

KES

Establishment Manual for Body Ass'y Parts Processing Standard

KES C-E001

(EST.) 1987 - 04 - 17

Contents

1. Purpose
2. Scope of Application
3. Basic Method of Consideration
on Processing Standard
4. Kind of Processing Standard
5. Symbol on Finishing
Reference
6. Data and Consideration for
Establishment
7. Integral Condition
8. Placement
9. Standard

Appendix



1. Purpose

This standard aims at establishing processing standards so as to achieve improvement of part's precision and constancy of qualities and to carry out problem solvings and settlement of the system of mass production early and economically.

2. Scope of Application

This standard applies to the body ass'y metal plate parts.

- To estimate part drawings in view of processing standard.
- To make plans responsive to inner or outer requests.
- To prepare or check up standard table for parts processings.
- To establish processing tolerance

In case of not applying, the scopes are determined for examples as follows.

2.1 Scope of not Applying in ONLY processings

- (1) Processing except for normal shape processing

Example: Rough drawing, Rough trim,

- (2) Processing which are not affected by other parts or after-process, and not affected by parts precision.

Example: Diameter decreasing hole (reducing hole)

Burring processings

- (3) Overall processings which are not affected by processing places.

Example: Retainer, clip,

- (4) Parts which are processed by special and exclusive tools.

Example: Roll processing parts, drawing processing parts pipe bender processing parts

- (5) Processing standard suitable to the press direction of processings in which the position of bottom dead center of press direction are not irrespective of parts characters.

Example: Processing standard plane relative to the press direction when processing direction is equal to press direction in piercing process.

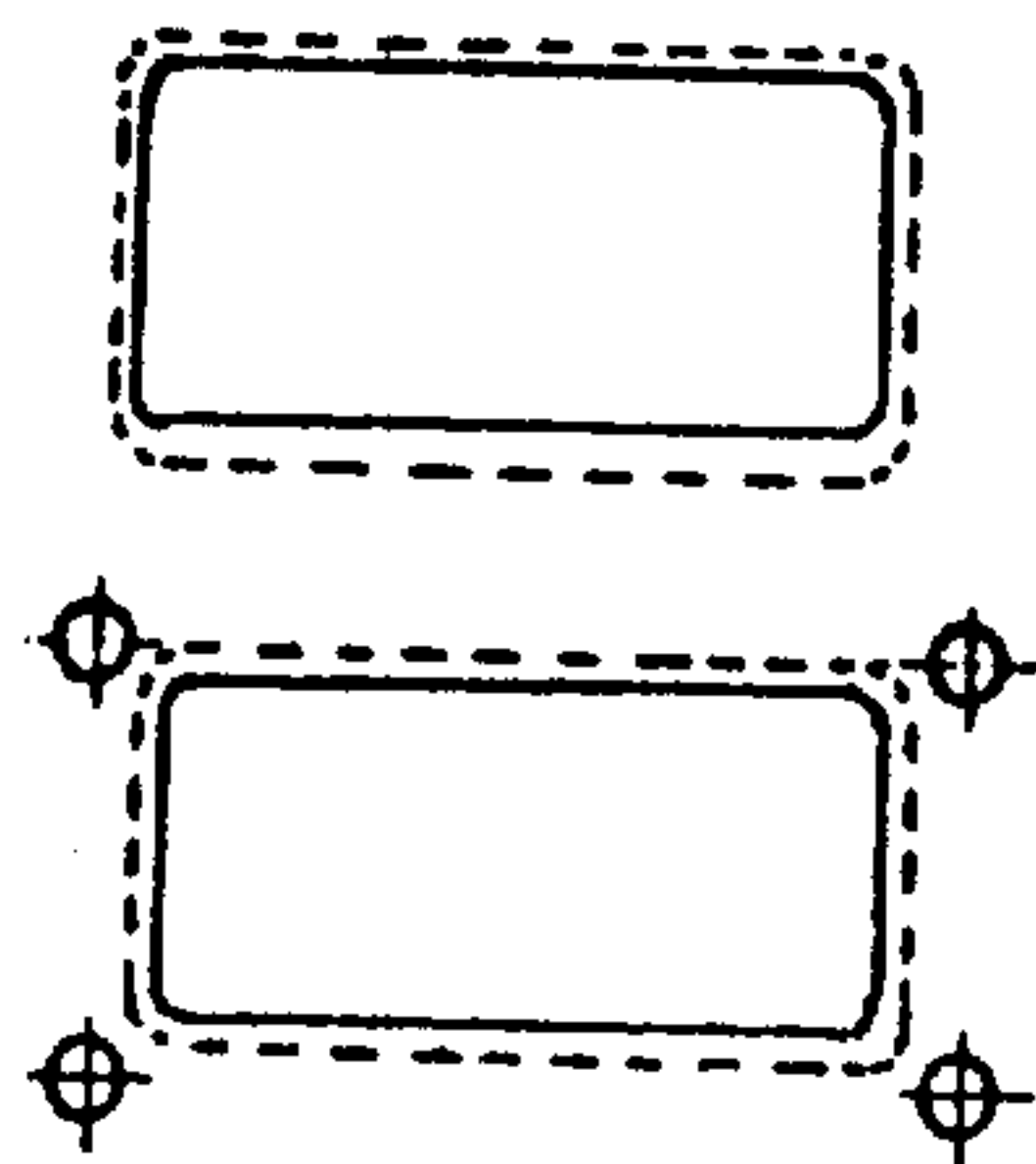
- (6) Overall processings in which dimensions are not determined if overall shape are not fixed.

- (7) Parts which have not other important characters than contact plane contacted by the opposed parts.

- (8) Parts which can be processed by one processing irrespective of any standard aspect.

- (9) Processings which require partial singular character irrespective of standard of all parts.

Example:



Burring processings with the standards of lower hole.
piercing processings on four attaching holes with the standard of burring hole.

(10) Parts which can be satisfied at taking any point of parts for standard.

2.2 Scope of not Applying in Ass'y Processing

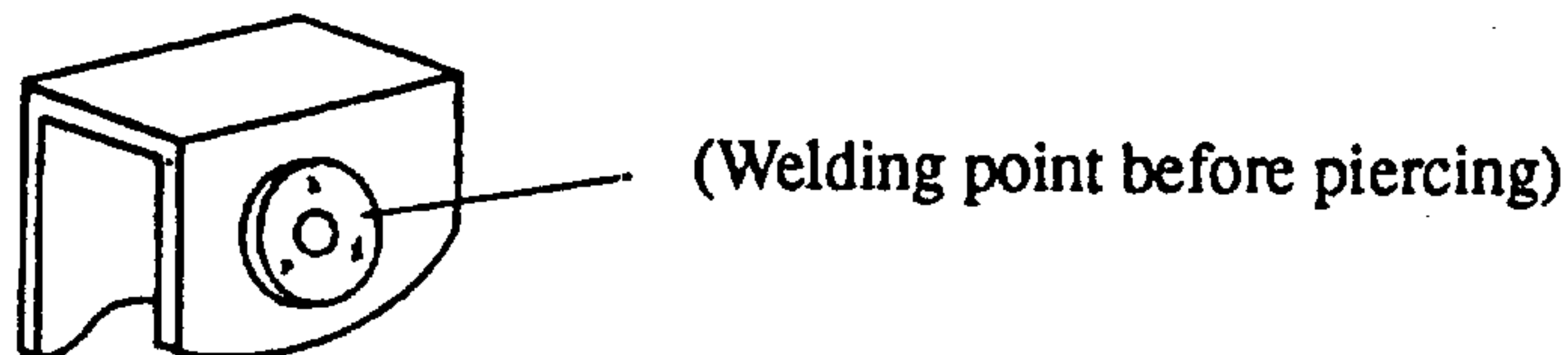
(1) Welding of nut, bolt by the standard of lower hole.

(2) Processing according to the opposed parts

Parts which can be allowed to be processed according to the opposed parts.

(3) Processings of semi processing parts which need not any processing standard.

Example : Jig for spot before piercing



(4) Parts the stability of which is determined by the degree of the combination with opposed parts.

(5) Part which can be satisfied at using any point of parts.

(6) Processing in which dimensions are not determined if overall shapes are not supported.

Example : processing of argon welding.

(7) Ass'y processing by special exclusive tools

except for multi spot, hemming.

Example : Lock seamer, power plunger, flash butt.

(8) Parts which can be positioned by a visual observation.

(9) Processing which require partial singular character irrespective of standard of all parts.

2.3 Scope of not Applying in Inspection Hole

(1) Parts which are not processed by processings standard in only processing and ass'y processing.

(2) Parts which are contacted with the opposed parts and have no characteristic problems.

Example : Drip mould

(3) Parts which can be stable by being combined with opposed parts and middle shapes of which are not important.

Example : Pipe

(4) Parts which can be processed better by the standard with the points which are combined with the opposed parts because it is processed by exclusive tools.

Example : Window mould, Door mould

3. Basic Method of Consideration on Processing Standard

3.1 Kind of Method of Consideration

- (1) Method of processing standard establishment at the critical points in view of jointing or functions.
- (2) Method of processing standard establishment at the non critical points in view of jointing or functions, and at the same time, establishment at the stable point in view of precession (In this standard, conditions are established on the base of method 2).

3.2 The Reason on choosing the Method 3.1 (2)

- (1) Metal plates parts are, which is different with Machining parts, not stiff and have inevitable deformation on plastic processing and one part may have either stable precision aspect and unstable precision aspect, so by taking method 3.1 (2).
- (2) Because effects and occurrence of reconstruction on other aspects are little, processings standard, once established are rarely changed.
- (3) Because hole as the processings standard and plane coordinate can be freely established, it is easy to accommodate customer manufacturing or gauging.

3.3 Exception (In case of taking method 3.1.(1))

- (1) Usually purchasing goods, or one which are processed by special tool and cannot unified at processing standard.

Example: Pipe, chassis

- (2) Parts which are weak and contacted with the opposed parts.

Example : kinds of mould representative of drip mould.

4. Kind of Processing Standard

• Normal standard	—	(S) (&) (H) (h) (E) (e)
• Provisional standard	—	(SK) (&K) (EK) (eK) (AK) (hK)
• CH standard	—	(CH) (ch)
• Correction standard	—	(ck)
• Fixing standard	—	~&~ ~h~ ~e~
• Transformation standard	—	▽S ▽& ▽H ▽h ▽E ▽e
• Combination standard (assembly standard)	—	[S] [&] [H] [h] [E] [e]
• Material standard	—	none

- Temporary standard — none

(1) Normal standard

It is the main standard in positioning by the unit of parts such as only, ass'y, and is used in almost all processing and gauging.

(2) Provisional standard

It is a normal standard, but used for aspects which can not be stable without trial and error and the requirement is controllable structure.

(3) C H standard

It is hole of standard used during pilot and generally established on outer plates, but on inner plates for special requirement.

(4) Correction standard

It is standard established to correct the parts which can be corrected by ass'y processings.

(5) Fixing standard

Depending on parts, if one direction is fixed as normal standard, the other direction is not fixed as normal standard. In this case, fixed standard is established in order to fix the both direction as fixed position.

(6) Transformation standard

Because of required construction, processing direction, numbers of processings, and occasion of parts, normal standard can not sometimes used, and processing standard may be displaced. This displaced processing standard is called transformation standard.

(7) Combination standard

This standard is used to combinate parts attached to body shell such as bonnet, door, front, fender.

(8) Material standard

It is used in initial step of processings, and is usually flat plane, step. If equal to the reference of posterior process, it is not called as material reference.

(9) Temporary reference

It is called slits which are established in initial process of finishings and is plate finishings reference in only finishing untill establishing normal standard.

5. Symbol on Finishing Reference

5.1 Symbol on Shape

(1) Plane

Main reference plane (S), auxilliary reference plane (&)

It is referenced by plate plane of parts; plane, shape surface flange surface, seat surface.

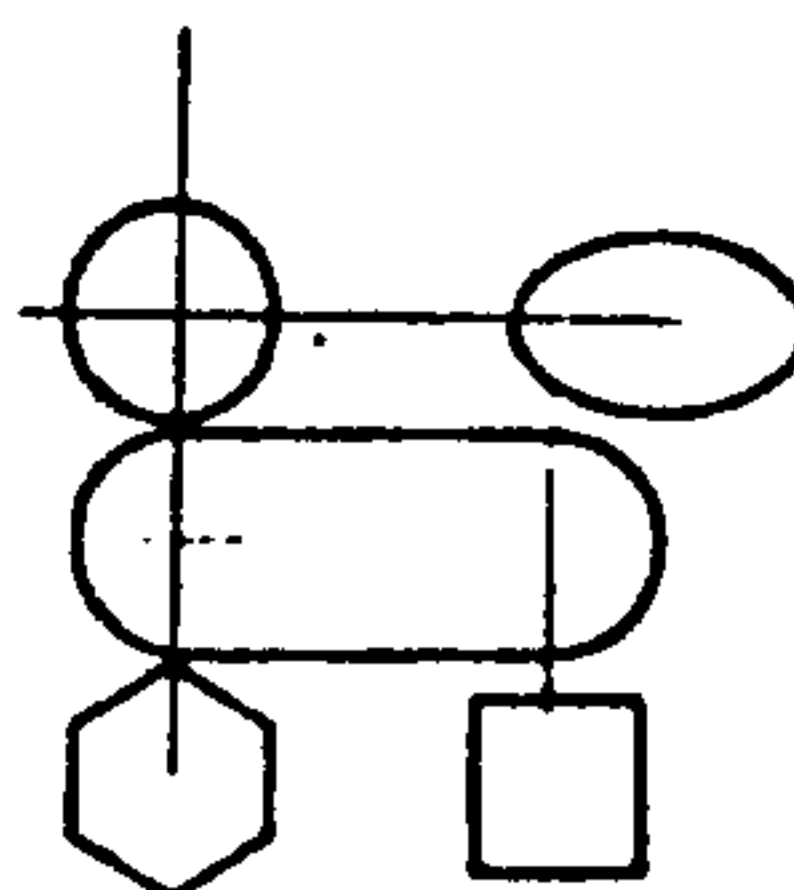
(2) Hole

Main reference hole (H), auxilliary reference hole (h)

It is referenced by parts hole; circle hole, longitudinal hole angled hole, burring hole.

Functional hole of parts or hole for finishings can be reference hole it these can be used in mass production.

Example: Circle hole,
longitudinal hole,
angled hole.

**(3) Edge**

Main reference edge (E), auxilliary reference edge(e).

Plate edge of parts is accepted as reference of plate thickness itself; straight line, curved line

It includes notch, side edge of hole, marking character line (these can indicate meanings by combination of shape symbol and indication symbol, and can not indicate any meaning independently).

5.2 Indication Symbol

(1) Normal reference



(6) Transformation reference



(2) Provisional reference



(7) Combination (assembly) reference



(3) CH reference



(8) Material reference

none

(4) Correction reference



(9) Temporary reference

none

(5) Fixed reference

**5.3 Initial Character Indicating the Process**

(1) O — It is for shapening tools and inspection tools of only parts.

(2) S — It is for jig on ass'y.

(3) K — It is for inspection tools of ass'y parts.

(4) C — It is for jig and inspection tool at CAB-ass'y.

5.4 Initial Character indicating the effective direction

It conforms to ordinary symbol.

TL, BL, WL, HL, VL

5.5 Others

(1) RH : right side

(5) UP : upper side

(2) LH : left side

(6) LWR : lower side

(3) F : front side

(7) ϕ : hole

(4) R : rear side

(8) : angle

6. Data and Consideration for Establishment

6.1 Data

- | | |
|-------------------------------------|---|
| (1) Parts drawing | (7) Expectant drawing at adjusting point ⁽¹⁾ |
| (2) Plan of only finishing process | (8) Plan of inspection tool |
| (3) Plan of ass'y finishing process | (9) Physical appearance tolerance |
| (4) Plan of shaping tools | (10) Transportation amount indicating parts list ⁽²⁾ |
| (5) Plan of jig-tools | (11) Other production condition |
| (6) Plan of ass'y automation | |

Note ⁽¹⁾: Expectant drawing of adjusting points.

It indicates points of spring back, spring go and the expectant amounts.

(2) Movement quantity instruction parts list

They are used when setting up reference as lists which indicate the places of parts setting up movement tolerance and they must be applied to demand manufacture. They are obtained from parts finishing tolerance setup reference and from special instructions of a projector.

6.2 Main Item for Checking

	Item	Content
1	Only, assy machining process	Process replacement, addition, integration, abolition, material change
2	Shaping tool planning	Change in machining direction, change of the planning, addition of shaping tool, integration, abolition
3	Jig planning	Change of base side planning, addition of jig, integration, abolition
4	Inspection tool planning	Base side material, change of tool, addition of the inspection tool, integration, abolition
5	Assessment countermeasure of parts degree about the adjustment place of only parts	Shaping, dimension, one body, position, process, demand countermeasure, etc.
6	Design assessment of the plane, hole, etc. for the finishing reference	Design shaping change of position, notch, hole, etc.
7	Discussion assessment countermeasure about the finishing tolerance	Shaping, dimension, junction, process, demand countermeasure, etc.
8	Others	

7. Integral Condition

7.1 Basic Item

7.1.1 Priority on setting up

(1) Priority on machining process

First ← Only, Ass'y, Inspection → Last

Reason: In case of assembling only parts of a little non-uniformity with unstable machining reference to only machining, the assembled parts have non-uniformity as well. Therefore, the inspection data of parts become non-uniform so that any proper correction measures can not be taken.

(2) Priority between shapes

First ← hole, surface, end → Last

Reason: ① About hole

- (a) There is little influence due to non-uniformity of material (plate thickness, stretch, etc.)
- (b) A position can be determined without clamp.
- (c) A variety of bad influence belonging to parts of plastic working is nearly zero.
- (d) Position matching is easy in each process.
- (e) Deformation and abrasion can be detected easily.
- (f) Setup can be made regardless of internal or external plate.

② About end

(End is not used if possible for the following reasons)

- (a) There is a possibility that the reference end is not contacted closely to recess when processing due to one free end even though the other is settled.
- (b) There are many parts which can not meet the two conditions of setting up of the reference end with an advanced process as possible and setting up of stable position. For example, there is a case that good parts can not be made without the processes such as drawing trimming, restriking, flanging ... etc. When trim line is used as a reference after restriking, the trim line changes largely after restriking so. The trim line is not suitable as a reference. When fine trim (normal trim) is added, the process becomes too late. Meanwhile, positioning can be made from the stable position to the trim process of the second process with the presence of a reference hole.
- (c) There are many cases that setup place is not found because of inevitable shear angle.

7.1.2 Optimum setup position

(1) Optimum condition for only finishing

(a) Place of a little non-uniformity

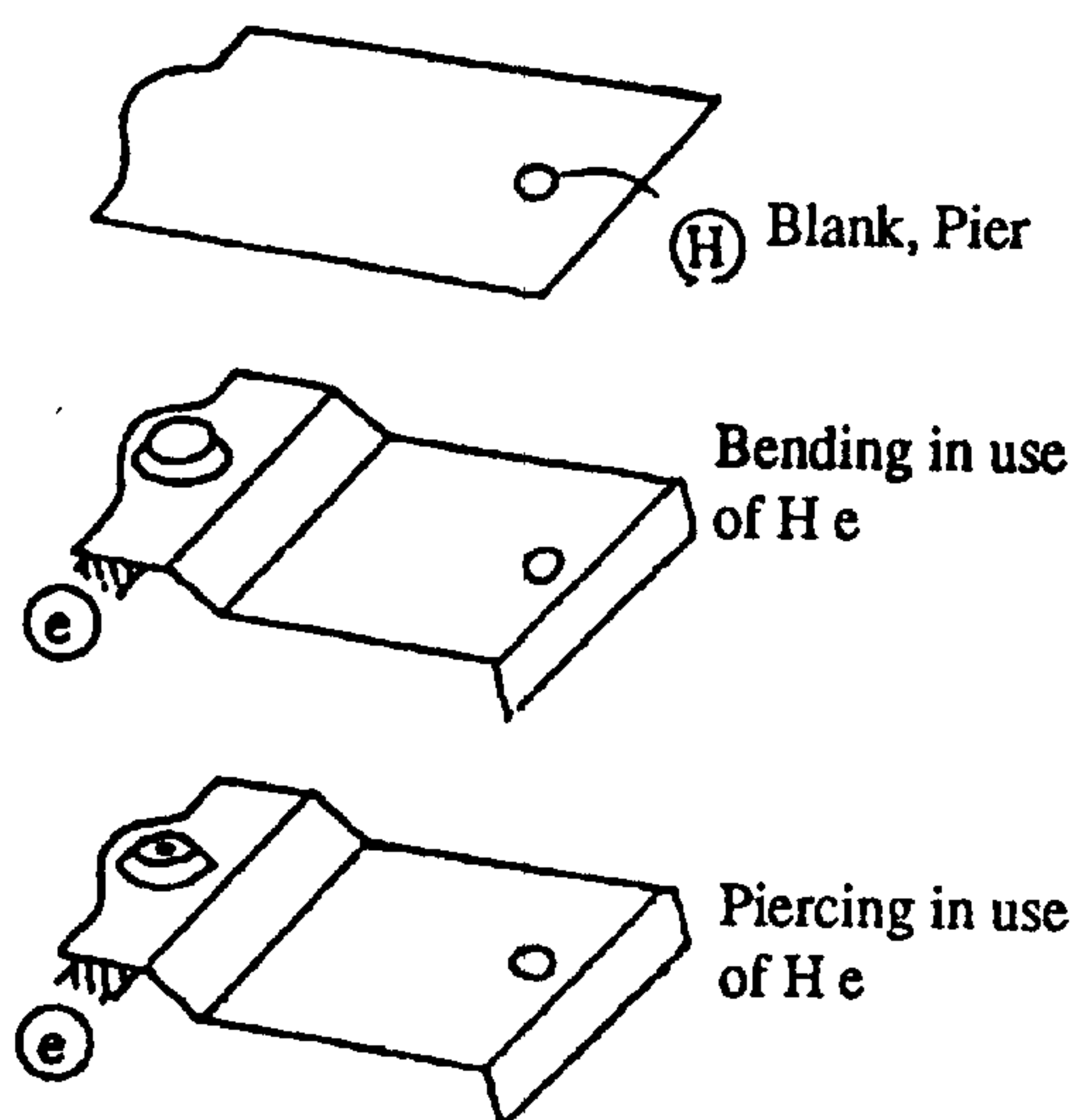
Reason: Non-uniform finishing makes other non-uniform finishing place so that inspection data non-uniform. Therefore, good parts can't be expected and it's difficult to make a proper countermeasure.

(b) Places available to be set up in advanced process as possible .

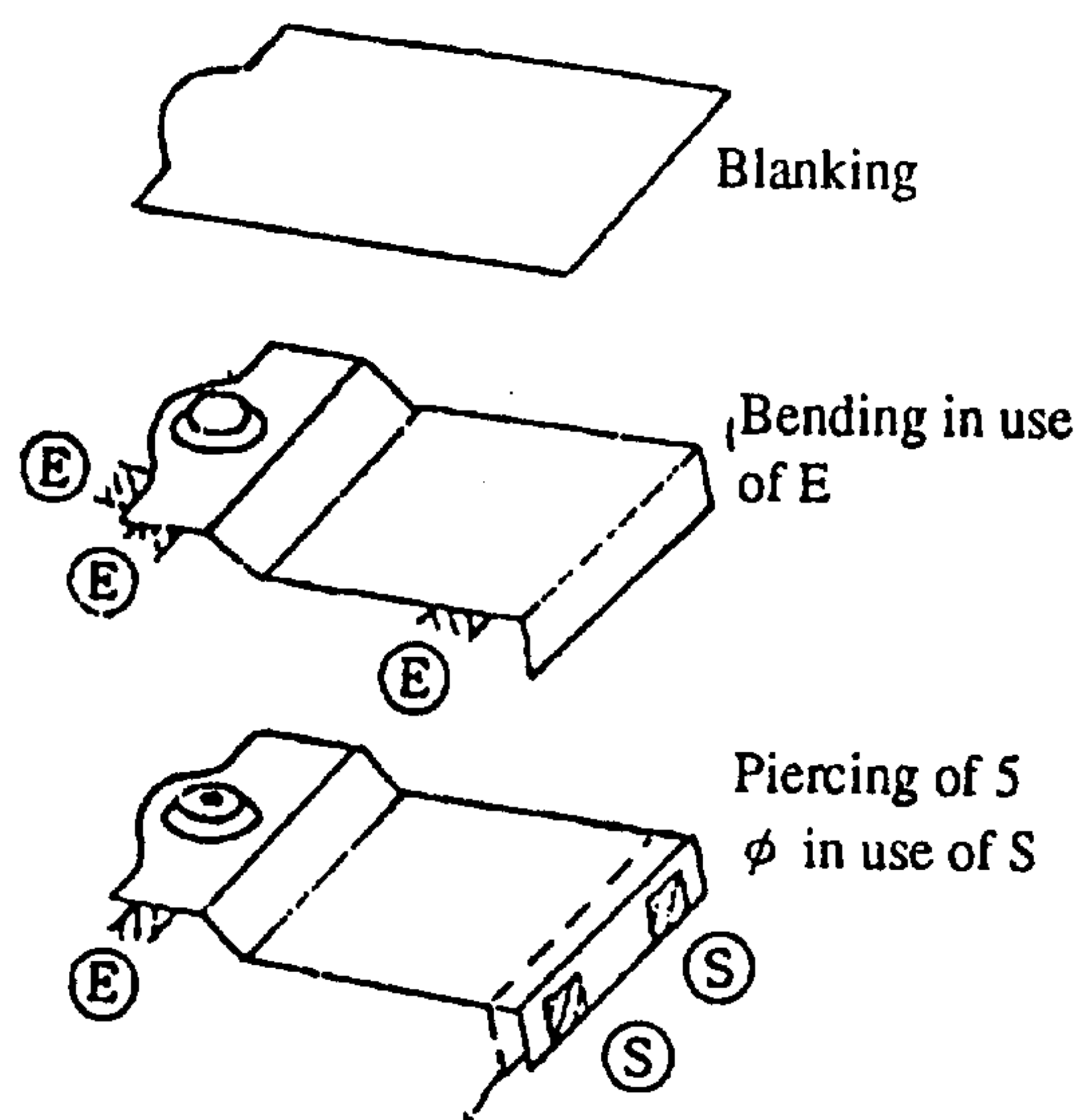
- ① Place available to be set up in the first process of finishing places characterized as parts (except for sensuous ones), or available to be set up in the earlier process than the first process.
- ② Places available for use as a reference when finishing necessary places as parts.
- ③ It must be a reference checkable of trial results of each process with use of inspection tool.

Reason: In reverse of the above, when A is chosen for postprocess as a finishing reference after finishing place A necessary for parts, later correction such as trial and design change has an effect on the finishing reference. It leads to many problems in that it brings difficulties in keeping the original state of the finishing reference and it does not bring completely the same correction quantity between demands because of increased demand points requiring the related correction between processes and demands.

(good examples)



(bad examples)



(c) Place with the least deformation till complete finishing

This is the place that the setup finishing reference is not change to the last. The place with the least effect must be chosen because a little deformation occurs by restriking, forming, fianging, beading which are in postprocess.

Reason: Finishing reference deformations occur

In case of a hole → Change of hole diameter

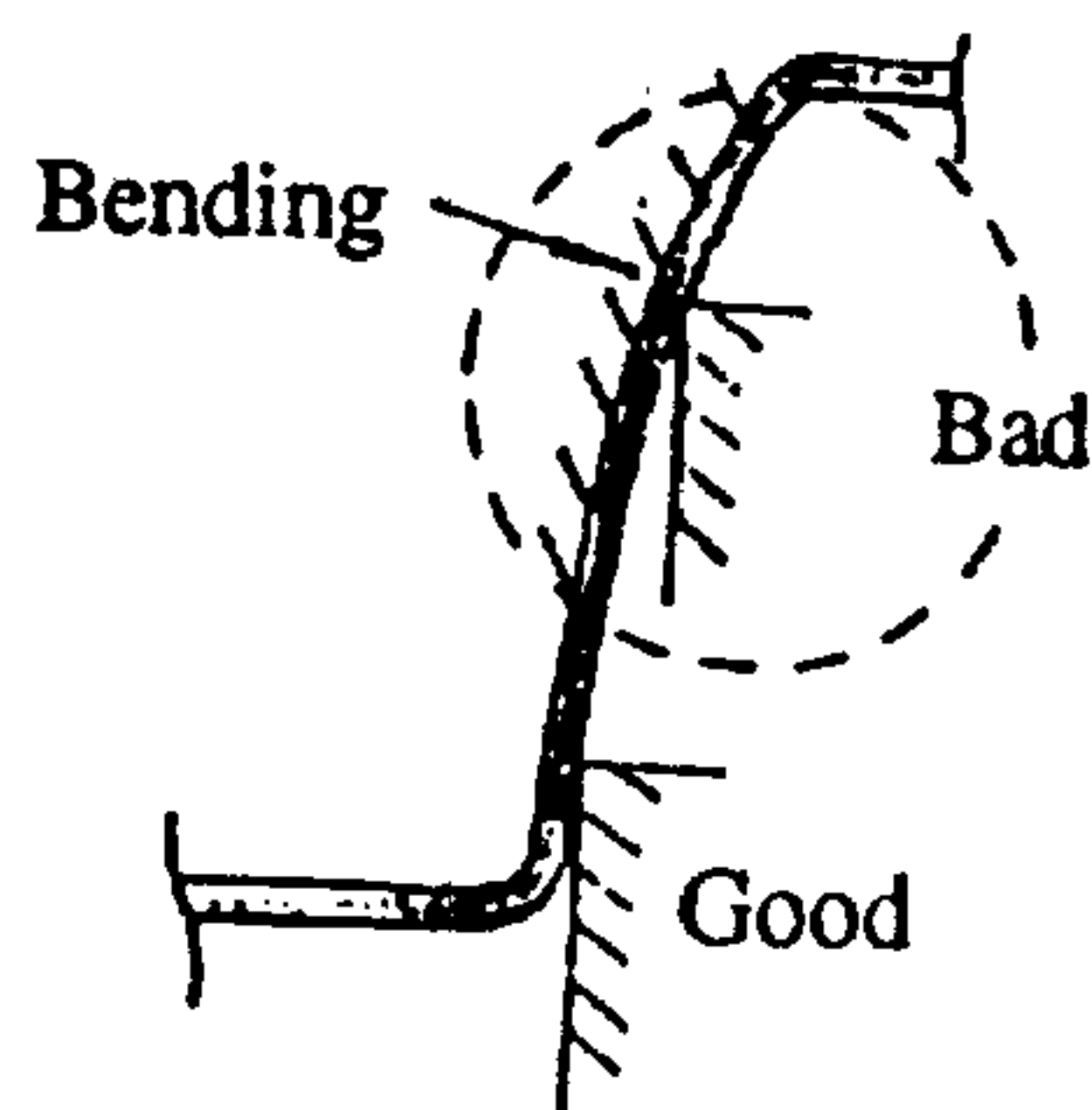
In case of a plane → Bending, creases of plane

In case of an edge → Change of trim line

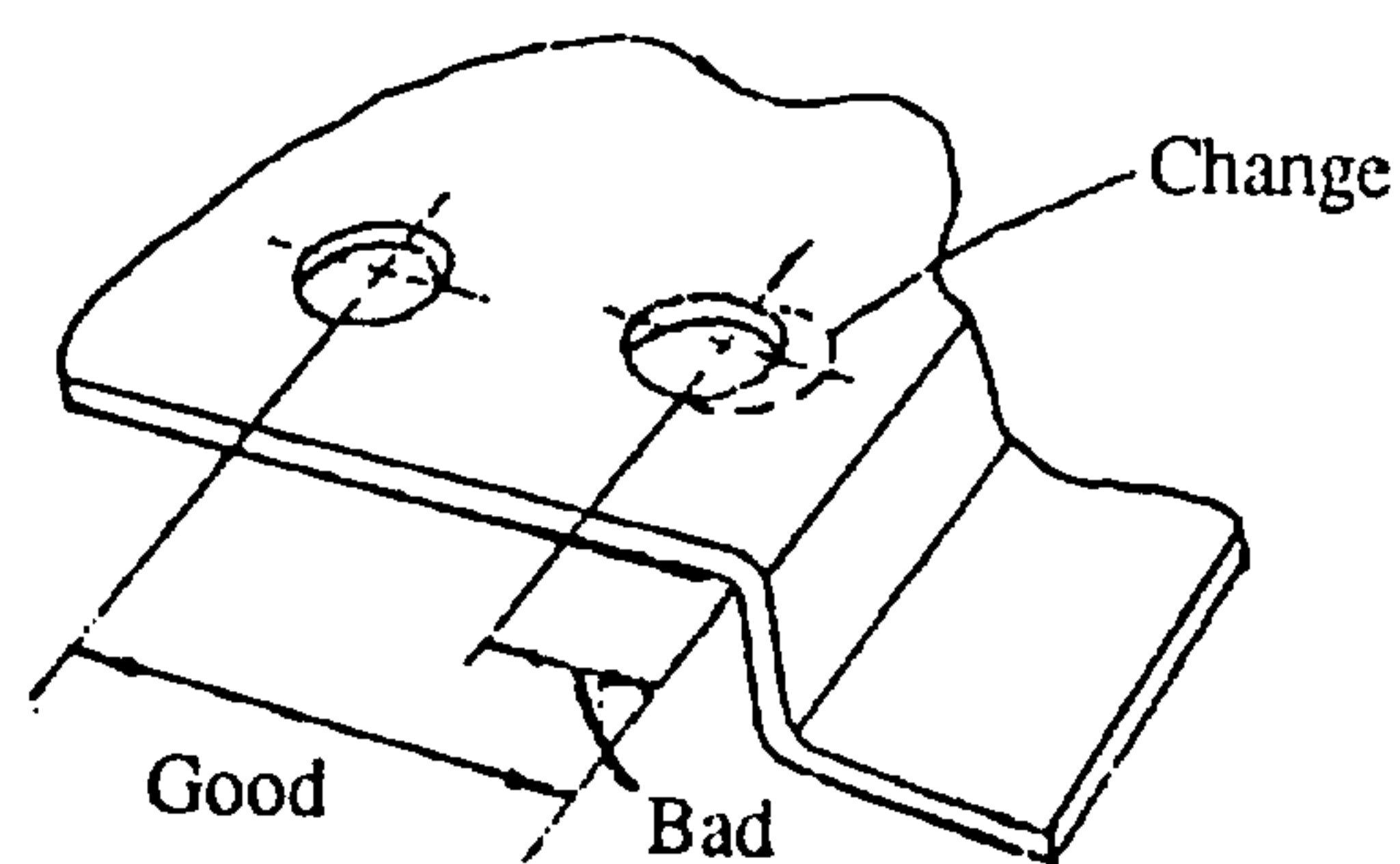
when they occur, non-uniformity can be added or expanded to other finishing parts.

Example:

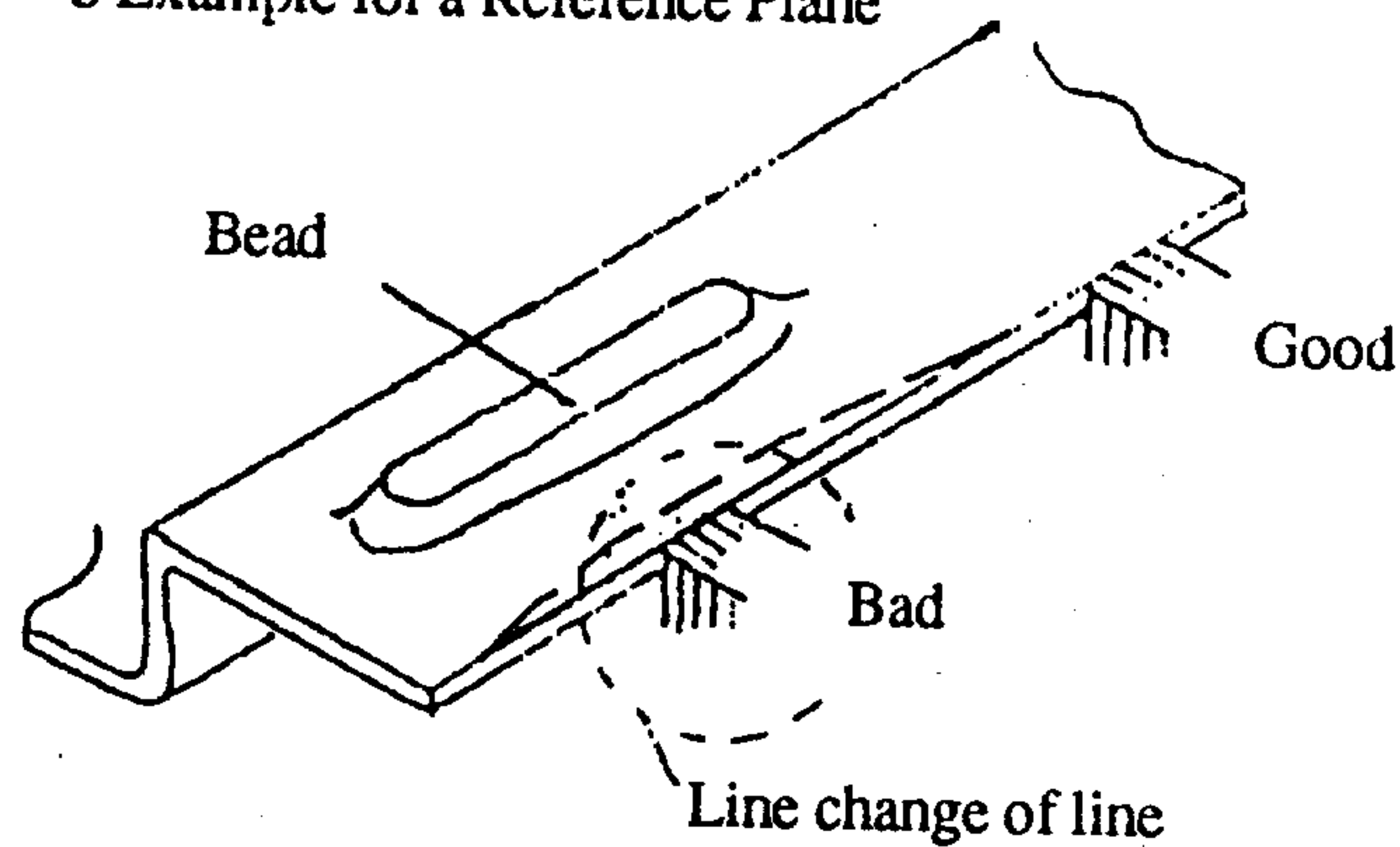
o Example for a reference plane



o Example for a reference hole



o Example for a Reference Plane

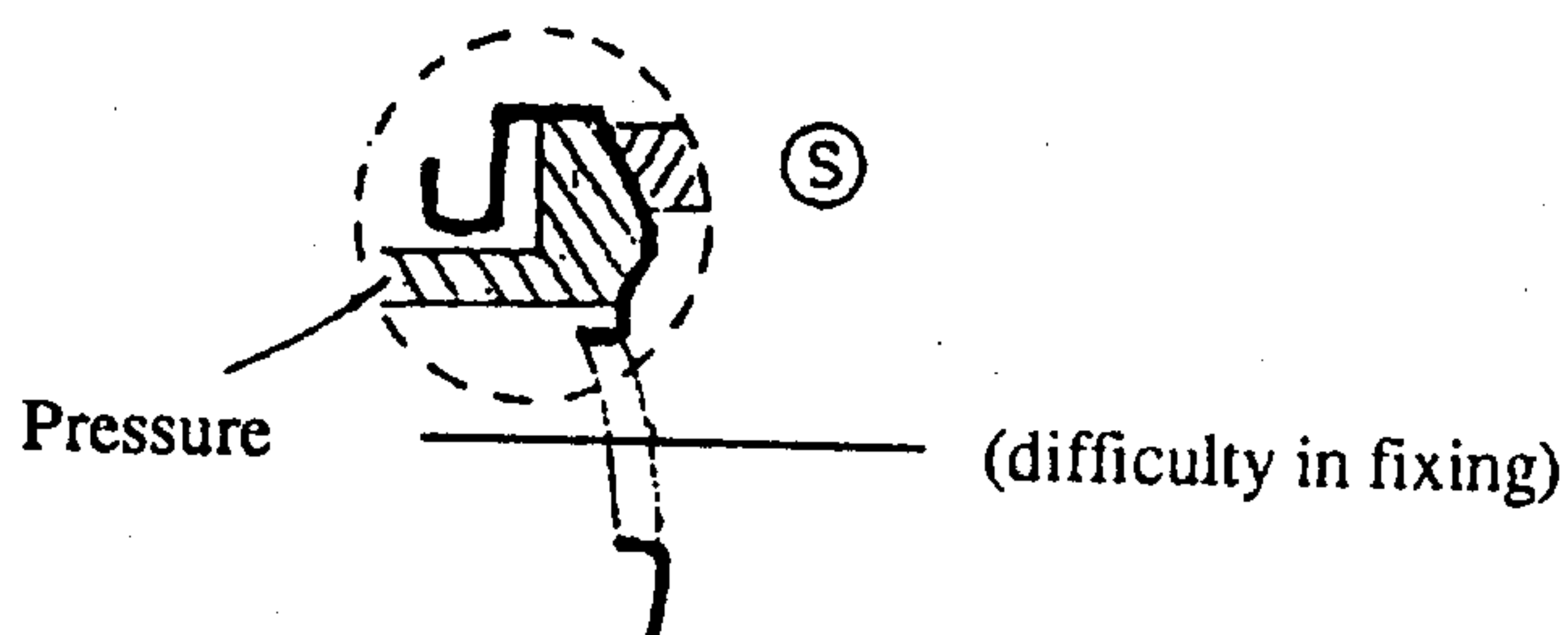


(d) Place easily available for fixing

Place where pressure of shaping tool can be easily set up.

Reason: The cause of non-uniformity can not be found out if not finished in state of the exact finishing reference of parts demand.

Example :

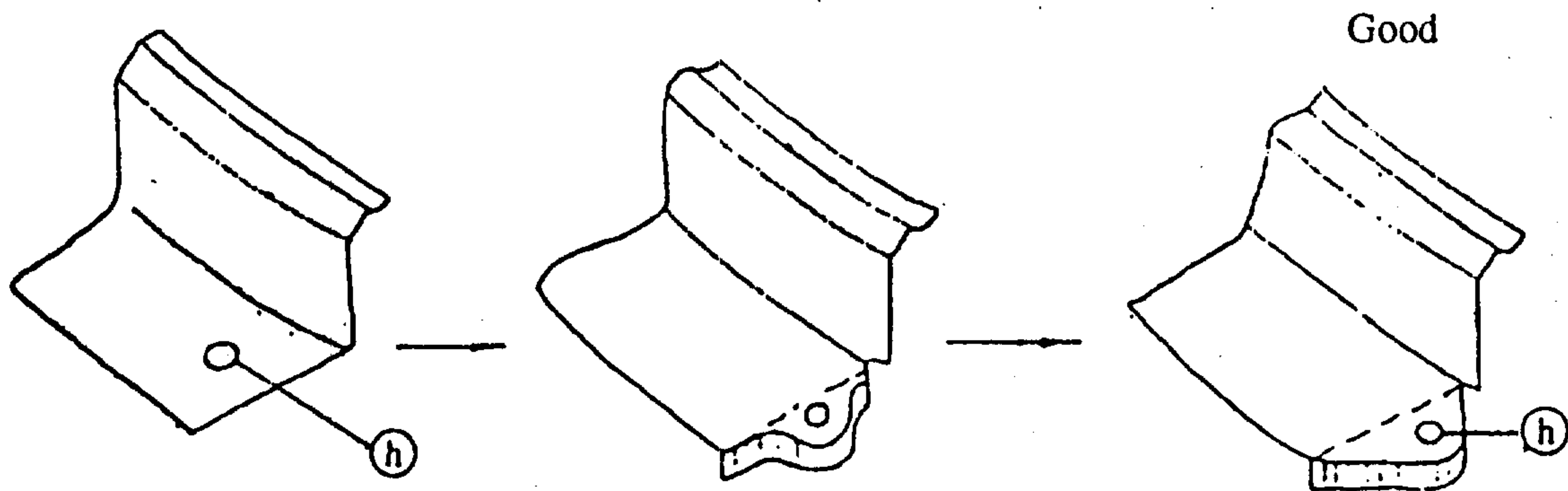


(e) Place where handling deformation does not occur

This is the place where deformation will hardly occur when loading, lifting up, unloading, sending and other handling before and after molding machining. Setup of bead or place by moving from the place where deformation easily occurs to other is considered as a countermeasure.

Reason: It's difficult to make a countermeasure because non-uniformity of parts gets big and various data occurs.

Example :



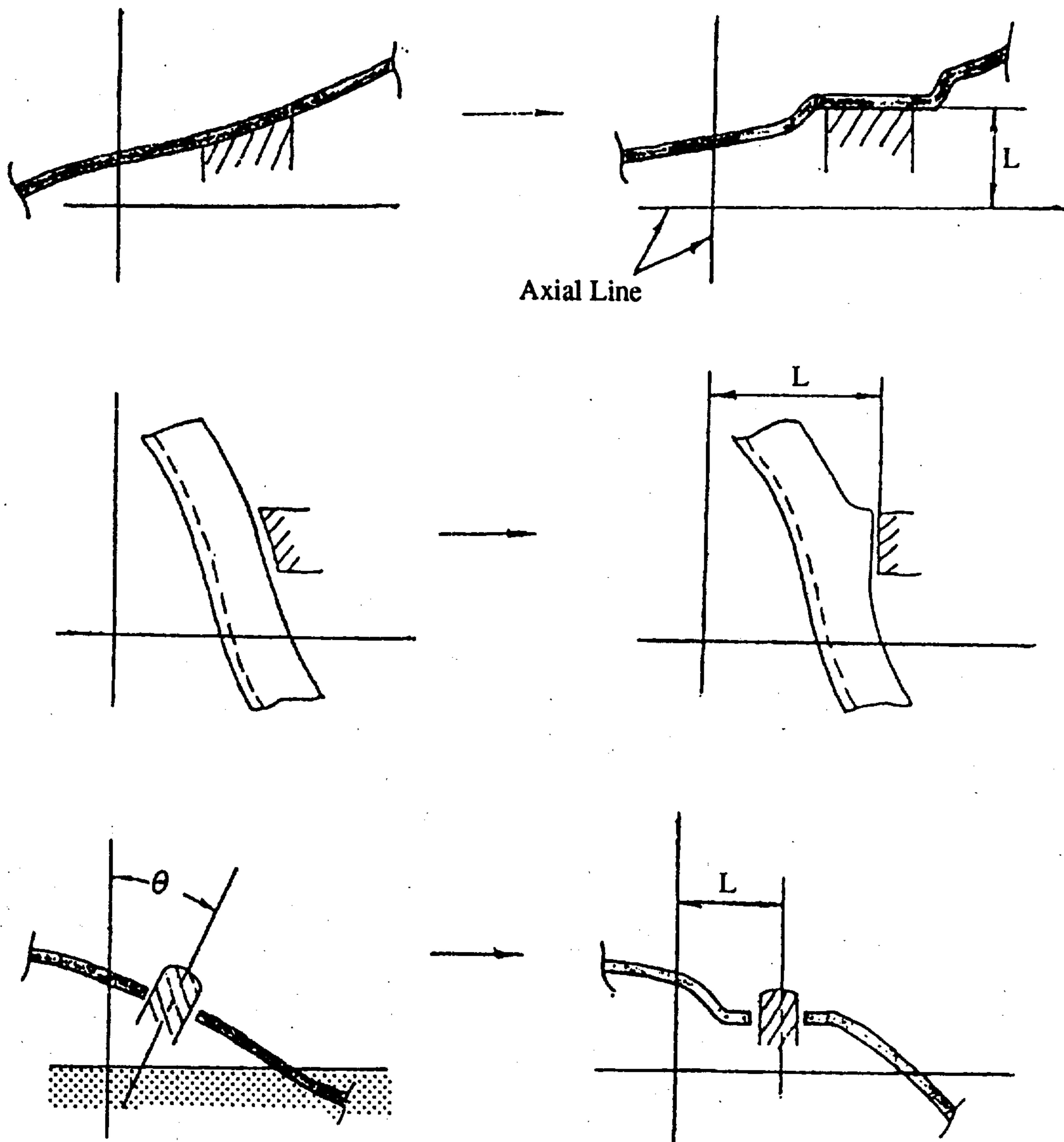
(f) Place of easy dimension calculation

The cases of Nos. 1, 2, and 3 in the table below are applied place setup or change to a simple line is preferable after No. 3. Additionally, it's a good angle for parallel to the axial line.

Section		Hole	
1	A simple line by the drawing dimension, a straight line parallel to the press direction, plane	1	A hole parallel to the press direction of tool by the drawing dimension.
2	A plane parallel to the axial line by the lofted drawing, simple line.	2	A hole parallel to the axial line by the lofted drawing
3	A non-simple line by the drawing dimension, a straight line having one-side direction in press direction of shaping tool, plane.	3	A normal hole to a plane having one-side direction in press of shaping tool by drawing dimension.
4	A plane curved plane by the lofted drawing, a straight line having an angle of one-side direction to the axial line, plane.	4	A normal hole to a plane having an angle of the axial line by the lofted drawing.
5	A complicated plane curved line by the drawing dimension, a straight line having angles of two directions in pressure direction, plane.	5	A normal hole to a plane having angles of two directions in press direction of shaping tool by the drawing dimension.
6	A tilted plane curved line to the axial line by the lofted drawing, a straight line having angles of two directions on the axial line, plane.	6	A normal hole to a plane having angles of two directions on the axial line by the lofted drawing.
7	Space curved line main plane (column plane).	7	A normal hole to the curved plane of a column plane, etc.
8	general curved plane.	8	A normal hole to the general curved plane

reason: Because the shape of the parts which are not limited by the finishing reference, the smaller the tilt is, the easier the manufacture and the measurement make and the smaller the mistakes make.

Example:

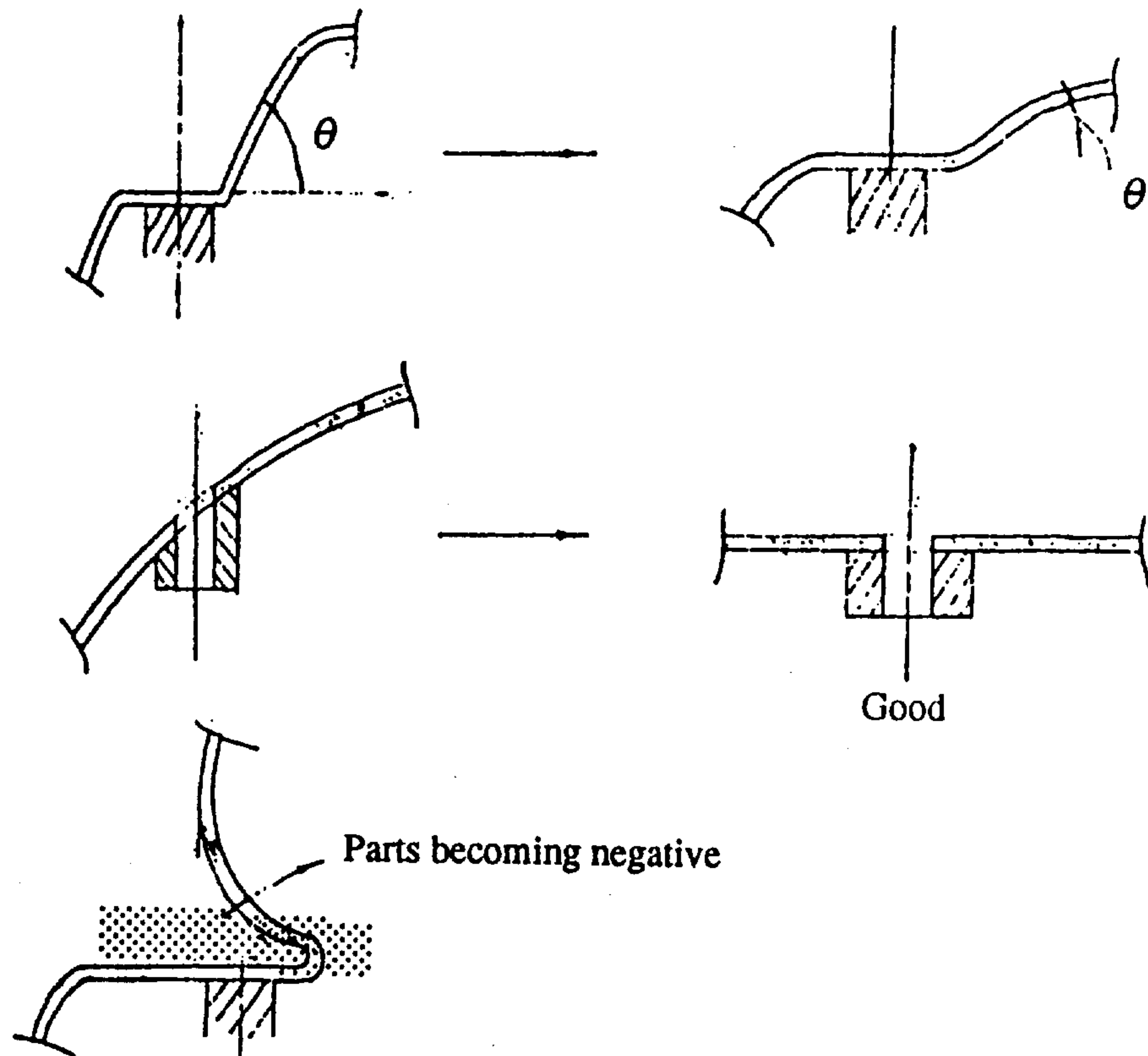


(g) Place good for setting up position, bole, etc.

Place except the junction, place which has not any problem functionally. A side near to the right angle to the finishing direction, place where a little tilt exists, place where a negative does not occur.

Reason: When setting up a position on a severe tilt, the shape change range of the surroundings becomes wide. In case of a hole, abrasion of the shaping tool comes early and the maintenance become difficult, which leads to a bigger burr. In case of becoming negative according to setting up a position, the structure of shaping tool gets so complicated that the stiffness deteriorates.

Example:



(h) place with a little correction as parts and shaping tool]

- ① Place where the frequency of rebuilding or adjustment is expected low as parts.
- ② Place with a small amount of abrasion of shaping tool
 - Place where the movement quantity of material is small.
 - Place of not being parallel to the finishing direction
 - Place where the mold quantity is small.
 - Place where the burr is small.
- ③ Place where the expectation correction of shaping tool is not necessary.
 - Place where the expectation correction of spring back or go is not necessary.
 - Place where movement tolerance does not exist.
 - Place where the strict tolerance (exact tolerance) is not necessary.

Reason: Because the places except the above terms require several times of correction necessary for admission, when the finishing reference is set up at these places, the reference becomes unstable. This gives an effect to others and it takes time from an unstable state to a stable state. Therefore the mass production can be made in an unstable state. Also, the recess suffers a severe abrasion with a few times of use.

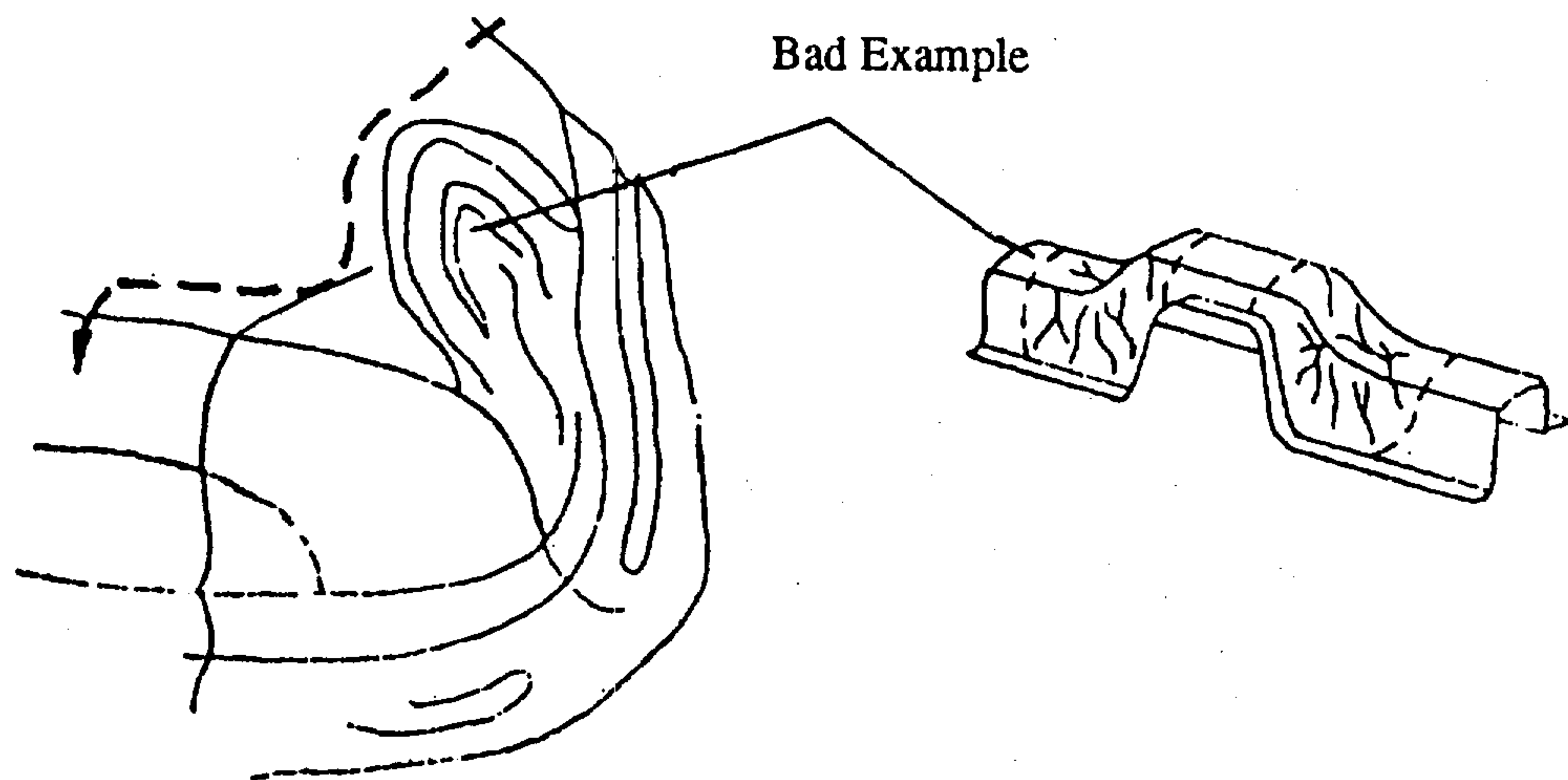
- (i) Place where the same finishing reference for all process can be applied.

Place where the same finishing reference for all process is available by considering loading, pressure, lift-up, etc. The finishing in the same direction according to parts does not become physical technologically and economically.

Because the finishing reference does not stop the movement of parts in right-angled intersection 3-axle direction, setting up of S plane and & plane is made by considering the finishing direction, it is preferable not to use a hole and edge as possible, and it is better not to change the reference at the place other than s and &.

Reason: When the reference is changed, the parts precision becomes bad due to the precision error between references, and other causes. Pin and others can be an obstacle in loading and unloading in hole and edge.

Example:

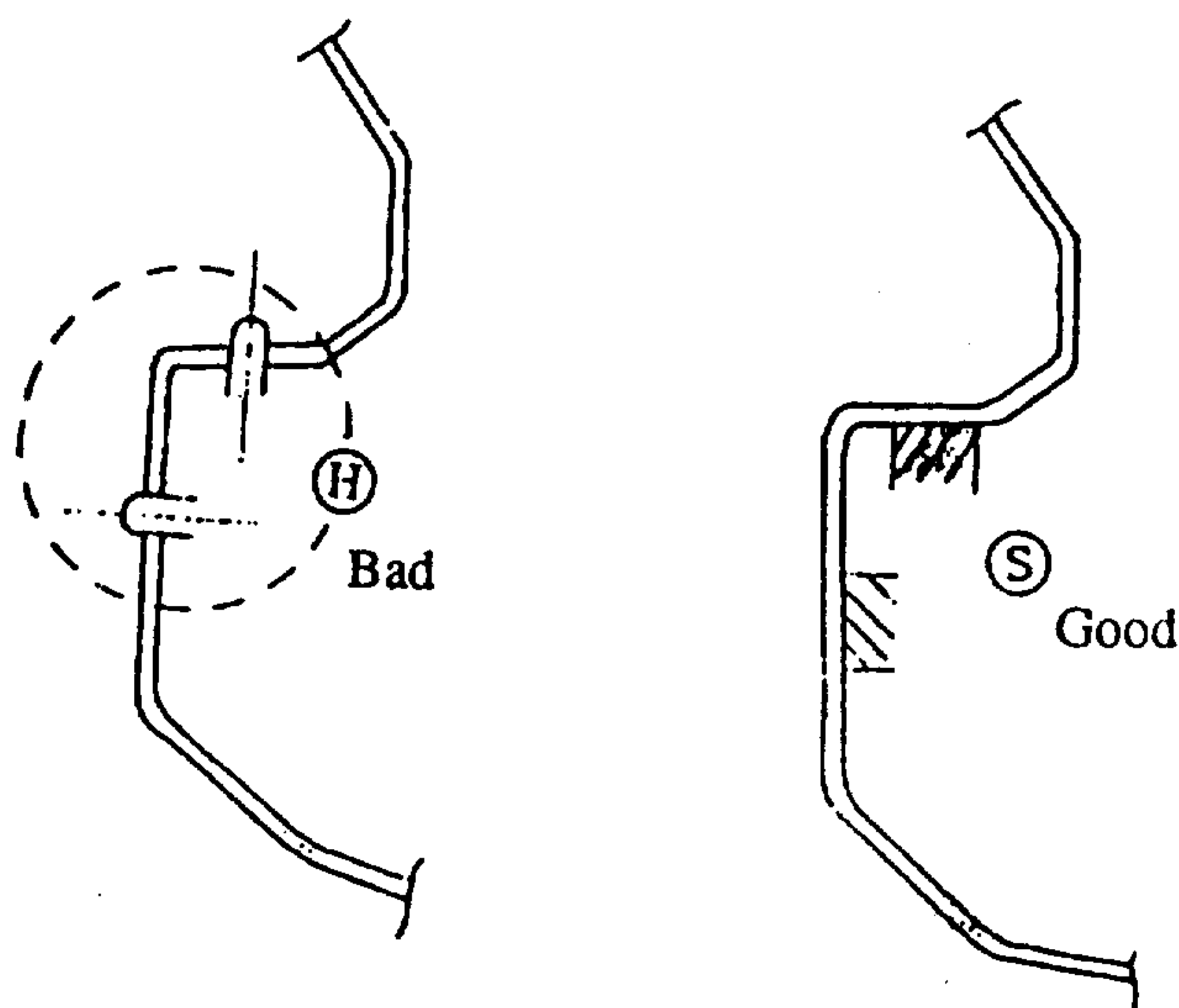


- (j) Place of the same finishing direction for all process.

A bill must be made for the integration of the finishing direction by moving the place to the same finishing direction such that the finishing reference is established at the process to be set up due to a different finishing direction.

Reason: Because the parts precision deteriorates in case that the finishing reference is not established at the process that is to be set up, the assessment of the design drawings for the finishing direction, review of demand planning, and change of process must be done.

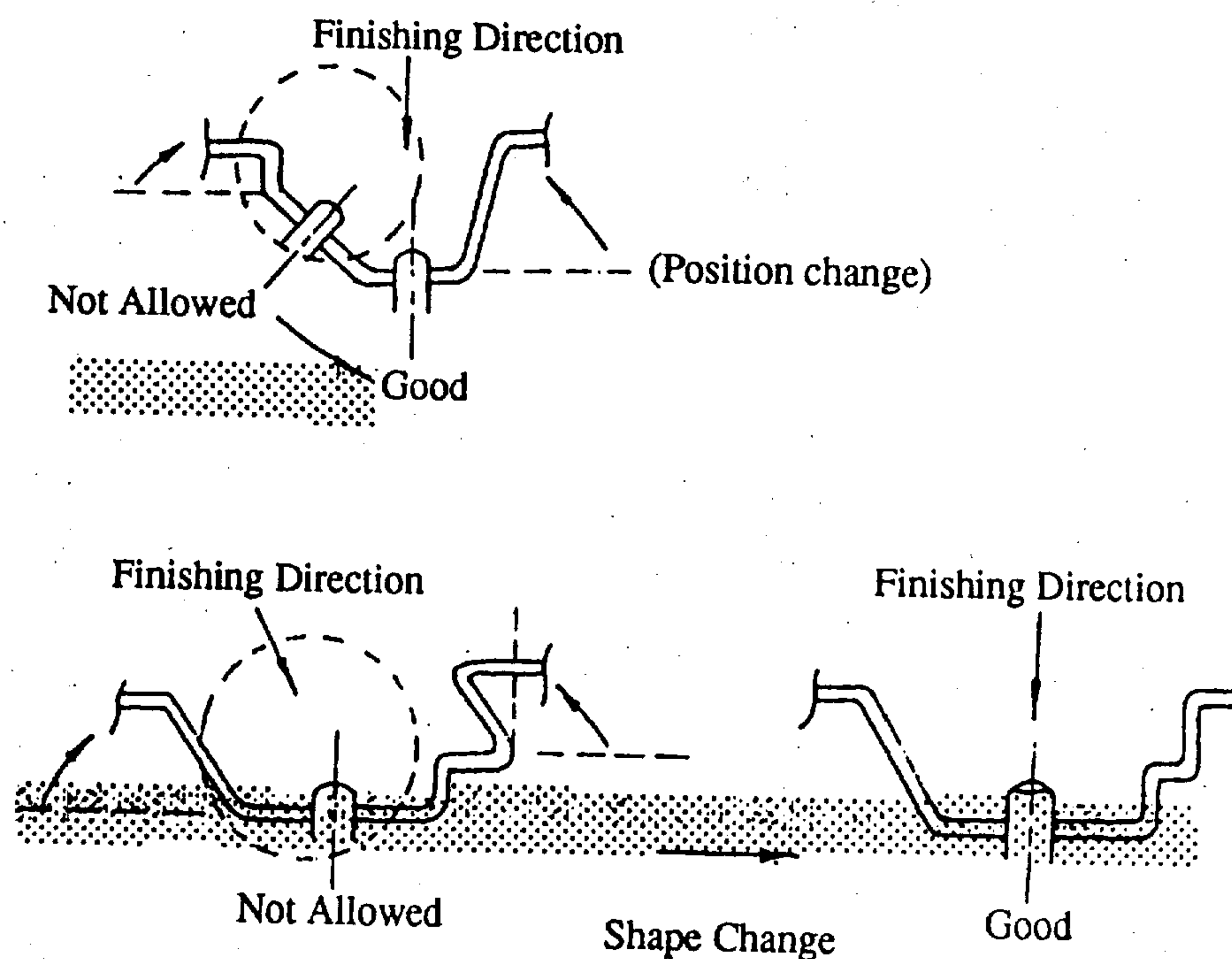
Example:



- (j) Place of the same finishing direction for all process, A bill must be made for the integration of the finishing direction by moving the place to the same finishing direction such that the finishing reference is established direction such that the finishing reference is established at the process to be set up due to a different finishing direction.

Reason: Be cause the parts precision deteriorates in case that the finishing reference is not established at the process that is to be set up, the reassessment of the design drawings for the finishing direction, review of demand planning, and change of process must be done.

Example:

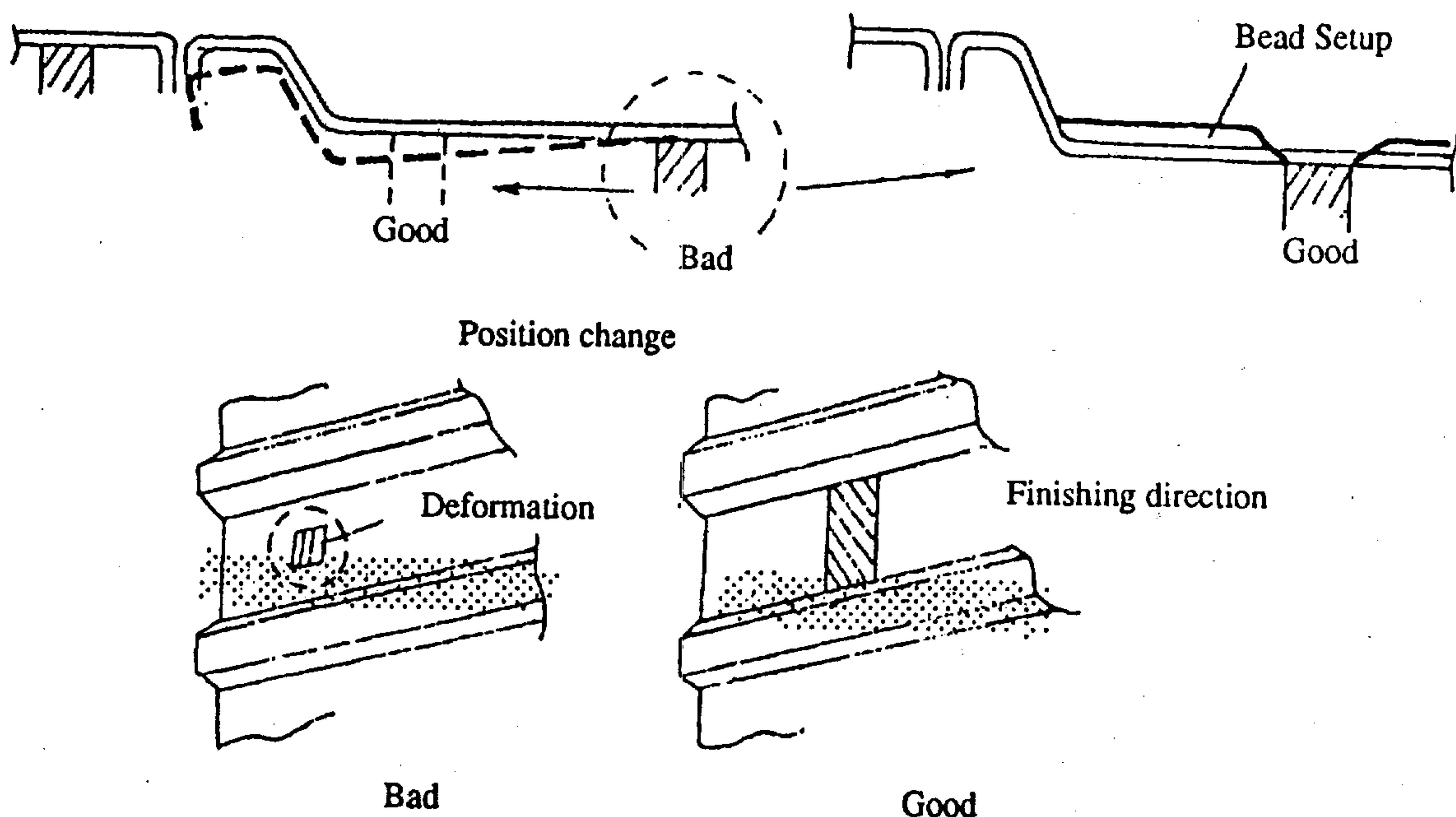


(2) Optimun condition of ass'y finishing

(a) Place with the least deformation until the finishing completion

- ① Surface
- ② Place with a small occurrence of flaw and deformation due to clamp or correction.
- ③ Place with a small occurrence of deformation or twist due to ass'y finishing.
- ④ Place with a high stiffness and a good performance of the position decision

Reason: Because the parts is bent partly when setting the place of no stiffness as a reference, the performance of the position decision gets worse. The number of J surface increas and the precision of J surface is worse than the reference surface.

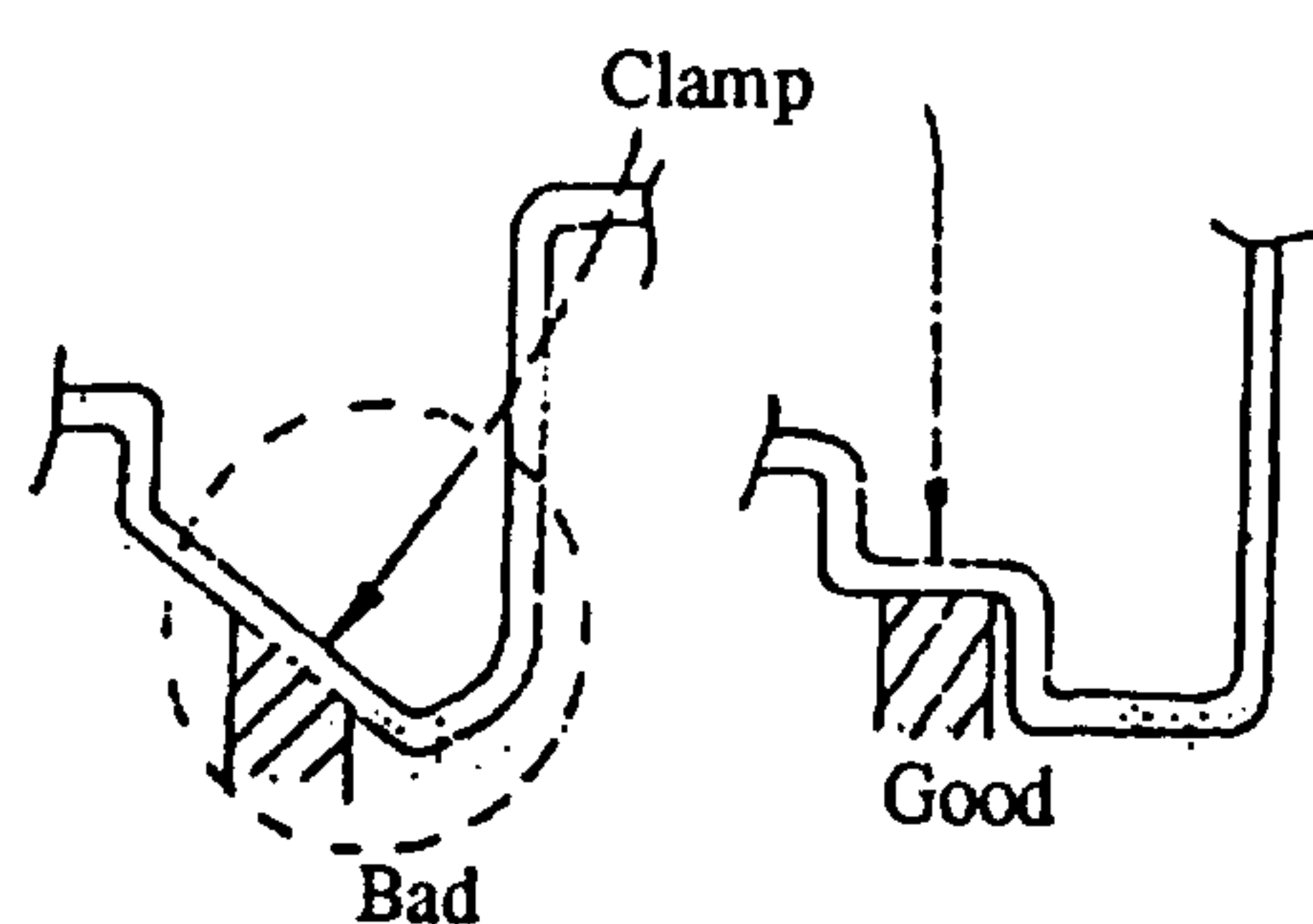
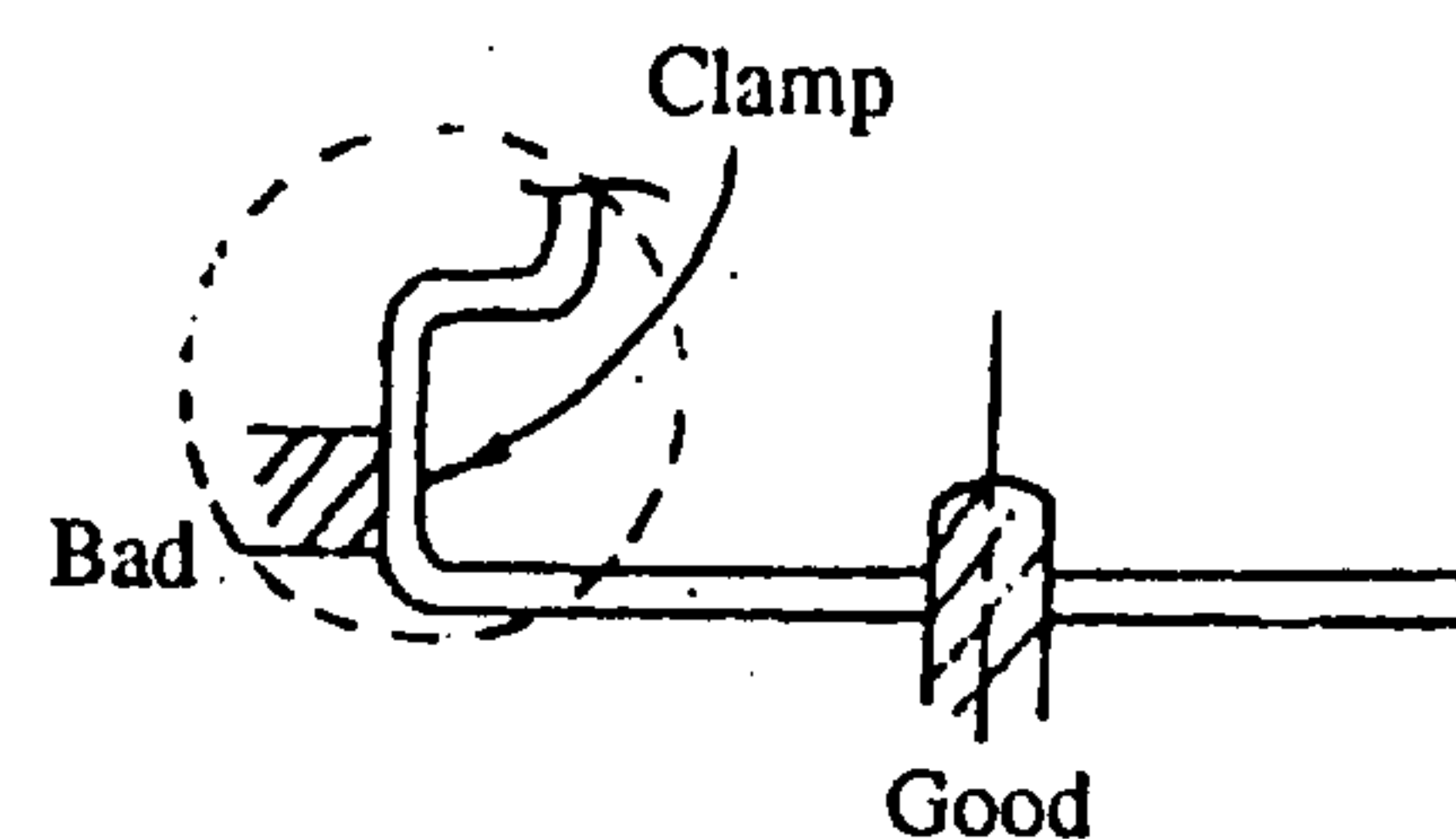
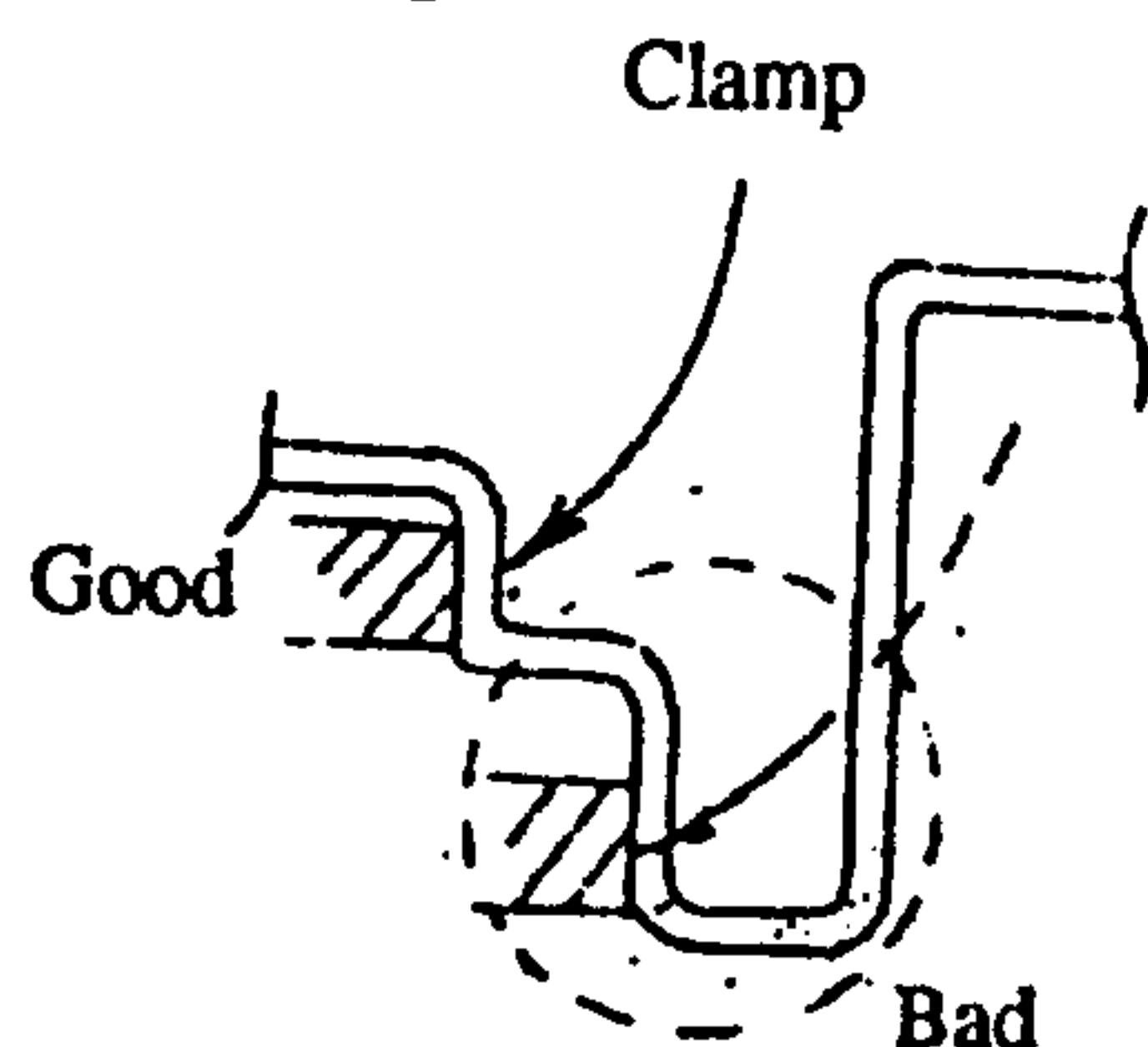


(b) Place where set can be made easily.

- ① Place where clamp tool can be done easily.
- ② Place where the interference does not occur.
- ③ Place where the indirect clamp is not made as possible .

Reason: The finishing or measurement of the parts must be done in the state which is not out of the reference according to the finishing reference of the jig. If not doing so, non-uniformity degree of the parts can not be seen. In case of the indirect clamp, the confirmation of whether or not the reference is met is difficult.

Example:

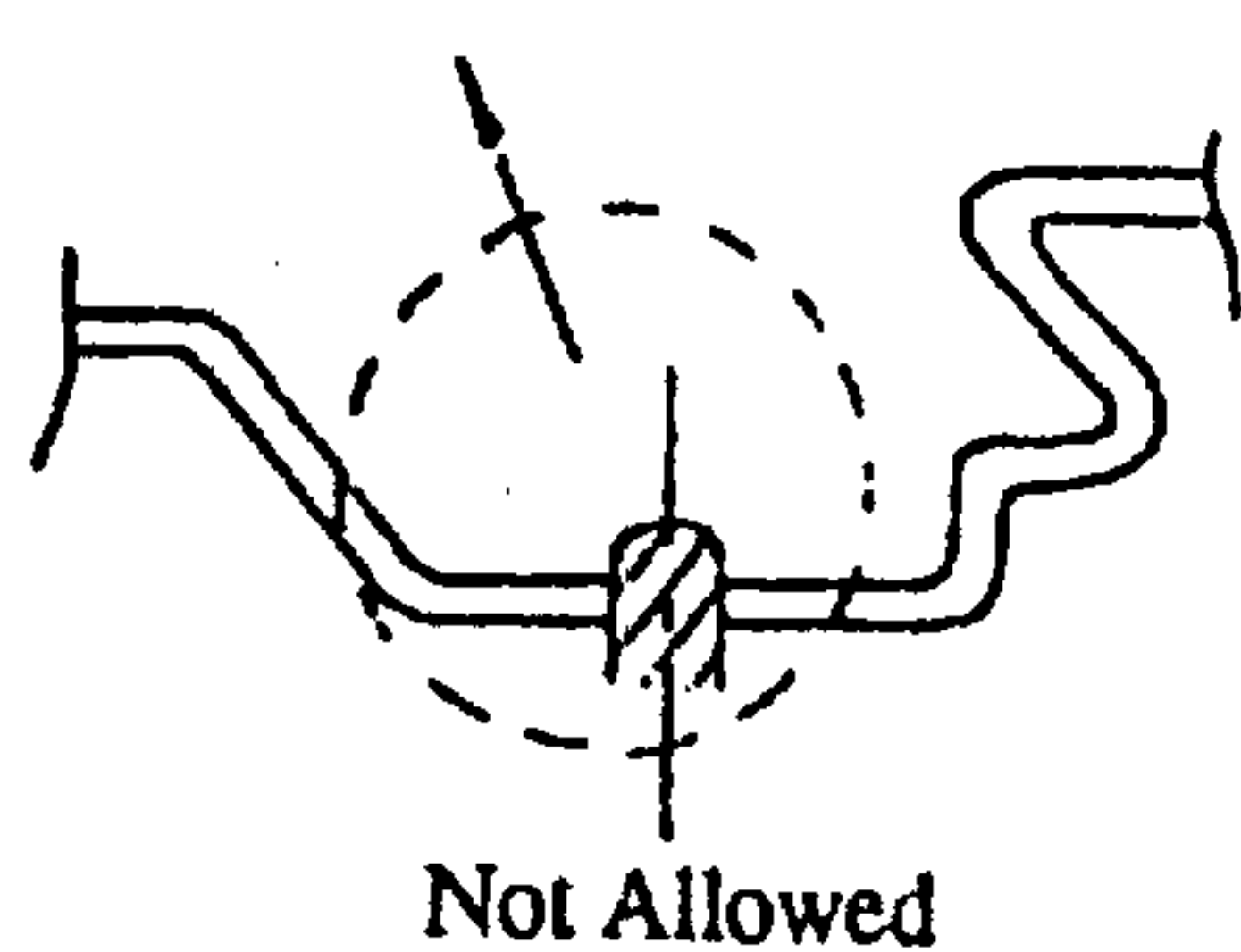


(c) Place with easy ejection and automation

- ① Place where pin can be erected with parallel to the ejection direction (parts removal direction).
- ② Place where no obstacle for setting up the ejection tool is made by an automation device.

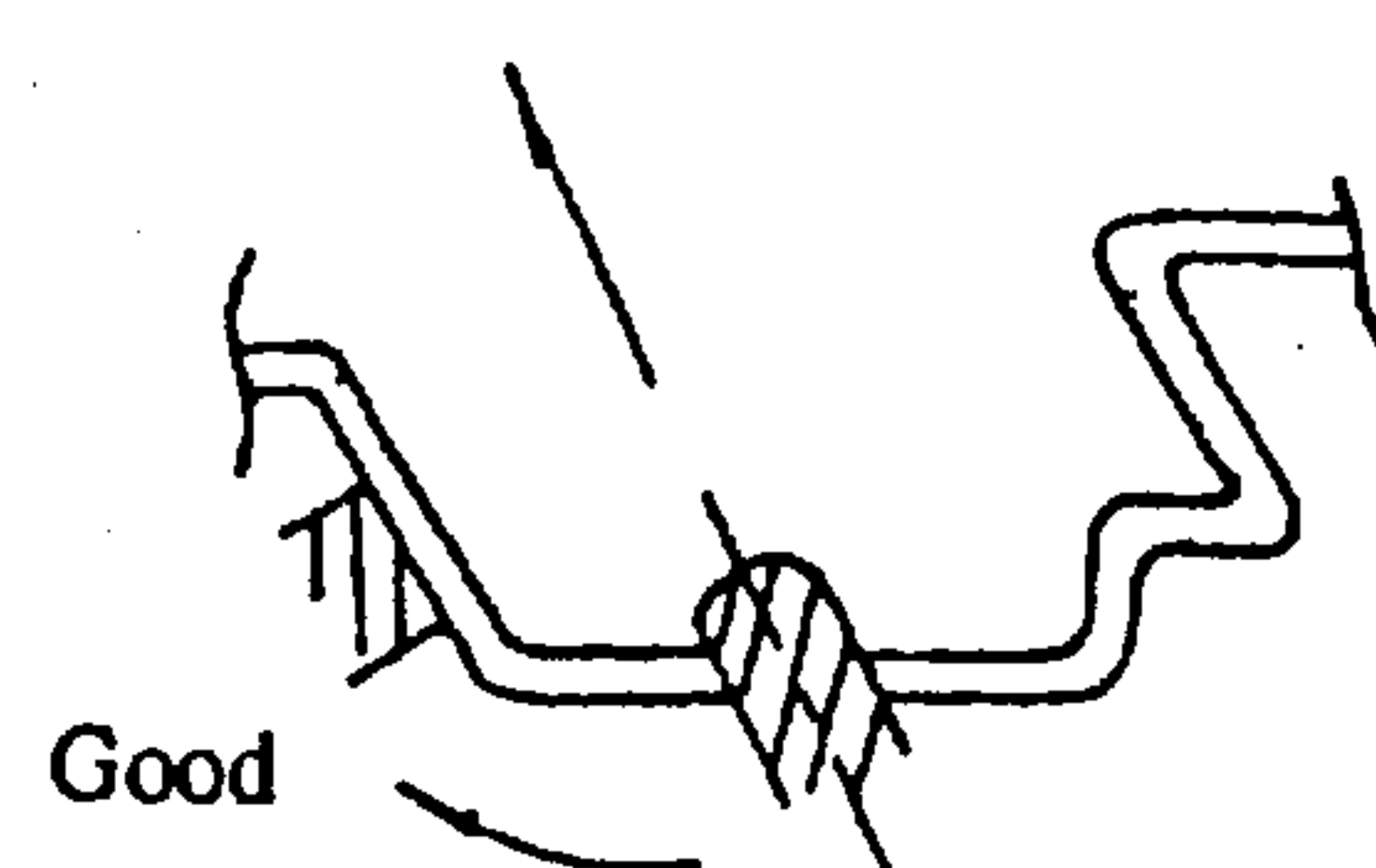
Example :

Parts Removal Direction



Not Allowed

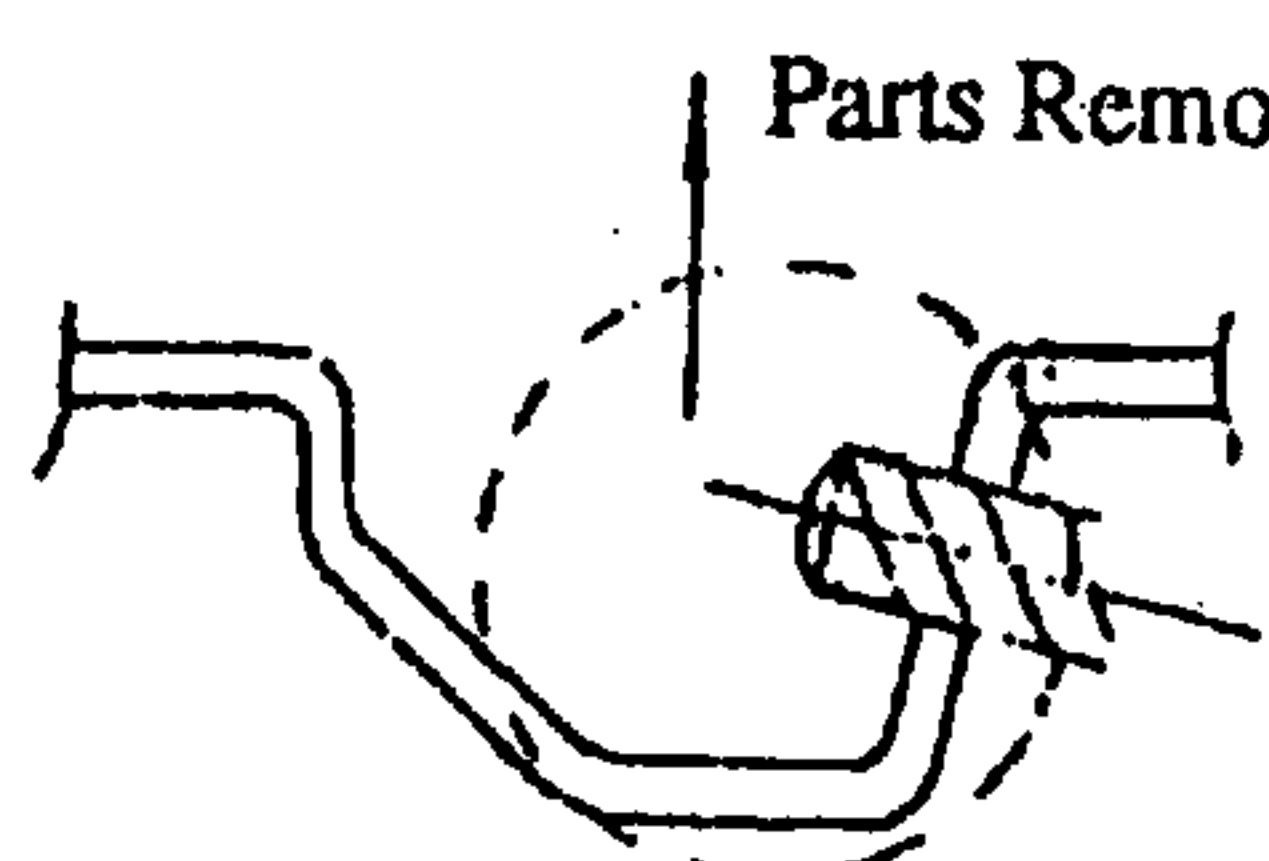
Parts Removal Direction



Good

Allowed (with in the limitation angel)

Parts Removal Direction



Bad

Not allowed when pin is small