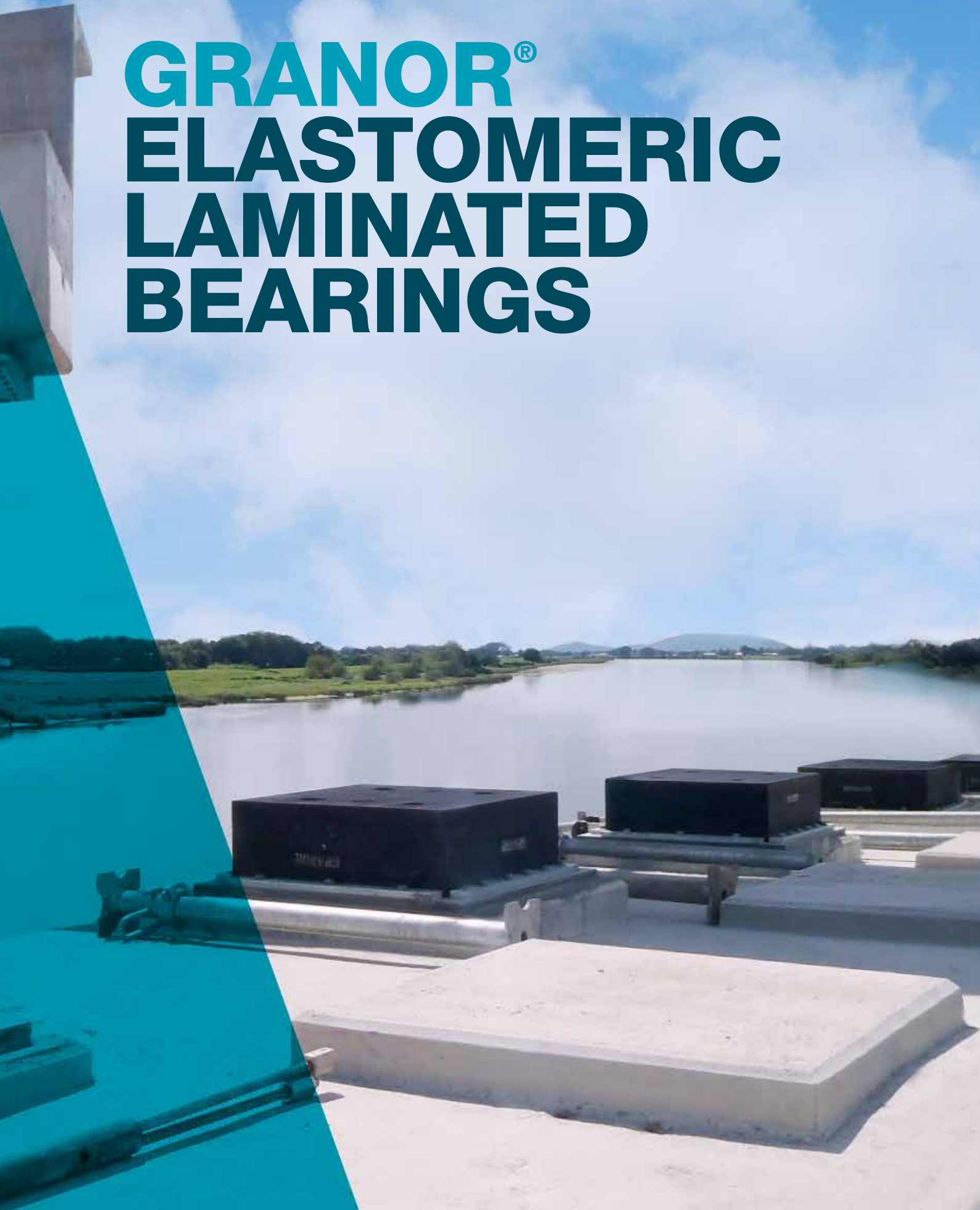


# GRANOR<sup>®</sup> ELASTOMERIC LAMINATED BEARINGS



# THE GRANOR® ELASTOMERIC LAMINATED BEARING RANGE

Elastomeric Laminated Bearings ("ELB's") are made from high purity elastomers which encapsulate layered internal steel reinforcing plates. Designed for use in bridge and building construction – under pre-cast concrete beams, steel beam supports and other support points. They are an effective means of giving long expansive structures freedom to move independent of the supports. Structural movement is generated by many different effects including thermal expansion/contraction, long term concrete creep and shrinkage, post tensioning effects, braking loads, wind loads, foundation settlement, and others. Without freed up support conditions these structures would build up considerable internal stresses leading to major safety issues such as structural cracking and concrete cancer.

Manufactured from high quality natural rubber, elastomeric bearings have been shown via numerous case studies to be an extremely reliable maintenance free bearing option. One such

example is work undertaken by Stevenson in 1985 involving testing of old "India Rubber" (Natural Rubber) bearing pads removed from the old Flinders Street Rail Viaduct in Melbourne. The viaduct was originally completed in 1889 so these pads had been in service for close to 100 years. The tests indicated that the parent material close to the surface of the bearing pads and representing the substantive volume of the bearing pads provided physicals and attributes very close to those tested and recorded at time of installation some 100 years prior. Over the nearly 100 years oxidation had occurred only within 5mm of the pads exposed rubber surfaces. Keeping in mind that technology in compounding of rubber has greatly improved since these pads were installed it can be safely stated that current day elastomeric bearings can be given a predictable design life expectancy of at least 100 years.

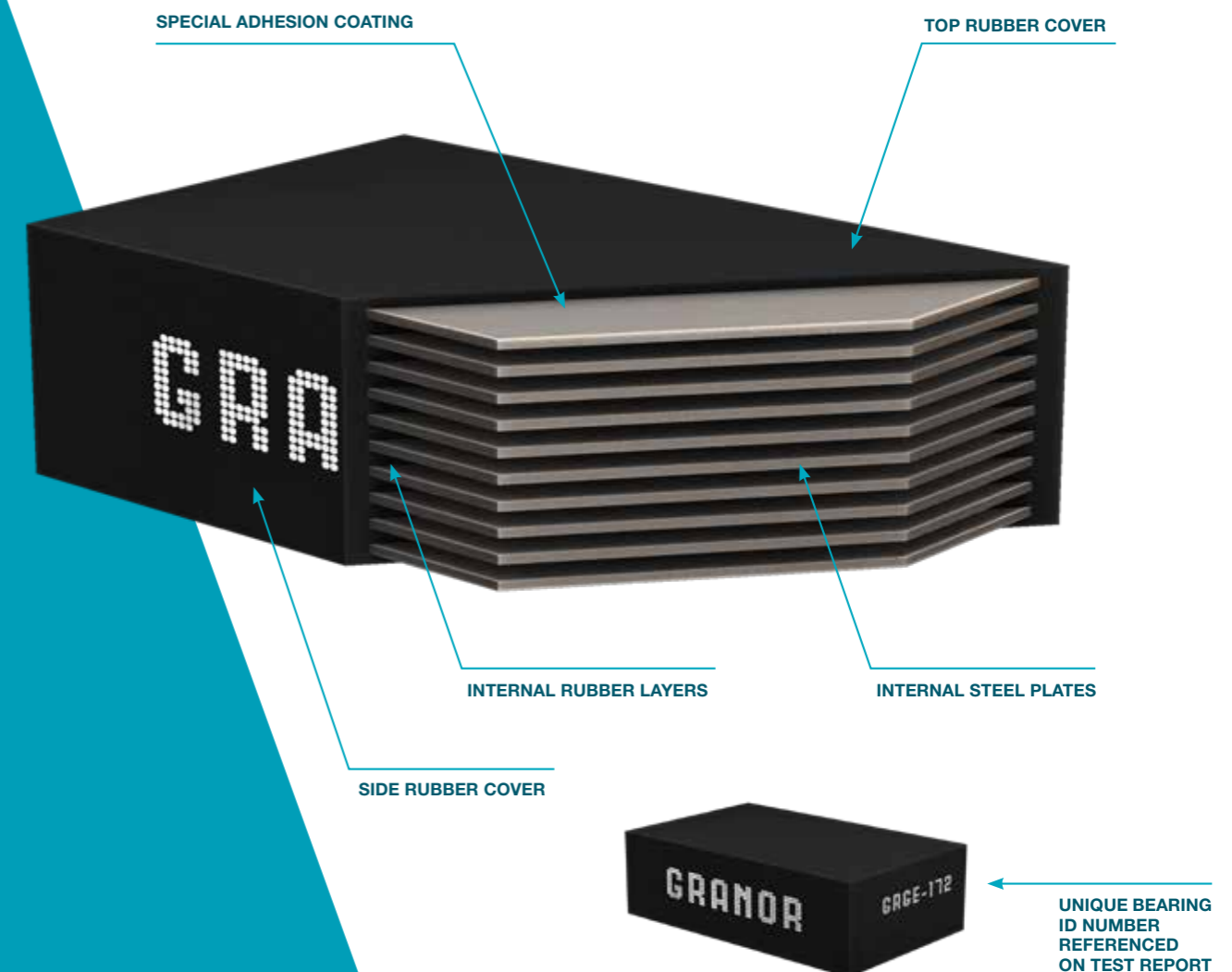
## FREEDOM INSTEAD OF RESTRAINT

## SYSTEM COMPONENTS

Design, manufacture and subsequent National Association of Testing Authorities (ILAC) MRA certified testing of Granor Elastomeric Bearings is to recognised Australian and international standards. Granor supplies bearings in accordance with Australian Standard AS5100.4 from natural rubber (other standards include: BS5400, EN1337, AASHTO). State authority regulations are catered for including RMS B281, TMR MRTS81, MRWA spec 860, VicRoads 652, etc. Granor's standard practice is to fully load test every single laminated bearing we supply (whether required to by specification or not).

Granor has a full design capability and can custom design non-standard sized laminated bearings for unique project requirements. Current maximum elastomeric laminated bearing size capabilities are: 2000 x 2000 x 440 millimeters. Current maximum testing capabilities are: 50,000kN vertical and 5,000kN shear. As the supplier with the longest continuous supply record of laminated bearings in Australia, Granor is proud to support the bridge and heavy construction sectors with its more than 40 years of proven quality supply history.

## LONG LIFE WITH ZERO MAINTENANCE

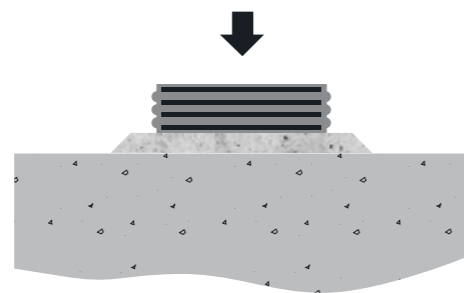


# PRODUCT FEATURES

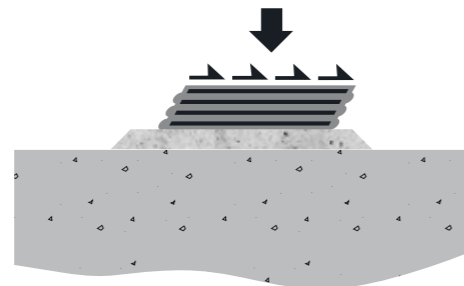
SUPPLIED BY GRANOR FOR MORE THAN 40 YEARS

- > Frees up support conditions allowing movement
- > Reduces shear / moment reactions in piers and abutments
- > Extremely durable proven technology
- > Zero maintenance
- > Economical

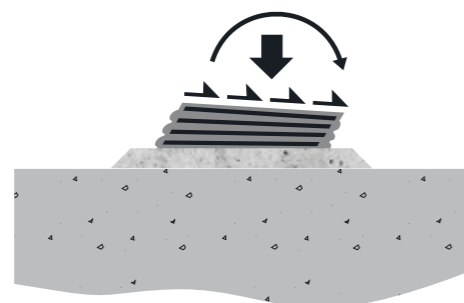
## UNDER COMPRESSION



## UNDER COMPRESSION & SHEAR



## UNDER COMPRESSION, SHEAR & ROTATION



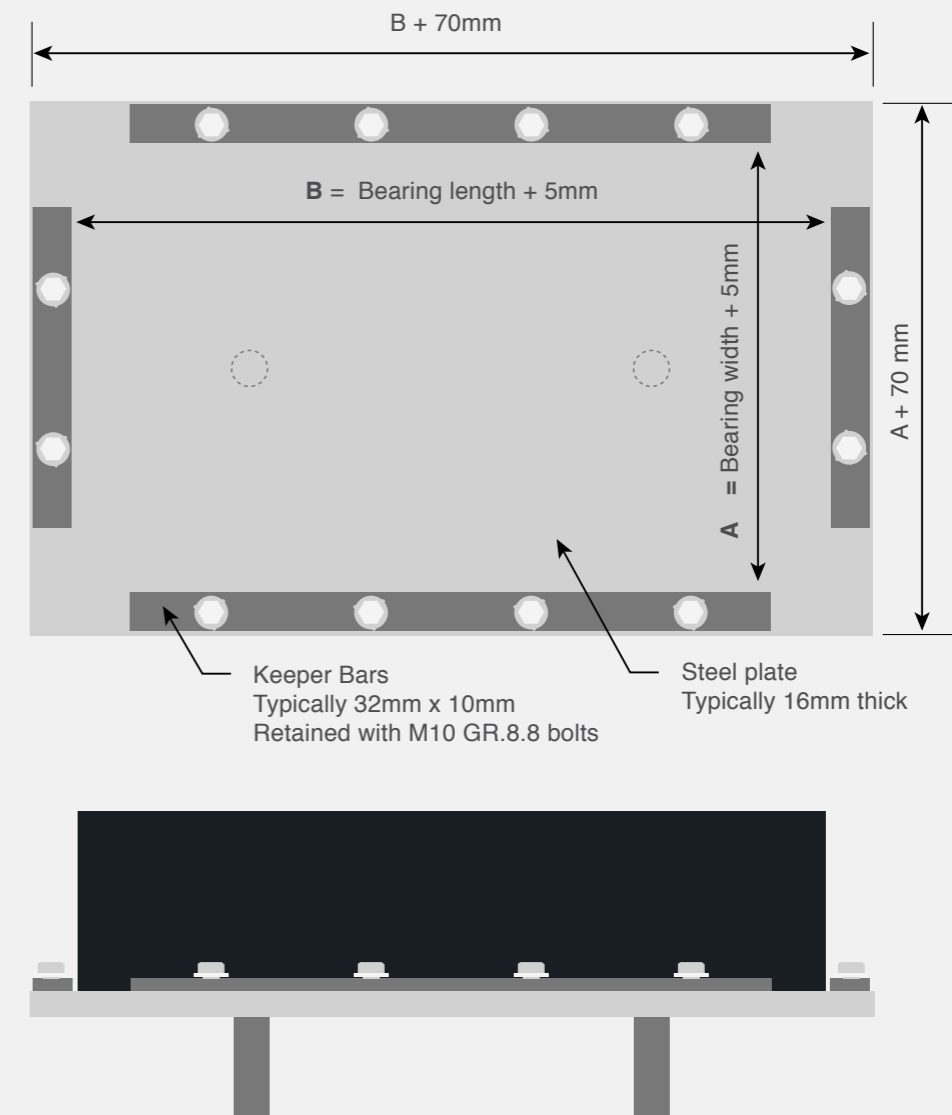
# INSTALLATION

Whilst elastomeric laminated bearings have extremely good design life it is always good design practice to detail installation in a way that facilitates possible removal for inspection / replacement of the bearings.

Options for installation vary greatly depending on the material for contact surfaces, i.e. concrete, steel, or a combination of both.

The following basic design guidelines should be considered:

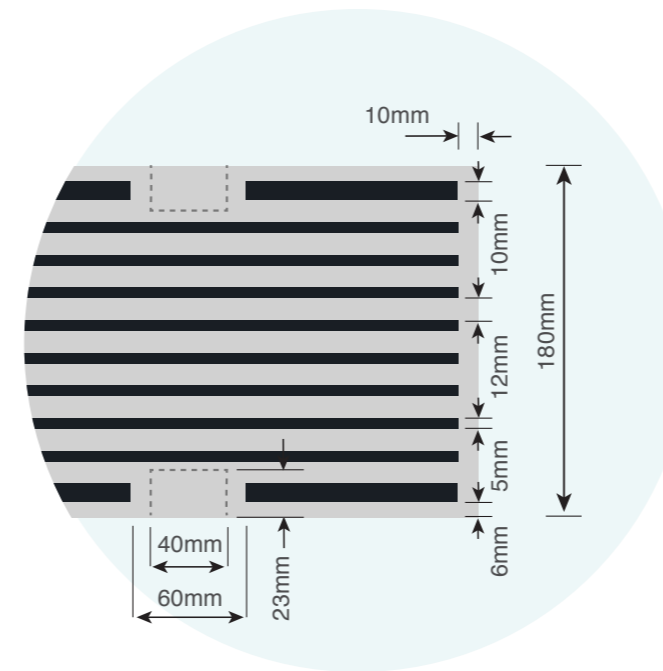
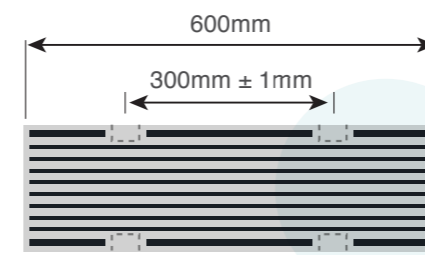
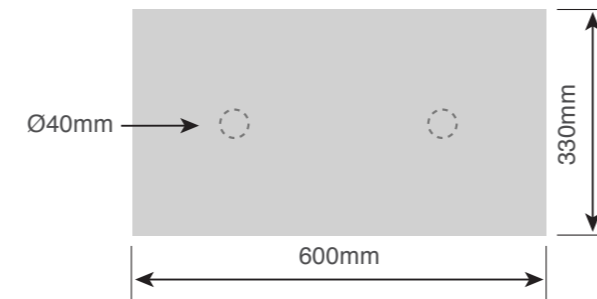
- > Flatness of contact surfaces should be within +/- 1mm over the required area. Where there is any out of parallelism due to construction tolerances this should be considered in the context of the total available rotation capacity of the bearing.
- > The texture of the contact surface should be kept at a high coefficient of friction. Where concrete mortar pads are used specify a rough "wood float" finish. Where steel retainer plates are used bolted on flat keeper bars should be specified around the perimeter of the bearing.
- > If the minimum load case stress on the ELB's is greater than 3MPa then the friction generated by wood float finish mortar pads is considered sufficient to prevent the bearings from gradually "walking" out of position under light load. If the minimum load case stress is less than 3MPa then steel retainer plates with flat keeper bars are recommended. However always consult with relevant state authority for preferred details in the applicable region.
- > Note that it is recommended that adhesives, including epoxies, not be used to restrain bearings from "walking" out of position under light load. The reason for this is that if the adhesive should fail then the resulting surface will typically have a very smooth low friction surface which may be worse than if no adhesive had been used.
- > Edge clearance – support area should always be larger than the ELB. A distance of approx. 25mm around the bearing should be adopted as minimum.
- > Supporting mortar pads under the bearings should be of a high quality cementitious grout or epoxy mortar and should be of at least 40MPa compressive strength. Mortar pads should be as flat and level as possible. Thick mortar pads may require reinforcing.
- > Bearings can be supplied with blind holes if necessary for mechanical restraint with steel "stub" dowels. Note however that the use of steel stub dowels to achieve positive retention makes removal of the bearings more difficult and is therefore to be discouraged unless required for project specific reasons (for example some seismic designs).



## KEEPER PLATE DETAIL - TYPICAL

The use of a Keeper Plate (or 'Retainer' Plate) achieves retention of the bearing and permits easy removability of the bearing with minimum jacking of the structure by removal of a "keeper bar". The Keeper Plate can be welded to the structure, or more commonly, retained by suitable counter-sunk fixings through the 16mm plate, into cast in ferrules.

# SPECIFICATIONS



## STUB DOWELS - TYPICAL

Stub Dowels – either direct through the mortar pad, or from a cast in steel plate, will positively locate the bearing and prevent “walking out”. However, it makes the bearing difficult to remove.

## MULTIPLE STUB DOWELS - TYPICAL

In some special applications (eg seismic areas) positive retention to both top and bottom faces is required. This arrangement uses Stub Dowels in both top & bottom and includes the addition of thicker than standard outer steel plates. The supply with various hole diameters and numbers of holes is possible.

## SPECIFICATIONS

## RECTANGULAR SERIES A-D

AS5100.4-2004

GRANOR Part number	Overall height mm	Calculated Compressive stiffness at zero shear kN/mm	Mean shear stiffness kN/mm	Calculated rotational stiffness kNm/rad	Shear deflection capacity mm	Rated load at ZERO rotation		Rated load at MAX rotation		AS Part No.	Mass kg
						At max. shear kN	At zero shear kN	At max. shear kN	At zero shear kN		
<b>SERIES A – 230 × 150</b>											
GAA-02	35	307	1.19	147	10.0	360	451	204	253	010602R-5	5
GAA-04	57	189	0.74	90	16.0	343	420	197	251	010604R-5	8
GAA-06	79	136	0.54	65	22.0	257	306	190	250	010606R-5	11
GAA-08	101	107	0.43	51	27.6	192	240	185	240	010608R-5	14
GAB-01	27	229	1.40	108	8.5	246	312	158	196	010901R-5	3
GAB-02	41	133	0.92	62	13.0	237	312	148	187	010902R-5	5
GAB-04	69	72	0.54	34	22.0	171	204	137	181	010904R-5	8
GAB-06	97	50	0.38	23	27.6	116	145	116	145	010906R-5	12
<b>SERIES B – 230 × 200</b>											
GBA-02	35	580	1.59	605	10.0	597	615	311	381	020602R-5	6
GBA-04	57	357	0.99	371	16.0	576	615	303	378	020604R-5	11
GBA-06	79	258	0.72	268	22.0	556	615	296	376	020606R-5	15
GBA-09	112	182	0.51	189	31.0	402	481	287	375	020609R-5	21
GBB-01	27	440	1.87	441	8.5	405	504	246	301	020901R-5	5
GBB-02	41	257	1.22	255	13.0	394	504	231	287	020902R-5	7
GBB-04	69	140	0.72	138	22.0	374	452	217	277	020904R-5	11
GBB-06	97	96	0.51	95	31.0	268	321	207	273	020906R-5	16
GBB-08	125	73	0.40	72	37.6	199	248	199	248	020908R-5	21
<b>SERIES C – 350 × 170</b>											
GCA-02	35	775	2.05	464	10.0	801	801	457	564	030602R-5	8
GCA-04	57	477	1.28	285	16.0	786	801	443	559	030604R-5	14
GCA-06	79	344	0.93	205	22.0	681	791	431	557	030606R-5	18
GCA-09	112	243	0.66	145	31.0	451	562	413	556	030609R-5	27
GCB-02	41	344	1.58	196	13.0	539	700	336	422	030902R-5	9
GCB-04	69	187	0.93	106	22.0	454	528	313	408	030904R-5	15
GCB-06	97	129	0.66	73	31.0	301	374	297	374	030906R-5	21
<b>SERIES D – 350 × 280</b>											
GDB-02	45	755	2.25	1 430	15.0	1 194	1 287	639	785	040902R	15
GDB-04	73	464	1.41	877	24.0	1 151	1 287	622	779	040904R	25
GDB-06	101	335	1.02	633	33.0	1 097	1 256	606	776	040906R	34
GDB-08	129	262	0.81	495	42.0	828	987	592	774	040908R	44
GDB-10	157	215	0.66	406	51.0	653	813	577	773	040910R	54
GDC-02	51	433	1.88	794	18.0	890	1 138	522	647	041202R	16
GDC-04	85	243	1.13	442	30.0	846	1 036	492	628	041204R	26
GDC-06	119	168	0.81	307	42.0	621	740	472	620	041206R	37
GDC-08	153	129	0.63	235	52.0	461	576	459	576	041208R	48
GDD-02	57	257	1.61	466	21.0	709	917	430	538	041502R	17
GDD-04	97	137	0.94	248	36.0	595	691	399	518	041504R	28
GDD-06	137	94	0.66	169	51.0	392	488	378	488	041506R	40

## Notes

1. Rated shear deflection may be based on the limit of 20% reduction in net loaded area, rather than the 50% of rubber free to shear.
2. If through hole(s) are required in a bearing, then typically load capacity reduces in the order of 25% of rated load, at zero shear. More holes and / or larger diameter will further reduce load bearing capacity.
3. Manufacturing tolerance does not apply to compressive stiffness, but results are typically within a mean of +/-20%.
4. Performance testing is generally specified in accordance with Appendix D of the AS.5100.4
5. Dimensions provided are subject to standard manufacturing tolerances.

## SPECIFICATIONS

## RECTANGULAR SERIES E-G

AS5100.4-2004

GRANOR Part number	Overall height mm	Calculated Compressive stiffness at zero shear kN/mm	Mean shear stiffness kN/mm	Calculated rotational stiffness kNm/rad	Shear deflection capacity mm	Rated load at ZERO rotation		Rated load at MAX rotation		AS Part No.	Mass kg
						At max. shear kN	At zero shear kN	At max. shear kN	At zero shear kN		
<b>SERIES E – 480 × 250</b>											
GEB-02	45	953	2.76	1 216	15.0	1 539	1 587	862	1 065	050902R	18
GEB-04	73	586	1.73	746	24.0	1 475	1 587	836	1 057	050904R	30
GEB-06	101	423	1.25	538	33.0	1 237	1 445	812	1 054	050906R	42
GEB-08	129	331	0.99	421	42.0	928	1 135	789	1 052	050908R	54
GEC-02	51	548	2.30	676	18.0	1 145	1 478	700	875	051202R	20
GEC-04	85	307	1.38	377	30.0	1 036	1 192	658	850	051204R	32
GEC-06	119	213	0.99	261	42.0	696	851	626	840	051206R	45
GED-02	57	326	1.97	398	21.0	909	1 190	575	726	051502R	21
GED-04	97	174	1.15	212	36.0	670	795	531	701	051504R	35
GED-06	137	119	0.81	144	46.0	449	561	449	561	051506R	49
<b>SERIES F – 480 × 300</b>											
GFB-03	59	1 115	2.55	2 308	19.5	1 932	1 932	1 135	1 403	060903R	29
GFB-05	87	755	1.74	1 561	28.5	1 932	1 932	1 108	1 396	060905R	44
GFB-07	115	571	1.32	1 179	37.5	1 852	1 932	1 084	1 393	060907R	58
GFB-09	143	459	1.07	947	46.5	1 438	1 725	1 060	1 391	060909R	73
GFC-02	51	855	2.76	1 689	18.0	1 601	1 932	946	1 171	061202R	24
GFC-04	85	480	1.66	942	30.0	1 528	1 932	896	1 138	061204R	39
GFC-06	119	334	1.18	653	42.0	1 217	1 432	861	1 124	061206R	55
GFC-08	153	256	0.92	500	54.0	899	1 114	830	1 114	061208R	71
GFD-02	57	514	2.37	991	21.0	1 273	1 638	782	976	061502R	25
GFD-04	97	275	1.38	527	36.0	1 165	1 337	730	942	061504R	42
GFD-06	137	188	0.97	359	51.0	772	944	693	928	061506R	59
<b>SERIES G – 480 × 380</b>											
GGB-04	73	1 484	2.62	5 860	24.0	2 484	2 484	1 570	1 933	070904R	47
GGB-06	101	1 072	1.91	4 228	33.0	2 484	2 484	1 544	1 927	070906R	65
GGB-08	129	840	1.50	3 307	42.0	2 484	2 484	1 520	1 923	070908R	84
GGB-10	157	690	1.23	2 715	51.0	2 484	2 484	1 496	1 921	070910R	102
GGC-03	68	1 040	2.62	3 836	24.0	2 377	2 484	1 310	1 618	071203R	40
GGC-05	102	667	1.75	2 448	36.0	2 292	2 484	1 262	1 589	071205R	60
GGC-07	136	491	1.31	1 797	48.0	2 083	2 404	1 226	1 575	071207R	80
GGC-10	187	352	0.95	1 285	66.0	1 428	1 748	1 178	1 564	071210R	110
GGD-03	77	616	2.21	2 185	28.5	1 883	2 434	1 086	1 355	071503R	43
GGD-05	117	385	1.45	1 357	43.5	1 798	2 122	1 036	1 325	071505R	64
GGD-07	157	279	1.08	984	58.5	1 321	1 578	998	1 311	071507R	86
GGD-09	197	220	0.86	772	72.0	1 005	1 256	970	1 256	071509R	108

## SPECIFICATIONS

## RECTANGULAR SERIES H-K

AS5100.4-2004

GRANOR Part number	Overall height mm	Calculated Compressive stiffness at zero shear kN/mm	Mean shear stiffness kN/mm	Calculated rotational stiffness kNm/rad	Shear deflection capacity mm	Rated load at ZERO rotation		Rated load at MAX rotation		AS Part No.	Mass kg
						At max. shear kN	At zero shear kN	At max. shear kN	At zero shear kN		
<b>SERIES H – 600 × 330</b>											
GHB-05	87	1 293	2.40	3 291	28.5	2 697	2 697	1 766	2 210	080905R	61
GHB-07	115	978	1.82	2 486	37.5	2 697	2 697	1 732	2 204	080907R	81
GHB-09	143	786	1.47	1 998	46.5	2 630	2 697	1 699	2 201	080909R	101
GHB-11	171	657	1.23	1 669	55.5	2 128	2 592	1 665	2 199	080911R	121
GHC-03	68	1 074	2.85	2 559	24.0	2 552	2 697	1 476	1 839	081203R	44
GHC-05	102	689	1.90	1 632	36.0	2 445	2 697	1 417	1 807	081205R	65
GHC-07	136	507	1.42	1 198	48.0	1 900	2 248	1 369	1 792	081207R	87
GHC-09	170	401	1.14	947	60.0	1 450	1 799	1 326	1 783	081209R	109
GHD-02	57	909	3.25	2 097	21.0	2 071	2 644	1 263	1 568	081502R	34
GHD-04	97	488	1.90	1 116	36.0	1 963	2 398	1 183	1 514	081504R	58
GHD-06	137	333	1.34	761	51.0	1 414	1 693	1 129	1 493	081506R	82
GHD-08	177	253	1.03	577	62.0	1 046	1 308	1 046	1 308	081508R	105
<b>SERIES J – 600 × 450</b>											
GJC-03	68	2 117	3.88	11 527	24.0	3 741	3 741	2 339	2 869	091203R	60
GJC-05	102	1 363	2.59	7 363	36.0	3 741	3 741	2 265	2 821	091205R	90
GJC-07	136	1 005	1.94	5 409	48.0	3 741	3 741	2 211	2 797	091207R	120
GJC-09	170	796	1.55	4 275	60.0	3 639	3 741	2 163	2 783	091209R	150
GJC-11	204	659	1.29	3 534	72.0	2 935	3 525	2 118	2 774	091211R	180
GJD-03	77	1 287	3.27	6 606	28.5	3 504	3 741	1 968	2 432	091503R	64
GJD-05	117	806	2.14	4 106	43.5	3 373	3 741	1 888	2 382	091505R	96
GJD-07	157	586	1.59	2 979	58.5	2 998	3 470	1 829	2 358	091507R	128
GJD-09	197	461	1.27	2 337	73.5	2 290	2 762	1 777	2 344	091509R	161
GJD-11	237	380	1.05	1 923	86.0	1 835	2 294	1 744	2 294	091511R	193
GJE-03	86	822	2.82	4 072	33.0	2 897	3 734	1 676	2 088	091803R	67
GJE-05	132	506	1.83	2 497	51.0	2 765	3 317	1 599	2 043	091805R	102
GJE-07	178	366	1.35	1 800	69.0	2 059	2 452	1 540	2 022	091807R	137
GJE-09	224	286	1.07	1 408	86.0	1 556	1 945	1 492	1 945	091809R	172
<b>SERIES K – 600 × 600</b>											
GKD-04	97	1 730	3.45	19 417	36.0	5 046	5 046	2 803	3 444	101504R	107
GKD-06	137	1 187	2.44	13 225	51.0	5 046	5 046	2 725	3 394	101506R	151
GKD-08	177	904	1.88	10 061	66.0	5 046	5 046	2 666	3 367	101508R	194
GKD-10	217	729	1.53	8 108	81.0	4 608	5 046	2 614	3 351	101510R	237
GKD-13	277	566	1.20	6 279	103.5	3 443	4 191	2 542	3 335	101513R	303
GKE-04	109	1 113	2.96	11 953	42.0	4 597	5 046	2 415	2 987	101804R	114
GKE-06	155	756	2.07	8 085	60.0	4 443	5 046	2 338	2 943	101806R	160
GKE-08	201	572	1.59	6 109	78.0	4 011	4 635	2 278	2 919	101808R	207
GKE-10	247	460	1.29	4 909	96.0	3 142	3 766	2 224	2 905	101810R	254
GKE-12	293	385	1.09	4 103	114.0	2 548	3 171	2 172	2 895	101812R	300



## SPECIFICATIONS

## CIRCULAR SERIES N-R

AS5100.4-2004

GRANOR Part number	Overall height mm	Calculated Compressive stiffness at zero shear kN/mm	Mean shear stiffness kN/mm	Calculated rotational stiffness kNm/rad	Shear deflection capacity mm	Rated load at ZERO rotation		Rated load at MAX rotation		AS Part No.	Mass kg
						At max. shear kN	At zero shear kN	At max. shear kN	At zero shear kN		
<b>SERIES N 2400 Circular</b>											
GNA-02	35	641	1.56	815	10.0	612	612	314	384	110602C-5	6
GNA-04	57	394	0.98	500	16.0	612	612	306	380	110604C-5	11
GNA-06	79	285	0.71	361	22.0	612	612	299	379	110606C-5	15
GNA-08	101	223	0.56	282	28.0	597	612	293	378	110608C-5	19
GNA-10	123	183	0.46	232	34.0	485	598	287	377	110610C-5	23
GNB-02	41	286	1.20	345	13.0	441	565	238	294	110902C-5	7
GNB-04	69	156	0.71	187	22.0	417	565	222	283	110904C-5	11
GNB-06	97	107	0.50	128	31.0	362	437	212	278	110906C-5	16
GNB-08	125	82	0.39	98	35.8	271	339	211	276	110908C-5	20
GNB-10	153	66	0.32	79	35.8	221	277	216	275	110910C-5	25
GNC-02	47	141	0.98	166	16.0	328	428	183	229	111202C-5	7
GNC-04	81	73	0.56	86	28.0	303	363	168	220	111204C-5	12
GNC-06	115	50	0.39	58	35.8	203	254	164	216	111206C-5	17
GNC-08	149	37	0.30	44	35.8	156	196	156	196	111208C-5	22
<b>SERIES Q 3300 Circular</b>											
GQB-03	59	564	1.51	1 370	19.5	1 181	1 191	567	701	120903C-5	20
GQB-05	87	382	1.04	926	28.5	1 135	1 191	553	697	120905C-5	27
GQB-07	115	289	0.79	699	37.5	1 089	1 191	541	695	120907C-5	35
GQB-10	157	211	0.58	512	50.0	805	1 006	525	694	120910C-5	49
GQC-02	51	426	1.64	1 001	18.0	896	1 149	476	589	121202C-5	14
GQC-04	85	239	0.98	558	30.0	850	1 149	448	569	121204C-5	24
GQC-06	119	166	0.70	387	42.0	762	916	429	561	121206C-5	33
GQC-08	153	127	0.55	296	50.0	570	713	423	557	121208C-5	43
GQD-02	57	254	1.41	586	21.0	712	925	394	492	121502C-5	15
QD-04	97	136	0.82	312	36.0	665	855	365	471	121504C-5	25
GQD-06	137	93	0.58	213	50.0	483	604	348	464	121506C-5	36
<b>SERIES R 4000 Circular</b>											
GRB-04	73	860	1.81	3 108	24.0	1 701	1 701	924	1 142	130904C	32
GRB-07	115	545	1.16	1 968	37.5	1 701	1 701	898	1 136	130907C	51
GRB-10	157	399	0.85	1 440	51.0	1 701	1 701	874	1 134	130910C	70
GRC-02	51	822	2.41	2 833	18.0	1 543	1 701	795	976	131202C	21
GRC-04	85	462	1.45	1 581	30.0	1 477	1 701	753	944	131204C	34
GRC-06	119	321	1.03	1 096	42.0	1 411	1 701	726	931	131206C	48
GRC-08	153	246	0.80	839	54.0	1 190	1 453	703	924	131208C	62
GRC-09	170	221	0.72	751	59.7	1 046	1 308	693	922	131209C	69
GRD-02	57	497	2.06	1 662	21.0	1 227	1 571	663	820	131502C	22
GRD-04	97	226	1.20	885	36.0	1 161	1 571	619	787	131504C	37
GRD-06	137	182	0.85	603	51.0	1 021	1 231	590	774	131506C	52
GRD-08	177	138	0.66	457	59.7	761	951	585	767	131508C	67
GRE-02	63	315	1.81	1 039	24.0	1 017	1 316	562	700	131802C	23
GRE-04	109	164	1.03	540	42.0	950	1 246	520	670	131804C	39
GRE-06	155	111	0.72	365	59.7	698	872	492	659	131806C	55

## SPECIFICATIONS

## CIRCULAR SERIES S-U

AS5100.4-2004

GRANOR Part number	Overall height mm	Calculated Compressive stiffness at zero shear kN/mm	Mean shear stiffness kN/mm	Calculated rotational stiffness kNm/rad	Shear deflection capacity mm	Rated load at ZERO rotation		Rated load at MAX rotation		AS Part No.	Mass kg
						At max. shear kN	At zero shear kN	At max. shear kN	At zero shear kN		
<b>SERIES S 480Ø Circular</b>											
GSD-04	85	921	2.08	4 804	30.0	2 493	2 493	1 297	1 608	141204C	50
GSD-06	119	641	1.49	3 334	42.0	2 493	2 493	1 258	1 587	141206C	70
GSD-08	153	492	1.16	2 553	54.0	2 472	2 493	1 226	1 575	141208C	90
GSD-10	187	399	0.95	2 068	66.0	2 087	2 493	1 196	1 568	141210C	110
GSE-03	77	704	2.19	3 526	28.5	2 148	2 493	1 109	1 376	141503C	43
GSE-05	117	450	1.44	2 191	43.5	2 051	2 493	1 058	1 343	141505C	64
GSE-07	157	320	1.07	1 590	58.5	1 931	2 304	1 021	1 327	141507C	86
GSE-09	197	251	0.85	1 247	72.3	1 467	1 834	993	1 318	141509C	108
GSF-02	63	646	2.60	3 173	24.0	1 821	2 321	981	1 211	141802C	33
GSF-04	109	338	1.49	1 651	42.0	1 724	2 321	915	1 161	141804C	57
GSF-06	155	229	1.04	1 116	60.0	1 561	1 872	874	1 142	141806C	80
GSF-08	201	173	0.80	842	72.3	1 152	1 440	859	1 132	141808C	103
<b>SERIES T 530Ø Circular</b>											
GTC-03	68	1 689	3.17	11 190	24.0	3 064	3 064	1 761	2 157	151203C	53
GTC-06	119	923	1.81	6 058	42.0	3 064	3 064	1 680	2 105	151206C	86
GTC-09	170	635	1.27	4 153	60.0	3 064	3 064	1 625	2 084	151209C	123
GTC-12	221	484	0.98	3 160	78.0	2 628	3 064	1 575	2 074	151212C	160
GTD-03	77	1 024	2.67	6 432	28.5	2 947	3 064	1 489	1 838	151503C	52
GTD-05	117	641	1.75	4 000	43.5	2 828	3 064	1 426	1 795	151505C	79
GTD-07	157	466	1.30	2 902	58.5	2 709	3 064	1 380	1 775	151507C	105
GTD-09	197	367	1.04	2 278	73.5	2 263	2 771	1 341	1 763	151509C	132
GTD-11	237	302	0.86	1 874	80.1	1 841	2 301	1 345	1 755	151511C	158
GTE-02	63	947	3.17	5 797	24.0	2 493	3 064	1 322	1 625	151802C	41
GTE-04	109	497	1.81	3 018	42.0	2 374	3 064	1 238	1 558	151804C	69
GTE-06	155	337	1.27	2 040	60.0	2 255	2 829	1 186	1 533	151806C	98
GTE-08	201	255	0.98	1 541	78.0	1 752	2 176	1 144	1 520	151808C	131
<b>SERIES U 590Ø Circular</b>											
GUC-03	68	2 471	3.93	21 195	24.0	3 828	3 828	2 382	2 906	161203C	61
GUC-06	119	1 354	2.25	11 490	42.0	3 828	3 828	2 282	2 837	161206C	107
GUC-09	170	932	1.57	7 881	60.0	3 828	3 828	2 215	2 811	161209C	153
GUC-12	221	711	1.21	5 997	78.0	3 828	3 828	2 156	2 797	161212C	199
GUD-03	77	1 524	3.31	12 268	28.5	3 828	3 828	2 037	2 503	161503C	65
GUD-05	117	956	2.17	7 636	43.5	3 828	3 828	1 957	2 445	161505C	98
GUD-07	157	696	1.61	5 543	58.5	3 828	3 828	1 900	2 418	161507C	131
GUD-09	197	547	1.28	4 350	73.5	3 614	3 828	1 852	2 402	161509C	164
GUE-02	63	1 424	3.93	11 088	24.0	3 497	3 828	1 817	2 225	161802C	51
GUE-04	109	749	2.25	5 779	42.0	3 349	3 828	1 708	2 135	161804C	86
GUE-06	155	509	1.57	3 908	60.0	3 200	3 828	1 644	2 101	161806C	122
GUE-08	201	385	1.21	2 952	78.0	2 804	3 395	1 591	2 083	161808C	157
GUE-10	247	310	0.98	2 372	89.5	2 207	2 759	1 577	2 072	161810C	193

## SPECIFICATIONS

## CIRCULAR SERIES V-Y

AS5100.4-2004

GRANOR Part number	Overall height mm	Calculated Compressive stiffness at zero shear kN/mm	Mean shear stiffness kN/mm	Calculated rotational stiffness kNm/rad	Shear deflection capacity mm	Rated load at ZERO rotation		Rated load at MAX rotation		AS Part No.	Mass kg
						At max. shear kN	At zero shear kN	At max. shear kN	At zero shear kN		
<b>SERIES V 650Ø Circular</b>											
GVD-03	77	2 164	4.02	21 874	28.5	4 676	4 676	2 688	3 290	171503C	79
GVD-05	117	1 360	2.63	13 626	43.5	4 676	4 676	2 589	3 216	171505C	119
GVD-07	157	991	1.96	9 895	58.5	4 676	4 676	2 521	3 181	171507C	159
GVD-09	197	780	1.56	7 768	73.5	4 676	4 676	2 464	3 161	171509C	199
GVD-11	237	643	1.29	6 394	88.5	4 401	4 676	2 412	3 147	171511C	240
GVE-03	86	1 411	3.47	13 604	33.0	4 650	4 676	2 329	2 867	171803C	83
GVE-05	132	872	2.24	8 354	51.0	4 469	4 676	2 231	2 799	171805C	127
GVE-07	178	631	1.66	6 028	69.0	4 287	4 676	2 162	2 768	171807C	170
GVE-09	224	494	1.32	4 715	87.0	3 744	4 543	2 103	2 750	171809C	213
<b>SERIES W 750Ø Circular</b>											
GWE-03	92	2 152	4.23	28 822	36.0	6 278	6 278	3 482	4 273	181803C	115
GWE-05	138	1 384	2.82	18 413	54.0	6 278	6 278	3 362	4 191	181805C	173
GWE-07	184	1 020	2.12	13 528	72.0	6 278	6 278	3 276	4 151	181807C	231
GWE-09	230	808	1.69	10 691	90.0	6 278	6 278	3 201	4 128	181809C	289
GWE-11	276	668	1.41	8 838	108.0	5 354	6 278	3 131	4 112	181811C	346
GWF-03	101	1 527	3.76	19 729	40.5	6 175	6 278	3 103	3 829	182103C	121
GWF-05	153	962	2.48	12 352	61.5	5 932	6 278	2 975	3 741	182105C	183
GWF-07	205	702	1.85	8 990	82.5	5 688	6 278	2 882	3 700	182107C	245
GWF-09	257	553	1.47	7 067	103.5	4 835	5 901	2 802	3 676	182109C	306
<b>SERIES X 810Ø Circular</b>											
GXE-03	92	2 831	4.94	45 446	36.0	7 353	7 353	4 327	5 293	191803C	135
GXE-05	138	1 823	3.29	29 052	54.0	7 353	7 353	4 186	5 193	191805C	202
GXE-07	184	1 345	2.47	21 350	72.0	7 353	7 353	4 086	5 145	191807C	270
GXE-09	230	1 065	1.98	16 876	90.0	7 353	7 353	4 001	5 116	191809C	337
GXE-11	276	882	1.65	13 593	108.0	7 353	7 353	3 922	5 097	191811C	405
GXF-03	101	2 024	4.39	31 206	40.5	7 353	7 353	3 876	4 766	192103C	142
GXF-05	153	1 277	2.89	19 548	61.5	7 353	7 353	3 724	4 659	192105C	214
GXF-07	205	933	2.15	14 231	82.5	7 294	7 353	3 616	4 608	192107C	286
GXF-09	257	735	1.72	11 188	103.5	6 743	7 353	3 524	4 578	192109C	358
<b>SERIES Y 880Ø Circular</b>											
GYE-04	115	2 965	4.66	57 712	45.0	8 713	8 713	5 350	6 566	201804C	199
GYE-07	184	1 800	2.91	34 786	72.0	8 713	8 713	5 162	6 458	201807C	319
GYE-10	253	1 292	2.12	24 896	99.0	8 713	8 713	5 019	6 411	201810C	439
GYE-12	299	1 088	1.79	20 930	117.0	8 713	8 713	4 931	6 391	201812C	518
GYF-03	101	2 729	5.18	50 991	40.5	8 713	8 713	4 907	6 014	202103C	168
GYF-05	153	1 724	3.41	31 965	61.5	8 713	8 713	4 726	5 881	202105C	253
GYF-07	205	1 260	2.54	23 279	82.5	8 713	8 713	4 600	5 818	202107C	338
GYF-09	257	993	2.03	18 305	103.5	8 713	8 713	4 494	5 782	202109C	423
GYF-11	309	819	1.69	15 082	124.5	7 707	8 713	4 395	5 758	202111C	509



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