International Standard 6305/1

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Railway components — Technical delivery requirements — Part 1 : Rolled steel fishplates

Éléments constitutifs de la voie ferrée — Spécifications techniques de livraison — Partie 1 : Éclisses en acier laminé

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 6305/1 was developed by Technical Committee ISO/TC 17, *Steel*, and was circulated to the member bodies in May 1980.

It has been approved by the member bodies of the following countries :

Austria	Germany, F. R.	South Africa, Rep. of
Belgium	Hungary	Spain
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Canada	Italy	Switzerland
Chile	Japan	Turkey
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Czechoslovakia	Korea, Rep. of	USA
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France	Romania	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Australia
Brazil

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Railway components — Technical delivery requirements — Part 1 : Rolled steel fishplates

1 Scope and field of application

This part of ISO 6305 specifies the quality requirements of the product and the conditions of acceptance testing for rolled steel fishplates intended for use with rails of linear mass equal to or greater than 35 kg/m.

2 References

ISO 82, *Steel — Tensile testing.*

ISO 2859, *Sampling procedures and tables for inspection by attributes.*

3 Conditions of manufacture

3.1 Steelmaking process

The steelmaking process shall be at the manufacturer's option. If requested by the purchaser, the manufacturer shall state in his tender the type and the principal characteristics of the steelmaking process; he may not alter them without advising the purchaser's representative.

The steel used shall be one of the grades defined in table 1 and as selected by the purchaser.

Table 1

Tensile strength, R_m N/mm^2	Elongation % min.
470 — 570	20
550 — 650	18
R > 690* (with R_{eH} > 480)	12*

* Refers to mechanical properties obtained after heat treatment.

3.2 Manufacture

The fishplates shall be manufactured by cutting to length a rolled section and finished in accordance with drawings supplied by the purchaser.

Throughout the production process, the manufacturer shall use the best techniques so that the fishplates satisfy the requirements of this part of ISO 6305. Continuously cast blooms may be used in addition to blooms made from ingots.

3.3 Heat treatment

Where the fishplates are to be subjected to heat treatment the purchaser shall be advised of the conditions of such treatment by the manufacturer.

3.4 Drawings and working gauges

A copy of the final drawings shall be supplied to the manufacturer by the purchaser together with the notification of approval of the order.

If stated in the order, the manufacturer before starting production shall make up two sets of maximum and minimum working gauges, incorporating the specified dimensional tolerances. If required by the purchaser the working gauges shall be stamped after approval by the purchaser's representative.

Only these working gauges shall be valid for checking purposes.

One set of working gauges shall be made available to the receiving inspector for the period of acceptance testing.

The working gauges shall be provided at the manufacturer's expense. New working gauges need not be provided for items ordered in quantities of less than 5 000 at any one time.

When the working gauges have been approved by a purchaser, or by an outside testing agency, these shall be used for other purchasers wherever possible.

3.5 Marking

The fishplates shall carry in legible characters at the position shown on the drawings compatible with the rolling requirements :

— the identification mark of the manufacturer's works;

— the last two figures of the year of manufacture;

— if required a symbol indicating the section of the fishplate.

3.6 Freedom from defects

The fishplates shall be free from defects adversely affecting their behaviour in service.

Surface defects may be tested by the receiving inspector with a suitable tool to decide whether the defect is likely to affect the fishplate in service.

Any operation carried out either in the cold or hot state with the object of concealing a defect is not permitted.

3.7 Finishing

3.7.1 Straightness

The straightening shall be carried out with gradual pressure and without impact.

3.7.2 Fishplate length

The rolled bars used shall be cut to length by any suitable method which does not impair the section and the quality of the metal. Each cut shall be perpendicular to the axis, clean and free of burrs. Any projections shall be removed from the surfaces bearing on the rail.

3.7.3 Drilling and slotting

By agreement with the purchaser, the holes shall be drilled or punched.

Slots and holes of special shape may be obtained by any suitable method.

All necessary precautions shall be taken to ensure that the fishing surfaces are not deformed or the metal impaired. The dimensions of the holes shall remain, on both surfaces, within the permissible tolerances limits.

Burrs resulting from drilling and slotting shall be carefully removed.

3.8 Dimensional and straightness tolerances

The methods and means of checking the principal dimensional tolerances are defined in table 2.

If, for normal operations and by agreement between the manufacturer and the purchaser, check gauges different from but equivalent to those given in 3.4 are used, only the latter shall be used in case of dispute.

4 Conditions of acceptance testing

4.1 General

The tests shall be carried out in the manufacturer's works; the preparation of the test pieces and the tests shall be at the manufacturer's expense.

4.1.1 Type and extent of tests

One tensile test on each type of fishplate per cast for casts of 50 t or less. For larger casts, one test for each additional 50 t or part thereof.

4.1.2 Dimensions and finish

Inspection of dimensions shall include the dimensions and measurements below :

- height;
- diameter of holes;
- position of holes;
- straightness;
- length;
- inclination of the fishing surfaces.

The other dimensions for which tolerances are specified in table 2 may at any time be checked by the receiving inspector, but are not subject to the inspection specified in 4.3.2.

The purchaser may waive the dimensional inspection in the conditions stated in 4.3.3.

4.2 Selection of test pieces

4.2.1 Mechanical test pieces

The parts shall be selected and marked as directed by the receiving inspector.

The test pieces shall be cut in the rolling direction and taken in the area adjacent to one of the fishing surfaces without, however, touching it.

Cutting and fishing shall be carried out entirely in the cold state, by means of machine tools and without any hammering, cold deformation, hardening or annealing.

If possible, the dimensions of the test piece shall meet the requirements of ISO 82.

4.2.2 Dimensional checks

The parts selected for sampling shall be grouped in batches of the same kind. The samples shall be selected in such a way that they are representative of the batches submitted. The size of a batch shall be not less than 1 000 parts, nor more than 5 000 parts.

The receiving inspector has the right to break down or form batches for inspection purposes.

The parts selected for sampling shall be marked by the receiving inspector, and these marks shall be kept intact until the end of the acceptance testing operations.

Table 2

		Dimensions	Tolerances	Checking methods in accordance with annex
		mm		
Height h of the fishplate (height at the check point selected)		H being height of rail $H < 165$ $165 \leqslant H < 180$ $180 \leqslant H < 190$ $190 \leqslant H$	 ± 0,5 ± 0,7 ± 0,8 ± 1,0	Annex A
Diameter of the holes		$\phi \leqslant 32$ $\phi > 32$	± 0,5 ± 1,0	
		For punched holes, the above tolerances are increased by 0,05 times the thickness of the fishplate for the diameter on the side where the punch emerges.		
Position of the holes		The position of the holes shall enable the fishplate to be mounted on a gauge with cylindrical pins, consisting of a rail end whose dimensions match those of the drawing as exactly as possible, and in the body of which are fixed a number of cylindrical pins corresponding to the holes in the fishplate. These pins shall be situated exactly on the line of the centres where the rail is to be drilled at the respective distances strictly equivalent to those of the centre lines of the fishplate holes. The pins shall have a diameter 1 mm less than the diameter of holes $\leqslant$ 32 mm and 2 mm less than the diameter of holes $>$ 32 mm. When the rail and the fishplates are brought together, all the pins shall engage simultaneously in the holes.		
Straightness	For fishplates supplied in rolled bars	On the side On the flat	1 mm/m 1 mm/m The total deflection noted on the rolled bar length shall not exceed 0,4 % of the length.	Checked by 1 m straight edge
	For fishplates supplied as units	Vertical direction	0,1 % of the length	Annex B
		Horizontal direction	0,16 % of the length	
Length		Any length	± 3 mm	Annex C
Inclination of the fishing surfaces			± 3,6 %	Annex D
End squareness			± 2 mm	
Tolerances on other dimensions defining the cross-section			± 0,5 mm	

4.3 Checks

4.3.1 Mechanical test methods

The tensile test shall be carried out in accordance with the requirements of ISO 82.

The steel tested shall meet the quality requirements corresponding to one of the grades shown in 3.1.

If, from the batch corresponding to a cast or part cast, the single part selected for the test does not satisfy the conditions laid down, two re-tests shall be carried out as directed by the receiving inspector. If one of these re-tests is not satisfactory the corresponding batch shall be rejected.

4.3.2 Interpretation of dimensional inspection

Any fishplate which, on inspection, is found to have at least one measurement exceeding the tolerances, or which does not satisfy the finish specified in 4.1.2, shall be deemed not to conform.

Dimensional inspection shall be carried out by random sampling from batches of fishplates.

The statistical sampling programme to be used shall be agreed between the purchaser and the manufacturer. The agreement shall define the acceptable levels of quality and risks and the size of the batch and of the sample.

In the absence of such an agreement, the statistical sampling plan shall be carried out according to the Wald diagram or according to the corresponding table of ISO 2859, which involves the same risks for the manufacturer and the user of this diagram. The two control plans are more or less equally efficient, but the progressive plan is much more economical.

The risks incurred in the plan represented by the diagram (annex E) are as follows :

— a 5 % maximum probability of the rejection of a batch containing no more than 5 % of faulty parts;

— a 5 % maximum probability of the acceptance of a batch containing not less than 15 % of faulty parts.

The test shall be terminated as soon as the point representing the progress of the check enters the acceptance or rejection area.

In the case of a rejection, the manufacturer shall be entitled to sort the parts of the faulty batch, at his own expense, and to re-submit the batch for acceptance.

For the purpose of this second submission, the inspection shall be carried out in accordance with a progressive plan (annex F) which provides a smaller risk for the purchaser.

4.3.3 Alternative to dimensional inspection by selection from batches — Quality control cards

When the manufacturer makes a regular practice of using a system of quality control agreed by the purchaser for these products, the purchaser may arrange at his option the frequency of the dimensional inspection by sampling from batches. The results recorded on the quality control cards shall then be considered as constituting an acceptance inspection.

The quality control cards shall be retained at the receiving inspector's disposal, who shall be free, at any time, to inspect the correct application of the procedure, by any method chosen by the purchaser.

The quality control cards shall contain any information necessary for the purpose of clearly identifying the product. They shall be retained by the manufacturer at least until 31 December of the year following the year shown on the parts.

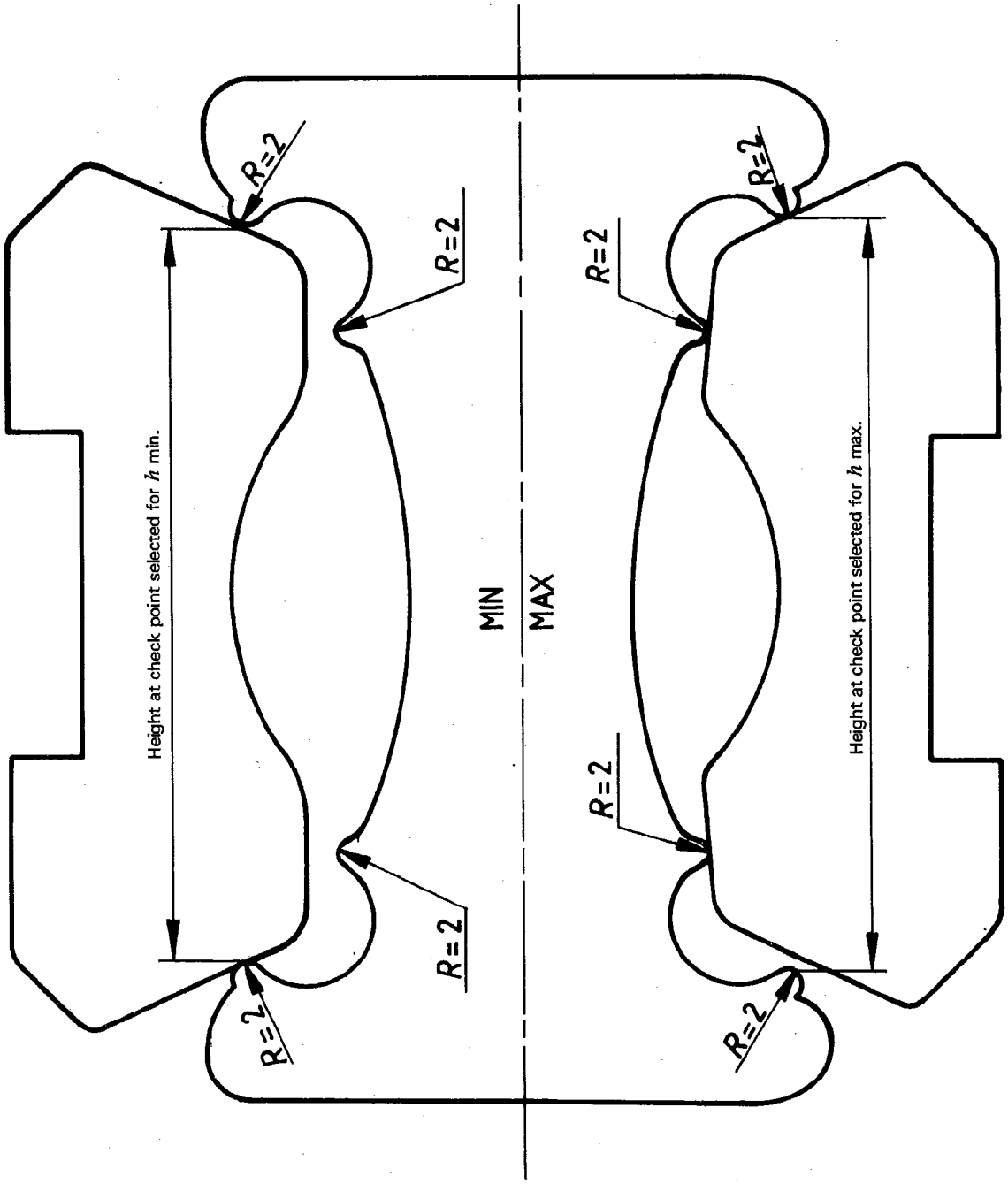
5 Information to be supplied by the purchaser

The attention of users of this part of ISO 6305 is drawn to the fact that an invitation to tender should normally be accompanied by a definition of the conditions of use and other relevant documents for carrying out the order, and in particular those concerning the application of the clauses in this specification.

Annex A

Referee gauge for checking height h

(Forms part of the standard.)



The point on the fishing surface where the height of the fishplate is to be measured is defined by the length obtained on the central axis of the rail, by prolonging the fishing surfaces to this axis.

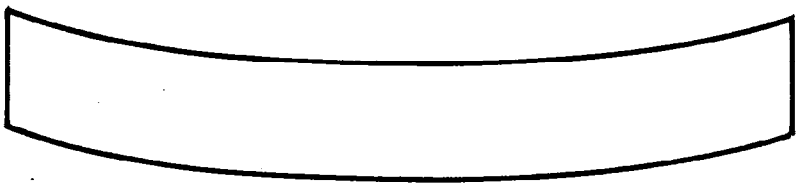
For checking height h

- one stop, at most, of the "**minimum**" side of the working gauge may touch the vertical part of the fishplate;
- both stops of the "**maximum**" side of the working gauge shall touch the vertical part of the application.

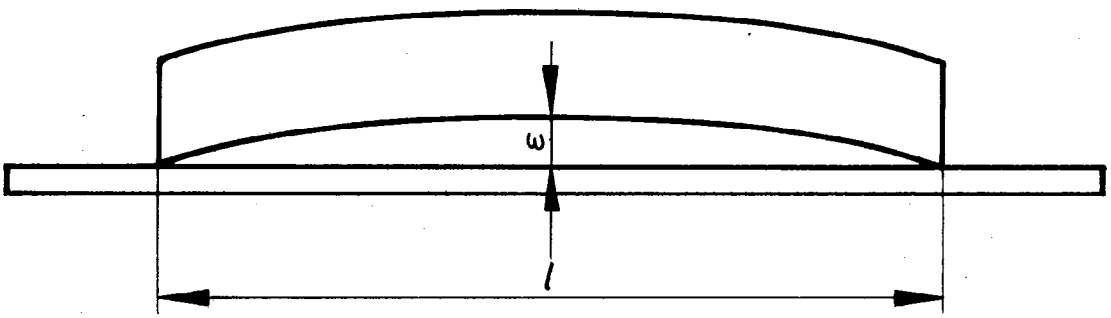
Annex B

Checking method of straightness in a vertical direction

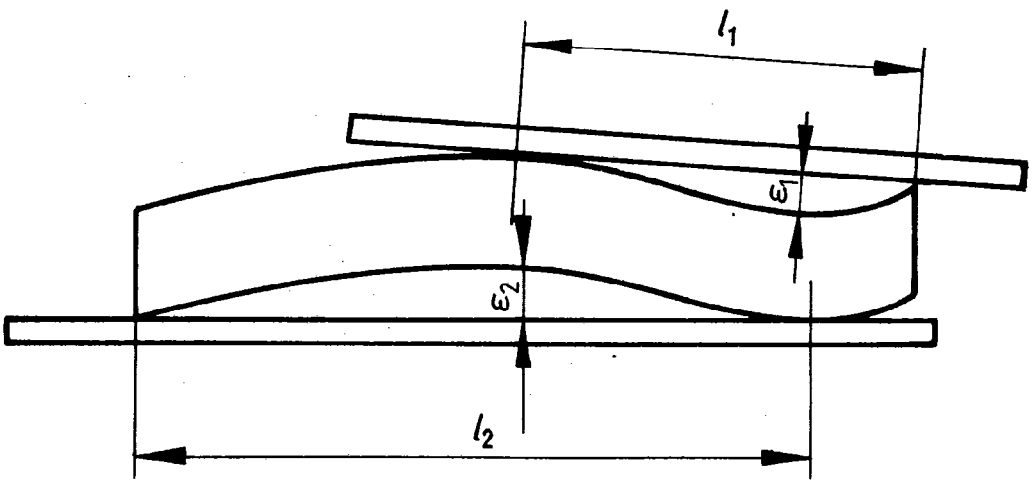
(Forms part of the standard.)



Unacceptable deformation (Centre lower than the ends)



$\varepsilon < 0{,}1$ % of l

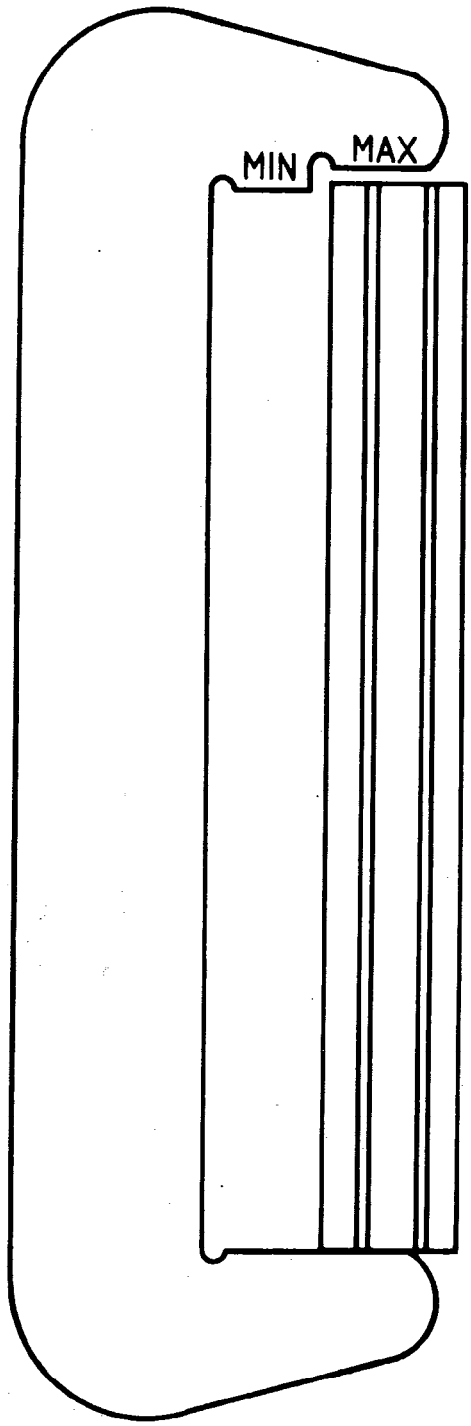


$\varepsilon_1 < 0{,}1$ % of l_1
and $\varepsilon_2 < 0{,}1$ % of l_2

Annex C

Referee gauge for checking length

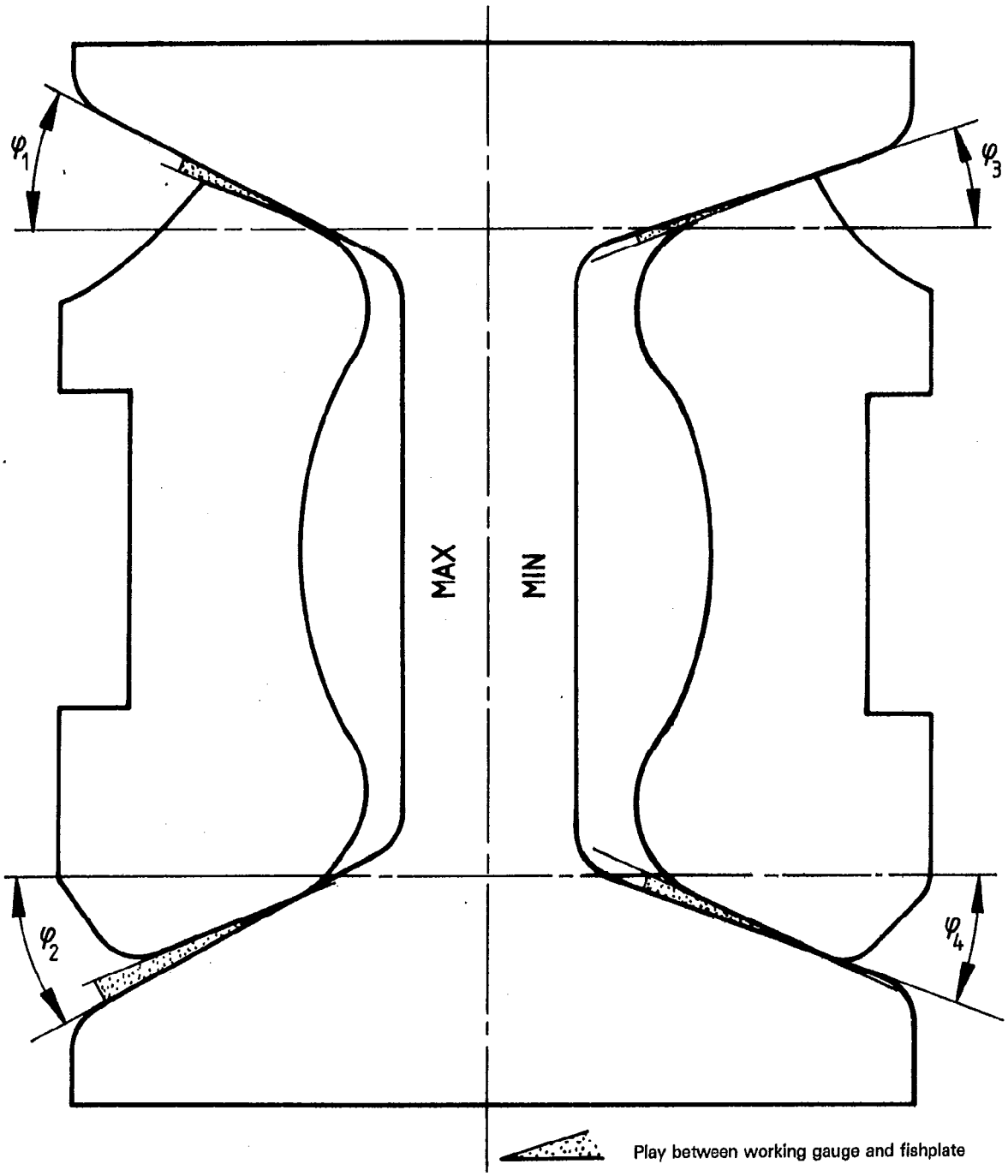
(Forms part of the standard.)



Annex D

Referee gauge for checking the opening of the fishing surfaces

(Forms part of the standard.)



Play between working gauge and fishplate

tg φ_1 = 1,036 tg α
tg φ_2 = 1,036 tg β
tg φ_3 = 0,964 tg α
tg φ_4 = 0,964 tg β

α and β are the theoretical angles; φ_1, φ_2, φ_3 and φ_4 are referee gauge angles.

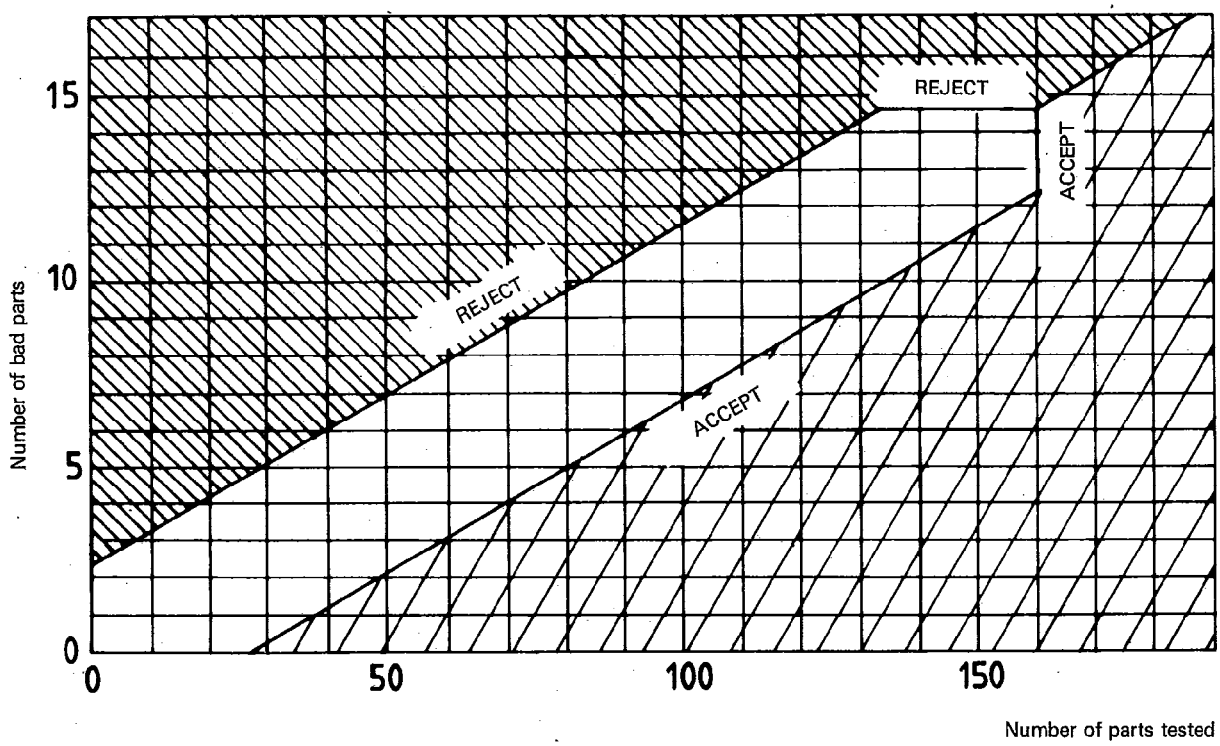
For checking the opening of the fishing surfaces

- the play between fishplate and "**maximum**" working gauge shall be on the outer side;
- the play between fishplate and "**minimum**" working gauge shall be on the inner side.

Annex E

Progressive sampling plan — Wald method

(Forms part of the standard.)



Note on the use of the Wald diagram

When a test is carried out, individual items are selected at random from the batch being checked. Each is checked and the result is recorded on the diagram before continuing.

A sample shall be deemed to conform if the test or check referred to in the diagram is satisfactory. It shall be deemed not to conform if the contrary is the case.

The results are represented by a point moving over the diagram. The starting position of the point is at zero. For each test, the point is moved by one unit parallel to the x-axis. For each non-conforming test, it is also moved by one unit parallel to the y-axis. The test is stopped as soon as the recording point has one of the areas marked "accept" or "reject".

Different kinds of test, forming a series, may be plotted on the same diagram.

The diagrams relating to each series of tests shall be appended to the acceptance report. They shall show each consecutive position of the recording point.

The purchaser may permit sampling to be carried out using groups of adjacent items instead of randomly selected individual items. In this case

1) the number of items in a group shall be constant throughout the test and be predetermined with a maximum number of 10;

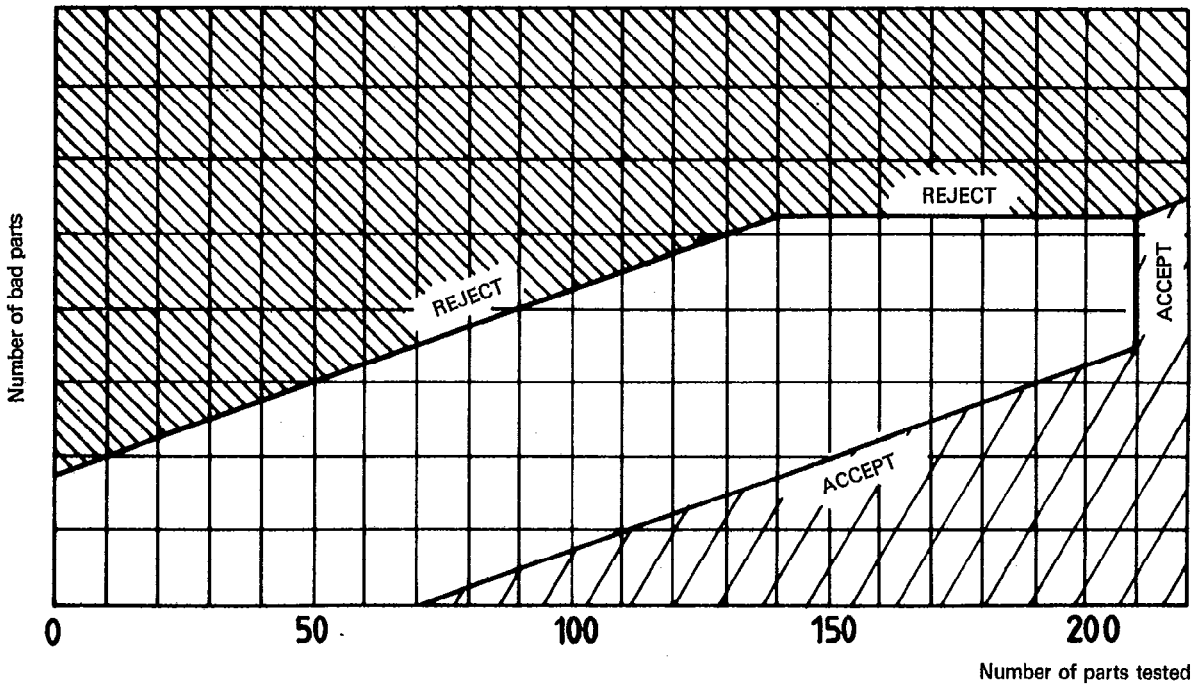
2) the position of the recording point shall be plotted on the diagram after all the items in the group have been checked; the recording point is replotted after each group, parallel to the x-axis, by as many units as there are items in the group, and parallel to the y-axis by a number of units equal to the number of non-conforming items found in the group.

Annex F

Progressive sampling plan for inspection of resubmitted batches

(Forms part of the standard.)

Wald diagram



See the note in annex E.