

APPENDIX A-6

Structural Analysis of NDGRs

A-6-1. Result of structural analysis of NDGRs	A-158
A-6-2. Structural analysis of Bahr Yusef Regulator	A-164
A-6-3. Structural analysis of Ibrahimia Regulator	A-187
A-6-4. Structural analysis of Badraman Regulator	A-210
A-6-5. Structural analysis of Abo Gabal Regulator	A-233
A-6-6. Structural analysis of Sahelyia Regulator	A-256

A-6-1. Result of structural analysis of NDGRs

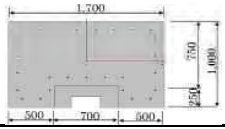
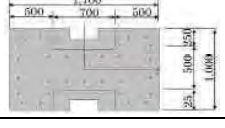
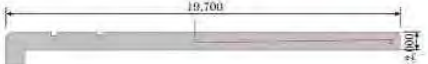
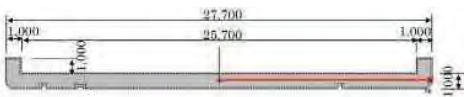

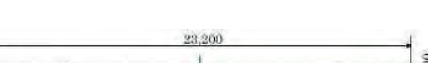
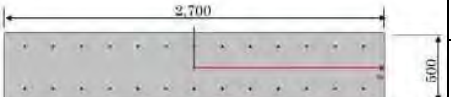
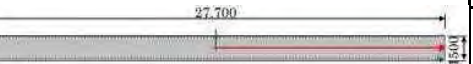
Result of structural analysis on Bahr Yusef Reg.

Name of target element	Outline of target element	Bar arrangement	Normal or Seismic	element No	Loading Case	Moment direction	Actual stress by structural analysis			$\sigma_c(N/mm^2)$	$\sigma_s(N/mm^2)$	$\sigma'_s(N/mm^2)$	$\tau(N/mm^2)$	Judgement
							M(kN·m)	N(kN·m)	S(kN·m)	$\sigma_{ca}(N/mm^2)$	$\sigma_{sa}(N/mm^2)$	$\sigma'_{sa}(N/mm^2)$	$\tau_a(N/mm^2)$	
Upper pier at abutment		D16@200	Normal	70	5	-	-2,587.5	2,008.1	-913.6	3.05	154.31	35.29	0.15	OK
			Seismic	70	10		-2,702.9	1,979.8	-913.4	9.50	200	200	0.70	OK
Upper pier at center		D16@200	Normal	67	5	-	-1,657.8	2,723.7	564.7	1.43	10.85	20.23	0.07	OK
			Seismic	67	10		-1,583.1	2,748.0	695.8	9.50	200	200	0.70	OK
Pier at abutment		D16@200	Normal	132	5	-	-11,831.4	9,639.0	457.2	1.69	64.11	20.93	0.01	OK
			Seismic	132	10		-13,018.0	9,312.3	834.2	9.50	200	200	0.70	OK
Pier at center		D16@200	Normal	117	6	-	-22,612.0	19,025.8	1,072.1	0.58	0.00	8.41	0.02	OK
			Seismic	117	9		-24,164.3	18,330.7	2,880.9	9.50	200	200	0.70	OK
Gate operation stage		D16@200	Normal	9	13	Tension at upper side	-782.2	-551.9	-36.5	1.61	157.60	5.45	0.01	OK
			Seismic	9	12		-534.8	-600.4	-36.7	9.50	200	200	0.70	OK
		D16@200	Normal	3	13	Tension at lower side	-339.8	-167.1	405.2	0.69	48.35	6.38	0.07	OK
			Seismic	3	12		-196.2	-190.9	409.6	9.50	200	200	0.70	OK
Bottom foundation		D18@200	Normal	88	3	Tension at upper side	-14,179.1	908.2	6,619.0	2.12	199.15	19.69	0.13	OK
			Seismic	88	9		-8,473.1	5,677.6	3,590.9	9.50	200	200	0.70	OK
		D18@200	Normal	86	13	Tension at lower side	-2,335.2	1,327.7	4,532.6	1.16	56.15	13.60	0.07	OK
			Seismic	86	12		-2,677.3	1,431.5	4,491.1	0.33	18.15	3.74	0.09	OK
									9.50	200	200	0.70	OK	
									0.38	21.88	4.28	0.09	OK	
									10.92	230	230	0.81	OK	

Result of structural analysis on Ibrahimia Reg.

Name of target element	Outline of target element	Bar arrangement	Normal or Seismic	element No	Loading Case	Moment direction	Actual stress by structural analysis			$\sigma_c(N/mm^2)$	$\sigma_s(N/mm^2)$	$\sigma's(N/mm^2)$	$r(N/mm^2)$	Judgement
							M(kN·m)	N(kN·m)	S(kN·m)	$\sigma_{ca}(N/mm^2)$	$\sigma_{sa}(N/mm^2)$	$\sigma'sa(N/mm^2)$	$r_a(N/mm^2)$	
Upper pier at abutment		D16@200	Normal	66	5	-	2.946.1	2,073.6	1,131.4	3.53	193.54	40.06	0.18	OK
			Seismic	66	10		2.829.2	2,105.0	1,135.3	9.50	200	200	0.70	
Upper pier at center		D16@200	Normal	67	5	-	-1,670.3	2,699.7	617.3	1.56	13.69	22.03	0.07	OK
			Seismic	67	10		1,702.8	2,725.3	743.8	9.50	200	200	0.70	
Pier at abutment		D16@200	Normal	136	5	-	-13,026.6	9,682.2	-741.5	1.78	69.21	21.93	0.01	OK
			Seismic	136	10		-13,964.6	9,292.8	-475.0	9.50	200	200	0.70	
Pier at center		D16@200	Normal	117	4	-	-23,082.2	18,995.4	594.2	0.57	0.00	8.39	0.01	OK
			Seismic	117	9		-24,515.8	18,235.3	2,886.8	9.50	200	200	0.70	
Gate operation stage		D18@200	Normal	6	13	Tension at upper side	-624.0	-475.5	31.9	1.42	141.30	4.09	0.01	OK
			Seismic	6	12		-444.2	-571.1	35.3	9.50	200	200	0.70	
		D18@200	Normal	12	13	Tension at lower side	-278.9	-137.3	-385.1	0.39	34.13	3.32	0.06	OK
			Seismic	12	12		-165.5	-182.9	-400.0	9.50	200	200	0.70	
Bottom foundation		D18@200	Normal	85	3	Tension at upper side	-13,535.0	581.0	11,014.1	2.02	193.71	18.47	0.21	OK
			Seismic	85	8		-13,235.1	583.0	10,690.8	9.50	200	200	0.70	
		D18@200	Normal	87	3	Tension at lower side	-1,882.4	441.4	14,338.7	2.00	189.58	18.42	0.20	OK
			Seismic	87	8		-1,907.4	467.6	13,941.8	10.92	230	230	0.81	

Result of structural analysis on Badraman Reg.-Dairuitiah

Name of target element	Outline of target element	Bar arrangement	Normal or Seismic	element No	Loading Case	Moment direction	Actual stress by structural analysis			$\sigma_c(N/mm^2)$	$\sigma_s(N/mm^2)$	$\sigma'_s(N/mm^2)$	$\tau(N/mm^2)$	Judgement
							M(kN·m)	N(kN·m)	S(kN·m)	$\sigma_{ca}(N/mm^2)$	$\sigma_{sa}(N/mm^2)$	$\sigma'_{sa}(N/mm^2)$	$\tau_a(N/mm^2)$	
Upper pier at abutment		D16@200	Normal	95	4	-	122.6	225.4	72.8	1.22	31.41	12.87	0.06	OK
			Seismic	95	11		116.7	226.4	62.0	1.16	28.19	12.42	0.05	
Upper pier at center		D16@200	Normal	11	4	-	36.9	127.7	-24.8	0.34	2.58	4.18	0.02	OK
			Seismic	11	11		51.5	120.9	-28.8	0.53	8.58	6.10	0.02	
Pier at abutment (1)		D16@200	Normal	4	1	-	-2,814.3	1,740.7	129.0	0.84	42.59	9.75	0.02	OK
			Seismic	4	8		-3,786.3	1,429.7	169.5	0.93	50.83	10.57	0.02	
Pier at abutment (2)		D16@200	Normal	135	6	-	-20,595.9	3,451.1	1,346.8	0.66	17.38	8.84	0.05	OK
			Seismic	135	9		-20,771.3	3,206.7	1,171.0	0.65	17.64	8.72	0.04	
Pier at center (1)		D16@200	Normal	3	1	-	3,873.5	1,508.6	263.6	1.45	62.46	12.98	0.02	OK
			Seismic	3	11		2,449.6	892.1	71.4	1.43	77.47	10.76	0.01	
Pier at center (2)		D16@200	Normal	101	6	-	5,291.8	2,395.9	226.7	0.31	1.27	4.19	0.01	OK
			Seismic	101	9		4,477.9	1,905.2	231.2	0.25	1.10	3.40	0.01	
Gate operation stage		D16@200	Normal	18	3	Tension at upper side	-35.5	-20.9	-48.9	0.79	34.10	1.84	0.05	OK
			Seismic	18	12		-39.0	-24.7	-49.0	0.83	35.70	2.00	0.05	
		D16@200	Normal	15	3	Tension at lower side	-33.9	3.8	-32.9	0.22	8.50	2.19	0.03	OK
			Seismic	15	12		-37.3	1.8	-35.1	0.27	10.36	2.63	0.03	
Bottom foundation		D16@200	Normal	80	13	Tension at upper side	-905.2	357.6	-1,100.3	0.27	18.70	2.43	0.03	OK
			Seismic	80	12		-937.0	358.1	-988.2	0.28	19.56	2.50	0.02	
		D16@200	Normal	74	13	Tension at lower side	-1,107.4	348.2	1,008.2	0.33	24.43	2.88	0.03	OK
			Seismic	74	8		-1,144.2	349.5	797.6	0.33	24.40	2.88	0.03	

A-161

Result of structural analysis on Abo Gabal Reg.

Name of target element	Outline of target element	Bar arrangement	Normal or Seismic	element No	Loading Case	Moment direction	Actual stress by structural analysis			$\sigma_c(N/mm^2)$	$\sigma_s(N/mm^2)$	$\sigma'_s(N/mm^2)$	$r(N/mm^2)$	Judgement
							M(kN·m)	N(kN·m)	S(kN·m)	$\sigma_{ca}(N/mm^2)$	$\sigma_{sa}(N/mm^2)$	$\sigma'_{sa}(N/mm^2)$	$r_a(N/mm^2)$	
Upper pier at abutment		D16@200	Normal	73	5	-	43.0	210.5	28.2	0.39	2.51	4.88	0.02	OK
			Seismic	73	11	-	-12.0	210.0	6.5	9.50	200	200	0.70	
Upper pier at center		D16@200	Normal	3	13	-	29.8	128.1	-14.4	0.47	5.89	5.36	0.01	OK
			Seismic	3	8	-	31.2	165.6	-14.5	9.50	200	200	0.70	
Pier at abutment		D16@200	Normal	11	6	-	-3,108.3	2,381.6	794.8	0.87	26.08	11.06	0.04	OK
			Seismic	11	8	-	-2,921.8	2,402.6	308.1	9.50	200	200	0.70	
Pier at center		D16@200	Normal	10	6	-	-381.2	627.0	210.8	0.41	11.93	4.24	0.02	OK
			Seismic	10	8	-	-332.5	735.2	128.8	9.50	200	200	0.70	
Gate operation stage		D16@200	Normal	36	3	Tension at upper side	-29.6	0.8	-60.4	0.63	27.68	0.50	0.05	OK
			Seismic	36	8	Tension at upper side	-28.7	3.5	-59.1	9.50	200	200	0.70	
		D16@200	Normal	40	4	Tension at lower side	-11.9	-5.1	-12.2	0.11	4.52	0.81	0.01	OK
			Seismic	40	8	Tension at lower side	-12.6	-11.8	-15.1	9.50	200	200	0.70	
Management bridge		D16@200	Normal	161	4	Tension at upper side	-239.8	-30.3	338.1	2.22	144.56	2.21	0.13	OK
			Seismic	161	8	Tension at upper side	-235.9	-98.3	344.0	9.50	200	200	0.70	
		D16@200	Normal	158	3	Tension at lower side	-87.3	-91.1	-82.3	0.61	18.08	4.96	0.03	OK
			Seismic	158	8	Tension at lower side	-81.1	-88.5	-61.7	9.50	200	200	0.70	
Bottom foundation		D16@200	Normal	65	3	Tension at upper side	1,026.4	301.6	-648.9	0.45	28.15	4.37	0.04	OK
			Seismic	65	8	Tension at upper side	1,021.3	295.7	-623.6	9.50	200	200	0.70	
		D16@200	Normal	62	3	Tension at lower side	1,768.6	575.2	-250.7	0.45	28.95	4.41	0.03	OK
			Seismic	59	8	Tension at lower side	1,633.9	568.0	43.6	10.92	230	230	0.81	

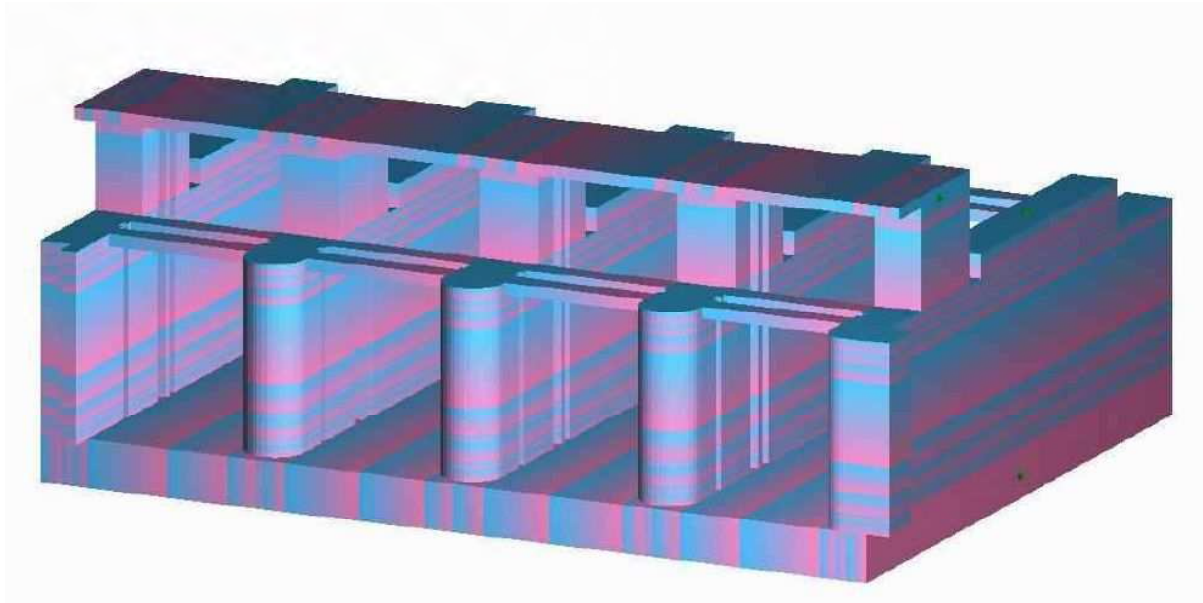
A-162

Result of structural analysis on Sahelyal Reg.

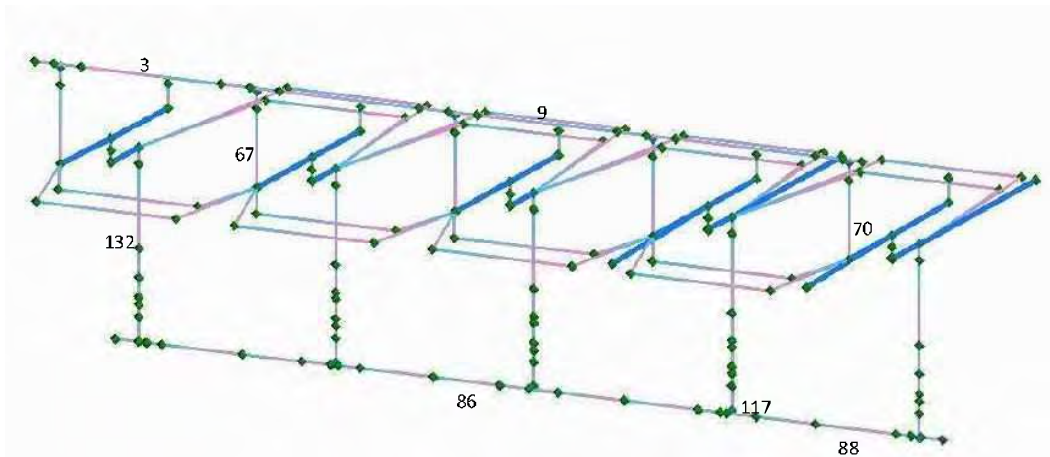
Name of target element	Outline of target element	Bar arrangement	Normal or Seismic	element No	Loading Case	Moment direction	Actual stress by structural analysis			$\sigma_c(N/mm^2)$	$\sigma_s(N/mm^2)$	$\sigma'_s(N/mm^2)$	$\tau(N/mm^2)$	Judgement
							M(kN·m)	N(kN·m)	S(kN·m)	$\sigma_{ca}(N/mm^2)$	$\sigma_{sa}(N/mm^2)$	$\sigma'_{sa}(N/mm^2)$	$\tau_a(N/mm^2)$	
Upper pier at abutment		D16@200	Normal	2	6	-	-38.4	102.5	5.8	0.45	7.01	5.12	0.01	OK
			Seismic	2	9	-	-24.7	95.8	7.1	9.50	200	200	0.70	
Upper pier at center		D16@200	Normal	44	6	-	42.7	289.0	27.7	0.63	1.67	8.24	0.02	OK
			Seismic	44	9	-	10.8	287.2	3.2	9.50	200	200	0.70	
Pier at abutment		D16@200	Normal	5	6	-	672.5	588.9	-297.7	0.41	32.50	4.15	0.03	OK
			Seismic	5	9	-	729.8	571.5	390.7	9.50	200	200	0.70	
Pier at center		D16@200	Normal	6	6	-	-674.4	480.1	730.7	0.23	4.09	2.74	0.06	OK
			Seismic	6	11	-	-1,024.5	365.4	766.1	9.50	200	200	0.70	
Gate operation stage		D16@200	Normal	30	5	Tension at upper side	-20.5	14.4	49.7	0.42	16.59	0.80	0.04	OK
			Seismic	30	8	Tension at upper side	-15.4	12.1	42.4	9.50	200	200	0.70	
		D16@200	Normal	28	3	Tension at lower side	-17.6	9.1	-46.2	0.32	12.36	0.77	0.04	OK
			Seismic	28	11	Tension at lower side	-12.9	5.8	-43.9	9.50	200	200	0.70	
Management bridge		D16@200	Normal	93	5	Tension at upper side	-210.9	-53.1	321.0	1.78	125.76	0.00	0.12	OK
			Seismic	93	8	Tension at upper side	-160.5	-37.5	264.7	9.50	200	200	0.70	
		D16@200	Normal	92	6	Tension at lower side	329.6	371.9	324.1	1.36	95.96	5.98	0.14	OK
			Seismic	92	11	Tension at lower side	333.8	312.2	-320.5	2.27	106.24	9.96	0.12	
Bottom foundation		D16@200	Normal	37	5	Tension at upper side	2,191.7	130.9	-857.7	0.33	14.41	0.17	0.04	OK
			Seismic	37	12	Tension at upper side	1,442.1	282.6	-721.3	9.50	200	200	0.70	
		D16@200	Normal	34	5	Tension at lower side	830.5	192.8	-714.7	0.31	13.79	3.62	0.03	OK
			Seismic	37	8	Tension at lower side	1,884.5	386.3	-1,005.9	10.92	230	230	0.81	

A-163

A-6-2. Structural analysis of Bahr Yusef Regulator



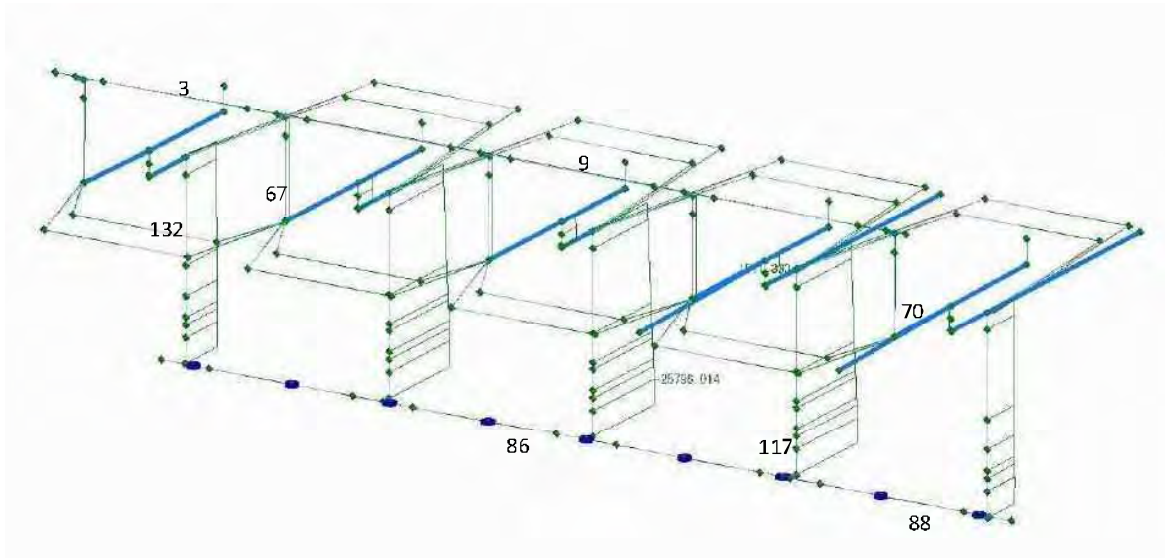
General view



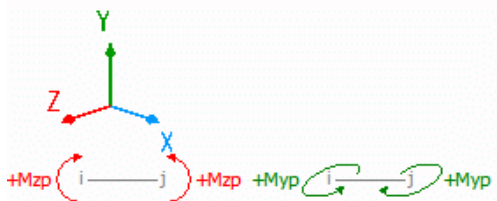
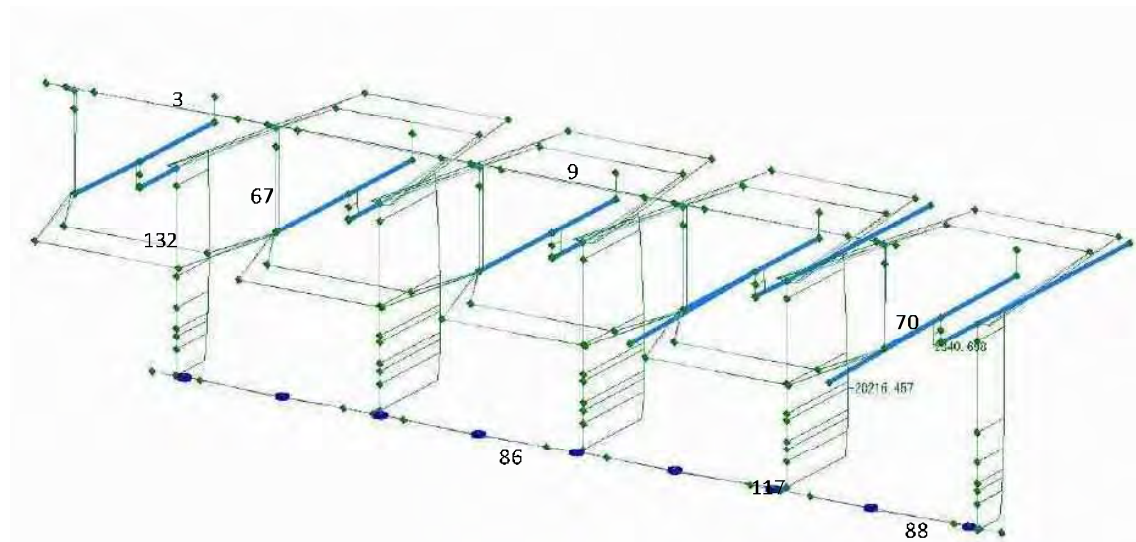
General view (frame)

1. bending Moment

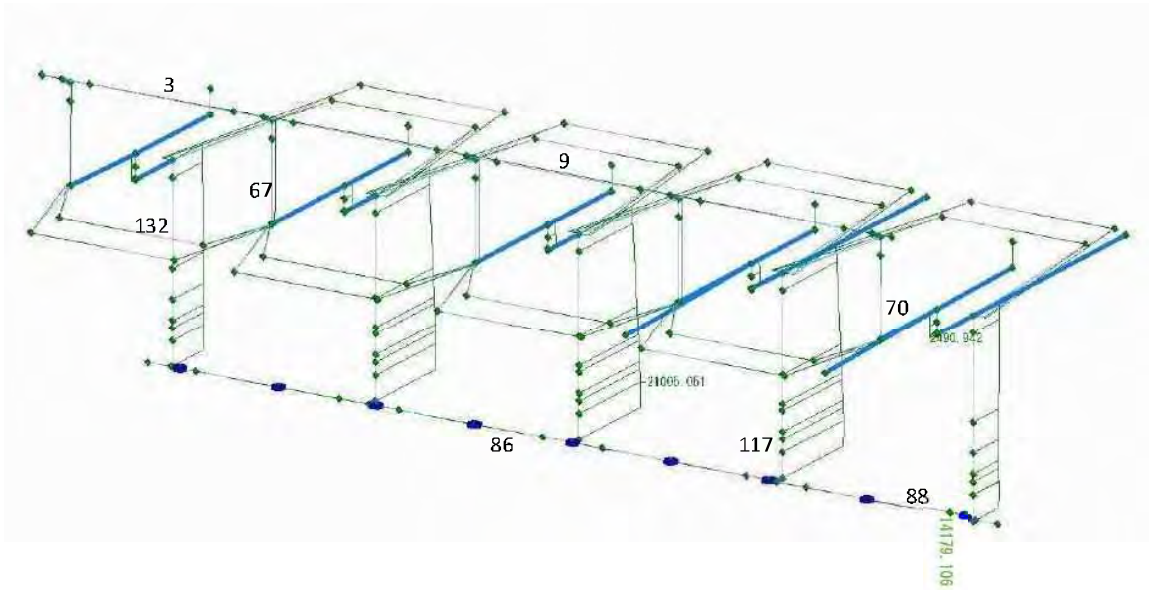
① CASE1 : Regular Longitudinal direction H.H.W.L. Full OP



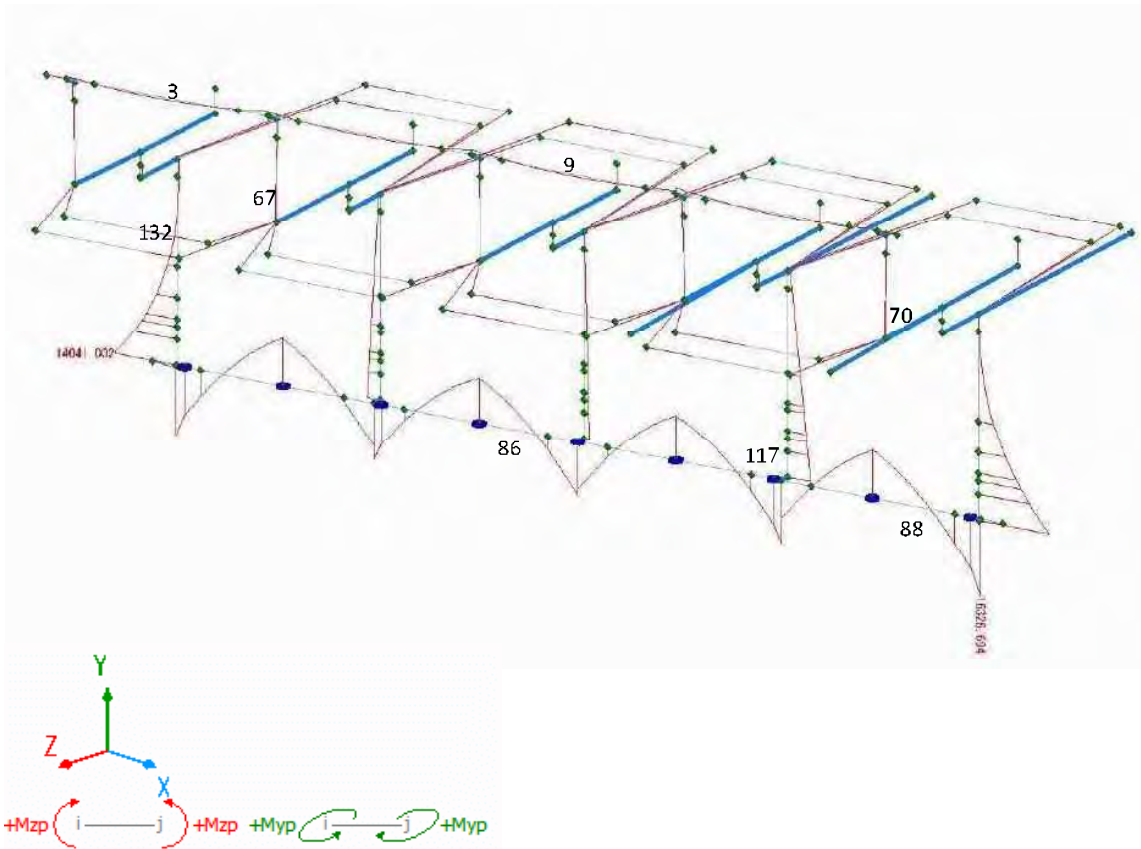
② CASE2 : Regular Longitudinal direction H.WL+0.25m water level Full CL



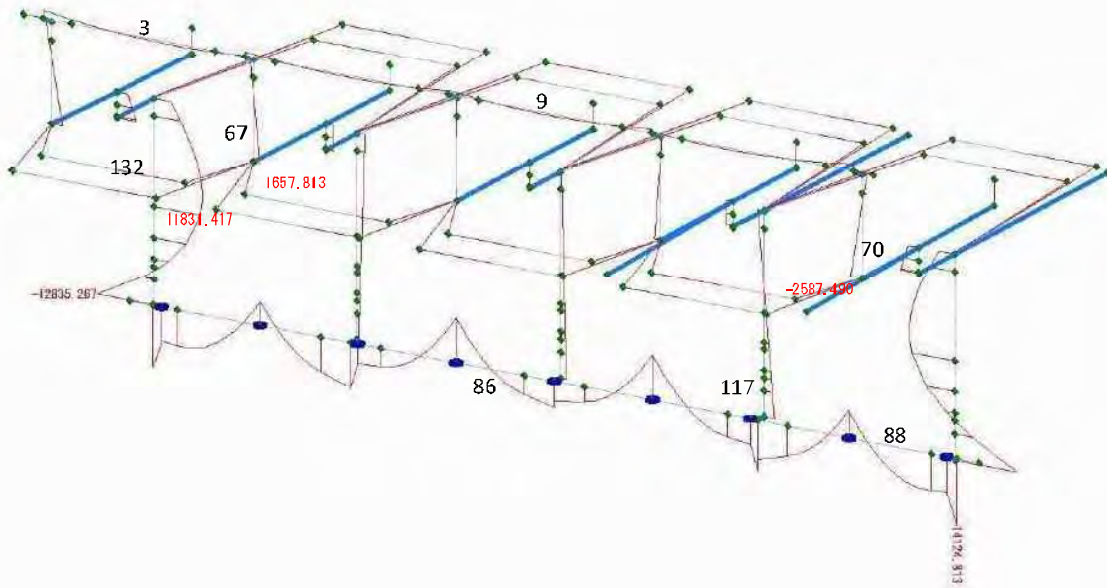
③ CASE3 : Regular Longitudinal direction No. water Full OP



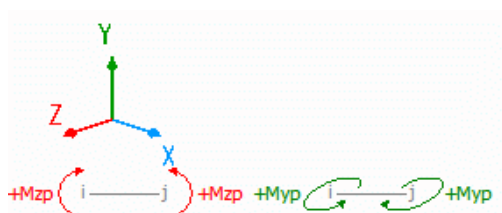
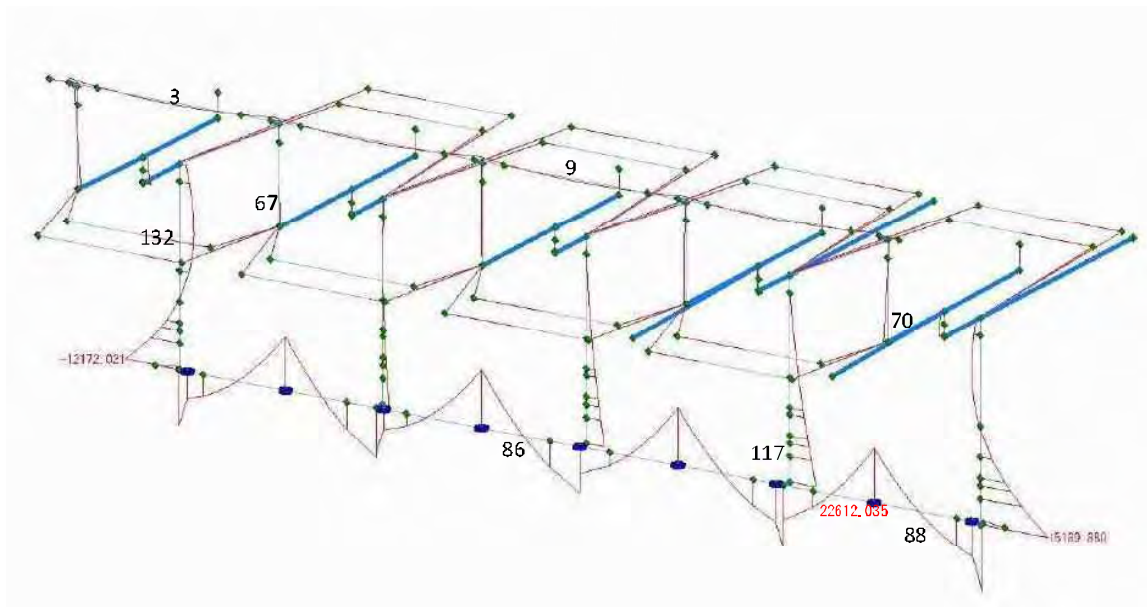
④ CASE4 : Regular Lateral direction H.W.L. +0.25m water level Full OP



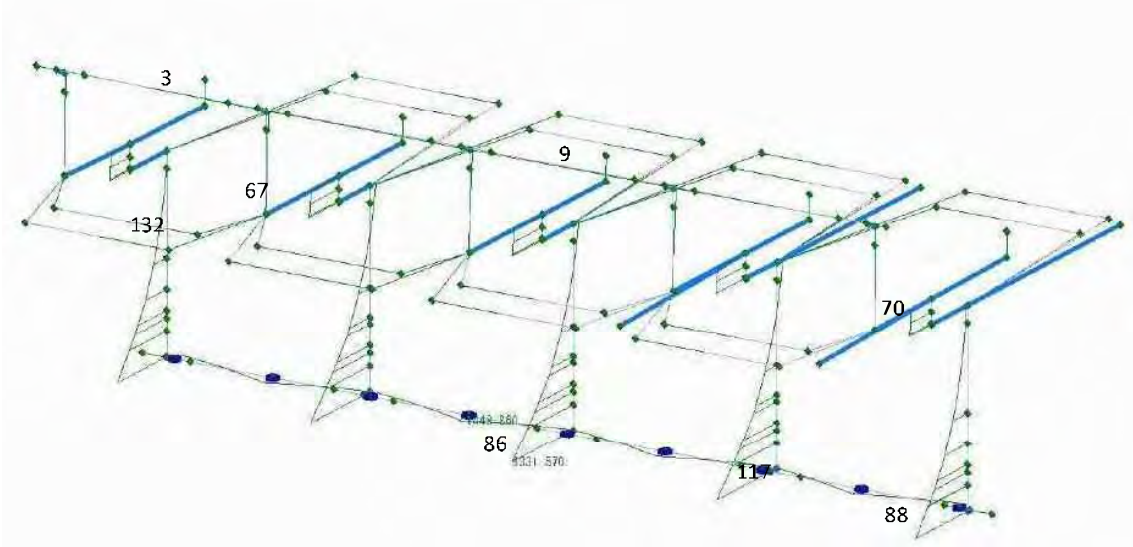
⑤ CASE5 : Regular Lateral direction H.W.L.+0.25m water level Full CL



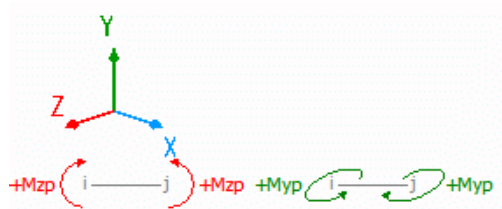
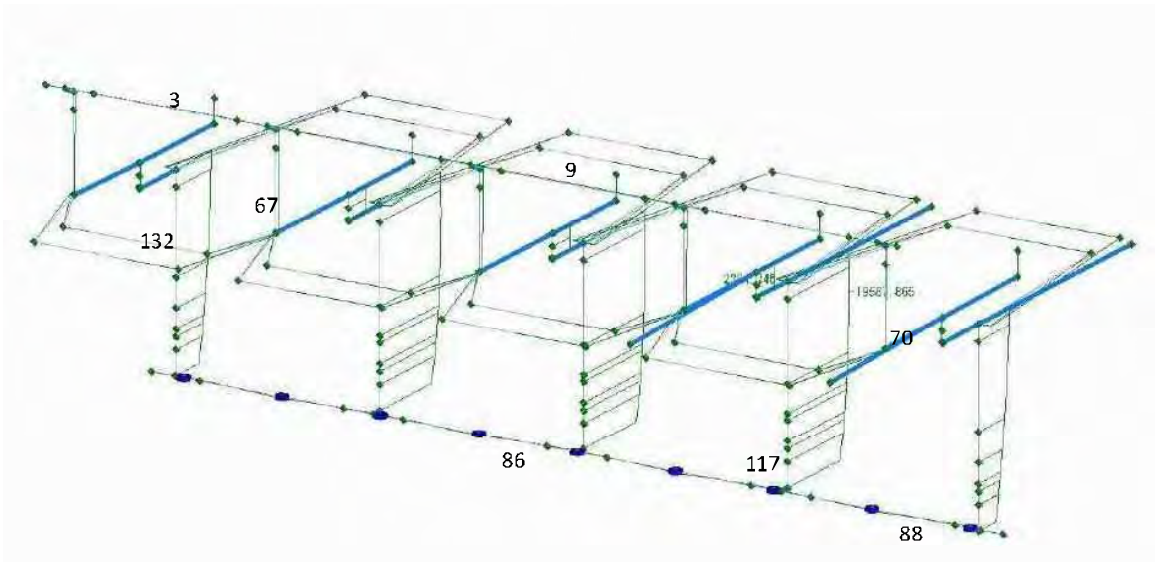
⑥ CASE6 : Regular Lateral direction No water Full OP



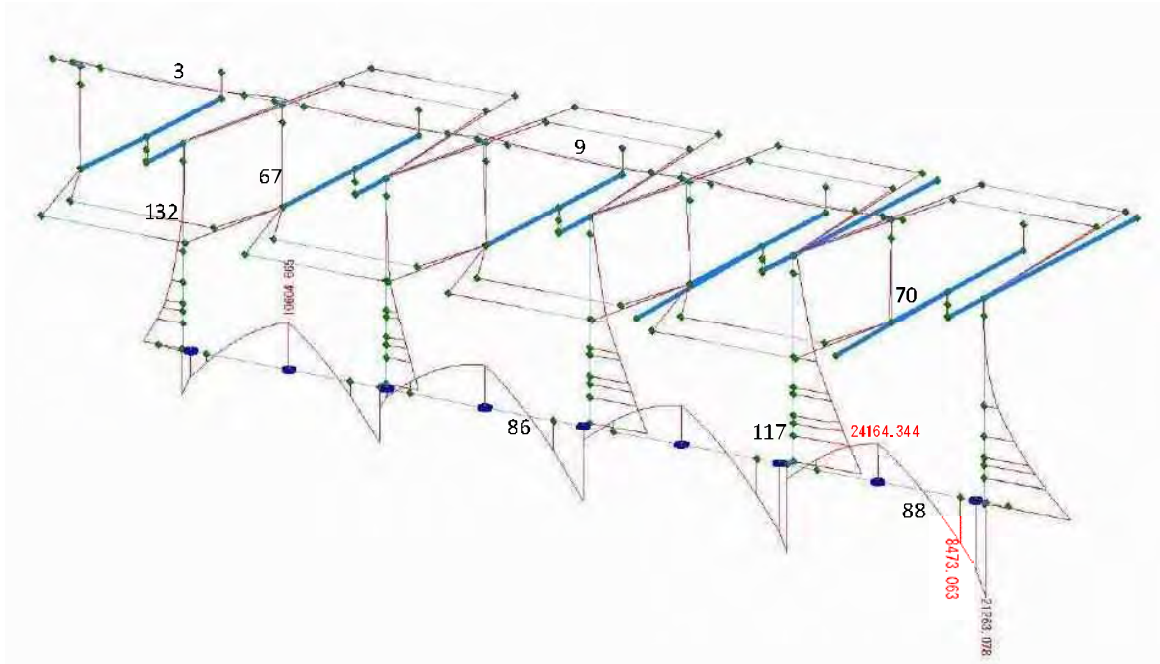
⑦ CASE7 : Seism Longitudinal direction H.W.L. +0.25m water level Full CL



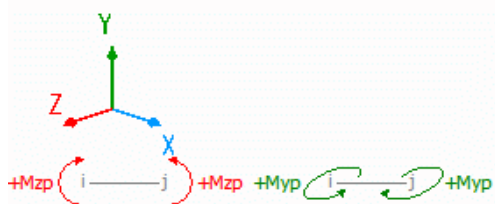
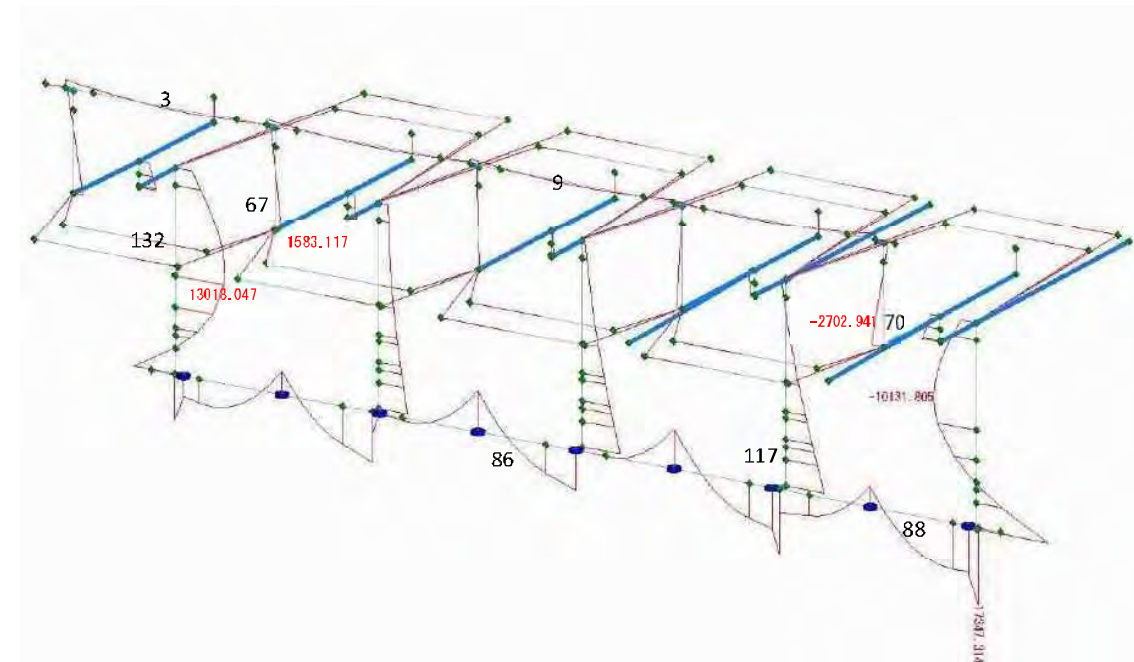
⑧ CASE8 : Seism Longitudinal direction No water Full OP



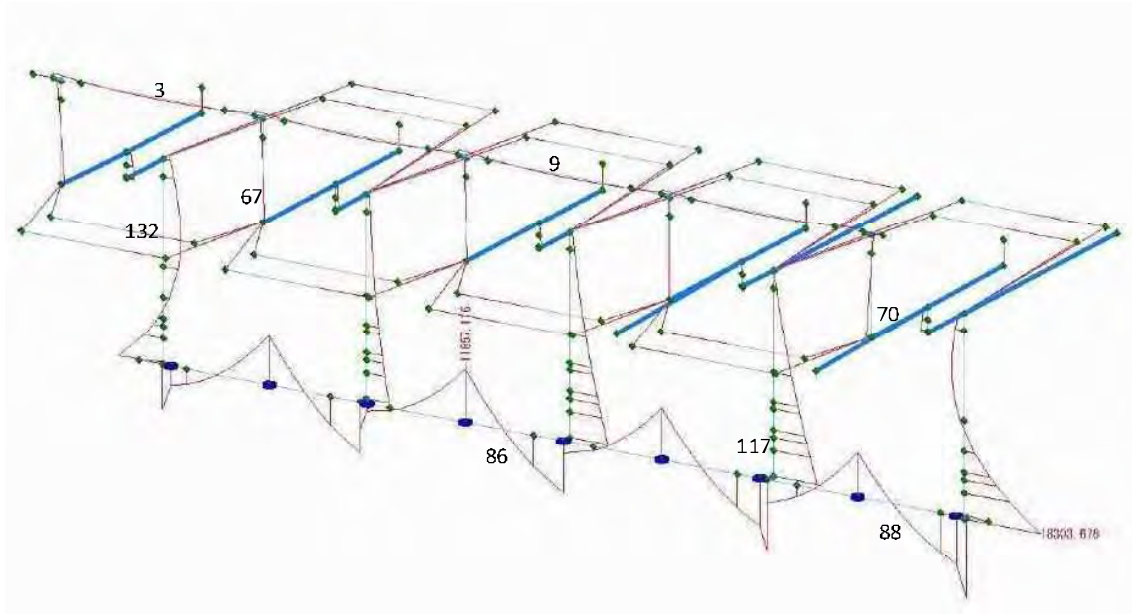
⑨ CASE9 : Seism Lateral direction H.W.L+ 0.25m water level Full OP



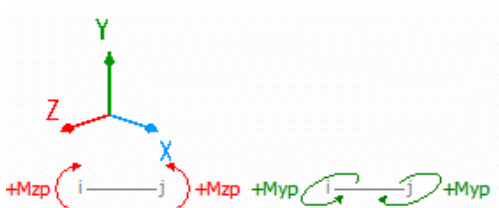
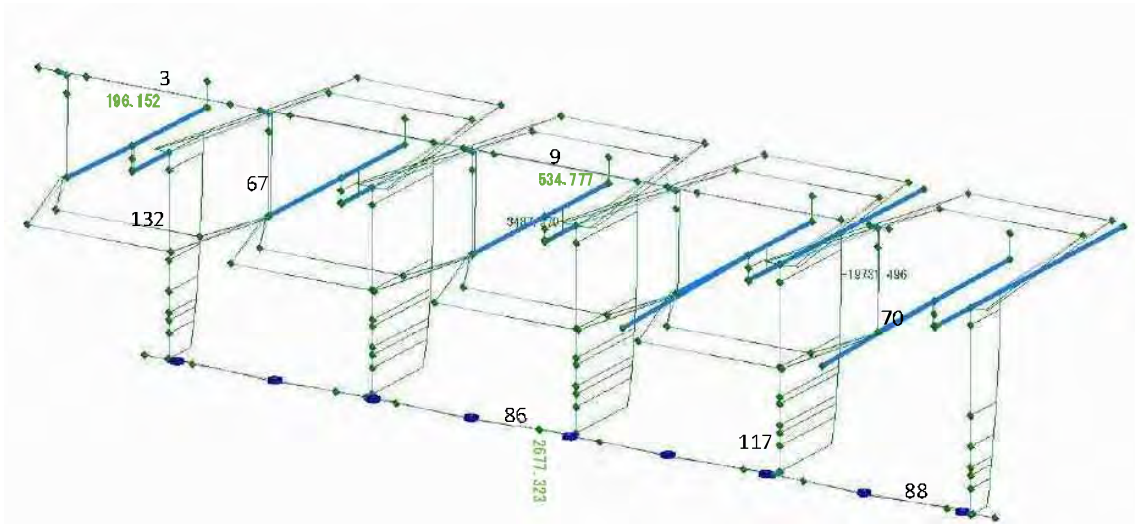
⑩ CASE10 : Seism Lateral direction H.W.L+0.25m level Full CL



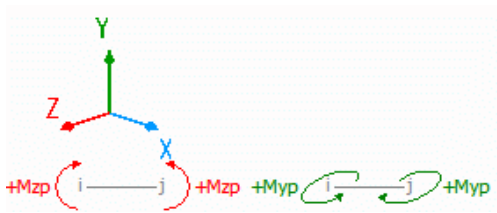
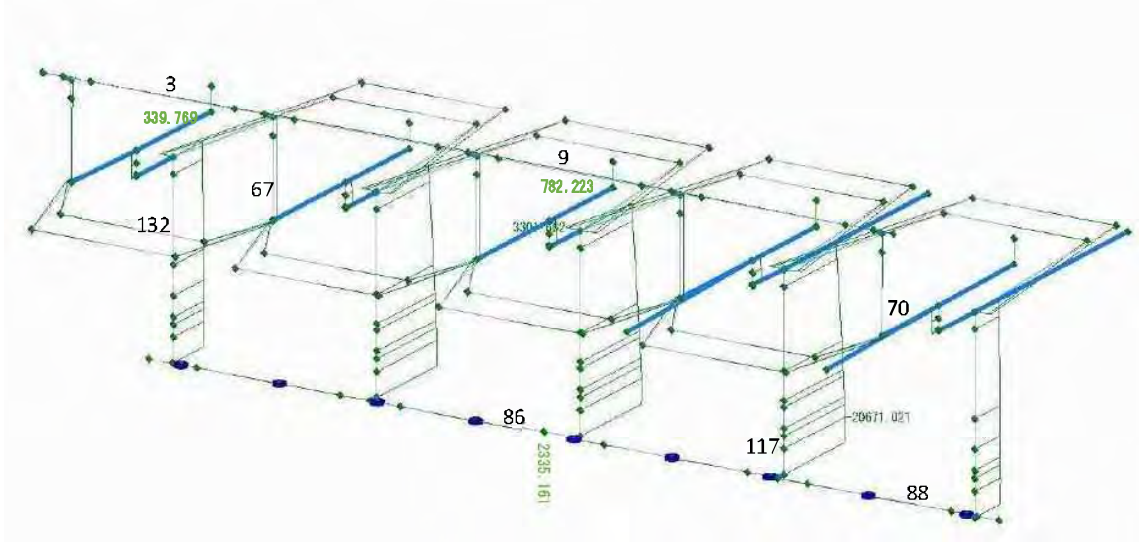
⑪ CASE11 : Seism Lateral direction No water Full OP



⑫ CASE12 : Seism Longitudinal direction H.W.L.+0.25m water level Full OP



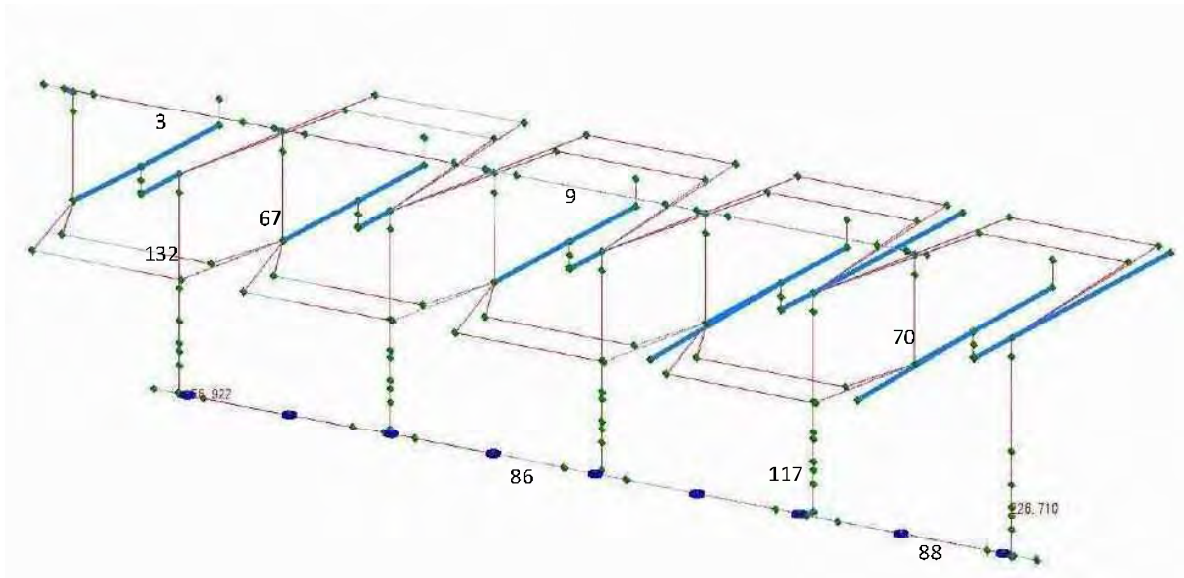
⑬ CASE13 : Regular Longitudinal direction H.W.L.+0.25m water level Maintenance



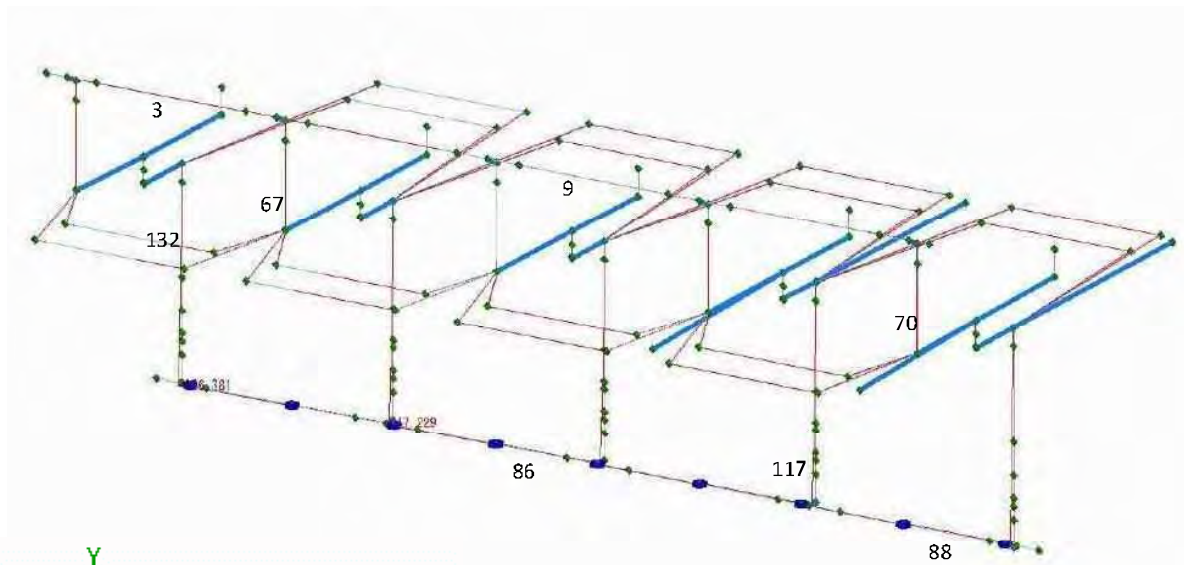
Bahr Yusef Reg

2. Shear power

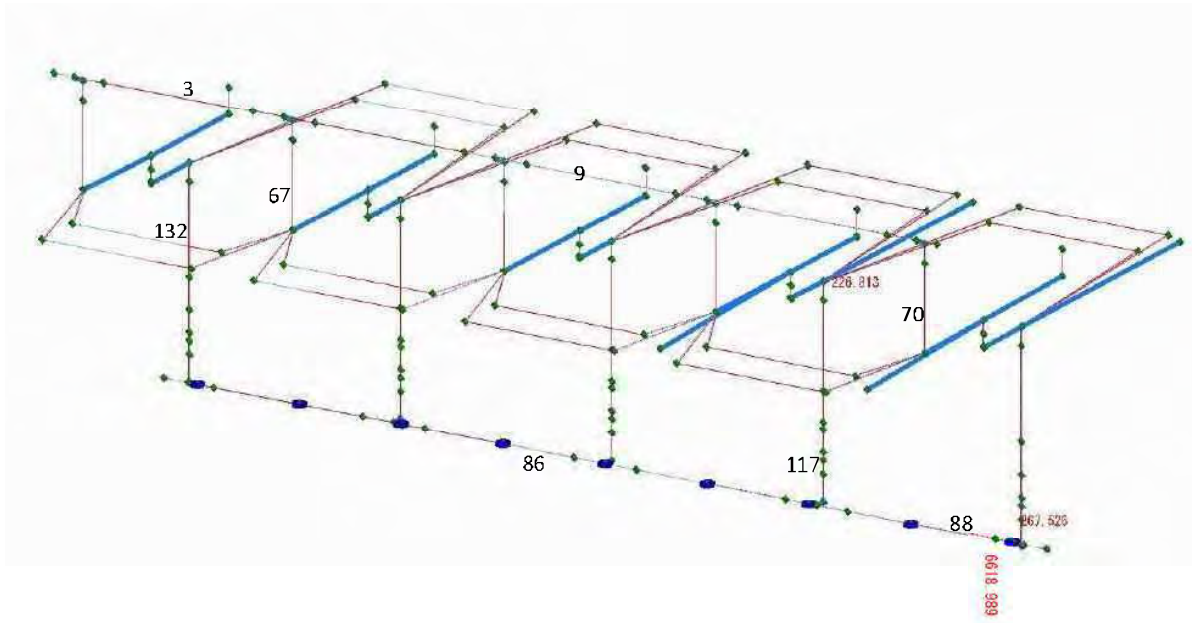
① CASE1 : Regular Longitudinal direction H.H.W.L. Full OP



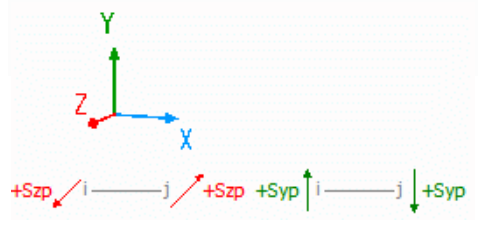
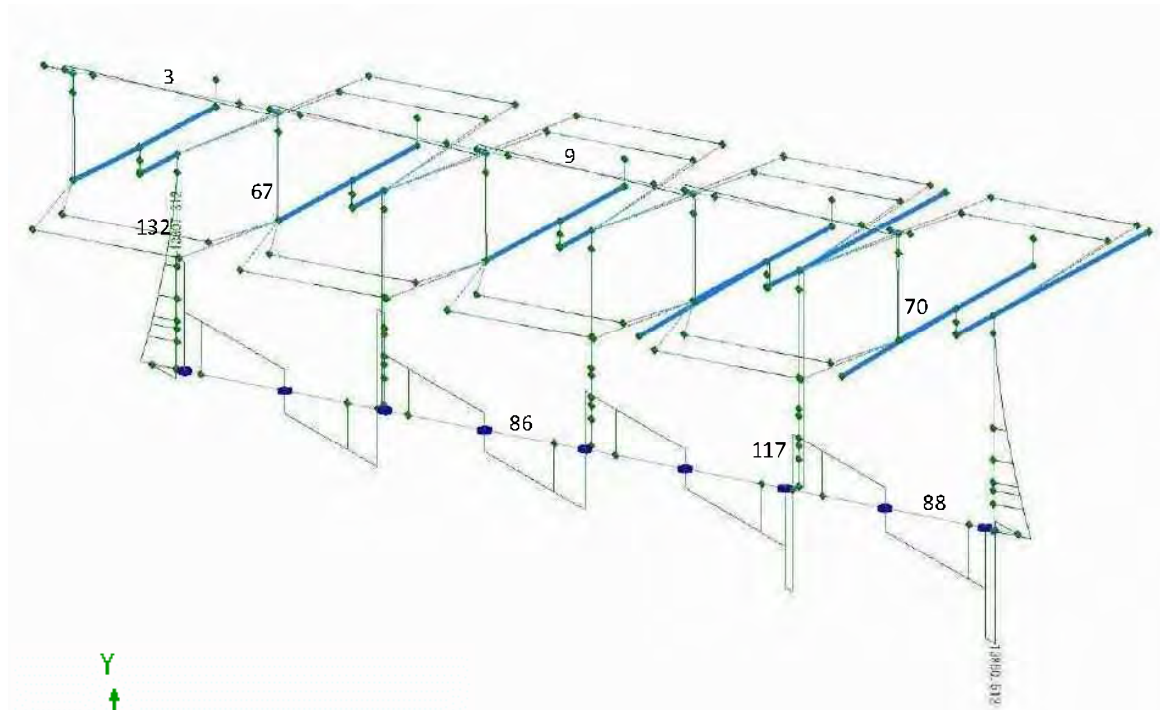
② CASE2 : Regular Longitudinal direction H.WL+0.25m water level Full CL



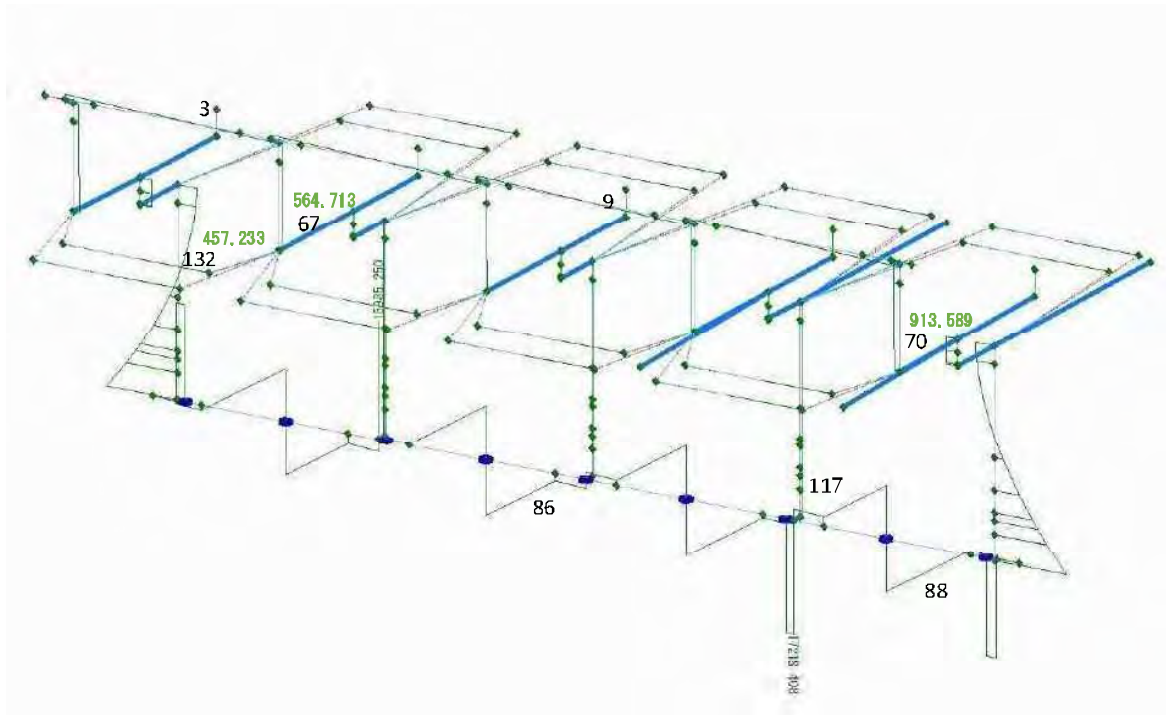
③ CASE3 : Regular Longitudinal direction No. water Full OP



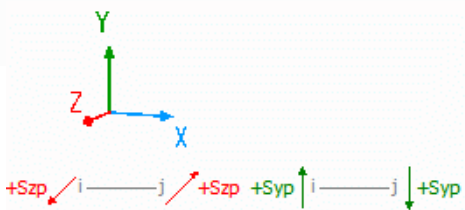
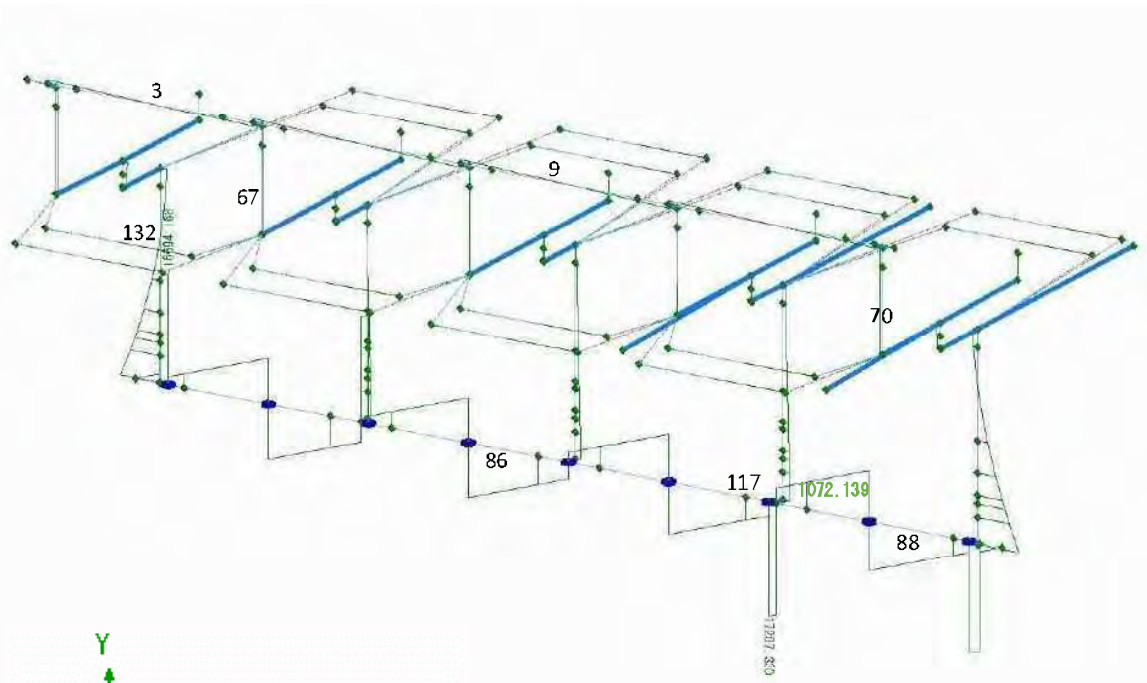
④ CASE4 : Regular Lateral direction H.W.L. +0.25m water level Full OP



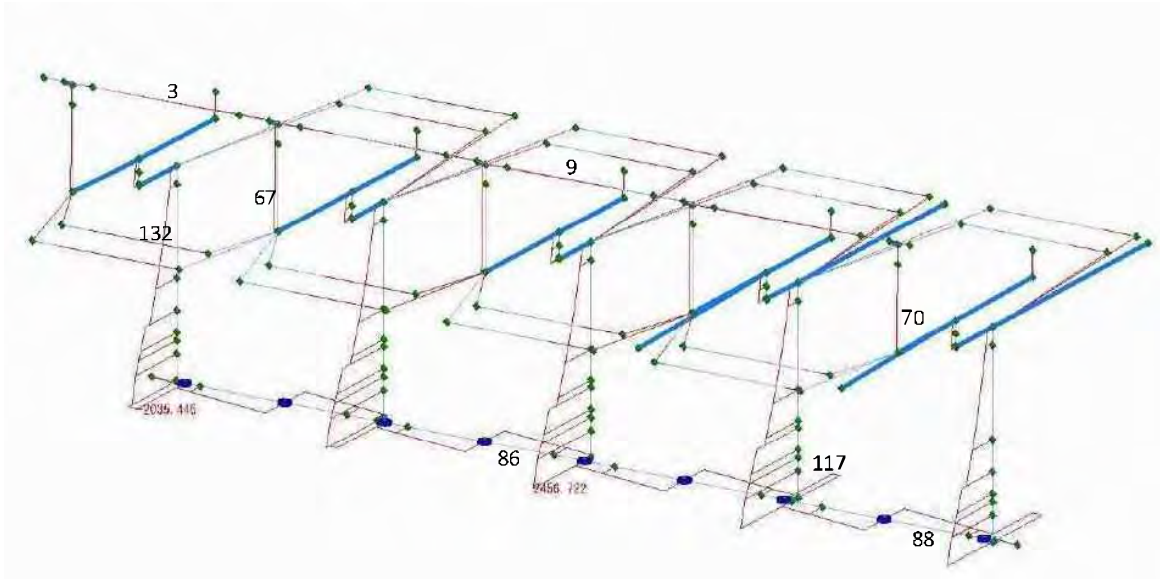
⑤ CASE5 : Regular Lateral direction H.W.L.+0.25m water level Full CL



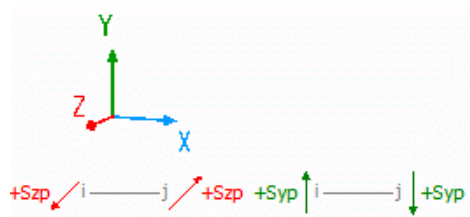
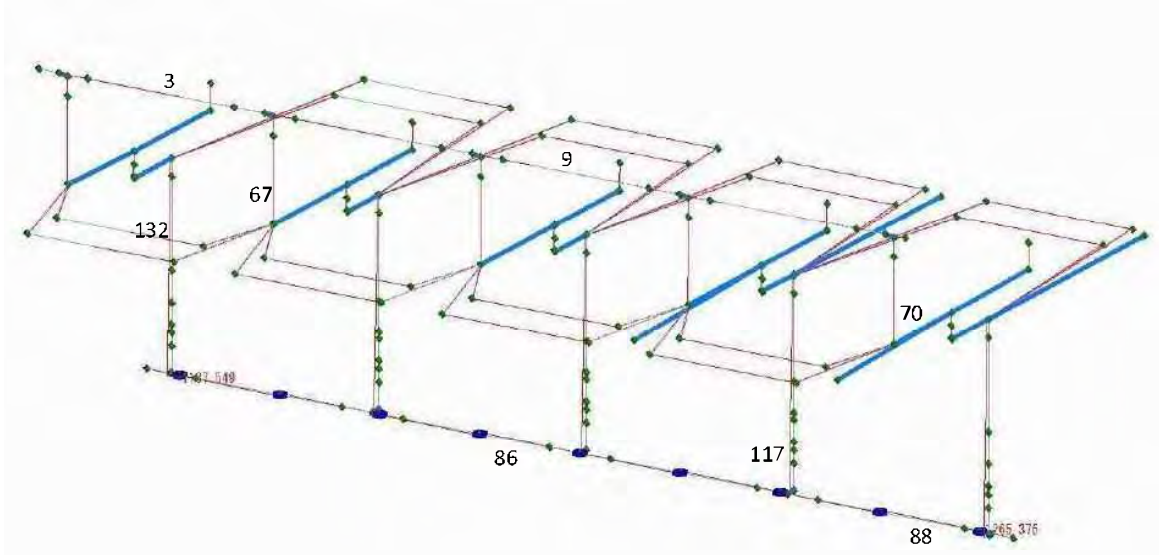
⑥ CASE6 : Regular Lateral direction No water Full OP



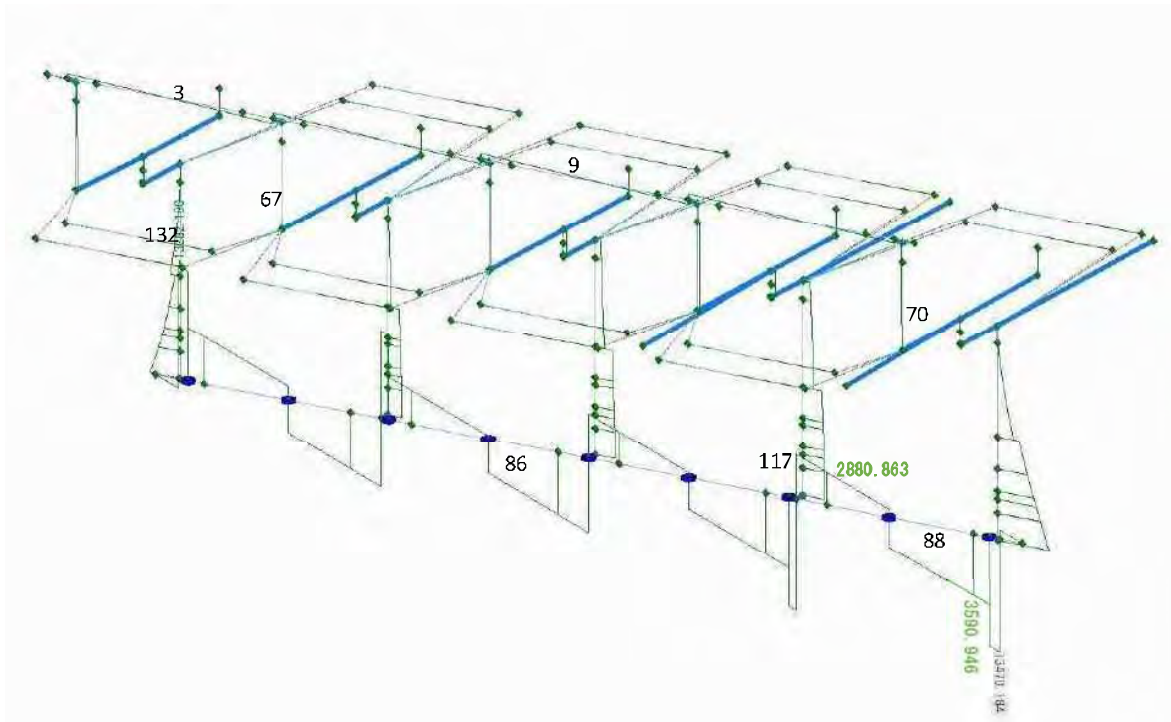
⑦ CASE7 : Seism Longitudinal direction H.W.L. +0.25m water level Full CL



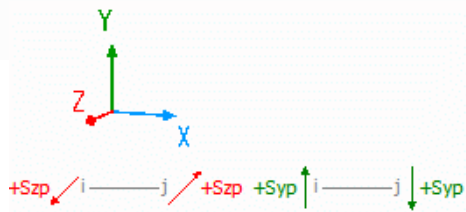
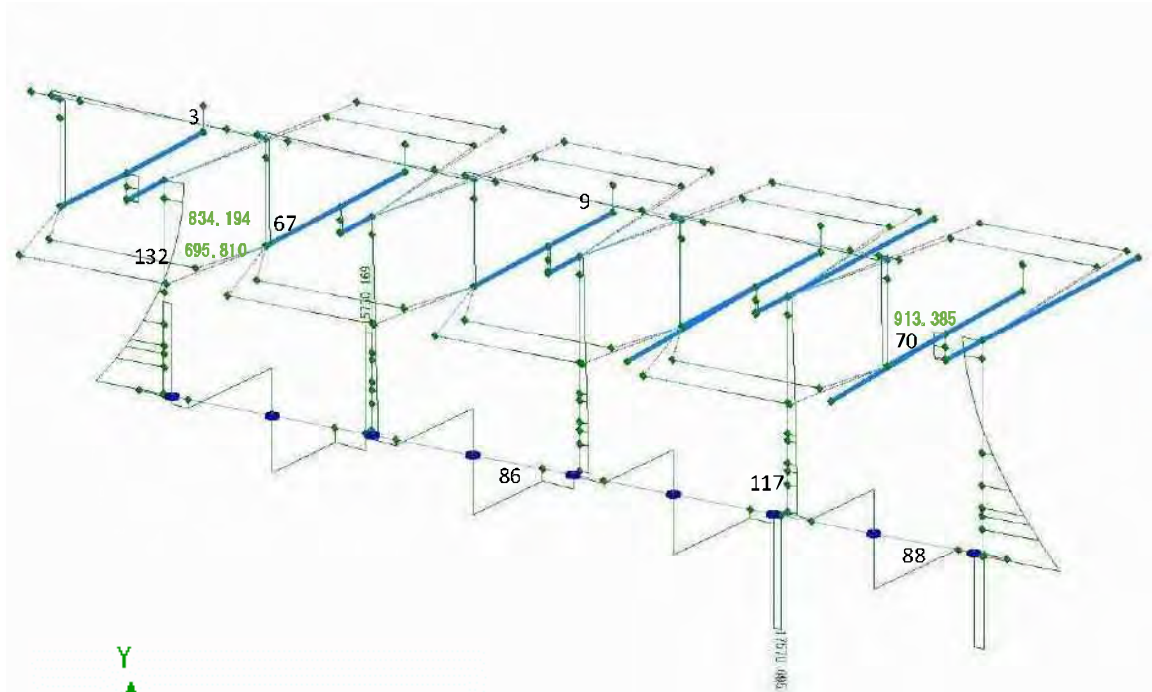
⑧ CASE8 : Seism Longitudinal direction No water Full OP



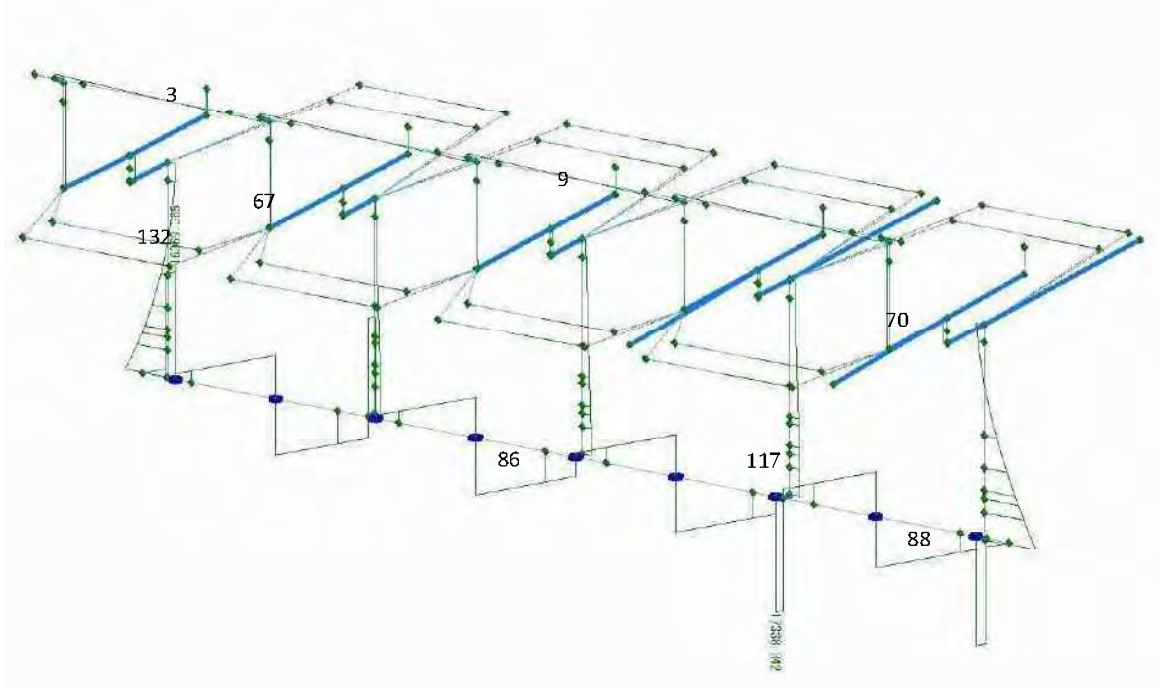
⑨ CASE9 : Seism Lateral direction H.W.L+ 0.25m water level Full OP



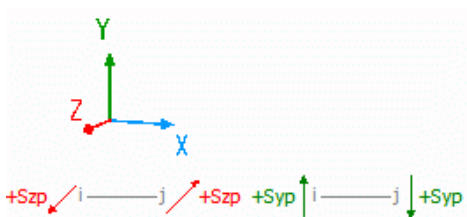
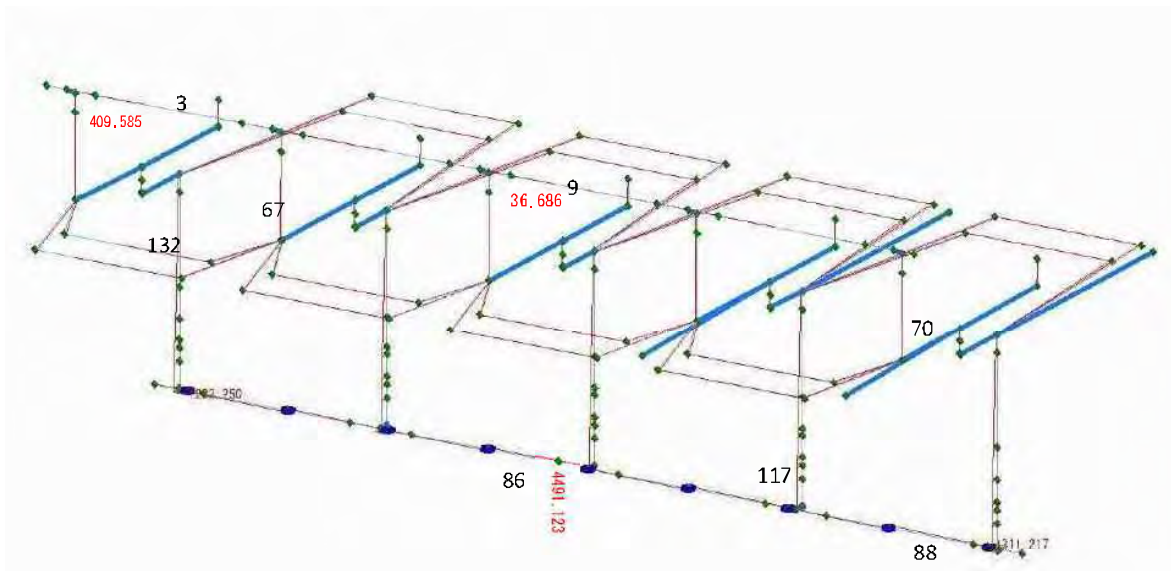
⑩ CASE10 : Seism Lateral direction H.W.L+0.25m level Full CL



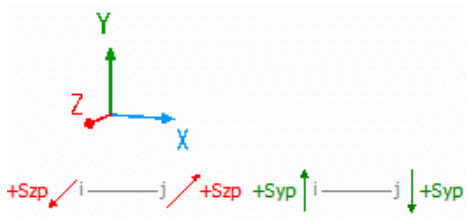
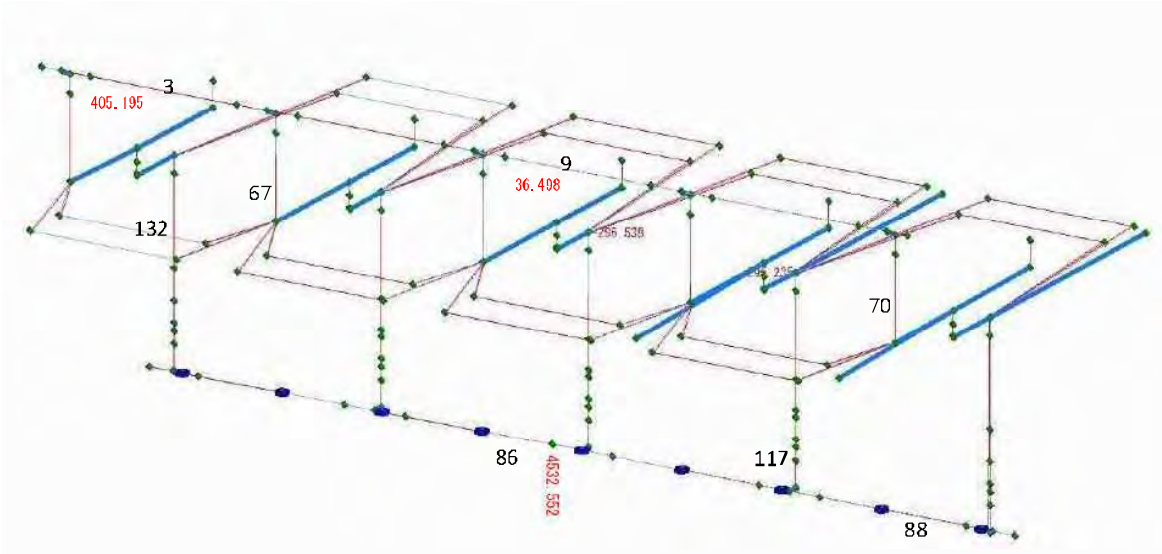
⑪ CASE11 : Seism Lateral direction No water Full OP



⑫ CASE12 : Seism Longitudinal direction H.W.L.+0.25m water level Full OP



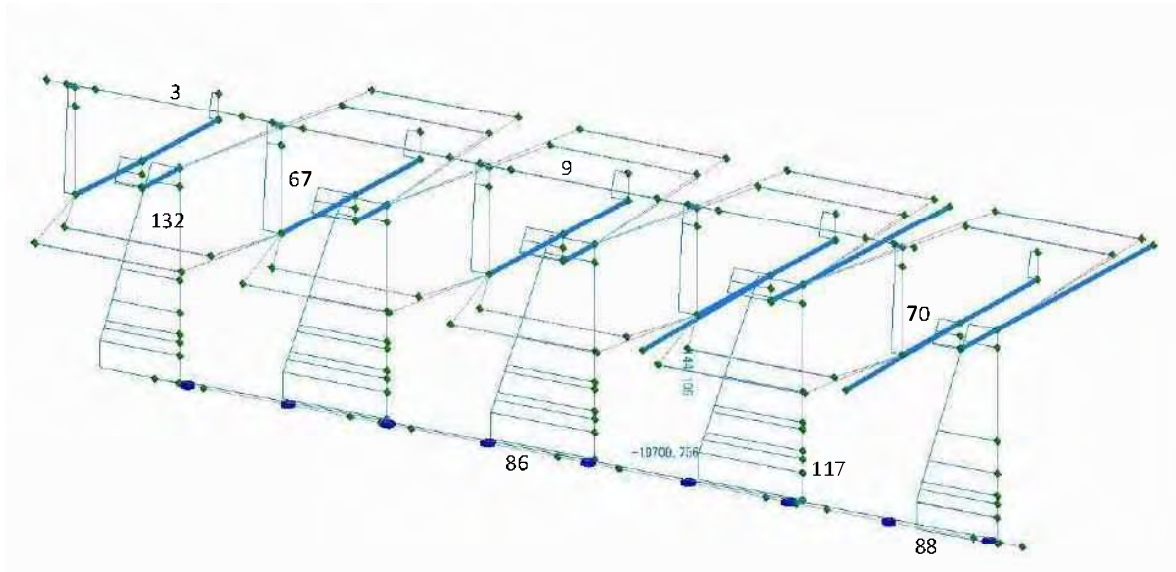
⑬ CASE13 : Regular Longitudinal direction H.W.L.+0.25m water level Maintenance



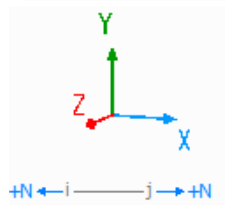
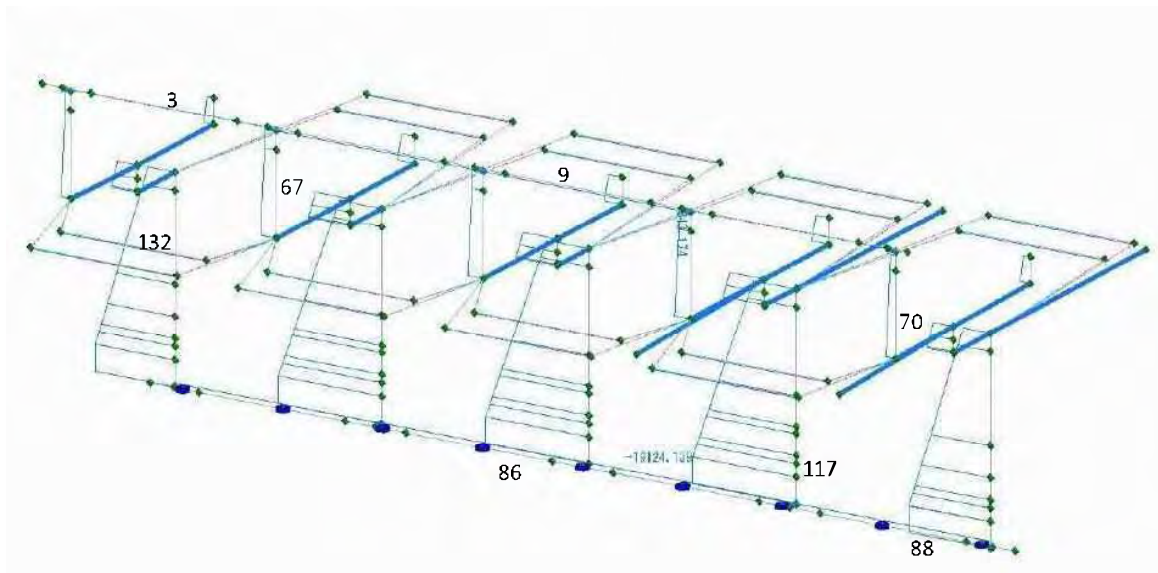
Bahr Yusef Reg

3.Axis power

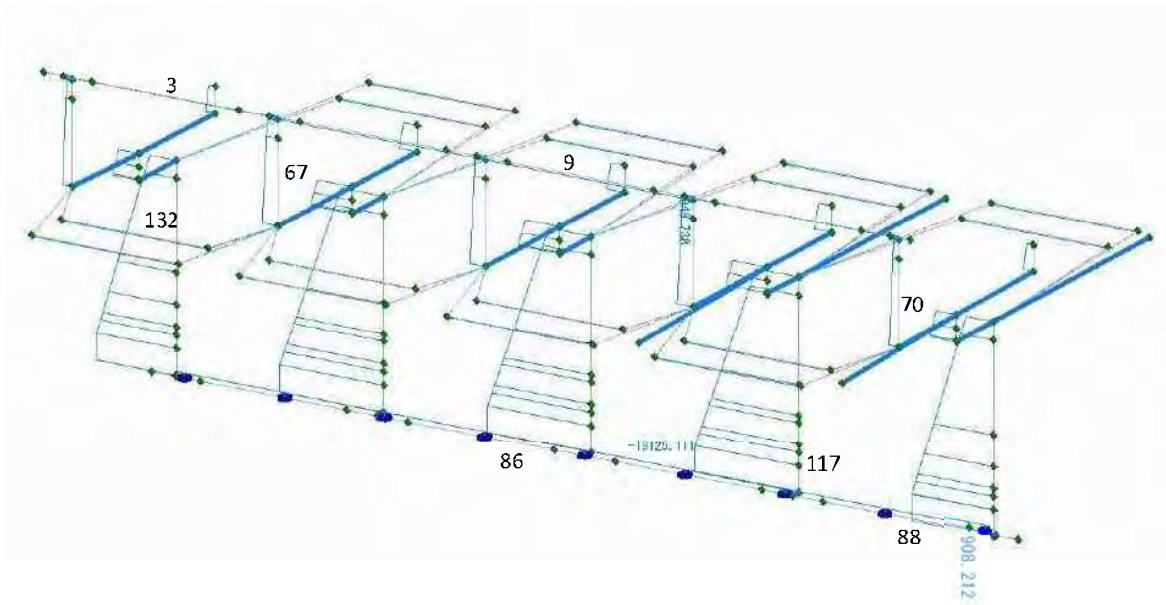
① CASE1 : Regular Longitudinal direction H.H.W.L. Full OP



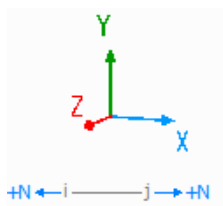
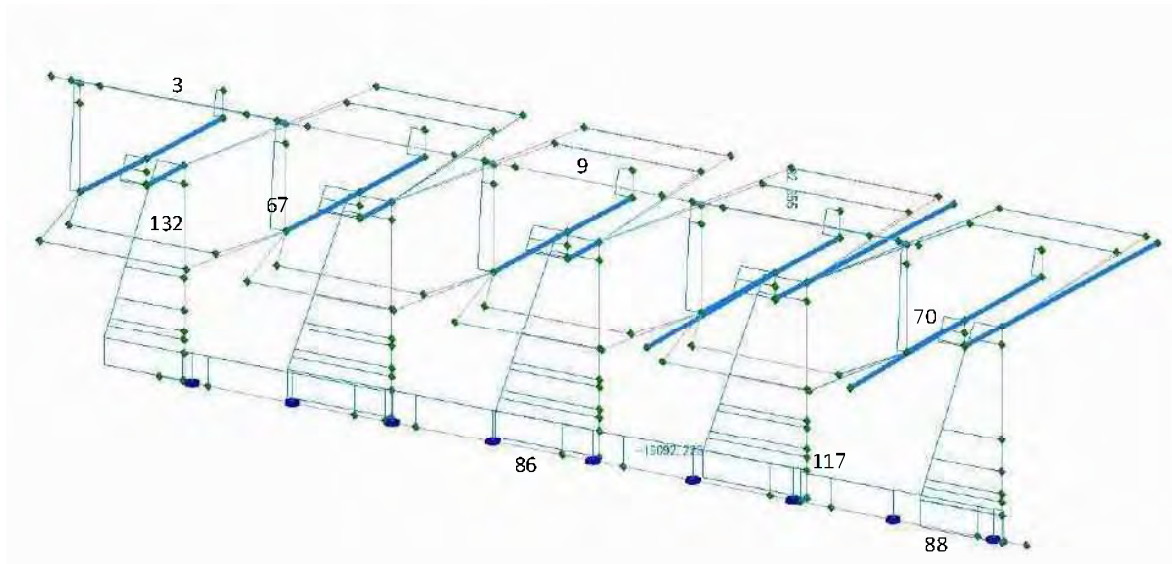
② CASE2 : Regular Longitudinal direction H.WL+0.25m water level Full CL



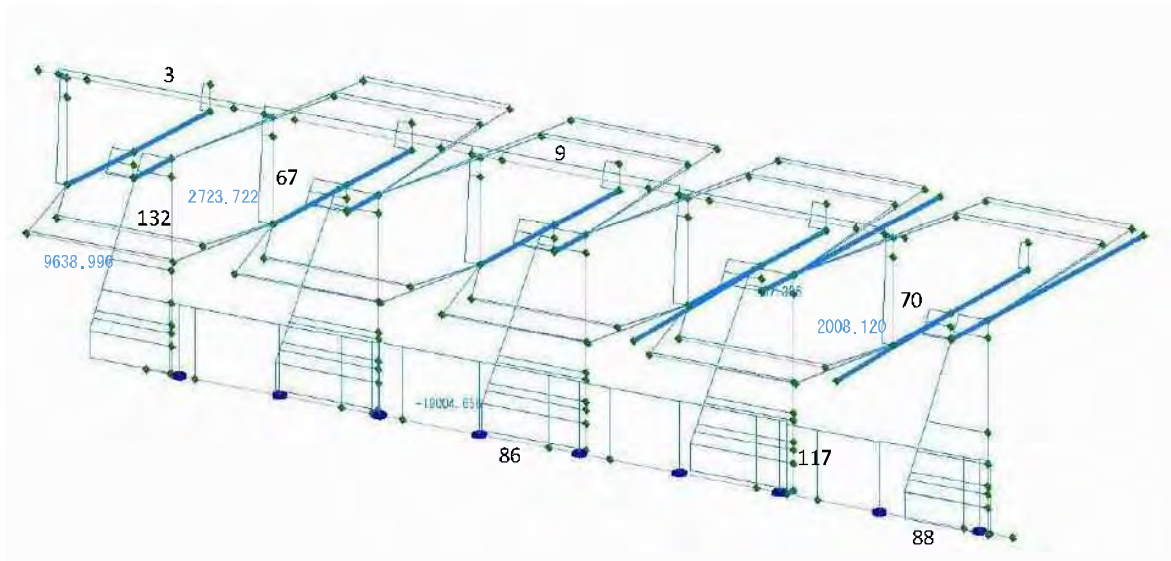
③ CASE3 : Regular Longitudinal direction No. water Full OP



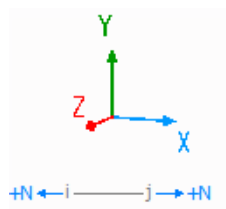
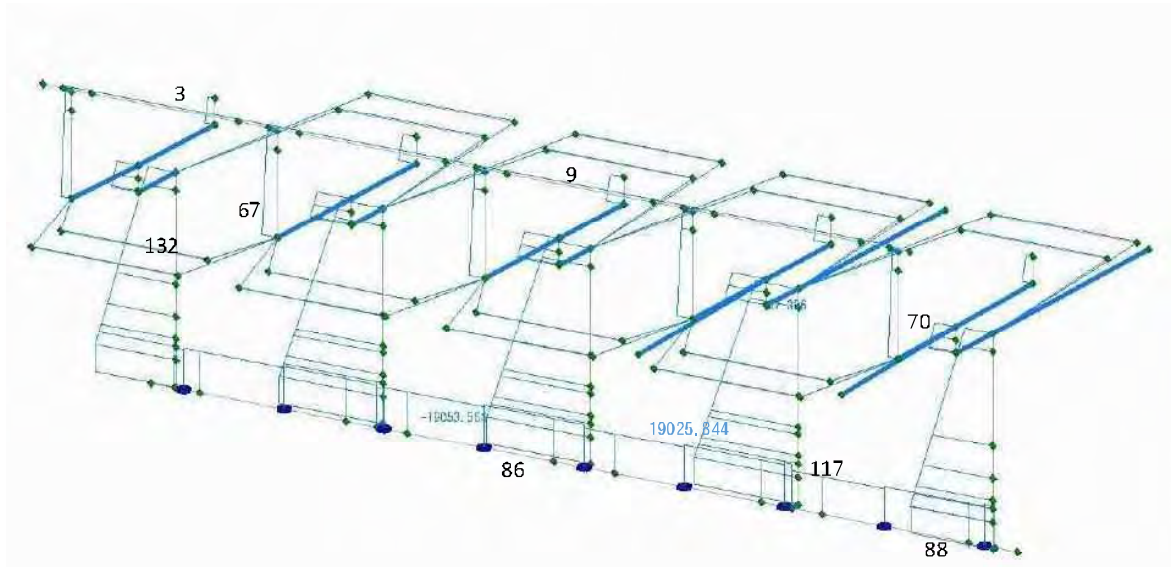
④ CASE4 : Regular Lateral direction H.W.L. +0.25m water level Full OP



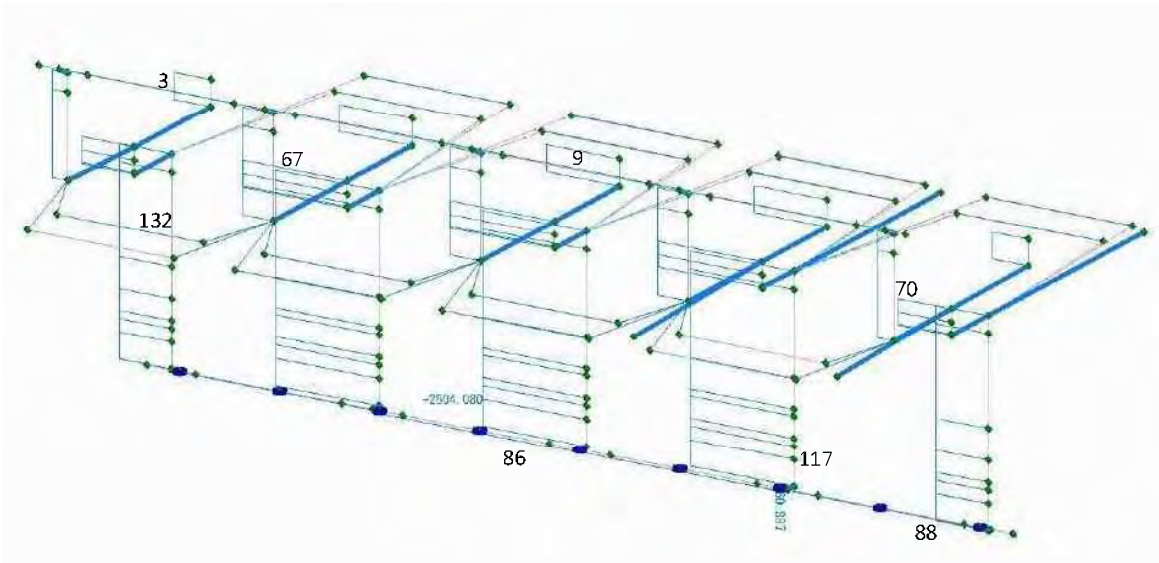
⑤ CASE5 : Regular Lateral direction H.W.L.+0.25m water level Full CL



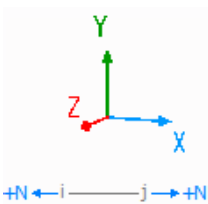
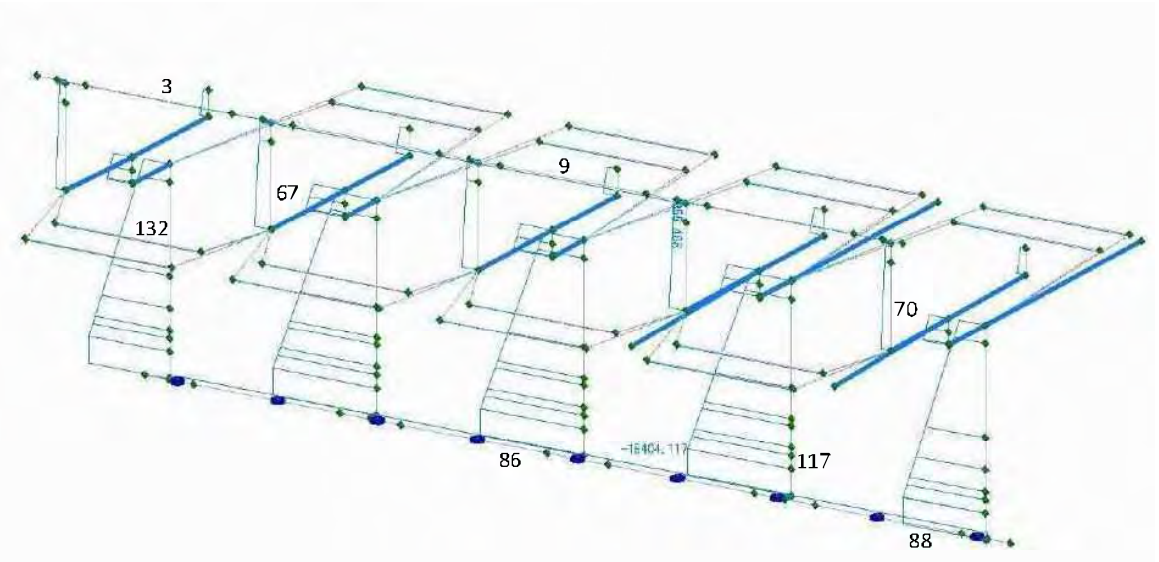
⑥ CASE6 : Regular Lateral direction No water Full OP



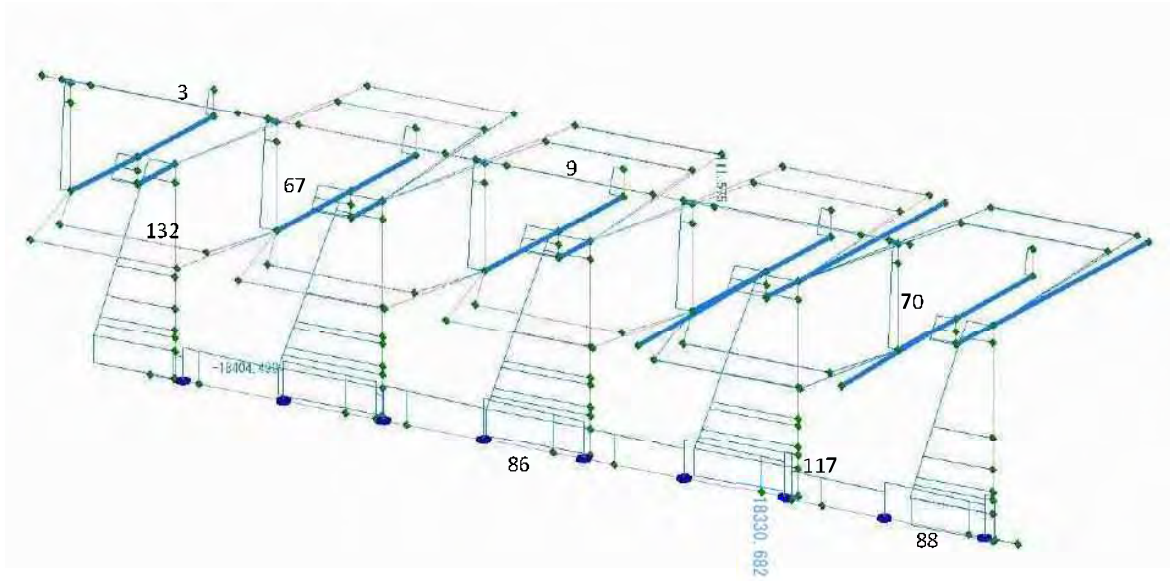
⑦ CASE7 : Seism Longitudinal direction H.W.L. +0.25m water level Full CL



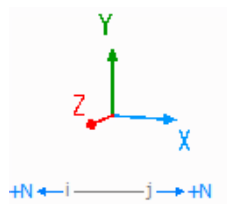
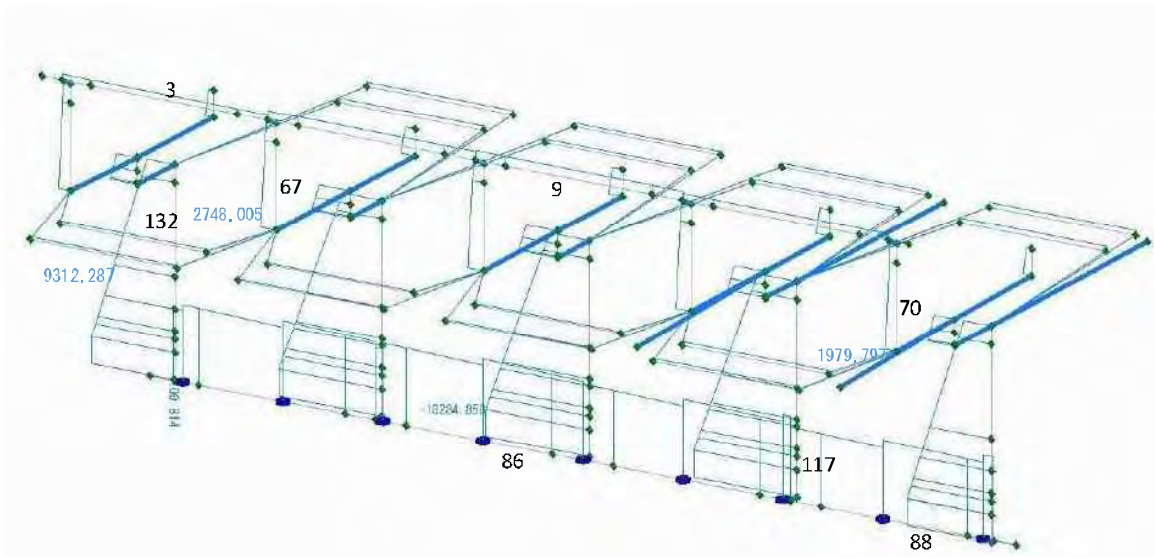
⑧ CASE8 : Seism Longitudinal direction No water Full OP



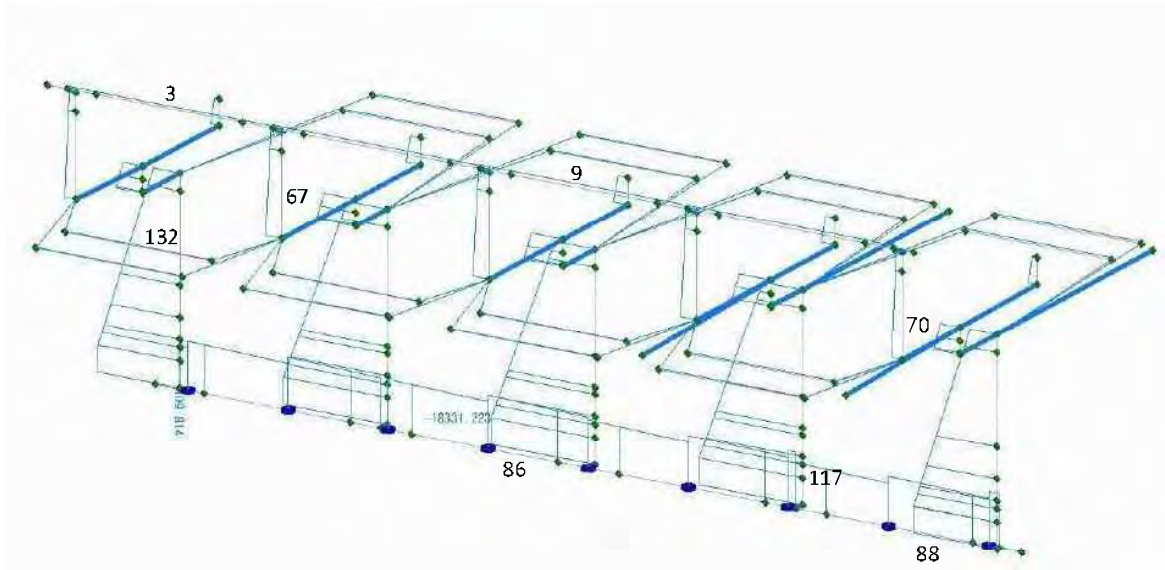
⑨ CASE9 : Seism Lateral direction H.W.L+ 0.25m water level Full OP



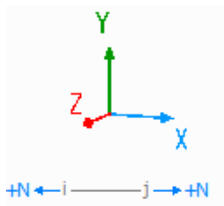
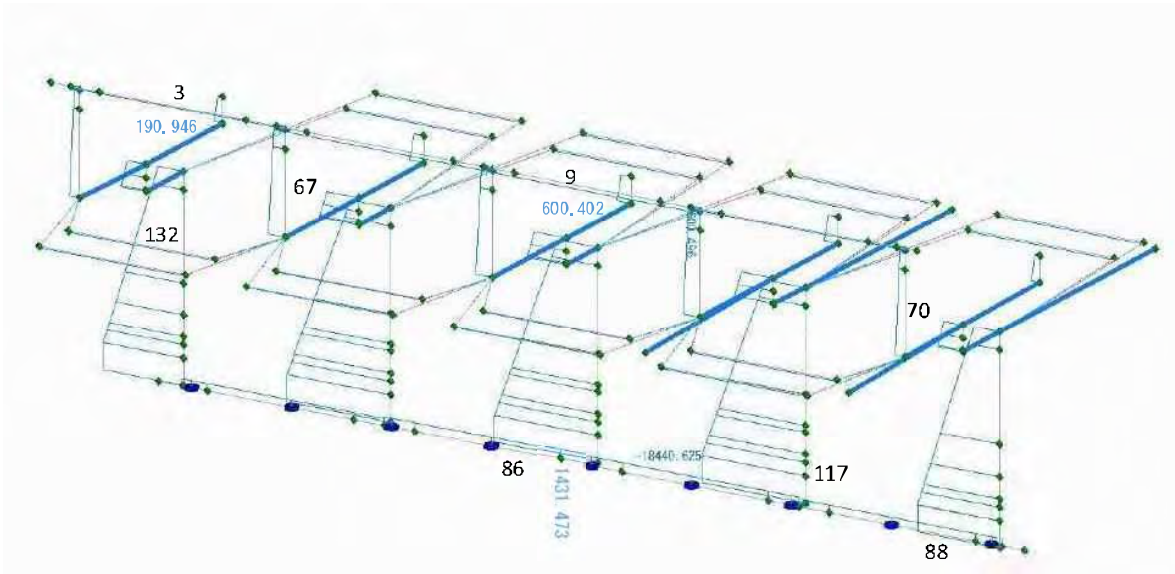
⑩ CASE10 : Seism Lateral direction H.W.L+0.25m level Full CL



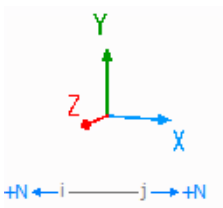
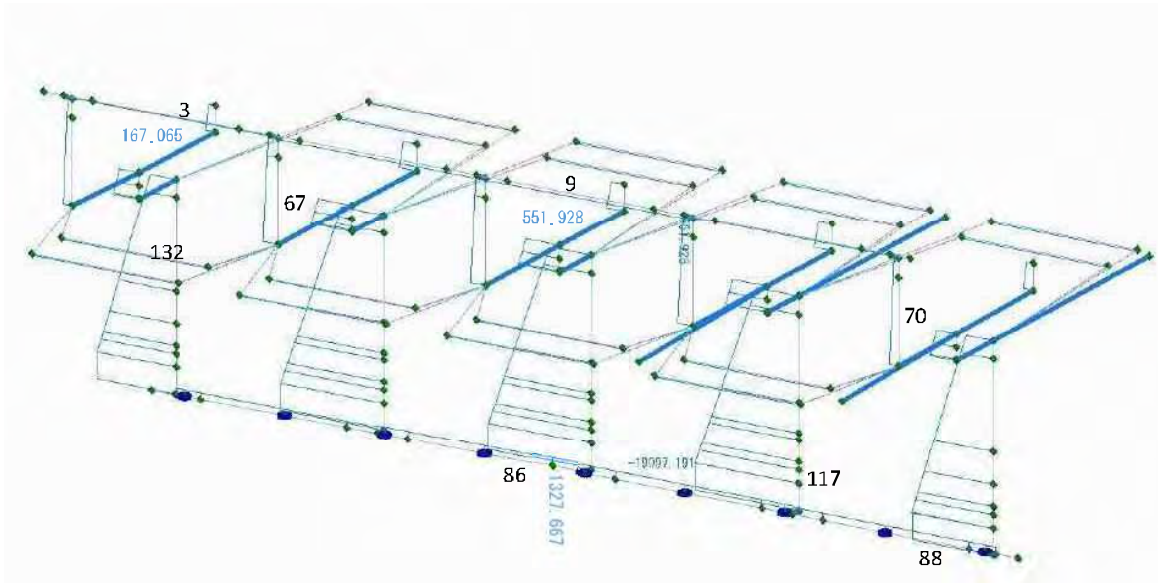
⑪ CASE11 : Seism Lateral direction No water Full OP



⑫ CASE12 : Seism Longitudinal direction H.W.L.+0.25m water level Full OP

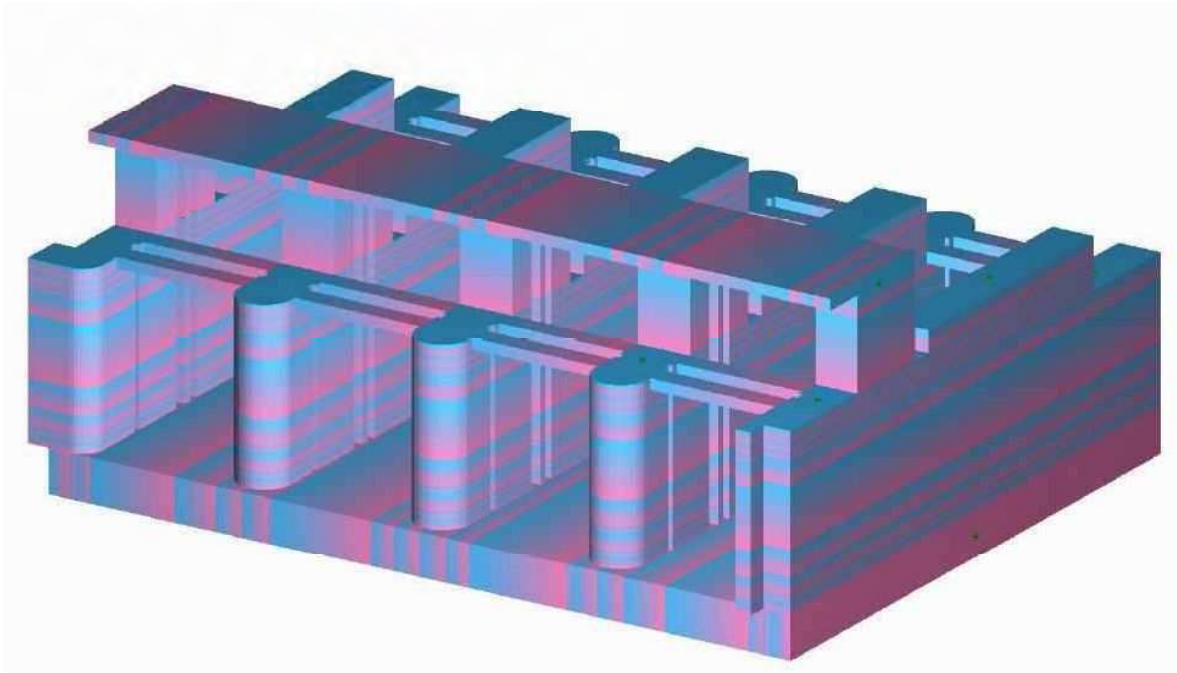


⑬ CASE13 : Regular Longitudinal direction H.W.L.+0.25m water level Maintenance

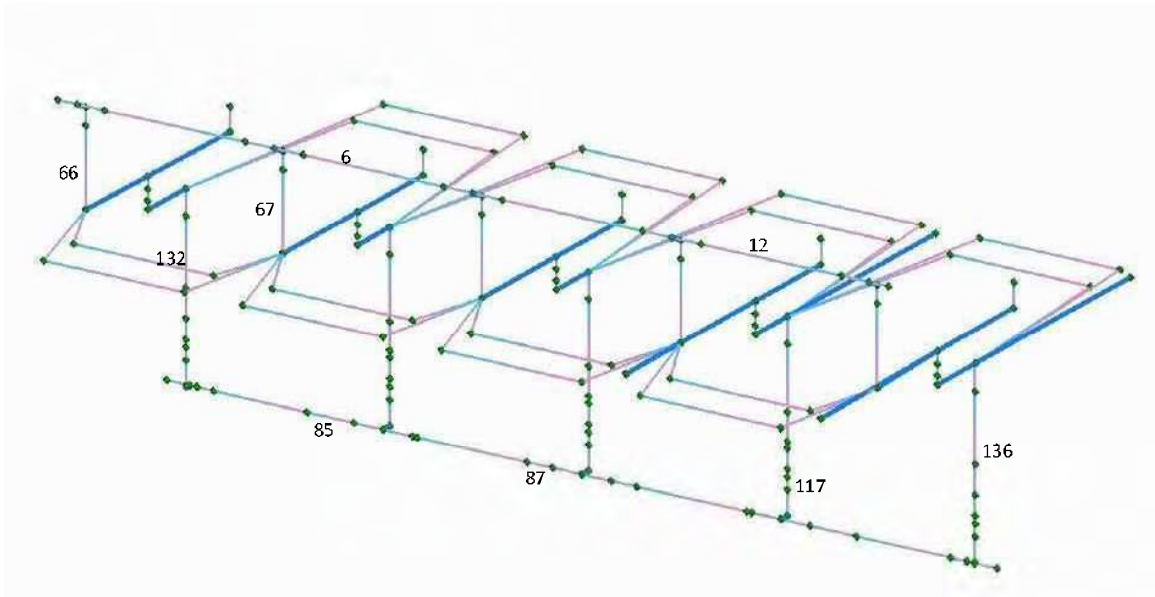


A-6-3. Structural analysis of Ibrahimia Regulator

Ibrahimia Reg.



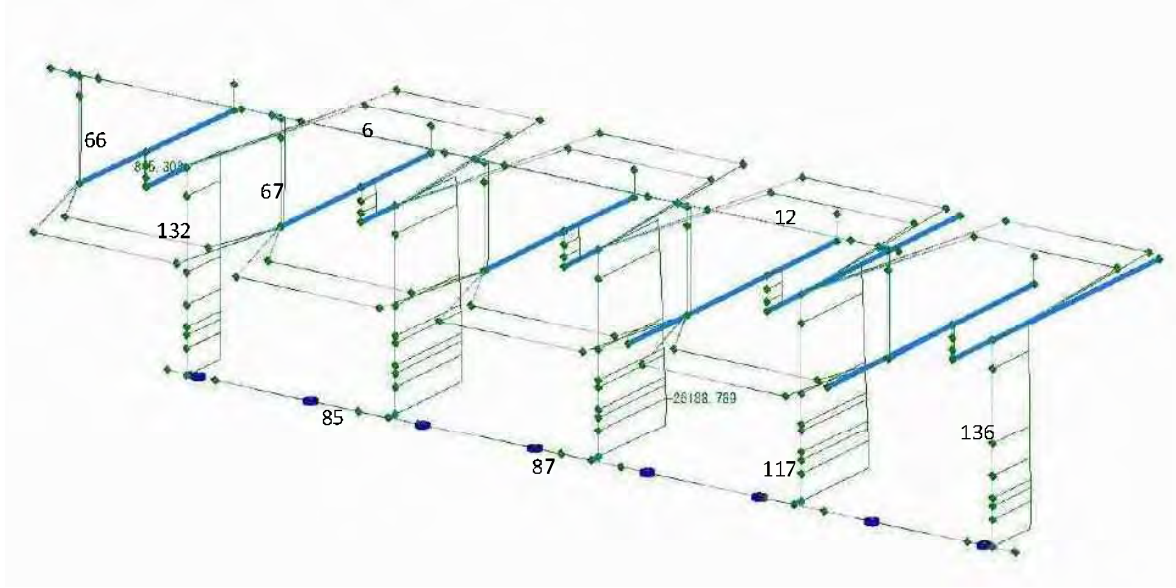
General view



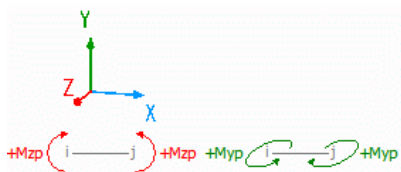
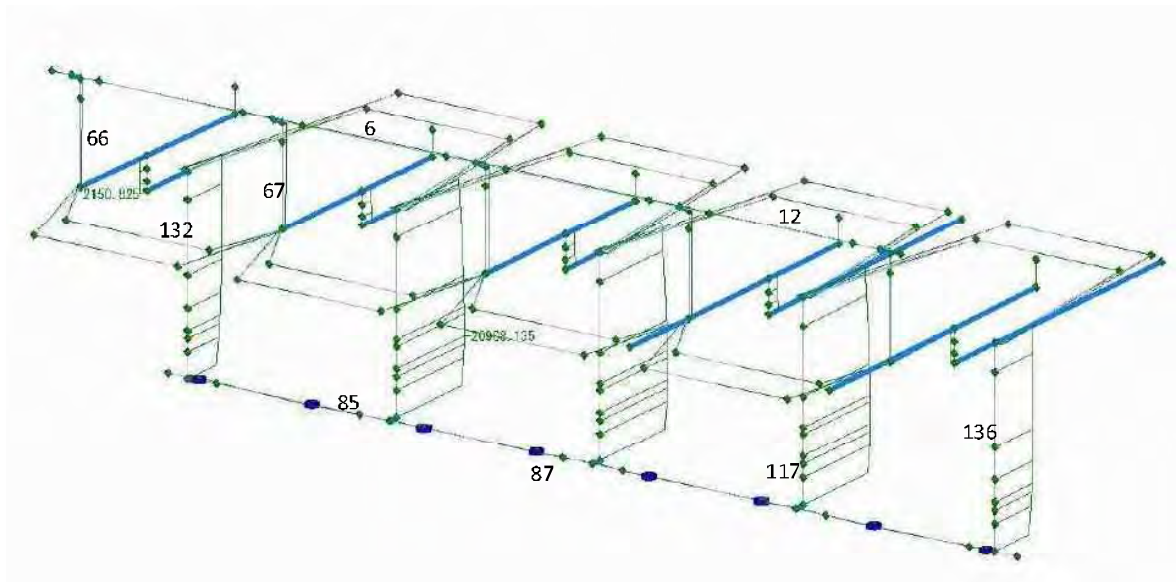
General view (frame)

1. bending Moment

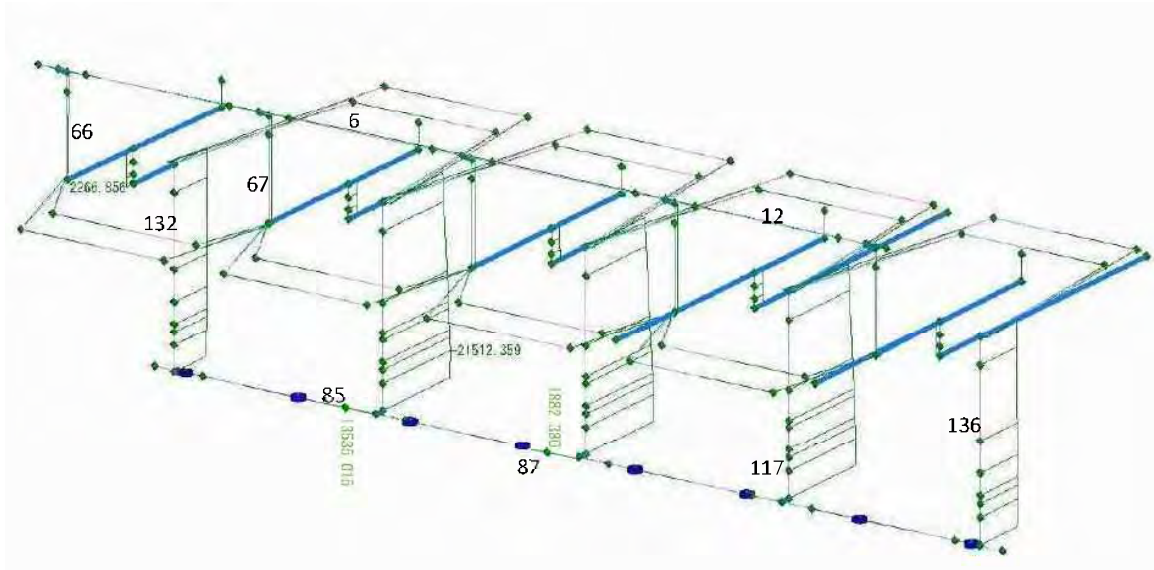
① CASE1 : Regular Longitudinal direction H.H.W.L. Full OP



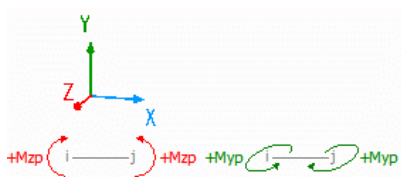
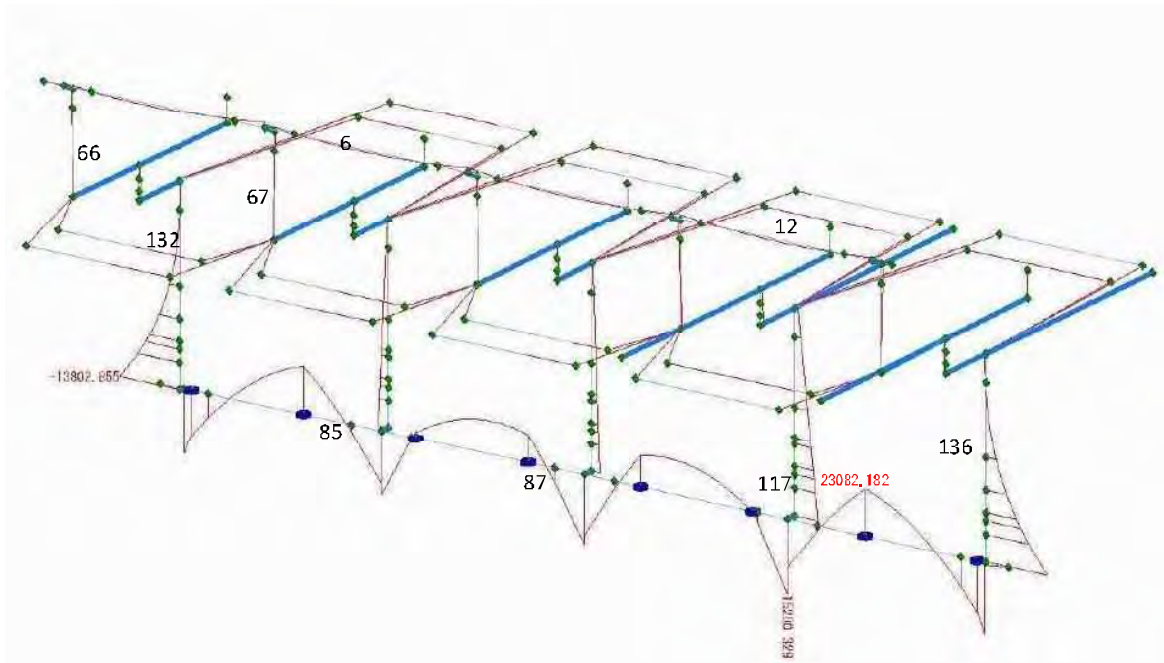
② CASE2 : Regular Longitudinal direction H.WL+0.25m water level Full CL



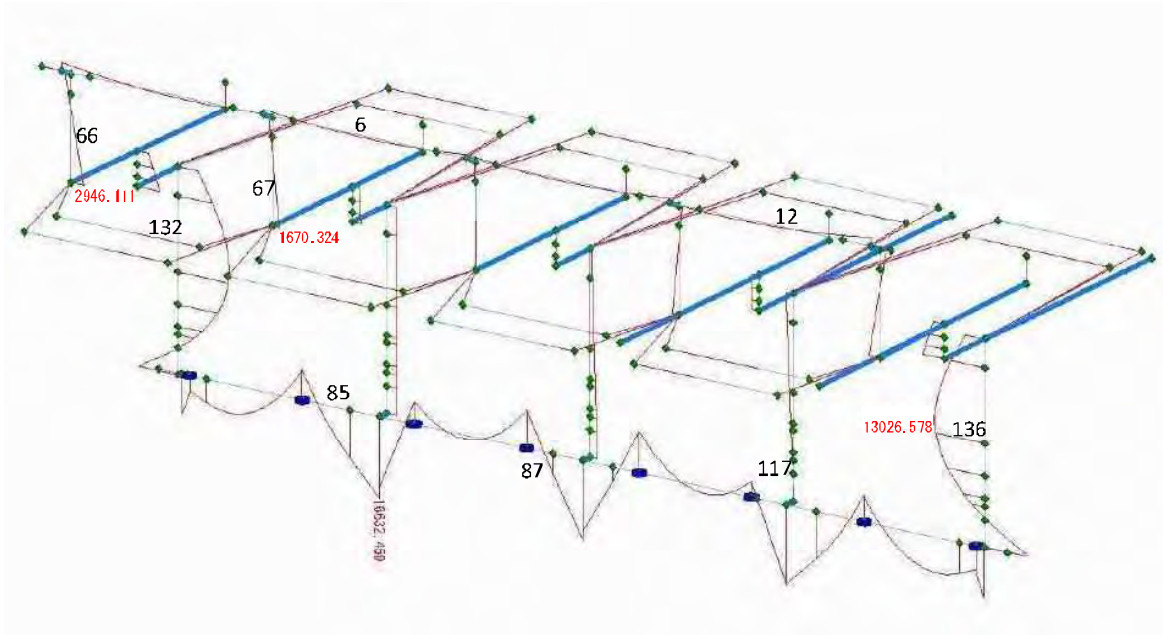
③ CASE3 : Regular Longitudinal direction No. water Full OP



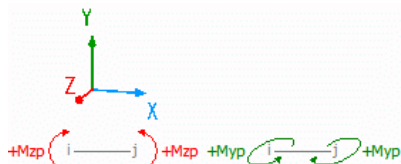
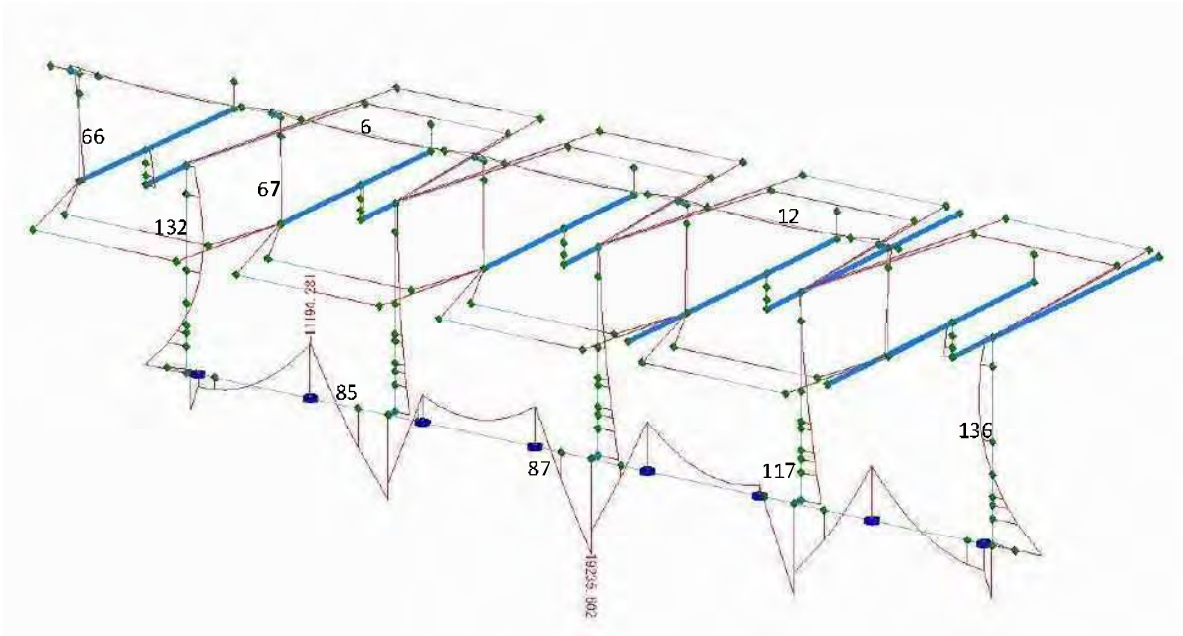
④ CASE4 : Regular Lateral direction H.W.L. +0.25m water level Full OP



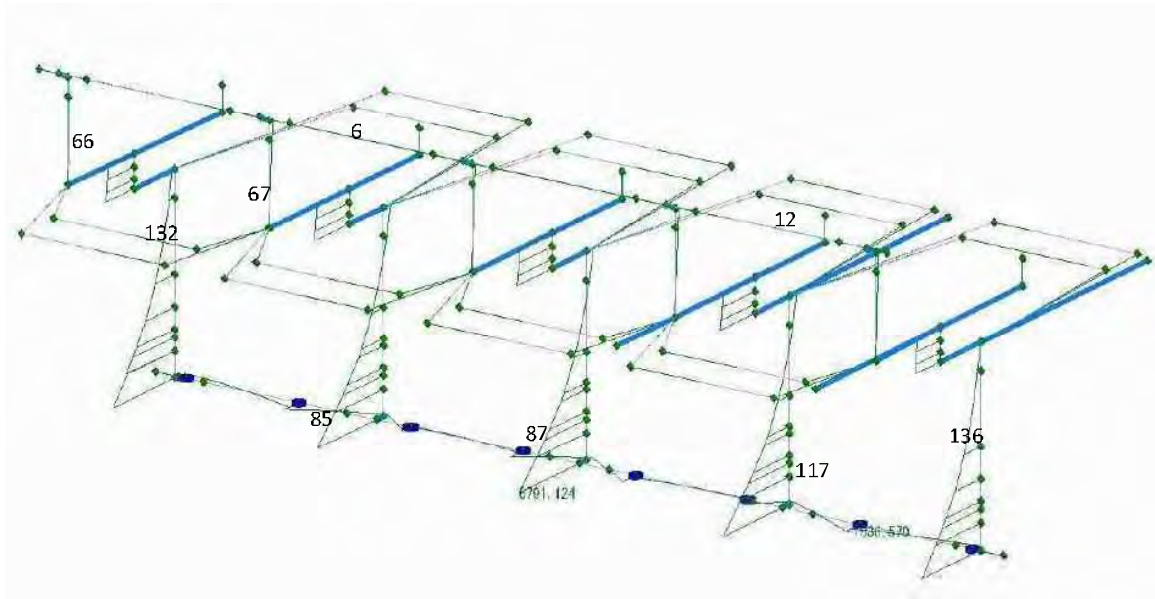
⑤ CASE5 : Regular Lateral direction H.W.L.+0.25m water level Full CL



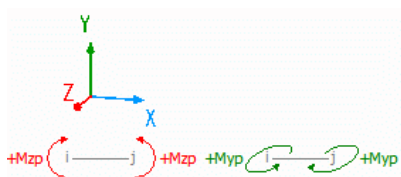
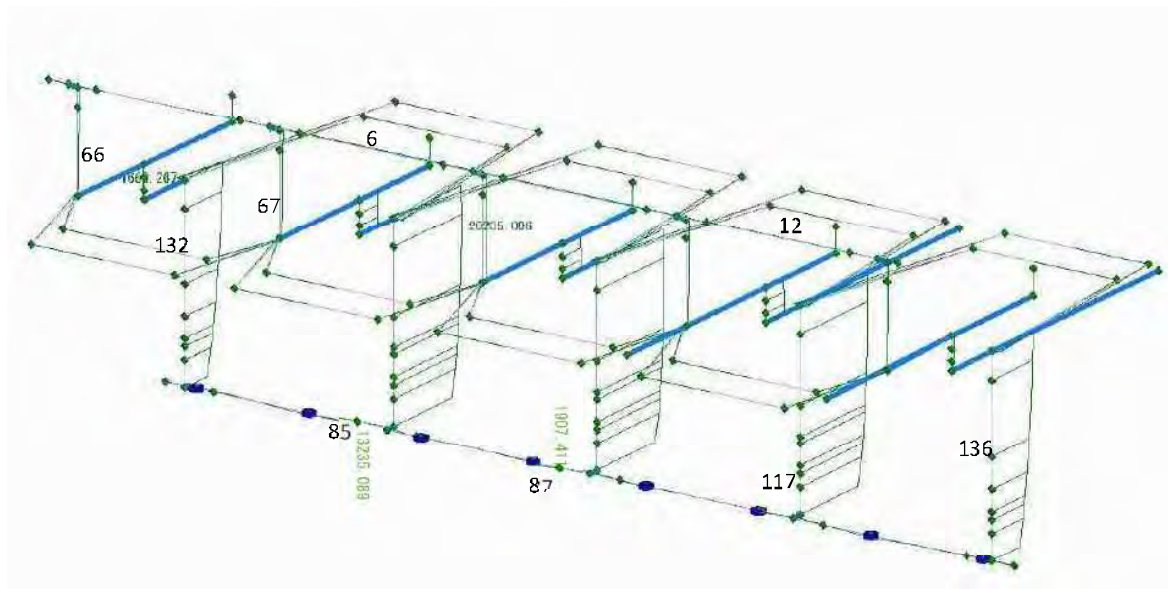
⑥ CASE6 : Regular Lateral direction No water Full OP



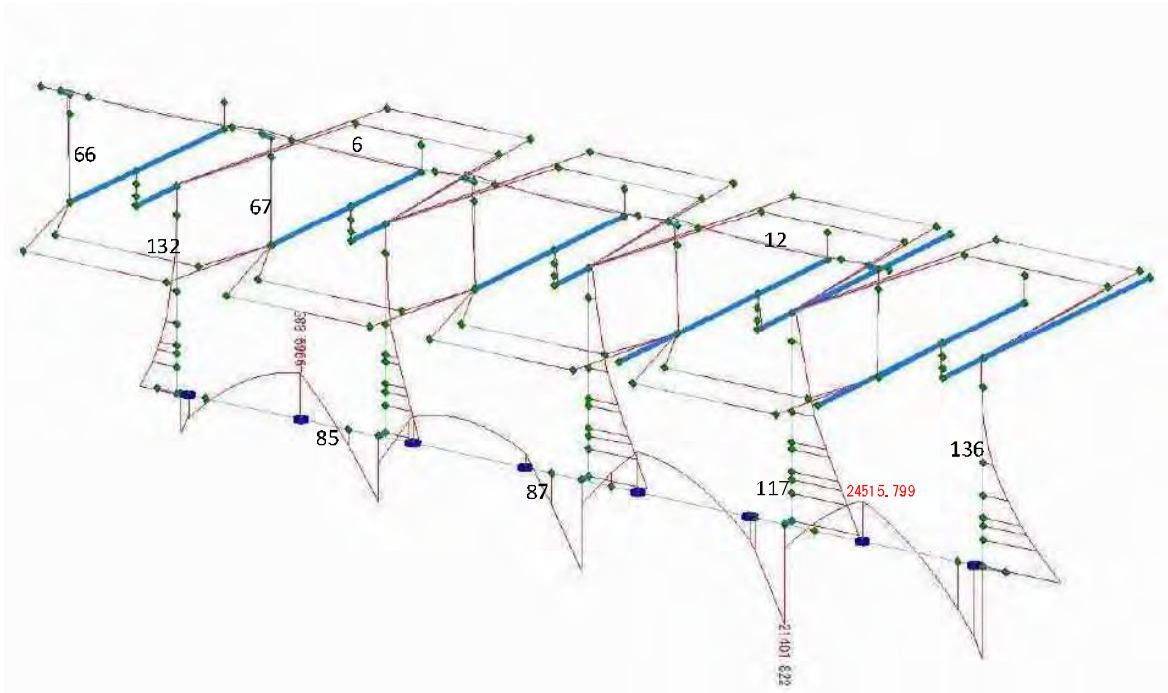
⑦ CASE7 : Seism Longitudinal direction H.W.L. +0.25m water level Full CL



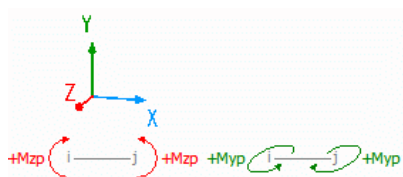
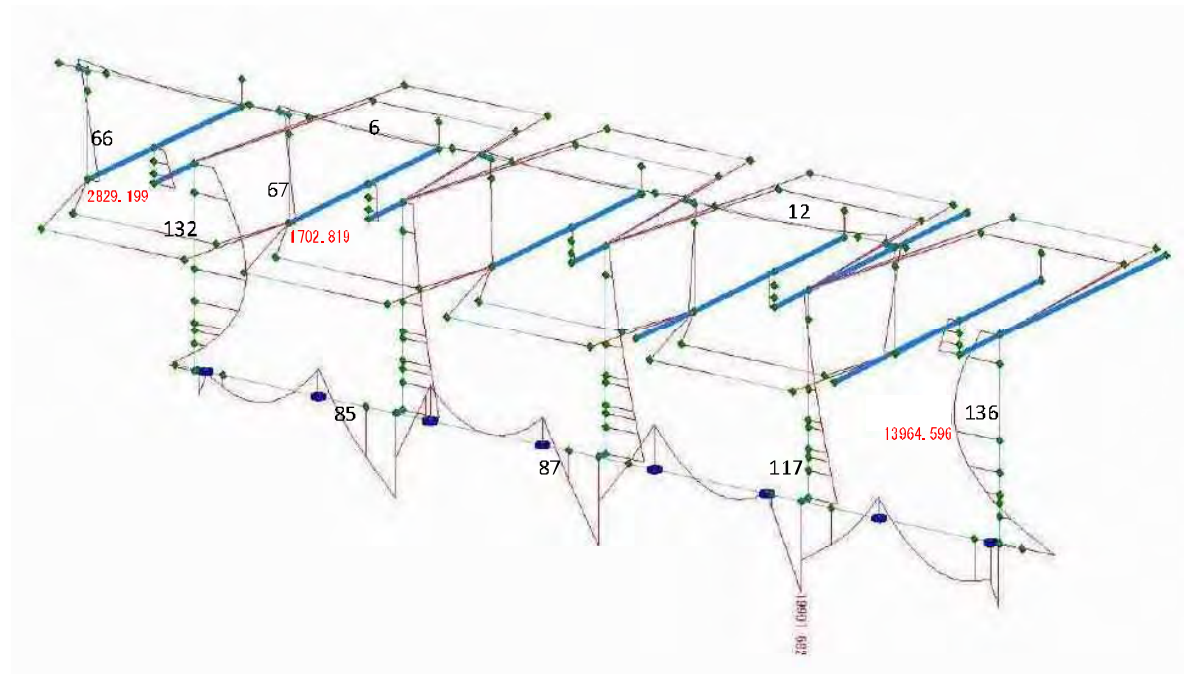
⑧ CASE8 : Seism Longitudinal direction No water Full OP



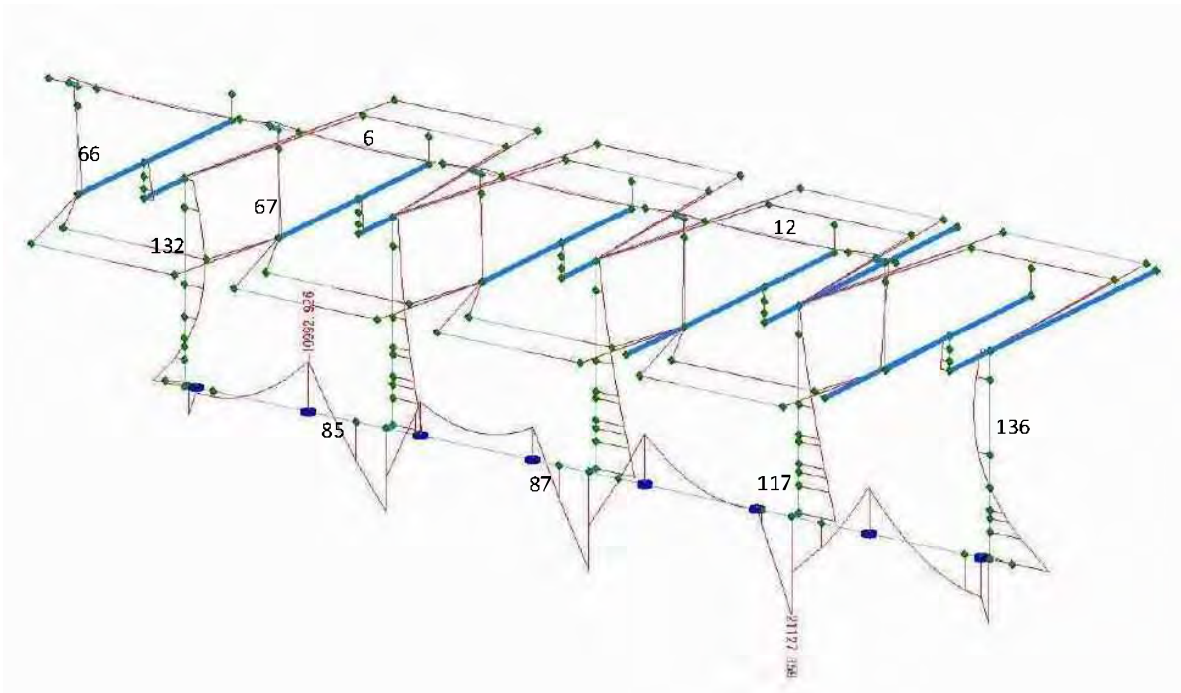
⑨ CASE9 : Seism Lateral direction H.W.L+ 0.25m water level Full OP



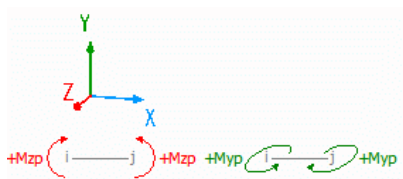
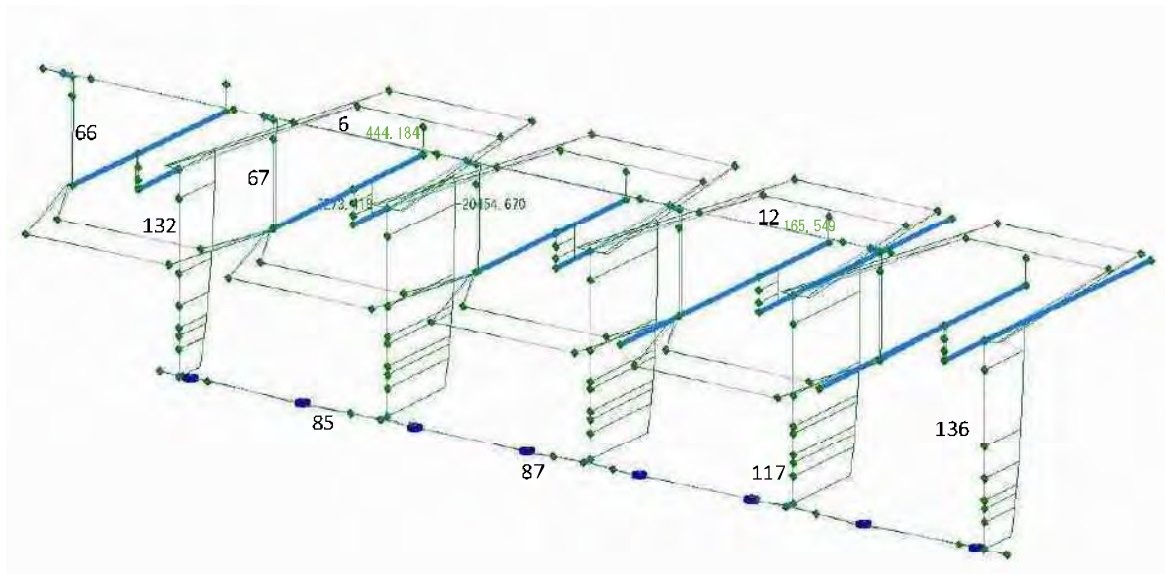
⑩ CASE10 : Seism Lateral direction H.W.L+0.25m level Full CL



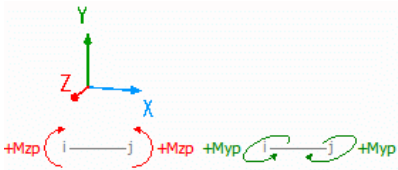
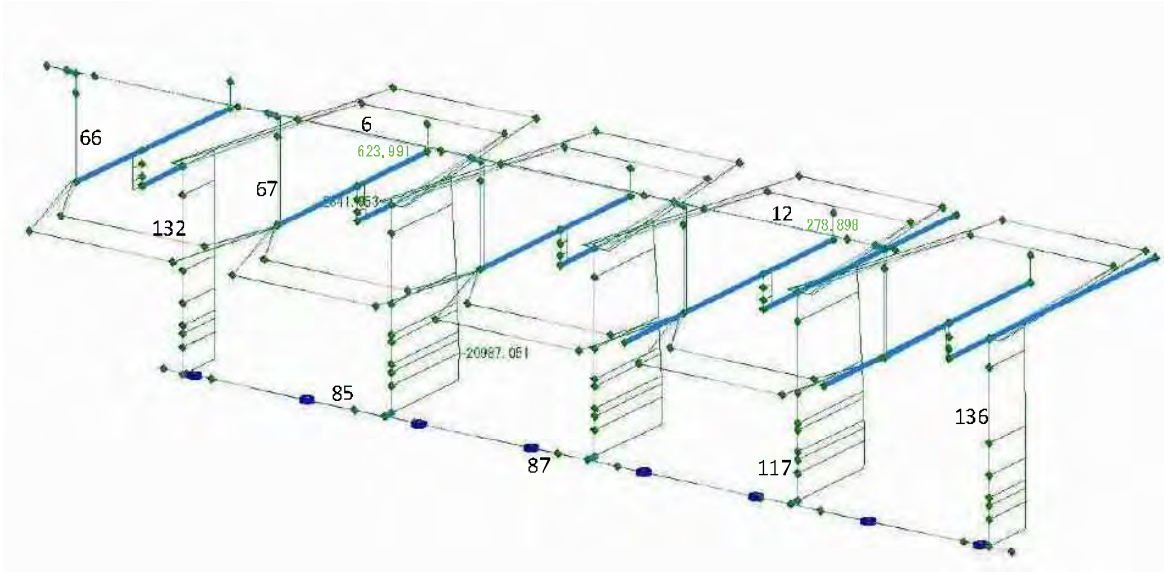
① CASE11 : Seism Lateral direction No water Full OP



② CASE12 : Seism Longitudinal direction H.W.L.+0.25m water level Full OP



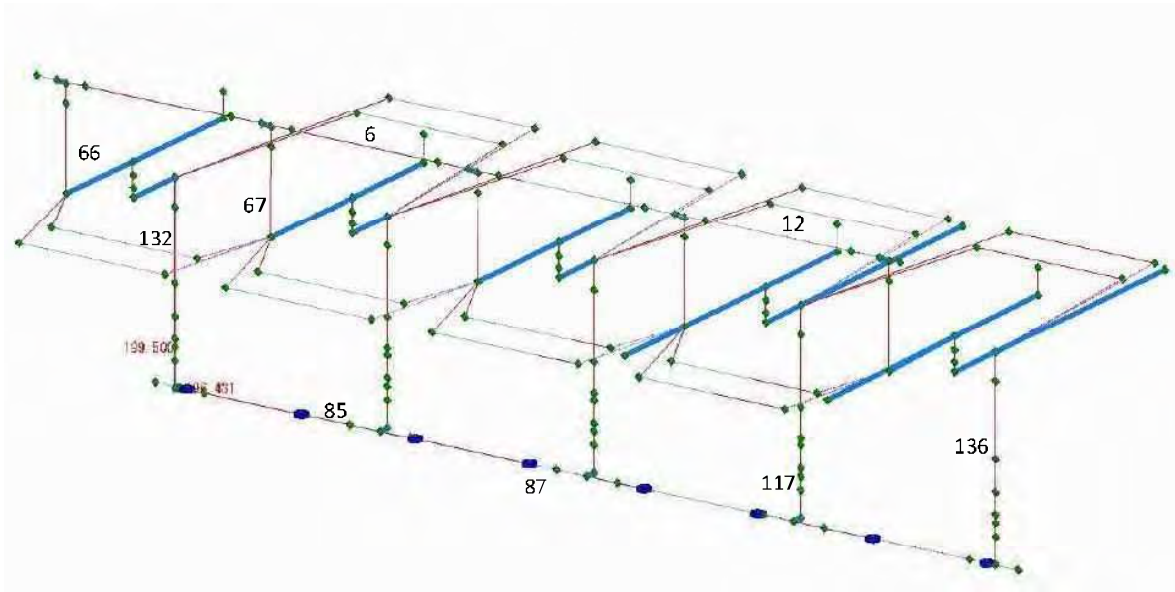
⑬ CASE13 : Regular Longitudinal direction H.W.L.+0.25m water level Maintenance



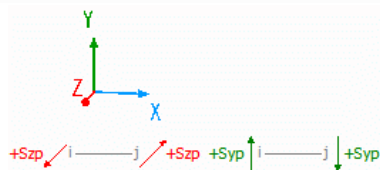
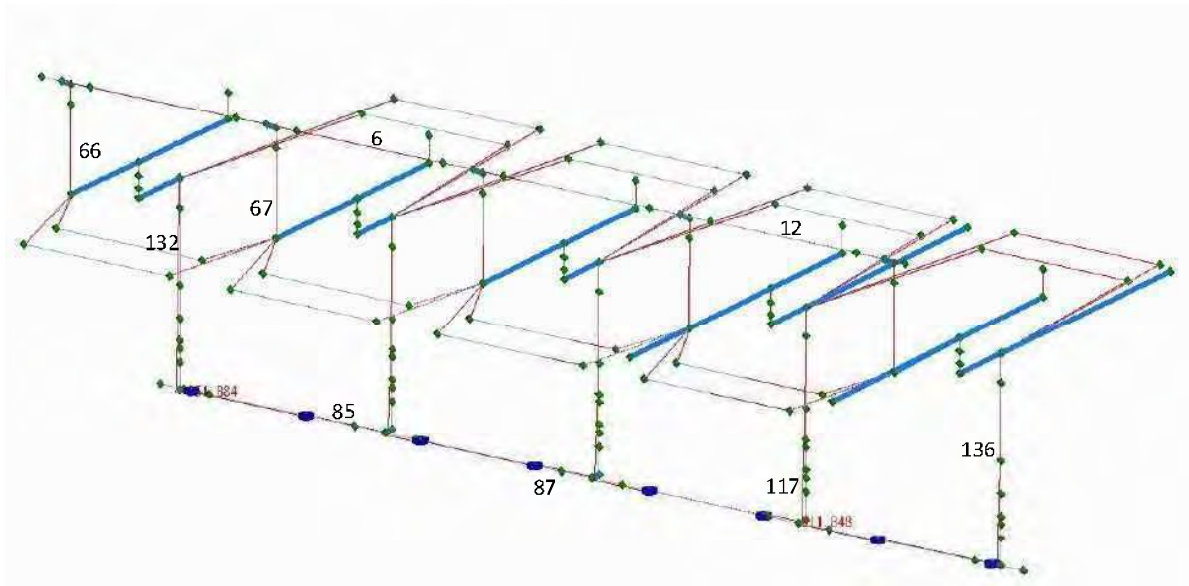
Ibrahimia Reg.

2. Shear power

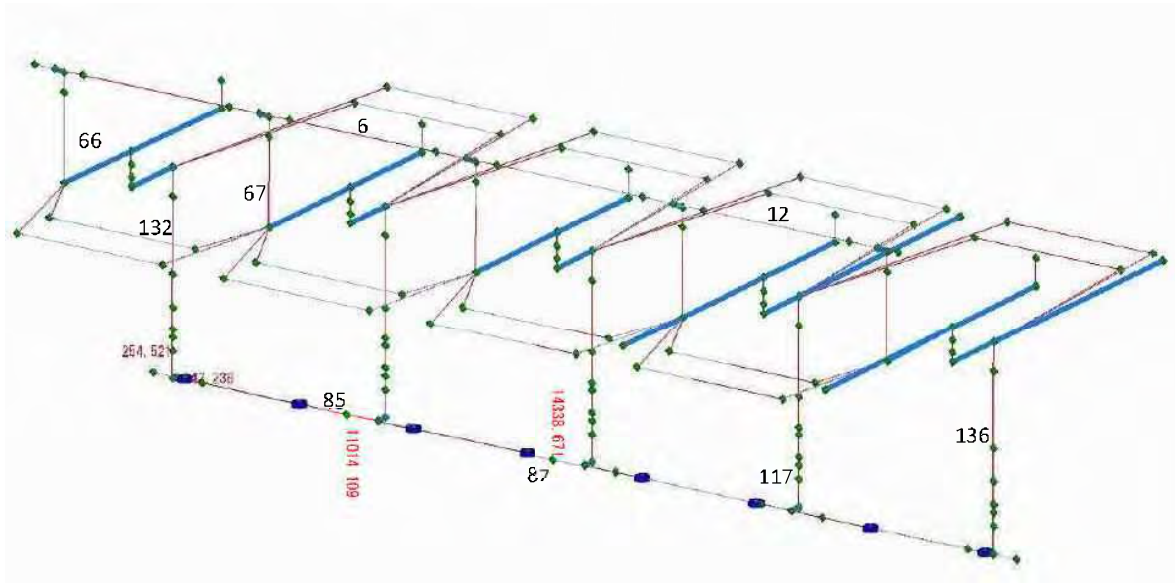
① CASE1 : Regular Longitudinal direction H.H.W.L. Full OP



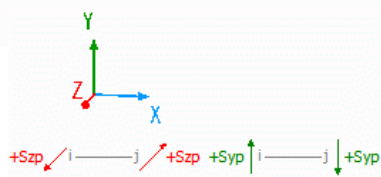
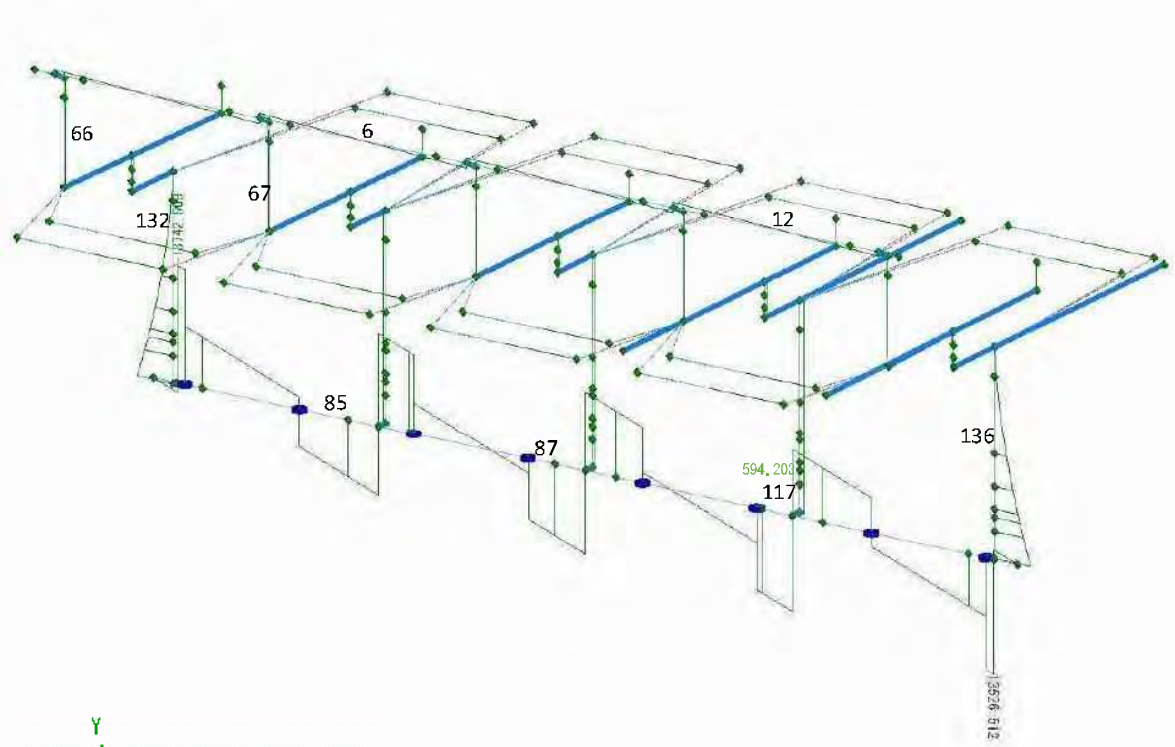
② CASE2 : Regular Longitudinal direction H.WL+0.25m water level Full CL



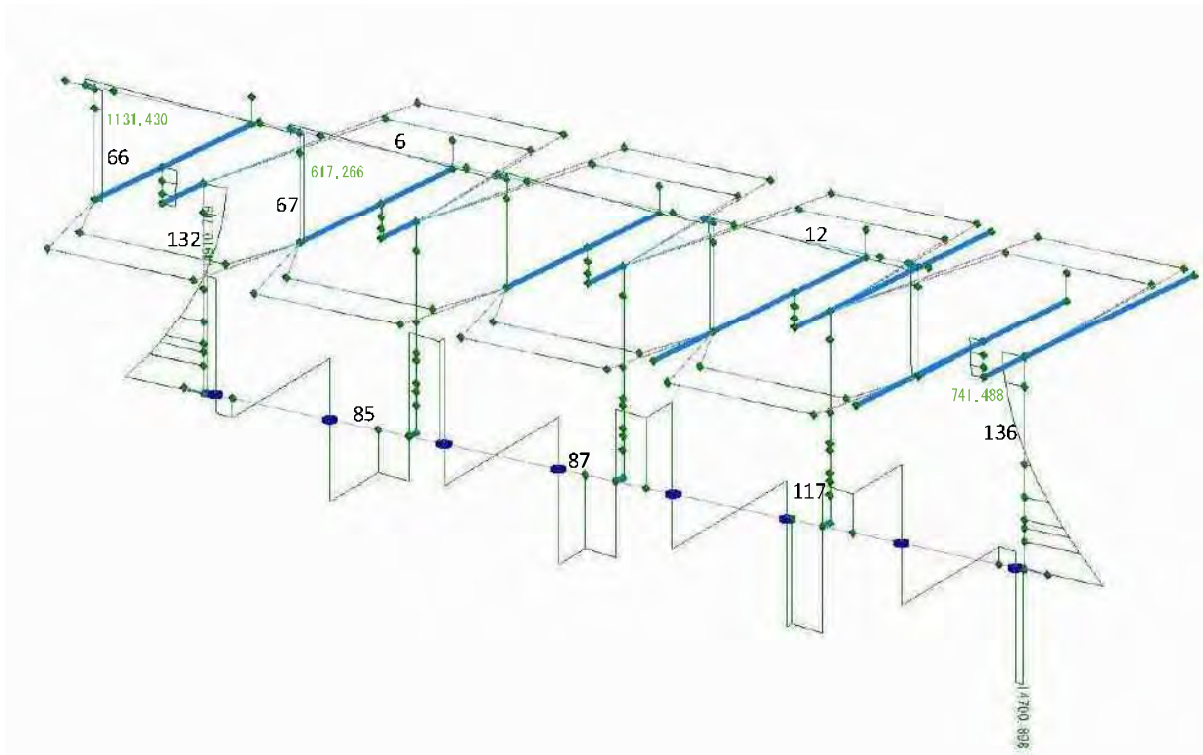
③ CASE3 : Regular Longitudinal direction No. water Full OP



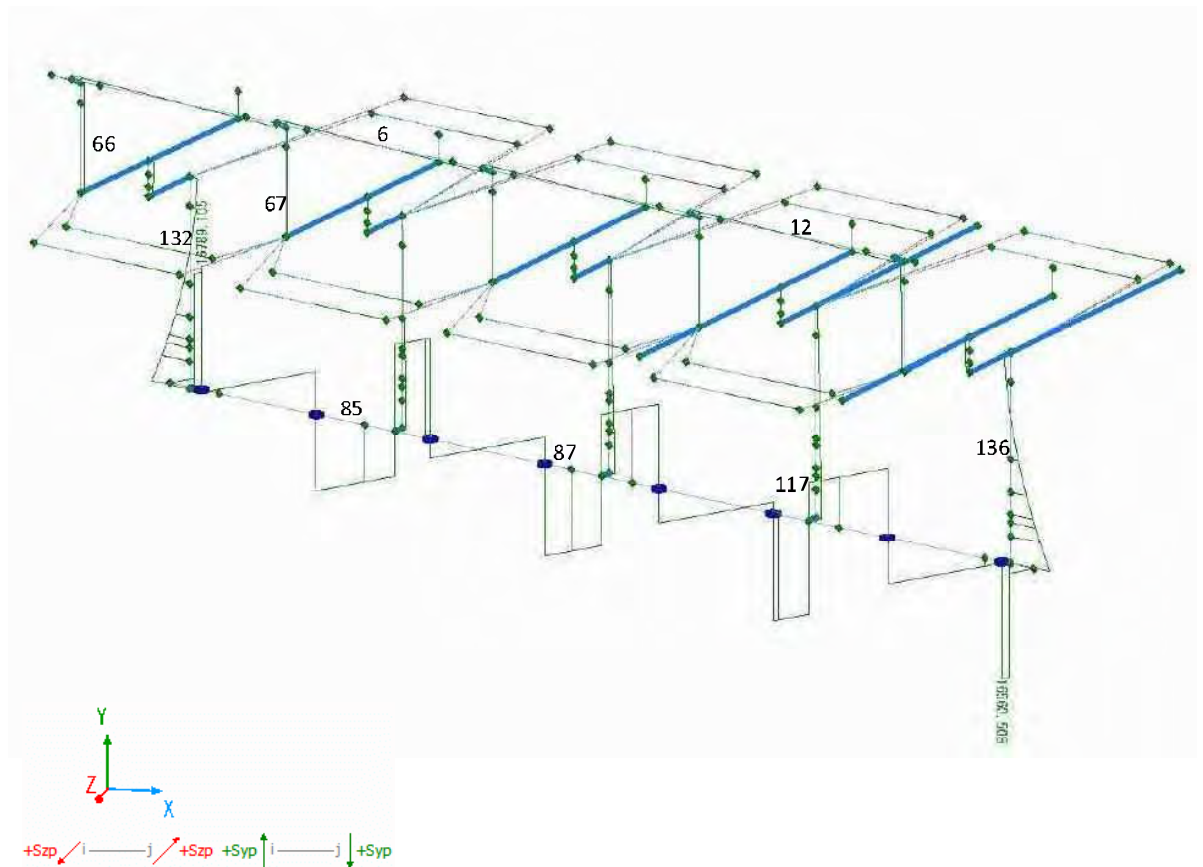
④ CASE4 : Regular Lateral direction H.W.L. +0.25m water level Full OP



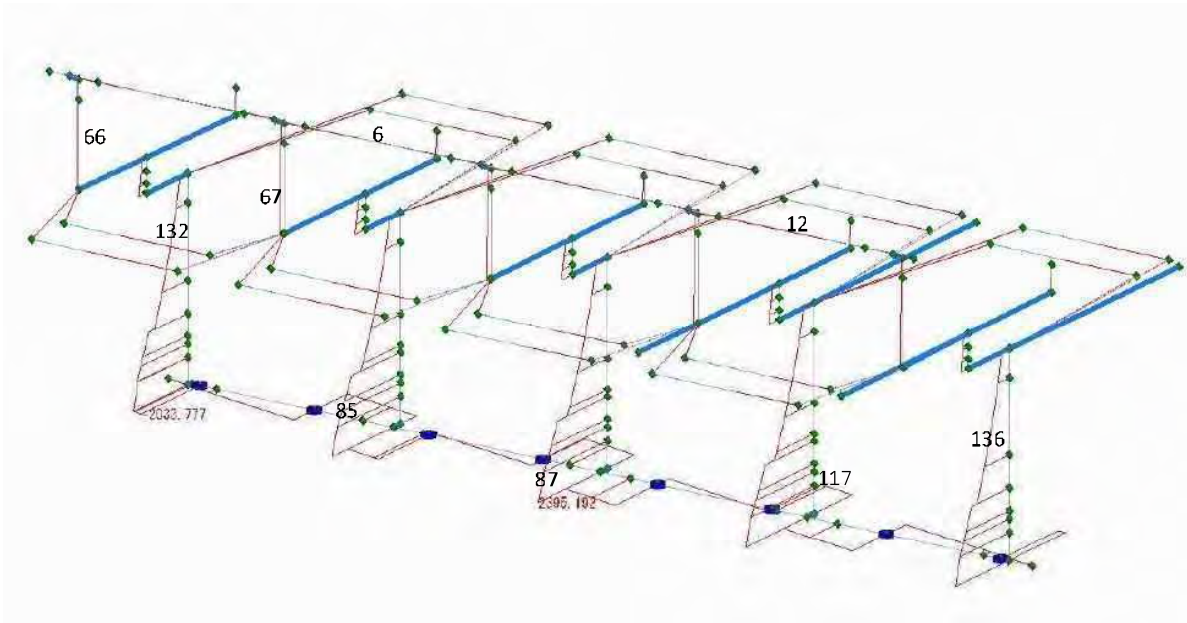
⑤ CASE5 : Regular Lateral direction H.W.L.+0.25m water level Full CL



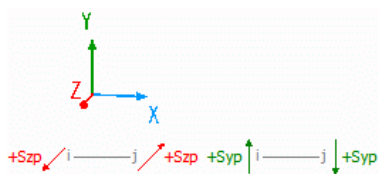
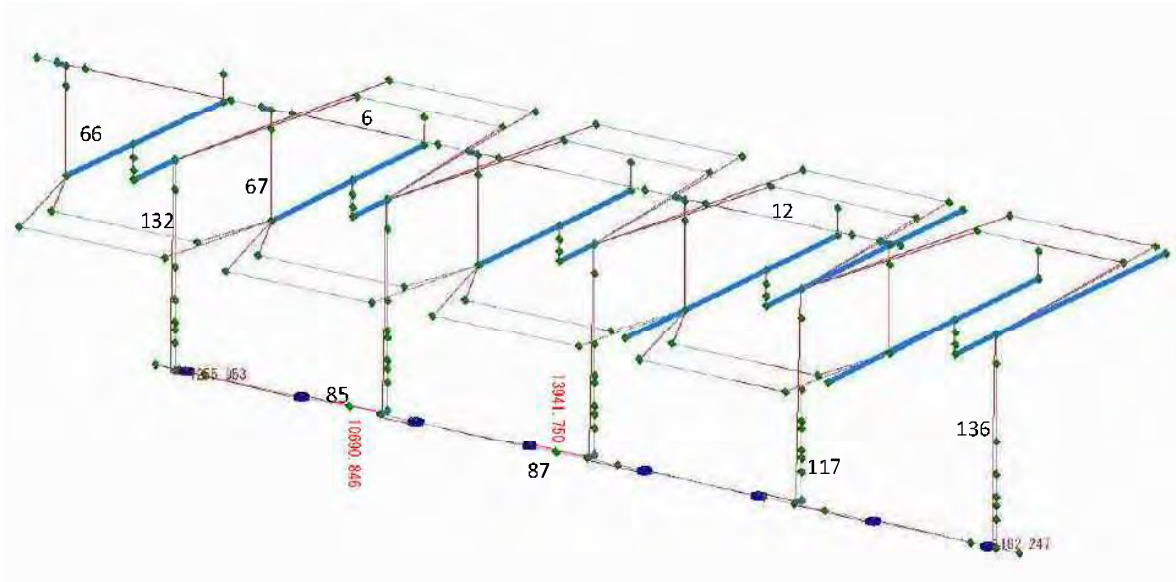
⑥ CASE6 : Regular Lateral direction No water Full OP



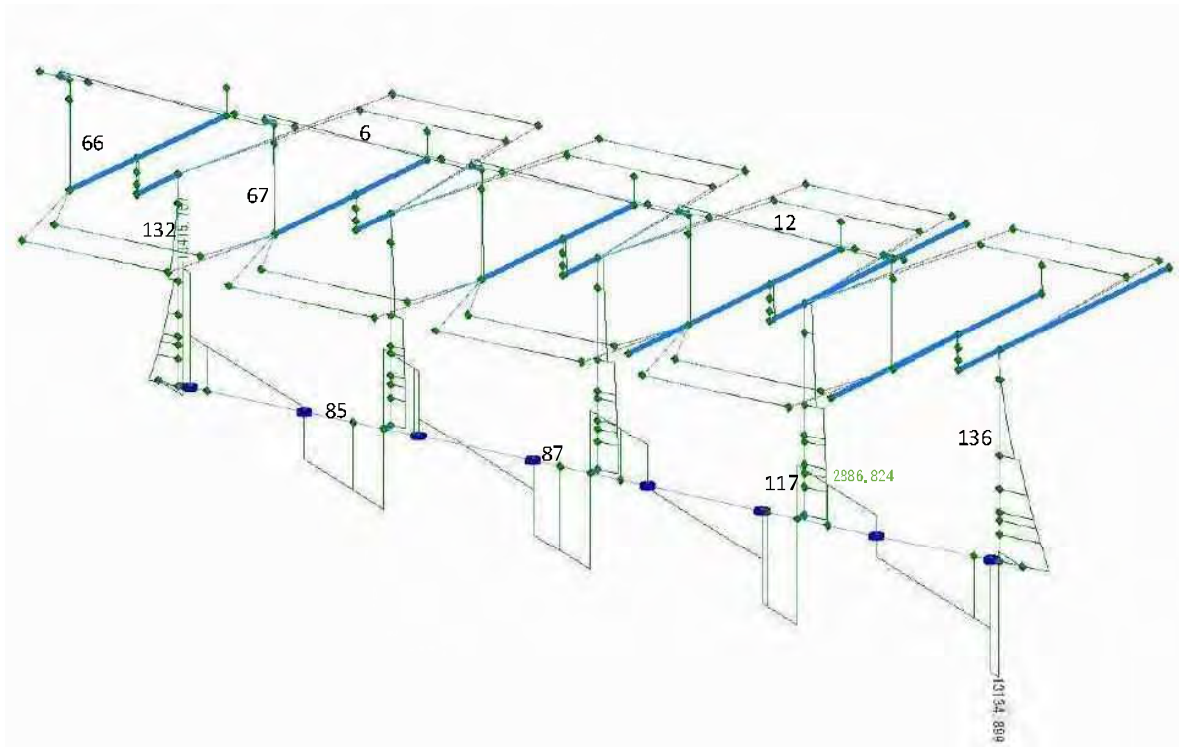
⑦ CASE7 : Seism Longitudinal direction H.W.L. +0.25m water level Full CL



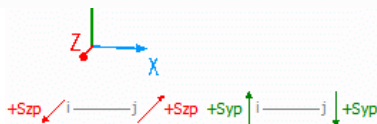
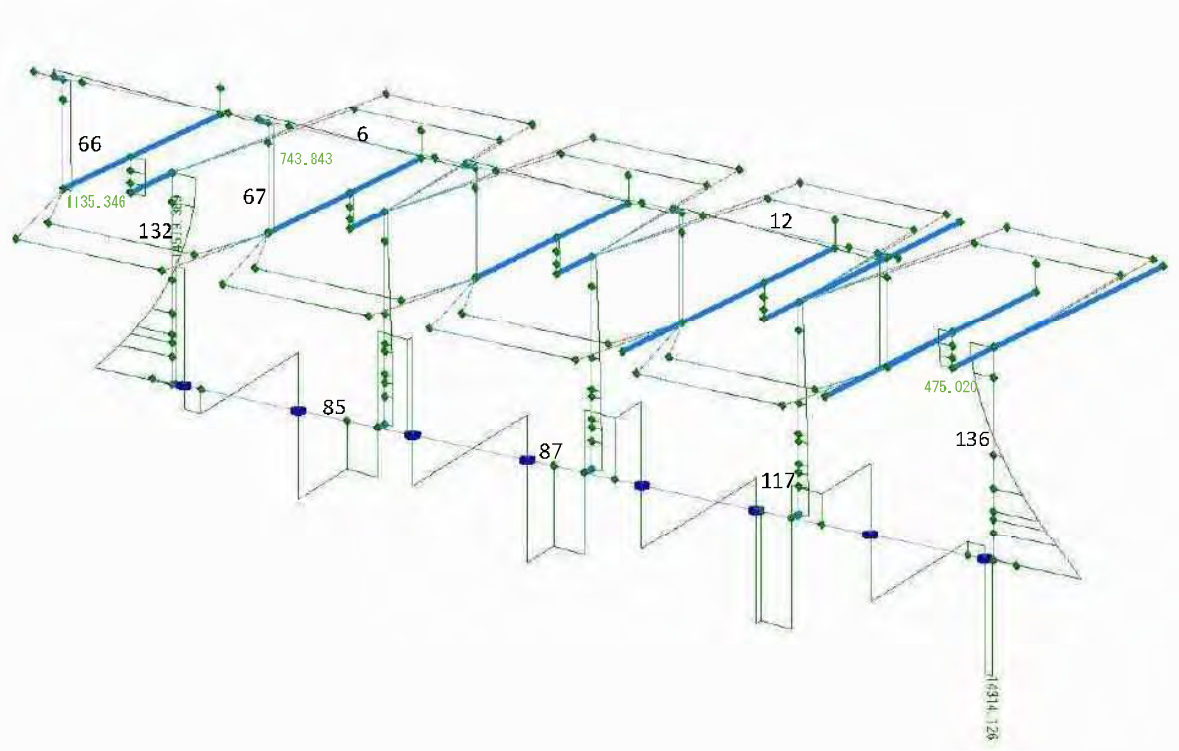
⑧ CASE8 : Seism Longitudinal direction No water Full OP



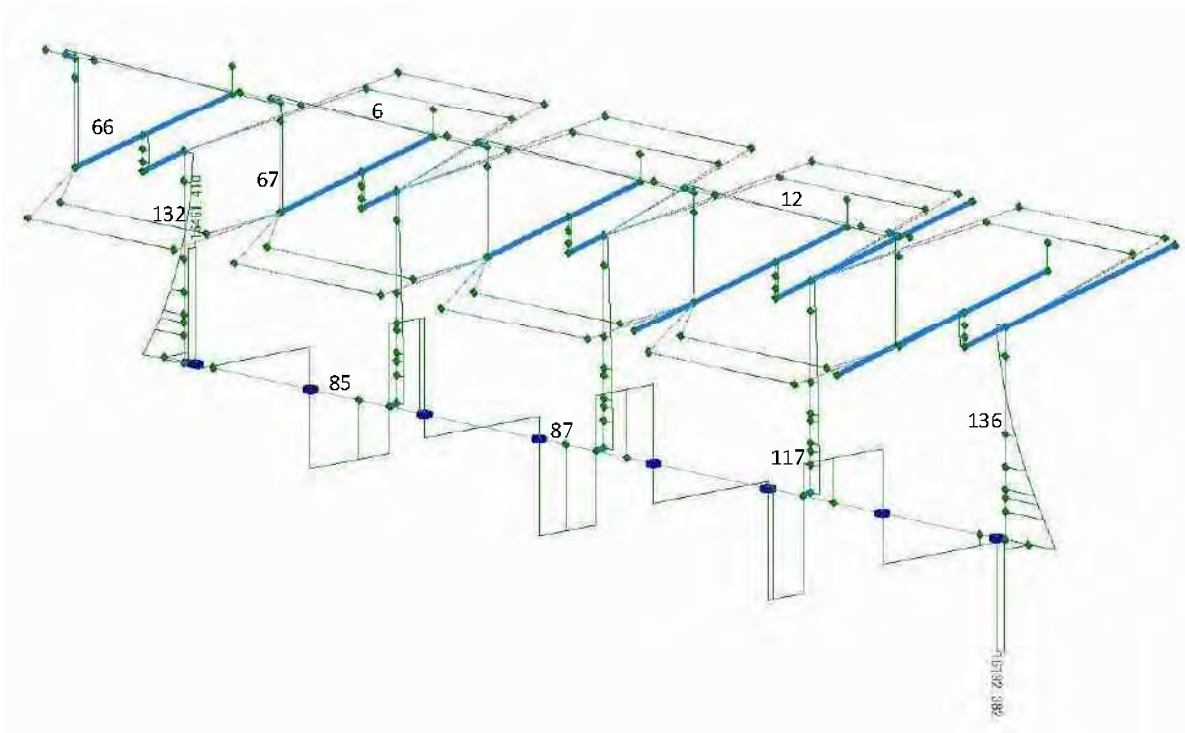
⑨ CASE9 : Seism Lateral direction H.W.L+ 0.25m water level Full OP



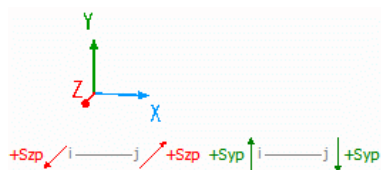
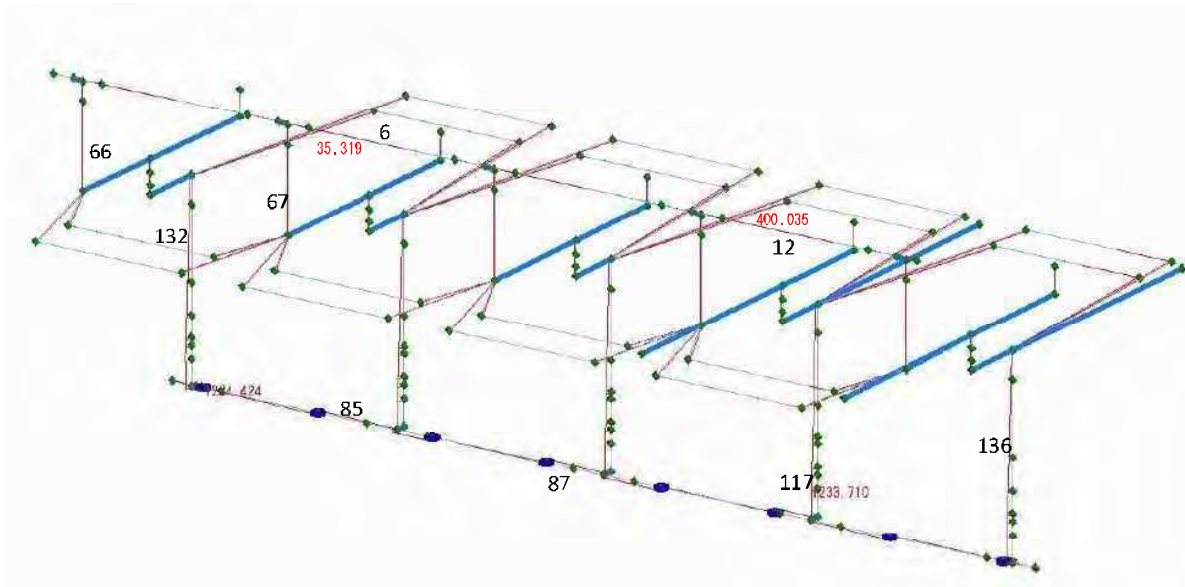
⑩ CASE10 : Seism Lateral direction H.W.L+0.25m level Full CL



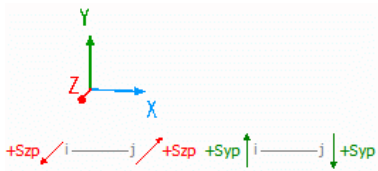
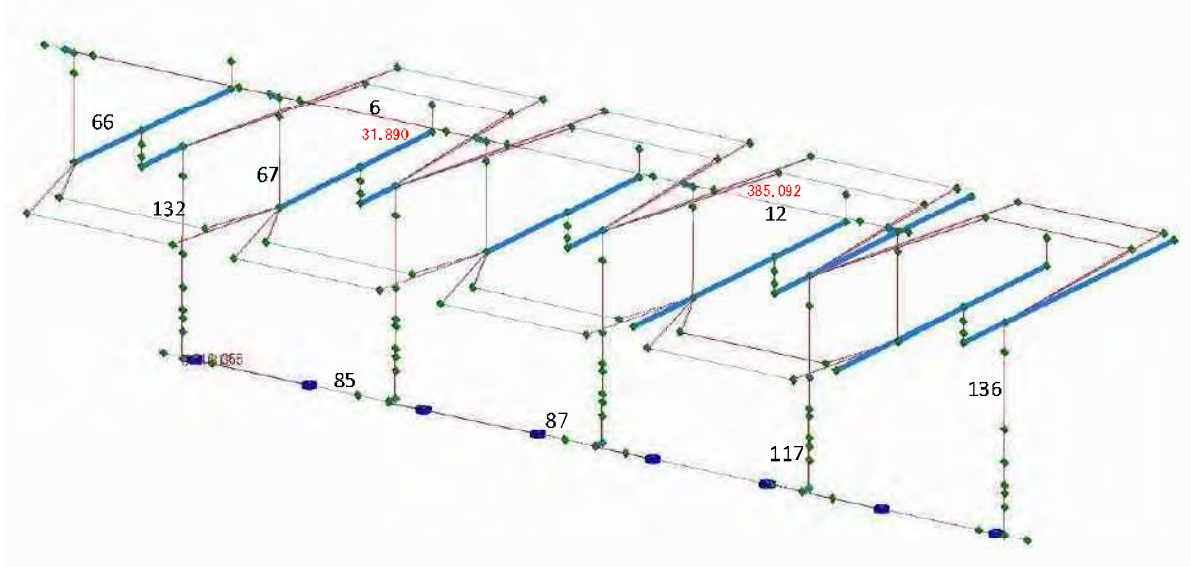
① CASE11 : Seism Lateral direction No water Full OP



② CASE12 : Seism Longitudinal direction H.W.L.+0.25m water level Full OP



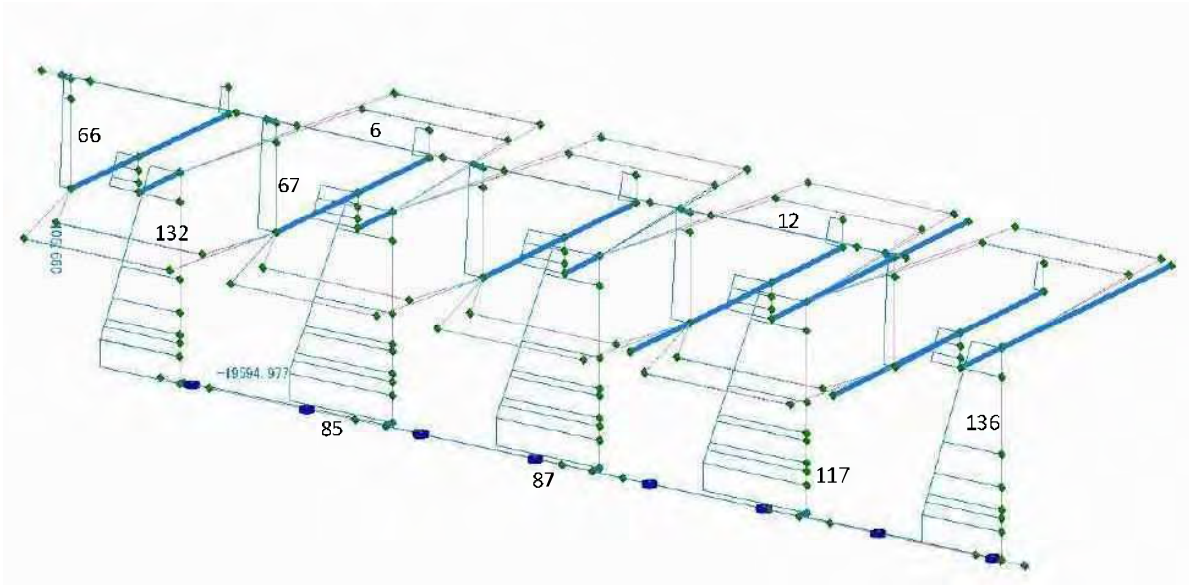
⑬ CASE13 : Regular Longitudinal direction H.W.L.+0.25m water level Maintenance



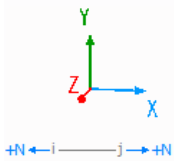
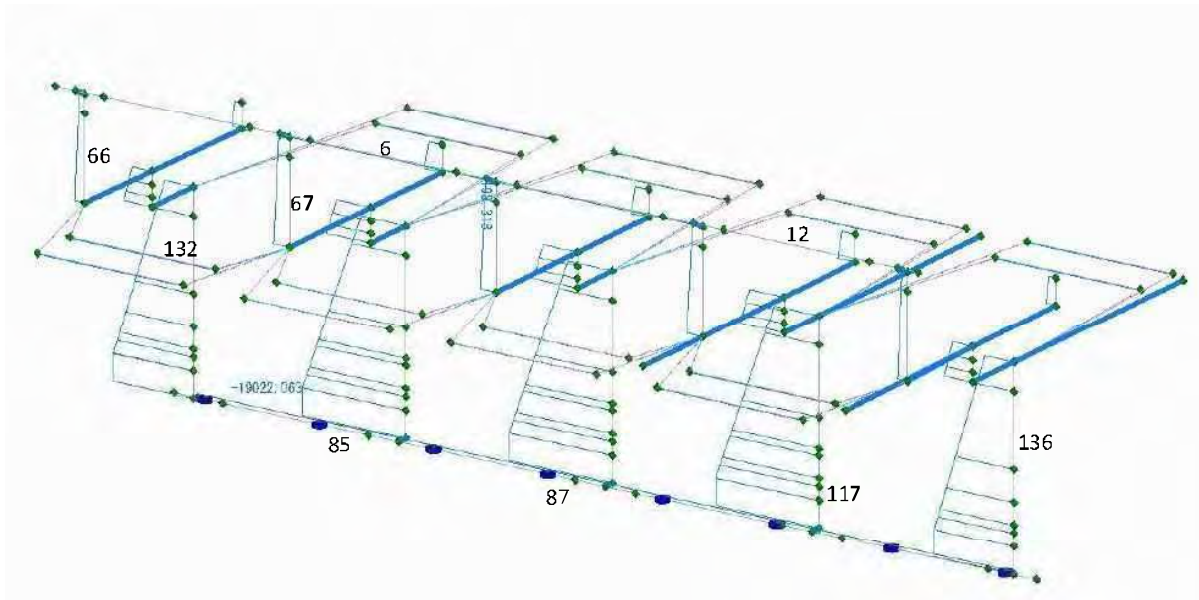
Ibrahimia Reg.

3.Axis power

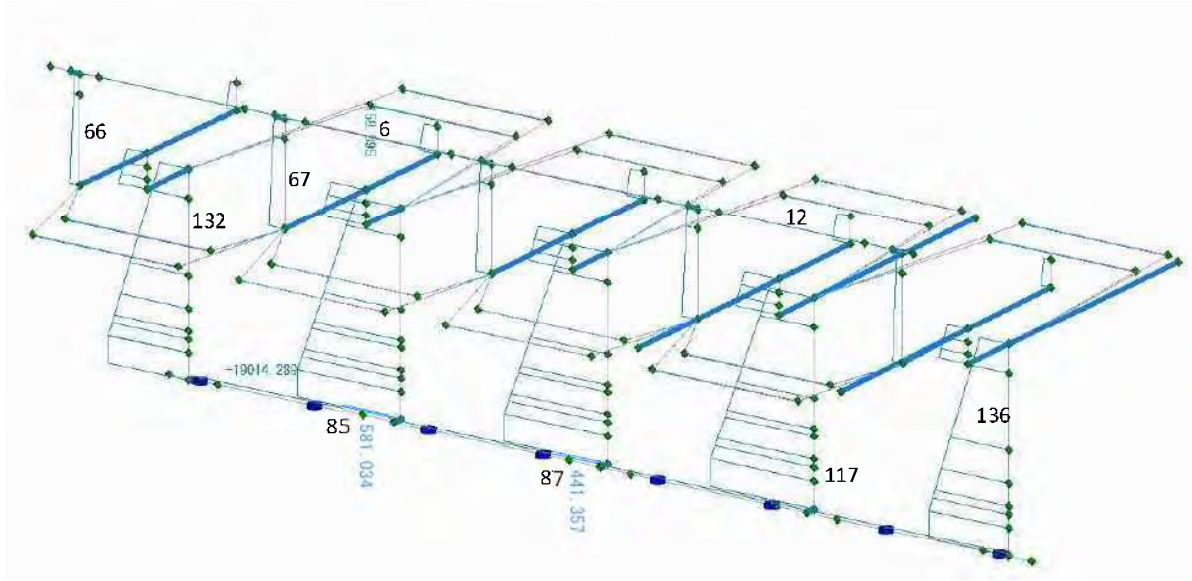
① CASE1 : Regular Longitudinal direction H.H.W.L. Full OP



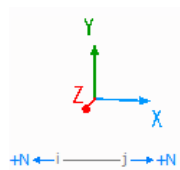
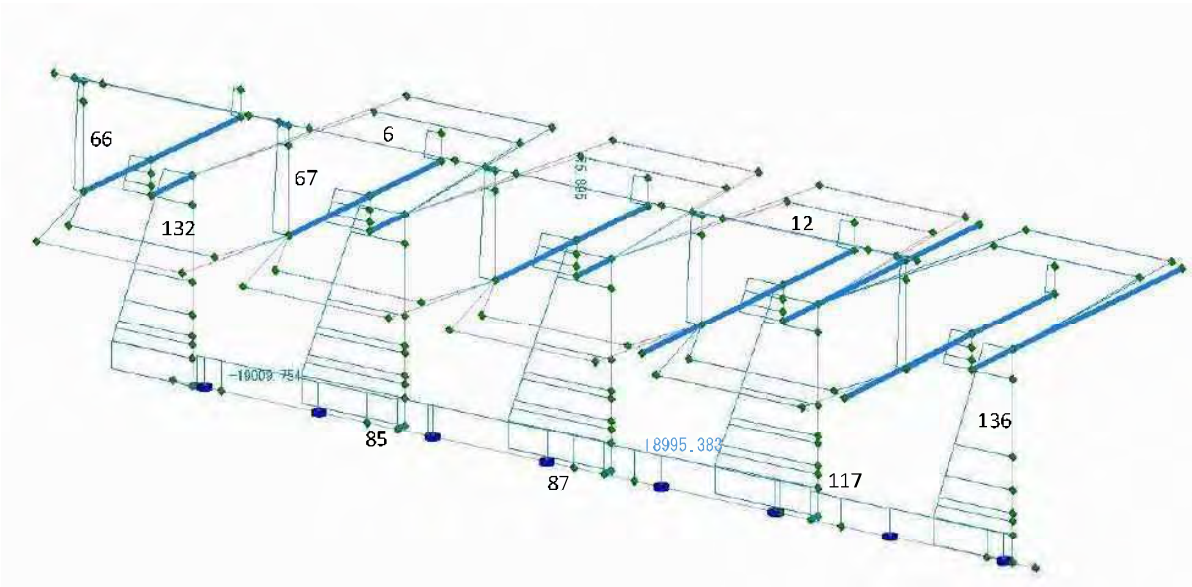
② CASE2 : Regular Longitudinal direction H.WL+0.25m water level Full CL



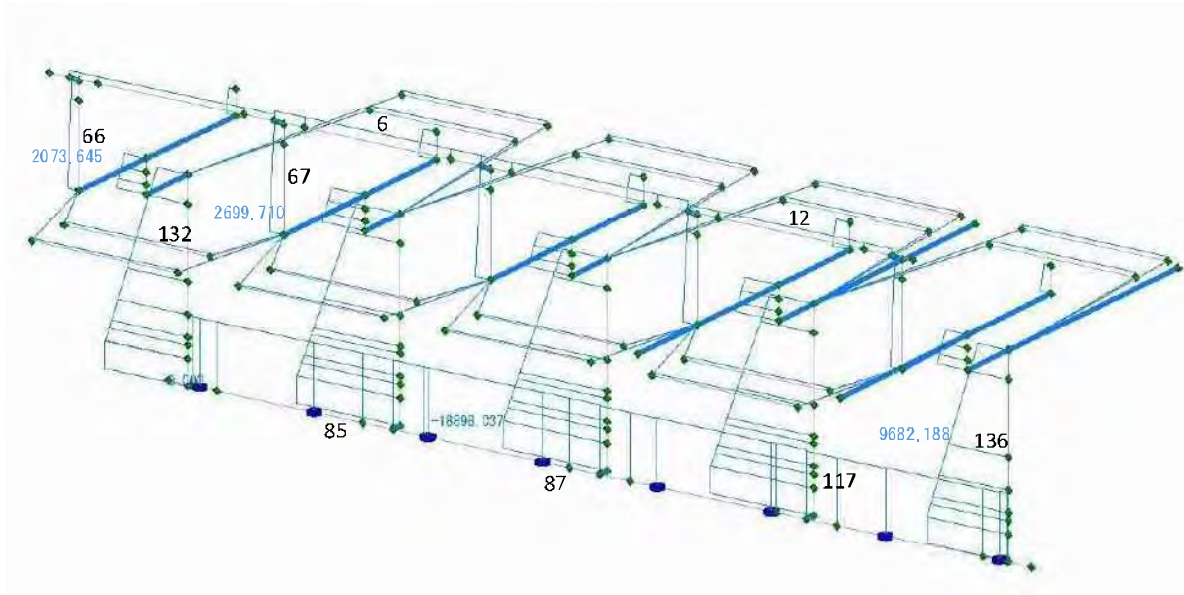
③ CASE3 : Regular Longitudinal direction No. water Full OP



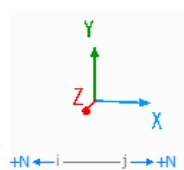
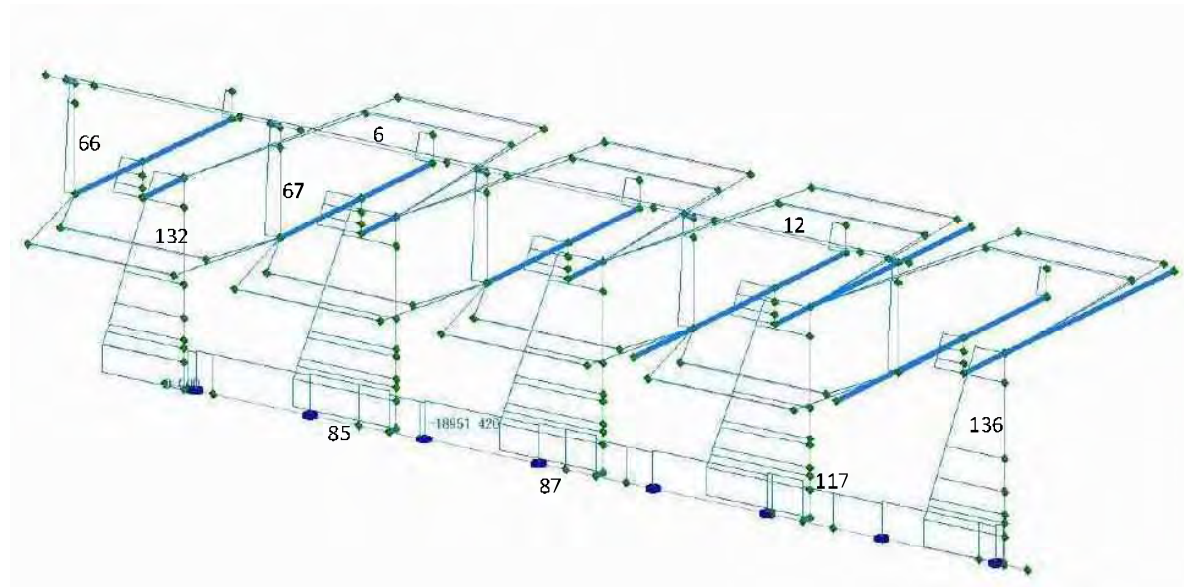
④ CASE4 : Regular Lateral direction H.W.L. +0.25m water level Full OP



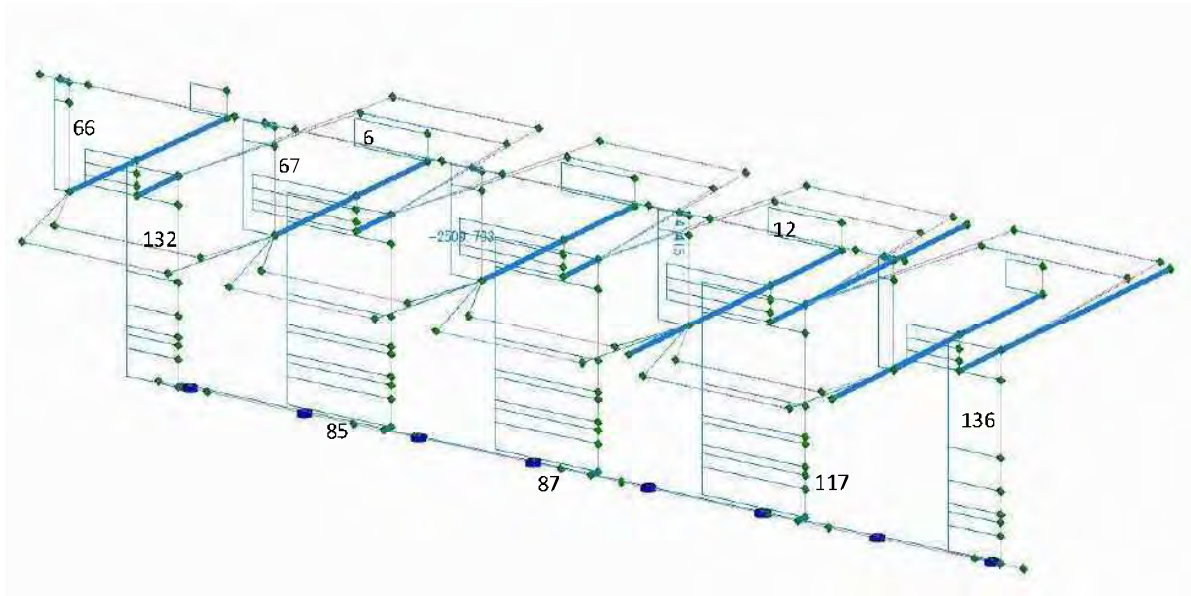
⑤ CASE5 : Regular Lateral direction H.W.L.+0.25m water level Full CL



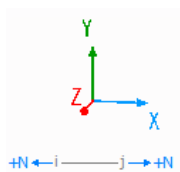
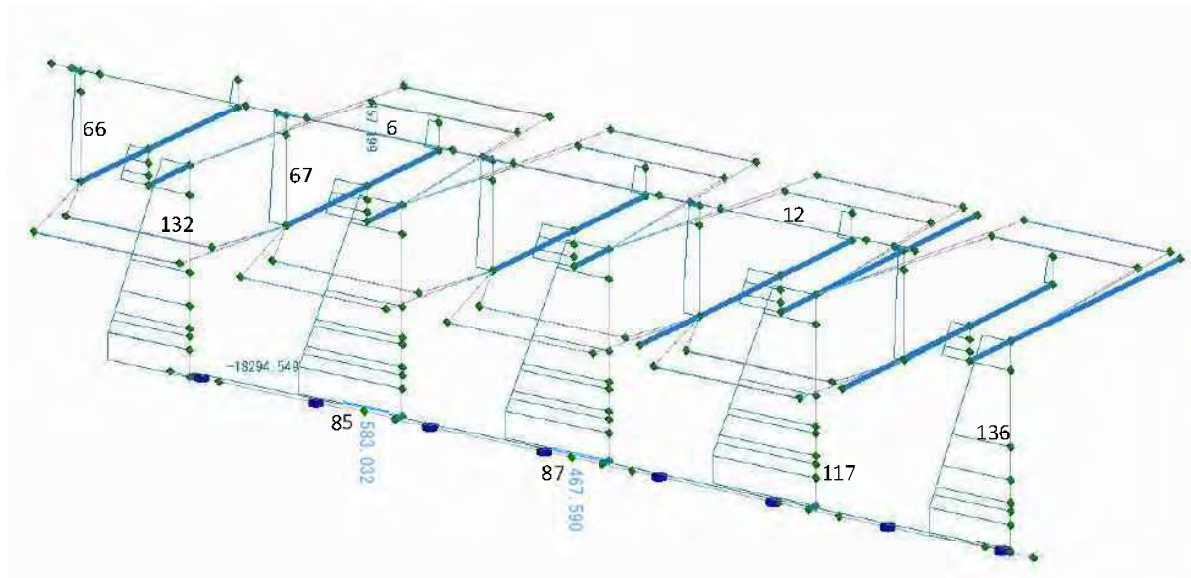
⑥ CASE6 : Regular Lateral direction No water Full OP



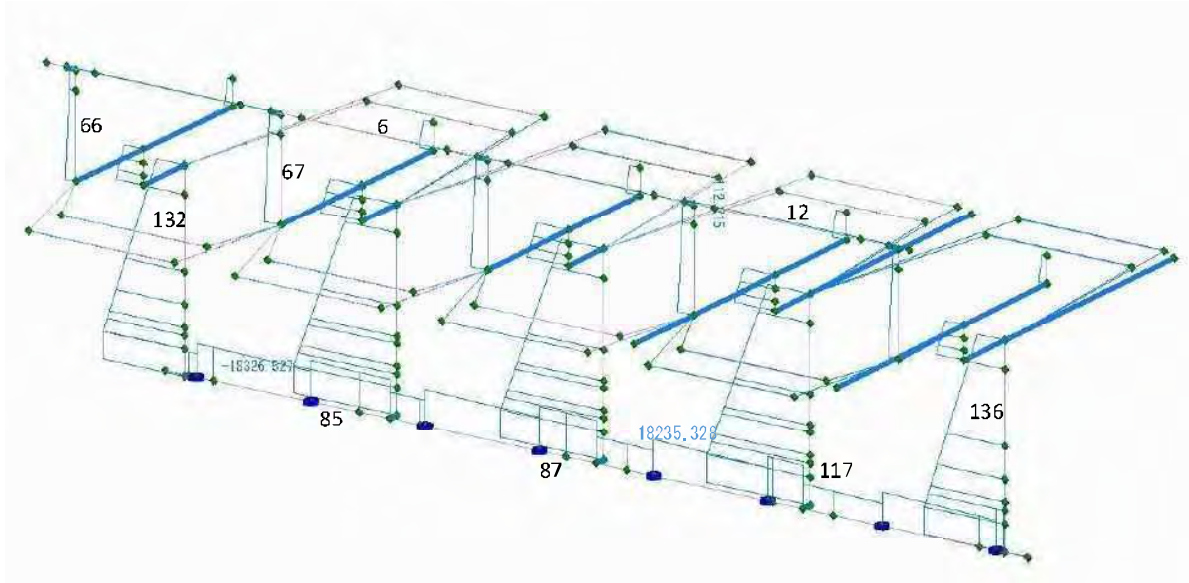
⑦ CASE7 : Seism Longitudinal direction H.W.L. +0.25m water level Full CL



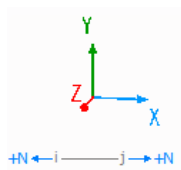
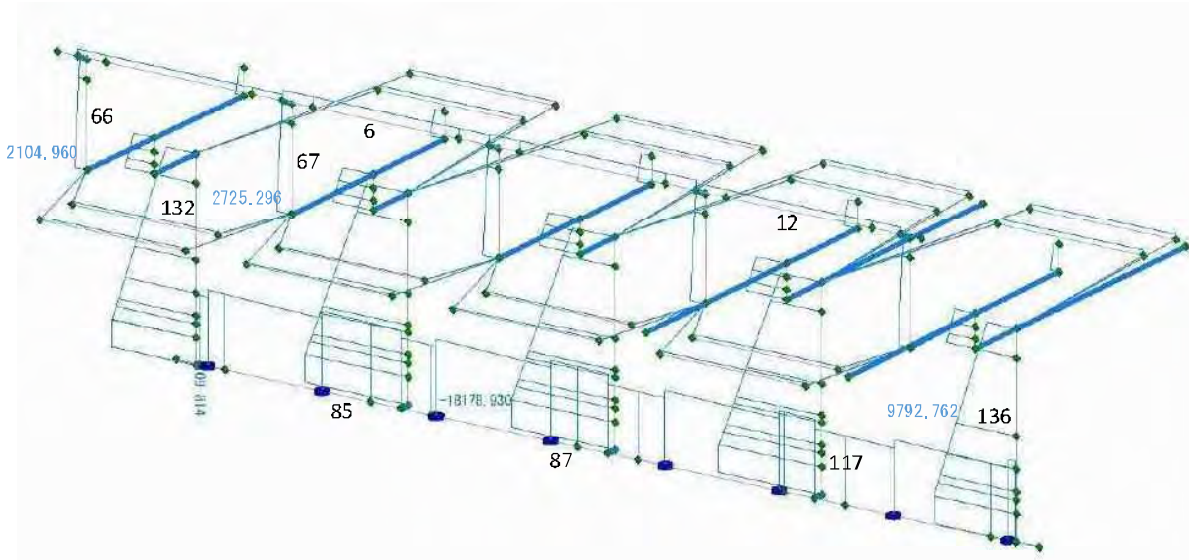
⑧ CASE8 : Seism Longitudinal direction No water Full OP



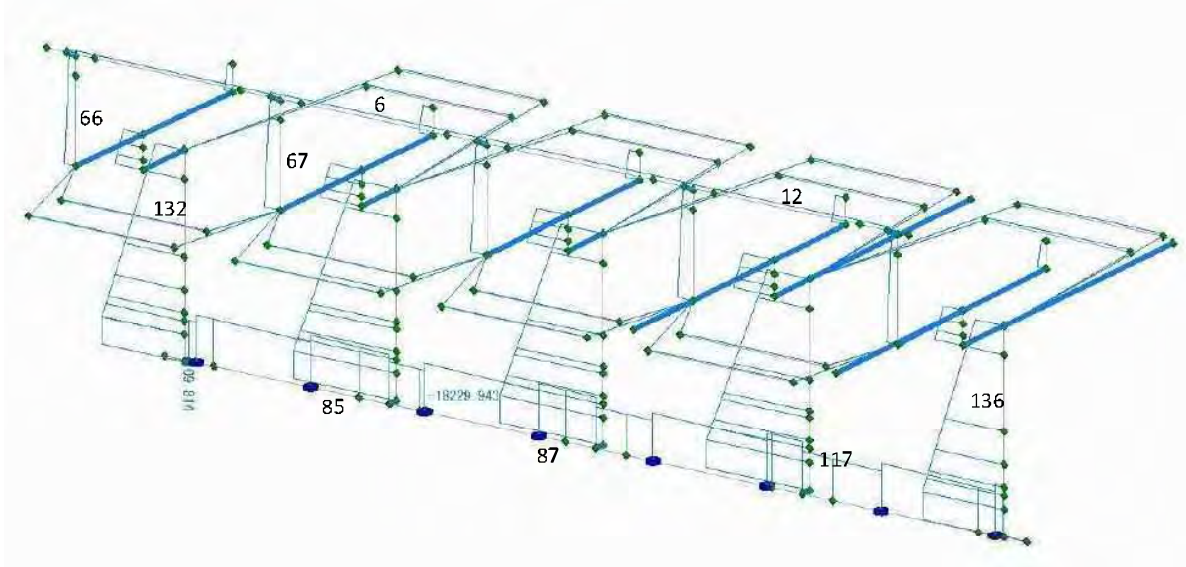
⑨ CASE9 : Seism Lateral direction H.W.L+ 0.25m water level Full OP



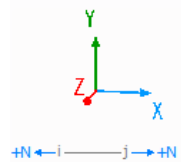
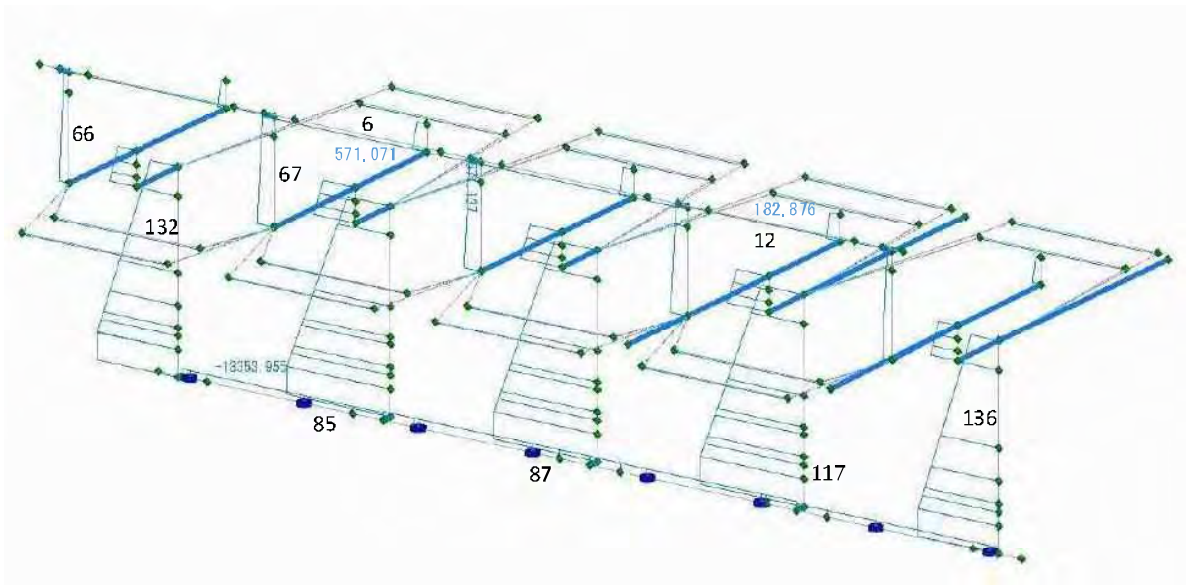
⑩ CASE10 : Seism Lateral direction H.W.L+0.25m level Full CL



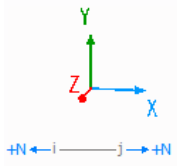
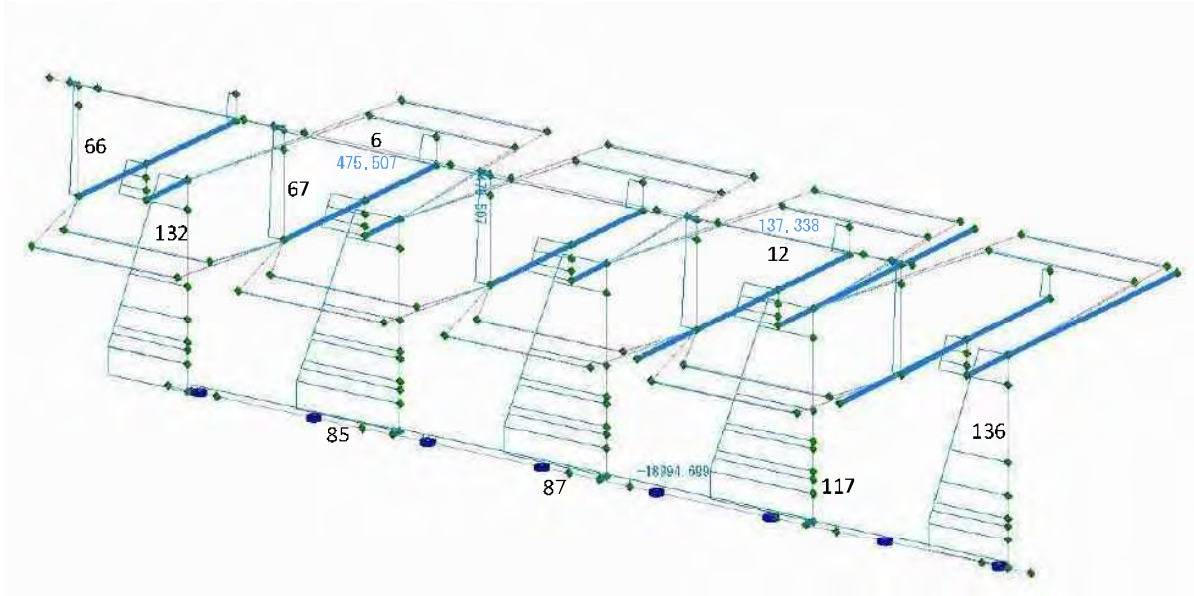
① CASE11 : Seism Lateral direction No water Full OP



② CASE12 : Seism Longitudinal direction H.W.L.+0.25m water level Full OP

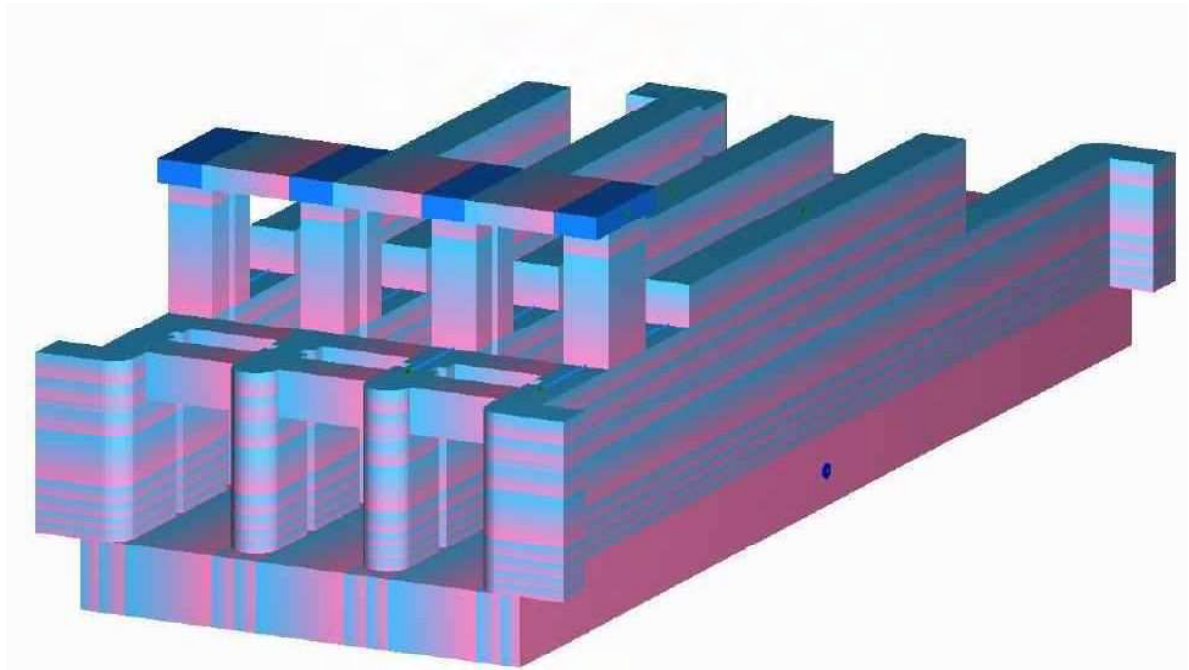


⑬ CASE13 : Regular Longitudinal direction H.W.L.+0.25m water level Maintenance

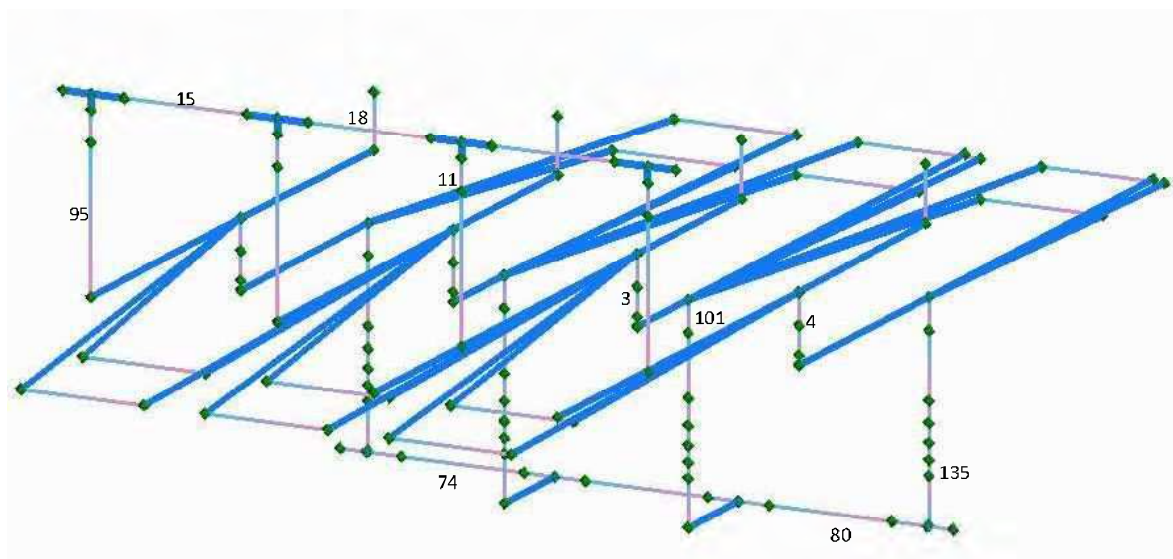


A-6-4. Structural analysis of Badraman Regulator

Badraman Reg-Dairutiah Canal



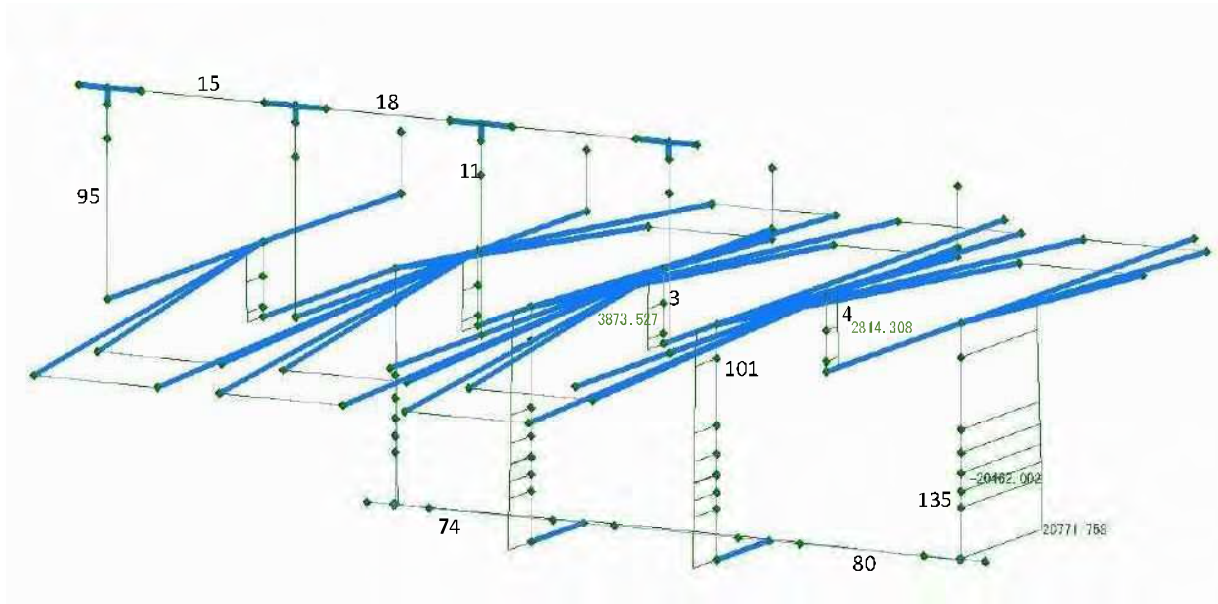
General view



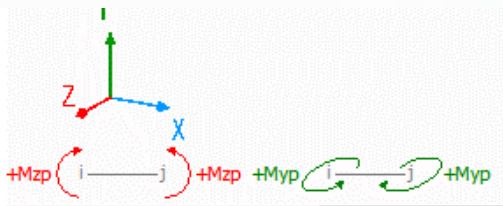
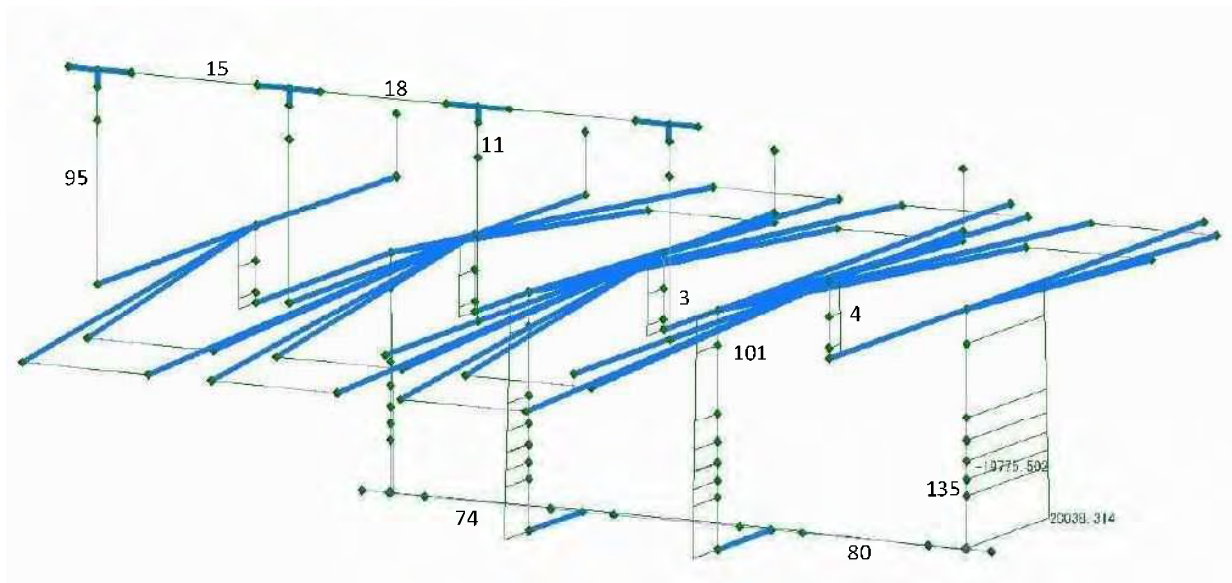
General view (frame)

1. bending Moment

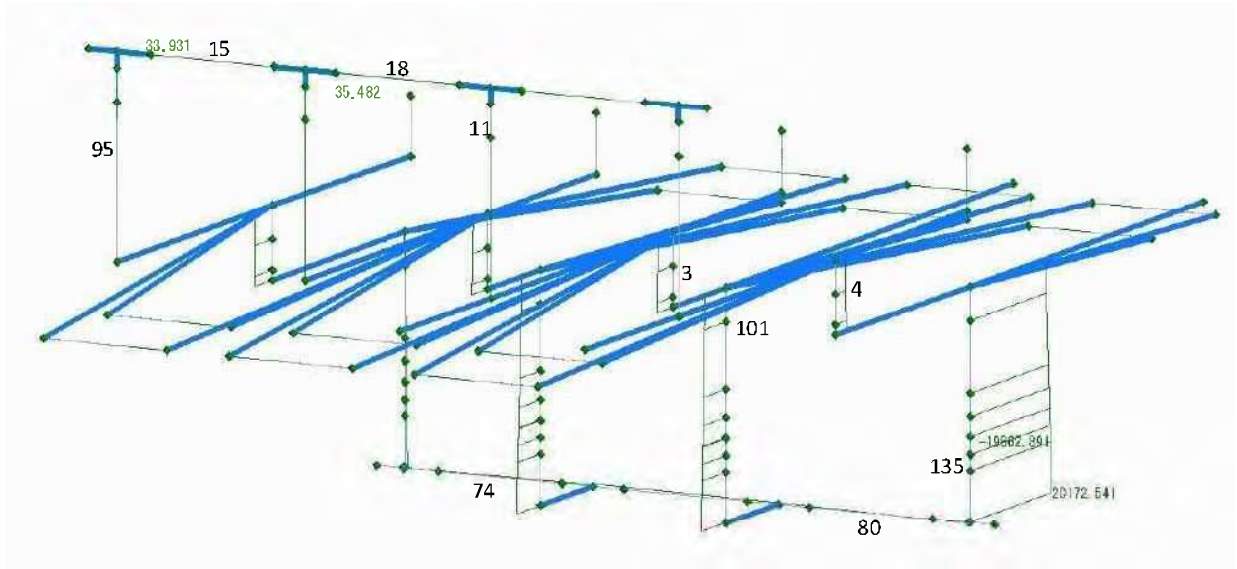
① CASE1 : Regular Longitudinal direction H.H.W.L Full OP



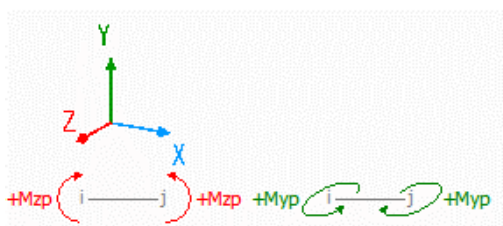
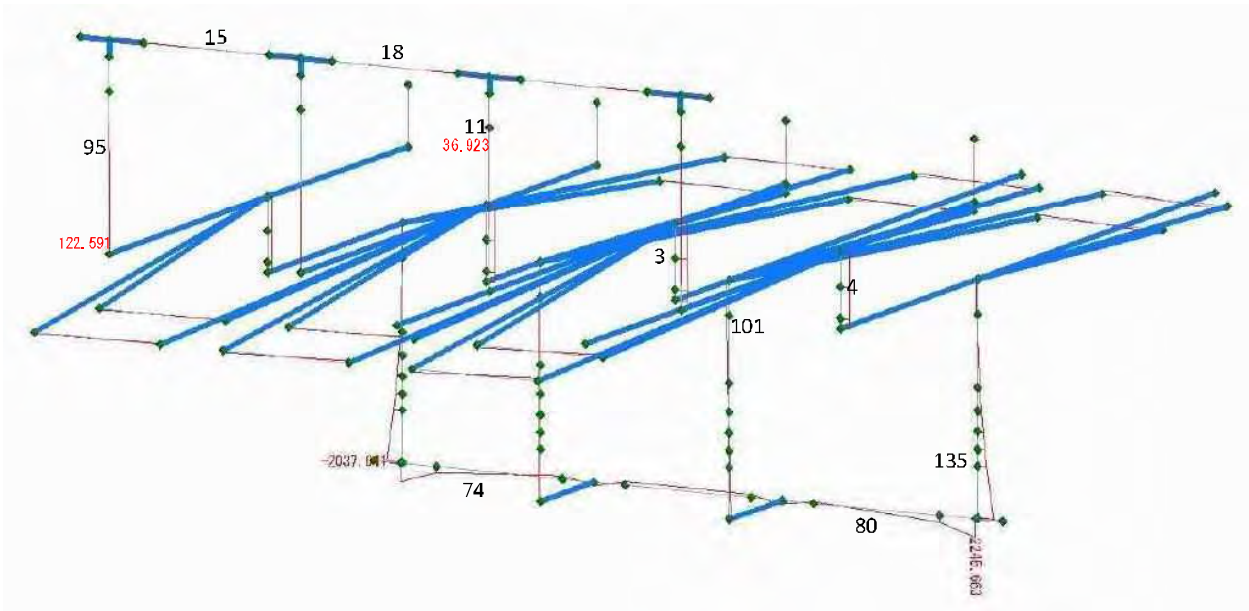
② CASE2 : Regular Longitudinal direction H.WL+0.25m water level Full CL



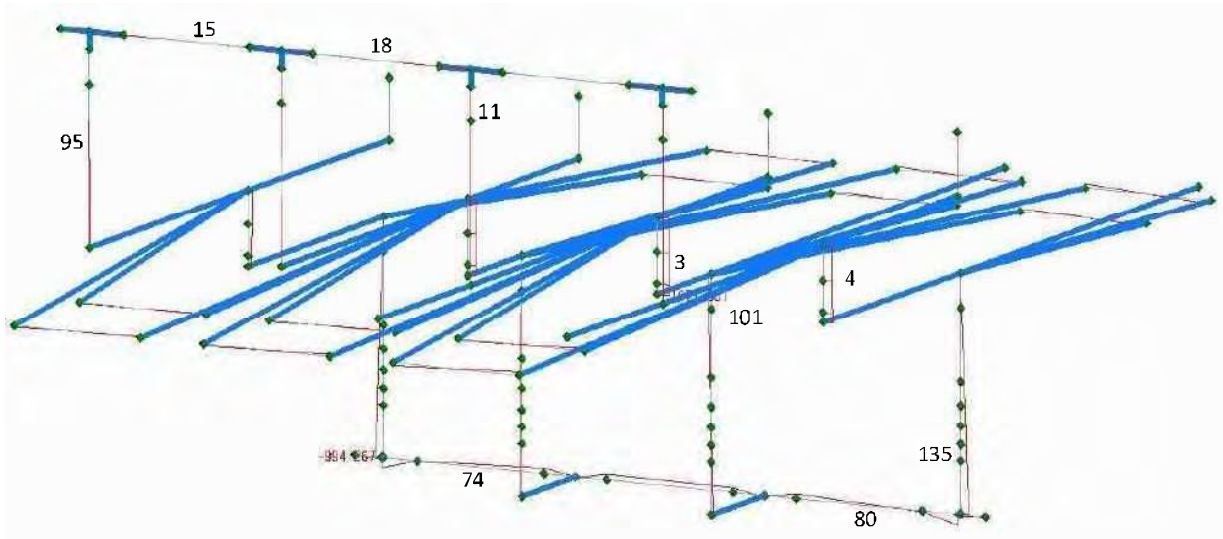
③ CASE3 : Regular Longitudinal direction No. water Full OP



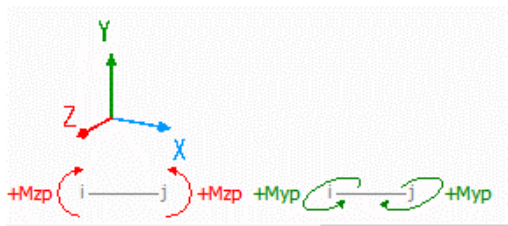
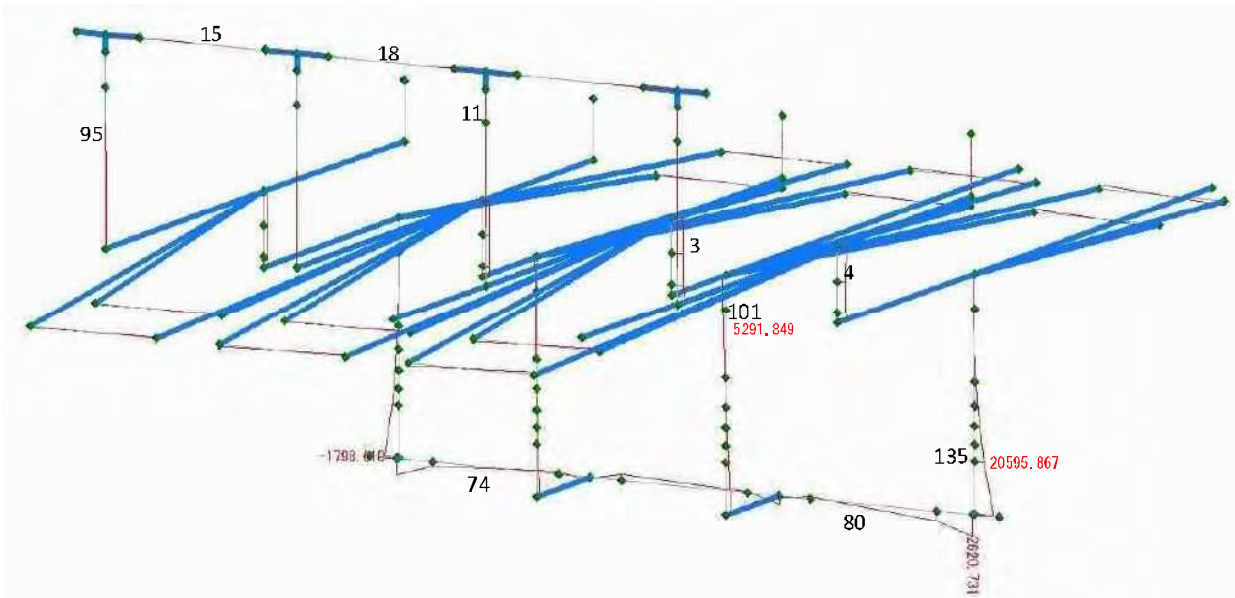
④ CASE4 : Regular Lateral direction H.W.L. +0.25m water level Full OP



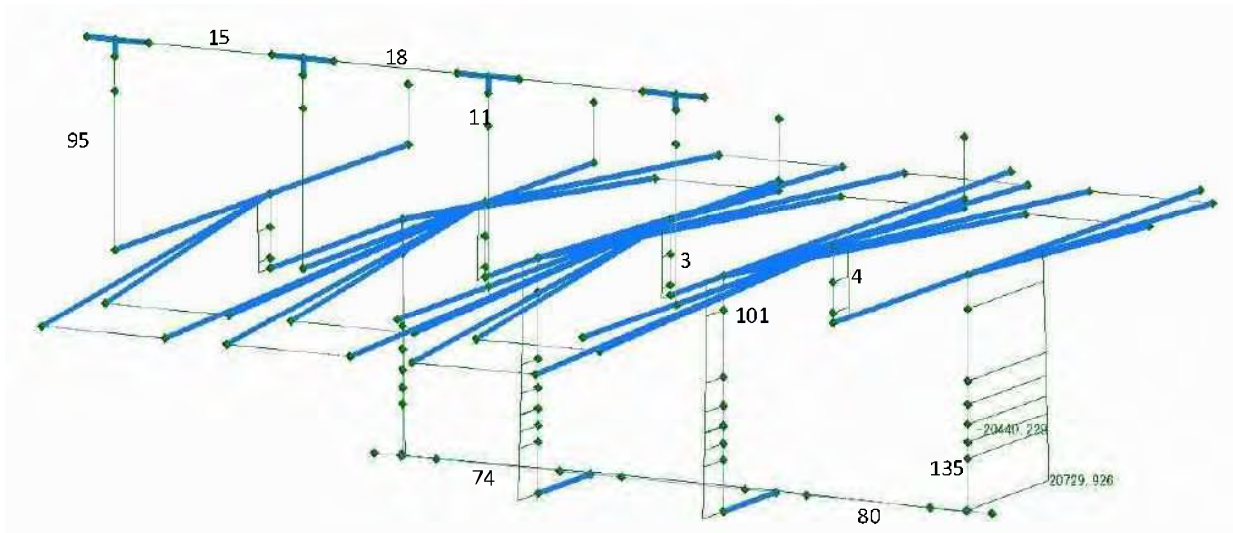
⑤ CASE5 : Regular Lateral direction H.W.L.+0.25m water level Full CL



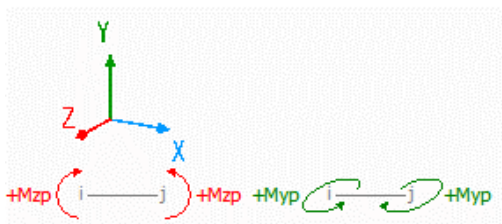
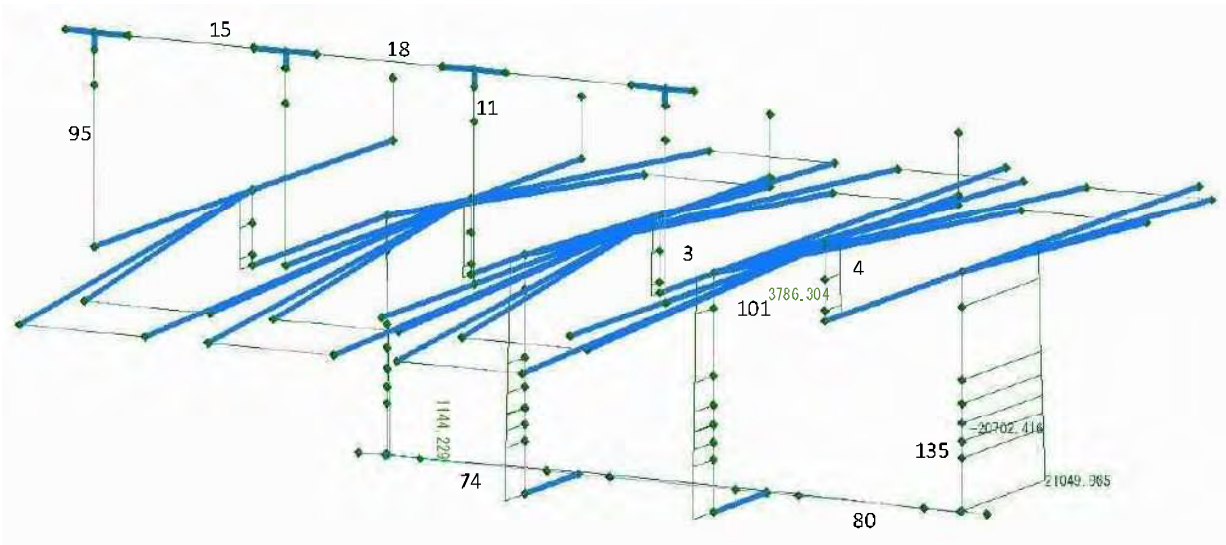
⑥ CASE6 : Regular Lateral direction No water Full OP



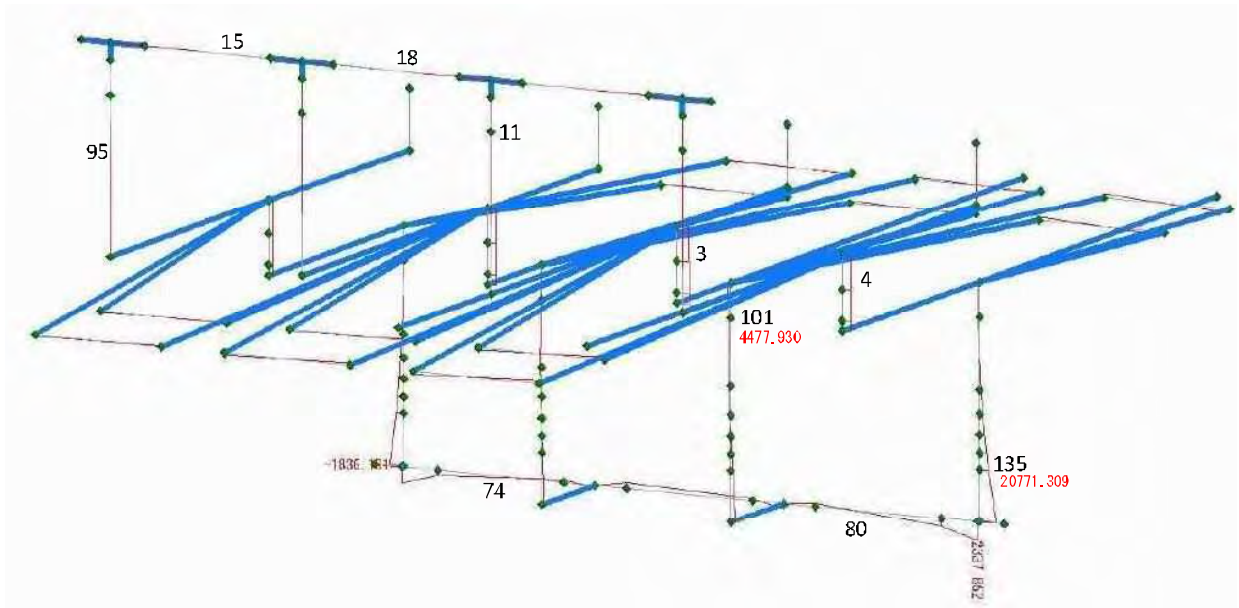
⑦ CASE7 : Seism Longitudinal direction H.W.L. +0.25m water level Full CL



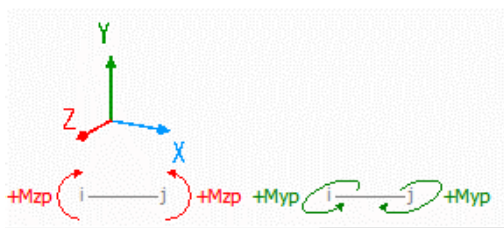
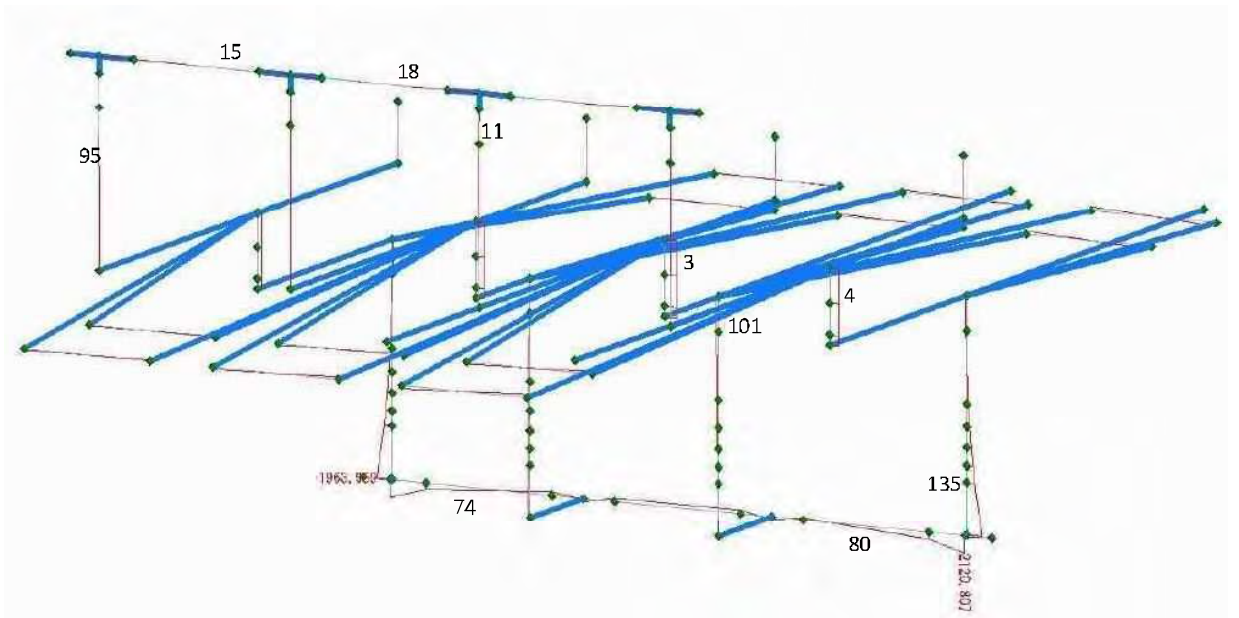
⑧ CASE8 : Seism Longitudinal direction No water Full OP



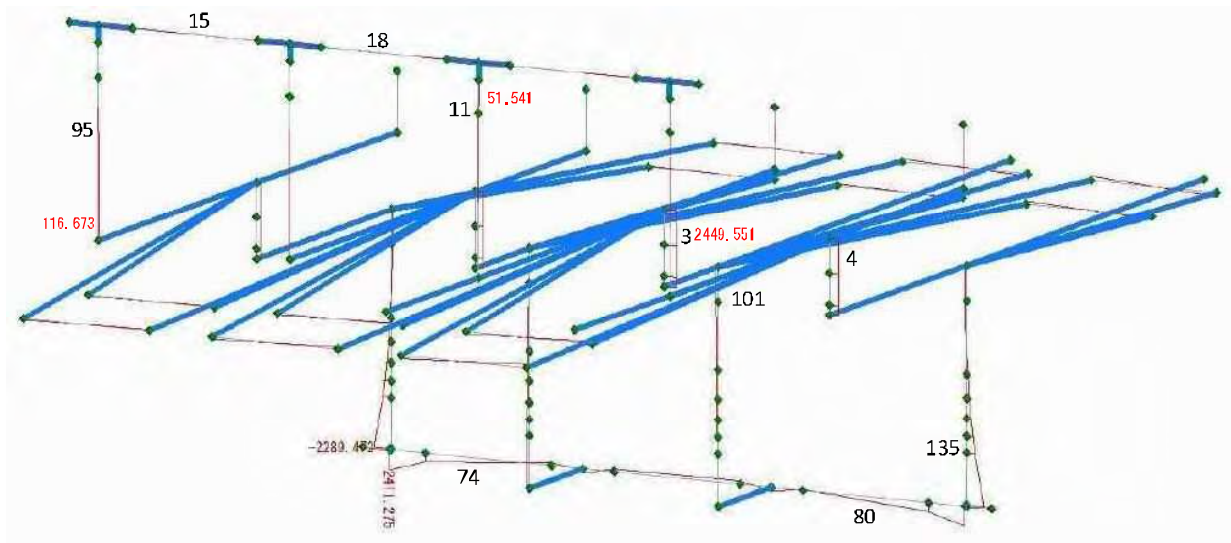
⑨ CASE9 : Seism Lateral direction H.W.L + 0.25m water level Full OP



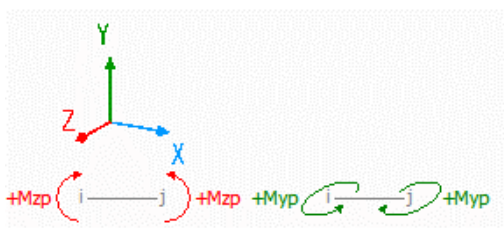
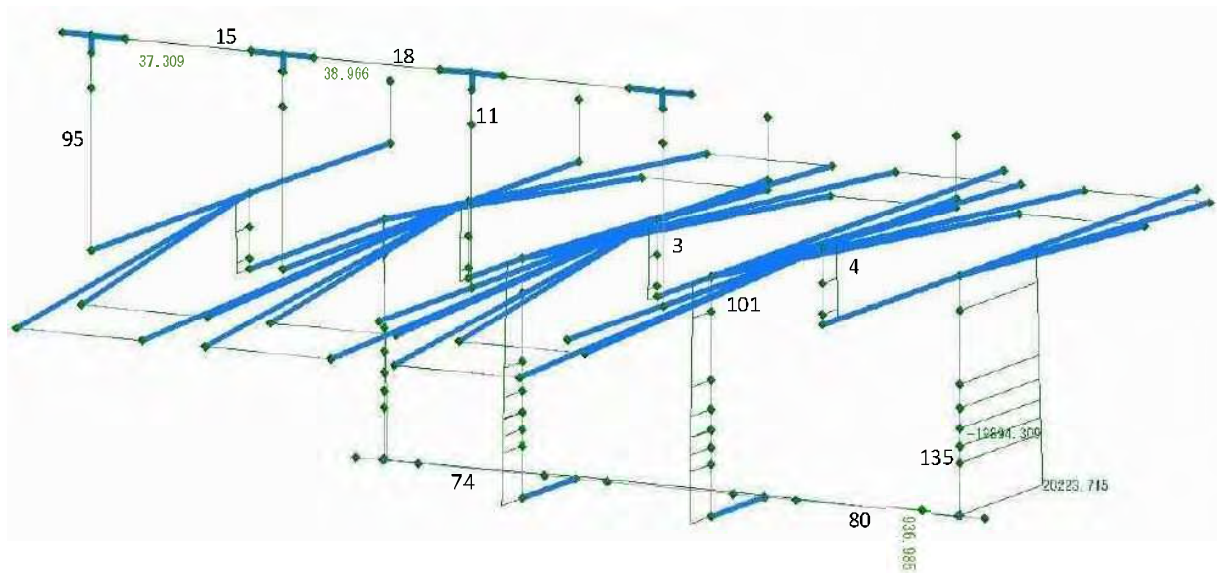
⑩ CASE10 : Seism Lateral direction H.W.L + 0.25m level Full CL



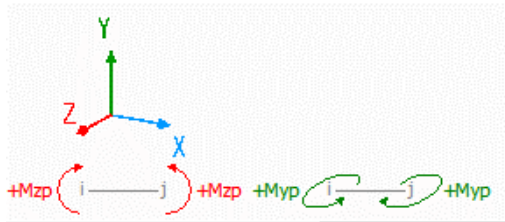
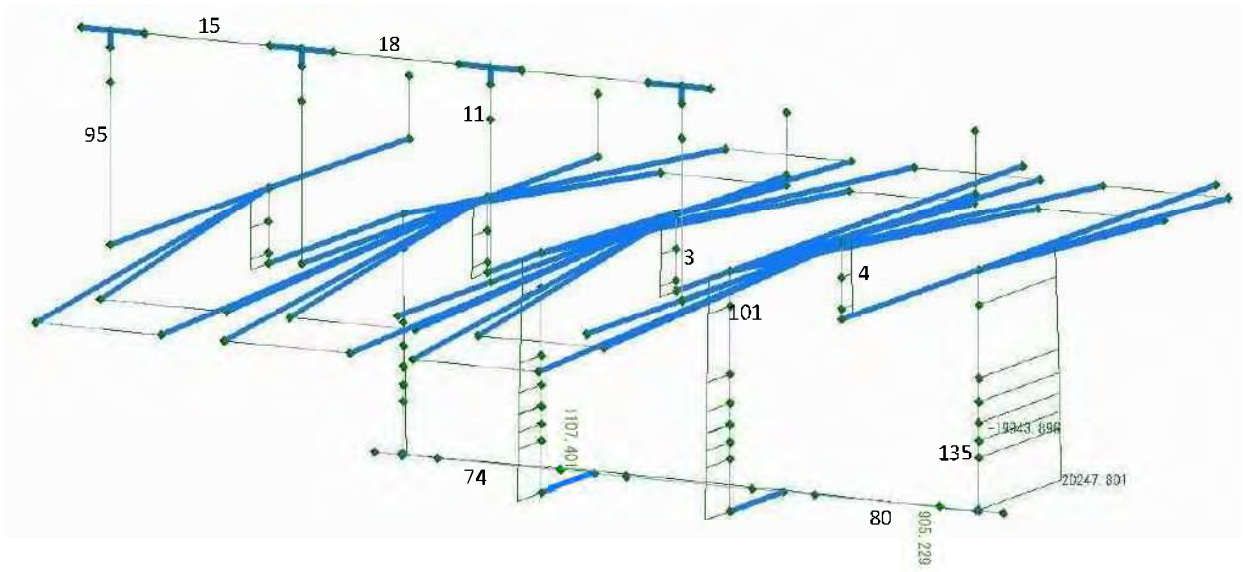
⑪ CASE11 : Seism Lateral direction No wate Full OP



⑫ CASE12 : Seism Longitudinal direction H.W.L.+0.25m water level Full OP



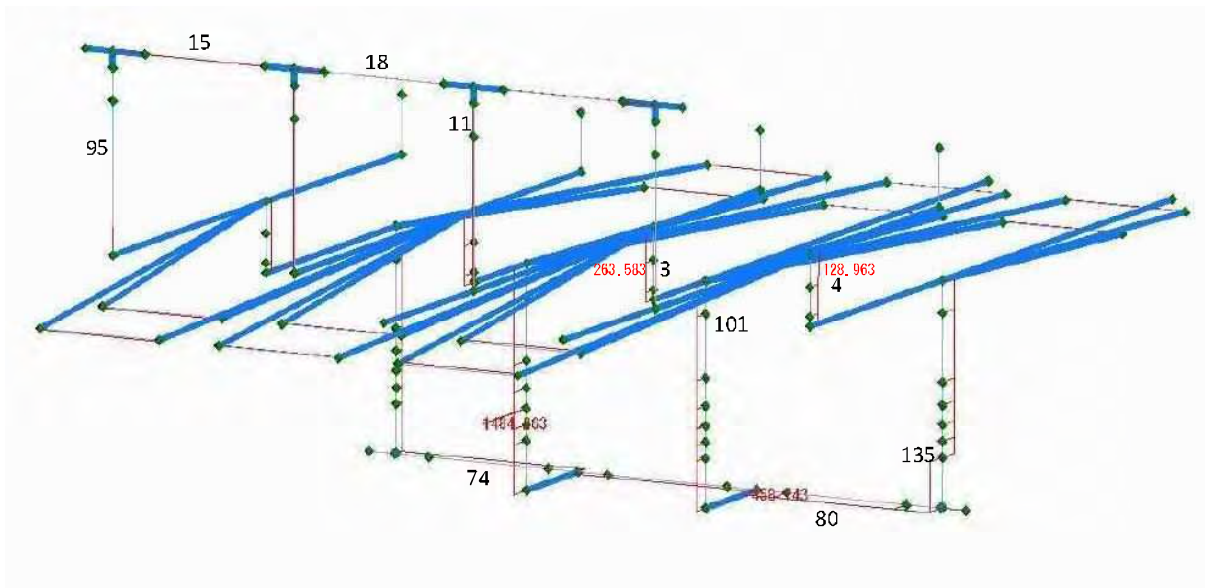
⑬ CASE13 : Regular Longitudinal direction H.W.L+0.25m water level Maintenance case



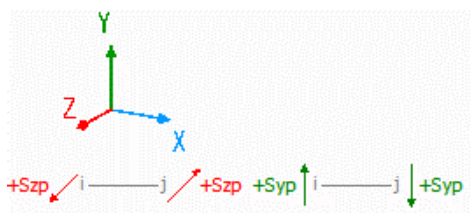
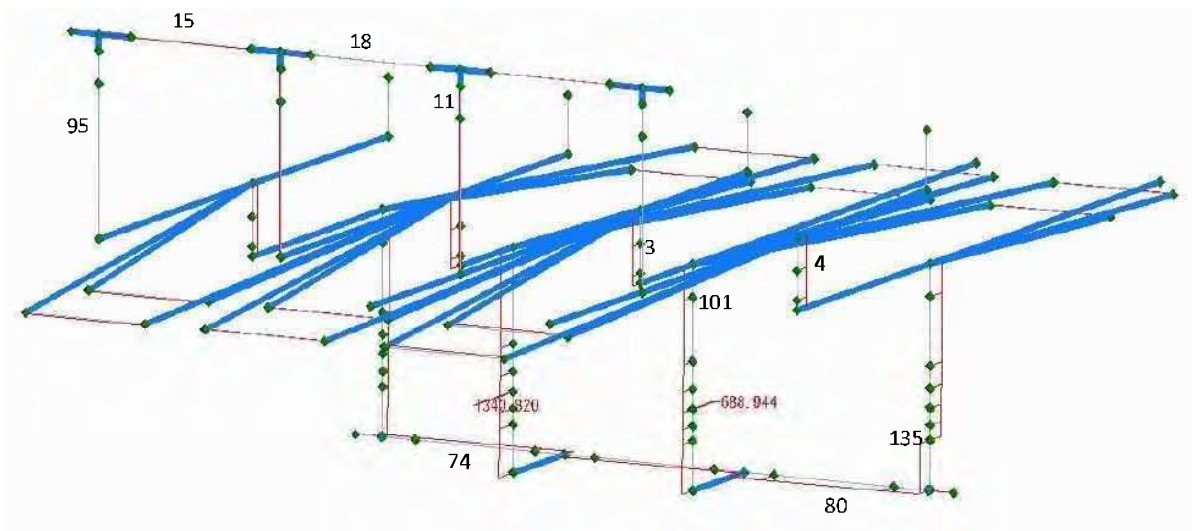
Badraman Reg-Dairutiah Canal

2. Shear power

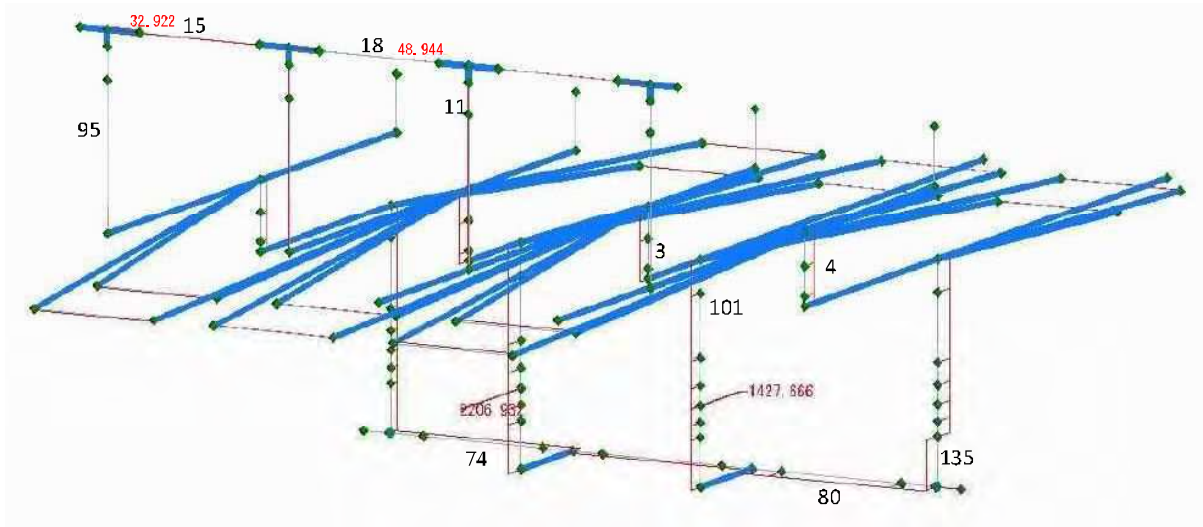
① CASE1 : Regular Longitudinal direction H.H.W.L Full OP



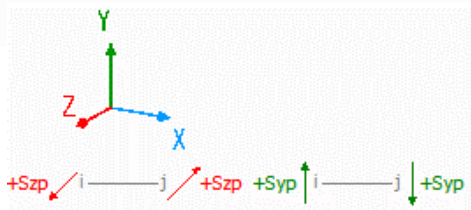
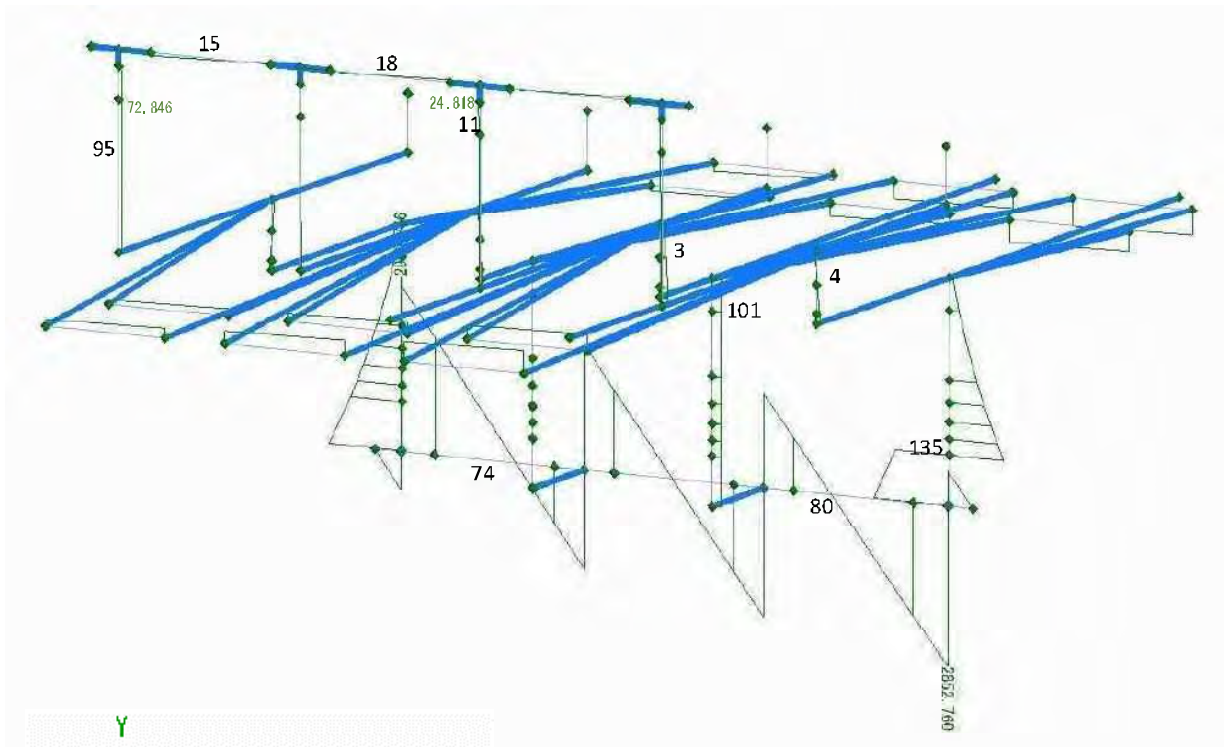
② CASE2 : Regular Longitudinal direction H.WL+0.25m water level Full CL



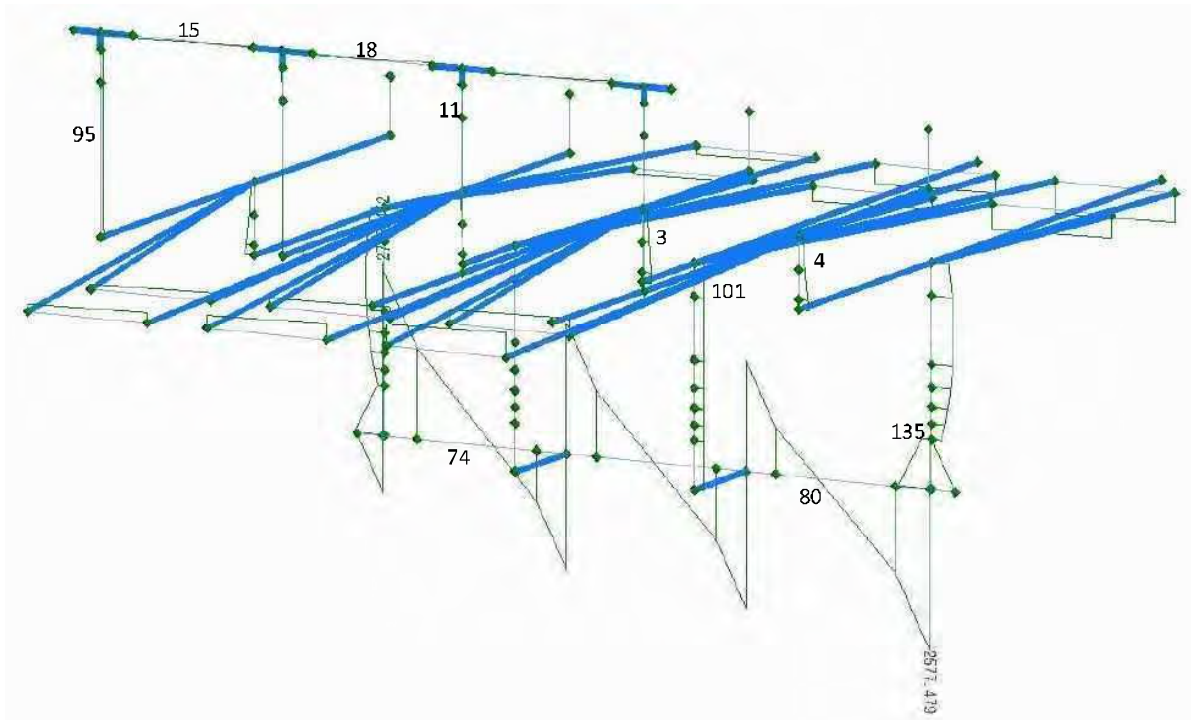
③ CASE3 : Regular Longitudinal direction No. water Full OP



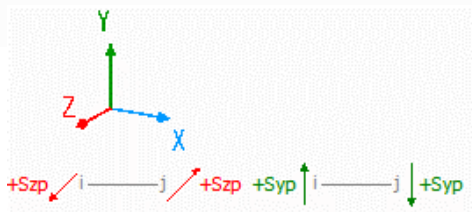
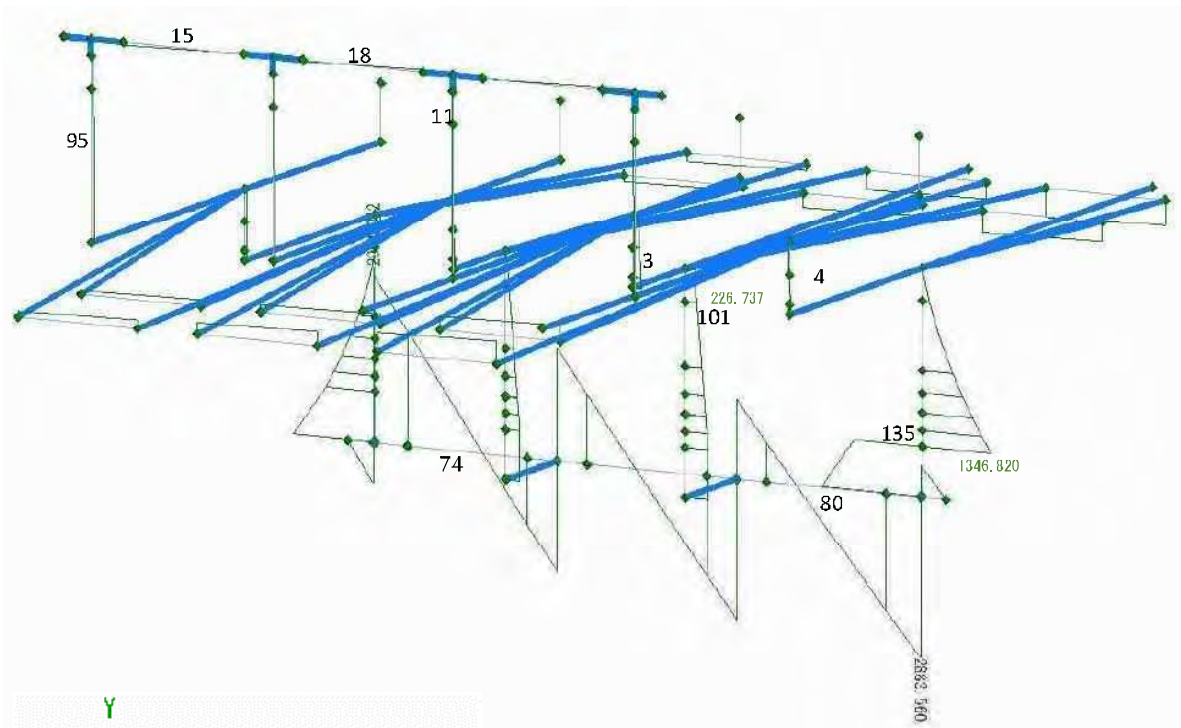
④ CASE4 : Regular Lateral direction H.W.L. +0.25m water level Full OP



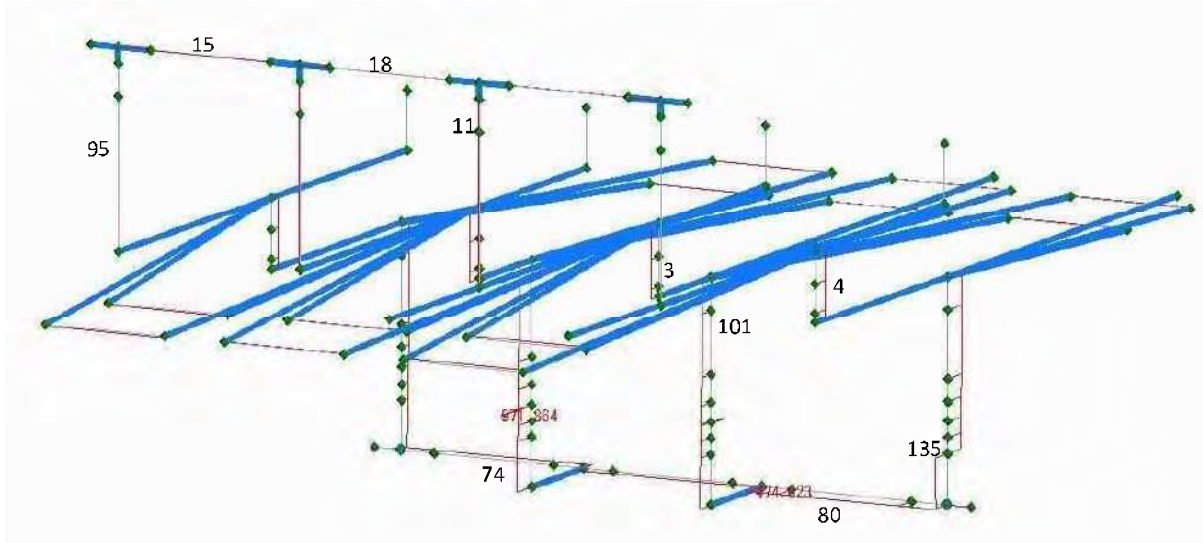
⑤ CASE5 : Regular Lateral direction H.W.L.+0.25m water level Full CL



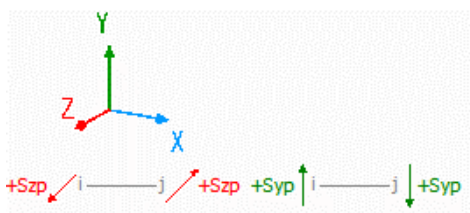
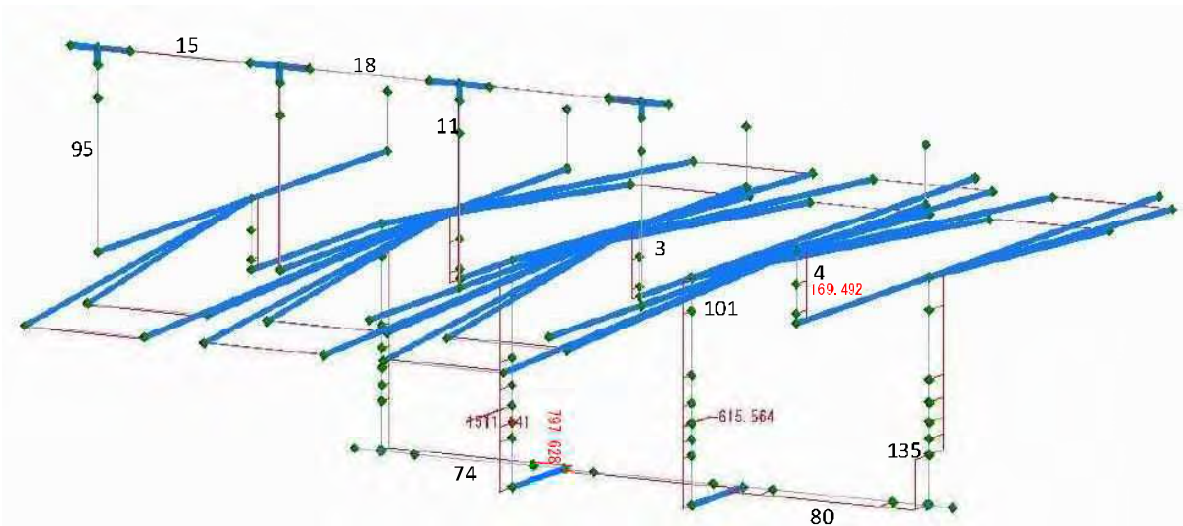
⑥ CASE6 : Regular Lateral direction No water Full OP



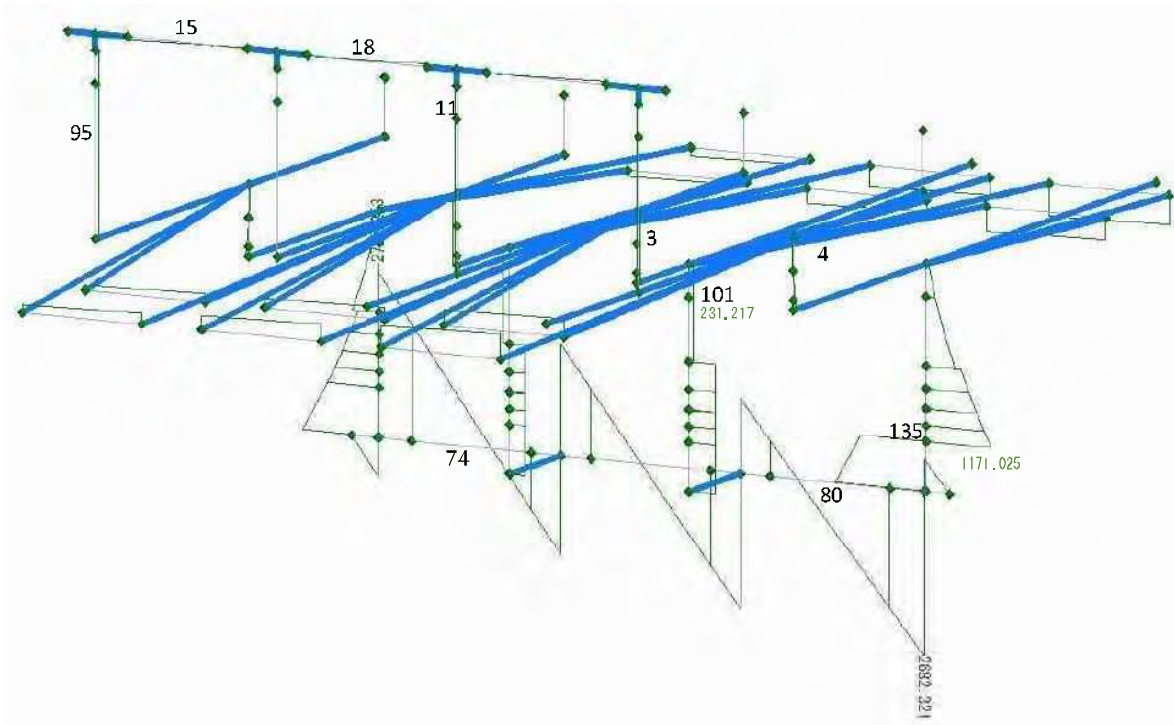
⑦ CASE7 : Seism Longitudinal direction H.W.L. +0.25m water level Full CL



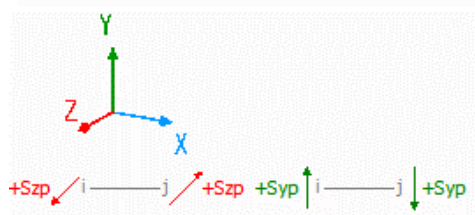
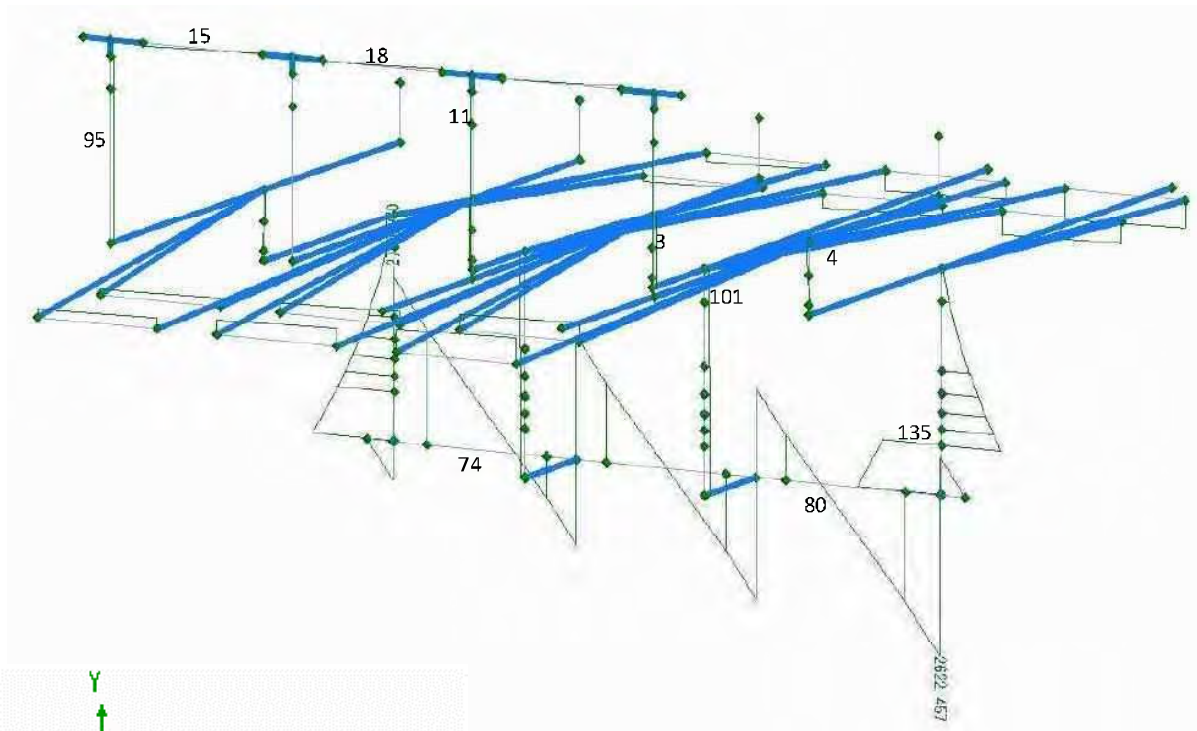
⑧ CASE8 : Seism Longitudinal direction No water Full OP



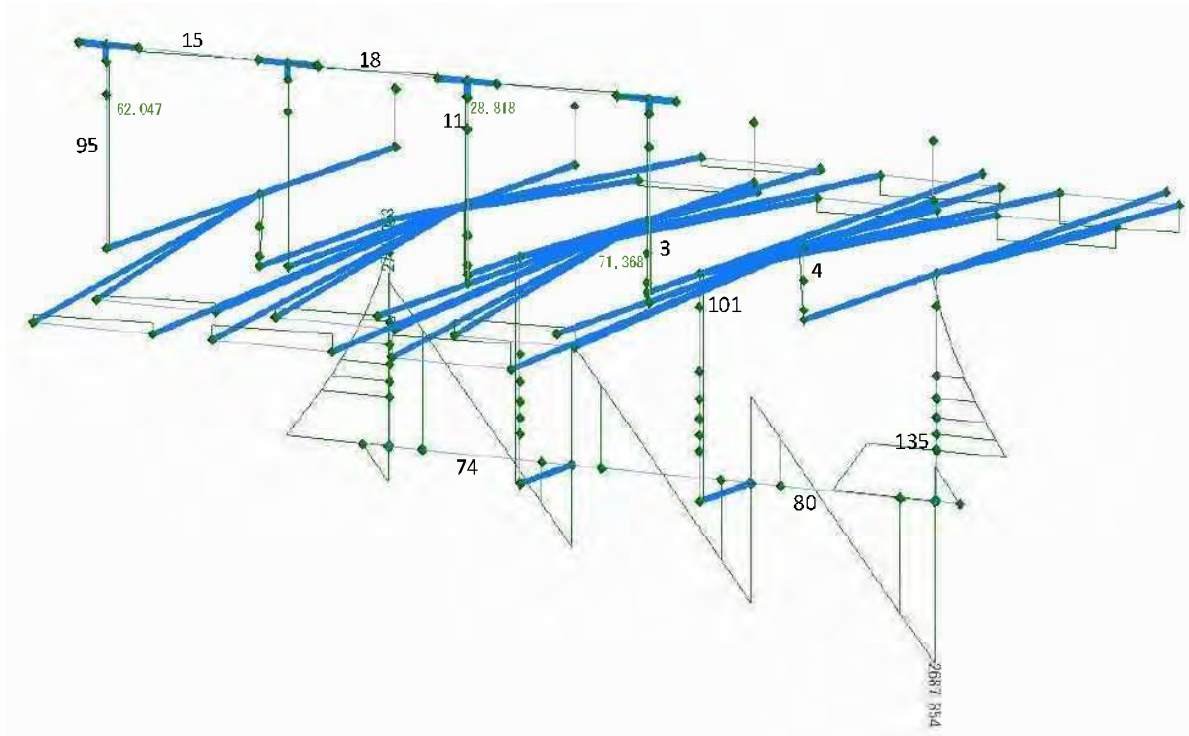
⑨ CASE9 : Seism Lateral direction H.W.L + 0.25m water level Full OP



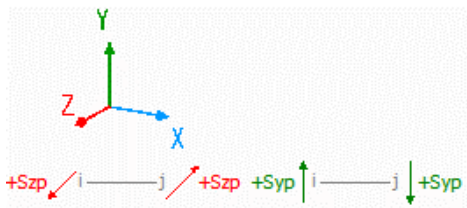
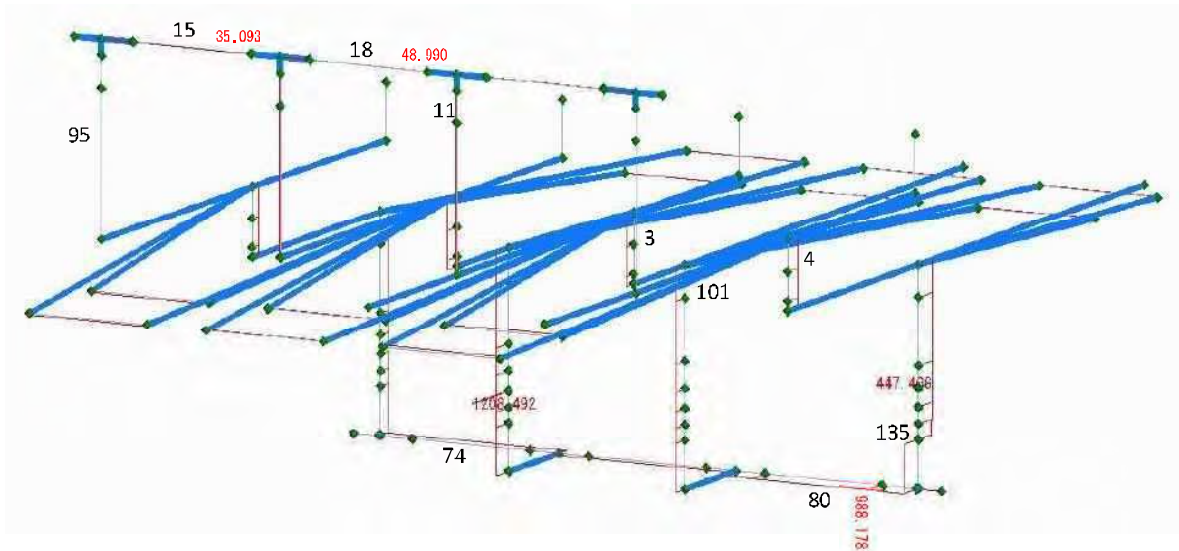
⑩ CASE10 : Seism Lateral direction H.W.L + 0.25m level Full CL



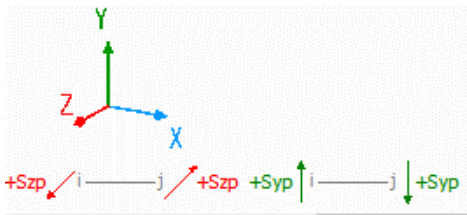
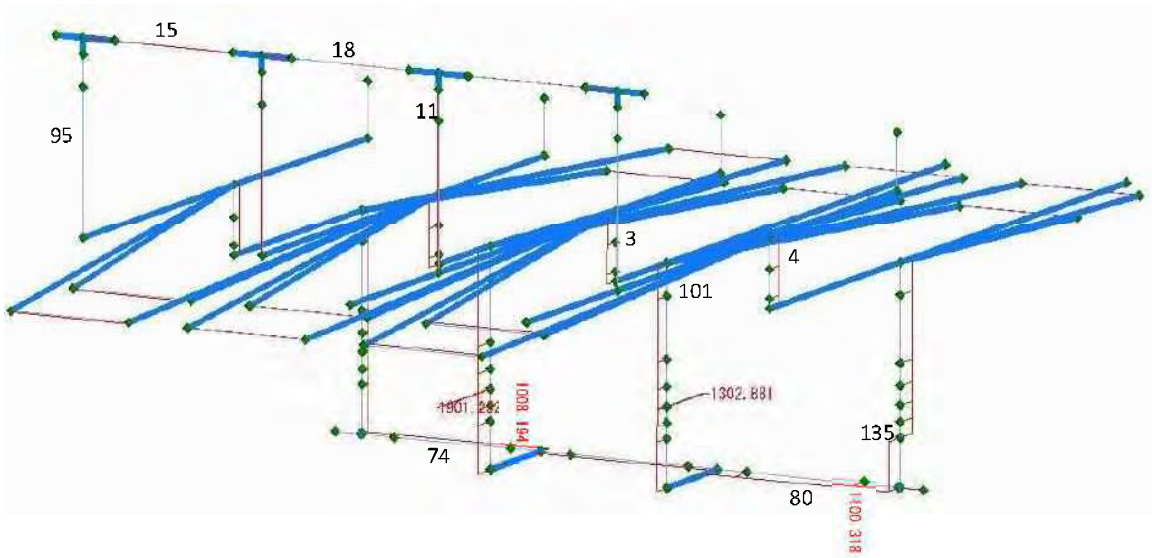
⑪ CASE11 : Seism Lateral direction No wate Full OP



⑫ CASE12 : Seism Longitudinal direction H.W.L.+0.25m water level Full OP



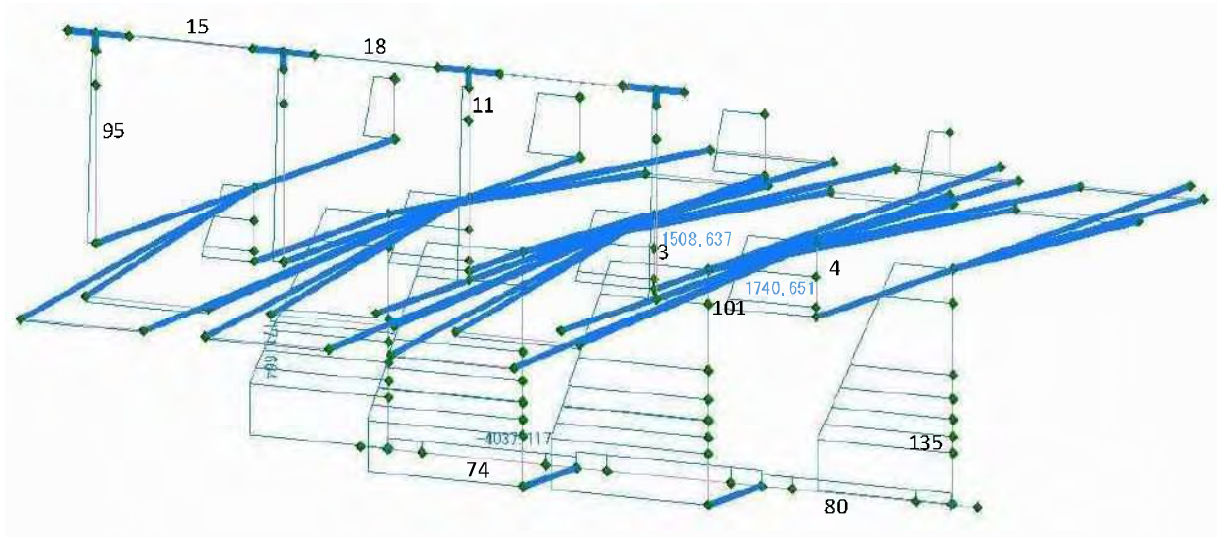
⑬ CASE13 : Regular Longitudinal direction H.W.L+0.25m water level Maintenance case



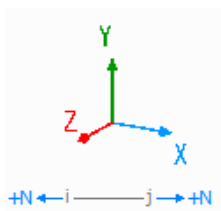
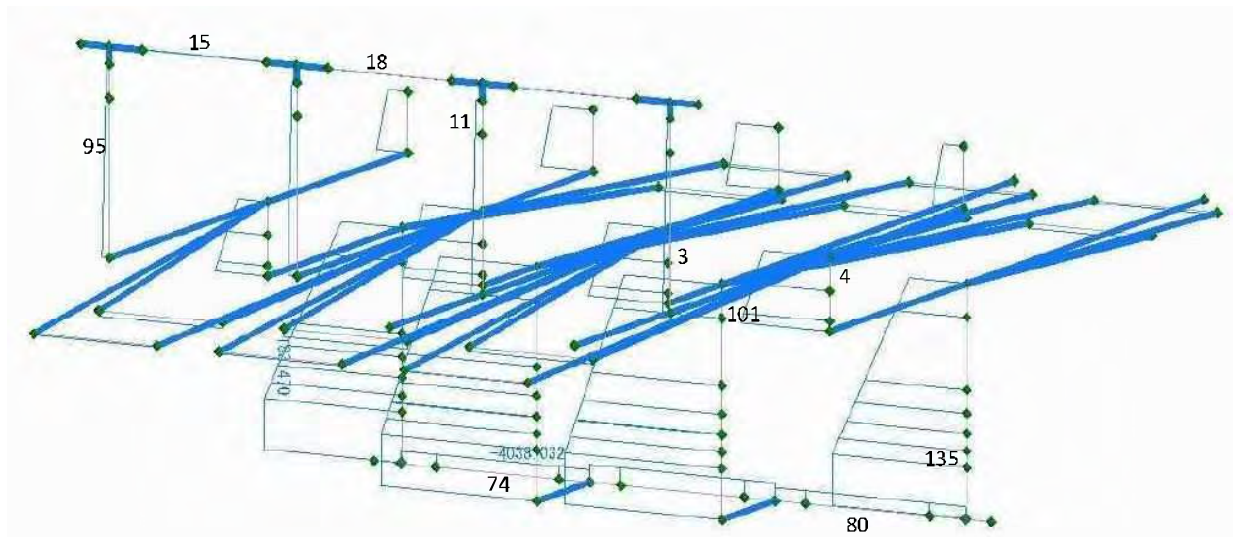
Badraman Reg-Dairutiah Canal

3.Axis power

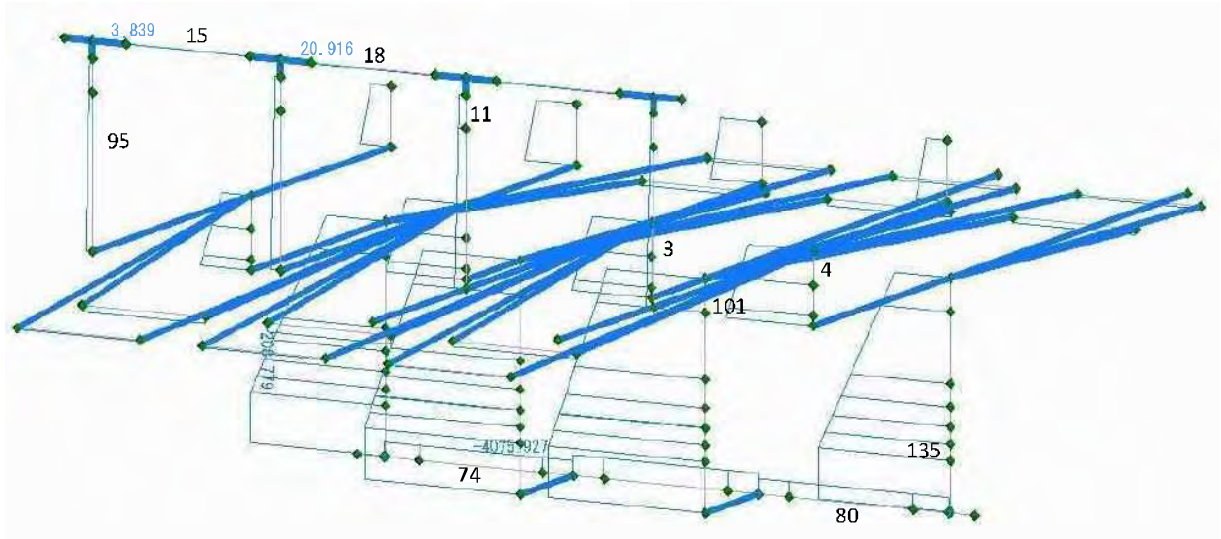
① CASE1 : Regular Longitudinal direction H.H.W.L Full OP



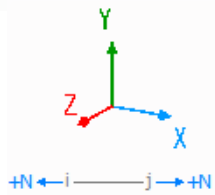
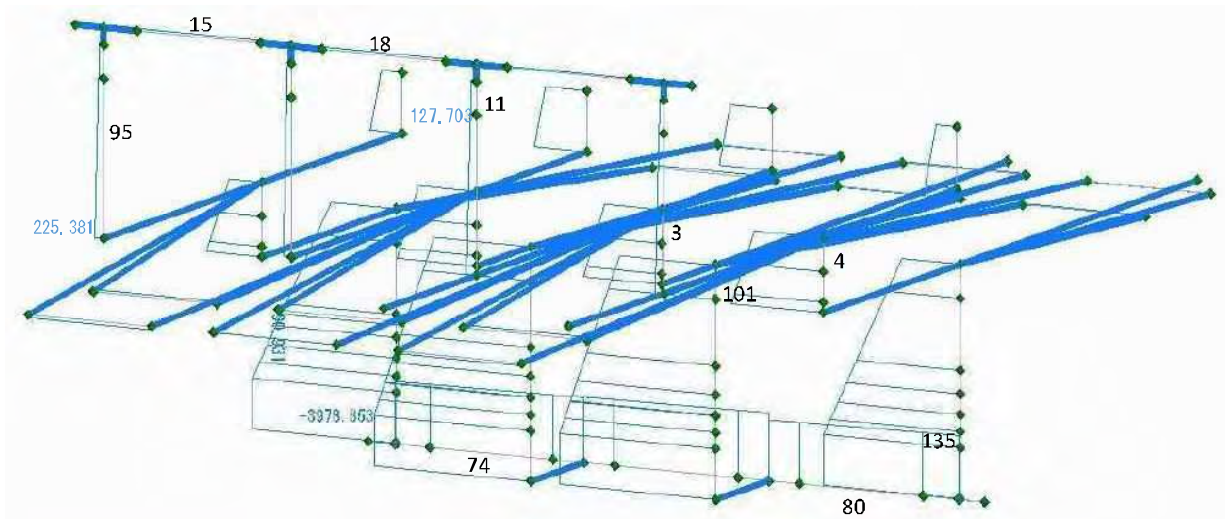
② CASE2 : Regular Longitudinal direction H.WL+0.25m water level Full CL



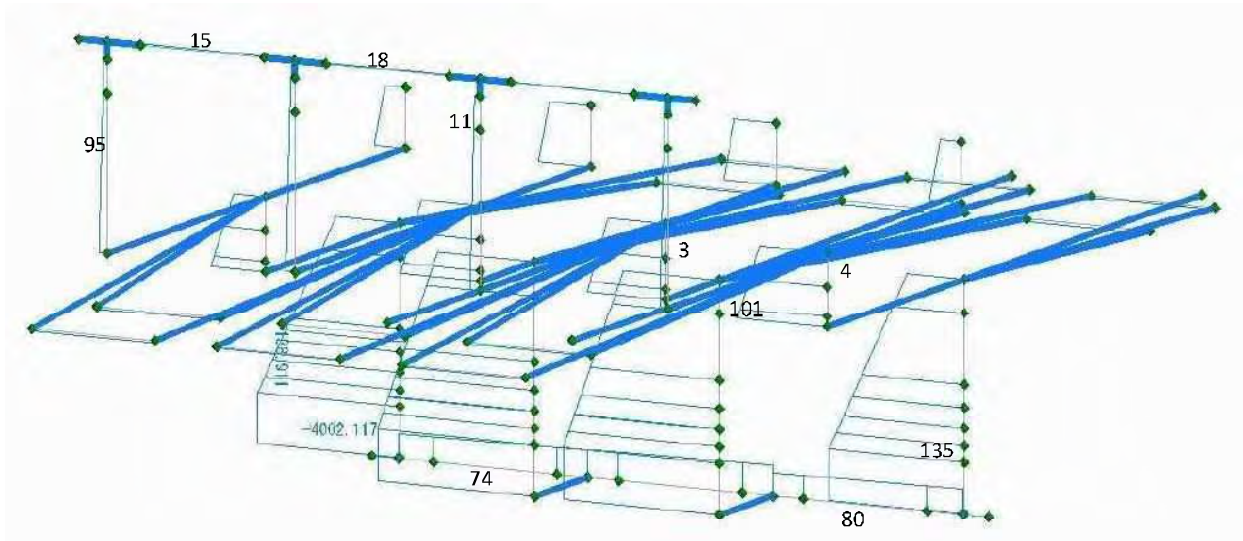
③ CASE3 : Regular Longitudinal direction No. water Full OP



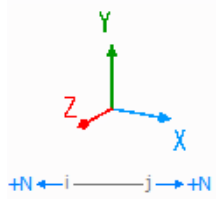
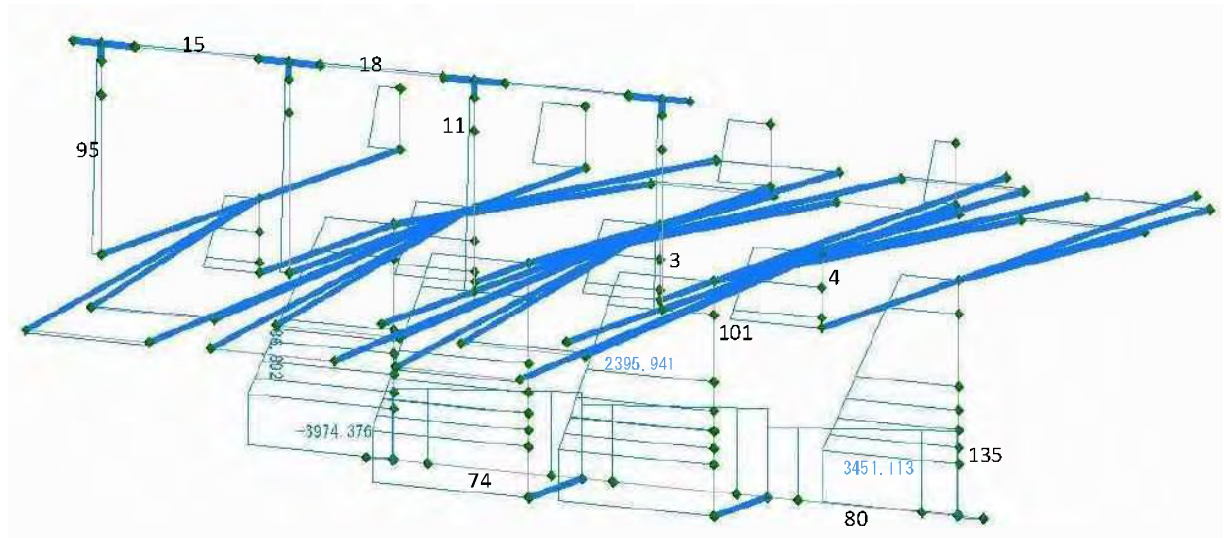
④ CASE4 : Regular Lateral direction H.W.L. +0.25m water level Full OP



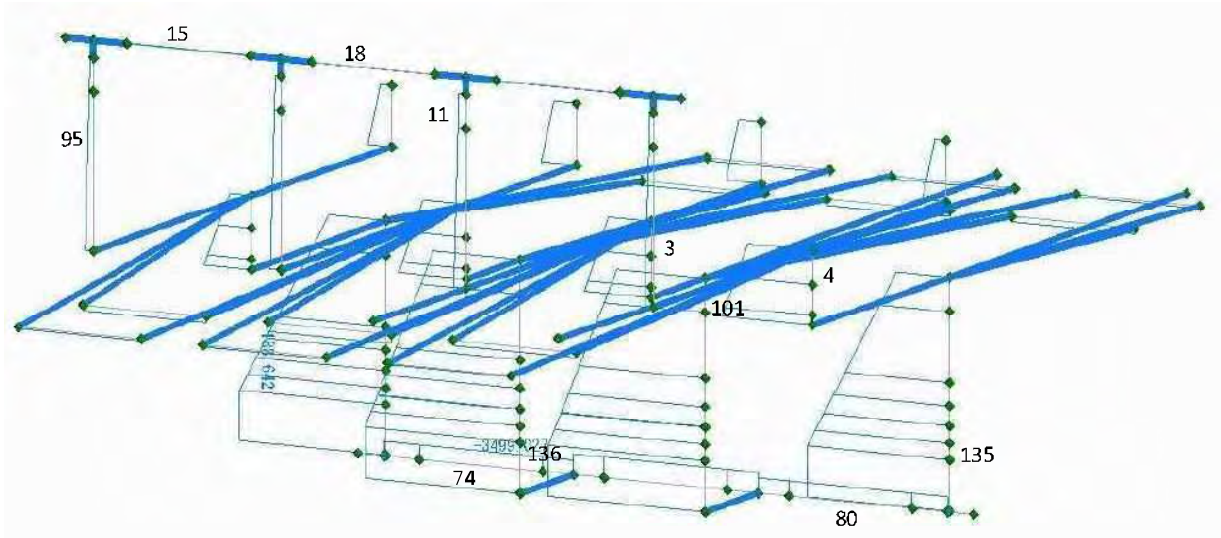
⑤ CASE5 : Regular Lateral direction H.W.L.+0.25m water level Full CL



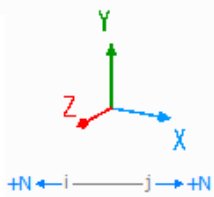
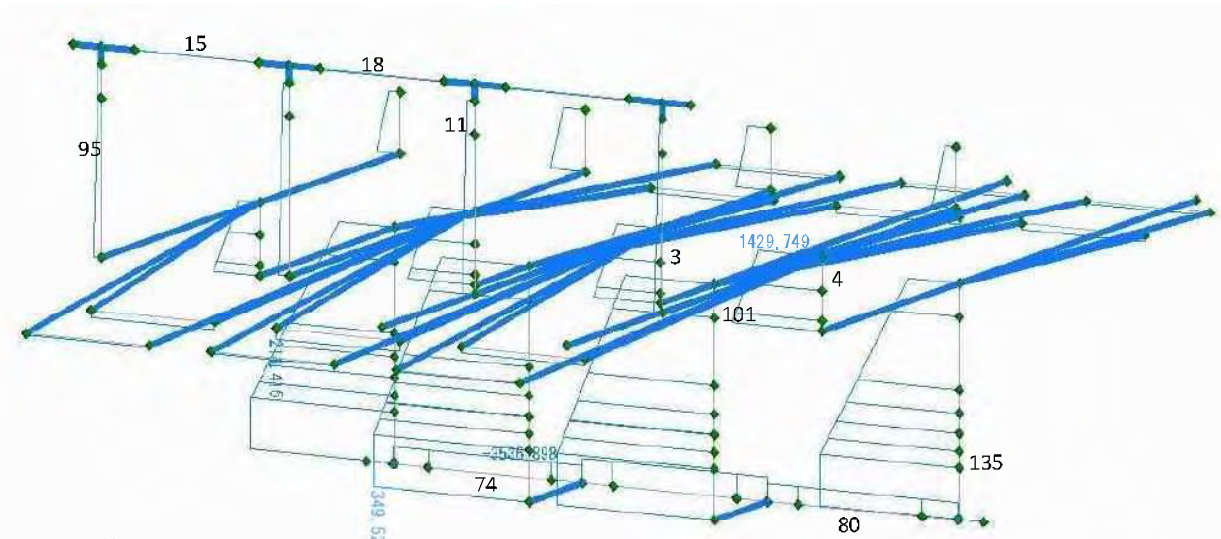
⑥ CASE6 : Regular Lateral direction No water Full OP



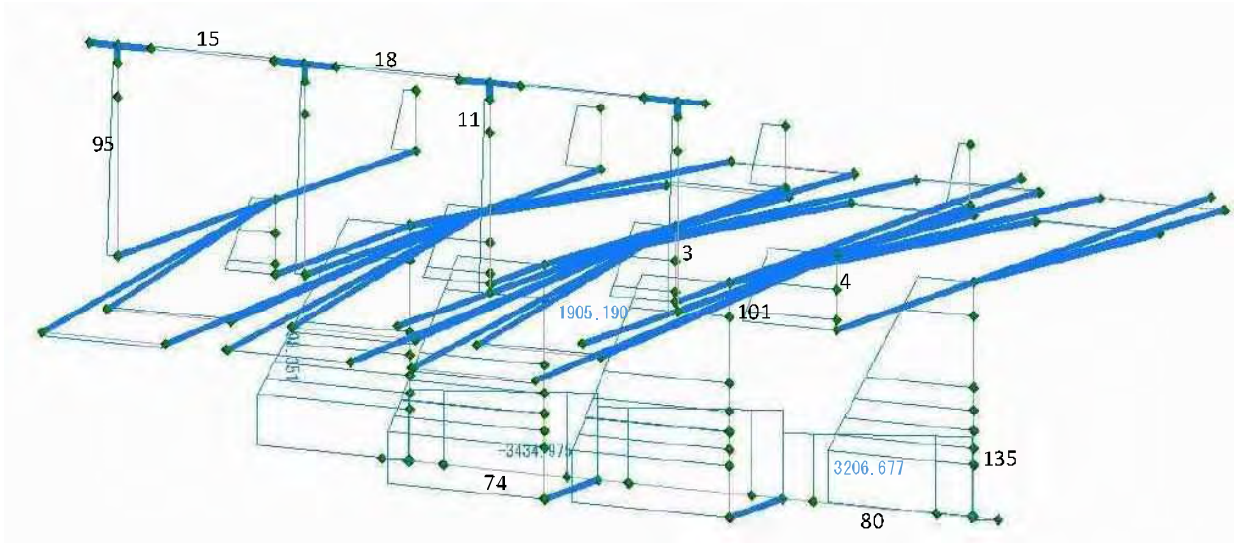
⑦ CASE7 : Seism Longitudinal direction H.W.L. +0.25m water level Full CL



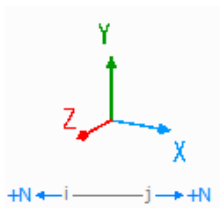
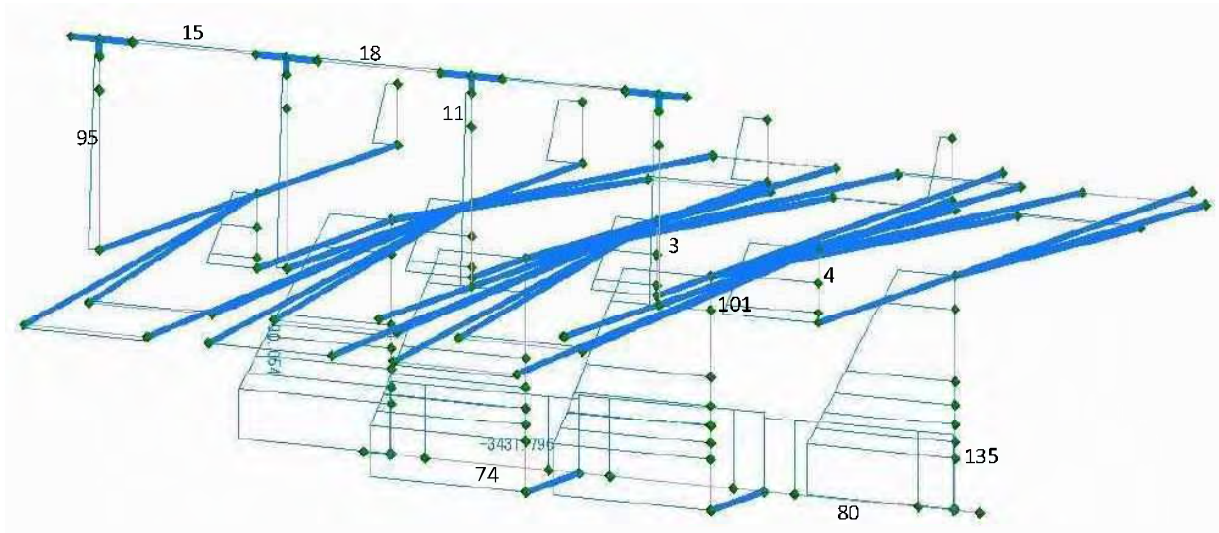
⑧ CASE8 : Seism Longitudinal direction No water Full OP



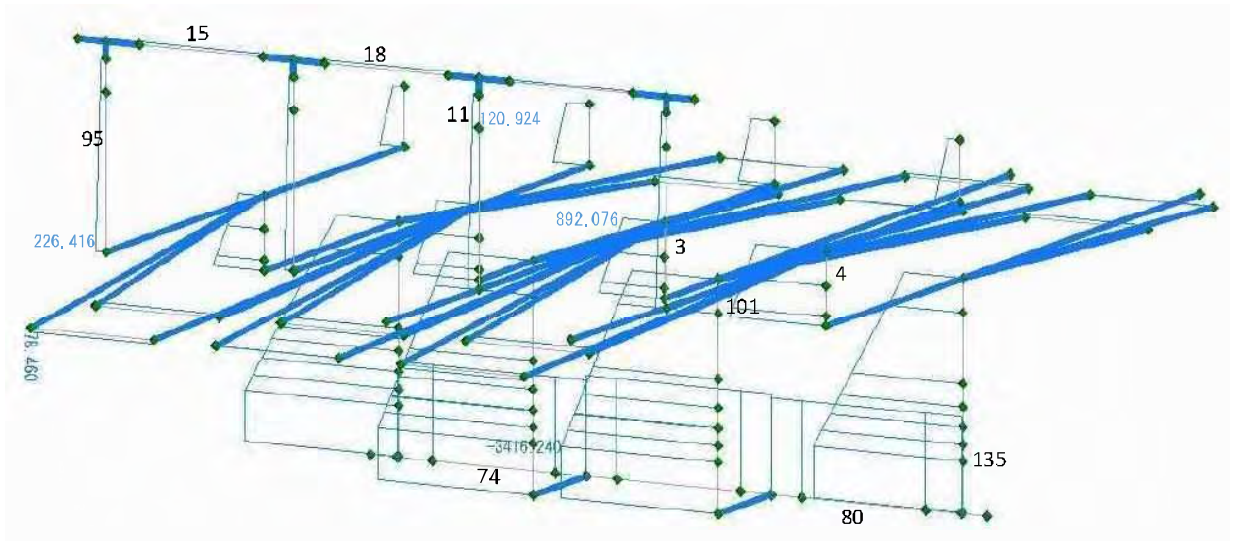
⑨ CASE9 : Seism Lateral direction H.W.L + 0.25m water level Full OP



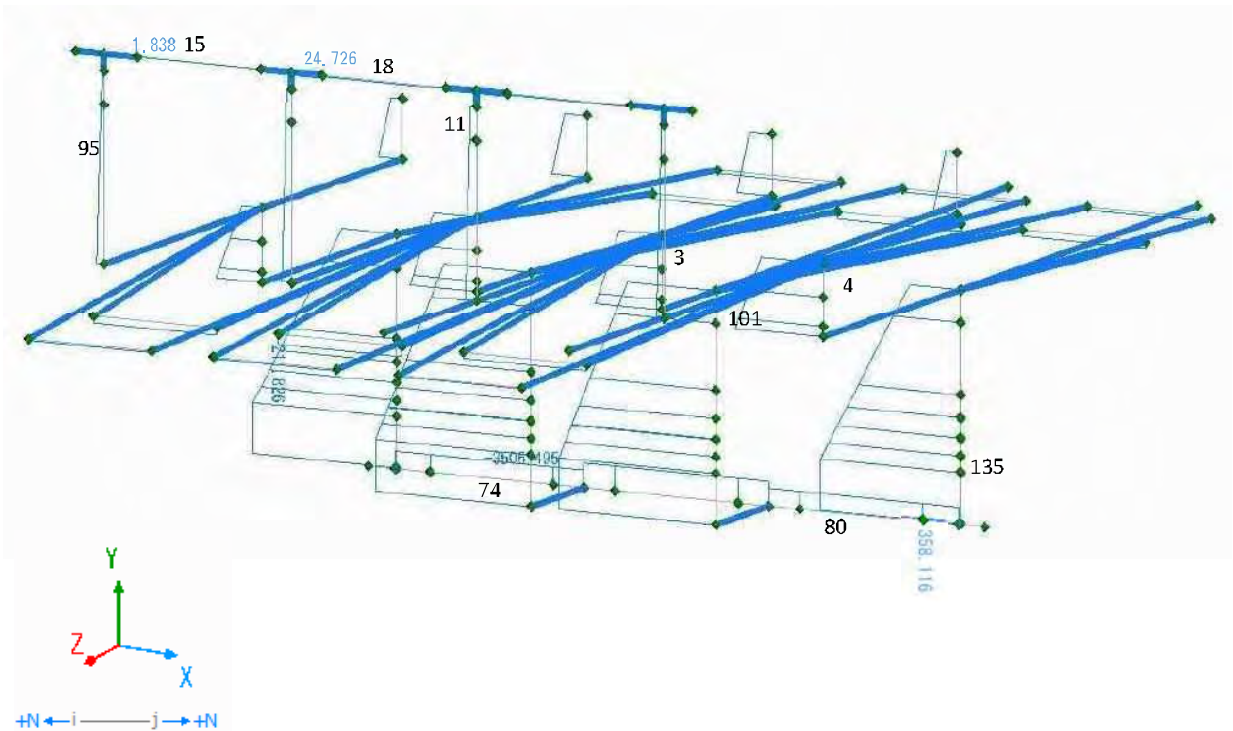
⑩ CASE10 : Seism Lateral direction H.W.L + 0.25m level Full CL



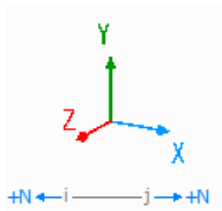
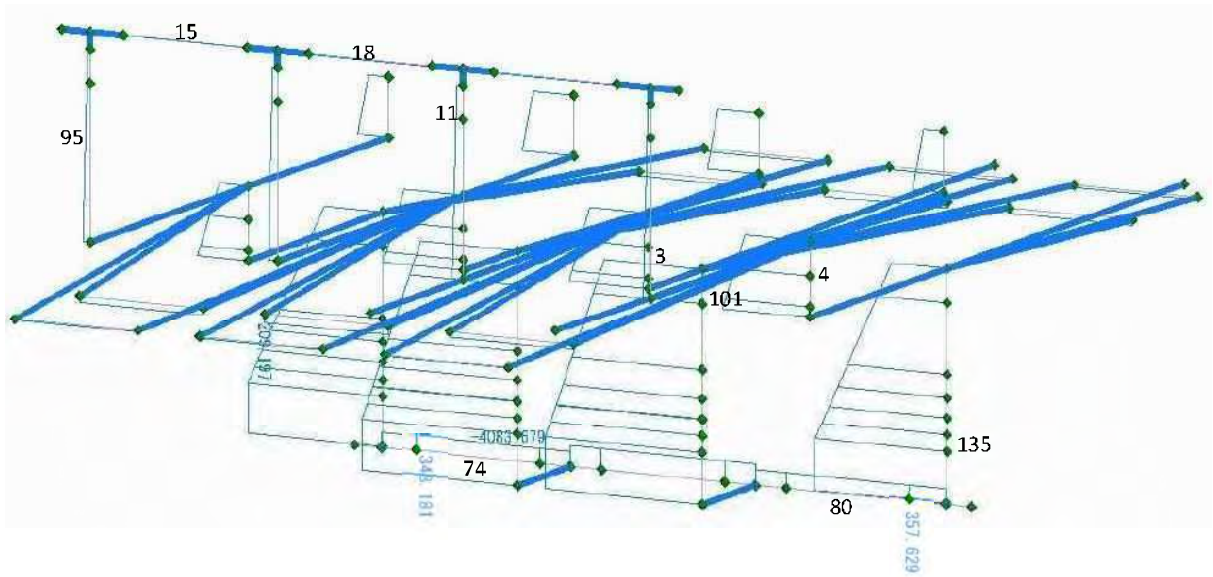
⑪ CASE11 : Seism Lateral direction No wate Full OP



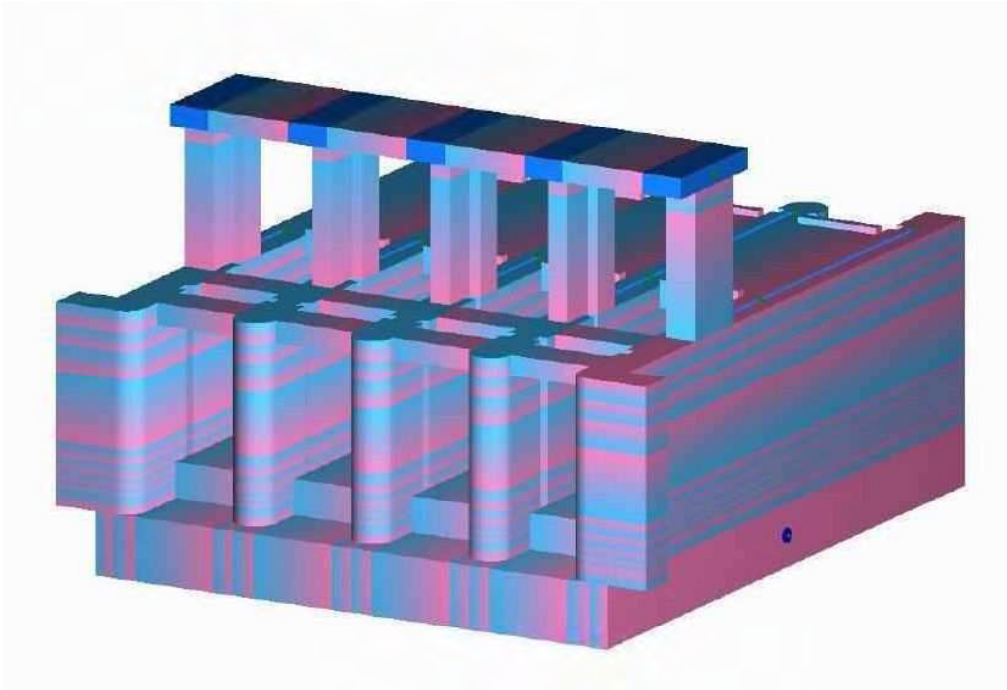
⑫ CASE12 : Seism Longitudinal direction H.W.L.+0.25m water level Full OP



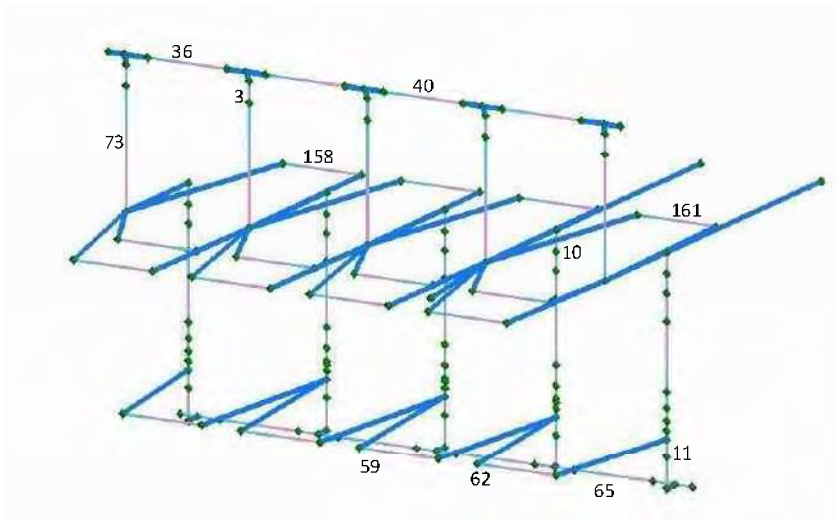
⑬ CASE13 : Regular Longitudinal direction H.W.L+0.25m water level Maintenance case



A-6-5. Structural analysis of Abo Gabal Regulator



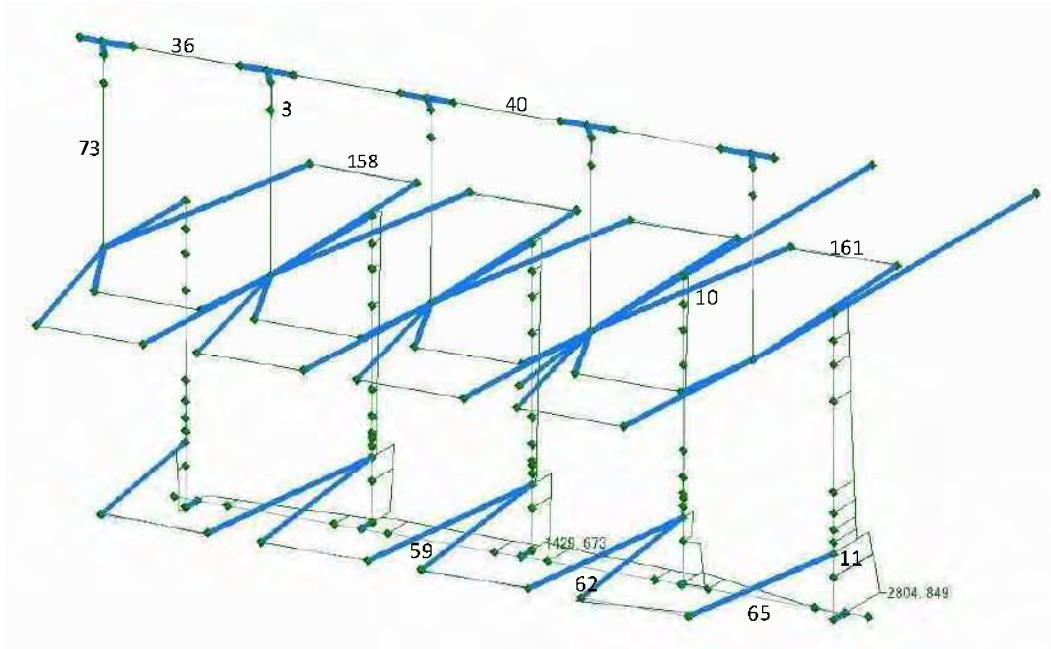
General view



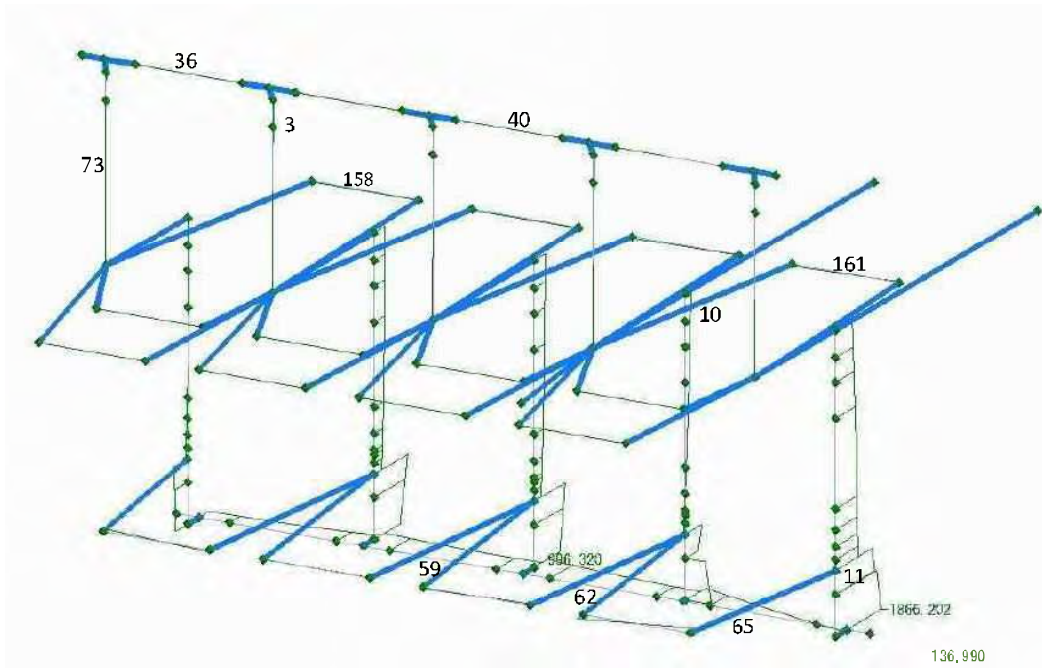
General view (frame)

1. bending Moment

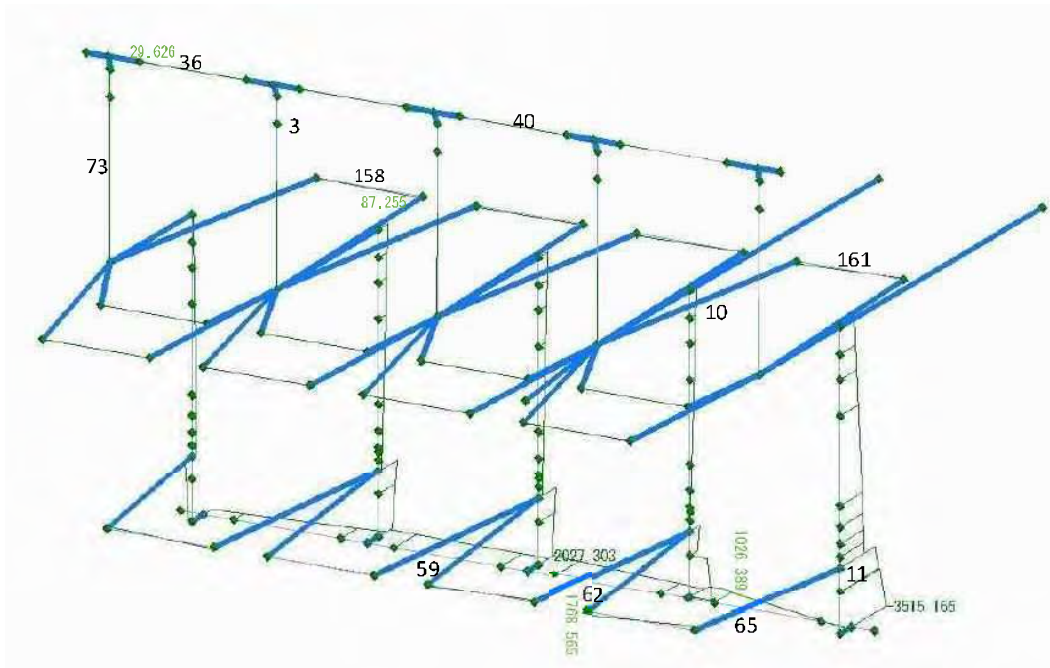
① CASE1 : Regular Longitudinal direction H.H.W.L Full OP



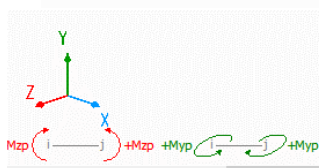
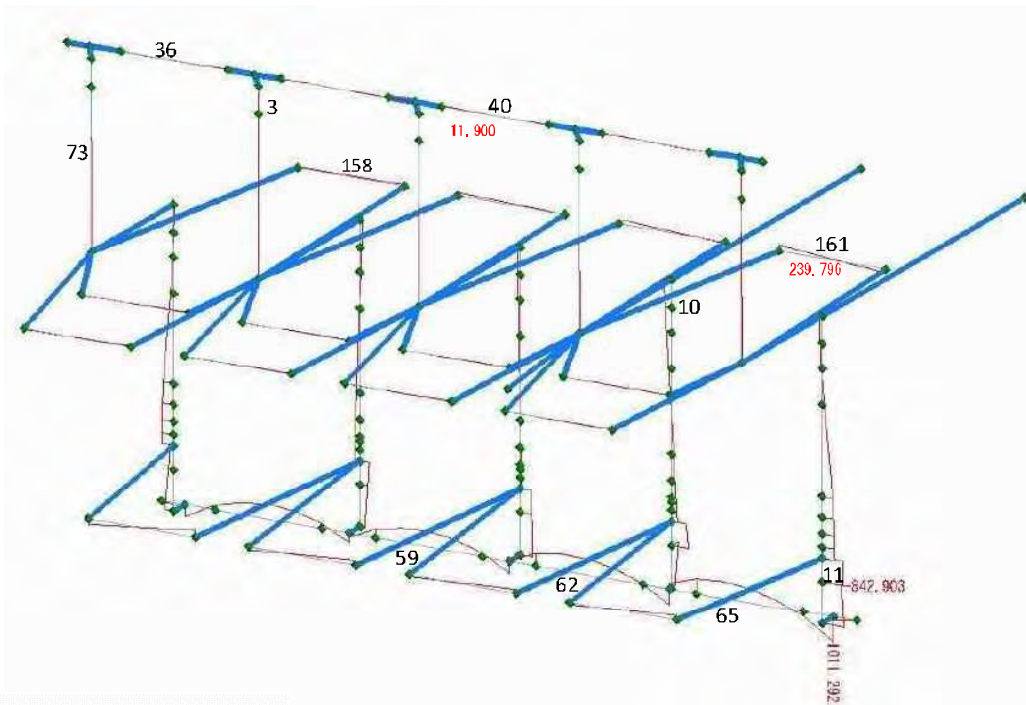
② CASE2 : Regular Longitudinal direction H.WL+0.25m water level Full CL



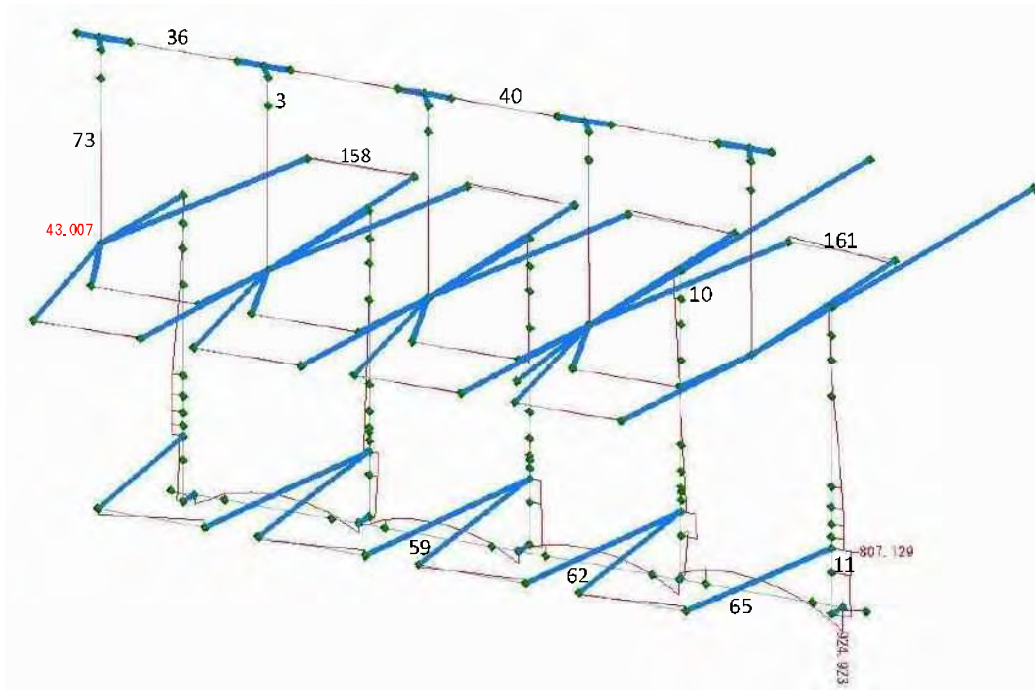
③ CASE3 : Regular Longitudinal direction No. water Full OP



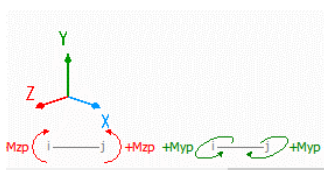
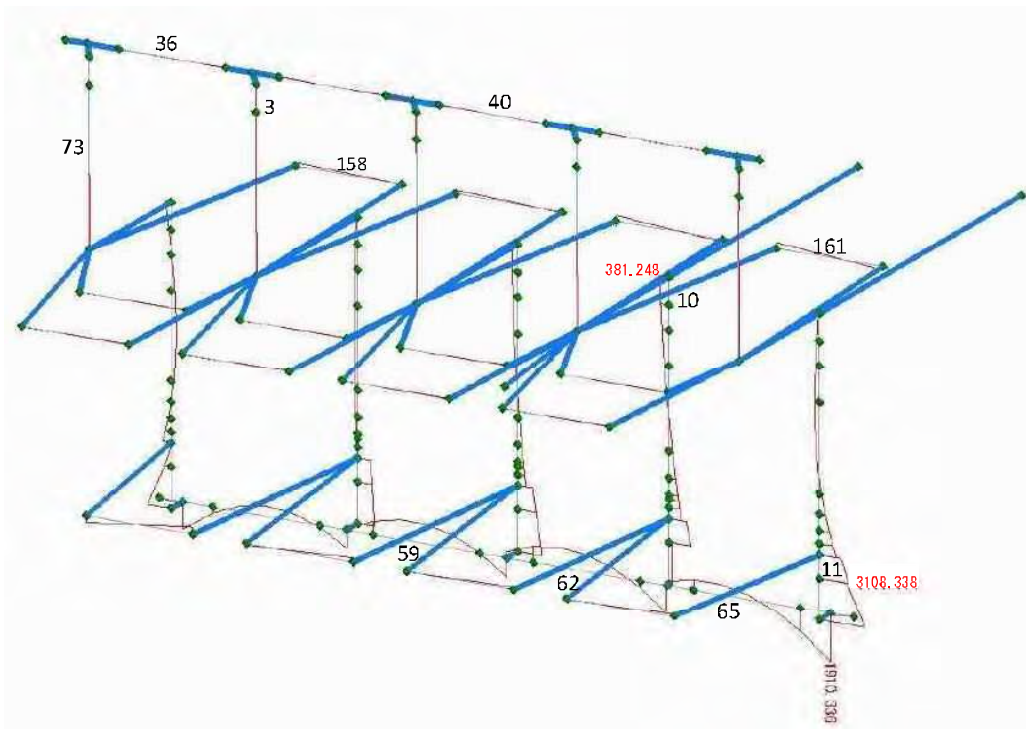
④ CASE4 : Regular Lateral direction H.W.L +0.25m water level Full OP



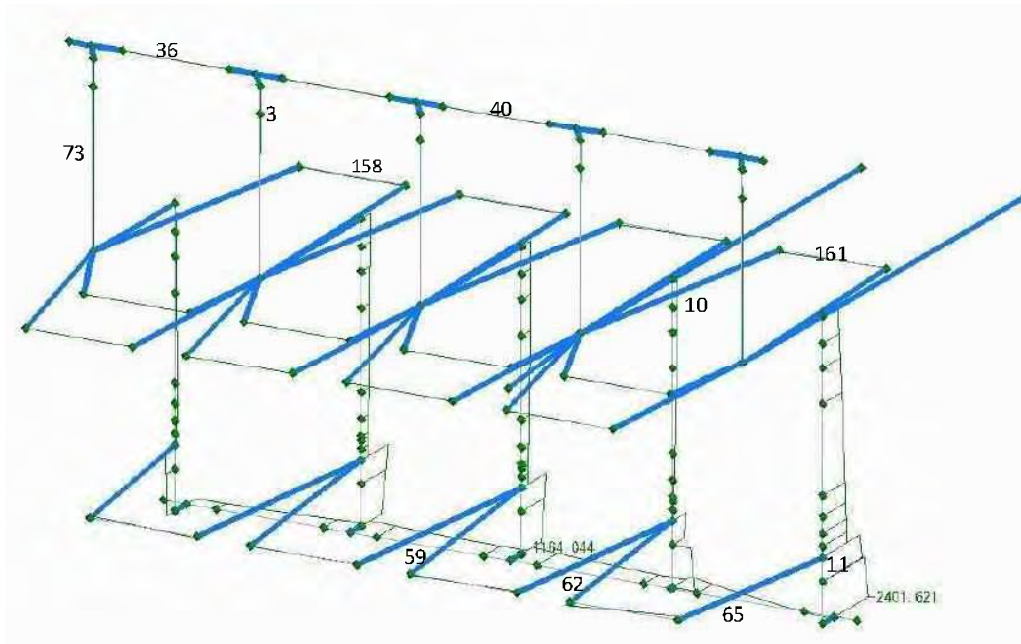
⑤ CASE5 : Regular Lateral direction H.W.L.+0.25m water level Full CL



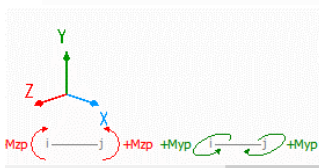
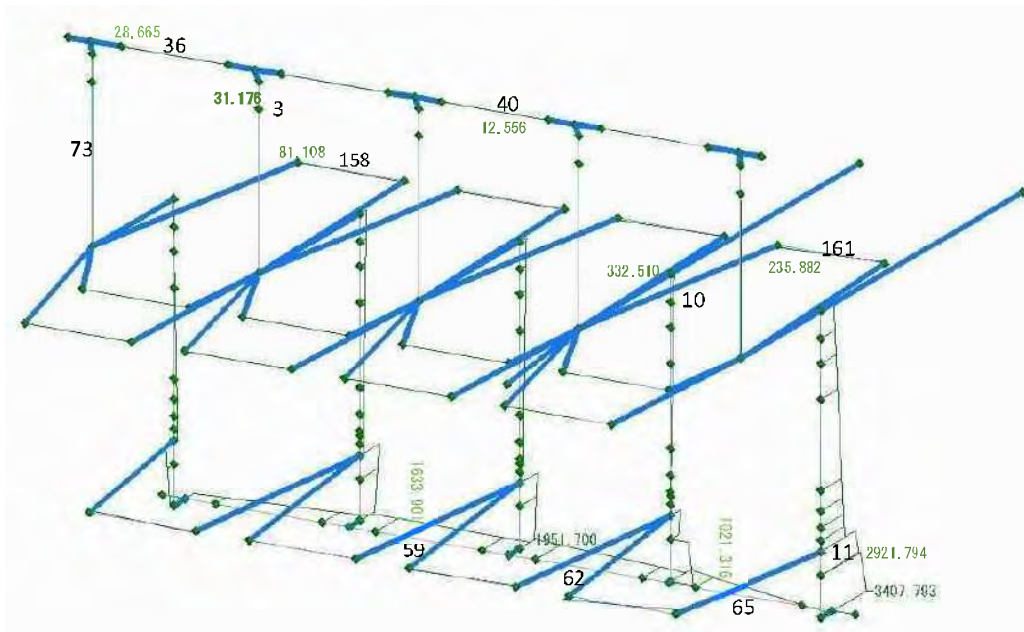
⑥ CASE6 : Regular Lateral direction No water Full OP



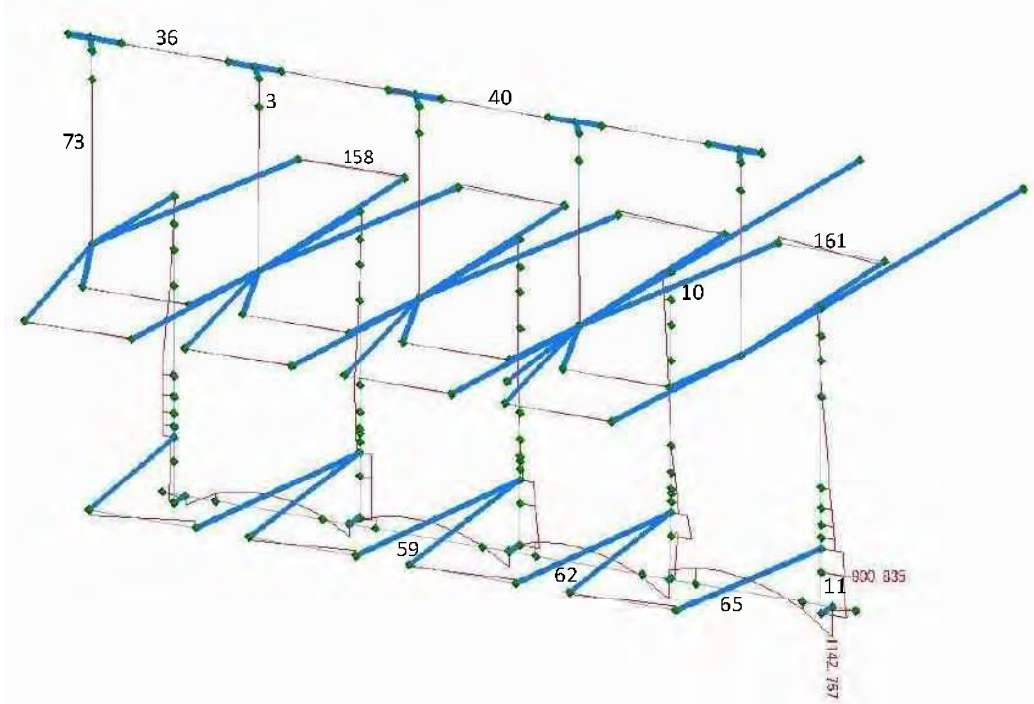
⑦ CASE7 : Seism Longitudinal direction H.W.L.+0.25m water level Full CL



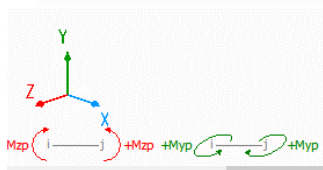
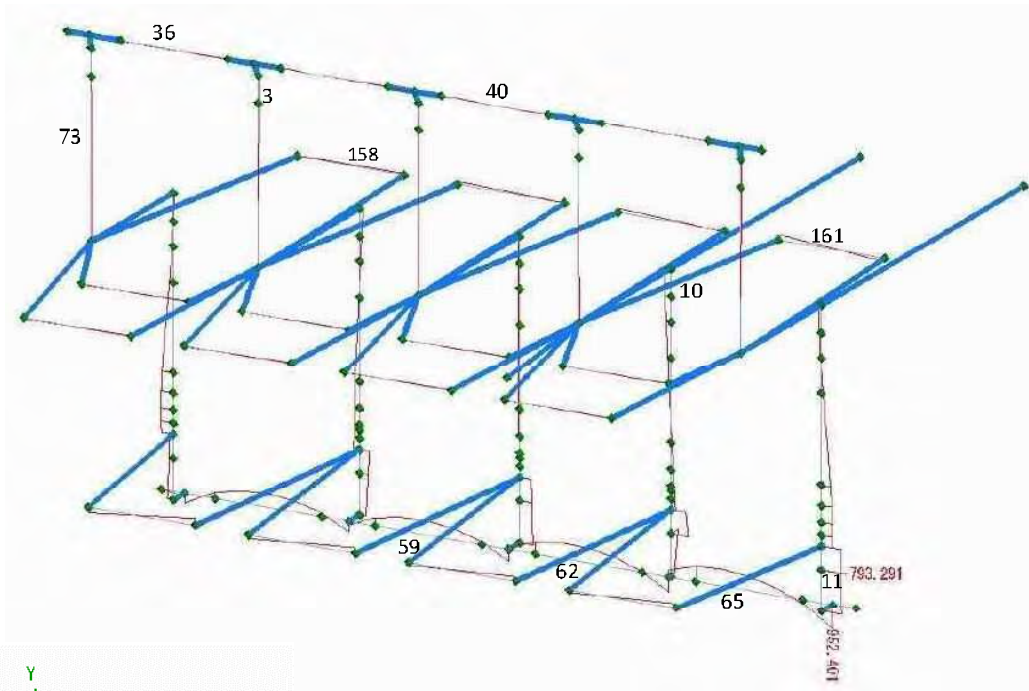
⑧ CASE8 : Seism Longitudinal direction No water Full OP



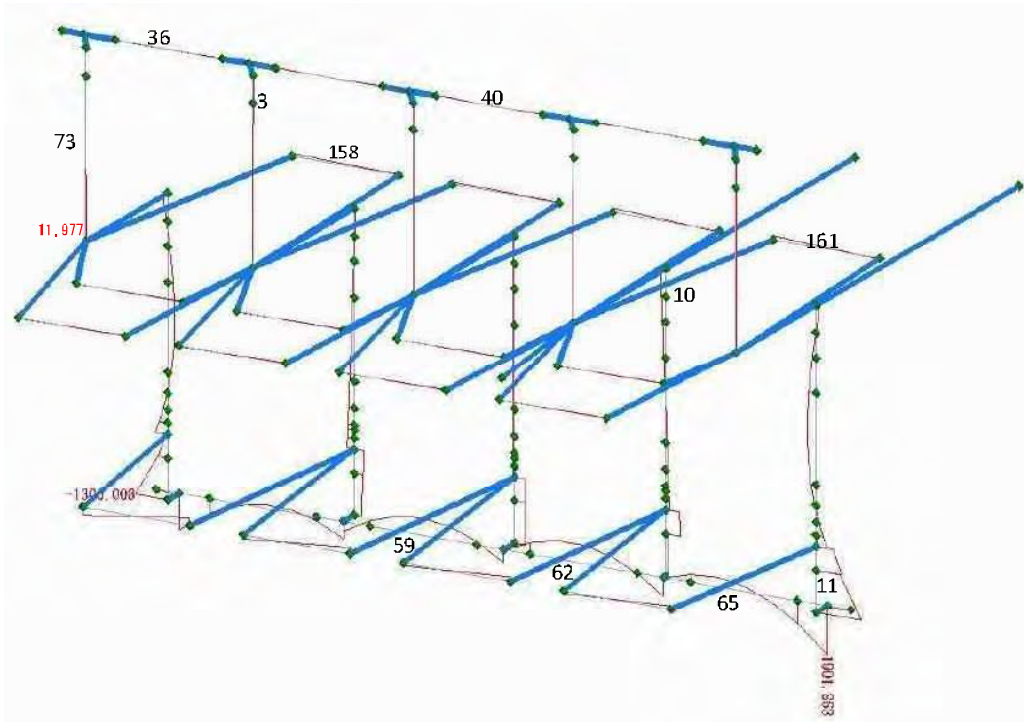
⑨ CASE9 : Seism Lateral direction H.W.L+0.25m water level Full OP



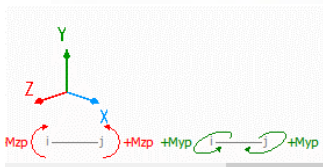
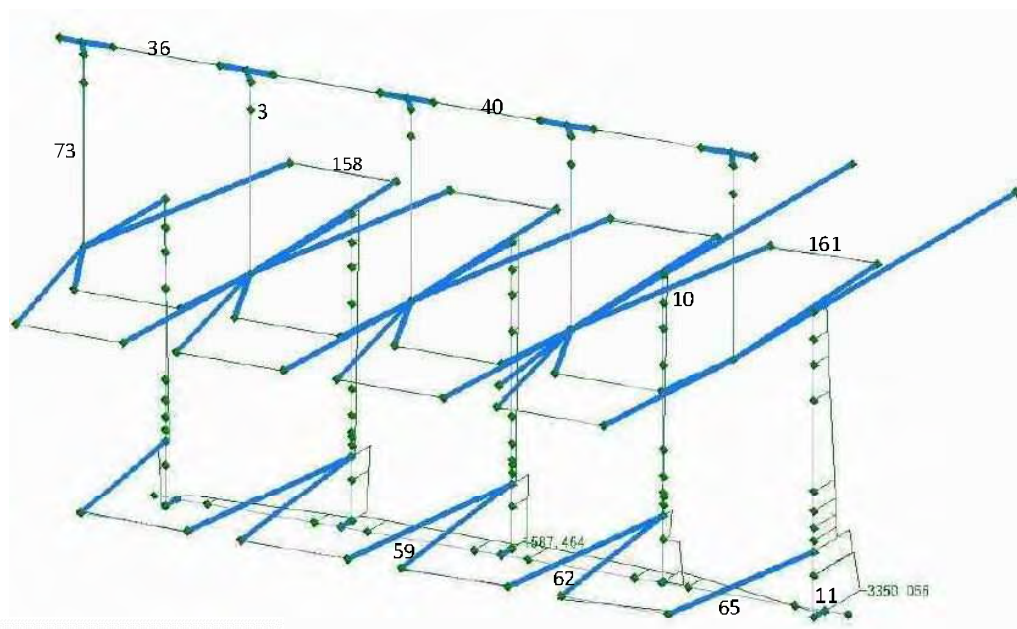
⑩ CASE10 : Seism Lateral direction H.W.L+0.25m level Full CL



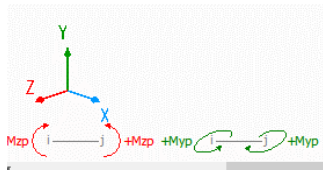
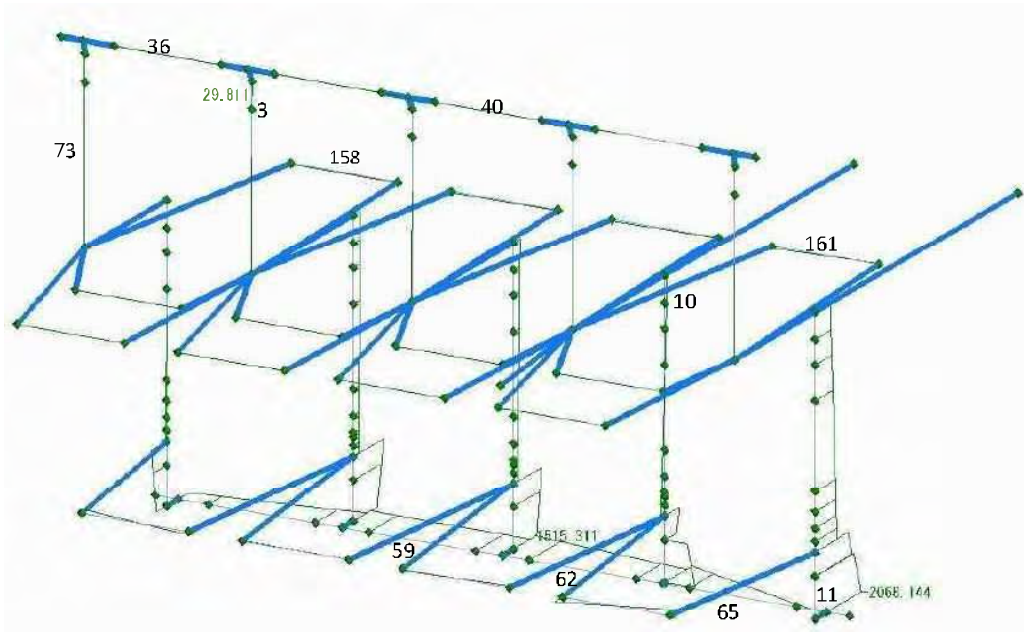
① CASE11 : Seism Lateral direction No water Full OP



② CASE12 : Seism Longitudinal direction H.W.L.+0.25m water level Full OP



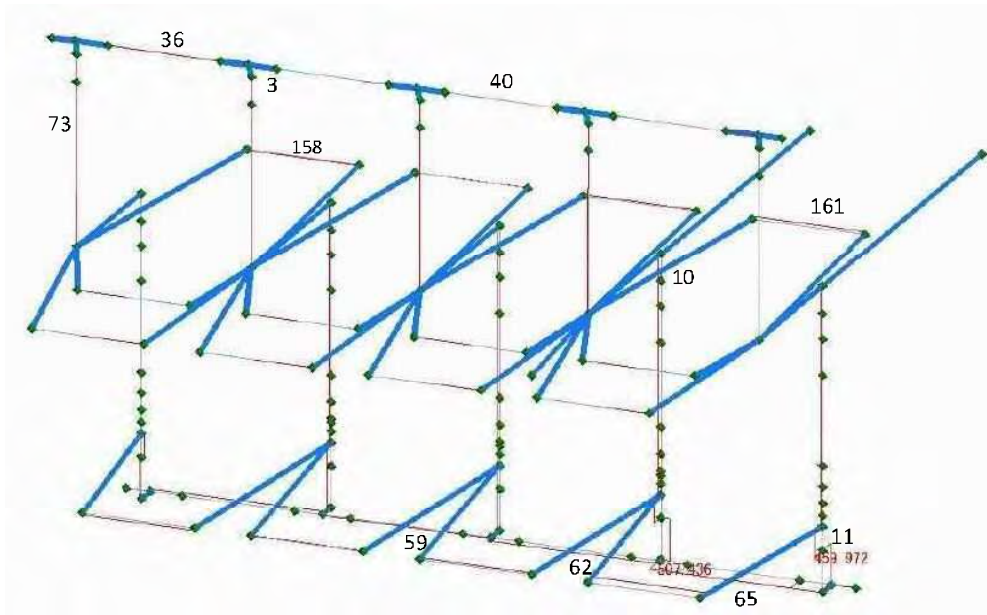
⑬ CASE13 : Regular Longitudinal direction H.W.L.+0.25m water level Maintenance case



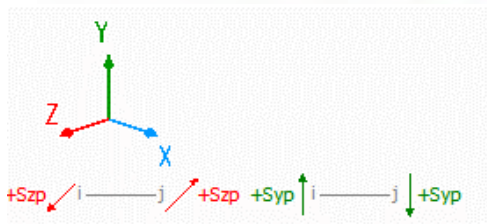
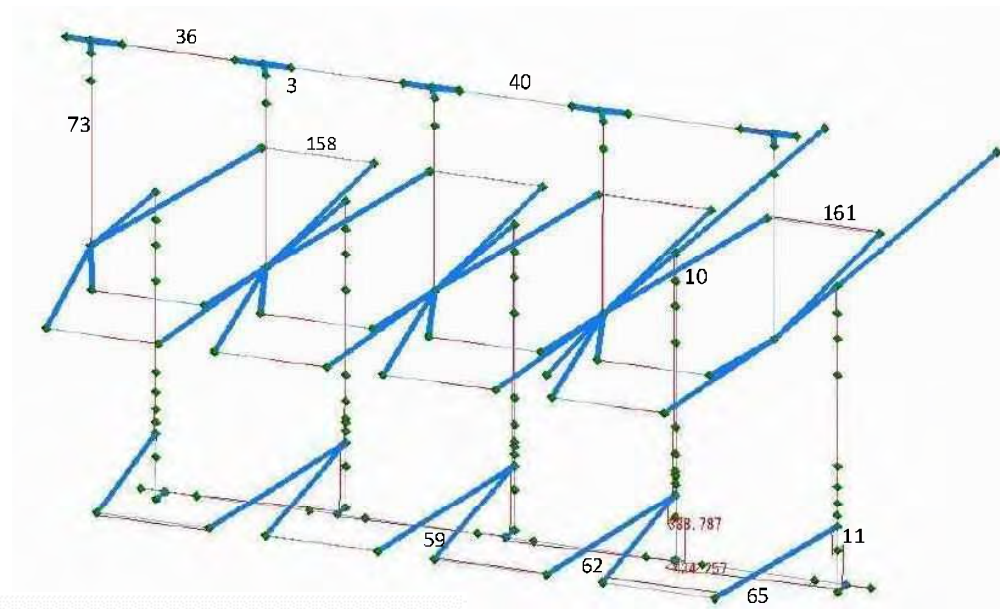
AboGabalReg

2. Shear power

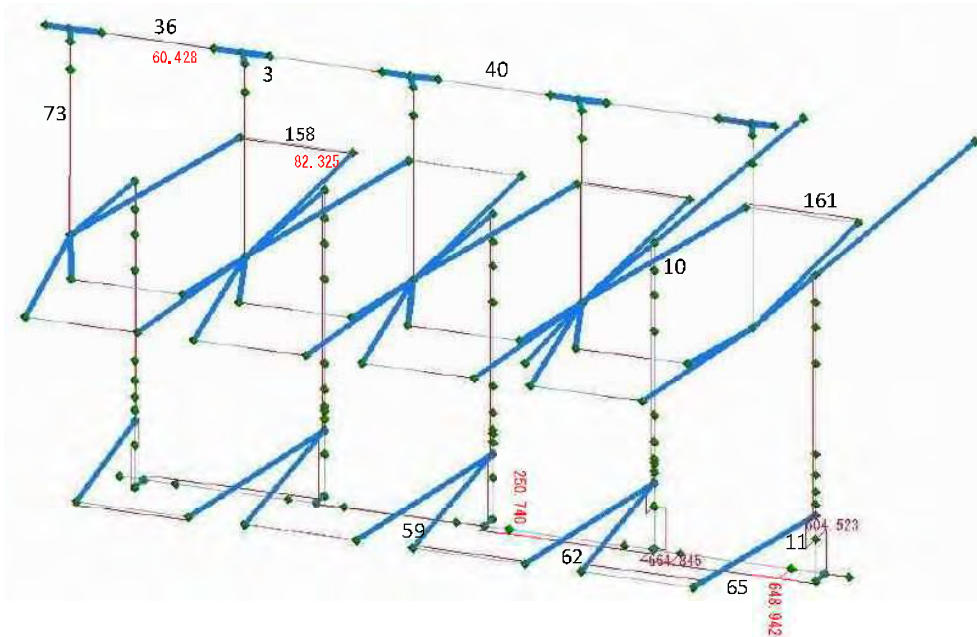
① CASE1 : Regular Longitudinal direction H.H.W.L Full OP



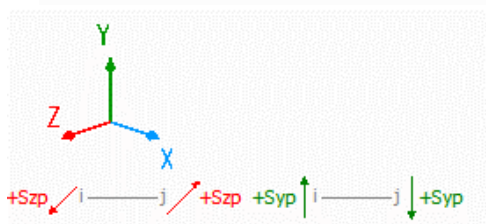
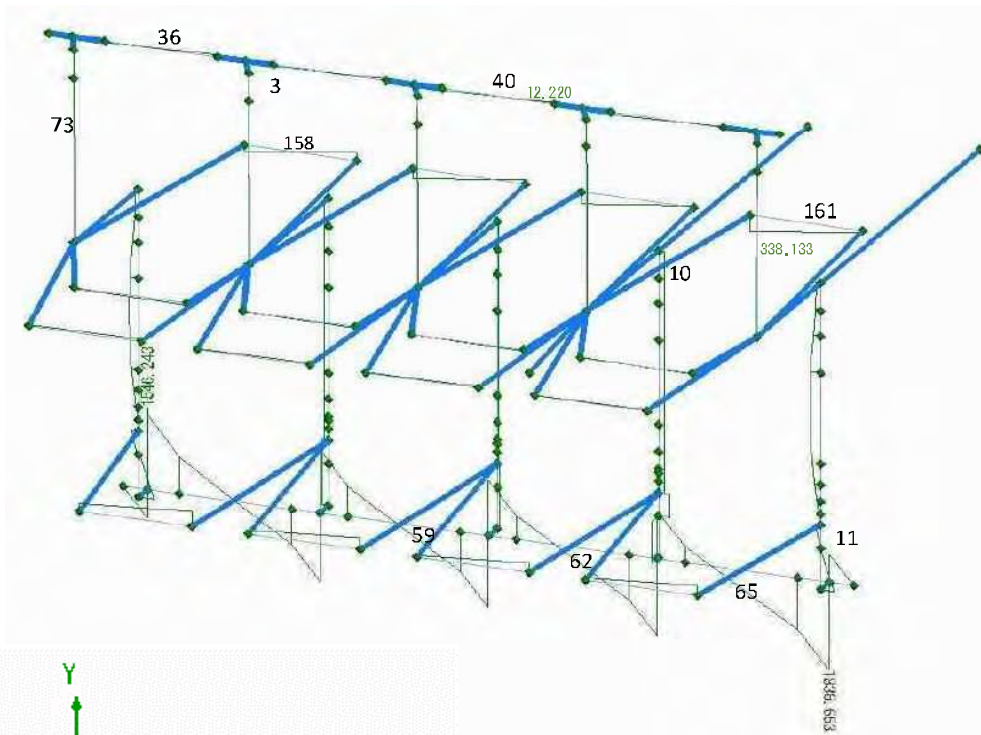
② CASE2 : Regular Longitudinal direction H.WL+0.25m water level Full CL



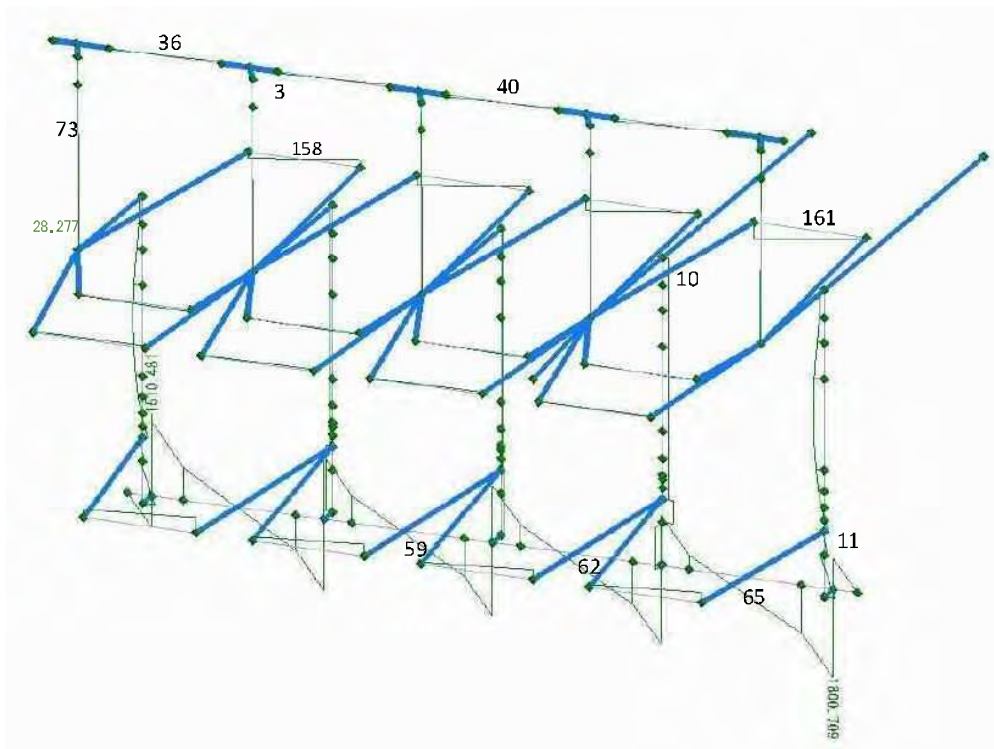
③ CASE3 : Regular Longitudinal direction No. water Full OP



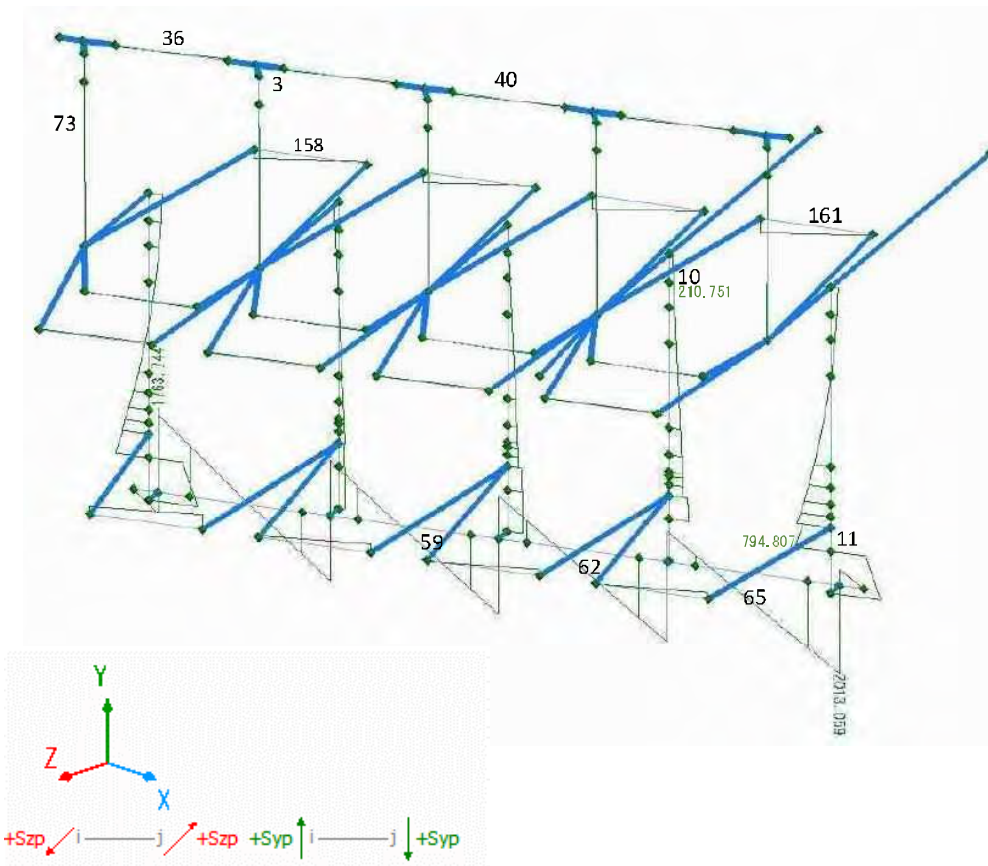
④ CASE4 : Regular Lateral direction H.W.L +0.25m water level Full OP



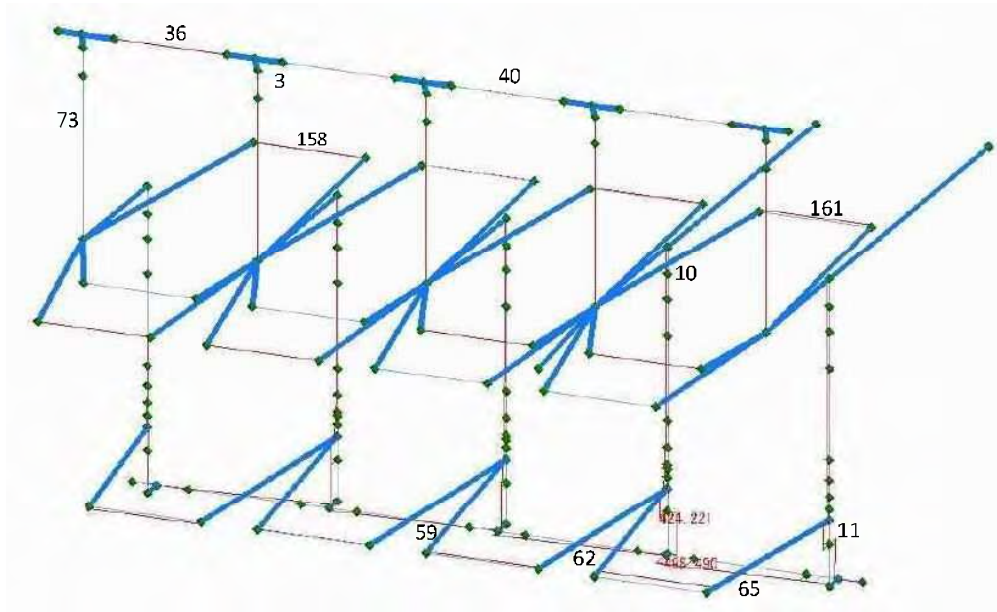
⑤ CASE5 : Regular Lateral direction H.W.L.+0.25m water level Full CL



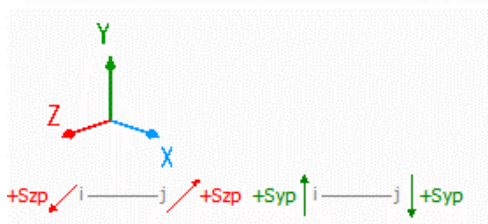
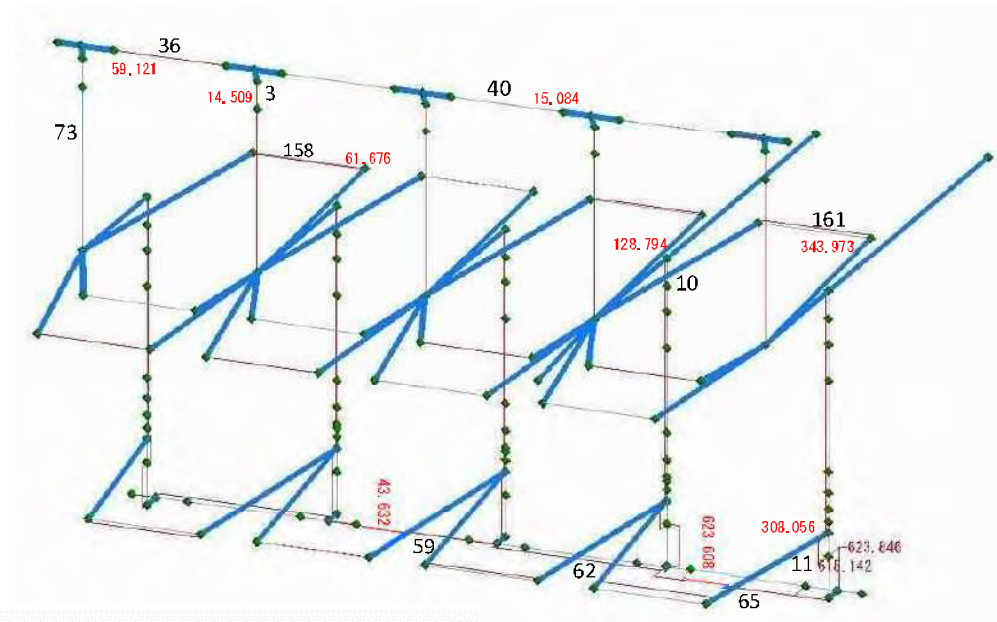
⑥ CASE6 : Regular Lateral direction No water Full OP



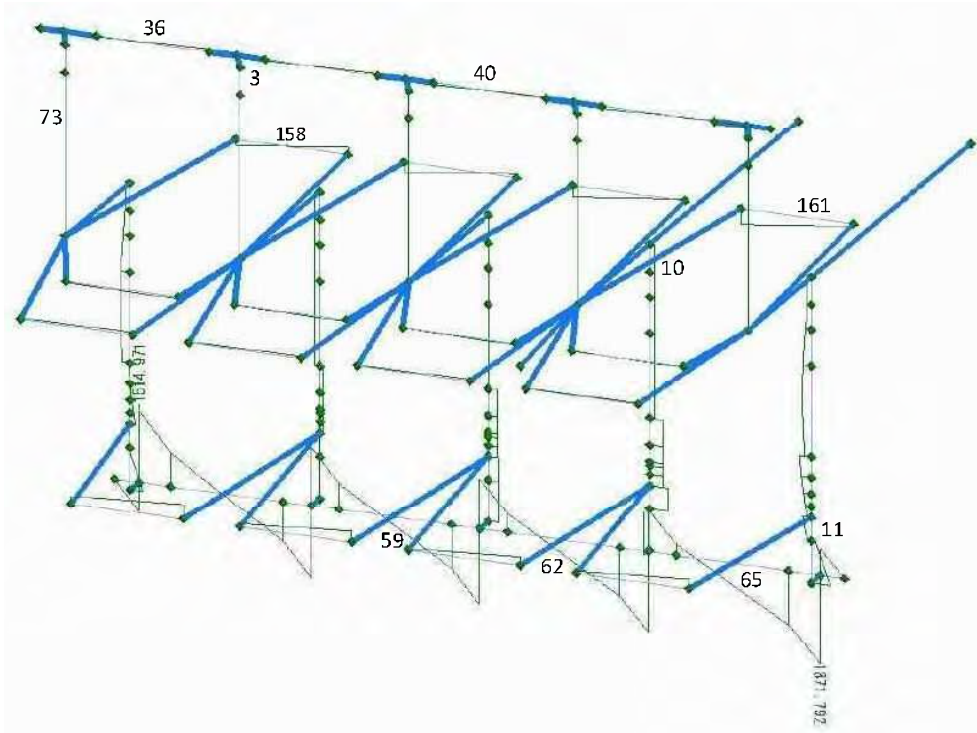
⑦ CASE7 : Seism Longitudinal direction H.W.L.+0.25m water level Full CL



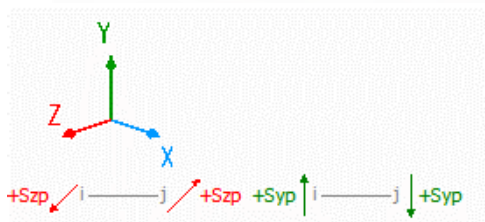
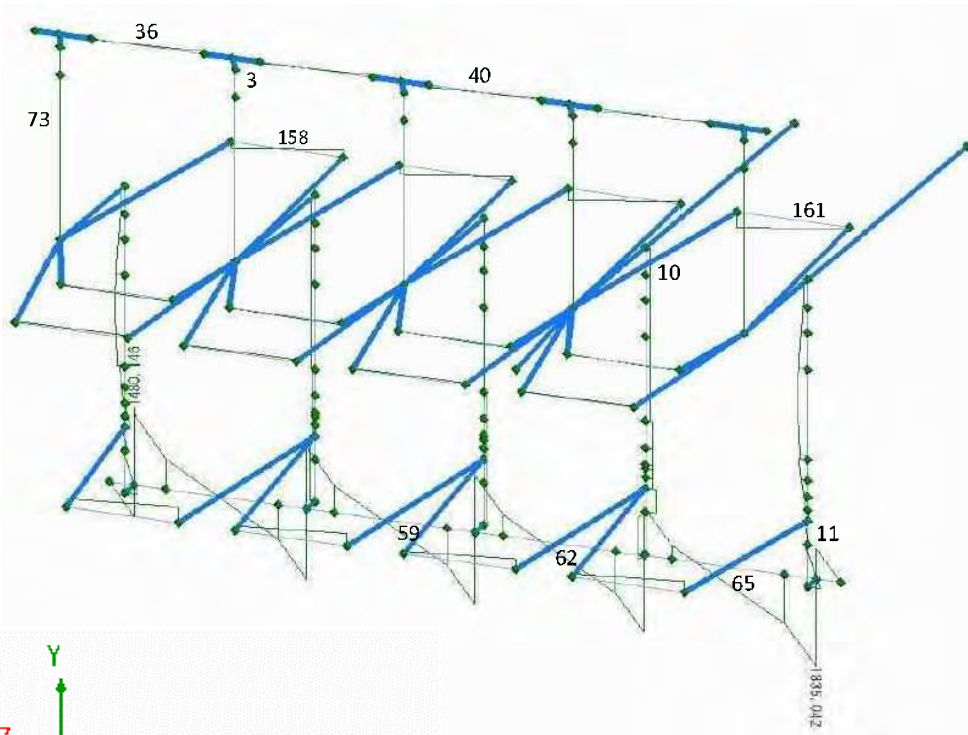
⑧ CASE8 : Seism Longitudinal direction No water Full OP



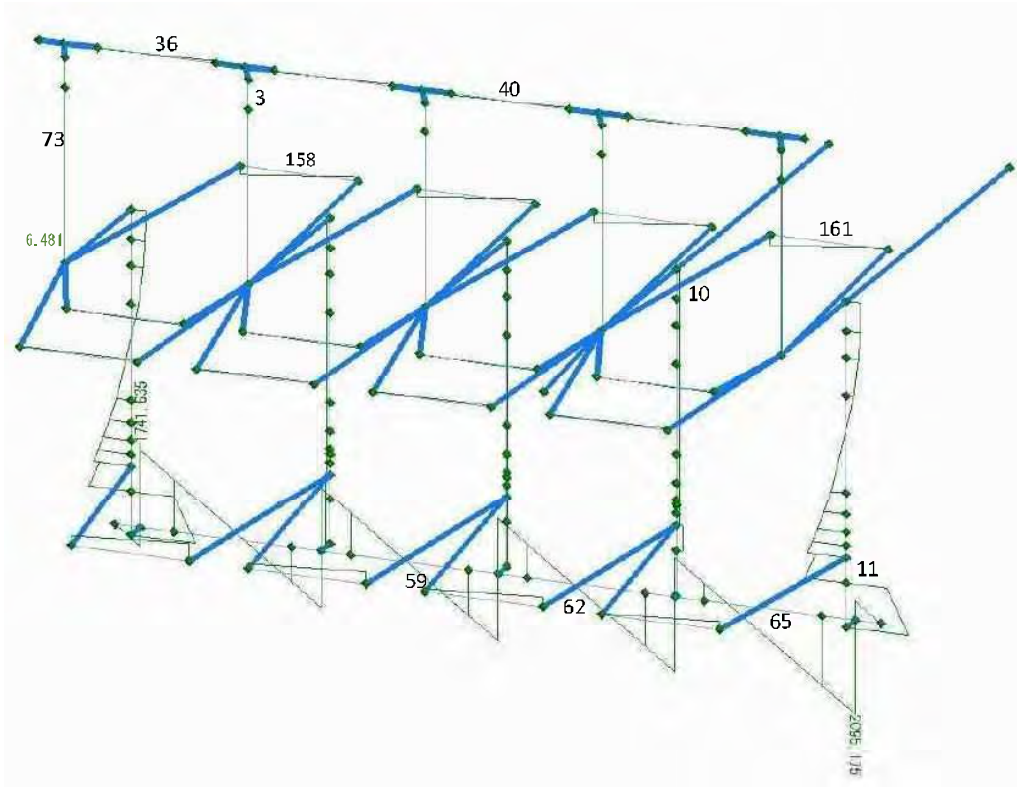
⑨ CASE9 : Seism Lateral direction H.W.L+0.25m water level Full OP



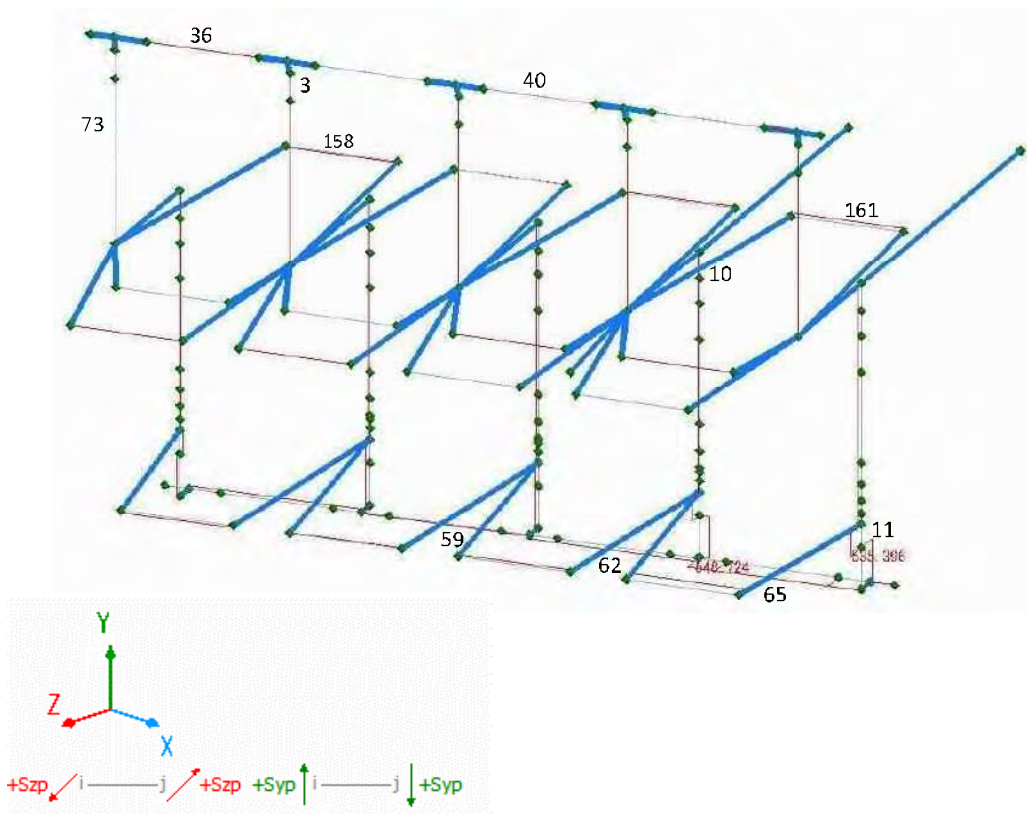
⑩ CASE10 : Seism Lateral direction H.W.L+0.25m level Full CL



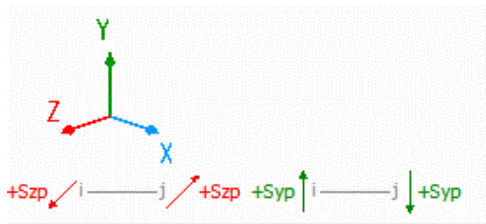
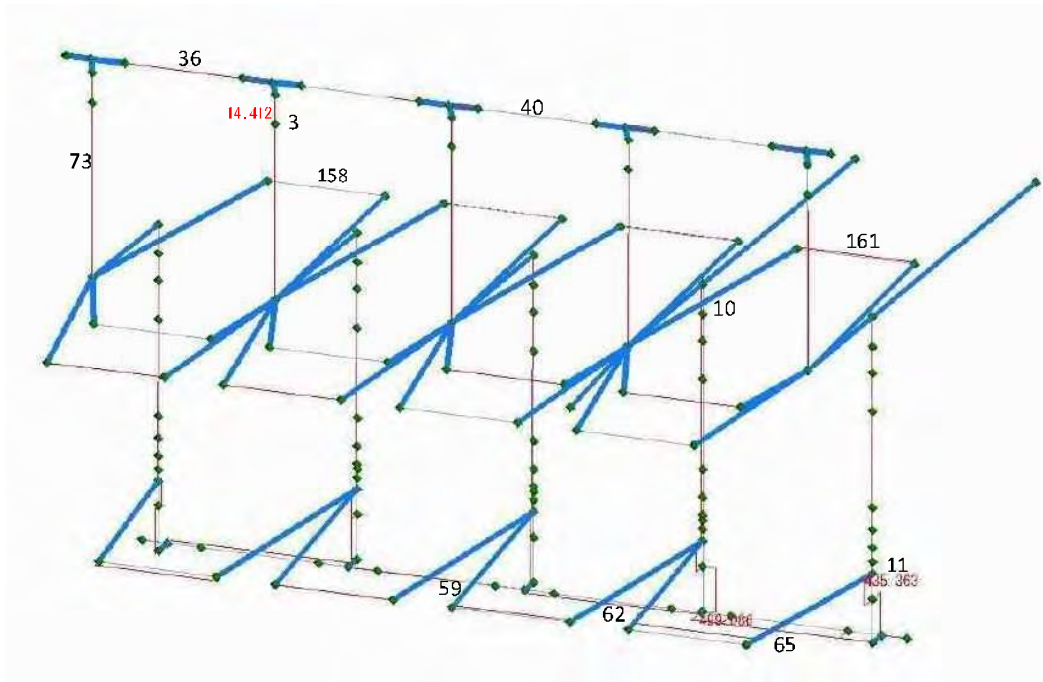
⑪ CASE11 : Seism Lateral direction No water Full OP



⑫ CASE12 : Seism Longitudinal direction H.W.L.+0.25m water level Full OP



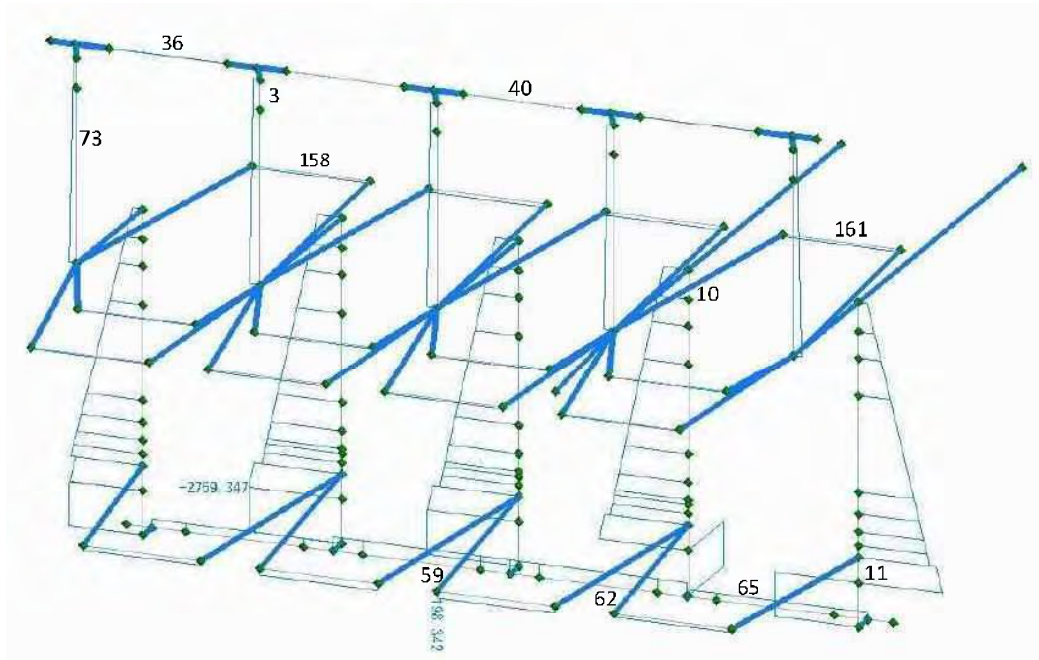
⑬ CASE13 : Regular Longitudinal direction H.W.L.+0.25m water level Maintenance case



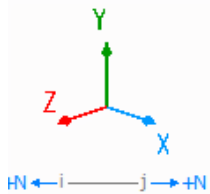
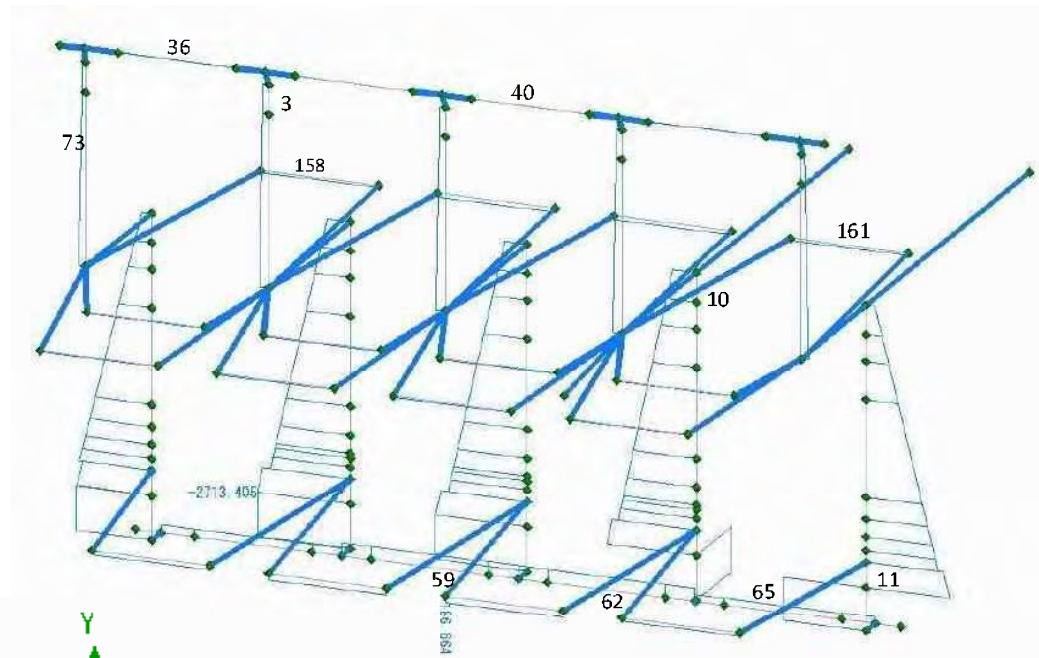
AboGabalReg

3.Axis power

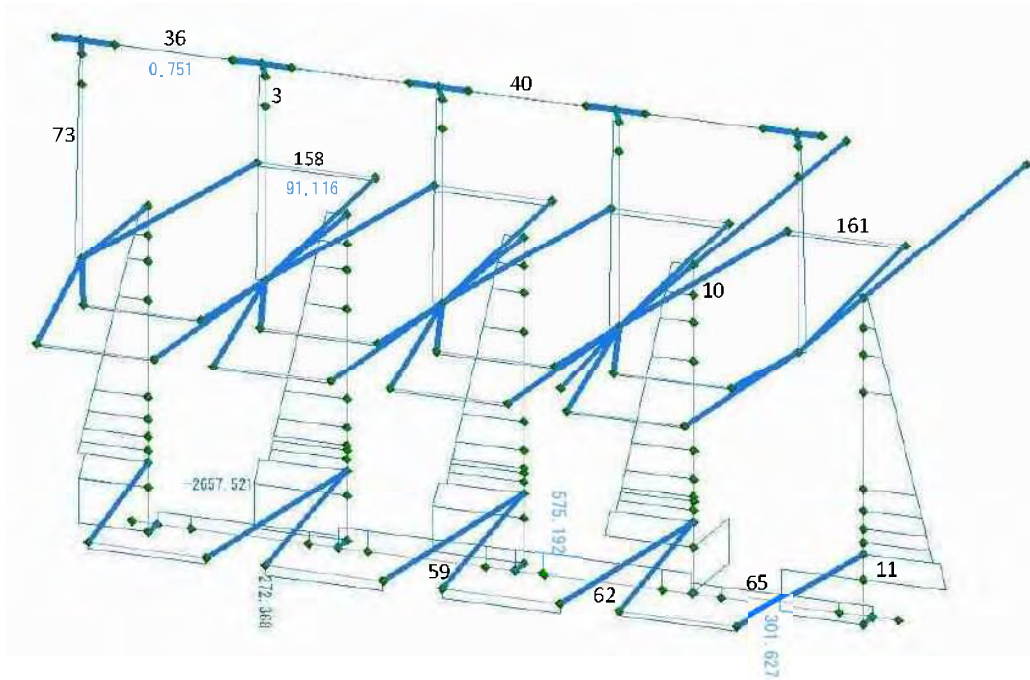
① CASE1 : Regular Longitudinal direction H.H.W.L Full OP



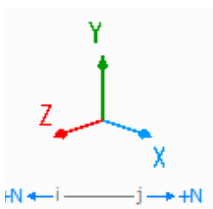
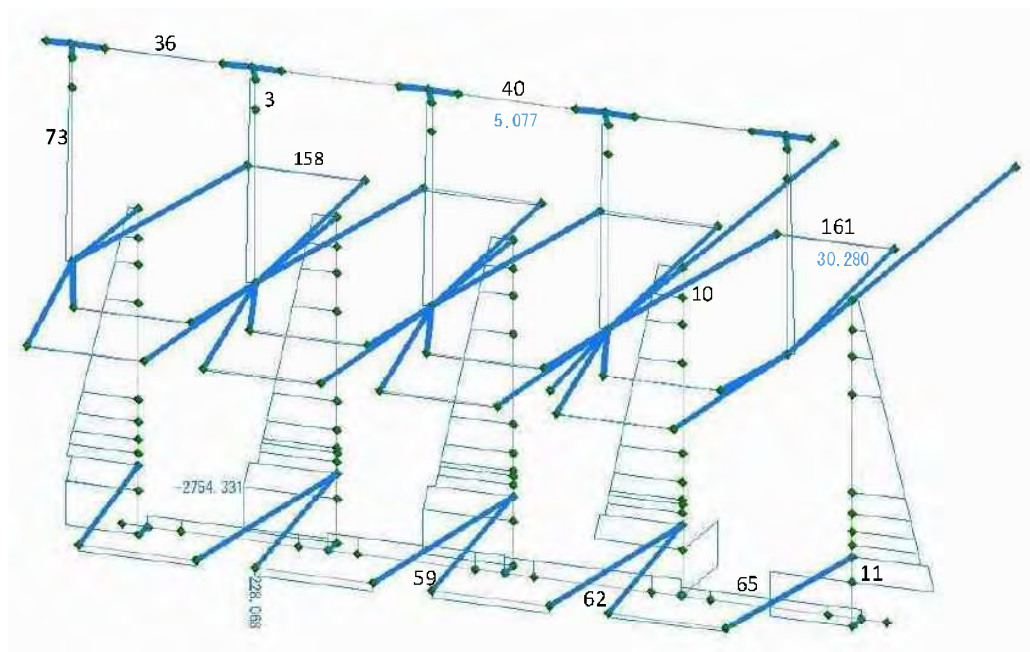
② CASE2 : Regular Longitudinal direction H.WL+0.25m water level Full CL



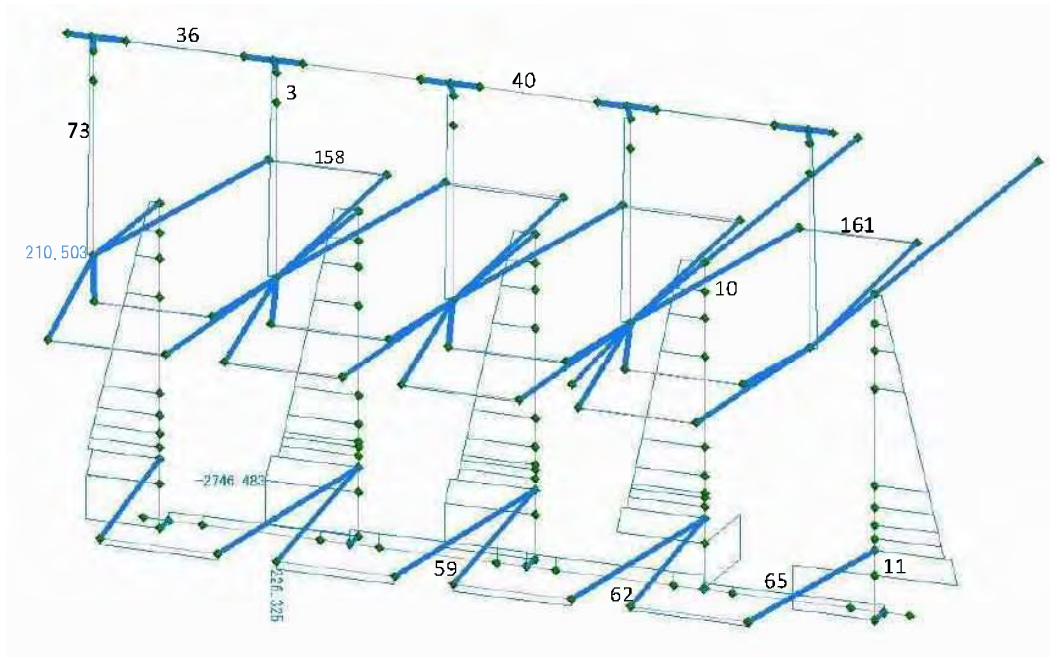
③ CASE3 : Regular Longitudinal direction No. water Full OP



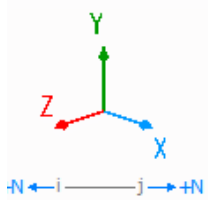
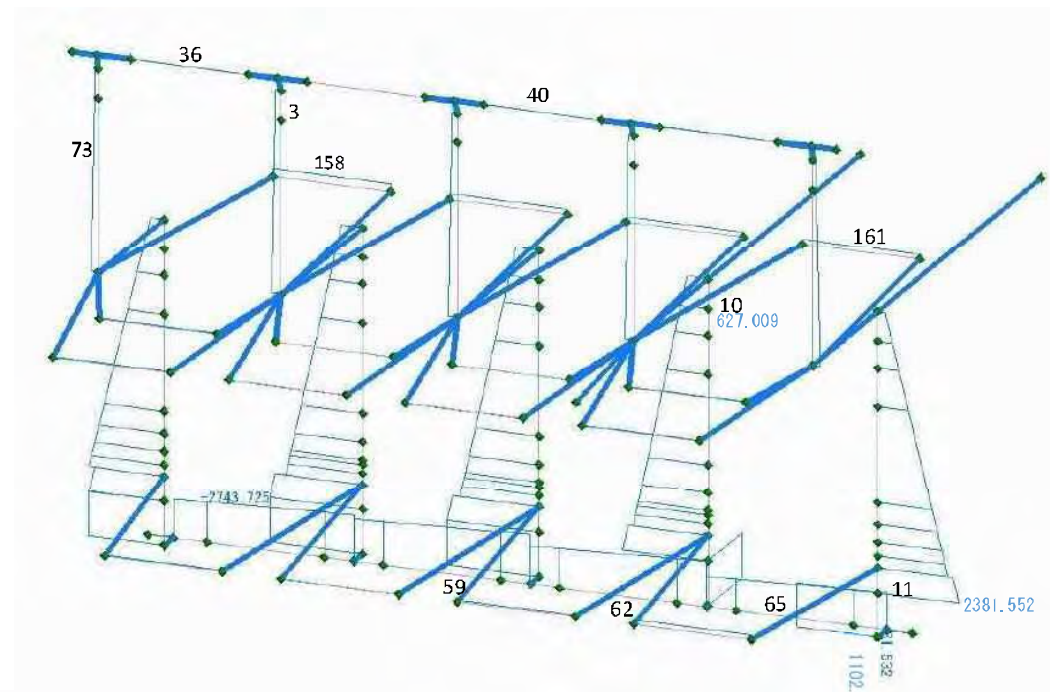
④ CASE4 : Regular Lateral direction H.W.L +0.25m water level Full OP



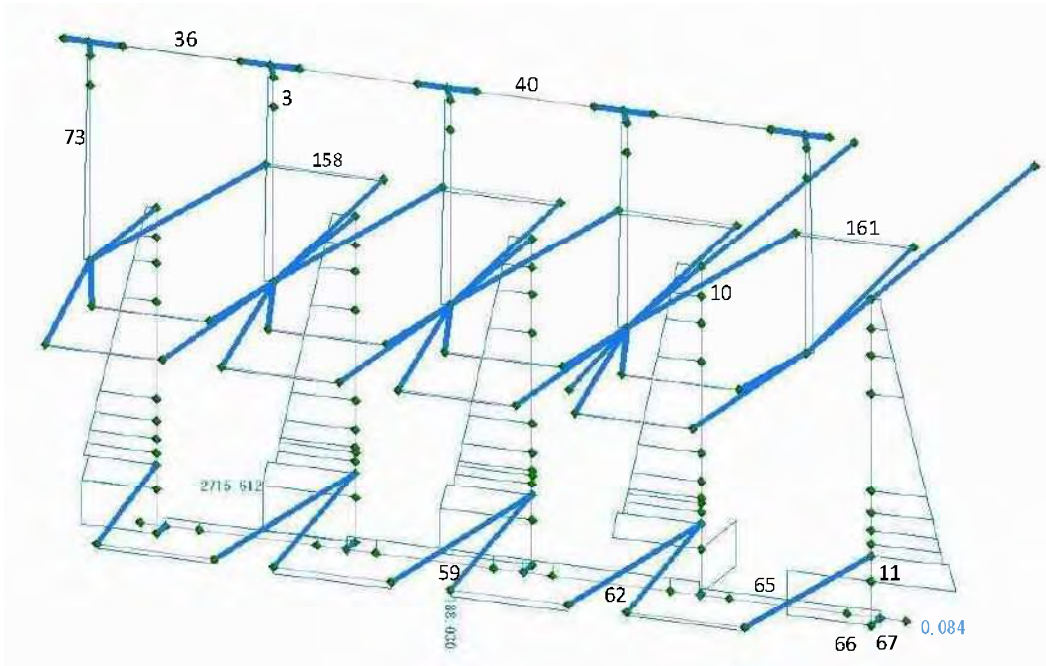
⑤ CASE5 : Regular Lateral direction H.W.L.+0.25m water level Full CL



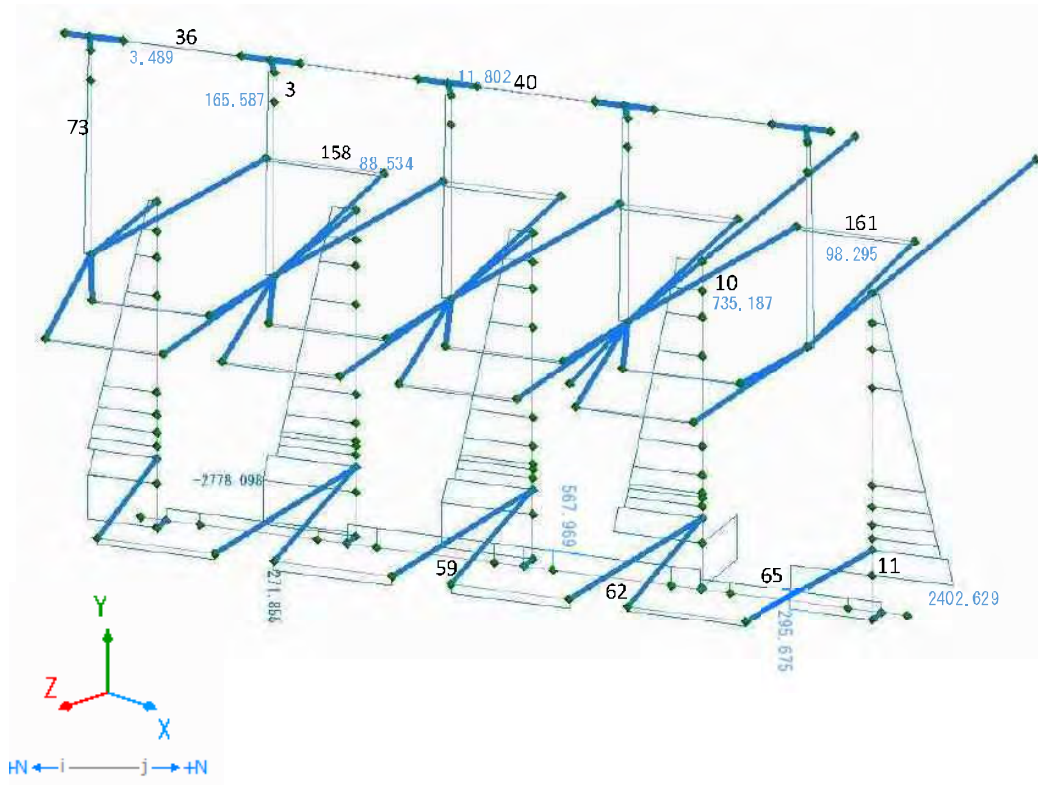
⑥ CASE6 : Regular Lateral direction No water Full OP



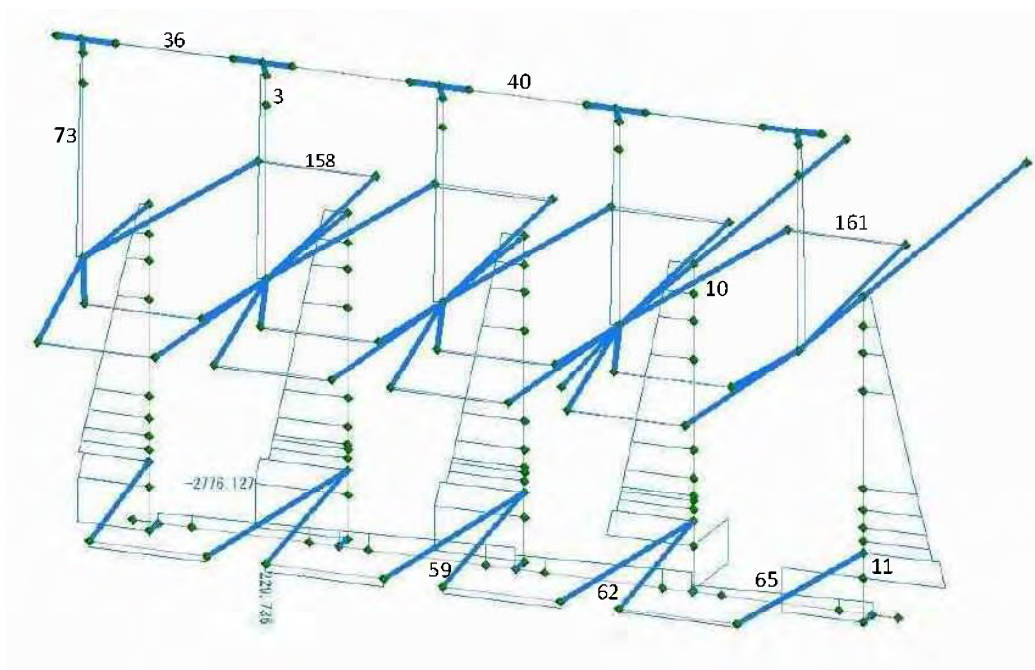
⑦ CASE7 : Seism Longitudinal direction H.W.L.+0.25m water level Full CL



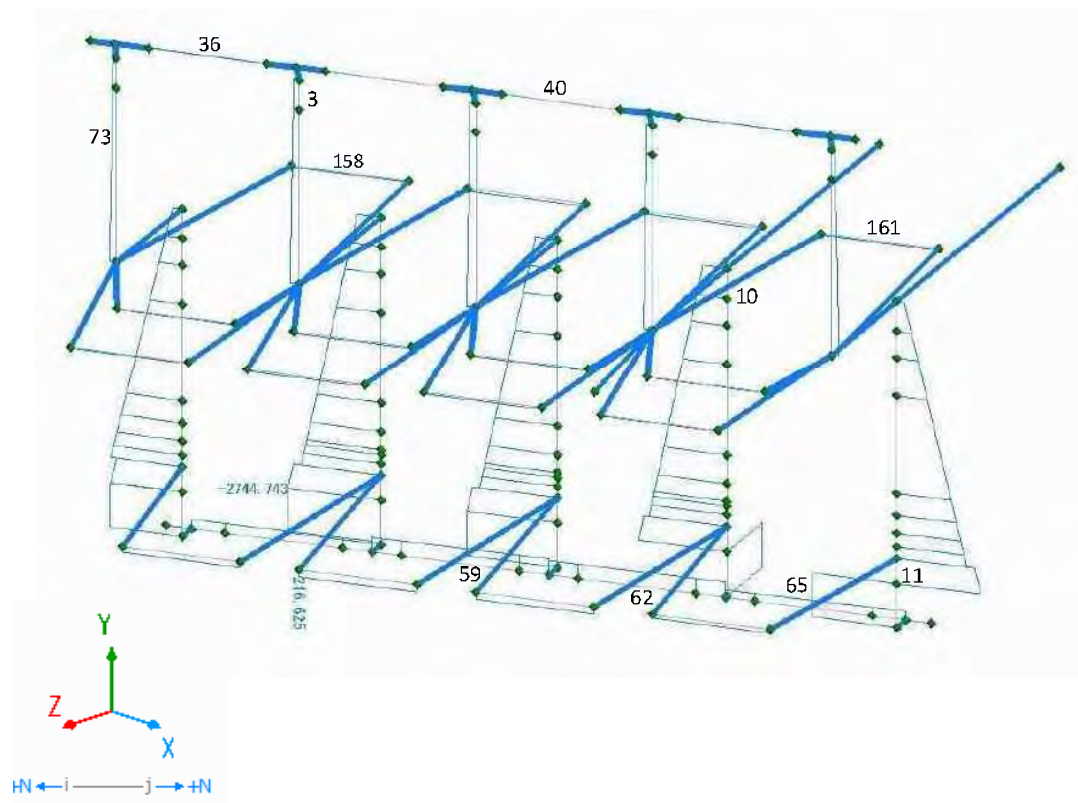
⑧ CASE8 : Seism Longitudinal direction No water Full OP



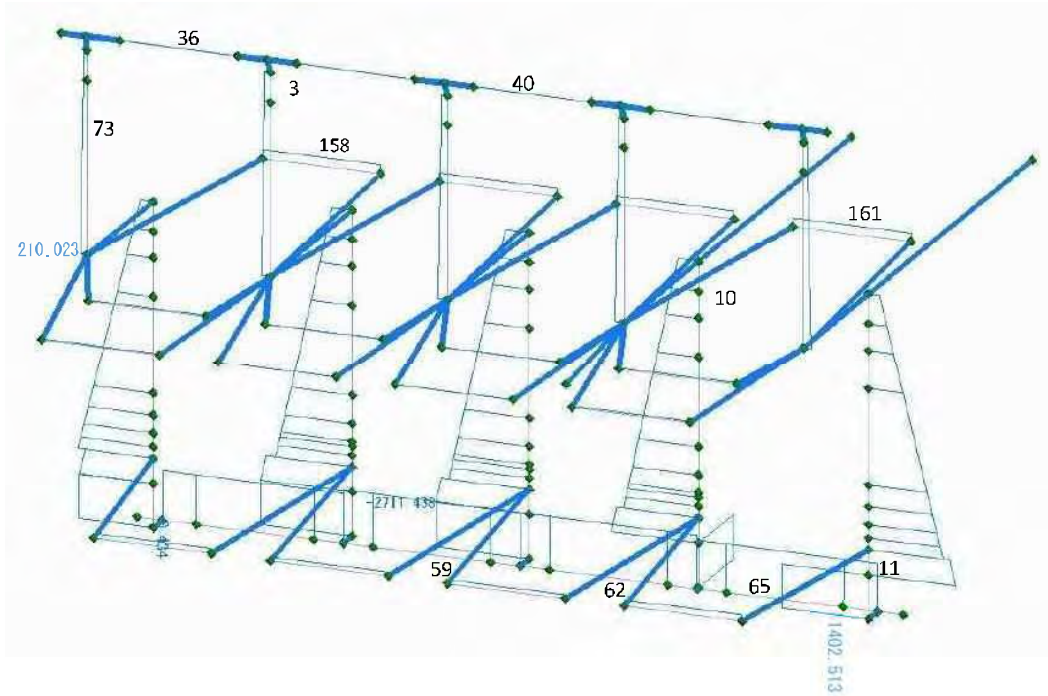
⑨ CASE9 : Seism Lateral direction H.W.L+0.25m water level Full OP



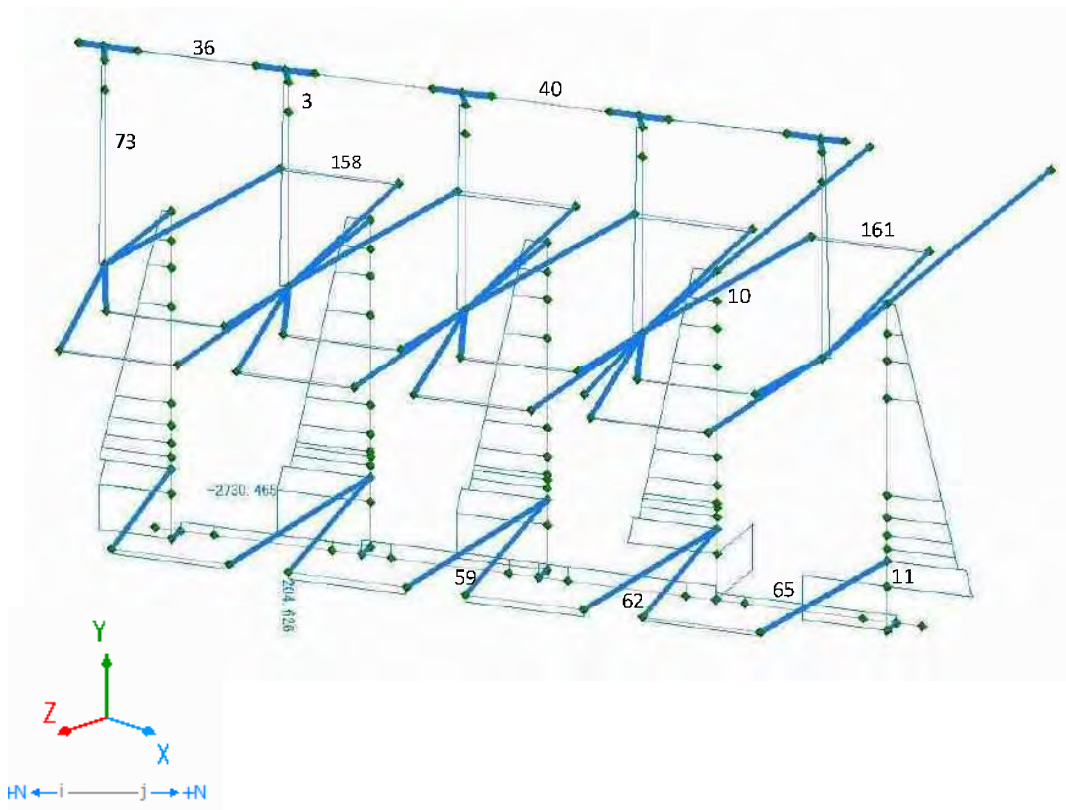
⑩ CASE10 : Seism Lateral direction H.W.L+0.25m level Full CL



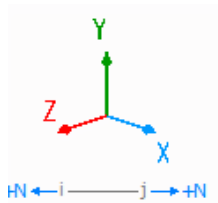
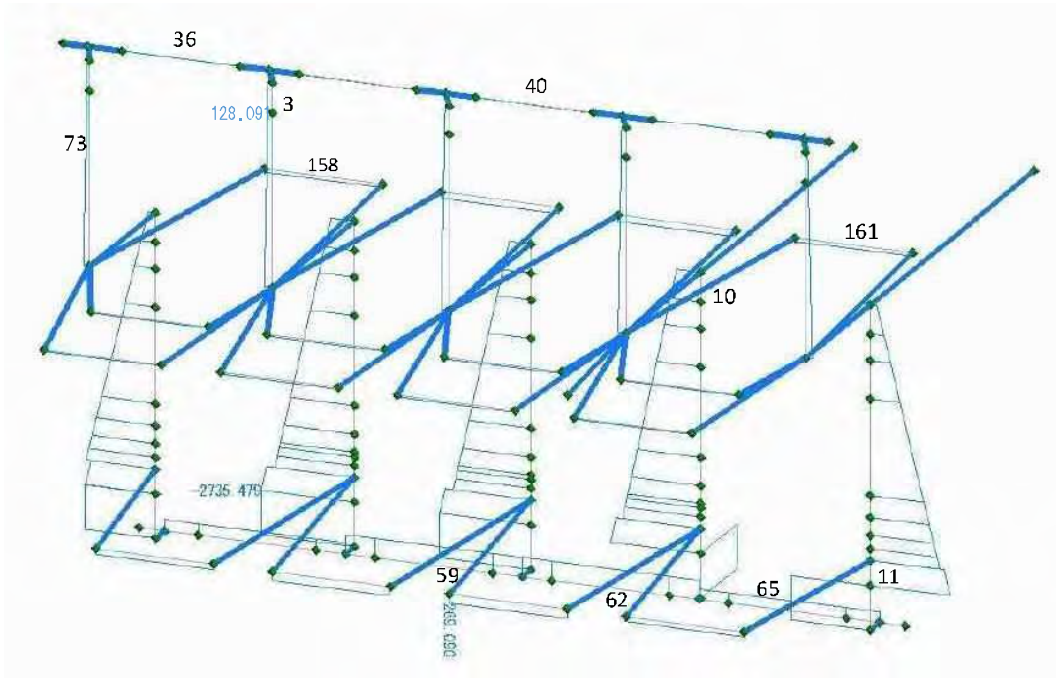
⑪ CASE11 : Seism Lateral direction No water Full OP



⑫ CASE12 : Seism Longitudinal direction H.W.L+0.25m water level Full OP

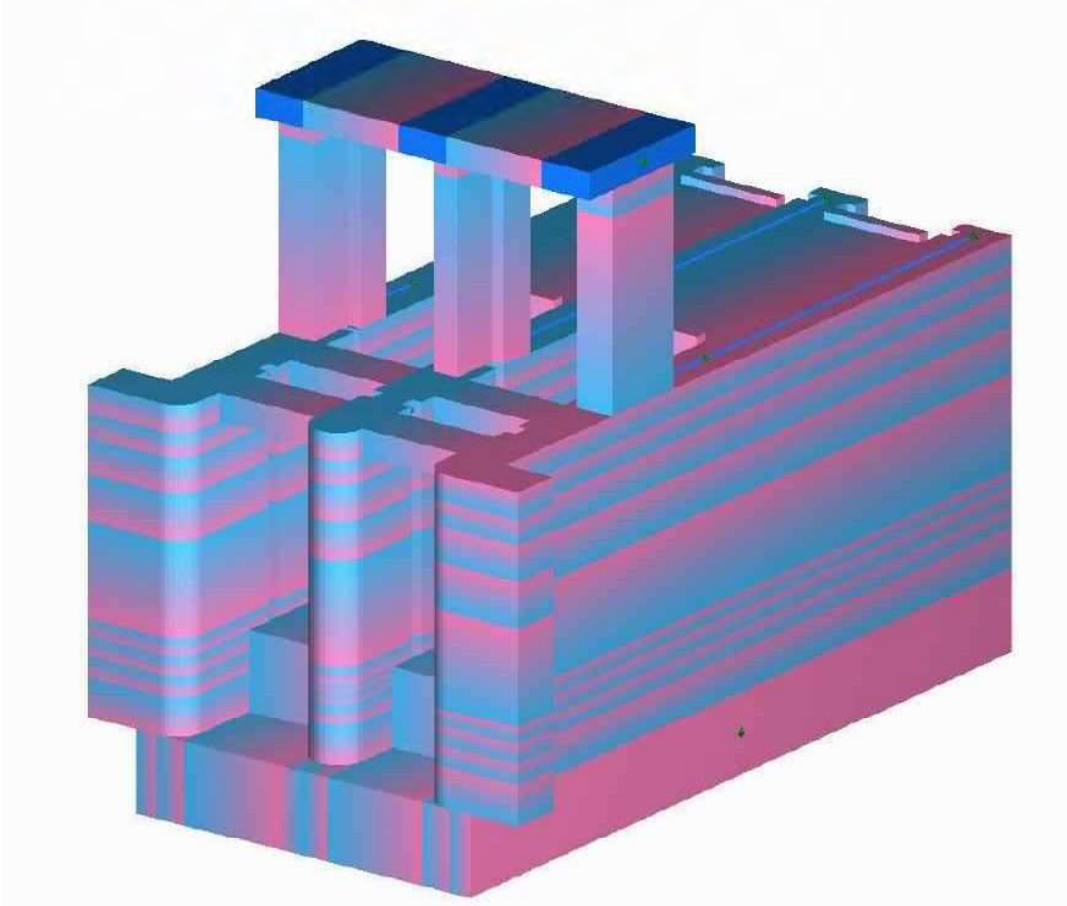


⑬ CASE13 : Regular Longitudinal direction H.W.L.+0.25m water level Maintenance case

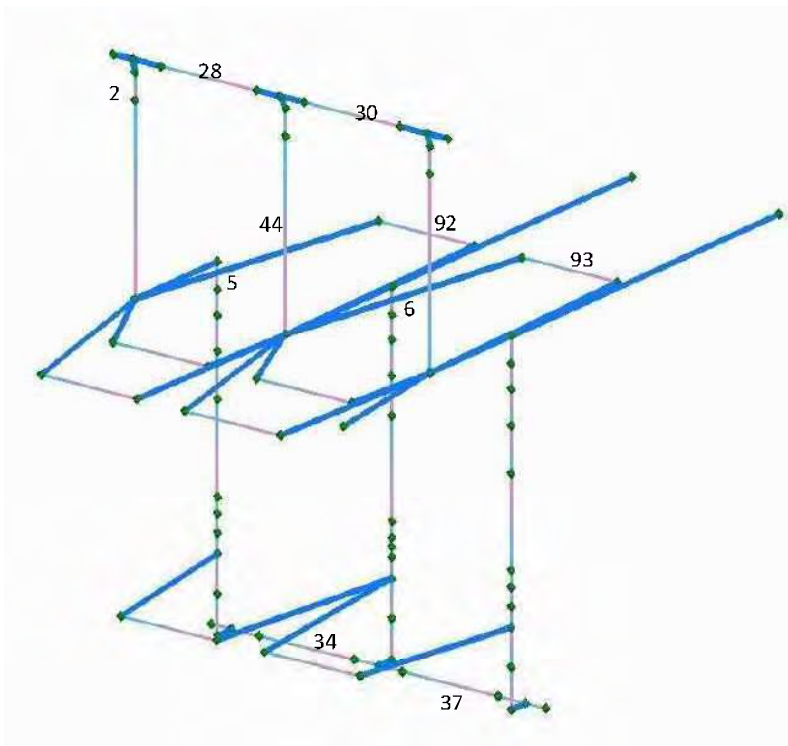


A-6-6. Structural analysis of Sahelyia Regulator

Sahelyial Reg.



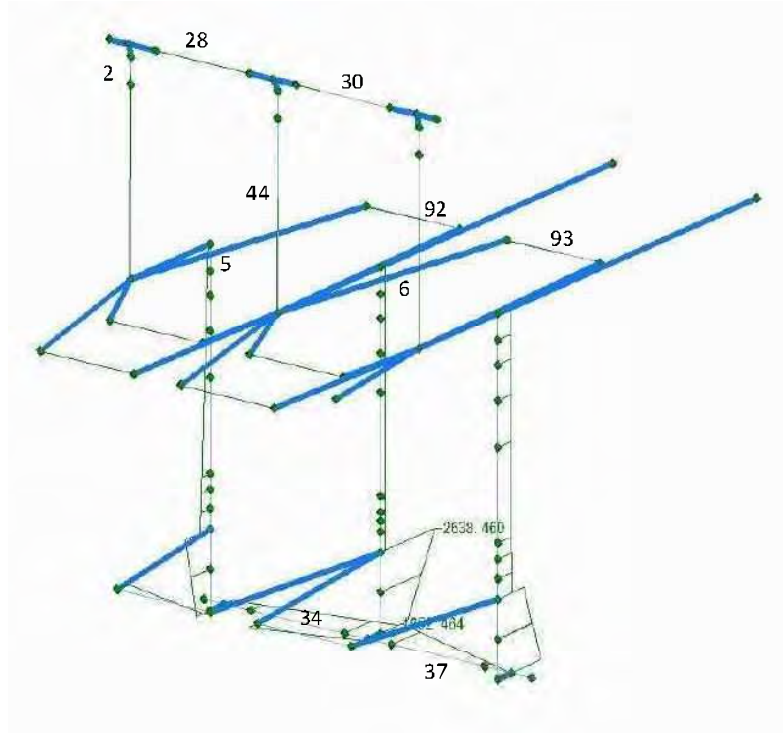
General view



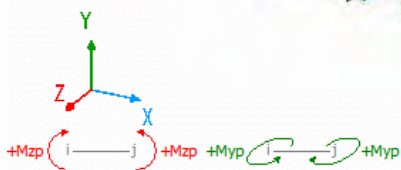
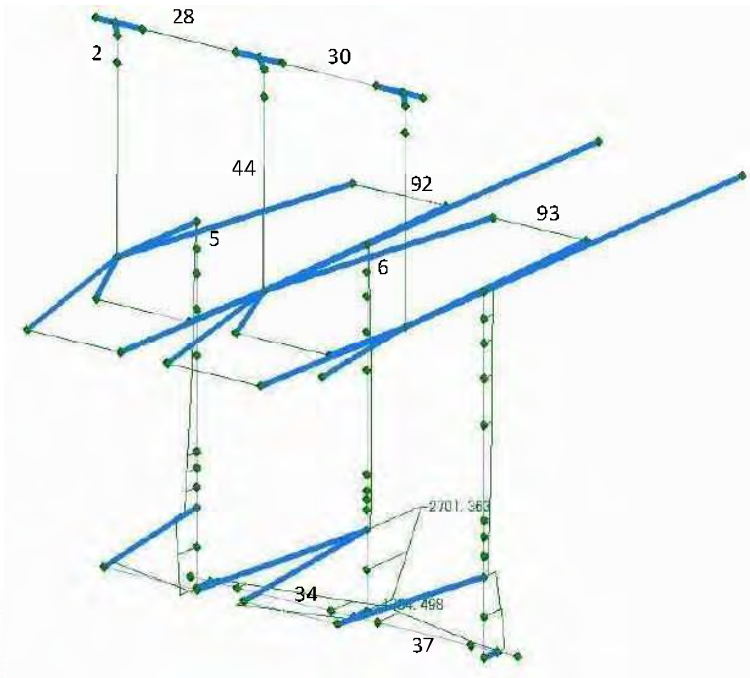
General view (frame)

1. bending Moment

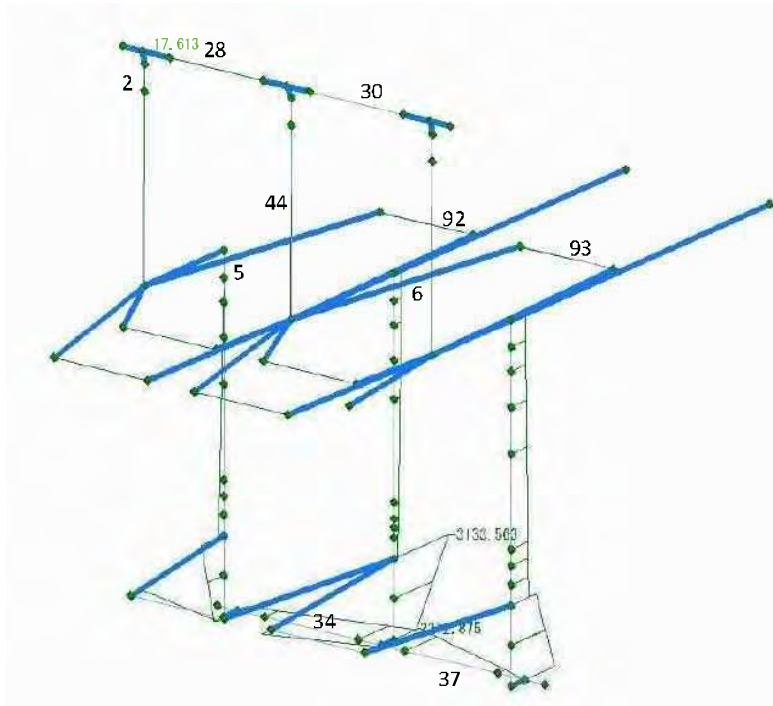
① CASE1 : Regular Longitudinal direction H.H.W.L. Full OP



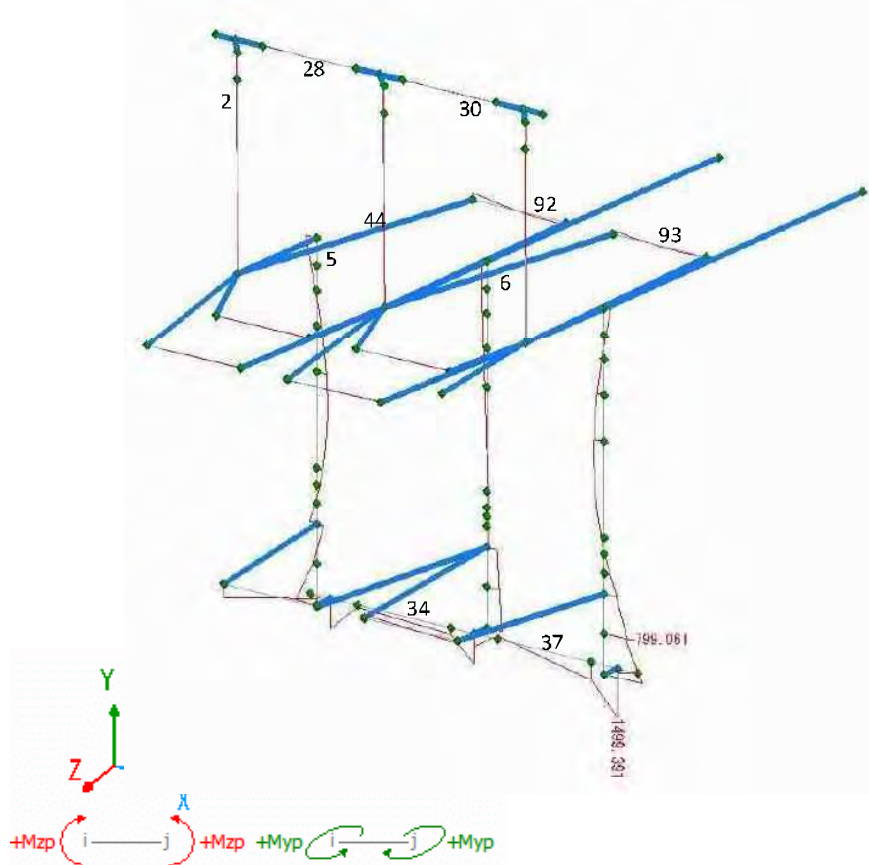
② CASE2 : Regular Longitudinal direction H.WL+0.25m water level Full CL



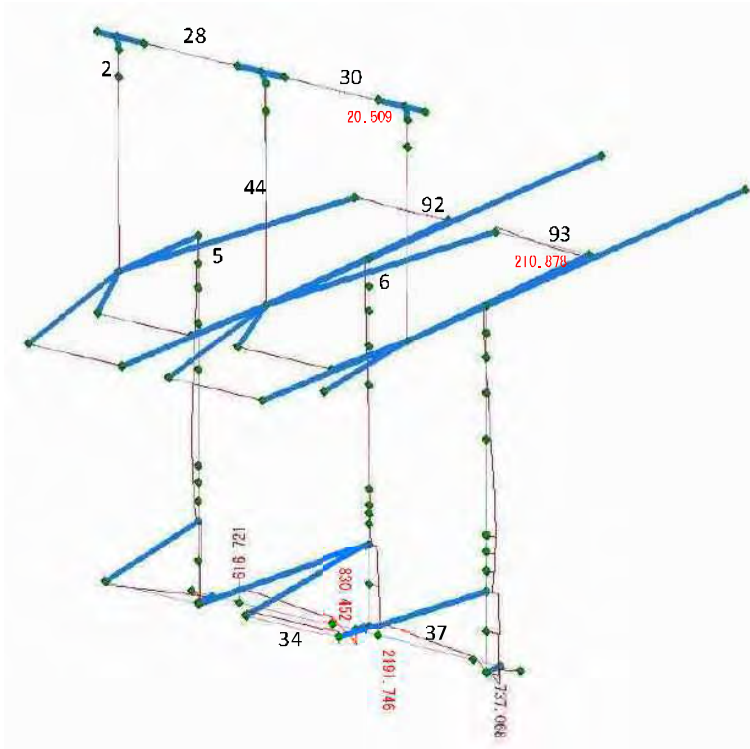
③ CASE3 : Regular Longitudinal direction No. water Full OP



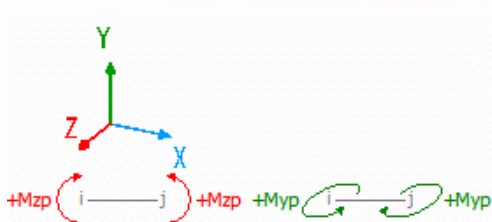
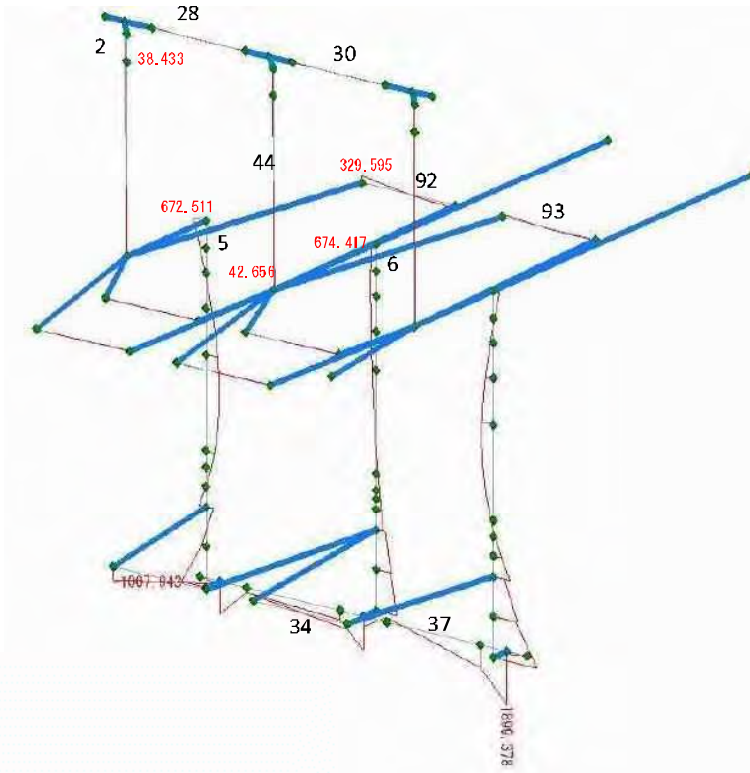
④ CASE4 : Regular Lateral direction H.W.L.+0.25m water level Full OP



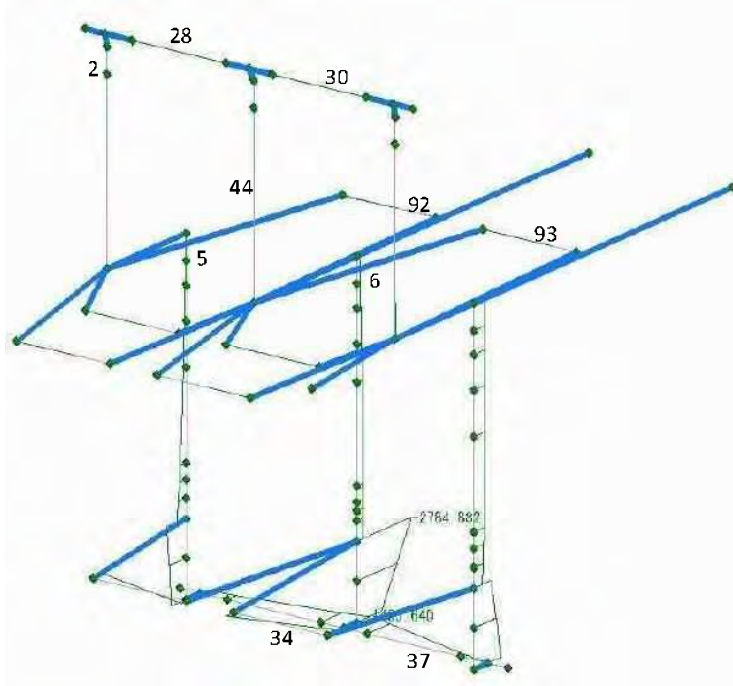
⑤ CASE5 : Regular Lateral direction H.W.L.+0.25m water level Full CL



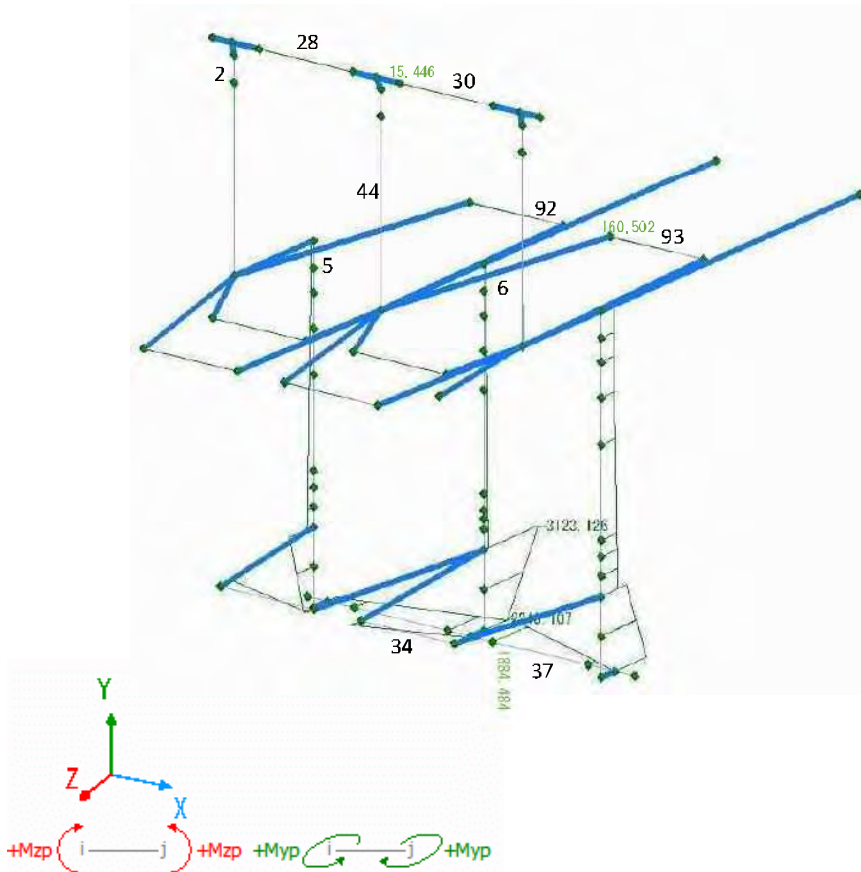
⑥ CASE6 : Regular Lateral direction No water Full OP



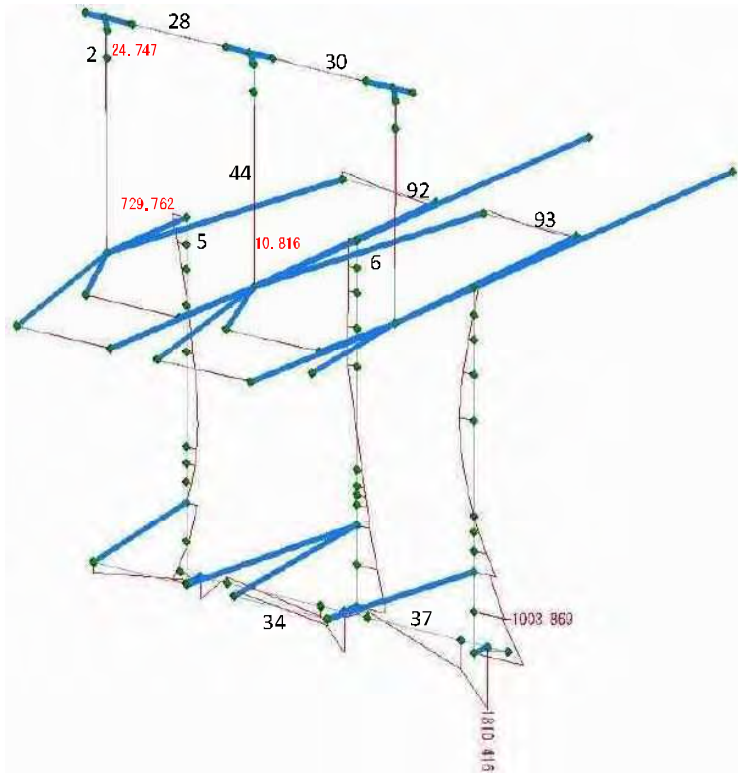
⑦ CASE7 : Seism Longitudinal direction H.W.L.+0.25m water level Full CL



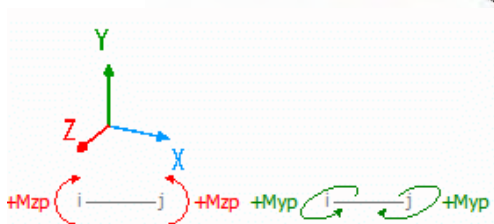
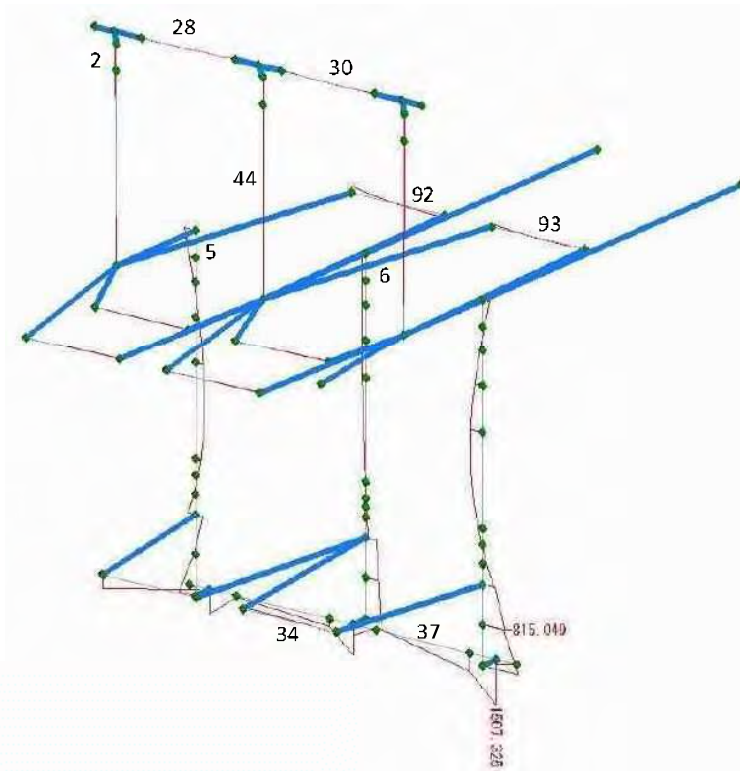
⑧ CASE8 : Seism Longitudinal direction No water Full OP



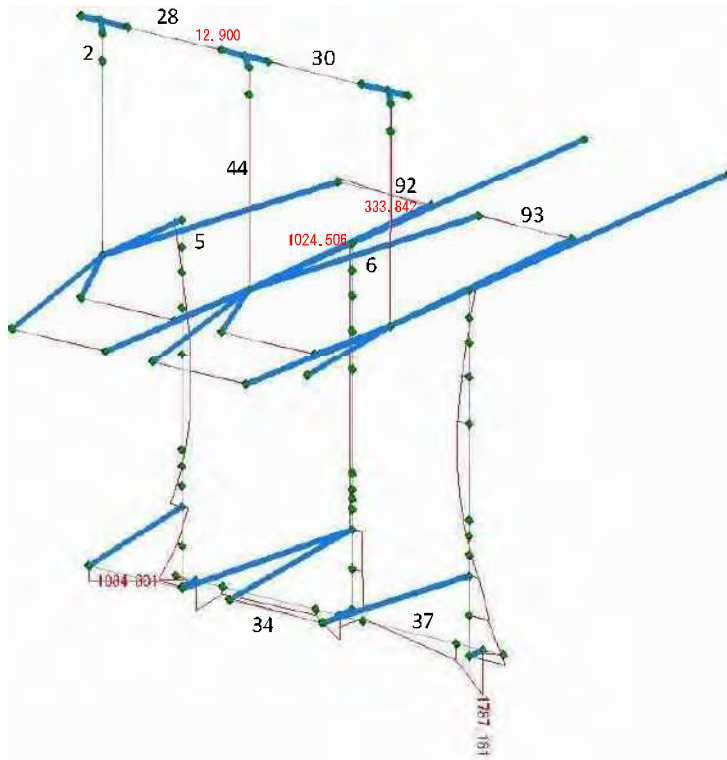
⑨ CASE9 : Seism Lateral direction H.W.L.+0.25m water level Full OP



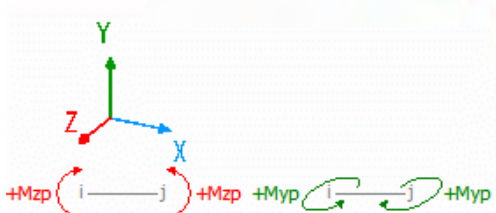
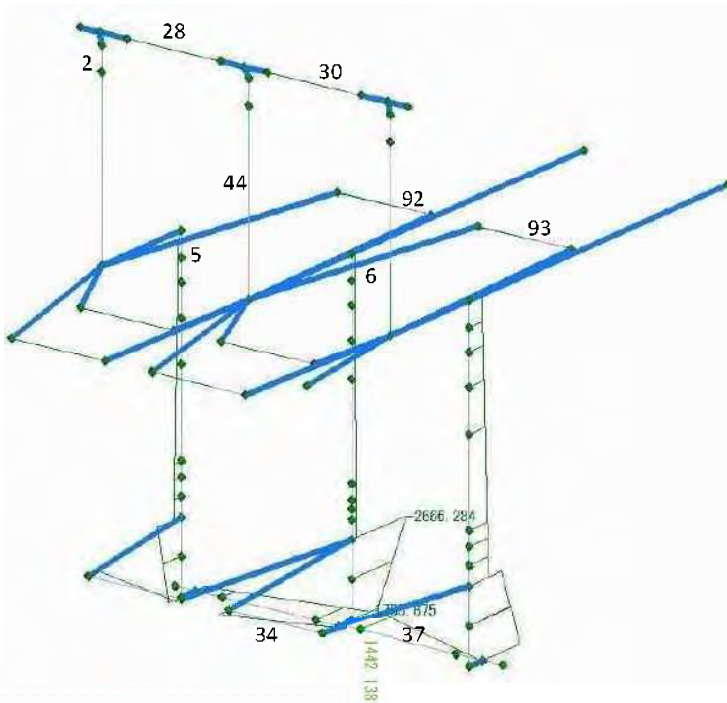
⑩ CASE10 : Seism Lateral direction H.W.L.+0.25m level Full CL



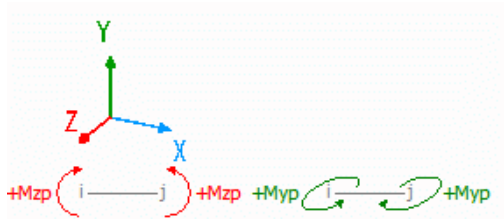
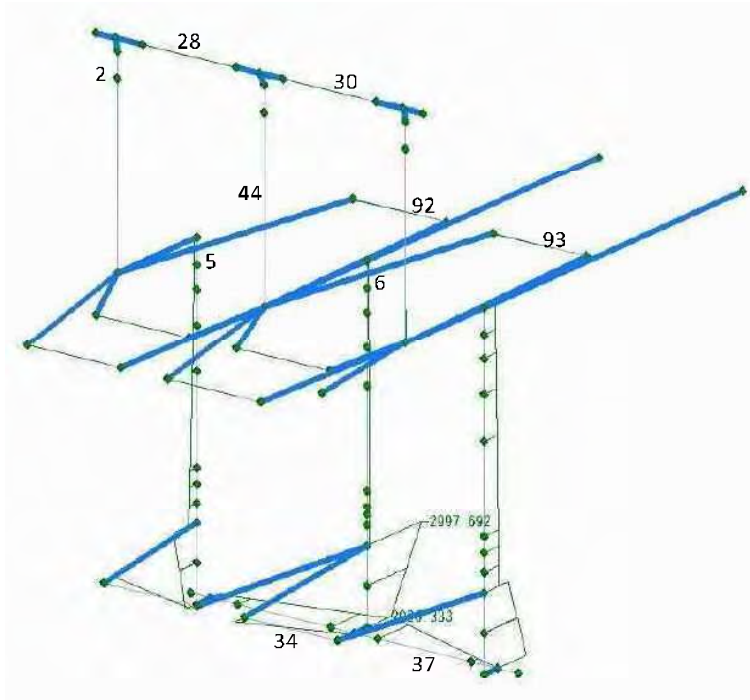
① CASE11 : Seism Lateral direction No water Full OP



② CASE12 : Seism Longitudinal direction H.W.L.+0.25m water level Full OP



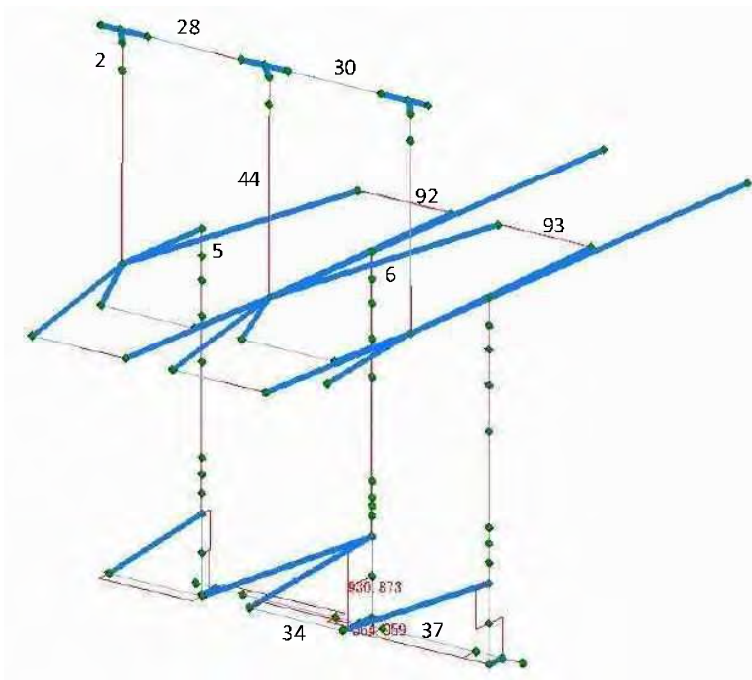
⑬ CASE13 : Regular Longitudinal direction H.W.L.+0.25m water level Maintenance case



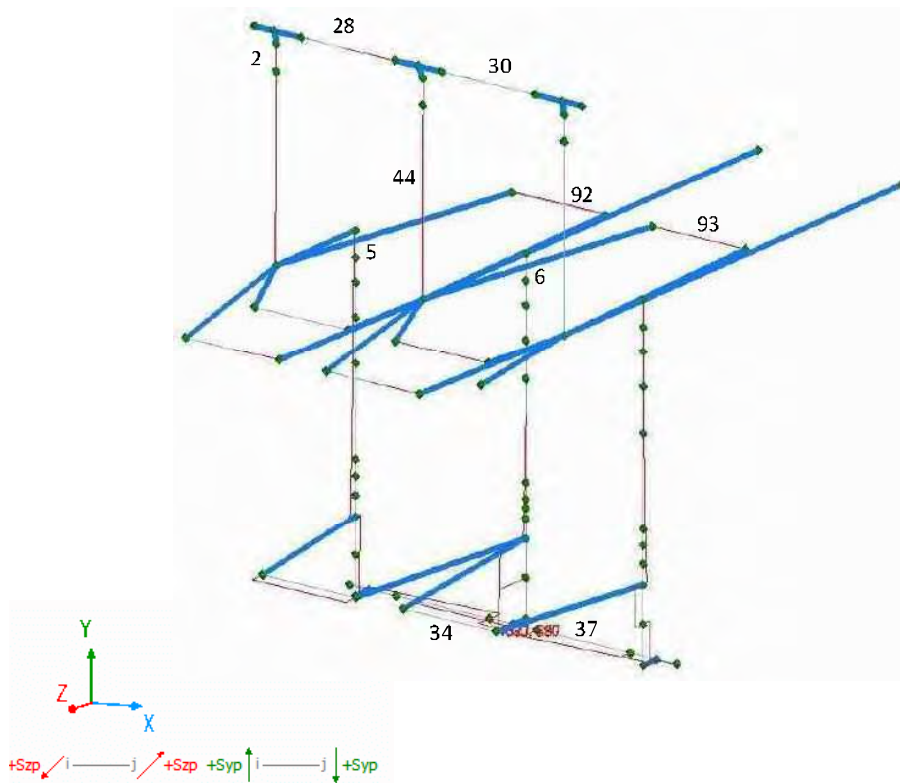
Sahelyial Reg.

2. Shear power

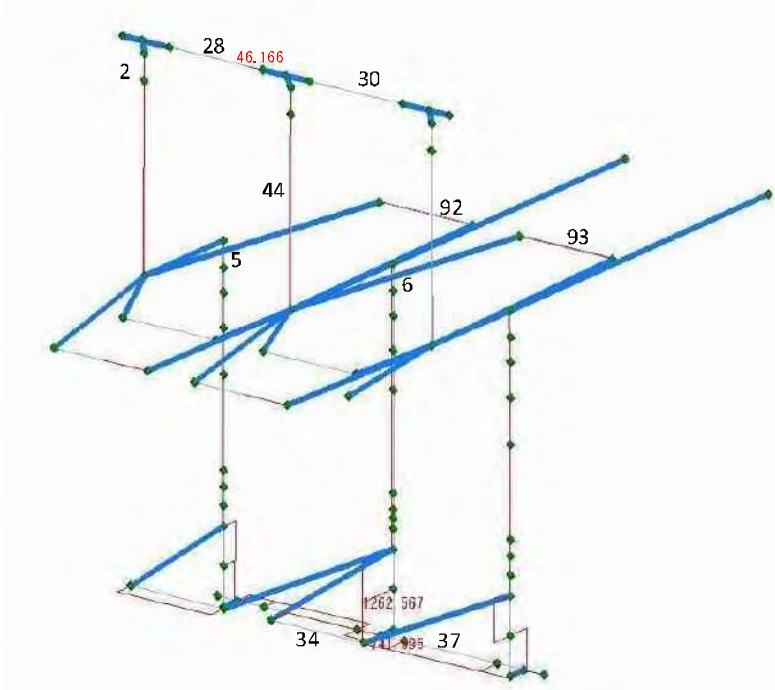
① CASE1 : Regular Longitudinal direction H.H.W.L. Full OP



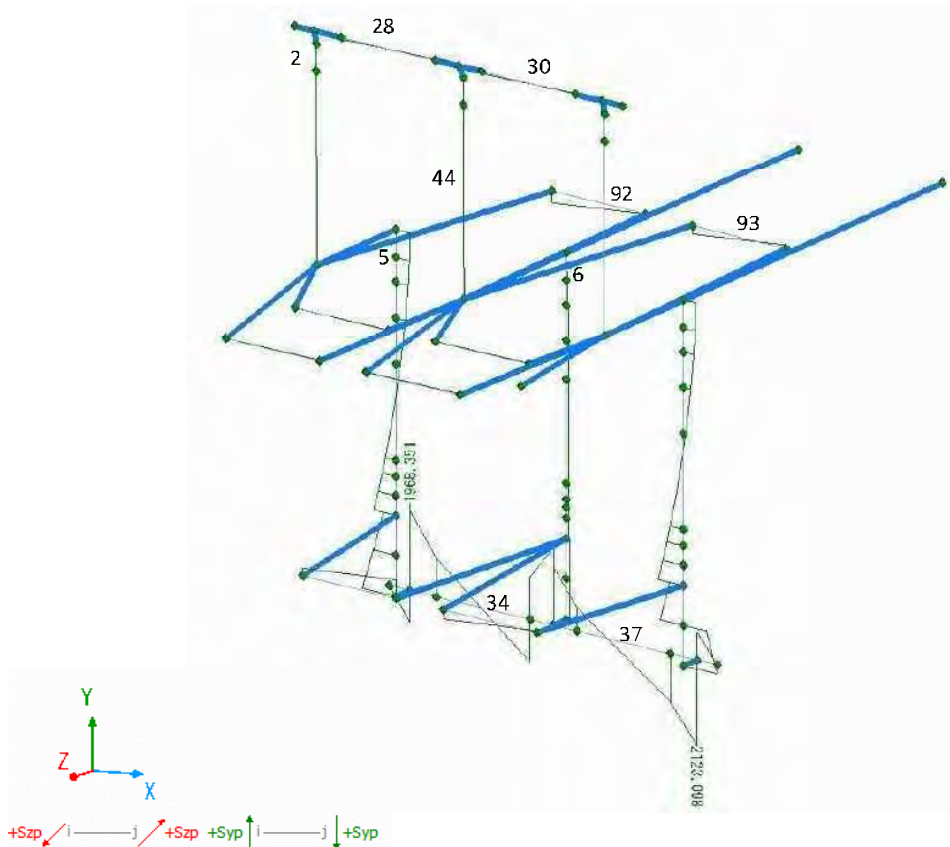
② CASE2 : Regular Longitudinal direction H.WL+0.25m water level Full CL



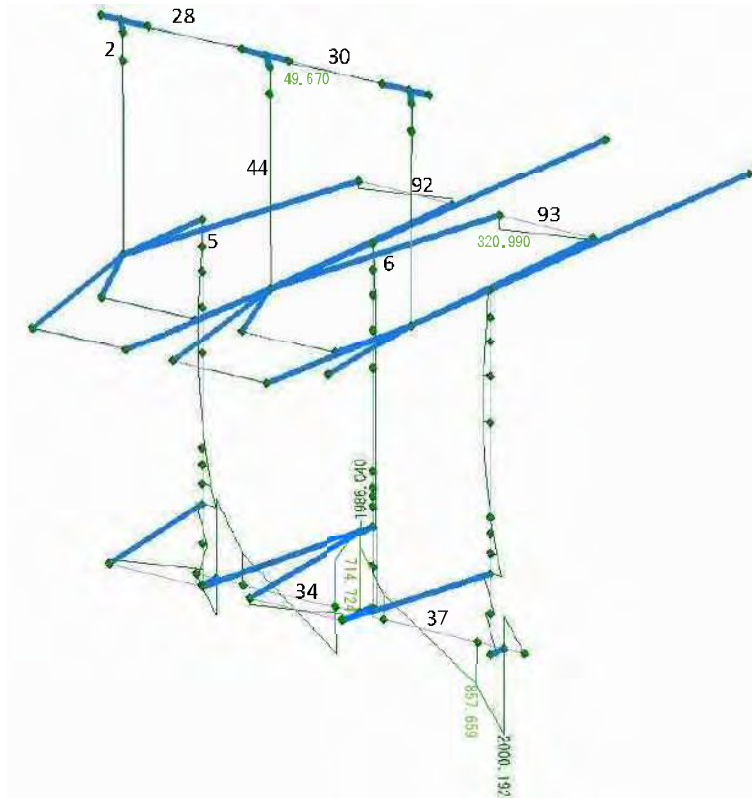
③ CASE3 : Regular Longitudinal direction No. water Full OP



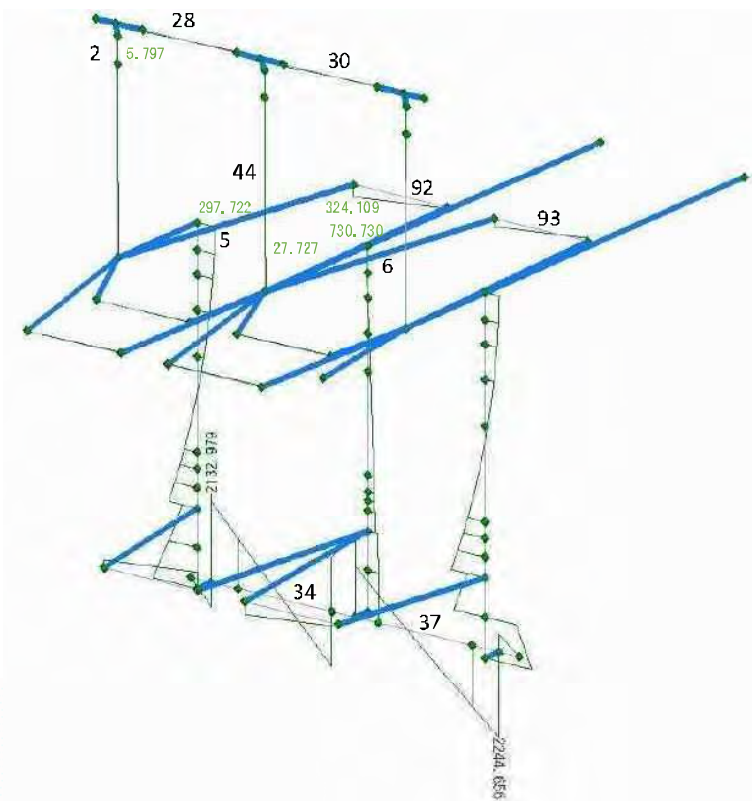
④ CASE4 : Regular Lateral direction H.W.L.+0.25m water level Full OP



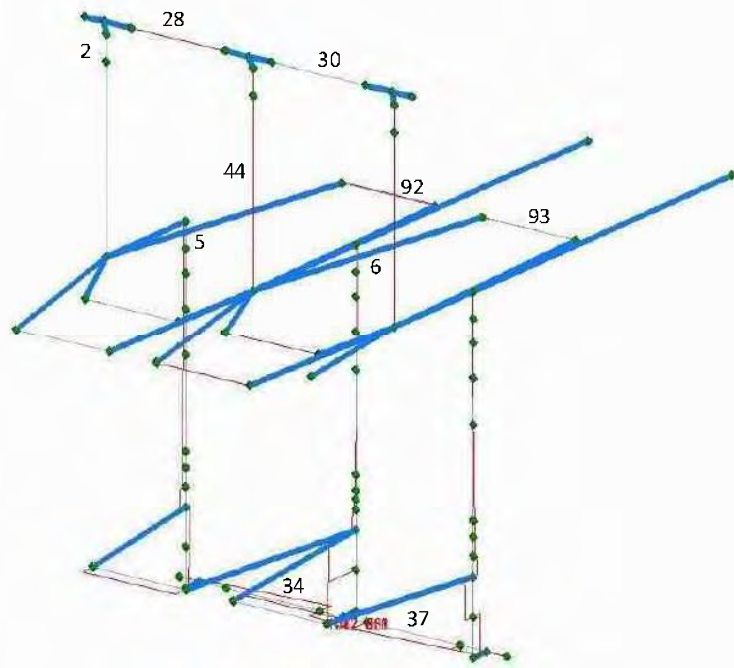
⑤ CASE5 : Regular Lateral direction H.W.L.+0.25m water level Full CL



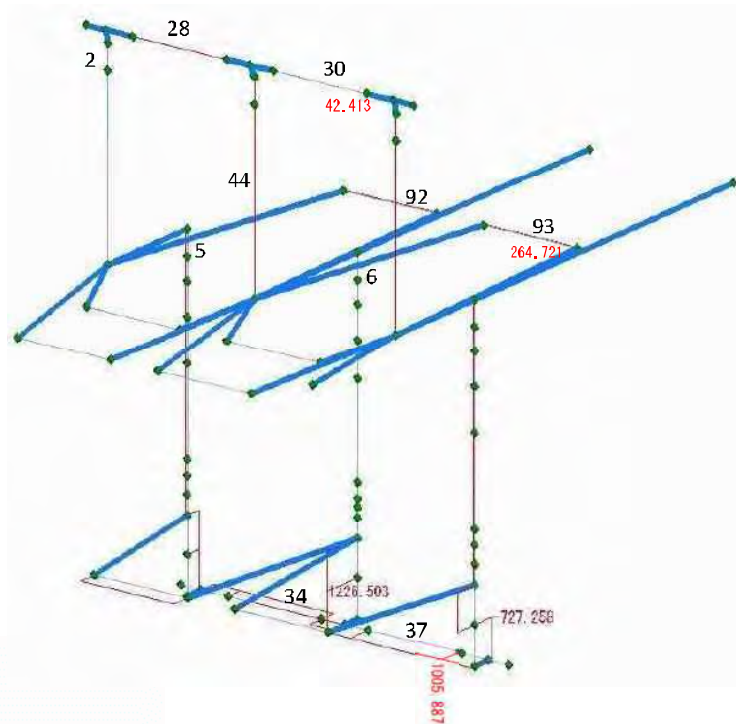
⑥ CASE6 : Regular Lateral direction No water Full OP



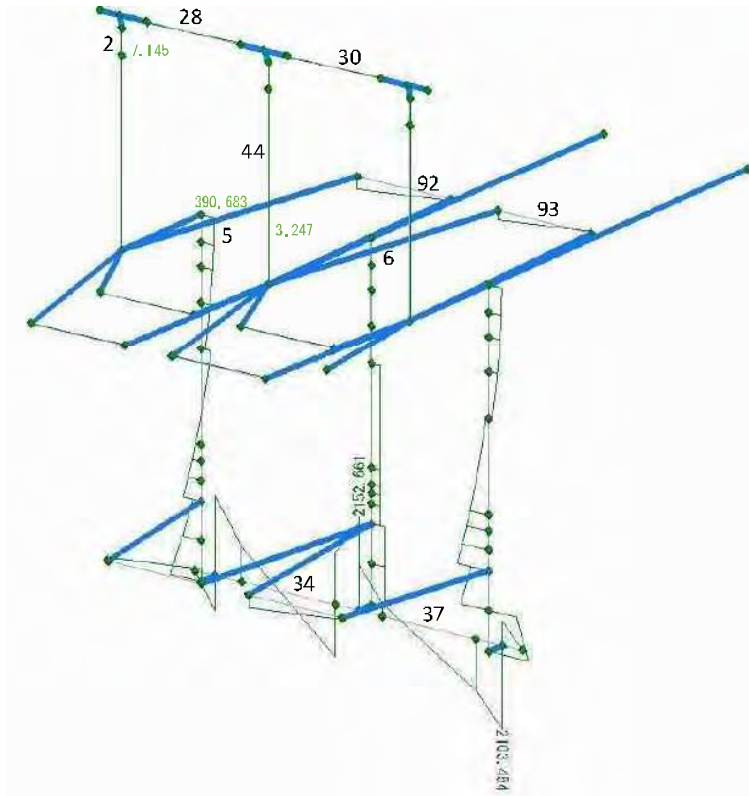
⑦ CASE7 : Seism Longitudinal direction H.W.L.+0.25m water level Full CL



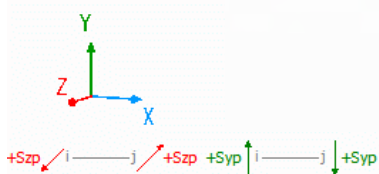
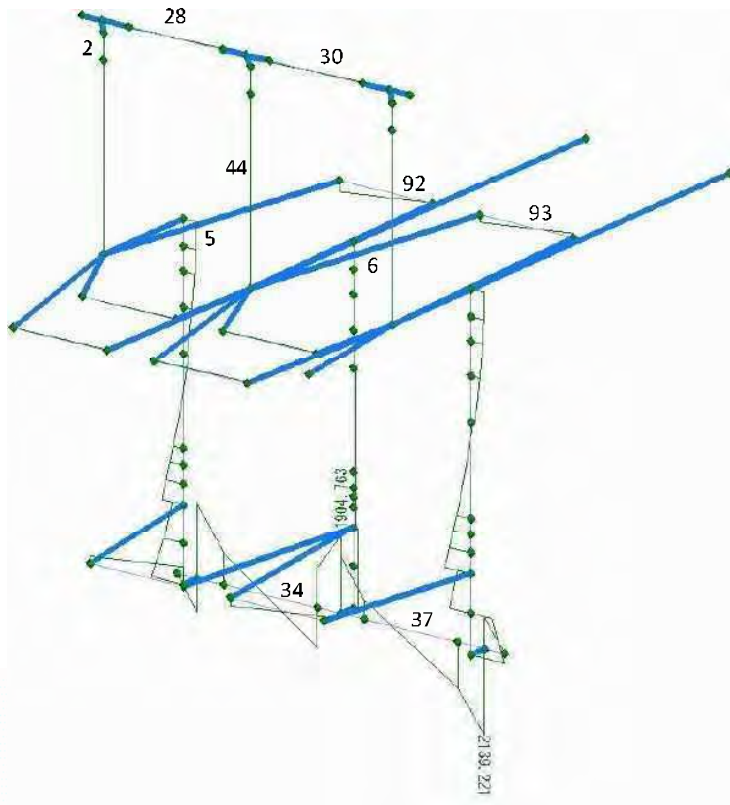
⑧ CASE8 : Seism Longitudinal direction No water Full OP



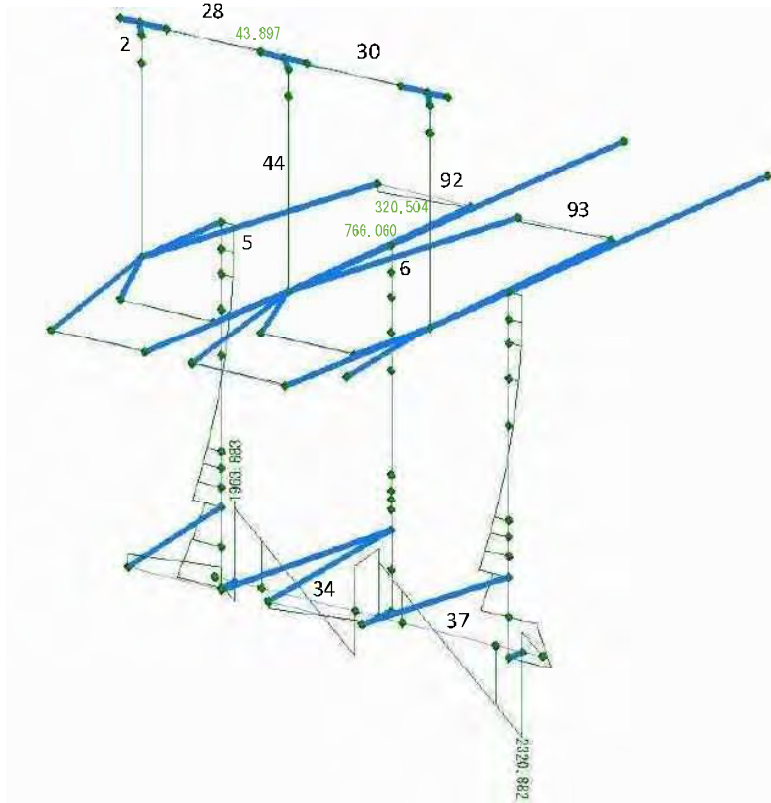
⑨ CASE9 : Seism Lateral direction H.W.L+0.25m water level Full OP



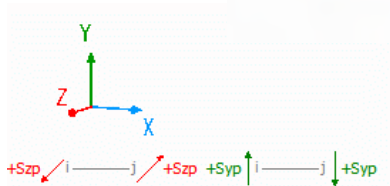
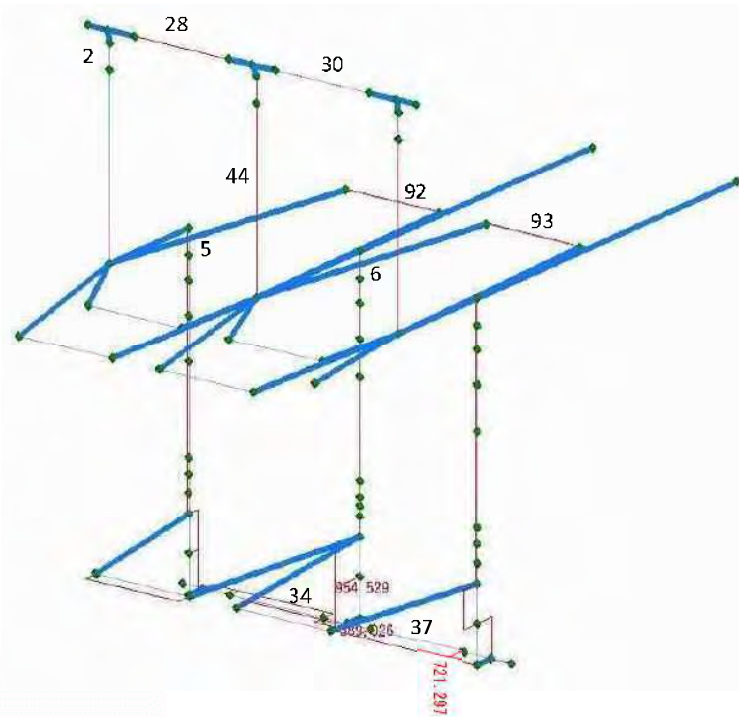
⑩ CASE10 : Seism Lateral direction H.W.L+0.25m level Full CL



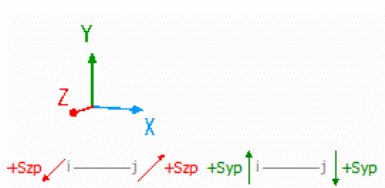
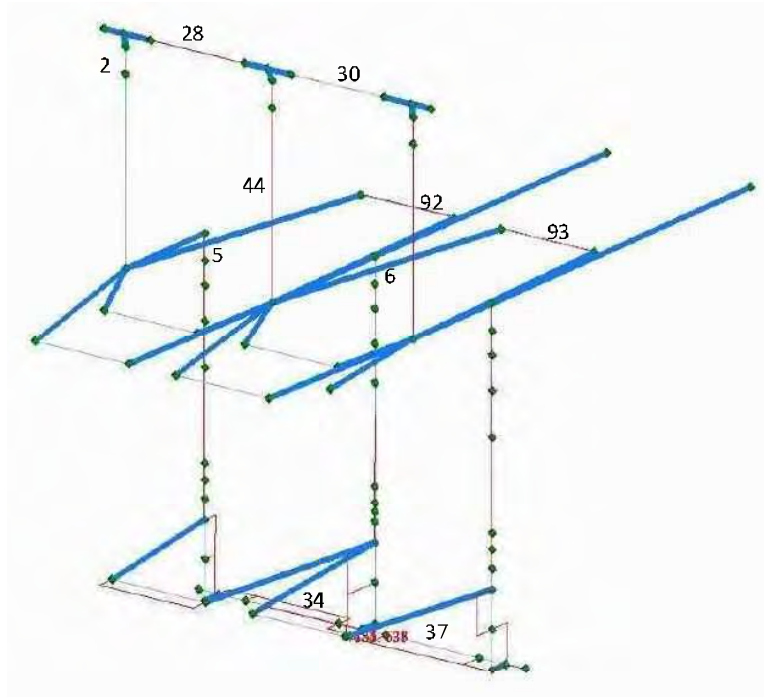
① CASE11 : Seism Lateral direction No water Full OP



② CASE12 : Seism Longitudinal direction H.W.L.+0.25m water level Full OP



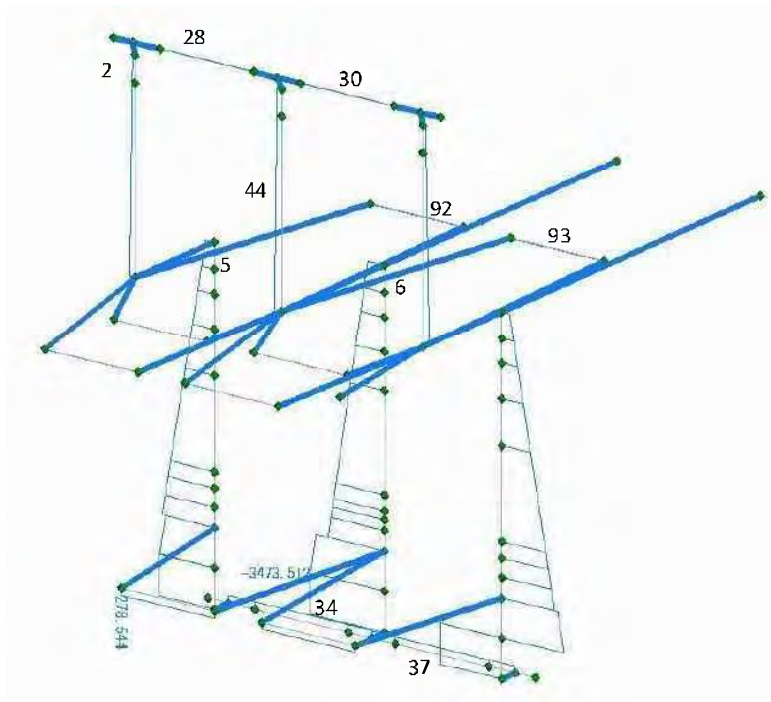
⑬ CASE13 : Regular Longitudinal direction H.W.L.+0.25m water level Maintenance case



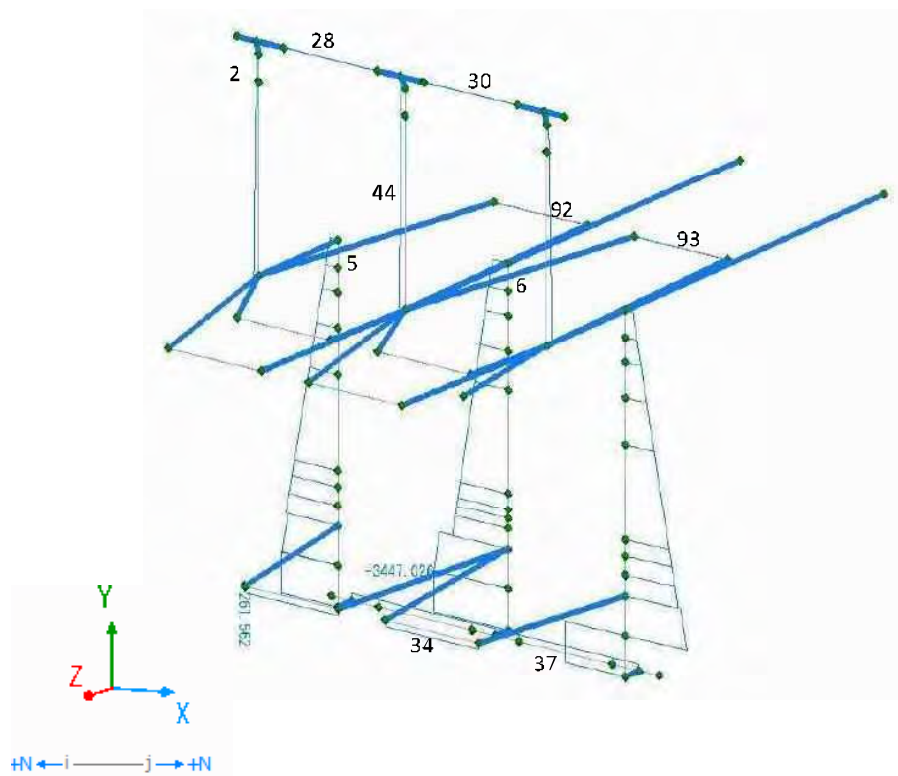
Sahelyial Reg.

3.Axis power

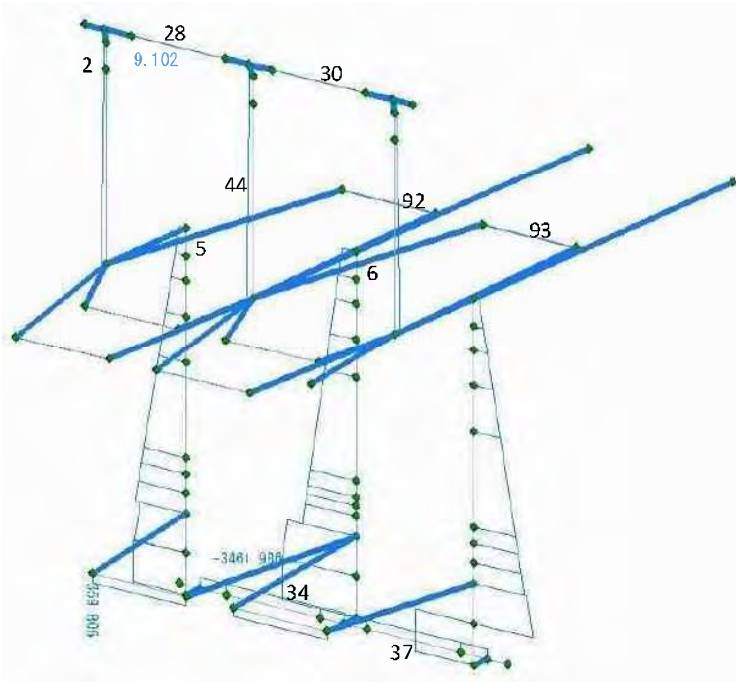
① CASE1 : Regular Longitudinal direction H.H.W.L. Full OP



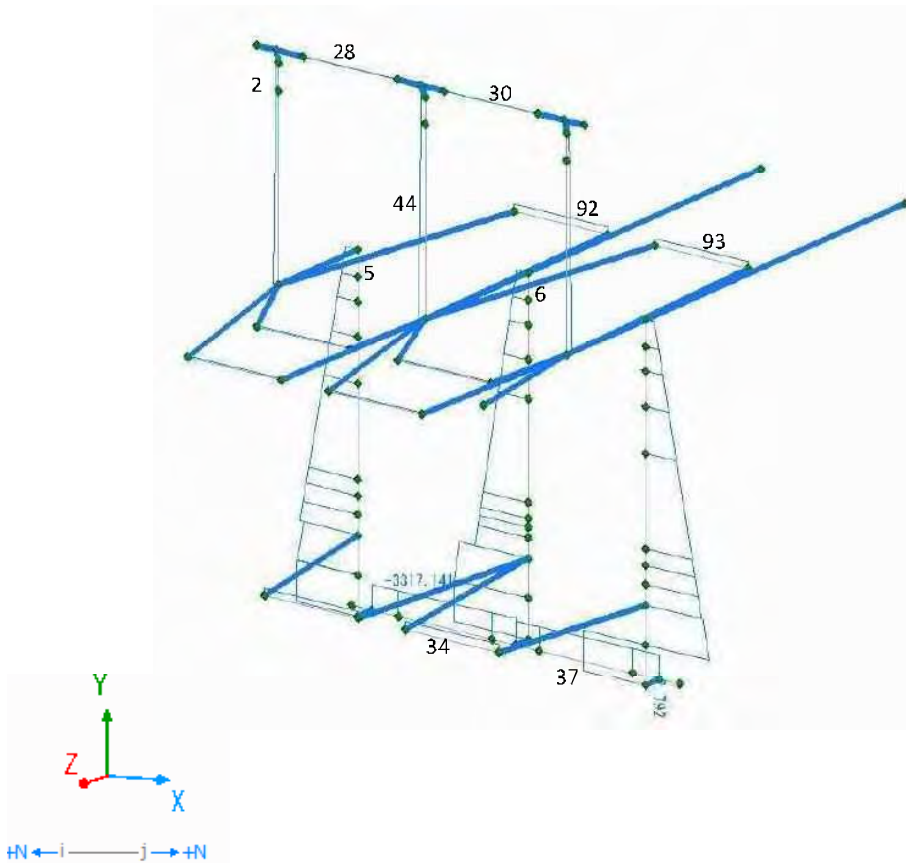
② CASE2 : Regular Longitudinal direction H.WL+0.25m water level Full CL



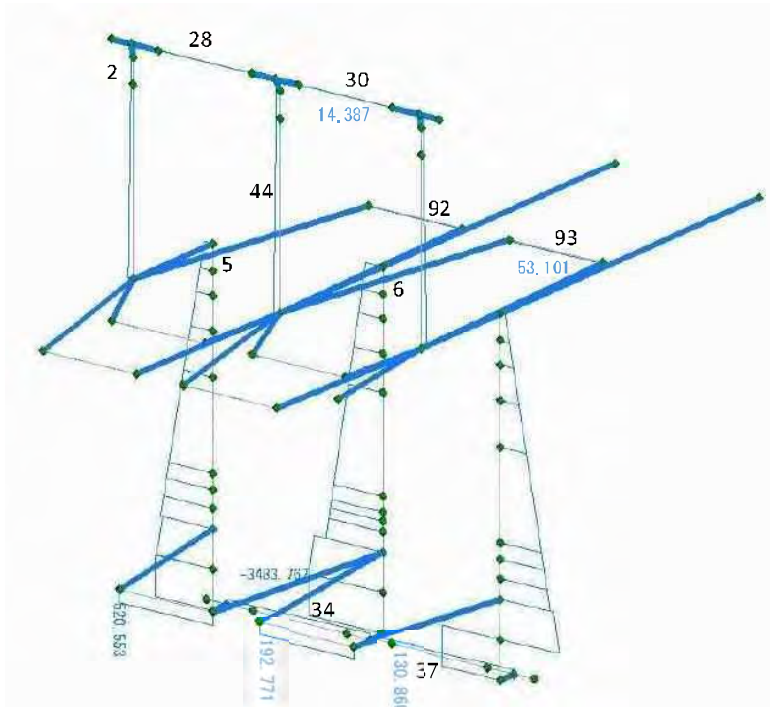
③ CASE3 : Regular Longitudinal direction No. water Full OP



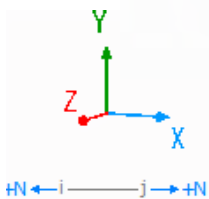
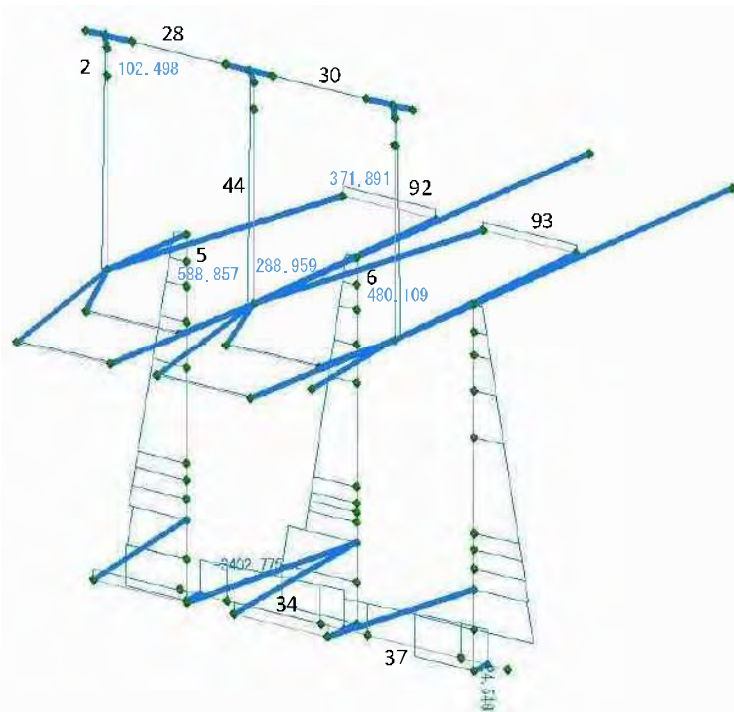
④ CASE4 : Regular Lateral direction H.W.L.+0.25m water level Full OP



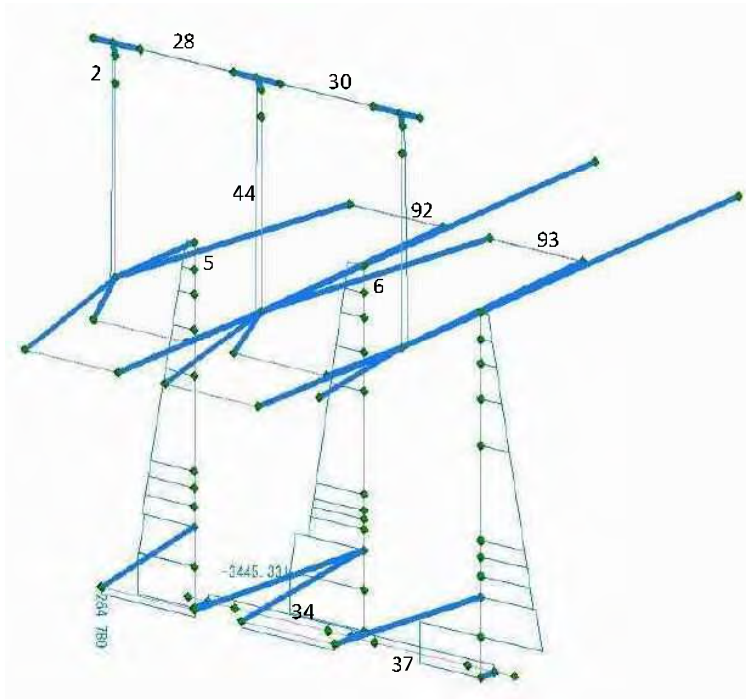
⑤ CASE5 : Regular Lateral direction H.W.L.+0.25m water level Full CL



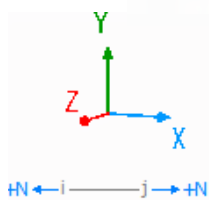
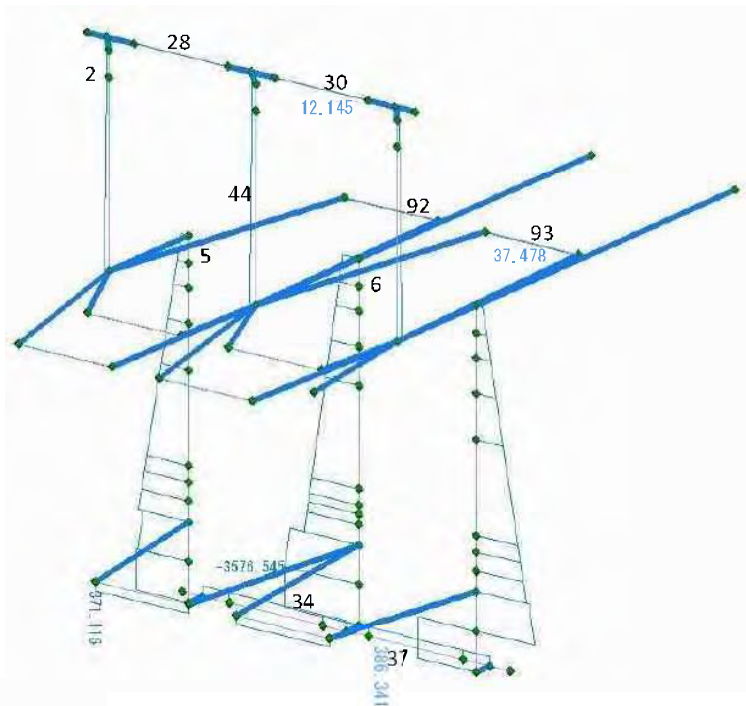
⑥ CASE6 : Regular Lateral direction No water Full OP



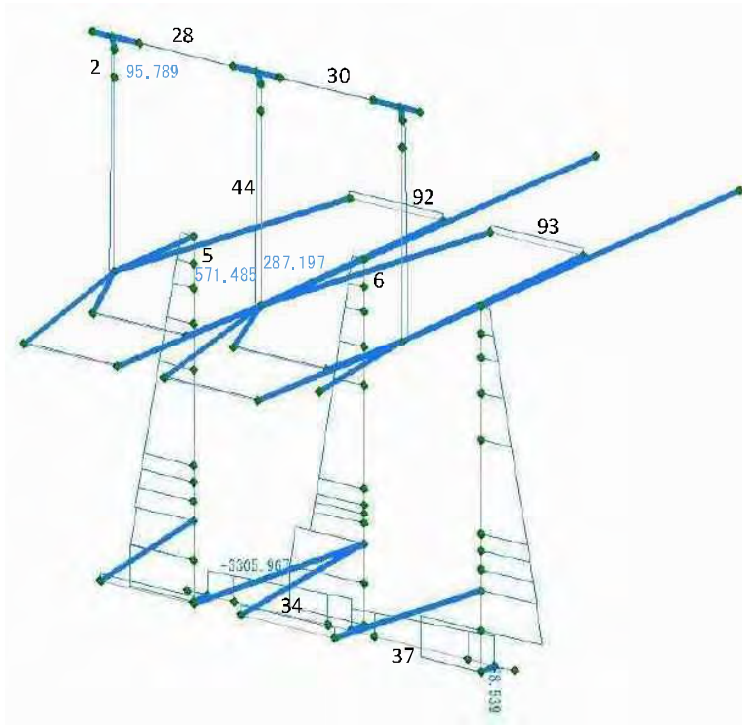
⑦ CASE7 : Seism Longitudinal direction H.W.L.+0.25m water level Full CL



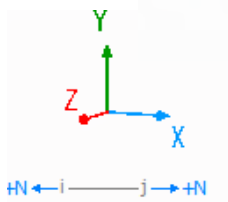
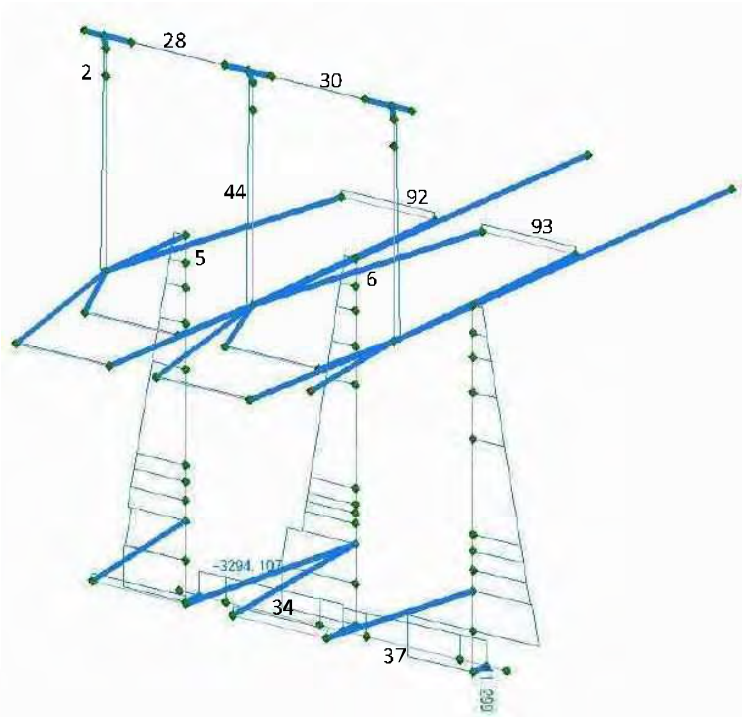
⑧ CASE8 : Seism Longitudinal direction No water Full OP



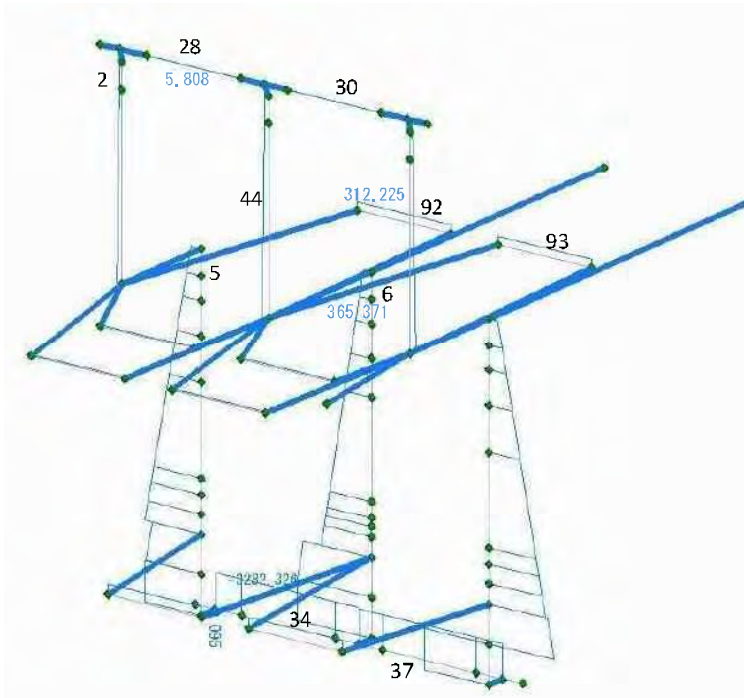
⑨ CASE9 : Seism Lateral direction H.W.L.+0.25m water level Full OP



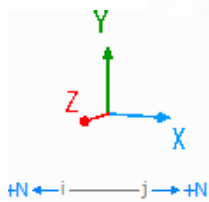
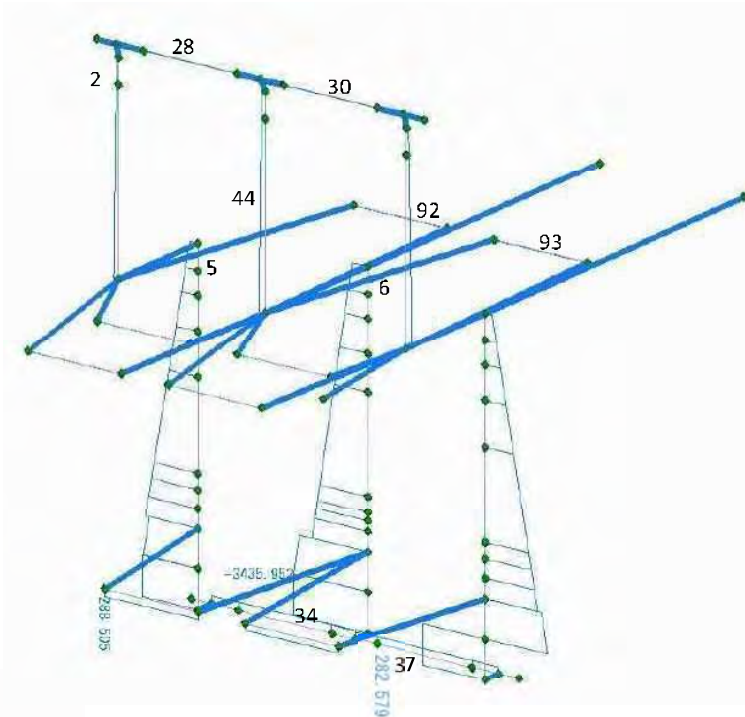
⑩ CASE10 : Seism Lateral direction H.W.L.+0.25m level Full CL



① CASE11 : Seism Lateral direction No water Full OP



② CASE12 : Seism Longitudinal direction H.W.L.+0.25m water level Full OP



⑬ CASE13 : Regular Longitudinal direction H.W.L.+0.25m water level Maintenance case

