U.S. Department of Energy

Office of River Protection

P.O. Box 450
Richland, Washington 99352

03-OSR-0441 December 8, 2003

Mr. J. P. Henschel, Project Director
Bechtel National, Inc.
2435 Stevens Center
Richland, Washington 99352

Dear Mr. Henschel:

CONTRACT NO. DE-AC27-01RV14136 – AUTHORIZATION TO PLACE CONCRETE FOR WALLS 47A, 47B, 48A, 48B, 60A, 60B, 62A, 62B, 62C, 62D, 65A, 65B, 70A, 70B, 70C, 72A, 72B, 75, 76, 79, and 80 (SATISFACTION OF AUTHORIZATION BASIS CHANGE CONDITION OF APPROVAL FOR THESE WALLS)

References:

1. ORP letter from R. J. Schepens to J. P. Henschel, BNI, "Partial, Conditional Approval of Bechtel National, Inc. (BNI) Authorization Basis Amendment Request (ABAR) 24590-WTP-SE-ENS-03-111, Revision 1," 03-OSR-0375, dated October 20, 2003.

2. BNI memorandum from S. Martin and J. White to K. Chen and L. Miller, ORP, "Transmittal of Revised SASSI Rev. 0B vs. 1.5 x Peak Force Comparison Results for HLW Walls 70A, 70B, 70C, 72A, 72B, 47A, 47B, 62A, 62B, 62C, and 62D," CCN: 075168, dated November 26, 2003.

3. BNI memorandum from S. Martin and J. White to K. Chen and L. Miller, ORP, "Transmittal of SASSI Rev. 0B vs. 1.5 x Peak Force Comparison Results for HLW Walls 48A, 48B, 60A, 60B, 65A, 65B, 75, 76, 79, and 80," CCN: 075169, dated November 26, 2003.

This letter authorizes Bechtel National, Inc. (BNI) for placement of concrete for Walls 47A, 47B, 48A, 48B, 60A, 60B, 62A, 62B, 62C, 62D, 65A, 65B, 70A, 70B, 70C, 72A, 72B, 75, 76, 79, and 80. Reference 1 required U.S. Department of Energy, Office of River Protection (ORP) pre-approval of concrete placement for these walls, due to their unique design methodology and data that indicated that the methodology was not consistently as conservative as a conventional dynamic analysis. These walls all used the original static wall design, including a representation of the High Level Waste Building before its design height was increased. References 2 and 3 summarize the results of selected load comparisons for these walls. Load predictions and load comparisons were summarized for the original wall design (static analysis) and the reconfigured building design (dynamic analysis), for a representative sample of section cuts, including those section cuts BNI considered by engineering judgment to be controlling.

The ORP has reviewed the information in References 2 and 3 and observed that all loads were well within the capacity using a conventional dynamic analysis of the reconfigured building, and the selected set of section cuts for which this was demonstrated was an adequate sample. ORP has concluded that there is reasonable assurance that the dynamic analysis and design approach

for the selected walls will ensure adequate safety. The health and safety of the public, workers and the environment will not be adversely affected by release of this condition for the listed walls. Release of the condition complies with applicable laws, regulations and River Protection Project Waste Treatment and Immobilization Plant contractual requirements. Therefore, the referenced condition for the walls listed above is released.

If you have any questions, please contact me, or your staff may contact L. F. Miller, Jr., WTP Safety Regulation Division, (509) 376-6817.

Sincerely,

Roy J. Schepens
Manager

OSR:KC

BACKGROUND MATERIAL

Memorandum

To	Ko Chen / Lew Miller	File No.	CCN: 075168		
Subject	Transmittal of Revised SASSI Rev. 0B vs 1.5 x Peak Force Comparison Results for HLW Walls 70A, 70B, 70C, 72A, 72B, 47A, 47B, 62A, 62B, 62C, and 62D	Date	November 26, 2003		
		From	Stan Martin / Jeff White		
		Of	CS&A		
Copies to	D. Patel (MS5-I) P. Schuetz (MS5-L) D. Scribner/ B. Bitner (MS4-B2) D. Klein (MS4-A1) B. Spezialetti (MS4-B1) P. Furlong (MS5-L) file	At	G 153	Ext.	371-3494

Ko;
Attached you will find the subject force comparison results per BNI's partial obligation for conditional approval of ABAR 24590-WTP-SW-ENS-03-111 Revision 2.

24590-HLW-RPT-CSA-03-006, Revision 1	HLW Wall Design Force Comparison Walls 70A, 70B, 70C, 72A, 72B, 47A, 47B, 62A, 62B, 62C, and 62D

This revision utilizes the new table format and corrects the Interaction Ratio basis as we discussed previously. Also attached is an updated schedule for tracking all similar load comparison submittals.

Let me know if you have questions or need additional information.
Regards;
Stan

HLW Wall Design Force Comparison

Walls 70A, 70B, 70C, 72A, 72B, 47A, 47B, 62A, 62B, 62C, and 62D

1.0 Purpose

The purpose of this document is to provide an evaluation of design forces on selected HLW walls extending vertically from the basemat to near grade.

This force comparison study was requested by the Office of River Protection as technical support for an evaluation of Authorization Basis Amendment Request (ABAR) 24590-WTP-SE-ENS-03-111, Revision 1, " The Reconfiguration of the High Level Waste Facility".

Design forces have been derived using the following models and design bases for comparison:

Analytical Model Description	Seismic Load Basis
GTSTRUDL Model based on original configuration of the building. This model is described in Calculation 24590-HLW-S0C-S15T-00025 Rev 0.	1.5 x Peak of Response Spectra
GTSTRUDL Model of structure based on revised GA drawings issued on 8/6/03. Included in this model are raised floor and roof elevations, new seismic shear walls, internal and external horizontal slabs and other physical modifications. This model has been issued as a formal calculation within Calculation 24590-HLW-S0C-S15T-00025 rev. 0A dated 10/13/2003.	SASSI Rev 0B Dynamic Analysis

Section cuts from the model were selected after careful review of the design basis calculations and the associated drawings to identify the controlling cuts that determined the reinforcement in the wall under consideration. Specific consideration was given to evaluation of the differences in the models from which the forces are derived and additional cuts were added as required. The horizontal and vertical cuts are numbered in accordance with the respective design basis calculation. These cuts are made at identical locations in each model and therefore are considered equivalent for comparison purposes.

Design forces for have been derived from processing applied loading combinations in accordance with project design criteria. Force variations between the two models are expected. These are primarily due to differences in applied seismic, self-weight and equipment loading, and changes to the load path. Maximum values for each of the 10 categories of forces (i.e. In- Plane Positive Bending Moment, etc) have been compiled in envelope format for comparison. This format is consistent with that used in design.

2.0 Force Comparison Results

Force comparison results for walls 70A, 70B, 70C, 72A, 72B, 47A, 47B, 62A, 62B, 62C, and 62D are provided in the attached tables (see page 3 to 5). They indicate relative Interaction Ratios (IR) for the controlling cuts for each wall section based on the Soil Structure Interaction (SSI) Revision 0B loading and the 1.5 times peak loading sets. The IR's are reported as a ratio of the reinforcement demand area versus the area provided from either calculations or drawings. Therefore, the maximum acceptable IR value per the ACI Code is 1.0 (usual engineering practice) but is limited to a 0.85 ratio in accordance with the current version of the Structural Design Criteria. Reinforcement area on drawings may exceed the value computed within calculations for reasons involving constructability or economy of design. The tables used to present the results now have columns indicating if the Area of Steel (AOS) required for the SSI loading increased, remained the same, or decreased from the values computed for the 1.5 peak loading. When the AOS increased the IR is computed as a ratio of the demand area divided by the area provided on the issued drawings at the area of interest.

3.0 Interpretations / Conclusions

Results provided in the subsequent force comparison table have been processed using the wall design spreadsheet to determine the interactive effects on the design of the horizontal and vertical reinforcement steel. This step is necessary, as a simple comparison of the raw data does not provide sufficient basis to determine proper conclusions. Additional verification steps were taken to evaluate all applicable Code design requirements, including those for boundary elements, lumped steel, cold joint shear friction, and transverse shear reinforcing. It should be noted that all optional load magnification factors used in the design basis calculations were reduced to 1.0 to provide a common basis for comparison. The tables provided (pages 3 to 6) were prepared using this methodology. No wall sections above El. 0' are covered in this evaluation report.

For the HLW Building walls considered in the scope of this load comparison, it is concluded that;

1. All wall sections considered show acceptable vertical and horizontal steel interaction ratios resulting the forces in the comparison. The maximum IR reported for SSI loading is 0.85 for horizontal rebar in Wall 47A and 0.84 for vertical rebar in Wall 62B. These values are based on lower total demand area (Note 4c in the table) so the IR would be lower if recomputed based on the drawing area. The highest IR for walls where AOS demand did not decrease is 0.82 for vertical rebar in Walls 70B, 47B and 62D.
2. Boundary Element (BE) provisions were satisfied for all walls.
3. In-plane and transverse shear requirements were satisfied for all walls for both loading conditions.
4. Lumped steel used to resist the in-plane moments were evaluated for all walls and determined to be acceptable for both loading conditions.
5. All other Code requirements including shear friction were verified to be acceptable for both loading conditions.
6. Based on a comparison of the static analysis and dynamic models there is no significant difference in geometry for the walls under consideration or the structural components immediately adjacent to the walls.

In summary the issued design for walls 70A, 70B, 70C, 72A, 72B, 47A, 47B, 62A, 62B, 62C, and 62D have been evaluated for both 1.5 peak and SSI loading and determined to be acceptable. Based on this evaluation, it is requested that permission be granted to proceed with construction.

FORCE COMPARISON BETWEEN SSI and 1.5 x PEAK ACCELERATION

CCN: 075168
Attachment 1

Vnp	Longitudinal Shear, Positive	Mnp	Longitudinal bending, positive	Vtp	Transverse shear, positive
Vnn	Longitudinal Shear, Negative	Mnn	Longitudinal bending, negative	Vtn	Transverse shear, negative
Pnc	Axial compression (or smallest tension)			Mtp	Transverse bending, positive
Pnt	Axial Tension (or smallest compression)			Mtn	Transverse bending, negative

Wall No:	Section Cut No:	Load Source	Cut	Combined Loads Extreme Values										IR -Bar Horz	Comments Horz	IR -Bar Vert	Comments Vert
				Vnp (Kip)	Vnn (Kip)	Pnc (Kip)	Pnt (Kip)	Mnp (Kip ft)	Mnn (Kip ft)	Vtp (Kip)	Vtn (Kip)	Mtp (Kip ft)	Mtn (Kip ft)				
Wall 70A	pf5e-21	SSI	Horz	4376	-3052	8900	1952	27146	-132930	730	-1062	8920	-7789	0.61	Note 4b	0.64	Note 4b
		1.5 x Peak		4525	-3546	8873	744	39442	-128981	1145	-1452	11535	-11097	0.61		0.64	
Wall 70A	pf5L	SSI	Horz	2128	-1662	2019	-550	14302	-35239	689	102	1613	-2626	0.61	Note 4c	0.43	Note 4b
		1.5 x Peak		2163	-2766	2020	-722	18374	-35776	371	-137	1602	-1582	0.57		0.57	
Wall 70B	s2e-21	SSI	Horz	2289	-2021	2850	-529	12157	-17172	163	-582	1065	-5188	0.64	Note 4b	0.78	Note 4b
		1.5 x Peak		2350	-2240	2691	-541	15513	-18490	246	-620	1662	-5380	0.66		0.80	
Wall 70B	s2e00	SSI	Horz	1495	-1122	2096	-1446	7823	-7805	94	-233	1573	-276	0.81	Note 4c	0.63	Note 4b
		1.5 x Peak		2148	-1999	2125	-1247	12255	-14070	207	-231	1436	-775	0.62		0.76	
Wall 70C	mn3e00	SSI	Horz	2680	-2485	6638	-672	56962	-45994	416	-458	5775	-7631	0.61	Note 4b	0.44	Note 4b
		1.5 x Peak		2876	-3334	6091	-1653	47004	-43756	344	-445	6987	-6276	0.61		0.45	
Wall 72A	mn3e-31a	SSI	Horz	1570	-2771	5396	730	58030	-1741	1551	-14	8554	-2427	0.61	Note 4b	0.56	Note 4b
		1.5 x Peak		3852	-4948	7430	319	49348	-42535	2627	301	13851	-3093	0.61		0.58	
Wall 72A	mn3e-31b	SSI	Horz	2868	-1859	3334	736	-3370	-20198	1707	713	7520	1891	0.61	Note 4c	0.57	Note 4c
		1.5 x Peak		3852	-4948	7430	319	49348	-42535	2627	301	13851	-3093	0.61		0.58	
Wall 72B	sL1e00	SSI	Horz	3124	-2517	5657	-750	17328	-22635	256	-86	635	-2223	0.77	Note 4c	0.77	Note 4c
		1.5 x Peak		3374	-3140	5108	-1761	20378	-29173	311	-220	1119	-2379	0.68		0.57	
Wall 47A	nr3e00	SSI	Horz	4498	-2026	4123	-524	25886	-8550	64	-50	487	-391	0.71	Note 4b	0.71	Note 4a
		1.5 x Peak		4360	-3062	3559	-755	17020	-12906	39	-35	379	-301	0.69		0.84	

Notes -

1) All provisions for transverse shear, boundary elements, and lumped steel were verified to be acceptable in all cases.
2) GTStrudl cuts were chosen after review of the design basis calculation for each wall under consideration and identification of the controlling cut(s).
3) Interaction ratios (IR) are reported as a ratio of reinforcement demand area versus the rebar area provided from either calculations or drawings.
4) SSI results processed by the Design Spreadsheet and reported in the Table will correspond to one of the cases described below:
4a) Area of Steel (AOS) selected increased so the IR reported is recomputed based on the drawing
4b) AOS selected remained the same so the IR reported is comparable
4c) AOS selected decreased so the IR reported is conservative

FORCE COMPARISON BETWEEN SSI and 1.5 x PEAK ACCELERATION

CCN: 075168
Attachment 1

Vnp	Longitudinal Shear, Positive	Mnp	Longitudinal bending, positive	Vtp	Transverse shear, positive
Vnn	Longitudinal Shear, Negative	Mnn	Longitudinal bending, negative	Vtn	Transverse shear, negative
Pnc	Axial compression (or smallest tension)			Mtp	Transverse bending, positive
Pnt	Axial Tension (or smallest compression)			Mtn	Transverse bending, negative

Wall No:	Section Cut No:	Load Source	Cut	Combined Loads Extreme Values										IR -Bar Horz		IR -Bar Vert	IR -Bar Vert
				Vnp (Kip)	Vnn (Kip)	Pnc (Kip)	Pnt (Kip)	Mnp (Kip ft)	Mnn (Kip ft)	Vtp (Kip)	Vtn (Kip)	Mtp (Kip ft)	Mtn (Kip ft)				
Wall 47A	nr3Le-10	SSI	Horz	8737	-4377	9257	-1142	54678	-41303	67	-88	321	18	0.85	Note 4c	0.69	Note 4c
		1.5 x Peak		8941	-6507	8155	-1636	83267	-53574	161	-140	1034	-89	0.59		0.71	
Wall 47B	opwsD	SSI	Horz	805	-809	2242	-140	5323	-6012	52	-28	403	-686	0.80	Note 4c	0.31	Note 4b
		1.5 x Peak		1206	-1223	2059	-104	10496	-10973	44	-22	573	-841	0.80		0.52	
Wall 62A	qL1Le-21	SSI	Horz	7258	-7820	10341	372	49091	-83467	1112	-1016	13274	-10747	0.61	Note 4c	0.56	Note 4c
		1.5 x Peak		10005	-10163	10369	-122	63073	-100339	1446	-1758	14842	-16162	0.68		0.57	
Wall 62A	qL2e-21	SSI	Horz	4496	-3625	2798	-449	13232	-19777	312	-336	3716	-3614	0.57	Note 4b	0.57	Note 4b
		1.5 x Peak		4823	-4259	3018	-412	18396	-23969	463	-577	4728	-5414	0.62		0.65	
Wall 62B	hf3e-10	SSI	Horz	2822	-2570	3371	384	16293	-2084	314	-104	-101	-497	0.63	Note 4c	0.84	Note 4c
		1.5 x Peak		4235	-3873	3022	189	38785	-23984	307	-139	42	-644	0.61		0.77	
Wall 62B	hf3e-21	SSI	Horz	2864	-2612	3568	477	30383	-20053	356	-146	3190	-1477	0.65	Note 4c	0.52	Note 4b
		1.5 x Peak		4343	-3981	3234	244	59145	-43766	415	-247	3328	-2078	0.63		0.79	
Wall 62C	hf4e-21	SSI	Horz	2406	-2858	3138	362	16899	-22201	313	-204	3262	-2118	0.72	Note 4c	0.55	Note 4b
		1.5 x Peak		3522	-3712	3059	55	30664	-44931	387	-305	3528	-2964	0.82		0.71	
Wall 62C	hf4L-21x	SSI	Horz	4394	-5542	5671	374	31291	-47784	1159	-966	10591	-7716	0.62	Note 4c	0.52	Note 4c
		1.5 x Peak		6480	-7057	5417	-142	33301	-52936	1299	-1185	11112	-9368	0.76		0.80	
Wall 62D	hf3e00	SSI	Horz	5985	-5246	5800	929	50837	-68279	664	-1552	1900	-5924	0.80	Note 4c	0.78	Note 4c
		1.5 x Peak		8277	-7155	4932	690	38759	-44977	1192	-2475	1004	-2950	0.69		0.66	

Notes -
1) All provisions for transverse shear, boundary elements, and lumped steel were verified to be acceptable in all cases.
2) GTStrudl cuts were chosen after review of the design basis calculation for each wall under consideration and identification of the controlling cut(s).
3) Interaction ratios (IR) are reported as a ratio of reinforcement demand area versus the rebar area provided from either calculations or drawings.
4) SSI results processed by the Design Spreadsheet and reported in the Table will correspond to one of the cases described below:
4a) Area of Steel (AOS) selected increased so the IR reported is recomputed based on the drawing
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Vnp	Longitudinal Shear, Positive	Mnp	Longitudinal bending, positive	Vtp	Transverse shear, positive
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Wall No:	Section Cut No:	Load Source	Cut	Combined Loads Extreme Values										IR -Bar Horz		IR -Bar Vert	IR -Bar Vert
				Vnp (Kip)	Vnn (Kip)	Pnc (Kip)	Pnt (Kip)	Mnp (Kip ft)	Mnn (Kip ft)	Vtp (Kip)	Vtn (Kip)	Mtp (Kip ft)	Mtn (Kip ft)				
Wall 70A	pf5v	SSI	Vert	2461	-1770	1965	256	17367	-32117	-139	-369	62	-1644	0.62	Note 4c	0.39	Note 4b
		1.5 x Peak		2696	-1980	2414	-543	26011	-41844	-107	-361	594	-1900	0.59		0.66	
Wall 70B	s2vb	SSI	Vert	2368	-3153	750	-551	13969	-11766	198	-123	630	-601	0.67	Note 4b	0.82	Note 4b
		1.5 x Peak		2838	-3250	512	-387	14247	-13922	179	-92	486	-425	0.69		0.84	
Wall 70C	mn3v	SSI	Vert	632	-3094	828	-1591	9816	-5115	376	145	1340	-149	0.68	Note 4a	0.79	Note 4b
		1.5 x Peak		732	-2700	664	-1513	9548	-6369	355	148	1317	-92	0.80		0.67	
Wall 72A	mn3vLm	SSI	Vert	2138	-1435	805	78	9526	-5296	71	-102	1121	-425	0.64	Note 4b	0.39	Note 4b
		1.5 x Peak		1830	-1132	1319	-452	6731	-4386	92	-105	925	-316	0.63		0.63	
Wall 72A	mn4v	SSI	Vert	2086	-1765	775	-256	20370	-14633	730	298	2351	744	0.77	Note 4b	0.49	Note 4b
		1.5 x Peak		1490	-1581	832	-167	15815	-15125	727	310	2601	800	0.63		0.39	
Wall 72b	sL1vL	SSI	Vert	3015	-1371	1351	-4762	13602	-4020	164	-69	1218	-515	0.72	Note 4a	0.57	Note 4b
		1.5 x Peak		2777	-1619	1686	-3951	16999	-9172	228	-48	1462	-280	0.85		0.70	
Wall 47A	nr3vb	SSI	Vert	1350	-3018	653	-534	19003	-6302	87	-45	577	-215	0.64	Note 4a	0.77	Note 4b
		1.5 x Peak		2313	-3278	684	-405	20449	-11953	71	-32	471	-154	0.82		0.67	
Wall 47B	am2vr	SSI	Vert	465	-281	379	-240	1970	-2435	61	-9	369	-17	0.61	Note 4a	0.39	Note 4b
		1.5 x Peak		485	-300	373	-305	2577	-2898	69	-27	372	-87	0.69		0.26	
Wall 62A	qL2vf	SSI	Vert	2971	-3658	2599	-1722	11902	-16910	59	-37	478	-285	0.57	Note 4b	0.57	Note 4b
		1.5 x Peak		4600	-4763	2575	-1718	22339	-18749	77	-70	483	-434	0.57		0.57	

Notes -

1) All provisions for transverse shear, boundary elements, and lumped steel were verified to be acceptable in all cases.
2) GTStrudl cuts were chosen after review of the design basis calculation for each wall under consideration and identification of the controlling cut(s).
3) Interaction ratios (IR) are reported as a ratio of reinforcement demand area versus the rebar area provided from either calculations or drawings.
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Wall No:	Section Cut No:	Load Source	Cut	Combined Loads Extreme Values										IR -Bar Horz		IR -Bar Vert	IR -Bar Vert
				Vnp (Kip)	Vnn (Kip)	Pnc (Kip)	Pnt (Kip)	Mnp (Kip ft)	Mnn (Kip ft)	Vtp (Kip)	Vtn (Kip)	Mtp (Kip ft)	Mtn (Kip ft)				
Wall 62B	hf3v00	SSI	Vert	2275	-2887	590	-1030	11399	-9553	107	-110	468	-770	0.77	Note 4b	0.77	Note 4b
		1.5 x Peak		2944	-3591	977	-1282	14512	-12714	109	-39	566	-189	0.70		0.70	
Wall 62C	hf4vr	SSI	Vert	2356	-2142	420	-429	15171	-23132	23	-24	125	-304	0.84	Note 4c	0.68	Note 4b
		1.5 x Peak		3046	-3002	580	-873	20391	-25321	25	-29	162	-324	0.79		0.79	
Wall 62D	hf4vm	SSI	Vert	2676	-2142	806	-741	6007	-10911	104	-329	1764	-357	0.67	Note 4b	0.82	Note 4b
		1.5 x Peak		3038	-2717	579	-825	8841	-12503	94	-290	1567	-455	0.79		0.79	
Not Used	0	SSI	Vert														
		1.5 x Peak															
Not Used	0	SSI	Vert														
		1.5 x Peak															
Not Used	0	SSI	Vert														
		1.5 x Peak															
Not Used	0	SSI	Vert														
		1.5 x Peak															
Not Used	0	SSI	Vert														
		1.5 x Peak															
Not Used	0	SSI	Vert														
		1.5 x Peak															

Notes -
1) All provisions for transverse shear, boundary elements, and lumped steel were verified to be acceptable in all cases.
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CCN 075168
Attachment 2

Schedule for Load Comparison Submittals to OSR

Updated: November 26, 2003

Report Number	Transmittal Date	CCN	Subject Walls
24590-HLW-RPT-CSA-03-004, Rev. 0	10/9/03 (A)	071320	24,33A,33B,33C,33D 71A,71B,57A,57B,57C,57D
24590-HLW-RPT-CSA-03-005, Rev. 0	10/20/03 (A)	071321	90A,90B,91A,91B,51A,51B 67A,67B,67C,67D
24590-HLW-RPT-CSA-03-006, Rev. 0	11/02/03 (A)	071324	70A,70B,70C,62A,62B,62C 62D,47A,47B,72A,72B
24590-HLW-RPT-CSA-03-006, Rev. 1	11/26/03 (A)	075168	70A,70B,70C,62A,62B,62C 62D,47A,47B,72A,72B
24590-HLW-RPT-CSA-03-007, Rev. 0	11/26/03 (A)	075169	60A,60B,75,76,79,80 48A,48B,65A,65B
24590-HLW-RPT-CSA-03-008	12/15/03 (F/C)		64,73A,73B,54A,54B,74A 74B,74C,74D,52A,52B
24590-HLW-RPT-CSA-03-009	12/22/03 (F/C)		87A,87B,87C,68A,68B,68C 83A,83B,83C,34A
24590-HLW-RPT-CSA-03-010	1/12/04 (F/C)		53A,53B,53C,45B,46B,89A 89B,89C,85A,85B,85C,85D
24590-HLW-RPT-CSA-03-011	1/19/04 (F/C)		88A,88B,88C,86A,86B

BECHTEL

Memorandum

To	Ko Chen / Lew Miller	File No.	CCN: 075169
Subject	Transmittal of SASSI Rev. 0B vs 1.5 x Peak Force Comparison Results for HLW Walls 48A, 48B, 60A, 60B, 65A, 65B, 75, 76, 79 and 80	Date	November 26, 2003
		From	Stan Martin / Jeff White
		Of	CS&A
Copies to	D. Patel (MS5-I) P. Schuetz (MS5-L) D. Scribner/ B. Bitner (MS4-B2) D. Klein (MS4-A1) B. Spezialetti (MS4-B1) P. Furlong (MS5-L) file	At	G 153 Ext. 371-3494

Ko;
Attached you will find the subject force comparison results per BNI's partial obligation for conditional approval of ABAR 24590-WTP-SW-ENS-03-111 Revision 2.

24590-HLW-RPT-CSA-03-007, Revision 0	HLW Wall Design Force Comparison Walls 48A, 48B, 60A, 60B, 65A, 65B, 75, 76, 79 and 80

Let me know if you have questions or need additional information.
Regards;
Stan

Enclosures

HLW Wall Design Force Comparison

Walls 48A, 48B, 60A, 60B, 65A, 65B, 75, 76, 79 and 80

1.0 Purpose

The purpose of this document is to provide an evaluation of design forces on selected HLW walls extending vertically from the basemat to near grade.

This force comparison study was requested by the Office of River Protection as technical support for an evaluation of Authorization Basis Amendment Request (ABAR) 24590-WTP-SE-ENS-03-111, Revision 2, " The Reconfiguration of the High Level Waste Facility".

Design forces have been derived using the following models and design bases for comparison:

Analytical Model Description	Seismic Load Basis
GTSTRUDL Model based on original configuration of the building. This model is described in Calculation 24590-HLW-S0C-S15T-00025 Rev 0.	1.5 x Peak of Response Spectra
GTSTRUDL Model of structure based on revised GA drawings issued on 8/6/03. Included in this model are raised floor and roof elevations, new seismic shear walls, internal and external horizontal slabs and other physical modifications. This model has been issued as a formal calculation within Calculation 24590-HLW-S0C-S15T-00025 rev. 0A dated 10/13/2003.	SASSI Rev 0B Dynamic Analysis

Section cuts from the model were selected after careful review of the design basis calculations and the associated drawings to identify the controlling cuts that determined the reinforcement in the wall under consideration. Specific consideration was given to evaluation of the differences in the models from which the forces are derived and additional cuts were added as required. The horizontal and vertical cuts are numbered in accordance with the respective design basis calculation. These cuts are made at identical locations in each model and therefore are considered equivalent for comparison purposes.

Design forces for have been derived from processing applied loading combinations in accordance with project design criteria. Force variations between the two models are expected. These are primarily due to differences in applied seismic, self-weight and equipment loading, and changes to the load path. Maximum values for each of the 10 categories of forces (i.e. In- Plane Positive Bending Moment, etc) have been compiled in envelope format for comparison. This format is consistent with that used in design.

2.0 Force Comparison Results

Force comparison results for walls 48A, 48B, 60A, 60B, 65A, 65B, 75, 76, 79 and 80 are provided in the attached tables (see page 3 to 5). They indicate relative Interaction Ratios (IR) for the controlling cuts for each wall section based on the Soil Structure Interaction (SSI) Revision 0B loading and the 1.5 times peak loading sets. The IR's are reported as a ratio of the reinforcement demand area versus the area provided from either calculations or drawings. Therefore, the maximum acceptable IR value per the ACI Code is 1.0 (usual engineering practice) but is limited to a 0.85 ratio in accordance with the current version of the Structural Design Criteria. Reinforcement area on drawings may exceed the value computed within calculations for reasons involving constructability or economy of design. The tables used to present the results now have columns indicating if the Area of Steel (AOS) required for the SSI loading increased, remained the same, or decreased from the values computed for the 1.5 peak loading. In cases where the AOS increased, the IR is computed as the ratio of the demand area required divided by the area provided on the issued drawings at the area of interest. This step is taken to ensure that the reported IR results are not inadvertently understated.

3.0 Interpretations / Conclusions

Results provided in the subsequent force comparison table have been processed using the wall design spreadsheet to determine the interactive effects on the design of the horizontal and vertical reinforcement steel. This step is necessary, as a simple comparison of the raw data does not provide sufficient basis to determine proper conclusions. Additional verification steps were taken to evaluate all applicable Code design requirements, including those for boundary elements, lumped steel, cold joint shear friction, and transverse shear reinforcing. It should be noted that all optional load magnification factors used in the design basis calculations were reduced to 1.0 to provide a common basis for comparison. The tables provided (pages 3 to 6) were prepared using this methodology. No wall sections above El. 0' are covered in this evaluation report.

For the HLW Building walls considered in the scope of this load comparison, it is concluded that;

1. All wall sections considered show acceptable vertical and horizontal steel interaction ratios resulting the forces in the comparison. The maximum IR reported for SSI loading is 0.82 for horizontal rebar in Wall 80 and 0.81 for vertical rebar in Walls 48B and 79. These values are based on lower total demand area (Note 4c in the table) so the IR would be lower if recomputed based on the drawing area. The highest IR for walls where AOS demand did not decrease is 0.78 for vertical rebar in Wall 79 (vertical cut #cf2vrL).
2. Boundary Element (BE) provisions were satisfied for all walls.
3. In-plane and transverse shear requirements were satisfied for all walls for both loading conditions.
4. Lumped steel used to resist the in-plane moments were evaluated for all walls and determined to be acceptable for both loading conditions.
5. All other Code requirements including shear friction were verified to be acceptable for both loading conditions.
6. Based on a comparison of the static analysis and dynamic models there is no significant difference in geometry for the walls under consideration or the structural components immediately adjacent to the walls.

In summary the issued design for walls 48A, 48B, 60A, 60B, 65A, 65B, 75, 76, 79 and 80 have been evaluated for both 1.5 peak and SSI loading and determined to be acceptable. Based on this evaluation, it is requested that permission be granted to proceed with construction.

FORCE COMPARISON BETWEEN SSI and 1.5 x PEAK ACCELERATION

CCN: 075169
Attachment 1

Vnp	Longitudinal Shear, Positive	Mnp	Longitudinal bending, positive	Vtp	Transverse shear, positive
Vnn	Longitudinal Shear, Negative	Mnn	Longitudinal bending, negative	Vtn	Transverse shear, negative
Pnc	Axial compression (or smallest tension)			Mtp	Transverse bending, positive
Pnt	Axial Tension (or smallest compression)			Mtn	Transverse bending, negative

Wall No:	Section Cut No:	Load Source	Cut	Combined Loads Extreme Values										IR -Bar Horz	Comments Horz	IR -Bar Vert	Comments Vert
				Vnp (Kip)	Vnn (Kip)	Pnc (Kip)	Pnt (Kip)	Mnp (Kip ft)	Mnn (Kip ft)	Vtp (Kip)	Vtn (Kip)	Mtp (Kip ft)	Mtn (Kip ft)				
Wall 48A	a22e-21	SSI	Horz	1442	-1474	5700	-640	22051	-12418	246	-186	2100	-1677	0.69	Note 4b	0.77	Note 4b
		1.5 x Peak		1363	-1464	5587	-1744	24137	-15412	309	-278	2342	-2192	0.73		0.77	
Wall 48A	a3e00	SSI	Horz	1440	-1062	3058	-489	12126	-16256	110	-62	958	-436	0.72	Note 4c	0.76	Note 4c
		1.5 x Peak		2137	-1909	2856	-690	18426	-20441	163	-107	1210	-715	0.77		0.69	
Wall 48B	nL4e-21	SSI	Horz	4460	-3059	8582	-296	27074	-62689	310	-301	2723	-2621	0.65	Note 4b	0.65	Note 4b
		1.5 x Peak		4683	-4383	9459	-2467	43613	-74176	428	-405	3361	-3156	0.76		0.76	
Wall 48B	nL4e00	SSI	Horz	5155	-2885	8190	-904	13711	-29383	208	-217	2209	-2211	0.81	Note 4c	0.81	Note 4c
		1.5 x Peak		5177	-4160	9443	-3362	10275	-30316	112	-104	441	-412	0.66		0.57	
Wall 60A	pf1e-21	SSI	Horz	1418	-3027	7079	1459	24040	-33414	373	-473	3840	-4314	0.61	Note 4b	0.52	Note 4b
		1.5 x Peak		2725	-2734	6094	398	31510	-45619	579	-758	5447	-6659	0.61		0.61	
Wall 60A	pf1e03L	SSI	Horz	1147	-444	1594	-88	2731	-700	176	-460	2156	-1287	0.70	Note 4b	0.65	Note 4c
		1.5 x Peak		1195	-949	2963	-498	5125	-2198	493	-359	1406	-1627	0.78		0.76	
Wall 60B	qL3e-21	SSI	Horz	2202	-3445	5892	392	20928	-19568	547	-470	7489	-5579	0.61	Note 4b	0.59	Note 4b
		1.5 x Peak		4070	-4436	5337	225	28645	-32798	616	-779	6806	-8084	0.61		0.67	
Wall 65A	b5e-21	SSI	Horz	2173	-2402	4768	-1813	17643	-18349	337	-1354	4771	-11642	0.76	Note 4c	0.77	Note 4c
		1.5 x Peak		2849	-2827	5230	-2100	22727	-24431	408	-1320	5172	-11097	0.64		0.62	
Wall 65B	w1e-10	SSI	Horz	3884	-4823	14226	1312	49394	-118175	356	-913	1519	-6822	0.61	Note 4b	0.48	Note 4b
		1.5 x Peak		6346	-6584	13523	743	65296	-109307	589	-1020	1291	-7027	0.61		0.65	

Notes -
1) All provisions for transverse shear, boundary elements, and lumped steel were verified to be acceptable in all cases.
2) GTStrudl cuts were chosen after review of the design basis calculation for each wall under consideration and identification of the controlling cut(s).
3) Interaction ratios (IR) are reported as a ratio of reinforcement demand area versus the rebar area provided from either calculations or drawings.
4) SSI results processed by the Design Spreadsheet and reported in the Table will correspond to one of the cases described below:
4a) Area of Steel (AOS) selected increased so the IR reported is recomputed based on the drawing
4b) AOS selected remained the same so the IR reported is comparable
4c) AOS selected decreased so the IR reported is conservative

FORCE COMPARISON BETWEEN SSI and 1.5 x PEAK ACCELERATION

CCN: 075169
Attachment 1

Vnp	Longitudinal Shear, Positive	Mnp	Longitudinal bending, positive	Vtp	Transverse shear, positive
Vnn	Longitudinal Shear, Negative	Mnn	Longitudinal bending, negative	Vtn	Transverse shear, negative
Pnc	Axial compression (or smallest tension)			Mtp	Transverse bending, positive
Pnt	Axial Tension (or smallest compression)			Mtn	Transverse bending, negative

Wall No:	Section Cut No:	Load Source	Cut	Combined Loads Extreme Values										IR -Bar Horz		IR -Bar Vert	IR -Bar Vert
				Vnp (Kip)	Vnn (Kip)	Pnc (Kip)	Pnt (Kip)	Mnp (Kip ft)	Mnn (Kip ft)	Vtp (Kip)	Vtn (Kip)	Mtp (Kip ft)	Mtn (Kip ft)				
Wall 65B	w1e-21	SSI	Horz	2646	-6864	11620	1700	35217	-24661	757	-566	8477	-9851	0.58	Note 4b	0.76	Note 4c
		1.5 x Peak		4459	-7489	11208	970	50922	-39938	1079	-835	10548	-11876	0.67		0.83	
Wall 75	cf1e-10	SSI	Horz	1841	-2702	5344	964	22913	-22744	1304	-1223	7209	-5598	0.61	Note 4b	0.59	Note 4b
		1.5 x Peak		2663	-3318	5286	215	23609	-21294	1067	-1256	7058	-6525	0.61		0.64	
Wall 75	cf2e-10	SSI	Horz	3432	-5202	2154	-246	18566	-5240	706	-668	3230	-3469	0.66	Note 4b	0.66	Note 4b
		1.5 x Peak		4395	-6127	1828	-841	19931	-12083	472	-537	2756	-3413	0.81		0.81	
Wall 76	cm2e-10	SSI	Horz	2657	-5147	2547	-309	16731	-5750	364	-611	2276	-3892	0.65	Note 4b	0.65	Note 4b
		1.5 x Peak		3677	-6158	2566	-1221	34012	-17406	579	-719	3222	-4404	0.82		0.82	
Wall 79	cf2e-10L	SSI	Horz	3569	-2141	1963	-217	5480	-10223	698	-614	3037	-3086	0.65	Note 4c	0.81	Note 4c
		1.5 x Peak		4765	-3141	1832	-923	10282	-15827	405	-422	2575	-2537	0.63		0.64	
Wall 80	cmße-10	SSI	Horz	3700	-1578	2071	109	7553	-13180	311	-552	1956	-3449	0.82	Note 4c	0.60	Note 4c
		1.5 x Peak		4481	-2445	2444	-1488	16308	-26281	700	-542	3597	-3039	0.60		0.60	
Not used	0	SSI	Horz														
		1.5 x Peak															
Not used	0	SSI	Horz														
		1.5 x Peak															
Not used	0	SSI	Horz														
		1.5 x Peak															

Notes -
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Wall No:	Section Cut No:	Load Source	Cut	Combined Loads Extreme Values										IR -Bar Horz		IR -Bar Vert	IR -Bar Vert
				Vnp (Kip)	Vnn (Kip)	Pnc (Kip)	Pnt (Kip)	Mnp (Kip ft)	Mnn (Kip ft)	Vtp (Kip)	Vtn (Kip)	Mtp (Kip ft)	Mtn (Kip ft)				
Wall 48A	a22vL	SSI	Vert	862	-941	374	-367	4245	-5757	51	-6	28	-289	0.57	Note 4b	0.28	Note 4b
		1.5 x Peak		636	-655	582	-600	2222	-3079	78	-27	46	-298	0.54		0.26	
Wall 48B	nL4vr	SSI	Vert	1123	-2417	712	-1241	14011	-4820	77	-14	485	-43	0.59	Note 4b	0.68	Note 4b
		1.5 x Peak		1866	-2527	765	-1147	14216	-8347	80	-22	402	-9	0.61		0.71	
Wall 60A	pf1vL	SSI	Vert	1230	-1647	1133	137	21535	-2657	245	-133	1417	-759	0.68	Note 4c	0.39	Note 4b
		1.5 x Peak		1470	-2371	998	55	19954	-3191	222	-145	1185	-716	0.62		0.39	
Wall 60B	qL3vb	SSI	Vert	1899	-1953	1324	-2346	12060	-18161	50	-153	244	-209	0.72	Note 4b	0.59	Note 4b
		1.5 x Peak		2001	-2901	1061	-2012	11327	-17563	154	-136	226	-638	0.82		0.59	
Wall 65A	b5vr00	SSI	Vert	2556	-2641	5241	-287	23597	-39086	752	-10	7324	-404	0.75	Note 4c	0.53	Note 4b
		1.5 x Peak		3348	-3622	3650	-414	29826	-33491	606	-7	5752	-206	0.71		0.58	
Wall 65B	w1vb	SSI	Vert	3877	-1586	3333	-180	8314	-19887	30	-631	459	-5062	0.81	Note 4c	0.66	Note 4b
		1.5 x Peak		4139	-2068	3076	-200	11335	-20893	22	-488	510	-4762	0.59		0.72	
Wall 75	cf2vL	SSI	Vert	2223	-1408	845	69	14794	-9493	65	-4	36	-703	0.81	Note 4c	0.59	Note 4b
		1.5 x Peak		2587	-1724	989	-107	16164	-11010	70	-33	197	-614	0.84		0.84	
Wall 76	cm2vL	SSI	Vert	2323	-1266	1388	16	16013	-8798	11	-82	874	-118	0.61	Note 4c	0.71	Note 4b
		1.5 x Peak		2614	-1455	1378	-161	16786	-9387	38	-92	746	-205	0.64		0.64	
Wall 79	cf2vrL	SSI	Vert	949	-1722	1053	-64	7205	-3905	0	-122	91	-828	0.78	Note 4c	0.78	Note 4b
		1.5 x Peak		1124	-2041	1280	-349	7885	-4279	15	-92	179	-641	0.65		0.65	

Notes -
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Wall No:	Section Cut No:	Load Source	Cut	Combined Loads Extreme Values										IR -Bar Horz		IR -Bar Vert	IR -Bar Vert
				Vnp (Kip)	Vnn (Kip)	Pnc (Kip)	Pnt (Kip)	Mnp (Kip ft)	Mnn (Kip ft)	Vtp (Kip)	Vtn (Kip)	Mtp (Kip ft)	Mtn (Kip ft)				
Wall 80	cm8vr	SSI	Vert	957	-2104	1625	-109	9337	-4103	226	-32	1437	-213	0.66	Note 4b	0.66	Note 4b
		1.5 x Peak		946	-1923	1938	-483	7708	-3524	204	-32	1129	-165	0.61		0.61	
Not Used	0	SSI	Vert														
		1.5 x Peak															
Not Used	0	SSI	Vert														
		1.5 x Peak															
Not Used	0	SSI	Vert														
		1.5 x Peak															
Not Used	0	SSI	Vert														
		1.5 x Peak															
Not Used	0	SSI	Vert														
		1.5 x Peak															
Not Used	0	SSI	Vert														
		1.5 x Peak															
Not Used	0	SSI	Vert														
		1.5 x Peak															

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4c) AOS selected decreased so the IR reported is conservative