



CADAM - Stability drawing

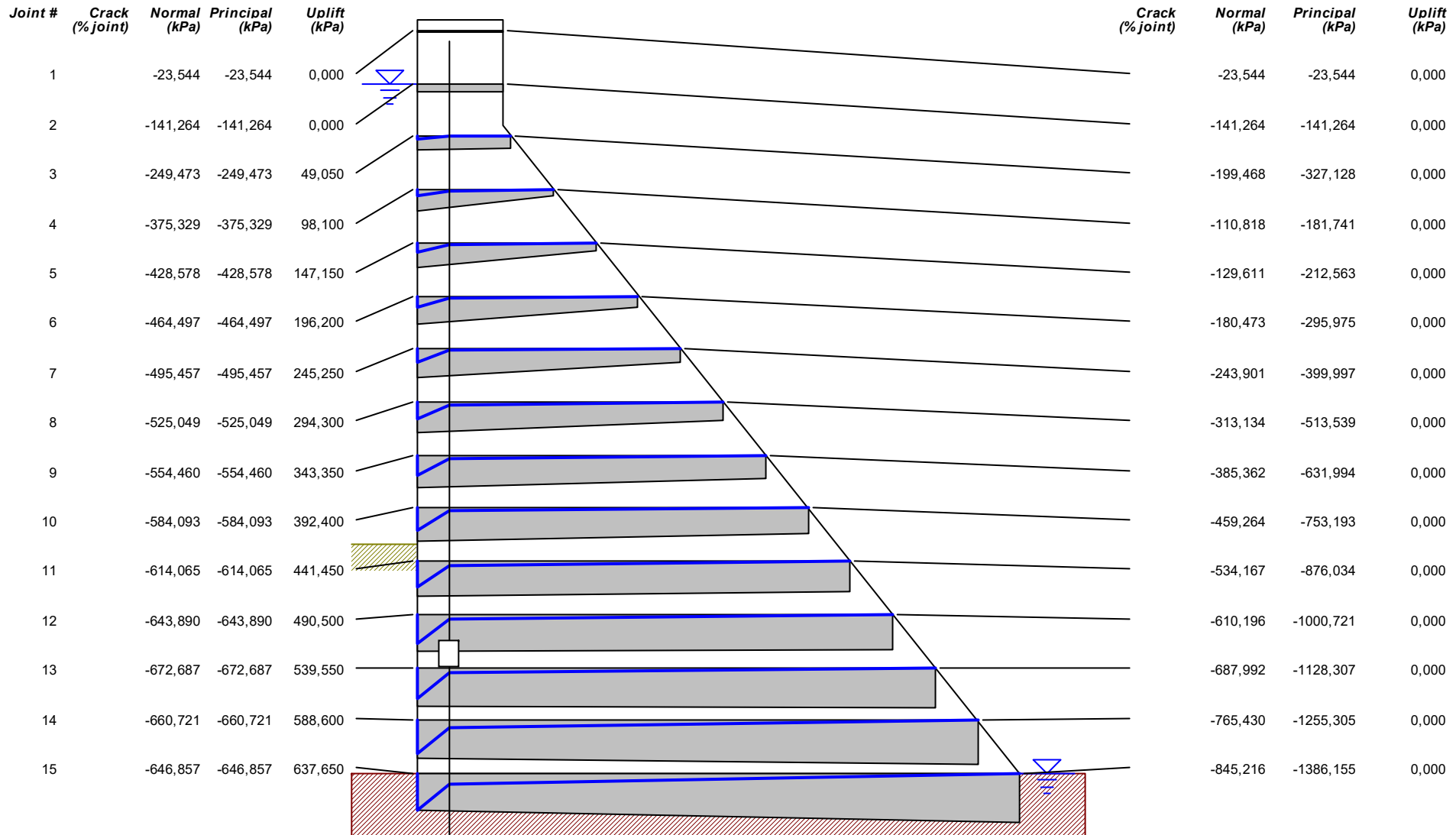
Page 1

By Martin Leclerc, M. Ing.

NSERC / Hydro-Quebec / Alcan Industrial Chair on Structural Safety of Concrete Dams, École Polytechnique de Montréal, Canada

Project:	TD4	Dam location:	FGG	Analysis performed by:	
Dam:	Example 1	Date:	30/11/2021	Project engineer:	Arthur Guillot - Le Goff
Owner:					

Usual combination (effective stress analysis)





CADAM - Stability drawing

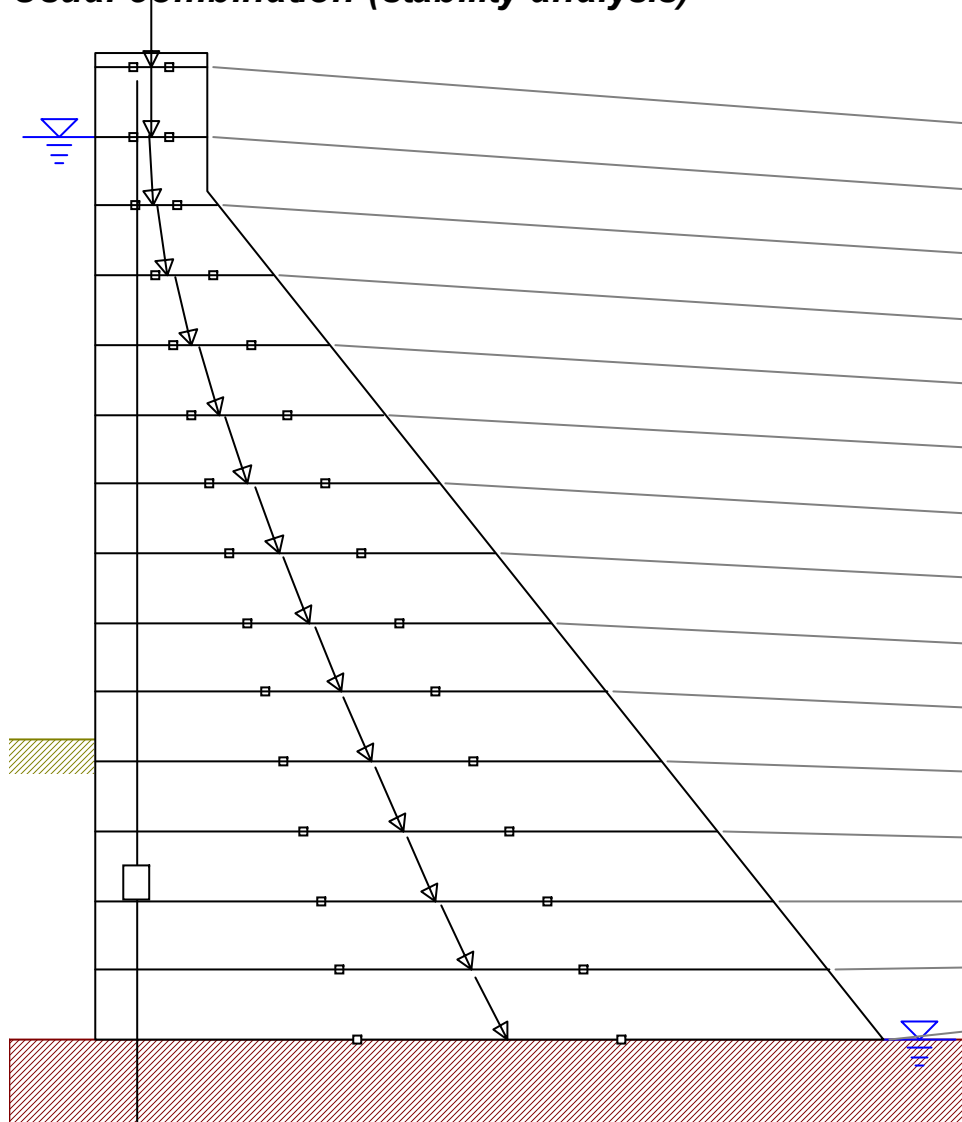
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By Martin Leclerc, M. Ing.

NSERC / Hydro-Quebec / Alcan Industrial Chair on Structural Safety of Concrete Dams, École Polytechnique de Montréal, Canada

Project:	TD4	Dam location:	FGG	Analysis performed by:	
Dam:	Example 1	Date:	30/11/2021	Project engineer:	Arthur Guillot - Le Goff
Owner:					

Usual combination (stability analysis)



Joint #	SSF (peak)	SSF (residual)	OSF (U/S <-)	OSF (-> D/S)	USF	Normal (kN)	Shear (kN)	Moment (kN·m)	Res. Pos. (% joint)
1	> 100	> 100	> 100	> 100	> 100	-188,4	0,0	0,0	50,000
2	> 100	> 100	> 100	> 100	> 100	-1130,1	0,0	0,0	50,000
3	28,747	23,006	42,655	10,633	19,644	-1975,3	122,6	-322,7	48,144
4	11,147	9,059	26,346	6,765	13,893	-3111,3	490,5	-3611,5	40,932
5	7,285	6,068	23,399	5,260	12,545	-4688,8	1103,6	-7031,7	41,073
6	5,731	4,883	22,862	4,502	12,173	-6707,7	1962,0	-10240,0	42,661
7	4,918	4,271	22,935	4,058	12,126	-9168,0	3065,6	-12893,1	44,329
8	4,427	3,905	23,168	3,772	12,205	-12069,8	4414,5	-14647,6	45,786
9	4,100	3,663	23,428	3,574	12,336	-15413,1	6008,6	-15160,1	47,001
10	3,869	3,494	23,676	3,429	12,485	-19197,8	7848,0	-14087,4	48,006
11	3,695	3,366	23,898	3,320	12,636	-23423,9	9937,4	-11083,4	48,840
12	3,541	3,250	24,101	3,233	12,784	-28091,5	12343,0	-5635,5	49,552
13	3,402	3,143	24,294	3,158	12,925	-33200,6	15086,2	3037,4	50,187
14	3,192	2,960	16,736	2,868	9,727	-37650,4	18167,1	24326,0	51,224
15	3,014	2,804	13,284	2,652	8,015	-42374,9	21585,6	53329,6	52,216
	3,000	1,500	2,000	2,000	1,200				



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Project: TD4

Dam location: FGG

Analysis performed by:

Dam: Example 1

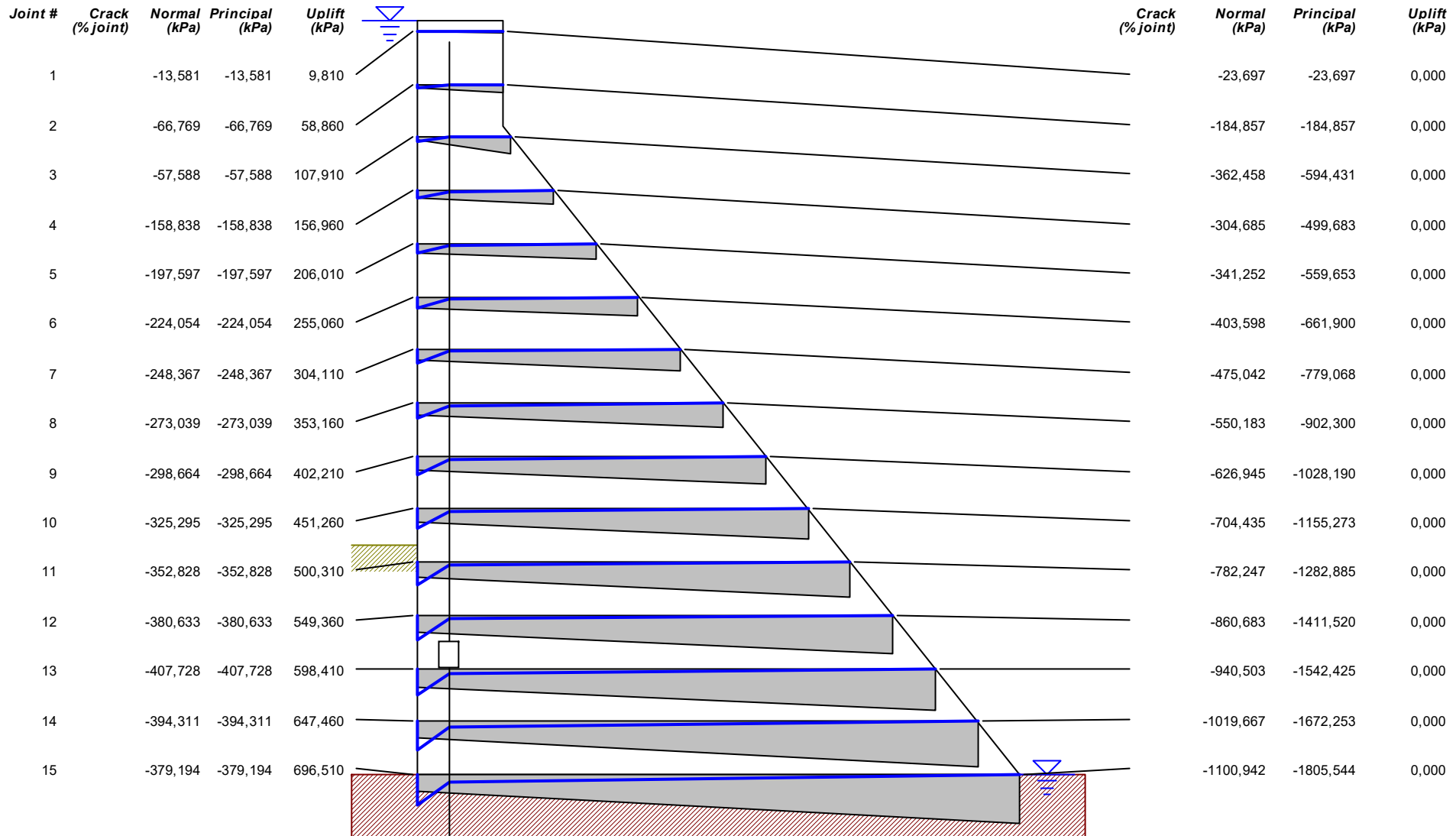
Date: 30/11/2021

Project engineer:

Arthur Guillot - Le Goff

Owner:

Flood combination (effective stress analysis)





CADAM - Stability drawing

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By Martin Leclerc, M. Ing.

NSERC / Hydro-Quebec / Alcan Industrial Chair on Structural Safety of Concrete Dams, École Polytechnique de Montréal, Canada

Project: TD4

Dam location: FGG

Analysis performed by:

Dam: Example 1

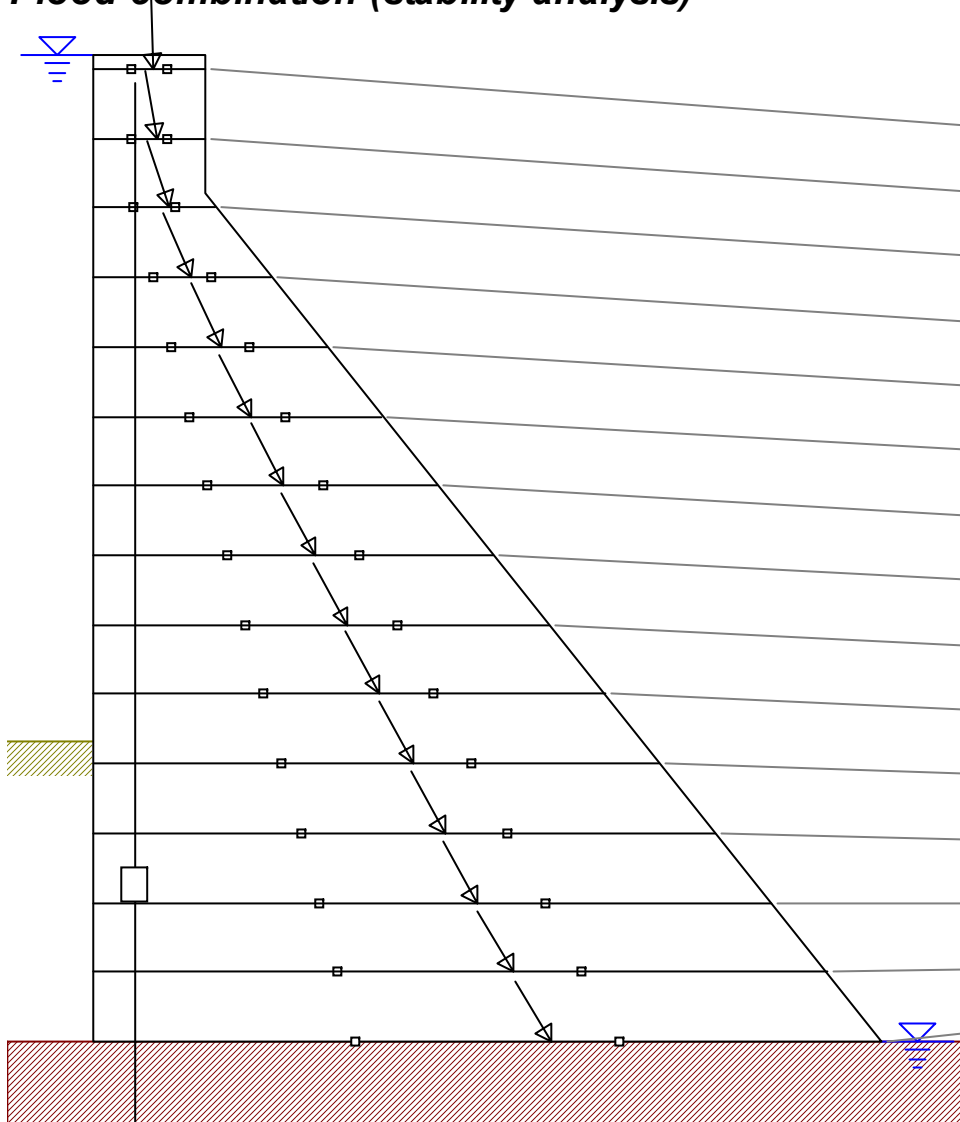
Date: 30/11/2021

Project engineer:

Arthur Guillot - Le Goff

Owner:

Flood combination (stability analysis)



Joint #	SSF (peak)	SSF (residual)	OSF (U/S <-)	OSF (-> D/S)	USF	Normal (kN)	Shear (kN)	Moment (kN·m)	Res. Pos. (% joint)
1	> 100	43,416	7,216	3,572	4,800	-149,1	4,9	54,0	54,523
2	11,765	8,140	22,378	4,021	9,143	-1006,5	176,6	629,8	57,822
3	5,633	4,447	23,850	2,629	8,929	-1848,2	593,5	1967,4	62,097
4	4,189	3,374	21,385	2,602	8,683	-2966,5	1255,7	1991,3	55,244
5	3,610	2,988	21,473	2,528	8,961	-4526,3	2163,1	3378,8	54,443
6	3,313	2,812	22,010	2,482	9,363	-6527,6	3315,8	6473,2	54,768
7	3,139	2,718	22,561	2,457	9,779	-8970,3	4713,7	11617,9	55,222
8	3,026	2,663	23,036	2,445	10,171	-11854,4	6356,9	19156,2	55,611
9	2,948	2,629	23,431	2,439	10,531	-15180,0	8245,3	29431,5	55,911
10	2,891	2,607	23,756	2,438	10,856	-18947,0	10379,0	42787,2	56,137
11	2,847	2,591	24,025	2,439	11,150	-23155,5	12762,6	59569,0	56,305
12	2,800	2,568	24,256	2,440	11,414	-27805,5	15462,6	80290,0	56,445
13	2,751	2,540	24,464	2,440	11,654	-32896,9	18500,1	105731,0	56,586
14	2,630	2,437	17,356	2,296	9,052	-37329,0	21875,3	145282,6	57,371
15	2,524	2,346	13,923	2,181	7,589	-42035,8	25588,1	194044,3	58,127
	2,000	1,300	1,100	1,100	1,100				



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Project: TD4

Dam location: FGG

Analysis performed by:

Dam: Example 1

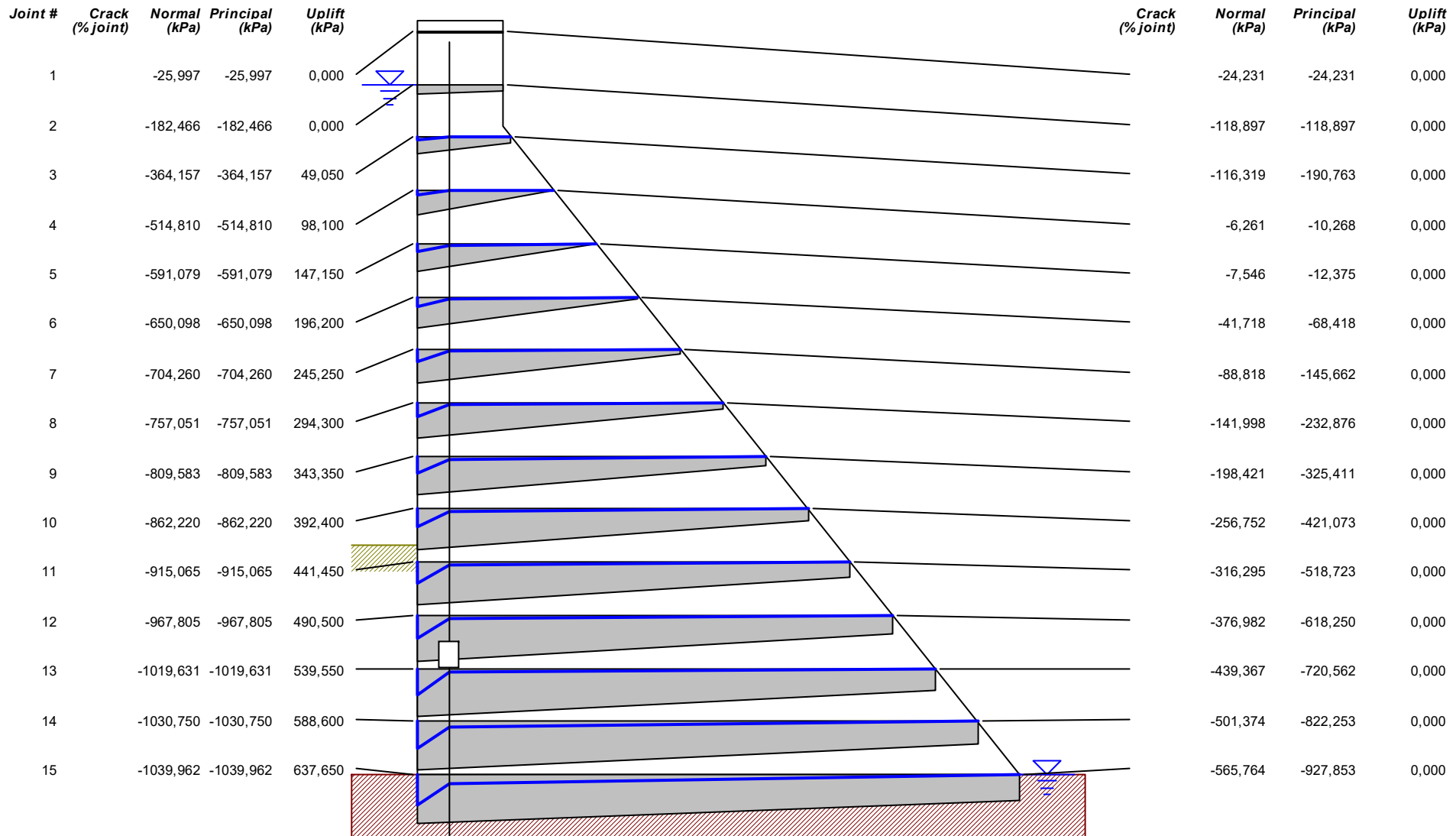
Date: 30/11/2021

Project engineer:

Arthur Guillot - Le Goff

Owner:

Seismic #1 combination - Peak accelerations (stress analysis) (effective stress analysis)





CADAM - Stability drawing

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By Martin Leclerc, M. Ing.

NSERC / Hydro-Quebec / Alcan Industrial Chair on Structural Safety of Concrete Dams, École Polytechnique de Montréal, Canada

Project: TD4

Dam location: FGG

Analysis performed by:

Dam: Example 1

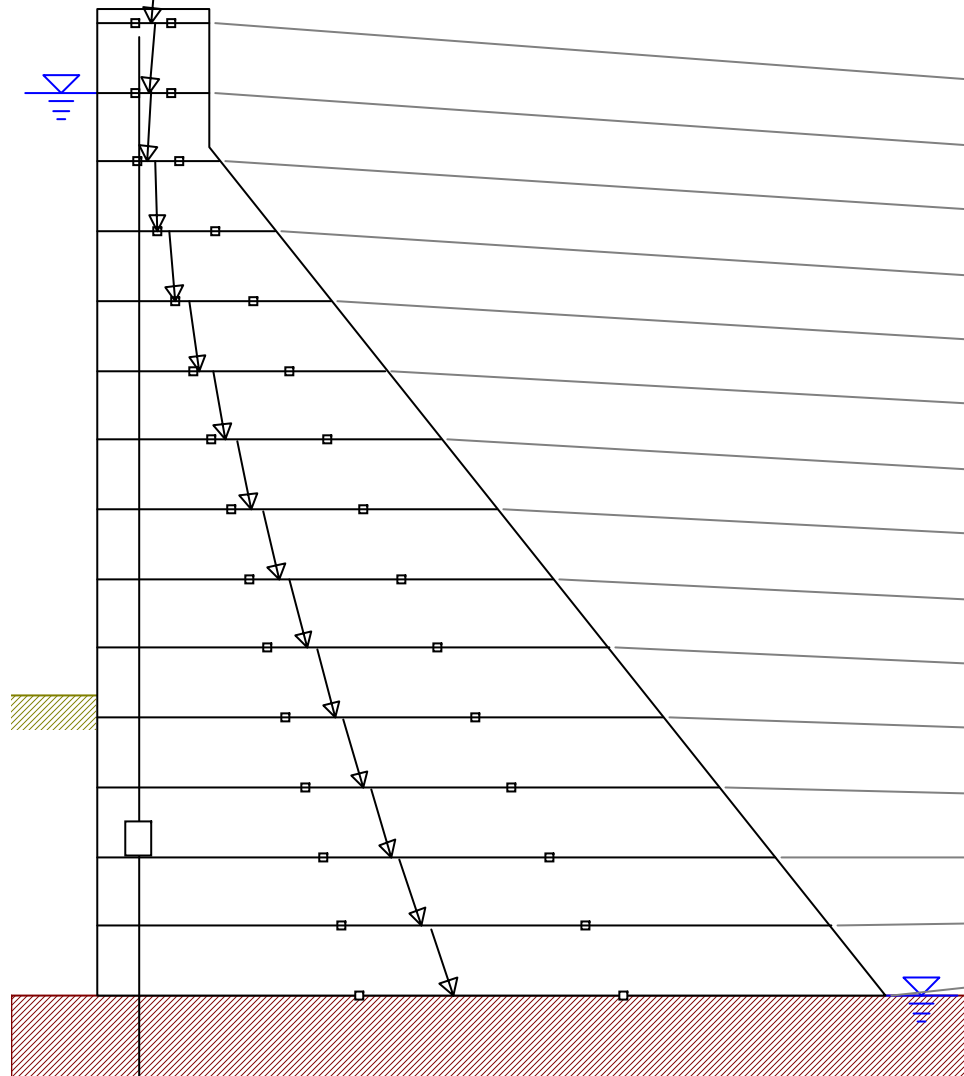
Date: 30/11/2021

Project engineer:

Arthur Guillot - Le Goff

Owner:

Seismic #1 combination - Peak accelerations (stress analysis) (stability analysis)



Joint #	SSF (peak)	SSF (residual)	OSF (U/S <-)	OSF (-> D/S)	USF	Normal (kN)	Shear (kN)	Moment (kN·m)	Res. Pos. (% joint)
1	49,213	15,234	85,333	> 100	> 100	-200,9	-18,8	-9,4	49,414
2	20,897	15,234	14,222	> 100	> 100	-1205,5	-113,0	-339,0	46,484
3	29,514	23,934	6,406	12,649	20,954	-2114,1	-126,2	-1599,4	41,403
4	> 100	95,548	5,039	7,932	14,819	-3334,9	49,8	-6943,4	33,734
5	20,591	17,345	4,977	6,136	13,381	-5028,5	414,0	-13724,7	33,754
6	12,291	10,578	5,189	5,235	12,984	-7194,9	971,4	-21934,1	35,343
7	9,292	8,142	5,452	4,708	12,934	-9834,2	1725,0	-31543,4	37,066
8	7,769	6,908	5,708	4,367	13,019	-12946,3	2676,6	-42512,5	38,598
9	6,853	6,168	5,943	4,131	13,158	-16531,3	3827,7	-54792,6	39,895
10	6,245	5,677	6,155	3,957	13,317	-20589,1	5179,6	-68329,1	40,982
11	5,812	5,327	6,346	3,826	13,479	-25119,7	6734,4	-83061,4	41,896
12	5,454	5,035	6,516	3,720	13,636	-30123,2	8544,5	-98817,1	42,678
13	5,144	4,777	6,669	3,631	13,787	-35599,6	10642,6	-115155,4	43,371
14	4,756	4,432	6,063	3,294	10,375	-40448,1	13032,8	-122984,7	44,241
15	4,433	4,144	5,639	3,044	8,549	-45602,6	15717,4	-127489,9	45,078
	1,300	1,000	1,100	1,100	1,100				



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By Martin Leclerc, M. Ing.

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Project: TD4

Dam location: FGG

Analysis performed by:

Dam: Example 1

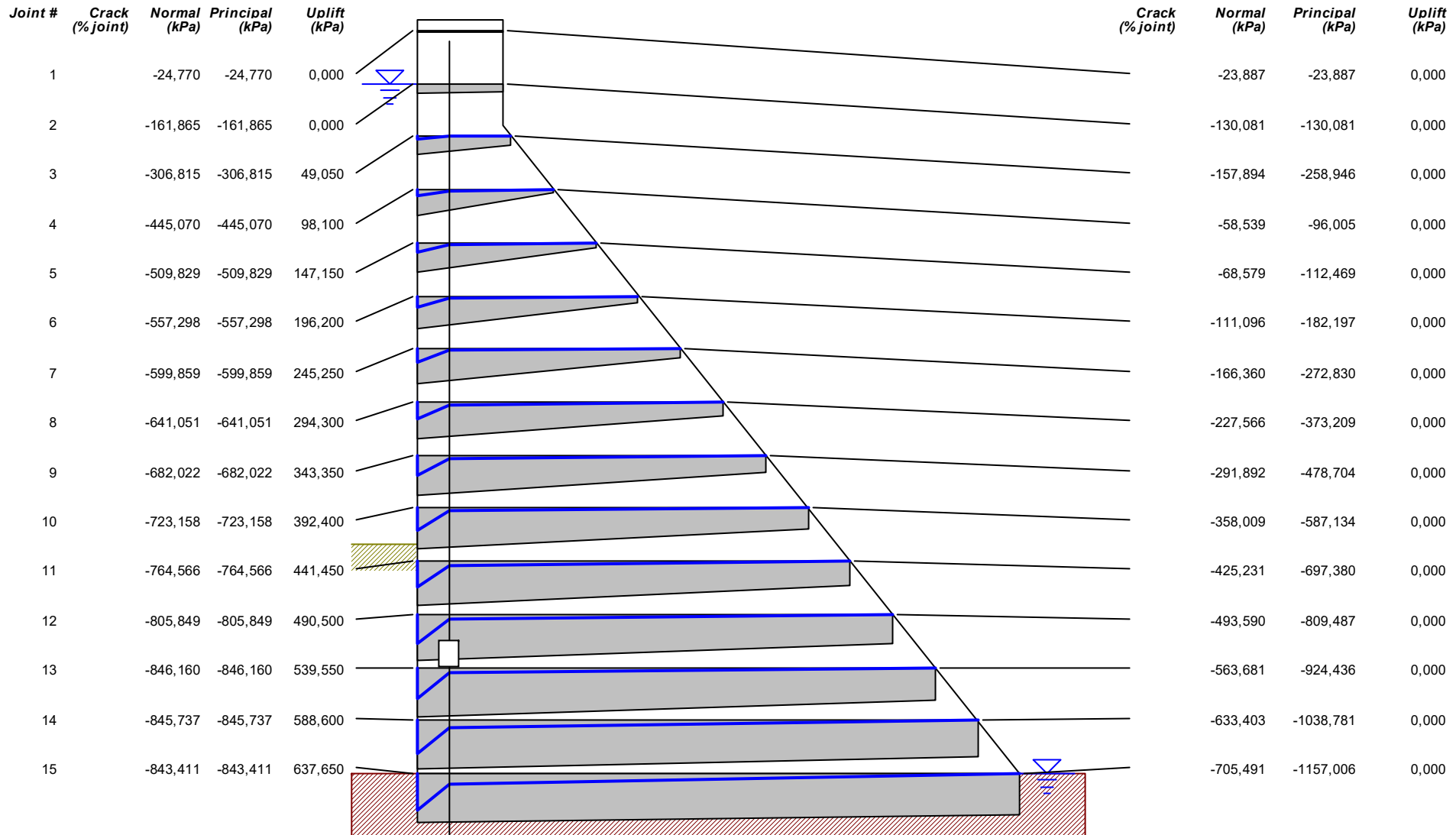
Date: 30/11/2021

Project engineer:

Arthur Guillot - Le Goff

Owner:

Seismic #1 combination - Sustained accelerations (stability analysis) (effective stress analysis)





CADAM - Stability drawing

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By Martin Leclerc, M. Ing.

NSERC / Hydro-Quebec / Alcan Industrial Chair on Structural Safety of Concrete Dams, École Polytechnique de Montréal, Canada

Project: TD4

Dam location: FGG

Analysis performed by:

Dam: Example 1

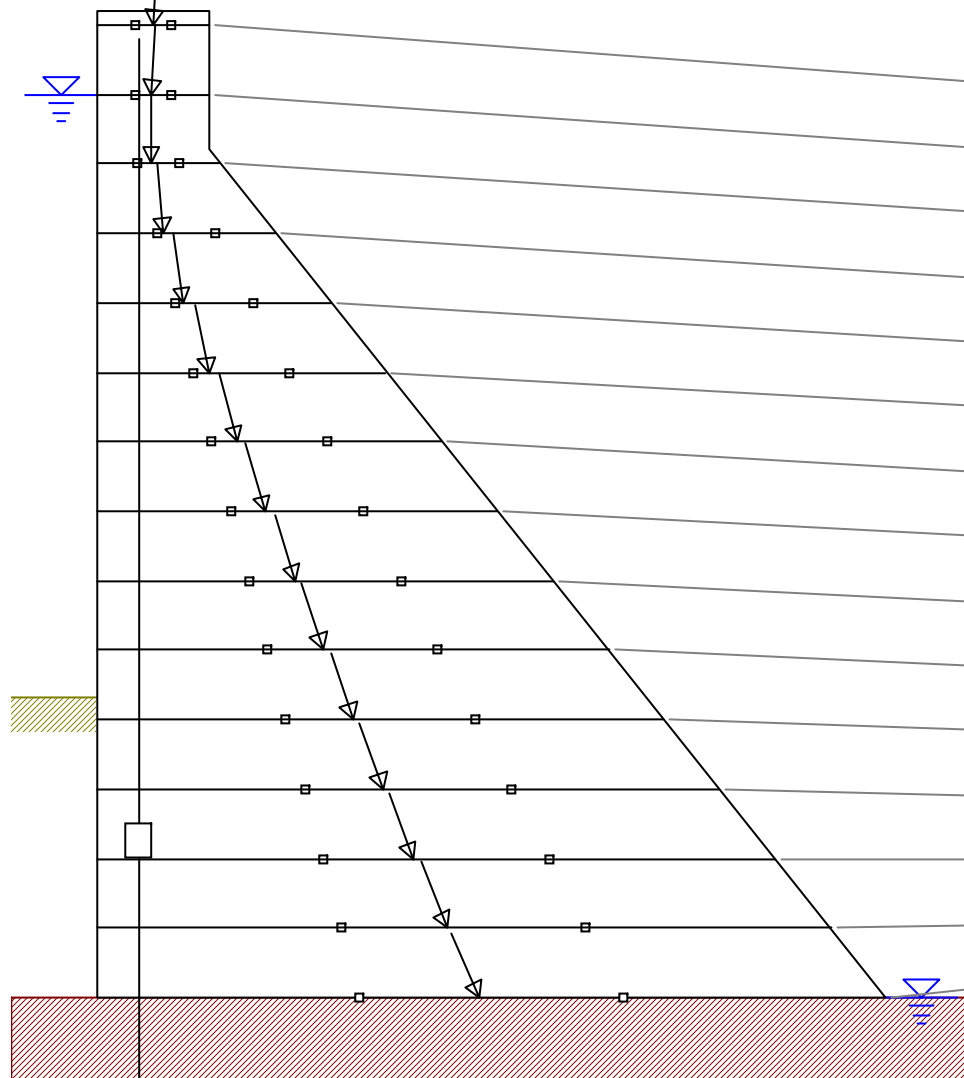
Date: 30/11/2021

Project engineer:

Arthur Guillot - Le Goff

Owner:

Seismic #1 combination - Sustained accelerations (stability analysis) (stability analysis)



Joint #	SSF (peak)	SSF (residual)	OSF (U/S <-)	OSF (-> D/S)	USF	Normal (kN)	Shear (kN)	Moment (kN·m)	Res. Pos. (% joint)
1	97,473	29,515	> 100	> 100	> 100	-194,6	-9,4	-4,7	49,698
2	40,841	29,515	27,556	> 100	> 100	-1167,8	-56,5	-169,5	48,185
3	> 100	> 100	10,886	11,641	20,299	-2044,7	-1,8	-961,0	44,659
4	20,828	17,037	8,295	7,348	14,356	-3223,1	270,2	-5277,4	37,208
5	10,915	9,144	8,066	5,698	12,963	-4858,6	758,8	-10378,2	37,285
6	7,903	6,769	8,324	4,869	12,578	-6951,3	1466,7	-16087,1	38,874
7	6,493	5,665	8,678	4,383	12,530	-9501,1	2395,3	-22218,3	40,571
8	5,688	5,038	9,029	4,070	12,612	-12508,1	3545,5	-28580,1	42,066
9	5,172	4,638	9,351	3,852	12,747	-15972,2	4918,2	-34976,4	43,324
10	4,814	4,362	9,641	3,693	12,901	-19893,5	6513,8	-41208,3	44,371
11	4,550	4,158	9,900	3,573	13,057	-24271,9	8335,9	-47072,5	45,247
12	4,324	3,980	10,129	3,477	13,210	-29107,4	10443,8	-52226,4	45,995
13	4,122	3,819	10,336	3,395	13,356	-34400,1	12864,4	-56059,0	46,661
14	3,846	3,575	8,811	3,081	10,051	-39049,3	15600,0	-49329,4	47,607
15	3,612	3,368	7,848	2,848	8,282	-43988,8	18651,5	-37080,2	48,516
	1,300	1,000	1,100	1,100	1,100				



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NSERC / Hydro-Quebec / Alcan Industrial Chair on Structural Safety of Concrete Dams, École Polytechnique de Montréal, Canada

Project: TD4

Dam location: FGG

Analysis performed by:

Dam: Example 1

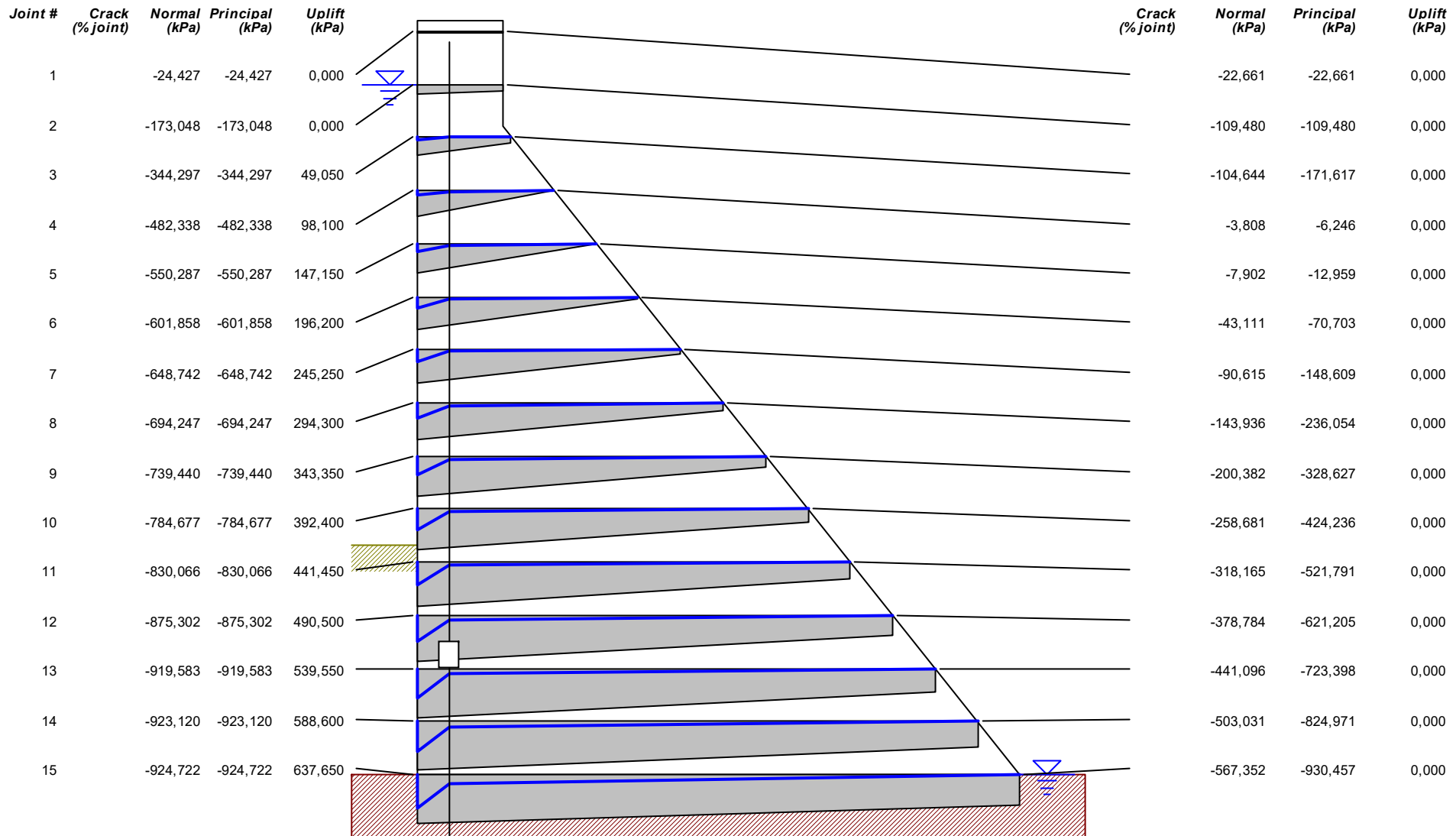
Date: 30/11/2021

Project engineer:

Arthur Guillot - Le Goff

Owner:

Seismic #2 combination - Peak accelerations (stress analysis) (effective stress analysis)





CADAM - Stability drawing

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By Martin Leclerc, M. Ing.

NSERC / Hydro-Quebec / Alcan Industrial Chair on Structural Safety of Concrete Dams, École Polytechnique de Montréal, Canada

Project: TD4

Dam location: FGG

Analysis performed by:

Dam: Example 1

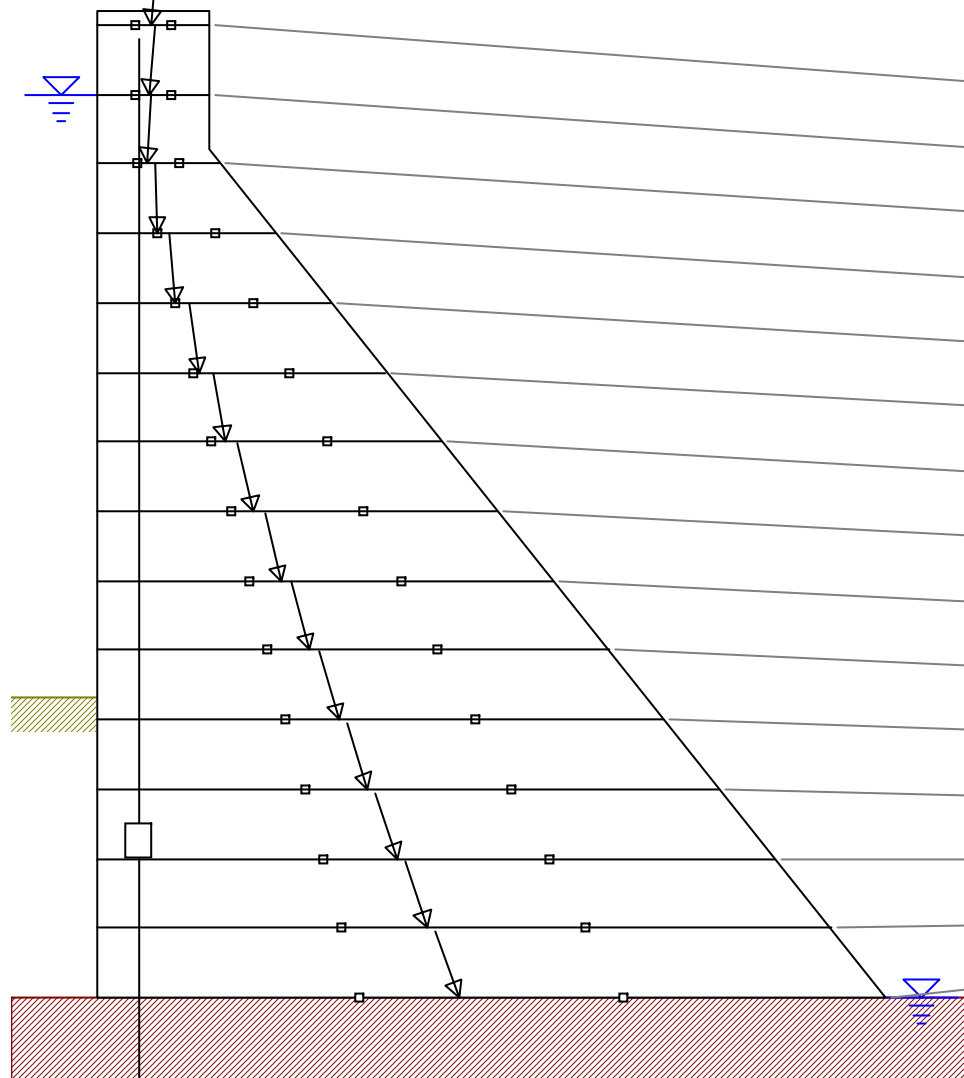
Date: 30/11/2021

Project engineer:

Arthur Guillot - Le Goff

Owner:

Seismic #2 combination - Peak accelerations (stress analysis) (stability analysis)



Joint #	SSF (peak)	SSF (residual)	OSF (U/S <-)	OSF (-> D/S)	USF	Normal (kN)	Shear (kN)	Moment (kN·m)	Res. Pos. (% joint)
1	48,260	14,281	80,000	> 100	> 100	-188,4	-18,8	-9,4	49,375
2	19,945	14,281	13,333	> 100	> 100	-1130,1	-113,0	-339,0	46,250
3	27,944	22,363	6,015	11,940	19,644	-1975,3	-126,2	-1546,6	41,103
4	> 100	89,144	4,753	7,481	13,893	-3111,3	49,8	-6533,5	33,594
5	19,420	16,174	4,714	5,785	12,545	-4688,8	414,0	-12756,9	33,805
6	11,574	9,861	4,929	4,935	12,173	-6707,7	971,4	-20144,7	35,561
7	8,741	7,591	5,189	4,438	12,126	-9168,0	1725,0	-28605,9	37,419
8	7,301	6,440	5,441	4,116	12,205	-12069,8	2676,6	-38037,5	39,057
9	6,436	5,751	5,672	3,892	12,336	-15413,1	3827,7	-48328,3	40,440
10	5,862	5,293	5,879	3,729	12,485	-19197,8	5179,6	-59360,4	41,598
11	5,452	4,967	6,066	3,604	12,636	-23423,9	6734,4	-71010,9	42,570
12	5,115	4,695	6,232	3,505	12,784	-28091,5	8544,5	-83044,4	43,401
13	4,822	4,455	6,381	3,420	12,925	-33200,6	10642,6	-94957,2	44,139
14	4,450	4,126	5,803	3,103	9,727	-37650,4	13032,8	-97595,0	45,091
15	4,139	3,850	5,399	2,867	8,015	-42374,9	15717,4	-96080,0	46,008
	1,300	1,000	1,100	1,100	1,100				



CADAM - Stability drawing

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By Martin Leclerc, M. Ing.

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Project: TD4

Dam location: FGG

Analysis performed by:

Dam: Example 1

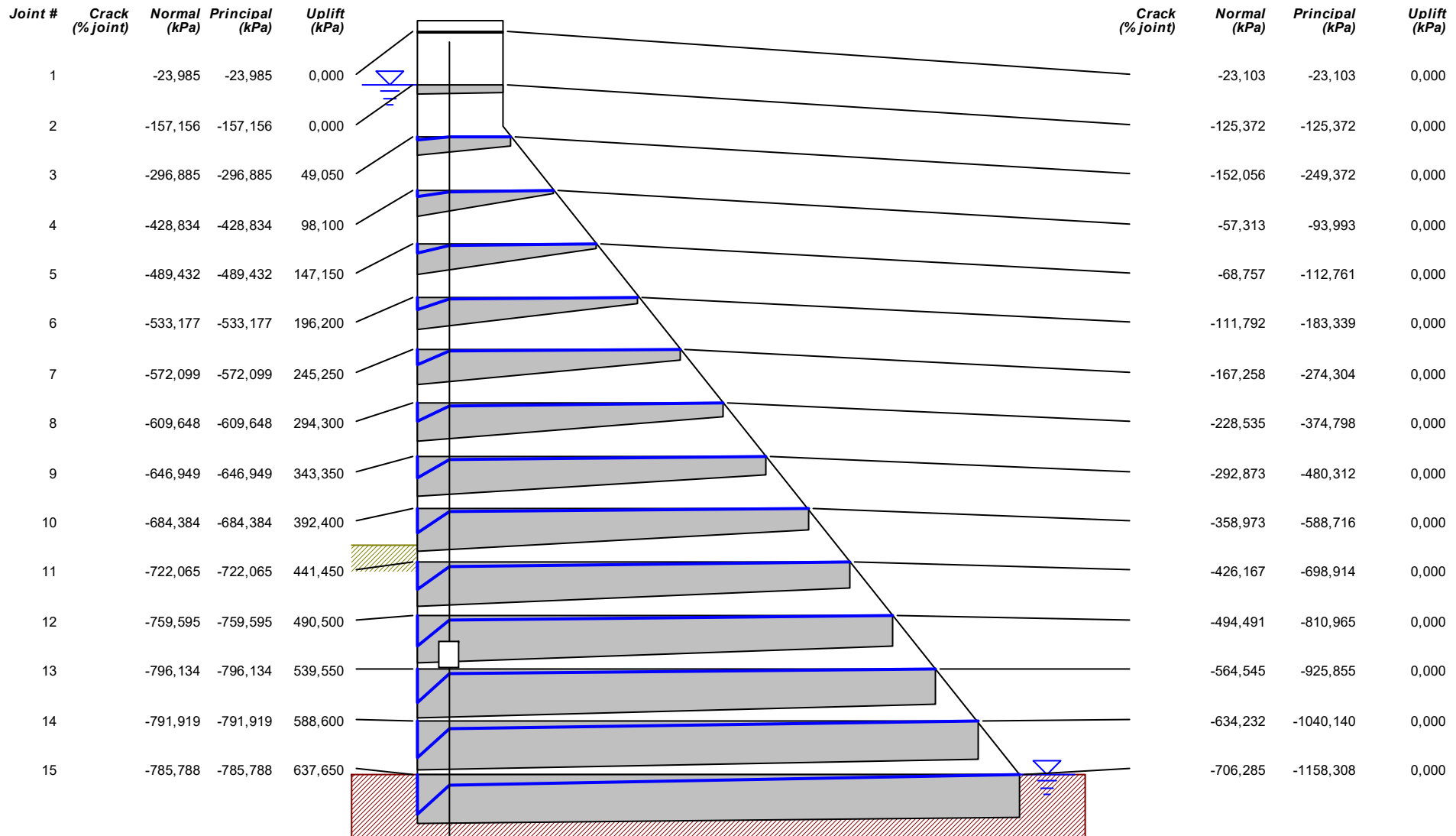
Date: 30/11/2021

Project engineer:

Arthur Guillot - Le Goff

Owner:

Seismic #2 combination - Sustained accelerations (stability analysis) (effective stress analysis)





CADAM - Stability drawing

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By Martin Leclerc, M. Ing.

NSERC / Hydro-Quebec / Alcan Industrial Chair on Structural Safety of Concrete Dams, École Polytechnique de Montréal, Canada

Project: TD4

Dam location: FGG

Analysis performed by:

Dam: Example 1

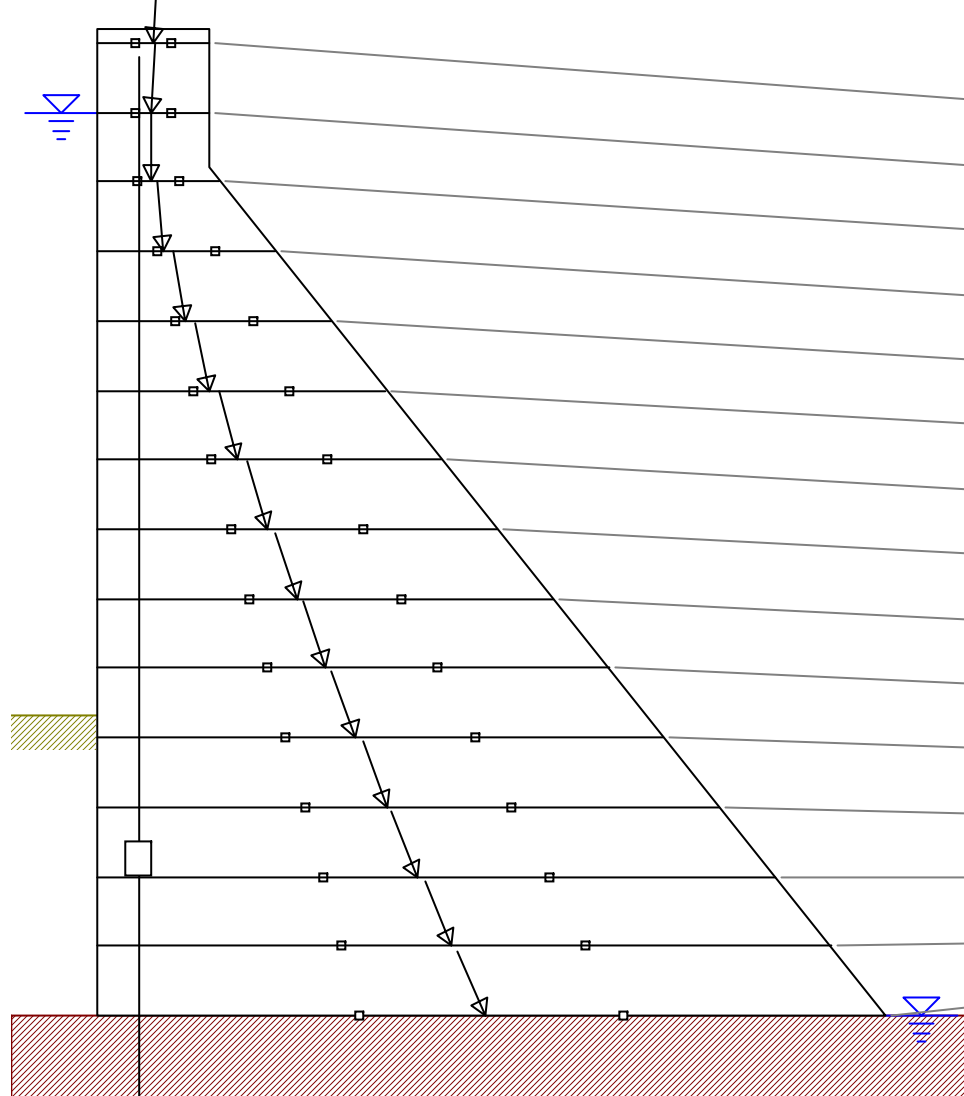
Date: 30/11/2021

Project engineer:

Arthur Guillot - Le Goff

Owner:

Seismic #2 combination - Sustained accelerations (stability analysis) (stability analysis)



Joint #	SSF (peak)	SSF (residual)	OSF (U/S <-)	OSF (-> D/S)	USF	Normal (kN)	Shear (kN)	Moment (kN·m)	Res. Pos. (% joint)
1	96,521	28,563	> 100	> 100	> 100	-188,4	-9,4	-4,7	49,688
2	39,889	28,563	26,667	> 100	> 100	-1130,1	-56,5	-169,5	48,125
3	> 100	> 100	10,543	11,286	19,644	-1975,3	-1,8	-934,6	44,623
4	20,237	16,447	8,053	7,123	13,893	-3111,3	270,2	-5072,5	37,263
5	10,596	8,825	7,847	5,522	12,545	-4688,8	758,8	-9894,3	37,439
6	7,666	6,531	8,110	4,719	12,173	-6707,7	1466,7	-15192,3	39,111
7	6,295	5,466	8,464	4,248	12,126	-9168,0	2395,3	-20749,5	40,874
8	5,512	4,862	8,813	3,944	12,205	-12069,8	3545,5	-26342,5	42,422
9	5,009	4,476	9,133	3,733	12,336	-15413,1	4918,2	-31744,1	43,721
10	4,661	4,209	9,420	3,579	12,485	-19197,8	6513,8	-36723,7	44,802
11	4,405	4,013	9,676	3,462	12,636	-23423,9	8335,9	-41047,0	45,705
12	4,185	3,841	9,903	3,369	12,784	-28091,5	10443,8	-44339,6	46,477
13	3,989	3,686	10,107	3,289	12,925	-33200,6	12864,4	-45959,5	47,163
14	3,718	3,447	8,618	2,985	9,727	-37650,4	15600,0	-36634,0	48,157
15	3,488	3,245	7,678	2,760	8,015	-42374,9	18651,5	-21374,6	49,112
	1,300	1,000	1,100	1,100	1,100				