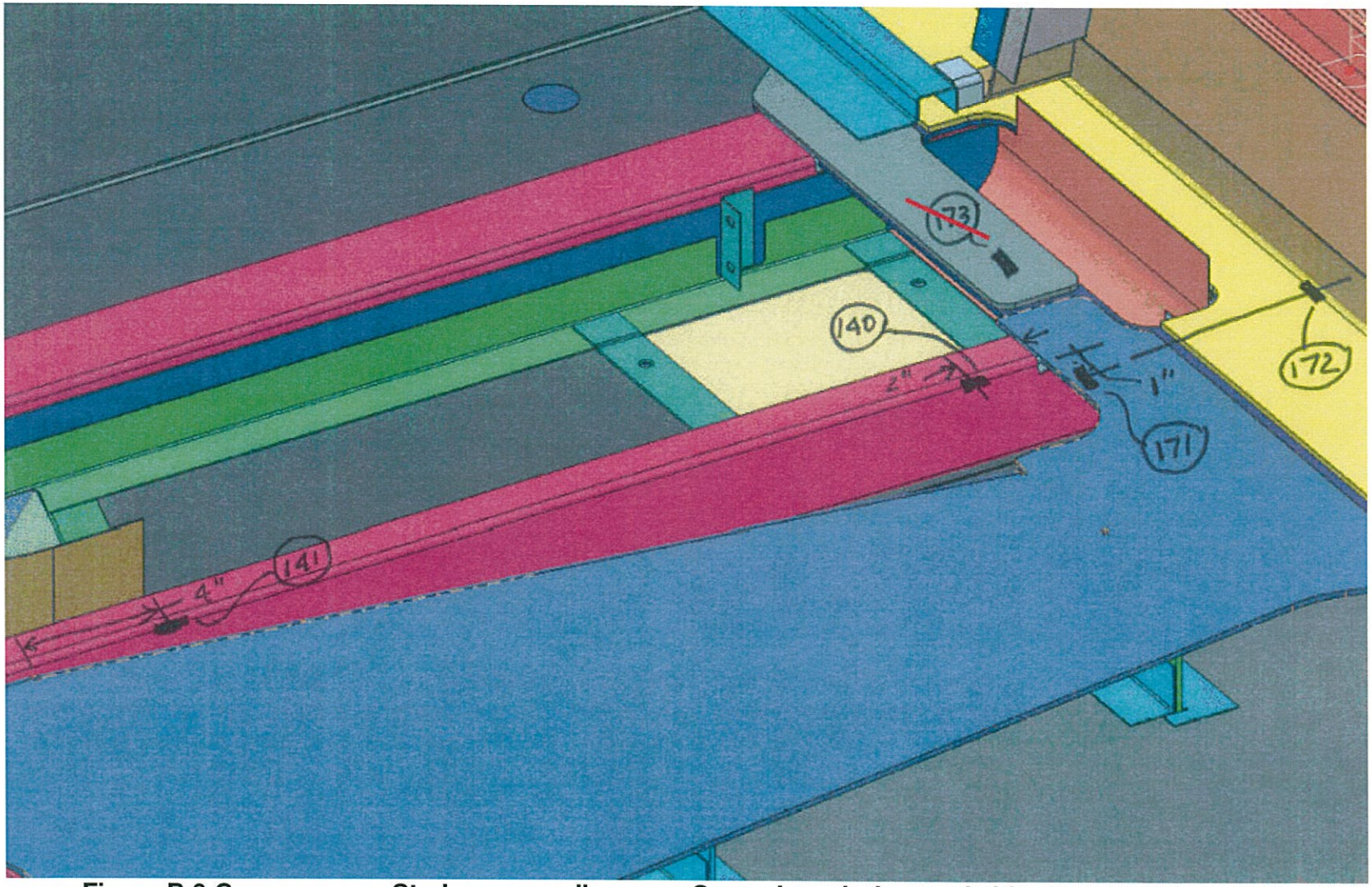


Figure B.6-C, Strain gauges diagram – Secondary air duct and side sill, end #2

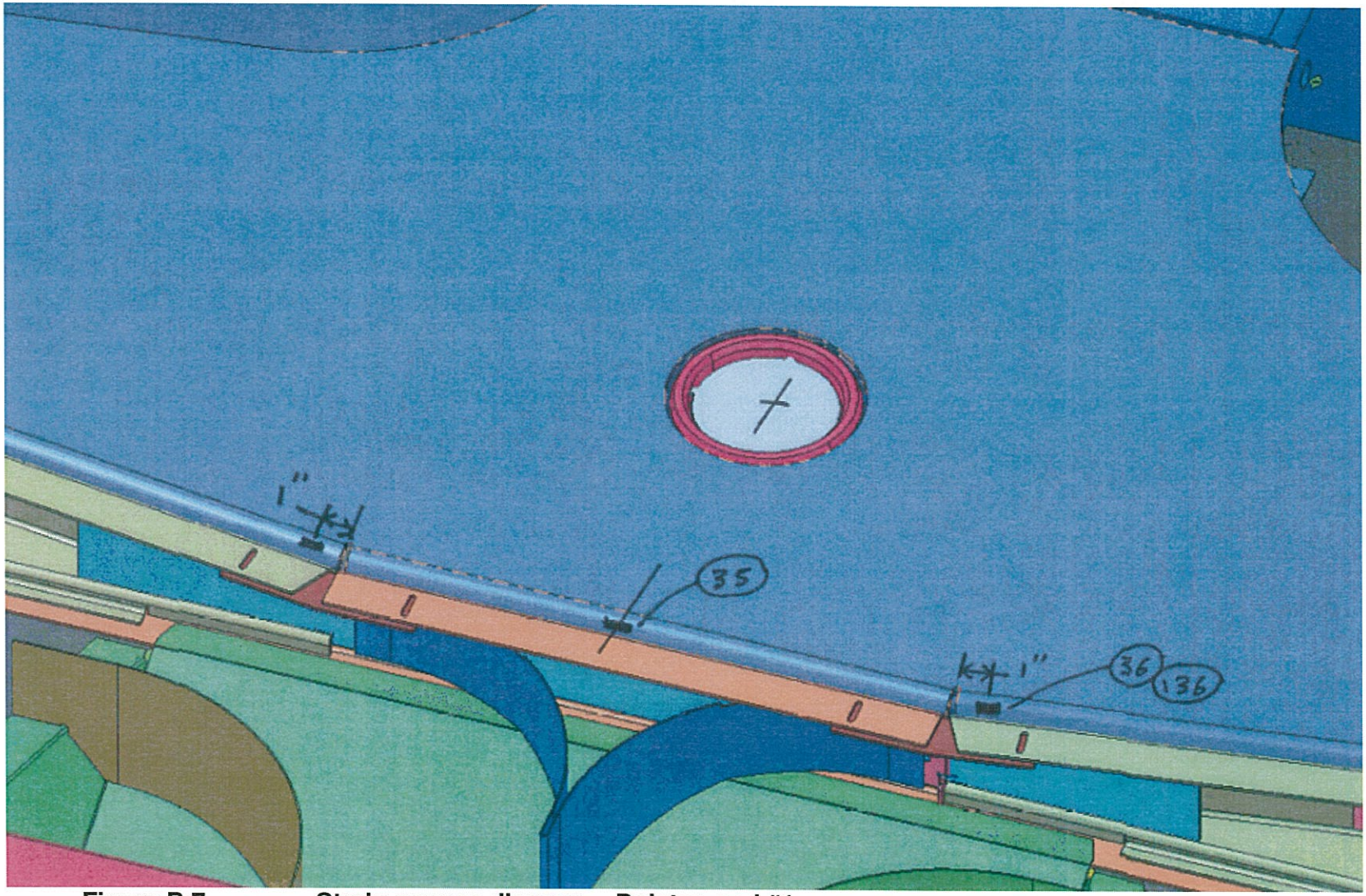


Figure B.7, Strain gauges diagram – Bolster, end #1.

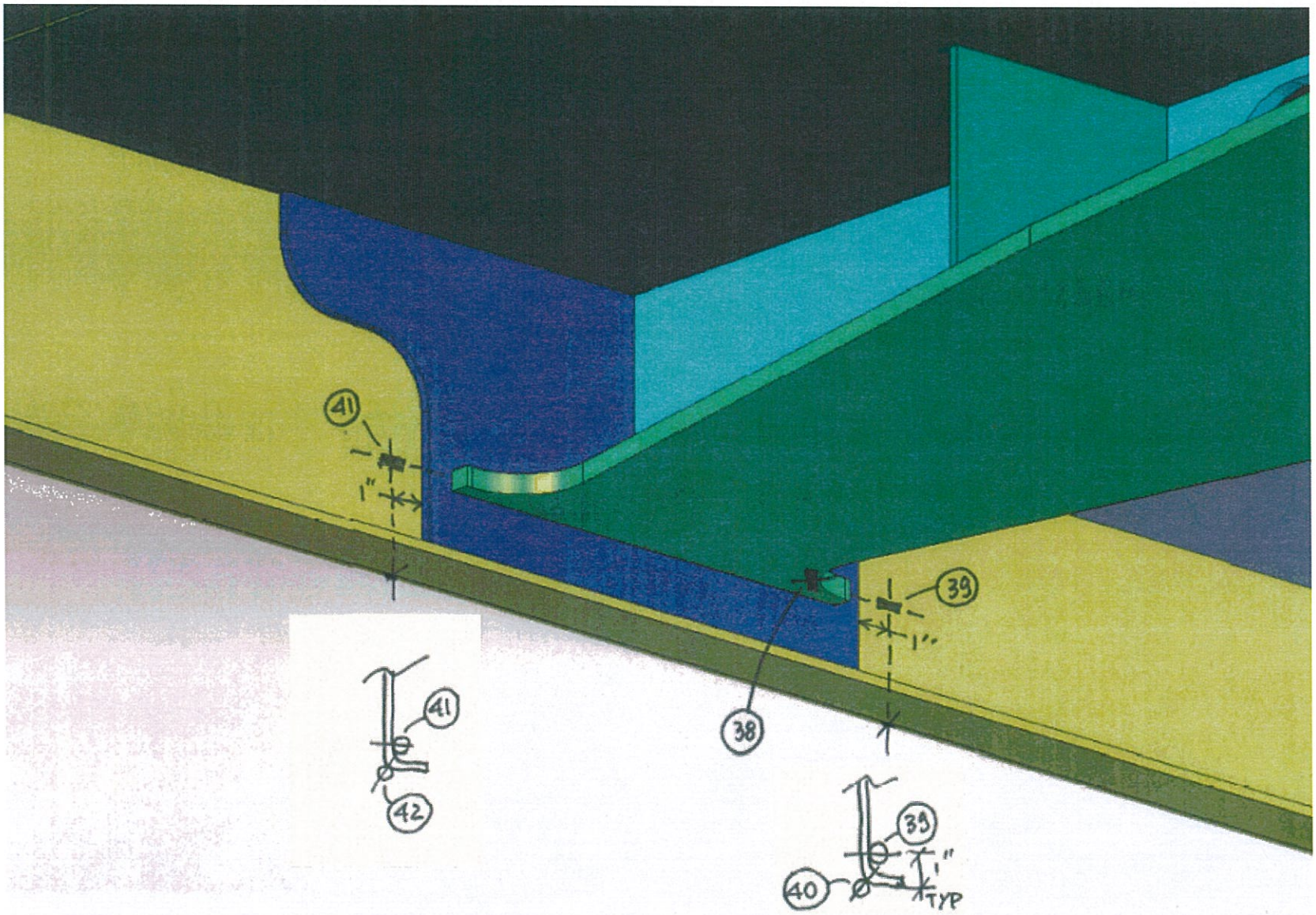


Figure B.8, Strain gauges diagram – Bolster, side sill, end #1, RH.

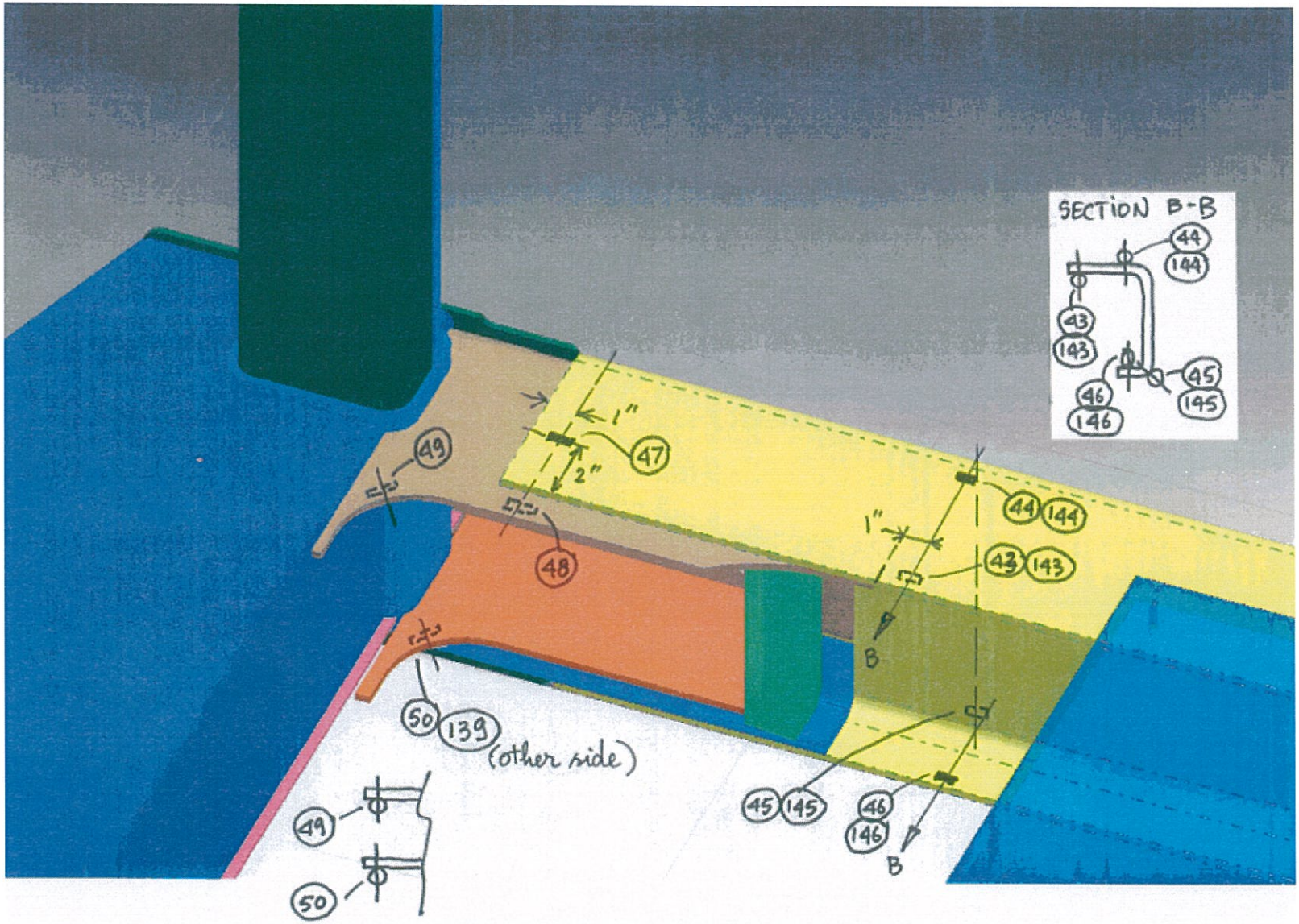


Figure B.9, Strain gauges diagram – End sill, side sill, end #1, RH.

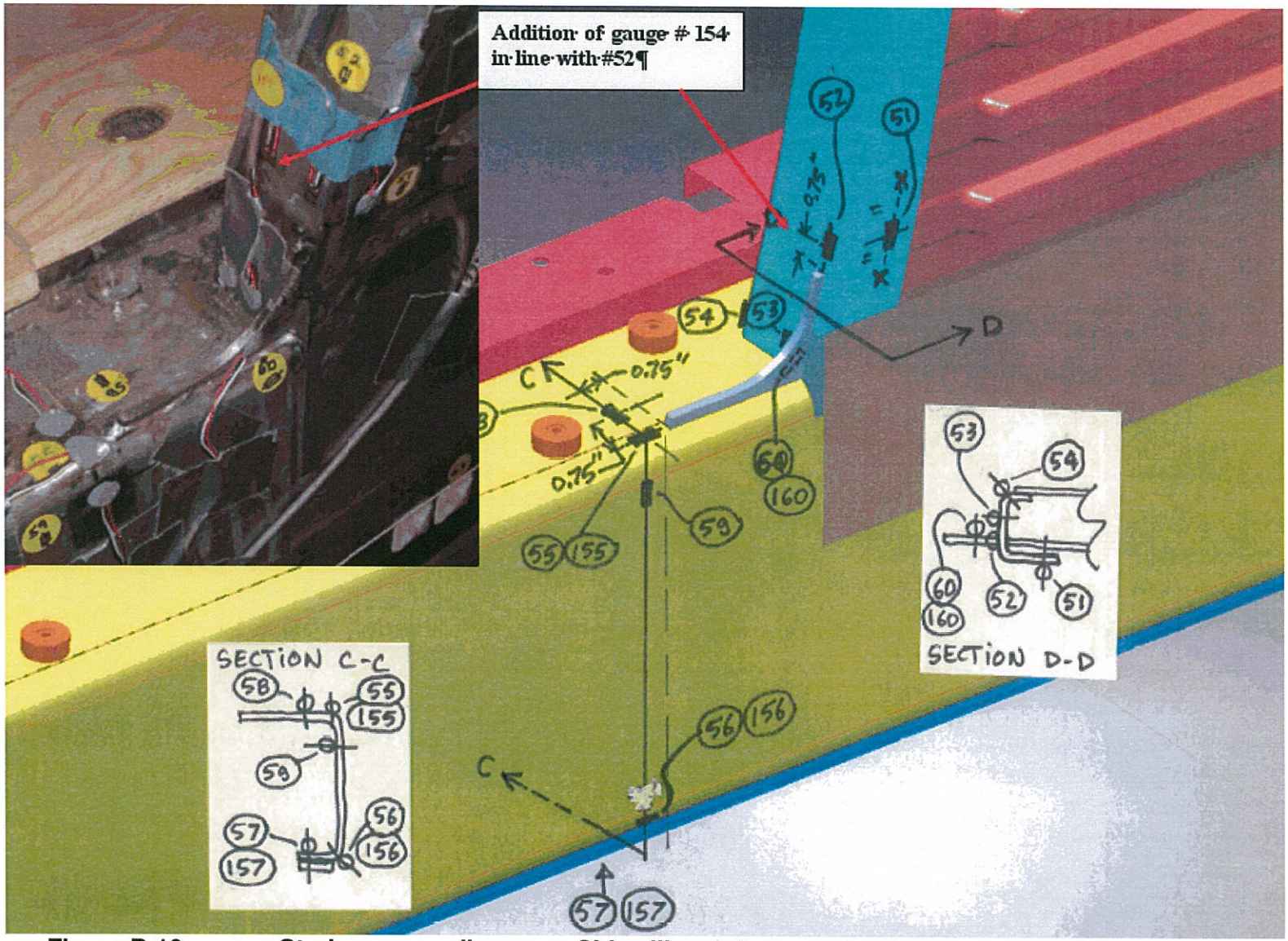


Figure B.10, Strain gauges diagram – Side sill and door mask at bottom, end #1, RH.

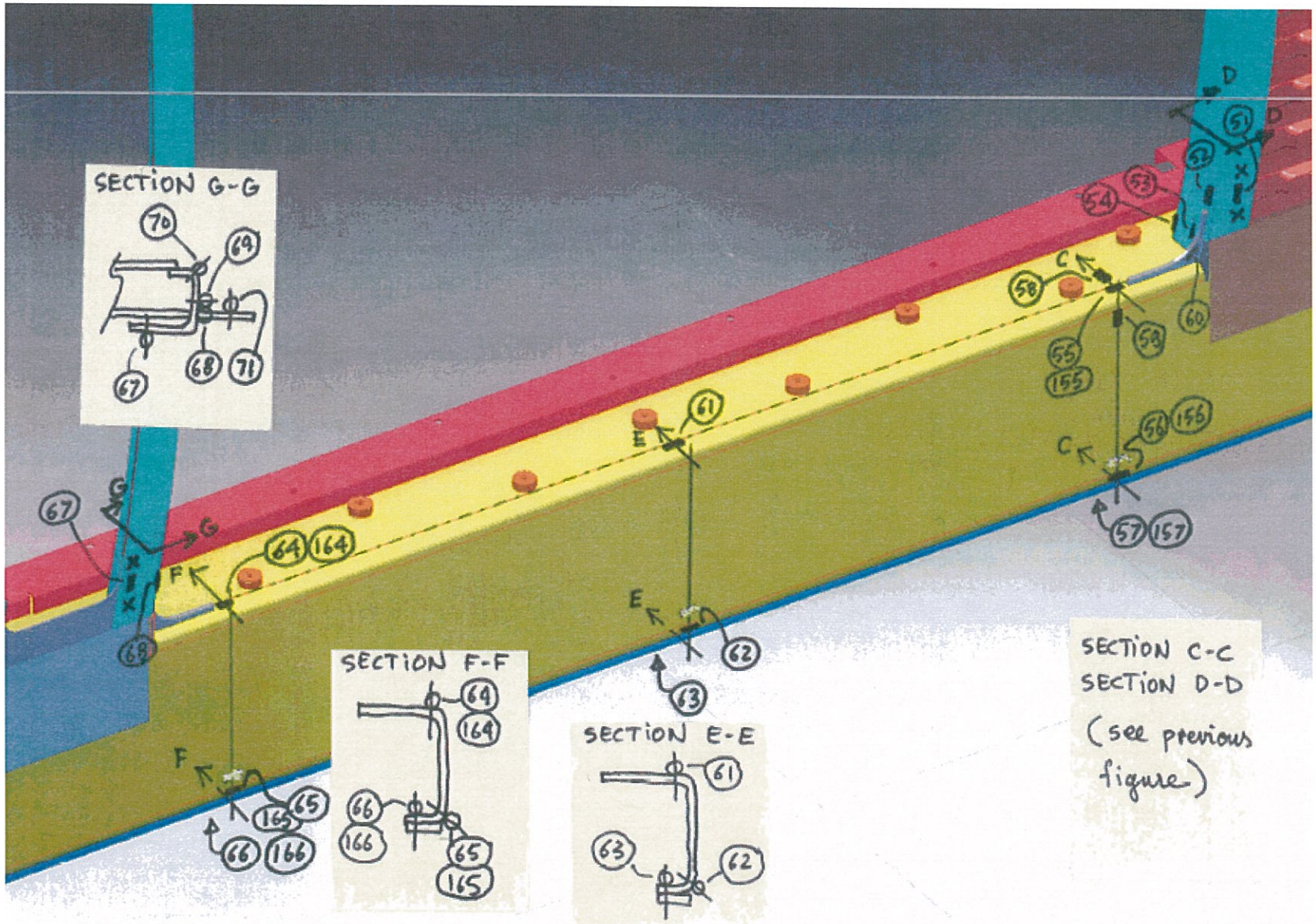


Figure B.11, Strain gauges diagram – Door area and masks at end #1, RH.

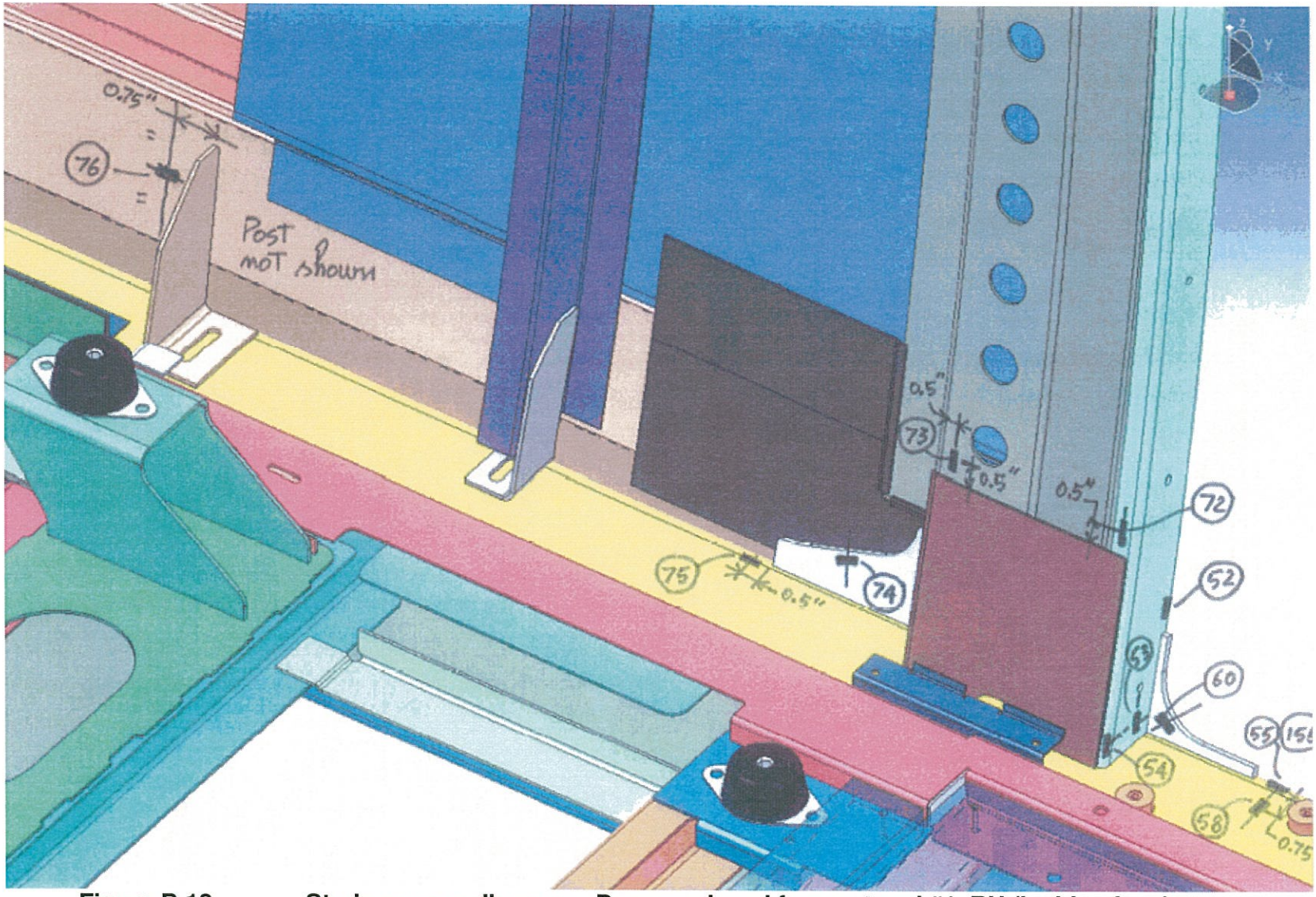


Figure B.12, Strain gauges diagram – Door mask and frame at end #1, RH (inside of car).

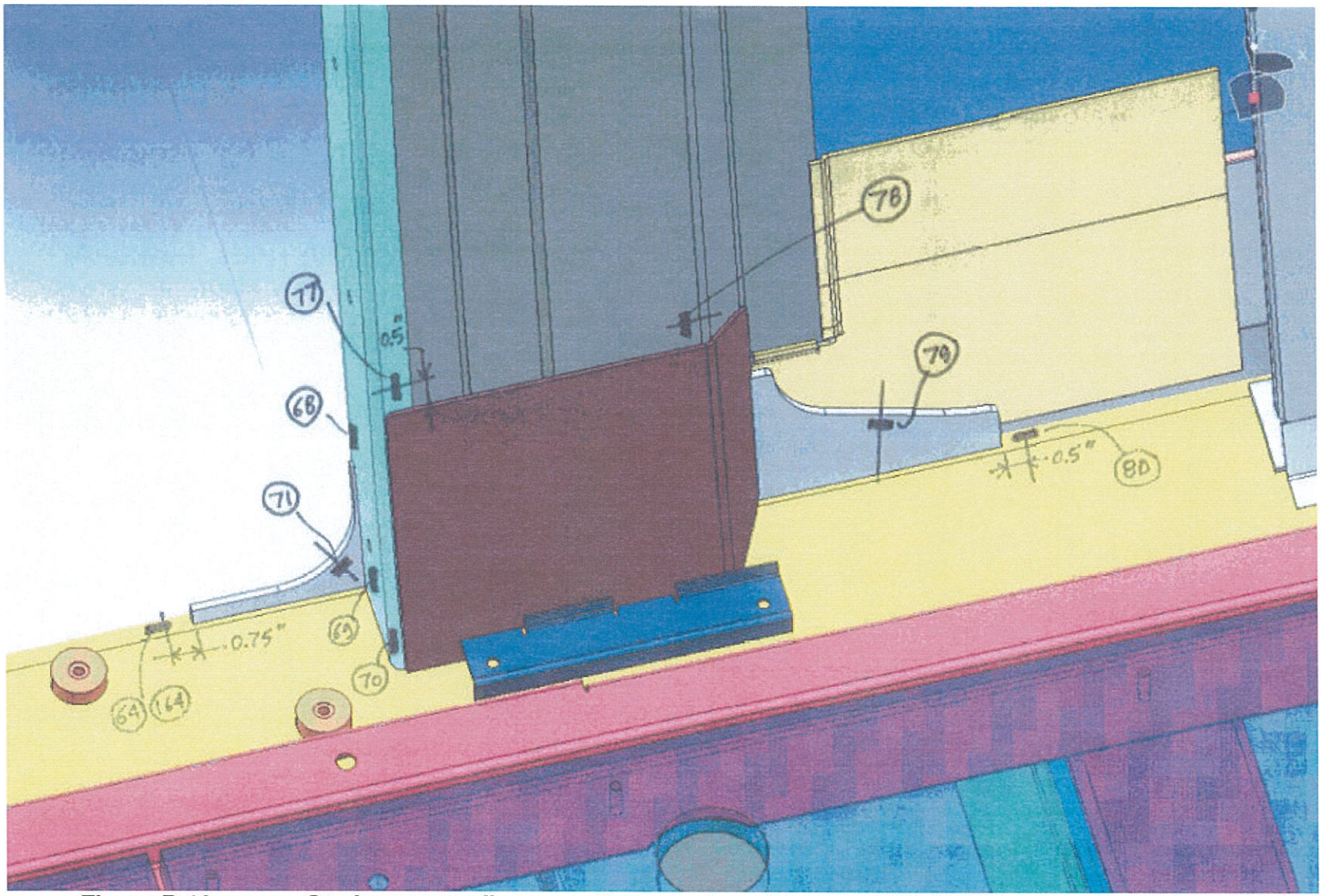


Figure B.13, Strain gauges diagram – Door mask and frame at end #1, RH.

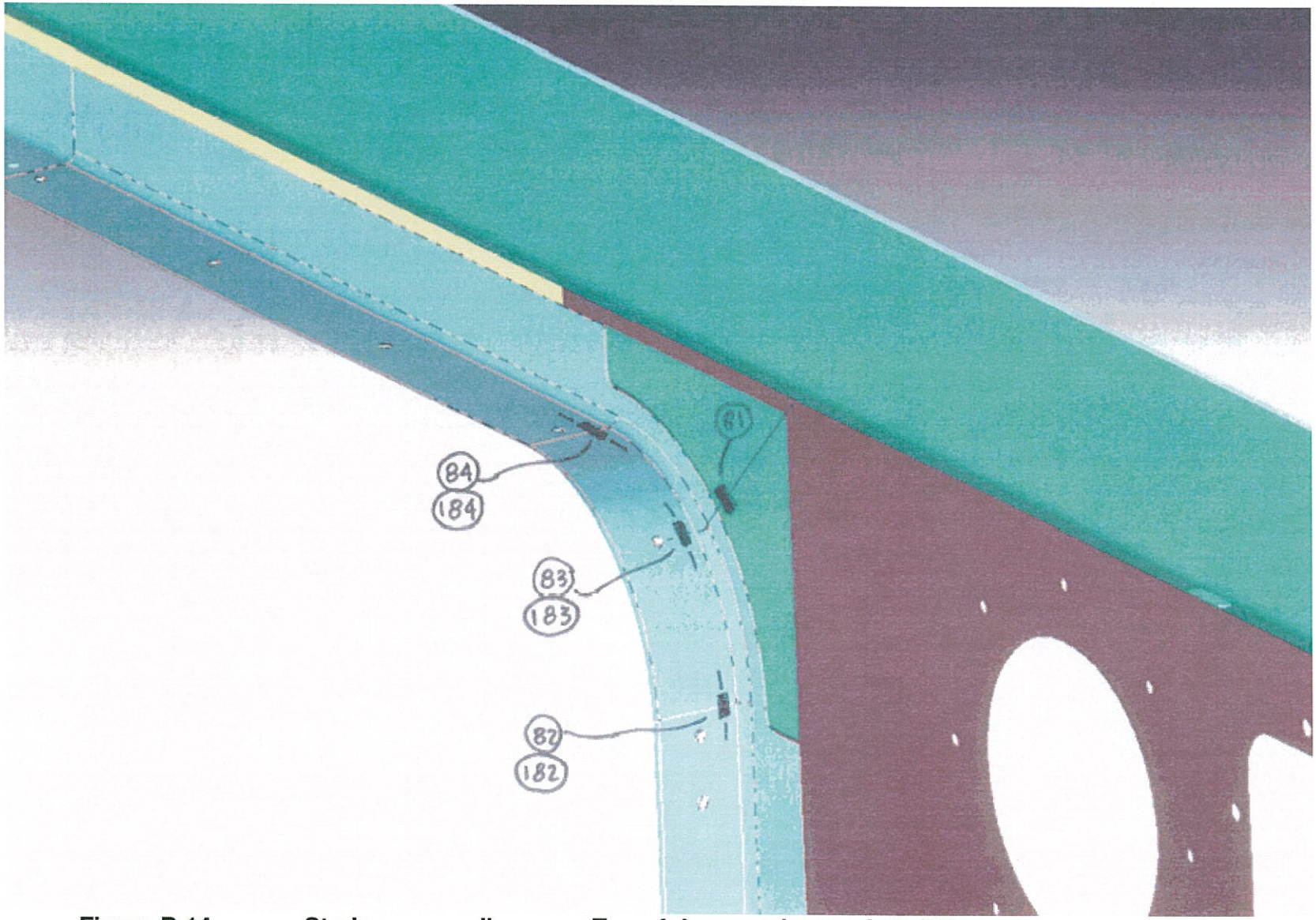


Figure B.14, Strain gauges diagram – Top of door mask at end #1, RH.

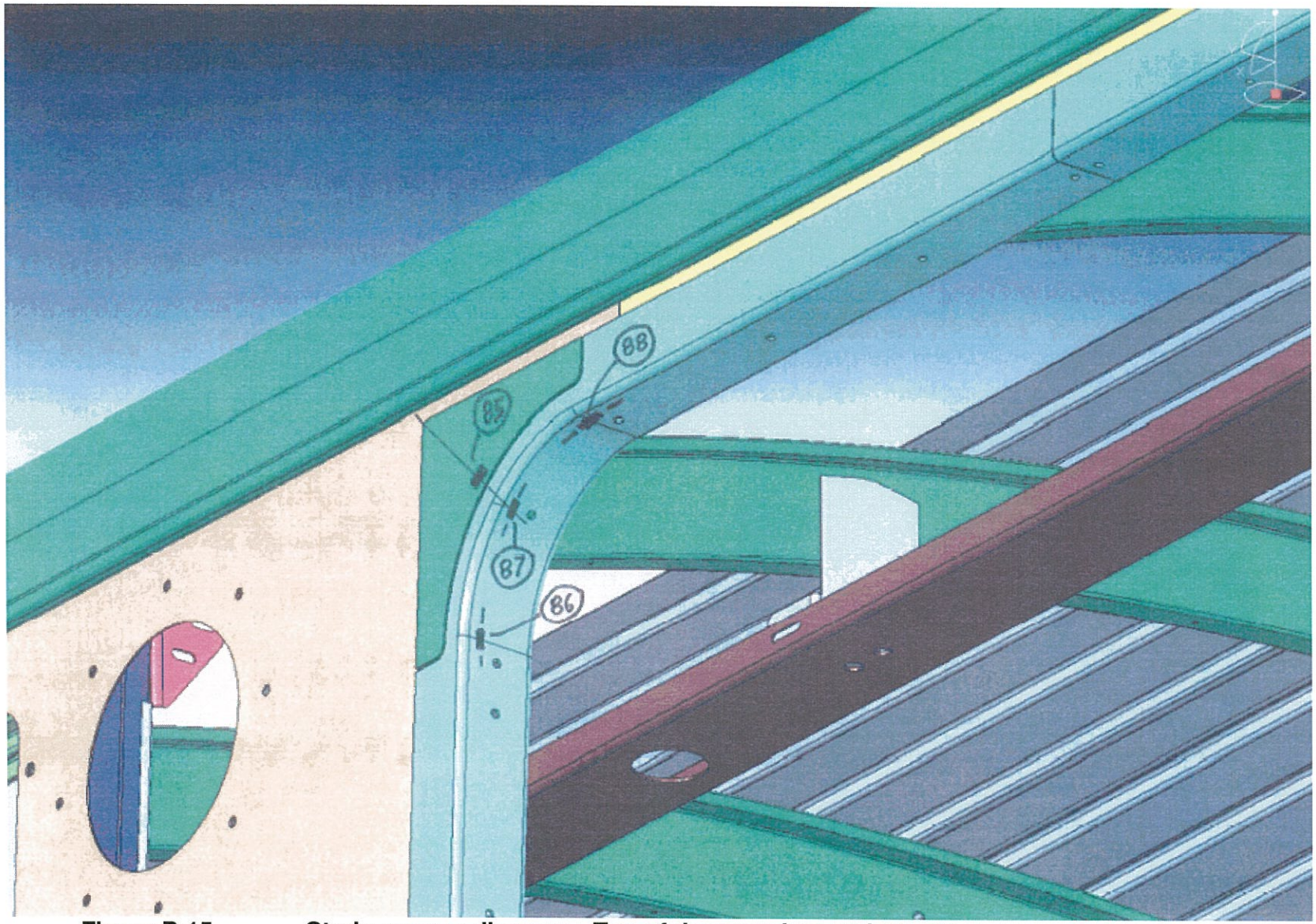


Figure B.15, Strain gauges diagram – Top of door mask at end #1, RH.

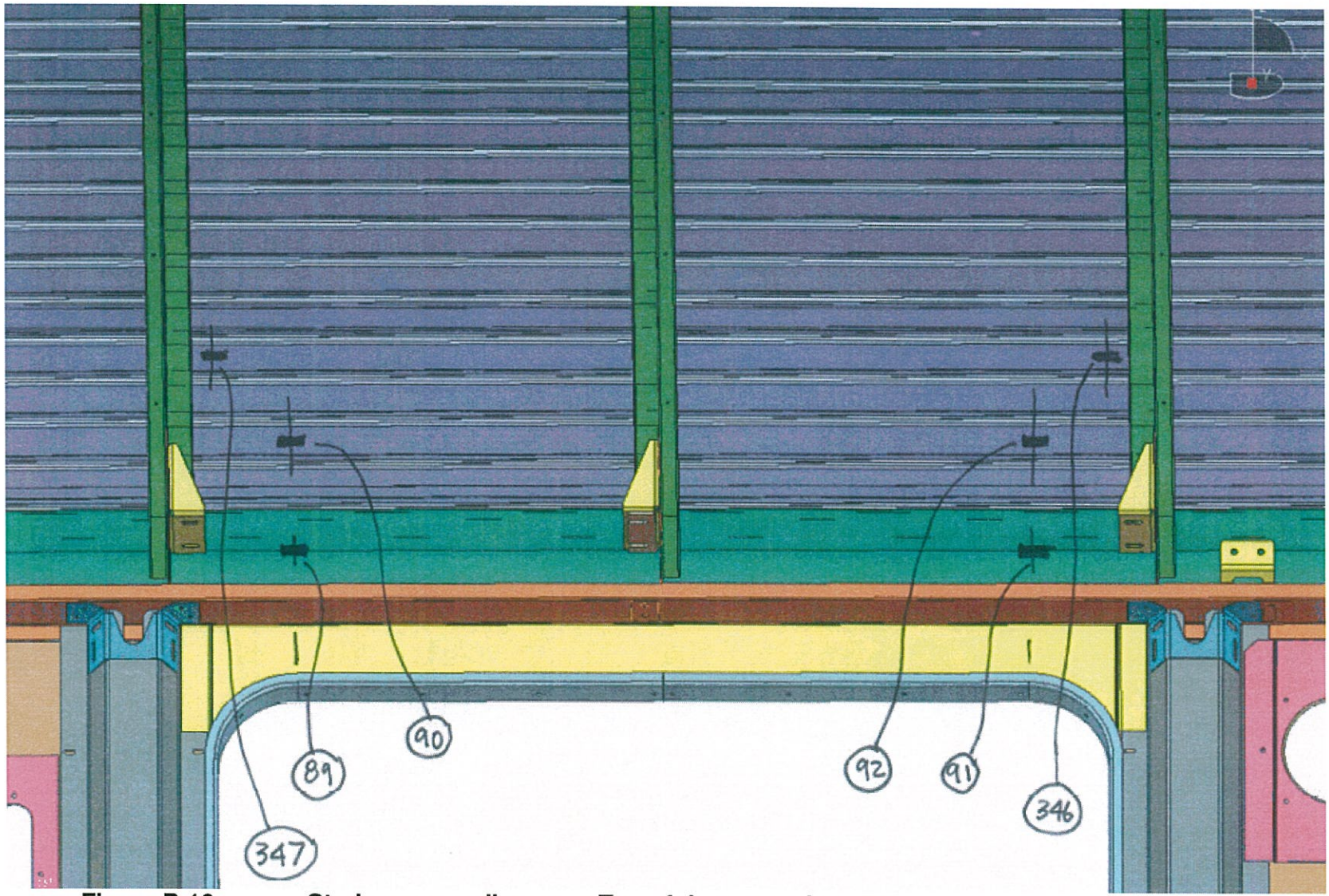


Figure B.16, Strain gauges diagram – Top of door at end #1, RH.

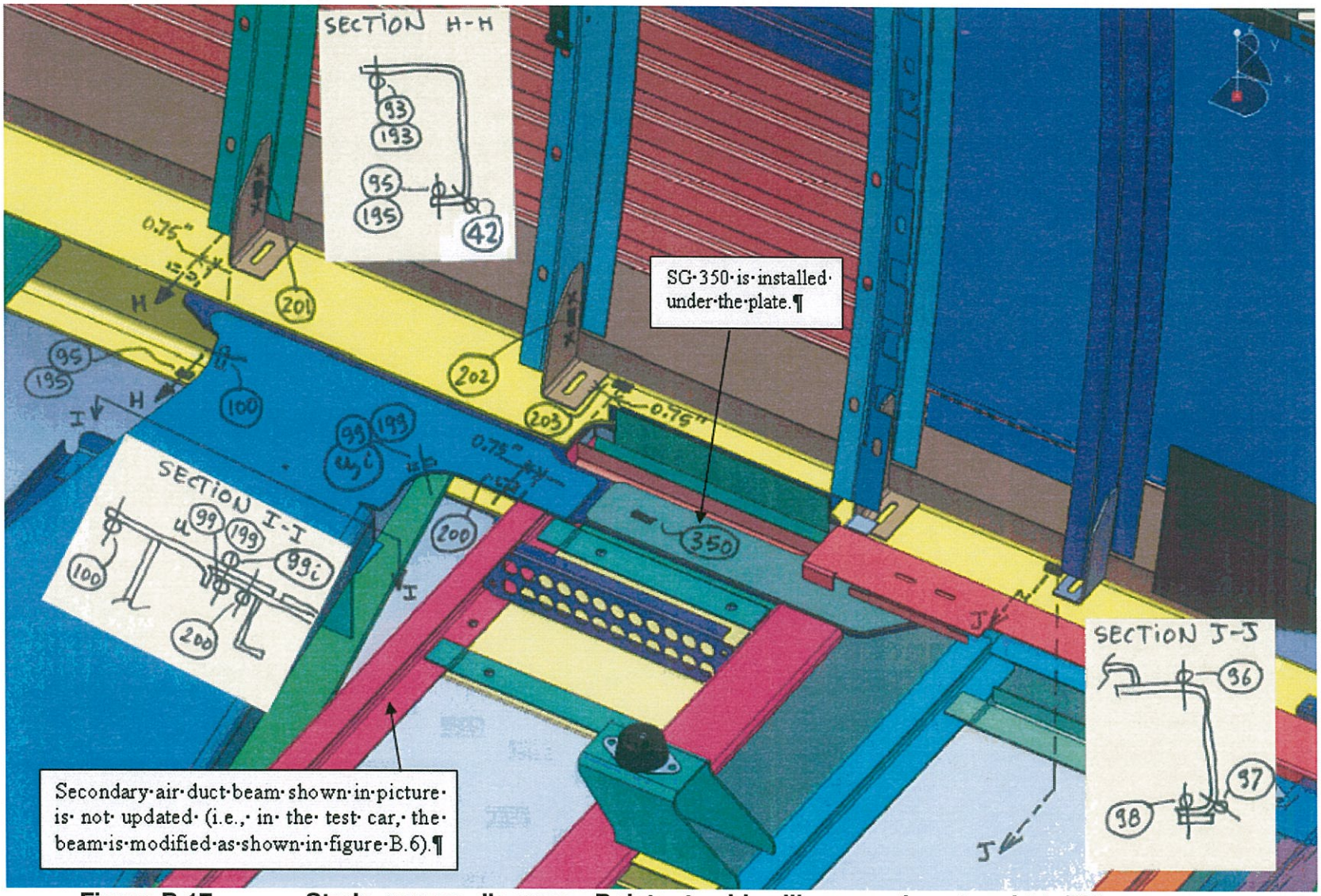


Figure B.17, Strain gauges diagram – Bolster to side sill connection at end #1, RH.

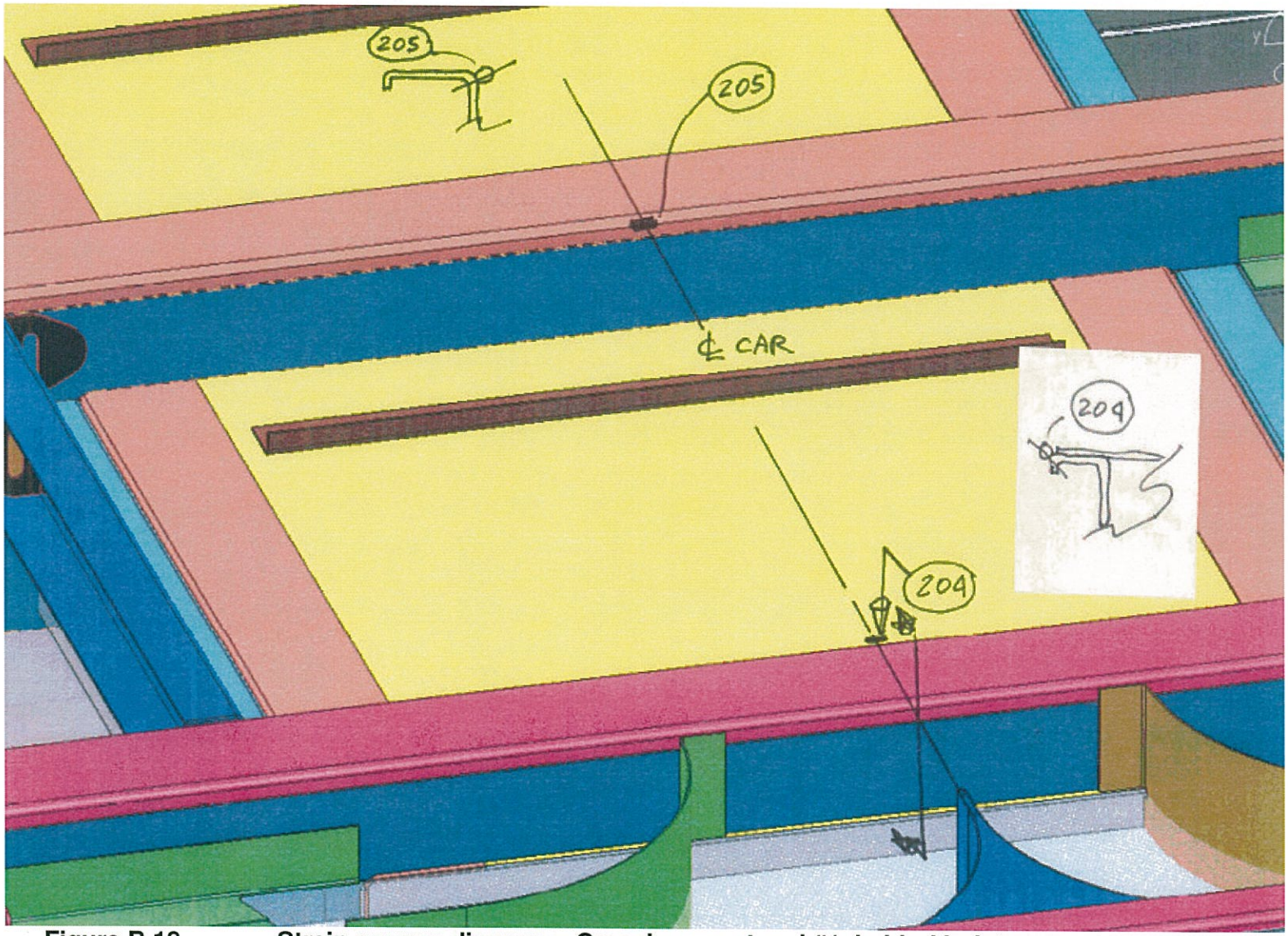


Figure B.18, Strain gauges diagram – Crossbeams at end #1, behind bolster.

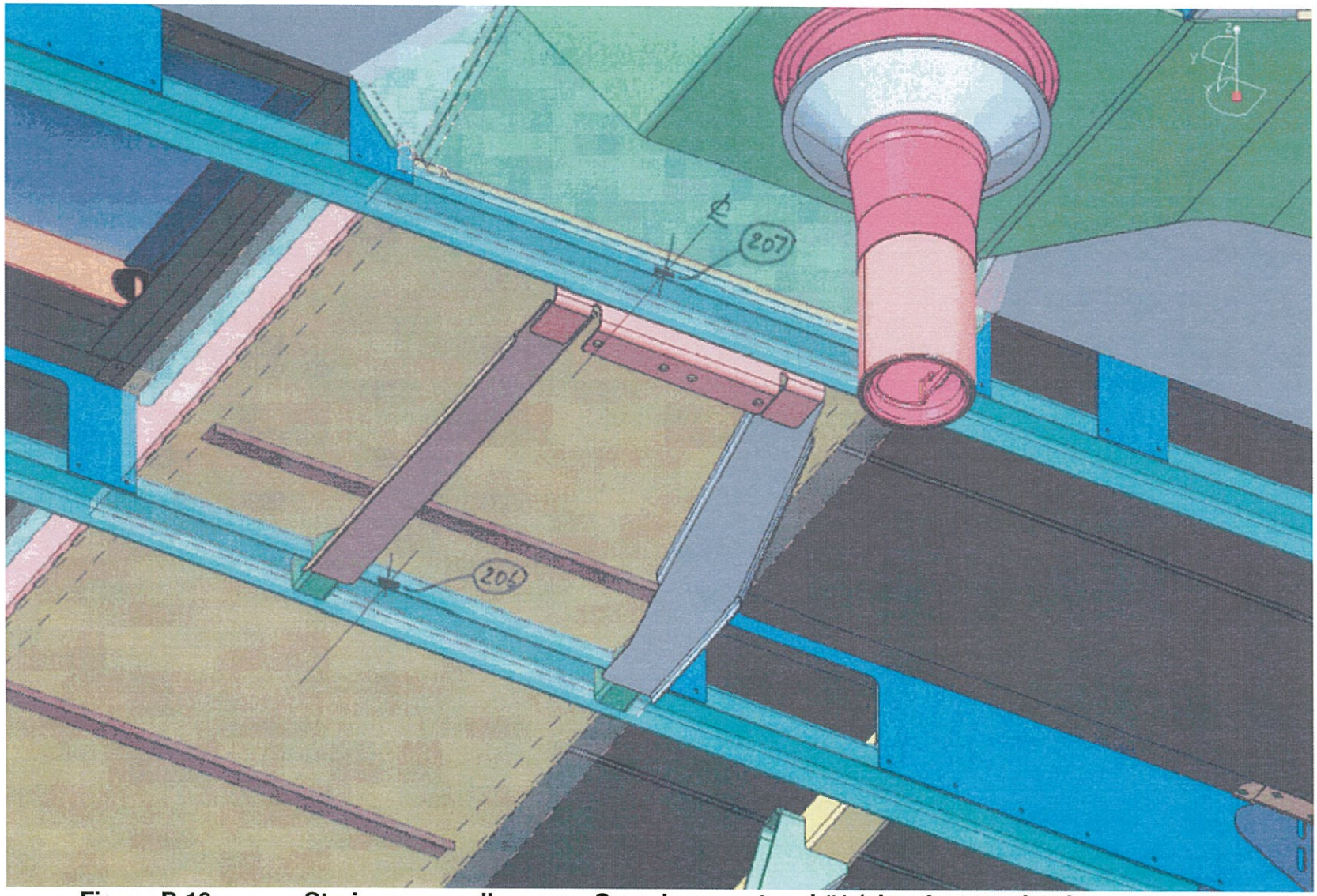


Figure B.19, Strain gauges diagram – Crossbeams at end #1 (view from under the car).

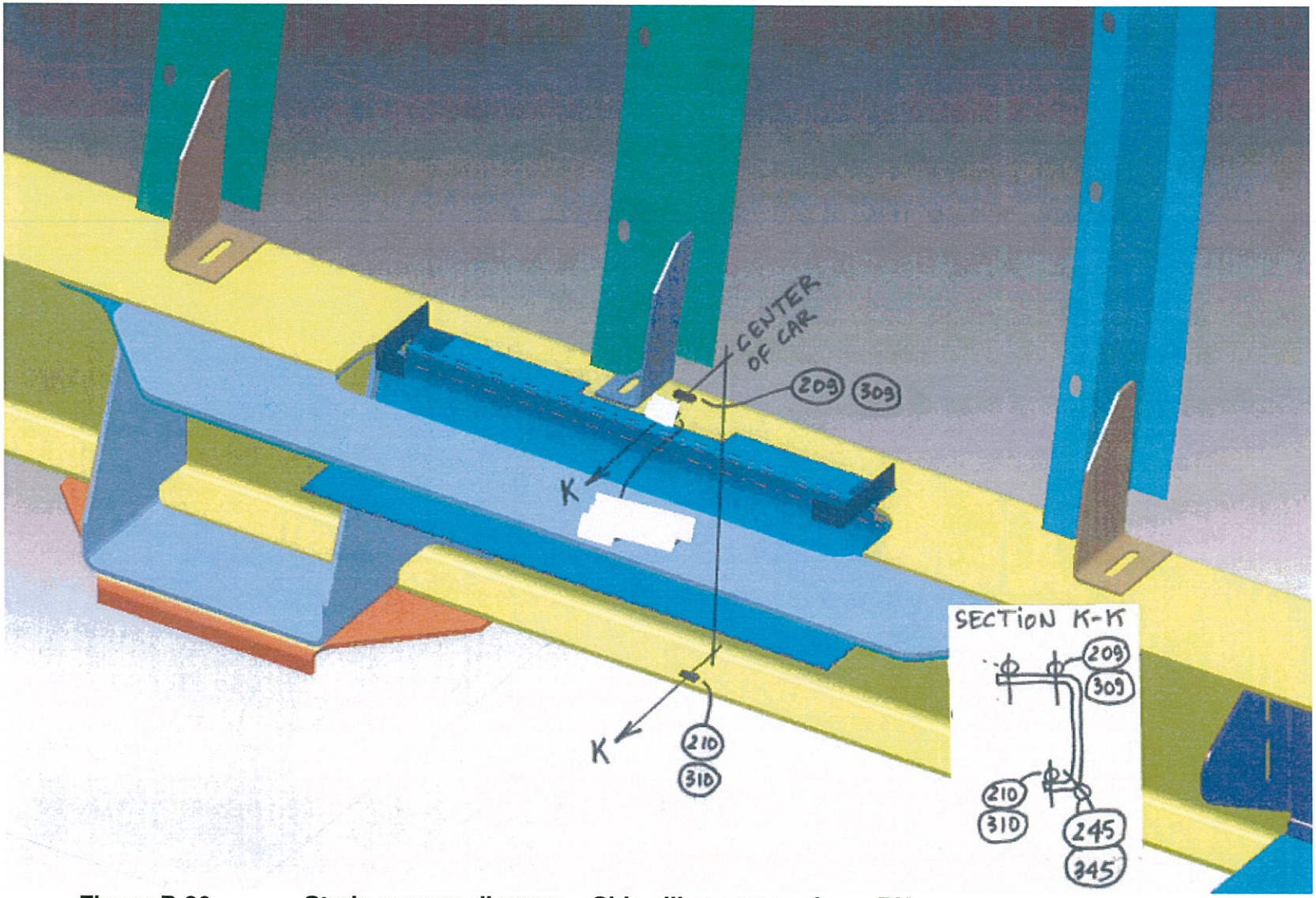


Figure B.20, Strain gauges diagram – Side sill at center of car, RH.

Figure B.21, Strain gauges diagram – RH face at end #1 (from inside the car at sash window).

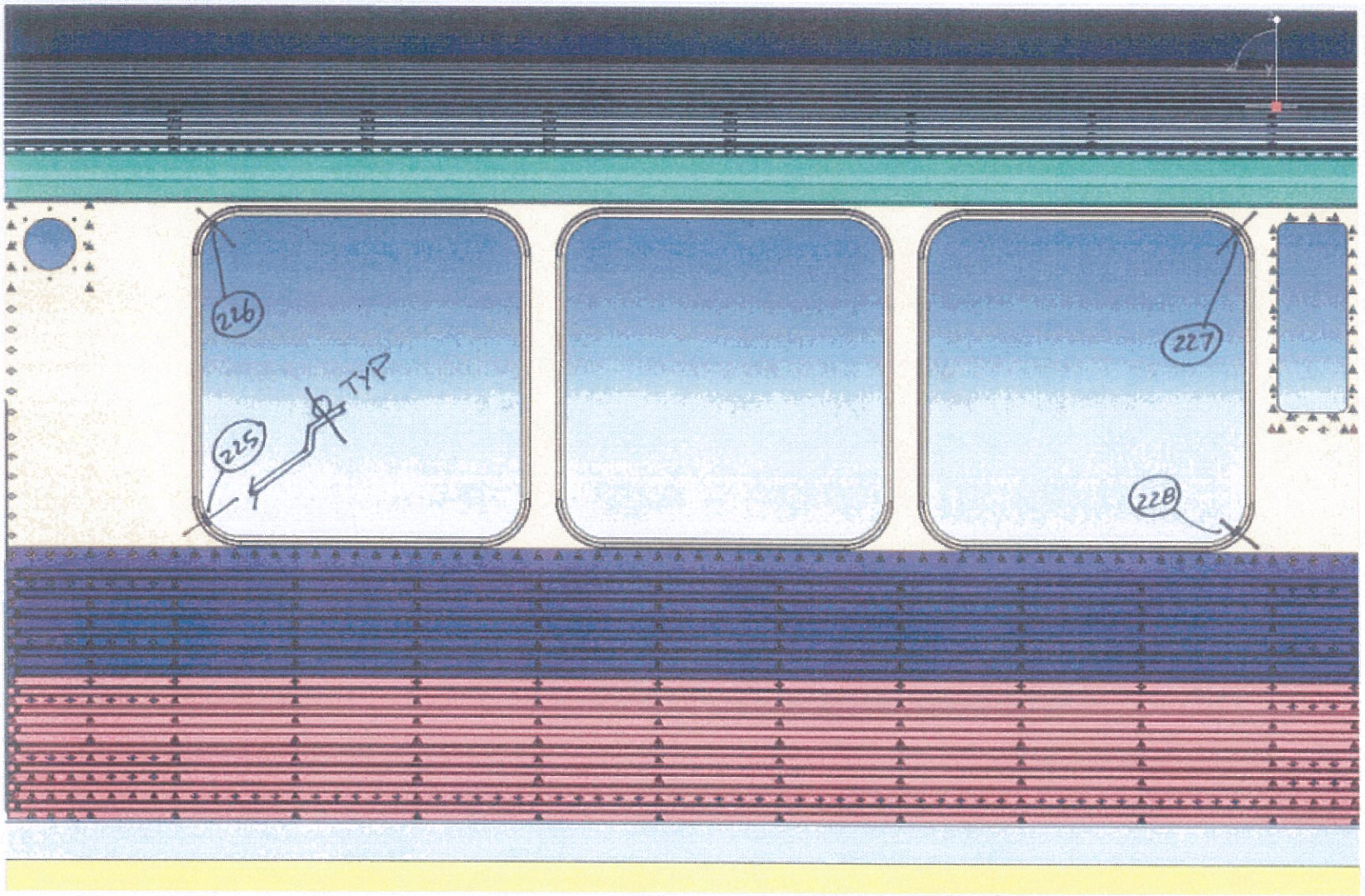


Figure B.22, Strain gauges diagram – RH face at the center of car (view from outside).

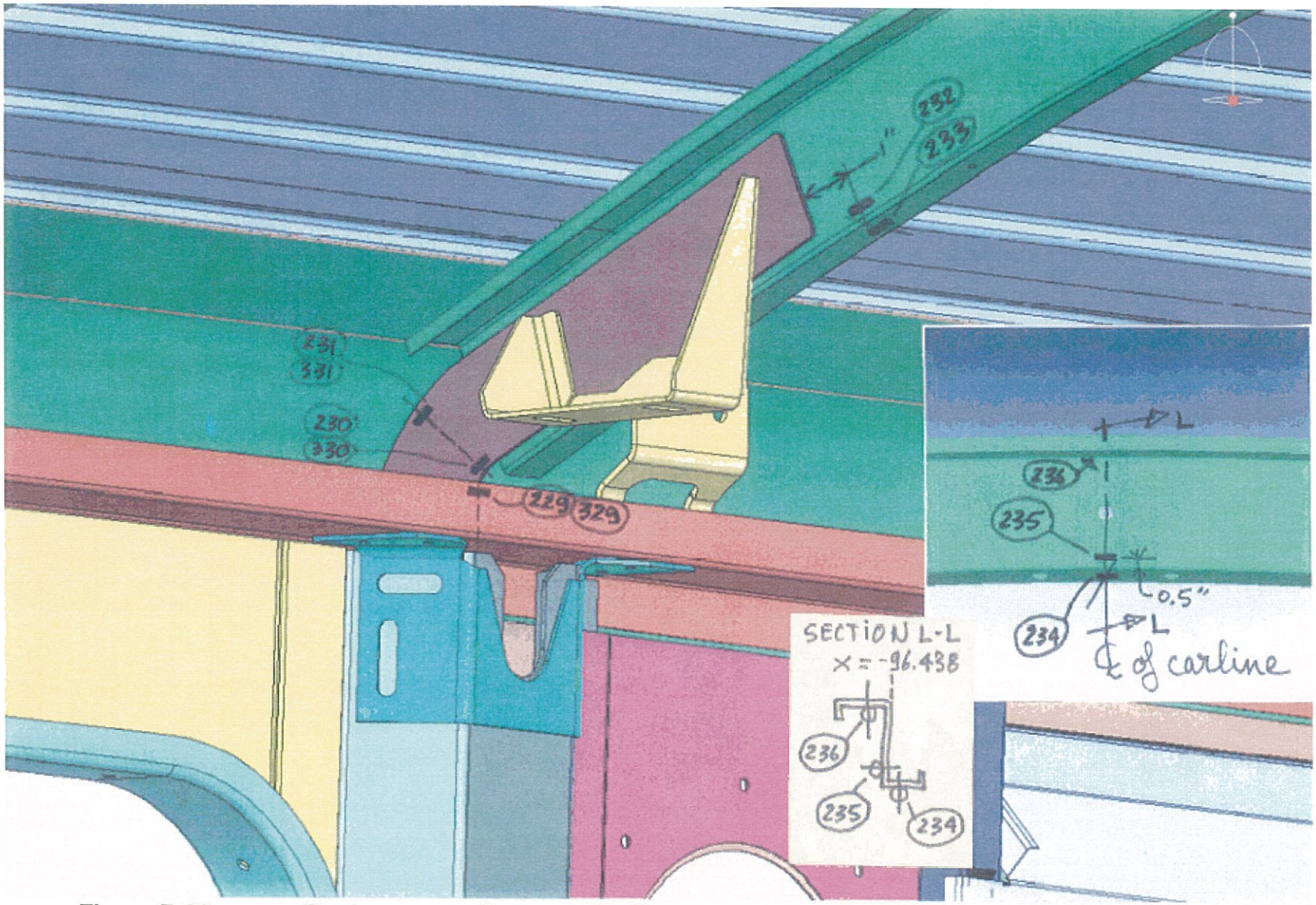


Figure B.23, Strain gauges diagram – Carline and roof rail at door post, end #1, RH, (x= -96.438).

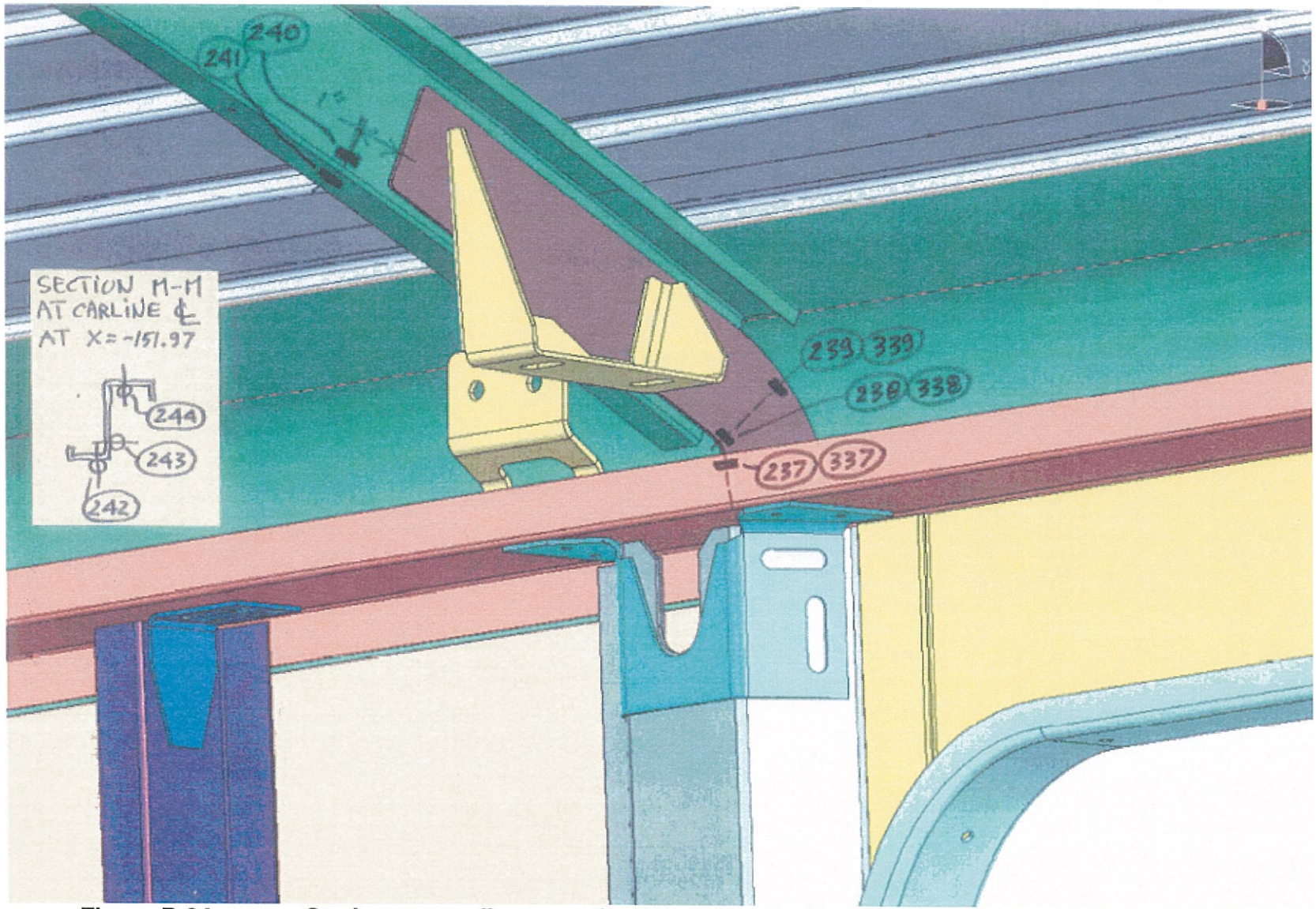
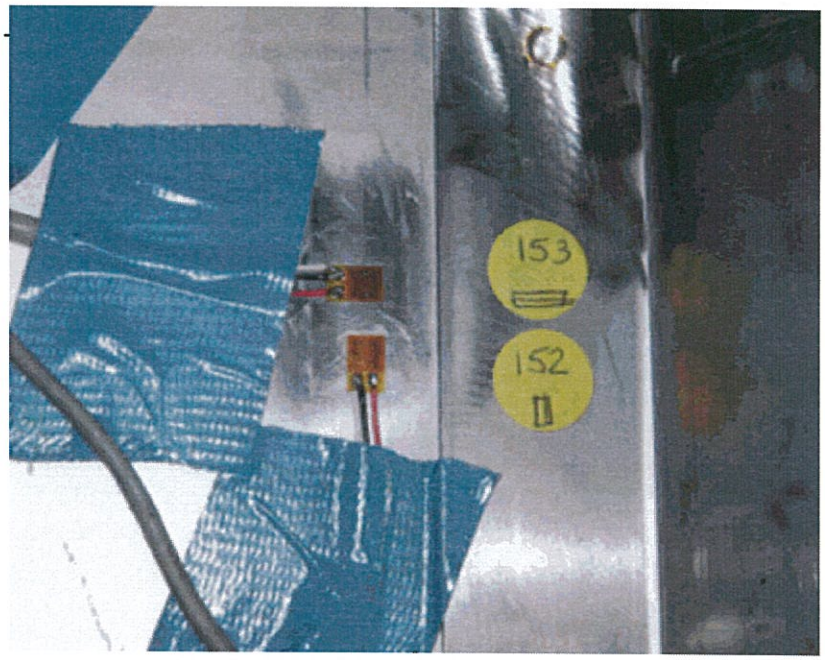


Figure B.24, Strain gauges diagram – Carline and roof rail at door post, end #1, RH, (x= -151.97).



End·#·2,·outboard·of·door,·LH·side¶

End·#·1,·outboard·of·door,·LH·side¶

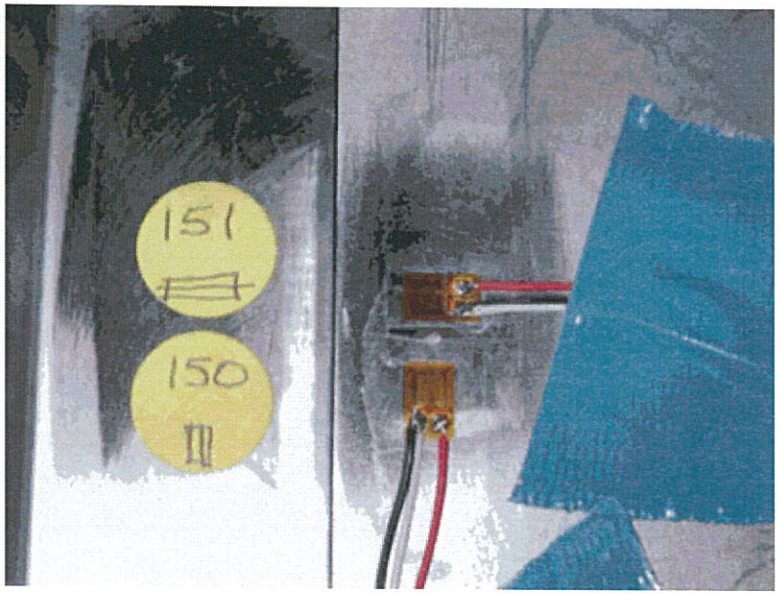


Figure B.25, Strain gauges pictures – Deadlight skin at door corner, end #1 & #2, LH.

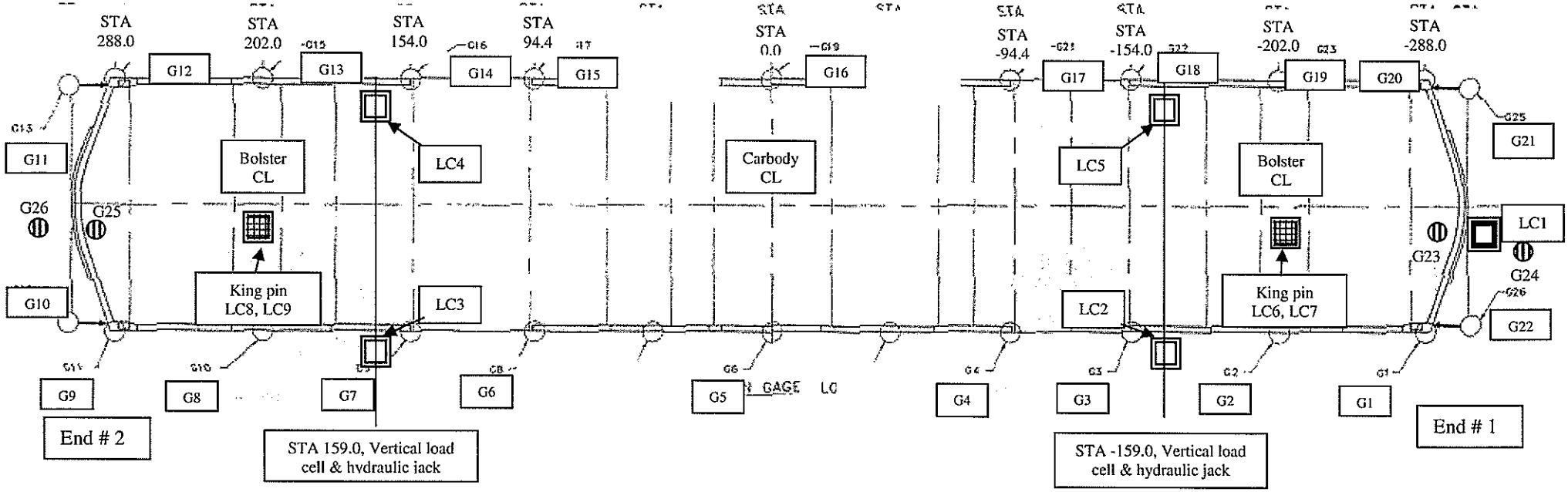
Updated list of load cells, deflection gauges and channels:

CHANNEL	Load Cells Gauges	Description and location	Instrumentation ID
		Vertical & compression load cells	
260	LC1 (300K)	Compression load cell at hydraulic cylinder	LTC0942
261	LC2 (50K)	Jacking pad vertical load cell (R.S. at end # 1)	LTC0983
262	LC3 (50K)	Jacking pad vertical load cell (R.S. at end # 2)	LTC0984
263	LC4 (50K)	Jacking pad vertical load cell (L.S. at end # 2)	LTC0985
264	LC5 (50K)	Jacking pad vertical load cell (L.S. at end # 1)	LTC0987
265	LC6 (25K)	King pin vertical load cell (L.S. at end # 1)	LTC0977
266	LC7 (25K)	King pin vertical load cell (R.S. at end # 1)	LTC0978
267	LC8 (25K)	King pin vertical load cell (L.S. at end # 2)	LTC0979
268	LC9 (25K)	King pin vertical load cell (R.S. at end # 2)	LTC0980
		Carbody Shortening Measurement	
269	G10	Corner of end # 2 R.S.	LTC1423
270	G11	Corner of end # 2 L.S.	LTC1490
271	G21	Corner of end # 1 L.S.	LTC1429
272	G22	Corner of end # 1 R.S.	LTC1482
		Right Side Deflection	
273	G1	Deflection at x = -288.0 (# 1 end)	LTC1478
274	G2	Deflection at x = -202.0 (# 1 end)	LTC1433
275	G3	Deflection at x = -154.0 (# 1 end)	LTC1489
276	G4	Deflection at x = -94.4 (# 1 end)	LTC1481
277	G5	Deflection at x = 0.0 (center of car)	LTC1471
278	G6	Deflection at x = 94.4 (# 2 end)	LTC1485
279	G7	Deflection at x = 154.0 (# 2 end)	LTC1463
280	G8	Deflection at x = 202.0 (# 2 end)	LTC1476
281	G9	Deflection at x = 288.0 (# 2 end)	LTC1479
		Left Side Deflection	
282	G12	Deflection at x = 288.0 (# 2 end)	LTC1480
283	G13	Deflection at x = 202.0 (# 2 end)	LTC1477
291	G14	Deflection at x = 154.0 (# 2 end)	LTC1435*
284	G15	Deflection at x = 94.4 (# 2 end)	LTC1486
292	G16	Deflection at x = 0.0 (center of car)	LTC1438*
285	G17	Deflection at x = -94.4 (# 1 end)	LTC1487
286	G18	Deflection at x = -154.0 (# 1 end)	LTC1427
293	G19	Deflection at x = -202.0 (# 1 end)	LTC1425*
294	G20	Deflection at x = -288.0 (# 1 end)	LTC1439*
		Vertical end sill/rollers Deflection	
295	G23	Vertical Deflection of end sill (# 1 end)	LTC1428*
287	G24	Vertical Deflection rollers (# 1 end)	LTC1483
296	G25	Vertical Deflection of end sill (# 2 end)	LTC1431*
288	G26	Vertical Deflection rollers (# 2 end)	LTC1484
289	PT1	Hydraulic pressure in lb	LTC0890

Figure C.1 update – Load cells and deflection gauges list.

- (4) Load cells for vertical load (installed at center of jacking pads over the vertical hydraulic cylinders) (LC2 to LC5).
- (4) Load cells for vertical load (installed at the king pins) (LC6 to LC9)

- (1) Load cell for compression load (installed at compression hydraulic cylinder) (LC1).



- (18) Vertical displacement gauges (will be placed at bottom of side sill) (G1 to G9 and G12 to G20).

- (4) Horizontal displacement gauges for end shortening measurement (at top of side sill level) (G10,G11,G21,G22).

- (4) Vertical displacement gauges to control the end sills and compression jig vertical movement (G23,G24,G25,G26).

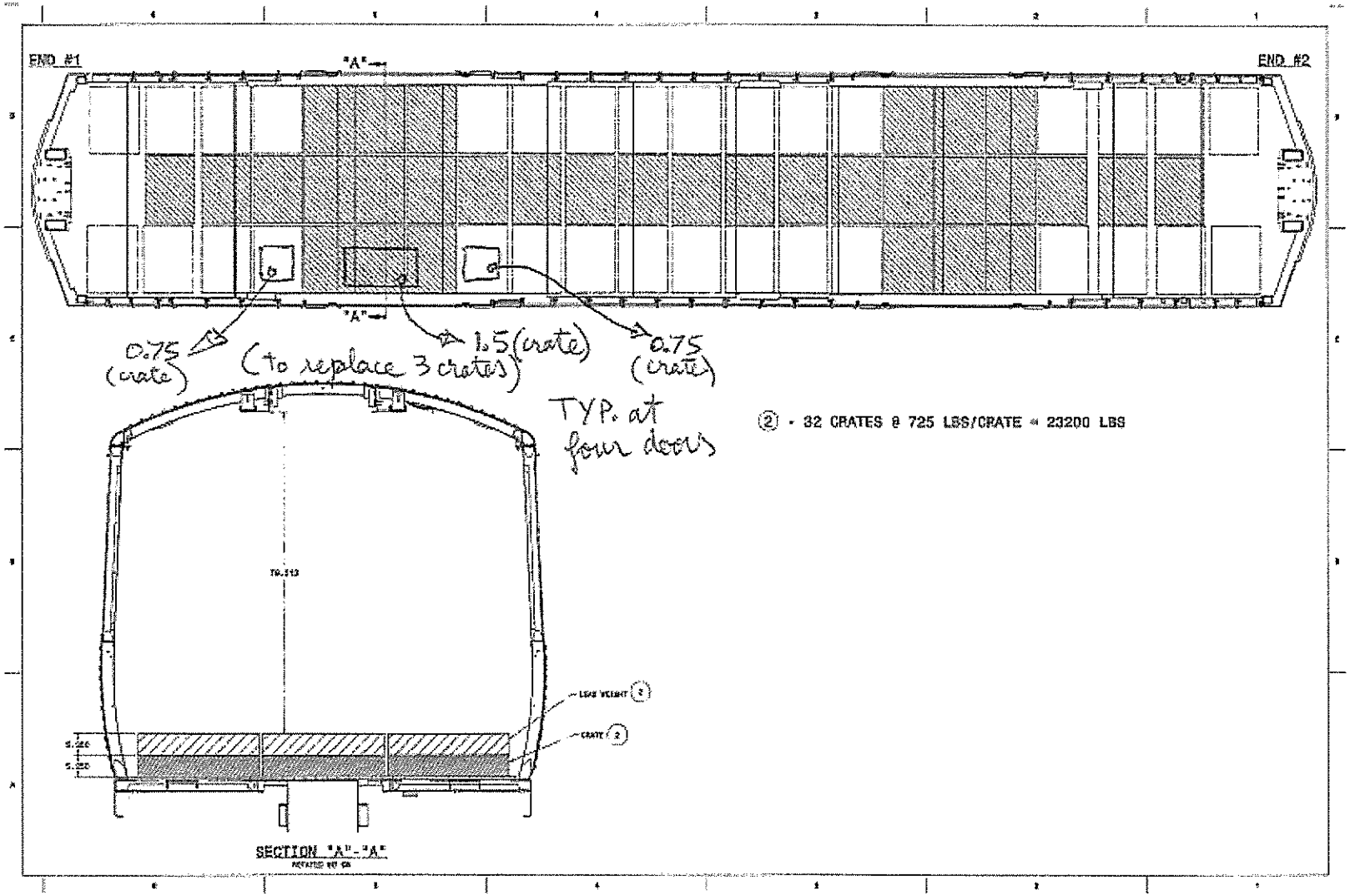


Figure D.2 update – Lead blocks distribution to arrive to AW3 weight for camber.

Updated test steps index description:

Test Steps #	Test Steps Index Description:	File Name & Record No.	Witness Initials	Remarks
	TEST RIG & CARBODY PREPARATION			
1	Review with CTA of the test jig, testing equipment, strain gauges, deflection gauges and load cells. Obtain approval from CTA to carry on with the test.			The carbody is initially resting on the hydraulic jacks.
2	Lower the hydraulic jacks so that the car rests on the dummy trucks.			To permit the zero of the hydraulic jacks load cells.
3	Zero the load cells on the hydraulic jacks (LC2, LC3, LC4 and LC5).			
4	Raise the carbody on the hydraulic jacks, adjust and balance the weight of the bare shell carbody with lead blocks to 13000 lb between the jacks load cells LC2, LC3, LC4 and LC5).			The total weight should read 13000 lb.
5	Zero the load cells on the dummy trucks king pin (LC6, LC7, LC8 and LC9).			
6	Lower the hydraulic jacks so that the car rests on the king pins load cells and record the load cell readings (LC6, LC7, LC8 and LC9)..			Verify the bare shell weight at the king pin is equivalent to that of the hydraulic jacks weight. The total weight should read 13000 lb.
7	Measure the initial camber of the car shell with respect to the centerlines of the bolsters.			Camber picture and measure (1)
8	Zero strain gauges, deflection gauges and dial indicators. **Do not zero the load cells.**			
9	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (1)
10	Provide a copy of all recorded electronic data of the starting data point to CTA.			Provide to CTA initial data set point (1)
11	Raise the hydraulic jacks and support the carbody on the hydraulic jacks load cells, verify that the carbody is stable.			

Test Steps #	Test Steps Index Description:	File Name & Record No.	Witness Initials	Remarks
	Obtain approval by CTA to continue with phase 1.			
	PHASE 1			
12	Load carbody to level 1, add 24000 lb of lead blocks on the carbody floor as per figure D.1. Make sure the total load is well balanced between the four hydraulic jacks.			Carbody Weight to get camber at AW0 (total ballast = 24000 lb, total load on trucks =37000 lb).
13	Lower the hydraulic jacks so that the car rests on the king pins, verify that the carbody is stable and that the total load on the trucks load cells = 37000 lb.			*Adjust the weight in the car so as to get a balanced load between the king pin load cells (LC6, LC7, LC8,LC9, within 500 lb).*
14	Measure the camber of the car shell with respect to the centerlines of the bolsters for AW0.			Camber picture and measure (2)
15	Record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (2)
	Obtain approval by CTA to proceed with phase 2.			
	PHASE 2			
16	Apply a total load of 20 kip to the buffer beam.			
17	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (3)
18	Apply a total load of 100 kip to the buffer beam.			
19	*Lower slowly the vertical roller system if required (if the total weight has changed) with the hydraulic cylinder so as to re-balance the total load of the carbody.*			*Adjust the height of the compression cylinder at each end as required.*
20	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (4)
21	Lower the load to 20 kip at the buffer beam.			
22	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (5)
23	Apply a total load of 150 kip to the buffer beam.			

Test Steps #	Test Steps Index Description:	File Name & Record No.	Witness Initials	Remarks
24	*Lower slowly the vertical roller system if required (if the total weight has changed) with the hydraulic cylinder so as to re-balance the total load of the carbody.*			*Adjust the height of the compression cylinder at each end as required.*
25	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (6)
26	Lower the load to 20 kip at the buffer beam.			
27	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (7)
28	Apply a total load of 200 kip to the buffer beam.			
29	*Lower slowly the vertical roller system if required (if the total weight has changed) with the hydraulic cylinder so as to re-balance the total load of the carbody.*			*Adjust the height of the compression cylinder at each end as required.*
30	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (8)
31	Lower the load to 20 kip at the buffer beam.			
32	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (9)
33	Lower the load to 0 kip at the buffer beam.			
34	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (10)
35	Raise the hydraulic jacks and support the carbody on jacks load cells, verify that the carbody is stable (LC2, LC3, LC4 and LC5).			
36	Provide a copy of all recorded electronic data of phase 2 to CTA.			Provide to CTA a copy of all available data set readings.

Test Steps #	Test Steps Index Description:	File Name & Record No.	Witness Initials	Remarks
	Obtain approval by CTA to proceed with phase 3			
	PHASE 3			
37	Load carbody to level 2, add 23200 lb of lead blocks as per figure D.2.			Carbody Weight @ AW3 camber 47200 lb (total ballast = 47200 lb, total load on trucks =60200 lb).
38	Lower the hydraulic jacks so that the car rests on the king pins, verify that the carbody is stable and that the total load on the trucks = 60200 lb.			*Adjust the weight in the car so as to get a balanced load between the king pin load cells (LC6, LC7, LC8,LC9, within 500 lb).*
39	Measure the camber of the car shell with respect to the centerlines of the bolsters at AW3.			Camber picture and measure (3)
40	Record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (11)
41	Provide a copy of all recorded electronic data of phase 3 to CTA.			Provide to CTA a copy of all available data set readings.
	Obtain approval by CTA to proceed with phase 4.			
	PHASE 4			
42	Apply a total load of 20 kip to the buffer beam.			
43	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (12)
44	Apply a total load of 100 kip to the buffer beam.			
45	*Lower slowly the vertical roller system if required (if the total weight has changed) with the hydraulic cylinder so as to re-balance the total load of the carbody.*			*Adjust the height of the compression cylinder at each end as required.*
46	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (13)
47	Lower the load to 20 kip at the buffer beam.			
48	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (14)
49	Apply a total load of 150 kip to the buffer beam.			

Test Steps #	Test Steps Index Description:	File Name & Record No.	Witness Initials	Remarks
50	*Lower slowly the vertical roller system if required (if the total weight has changed) with the hydraulic cylinder so as to re-balance the total load of the carbody.*			*Adjust the height of the compression cylinder at each end as required.*
51	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (15)
52	Lower the load to 20 kip at the buffer beam.			
53	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (16)
54	Apply a total load of 200 kip to the buffer beam.			
55	*Lower slowly the vertical roller system if required (if the total weight has changed) with the hydraulic cylinder so as to re-balance the total load of the carbody.*			*Adjust the height of the compression cylinder at each end as required.*
56	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			**Data Set Reading (17)**
57	Lower the load to 20 kip at the buffer beam.			
58	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (18)
59	Lower the load to 0 kip at the buffer beam.			
60	Data set reading, record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (19)
61	Raise the hydraulic jacks and support the carbody on jacks load cells, verify that the carbody is stable (LC2, LC3, LC4 and LC5).			Verify that the total vertical load on the jacks load cells is still 60200 lb.
62	Provide a copy of all recorded electronic data of phase 4 to CTA.			Provide to CTA a copy of all available data set readings.
	Obtain approval by CTA to proceed with phase 5			
	PHASE 5			
63	Unload the carbody from level 2 to level 1, remove 23200 lb of lead blocks as per figure D.2. Make sure			

Test Steps #	Test Steps Index Description:	File Name & Record No.	Witness Initials	Remarks
	the remaining total load is well balanced between the four hydraulic jacks.			
64	Lower the hydraulic jacks so that the car rests on the king pins, verify that the carbody is stable and that the total load on the trucks = 37000 lb.			
65	Record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (20)
66	Raise the hydraulic jacks and support the carbody on jacks load cells, verify that the carbody is stable			
67	Unload the carbody by removing the remaining 24000 lb of lead blocks as per figure D.1. Make sure the remaining total load is well balanced between the four hydraulic jacks.			Verify that the total vertical load on the jacks load cells is 13000 lb.
68	Lower the hydraulic jacks so that the car rests on the king pins, verify that the carbody is stable and that the total load on the trucks = 13000 lb.			
69	Measure the residual camber of the car shell with respect to the centerlines of the bolsters.			Residual camber picture and measure (4)
70	Record the measurement of all load cells, strain gauges, and deflection gauges.			Data Set Reading (21)
71	Raise the hydraulic jacks and support the carbody on vertical load cells, verify that the carbody is stable.			
72	Inspect and verify that there is no permanent deformation, fractures, cracks, or separations in the car structure. Broken welds shall be jointly inspected by the CTA and Bombardier to determine if the failure is the result of the weld quality or stress.			Photographic record of inspected areas.
73	At the end of phase 5, provide a copy of all recorded data to CTA.			Provide to CTA a complete electronic data Set from phase 1 to phase 5.

APPENDIX C

Raw Data
(for all strain gauges, load cells, displacement gauges including total weight per data point readings as shown on the loading schematic of section 4)

(A1 1): means gauge #1 channel #1

Gauge #-	Data points readings																					
channel #	1	2	3	4	5	6	7	8	9	10	10b	11	12	13	14	15	16	17	18	19	20	21
	Start	AW0	AW0+20ki	AW0+100k	AW0+20ki	AW0+150k	AW0+20ki	AW0+200k	AW0+20ki	AW0	W1 (apprc	AW3	AW3+20ki	AW3+100k	AW3+20ki	AW3+150k	AW3+20ki	AW3+200k	AW3+20ki	AW3	AW0	End
A1 1	0	0	-42	-247	-58	-358	-61	-411	-52	-7	-10	-14	-64	-239	-59	-336	-57	-428	-72	-17	-4	-4
A2 2	0	0	-83	-374	-98	-522	-101	-650	-94	-9	-10	-13	-83	-375	-99	-523	-96	-660	-102	-16	-7	-6
A3 3	-1	-6	-71	-406	-87	-582	-90	-758	-96	-16	-15	-18	-80	-402	-100	-593	-98	-765	-92	-20	-14	-7
A4 4	0	-10	-83	-344	-107	-476	-110	-683	-124	-20	-18	-20	-43	-375	-123	-544	-121	-677	-95	-21	-14	-2
A5 5	-1	6	14	-60	31	-154	31	-115	48	15	15	17	-36	-17	50	-55	50	-138	19	17	13	7
A6 6	0	4	13	-65	30	-162	31	-134	46	14	13	15	-37	-18	48	-59	48	-155	20	15	13	9
A7 7	0	-11	-64	-311	-62	-453	-63	-541	-54	-10	-14	-19	-95	-301	-65	-427	-63	-555	-75	-18	-11	1
A8 8	0	-15	-64	-313	-57	-494	-58	-629	-53	-14	-19	-26	-100	-307	-65	-463	-64	-658	-78	-27	-16	0
A9 9	0	-10	-30	-182	-24	-301	-27	-363	-18	-10	-16	-21	-70	-183	-32	-280	-31	-393	-51	-23	-11	0
A10 10	0	-26	-138	-659	-166	-959	-173	-1348	-190	-33	-52	-72	-154	-728	-226	-1075	-223	-1401	-199	-77	-32	-4
A11 11	0	23	190	940	253	1327	262	1799	317	72	66	72	182	983	316	1422	315	1808	280	84	74	46
A12 12	-1	106	6	-349	22	-575	17	-870	-2	106	132	177	76	-331	70	-572	73	-807	88	168	103	-7
A13 13	0	7	78	364	101	505	104	685	120	19	15	18	58	373	117	536	115	677	94	17	16	6
A14 14	0	16	-71	-421	-75	-608	-79	-910	-113	10	15	23	-26	-488	-109	-713	-104	-897	-62	22	8	-8
A15 15	-1	9	-35	-181	-35	-258	-36	-373	-46	12	15	19	-7	-199	-44	-293	-40	-361	-18	21	13	4
A16 16	0	-37	-26	190	19	282	25	318	7	-19	-25	-37	-5	166	-3	256	-3	324	18	-30	-22	18
A17 17	0	14	135	809	194	1158	205	1440	203	43	52	59	197	832	231	1181	227	1487	238	78	43	28
A18 18	0	-39	-70	-182	-65	-261	-65	-327	-64	-37	-46	-62	-96	-197	-88	-268	-88	-351	-90	-60	-36	6
A19 19	-1	-114	-199	-615	-235	-832	-241	-1084	-258	-125	-170	-227	-278	-725	-355	-969	-352	-1175	-329	-231	-120	-2
A20 20	1	-45	-49	-43	-49	-35	-50	-44	-54	-45	-64	-86	-80	-86	-92	-85	-91	-80	-88	-86	-45	2
TC SS-20	0	1	3	3	4	3	3	4	3	6	8	9	11	10	10	11	10	11	11	11	12	14
A22 22	-1	-8	-14	-59	-24	-75	-26	-88	-27	-13	-14	-16	-15	-50	-29	-66	-29	-80	-28	-12	-8	0
A23 23	0	-8	-65	-273	-60	-417	-62	-582	-73	-10	-12	-14	-71	-287	-75	-431	-74	-583	-73	-19	-18	-12
A24 24	0	-94	-38	297	-5	481	0	640	-1	-81	-123	-171	-113	194	-91	377	-91	549	-87	-168	-90	1
A25 25	0	-208	-228	-240	-233	-236	-234	-295	-254	-212	-296	-408	-391	-462	-447	-482	-444	-482	-421	-410	-218	-4
A26 26	0	-155	-215	-467	-242	-593	-247	-755	-267	-169	-226	-305	-331	-614	-402	-760	-401	-875	-381	-313	-166	-5
A27 27	0	-485	-537	-595	-552	-597	-552	-732	-596	-493	-686	-934	-902	-1089	-1030	-1139	-1024	-1145	-973	-939	-504	-2
A28 28	-1	223	234	181	232	147	229	168	249	226	315	428	403	405	450	387	446	353	426	430	234	1
A29 29	0	437	480	526	490	533	489	662	531	444	621	848	816	981	932	1034	926	1044	878	850	452	2
A30 30	-1	-318	-351	-378	-360	-377	-361	-462	-390	-324	-451	-617	-593	-706	-677	-737	-674	-738	-640	-621	-333	-4
A31 31	0	-8	-52	-244	-57	-361	-58	-489	-57	-11	-10	-16	-58	-246	-63	-364	-62	-493	-60	-12	-11	0
A32 32	0	45	-15	-188	-30	-158	-31	-72	-7	63	84	110	35	-210	27	-234	28	-185	27	108	63	22
A33 33	0	-49	-23	491	-1	1035	6	1540	40	-10	-22	-27	-10	298	-7	738	-8	1268	-5	-29	-18	36
A34 34	1	18	46	194	69	271	73	366	80	20	25	24	38	192	76	272	74	353	65	24	4	-15
A35 35	0	62	136	480	160	670	166	865	177	74	94	107	169	510	210	706	209	886	200	117	75	8
A36 36	-1	64	127	463	158	640	162	823	171	75	101	140	187	531	239	724	237	890	226	147	72	0
TC HSLA	0	0	0	1	0	0	1	1	1	0	0	1	1	2	1	2	1	1	1	2	1	2
A38 38	0	8	-9	-106	-31	-149	-33	-203	-36	-1	7	18	9	-87	-17	-141	-19	-187	-12	14	6	4
A39 39	0	-93	-168	-473	-179	-648	-184	-872	-201	-107	-145	-197	-241	-580	-289	-780	-288	-970	-274	-204	-117	-21
A40 40	0	-119	-203	-546	-228	-736	-233	-982	-255	-140	-188	-253	-298	-681	-367	-903	-367	-1104	-348	-266	-149	-21
A41 41	1	-110	-194	-551	-216	-748	-222	-997	-243	-129	-169	-226	-274	-669	-338	-894	-339	-1099	-321	-237	-135	-19
A42 42	0	-166	-257	-608	-277	-805	-283	-1079	-309	-186	-249	-334	-377	-788	-456	-1024	-456	-1237	-431	-346	-200	-26
A43 43	0	-14	-110	-708	-171	-1022	-182	-1287	-183	-38	-35	-34	-129	-696	-182	-1025	-181	-1307	-186	-49	-33	-21
A44 44	0	-9	-47	-252	-62	-368	-64	-462	-62	-19	-20	-21	-62	-247	-67	-362	-66	-474	-71	-24	-19	-9
A45 45	0	-14	-66	-280	-78	-393	-82	-556	-97	-23	-33	-45	-73	-327	-120	-467	-120	-581	-101	-50	-24	-10
A46 46	1	0	-90	-527	-126	-749	-129	-1016	-145	-11	-18	-27	-88	-562	-161	-813	-158	-1024	-133	-31	-5	-8
A47 47	0	0	-42	-260	-56	-382	-59	-467	-55	-9	-9	-7	-55	-247	-56	-369	-54	-474	-62	-10	-8	-10
A48 48	0	-20	-123	-668	-167	-951	-173	-1181	-170	-37	-36	-37	-140	-655	-171	-946	-171	-1192	-171	-45	-29	-4
A49 49	0	-24	-203	-1181	-264	-1728	-273	-2165	-251	-55	-51	-48	-254	-1138	-260	-1682	-253	-2197	-274	-57	-44	-17
A50 50	0	14	-57	-372	-77	-538	-84	-740	-127	-34	-37	-41	-91	-424	-130	-605	-130	-764	-130	-53	-49	-61
A51 51	0	152	166	223	168	261	171	301	174	155	221	314	321	390	338	432	334	471	337	323	165	6
A52 52	0	485	530	701	547	823	554	975	572	504	724	1039	1056	1292	1127	1426	1115	1542	1115	1066	523	12
A53 53	1	110	123	172	127	208	129	256	134	113	164	240	246	318	266	360	263	399	265	250	119	4
A54 54	1	6	4	-27	2	-45	3	-47	7	3	4	8	-2	-14	10	-25	13	-36	11	16	12	-1
A55 55	0	210	100	-469	72	-800	60	-1112	57	190	269	400	276	-234	276	-569	268	-906	266	395	203	-14
A56 56	1	-163	-245	-565	-262	-750	-267	-980	-282	-181	-237	-335	-384	-750	-442	-957	-438	-1153	-429	-345	-188	-18
A57 57	1	-245	-366	-866	-413	-1169	-429	-1547	-464	-294	-345	-477	-552	-1123	-657	-1459	-653	-1764	-642	-512	-309	-37
A58 58	0	8	19	78	22	114	28	155	31	11	28	34	45	106	53	142	52	180	52	38	10	0
A59 59	1	-59	-26	149	-17	254	-11	354	-10	-53	-63	-97	-61	99	-57	200	-56	307	-56	-94	-60	-1
A60 60	0	543	459	-15	443	-276	436	-481	447	533	786	1143	1024	660	1072	408	1054	146	1050	1149	554	-7
A61 61	0	22	-69	-482	-84	-719	-89	-966	-99	9	-22	-21	-106	-508	-124	-762	-127	-1009	-126	-29	4	-20
A62 62	0	9	-67	-403	-87	-600	-94	-822	-105	-10	47	78	17	-322	-17	-531	-15	-732	-5	74	-5	-13
A63 63	1	1	-77	-414	-95	-607	-100	-830	-111	-14	12	24	-38	-389	-75	-599	-73	-801	-64	20	-12	-14
A64 64	1	-182	-321	-925	-364	-1285	-378	-1682	-394	-220	-269	-385	-502	-1124	-566	-1505	-565	-1879	-559	-409	-229	-38
A65 65	0	168	108	-186	91	-354	86	-531	83	153	216	330	274	5	264	-167	260	-344	266	330	164	-11
A66 66	0	227	147	-253	130	-486	123	-712	112	214	322	482	398	38	390	-206	385	-425	393	481	230	-4
A67 67	0	-164	-157	-84	-157	-46	-155	-31	-162	-168	-219	-332	-309	-268	-334	-238	-328	-201	-327	-337	-181	-8
A68 68	1	-371	-341	-114	-338	10	-334	86	-346	-377	-477	-721	-657	-509	-709	-398	-695	-270	-688	-730	-404	-14

Gauge #-	Data points readings																						
channel #	1	2	3	4	5	6	7	8	9	10	10b	11	12	13	14	15	16	17	18	19	20	21
	Start	AW0	AW0+20k	W0+100k	AW0+20k	W0+150k	AW0+20k	W0+200k	AW0+20k	AW0	W1 (appro	AW3	AW3+20k	W3+100k	AW3+20k	W3+150k	AW3+20k	W3+200k	AW3+20k	AW3	AW0	End
A69 69	1	-129	-123	-74	-124	-47	-121	-30	-124	-129	-166	-246	-232	-205	-246	-182	-242	-153	-240	-249	-134	-1
A70 70	0	-73	-77	-92	-79	-103	-78	-109	-78	-74	-91	-126	-130	-148	-133	-159	-131	-165	-130	-126	-75	-6
A71 71	1	-519	-626	-1013	-655	-1249	-662	-1557	-686	-549	-674	-983	-1043	-1506	-1135	-1770	-1121	-2015	-1105	-1000	-566	-29
A72 72	1	6	14	-2	11	-14	12	3	18	1	24	42	37	46	52	43	55	40	47	43	10	-2
A73 73	0	-86	-88	-131	-95	-163	-94	-187	-95	-92	-106	-143	-147	-193	-156	-223	-149	-247	-151	-143	-83	-4
A74 74	1	37	0	-182	-7	-284	-9	-387	-9	32	43	62	22	-148	19	-255	19	-362	19	61	32	-8
A75 75	1	29	-42	-356	-56	-536	-60	-730	-67	18	30	51	-12	-322	-31	-513	-33	-699	-28	47	20	-9
A76 76	1	-6	-55	-273	-64	-400	-66	-544	-73	-15	-20	-28	-69	-298	-88	-442	-89	-574	-84	-32	-21	-17
A77 77	0	87	92	79	92	72	94	84	99	89	145	236	228	238	248	239	247	238	245	242	102	1
A78 78	0	14	21	38	21	48	22	62	23	14	45	87	93	119	98	133	100	148	100	91	23	-1
A79 79	0	-55	-99	-288	-109	-399	-111	-519	-115	-64	-83	-115	-155	-344	-167	-461	-167	-579	-166	-120	-65	-14
A80 80	0	-63	-144	-493	-162	-702	-167	-934	-175	-75	-107	-163	-234	-588	-262	-812	-262	-1032	-256	-170	-79	-15
A81 81	0	-381	-386	-358	-390	-360	-390	-382	-394	-387	-535	-770	-757	-783	-794	-788	-778	-787	-785	-782	-399	-9
A82 82	1	-247	-250	-216	-253	-208	-253	-226	-259	-252	-357	-546	-527	-547	-569	-548	-555	-540	-556	-557	-264	-4
A83 83	1	-235	-239	-216	-241	-214	-241	-230	-245	-240	-326	-466	-455	-470	-483	-472	-473	-467	-474	-475	-249	-7
A84 84	0	-360	-367	-358	-371	-371	-371	-399	-375	-367	-503	-716	-706	-741	-738	-755	-725	-763	-731	-726	-380	-9
A85 85	0	416	394	195	392	99	391	58	406	420	560	809	743	648	815	562	791	460	785	820	442	10
A86 86	0	167	168	145	169	137	170	138	173	171	231	334	325	329	343	322	339	314	340	341	176	4
A87 87	0	270	257	142	257	88	258	67	266	272	365	528	489	438	534	386	520	329	516	536	281	0
A88 88	0	407	383	180	381	80	379	38	395	409	545	791	722	622	795	532	773	427	766	802	427	1
A89 89	1	156	156	115	158	93	158	105	168	158	205	289	267	271	304	257	297	237	290	295	167	5
A90 90	0	11	12	9	12	6	13	13	16	11	11	13	8	16	17	14	17	12	13	12	12	1
A91 91	1	-212	-208	-165	-209	-152	-208	-144	-208	-215	-298	-428	-414	-400	-431	-386	-422	-369	-427	-432	-220	-4
A92 92	0	-73	-69	-58	-70	-57	-68	-48	-66	-74	-108	-161	-161	-148	-158	-146	-154	-142	-162	-163	-76	-3
A93 93	0	-65	-59	85	-21	133	-18	148	-28	-63	-81	-100	-84	47	-64	93	-64	132	-57	-98	-66	1
A99I 94	0	-20	-153	-841	-208	-1155	-217	-1441	-223	-28	-34	-48	-169	-845	-238	-1199	-235	-1480	-229	-53	-8	11
A95 95	1	-78	-143	-401	-153	-556	-156	-749	-171	-91	-126	-171	-207	-493	-250	-669	-248	-835	-237	-179	-98	-14
A96 96	0	25	-36	-317	-50	-472	-54	-632	-62	11	22	41	-11	-289	-32	-459	-34	-613	-29	34	10	-11
A97 97	1	-37	-104	-400	-119	-567	-123	-753	-130	-48	-49	-65	-115	-424	-149	-607	-145	-776	-136	-66	-47	-8
A98 98	0	-77	-134	-364	-144	-497	-146	-656	-155	-87	-121	-169	-208	-459	-240	-603	-237	-741	-226	-173	-92	-15
A99U 99	0	-40	-128	-582	-170	-799	-181	-1015	-193	-56	-70	-95	-168	-623	-225	-864	-228	-1063	-225	-106	-46	0
A100 100	0	-32	0	180	15	275	15	355	11	-30	-37	-46	-14	157	-1	254	-2	341	-2	-46	-30	0
A101 101	-1	-2	-50	-244	-62	-359	-65	-428	-76	-8	-9	-12	-54	-253	-85	-351	-82	-444	-70	-16	-2	-1
A102 102	0	-1	-98	-387	-110	-532	-112	-670	-118	-10	-10	-13	-90	-397	-124	-544	-120	-679	-115	-16	-7	-6
A103 103	-1	-7	-81	-418	-100	-597	-105	-777	-101	-17	-16	-19	-101	-411	-101	-602	-101	-773	-112	-20	-15	-9
A104 104	-1	-10	-93	-349	-117	-475	-120	-685	-145	-21	-18	-22	-47	-363	-137	-537	-138	-676	-108	-22	-16	-5
A105 105	-1	5	13	-7	23	-99	22	-63	47	14	13	15	-12	26	48	-4	48	-76	21	15	12	5
A106 106	-1	5	12	-22	21	-123	20	-94	47	15	14	15	-17	15	48	-21	48	-106	19	16	13	7
A107 107	-1	-11	-60	-272	-58	-437	-58	-551	-49	-13	-16	-20	-85	-266	-58	-406	-55	-567	-70	-22	-14	-2
A110 110	-1	-29	-139	-601	-164	-902	-169	-1331	-194	-41	-58	-79	-159	-686	-232	-1039	-230	-1385	-204	-90	-36	-8
A112 112	0	103	13	-317	25	-531	20	-818	0	104	126	170	79	-297	72	-526	73	-760	88	161	99	-8
R21 113,	-1	18	29	76	33	101	33	129	36	20	28	36	42	91	51	118	51	140	48	35	20	0
R21 113,	-1	-5	-10	-28	-11	-38	-11	-47	-12	-7	-8	-11	-12	-27	-13	-34	-13	-41	-13	-10	-8	-4
R21 113,	-1	-103	-165	-451	-192	-597	-198	-768	-214	-117	-155	-204	-238	-540	-295	-702	-295	-837	-278	-209	-116	-9
A118 118	0	-36	-61	-188	-62	-278	-62	-352	-56	-32	-42	-55	-87	-201	-79	-282	-78	-375	-81	-54	-33	6
A119 119	-1	-83	-151	-463	-180	-627	-184	-821	-200	-95	-123	-166	-209	-537	-270	-721	-267	-877	-251	-170	-88	-2
A120 120	-1	-35	-36	-39	-38	-37	-39	-45	-41	-36	-50	-67	-61	-74	-71	-75	-71	-74	-68	-67	-36	-1
A122 122	0	-8	-15	-56	-26	-71	-27	-85	-27	-14	-16	-18	-18	-50	-29	-67	-30	-79	-28	-14	-9	1
A124 124	0	-208	-223	-253	-230	-260	-230	-318	-246	-212	-295	-404	-384	-468	-440	-496	-436	-501	-416	-406	-216	-2
A125 125	0	-110	-42	305	-14	499	-8	679	3	-89	-136	-194	-121	196	-104	392	-102	579	-98	-190	-98	10
A127 127	0	-454	-493	-580	-506	-606	-507	-738	-542	-466	-642	-877	-841	-1034	-961	-1100	-953	-1122	-910	-885	-475	-8
A128 128	1	218	225	227	229	220	227	262	243	220	305	415	389	445	443	455	437	448	418	417	227	5
A129 129	0	454	489	583	504	615	504	752	538	462	641	873	835	1041	961	1116	949	1142	903	877	468	7
A130 130	1	-295	-317	-365	-327	-376	-327	-455	-350	-301	-415	-567	-542	-660	-620	-699	-614	-706	-587	-572	-307	-3
A131 131	1	-11	-53	-227	-59	-338	-60	-462	-63	-14	-14	-19	-60	-228	-68	-340	-68	-465	-65	-17	-14	-1
A132 132	0	-93	-98	175	-88	559	-81	992	-40	-51	-69	-110	-121	20	-124	319	-121	733	-115	-110	-58	40
A134 134	0	21	46	189	68	247	72	316	82	24	29	28	45	199	82	263	79	318	70	27	4	-11
A136 136	0	62	139	480	165	666	170	864	184	77	101	136	197	549	248	750	246	927	236	143	74	7
A137 137	1	105	130	184	119	250	118	313	121	97	142	221	244	326	246	374	245	419	244	225	117	-6
A139 139	0	18	-51	-364	-71	-521	-74	-706	-100	2	1	-7	-55	-389	-109	-558	-107	-704	-90	-12	6	-15
A140 140	1	36	74	319	94	415	96	490	94	37	42	64	103	336	125	453	126	535	122	65	32	-12
A141 141	0	47	77	242	97	325	105	388	111	57	74	90	122	257	127	355	138	428	139	97	54	-3
A143 143	0	-25	-155	-742	-202	-1085	-215	-1392	-229	-55	-43	-41	-168	-722	-214	-1074	-219	-1387	-221	-54	-45	-20

Gauge #-	Data points readings																				
channel #	1	2	3	4	5	6	7	8	9	10	10b	11	12	13	14	15	16	17	18	19	20	21
	Start	AW0	AW0+20k	AW0+100k	AW0+20k	AW0+150k	AW0+20k	AW0+200k	AW0+20k	AW0	W1 (appro	AW3	AW3+20k	AW3+100k	AW3+20k	AW3+150k	AW3+20k	AW3+200k	AW3+20k	AW3	AW0	End
A144 144	0	-10	-46	-209	-54	-309	-56	-392	-54	-18	-15	-16	-55	-200	-55	-297	-55	-393	-58	-17	-15	-9
A145 145	0	-14	-64	-242	-75	-338	-77	-483	-92	-23	-34	-49	-78	-289	-117	-410	-119	-511	-104	-55	-26	-12
A146 146	0	-3	-97	-456	-122	-650	-127	-890	-145	-20	-25	-35	-101	-488	-159	-709	-158	-898	-138	-38	-17	-13
A150 150	0	32	32	35	32	41	33	46	32	32	43	66	65	74	71	79	70	83	69	68	30	-3
A151 151	0	-44	-44	-61	-44	-78	-43	-73	-36	-41	-70	-79	-94	-81	-67	-81	-67	-91	-75	-74	-39	1
A152 152	-1	7	6	5	6	3	7	-1	7	7	4	2	3	-2	0	-8	2	-13	1	2	9	1
A153 153	0	-104	-113	-139	-115	-160	-114	-173	-111	-106	-158	-229	-240	-260	-238	-275	-235	-293	-242	-233	-109	-3
A154 154	0	143	159	201	165	230	168	287	178	148	216	312	312	389	346	430	345	465	342	327	162	6
A155 155	0	191	68	-447	49	-749	42	-1030	37	172	245	368	233	-226	249	-525	239	-828	236	370	182	-18
A156 156	-1	-139	-215	-509	-231	-685	-237	-909	-257	-154	-195	-284	-332	-666	-392	-863	-386	-1051	-381	-299	-164	-23
A157 157	0	-188	-291	-708	-324	-957	-338	-1278	-371	-220	-251	-364	-424	-892	-525	-1171	-517	-1431	-507	-392	-233	-32
A158 158	-1	65	-47	-482	-51	-748	-57	-1117	-136	-4	14	42	-61	-536	-87	-819	-85	-1103	-79	26	-16	-84
A159 159	-1	59	-43	-447	-45	-700	-50	-1065	-137	-9	7	32	-62	-507	-91	-778	-91	-1058	-84	14	-23	-83
A160 160	0	529	475	250	476	142	477	80	488	532	781	1125	1039	900	1113	794	1086	679	1075	1134	525	-9
A164 164	0	-203	-347	-956	-377	-1325	-390	-1740	-411	-221	-274	-423	-543	-1169	-615	-1566	-611	-1945	-599	-435	-215	-9
A165 165	2	95	52	-82	63	-154	65	-229	62	86	126	185	142	15	156	-59	156	-128	159	192	70	-12
A166 166	1	218	137	-213	112	-421	108	-607	118	203	309	461	384	64	383	-135	374	-350	381	464	209	-7
A167 167	1	61	19	-129	31	-226	29	-340	28	72	80	105	58	-120	62	-219	64	-310	71	97	69	7
A168 168	0	55	15	-115	26	-203	25	-309	21	63	73	95	51	-106	53	-196	54	-281	61	87	60	2
A169 169	0	59	52	-14	47	-52	47	-70	55	56	84	118	102	52	113	15	113	-22	109	120	56	-4
A170 170	2	48	42	-9	41	-38	41	-49	46	46	68	98	83	52	98	26	96	-1	91	99	46	-2
A171 171	0	6	-45	-291	-59	-409	-62	-508	-62	2	2	7	-38	-287	-59	-416	-57	-511	-52	5	7	7
A172 172	1	36	1	-131	-7	-212	-7	-296	-7	31	44	66	36	-98	27	-185	29	-268	32	67	33	-7
A182 182	0	-222	-221	-212	-223	-221	-221	-248	-226	-225	-332	-508	-492	-531	-531	-547	-515	-556	-520	-522	-229	-4
A183 183	1	-252	-254	-249	-256	-263	-254	-287	-258	-258	-354	-508	-496	-530	-530	-544	-517	-551	-521	-522	-265	-10
A184 184	2	-450	-456	-472	-459	-511	-459	-562	-462	-458	-635	-914	-903	-975	-955	-1010	-931	-1037	-939	-934	-466	-16
A193 193	0	-66	-42	87	-19	151	-14	180	-15	-56	-88	-113	-79	33	-70	97	-72	137	-67	-113	-68	6
A195 195	0	-98	-166	-436	-184	-596	-187	-795	-201	-115	-151	-207	-248	-544	-299	-722	-296	-890	-285	-216	-116	-21
A199 199	0	-4	-123	-752	-171	-1065	-177	-1362	-184	-18	-16	-19	-131	-756	-190	-1105	-187	-1392	-177	-20	9	12
A200 200	0	3	-108	-651	-154	-876	-162	-1068	-169	-9	-1	0	-96	-630	-160	-891	-161	-1078	-151	-8	6	1
A201 201	1	-31	-33	-22	-34	-15	-32	-16	-34	-32	-45	-57	-53	-47	-57	-38	-56	-29	-52	-55	-35	-5
A202 202	0	-11	-12	-16	-13	-18	-12	-22	-11	-11	-15	-21	-23	-27	-22	-30	-21	-33	-21	-20	-10	-1
A203 203	0	44	16	-116	15	-200	14	-281	17	40	58	81	48	-79	53	-164	53	-251	52	81	41	-9
A204 204	0	14	5	-38	-5	-43	-10	-19	-10	7	6	30	19	-16	22	-39	19	-32	15	27	-5	-13
A205 205	0	-26	-26	-33	-25	-48	-22	-51	-18	-26	-79	-203	-214	-218	-208	-215	-210	-222	-215	-213	-41	-15
A206 206	0	68	75	111	77	134	79	153	83	67	164	305	316	354	317	374	317	395	321	309	61	-9
A207 207	0	-47	-24	112	-21	195	-21	236	-25	-50	-55	-28	12	120	-9	188	-6	255	3	-27	-51	-6
A209 209	0	29	-41	-359	-58	-544	-63	-747	-70	18	33	60	-7	-314	-25	-507	-26	-705	-22	56	23	-6
A210 210	0	110	23	-364	2	-586	-3	-825	-13	93	116	194	115	-256	93	-487	91	-717	96	192	103	-11
A211 211	0	-5	1	13	3	11	3	36	11	-22	-39	-56	-65	-33	-41	-25	-42	-24	-55	-58	-12	-3
A212 212	1	-11	-15	-24	-15	-28	-15	-37	-17	-10	-18	-26	-27	-42	-33	-51	-33	-57	-31	-27	-11	0
A213 213	1	10	8	1	6	1	7	-4	5	10	17	27	28	19	24	14	23	14	26	28	9	0
A214 214	0	-38	-42	-59	-43	-72	-43	-83	-43	-38	-60	-87	-90	-107	-92	-117	-92	-125	-93	-89	-42	-4
A215 215	1	-118	-134	-201	-139	-240	-140	-298	-145	-122	-184	-268	-275	-370	-300	-421	-296	-462	-293	-276	-127	-8
A216 216	0	-54	-57	-85	-56	-113	-55	-119	-50	-55	-97	-149	-164	-179	-149	-201	-148	-229	-160	-154	-60	-5
A217 217	1	-21	-24	-34	-23	-40	-24	-45	-23	-20	-36	-48	-52	-60	-50	-66	-50	-71	-50	-48	-19	2
A218 218	0	-42	-47	-62	-46	-72	-45	-83	-46	-43	-66	-94	-98	-115	-98	-126	-97	-136	-99	-94	-41	0
A219 219	-1	3	1	-2	1	-6	1	-8	2	2	2	-3	-7	-14	-4	-22	-4	-30	-6	-3	4	-2
A220 220	0	-48	-56	-98	-58	-126	-58	-151	-58	-51	-73	-107	-115	-160	-118	-188	-117	-216	-120	-111	-54	-6
A221 221	1	-8	-9	-10	-9	-11	-9	-13	-8	-9	-13	-18	-19	-22	-19	-25	-20	-26	-19	-19	-11	-2
A222 222	1	27	24	17	21	19	23	4	19	29	49	78	83	62	69	56	67	57	77	79	30	3
A223 223	0	49	42	31	39	36	40	10	31	47	91	157	170	128	140	119	135	123	157	161	45	-4
A224 224	1	-28	-26	-23	-26	-23	-25	-17	-21	-28	-44	-57	-58	-55	-56	-53	-55	-54	-58	-58	-30	-1
A225 225	1	-1	-2	-2	-2	-1	-2	2	-2	-3	-3	-4	-3	-5	-4	-9	-5	-9	-4	-4	-3	0
A226 226	0	24	21	-2	20	-11	20	-18	22	24	30	44	35	23	43	11	39	0	39	44	24	-1
A227 227	0	38	29	9	26	-4	27	-30	23	35	41	66	67	34	53	15	55	2	59	65	34	-2
A228 228	1	-12	-6	8	-5	20	-3	47	0	-9	-12	-23	-27	3	-10	16	-15	26	-18	-23	-10	1
A229 229	1	82	79	47	79	27	78	11	80	83	101	144	138	122	144	110	143	96	142	147	83	1
A230 230	0	103	87	13	80	-20	80	-69	75	102	142	223	212	141	204	95	198	55	206	226	103	1
A231 231	0	18	20	24	18	28	19	34	19	14	27	46	46	54	48	56	47	60	47	45	26	2
A232 232	1	-94	-101	-121	-103	-133	-102	-143	-101	-95	-141	-196	-205	-230	-203	-247	-205	-265	-208	-200	-107	-5
A233 233	1	-73	-79	-92	-79	-100	-80	-104	-79	-75	-110	-155	-163	-178	-158	-189	-160	-202	-164	-158	-85	-6
A234 234	0	-119	-106	-57	-102	-37	-100	10	-92	-118	-172	-259	-260	-201	-241	-173	-240	-151	-251	-263	-122	0
A235 235	0	-174	-151	-70	-143	-35	-142	44	-127	-172	-256	-395	-397	-288	-360	-235	-358	-195	-379	-400	-178	-2
A236 236	0	64	56	48	54	47	55	40	55	65	109	197	195	156	185	137	183	124	192	201	70	5
A237 237	0	-107	-113	-135	-117	-155	-118	-180	-118	-109	-162	-242	-247	-289	-258	-315	-254	-339	-258	-248	-117	-2
A238 238	0	-24	-37	-79	-42	-103	-42	-140	-45	-26	-47	-70	-77	-131	-89	-161	-88	-187	-84	-71	-27	0
A239 239	0	-17	-12	10	-12	23	-11	36	-12	-18	-17	-25	-19	2	-20	15	-20	28	-21	-27	-17	1

Gauge #-	Data points readings																						
channel #	1	2	3	4	5	6	7	8	9	10	10b	11	12	13	14	15	16	17	18	19	20	21
	Start	AW0	W0+20ki	W0+100k	W0+20ki	W0+150k	W0+20ki	W0+200k	W0+20ki	AW0	W1 (appro	AW3	W3+20ki	W3+100k	W3+20ki	W3+150k	W3+20ki	W3+200k	W3+20ki	AW3	AW0	End
A240 240	0	31	26	-15	27	-41	28	-43	34	33	21	21	1	-14	24	-35	22	-60	15	23	34	1
A241 241	0	10	7	-12	8	-24	9	-19	14	10	-1	-9	-20	-21	-4	-30	-6	-42	-10	-8	10	-1
A242 242	0	-26	-15	18	-10	31	-9	78	0	-25	-45	-74	-80	-24	-53	1	-55	17	-67	-75	-27	-2
A243 243	1	-61	-40	20	-34	46	-31	119	-17	-57	-97	-158	-165	-63	-121	-19	-123	9	-143	-161	-62	0
A244 244	0	-5	-10	-18	-12	-19	-12	-41	-17	-8	-5	-4	0	-19	-14	-27	-13	-29	-8	-6	-7	2
A245 245	0	86	1	-375	-21	-594	-26	-832	-34	69	85	127	49	-314	25	-544	22	-781	27	120	73	-12
A347 246	1	-6	-1	10	-1	13	0	30	4	-6	-12	-20	-22	-2	-12	6	-11	11	-18	-21	-5	2
A349 247	1	-10	-10	-7	-10	-4	-9	-4	-8	-10	-17	-21	-22	-18	-20	-16	-20	-15	-20	-20	-9	-1
A350 248	1	63	-9	-477	-87	-699	-96	-900	-104	28	47	82	18	-416	-51	-655	-54	-867	-52	64	43	-14
A309 250	0	29	-39	-345	-57	-527	-62	-730	-71	17	35	61	-4	-301	-23	-490	-26	-685	-22	57	21	
A310 251	0	114	26	-374	0	-610	-6	-871	-23	93	117	192	108	-276	83	-522	79	-768	85	188	98	-18
A329 252	1	95	89	57	87	40	88	23	88	96	125	180	173	156	178	143	176	129	177	183	99	5
A330 253	1	57	46	-3	43	-27	43	-60	40	55	77	120	110	67	107	36	103	9	106	120	58	1
A331 254	0	8	11	29	11	41	12	53	13	8	12	22	23	45	28	56	28	67	26	22	13	3
A337 255	0	-65	-70	-92	-72	-114	-72	-151	-74	-67	-100	-151	-152	-208	-172	-245	-166	-275	-167	-158	-68	-1
A338 256	0	-42	-51	-92	-55	-121	-55	-156	-57	-45	-73	-108	-111	-165	-127	-194	-123	-220	-121	-112	-41	-2
A339 257	0	-39	-39	-37	-41	-34	-41	-41	-44	-41	-53	-76	-71	-75	-82	-74	-79	-72	-79	-80	-41	0
A345 258	0	81	0	-359	-21	-573	-27	-807	-37	67	86	127	51	-296	28	-520	24	-747	29	122	70	-11
A346 259	1	-51	-44	-24	-45	-18	-43	0	-39	-53	-77	-113	-111	-86	-105	-74	-102	-66	-108	-115	-51	-1
LC1 260	0	-76	19570	100292	20028	150610	20409	200165	20448	0	0	0	20257	100712	20982	150839	20142	201081	19036	38	0	0
LC6 265	3461	9514	10536	9523	10727	8827	10746	9367	11310	9617	11307	15078	15417	15207	17244	14395	16974	13247	16570	15228	9542	3802
LC7 266	3201	9138	8539	9006	8454	9022	8439	10276	8736	9022	11686	14783	13216	15689	13931	16620	13978	16868	13269	14714	9147	2846
LC8 267	3369	9356	9934	10407	10003	9916	10060	9181	10044	9224	11408	15499	16334	15346	15252	15336	15990	15252	16018	14952	9384	3137
LC9 268	3303	9564	8920	9664	8647	9397	8562	8967	8443	9265	11300	15027	15338	14462	13724	14468	14678	14945	14371	15222	9491	3485
G10 269	-0.001	-0.005	-0.22	-0.44	-0.272	-0.502	-0.28	-0.558	-0.288	-0.08	-0.074	-0.071	-0.229	-0.449	-0.307	-0.522	-0.296	-0.566	-0.288	0.038	0.03	0.035
G11 270	0.001	-0.005	-0.226	-0.44	-0.283	-0.496	-0.289	-0.553	-0.295	-0.08	-0.075	-0.074	-0.229	-0.439	-0.308	-0.509	-0.296	-0.555	-0.289	0.042	0.039	0.041
G21 271	-0.001	-0.01	0.246	0.642	0.307	0.803	0.316	0.972	0.326	0.058	0.051	0.038	0.242	0.627	0.323	0.802	0.313	0.963	0.309	-0.07	-0.058	-0.052
G22 272	-0.001	-0.008	0.244	0.659	0.323	0.814	0.323	0.978	0.334	0.074	0.063	0.055	0.248	0.636	0.336	0.817	0.323	0.978	0.32	-0.057	-0.051	-0.037
G1 273	-0.001	-0.115	-0.105	-0.188	-0.105	-0.221	-0.106	-0.32	-0.123	-0.115	-0.193	-0.23	-0.203	-0.323	-0.247	-0.377	-0.247	-0.411	-0.219	-0.226	-0.139	0.059
G2 274	0	-0.115	-0.094	-0.119	-0.088	-0.122	-0.084	-0.154	-0.091	-0.113	-0.198	-0.246	-0.226	-0.257	-0.235	-0.27	-0.238	-0.276	-0.224	-0.239	-0.135	0.068
G3 275	0	-0.155	-0.135	-0.154	-0.127	-0.154	-0.125	-0.168	-0.126	-0.152	-0.255	-0.338	-0.318	-0.339	-0.317	-0.343	-0.323	-0.344	-0.313	-0.321	-0.173	0.07
G4 276	-0.002	-0.25	-0.226	-0.202	-0.203	-0.177	-0.199	-0.152	-0.202	-0.243	-0.383	-0.515	-0.498	-0.469	-0.485	-0.458	-0.486	-0.44	-0.492	-0.509	-0.266	0.066
G5 277	-0.001	-0.282	-0.235	-0.157	-0.213	-0.111	-0.205	-0.063	-0.206	-0.269	-0.416	-0.569	-0.525	-0.444	-0.5	-0.408	-0.515	-0.361	-0.5	-0.561	-0.314	0.069
G6 278	0	-0.253	-0.221	-0.194	-0.208	-0.168	-0.203	-0.138	-0.2	-0.243	-0.383	-0.52	-0.507	-0.461	-0.471	-0.432	-0.489	-0.415	-0.491	-0.512	-0.273	0.071
G7 279	-0.003	-0.151	-0.127	-0.136	-0.12	-0.12	-0.114	-0.105	-0.111	-0.142	-0.247	-0.316	-0.316	-0.286	-0.28	-0.274	-0.283	-0.271	-0.292	-0.316	-0.169	0.072
G8 280	0.001	-0.113	-0.099	-0.121	-0.093	-0.119	-0.091	-0.12	-0.087	-0.104	-0.193	-0.235	-0.241	-0.239	-0.211	-0.229	-0.23	-0.244	-0.227	-0.223	-0.132	0.071
G9 281	-0.002	-0.112	-0.11	-0.22	-0.104	-0.243	-0.102	-0.271	-0.097	-0.099	-0.177	-0.222	-0.257	-0.292	-0.199	-0.32	-0.23	-0.381	-0.227	-0.207	-0.137	0.065
G12 282	0.001	-0.136	-0.184	-0.258	-0.19	-0.282	-0.193	-0.29	-0.189	-0.145	-0.13	-0.218	-0.263	-0.31	-0.239	-0.334	-0.261	-0.374	-0.261	-0.226	-0.137	-0.085
G13 283	-0.002	-0.143	-0.18	-0.187	-0.186	-0.185	-0.188	-0.169	-0.184	-0.151	-0.147	-0.231	-0.256	-0.264	-0.256	-0.26	-0.264	-0.261	-0.267	-0.238	-0.139	-0.082
G15 284	-0.001	-0.267	-0.29	-0.221	-0.289	-0.18	-0.291	-0.128	-0.29	-0.273	-0.327	-0.496	-0.507	-0.454	-0.505	-0.419	-0.509	-0.376	-0.51	-0.508	-0.272	-0.076
G17 285	0.001	-0.259	-0.287	-0.212	-0.289	-0.174	-0.293	-0.133	-0.295	-0.265	-0.32	-0.482	-0.485	-0.449	-0.499	-0.424	-0.496	-0.382	-0.501	-0.494	-0.261	-0.072
G18 286	-0.002	-0.17	-0.208	-0.173	-0.216	-0.152	-0.218	-0.119	-0.223	-0.185	-0.196	-0.302	-0.312	-0.299	-0.325	-0.302	-0.323	-0.274	-0.333	-0.317	-0.172	-0.081
G24 287	-0.001	-0.015	0.184	0.179	0.194	0.166	0.196	-0.084	-0.059	-0.263	-0.27	0.392	0.416	0.012	-0.046	-0.086	-0.071	-0.139	0.19	0.155	0.151	0.155
G26 288	0.001	0.001	0.093	0.128	0.128	0.105	0.127	0.078	0.128	0.093	0.085	-0.942	-0.898	-0.762	-0.753	-0.802	-0.842	-0.881	-0.846	-0.847	-0.846	-0.792
PT1 289	0	-13.58	20762	102249	18413	151432	18766	206278	18970	-54.32	-67.9	-40.74	18793	103526	19065	154909	18209	205612	18549	0	-81.47	-81.47
G14 291	0	-0.168	-0.192	-0.164	-0.192	-0.145	-0.197	-0.113	-0.197	-0.175	-0.188	-0.296	-0.307	-0.29	-0.307	-0.272	-0.31	-0.253	-0.323	-0.314	-0.17	-0.08
G16 292	-0.001	-0.287	-0.296	-0.181	-0.293	-0.121	-0.294	-0.048	-0.297	-0.292	-0.358	-0.538	-0.537	-0.451	-0.536	-0.394	-0.537	-0.332	-0.549	-0.566	-0.311	-0.096
G19 293	0	-0.126	-0.155	-0.12	-0.158	-0.104	-0.163	-0.093	-0.174	-0.131	-0.131	-0.202	-0.204	-0.199	-0.228	-0.204	-0.224	-0.18	-0.23	-0.219	-0.131	-0.082
G20 294	0.001	-0.117	-0.17	-0.196	-0.19	-0.209	-0.195	-0.277	-0.219	-0.133	-0.121	-0.175	-0.175	-0.269	-0.246	-0.314	-0.241	-0.322	-0.221	-0.19	-0.124	-0.081
G23 295	-0.001	-0.119	-0.169	-0.292	-0.186	-0.346	-0.188	-0.517	-0.225	-0.135	-0.158	-0.208	-0.195	-0.407	-0.296	-0.514	-0.292	-0.58	-0.255	-0.214	-0.14	-0.016
G25 296	0.002	-0.127	-0.154	-0.304	-0.159	-0.337	-0.158	-0.385	-0.154	-0.124	-0.154	-0.223	-0.276	-0.354	-0.224	-0.411	-0.265	-0.485	-0.265	-0.224	-0.15	-0.013
WEIGHT	13333	37571	37929	38600	37831	37162	37806	37790	38533	37129	45701	60387	60304	60703	60151	60819	61621	60312	60228	60116	37565	13271

APPENDIX D

Stress Calculation Results per Strain Gauge:

- **Vertical load**
- **200000 lb Compression @ AW0**
- **200000 lb Compression @ AW3**

Vertical at AW3 (Data point 11, Allowable = yield x 0.5):
(sorted by strain gauge #) (factor for bareshell weight in table is applied on factored stress only = + 21%)

SG	Material	Figure (App. B)	SG installed on	Allow. yieldx0.5	Factored Stress (psi)	Margin Safety	Measured Strain	Measured Stress	
SG1	HSLA 80	Fig. B.1	Anticlimber bottom rib	-40000	-491	80.42	-14	-406	
SG2	HSLA 80	Fig. B.1	Anticlimber bottom web	-40000	-456	86.69	-13	-377	
SG3	HSLA 80	Fig. B.1	Anticlimber top web	-40000	-632	62.33	-18	-522	
SG4	HSLA 80	Fig. B.1	Anticlimber top rib	-40000	-702	56.00	-20	-580	
SG5	HSLA 80	Fig. B.1	End sill top plate	40000	597	66.05	17	493	
SG6	HSLA 80	Fig. B.1	End sill top plate	40000	526	75.00	15	435	
SG7	HSLA 80	Fig. B.1	End sill top plate	-40000	-667	59.00	-19	-551	
SG8	HSLA 80	Fig. B.1	End sill top plate	-40000	-912	42.84	-26	-754	
SG9	HSLA 80	Fig. B.1	End sill bottom plate	-40000	-737	53.28	-21	-609	
SG10	HSLA 80	Fig. B.2	End sill bottom plate	-40000	-2526	14.83	-72	-2088	
SG11	HSLA 80	Fig. B.2	End sill back vertical doubler	40000	2526	14.83	72	2088	
SG12	HSLA 80	Fig. B.2	Draft sill under bottom lip	40000	6211	5.44	177	5133	
SG13	HSLA 80	Fig. B.2	End sill bottom plate	40000	632	62.33	18	522	
SG14	HSLA 80	Fig. B.2	End sill bottom plate	40000	807	48.56	23	667	
SG15	HSLA 80	Fig. B.2	End sill bottom plate	40000	667	59.00	19	551	
SG16	HSLA 80	Fig. B.3	End sill top plate under guss	-40000	-1298	29.81	-37	-1073	
SG17	HSLA 80	Fig. B.3	End sill top plate under guss	40000	2070	18.32	59	1711	
SG18	HSLA 80	Fig. B.3	Draft sill top plate at hole	-40000	-2176	17.39	-62	-1798	
SG19	HSLA 80	Fig. B.4	Bolster bottom plate	-40000	-7965	4.02	-227	-6583	
SG20	HSLA 80	Fig. B.4	Bolster bottom plate	-40000	-3018	12.25	-86	-2494	
SG21	HSLA 80	Fig. B.4	Bolster bottom plate	40000	20570	0.94	rosette	10	Von Mises
SG22	HSLA 80	Fig. B.4	Bolster gusset	-40000	-561	70.25	-16	-464	
SG23	HSLA 80	Fig. B.4	Draft sill web at hole	-40000	-491	80.42	-14	-406	
SG24	HSLA 80	Fig. B.4	Bolster bottom plate	-40000	-6000	5.67	-171	-4959	
SG25	HSLA 80	Fig. B.4	Bolster bottom plate	-40000	-14317	1.79	-408	-11832	
SG26	HSLA 80	Fig. B.4	Bolster bottom plate	-40000	-10702	2.74	-305	-8845	
SG27	HSLA 80	Fig. B.5	Bolster web around hole	-40000	-32774	0.22	-934	-27086	
SG28	HSLA 80	Fig. B.5	Bolster web around hole	40000	15019	1.66	428	12412	
SG29	HSLA 80	Fig. B.5	Bolster web around hole	40000	29756	0.34	848	24592	
SG30	HSLA 80	Fig. B.5	Bolster web around hole	-40000	-21651	0.85	-617	-17893	
SG31	HSLA 80	Fig. B.6	Draft sill flange around hole	-40000	-561	70.25	-16	-464	
SG32	HSLA 80	Fig. B.6	Bolster draft sill merge	40000	3860	9.36	110	3190	
SG33	HSLA 80	Fig. B.6	Bolster top plate	-40000	-947	41.22	-27	-783	
SG34	201LN-MT-1/4hard	Fig. B.6	Air duct top beam	37500	813	45.12	24	672	
SG35	HSLA 80	Fig. B.7	Bolster top plate back	40000	3755	9.65	107	3103	
SG36	HSLA 80	Fig. B.7	Bolster top plate back	40000	4913	7.14	140	4060	
SG38	HSLA 80	Fig. B.8	Bolster bottom plate	40000	632	62.33	18	522	
SG39	201LN-MT-1/4hard	Fig. B.8	Side sill at bolster connect.	-31000	-6674	3.64	-197	-5516	
SG40	201LN-MT-1/4hard	Fig. B.8	Side sill at bolster connect.	-31000	-8572	2.62	-253	-7084	
SG41	201LN-MT-1/4hard	Fig. B.8	Side sill at bolster connect.	-31000	-7657	3.05	-226	-6328	
SG42	201LN-MT-1/4hard	Fig. B.8	Side sill at bolster connect.	-31000	-11316	1.74	-334	-9352	
SG43	201LN-MT-1/4hard	Fig. B.9	Side sill top flange (sec.B-B)	-31000	-1152	25.91	-34	-952	
SG44	201LN-MT-1/4hard	Fig. B.9	Side sill top flange (sec.B-B)	-31000	-711	42.57	-21	-588	
SG45	201LN-MT-1/4hard	Fig. B.9	Side sill web (sec. B-B)	-31000	-1525	19.33	-45	-1260	
SG46	201LN-MT-1/4hard	Fig. B.9	Side sill bot flange (sec.B-B)	-31000	-915	32.89	-27	-756	
SG47	201LN-MT-1/4hard	Fig. B.9	Side sill at end sill connec.	-31000	-237	129.71	-7	-196	
SG48	HSLA 80	Fig. B.9	Side sill at end sill connec.	-40000	-1298	29.81	-37	-1073	
SG49	HSLA 80	Fig. B.9	Side sill at end sill connec.	-40000	-1684	22.75	-48	-1392	
SG50	HSLA 80	Fig. B.9	Side sill at end sill connec.	-40000	-1439	26.80	-41	-1189	
SG51	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (sec.D-D	37500	10638	2.52	314	8792	
SG52	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (sec.D-D	37500	35200	0.07	1039	29091	
SG53	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (sec.D-D	37500	8131	3.61	240	6720	
SG54	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (sec.D-D	37500	271	137.36	8	224	
SG55	201LN-MT-1/4hard	Fig. B.10	Side sill top flange (sec.C-C	37500	13552	1.77	400	11200	
SG56	201LN-MT-1/4hard	Fig. B.10	Side sill web (sec. C-C)	-31000	-11350	1.73	-335	-9380	
SG57	201LN-MT-1/4hard	Fig. B.10	Side sill bot flange (sec.C-C	-31000	-16161	0.92	-477	-13356	
SG58	201LN-MT-1/4hard	Fig. B.10	Side sill top flange (sec.C-C	37500	1152	31.55	34	952	
SG59	201LN-MT-1/4hard	Fig. B.10	Side sill web (sec. C-C)	-31000	-3286	8.43	-97	-2716	
SG60	201LN-MT-1/4hard	Fig. B.10	Door mask gusset	40000	38721	0.03	1143	32001	Trans. All.
SG61	201LN-MT-1/4hard	Fig. B.11	Side sill top flange (sec.E-E)	-31000	-711	42.57	-21	-588	
SG62	201LN-MT-1/4hard	Fig. B.11	Side sill web (sec. E-E)	37500	2643	13.19	78	2184	
SG63	201LN-MT-1/4hard	Fig. B.11	Side sill bot flange (sec.E-E)	37500	813	45.12	24	672	
SG64	201LN-MT-1/4hard	Fig. B.11	Side sill top flange (sec.F-F)	-31000	-13044	1.38	-385	-10780	
SG65	201LN-MT-1/4hard	Fig. B.11	Side sill web (sec. F-F)	37500	11180	2.35	330	9240	
SG66	201LN-MT-1/4hard	Fig. B.11	Side sill bot flange (sec.F-F)	37500	16330	1.30	482	13496	
SG67	201LN-MT-1/4hard	Fig. B.11	Bottom door mask (sec.G-G	-31000	-11248	1.76	-332	-9296	
SG68	201LN-MT-1/4hard	Fig. B.11	Bottom door mask (sec.G-G	-31000	-24427	0.27	-721	-20188	
SG69	201LN-MT-1/4hard	Fig. B.11	Bottom door mask (sec.G-G	-31000	-8334	2.72	-246	-6888	
SG70	201LN-MT-1/4hard	Fig. B.11	Bottom door mask (sec.G-G	-31000	-4269	6.26	-126	-3528	
SG71	201LN-MT-1/4hard	Fig. B.11	Door mask gusset	-40000	-33304	0.20	-983	-27524	Trans. All.

Vertical at AW3 (cont.):

SG	Material	Figure (App. B)	SG installed on	Allow. yield x0.5	Factored Stress (psi)	Margin Safety	Measured Strain	Measured Stress	
SG72	201LN-MT-1/4hard	Fig. B.12	Bottom of door post	37500	1423	25.35	42	1176	
SG73	201LN-MT-1/4hard	Fig. B.12	Bottom of door post	-31000	-4845	5.40	-143	-4004	
SG74	201LN-MT-1/4hard	Fig. B.12	Door mask inside gusset	37500	2101	16.85	62	1736	
SG75	201LN-MT-1/4hard	Fig. B.12	Side sill at inside gusset	37500	1728	20.70	51	1428	
SG76	201LN-MT-1/4hard	Fig. B.12	Bottom of skin inside car	-31000	-949	31.68	-28	-784	
SG77	201LN-MT-1/4hard	Fig. B.13	Bottom of door post	37500	7996	3.69	236	6608	
SG78	201LN-MT-1/4hard	Fig. B.13	Bottom of door post	37500	2948	11.72	87	2436	
SG79	201LN-MT-1/4hard	Fig. B.13	Door mask inside gusset	-31000	-3896	6.96	-115	-3220	
SG80	201LN-MT-1/4hard	Fig. B.13	Side sill at inside gusset	-31000	-5522	4.61	-163	-4564	
SG81	201LN-MT-1/4hard	Fig. B.14	Top outer door mask radius	-31000	-26088	0.19	-770	-21560	
SG82	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(bot.)	-31000	-18498	0.68	-546	-15288	
SG83	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(cent.)	-31000	-15788	0.96	-466	-13048	
SG84	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(top)	-31000	-24258	0.28	-716	-20048	
SG85	201LN-MT-1/4hard	Fig. B.15	Top outer door mask radius	37500	27409	0.37	809	22652	
SG86	201LN-MT-1/4hard	Fig. B.15	Top door mask radius(bot.)	37500	11316	2.31	334	9352	
SG87	201LN-MT-1/4hard	Fig. B.15	Top door mask radius(cent.)	37500	17889	1.10	528	14784	
SG88	201LN-MT-1/4hard	Fig. B.15	Top door mask radius(top)	37500	26799	0.40	791	22148	
SG89	201LN-MT-1/4hard	Fig. B.16	Inside roof gutter at door	37500	9791	2.83	289	8092	
SG90	201LN-MT-1/4hard	Fig. B.16	Inside roof at door	37500	440	84.14	13	364	
SG91	201LN-MT-1/4hard	Fig. B.16	Inside roof gutter at door	-31000	-14501	1.14	-428	-11984	
SG92	201LN-MT-1/4hard	Fig. B.16	Inside roof at door	-31000	-5455	4.68	-161	-4508	
SG93	201LN-MT-1/4hard	Fig. B.17	Side sill top flange (sec.H-H)	-31000	-3388	8.15	-100	-2800	
SG95	201LN-MT-1/4hard	Fig. B.17	Side sill bot flange (sec.H-H)	-31000	-5793	4.35	-171	-4788	
SG96	201LN-MT-1/4hard	Fig. B.17	Side sill top flange (sec.J-J)	37500	1389	26.00	41	1148	
SG97	201LN-MT-1/4hard	Fig. B.17	Side sill web (sec.J-J)	-31000	-2202	13.08	-65	-1820	
SG98	201LN-MT-1/4hard	Fig. B.17	Side sill bot flange (sec.J-J)	-31000	-5726	4.41	-169	-4732	
SG99i	HSLA 80	Fig. B.17	Back of bolster at side sill (i	-40000	-1684	22.75	-48	-1392	
SG99u	HSLA 80	Fig. B.17	Back of bolster at side sill (o	-40000	-3334	11.00	-95	-2755	
SG100	HSLA 80	Fig. B.17	Front of bolster at side sill	-40000	-1614	23.78	-46	-1334	
SG101	HSLA 80	Fig. B.1	Anticlimber bottom rib	-40000	-421	93.99	-12	-348	
SG102	HSLA 80	Fig. B.1	Anticlimber bottom web	-40000	-456	86.69	-13	-377	
SG103	HSLA 80	Fig. B.1	Anticlimber top web	-40000	-667	59.00	-19	-551	
SG104	HSLA 80	Fig. B.1	Anticlimber top rib	-40000	-772	50.81	-22	-638	
SG105	HSLA 80	Fig. B.1	End sill top plate	40000	526	75.00	15	435	
SG106	HSLA 80	Fig. B.1	End sill top plate	40000	526	75.00	15	435	
SG107	HSLA 80	Fig. B.1	End sill top plate	-40000	-702	56.00	-20	-580	
SG110	HSLA 80	Fig. B.2	End sill bottom plate	-40000	-2772	13.43	-79	-2291	
SG112	HSLA 80	Fig. B.2	Draft sill under bottom lip	40000	5965	5.71	170	4930	
SG118	HSLA 80	Fig. B.3	Draft sill top plate at hole	-40000	-1930	19.73	-55	-1595	
SG119	HSLA 80	Fig. B.4	Bolster bottom plate	-40000	-5825	5.87	-166	-4814	
SG120	HSLA 80	Fig. B.4	Bolster bottom plate	-40000	-2351	16.01	-67	-1943	
SG122	HSLA 80	Fig. B.4	Bolster gusset	-40000	-632	62.33	-18	-522	
SG124	HSLA 80	Fig. B.4	Bolster bottom plate	-40000	-14176	1.82	-404	-11716	
SG125	HSLA 80	Fig. B.4	Bolster bottom plate	-40000	-6807	4.88	-194	-5626	
SG127	HSLA 80	Fig. B.5	Bolster web around hole	-40000	-30774	0.30	-877	-25433	
SG128	HSLA 80	Fig. B.5	Bolster web around hole	40000	14562	1.75	415	12035	
SG129	HSLA 80	Fig. B.5	Bolster web around hole	40000	30634	0.31	873	25317	
SG130	HSLA 80	Fig. B.5	Bolster web around hole	-40000	-19896	1.01	-567	-16443	
SG131	HSLA 80	Fig. B.6	Draft sill flange around hole	-40000	-667	59.00	-19	-551	
SG132	HSLA 80	Fig. B.6	Bolster draft sill merge	-40000	-3860	9.36	-110	-3190	
SG134	201LN-MT-1/4hard	Fig. B.6.b	Air duct top beam	37500	949	38.53	28	784	
SG136	HSLA 80	Fig. B.7	Bolster top plate back	40000	4772	7.38	136	3944	
SG137	201LN-MT-1/4hard	Fig.B.9	secondary air duct	37500	7487	4.01	221	6188	
SG139	HSLA 80	Fig.B.9	Side sill at end sill connec.	-40000	-246	161.85	-7	-203	
SG140	201LN-MT-1/4hard	Fig.b 6 c	secondary air duct(137)	37500	2168	16.29	64	1792	
SG141	201LN-MT-1/4hard	Fig.b 6 c	secondary air duct(34)	37500	3049	11.30	90	2520	
SG143	201LN-MT-1/4hard	Fig. B.9	Side sill top flange (sec.B-B)	-31000	-1389	21.32	-41	-1148	
SG144	201LN-MT-1/4hard	Fig. B.9	Side sill top flange (sec.B-B)	-31000	-542	56.19	-16	-448	
SG145	201LN-MT-1/4hard	Fig. B.9	Side sill web (sec. B-B)	-31000	-1660	17.67	-49	-1372	
SG146	201LN-MT-1/4hard	Fig. B.9	Side sill bot flange (sec.B-B)	-31000	-1186	25.14	-35	-980	
SG150	201LN-deadlight	Fig. B.25	Skin (for buckling) End #1 L	25000	2236	10.18	66	1848	
SG151	201LN-deadlight	Fig. B.25	Skin (for buckling) End #1 L	-21000	-2677	6.85	-79	-2212	
SG152	201LN-deadlight	Fig. B.25	Skin (for buckling) End #2 L	25000	68	367.95	2	56	
SG153	201LN-deadlight	Fig. B.25	Skin (for buckling) End #2 L	-21000	-7758	1.71	-229	-6412	
SG154	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (in line w	37500	10571	2.55	312	8736	
SG155	201LN-MT-1/4hard	Fig. B.10	Side sill top flange (sec.C-C)	37500	12468	2.01	368	10304	Trans. All.
SG156	201LN-MT-1/4hard	Fig. B.10	Side sill web (sec. C-C)	-31000	-9622	2.22	-284	-7952	
SG157	201LN-MT-1/4hard	Fig. B.10	Side sill bot flange (sec.C-C)	-31000	-12332	1.51	-364	-10192	
SG158	HSLA 80	Fig.B.2	draft sill web at hole	40000	1474	26.14	42	1218	
SG159	HSLA 80	Fig.B.2	draft sill web at hole	40000	1123	34.62	32	928	
SG160	201LN-MT-1/4hard	Fig. B.10	Door mask gusset	37500	38111	-0.02	1125	31497	
SG164	201LN-MT-1/4hard	Fig. B.11	Side sill top flange (sec.F-F)	-31000	-14331	1.16	-423	-11844	

Vertical at AW3 (cont.):

SG	Material	Figure (App. B)	SG Installed on	Allow. Yield x0.5	Factored Stress (psi)	Margin Safety	Measured Strain	Measured Stress
SG165	201LN-MT-1/4hard	Fig. B.11	Side sill web (sec. F-F)	37500	6268	4.98	185	5180
SG166	201LN-MT-1/4hard	Fig. B.11	Side sill bot flange (sec.F-F)	37500	15619	1.40	461	12908
SG167	HSLA 80	Fig.B.2	draft sill web at tampon	40000	3684	9.86	105	3045
SG168	HSLA 80	Fig.B.2	draft sill web at tampon	40000	3334	11.00	95	2755
SG169	201LN-MT-1/4hard	Fig.b.21	side corrugation at seam we	37500	3998	8.38	118	3304
SG170	201LN-MT-1/4hard	Fig.b.21	side corrugation at seam we	37500	3320	10.29	98	2744
SG171	HSLA 80	Fig.b.6-c	back bolster at side sill (200	40000	246	161.85	7	203
SG172	201LN-MT-1/4hard	Fig.b.6-c	side sill at bolster (203)	37500	2236	15.77	66	1848
SG182	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(bot.)	-31000	-17211	0.80	-508	-14224
SG183	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(cent.)	-31000	-17211	0.80	-508	-14224
SG184	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(top)	-31000	-30724	0.01	-914	-25392
SG193	201LN-MT-1/4hard	Fig. B.17	Side sill top flange (sec.H-H	-31000	-3828	7.10	-113	-3164
SG195	201LN-MT-1/4hard	Fig. B.17	Side sill bot flange (sec.H-H	-31000	-7013	3.42	-207	-5796
SG199	HSLA 80	Fig. B.17	Back of bolster at side sill	-40000	-667	59.00	-19	-551
SG200	HSLA 80	Fig. B.17	Back of bolster at side sill	40000	35	1138.93	1	29
SG201	201LN-MT-1/4hard	Fig. B.17	Window post gusset at bolst	-31000	-1931	15.05	-57	-1596
SG202	201LN-MT-1/4hard	Fig. B.17	Window post gusset at bolst	-31000	-711	42.57	-21	-588
SG203	201LN-MT-1/4hard	Fig. B.17	Side sill at bolst.	37500	2744	12.66	81	2268
SG204	201LN-MT-1/4hard	Fig. B.18	1st crossbeam flange at cen	37500	1016	35.89	30	840
SG205	201LN-MT-1/4hard	Fig. B.18	2nd crossbeam flange at ce	-31000	-6878	3.51	-203	-5684
SG206	201LN-MT-1/4hard	Fig. B.19	2nd crossbeam bottom flang	37500	10333	2.63	305	8540
SG207	201LN-MT-1/4hard	Fig. B.19	1st crossbeam flange at cen	-31000	-949	31.68	-28	-784
SG209	201LN-MT-1/4hard	Fig. B.20	Side sill top flange (sec.K-K)	37500	2033	17.45	60	1680
SG210	201LN-MT-1/4hard	Fig. B.20	Side sill bot flange (sec.K-K)	37500	6573	4.71	194	5432
SG211	201LN-MT-1/4hard	Fig. B.21	Window rail at 1st hole (sas	-31000	-1897	15.34	-56	-1568
SG212	201LN-MT-1/4hard	Fig. B.21	Sash window post	-31000	-881	34.19	-26	-728
SG213	201LN-MT-1/4hard	Fig. B.21	Sash window at skin side	37500	915	39.99	27	756
SG214	201LN-MT-1/4hard	Fig. B.21	Sash window post	-31000	-2948	9.52	-87	-2436
SG215	201LN-MT-1/4hard	Fig. B.21	Sash window 2nd post	-31000	-9080	2.41	-268	-7504
SG216	201LN-MT-1/4hard	Fig. B.21	Window rail at 2nd hole (sas	-31000	-5048	5.14	-149	-4172
SG217	201LN-MT-1/4hard	Fig. B.21	Window rail	-31000	-1626	18.06	-48	-1344
SG218	201LN-MT-1/4hard	Fig. B.21	Window rail	-31000	-3185	8.73	-94	-2632
SG219	201LN-MT-1/4hard	Fig. B.21	Window rail	-31000	-102	304.00	-3	-84
SG220	201LN-MT-1/4hard	Fig. B.21	Window post web	-31000	-3625	7.55	-107	-2996
SG221	201LN-deadlight	Fig. B.21	At window bot. inside radius	-21000	-610	33.44	-18	-504
SG222	201LN-deadlight	Fig. B.21	At window bot. inside radius	25000	2643	8.46	78	2184
SG223	201LN-deadlight	Fig. B.21	At window top inside radius	25000	5319	3.70	157	4396
SG224	201LN-deadlight	Fig. B.21	At window top inside radius	-21000	-1931	9.87	-57	-1596
SG225	201LN-deadlight	Fig. B.22	At window radius (center are	-21000	-136	153.96	-4	-112
SG226	201LN-deadlight	Fig. B.22	At window radius (center are	25000	1491	15.77	44	1232
SG227	201LN-deadlight	Fig. B.22	At window radius (center are	25000	2236	10.18	66	1848
SG228	201LN-deadlight	Fig. B.22	At window radius (center are	-21000	-779	25.95	-23	-644
SG229	201LN-MT-1/4hard	Fig. B.23	Roof rail at door carline clip	37500	4879	6.69	144	4032
SG230	201LN-MT-1/4hard	Fig. B.23	Door carline clip (x= -96.438	37500	7555	3.96	223	6244
SG231	201LN-MT-1/4hard	Fig. B.23	Door carline clip (x= -96.438	37500	1558	23.06	46	1288
SG232	201LN-MT-1/4hard	Fig. B.23	Roof carline web (x= -96.43	-31000	-6640	3.67	-196	-5488
SG233	201LN-MT-1/4hard	Fig. B.23	Roof carline bottom flange	-31000	-5251	4.90	-155	-4340
SG234	201LN-MT-1/4hard	Fig. B.23	Roof carline flange at center	-31000	-8775	2.53	-259	-7252
SG235	201LN-MT-1/4hard	Fig. B.23	Roof carline web at center	-31000	-13383	1.32	-395	-11060
SG236	201LN-MT-1/4hard	Fig. B.23	Roof carline flange at center	37500	6674	4.62	197	5516
SG237	201LN-MT-1/4hard	Fig. B.24	Roof rail at door carline clip	-31000	-8199	2.78	-242	-6776
SG238	201LN-MT-1/4hard	Fig. B.24	Door carline clip (x= -151.97	-31000	-2372	12.07	-70	-1960
SG239	201LN-MT-1/4hard	Fig. B.24	Door carline clip (x= -151.97	-31000	-847	35.60	-25	-700
SG240	201LN-MT-1/4hard	Fig. B.24	Roof carline web (x= -151.9	37500	711	51.71	21	588
SG241	201LN-MT-1/4hard	Fig. B.24	Roof carline bottom flange	-31000	-305	100.67	-9	-252
SG242	201LN-MT-1/4hard	Fig. B.24	Roof carline flange at center	-31000	-2507	11.36	-74	-2072
SG243	201LN-MT-1/4hard	Fig. B.24	Roof carline web at center	-31000	-5353	4.79	-158	-4424
SG244	201LN-MT-1/4hard	Fig. B.24	Roof carline flange at center	-31000	-136	227.75	-4	-112
SG245	201LN-MT-1/4hard	Fig. B.20	Side sill web (sec.K-K)	37500	4303	7.72	127	3556
SG309	201LN-MT-1/4hard	Fig. B.20	Side sill top flange (sec.K-K)	37500	2067	17.15	61	1708
SG310	201LN-MT-1/4hard	Fig. B.20	Side sill bot flange (sec.K-K)	37500	6505	4.76	192	5376
SG329	201LN-MT-1/4hard	Fig. B.23	Roof rail at door carline clip	37500	6098	5.15	180	5040
SG330	201LN-MT-1/4hard	Fig. B.23	Door carline clip (x= -96.438	37500	4066	8.22	120	3360
SG331	201LN-MT-1/4hard	Fig. B.23	Door carline clip (x= -96.438	37500	745	49.31	22	616
SG337	201LN-MT-1/4hard	Fig. B.24	Roof rail at door carline clip	-31000	-5116	5.06	-151	-4228
SG338	201LN-MT-1/4hard	Fig. B.24	Door carline clip (x= -151.97	-31000	-3659	7.47	-108	-3024
SG339	201LN-MT-1/4hard	Fig. B.24	Door carline clip (x= -151.97	-31000	-2575	11.04	-76	-2128
SG345	201LN-MT-1/4hard	Fig. B.20	Side sill web (sec.K-K)	37500	4303	7.72	127	3556
SG346	201LN-MT-1/4hard	Fig. B.25	Roof ream weld	-31000	-3828	7.10	-113	-3164
SG347	201LN-MT-1/4hard	Fig.B.25	Roof ream weld	-31000	-678	44.75	-20	-560
SG349	201LN-MT-1/4hard	Fig.B.21	Window rail	-31000	-711	42.57	-21	-588
SG350	HSLA 80	Fig.B.17	Bolster ss connect plate	40000	2877	12.90	82	2378

Compression at AW0 + 200 kip (Data point 8, Allowable = yield x 0.9):
(sorted by SG number)

SG	Material	Figure	SG installed on	Allow.	Stress (psi)	M.S.	Strain	
SG1	HSLA 80	Fig. B.1	Anticlimber bottom rib	-72000	-11919	5.04	-411	
SG2	HSLA 80	Fig. B.1	Anticlimber bottom web	-72000	-18850	2.82	-650	
SG3	HSLA 80	Fig. B.1	Anticlimber top web	-72000	-21982	2.28	-758	
SG4	HSLA 80	Fig. B.1	Anticlimber top rib	-72000	-19807	2.64	-683	
SG5	HSLA 80	Fig. B.1	End sill top plate	-72000	-3335	20.59	-115	
SG6	HSLA 80	Fig. B.1	End sill top plate	-72000	-3886	17.53	-134	
SG7	HSLA 80	Fig. B.1	End sill top plate	-72000	-15689	3.59	-541	
SG8	HSLA 80	Fig. B.1	End sill top plate	-72000	-18241	2.95	-629	
SG9	HSLA 80	Fig. B.1	End sill bottom plate	-72000	-10527	5.84	-363	
SG10	HSLA 80	Fig. B.2	End sill bottom plate	-72000	-39092	0.84	-1348	
SG11	HSLA 80	Fig. B.2	End sill back vertical doubler	72000	52171	0.38	1799	
SG12	HSLA 80	Fig. B.2	Draft sill under bottom lip	-72000	-25230	1.85	-870	
SG13	HSLA 80	Fig. B.2	End sill bottom plate	72000	19865	2.62	685	
SG14	HSLA 80	Fig. B.2	End sill bottom plate	-72000	-26390	1.73	-910	
SG15	HSLA 80	Fig. B.2	End sill bottom plate	-72000	-10817	5.66	-373	
SG16	HSLA 80	Fig. B.3	End sill top plate under gusse	72000	9222	6.81	318	
SG17	HSLA 80	Fig. B.3	End sill top plate under gusse	72000	41760	0.72	1440	
SG18	HSLA 80	Fig. B.3	Draft sill top plate at hole	-72000	-9483	6.59	-327	
SG19	HSLA 80	Fig. B.4	Bolster bottom plate	-72000	-31436	1.29	-1084	
SG20	HSLA 80	Fig. B.4	Bolster bottom plate	-72000	-1276	55.43	-44	
SG21	HSLA 80	Fig. B.4	Bolster bottom plate	72000	24230	1.97	rosette	Von Mises
SG22	HSLA 80	Fig. B.4	Bolster gusset	-72000	-2552	27.21	-88	
SG23	HSLA 80	Fig. B.4	Draft sill web at hole	-72000	-16878	3.27	-582	
SG24	HSLA 80	Fig. B.4	Bolster bottom plate	72000	18560	2.88	640	
SG25	HSLA 80	Fig. B.4	Bolster bottom plate	-72000	-8555	7.42	-295	
SG26	HSLA 80	Fig. B.4	Bolster bottom plate	-72000	-21895	2.29	-755	
SG27	HSLA 80	Fig. B.5	Bolster web around hole	-72000	-21228	2.39	-732	
SG28	HSLA 80	Fig. B.5	Bolster web around hole	72000	4872	13.78	168	
SG29	HSLA 80	Fig. B.5	Bolster web around hole	72000	19198	2.75	662	
SG30	HSLA 80	Fig. B.5	Bolster web around hole	-72000	-13398	4.37	-462	
SG31	HSLA 80	Fig. B.6	Draft sill flange around hole	-72000	-14181	4.08	-489	
SG32	HSLA 80	Fig. B.6	Bolster draft sill merge	-72000	-2088	33.48	-72	
SG33	HSLA 80	Fig. B.6	Bolster top plate	72000	44660	0.61	1540	
SG34	201LN-MT-1/4hard	Fig. B.6	Air duct top beam	67500	10248	5.59	366	
SG35	HSLA 80	Fig. B.7	Bolster top plate back	72000	25085	1.87	865	
SG36	HSLA 80	Fig. B.7	Bolster top plate back	72000	23867	2.02	823	
SG38	HSLA 80	Fig. B.8	Bolster bottom plate	-72000	-5887	11.23	-203	
SG39	201LN-MT-1/4hard	Fig. B.8	Side sill at bolster connect.	-55800	-24416	1.29	-872	
SG40	201LN-MT-1/4hard	Fig. B.8	Side sill at bolster connect.	-55800	-27496	1.03	-982	
SG41	201LN-MT-1/4hard	Fig. B.8	Side sill at bolster connect.	-55800	-27916	1.00	-997	
SG42	201LN-MT-1/4hard	Fig. B.8	Side sill at bolster connect.	-55800	-30211	0.85	-1079	
SG43	201LN-MT-1/4hard	Fig. B.9	Side sill top flange (sec.B-B)	-55800	-36027	0.55	-1287	
SG44	201LN-MT-1/4hard	Fig. B.9	Side sill top flange (sec.B-B)	-55800	-12936	3.31	-462	
SG45	201LN-MT-1/4hard	Fig. B.9	Side sill web (sec. B-B)	-55800	-15568	2.58	-556	
SG46	201LN-MT-1/4hard	Fig. B.9	Side sill bot flange (sec.B-B)	-55800	-28448	0.96	-1016	
SG47	201LN-MT-1/4hard	Fig. B.9	Side sill at end sill connec.	-55800	-13076	3.27	-467	
SG48	HSLA 80	Fig. B.9	Side sill at end sill connec.	-72000	-34249	1.10	-1181	
SG49	HSLA 80	Fig. B.9	Side sill at end sill connec.	-72000	-62780	0.15	-2165	
SG50	HSLA 80	Fig. B.9	Side sill at end sill connec.	-72000	-21460	2.36	-740	
SG51	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (sec.D-D)	67500	8428	7.01	301	
SG52	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (sec.D-D)	67500	27299	1.47	975	
SG53	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (sec.D-D)	67500	7168	8.42	256	
SG54	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (sec.D-D)	-55800	-1316	41.40	-47	
SG55	201LN-MT-1/4hard	Fig. B.10	Side sill top flange (sec.C-C)	-55800	-31133	0.79	-1112	
SG56	201LN-MT-1/4hard	Fig. B.10	Side sill web (sec. C-C)	-55800	-27440	1.03	-980	
SG57	201LN-MT-1/4hard	Fig. B.10	Side sill bot flange (sec.C-C)	-55800	-43156	0.29	-1547	
SG58	201LN-MT-1/4hard	Fig. B.10	Side sill top flange (sec.C-C)	67500	4340	14.55	155	
SG59	201LN-MT-1/4hard	Fig. B.10	Side sill web (sec. C-C)	67500	9912	5.81	354	
SG60	201LN-MT-1/4hard	Fig. B.10	Door mask gusset	-72000	-13468	4.35	-481	Trans. All.
SG61	201LN-MT-1/4hard	Fig. B.11	Side sill top flange (sec.E-E)	-55800	-27047	1.06	-966	
SG62	201LN-MT-1/4hard	Fig. B.11	Side sill web (sec. E-E)	-55800	-23016	1.42	-822	
SG63	201LN-MT-1/4hard	Fig. B.11	Side sill bot flange (sec.E-E)	-55800	-23240	1.40	-830	
SG64	201LN-MT-1/4hard	Fig. B.11	Side sill top flange (sec.F-F)	-55800	-46552	0.20	-1682	
SG65	201LN-MT-1/4hard	Fig. B.11	Side sill web (sec. F-F)	-55800	-14868	2.75	-531	
SG66	201LN-MT-1/4hard	Fig. B.11	Side sill bot flange (sec.F-F)	-55800	-19936	1.80	-712	
SG67	201LN-MT-1/4hard	Fig. B.11	Bottom door mask (sec.G-G)	-55800	-868	63.29	-31	
SG68	201LN-MT-1/4hard	Fig. B.11	Bottom door mask (sec.G-G)	67500	2408	27.03	86	
SG69	201LN-MT-1/4hard	Fig. B.11	Bottom door mask (sec.G-G)	-55800	-840	65.43	-30	
SG70	201LN-MT-1/4hard	Fig. B.11	Bottom door mask (sec.G-G)	-55800	-3052	17.28	-109	
SG71	201LN-MT-1/4hard	Fig. B.11	Door mask gusset	-78000	-43419	0.80	-1557	Trans. All.

Compression at AW0 + 200 kip (cont.):

SG	Material	Figure	SG installed on	Allow.	Stress (psi)	M.S.	Strain
SG72	201LN-MT-1/4hard	Fig. B.12	Bottom of door post	67500	84	802.57	3
SG73	201LN-MT-1/4hard	Fig. B.12	Bottom of door post	-55800	-5236	9.66	-187
SG74	201LN-MT-1/4hard	Fig. B.12	Door mask inside gusset	-55800	-10836	4.15	-387
SG75	201LN-MT-1/4hard	Fig. B.12	Side sill at inside gusset	-55800	-20440	1.73	-730
SG76	201LN-MT-1/4hard	Fig. B.12	Bottom of skin inside car	-55800	-15232	2.66	-544
SG77	201LN-MT-1/4hard	Fig. B.13	Bottom of door post	67500	2352	27.70	84
SG78	201LN-MT-1/4hard	Fig. B.13	Bottom of door post	67500	1736	37.88	62
SG79	201LN-MT-1/4hard	Fig. B.13	Door mask inside gusset	-55800	-14532	2.84	-519
SG80	201LN-MT-1/4hard	Fig. B.13	Side sill at inside gusset	-55800	-26152	1.13	-934
SG81	201LN-MT-1/4hard	Fig. B.14	Top outer door mask radius	-55800	-10696	4.22	-382
SG82	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(bot.)	-55800	-6328	7.82	-226
SG83	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(cent.)	-55800	-6440	7.66	-230
SG84	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(top)	-55800	-11172	3.99	-399
SG85	201LN-MT-1/4hard	Fig. B.15	Top outer door mask radius	67500	1624	40.56	58
SG86	201LN-MT-1/4hard	Fig. B.15	Top door mask radius(bot.)	67500	3864	16.47	138
SG87	201LN-MT-1/4hard	Fig. B.15	Top door mask radius(cent.)	67500	1876	34.98	67
SG88	201LN-MT-1/4hard	Fig. B.15	Top door mask radius(top)	67500	1064	62.44	38
SG89	201LN-MT-1/4hard	Fig. B.16	Inside roof gutter at door	67500	2940	21.96	105
SG90	201LN-MT-1/4hard	Fig. B.16	Inside roof at door	67500	364	184.44	13
SG91	201LN-MT-1/4hard	Fig. B.16	Inside roof gutter at door	-55800	-4032	12.84	-144
SG92	201LN-MT-1/4hard	Fig. B.16	Inside roof at door	-55800	-1344	40.52	-48
SG93	201LN-MT-1/4hard	Fig. B.17	Side sill top flange (sec.H-H)	67500	4144	15.29	148
SG95	201LN-MT-1/4hard	Fig. B.17	Side sill bot flange (sec.H-H)	-55800	-20972	1.66	-749
SG96	201LN-MT-1/4hard	Fig. B.17	Side sill top flange (sec.J-J)	-55800	-17696	2.15	-632
SG97	201LN-MT-1/4hard	Fig. B.17	Side sill web (sec.J-J)	-55800	-21084	1.65	-753
SG98	201LN-MT-1/4hard	Fig. B.17	Side sill bot flange (sec.J-J)	-55800	-18368	2.04	-656
SG99i	HSLA 80	Fig. B.17	Back of bolster at side sill (in	-72000	-41789	0.72	-1441
SG99u	HSLA 80	Fig. B.17	Back of bolster at side sill (ou	-72000	-29435	1.4461	-1015
SG100	HSLA 80	Fig. B.17	Front of bolster at side sill	72000	10295	5.99	355
SG101	HSLA 80	Fig. B.1	Anticlimber bottom rib	-72000	-12412	4.80	-428
SG102	HSLA 80	Fig. B.1	Anticlimber bottom web	-72000	-19430	2.71	-670
SG103	HSLA 80	Fig. B.1	Anticlimber top web	-72000	-22533	2.20	-777
SG104	HSLA 80	Fig. B.1	Anticlimber top rib	-72000	-19865	2.62	-685
SG105	HSLA 80	Fig. B.1	End sill top plate	-72000	-1827	38.41	-63
SG106	HSLA 80	Fig. B.1	End sill top plate	-72000	-2726	25.41	-94
SG107	HSLA 80	Fig. B.1	End sill top plate	-72000	-15979	3.51	-551
SG110	HSLA 80	Fig. B.2	End sill bottom plate	-72000	-38599	0.87	-1331
SG112	HSLA 80	Fig. B.2	Draft sill under bottom lip	-72000	-23722	2.04	-818
SG118	HSLA 80	Fig. B.3	Draft sill top plate at hole	-72000	-10208	6.05	-352
SG119	HSLA 80	Fig. B.4	Bolster bottom plate	-72000	-23809	2.02	-821
SG120	HSLA 80	Fig. B.4	Bolster bottom plate	-72000	-1305	54.17	-45
SG122	HSLA 80	Fig. B.4	Bolster gusset	-72000	-2465	28.21	-85
SG124	HSLA 80	Fig. B.4	Bolster bottom plate	-72000	-9222	6.81	-318
SG125	HSLA 80	Fig. B.4	Bolster bottom plate	72000	19691	2.66	679
SG127	HSLA 80	Fig. B.5	Bolster web around hole	-72000	-21402	2.36	-738
SG128	HSLA 80	Fig. B.5	Bolster web around hole	72000	7598	8.48	262
SG129	HSLA 80	Fig. B.5	Bolster web around hole	72000	21808	2.30	752
SG130	HSLA 80	Fig. B.5	Bolster web around hole	-72000	-13195	4.46	-455
SG131	HSLA 80	Fig. B.6	Draft sill flange around hole	-72000	-13398	4.37	-462
SG132	HSLA 80	Fig. B.6	Bolster draft sill merge	72000	28768	1.50	992
SG134	201LN-MT-1/4hard	Fig. B.6.b	Air duct top beam	67500	8848	6.63	316
SG136	HSLA 80	Fig. B.7	Bolster top plate back	72000	25056	1.87	864
SG137	201LN-MT-1/4hard	Fig.B.9	secondary air duct	67500	8764	6.70	313
SG139	HSLA 80	Fig.B.9	Side sill at end sill connec.	-72000	-20474	2.52	-706
SG140	201LN-MT-1/4hard	Fig.b 6 c	secondary air duct(137)	67500	13720	3.92	490
SG141	201LN-MT-1/4hard	Fig.b 6 c	secondary air duct(34)	67500	10864	5.21	388
SG143	201LN-MT-1/4hard	Fig. B.9	Side sill top flange (sec.B-B)	-55800	-38946	0.43	-1392
SG144	201LN-MT-1/4hard	Fig. B.9	Side sill top flange (sec.B-B)	-55800	-10976	4.08	-392
SG145	201LN-MT-1/4hard	Fig. B.9	Side sill web (sec. B-B)	-55800	-13524	3.13	-483
SG146	201LN-MT-1/4hard	Fig. B.9	Side sill bot flange (sec.B-B)	-55800	-24920	1.24	-890
SG150	201LN-deadlight	Fig. B.25	Skin (for buckling) End #1 LH	45000	1288	33.94	46
SG151	201LN-deadlight	Fig. B.25	Skin (for buckling) End #1 LH	-37800	-2044	17.49	-73
SG152	201LN-deadlight	Fig. B.25	Skin (for buckling) End #2 LH	-37800	-28	1349.00	-1
SG153	201LN-deadlight	Fig. B.25	Skin (for buckling) End #2 LH	-37800	-4844	6.80	-173
SG154	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (in line with	67500	8036	7.40	287
SG155	201LN-MT-1/4hard	Fig. B.10	Side sill top flange (sec.C-C)	-55800	-28839	0.93	-1030
SG156	201LN-MT-1/4hard	Fig. B.10	Side sill web (sec. C-C)	-55800	-25452	1.19	-909
SG157	201LN-MT-1/4hard	Fig. B.10	Side sill bot flange (sec.C-C)	-55800	-35776	0.56	-1278
SG158	HSLA 80	Fig.B.2	draft sill web at hole	-72000	-32393	1.22	-1117
SG159	HSLA 80	Fig.B.2	draft sill web at hole	-72000	-30885	1.33	-1065
SG160	201LN-MT-1/4hard	Fig. B.10	Door mask gusset	72000	2240	31.14	80

Trans. All.

Compression at AW0 + 200 kip (cont.):

SG	Material	Figure	SG installed on	Allow.	Stress (psi)	M.S.	Strain
SG164	201LN-MT-1/4hard	Fig. B.11	Side sill top flange (sec.F-F)	-55800	-47866	0.17	-1740
SG165	201LN-MT-1/4hard	Fig. B.11	Side sill web (sec. F-F)	-55800	-6412	7.70	-229
SG166	201LN-MT-1/4hard	Fig. B.11	Side sill bot flange (sec.F-F)	-55800	-16996	2.28	-607
SG167	HSLA 80	Fig.B.2	draft sill web at tampon	-72000	-9860	6.30	-340
SG168	HSLA 80	Fig.B.2	draft sill web at tampon	-72000	-8961	7.03	-309
SG169	201LN-MT-1/4hard	Fig.b.21	side corrugation at seam welc	-55800	-1960	27.47	-70
SG170	201LN-MT-1/4hard	Fig.b.21	side corrugation at seam welc	-55800	-1372	39.67	-49
SG171	HSLA 80	Fig.b.6-c	back bolster at side sill (200)	-72000	-14732	3.89	-508
SG172	201LN-MT-1/4hard	Fig.b.6-c	side sill at bolster (203)	-55800	-8288	5.73	-296
SG182	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(bot.)	-55800	-6944	7.04	-248
SG183	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(cent.)	-55800	-8036	5.94	-287
SG184	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(top)	-55800	-15736	2.55	-562
SG193	201LN-MT-1/4hard	Fig. B.17	Side sill top flange (sec.H-H)	67500	5040	12.39	180
SG195	201LN-MT-1/4hard	Fig. B.17	Side sill bot flange (sec.H-H)	-55800	-22260	1.51	-795
SG199	HSLA 80	Fig. B.17	Back of bolster at side sill	-72000	-39498	0.82	-1362
SG200	HSLA 80	Fig. B.17	Back of bolster at side sill	-72000	-30972	1.32	-1068
SG201	201LN-MT-1/4hard	Fig. B.17	Window post gusset at bolst.	-55800	-448	123.55	-16
SG202	201LN-MT-1/4hard	Fig. B.17	Window post gusset at bolst.	-55800	-616	89.58	-22
SG203	201LN-MT-1/4hard	Fig. B.17	Side sill at bolst.	-55800	-7868	6.09	-281
SG204	201LN-MT-1/4hard	Fig. B.18	1st crossbeam flange at cente	-55800	-532	103.89	-19
SG205	201LN-MT-1/4hard	Fig. B.18	2nd crossbeam flange at cent	-55800	-1428	38.08	-51
SG206	201LN-MT-1/4hard	Fig. B.19	2nd crossbeam bottom flange	67500	4284	14.76	153
SG207	201LN-MT-1/4hard	Fig. B.19	1st crossbeam flange at cente	67500	6608	9.21	236
SG209	201LN-MT-1/4hard	Fig. B.20	Side sill top flange (sec.K-K)	-55800	-20916	1.67	-747
SG210	201LN-MT-1/4hard	Fig. B.20	Side sill bot flange (sec.K-K)	-55800	-23100	1.42	-825
SG211	201LN-MT-1/4hard	Fig. B.21	Window rail at 1st hole (sash)	67500	1008	65.96	36
SG212	201LN-MT-1/4hard	Fig. B.21	Sash window post	-55800	-1036	52.86	-37
SG213	201LN-MT-1/4hard	Fig. B.21	Sash window at skin side	-55800	-112	497.21	-4
SG214	201LN-MT-1/4hard	Fig. B.21	Sash window post	-55800	-2324	23.01	-83
SG215	201LN-MT-1/4hard	Fig. B.21	Sash window 2nd post	-55800	-8344	5.69	-298
SG216	201LN-MT-1/4hard	Fig. B.21	Window rail at 2nd hole (sash	-55800	-3332	15.75	-119
SG217	201LN-MT-1/4hard	Fig. B.21	Window rail	-55800	-1260	43.29	-45
SG218	201LN-MT-1/4hard	Fig. B.21	Window rail	-55800	-2324	23.01	-83
SG219	201LN-MT-1/4hard	Fig. B.21	Window rail	-55800	-224	248.11	-8
SG220	201LN-MT-1/4hard	Fig. B.21	Window post web	-55800	-4228	12.20	-151
SG221	201LN-deadlight	Fig. B.21	At window bot. inside radius	-37800	-364	102.85	-13
SG222	201LN-deadlight	Fig. B.21	At window bot. inside radius	45000	112	400.79	4
SG223	201LN-deadlight	Fig. B.21	At window top inside radius	45000	280	159.71	10
SG224	201LN-deadlight	Fig. B.21	At window top inside radius	-37800	-476	78.41	-17
SG225	201LN-deadlight	Fig. B.22	At window radius (center area	45000	56	802.57	2
SG226	201LN-deadlight	Fig. B.22	At window radius (center area	-37800	-504	74.00	-18
SG227	201LN-deadlight	Fig. B.22	At window radius (center area	-37800	-840	44.00	-30
SG228	201LN-deadlight	Fig. B.22	At window radius (center area	45000	1316	33.19	47
SG229	201LN-MT-1/4hard	Fig. B.23	Roof rail at door carline clip	67500	308	218.16	11
SG230	201LN-MT-1/4hard	Fig. B.23	Door carline clip (x= -96.438)	-55800	-1932	27.88	-69
SG231	201LN-MT-1/4hard	Fig. B.23	Door carline clip (x= -96.438)	67500	952	69.90	34
SG232	201LN-MT-1/4hard	Fig. B.23	Roof carline web (x= -96.438)	-55800	-4004	12.94	-143
SG233	201LN-MT-1/4hard	Fig. B.23	Roof carline bottom flange	-55800	-2912	18.16	-104
SG234	201LN-MT-1/4hard	Fig. B.23	Roof carline flange at center	67500	280	240.07	10
SG235	201LN-MT-1/4hard	Fig. B.23	Roof carline web at center	67500	1232	53.79	44
SG236	201LN-MT-1/4hard	Fig. B.23	Roof carline flange at center	67500	1120	59.27	40
SG237	201LN-MT-1/4hard	Fig. B.24	Roof rail at door carline clip	-55800	-5040	10.07	-180
SG238	201LN-MT-1/4hard	Fig. B.24	Door carline clip (x= -151.97)	-55800	-3920	13.23	-140
SG239	201LN-MT-1/4hard	Fig. B.24	Door carline clip (x= -151.97)	67500	1008	65.96	36
SG240	201LN-MT-1/4hard	Fig. B.24	Roof carline web (x= -151.97)	-55800	-1204	45.35	-43
SG241	201LN-MT-1/4hard	Fig. B.24	Roof carline bottom flange	-55800	-532	103.89	-19
SG242	201LN-MT-1/4hard	Fig. B.24	Roof carline flange at center	67500	2184	29.91	78
SG243	201LN-MT-1/4hard	Fig. B.24	Roof carline web at center	67500	3332	19.26	119
SG244	201LN-MT-1/4hard	Fig. B.24	Roof carline flange at center	-55800	-1148	47.61	-41
SG245	201LN-MT-1/4hard	Fig. B.20	Side sill web (sec.K-K)	-55800	-23296	1.40	-832
SG309	201LN-MT-1/4hard	Fig. B.20	Side sill top flange (sec.K-K)	-55800	-20440	1.73	-730
SG310	201LN-MT-1/4hard	Fig. B.20	Side sill bot flange (sec.K-K)	-55800	-24388	1.29	-871
SG329	201LN-MT-1/4hard	Fig. B.23	Roof rail at door carline clip	67500	644	103.81	23
SG330	201LN-MT-1/4hard	Fig. B.23	Door carline clip (x= -96.438)	-55800	-1680	32.21	-60
SG331	201LN-MT-1/4hard	Fig. B.23	Door carline clip (x= -96.438)	67500	1484	44.49	53
SG337	201LN-MT-1/4hard	Fig. B.24	Roof rail at door carline clip	-55800	-4228	12.20	-151
SG338	201LN-MT-1/4hard	Fig. B.24	Door carline clip (x= -151.97)	-55800	-4368	11.77	-156
SG339	201LN-MT-1/4hard	Fig. B.24	Door carline clip (x= -151.97)	-55800	-1148	47.61	-41
SG345	201LN-MT-1/4hard	Fig. B.20	Side sill web (sec.K-K)	-55800	-22596	1.47	-807
SG346	201LN-MT-1/4hard	Fig. B.25	Roof ream weld	67500	28	2409.71	1
SG347	201LN-MT-1/4hard	Fig.B.25	Roof ream weld	67500	840	79.36	30
SG349	201LN-MT-1/4hard	Fig.B.21	Window rail	-55800	-112	497.21	-4
SG350	HSLA 80	Fig.B.17	Bolster ss connect plate	-72000	-26100	1.76	-900

Compression at AW3 + 200 kip (Data point 17, Allowable = yield x 0.9):
(sorted by SG number)

SG	Material	Figure	SG installed on	Allow.	Stress (psi)	M.S.	Strain	
SG1	HSLA 80	Fig. B.1	Anticlimber bottom rib	-72000	-12412	4.80	-428	
SG2	HSLA 80	Fig. B.1	Anticlimber bottom web	-72000	-19140	2.76	-660	
SG3	HSLA 80	Fig. B.1	Anticlimber top web	-72000	-22185	2.25	-765	
SG4	HSLA 80	Fig. B.1	Anticlimber top rib	-72000	-19633	2.67	-677	
SG5	HSLA 80	Fig. B.1	End sill top plate	-72000	-4002	16.99	-138	
SG6	HSLA 80	Fig. B.1	End sill top plate	-72000	-4495	15.02	-155	
SG7	HSLA 80	Fig. B.1	End sill top plate	-72000	-16095	3.47	-555	
SG8	HSLA 80	Fig. B.1	End sill top plate	-72000	-19082	2.77	-658	
SG9	HSLA 80	Fig. B.1	End sill bottom plate	-72000	-11397	5.32	-393	
SG10	HSLA 80	Fig. B.2	End sill bottom plate	-72000	-40629	0.77	-1401	
SG11	HSLA 80	Fig. B.2	End sill back vertical doubler	72000	52432	0.37	1808	
SG12	HSLA 80	Fig. B.2	Draft sill under bottom lip	-72000	-23403	2.08	-807	
SG13	HSLA 80	Fig. B.2	End sill bottom plate	72000	19633	2.67	677	
SG14	HSLA 80	Fig. B.2	End sill bottom plate	-72000	-26013	1.77	-897	
SG15	HSLA 80	Fig. B.2	End sill bottom plate	-72000	-10469	5.88	-361	
SG16	HSLA 80	Fig. B.3	End sill top plate under gusse	72000	9396	6.66	324	
SG17	HSLA 80	Fig. B.3	End sill top plate under gusse	72000	43123	0.67	1487	
SG18	HSLA 80	Fig. B.3	Draft sill top plate at hole	-72000	-10179	6.07	-351	
SG19	HSLA 80	Fig. B.4	Bolster bottom plate	-72000	-34075	1.11	-1175	
SG20	HSLA 80	Fig. B.4	Bolster bottom plate	-72000	-2320	30.03	-80	
SG21	HSLA 80	Fig. B.4	Bolster bottom plate	72000	26400	1.73	rosette	Von Mises
SG22	HSLA 80	Fig. B.4	Bolster gusset	-72000	-2320	30.03	-80	
SG23	HSLA 80	Fig. B.4	Draft sill web at hole	-72000	-16907	3.26	-583	
SG24	HSLA 80	Fig. B.4	Bolster bottom plate	72000	15921	3.52	549	
SG25	HSLA 80	Fig. B.4	Bolster bottom plate	-72000	-13978	4.15	-482	
SG26	HSLA 80	Fig. B.4	Bolster bottom plate	-72000	-25375	1.84	-875	
SG27	HSLA 80	Fig. B.5	Bolster web around hole	-72000	-33205	1.17	-1145	
SG28	HSLA 80	Fig. B.5	Bolster web around hole	72000	10237	6.03	353	
SG29	HSLA 80	Fig. B.5	Bolster web around hole	72000	30276	1.38	1044	
SG30	HSLA 80	Fig. B.5	Bolster web around hole	-72000	-21402	2.36	-738	
SG31	HSLA 80	Fig. B.6	Draft sill flange around hole	-72000	-14297	4.04	-493	
SG32	HSLA 80	Fig. B.6	Bolster draft sill merge	-72000	-5365	12.42	-185	
SG33	HSLA 80	Fig. B.6	Bolster top plate	72000	36772	0.96	1268	
SG34	201LN-MT-1/4hard	Fig. B.6	Air duct top beam	67500	9884	5.83	353	
SG35	HSLA 80	Fig. B.7	Bolster top plate back	72000	25694	1.80	886	
SG36	HSLA 80	Fig. B.7	Bolster top plate back	72000	25810	1.79	890	
SG38	HSLA 80	Fig. B.8	Bolster bottom plate	-72000	-5423	12.28	-187	
SG39	201LN-MT-1/4hard	Fig. B.8	Side sill at bolster connect.	-55800	-27160	1.05	-970	
SG40	201LN-MT-1/4hard	Fig. B.8	Side sill at bolster connect.	-55800	-30911	0.81	-1104	
SG41	201LN-MT-1/4hard	Fig. B.8	Side sill at bolster connect.	-55800	-30771	0.81	-1099	
SG42	201LN-MT-1/4hard	Fig. B.8	Side sill at bolster connect.	-55800	-34631	0.61	-1237	
SG43	201LN-MT-1/4hard	Fig. B.9	Side sill top flange (sec.B-B)	-55800	-36585	0.53	-1307	
SG44	201LN-MT-1/4hard	Fig. B.9	Side sill top flange (sec.B-B)	-55800	-13272	3.20	-474	
SG45	201LN-MT-1/4hard	Fig. B.9	Side sill web (sec. B-B)	-55800	-16268	2.43	-581	
SG46	201LN-MT-1/4hard	Fig. B.9	Side sill bot flange (sec.B-B)	-55800	-28672	0.95	-1024	
SG47	201LN-MT-1/4hard	Fig. B.9	Side sill at end sill connec.	-55800	-13272	3.20	-474	
SG48	HSLA 80	Fig. B.9	Side sill at end sill connec.	-72000	-34568	1.08	-1192	
SG49	HSLA 80	Fig. B.9	Side sill at end sill connec.	-72000	-63705	0.13	-2197	
SG50	HSLA 80	Fig. B.9	Side sill at end sill connec.	-72000	-22156	2.25	-764	
SG51	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (sec.D-D)	67500	13188	4.12	471	
SG52	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (sec.D-D)	67500	43067	0.57	1542	
SG53	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (sec.D-D)	67500	11172	5.04	399	
SG54	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (sec.D-D)	-55800	-1008	54.36	-36	
SG55	201LN-MT-1/4hard	Fig. B.10	Side sill top flange (sec.C-C)	-55800	-25368	1.20	-906	
SG56	201LN-MT-1/4hard	Fig. B.10	Side sill web (sec. C-C)	-55800	-32283	0.73	-1153	
SG57	201LN-MT-1/4hard	Fig. B.10	Side sill bot flange (sec.C-C)	-55800	-48378	0.15	-1764	
SG58	201LN-MT-1/4hard	Fig. B.10	Side sill top flange (sec.C-C)	67500	5040	12.39	180	
SG59	201LN-MT-1/4hard	Fig. B.10	Side sill web (sec. C-C)	67500	8596	6.85	307	
SG60	201LN-MT-1/4hard	Fig. B.10	Door mask gusset	72000	4088	16.61	146	Trans. All.
SG61	201LN-MT-1/4hard	Fig. B.11	Side sill top flange (sec.E-E)	-55800	-28251	0.98	-1009	
SG62	201LN-MT-1/4hard	Fig. B.11	Side sill web (sec. E-E)	-55800	-20496	1.72	-732	
SG63	201LN-MT-1/4hard	Fig. B.11	Side sill bot flange (sec.E-E)	-55800	-22428	1.49	-801	
SG64	201LN-MT-1/4hard	Fig. B.11	Side sill top flange (sec.F-F)	-55800	-50549	0.10	-1879	
SG65	201LN-MT-1/4hard	Fig. B.11	Side sill web (sec. F-F)	-55800	-9632	4.79	-344	
SG66	201LN-MT-1/4hard	Fig. B.11	Side sill bot flange (sec.F-F)	-55800	-11900	3.69	-425	
SG67	201LN-MT-1/4hard	Fig. B.11	Bottom door mask (sec.G-G)	-55800	-5628	8.91	-201	
SG68	201LN-MT-1/4hard	Fig. B.11	Bottom door mask (sec.G-G)	-55800	-7560	6.38	-270	
SG69	201LN-MT-1/4hard	Fig. B.11	Bottom door mask (sec.G-G)	-55800	-4284	12.03	-153	
SG70	201LN-MT-1/4hard	Fig. B.11	Bottom door mask (sec.G-G)	-55800	-4620	11.08	-165	

Compression at AW3 + 200 kip (cont.):

SG	Material	Figure	SG installed on	Allow.	Stress (psi)	M.S.	Strain	
SG71	201LN-MT-1/4hard	Fig. B.11	Door mask gusset	-76000	-52553	0.45	-2015	Trans. All.
SG72	201LN-MT-1/4hard	Fig. B.12	Bottom of door post	67500	1120	59.27	40	
SG73	201LN-MT-1/4hard	Fig. B.12	Bottom of door post	-55800	-6916	7.07	-247	
SG74	201LN-MT-1/4hard	Fig. B.12	Door mask inside gusset	-55800	-10136	4.51	-362	
SG75	201LN-MT-1/4hard	Fig. B.12	Side sill at inside gusset	-55800	-19572	1.85	-699	
SG76	201LN-MT-1/4hard	Fig. B.12	Bottom of skin inside car	-55800	-16072	2.47	-574	
SG77	201LN-MT-1/4hard	Fig. B.13	Bottom of door post	67500	6664	9.13	238	
SG78	201LN-MT-1/4hard	Fig. B.13	Bottom of door post	67500	4144	15.29	148	
SG79	201LN-MT-1/4hard	Fig. B.13	Door mask inside gusset	-55800	-16212	2.44	-579	
SG80	201LN-MT-1/4hard	Fig. B.13	Side sill at inside gusset	-55800	-28896	0.93	-1032	
SG81	201LN-MT-1/4hard	Fig. B.14	Top outer door mask radius	-55800	-22036	1.53	-787	
SG82	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(bot.)	-55800	-15120	2.69	-540	
SG83	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(cent.)	-55800	-13076	3.27	-467	
SG84	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(top)	-55800	-21364	1.61	-763	
SG85	201LN-MT-1/4hard	Fig. B.15	Top outer door mask radius	67500	12880	4.24	460	
SG86	201LN-MT-1/4hard	Fig. B.15	Top door mask radius(bot.)	67500	8792	6.68	314	
SG87	201LN-MT-1/4hard	Fig. B.15	Top door mask radius(cent.)	67500	9212	6.33	329	
SG88	201LN-MT-1/4hard	Fig. B.15	Top door mask radius(top)	67500	11956	4.65	427	
SG89	201LN-MT-1/4hard	Fig. B.16	Inside roof gutter at door	67500	6636	9.17	237	
SG90	201LN-MT-1/4hard	Fig. B.16	Inside roof at door	67500	336	199.89	12	
SG91	201LN-MT-1/4hard	Fig. B.16	Inside roof gutter at door	-55800	-10332	4.40	-369	
SG92	201LN-MT-1/4hard	Fig. B.16	Inside roof at door	-55800	-3976	13.03	-142	
SG93	201LN-MT-1/4hard	Fig. B.17	Side sill top flange (sec.H-H)	67500	3696	17.26	132	
SG99l	HSLA 80	Fig. B.17	Back of bolster at side sill (in	-72000	-42920	0.68	-1480	
SG95	201LN-MT-1/4hard	Fig. B.17	Side sill bot flange (sec.H-H)	-55800	-23380	1.39	-835	
SG96	201LN-MT-1/4hard	Fig. B.17	Side sill top flange (sec.J-J)	-55800	-17164	2.25	-613	
SG97	201LN-MT-1/4hard	Fig. B.17	Side sill web (sec.J-J)	-55800	-21728	1.57	-776	
SG98	201LN-MT-1/4hard	Fig. B.17	Side sill bot flange (sec.J-J)	-55800	-20747.9988	1.6894	-741	
SG99u	HSLA 80	Fig. B.17	Back of bolster at side sill (ou	-72000	-30827	1.34	-1063	
SG100	HSLA 80	Fig. B.17	Front of bolster at side sill	72000	9889	6.28	341	
SG101	HSLA 80	Fig. B.1	Anticlimber bottom rib	-72000	-12876	4.59	-444	
SG102	HSLA 80	Fig. B.1	Anticlimber bottom web	-72000	-19691	2.66	-679	
SG103	HSLA 80	Fig. B.1	Anticlimber top web	-72000	-22417	2.21	-773	
SG104	HSLA 80	Fig. B.1	Anticlimber top rib	-72000	-19604	2.67	-676	
SG105	HSLA 80	Fig. B.1	End sill top plate	-72000	-2204	31.67	-76	
SG106	HSLA 80	Fig. B.1	End sill top plate	-72000	-3074	22.42	-106	
SG107	HSLA 80	Fig. B.1	End sill top plate	-72000	-16443	3.38	-567	
SG110	HSLA 80	Fig. B.2	End sill bottom plate	-72000	-40165	0.79	-1385	
SG112	HSLA 80	Fig. B.2	Draft sill under bottom lip	-72000	-22040	2.27	-760	
SG118	HSLA 80	Fig. B.3	Draft sill top plate at hole	-72000	-10875	5.62	-375	
SG119	HSLA 80	Fig. B.4	Bolster bottom plate	-72000	-25433	1.83	-877	
SG120	HSLA 80	Fig. B.4	Bolster bottom plate	-72000	-2146	32.55	-74	
SG122	HSLA 80	Fig. B.4	Bolster gusset	-72000	-2291	30.43	-79	
SG124	HSLA 80	Fig. B.4	Bolster bottom plate	-72000	-14529	3.96	-501	
SG125	HSLA 80	Fig. B.4	Bolster bottom plate	72000	16791	3.29	579	
SG127	HSLA 80	Fig. B.5	Bolster web around hole	-72000	-32538	1.21	-1122	
SG128	HSLA 80	Fig. B.5	Bolster web around hole	72000	12992	4.54	448	
SG129	HSLA 80	Fig. B.5	Bolster web around hole	72000	33118	1.17	1142	
SG130	HSLA 80	Fig. B.5	Bolster web around hole	-72000	-20474	2.52	-706	
SG131	HSLA 80	Fig. B.6	Draft sill flange around hole	-72000	-13485	4.34	-465	
SG132	HSLA 80	Fig. B.6	Bolster draft sill merge	72000	21257	2.39	733	
SG134	201LN-MT-1/4hard	Fig. B.6.b	Air duct top beam	67500	8904	6.58	318	
SG136	HSLA 80	Fig. B.7	Bolster top plate back	72000	26883	1.68	927	
SG137	201LN-MT-1/4hard	Fig.B.9	secondary air duct	67500	11732	4.75	419	
SG139	HSLA 80	Fig.B.9	Side sill at end sill connec.	-72000	-20416	2.53	-704	
SG140	201LN-MT-1/4hard	Fig.b 6 c	secondary air duct(137)	67500	14980	3.51	535	
SG141	201LN-MT-1/4hard	Fig.b 6 c	secondary air duct(34)	67500	11984	4.63	428	
SG143	201LN-MT-1/4hard	Fig. B.9	Side sill top flange (sec.B-B)	-55800	-38807	0.44	-1387	
SG144	201LN-MT-1/4hard	Fig. B.9	Side sill top flange (sec.B-B)	-55800	-11004	4.07	-393	
SG145	201LN-MT-1/4hard	Fig. B.9	Side sill web (sec. B-B)	-55800	-14308	2.90	-511	
SG146	201LN-MT-1/4hard	Fig. B.9	Side sill bot flange (sec.B-B)	-55800	-25144	1.22	-898	
SG150	201LN-deadlight	Fig. B.25	Skin (for buckling) End #1 LH	45000	2324	18.36	83	
SG151	201LN-deadlight	Fig. B.25	Skin (for buckling) End #1 LH	-37800	-2548	13.84	-91	
SG152	201LN-deadlight	Fig. B.25	Skin (for buckling) End #2 LH	-37800	-364	102.85	-13	
SG153	201LN-deadlight	Fig. B.25	Skin (for buckling) End #2 LH	-37800	-8204	3.61	-293	
SG154	201LN-MT-1/4hard	Fig. B.10	Bottom door mask (in line with	67500	13020	4.18	465	
SG155	201LN-MT-1/4hard	Fig. B.10	Side sill top flange (sec.C-C)	-55800	-23184	1.41	-828	
SG156	201LN-MT-1/4hard	Fig. B.10	Side sill web (sec. C-C)	-55800	-29428	0.90	-1051	
SG157	201LN-MT-1/4hard	Fig. B.10	Side sill bot flange (sec.C-C)	-55800	-40021	0.39	-1431	
SG158	HSLA 80	Fig.B.2	draft sill web at hole	-72000	-31987	1.25	-1103	
SG159	HSLA 80	Fig.B.2	draft sill web at hole	-72000	-30682	1.35	-1058	

Compression at AW3 + 200 kip (cont.):

SG	Material	Figure	SG installed on	Allow.	Stress (psi)	M.S.	Strain	
SG160	201LN-MT-1/4hard	Fig. B.10	Door mask gusset	72000	19012	2.79	679	Trans. All.
SG164	201LN-MT-1/4hard	Fig. B.11	Side sill top flange (sec.F-F)	-55800	-51591	0.08	-1945	
SG165	201LN-MT-1/4hard	Fig. B.11	Side sill web (sec. F-F)	-55800	-3584	14.57	-128	
SG166	201LN-MT-1/4hard	Fig. B.11	Side sill bot flange (sec.F-F)	-55800	-9800	4.69	-350	
SG167	HSLA 80	Fig.B.2	draft sill web at tampon	-72000	-8990	7.01	-310	
SG168	HSLA 80	Fig.B.2	draft sill web at tampon	-72000	-8149	7.84	-281	
SG169	201LN-MT-1/4hard	Fig.b.21	side corrugation at seam weld	-55800	-616	89.58	-22	
SG170	201LN-MT-1/4hard	Fig.b.21	side corrugation at seam weld	-55800	-28	1991.86	-1	
SG171	HSLA 80	Fig.b.6-c	back bolster at side sill (200)	-72000	-14819	3.86	-511	
SG172	201LN-MT-1/4hard	Fig.b.6-c	side sill at bolster (203)	-55800	-7504	6.44	-268	
SG182	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(bot.)	-55800	-15568	2.58	-556	
SG183	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(cent.)	-55800	-15428	2.62	-551	
SG184	201LN-MT-1/4hard	Fig. B.14	Top door mask radius(top)	-55800	-29036	0.92	-1037	
SG193	201LN-MT-1/4hard	Fig. B.17	Side sill top flange (sec.H-H)	67500	3836	16.60	137	
SG195	201LN-MT-1/4hard	Fig. B.17	Side sill bot flange (sec.H-H)	-55800	-24920	1.24	-890	
SG199	HSLA 80	Fig. B.17	Back of bolster at side sill	-72000	-40368	0.78	-1392	
SG200	HSLA 80	Fig. B.17	Back of bolster at side sill	-72000	-31262	1.30	-1078	
SG201	201LN-MT-1/4hard	Fig. B.17	Window post gusset at bolst.	-55800	-812	67.72	-29	
SG202	201LN-MT-1/4hard	Fig. B.17	Window post gusset at bolst.	-55800	-924	59.39	-33	
SG203	201LN-MT-1/4hard	Fig. B.17	Side sill at bolst.	-55800	-7028	6.94	-251	
SG204	201LN-MT-1/4hard	Fig. B.18	1st crossbeam flange at cente	-55800	-896	61.28	-32	
SG205	201LN-MT-1/4hard	Fig. B.18	2nd crossbeam flange at cent	-55800	-6216	7.98	-222	
SG206	201LN-MT-1/4hard	Fig. B.19	2nd crossbeam bottom flange	67500	11060	5.10	395	
SG207	201LN-MT-1/4hard	Fig. B.19	1st crossbeam flange at cente	67500	7140	8.45	255	
SG209	201LN-MT-1/4hard	Fig. B.20	Side sill top flange (sec.K-K)	-55800	-19740	1.83	-705	
SG210	201LN-MT-1/4hard	Fig. B.20	Side sill bot flange (sec.K-K)	-55800	-20076	1.78	-717	
SG211	201LN-MT-1/4hard	Fig. B.21	Window rail at 1st hole (sash)	-55800	-672	82.04	-24	
SG212	201LN-MT-1/4hard	Fig. B.21	Sash window post	-55800	-1596	33.96	-57	
SG213	201LN-MT-1/4hard	Fig. B.21	Sash window at skin side	67500	392	171.19	14	
SG214	201LN-MT-1/4hard	Fig. B.21	Sash window post	-55800	-3500	14.94	-125	
SG215	201LN-MT-1/4hard	Fig. B.21	Sash window 2nd post	-55800	-12936	3.31	-462	
SG216	201LN-MT-1/4hard	Fig. B.21	Window rail at 2nd hole (sash	-55800	-6412	7.70	-229	
SG217	201LN-MT-1/4hard	Fig. B.21	Window rail	-55800	-1988	27.07	-71	
SG218	201LN-MT-1/4hard	Fig. B.21	Window rail	-55800	-3808	13.65	-136	
SG219	201LN-MT-1/4hard	Fig. B.21	Window rail	-55800	-840	65.43	-30	
SG220	201LN-MT-1/4hard	Fig. B.21	Window post web	-55800	-6048	8.23	-216	
SG221	201LN-deadlight	Fig. B.21	At window bot. inside radius	-37800	-728	50.92	-26	
SG222	201LN-deadlight	Fig. B.21	At window bot. inside radius	45000	1596	27.20	57	
SG223	201LN-deadlight	Fig. B.21	At window top inside radius	45000	3444	12.07	123	
SG224	201LN-deadlight	Fig. B.21	At window top inside radius	-37800	-1512	24.00	-54	
SG225	201LN-deadlight	Fig. B.22	At window radius (center area	-37800	-252	149.00	-9	
SG226	201LN-deadlight	Fig. B.22	At window radius (center area	45000	28	1606.14	1	
SG227	201LN-deadlight	Fig. B.22	At window radius (center area	45000	56	802.57	2	
SG228	201LN-deadlight	Fig. B.22	At window radius (center area	45000	728	60.81	26	
SG229	201LN-MT-1/4hard	Fig. B.23	Roof rail at door carline clip	67500	2688	24.11	96	
SG230	201LN-MT-1/4hard	Fig. B.23	Door carline clip (x= -96.438)	67500	1540	42.83	55	
SG231	201LN-MT-1/4hard	Fig. B.23	Door carline clip (x= -96.438)	67500	1680	39.18	60	
SG232	201LN-MT-1/4hard	Fig. B.23	Roof carline web (x= -96.438)	-55800	-7420	6.52	-265	
SG233	201LN-MT-1/4hard	Fig. B.23	Roof carline bottom flange	-55800	-5656	8.87	-202	
SG234	201LN-MT-1/4hard	Fig. B.23	Roof carline flange at center	-55800	-4228	12.20	-151	
SG235	201LN-MT-1/4hard	Fig. B.23	Roof carline web at center	-55800	-5460	9.22	-195	
SG236	201LN-MT-1/4hard	Fig. B.23	Roof carline flange at center	67500	3472	18.44	124	
SG237	201LN-MT-1/4hard	Fig. B.24	Roof rail at door carline clip	-55800	-9492	4.88	-339	
SG238	201LN-MT-1/4hard	Fig. B.24	Door carline clip (x= -151.97)	-55800	-5236	9.66	-187	
SG239	201LN-MT-1/4hard	Fig. B.24	Door carline clip (x= -151.97)	67500	784	85.10	28	
SG240	201LN-MT-1/4hard	Fig. B.24	Roof carline web (x= -151.97)	-55800	-1680	32.21	-60	
SG241	201LN-MT-1/4hard	Fig. B.24	Roof carline bottom flange	-55800	-1176	46.45	-42	
SG242	201LN-MT-1/4hard	Fig. B.24	Roof carline flange at center	67500	476	140.81	17	
SG243	201LN-MT-1/4hard	Fig. B.24	Roof carline web at center	67500	252	266.86	9	
SG244	201LN-MT-1/4hard	Fig. B.24	Roof carline flange at center	-55800	-812	67.72	-29	
SG245	201LN-MT-1/4hard	Fig. B.20	Side sill web (sec.K-K)	-55800	-21868	1.55	-781	
SG309	201LN-MT-1/4hard	Fig. B.20	Side sill top flange (sec.K-K)	-55800	-19180	1.91	-685	
SG310	201LN-MT-1/4hard	Fig. B.20	Side sill bot flange (sec.K-K)	-55800	-21504	1.59	-768	
SG329	201LN-MT-1/4hard	Fig. B.23	Roof rail at door carline clip	67500	3612	17.69	129	
SG330	201LN-MT-1/4hard	Fig. B.23	Door carline clip (x= -96.438)	67500	252	266.86	9	
SG331	201LN-MT-1/4hard	Fig. B.23	Door carline clip (x= -96.438)	67500	1876	34.98	67	
SG337	201LN-MT-1/4hard	Fig. B.24	Roof rail at door carline clip	-55800	-7700	6.25	-275	
SG338	201LN-MT-1/4hard	Fig. B.24	Door carline clip (x= -151.97)	-55800	-6160	8.06	-220	
SG339	201LN-MT-1/4hard	Fig. B.24	Door carline clip (x= -151.97)	-55800	-2016	26.68	-72	
SG345	201LN-MT-1/4hard	Fig. B.20	Side sill web (sec.K-K)	-55800	-20916	1.67	-747	
SG346	201LN-MT-1/4hard	Fig. B.25	Roof ream weld	-55800	-1848	29.19	-66	
SG347	201LN-MT-1/4hard	Fig.B.25	Roof ream weld	67500	308	218.16	11	
SG349	201LN-MT-1/4hard	Fig.B.21	Window rail	-55800	-420	131.86	-15	
SG350	HSLA 80	Fig.B.17	Bolster ss connect plate	-72000	-25143	1.86	-867	

APPENDIX E

Camber Measurement Sheet

Carbody Camber Measurement Sheet:

	Initial camber reading (1)		Camber at AW0 Reading (2)		Camber at AW3 Reading (3)		Residual camber reading (4)	
	Rec data point num: (1) M		Rec data point num: (2) M		Rec data point num: (11) M		Rec data point num: (21) M	
Carbody Right Side								
#1-end Bolster	2 5/16	2 9/16	2 9/16	2 9/16	2 9/16	2 5/16	2 9/16	2 9/16
Car Center	2	2 1/32	2 3/16	2 3/16	2 11/32	2 3/8	2	2 1/32
#2-end Bolster	2 9/16	2 9/16	2 9/16	2 9/16	2 5/16	2 5/16	2 9/16	2 9/16
Carbody Left Side								
#1-end Bolster	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8
Car Center	2 1/16	2 1/16	2 1/4	2 3/16	2 3/8	2 13/32	2 1/16	2 1/16
#2-end Bolster	2 11/16	2 31/32	2 11/16	2 11/16	2 11/16	2 11/16	2 5/8	2 21/32

Camber = 0.56

0.23 = Residual camber

△ displacement = 0.56 - 0.23 = 0.33"

Signatures: _____ Date: 15 october 2008

CTA Representative

[redacted]

APPENDIX F

Compression Test Results Review of the Projected Crushing Behavior

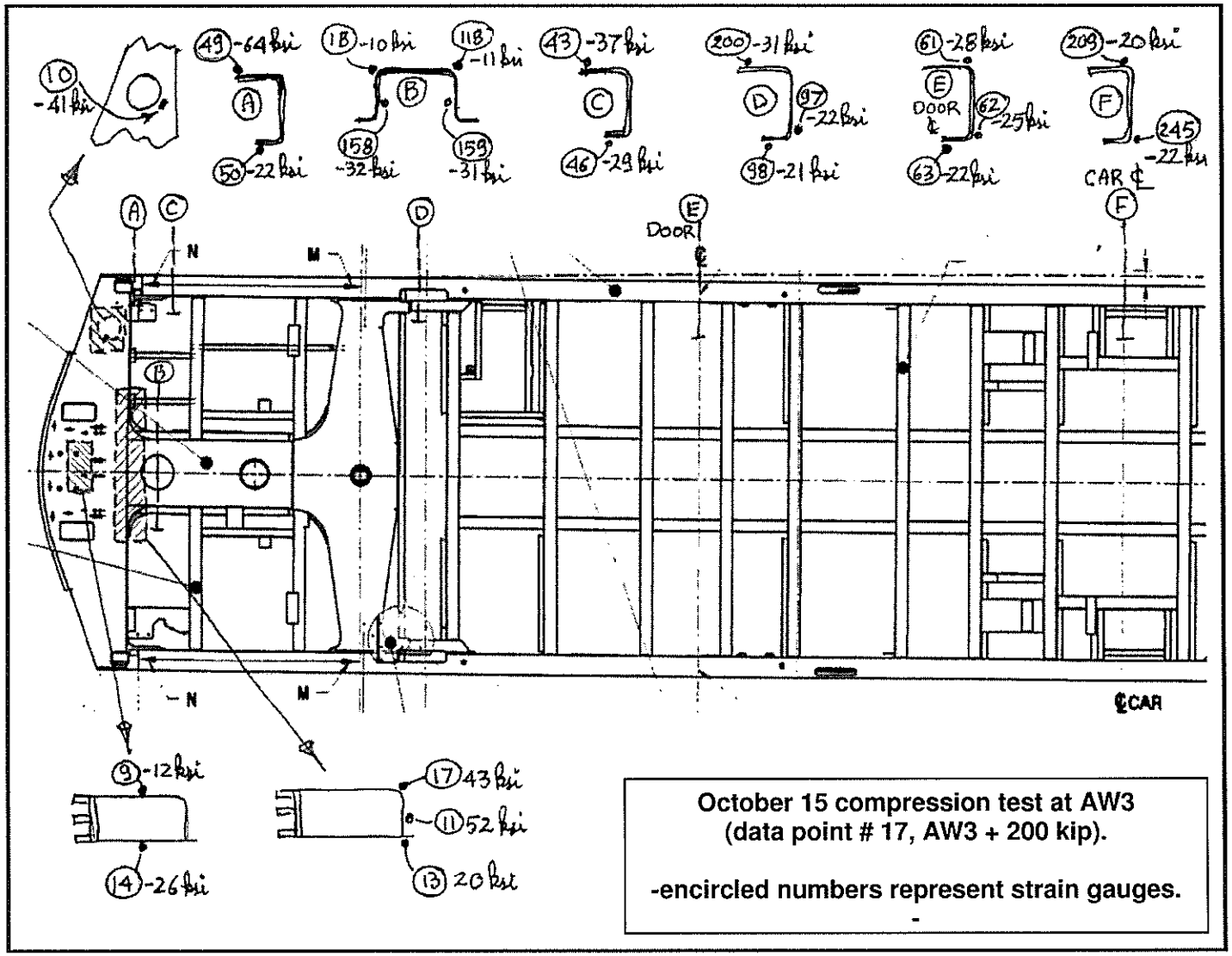
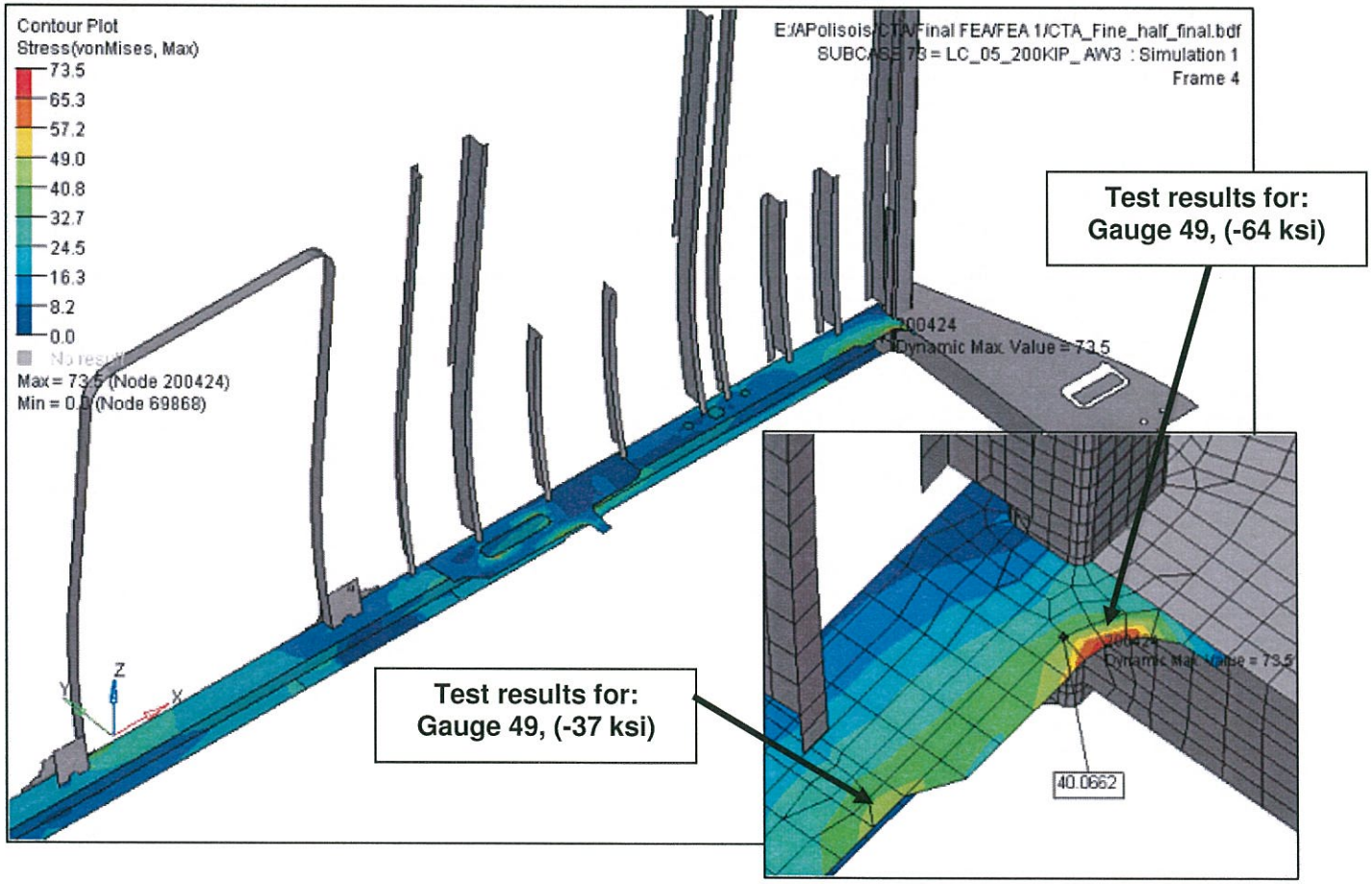


Figure F.1, Carbody Stress distribution during the compression test.



Figure·4.4.1·Side·sill·maximum·stress·for·LC_05·(200·kip·+·AW3)¶

Figure F.2, Side sill FEA Analysis results correlation (ref. 5, p. 52)

→ → σ_{CR} = -39 ksi x 90% = -35 ksi for the side sill top lip at the door region¶

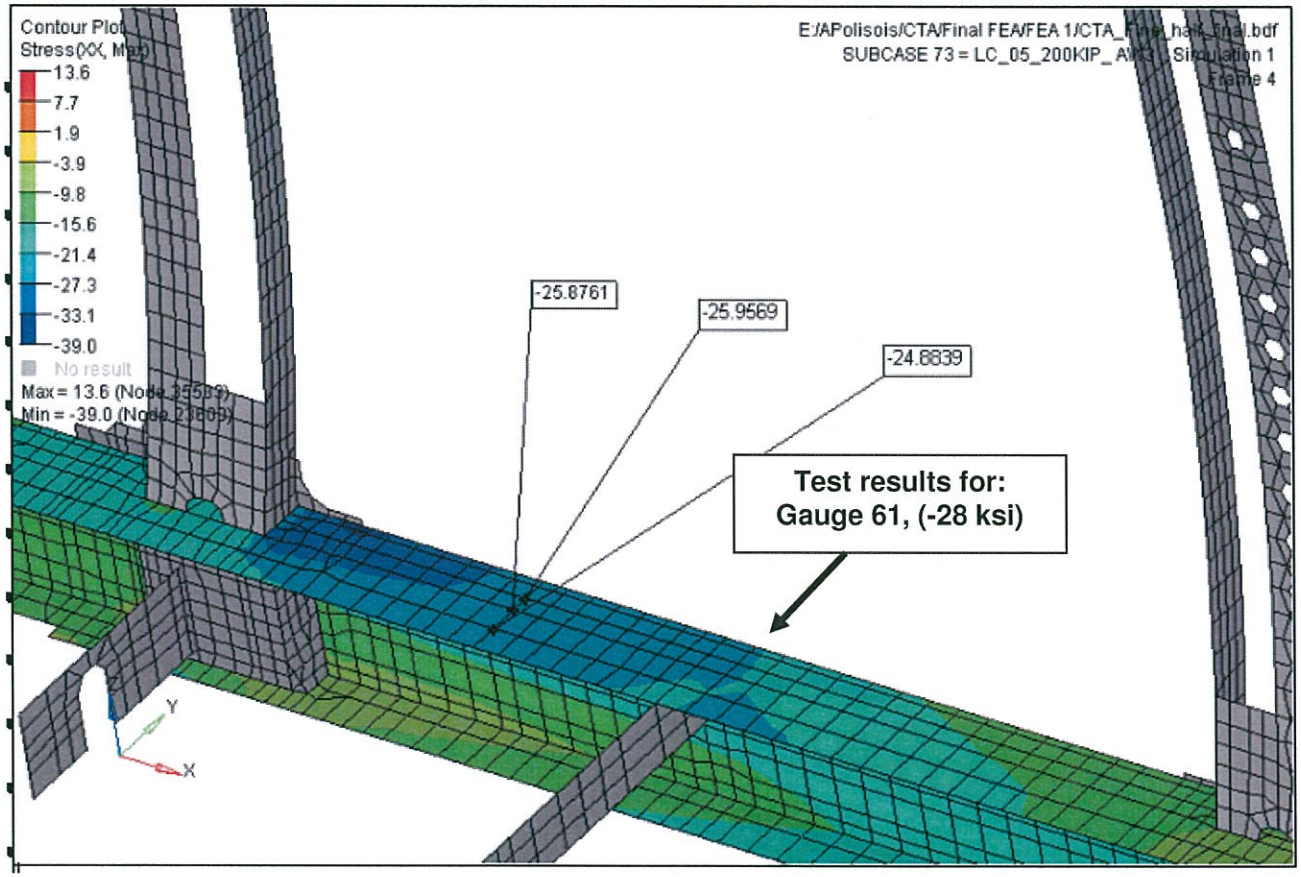


Figure 4.4.3 Side sill top plate nominal compression stress (Sxx)¶

Figure F.3, Side sill FEA Analysis results correlation (ref. 5, p. 54)

4.1 → End sill:¶

Von Mises stresses are reviewed for the end sill for all load cases. Results are presented for the most severe load case which is LC_05 : Compressive end load of 200 kip at AW3. The allowable stress for this load case is 90% of yield.¶

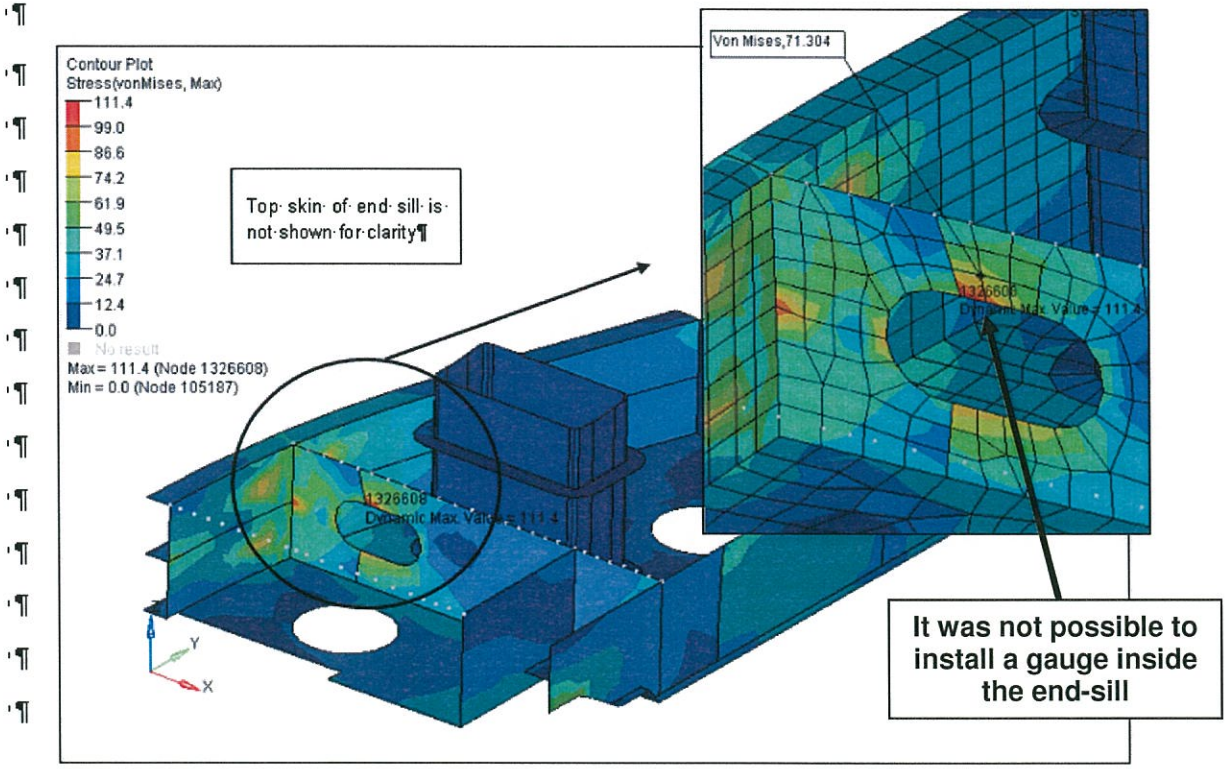
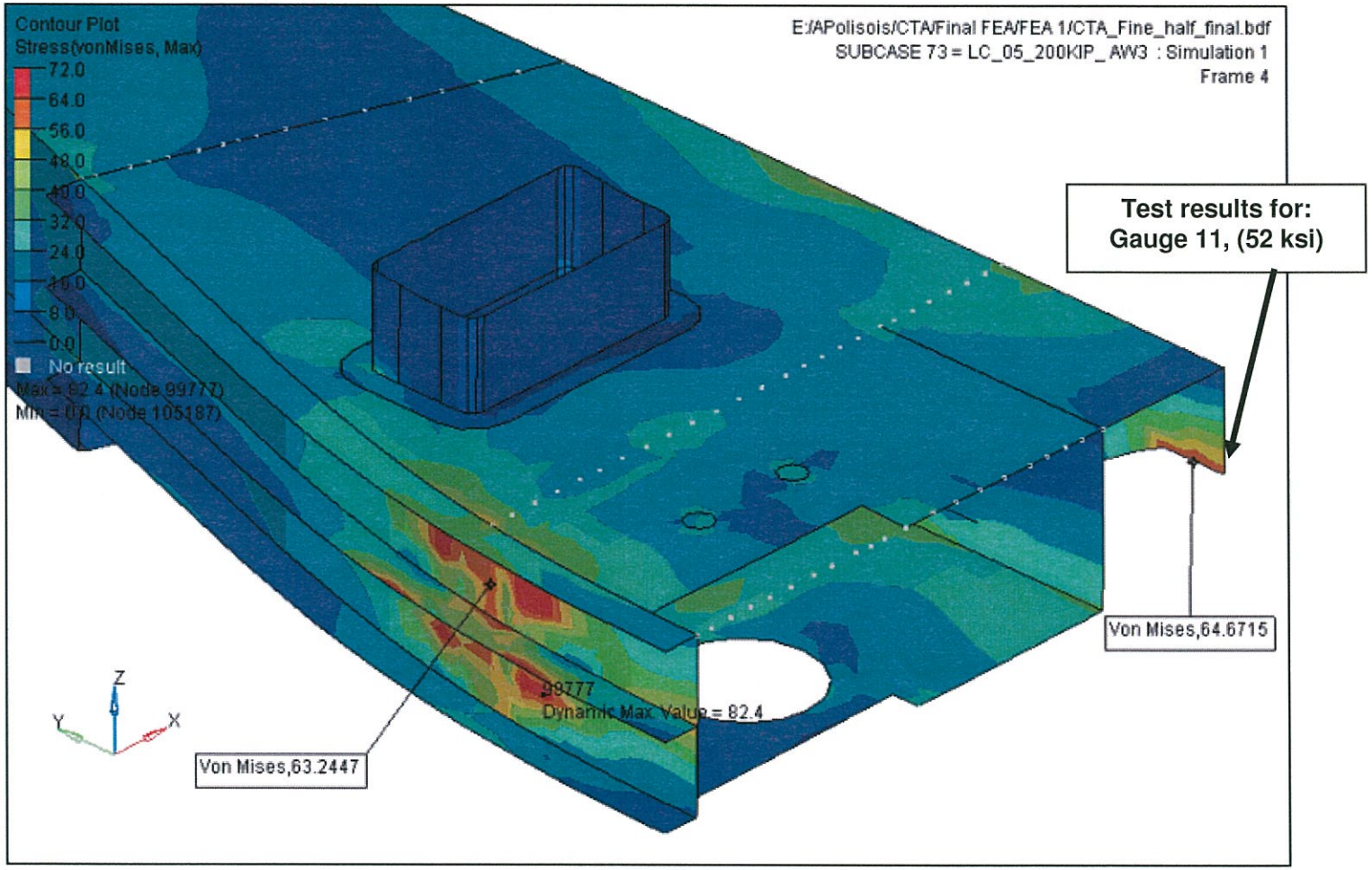


Figure 4.1.1 End sill maximum stress for LC_05 (200 kip + AW3)¶

Figure F.4, End sill FEA Analysis results correlation (ref. 5, p. 42).



Figure·4.1.2·End·sill·next·higher·stresses¶

Figure F.5, End sill FEA Analysis results correlation (ref. 5, p. 43) .

→ σ_{CR} = -21 ksi x 90% = -19 ksi¶

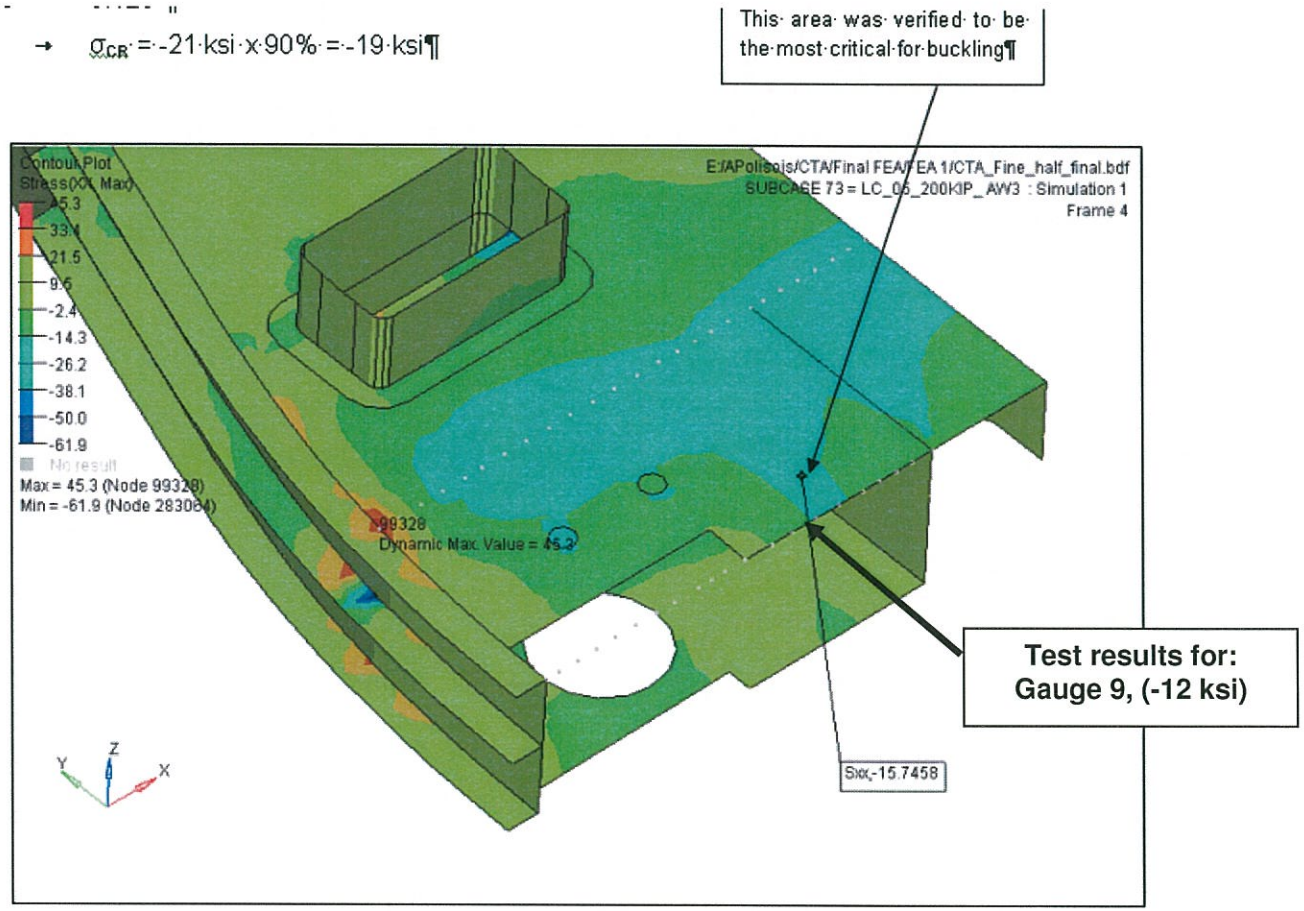
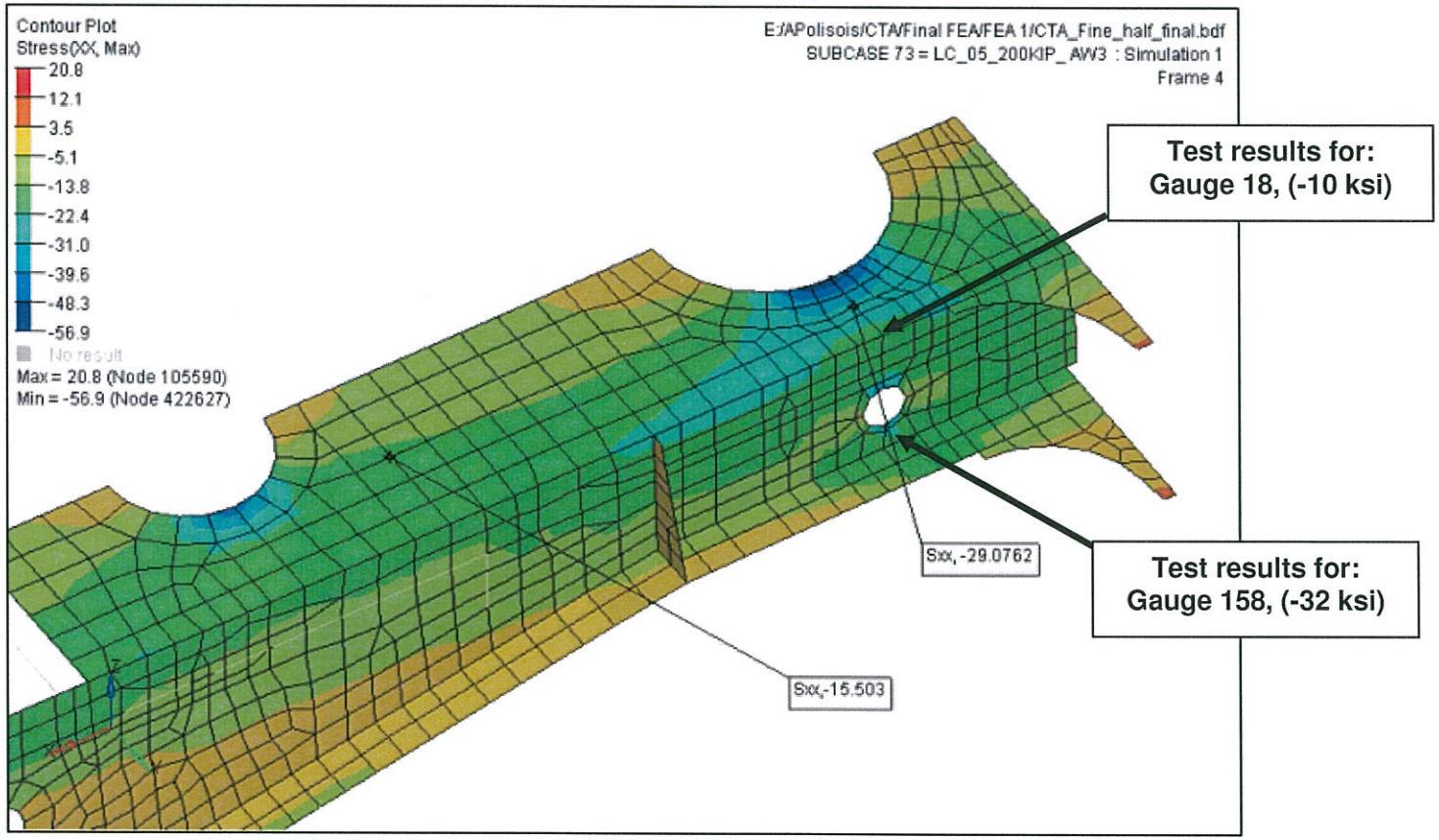


Figure 4.1.3 End sill top plate compression stress (Sxx) for LC_05 (200 kip + AW3)¶

Figure F.6, End sill FEA Analysis results correlation (ref. 5, p. 44)..



Figure·4.2.2·End·sill·top·plate·compression·stress·(Sxx)·for·LC_05·(200·kip·+·AW3)¶

Figure F.7, Draft sill FEA Analysis results correlation (ref. 5, p. 46).

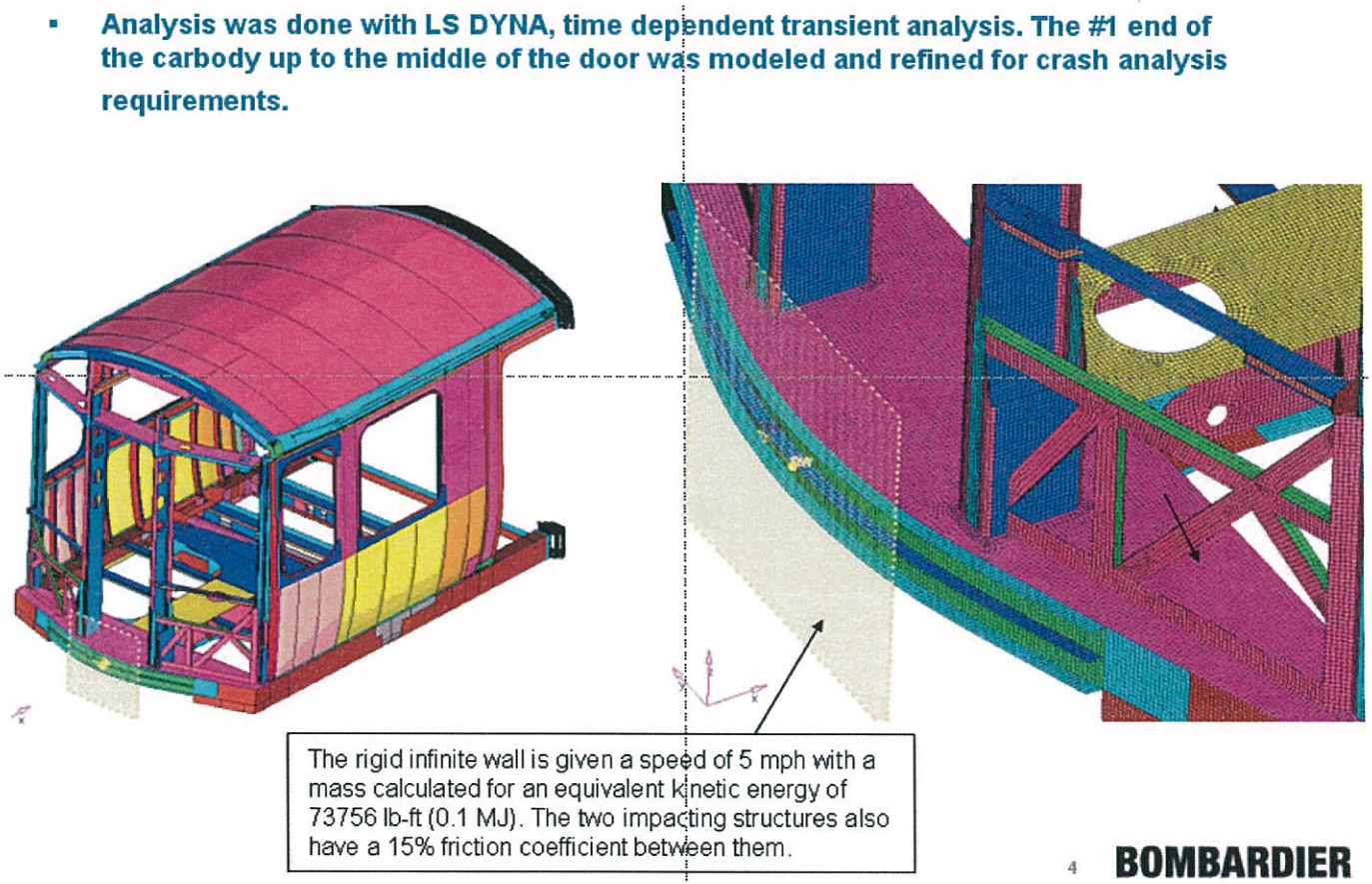


Figure F.8, End sill Crash Analysis load application (ref. 4).
The test loads were applied with an adaptor(ref. 2).

- **Overall maximum plastic strain 69.39% at the end of the analysis. Maximum plastic strain is at the end sill main rib with the advanced holes.**

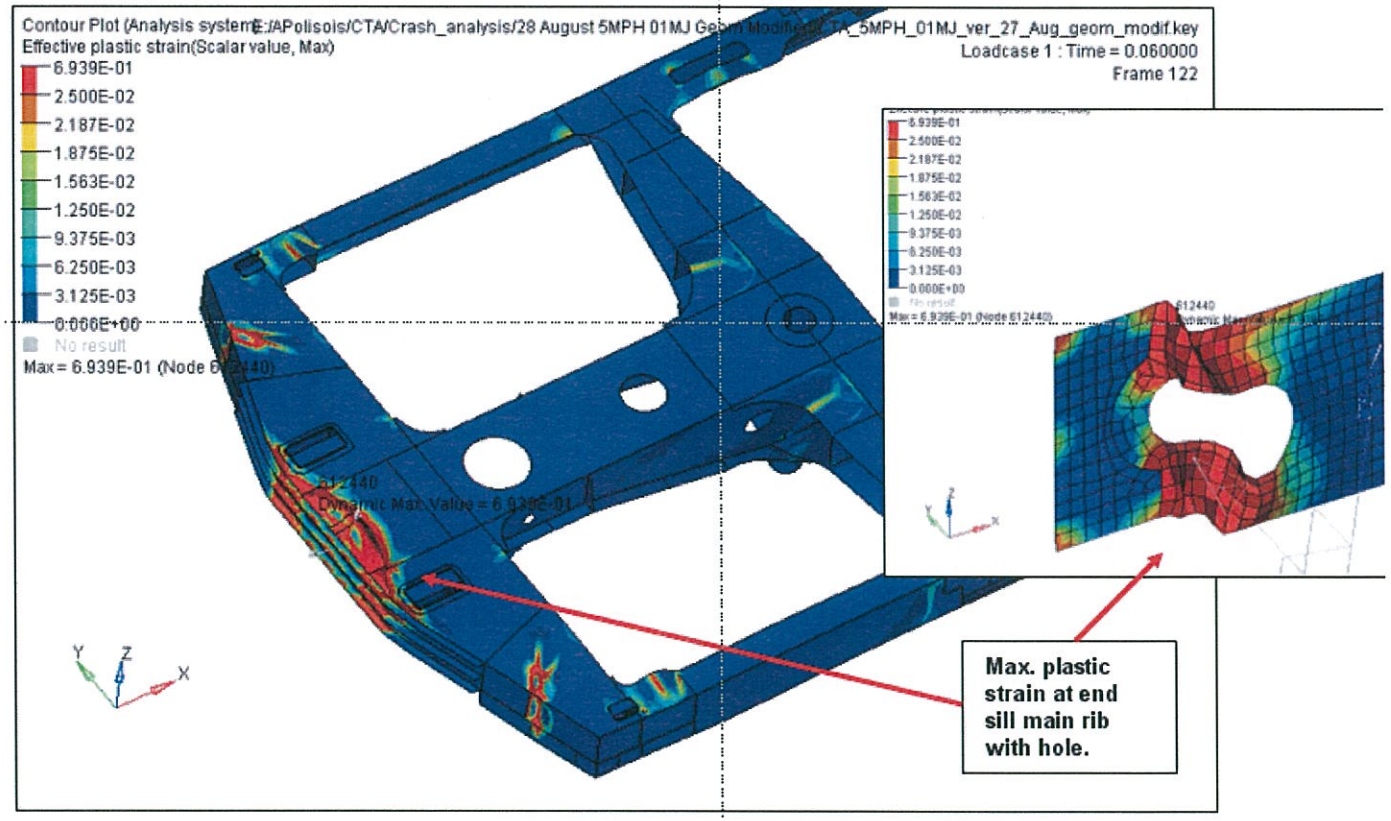


Figure F.9, End sill Crash Analysis showing the trigger mechanism of the end sill crushing (ref. 4)

APPENDIX G

Skin buckling (oil canning)

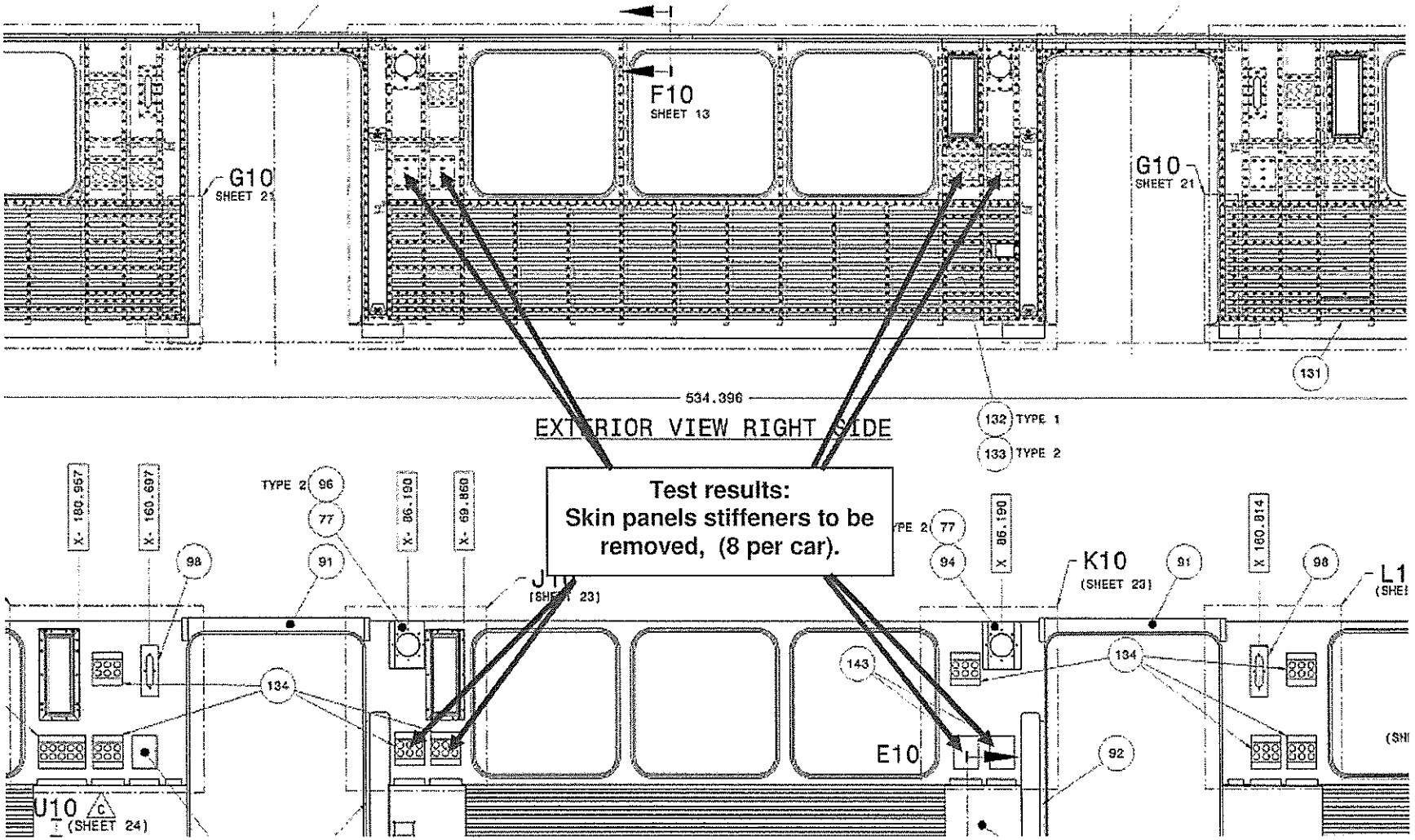
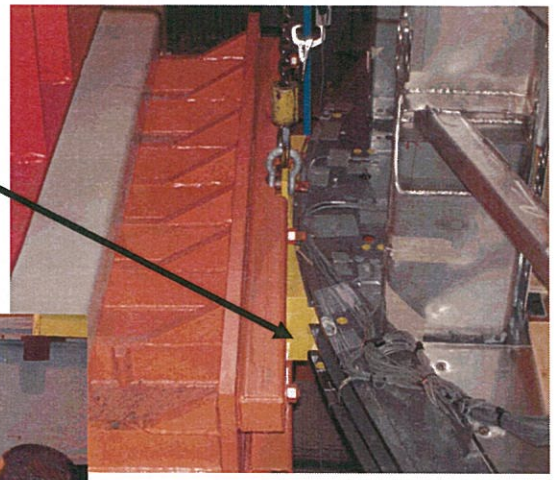


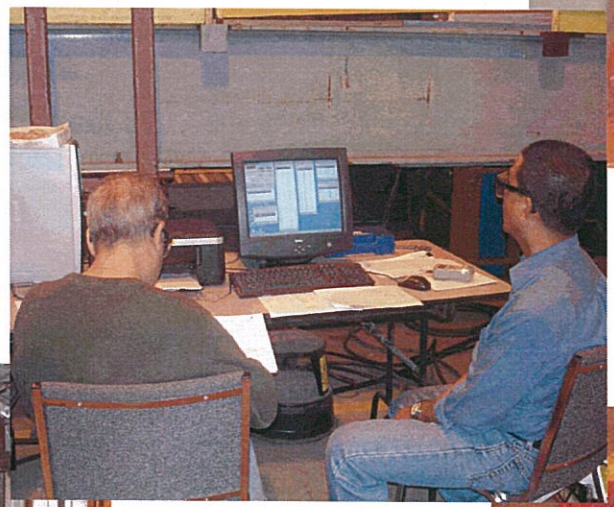
Figure G.1, Stiffeners (8) of side frame skin panels to be removed (ref. dwg A-319-0008-10 rev. C).

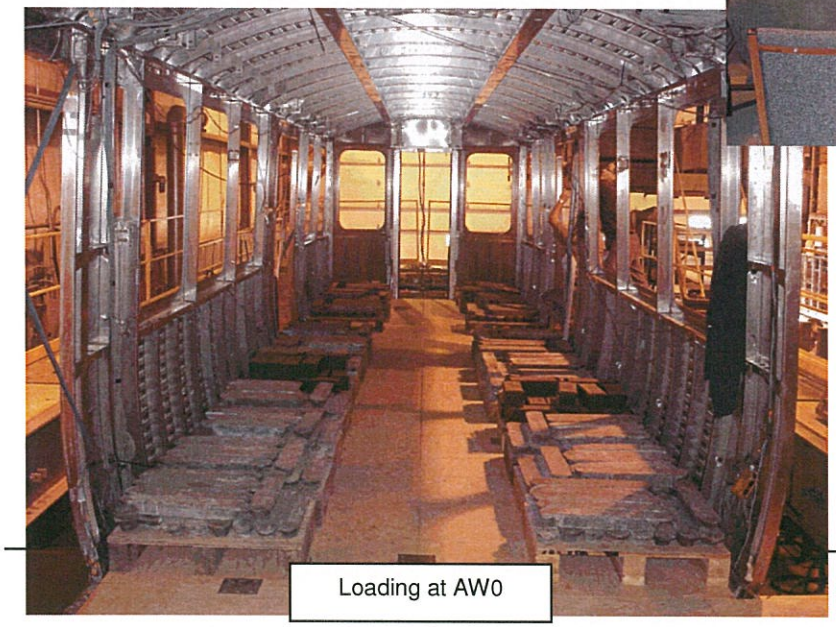
APPENDIX H

Photographs

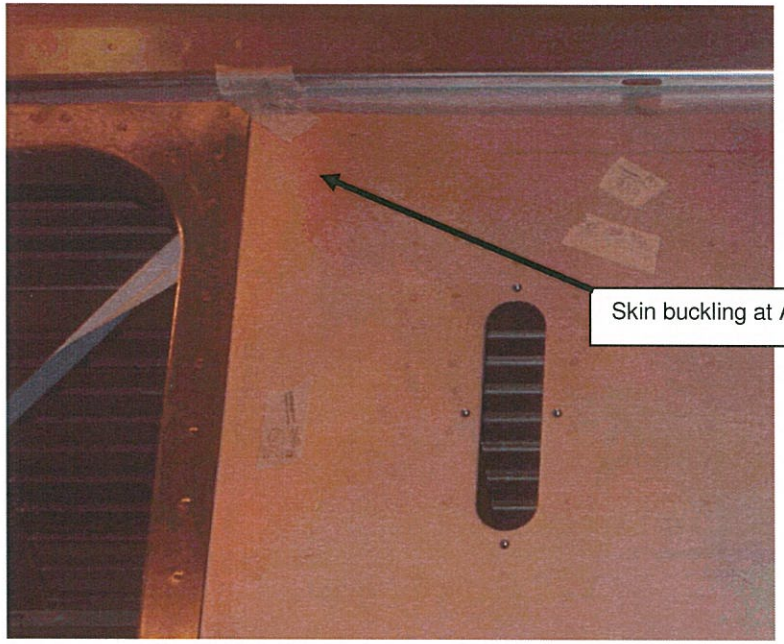
H.1- Test pictures:

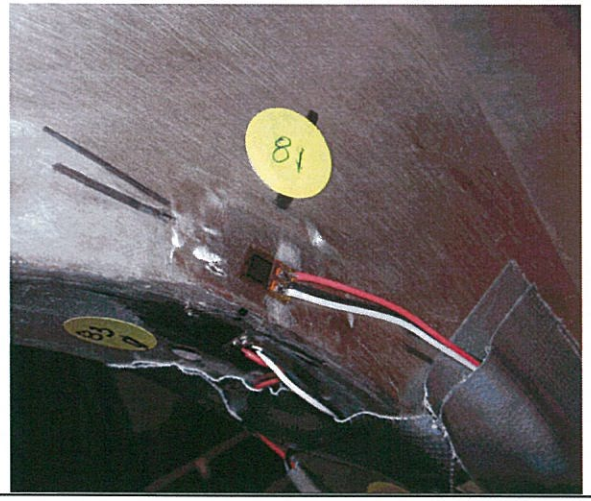




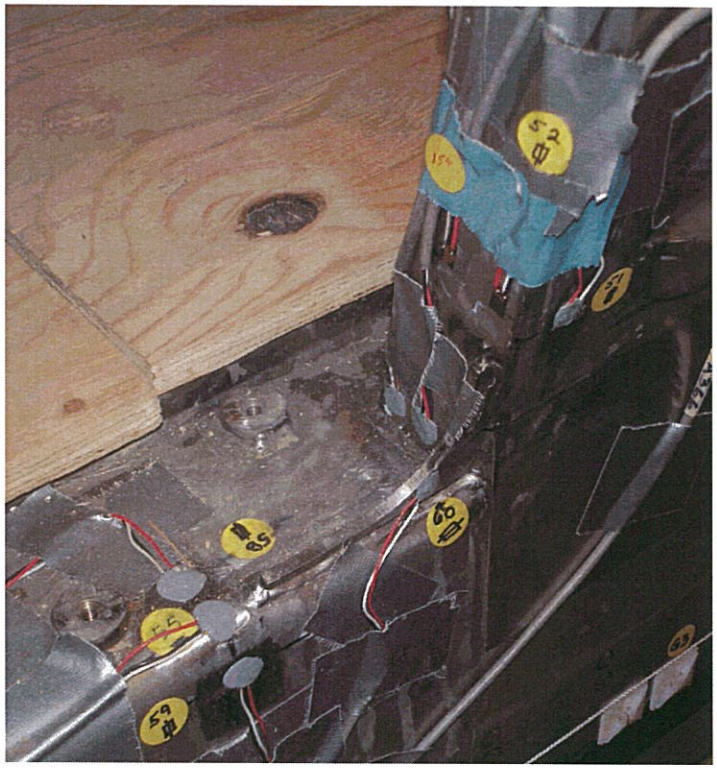


H.2- Pictures of skin buckling at door corner and critical gauges:



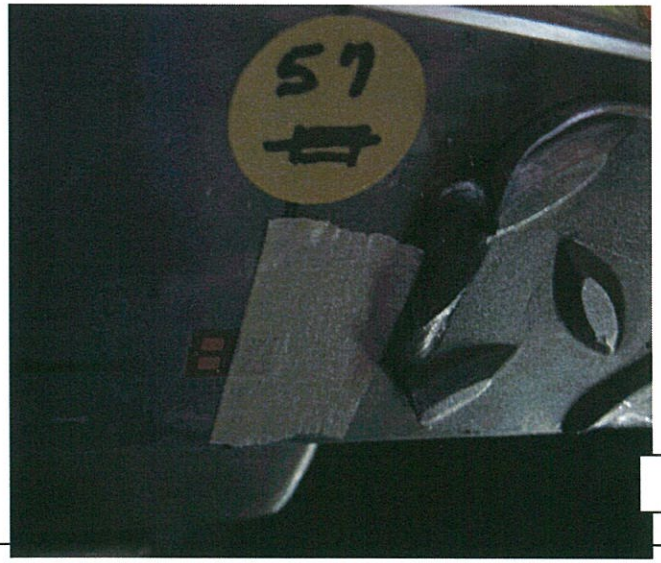


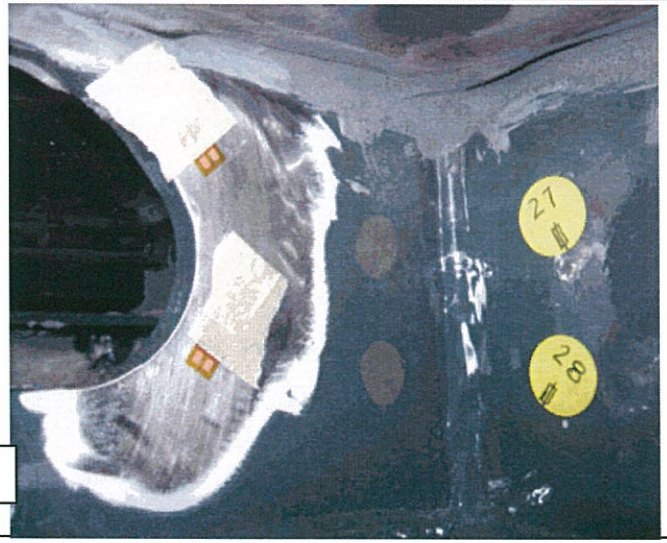
Pictures of critical gauges (cont.):



Critical strain gauges

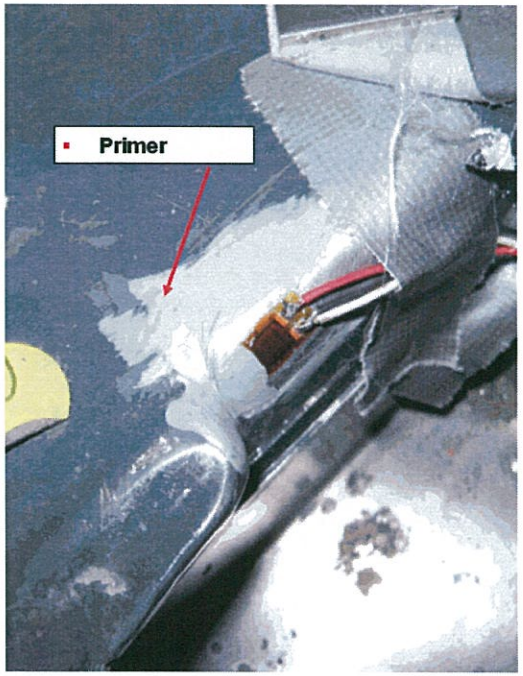
Pictures of critical gauges (cont.):

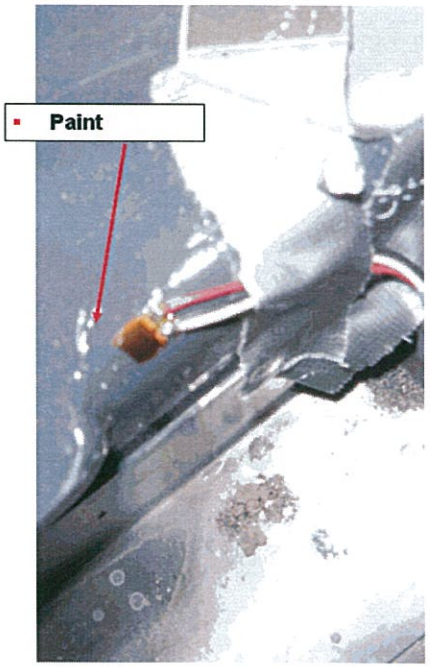




Critical strain gauges

H.3- Pictures of some of the strain gauges installed under the plymetal floor:





Pictures of some of the strain gauges installed under the plymetal floor (cont.):