

# **RSE-M**

## **IN-SERVICE INSPECTION RULES FOR MECHANICAL COMPONENTS OF PWR NUCLEAR ISLANDS.**

**2017 EDITION**

**2<sup>nd</sup> Erratum – Juillet 2021**

**Afcen**

AFCEN - Association governed by the French Law of 1<sup>st</sup> July, 1901  
Administrative Offices: AFCEN, Tour AREVA - 92084 Paris la Défense Cedex  
Legal registration No. 2017-206  
ISBN No. 979-10-95971-20-7

## NOTE TO THE USERS

This document proposes modification which correspond to a sign error in parameters (p, q and r) for the calculation of shear stresses in elbows in the RSE-M 2018 English edition.

The following pages are to be replaced:

- Volume II – Appendix 5.4 :
  - **Table VII.4.1.2.2.a** – Page 169
  - **Table VII.4.1.2.2.c** – Page 171
  - **Table VII.4.1.2.2.e** – Page 173

**Table VII.4.1.2.2.a: Elbow  $\psi_c = \pi/4$  – Moment  $M_2$   
Coefficients for the inlet section ( $\psi = 0$ )**

		a	b	c	d	e	f	p	q	r
$\sigma_{1m}$	s1	-0.98378	0.00515	-0.02043	-0.02875	1.00E-03	0.17972	-2.09E-03	1.35E-03	-0.03114
	s3	0.85418	-0.10054	0.17694	-1.06341	3.91E-03	0.27351	1.02E-03	-3.86E-02	0.04281
	s5	0.00836	-0.01004	0.00376	0.00182	-3.33E-04	0.00542	9.55E-03	-2.74E-01	-0.12665
	c0	0.00040	-0.00004	-0.00085	-0.00074	6.39E-05	0.00398	2.34E-01	-8.67E-01	-4.83268
	c2	-0.31145	-0.17108	0.51751	-0.02919	6.15E-04	-0.25125	6.40E-04	-4.00E-02	-0.08270
	c4	-0.39029	0.45316	-0.07698	-0.00313	2.51E-04	0.02725	-1.43E-05	-8.46E-03	-2.07984
$\sigma_{1b}$	s1	-0.52015	0.12180	0.40193	0.01331	-2.70E-04	-0.84740	-2.09E-03	7.59E-02	-1.90309
	s3	-0.05092	0.05015	-0.01566	-0.02397	1.68E-03	0.16398	1.98E-03	3.23E-02	-2.42678
	s5	0.01719	0.00866	-0.03264	0.01427	-3.14E-04	-0.01869	7.84E-03	-2.22E-01	-0.04562
	c0	-0.03947	0.05994	-0.03083	-0.03014	1.98E-03	0.23675	7.13E-04	6.82E-02	-2.44582
	c2	-0.36232	0.08041	0.24922	-0.12920	-1.34E-03	-0.39203	-2.63E-03	1.01E-01	-1.58809
	c4	-1.66623	0.07394	1.64967	-0.06441	2.21E-04	0.01198	-2.01E-04	7.03E-03	-1.11378
$\sigma_{2m}$	s1	-0.04919	0.04014	0.01387	0.01965	-5.52E-04	-0.23326	3.95E-03	-1.06E-01	-1.12095
	s3	-0.01681	0.01924	-0.00552	0.01598	-5.03E-04	-0.11862	1.32E-02	-3.79E-01	-0.15570
	s5	-0.00553	-0.00308	0.01141	-0.00603	1.49E-04	0.00716	6.33E-03	-1.92E-01	-0.04552
	c0	0.03002	-0.02288	0.00988	-0.03758	1.04E-03	0.33462	2.95E-03	-1.29E-01	-0.78999
	c2	0.09331	0.01618	-0.10744	0.02091	-9.89E-04	0.32748	8.20E-04	-7.37E-02	0.46649
	c4	0.02139	0.02025	-0.05431	0.01606	-3.71E-05	-0.01744	-4.89E-03	1.20E-01	-1.12418
$\sigma_{2b}$	s1	-0.02758	0.02096	0.01072	0.00637	-2.31E-04	-0.12181	-1.85E-03	7.87E-02	-2.30248
	s3	-0.04772	-0.04015	0.08539	0.08967	-4.97E-03	0.13221	-3.09E-03	1.54E-02	-1.24963
	s5	-0.07853	0.09310	-0.02421	0.00934	6.24E-04	-0.01723	-1.04E-03	6.94E-02	-2.46390
	c0	-0.01147	0.00547	-0.00117	-0.01356	7.72E-04	0.05943	3.10E-02	-6.45E-01	-0.26337
	c2	2.81915	-0.60430	1.86157	-4.99997	9.94E-03	0.78362	4.53E-04	-1.61E-02	0.07701
	c4	0.08699	-0.09041	0.16761	-0.18931	1.14E-03	0.13941	6.40E-03	-2.20E-01	0.89099
$\sigma_{12m}$	c1	0,05031	-0,03250	-0,02283	-0,01075	3,29E-04	0,12183	2,52E-03	-0,07743	1,98517
	c3	-0,81145	0,01190	-0,06130	0,80606	1,94E-03	0,13363	5,32E-04	-0,01853	0,01027
	c5	0,00354	-0,00511	0,00064	0,00212	-1,55E-04	0,00795	-8,30E-04	0,11411	-0,04281
	s2	0,13507	0,09783	-0,27395	0,15468	-3,35E-03	0,01587	-6,04E-03	0,18096	-1,15169
	s4	0,01732	0,02893	-0,07700	0,04709	-6,92E-04	-0,03235	-3,90E-03	0,12564	0,13728
	s6	-0,00141	0,00417	-0,00393	0,00051	3,60E-05	0,00157	-1,00E-02	0,29417	0,07604
$\sigma_{12b}$	c1	-0,00398	0,00447	-0,00245	0,01552	-9,94E-04	-0,05323	-7,51E-02	0,99971	0,68509
	c3	0,08787	-0,07481	0,17828	-0,25226	2,48E-03	0,05248	-1,62E-03	0,05153	-0,02336
	c5	-0,01080	-0,01907	0,04326	-0,01741	1,25E-04	0,01867	-5,84E-03	0,18141	-0,02112
	s2	-0,20042	0,26169	-0,74119	0,48414	5,67E-03	0,14342	1,98E-02	-0,41493	-2,10782
	s4	0,04948	-0,00765	-0,00476	-0,03704	-8,04E-06	0,01927	-1,54E-03	0,07049	-0,02123
	s6	0,00130	0,00112	-0,00417	0,00200	-4,50E-05	0,00042	-1,06E-02	0,22439	0,63140

-2,52E-03	0,07743	-1,98517
-5,32E-04	0,01853	-0,01027
8,30E-04	-0,11411	-0,04281
6,04E-03	-0,18096	1,15169
3,90E-03	-0,12564	-0,13728
1,00E-02	-0,29417	-0,07604
7,51E-02	-0,99971	-0,68509
1,62E-03	-0,05153	-0,02336
5,84E-03	-0,18141	-0,02112
-1,98E-02	0,41493	2,10782
1,54E-03	-0,07049	-0,02123
1,06E-02	-0,22439	-0,63140

**Table VII.4.1.2.2.c: Elbow  $\psi_c = \pi/4$  – Moment  $M_2$   
Coefficients for the inlet section ( $\psi = 0$ )**

		a	b	c	d	e	f	p	q	r
$\sigma_{1m}$	s1	-0.97668	0.00872	-0.03109	-0.03096	1.10E-03	0.18816	-5.44E-04	-2.92E-02	-0.03326
	s3	-0.27269	-0.32708	0.87873	-0.37809	1.34E-03	0.16222	2.34E-03	-6.74E-02	-0.20051
	s5	0.00457	-0.02404	0.02362	-0.01249	1.27E-05	0.05656	1.03E-02	-2.89E-01	-0.12294
	c0	0.00036	0.00012	-0.00100	-0.00070	6.06E-05	0.00405	2.34E-01	-8.67E-01	-4.83268
	c2	0.08307	-0.11826	0.02616	0.00018	5.40E-05	-0.06748	-5.82E-03	1.26E-01	-2.19435
	c4	-0.29138	0.32156	-0.03168	0.00223	1.03E-04	-0.06517	-6.59E-05	-5.68E-04	-2.03590
$\sigma_{1b}$	s1	-0.46118	0.11850	0.35018	0.03023	-8.97E-04	-0.92857	-3.99E-03	1.31E-01	-2.24010
	s3	0.06022	-0.02588	-0.03055	-0.07030	2.94E-03	0.22820	1.30E-03	-1.06E-01	-0.21644
	s5	-0.00013	-0.00380	0.00259	-0.00652	2.94E-04	0.03444	2.24E-02	-4.53E-01	-0.95653
	c0	0.07970	-0.04447	-0.04906	-0.01579	4.91E-04	0.23739	-8.80E-03	2.67E-01	-3.26146
	c2	-0.32203	0.17343	0.05397	-0.02311	-3.36E-03	-0.47975	-2.86E-03	1.21E-01	-2.01943
	c4	-0.27527	-0.04050	0.37461	-0.08777	1.33E-03	0.05680	1.91E-03	-4.79E-02	-0.88895
$\sigma_{2m}$	s1	-0.08022	0.05282	0.03608	0.02064	-6.21E-04	-0.23600	-3.72E-03	1.08E-01	-2.15326
	s3	-0.01956	0.02123	-0.00228	0.01648	-5.27E-04	-0.12311	1.35E-02	-3.81E-01	-0.15604
	s5	-0.00793	0.00916	0.00005	0.00024	7.45E-06	-0.01326	4.55E-03	-1.22E-01	-1.39794
	c0	0.04344	-0.03694	0.01128	-0.04244	1.23E-03	0.35282	2.93E-03	-1.29E-01	-0.79565
	c2	0.20349	0.03968	-0.24059	0.01362	-5.97E-04	0.36083	3.44E-03	-1.02E-01	-0.23350
	c4	-0.05648	0.02170	0.01945	0.02014	-1.52E-04	-0.00819	-2.78E-04	2.04E-02	-1.25020
$\sigma_{2b}$	s1	0.02974	-0.03062	0.00530	0.01966	-1.31E-03	-0.15308	2.34E-05	7.00E-02	-2.44682
	s3	0.34999	-0.27288	-0.05647	-0.03416	9.13E-04	0.39646	-6.16E-04	8.61E-03	-1.67134
	s5	-0.04565	0.07138	-0.04774	0.02118	3.15E-04	0.00203	-1.56E-03	9.43E-02	-2.48243
	c0	-0.01624	0.01112	-0.00385	-0.02012	1.22E-03	0.08406	3.14E-02	-6.49E-01	-0.26452
	c2	-0.56778	-0.51594	1.70338	-1.35146	1.56E-03	0.09351	2.63E-05	3.35E-03	-0.33303
	c4	-0.12277	-0.20087	0.47641	-0.19855	7.57E-04	0.22704	3.13E-03	-9.00E-02	-0.51811
$\sigma_{12m}$	c1	0,03375	-0,02113	-0,01803	-0,01310	4,20E-04	0,12929	1,00E-02	-0,27901	2,95562
	c3	-0,05827	-0,09856	0,25251	-0,14743	1,73E-03	0,11019	-2,51E-03	0,06744	0,15342
	c5	0,01790	-0,01771	0,00254	-0,01501	5,06E-04	0,05873	-1,05E-03	0,11554	-0,04282
	s2	-0,03487	0,02407	-0,08198	0,17696	-1,60E-03	0,06161	-1,88E-04	-0,00066	0,30524
	s4	-0,22632	0,14537	0,08035	0,00750	-2,54E-04	0,00972	5,50E-04	-0,01856	1,75024
	s6	-0,00595	0,00897	-0,00515	0,00222	-2,39E-05	-0,00229	-1,00E-02	0,29417	0,07602
$\sigma_{12b}$	c1	-0,00395	0,00577	-0,00353	0,02105	-1,35E-03	-0,07232	-6,69E-02	0,86522	1,00118
	c3	-0,21800	-0,09224	0,35689	-0,09190	1,70E-03	-0,02575	-2,86E-03	0,07694	0,26158
	c5	-0,09930	0,01124	0,10637	-0,03079	6,28E-04	0,03747	-1,56E-03	0,03427	1,23007
	s2	0,23960	-0,10045	0,31086	-0,61659	4,93E-03	-0,01357	2,50E-04	-0,01065	0,11873
	s4	0,01504	-0,04383	0,06435	-0,04701	2,45E-04	0,07552	-5,18E-03	0,15336	0,04869
	s6	-0,00114	-0,00343	0,00287	0,01059	-4,97E-04	-0,02253	3,77E-03	0,04049	0,00762

-1,00E-02	0,27901	-2,95562
2,51E-03	-0,06744	-0,15342
1,05E-03	-0,11554	-0,04282
1,88E-04	0,00066	-0,30524
-5,50E-04	0,01856	-1,75024
1,00E-02	-0,29417	-0,07602
6,69E-02	-0,86522	-1,00118
2,86E-03	-0,07694	-0,26158
1,56E-03	-0,03427	-1,23007
-2,50E-04	0,01065	-0,11873
5,18E-03	-0,15336	-0,04869
-3,77E-03	-0,04049	-0,00762

**Table VII.4.1.2.2.e: Elbow  $\psi_c = \pi$  - Moment  $M_2$   
Coefficients for the inlet section ( $\psi = 0$ )**

		a	b	c	d	e	f	p	q	r
$\sigma_{1m}$	s1	-0.98030	0.01173	-0.03066	-0.02681	9.35E-04	0.17247	-6.07E-03	1.37E-01	-1.04711
	s3	-0.81217	-0.35359	1.33022	-0.26477	1.86E-03	0.12685	1.70E-03	-4.23E-02	-0.49209
	s5	-0.00289	-0.02732	0.03704	-0.02256	3.24E-04	0.08184	8.62E-03	-2.51E-01	-0.12819
	c0	0.00048	0.00034	-0.00097	-0.00039	2.96E-05	0.00302	2.34E-01	-8.67E-01	-4.83268
	c2	-0.03448	-0.00761	0.02152	-0.01018	1.01E-03	0.00729	-1.19E-02	4.68E-01	-5.56157
	c4	-0.40380	0.44723	-0.04669	0.01669	-4.12E-04	-0.10756	-5.67E-04	1.17E-02	-2.08745
$\sigma_{1b}$	s1	-0.41714	0.07258	0.35118	0.03095	-1.03E-03	-0.92479	-5.24E-03	1.64E-01	-2.32815
	s3	-0.32265	0.04261	0.31492	-0.08509	2.77E-03	0.12112	1.85E-03	-3.93E-02	-1.09777
	s5	0.00384	-0.01098	0.00654	-0.01627	1.02E-03	0.05574	7.51E-02	-9.51E-01	-0.53927
	c0	0.08520	-0.04719	-0.04895	-0.01697	5.32E-04	0.24128	-9.37E-03	2.80E-01	-3.26424
	c2	-0.39175	0.11182	0.21741	-0.07768	-2.23E-03	-0.41416	-3.69E-03	1.33E-01	-1.75616
	c4	-0.68105	-0.10549	0.85252	-0.09155	1.33E-03	0.03965	1.12E-03	-3.11E-02	-0.79937
$\sigma_{2m}$	s1	-0.06675	0.03708	0.03690	0.02008	-6.25E-04	-0.22132	-5.07E-03	1.43E-01	-2.13809
	s3	-0.00247	-0.00016	0.00044	0.01050	-3.49E-04	-0.07587	1.30E-02	-3.66E-01	-0.15213
	s5	-0.00207	0.00546	-0.00171	0.00385	-1.15E-04	-0.03034	6.01E-03	-1.60E-01	-1.41292
	c0	0.03701	-0.02977	0.01207	-0.04070	1.16E-03	0.34561	2.67E-03	-1.22E-01	-0.79298
	c2	0.23684	0.03191	-0.26124	0.00679	-3.96E-04	0.34448	1.59E-03	-4.60E-02	-0.64725
	c4	-0.09889	0.02848	0.04730	0.01885	3.47E-04	0.02111	-6.00E-04	3.64E-02	-1.29946
$\sigma_{2b}$	s1	-0.03891	0.02495	0.02370	0.00471	-2.00E-04	-0.14501	-4.70E-03	1.56E-01	-2.55911
	s3	0.29109	-0.25589	0.02269	-0.10591	4.11E-03	0.41409	-6.51E-03	1.21E-01	-1.90811
	s5	-0.02878	0.07330	-0.08273	0.03307	5.10E-04	0.01437	-4.35E-03	1.78E-01	-2.67979
	c0	-0.01593	0.01140	-0.00385	-0.02039	1.24E-03	0.08448	3.14E-02	-6.49E-01	-0.26454
	c2	-0.61577	-0.58149	1.83768	-1.36903	7.58E-04	0.14160	-2.66E-05	1.51E-03	-0.22115
	c4	-0.88927	-0.15227	1.21556	-0.24912	3.05E-03	0.25094	1.49E-03	-3.54E-02	-0.91990
$\sigma_{12m}$	c1	0,03328	-0,02072	-0,01770	-0,01421	4,69E-04	0,12987	1,06E-02	-0,29171	2,95346
	c3	-0,25010	-0,11138	0,41645	-0,11915	2,81E-03	0,10850	-3,22E-03	0,07943	-0,31797
	c5	0,02107	-0,01847	0,00225	-0,01948	7,48E-04	0,06227	-6,90E-04	0,11692	-0,04305
	s2	-0,03657	0,02526	-0,10939	0,21888	-2,33E-03	0,01173	-1,35E-03	0,04144	-0,17169
	s4	1,29190	0,13522	-1,43965	0,00479	5,48E-04	0,04627	-2,20E-04	0,00890	0,84895
	s6	-0,00055	0,00607	-0,00709	0,00448	-9,12E-05	-0,01392	-1,05E-02	0,29748	0,07686
$\sigma_{12b}$	c1	-0,00200	-0,00065	-0,00036	0,01212	-8,12E-04	-0,04035	-1,07E-01	1,25014	1,27802
	c3	-0,14259	-0,11727	0,32049	-0,08821	7,12E-04	-0,06089	-4,00E-03	0,12570	-0,45597
	c5	-0,15688	-0,00245	0,18285	-0,04271	1,03E-03	0,05415	-1,96E-03	0,04549	0,99895
	s2	0,27201	-0,09383	0,26899	-0,60958	4,50E-03	-0,01531	4,69E-04	-0,01798	0,19989
	s4	-0,00680	-0,03724	0,07361	-0,03738	1,09E-04	0,04978	1,76E-04	-0,02223	1,50004
	s6	-0,00039	-0,00529	0,00486	0,00849	-4,16E-04	-0,02016	3,39E-03	0,04064	0,00766

-1,06E-02	0,29171	-2,95346
3,22E-03	-0,07943	-0,31797
6,90E-04	-0,11692	-0,04305
1,35E-03	-0,04144	0,17169
2,20E-04	-0,00890	-0,84895
1,05E-02	-0,29748	-0,07686
1,07E-01	-1,25014	-1,27802
4,00E-03	-0,12570	0,45597
1,96E-03	-0,04549	-0,99895
-4,69E-04	0,01798	-0,19989
-1,76E-04	0,02223	-1,50004
-3,39E-03	-0,04064	-0,00766