Hot rolled steel sheet piles

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Introduction

This Standard was established in 2019 and has gone through 5 revisions to this day including the revision at this time. In the previous revision, the shape of the hat type was added. The revision at this time is to correspond to the increase of necessity of modification for the specified values of the mechanical properties, afterwards.

The corresponding International Standard has not been established at this point.

1 Scope

This Standard specifies the hot rolled steel sheet piles (hereafter referred to as "steel sheet piles") which are used for sheathing, coffering, structural foundations and other similar applications.

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) indicated below shall be applies.

MMS G 0320 Standard test method for heat analysis of steel products

MMS G 0404 Steel and steel products __ General technical delivery requirements

MMS G 0415 Steel and steel products __ Inspection documents

MMS G 3192 Dimensions, mass and permissible variations of hot rolled steel sections

MMS Z 2241 Metallic materials __ Tensile testing __ Method of test at room temperature

3 Classification and symbols

Steel sheet piles shall be classified into two types, and symbols thereof shall be as given in table 1.

Table 1 Classification symbol

Classification symbol
MM 295
MM 390

4 Chemical composition

Steel sheet piles shall be tested in accordance with 8.1, and the heat analysis values thereof shall be as given in table 2.

Table 2 Chemical composition

Unit :%

Classification symbols	P	S
MM 295	0.040 max.	0.040 max.
MM 390	0.040 max.	0.040 max.
If necessary, alloy elements other than those given in this table may be added.		

5 Mechanical properties

5.1 Yield point or proof stress, tensile strength and elongation

Steel sheet piles shall be tested in accordance with 8.2, and their yield point or proof stress, tensile strength and elongation shall be as given in table 3.

Table 3 Yield point or proof stress, tensile strength and elongation

Classification symbol	Yield point or proof stress N/mm^2	Tensile strength N/mm^2	Test specimen	Elongation %
MM 295	295 min.	450 min.	No. 1A	18 min.
			No. 14B	24 min.
MM 390	390 min.	490 min.	No. 1A	16 min.
			No. 14B	20 min.
NOTE : 1 N/mm^2 = 1 MPa				

5.2 Coupling tensile strength of straight line shape steel sheet piles

Straight line shape steel sheet piles shall be tested in accordance with 8.3, and the coupling tensile strength [1)] thereof shall be not less than 3.92 MN/m for those of under 10 mm in thickness or not less than 5.88 MN/m for those of 10 mm or over to excluding 16 mm in thickness.

Note[1)] The value of maximum load that the test specimen withstands during the course of the coupling tensile strength test of steel sheet piles, which is converted to that of 1m in width.

6 Shapes, dimensional tolerances and unit mass

Shapes, dimensional tolerances and the unit mass shall be as follows.

a) The sectional shapes of steel sheet piles shall be U shape, straight line shape, Z shape, H shape and hat shape, and the designation of each part shall be as given in figure 1.

b) The coupling of steel sheet piles shall have a shape that allows adequate interlocking at the time of piling and easy disengagement at the time of extracting, and should be of a structure that secures water tightness as much as possible.

c) The shape and dimensional tolerance of steel sheet piles shall be as given in table 4.

d) The unit mass shall be upon the agreement between the purchaser and the manufacturer.

e) According to the designation by the purchaser, boring or mounting of accessories for suspension at construction may be carried out. The inspection, marking, etc. in this case shall be upon the agreement between the purchaser and the manufacturer.

7 Appearance

Steel sheet piles shall be free from defects detrimental to use. However, such defects may be removed or repaired in accordance with clause 9 of MMS G 3192.

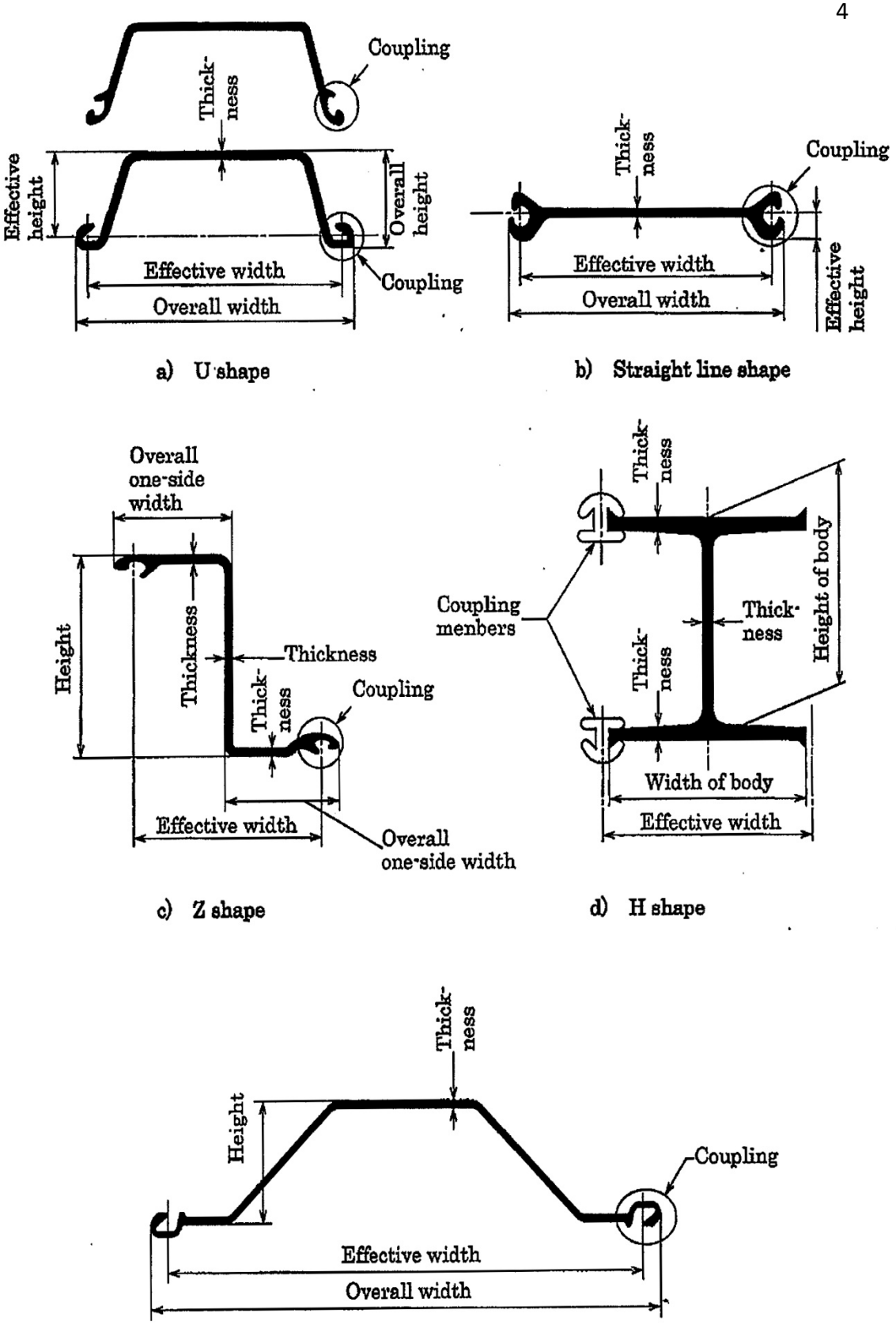

Figure 1 Designation of each part

Table 4 Shape and dimensional tolerances

Items		Sectional shape				
		Straight line shape	U shape	Hat shape	Z shape	H shape
Width		±4 mm	+ 10mm -5 mm		+ 8mm -4mm	±4 mm
Height		-	±4 %		±5 mm	±1.0 %
Thick-ness	Under 10 mm	+ 1.5 mm - 0.7 mm	±1.0 mm			
	10 mm or over to and excl. 6 mm	+ 1.5 mm - 0.7 mm	±1.2 mm			
	16 mm or over	-	±1.5 mm			
Length		+ Not specified 0				
Deflec-tion [a)]	10 m or under in length	Overall length (m) x 0.15 % max.	Overall length (m) x 0.12 % max.		Overall length (m) x 0.15 % max.	
	Over 10 m in length	[(Overall length - 10m) x0.10%+15 mm]max.	[(Overall length - 10m) x0.10%+12 mm]max.		[(Overall length - 10m) x0.10%+15 mm]max.	
Cam-ber [a)]	10 m or under in length	Overall length (m) x 0.20% max.	Overall length (m) x 0.25% max.		Overall length (m) x 0.15% max.	
	Over 10 m in length	[(Overall length - 10m) x0.10%+20 mm]max.	[(Overall length - 10m) x0.20%+25 mm]max.		[(Overall length - 10m) x0.15%+15 mm]max.	
Difference in vertically cut sections		4%of width max.			4% of height and width max.	
The applicable places of tolerance on width, height and thickness shall be as show in figure 1, provided that width tolerances are applied to overall width for a straight line shape, a U shape and a hat shape, to overall one side width for a Z shape and to the width of body for an H shape. Height tolerance shall be applied to overall height for a U shape and to the height of body for an H shape. Not [a)] Deflection shall be in the parallel direction to a sheet pile wall and camber shall be in the vertical direction to a sheet pile wall.						

8 Tests

8.1 Chemical analysis test

The chemical analysis test shall be as follows.

a) Chemical composition shall be obtained from heat analysis, and general requirements for chemical analysis test and sampling method shall be in accordance with clause 8 of MMS G 0404.

b) The heat analysis method shall be in accordance with MMS G 0320.

8.2 Mechanical test

8.2.1 General test requirements

General requirements for mechanical tests shall be in accordance with clause 7 and clause 9 of MMS G 0404. The sampling method shall be in accordance with Class A of 7.6 of MMS G 0404. The number of test pieces, and the sampling position and sampling direction shall be as follows.

a) Number of tensile test pieces. The steel sheet piles of the same heat, same sectional shape and same dimensions constitute one lot, from which one tensile test piece shall be taken. When the lot exceeds 50 t in mass, two test pieces shall be taken.

b) Sampling position and sampling direction of tensile test piece. The tensile test piece shall be taken parallel to the rolling direction from the position as given in figure 2. When sampling of figure 2 is impracticable, the test piece shall be taken as close to the specified position as possible.

8.2.2 Test piece

The tensile test piece shall be No. 1A or No.14B test pieces in MMS Z 2241.

8.2.3 Test method

The tensile test method shall be in accordance with MMS Z 2241.

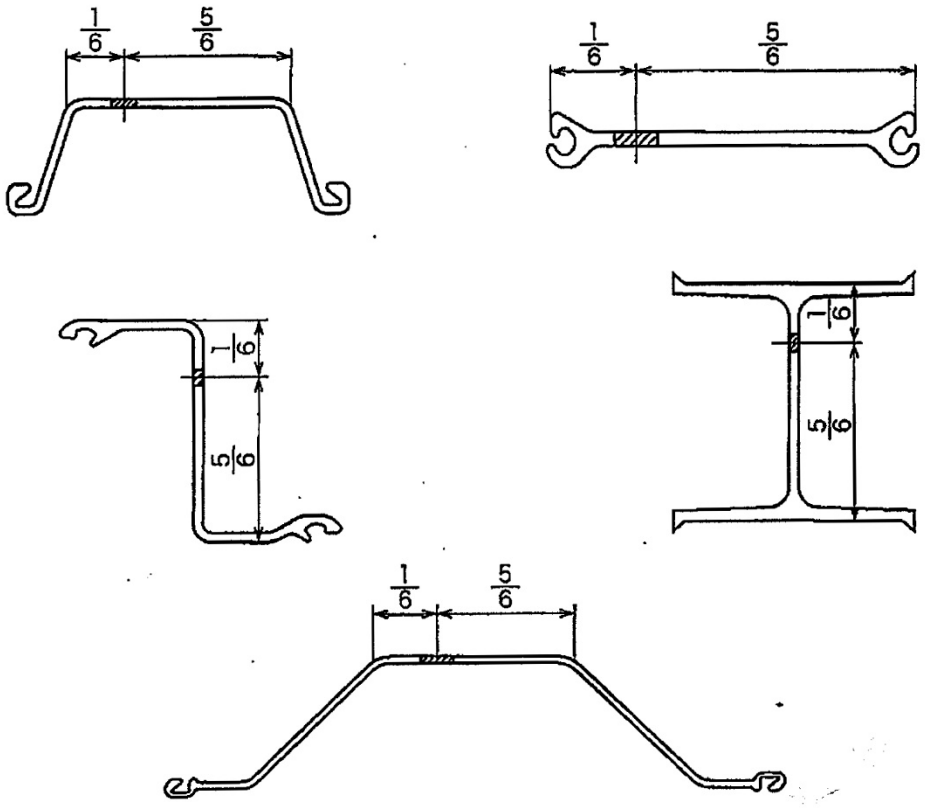

Figure 2 Sampling position of tensile test pieces

8.3 Coupling tensile test on straight line shape steel sheet piles

The coupling tensile test on the straight line shape steel sheet piles shall be as follows.

a) Two coupling tensile test pieces shall be taken at right angles to the rolling direction from each lot of the same heat and the same sectional dimensions. In this case, the dimensions of one test piece shall be about 100 mm in width and about 300 mm in length, and each one of the pair shall have a coupling on one side and thus representing the couplings on both sides of the steel sheet pile.

b) The coupling tensile test shall be carried out by measuring the disengagement strength of coupling (the breaking strength if the test piece breaks before the disengagement of the coupling) in accordance with MMS Z 2241. In this case, the test piece shall be set in such a manner that the two coupling engage each other with the tensile axis parallel to the axis of the test pieces, as given in figure 3. The distance between grips shall be not less than 400 mm.

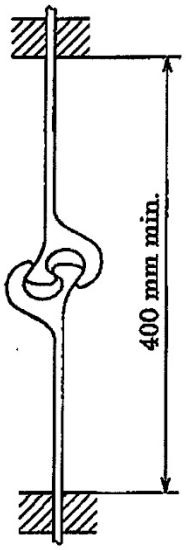

Figure 3 State of test pieces adequately set

9 Inspection

The inspection shall be as follows.

a) General requirements for inspection shall be in accordance with MMS G 0404.

b) Chemical composition shall comply with the requirements of clause 4.

c) Mechanical properties shall comply with the requirements of clause 5.

d) Shapes and dimensions shall comply with the requirements of clause 6.

e) Appearance shall comply with the requirements of clause 7.

10 Reinspection

For steel sheet piles having failed to meet the requirements of tensile test or coupling tensile test, a retest may be carried out for acceptance in accordance with 9.8 of MMS G 0404.

11 Marking

For each steel sheet pile that has passed the inspection, the following items shall be marked by suitable means so as to ensure that those markings remain until the time of pile driving. However, part of the items may be omitted upon the agreement between the purchaser and the manufacturer.

a) Classification symbol
b) Heat number or inspection number
c) Symbol (agreed between the purchaser and the manufacturer) indicating shape and dimensions (or sectional performance)
d) Length (in metre)
e) Manufacturer's name or its abbreviation

12 Report

The report shall be in accordance with the requirements of clause 13 of MMS G 0404, and the manufacturer shall submit the standard designation 3.1B specified in MMS G 0415 to the purchaser. When inspection documents other than this are required, the purchaser shall make a request to the manufacturer at the time of ordering.

Further, when any chemical composition other than those given in table 2 is added, the content thereof shall be appended.