

KES

Specification of Pad

KES B – L072

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1. Scope of Application

This standard shall be applicable to the quality standard and the evaluation method of the stiffness reinforcing pad (Hereinafter 'stiffness pad') used for reinforcing the stiffness of door, trunk, fender and other press part of car parts.

2. Classification

The stiffness pads are classified by the foaming ratio of thermosetting material when cured by heat as the followings.

Table 1. Classification of Stiffness Pad

Classification	Material Symbol	Contents
Non foaming type		Non foaming thermosetting type when cured by heat
Foaming type		Thermosetting type that a little foam is made when cured by heat.

3. Quality

The stiffness pad shall be satisfied with the following quality conditions.

- (1) Its main ingredient shall be epoxy resin. And it shall be contain the additives of filling material, foaming agent, and glass fiber and cured by heating.
- (2) The appearance of products shall be free of deformation, bulge and bubble, and be all right. And the thickness shall be satisfied with the thickness indicated on the drawing.
- (3) The product shall be easy to handle and to work with tools.
- (4) The product shall not contain the harmful objects specified by rules and have the defects to give out bad smell to workers or affect the skin.
- (5) The product shall not have the defects to affect the quality like discoloration, bulge and drop in property after being left in a room for a long time (Normally 1 month).
- (6) The quality of the product shall be that the resultant values evaluated by clause 4 are satisfied with the quality standard of Table 2 and Table 3.

4. Test Condition

4.1 General Condition of Test

4.1.1 Standard Condition of Test Chamber

The standard condition of the test chamber shall be 23 ± 2 °C of temperature and 65 ± 5 % of relative humidity in principle.

But, when it is difficult to maintain the standard condition of the test chamber, the temperature and the humidity shall be recorded on the evaluation result report.

4.1.2 Condition of Test Piece

The test piece shall be cleaned completely and used after being left under the standard condition over 1 hour.

Table 2. Property before Curing

Evaluation item		Evaluation condition	Material specification		Test method
			Non foaming type	Foaming type	
Penetrating		20 ± 2 °C 1Hr	Report	Report	5-1
Non volatile ratio		105 ± 2 °C 3Hrs	Report	Report	5-2
Initial peel strength Kg/25mm	Peel strength of state	RT 24Hrs	More than 0.3		5-3
	Peel strength on oily surface	RT 24Hrs	More than 0.3		
Adhesion on oily surface		70 Degree angle	No abnormality like bulging, exfoliation, sagging and disjoining.		5-4
Pot life (Day)		40 °C 95 % Rh	More than 3 days		5-5
Pretreatment solution contaminating		50 °C 10 Days	No contamination of solution and melting of pad		5-6
Pre-coating Solution contaminating		50 °C 10 Days			5-7
Storage stability		40 ± 2 °C 30 Days	Satisfy the initial and adhesion on oily surface. Change rate of penetrating shall be less than 50%.		5-8
Fluidity		RT 15 minutes	Report	Report	5-9
Solubility		Line condition	Report	Report	5-10

Table 3. Property after Curing

Evaluation item		Evaluation condition	Material specification		Test method
			Non foaming type	Foaming type	
Specific gravity		165 °C 20 Minutes	Report	Report	5-11
Shearing aadhesion strength Kg/cm ²	During state	RT 30 Minutes	More than 40	More than 40	5-12
	Thermal aging	100 ± 2 °C 168 Hrs	More than 40	More than 40	
	Water resistance	40 ± 2 °C 168 Hrs	More than 40	More than 40	
	Humidity resistance	50 °C 95 %Rh 168 Hrs	More than 40	More than 40	
	Cold resistance	-30 °C 48 Hrs	More than 40	More than 40	
	Thermal shock	4 Cycle	More than 40	More than 40	
Bending strength		5 mm/ min	More than 7kg per 1mm deformation, more than 30kg of maximum payload and no abnormality of appearance		5-13
Impact resistance			More than 10 times		5-14
Over baking		185 °C 20 Minutes	Satisfy deformation resistance, bending strength and impact resistance.		5-15
Under baking		150°C 20 Minutes			
Deformation resistance		RT 3Hrs	± 0.3		5-16
Part adaptability	Deformation resistance		No deformation by examination with the naked eye		5-17
	Dent resistance		Less than 0.3		
Corrosion resistance		SST 480 Hrs	No object caused by corrosion		5-18
Volume change ratio			Report	Report	5-19
Strength			Report	Report	5-20
Low temperature impact		40 ± 2 °C	No breakaway of pad		5-21

4.1.3 Test Piece

The test piece used to the test shall be the material applicable actually in principle. If not, the test piece determined after discussing with our company shall be used and the material of part attached shall be recorded in the resultant value.

4.1.4 Manufacturing Condition of Test Piece

The item conforming the quality after attaching the product to a steel plate and heat cure shall be according to the line condition as long as specific rules are not applicable.

But, if a special condition is not specified, $165 \pm 2^\circ\text{C}$ shall be applicable for 30 minutes.

5. Test Method

5.1 Penetrating

The sample shall be taken from a product, and formed part that is pulled and piled up more than 20mm thickness not to contain bubbles like Figure 2.

After letting the sample left in the environmental chamber of $20 \pm 2^\circ\text{C}$ for 1 hour, put the sample on the penetration gauge immediately, set pins at the pin holders, contact the end of pins at 3 points on surface of the sample and penetrate the pins into the sample with the total falling payload of $50 \pm 0.06\text{ kgf}$ after confirming the 0 point on the indicator.

And, make the penetration measuring lock contact to the top of the pin holder and read the scale.

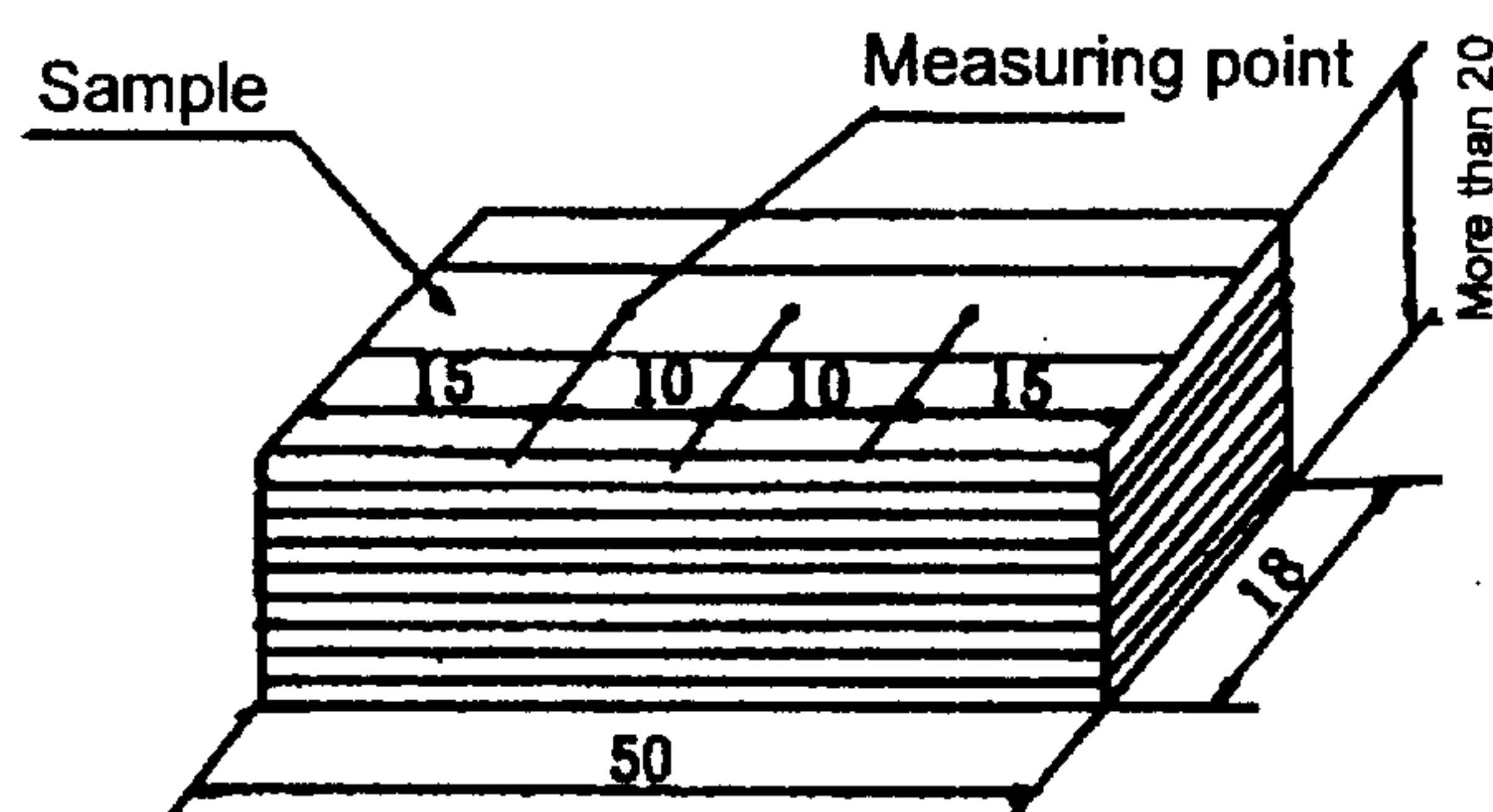


Figure 1. Manufacturing of Test Piece

5.2 Non Volatile Ratio

This test is for measuring the non volatile ratio of the stiffness pad after heating and drying.

5.2.1 Test Instrument

- (1) Drier : The drier shall be a hot blast circulation type that can maintain constant temperature.
- (2) Weighing Bottle : The instrument shall be about 50 mm of inside diameter and about 30 mm of depth, and have a cap.
- (3) Chemical Scale : Use the instrument specified in 9.2.2(1)
- (4) Desiccator : Use the desiccator with silica gel as drying agent.
- (5) Plate of Aluminum Foil : Use the plate of aluminum foil formed along the inside wall, 50mm of inside diameter, of the weighing bottle.

5.2.2 Test Method

Measure the weight of the weighing bottle and the plate of aluminum foil.
Collect the sample of 1.5gr on the plate of aluminum foil formed to be circular along the inside wall of the weighing bottle, close the cap and measure the weight. And open the cap, let the bottle left for 30 ~ 60 minutes in a room, dry it for 3 hours in the desiccator maintained at 105 ± 2 °C, cool it in the desiccator, measure the weight of the bottle with the cap closed and calculate the non volatile ratio according to the following equation.

$$\text{Non volatile ratio R (\%)} = \frac{\text{Weight after Drying} - (\text{Weighing Bottle} + \text{Weight of Aluminum Foil})}{\text{Weight before Test} - (\text{Weighing Bottle} + \text{Weight of Aluminum Foil})} \times 100$$

5.2.3 Report of Resultant Value

After measuring 2 samples, report the test result of average value calculated down to one place of decimal.

5.3 Initial Peel Strength

5.3.1 Test Piece Manufacturing

Attach the sheet in size of 25 x 100 x 2.0 t (mm) to the steel plate at the normal temperature as Figure 2, press the sheet and the steel plate by one going and returning with the roller of 2kg and use it for a test piece after left for 3 hours at the normal temperature.

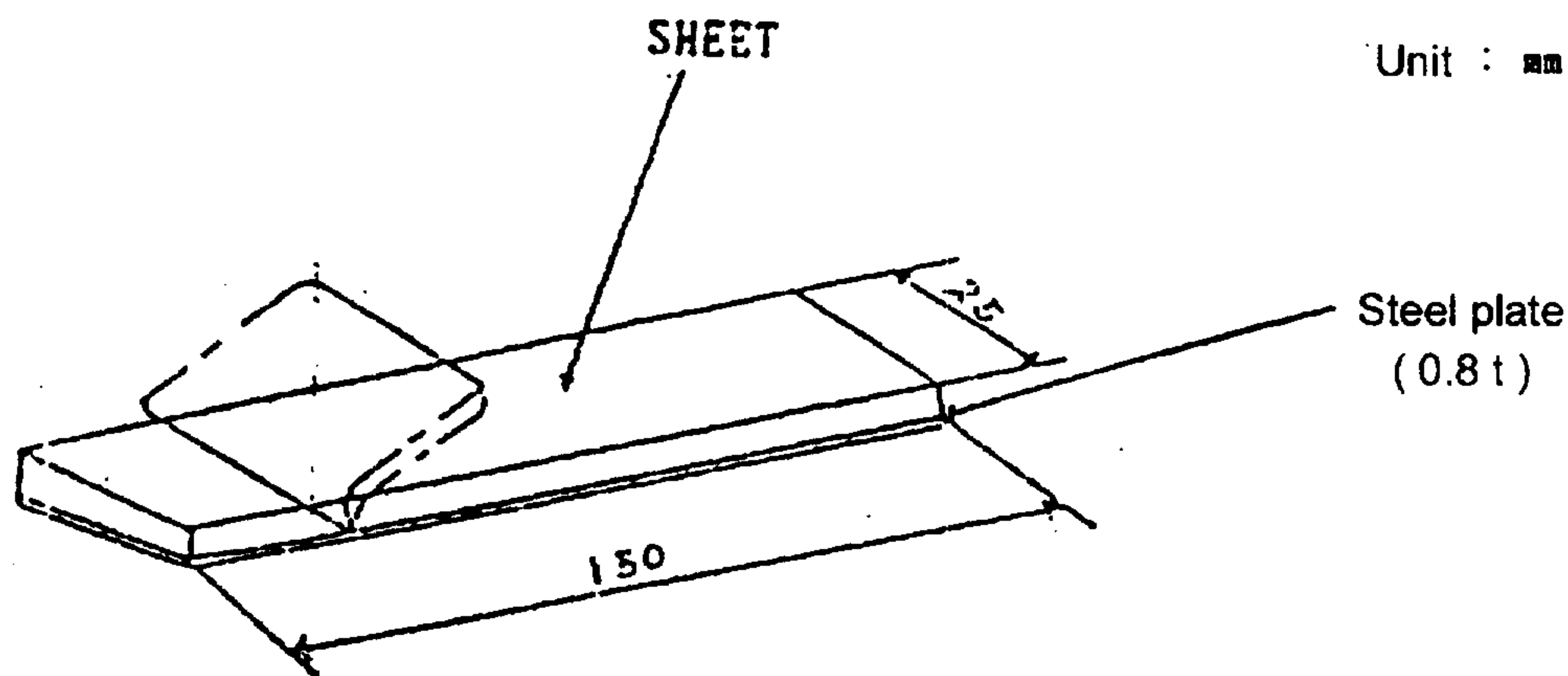


Figure 2

5.3.2 Peel Strength of State

After maintain the test piece manufactured by 5.3.1 at the normal temperature for 24 hours, pull the end side of the adhesive, attach it to a tensile tester and measure the breakaway payload applying payload to the longitudinal direction.

At this time, the surface of the steel plate used for the test piece shall be cleaned with solvent.

5.3.3 Peel Strength on Oily Surface

After cleaning the steel plate to be used for the test piece clearly with solvent and coating rust preventing oil used for short term rust preventing in the press line, dry it at the normal temperature for 24 hours. After manufacturing the test piece with the steel plate coated with rust preventing oil according to 5.3.1, let it left at the normal temperature for 24 hours and evaluate it according to the test method of 5.3.2.

5.3.4 Result Reporting

Report the test result, which is average value taken from 3 test pieces.

5.4 Adhesion on Oily Surface

Attach the sheet in size of 10 x 100 x 2.0 t (mm) to the oily steel plate as Figure 3, press the sheet and the steel plate by one going and returning with the roller of 2kg, attach it

immediately in the condition of overhanging at 70° to the holding device and cure it by heat under the condition of 4.1.4.

After letting it left at the room temperature and cooling, inspect the abnormality of sagging of the plate, peeling, bulging, etc. And the condition of the oily steel plate shall be according to 5.3.3.

The results shall be recorded individually about three test pieces.

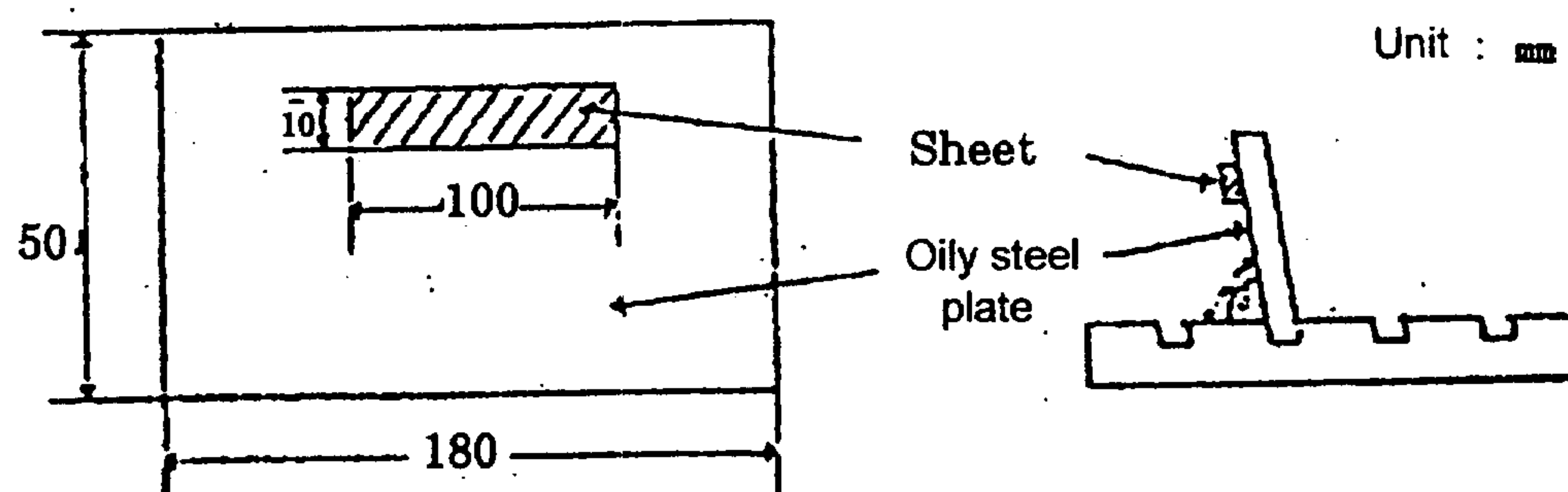


Figure 3

5.5 Pot Life

Attach the stiffness pad in size of 50x150x2.0t(mm) to the oily steel plate like Figure 4, press the stiffness pad and the steel plate by one going and returning with the roller of 5kg and let it left under the circumstance of 40°C 93%RH for 1,2,3,7,10 days.

After letting it left again at the normal temperature and heat it in the condition of 4.1.4, inspect the abnormality of appearance like bulging and peeling off of pad and measure the bending strength according to 5.13.

The result shall be of the minimum leaving days satisfying the result value of appearance and bending strength according to each leaving day.

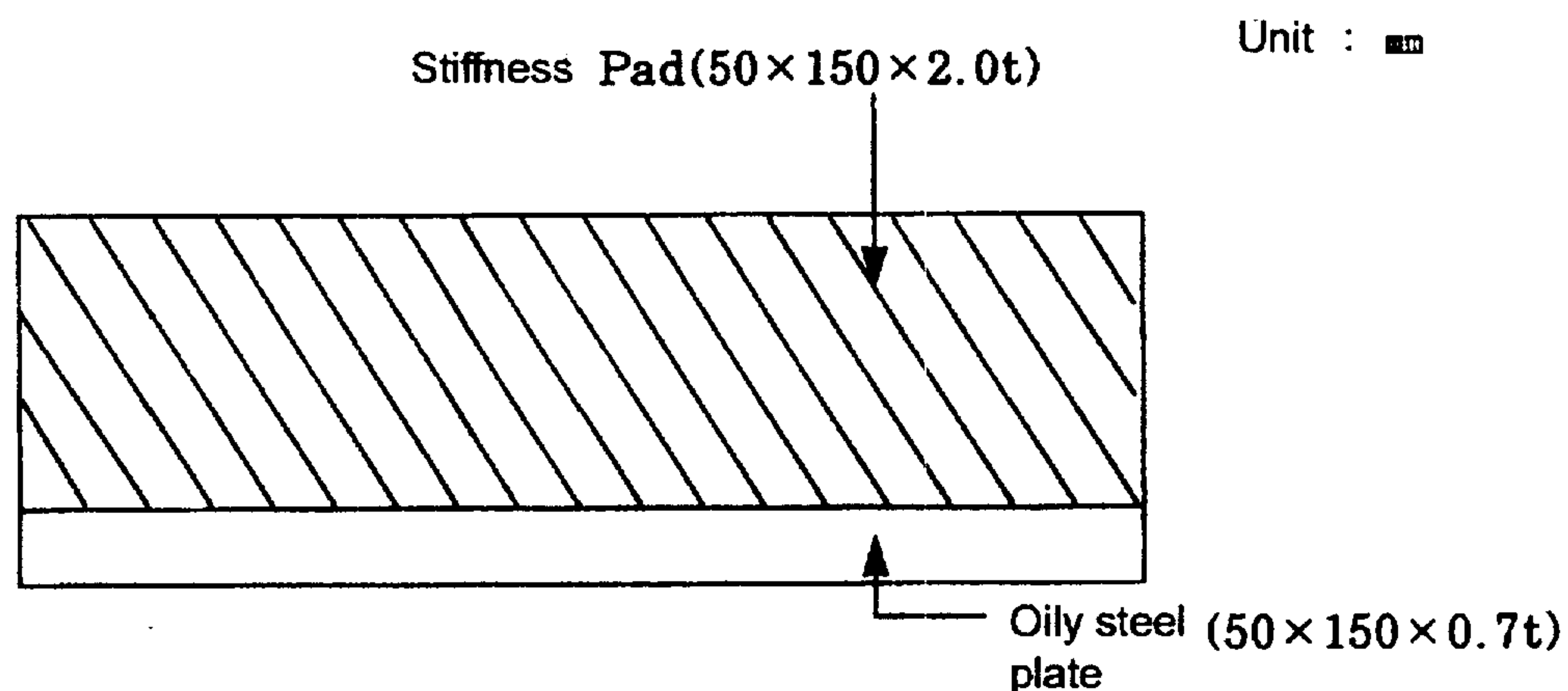


Figure 4

5.6 Pre-treatment Solution Contaminating

(1) Purpose

This test is for examining the correlativity between adhesive and surface treating solution.

(2) Test Method

After depositing sample of 5g individually in fat-removed solution of 2 liter and phosphate treated solution of 2liter, and letting the fat-removed solution left at 40 °C and letting the phosphate treated solution at 50°C for 10 days, evaluate PH of the fat-removed solution and the ingredient change of the phosphate treated solution. And, adjust the tested fat-removed solution and phosphate treated solution to the condition of 800±100ppm zinc, treat the oily steel plate and evaluate the treating efficiency.

Note : The treatment condition of the fat-removed solution and the phosphate treated solution to be used for the test shall be decided through discussion with our company.

(3) Result Report

Inspect the abnormality about contamination of solution and melting of pad, and report the test result.