

Recommended specification C-1 Prestressed concrete sheet piles

C-1.1 Outline

This recommended specification describes the prestressed concrete sheet piles in Group I of retaining walls (hereafter referred to as “sheet piles”) in Annex C.

C-1.2 Classification

The sheet piles shall be classified by the shape, dimensions and cracking moment as shown in recommended specification C-1 tables 1 to 5.

Recommended specification C-1 Table 1
Flat type sheet pile (nominal designation width 500 mm)

Classification	Height	Product width <i>B</i> mm	Cracking moment kN • m		Length (<i>L</i>)																					
	<i>H</i> mm				m																					
					Per sheet	Per 1 m	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	9.0	10.0	11.0	12.0	13.0	14.0	
SF 50H	50	500	2.7	5.4	○	○	○	○	○																	
SF 60H	60		4.0	8.0		○	○	○	○	○	○															
SF 70H	70		5.5	11		○	○	○	○	○	○	○	○													
SF 80H	80		7.5	15			○	○	○	○	○	○	○													
SF 90H	90		10	20				○	○	○	○	○	○	○	○	○	○									
SF100H	100		11	22				○	○	○	○	○	○	○	○	○	○	○								
SF110H	110		15	30					○	○	○	○	○	○	○	○	○	○								
SF120H	120		18	36						○	○	○	○	○	○	○	○	○	○							
SF130H	130		22	44							○	○	○	○	○	○	○	○	○							
SF140H	140		25	50							○	○	○	○	○	○	○	○	○							
SF150H	150		29	58									○	○	○	○	○	○	○	○	○					
SF160H	160		34	68										○	○	○	○	○	○	○	○					
SF180H	180		42	84												○	○	○	○	○	○	○	○			
SF190H	190		45	90													○	○	○	○	○	○	○			
SF200H	200		51	102														○	○	○	○	○	○	○		
SF220H	220		65	130															○	○	○	○	○	○		
NOTE : As to the sheet pile of this shape, there is no distinction of a cross section between the compression side and the tension side.																										

Recommended specification C-1 Table 2
Flat type sheet pile (nominal designation width 1 000 mm)

Classifi- cation	Height <i>H</i> mm	Product width <i>B</i> mm	Cracking moment kN • m	Length (<i>L</i>) m																	
				2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	9.0	10.0	11.0	12.0	13.0
SF 50	50	996	5.4	○	○	○	○	○													
SF 60	60		8.0		○	○	○	○	○	○											
SF 70	70		11		○	○	○	○	○	○	○										
SF 80	80		15			○	○	○	○	○	○	○									
SF 90	90		20				○	○	○	○	○	○	○	○	○	○					
SF100	100		22				○	○	○	○	○	○	○	○	○	○					
SF110	110		30					○	○	○	○	○	○	○	○	○					
SF120	120		36						○	○	○	○	○	○	○	○	○				
SF130	130		44							○	○	○	○	○	○	○	○				
SF140	140		50							○	○	○	○	○	○	○	○				
SF150	150		58								○	○	○	○	○	○	○	○			
SF160	160		68									○	○	○	○	○	○	○			
SF180	180		84											○	○	○	○	○	○		
SF190	190		90											○	○	○	○	○	○		
SF200	200		102													○	○	○	○	○	○
SF220	220		130														○	○	○	○	○

NOTE : As to the sheet pile of this shape, there is no distinction of a cross section between the compression side and the tension side.

Recommended specification C-1 Table 3
Slot type sheet pile (nominal designation width 1 000 mm)

Classifi- cation	Height <i>H</i> mm	Thick- ness <i>T</i> mm	Prod- uct width <i>B</i> mm	Crack- ing moment kN • m	Length (<i>L</i>) m																					
					2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	11.0	12.0	13.0	14.0	
SC 90A	90	45	996	5.9	○	○	○	○	○	○																
SC 90B				8.9		○	○	○	○	○	○															
SC 90C				12		○	○	○	○	○	○															
SC120	120	50		15					○	○	○	○	○	○												
SC150A	150	60		21					○	○	○	○	○	○												
SC150B				28					○	○	○	○	○	○												
SC175	175			35						○	○	○	○	○	○	○										
SC200A	200	70		41									○	○	○	○	○	○								
SC200B				53										○	○	○	○	○	○	○						
SC230	230			63										○	○	○	○	○	○	○						
SC255A	255			83											○	○	○	○	○	○	○	○				
SC255B				100													○	○	○	○	○	○	○	○		
SC275A	275			120													○	○	○	○	○	○	○	○		
SC275B				140															○	○	○	○	○	○	○	
SC300	300	100		160																		○	○	○	○	
SC350	350			190																			○	○	○	○

NOTE : As to the sheet pile of this shape, there is distinction of a cross section between the compression side and the tension side.

Recommended specification C-1 Table 4
Wavy type sheet pile (nominal designation width 1 000 mm)

Classification	Height	Thick- ness	Product width <i>B</i> mm	Crack- ing moment kN • m	Length (<i>L</i>) m																										
	<i>H</i> mm	<i>T</i> mm			3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0	
SW120	120	60	996	15	○	○	○	○	○	○	○	○	○																		
SW160	160	80		20			○	○	○	○	○	○	○	○																	
SW180	180			31			○	○	○	○	○	○	○	○	○																
SW225	225	100		42				○	○	○	○	○	○	○	○	○															
SW250	250			55					○	○	○	○	○	○	○	○	○														
SW275	275			73						○	○	○	○	○	○	○	○	○													
SW300	300	110		94							○	○	○	○	○	○	○	○													
SW325A	325			120								○	○	○	○	○	○	○	○	○											
SW325B				130									○	○	○	○	○	○	○	○	○	○									
SW350A	350	120		160											○	○	○	○	○	○	○	○	○	○							
SW350B				170													○	○	○	○	○	○	○	○	○	○					
SW400A	400			200															○	○	○	○	○	○	○	○	○				
SW400B				230																○	○	○	○	○	○	○	○	○			
SW450A	450			270																	○	○	○	○	○	○	○	○			
SW450B				310																		○	○	○	○	○	○	○	○		
SW500A	500			350																		○	○	○	○	○	○	○			
SW500B				400																			○	○	○	○	○	○	○		
SW600A	600			500																				○	○	○	○	○	○	○	
SW600B				590																					○	○	○	○	○	○	○
NOTE :					As to the sheet pile of this shape, there is no distinction of a cross section between the compression side and the tension side.																										

Recommended specification C-1 Table 5
Wavy type sheet pile (nominal designation width 1 250 mm)

Classifica- tion	Height <i>H</i> mm	Thick- ness <i>T</i> mm	Prod- uct width <i>B</i> mm	Crack- ing moment kN • m	Length (<i>L</i>) m																									
					8.0	8.5	9.0	9.5	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0						
SW 350W	350	130	1 246	133	○	○	○	○	○	○	○	○	○	○																
SW 400W	400			179			○	○	○	○	○	○	○	○	○	○	○													
SW 450W	450			230					○	○	○	○	○	○	○	○	○	○												
SW 500W	500			287						○	○	○	○	○	○	○	○	○	○											
SW 550W	550			325									○	○	○	○	○	○	○	○										
SW 600W	600			389										○	○	○	○	○	○	○	○									
SW 650W	650			430											○	○	○	○	○	○	○	○								
SW 700W	700			500													○	○	○	○	○	○	○							
SW 750W	750			543														○	○	○	○	○	○	○						
SW 800W	800			619															○	○	○	○	○	○	○					
SW 850W	850			664																○	○	○	○	○	○	○				
SW 900W	900			747																	○	○	○	○	○	○	○			
SW 950W	950			794																		○	○	○	○	○	○	○		
SW1000W	1 000			884																			○	○	○	○	○	○	○	
SW1050W	1 050			933																				○	○	○	○	○	○	
SW1100W	1 100			1 029																					○	○	○	○	○	
SW1150W	1 150			1 081																						○	○	○	○	
SW1200W	1 200			1 183																							○	○	○	○
NOTE : As to the sheet pile of this shape, there is no distinction of a cross section between the com- pression side and the tension side.																														

C-1.3 Performance

C-1.3.1 Bending strength

The sheet pile shall be subjected to the bending strength test as specified in **C-1.6.2**. When it receives the cracking moment specified in recommended specification C-1 tables 1 to 5, it shall not produce the crack of over 0.05 mm in width. Moreover, it shall not break when it is subjected to twice the cracking moment specified in **C-1.2**.

The force shall be calculated as follows.

$$F = \frac{6M}{l} - Wg$$

where, F : loading force (kN)

M : cracking moment (value specified in recommended specification C-1 tables 1 to 5) (kN·m)

l : span (m) $l = L/2$, and $b = l/3$

However, when l is smaller than $10H$, $l = 10H$.

H : height of sheet pile (m)

W : beam for load, total mass of round steel and steel sheet applied as force (t)

However, when beam for load and bending tester are integrated, mass of beam for load is not included.

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

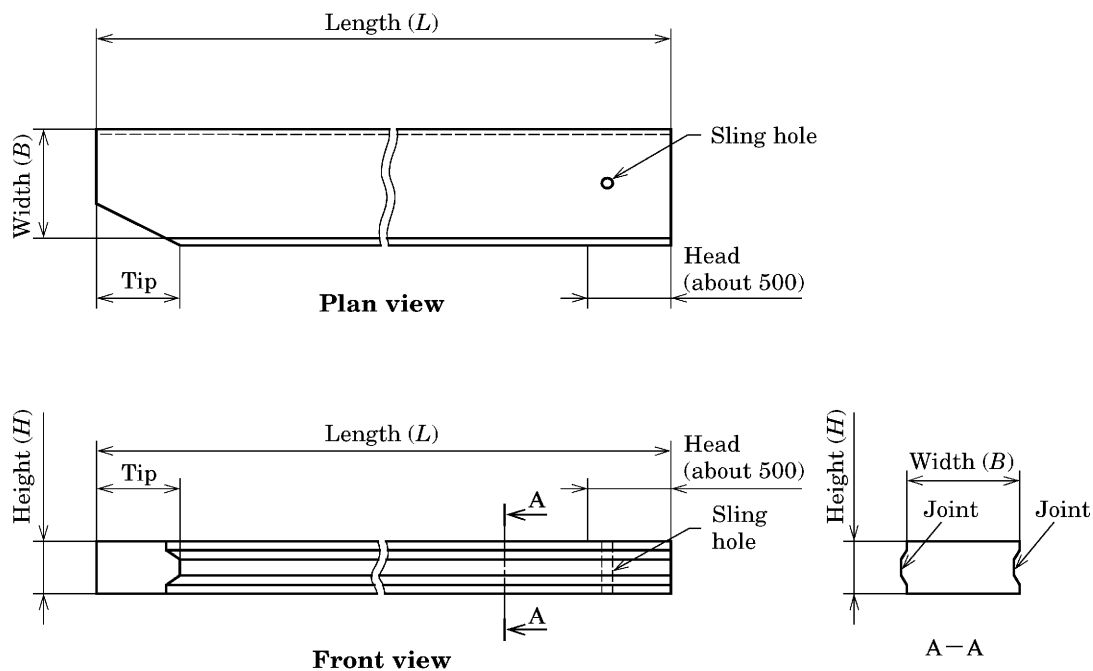
C-1.4 Shape, dimensions and dimensional tolerances

The shape, dimensions and dimensional tolerances of sheet piles shall be as specified in recommended specification C-1 figures 1 to 4 and recommended specification C-1 tables 1 to 6.

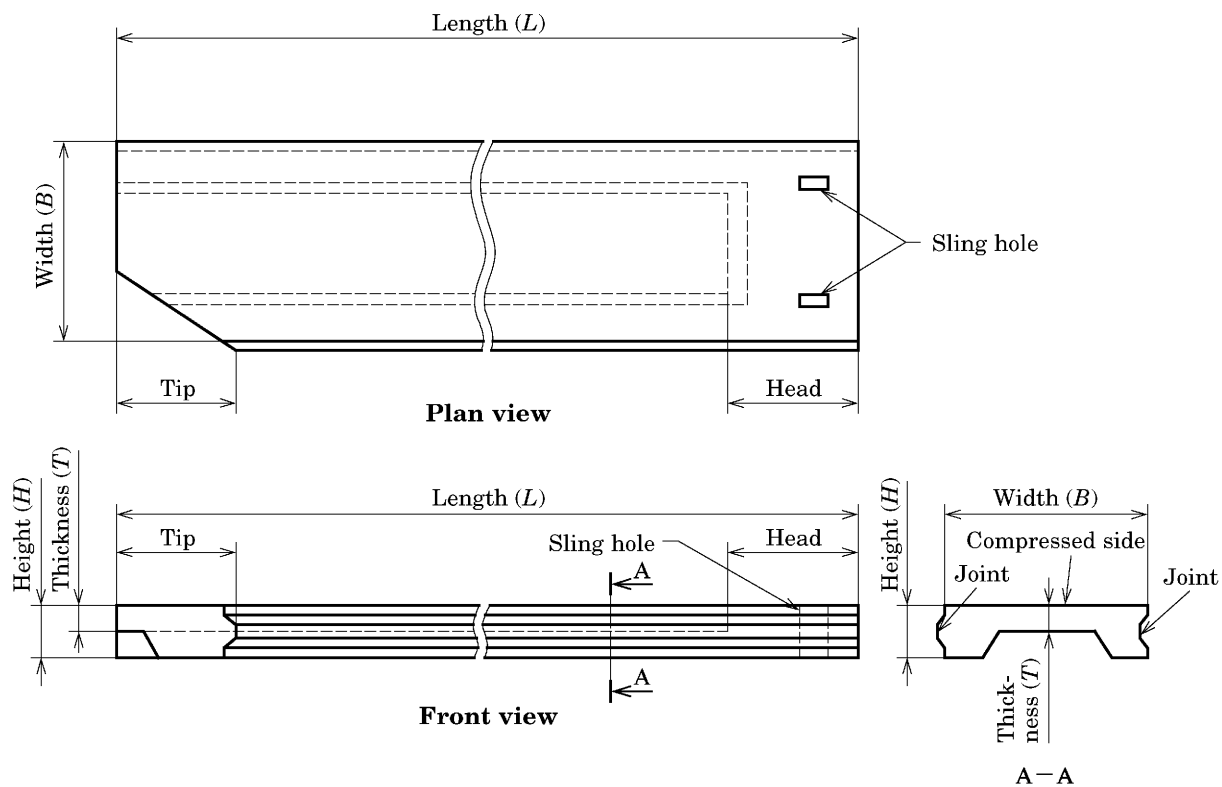
The tolerances on curvature shall be as specified in recommended specification C-1 table 7.

If the reference dimension is changed within the range as specified in **C.4**, the manufacturer shall present the data indicating that sheet piles conform to **C.3** by the design document or the performance test when requested by the purchaser.

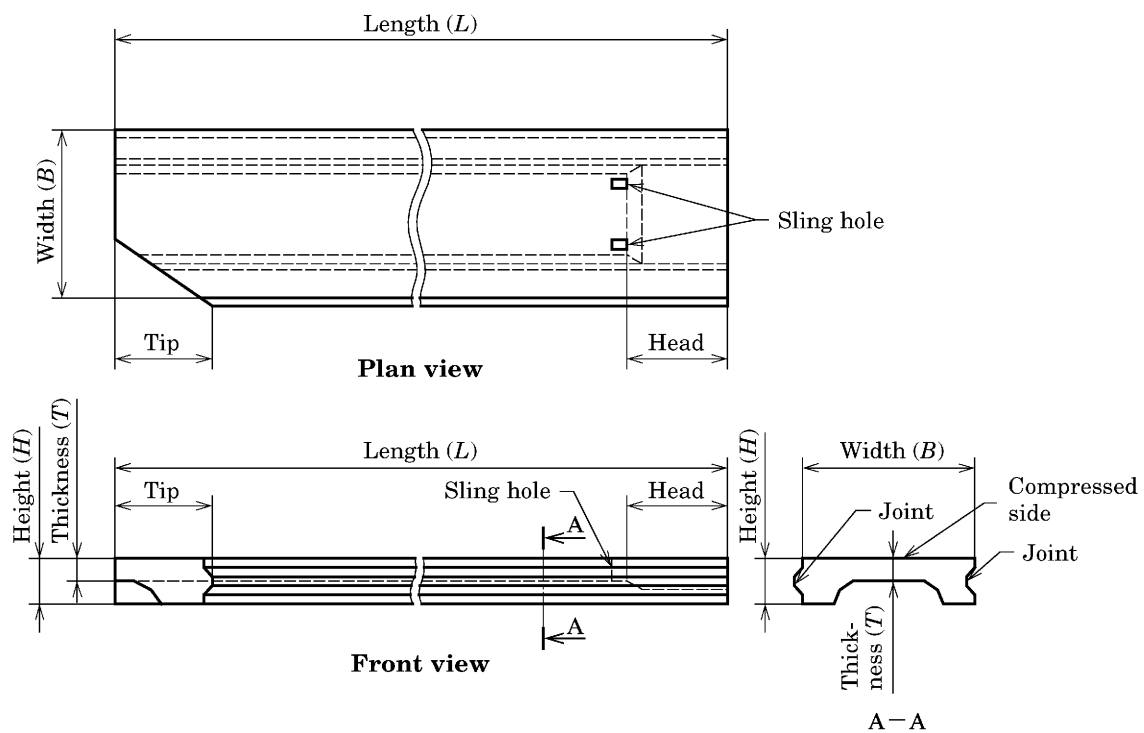
Unit: mm



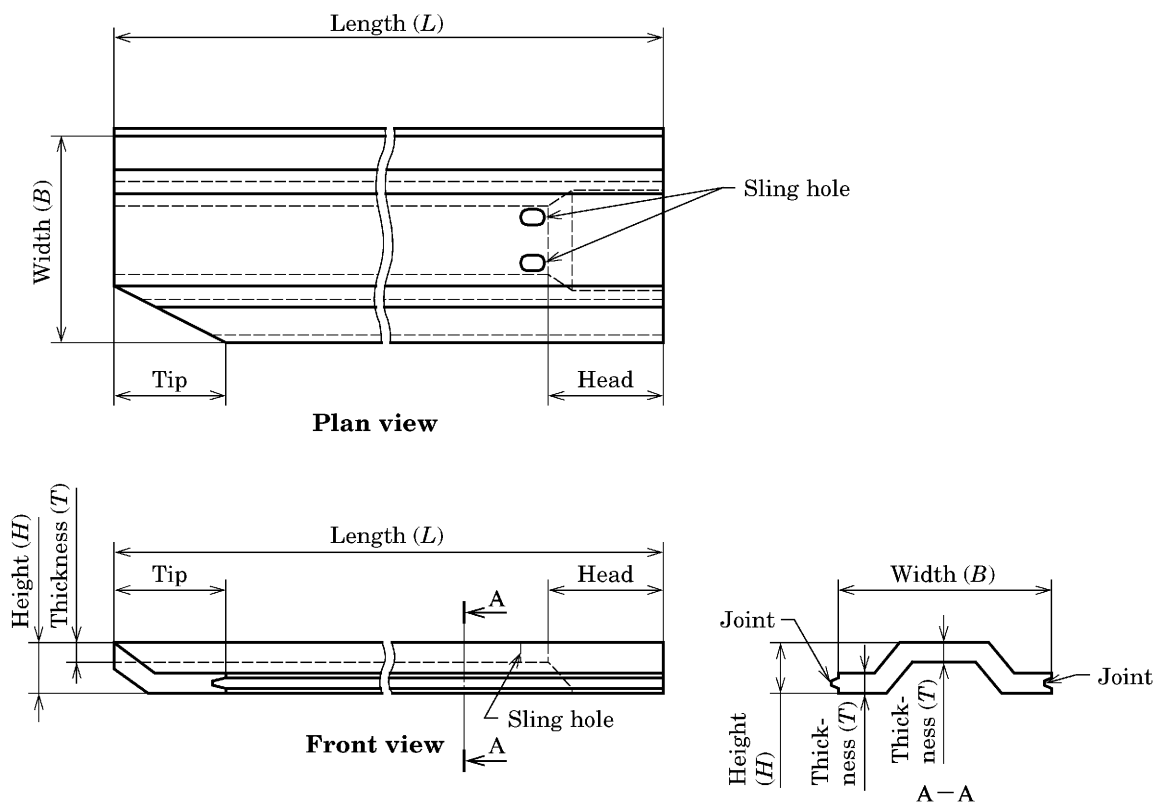
Recommended specification C-1 Figure 1 Shape of flat type



**Recommended specification C-1 Figure 2 Shape of slot type
(height 90 mm to 120 mm)**



**Recommended specification C-1 Figure 3 Shape of slot type
(height 150 mm to 350 mm)**



Recommended specification C-1 Figure 4 Shape of wavy type

Recommended specification C-1 Table 6
Dimensions and dimensional tolerances

Unit: mm

Classification		Width	Height	Thickness	Length
Flat type	Dimensions	500	50 to 220	—	2 000 to 14 000
	Tolerances	+5 -2	+5 -2	—	±30
Flat type	Dimensions	996	50 to 220	—	2 000 to 14 000
	Tolerances	+7 -2	+7 -2	—	±30
Slot type	Dimensions	996	90 to 350	45 to 100	2 000 to 14 000
	Tolerances	+7 -2	+7 -2	+7 -2	±30
Wavy type	Dimensions	996, 1 246	120 to 1 200	60 to 130	3 000 to 25 000
	Tolerances	+7 -2	+7 -2	+7 -2	±30

Recommended specification C-1 table 7 Tolerances on curvature

Unit: mm

Curvature	$L \leq 7\,000$	10
	$L > 7\,000$	15

C-1.5 Bar arrangement

The bar arrangement of sheet piles shall be as follows.

- The covering of reinforcing bar shall be 12 mm or more.
- The covering of prestressing tendon shall be 15 mm or more.

C-1.6 Strength test

C-1.6.1 Compressive strength test

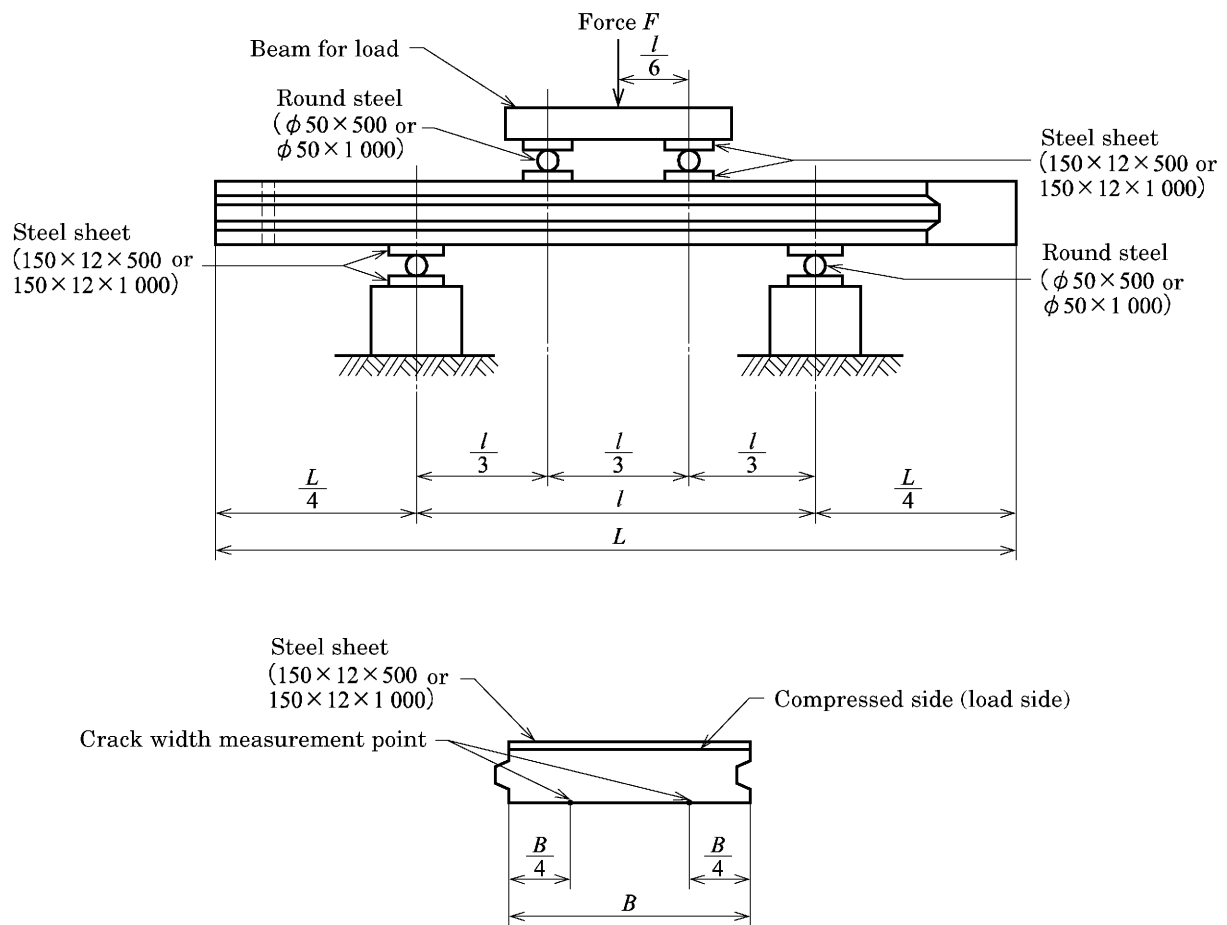
The compressive strength test of sheet piles shall be as specified in C.6.1.

C-1.6.2 Bending strength test

The bending strength test of sheet piles shall be conducted by the loading method shown in recommended specification C-1 figures 5 to 7. When the sheet pile receives the force F equivalent to the cracking moment specified in recommended specification C-1 tables 1 to 5, the crack situation shall be investigated at the crack width measurement point shown in recommended specification C-1 figures 5 to 7. Moreover, the sheet pile shall be confirmed that it does not break when the force equivalent to twice the cracking moment specified in recommended specification C-1 tables 1 to 5 is applied.

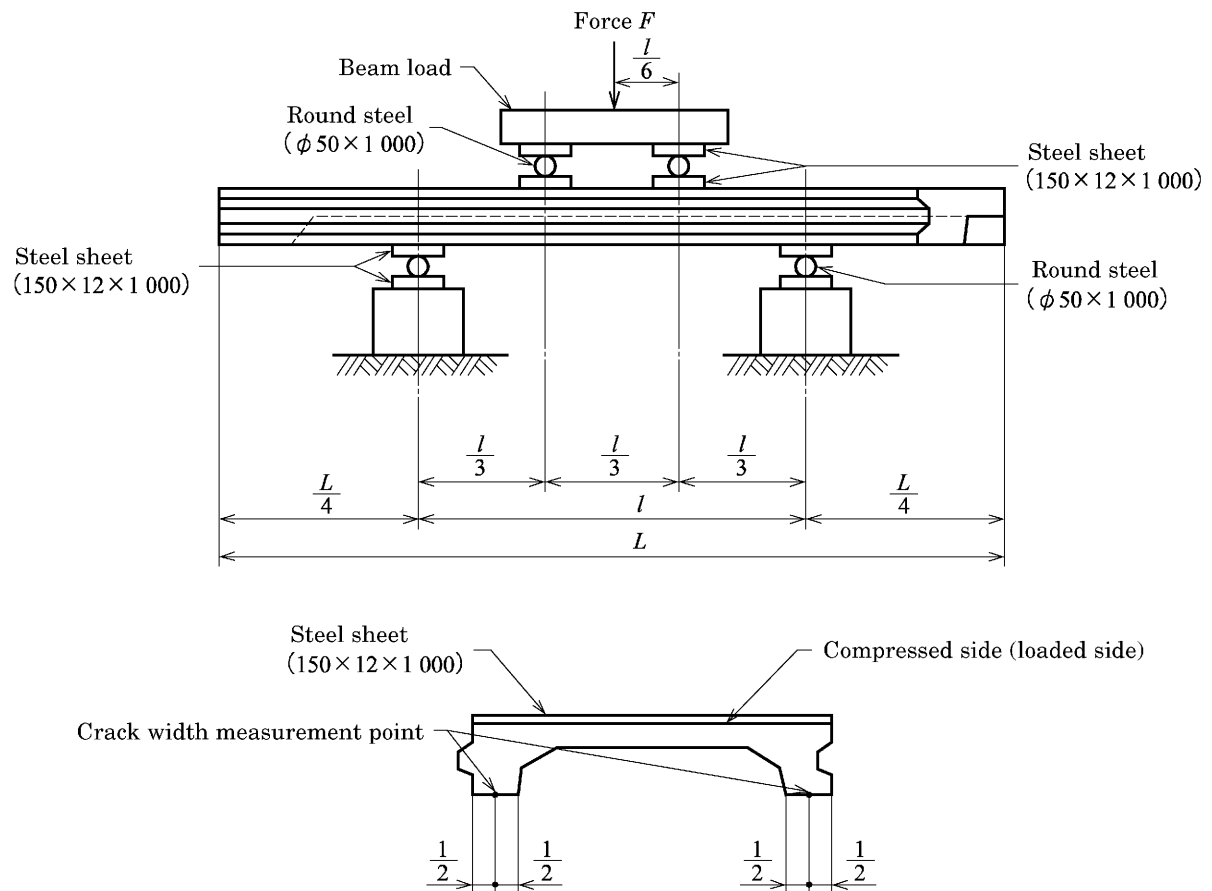
The tester shall be of Class 1 or superior specified in **JIS B 7721**, or shall be at least equivalent in allowance thereto.

Unit: mm



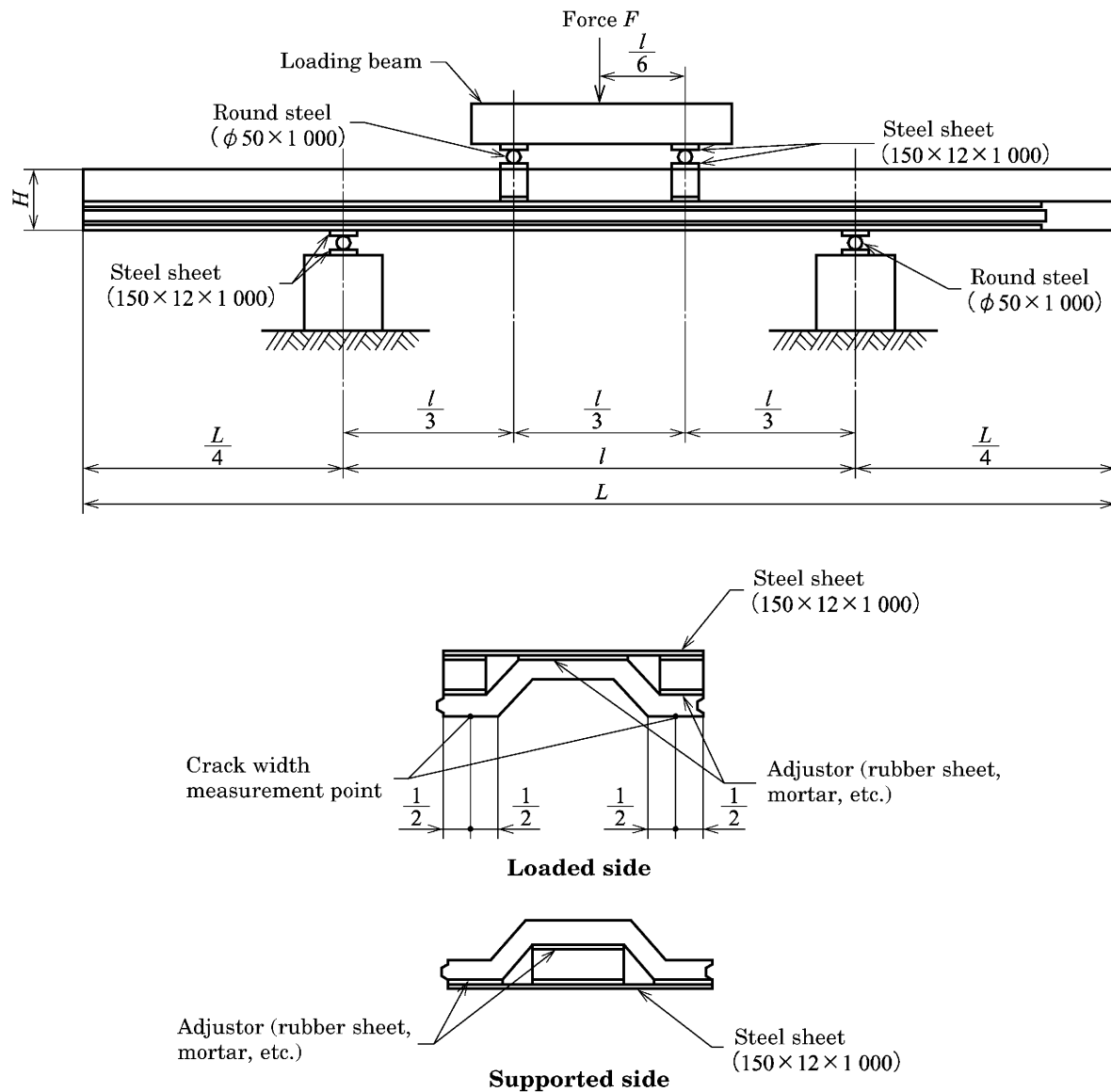
Recommended specification C-1 Figure 5
Bending strength test method (flat type)

Unit: mm



Recommended specification C-1 Figure 6
Bending strength test method (slot type)

Unit: mm



Recommended specification C-1 Figure 7
Bending strength test (wavy type)

C-1.7 Quality of concrete

The compressive strength of concrete shall be as specified in **C.7.2**.

C-1.8 Inspections

C-1.8.1 Inspection items

The inspection items of sheet piles shall be as follows.

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

- 1) Appearance
- 2) Performance