

JIS

JAPANESE INDUSTRIAL STANDARD

**Prestressed concrete beams
for light load slab bridges**

Ⓔ **JIS A 5319**—1992

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In the event of any doubt arising,
the original Standard in Japanese is to be final authority.



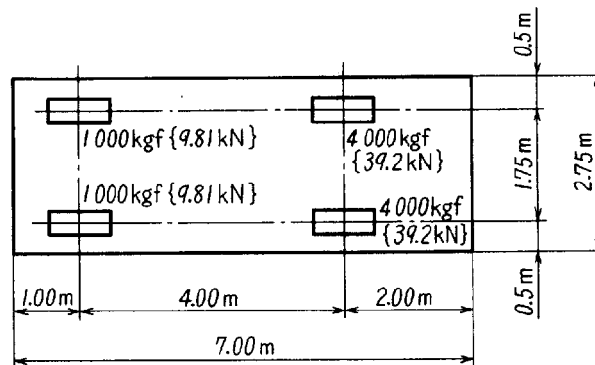
1. Scope

This Japanese Industrial Standard specifies the prestressed concrete bridge beams manufactured by pretensioning and to be used for light load slab bridges of a single lane. (Hereafter referred to as bridge beams).

Remarks 1. The bridge beams mentioned above are intended for the cars 10000 kgf {98.1 kN} in design car load, and therefore are not suited to the road bridges which fall under the Road Construction Ordinance.

2. The design car load is to be as shown in Fig. 1.

Fig. 1. Design car load



3. The following Standards are cited in this Standard:

JIS A 1108-Method of Test for Compressive Strength of Concrete

JIS A 1132-Method of Making and Curing Concrete Specimens

JIS A 5011-Air-Cooled Iron-Blast-Furnace Slag Aggregate for Concrete

JIS A 5012-Granulated Blast Furnace Slag Fine Aggregate for Concrete

JIS A 5308-Ready-Mixed Concrete

JIS A 6202-Expansive Additive for Concrete

JIS A 6204-Chemical Admixtures for Concrete

JIS G 3112-Steel Bars for Concrete Reinforcement

JIS G 3536-Uncoated Stress-Relieved Steel Wires and Strands
for Prestressed Concrete

JIS R 5210-Portland Cement

JIS Z 8401-Rules for Rounding off of Numerical Values

4. The units and numerical values given in { } in this Standard are based on the International System of Units (SI) and are appended for informative reference.

Further, the traditional units and numerical values are converted to SI units and numerical values on April 1, 1995.

2. Types

The bridge beams shall be classified into the types given in Table 1.

Table 1. Type

Type designation	Design car load kgf {kN}	Standard span m	Beam height mm	PC stranded steel wire SWPR7B of 7-wire strand 12.7 mm and 15.2 mm		Remarks
				Number to be used	Standard diameter mm	
LS05	10000 {98.1}	5	225	8	12.7	1. If the spacing between centers of bridge beams assembled as a bridge exceeds 0.77 m it is necessary to discuss about the bridge beams and lateral members. 2. When used for bridges, these are applicable to oblique angles 60° or over. 3. The span for these beams may be longer than the standard span by 0.2 m or less. Further, it may be shorter 1 m or less. 4. Snow load of 100 kgf/m ² {981 N/m ² } is also taken into consideration for these bridge beams.
LS06		6	225	10		
LS07		7	225	13		
LS08		8	250	13		
LS09		9	275	16		
LS10		10	300	13	15.2	
LS11		11	350	13		
LS12		12	375	15		
LS13		13	400	17		

3. Quality

3.1 Appearance the bridge beams shall have a fine appearance and shall be free from harmful defects such flaws, cracks and twists.

3.2 Crack strength The crack strength of the bridge beam shall be such that it shall not produce crackings when it is subjected to the cracking test moment given in Table 2 or Table 3 in the crack strength test specified in 7.

Table 2. (Applicable till March 31, 1995)
Unit: tf·m{kN·m}

Type designation	Crack test moment	(Informative reference) Breaking resistance moment
LS05	7.75 { 76.0 }	17.2 {169}
LS06	9.55 { 93.7 }	21.4 {210}
LS07	11.0 {108 }	25.0 {245}
LS08	13.4 {131 }	30.1 {295}
LS09	17.1 {168 }	38.5 {378}
LS10	21.1 {207 }	47.8 {469}
LS11	26.2 {257 }	58.5 {574}
LS12	32.6 {320 }	72.5 {711}
LS13	38.3 {376 }	85.0 {834}

Table 3. (Applicable on and after April 1, 1995)
Unit: kN·m

Type designation	Crack test moment	(Informative reference) Breaking resistance moment
LS05	76.0	169
LS06	93.7	210
LS07	108	245
LS08	131	295
LS09	168	378
LS10	207	469
LS11	257	574
LS12	320	711
LS13	376	834

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4. Shapes, dimensions and dimensional tolerances

The shapes⁽¹⁾ and dimensions of the bridge beams shall be as specified in Attached Figs. 1 to 9, and the dimensional tolerances be as specified in Table 4.

Note (1) Auxiliary articles required for a bridge beam may be attached and proper processing may be made by agreement between the parties concerned with delivery.

Further, lifting lugs, if attached, shall be located within $\frac{l}{10}$ (l = span length) from one edge of a bridge beam.

Table 4. Dimensional tolerances

Unit: mm

Item	Tolerances	
Beam length L	When $L \leq 10$ m	± 10
	When $L > 10$ m	$\pm L/1000$ ⁽²⁾
External dimensions of section	± 5	
Warp of beam ⁽³⁾	± 8 ⁽⁴⁾	
Lateral bend of beam	± 10	

Notes (2) Beam length L is expressed in mm.

(3) The warp of beam is the value in the middle of the span.

(4) This means the deviation from the mean value obtained from a group of beams used in one span.

5. Materials

5.1 Cement The cement used shall be Portland cement except ultra high-early-strength Portland cement that complies with JIS R 5210.

5.2 Aggregates The aggregates used shall be clean, tough, durable and shall have appropriate grain sizes. They shall not contain injurious amount of dust, mud, chlorides, organic substances, etc. The maximum size of coarse aggregate shall be 20 mm.

Further, the aggregates shall be subjected to alkali-silica reactivity test specified in Annex 7 [alkali-silica reactivity test of aggregate (chemical method)] or Annex 8 [alkali-silica reactivity test of aggregate (mortar bar method)] to JIS A 5308 to be judged innocuous. However, the aggregate specified in JIS A 5011 and JIS A 5012, are not necessarily subjected to the alkali-silica reactivity test.

5.3 Water The water to serve shall not contain injurious amount of substances such as oils, acids, salts, organic substances, which affect the quality of bridge beam.

5.4 PC steel The PC steel shall be the SWPR7B of 12.7 mm 7-wire strand and 15.2 mm 7-wire strand specified in JIS G 3536, and both shall be tested according to 8.3 (Relaxation test) of JIS G 3536. The relaxation value shall be not more than 0.25 %. However, the duration of maintaining grip interval as it is shall be 1000 h.

5.5 Reinforcing steel The reinforcing steel to serve shall be SD295 A or SD295 B, specified in JIS G 3112.

5.6 Admixtures Admixtures, if used, shall be those not affecting the quality of bridge berms adversely. When the expansive additive and chemical admixture are used they shall comply with the following Standards.

(1) JIS A 6202

(2) JIS A 6204

6. Manufacture

6.1 Concrete The concrete shall satisfy the following matters:

- (1) Chlorides amount (as Cl^-) included in the fresh concrete shall be not more than 0.3 kg/m^3 .
- (2) The quality of concrete shall be not less than 700 kgf/cm^2 { 68.7 N/mm^2 } in compressive strength at 28 days in age, rich in durability, and shall show less dispersion of material quality.

The compressive strength test shall be as specified in JIS A 1132 and JIS A 1108.

Remarks: Before March 31, 1995, if a tester in which the load is marked in SI unit is used, the compressive strength shall be calculated in such a way, that the measured maximum load is divided by 9.80665, the quotient is rounded off to three significant figures in accordance with JIS Z 8401 and the rounded value is divided by the cross-sectional area.

- (3) The mixing of concrete shall be so made as to minimize the unit water content by taking the required strength and durability, into consideration.

Further, in the case of using that judged to be where the aggregate which is decided "not harmless" in alkali-silica reactivity test of aggregate, a countermeasures to limit alkali aggregate reaction shall be taken according to Annex 6 (Method for restraining alkali reactivity of aggregate through selection of cement or others) of JIS A 5308.

- (4) For mixing of concrete, use a batch mixer and mix sufficiently so as the mixed up concrete is plastic and uniform quality.
- (5) In placing the concrete, compact it sufficiently by using a vibrator.

- (6) After finishing the placing of concrete, cure it by giving sufficient moist. In the case of performing the steam curing under atmospheric pressure, it shall attain satisfactory results for the qualities of the concrete and the products.

6.2 Method of imparting prestress The method of imparting prestress shall satisfy the following matters:

- (1) Arrange the PC steels in the correct positions, stretch and fix perfectly at both ends to reaction supporters so as not to work loss until prestressing.
- (2) Immediately after fixing the PC steels to the reaction supporters, each PC steel shall sustain a force of 13230 kgf{129.8 kN} in the case of 7-wire strand 12.7 mm, and a force of 18590 kgf{182.3 kN} in the case of 7-wire strand 15.2 mm.
- (3) In the procedure of giving prestress, detach the mould frame of side face, and loosen gradually the fixing apparatus of PC steels. The compression strength of concrete, at the time of prestressing, shall be not less than 420 kgf/cm²{41.2 N/mm²}. In this case, the compressive strength test shall be carried out on the specimen performed by the same curing as that of the product, according to JIS A 1108.

Remarks: Before March 31, 1995, if a tester in which the load is marked in SI unit is used, the compressive strength shall be calculated in such a way, that the measured maximum load is divided by 9.80665, the quotient is rounded off to three significant figures in accordance with JIS Z 8401 and the rounded value is divided by the cross-sectional area.

- (4) Cut the PC steels so as not to protrude from the member end surface and protect by using the material having water proofness, adhesive property, and alkali resistance.

6.3 Shipping The shipping shall be carried out after the compressive strength of the specimen cured in the same way as the product has reached 700 kgf/cm²{68.7 N/mm²} or over, or after it is confirmed that the specimen satisfies the provision of 6.1 (2).

7. Test method

The cracking strength test of the bridge beam shall be carried out by means of the loading method shown in Fig. 2.

The test shall be carried out after the compressive strength of the specimen cured in the same way as that for the products has reached 700 kgf/cm²{68.7 N/mm²} or over, or after it is confirmed that the said strength satisfies the provision of 6.1 (2).

The calculation of the crack test moment shall be made by the use of the following equation:

$$M = \frac{wl^2}{8} + \frac{(P+W)}{4} (l-2a)$$

where, M : crack test moment specified in Table 2 or Table 3
(tf·m){N·m}

P : load (tf){N}

Remarks: Before March 31, 1995, if a tester in which the load is marked in SI unit is used, the load shall be calculated in such a way, that the value calculated according to traditional units is multiplied by 9.80665, and the product is rounded off to three significant figures in accordance with JIS Z 8401.

W : weight of loading device (tf) {N}

l : span calculated by the following formula

$$l = L - 2d$$

where, L : length of beam (m)

d : length from the beam end to supporting point (m)

In the case of $l \leq 7$ m 0.15

In the case $7 \text{ m} < l \leq 9$ m 0.20

In the case $9 \text{ m} < l$ 0.25

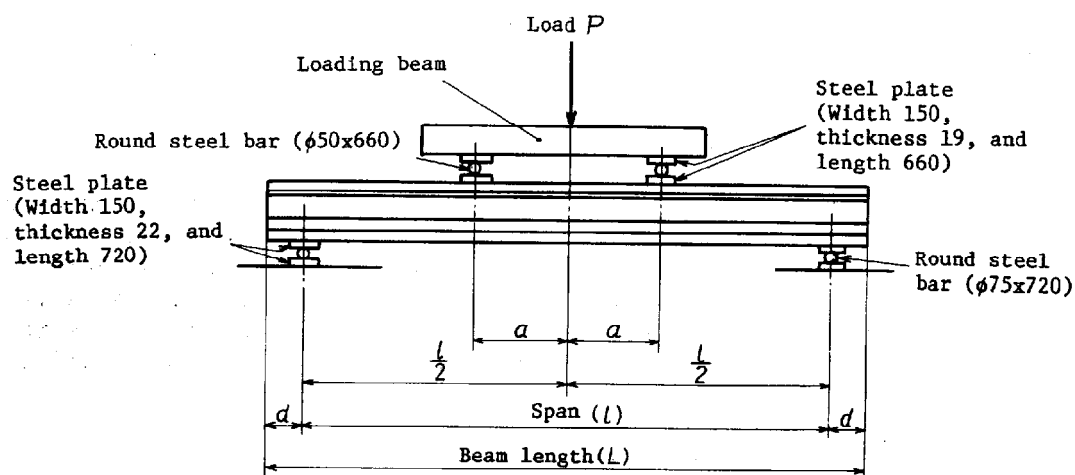
w : weight per unit length of beam (tf/m){N/m} of the value given in Table 5 or Table 6

a : = 0.50 (m) when $l < 10$ m (m)

= 0.75 (m) when $l \geq 10$ m (m)

Fig. 2. Loading method

Unit: mm

Table 5. (Applicable till March 31, 1995)
Unit: tf/m [kN·m]

Type designation	Weight per unit length ⁽⁵⁾
LS05	0.373 {3.66}
LS06	0.373 {3.66}
LS07	0.373 {3.66}
LS08	0.411 {4.03}
LS09	0.452 {4.43}
LS10	0.490 {4.80}
LS11	0.569 {5.80}
LS12	0.610 {5.98}
LS13	0.651 {6.38}