

*Stay Cable System*  
**SPWC®**  
*Semi Parallel Wire Cable*



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**SHINKO WIRE CO.,LTD.**



## INTRODUCTION

Shinko Wire Company Ltd. is a manufacturer of high-tension wires with an annual output of about 100,000 tons. We offer a full range of this category including PC wires, wire ropes, galvanized steel wires, stainless steel wires, and spring wires. With each of these products, we are proud of being one of the top manufacturers and the industry-leader in terms of production volume and quality.

SPWC cable systems are processed from large-diameter, high-tension, galvanized steel wires. Shinko Wire is the only fully in-house manufacturer of such cables. All the manufacturing processes, from the manufacturing of wires to the packaging of finished cables, are conducted in our own factory. This allows us to apply uniform quality control to all processes, which is essential for producing high-quality cables.

For 28 years since its foundation in 1978, Shinko Wire has supplied cables for all types of bridges that use cables, including cable stayed bridges, arched bridges, suspension bridges, cable trussed bridges, and extra-dosed bridges. We are proud of our track record, especially with cable stayed bridges, which require high fatigue resistance. Shinko Wire has also supplied cables for various structures such as stadiums, domes, and gymnasiums. Our cables have been used in all types of cable constructions and are highly valued by customers for their reliability and performance. In the last 28 years, we have supplied over 9,000 cables, weighing approximately 21,000 tons, for more than 250 projects, including three overseas projects, which were highly regarded by the customers.

We are confident that the SPWC cable systems introduced herein offer many advantages for all types of cable supported structures.



## ADVANTAGES

### ◆ HIGH FATIGUE RESISTANCE

FR anchor socket is filled with epoxy resin, zinc powder and steel balls at an ambient temperature. CM anchor head, on the other hand, employs cold button heads and epoxy resin. Both FR and CM anchor cables exhibit high fatigue performance because the cables are not affected by heat at the anchorage which may be experienced with the conventional zinc poured sockets. The two million cycle fatigue strength of the cable is more than 200 to 250 N/mm<sup>2</sup> at a maximum stress of 45% of specified minimum tensile strength.

### ◆ HIGH LOAD BEARING CAPACITY PER CABLE

Bundling any number of 7 mm diameter galvanized wires, any load bearing capacity is possible up to 30,000 kN. The breaking load of the cable is the sum of those of wires incorporated because the wires are bundled in a long lay and consequently there is no lay loss. The anchorage efficiency is always 100%.

### ◆ HIGH AND STABLE YOUNG'S MODULUS

The Young's modulus of the cable is high and stable at 196,000N/mm<sup>2</sup> which is equivalent to that of single wire because the cable is made of wire bundles laid in a very long pitch.

### ◆ COMPACT ANCHORAGE AND CABLE

The anchorages are smaller in size compared with zinc poured sockets. The cable's cross-section is compact because the wires are arranged in a densest possible manner.

### ◆ HIGH CORROSION RESISTANCE AND DURABILITY

The cables are protected from corrosion during transportation and installation because the cables are covered with polyethylene jacket. The element wires are assembled in a building without exposing to the weather, corrosion inhibiting compound is applied and the polyethylene jacket is extruded immediately at the same place. There is no concern of corrosion at the transition of the anchorage and the cable because water-tightness is secured. The cable jacket, which is made of black high density polyethylene, is very durable under the natural environment.

### ◆ EASE IN HANDLING

The handling of the cables is easy and safe because they are fabricated in a plant and wound on steel reels for transportation. No catwalk is necessary for the cable installation or corrosion protection work.

### ◆ STABLE QUALITY

An accurate cable length, a good cross-section and a good corrosion protection are obtained because the cables are fabricated in a plant under a stringent quality control.

### ◆ LOW CREEP

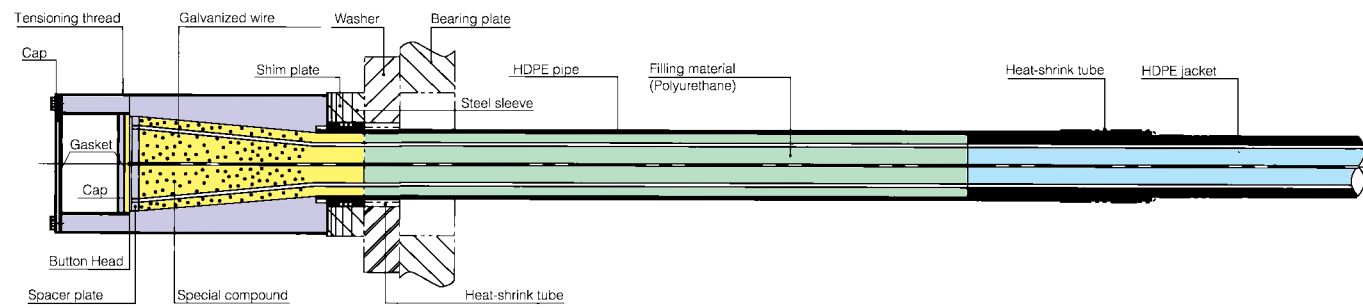
Creep of the cable is negligibly small under the design load because the performance of the very long lay cable is identical with that of the parallel wire cable. The set-back of the wire bundle in socket is not more than 2 mm for FR and 0.5 mm for CM after two million cycles at an amplitude of 200N/mm<sup>2</sup> without pre-compression.

MAKE-UP OF CABLES



[SPWC-FR ANCHOR]

Live end



**ANCHORAGE**

- Completely sealed with no internal voids

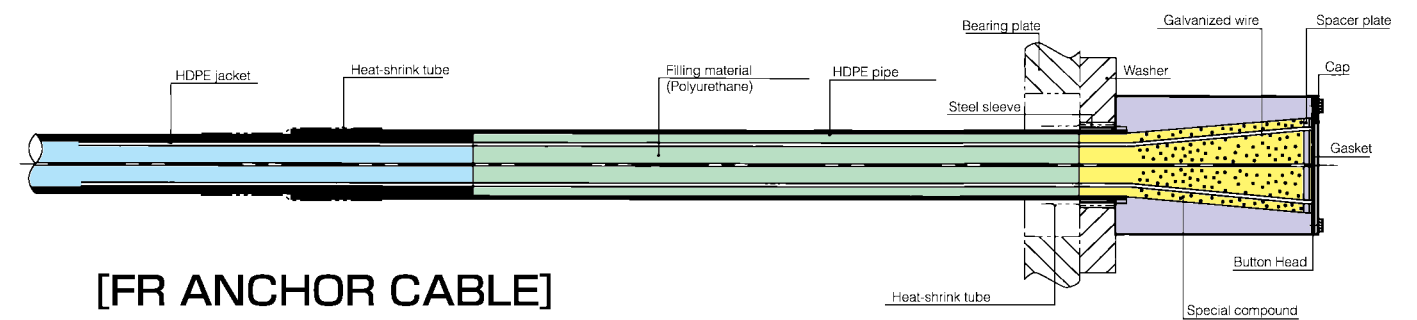
**TRANSITION**

- Protected with a steel sleeve and overlap HDPE pipe
- Filled with a reliable corrosion protection material
- Galvanized wire



[SPWC-CM ANCHOR]

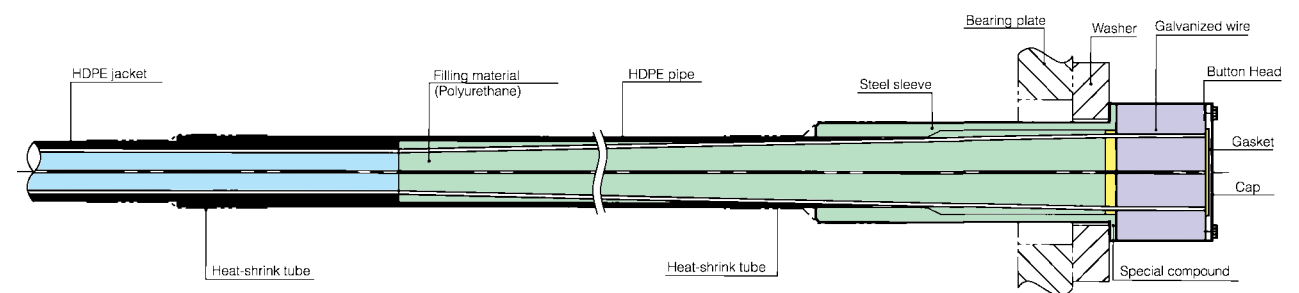
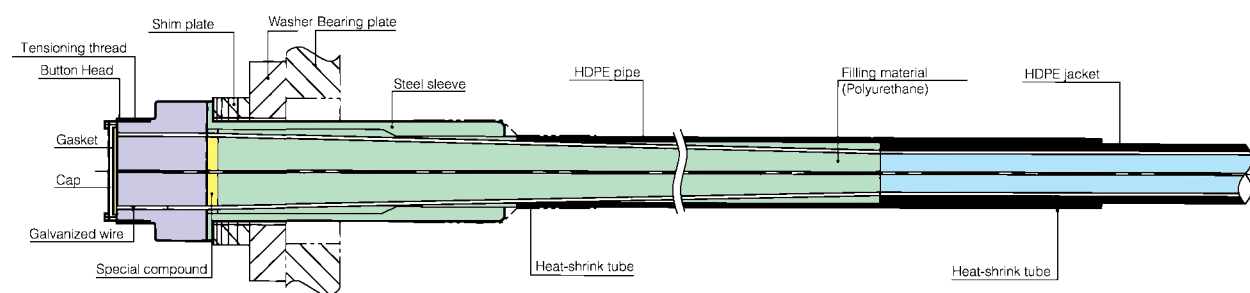
Dead end



[FR ANCHOR CABLE]

**CABLE**

- Protected with HDPE jacket
- Internal corrosion protection compound
- Galvanized wire



[CM ANCHOR CABLE]

○ The standard FR and CM anchor cables have a bearing type anchorage on either end. However, depending on the design or installation conditions, other type of anchorages can also be provided.

WIRE

Seven mm diameter galvanized wire is the standard material for the FR and CM anchor cables.

SPECIFICATION FOR THE WIRE

Denomination	Nom. Area	Unit Weight	Tensile Strength <sup>*3</sup>		Yield Strength <sup>*1</sup>		Elongation <sup>*2</sup>		Young's Modulus <sup>*3</sup>
			Load	Stress	Load	Stress	%	G.L.	
7.0mm Wire	mm <sup>2</sup>	kg/km	kN	N/mm <sup>2</sup>	kN	N/mm <sup>2</sup>	%	mm	N/mm <sup>2</sup>
	38.48	301	(60.3)	1,570	(44.5)	1,160	4.0	250	(196,000)

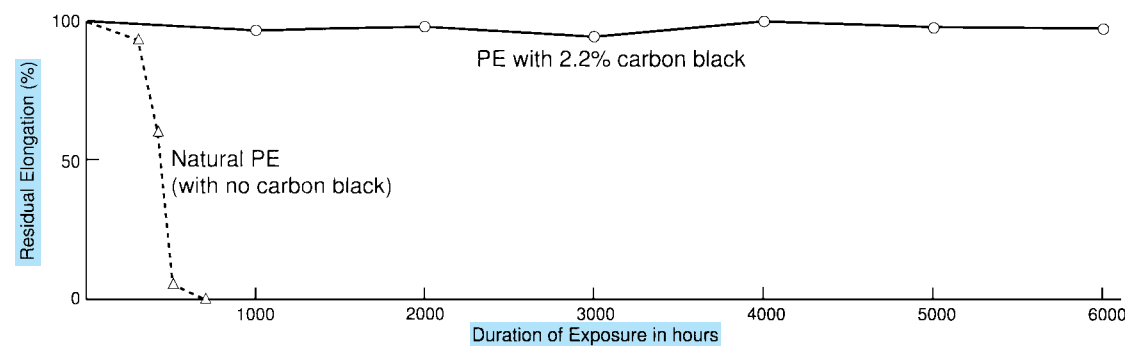
remarks : \*1: Proof load under 0.7% total elongation. \*2: Total elongation after rupture in gauge length of 250mm. \*3: Values in ( ) are for reference only.

POLYETHYLENE

The polyethylene material for the cable is selected from the highest quality which has a low creep value and a superior stress cracking resistance.

QUALITY OF POLYETHYLENE

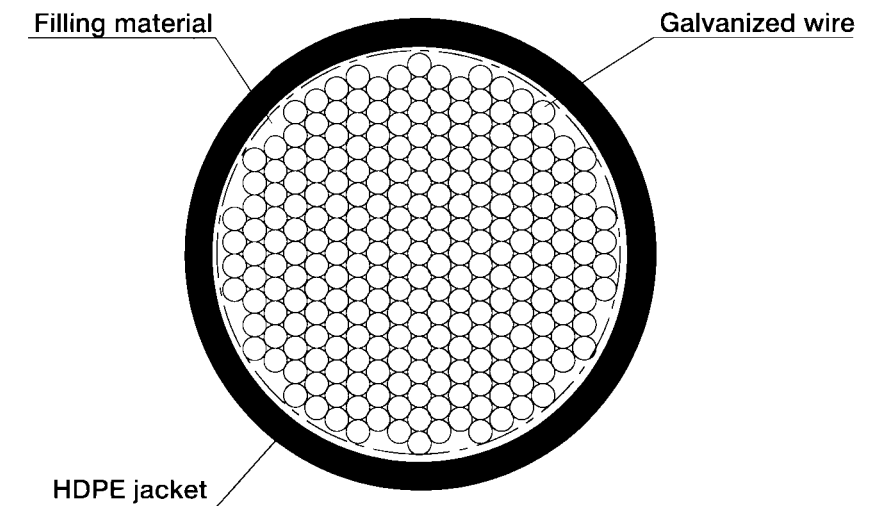
Item	Property	Testing Method
Melt flow rate	0.11±0.04g/10min	JIS K 6922-2
Density	942kg/m <sup>3</sup> 以上	JIS K 6922-2
Tensile stress at yield point	20MPa以上	JIS K 6922-2
Elongation at fracture	300%以上	JIS K 6922-2
Duro meter hardness	HDD60以上	JIS K 7215
Vicat softening temperature	115℃以上	JIS K 7206



WEATHER-O-METER TEST RESULTS FOR POLYETHYLENE

COLORING OF CABLES

The color of pure polyethylene is milky white but can be made in any preferred colors such as blue, green or red. However, polyethylene is not resistant to ultra-violet ray unless it is black in color with carbon black in it and is not suitable for corrosion protection material used in outdoor. Therefore, black polyethylene is most commonly used for cable cover. However, if coloring is required from aesthetics or temperature control, black polyethylene jacket can be colored. Fluoric paint coating is applied on the surface which has been treated with a special primer and baked with far-infrared ray. The color selection is as free as a regular paint. Since this system was developed, the coloring method have been applied to more than 80 projects as of March 2006.

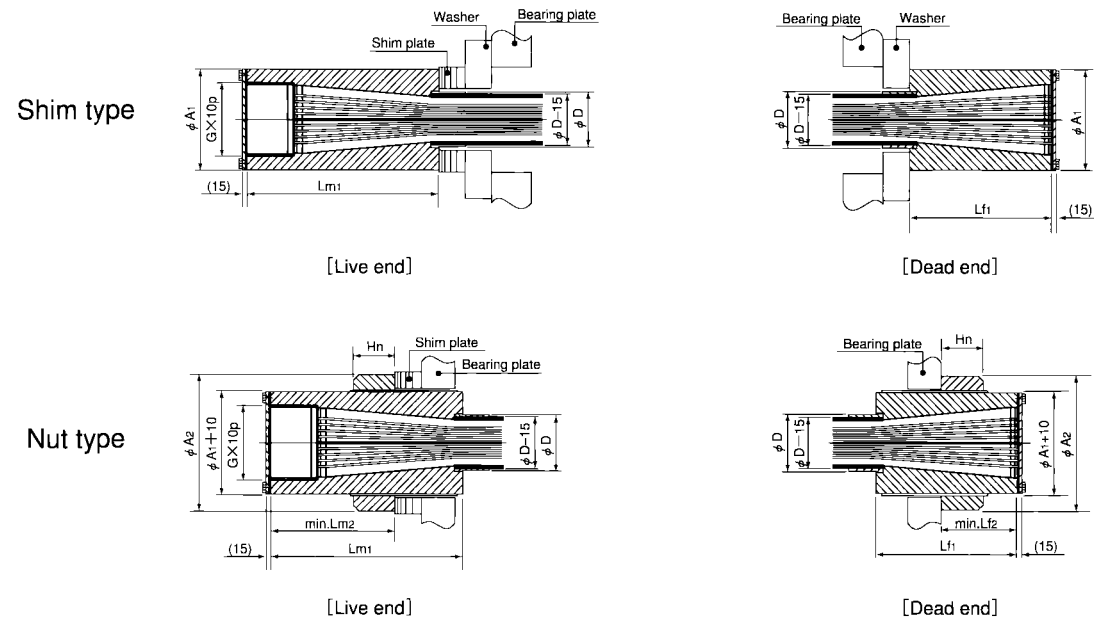


CABLE CROSS-SECTION (SPWC241)

No. of Wires	Steel Area (mm <sup>2</sup> )	Breaking Load (kN)	Wire Bundle Dia. (mm)	O.D. (mm)	Thickness (mm)	Wire Bundle Wt. (kg/m)	Cable Wt. (kg/m) <sup>*1</sup>
19	731	1,150	35.0	45	4.5	5.7	6.5
31	1,190	1,870	44.0	55	5.0	9.3	10.4
37	1,420	2,240	49.0	60	5.0	11.1	12.4
55	2,120	3,320	57.5	70	5.5	16.6	18.2
61	2,350	3,690	63.0	75	5.5	18.4	20.4
73	2,810	4,410	68.0	80	5.5	22.0	24.1
85	3,270	5,140	71.2	85	6.5	25.6	27.9
91	3,500	5,500	77.0	90	6.0	27.4	30.1
109	4,190	6,590	81.1	95	6.5	32.8	35.5
121	4,660	7,310	84.9	100	7.0	36.4	39.4
127	4,890	7,670	91.0	105	6.5	38.2	41.8
139	5,350	8,400	92.2	105	6.0	41.8	44.9
151	5,810	9,120	94.4	110	7.5	45.5	49.0
163	6,270	9,850	98.8	115	7.5	49.1	53.0
187	7,200	11,200	105.0	120	7.0	56.3	60.2
199	7,660	12,000	108.0	125	8.0	59.9	64.3
211	8,120	12,700	112.7	130	8.0	63.5	68.4
223	8,580	13,500	116.3	135	9.0	67.1	72.5
241	9,270	14,600	119.0	135	7.5	72.5	77.3
253	9,740	15,300	121.6	140	8.5	76.2	81.6
265	10,200	16,000	126.6	145	8.5	79.8	85.8
283	10,900	17,100	129.0	150	10.0	85.2	91.6
295	11,400	17,800	131.4	150	9.0	88.8	94.7
301	11,600	18,200	133.0	155	10.5	90.6	97.5
313	12,000	18,900	135.3	155	9.5	94.2	100.7
337	13,000	20,400	140.6	160	9.0	101.0	107.7
349	13,400	21,100	142.0	165	11.0	105.0	112.6
361	13,900	21,800	144.9	165	9.5	109.0	116.1
367	14,100	22,200	147.0	170	11.0	110.0	118.1
379	14,600	22,900	149.1	170	10.0	114.0	121.7
397	15,300	24,000	153.2	175	10.5	119.0	127.3
421	16,200	25,400	155.2	180	12.0	127.0	135.8
451	17,400	27,200	162.9	190	13.0	136.0	146.4
499	19,200	30,100	168.5	195	12.5	150.0	160.1

Remarks : \*1 The cable weight includes the weight of HDPE jacket.

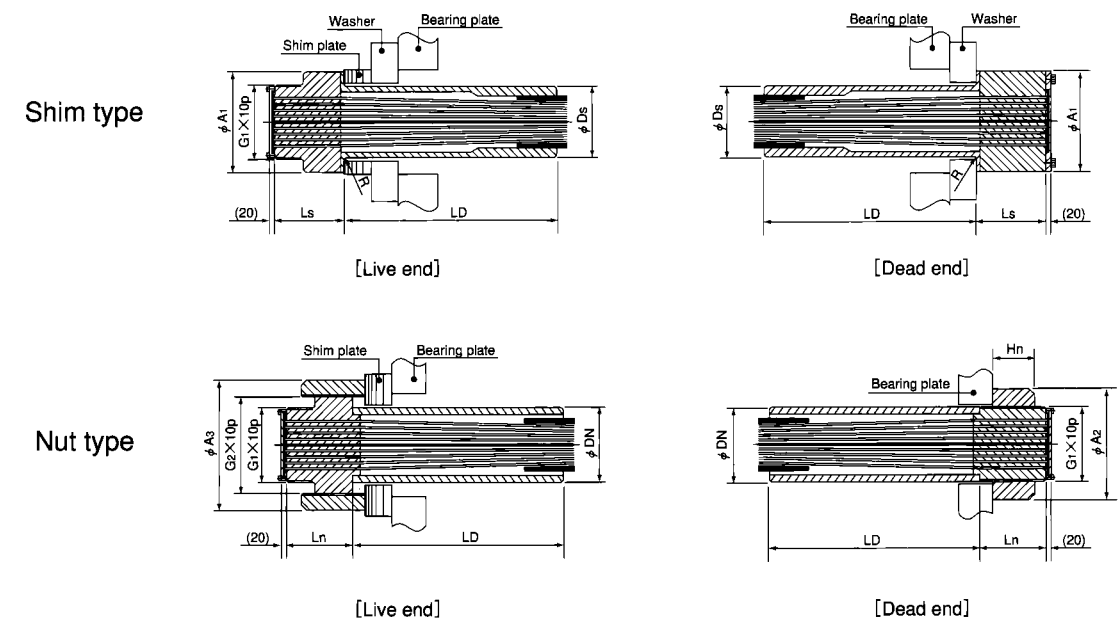
— SPWC - FR ANCHOR DIMENSIONS AND WEIGHT —



No. of Wires	Standard Dimensions in mm *1								Anchor Wt. in kg *3				
	O.D.		Dead End		Live End		Tensioning Thread G	Nut Length Hn	Steel Sleeve O.D. *2	Live End		Dead End	
	$\phi A_1$	$\phi A_2$	Lf1	Lf2	Lm1	Lm2				Shim	Nut	Shim	Nut
19	130	170	150	75	220	145	Tr100	50	80	21	26	17	20
31	145	195	170	85	245	160	Tr120	60	90	28	36	23	29
37	155	205	190	95	270	175	Tr125	65	95	35	44	29	36
55	185	240	240	120	330	210	Tr145	70	105	60	74	50	62
61	190	250	250	125	345	220	Tr150	75	110	66	82	55	69
73	200	265	260	130	360	230	Tr155	80	115	77	96	63	80
85	215	280	280	140	385	245	Tr160	85	120	96	118	79	99
91	220	290	290	145	395	250	Tr170	85	125	102	126	85	107
109	230	305	310	155	425	270	Tr180	95	130	118	148	99	126
121	235	315	320	160	440	280	Tr185	100	135	126	161	106	137
127	250	330	340	170	460	290	Tr195	100	140	151	187	127	160
139	255	340	350	175	475	300	Tr195	105	140	162	204	136	174
151	260	350	360	180	490	310	Tr200	110	145	173	220	146	188
163	265	355	370	185	505	320	Tr205	115	150	184	234	155	200
187	290	385	400	200	545	345	Tr215	120	160	241	300	201	255
199	295	395	410	205	560	355	Tr220	120	165	255	319	213	271
211	300	405	420	210	570	360	Tr230	125	170	266	336	225	289
223	305	415	440	220	595	375	Tr235	130	175	286	364	243	314
241	325	435	460	230	615	385	Tr245	130	175	341	423	289	365
253	330	440	470	235	630	395	Tr250	135	180	358	445	304	384
265	335	450	480	240	645	405	Tr255	135	185	377	469	320	405
283	340	460	485	240	655	410	Tr260	145	190	392	495	333	429
295	345	465	485	240	655	410	Tr265	145	190	403	508	343	440
301	350	470	490	245	660	415	Tr270	145	200	418	524	356	455
313	355	480	500	250	675	425	Tr275	150	200	438	554	374	481
337	370	495	540	270	725	455	Tr275	155	205	517	642	437	554
349	380	510	540	270	725	455	Tr280	155	210	547	680	462	586
361	385	515	550	275	740	465	Tr285	160	210	571	710	482	611
367	385	515	550	275	740	465	Tr285	160	215	572	710	482	611
379	405	535	570	285	765	480	Tr290	155	215	661	807	554	690
397	405	540	575	285	770	480	Tr295	160	220	662	813	557	699
421	415	555	590	295	795	500	Tr300	165	225	717	883	601	756
451	425	565	625	310	835	520	Tr305	175	235	795	974	669	837
499	440	590	645	320	870	545	Tr315	185	240	885	1093	741	937

Remarks: \*1 Dimensions may be modified for the actual loading conditions.  
 \*2 The standard length of the steel sleeve is 100mm.  
 \*3 The anchorage weight is approximate including wires and filler material.

— SPWC - CM ANCHOR DIMENSIONS AND WEIGHT —



No. of Wires	Standard Dimensions in mm *1								Steel Sleeve		Weight of Anchorage in kg *2				
	O.D.		Length		Tensioning Thread		Nut Length Hn	O.D.		Length LD	Live End		Dead End		
	$\phi A_1$	$\phi A_2$	$\phi A_3$	Ls	Ln	G1		G2	$\phi D_s$		$\phi D_N$	Shim	Nut	Shim	Nut
19	130	140	165	95	80	S105	S135	45	84	105	200	14	20	16	19
31	145	165	190	105	90	S120	S155	50	98	120	250	20	30	22	28
37	155	175	200	110	95	S125	S160	55	108	125	250	24	33	26	31
55	185	195	225	120	105	S140	S180	65	137	140	300	42	46	46	43
61	190	215	240	120	105	S155	S195	65	142	155	350	48	61	51	58
73	200	225	255	130	115	S160	S205	75	144	160	400	53	71	58	68
85	215	240	270	135	120	S170	S215	80	159	170	400	67	83	73	80
91	220	240	280	145	130	S170	S220	85	165	170	450	74	88	81	82
109	230	260	295	150	135	S180	S230	90	171	180	450	81	102	88	96
121	235	265	305	160	145	S185	S240	95	175	185	450	85	111	94	103
127	250	275	315	160	145	S195	S250	95	191	195	500	106	125	116	117
139	255	280	325	165	150	S195	S255	100	193	195	550	114	133	126	124
151	260	295	345	175	160	S205	S265	105	195	205	550	120	156	132	145
163	265	300	350	180	165	S205	S270	110	197	205	550	119	155	132	143
187	290	315	370	190	175	S215	S285	120	214	215	600	154	181	172	167
199	295	325	380	200	185	S220	S290	125	218	220	600	163	196	183	181
211	300	335	390	205	190	S230	S300	125	220	230	650	170	221	189	204
223	305	345	405	205	190	S235	S310	125	223	235	650	170	231	190	212
241	325	355	410	210	195	S240	S315	135	242	240	700	220	250	247	235
253	330	370	425	220	205	S250	S325	135	245	250	700	232	283	258	265
265	335	375	430	230	215	S250	S330	140	248	250	700	234	281	263	262
283	340	385	450	230	215	S260	S340	140	249	260	700	235	314	264	287
295	345	395	455	235	220	S265	S345	145	252	265	750	250	337	279	313
301	350	395	460	240	225	S265	S350	145	257	265	750	265	341	296	312
313	355	405	470	250	235	S270	S355	150	260	270	750	276	364	309	333
337	370	415	485	260	245	S280	S365	155	271	280	800	318	411	354	371
349	380	420	490	260	245	S280	S370	160	273	280	800	322	407	365	372
361	385	435	500	270	255	S290	S380	160	276	290	800	339	448	380	413
367	385	435	500	270	255	S290	S380	160	279	290	800	339	440	380	405
379	405	440	510	285	270	S295	S385	165	290	295	850	406	489	456	441
397	405	450	520	290	275	S300	S395	165	297	300	850	416	502	466	454
421	415	460	530	290	275	S305	S400	175	304	305	850	441	526	495	481
451	425	475	550	315	300	S315	S415	180	309	315	850	467	583	524	523
499	440	495	570	325	310	S325	S430	190	318	325	900	513	650	578	586

Remarks: \*1 Dimensions may be modified for the actual loading conditions.  
 \*2 The anchorage weight is approximate including wires and filler material.



BAN-NAGURO BRIDGE (HOKKAIDO)



OKUTAMA BRIDGE (TOKYO)



KATUSHIKA HARP BRIDGE (TOKYO)



MAEDA SHINRIN KOEN BRIDGE (HOKKAIDO)



RURUMOPPE BRIDGE (HOKKAIDO)



SHIBA KORO BRIDGE (YOKOHAMA)



DAISHI BRIDGE (KANAGAWA)



TOKACHI CHUO BRIDGE (HOKKAIDO)



CHUO BRIDGE (TOKYO)



DAINI CHIKUMAGAWA BRIDGE (NAGANO)



NISINOMIYA-KO BRIDGE (HYOGO)



HIGASHI KOBE BRIDGE (KOBE)



FUREAI BRIDGE (AICHI)



MEIKO HIGASHI BRIDGE (NAGOYA)



OSAKA MONO-RAIL BRIDGE (OSAKA)



AKASHI KAIKYO BRIDGE (KOBE)



DEAI BRIDGE (AICHI)



CENTURY BRIDGE (HYOGO)



TOYODA BRIDGE (AICHI)



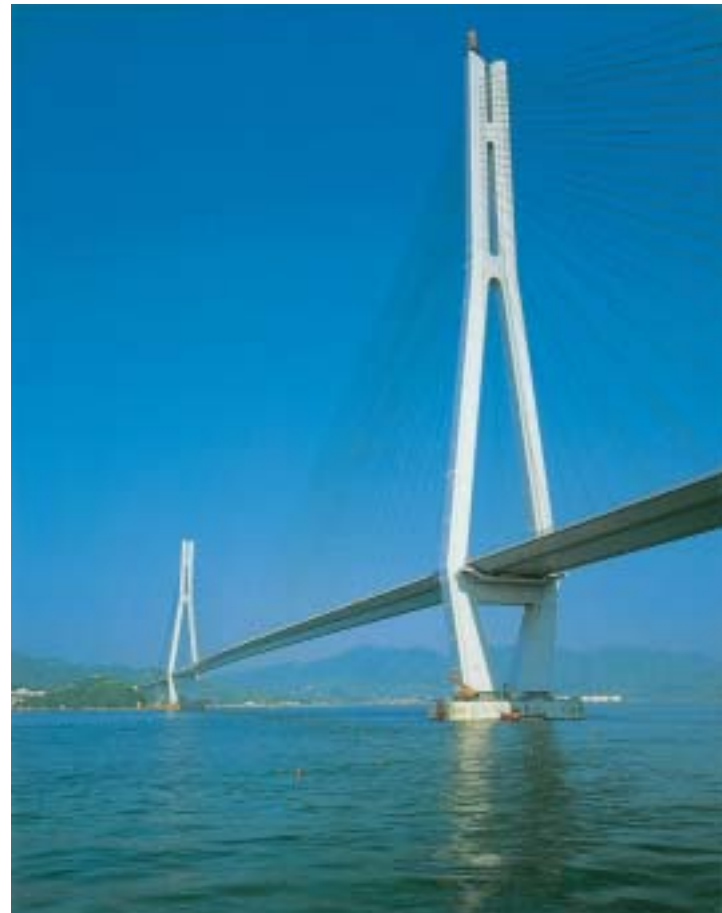
SHIN-INAGAWA BRIDGE (HYOGO)



SUGAWARA SHIROKITA BRIDGE (OSAKA)



IKUCHI BRIDGE (HIROSHIMA)



TATARA BRIDGE (HIROSHIMA-EHIME)



SANUKI FUCHUKO BRIDGE (KAGAWA)



ARATSU BRIDGE (FUKUOKA)



ALRT SKY BRIDGE (VANCOUVER, CANADA)



KONIYA GYOKO BRIDGE (KAGOSHIMA)



HITUISHI JIMA AND IWAKURO JIMA BRIDGES (KAGAWA)



MAKUHARI MESSE NORTH HALL (CHIBA)



BEACON PLAZA GLOBAL TOWER (OITA)



OHSHIBA BRIDGE (HIROSHIMA)



KUMAMOTO STADIUM (KUMAMOTO)