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**Precast prestressed concrete
products**

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Precast Concrete Standard Committee (JPCC)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS A 5373:2010** is replaced with this Standard.

However, **JIS A 5373:2010** may be applied in the **JIS** mark certification based on the relevant provisions of Article 19 Clause 1, etc. of the Industrial Standardization Law until October 19, 2016.

This **JIS** document is protected by the Copyright Law.

Attention is drawn to the possibility that some parts of this Standard may conflict with patent rights, applications for a patent after opening to the public or utility model rights. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying any of such patent rights, applications for a patent after opening to the public or utility model rights.

Precast prestressed concrete products

1 Scope

This Japanese Industrial Standard specifies the precast prestressed concrete products (hereafter referred to as PC products). However, this Standard is not applied to the concrete products for buildings separately specified in Japanese Industrial Standards.

This Standard is not applied to the products which use the prestressing tendon¹⁾, etc. for the purpose of ensuring the safety in construction, and is not intended to have the prestressed concrete structure.

The comparison table between previous and current editions of this Standard on technically significant revisions is given in Annex F.

Note ¹⁾ The prestressing tendon means the materials specified in **JIS G 3109**, **JIS G 3137** and **JIS G 3502**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) listed below shall be applied.

JIS A 0203 *Concrete terminology*

JIS A 1108 *Method of test for compressive strength of concrete*

JIS A 1136 *Method of test for compressive strength of spun concrete*

JIS A 5361 *Precast concrete products—General rules for classification, designation and marking*

JIS A 5362 *Precast concrete products—Required performance and methods of verification*

JIS A 5363 *Precast concrete products—General rules for methods of performance test*

JIS A 5364 *Precast concrete products—General rules of materials and product methods*

JIS A 5365 *Precast concrete products—General rules for method of inspection*

3 Terms and definitions

For the purposes of this Standard, the terms and definitions given in **JIS A 0203**, and the following apply.

3.1 Group I

PC products which are manufactured based on specifications that have been confirmed by actual results to satisfy the required performances

The recommended specifications are shown in respective Annexes.

3.2 Group II

PC products manufactured based on the performance requirements and specification which are agreed previously between the parties concerned with delivery

4 Classification

PC products shall be classified as specified in Table 1 according to the applications.

They shall be classified into Group I and Group II according to the determination method of performance and specification.

Table 1 Classification of PC products

Type	Applicable clause in Annex
Poles	See A.2.
Bridges	See B.2.
Retaining walls	See C.2.
Covered conduits	See D.2.
Piles	See E.2.
Other products Example: Disaster prevention facilities	As agreed between the parties concerned with delivery.
NOTE : Each Annex contains specifications of Group I and Group II. Recommended specification is provided for Group I, but not for Group II.	

5 Quality

5.1 Appearance

PC products shall be free from any flaw, crack, chip, camber, torsion (board products), etc. detrimental to practical use.

5.2 Performance

The performance according to the type of PC products shall conform to the provisions of Table 2. The performance tests for the verification of performances shall be as specified in **9.2.**

Table 2 Performances of PC products

Type	Applicable clause in Annex
Poles	See A.3.
Bridges	See B.3.
Retaining walls	See C.3.
Covered conduits	See D.3.
Piles	See E.3.
Other products Example : Disaster prevention facilities	a) Performance Specific items of performance shall be selected and designated as agreed between the parties concerned with delivery according to JIS A 5362. When the correlativity between the performance and the product specifications (dimensions, materials, constructions, etc.) is proven by actual results, the product specification indicated in b) may be alternatively given. b) Alternative specification for performance As follows. 1) Dimensions 2) Compressive strength of concrete 3) Bar arrangement 4) Effective prestress

6 Shape, dimensions and dimensional tolerances

The shape, dimensions and dimensional tolerances shall be as specified in Table 3.

Table 3 Shape, dimensions and dimensional tolerances of PC products

Type	Applicable clause in Annex
Poles	See A.4.
Bridges	See B.4.
Retaining walls	See C.4.
Covered conduits	See D.4.
Piles	See E.4.
Other products Example : Disaster prevention facilities	As agreed between the parties concerned with delivery.

7 Bar arrangement and tolerances on bar arrangement

The bar arrangement (reinforcing bar and prestressing tendon) of PC products shall be measured as specified in **9.3**, and the arrangement and the tolerance shall conform to the provisions of the following **a)** and **b)**.

- a) **Bar arrangement** The bar arrangement (including covering of reinforcing bar) shall be as specified in Table 4. However, as agreed between the parties concerned with delivery, other bar arrangement may be adopted unless it compromises the performance of PC products (including the provisions of **5.2**). The manufacturer

shall prepare the bar arrangement drawing for each product, and shall provide it to the purchaser, if requested.

Table 4 Bar arrangement of PC products

Type	Applicable clause in Annex
Poles	See A.5 .
Bridges	See B.5 .
Retaining walls	See C.5 .
Covered conduits	See D.5 .
Piles	See E.5 .
Other products Example : Disaster prevention facilities	Determined by the manufacturer.
NOTE : General precautions for designing the bar arrangement should be as follows. — The minimum gap between the reinforcing bar and the prestressing tendon should be at least $5/4$ of the maximum dimension of coarse aggregates. — The necessary cross-sectional area of reinforcing bar and prestressing tendon shall be determined from the structural calculation or the structural details; however, there are more than one combination of diameter and the number of reinforcing bars and prestressing tendons which satisfy the cross-sectional area. The diameter and the number of reinforcing bars and prestressing tendons shall be selected in consideration of the thickness of components, the maximum dimension of coarse aggregates, etc. The bar arrangement shall be selected to ensure the complete adhesion between the reinforcing bar, prestressing tendon and concrete, and to obtain the good crack dispersion of concrete components.	

- b) **Tolerance on bar arrangement** The tolerance on bar arrangement ²⁾ shall be determined by the manufacturer according to the type of product within the range in which the required performance can be satisfied.

Note ²⁾ The tolerance on bar arrangement means the limit of deviation between the positions of reinforcing bar and prestressing tendon indicated on the bar arrangement drawing, and the positions of reinforcing bar and prestressing tendon of the product.

8 Materials and production methods

The materials used for PC products and the production methods shall be as specified in **JIS A 5364**.

9 Test methods

9.1 Appearance test

The appearance shall be tested visually, and the product shall be examined for flaw, crack, chip, camber, torsion (in the case of board products), etc. detrimental to practical use.

9.2 Performance test

The test method of performance shall be as specified in **JIS A 5363** and Table 5.

Table 5 Performance test method of PC products

Type	Applicable clause in Annex
Poles	See A.7.
Bridges	See B.7.
Retaining walls	See C.7.
Covered conduits	See D.7.
Piles	See E.7.
Other products Example: Disaster prevention facilities	As agreed between the parties concerned with delivery.

9.3 Measurement of bar arrangement

In the measurement of bar arrangement, the diameter, number and covering of reinforcing bars and prestressing tendons shall be checked. The method shall be any of the following.

- Method by non-destructive test** The measurement by the non-destructive test shall be conducted using the electromagnetic induction method, radar method, etc. According to each designated measurement method, the diameter, number, and covering of reinforcing bars and prestressing tendons shall be measured.
- Method using broken sample** The measurement using the broken sample shall be conducted after finishing the performance test such as outside pressure test. The concrete part of the sample shall be chipped; reinforcing bars shall be exposed; and the diameter of reinforcing bar and prestressing tendon, and the number and covering thereof shall be measured.
- Method using bar arrangement before placing concrete** If the positions of reinforcing bar and prestressing tendon before and after placing concrete are not affected by the assembly method of reinforcing bar and prestressing tendon, fixing method of reinforcing bar and prestressing tendon to a formwork, and securing method of covering, the positions of reinforcing bar and prestressing tendon can be regarded as the positions of reinforcing bar and prestressing tendon of finished product by measuring the diameter, number, and covering of reinforcing bar and prestressing tendon before placing concrete.

10 Inspections

10.1 Division and items of inspections

The inspections on PC products are divided into the final inspection and the delivery inspection and as follows.

- Final inspection** The final inspection shall be conducted by the manufacturer of product on the following items.

- 1) Appearance
 - 2) Performance
 - 3) Shape and dimensions
- b) **Delivery inspection** The delivery inspection items shall be as follows. The delivery inspection may be omitted as agreed between the parties concerned with delivery.
- 1) Appearance
 - 2) Shape and dimensions

10.2 Inspection methods

The inspection methods of PC products shall be as specified in **JIS A 5365** and Table 6.

Table 6 Inspection methods of PC products

Type	Applicable clause in Annex
Poles	See A.8.
Bridges	See B.8.
Retaining walls	See C.8.
Covered conduits	See D.8.
Piles	See E.8.
Other products Example: Disaster prevention facilities	As agreed between the parties concerned with delivery.

10.3 Judgement on inspection

The judgement method of inspection shall be as specified in **JIS A 5365**.

11 Designation of products

The designation of products shall be as specified in **JIS A 5361**.

12 Marking

Items specified in **JIS A 5361** shall be marked on PC products. If the marking is particularly specified in Annex of this Standard, the provisions in Annex shall prevail. For the Group II products, the following items shall be marked on the product.

- a) Characters “Group II” or its abbreviation
- b) Type (designation determined by manufacturer) or its abbreviation
- c) Other necessary item or its abbreviation

13 Report

The manufacturer shall submit the report about the appearance, performance, shape/dimensions, etc., when requested by the purchaser.

Annex A (normative)

Poles

A.1 Outline

This Annex specifies Group I and Group II of poles which are mainly used for the communication, traffic-light and utility poles.

A.2 Classification

The poles shall be classified as specified in Table A.1, and Group I shall be as specified in Table A.2.

Table A.1 Classification of poles

Major division	Minor division
Poles	Prestressed concrete poles
	Decorative light poles
	Others

Table A.2 Classification of Group I of poles

Type	Division by application	Division by verification	Detail
Class 1	Power transmission, power distribution, communication, traffic light, etc.	Cracking test load	See Recommended specification A-1.
Class 2	Line in railroad and track (including trolley coach), etc.	Critical cracking width strength	
NOTE : The critical cracking width strength means the strength that can keep the flexural crack width below the limit value.			

A.3 Performance

The performance and the performance verification method shall be as follows.

- Product of Group I** The performance of product shall conform to the provisions of Recommended specification A-1.
- Product of Group II** The performance of product shall conform to the provisions of clause 4 and clause 5 of **JIS A 5362**, and shall be determined as agreed between the parties concerned with delivery. Table A.3 may be applied for general specifications.

Table A.3 Performance and performance verification method of poles

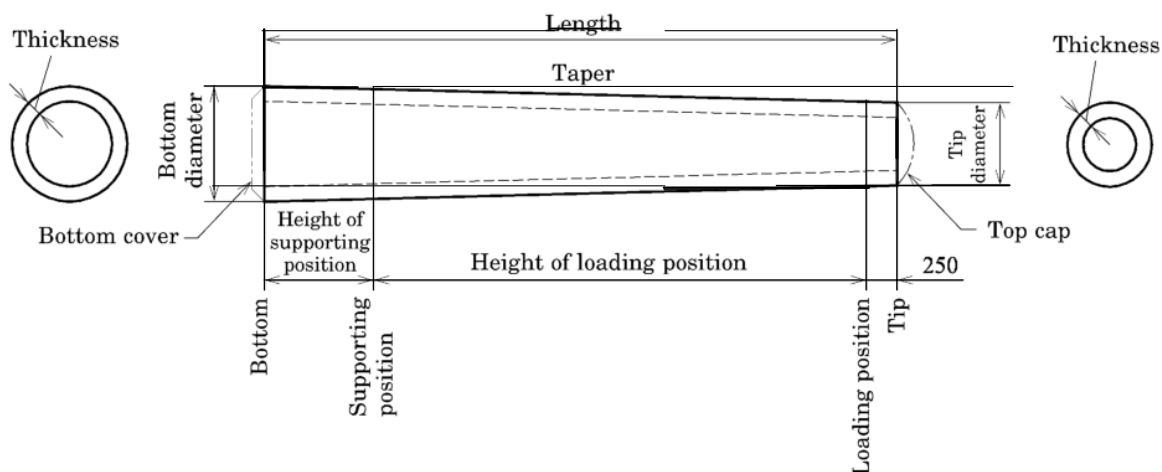
Performance item	Performance	Performance verification method
Service performance	It shall be able to be used smoothly under a load expected during service, fulfilling the required function.	See design document, A.7 or actual results.
Safety ^{a)}	It shall not fracture under a load expected in design. The same applies to performance for joint.	See design document, A.7 or actual results.
Durability ^{b)}	Cracking, ageing of material properties or the like due to the expected impact shall not deteriorate the required performance.	See design document or actual results.
Workability	It shall be transported, installed, assembled and joined safely and easily without abnormalities detrimental to use.	See design document or actual results.
The prestressing tendons whose durability against the stress corrosion cracking is confirmed shall be used for poles upon agreement between the parties concerned with delivery.		
Notes ^{a)} The verification of the safety shall be made when requested by the purchaser.		
^{b)} Durability may be verified by the actual results of similar products equivalent in water-cement ratio and/or air content as well as the covering of reinforcing bar, etc. and production method.		

A.4 Shape, dimensions and dimensional tolerances

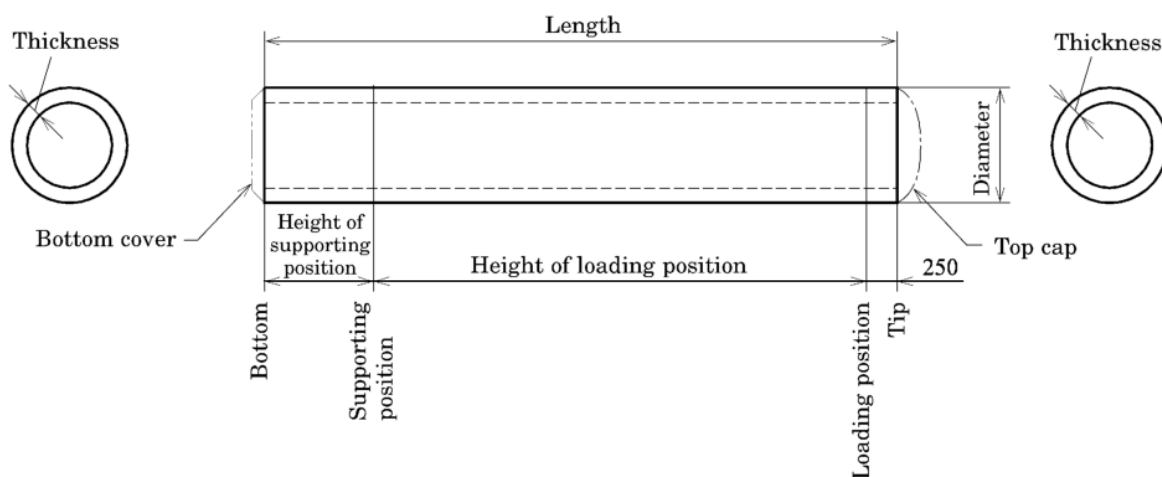
The shape, dimensions and dimensional tolerances of poles shall be as follows. As to Group I, if the design concept is equivalent and the performance and the performance verification method are the same, the reference dimension may be changed within $\pm 10\%$ in response to the purchaser's demand, provided that the necessary performance is satisfied.

- a) **Shape** An example of shapes of poles is shown in Figure A.1. A joint may be provided, if necessary.

Unit: mm



a) Tapered hollow truncated cone



b) Hollow cylinder

Figure A.1 Example of shapes of poles

- b) **Dimensions and dimensional tolerances** The dimensions and dimensional tolerances of the products classified into Group I shall be as specified in Table A.4. However, the lengths of a top cap and a bottom cover are not to be included in the length. The dimensions and dimensional tolerances of the products classified into Group II shall be as agreed between the parties concerned with delivery.

Table A.4 Dimensions and dimensional tolerances of poles

Unit: mm

Type		Length	Thickness	Tip diameter	Bottom diameter	Diameter
Prestressed concrete poles	Dimensions	7 m to 17 m	See a design document	120 to 220	230 to 450	300 to 400
	Tolerances	+50 -10	+ Not specified. -0	+4 -2		
— The tip diameter, bottom diameter and diameter shall be the average of two values measured along each orthogonal axis at one cross-section of the end face, which is rounded to integer. — The thickness shall be the average of four values measured along each orthogonal axis in one cross-section of the end face, which is rounded to integer.						

A.5 Bar arrangement

The bar arrangement shall be as specified in clause 7, **JIS A 5364** and a design document. However, as agreed between the parties concerned with delivery, the bar arrangement other than that of the recommended specification may be adopted unless it compromises the performance of PC products (including the provisions of **A.3**). The bar arrangement of poles that satisfy **A.3** shall be determined by the manufacturer for every product.

A.6 Quality of concrete

A.6.1 Material and production method

The materials for concrete and the production method shall be as specified in clause 8.

A.6.2 Compressive strength

The compressive strength of concrete shall be 50 N/mm² or more after the predetermined material aging. The compressive strength at the time of prestress introduction shall be at least 1.7 times the prestress given at a supporting position, at least 1.3 times the prestress given at a loading position, and 25 N/mm² or more.

The compressive strength for Group II shall be as agreed between the parties concerned with delivery.

A.7 Test method

A.7.1 Compressive strength test of concrete

The compressive strength test of concrete shall be as specified in **JIS A 1108** or **JIS A 1136**.

The test piece shall be processed by the same curing as the product or be controlled properly.

A.7.2 Flexural strength test of product

The flexural strength test of product shall be as specified in **JIS A 5363**.

A.8 Inspection

Inspections shall be as specified in **JIS A 5365** and the following.

- a) **Final inspection** The final inspection of poles shall be conducted on the appearance, performance, shape and dimensions, and shall be as follows.
 - 1) **Appearance** As the inspection of the appearance, a 100 % inspection or a sampling inspection shall be conducted considering the characteristics of product, production method, production quantity, etc.
 - 2) **Performance, shape and dimensions** As the inspections of performance, shape and dimensions, a sampling inspection shall be applied.

When substitute characteristics are inspected by using an alternative test piece in place of inspecting performances of a product, the correlation between the properties of the test piece and those of the product shall be confirmed in advance.
 - 3) **Size of inspection lot** The size of inspection lot shall be determined by the manufacturer in consideration of the characteristics of product, production method, production quantity, production period, quantity of ordered poles, etc.

Any product in the inspection lot shall have the same characteristics, and shall be manufactured using the same materials, concrete mix proportion and manufacturing process, etc.
- b) **Delivery inspection** The delivery inspection of poles shall be conducted on the appearance, shape and dimensions. The size of inspection lot and the sampling method shall be specified by the purchaser as agreed between the parties concerned with delivery. The delivery inspection may be omitted as agreed between the parties concerned with delivery.

A.9 Marking

The following items shall be marked on the poles as specified in **JIS A 5361**.

- a) Type or its abbreviation
- b) Designation of product
- c) Manufacturer's name or its abbreviation
- d) Date of manufacture or its abbreviation

A.10 Others (recommended specification)

The recommended specification of Group I of poles is shown in Table A.5.

Table A.5 Recommended specification

Structure-specific product group standard		Recommended specification
JIS A 5373	Annex A Poles	Recommended specification A-1 Prestressed concrete poles

Recommended specification A-1

Prestressed concrete poles

A-1.1 Outline

This recommended specification describes the prestressed concrete poles in Group I of poles (hereafter referred to as poles) specified in Annex A.

A-1.2 Classification

The poles shall be classified into Class 1 and Class 2.

- a) Class 1 shall be divided according to the dimensions and the cracking test load as specified in Recommended specification A-1 Table 1.
- b) Class 2 shall be divided according to the dimensions and the critical cracking width strength as specified in Recommended specification A-1 Table 2.

Recommended specification A-1 Table 1
Dimensions and cracking test load (Class 1)

Length <i>L</i> m	Height of loading position m	Height of supporting position <i>l'</i> m	Cracking test load kN			
			Tip diameter			
			120 mm	140 mm	190 mm	220 mm
7	5.55	1.2	—	1.5	—	—
8	6.35	1.4	—	1.5 2.0	4.3	—
9	7.25	1.5	2.0	2.5	3.5 4.3 5.0	—
10	8.05	1.7	2.0	2.5	3.5 5.0	—
11	8.85	1.9	2.0	—	3.5 5.0	—
12	9.75	2.0	—	—	3.5 5.0 7.0	—
13	10.55	2.2	—	—	3.5 5.0 7.0	—
14	11.35	2.4	—	—	3.5 5.0 7.0	—
15	12.25	2.5	—	—	5.0 7.0	—
	11.95	2.8	—	—	10	10
	11.75	3.0	—	—	—	15

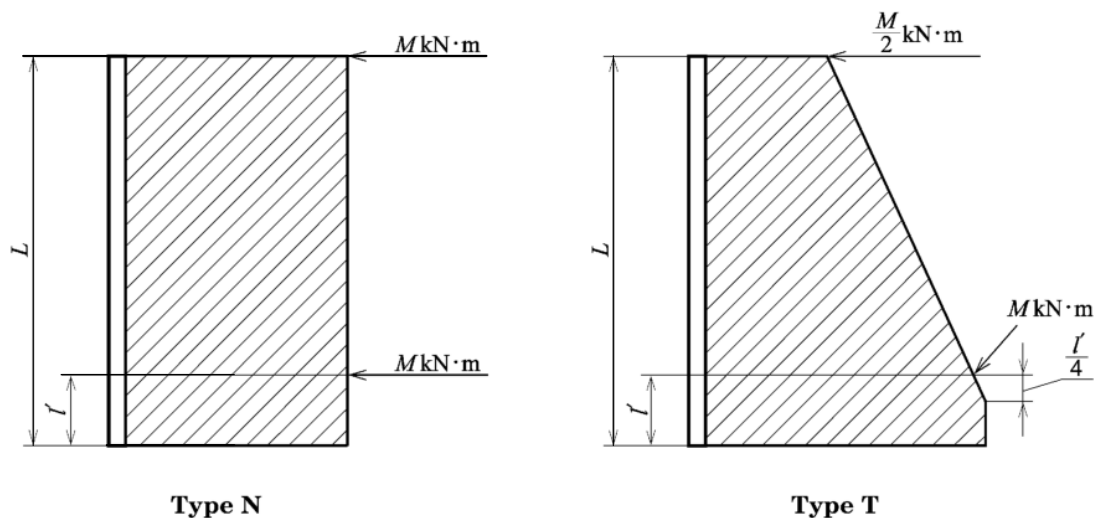
Recommended specification A-1 Table 1 (concluded)

Length <i>L</i> m	Height of loading position m	Height of supporting position <i>l'</i> m	Cracking test load kN			
			Tip diameter			
			120 mm	140 mm	190 mm	220 mm
16	13.25	2.5	—	—	5.0 7.0	—
	12.95	2.8	—	—	10	10
	12.75	3.0	—	—	—	15
17	13.95	2.8	—	—	5.0 7.0 10	— 10
	13.75	3.0	—	—	—	15
A taper shall be 1/75.						

**Recommended specification A-1 Table 2
Dimensions and critical cracking width strength (Class 2)**

Length <i>L</i> m	Height of loading position m	Height of supporting position <i>l'</i> m	Critical cracking width strength kN · m			
			Type N			Type T
			Diameter			Diameter
			300 mm	350 mm	400 mm	350 mm
8	6.35	1.4	65	50 65	—	—
9	7.25	1.5	65	50 65	—	—
10	8.05	1.7	65	50 65 75	—	—
11	8.85	1.9	65	50 65 75	110	90 110
12	9.75	2.0	65	50 65 75	110	90 110
13	10.55	2.2	—	65 75	110	90 110
14	11.35	2.4	—	75	—	—
NOTE : Type N and Type T are the type symbols categorized by the distribution of critical cracking width strength. The magnitude and the distribution map of the critical cracking width strength according to the types are as specified in the following diagram.						

Recommended specification A-1 Table 2 (concluded)



L : length of pole

l' : height of supporting position

M : critical cracking width strength shown in Recommended specification A-1 Table 2

A-1.3 Performance

A-1.3.1 Class 1 poles

The performance of Class 1 poles shall be as follows.

- Cracking test load** The cracking test load on Class 1 pole (0.25 mm or under in crack width) shall be not less than the value specified in Recommended specification A-1 Table 1. When this cracking test load is removed, the crack exceeding 0.05 mm in width shall not remain.
- Ultimate load** The ultimate load on Class 1 pole shall be at least twice the cracking test load specified in Recommended specification A-1 Table 1.

A-1.3.2 Class 2 poles

The performance of Class 2 poles shall be as follows.

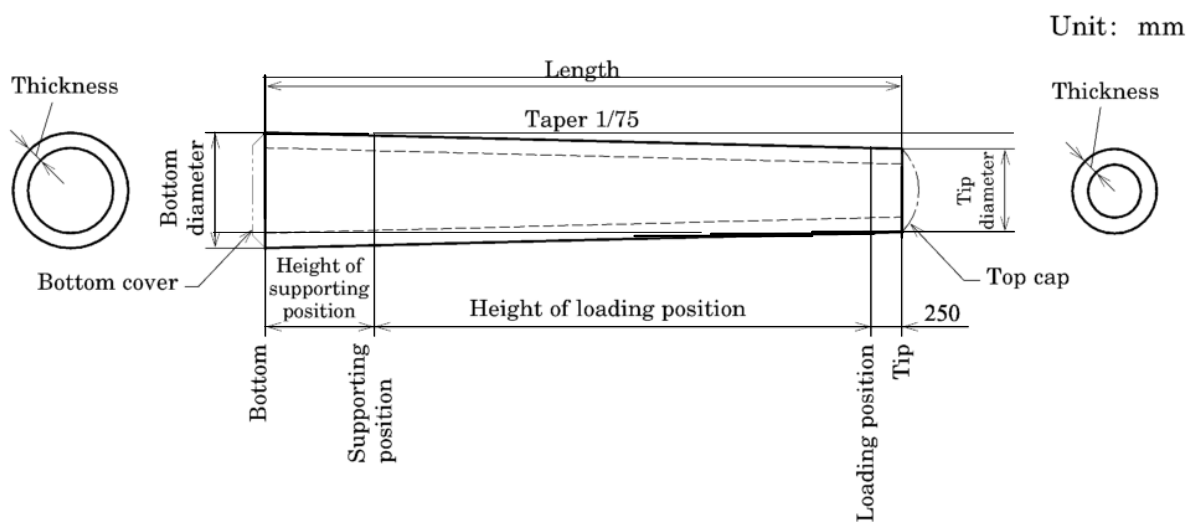
- Critical cracking width strength** The critical cracking width strength of Class 2 poles (0.25 mm or under in crack width) shall be not less than the value specified in Recommended specification A-1 Table 2. When the load equivalent to the critical cracking width strength is removed, the cracking exceeding 0.05 mm in width shall not remain.
- Ultimate flexural strength** The ultimate flexural strength of Class 2 pole shall be at least twice the critical cracking width strength specified in Recommended specification A-1 Table 2.
- Deflection** The deflection of Class 2 pole shall be such that the deflection of a 8 m pole at 6 m from the supporting position and the deflection of at least 9 m pole at 7 m from the supporting position shall not exceed 75 mm when the pole is subjected to the load equivalent to 2/3 of critical cracking width strength specified in Recommended specification A-1 Table 2.

A-1.4 Shape, dimensions and dimensional tolerances

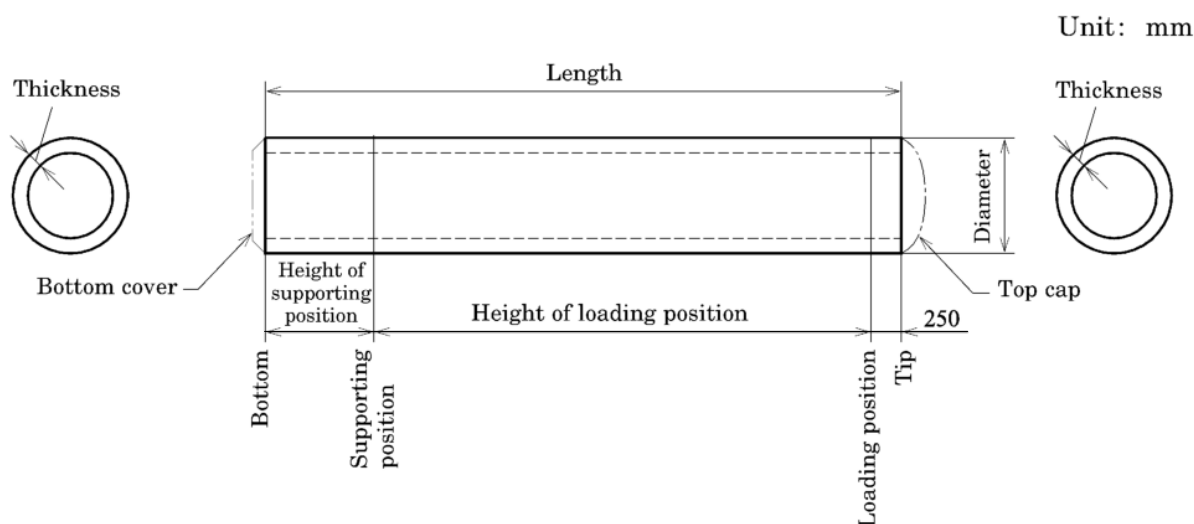
A-1.4.1 Shape

The shape of a pole shall be as follows.

- The shape of Class 1 pole shall be a tapered truncated hollow cone as shown in Recommended specification A-1 Figure 1.
- The shape of Class 2 pole shall be a hollow cylinder as shown in Recommended specification A-1 Figure 2.



Recommended specification A-1 Figure 1 Shape of pole (Class 1)



Recommended specification A-1 Figure 2 Shape of pole (Class 2)

A-1.4.2 Dimensions and dimensional tolerances

The dimensions of poles shall be as specified in Recommended specification A-1 Table 1 and Recommended specification A-1 Table 2, and dimensional tolerances shall be as specified in Recommended specification A-1 Table 3.

If the reference dimension is changed within the range specified in **A.4**, the manufacturer shall submit the data indicating that poles conform to Table A.3 in the design document or the performance test result when requested by the purchaser.

Recommended specification A-1 Table 3 Dimensional tolerances

Unit: mm

Type		Length	Thickness	Tip diameter	Bottom diameter	Diameter
Prestressed concrete poles	Dimensions	7 m to 17 m	See a design document	120 to 220	230 to 450	300 to 400
	Dimensional tolerances	+50 - 10	+ Not specified. - 0	+ 4 - 2		
— The tip diameter, bottom diameter and diameter shall be the average of two values measured along each orthogonal axis at one cross-section of the end face, which is rounded to integer. — The thickness shall be the average of four values measured along each orthogonal axis in one cross-section of the end face, which is rounded to integer.						

A-1.5 Bar arrangement

The bar arrangement of pole shall be as follows.

- The prestressing tendon and the longitudinal reinforcing bar shall be arranged as uniformly as possible over the cross-section of pole.
- The gap between the prestressing tendon and the longitudinal reinforcing bar shall be one or more times their diameters, and shall be $\frac{5}{4}$ or more times the maximum dimension of coarse aggregates. If the gap between the prestressing tendon and the longitudinal reinforcing bar becomes not more than the specified value by attaching the accessory, etc., it shall be confirmed that concrete is compacted enough by the centrifugal compaction.
- The prestressing tendon and the longitudinal reinforcing bar shall be assembled by execution bars. These execution bars shall be arranged so that the performance of body is not compromised.
- When prestressing tendons or longitudinal reinforcing bars are joined with execution bars by welding, it shall be guaranteed that the mechanical characteristics of prestressing tendons or longitudinal reinforcing bars do not fall short of each specified value due to welding.
- The covering shall be 9 mm or more and 1 or more times the diameter of prestressing tendon and longitudinal reinforcing bar.

A-1.6 Quality of concrete

The quality of concrete shall be as specified in **A.6.2**.

A-1.7 Test method

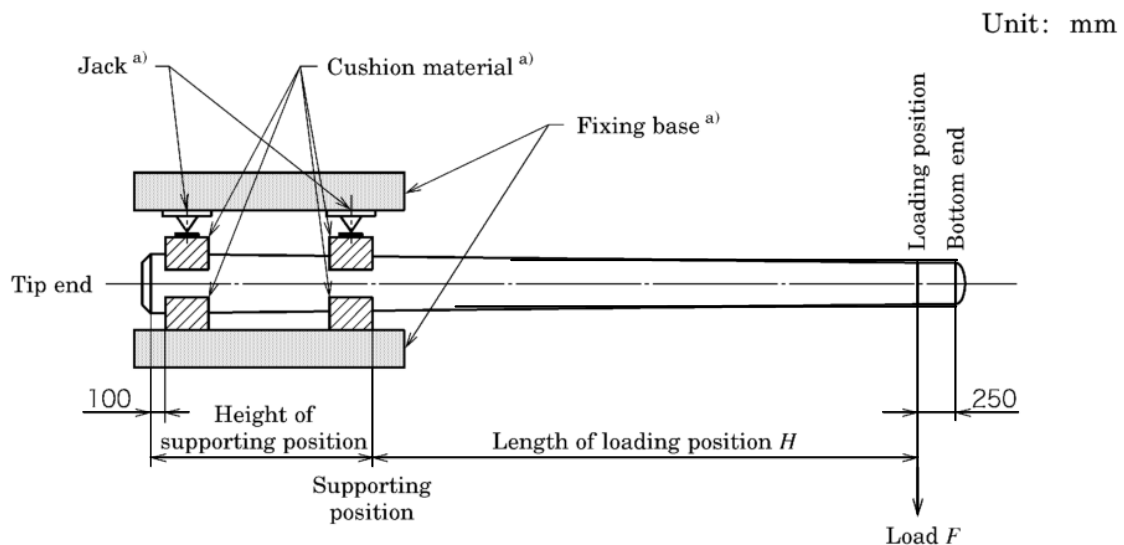
A-1.7.1 Compressive strength test

The compressive strength test of concrete shall be as specified in **A.7.1**.

A-1.7.2 Flexural strength test of product

For the flexural strength test on Class 1 pole, a pole shall be installed as shown in recommended specification A-1 Figure 3 and be fixed by applying cushion materials, etc. At a loading position, the load shall be applied in a direction as perpendicularly to the axis of the pole as possible. Loading shall be applied up to the crack test load at a slow rate, and the crack width and the deflection shall be measured. At this time the pole shall be examined for the crack exceeding 0.25 mm in width. After that, the load shall be removed, and the residual crack width shall be measured. Then, the pole shall be examined for the crack exceeding 0.05 mm in residual crack width. Further, the load shall be applied in the same way up to the ultimate load of the pole, if necessary. The crack test load and the ultimate load used for the test are shown in Recommended specification A-1 Table 4.

The flexural strength test of Class 2 pole shall be the same as that of Class 1 pole. However, the load equivalent to the critical cracking width strength and the ultimate load shown in Recommended specification A-1 Table 5 shall be used for loading.



Note ^{a)} The fixing devices in the diagram (fixing bases, cushion materials and jacks) are examples.

Recommended specification A-1 Figure 3
Flexural strength test method of pole (example of Class 1)

Recommended specification A-1 Table 4
Cracking test load and ultimate load of pole (Class 1)

Unit: kN

Designation of product	Cracking test load	Ultimate load
7-14-1.5, 8-14-1.5	1.5	3.0
8-14-2.0, 9-12-2.0, 10-12-2.0, 11-12-2.0	2.0	4.0
9-14-2.5, 10-14-2.5	2.5	5.0
9-19-3.5, 10-19-3.5, 11-19-3.5, 12-19-3.5, 13-19-3.5, 14-19-3.5	3.5	7.0
8-19-4.3, 9-19-4.3	4.3	8.6
9-19-5.0, 10-19-5.0, 11-19-5.0, 12-19-5.0, 13-19-5.0, 14-19-5.0, 15-19-5.0, 16-19-5.0, 17-19-5.0	5.0	10.0
12-19-7.0, 13-19-7.0, 14-19-7.0, 15-19-7.0, 16-19-7.0, 17-19-7.0	7.0	14.0
15-19-10.0, 16-19-10.0, 17-19-10.0, 15-22-10.0, 16-22-10.0, 17-22-10.0	10.0	20.0
15-22-15.0, 16-22-15.0, 17-22-15.0	15.0	30.0
NOTE : The designation of product is shown by Length (m) – Tip diameter (cm) – Cracking test load (kN).		

Recommended specification A-1 Table 5
Load equivalent to critical cracking width strength and
ultimate load of pole (Class 2)

Unit: kN

Designation of product	Height of loading position m	Load equivalent to critical cracking width strength	Ultimate load
8-35-N50	6.35	7.9	15.8
8-30-N65, 8-35-N65		10.3	20.6
9-35-N50	7.25	6.9	13.8
9-30-N65, 9-35-N65		9.0	18.0
10-35-N50	8.05	6.3	12.6
10-30-N65, 10-35-N65		8.1	16.2
10-35-N75		9.4	18.8
11-35-N50	8.85	5.7	11.4
11-30-N65, 11-35-N65		7.4	14.8
11-35-N75		8.5	17.0
11-35-T90		10.2	20.4
11-40-N110, 11-35-T110		12.5	25.0
12-35-N50	9.75	5.2	10.4
12-30-N65, 12-35-N65		6.7	13.4
12-35-N75		7.7	15.4
12-35-T90		9.3	18.6
12-40-N110, 12-35-T110		11.3	22.6
13-35-N65	10.55	6.2	12.4
13-35-N75		7.2	14.4
13-35-T90		8.6	17.2
13-40-N110, 13-35-T110		10.5	21.0
14-35-N75	11.35	6.7	13.4
NOTE : The designation of product is shown by Length (m) – Diameter (cm) – Type symbol and Critical cracking width strength (kN·m).			

A-1.8 Inspections

A-1.8.1 Inspection items

The inspection items of poles shall be as follows.

a) **Final inspection** The final inspection items shall be as follows.

- 1) Appearance
- 2) Performance
- 3) Shape and dimensions

b) **Delivery inspection** The delivery inspection items shall be as follows. The delivery inspection may be omitted as agreed between the parties concerned with delivery.

- 1) Appearance
- 2) Shape and dimensions

A-1.8.2 Inspection lot

The size of inspection lot of poles shall be decided by the manufacturer for the final inspection, and by the purchaser for the delivery inspection as agreed between the parties concerned with delivery in consideration of the characteristics of product, production method, production quantity, production period, quantity of ordered poles, etc. One inspection lot may consist of 3 000 units or fractions thereof.

A-1.8.3 Inspection method

The inspection method of poles shall be as follows.

a) **Final inspection** The final inspection method shall be as follows.

- 1) **Appearance** As the inspection of the appearance, a 100 % inspection shall be conducted by visual observation, and poles conforming to the provisions of **5.1** shall be accepted.
- 2) **Performance** As the inspection of the cracking test load (Class 1) or the critical cracking width strength (Class 2), two arbitrary poles per lot shall be taken and inspected as specified in **A-1.7.2**. If both of the two conform to **A-1.3**, the lot shall be accepted. If neither of the two conforms, the lot shall be rejected. If only one of the two does not conform, the lot shall be re-inspected by taking four more poles from the lot. If all the four conform to the provisions, the lot shall be accepted after the first non-conforming product is eliminated. If one or more of them do not conform in the reinspection, the lot shall be rejected.

In the inspection of the ultimate load (Class 1) or the ultimate flexural strength (Class 2), one of the first two poles in the inspection of the cracking test load (Class 1) or the critical cracking width strength (Class 2) shall be inspected as specified in **A-1.7.2**. If it conforms to the provisions of **A-1.3**, the lot shall be accepted. If it does not conform, two more poles shall be taken from the lot and re-inspected. If both of them conform to the provisions, the lot shall be accepted after the first non-conforming product is eliminated. If one or more of them do not conform in the reinspection, the lot shall be rejected.

- 3) **Shape and dimensions** For the inspection of shape and dimensions, two arbitrary poles per lot shall be taken. If they conform to **A-1.4**, the lot shall be accepted. If one or more do not conform, the remainder of the lot shall be subjected to a 100 % inspection. If the remainder conforms to the provisions, the lot shall be accepted.

b) **Delivery inspection** The delivery inspection method shall be as follows.

- 1) **Appearance** The appearance shall be inspected in the same way as a) 1) or as follows.

When adopting the sampling inspection, two arbitrary poles are taken. If both of them conform to the provisions of **5.1**, the lot shall be accepted. If one or more do not conform, the remainder of the lot shall be subjected to a 100 % inspection. If the remainder conforms to the provisions, the lot shall be accepted.

- 2) **Shape and dimensions** The shape and dimensions shall be inspected in the same way as a) 3).

A-1.9 Marking

The poles which conform to all the requirements of this Standard shall be marked as specified in **A.9**.

Annex B (normative)

Bridges

B.1 Outline

This Annex specifies Group I and Group II of bridges which are mainly used for highways.

B.2 Classification

The bridges shall be classified as specified in Table B.1, and Group I shall be as specified in Table B.2.

Table B.1 Classification of bridges

Major division	Minor division	
Bridges	Bridge beam	Bridge beam for highway bridge
		Segment of bridge beam for highway bridge
	Deck slab	Precast plate for composite deck slab
		Precast deck slab for highway bridge
	Others	

Table B.2 Classification of Group I of bridges

Division by application/shape				Detail
Standard span of bridge beam	Bridge beam for highway bridge	Ordinary bridge beam	Slab bridge beam	See Recommended specification B-1.
			T bridge beam	
		Light-load slab bridge beam		
	Segment of bridge beam for highway ^{a)}			See Recommended specification B-2.
Deck slab	Precast plate for composite deck slab			See Recommended specification B-3.
	Precast deck slab for highway bridge			See Recommended specification B-4.
Note ^{a)} PC product which becomes one bridge beam by assembling a set of several segments using prestressing tendon.				

B.3 Performance

The performance and the performance verification method of bridges shall be as follows.

- a) **Product of Group I** The performance of product shall conform to the provisions of Recommended specification B-1, Recommended specification B-2, Recommended specification B-3 and Recommended specification B-4.

- b) **Product of Group II** The performance of product shall conform to the provisions of clause 4 and clause 5 of **JIS A 5362**, and shall be determined as agreed between the parties concerned with delivery. Table B.3 may be applied for general specifications.

Table B.3 Performance and performance verification method of bridges

Performance item	Performance	Performance verification method
Service performance	It shall be able to be used smoothly under a load expected during service, fulfilling the required function.	See design document, B.7 or actual results.
Safety ^{a)}	It shall not fracture under a load expected in design.	See design document, B.7 or actual results.
Durability ^{b)}	Cracking or ageing of material properties due to the expected impact shall not deteriorate the required performance.	See design document or actual results.
Workability	It shall be transported, installed, assembled and joined safely and easily without abnormalities detrimental to use.	See design document or actual results.
Notes ^{a)} The verification of the safety shall be made when requested by the purchaser. ^{b)} Durability may be verified by the actual results of similar products equivalent in water-cement ratio and/or air content as well as the covering of reinforcing bar, etc. and production method.		

B.4 Shape, dimensions and dimensional tolerances

The shape, dimensions and dimensional tolerances of bridges shall be as follows. As to Group I, if the design concept is equivalent and the performance and the performance verification method are the same, the reference dimension may be changed within $\pm 10\%$ in response to the purchaser's demand, provided that the necessary performance is satisfied. A change in range of reference dimension for the bridge beam for highway and the precast deck slab for highway bridge shall be as specified in the recommended specification.

- a) **Shape** Examples of shapes of bridges are shown in Figure B.1, Figure B.2, Figure B.3 and Figure B.4.

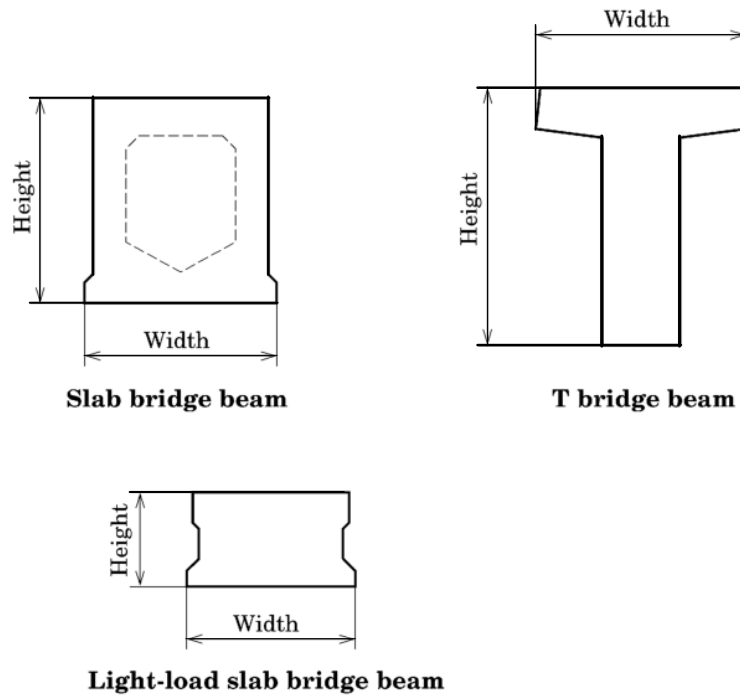


Figure B.1 Example of shape of bridge beams for highway bridge

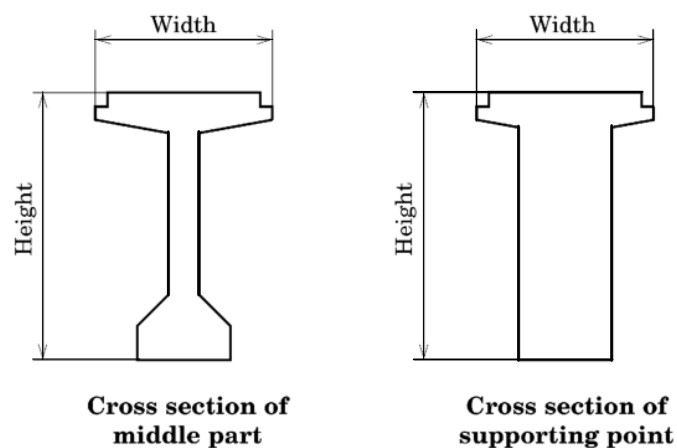


Figure B.2 Example of shape of segment of bridge beams for highway bridge

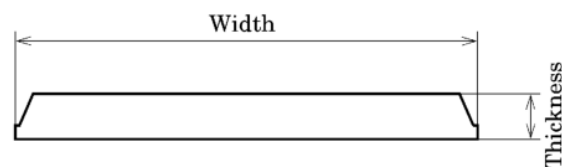


Figure B.3 Example of shape of precast plates for composite deck slab

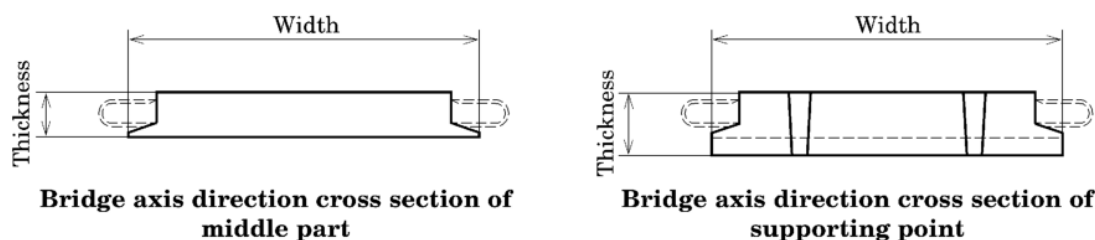


Figure B.4 Example of shape of precast deck slabs for highway bridge

- b) **Dimensions and dimensional tolerances** The dimensions and dimensional tolerances of the products classified into Group I shall be as follows.

The dimensions and dimensional tolerances of the products classified into Group II shall be as agreed between the parties concerned with delivery.

- 1) **Bridge beam** The dimensions and dimensional tolerances of bridge beams shall be as specified in Table B.4.
- 2) **Deck slab** The dimensions and dimensional tolerances of deck slabs shall be as specified in Table B.5.

Table B.4 Dimensions and dimensional tolerances of bridge beams

Unit: mm

Type		Height or thickness	Width (direction perpendicular to bridge axis)	Length (bridge axis direction)	
Slab bridge beam	Dimensions	350 to 1 000	700	Beam length L (m) 5.3 to 24.7	
	Tolerances	± 5	± 5	In the case of $L \leq 10$ m	± 10
				In the case of $L > 10$ m	$\pm L^a/1\,000$
Light-load slab bridge beam	Dimensions	225 to 400	700	Beam length L (m) 5.3 to 13.5	
	Tolerances	± 5	± 5	In the case of $L \leq 10$ m	± 10
				In the case of $L > 10$ m	$\pm L^a/1\,000$
T bridge beam	Dimensions	900 to 1 300	800	Beam length L (m) 18.6 to 24.7	
	Tolerances	± 5	± 5	$\pm L^a/1\,000$	
Segment of bridge beam for highway bridge	Dimensions	1 400 to 3 300	1 300	Segment length L (m) 4.05 to 11.5	
	Tolerances	$+ 10$ $- 5$	Upper width $+ 10$ $- 5$ Lower width ± 5	± 10	
Note ^{a)} The beam length L is expressed in mm.					

Table B.5 Dimensions and dimensional tolerances of deck slab

Unit: mm

Type		Thickness		Width (bridge axis direction)	Length (direction perpendicular to bridge axis)
Precast plate for composite deck slab	Dimensions	70 to 120		998	PC plate length L (m) PC beam: 1.57 to 3.12 Steel beam: 1.50 to 3.05
	Tolerances	+ 5 - 2		+ 5 - 3	+ 10 - 5
Precast deck slab for highway bridge	Dimensions	H_1	240 to 320	1 990	Deck slab length L (m) 7.9 to 18.5
		H_2	340 to 420		
	Tolerances	+ 10 0		+ 5 - 10	+ 20 0

B.5 Bar arrangement

The bar arrangement (position of prestressing tendon and reinforcing bar) shall be as specified in **JIS A 5364** and a design document. However, as agreed between the parties concerned with delivery, the bar arrangement (positions of prestressing tendon and reinforcing bar) not based on the recommended specification may be adopted unless it compromises the performance of PC products (including the provisions of **B.3**).

B.6 Quality of concrete

B.6.1 Material and production method

The materials for concrete and the production method shall be as specified in clause 8.

B.6.2 Compressive strength

The compressive strength of concrete shall satisfy the values of Table B.6 after the predetermined material aging.

The compressive strength for Group II shall be as agreed between the parties concerned with delivery.

Table B.6 Compressive strength of concrete

Unit: N/mm²

Type		Compressive strength of concrete	
		At prestress introduction	At quality assurance
Bridge beam	Slab bridge beam	35 min.	50 min.
	Light-load slab bridge beam	42 min.	70 min.
	T bridge beam	35 min.	50 min.
	Segment of bridge beam for highway bridge	35 min.	50 min.
Deck slab	Precast plate for composite deck slab	30 min.	50 min.
	Precast deck slab for highway bridge	35 min.	50 min.

B.7 Test method

B.7.1 Compressive strength test of concrete

The compressive strength test of concrete shall be as specified in **JIS A 1108**.

The test piece shall be processed by the same curing as the product or be controlled properly.

B.7.2 Flexural strength test of product

The flexural strength test of product shall be as specified in **JIS A 5363**. As shown in Figure B.5 and Figure B.6, the flexural cracking load F shall be applied, and the product shall be examined for a crack.

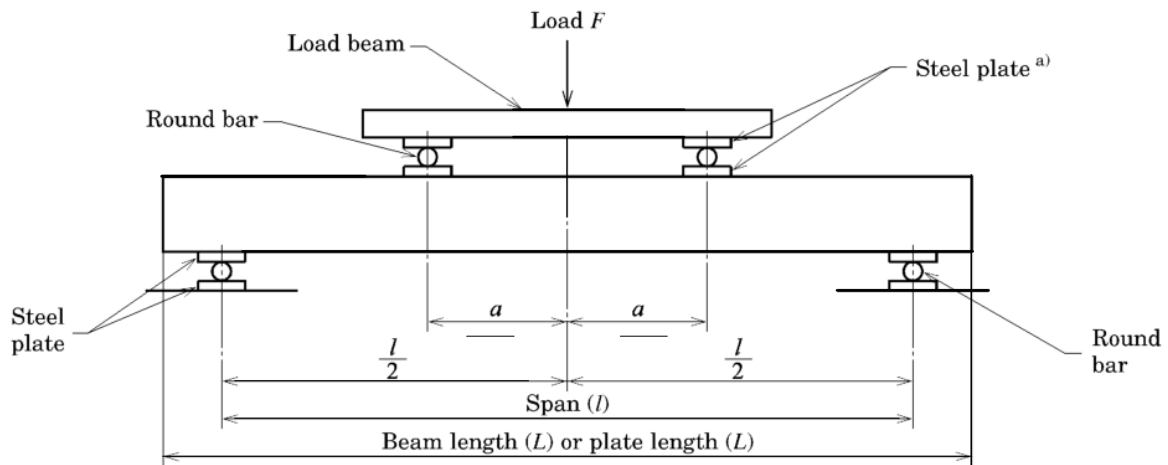
In the case of the simple-beam structure, the load F may be calculated according to the following formula. In the case of the successive-beam structure, the load F shall be calculated according to the calculation of in-plane framing.

$$F = \left[(M - M_{d0}) \times \frac{4}{l - 2a} \right] - W \times g$$

where, F : flexural cracking load (kN)
 M : flexural cracking strength (kN·m)
 M_{d0} : bending moment by own weight of product (kN·m)
 W : mass of loading equipment (t)
 l : span (m)
 a : loading position

In the case of bridge beam	$l < 10$ m	0.50 (m)
	$l \geq 10$ m	0.75 (m)
In the case of precast deck slab for highway bridge		0.25 (m)
In the case of precast plate for composite deck slab		0.20 (m)

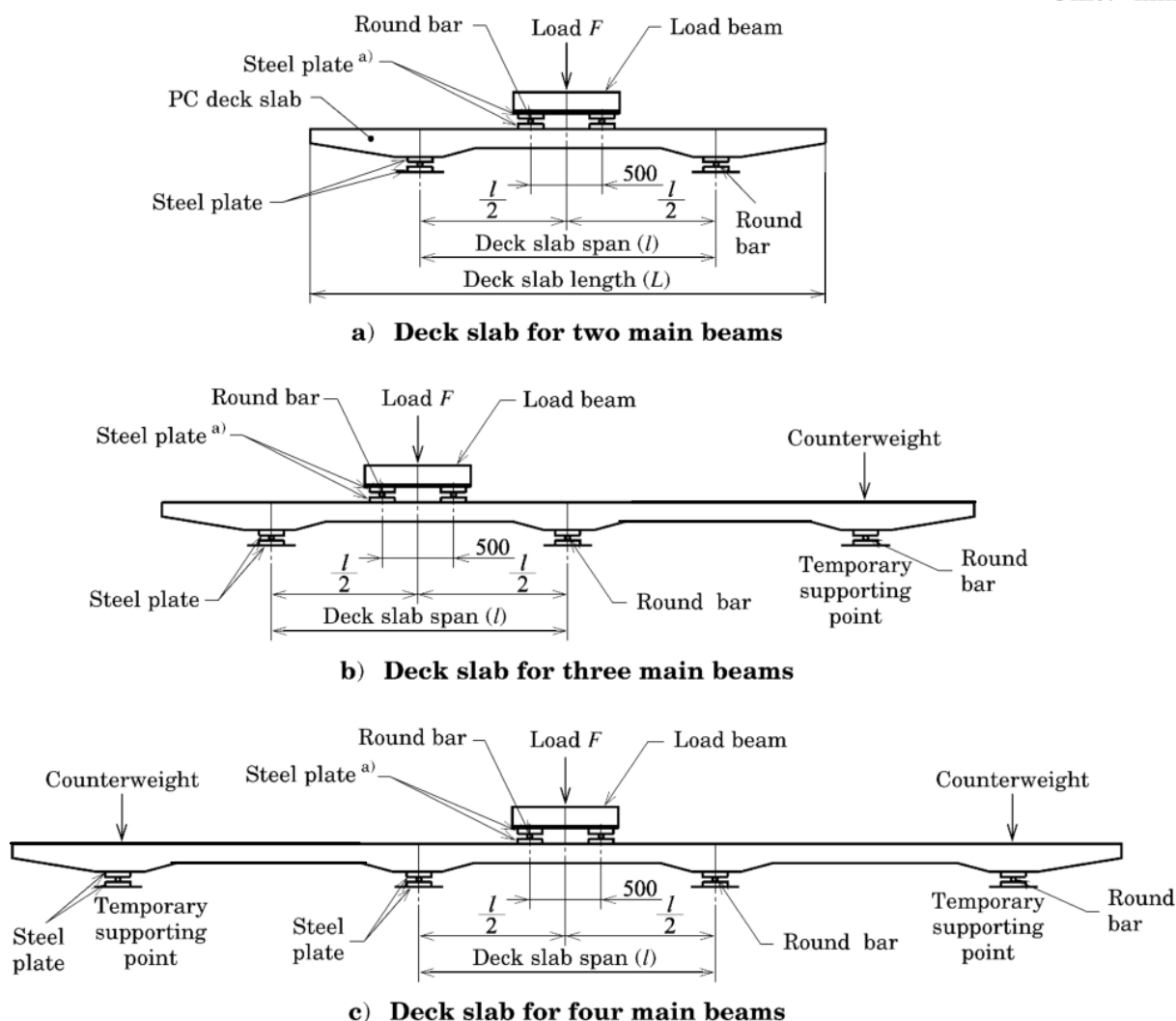
g : acceleration of gravity (use 9.81 m/s²)



Note ^{a)} About 10 cm to 15 cm width.

Figure B.5 Loading method (bridge beam for highway bridge and precast plate for composite deck slab)

Unit: mm



Note ^{a)} About 10 cm to 15 cm width.

Figure B.6 Loading method (precast deck slab for highway bridge)

B.8 Inspection

Inspections shall be as specified in **JIS A 5365** and the following.

- a) **Final inspection** The final inspection of bridges shall be conducted on the appearance, performance, shape and dimensions, and shall be as follows.
 - 1) **Appearance** As the inspection of the appearance, a 100 % inspection shall be conducted considering the characteristics of product, production method, production quantity, etc.
 - 2) **Performance, shape and dimensions** As the inspections of performance, shape and dimensions, a 100 % inspection or a sampling inspection shall be applied.

When substitute characteristics are inspected by using an alternative test piece in place of inspecting performances of a product, the correlation between the properties of the test piece and those of the product shall be confirmed in advance.

- 3) **Size of inspection lot** The size of inspection lot shall be determined by the manufacturer in consideration of the characteristics of product, production method, production quantity, production period, quantity of ordered poles, etc.
- b) **Delivery inspection** The delivery inspection of bridges shall be conducted on the appearance, shape and dimensions. The size of inspection lot and the sampling method shall be specified by the purchaser as agreed between the parties concerned with delivery. The delivery inspection may be omitted as agreed between the parties concerned with delivery.

B.9 Marking

The following items shall be marked on the bridges as specified in **JIS A 5361**.

- a) Type or its abbreviation
- b) Manufacturer's name or its abbreviation
- c) Date of manufacture or its abbreviation

B.10 Others (recommended specification)

The recommended specification of Group I of bridges is shown in Table B.7.

Table B.7 Recommended specification

Structure-specific product group standard			Recommended specification
JIS A 5373	Annex B Bridges	Bridge beam	Recommended specification B-1 Bridge beams for highway bridge
			Recommended specification B-2 Segments of bridge beams for highway bridge
		Deck slab	Recommended specification B-3 Precast plates for composite deck slab
			Recommended specification B-4 Precast deck slabs for highway bridge

Recommended specification B-1

Bridge beams for highway bridge

B-1.1 Outline

This recommended specification describes the bridge beams for highway bridge in Group I of bridges (hereafter referred to as bridge beams) specified in Annex B.

B-1.2 Classification

The bridge beams shall be classified into the ordinary bridge beam and the light-load slab bridge beam according to the standard span as specified in Recommended specification B-1 Table 1, Recommended specification B-1 Table 2 and Recommended specification B-1 Table 3.

B-1.2.1 Ordinary bridge beams¹⁾

The ordinary bridge beams shall be the slab bridge beams and T bridge beams, and as follows.

Note ¹⁾ The ordinary bridge beams mean the bridge beams used for the national expressway, national highway, prefectural roads and important municipal roads, or other important roads specified by Road Traffic Act.

- a) **Slab bridge beams** The slab bridge beams are shown in Recommended specification B-1 Table 1.

Recommended specification B-1 Table 1
Classification and flexural cracking strength of slab bridge beams

Standard span m	Live load A ^{a)}			Live load B ^{b)}		
	Type	Beam height mm	Flexural cracking strength kN · m	Type	Beam height mm	Flexural cracking strength kN · m
5	AS05	350	148	BS05	350	153
6	AS06	350	170	BS06	350	182
7	AS07	400	211	BS07	400	227
8	AS08	400	253	BS08	400	271
9	AS09	450	294	BS09	450	314
10	AS10	450	338	BS10	450	370
11	AS11	450	370	BS11	500	433
12	AS12	450	405	BS12	500	475
13	AS13	500	478	BS13	500	526
14	AS14	500	532	BS14	550	610
15	AS15	550	616	BS15	600	696
16	AS16	600	702	BS16	600	764
17	AS17	650	862	BS17	650	863
18	AS18	700	962	BS18	700	960
19	AS19	750	1 050	BS19	750	1 140
20	AS20	750	1 150	BS20	800	1 260
21	AS21	800	1 270	BS21	850	1 440
22	AS22	850	1 470	BS22	900	1 640
23	AS23	900	1 630	BS23	950	1 780
24	AS24	950	1 830	BS24	1 000	2 020
— The interval between the bridge beam centres after assembling the beam into a bridge shall not exceed 0.77 m. — The bridge beam shall have the angle of skew of 60 degrees or more after assembled to a bridge. — The span to be used may be longer than the standard span by maximum 0.2 m, and shorter than the standard span by maximum 1 m, if required. Notes ^{a)} Of design vehicle loads specified in the Road Structure Ordinance, Live load A is intended for comparatively low frequency of travel by large vehicles. ^{b)} Of design vehicle loads specified in the Road Structure Ordinance, Live load B is intended for comparatively high frequency of travel by large vehicles.						

- b) **T bridge beams** T bridge beams are shown in Recommended specification B-1 Table 2.

Recommended specification B-1 Table 2
Classification and flexural cracking strength of T bridge beams

Standard span m	Live load A ^{a)}			Live load B ^{b)}		
	Type	Beam height mm	Flexural cracking strength kN · m	Type	Beam height mm	Flexural cracking strength kN · m
18	AG18	900	1 270	BG18	1 000	1 450
19	AG19	1 000	1 490	BG19	1 000	1 500
20	AG20	1 000	1 560	BG20	1 100	1 790
21	AG21	1 100	1 890	BG21	1 100	1 910
22	AG22	1 100	1 920	BG22	1 200	2 270
23	AG23	1 200	2 280	BG23	1 200	2 300
24	AG24	1 200	2 310	BG24	1 300	2 690
— The interval between the bridge beam centres after assembling the beam into a bridge shall not exceed 1.08 m. — The bridge beam shall have the angle of skew of 70 degrees or more after assembled into a bridge. — The span to be used may be longer than the standard span by maximum 0.2 m, and shorter than the standard span by maximum 1 m, if required. Notes ^{a)} Of design vehicle loads specified in the Road Structure Ordinance, Live load A is intended for comparatively low frequency of travel by large vehicles. ^{b)} Of design vehicle loads specified in the Road Structure Ordinance, Live load B is intended for comparatively high frequency of travel by large vehicles.						

B-1.2.2 Light-load slab bridge beams

The light-load slab bridge beams ²⁾ are shown in Recommended specification B-1 Table 3.

Note ²⁾ The light-load slab bridge beams mean bridge beams which are used for the roads where the design load is smaller than that of the ordinary bridge beams, which are not specified in Road Traffic Act.

Recommended specification B-1 Table 3
Classification and flexural cracking strength of light-load
slab bridge beams

Standard span m	Type	Beam height mm	Flexural cracking strength kN · m
5	LS05	225	76.1
6	LS06	225	93.7
7	LS07	225	108
8	LS08	250	132
9	LS09	275	168
10	LS10	300	207
11	LS11	350	258
12	LS12	375	320
13	LS13	400	376
— The interval between the bridge beam centres after assembling the beam into a bridge shall not exceed 0.77 m. — The bridge beam shall have the angle of skew of 60 degrees or more after assembled into a bridge. — The span to be used may be longer than the standard span by maximum 0.2 m, and shorter than the standard span by maximum 1 m, if required.			

B-1.3 Performance

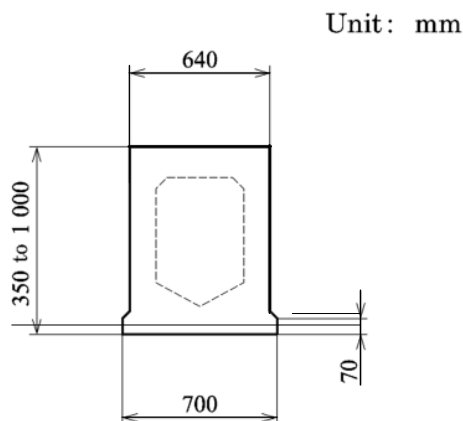
The required performance of bridge beams is the flexural cracking strength. Cracking shall not occur when the cracking load calculated in **B.7.2** using the flexural cracking strength specified in Recommended specification B-1 Table 1, Recommended specification B-1 Table 2 and Recommended specification B-1 Table 3 is applied.

B-1.4 Shape, dimensions and dimensional tolerances

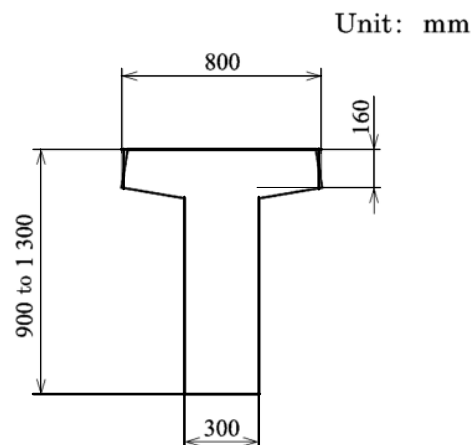
The shape, dimensions and dimensional tolerances of bridge beams shall be as specified in Recommended specification B-1 Figure 1, Recommended specification B-1 Figure 2, Recommended specification B-1 Figure 3 and Recommended specification B-1 Table 4.

If the reference dimension is changed within the range specified in **B.4**, the manufacturer shall submit the data indicating that bridge beams conform to Table B.3 in the design document or the performance test result when requested by the purchaser.

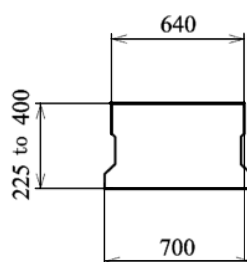
NOTE : As agreed between the parties concerned with delivery, the necessary attachment may be provided or the proper work may be performed unless it compromises the performance of bridge beam for highway bridge.



Recommended specification B-1
Figure 1
Shape and dimensions of slab
bridge beam (ordinary bridge beam)



Recommended specification B-1
Figure 2
Shape and dimensions of T bridge
beam (ordinary bridge beam)



Recommended specification B-1 **Figure 3**
Shape and dimensions of slab bridge beam
(light-load slab bridge beam)

Recommended specification B-1 Table 4 Dimensional tolerances

Unit: mm

Division		Tolerances
Beam length L	$L \leq 10$ m	± 10
	$L > 10$ m	$\pm \frac{L^a}{1\,000}$
Outside dimension of cross-section		± 5
Camber ^{b)} of bridge beams		$\pm 8^c)$
Deflection of transverse direction		10
Notes ^{a)} The beam length L is expressed in mm. ^{b)} The value of the centre of span. ^{c)} The number of the bridge beams used for one span is taken as one set, and this tolerance is for the average of camber for this set.		

B-1.5 Bar arrangement

The bar arrangement of bridge beams shall be based on a design document, and as follows.

- a) The covering of reinforcing bar and prestressing tendon shall be 25 mm or more.
- b) The gap between the reinforcing bar and the prestressing tendon shall be 20 mm or more. As to the prestressing tendon, the gap shall be at least three times the diameter, and shall be at least $\frac{4}{3}$ of the maximum dimension of coarse aggregates.
- c) The reinforcing bar and the prestressing tendon shall be free from loose scale, oil, etc. which damage the adhesion of concrete, and shall be assembled and fixed to the right position.

B-1.6 Quality of concrete

The quality of concrete shall be as specified in **B.6**.

B-1.7 Flexural strength test of product

The flexural strength test of the product shall be as specified in **B.7.2**, and the load shall be uniformly distributed using a steel plate of about 10 cm to 15 cm in width and a round steel bar of a proper diameter.

B-1.8 Inspections

B-1.8.1 Inspection items

The inspection items of bridge beams shall be as follows.

- a) **Final inspection** The final inspection items shall be as follows.
 - 1) Appearance
 - 2) Performance
 - 3) Shape and dimensions
- b) **Delivery inspection** The delivery inspection items shall be as follows. The delivery inspection may be omitted as agreed between the parties concerned with delivery.
 - 1) Appearance
 - 2) Shape and dimensions

B-1.8.2 Inspection lot

The size of inspection lot of bridge beams shall be decided by the manufacturer for the final inspection, and by the purchaser for the delivery inspection as agreed between the parties concerned with delivery in consideration of the characteristics of product, production method, production quantity, production period, quantity of ordered poles, etc. One inspection lot may consist of 400 units or fractions thereof.

B-1.8.3 Inspection method

The inspection method of bridge beams shall be as follows.

a) **Final inspection** The final inspection method shall be as follows.

- 1) **Appearance** As the inspection of the appearance, a 100 % inspection shall be conducted by visual observation, and those conforming to the provisions of **5.1** shall be accepted.
- 2) **Performance** As the inspection of the performance, two bridge beams per lot shall be taken and inspected as specified in **B-1.7**. If both of the two conform to **B-1.3**, the lot shall be accepted. If neither of the two conforms, the lot shall be rejected. If one of the two does not conform to the provisions, the remainder of the lot shall be subjected to a 100 % inspection. If they conform to the provisions, the lot shall be accepted.
- 3) **Shape and dimensions** As the inspection of shape and dimensions, a 100 % inspection shall be conducted, and those conforming to the provisions of **B-1.4** shall be accepted.

b) **Delivery inspection** The delivery inspection method shall be as follows.

- 1) **Appearance** The appearance shall be inspected in the same way as a) 1).
- 2) **Shape and dimensions** The shape and dimensions shall be inspected in the same way as a) 3).

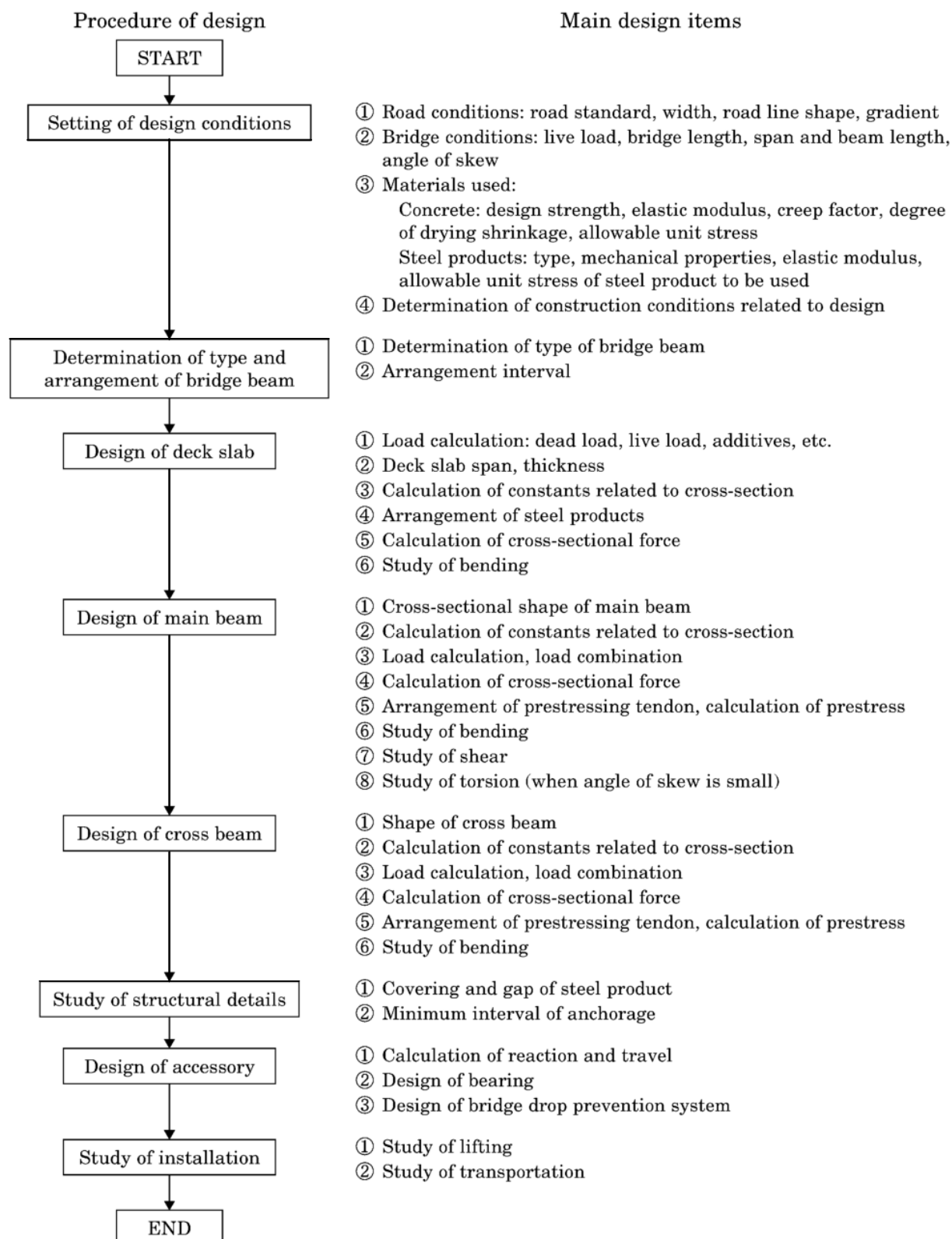
B-1.9 Marking

The bridge beams which conform to all the requirements of this Standard shall be marked as specified in **B.9**.

Recommended specification B-1

Procedure of design of bridge beam for highway bridge (informative)

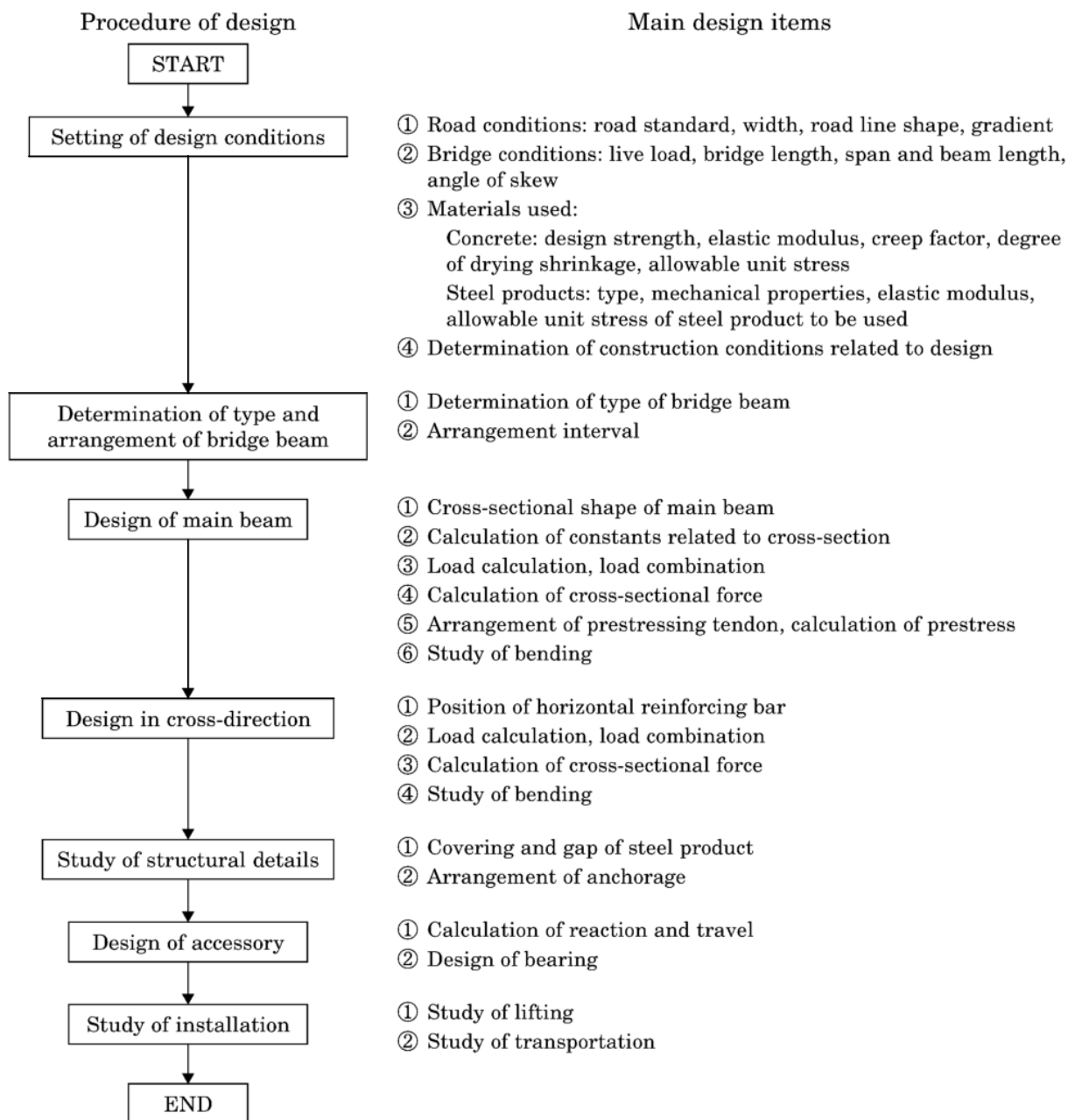
The general procedure of design and the main design items of the bridge beam for highway bridge are shown below.



Recommended specification B-1

Procedure of design of light-load slab bridge beams (informative)

The general procedure of design and the main design items of the light-load slab bridge beams are shown below.



Recommended specification B-2

Segments for bridge beams for highway bridges

B-2.1 Outline

This recommended specification describes the segments for bridge beams for highway bridges in Group I of bridges (hereafter referred to as segments for bridge beams) specified in Annex B.

B-2.2 Classification

The segments for bridge beams shall be divided according to the length of bridge beam as shown in Recommended specification B-2 Table 1. The segments for bridge beams consist of an edge, middle and central segments. At the time of manufacture, it is a reinforced concrete product (RC); however, at the time of use, several components are combined into a single body with prestressing tendon to form the prestressed concrete structure.

The types shown herein indicate the highway bridges of the main beam interval of 2.6 m to 3.8 m.

Recommended specification B-2 Table 1
Classification of segment for bridge beam and segment composition

Standard span of bridge beam	Type and number of edge segments	Type and number of middle segments	Type and number of central segments	Standard span of bridge beam	Type and number of edge segments	Type and number of middle segments	Type and number of central segments
25 m	Two pieces of T25-a	—	One piece of MD25-a	36 m	Two pieces of T36-a	Two pieces of M36-a	One piece of MD36-a
	Two pieces of T25-b	—	One piece of MD25-b		Two pieces of T36-b	Two pieces of M36-b	One piece of MD36-b
	Two pieces of T25-c	—	One piece of MD25-c		Two pieces of T36-c	Two pieces of M36-c	One piece of MD36-c
26 m	Two pieces of T26-a	—	One piece of MD26-a	37 m	Two pieces of T37-a	Two pieces of M37-a	One piece of MD37-a
	Two pieces of T26-b	—	One piece of MD26-b		Two pieces of T37-b	Two pieces of M37-b	One piece of MD37-b
	Two pieces of T26-c	—	One piece of MD26-c		Two pieces of T37-c	Two pieces of M37-c	One piece of MD37-c
27 m	Two pieces of T27-a	—	One piece of MD27-a	38 m	Two pieces of T38-a	Two pieces of M38-a	One piece of MD38-a
	Two pieces of T27-b	—	One piece of MD27-b		Two pieces of T38-b	Two pieces of M38-b	One piece of MD38-b
	Two pieces of T27-c	—	One piece of MD27-c		Two pieces of T38-c	Two pieces of M38-c	One piece of MD38-c
28 m	Two pieces of T28-a	—	One piece of MD28-a	39 m	Two pieces of T39-a	Two pieces of M39-a	One piece of MD39-a
	Two pieces of T28-b	—	One piece of MD28-b		Two pieces of T39-b	Two pieces of M39-b	One piece of MD39-b
	Two pieces of T28-c	—	One piece of MD28-c		Two pieces of T39-c	Two pieces of M39-c	One piece of MD39-c
29 m	Two pieces of T29-a	—	One piece of MD29-a	40 m	Two pieces of T40-a	Two pieces of M40-a	One piece of MD40-a
	Two pieces of T29-b	—	One piece of MD29-b		Two pieces of T40-b	Two pieces of M40-b	One piece of MD40-b
	Two pieces of T29-c	Two pieces of M29-c	One piece of MD29-c		Two pieces of T40-c	Four pieces of M40-c	One piece of MD40-c
30 m	Two pieces of T30-a	—	One piece of MD30-a	41 m	Two pieces of T41-a	Two pieces of M41-a	One piece of MD41-a
	Two pieces of T30-b	Two pieces of M30-b	One piece of MD30-b		Two pieces of T41-b	Four pieces of M41-b	One piece of MD41-b
	Two pieces of T30-c	Two pieces of M30-c	One piece of MD30-c		Two pieces of T41-c	Four pieces of M41-c	One piece of MD41-c
31 m	Two pieces of T31-a	Two pieces of M31-a	One piece of MD31-a	42 m	Two pieces of T42-a	Two pieces of M42-a	One piece of MD42-a
	Two pieces of T31-b	Two pieces of M31-b	One piece of MD31-b		Two pieces of T42-b	Four pieces of M42-b	One piece of MD42-b
	Two pieces of T31-c	Two pieces of M31-c	One piece of MD31-c		Two pieces of T42-c	Four pieces of M42-c	One piece of MD42-c
32 m	Two pieces of T32-a	Two pieces of M32-a	One piece of MD32-a	43 m	Two pieces of T43-a	Two pieces of M43-a	One piece of MD43-a
	Two pieces of T32-b	Two pieces of M32-b	One piece of MD32-b		Two pieces of T43-b	Six pieces of M43-b	One piece of MD43-b
	Two pieces of T32-c	Two pieces of M32-c	One piece of MD32-c		Two pieces of T43-c	Six pieces of M43-c	One piece of MD43-c
33 m	Two pieces of T33-a	Two pieces of M33-a	One piece of MD33-a	44 m	Two pieces of T44-a	Two pieces of M44-a	One piece of MD44-a
	Two pieces of T33-b	Two pieces of M33-b	One piece of MD33-b		Two pieces of T44-b	Six pieces of M44-b	One piece of MD44-b
	Two pieces of T33-c	Two pieces of M33-c	One piece of MD33-c		Two pieces of T44-c	Six pieces of M44-c	One piece of MD44-c
34 m	Two pieces of T34-a	Two pieces of M34-a	One piece of MD34-a	45 m	Two pieces of T45-a	Two pieces of M45-a	One piece of MD45-a
	Two pieces of T34-b	Two pieces of M34-b	One piece of MD34-b		Two pieces of T45-b	Six pieces of M45-b	One piece of MD45-b
	Two pieces of T34-c	Two pieces of M34-c	One piece of MD34-c		Two pieces of T45-c	Six pieces of M45-c	One piece of MD45-c
35 m	Two pieces of T35-a	Two pieces of M35-a	One piece of MD35-a	Omitted			
	Two pieces of T35-b	Two pieces of M35-b	One piece of MD35-b				
	Two pieces of T35-c	Two pieces of M35-c	One piece of MD35-c				
— For transportation and installation, the mass of one segment for bridge beams shall be 30 t or under, and the mass difference between segments shall be as small as possible.							
— The bridge beam shall have a skew angle of 70 degrees or more after assembled into a bridge.							

B-2.3 Performance

The compressive strength of concrete is used as substitute characteristic of segments for bridge beams. The compressive strength of concrete at the quality assurance shall be 50 N/mm² or more. The compressive strength of concrete at the introduction of pre-stress shall be 35 N/mm² or more.

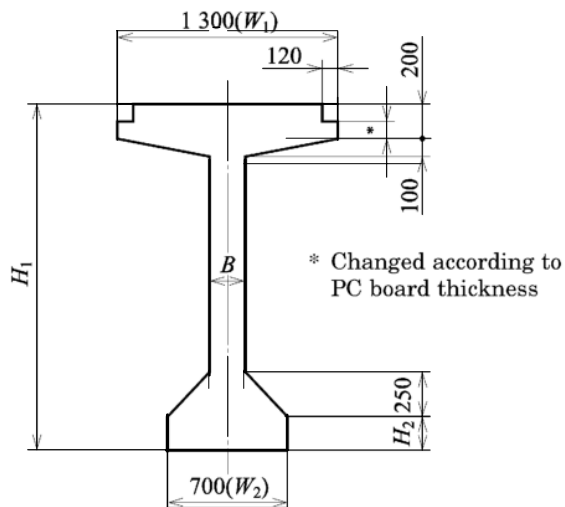
B-2.4 Shape, dimensions and dimensional tolerances

The shape, dimensions and dimensional tolerances of segments for bridge beams shall be as specified in Recommended specification B-2 Figure 1, Recommended specification B-2 Table 2, Recommended specification B-2 Table 3, Recommended specification B-2 Table 4 and Recommended specification B-2 Table 5.

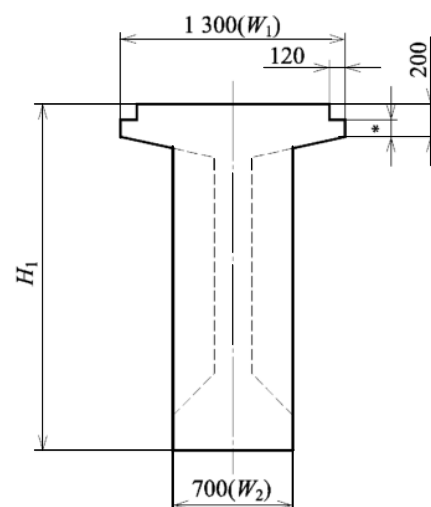
If the reference dimension is changed within the range specified in **B.4**, the manufacturer shall submit the data indicating that segments for bridge beams conform to Table B.3 in the design document or the performance test result when requested by the purchaser.

NOTE : As agreed between the parties concerned with delivery, the necessary attachment may be provided or the proper work may be performed unless it compromises the performance of segment for bridge beam.

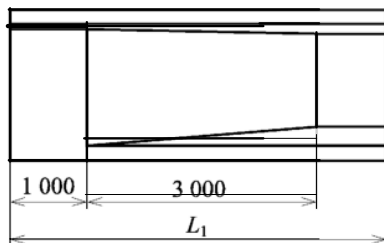
Unit: mm



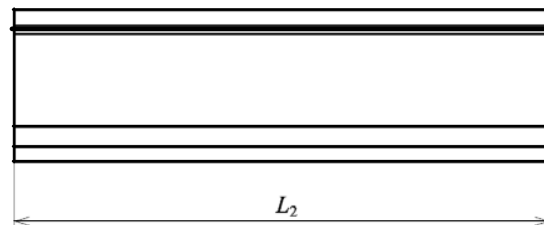
Middle cross-section



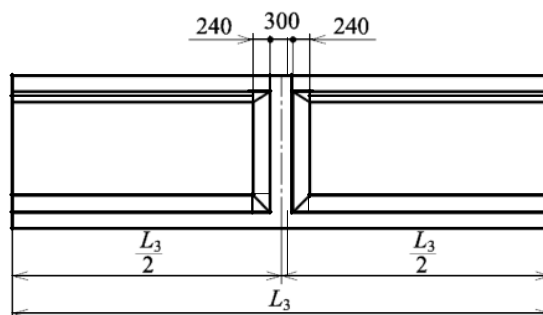
Supporting position cross-section



Edge segment



Middle segment



Central segment

Recommended specification B-2 Figure 1
Shape of segment for bridge beam

Recommended specification B-2 Table 2 Dimensions of edge segments

Unit: mm

Type		L_1	H_1	H_2	B	Type		L_1	H_1	H_2	B
T25-	a	8 100	1 400	200	220	T36-	a	6 400	2 000	200	220
	b	8 100	1 600	200	220		b	6 400	2 300	200	220
	c	8 100	1 900	200	220		c	4 900	2 700	200	220
T26-	a	8 600	1 400	200	220	T37-	a	6 900	2 000	200	220
	b	8 100	1 700	200	220		b	6 900	2 300	200	220
	c	8 100	2 000	200	220		c	5 400	2 700	200	220
T27-	a	8 600	1 400	200	220	T38-	a	5 900	2 100	200	220
	b	8 600	1 700	200	220		b	5 900	2 400	200	220
	c	8 600	2 000	200	220		c	5 900	2 800	200	220
T28-	a	9 100	1 500	200	220	T39-	a	6 400	2 100	250	230
	b	9 100	1 800	200	220		b	6 400	2 500	250	230
	c	9 100	2 100	200	220		c	6 400	2 900	250	230
T29-	a	9 100	1 600	200	220	T40-	a	6 200	2 100	250	230
	b	9 100	1 900	200	220		b	6 950	2 500	250	230
	c	4 350	2 300	200	220		c	4 700	3 000	250	230
T30-	a	9 900	1 700	200	220	T41-	a	6 700	2 200	250	230
	b	4 900	2 000	200	220		b	4 700	2 600	250	230
	c	4 900	2 400	200	220		c	5 200	3 000	250	230
T31-	a	4 100	1 700	200	220	T42-	a	7 200	2 200	250	230
	b	5 400	2 000	200	220		b	5 200	2 600	250	230
	c	4 100	2 400	200	220		c	5 700	3 100	250	230
T32-	a	4 400	1 800	200	220	T43-	a	7 700	2 300	250	230
	b	4 400	2 100	200	220		b	4 450	2 700	250	230
	c	4 400	2 500	200	220		c	4 100	3 200	250	230
T33-	a	4 900	1 800	200	220	T44-	a	8 200	2 300	250	230
	b	4 900	2 100	200	220		b	4 600	2 700	250	230
	c	4 900	2 500	200	220		c	4 250	3 200	250	230
T34-	a	5 400	1 900	200	220	T45-	a	7 800	2 400	250	230
	b	5 400	2 200	200	220		b	4 400	2 800	250	230
	c	5 400	2 600	200	220		c	4 050	3 300	250	230
T35-	a	5 900	2 000	200	220						
	b	5 900	2 300	200	220						
	c	4 400	2 600	200	220						

Recommended specification B-2 Table 3 Dimensions of middle segments

Unit: mm

Type		L_2	H_1	H_2	B	Type		L_2	H_1	H_2	B
M29-	a	—	—	—	—	M38-	a	9 000	2 100	200	220
	b	—	—	—	—		b	9 000	2 400	200	220
	c	7 000	2 300	200	220		c	9 000	2 800	200	220
M30-	a	—	—	—	—	M39-	a	9 000	2 100	250	230
	b	7 000	2 000	200	220		b	9 000	2 500	250	230
	c	7 000	2 400	200	220		c	9 000	2 900	250	230
M31-	a	7 800	1 700	200	220	M40-	a	9 500	2 100	250	230
	b	7 000	2 000	200	220		b	9 000	2 500	250	230
	c	7 800	2 400	200	220		c	6 300	3 000	250	230
M32-	a	8 000	1 800	200	220	M41-	a	9 500	2 200	250	230
	b	8 000	2 100	200	220		b	6 500	2 600	250	230
	c	8 000	2 500	200	220		c	6 300	3 000	250	230
M33-	a	8 000	1 800	200	220	M42-	a	9 500	2 200	250	230
	b	8 000	2 100	200	220		b	6 500	2 600	250	230
	c	8 000	2 500	200	220		c	6 300	3 100	250	230
M34-	a	8 000	1 900	200	220	M43-	a	9 500	2 300	250	230
	b	8 000	2 200	200	220		b	5 000	2 700	250	230
	c	8 000	2 600	200	220		c	5 100	3 200	250	230
M35-	a	8 000	2 000	200	220	M44-	a	9 500	2 300	250	230
	b	8 000	2 300	200	220		b	5 100	2 700	250	230
	c	9 000	2 600	200	220		c	5 200	3 200	250	230
M36-	a	8 000	2 000	200	220	M45-	a	10 100	2 400	250	230
	b	8 000	2 300	200	220		b	5 300	2 800	250	230
	c	9 000	2 700	200	220		c	5 400	3 300	250	230
M37-	a	8 000	2 000	200	220	Omitted					
	b	8 000	2 300	200	220						
	c	9 000	2 700	200	220						
NOTE : A middle segment is unnecessary if a bridge beam consists of three segments (edge segment $\times$ 2 and central segment). Therefore, middle segments of span of 25 m to 28 m (M25 to M28) and some of those of 29 m and 30 m (M29-a, M29-b, M30-a) do not exist.											