Generic fender database

The generic fender database contains the properties of several fender types. The contents of the generic fender database cannot be changed. A copy of a leaf can be made into a project's "Material database" node. Here it is possible to change the fender properties.

The generic fender database contains fenders from the following manufacturers:

- Bridgestone Tire Co. Ltd.
- Kléber Industrie
- Sumitomo Rubber Industries Ltd.
- Yokohama Rubber Co. Ltd.

There are 6 fender types available:

Radial cylindrical (Ref. [1])
The inner diameter of all subtypes is half the outer diameter. The properties of the fenders depend on the diameter (= height of the fender) and the length.

Trapezoidal (Ref. [1, 2])
The Kléber trapezoidal and Bridgestone Super M and Super Arch fenders were studied. The dimensionless static load-compression curves are approximately similar for both types of fenders. The load at a compression of 50% of the height of the fender, however, is larger for the Kléber fender than for the Bridgestone types. The information in the database is based on the Kléber fender types, available in four grades. The static load-compression curve of the fender depends on the grade, height and length of the fender.

PI type (Ref. [4])
The static load-compression curve is similar to the trapezoidal fenders. Again the static load-compression curve depends on the grade, height and length of the fender.

Cell (Ref. [1, 3])
The Kléber axial and Bridgestone cell fenders were studied. Comparing both fenders, the cell fenders take a much larger load at a maximum compression. The non-dimensional static load-compression curve has a similar form for the trapezoidal, pi-type and the axial fender. Only the particulars of the Bridgestone cell fenders are included in the database. The static load-compression curve (based on 55% of the height as maximum compression displacement) is used for all cell fender subtypes, although the maximum deflection for the C-type is 50%. The properties of the curve depend on the grade and height of the fender

Air block (Ref. [5])
These fenders differ from the cell fenders in construction. When an air block fender deflects, the air inside is compressed which results in a different static load-compression curve with respect to the cell fenders. The air block fender can be divided into two grades which is caused by the initial air pressure. The properties of the fender depend on the grade and the height of the fender.

Floating pneumatic (Ref. [6])
The floating fender is available in two grades which differ in their initial air pressure. The static load-compression curve depends on the height, length and grade of the fender.

The following figures show the database structure.

Figure Database structure fenders
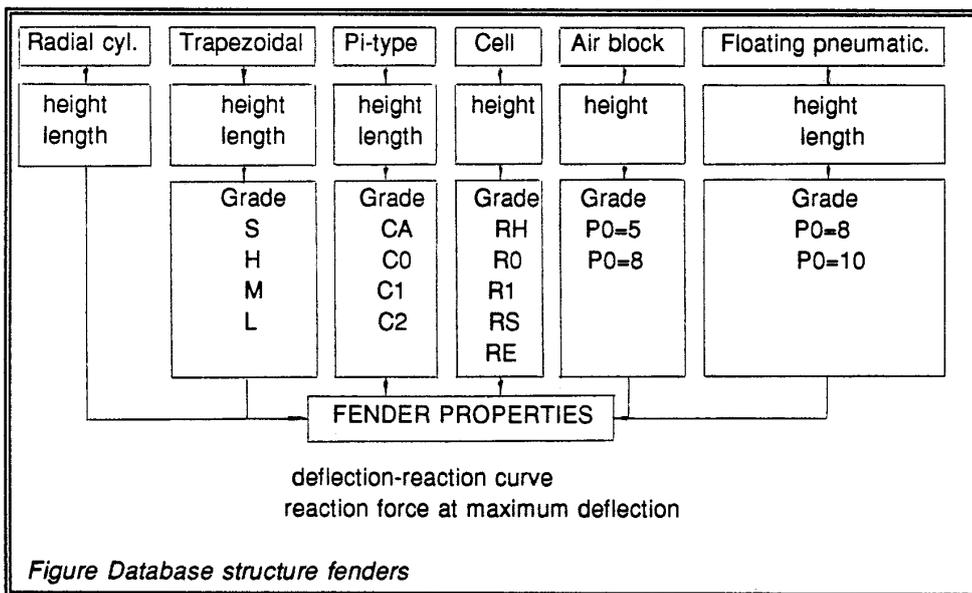
RADIAL CYLINDRICAL FENDERS, BRIDGESTONE
Reaction force and energy absorption are for 50% deflection and 1 m fender length

Height H [m]	Available length L [m]	Reaction force [kN/m]	Energy absorbtion [kNm/m]
0.150	12.0	72	2.3
0.200	12.0	95	4.2
0.250	12.0	120	6.5
0.300	12.0	143	9.5
0.380	12.0	181	15.2
0.400	12.0	191	16.9
0.450	12.0	215	21.4
0.480	12.0	231	24.5
0.500	12.0	239	26.5
0.530	12.0	253	29.6
0.600	12.0	286	38.1
0.700	12.0	335	51.9
0.800	12.0	383	67.8
0.900	12.0	431	85.7
1.000	10.0	479	105.9
1.100	3.0	527	128.1
1.200	3.0	575	152.5
1.300	3.0	623	179.0
1.400	3.0	670	207.6
1.500	3.0	718	238.4
1.600	3.0	766	271.1
1.700	2.5	814	306.2
1.800	2.5	862	343.3
1.900	2.0	909	382.4
2.000	2.0	957	423.8

TRAPEZOIDAL FENDER, KLEBER INDUSTRIE
Reaction force and energy absorbtion are for a 50% deflection and 1 m fender length

Type [-]	Height H [m]	Available length [m]	GRADE S Reaction force [kN/m]	GRADE S Energy absorbt. [kNm/m]	GRADE H Reaction force [kN/m]	GRADE H Energy absorbt. [kNm/m]	GRADE M Reaction force [kN/m]	GRADE M Energy absorbt. [kNm/m]	GRADE L Reaction force [kN/m]	GRADE L Energy absorbt. [kNm/m]
TR 3	0.315	3.0	363	46.1	304	38.3	255	31.4	212	26.5
TR 4	0.420	3.0	492	81.4	410	67.7	341	55.9	284	47.1
TR 5	0.525	3.0	608	126.5	507	105.9	423	88.3	352	72.6
TR 6	0.630	3.0	730	182.5	608	152.1	507	126.5	423	105.0
TR 8	0.840	2.5	981	323.7	819	269.8	683	224.6	569	187.4
TR 10	1.050	2.0	1226	506.2	1024	421.8	853	351.2	711	292.3

PI-TYPE FENDER, SUMITOMO RUBBER INDUSTRIES
Reaction force and energy absorbtion are for a 52.5% deflection and 1 m fender length.
(available lengths 1.0, 1.5, 2.0, 2.5 and 3.0 m)

Type [-]	Height H [m]	CA Reaction force [kN/m]	CA Energy absorbt. [kNm/m]	C0 Reaction force [kN/m]	C0 Energy absorbt. [kNm/m]	C1 Reaction force [kN/m]	C1 Energy absorbt. [kNm/m]	C2 Reaction force [kN/m]	C2 Energy absorbt. [kNm/m]
PI- 400H	0.400	346	53.0	324	49.1	277	42.2	231	35.3
PI- 600H	0.600	520	118.7	485	110.9	416	95.2	346	79.5
PI- 800H	0.800	693	210.9	646	197.2	554	168.7	462	141.3
HPI-1000H	1.000	862	356.1	804	332.6	690	285.5	575	237.4
HPI-1250H	1.250	1077	557.2	1006	519.9	862	445.4	718	370.8
HPI-1400H	1.400	1207	698.5	1126	651.4	965	559.2	804	466.0
HPI-1700H	1.700	1466	1030.1	1368	961.4	1172	824.0	977	686.7
HPI-2000H	2.000	1724	1425.4	1609	1330.2	1379	1139.9	1150	950.6
HPI-2500H	2.500	2155	226.9	2011	2078.7	1724	1781.5	1436	1484.3

CELL FENDERS, BRIDGESTONE
Reaction force and energy absorbtion is based on 55% deflection (maximum deflection)
(For "C" type fenders the reaction force should be based on 50% deflecion)

Type -	Height H m	Grade RH Reaction force kN	Grade RH Energy absorbtion kNm	Grade RO Reaction force kN	Grade RO Energy absorbtion kNm	Grade R1 Reaction force kN	Grade R1 Energy absorbtion kNm	Grade RS Reaction force kN	Grade RS Energy absorbtion kNm	Grade RE Reaction force kN	Grade RE Energy absorbtion kNm
C400H	0.400	97	13.7	75	10.8	59	8.8	119	16.7	126	18.6
C500H	0.500	160	28.4	125	22.6	99	17.7	187	34.3	211	38.3
SUC630H	0.630	237	57.9	182	44.1	146	35.3	274	75.5	309	85.3
SUC800H	0.800	378	119.7	292	92.2	225	73.6	438	153.0	493	172.7
SUC1000H	1.000	603	263.9	464	203.1	372	162.8	697	304.1	785	343.4
SUC1150H	1.150	799	401.2	614	309.0	491	247.2	921	463.0	1038	521.9
SUC1250H	1.250	943	516.0	725	396.3	581	316.9	1088	594.5	1226	670.0
SUC1450H	1.450	1269	804.4	976	619.0	781	495.4	1465	929.0	1650	1045.7
SUC1600H	1.600	1545	1081.1	1189	831.9	951	655.1	1782	1247.8	2008	1405.8
SUC1700H	1.700	1744	1296.9	1342	997.7	1073	798.5	2013	1496.0	2267	1686.3
SUC2000H	2.000	2414	2112.1	1857	1624.5	1485	1299.8	2785	2436.8	3138	2744.8
SUC2250H	2.250	3391	3337.4	2608	2567.3	2217	2181.7	3913	3850.4	4404	4339.0
SUC2500H	2.500	4187	4578.3	3221	3521.8	2738	2993.0	4831	5282.7	5444	5451.7
C3000H	3.000	6622	7063.2	5101	5346.5	4316	4561.7	–	–	–	–

AIR BLOCKFENDERS, YOKOHAMA (pneumatic fenders)
Reaction force and energy absorbtion are for a 60% deflection

Type -	Height H m	P0 = 8 N/cm^2 Reaction force kN	P0 = 8 N/cm^2 Energy absorbtion kNm	P0 = 10 N/cm^2 Reaction force kN	P0 = 10 N/cm^2 Energy absorbtion kNm
800H	0.800	394	76.5	452	88.3
900H	0.900	499	107.9	572	125.6
1000H	1.000	616	148.1	706	172.7
1100H	1.100	746	198.2	854	229.6
1200H	1.200	887	257.0	1020	298.2
1350H	1.350	1118	365.9	1285	424.8
1500H	1.500	1383	501.3	1589	582.7
1800H	1.800	1991	866.2	2286	1010.4
2000H	2.000	2462	1187.0	2825	1383.2
2100H	2.100	2717	1373.4	3120	1599.0
2250H	2.250	3120	1687.3	3581	1962.0
2400H	2.400	3551	2050.3	4071	2383.8

P0 = initial air pressure

FLOATING PNEUMATIC RUBBER YOKOHAMA
Reaction force and energy absorbtion are for a 55% deflection of the height

| Height H m	Length L m	P0 = 5 N/cm^2 Reaction force kN	P0 = 5 N/cm^2 Energy absorbtion kNm	P0 = 8 N/cm^2 Reaction force kN	P0 = 8 N/cm^2 Energy absorbtion kNm
0.500	1.000	49	4.2	–	–
0.600	1.000	58	5.9	–	–
0.700	1.500	103	12.5	–	–
1.000	1.500	139	23.7	–	–
1.000	2.000	196	33.6	–	–
1.200	2.000	229	47.3	–	–
1.350	2.500	325	76.6	–	–
1.500	3.000	430	37.6	–	–
1.700	3.000	479	142.0	–	–
2.000	3.500	654	225.6	–	–
2.200	4.500	976	370.9	–	–
2.500	4.000	939	396.2	–	–
2.500	5.500	1341	588.6	1802	816.7
3.300	4.500	1559	897.3	2063	1226.3
3.300	6.500	2406	1337.7	3205	1915.3
3.300	10.600	4037	2253.0	5381	3195.3
4.500	9.000	4531	3550.3	5951	5003.1
4.500	12.000	6213	4774.2	8402	6867.0

P0 = initial air pressure

DIMENSIONLESS REACTION FORCE CHARACTERISTICS FOR FENDERS

R = reaction force

Rm = reaction force from the tables

———————— RADIAL CYLINDER FENDER, BRIDGESTONE
— — — — — — TRAPEZOIDAL FENDER , KLEBER INDUSTRIE
——— — ——— PI-TYPE FENDER , SUMITOMO
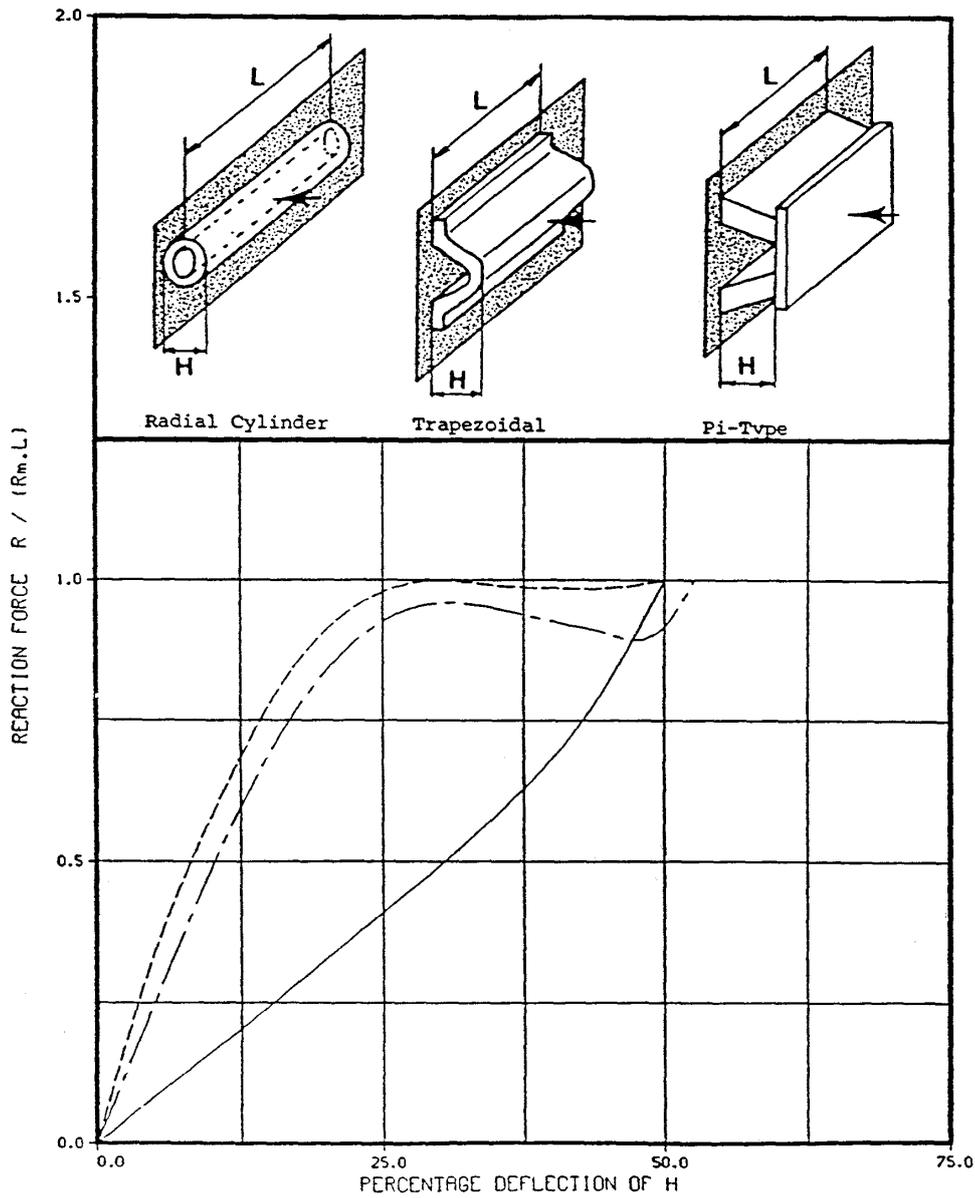
Radial Cylinder   Trapezoidal   Pi-Type

REACTION FORCE   R / (Rm.L)

PERCENTAGE DEFLECTION OF H

DIMENSIONLESS REACTION FORCE CHARACTERISTICS FOR FENDERS

R = reaction force

Rm = reaction force from the tables

———————	CELL FENDERS	, BRIDGESTONE
— — — — — — —	AIR BLOCK FENDERS (ABF-P)	, YOKOHAMA
——— - ———	FLOATING PNEUMATIC RUBBER FENDER,	YOKOHAMA

PERCENTAGE DEFLECTION OF H
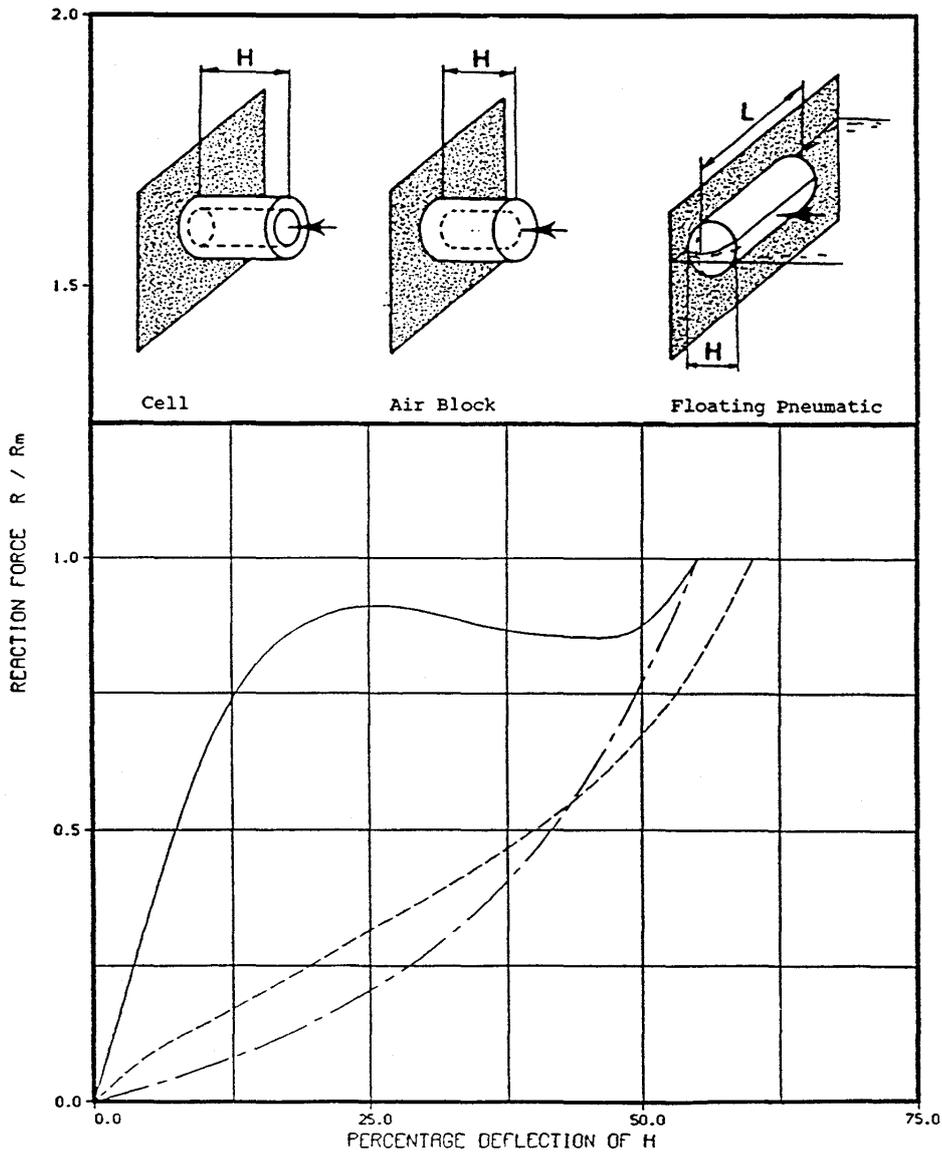
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