International Standard 710/7

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Graphical symbols for use on detailed maps, plans and geological cross-sections — Part 7 : Tectonic symbols

Symboles graphiques à utiliser sur les cartes, les plans et les coupes géologiques détaillés — Partie 7 : Symboles tectoniques

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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.

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

Austria	France	United Kingdom
Bulgaria	Germany, F.R.	USSR
China	Poland	Yugoslavia
Czechoslovakia	Romania	

The member body of the following country expressed disapproval of the document on technical grounds :

Australia

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Graphical symbols for use on detailed maps, plans and geological cross-sections — Part 7 : Tectonic symbols

0 Introduction

ISO 710, a series of documents on graphical symbols for use on detailed maps, plans and geological cross-sections, comprises the following parts :

Part 1 : General rules of representation.

Part 2 : Representation of sedimentary rocks.

Part 3 : Representation of magmatic rocks.

Part 4 : Representation of metamorphic rocks.

Part 5 : Representation of minerals.

Part 6 : Representation of contact rocks and rocks which have undergone metasomatic, pneumatolytic or hydrothermal transformation or transformation by weathering.

Part 7 : Tectonic symbols.

1 Scope and field of application

This part of ISO 710 provides a series of graphical symbols to represent tectonic phenomena on detailed maps, particularly large-scale maps, or plans and geological cross-sections.

This part of ISO 710 includes symbols for

— strata, faults, joints and schistosity;

— folds and monoclines;

— lineations and axes.

2 Principles of representation

2.1 The symbols used are intended to characterize the existing state as found in nature and shall not be used to represent genetic processes and their connection.

2.2 The tectonic elements can be regarded as surfaces or lineations characterized by their situation in space.

2.2.1 Planes

Tectonic planes are represented by their traces in the reference plane.

The basic symbol for traces is a continuous line to which additional symbols characterizing the nature of the surface are added.

2.2.2 Lineation

Lineations are represented by their projection on the reference plane.

The basic symbol for the projection of the lineations is a compound line of alternate dots and dashes to which additional symbols characterizing the nature of the lineations in question are added.

2.2.3 Indication of position

The positions of the planes and lineations are given by the oriented representation of their traces and projections on the map or plan.

On plans, a slope is expressed by an arrow pointing in the direction of the slope; the angle of dip (slope) is indicated in grades or degrees.

In the case of an inverted stratum, the arrow is curved with its point indicating the direction of slope of the inverted stratum.

2.3 A greater or lesser degree of certainty as to the existence and orientation of a tectonic element can be shown by means of a variation on the basic symbol (see table 1).

In order to be termed "certain", the existence of a tectonic element shall be confirmed with a sufficient degree of accuracy.

If necessary, unconfirmed tectonic elements can be divided into two categories : "probable" and "possible".

2.4 If the information is obtained from another document, this can be indicated in a suitable manner, for example by putting it in parentheses (see figure 1).

2.5 In the case of information obtained by a geophysical method, the method used can be indicated in writing (see figure 2).

3 Representation of special planes

Planes to be represented are characterized by varying the basic symbol and by using additional symbols. The symbols (basic symbols and additional symbols) to be used for representing strata, faults, joints and schistosity are given in table 2. The principles stated in clause 2 shall be complied with for these symbols.

If the direction of sinistral or dextral movement in connection with the trace of a fault or with the projection of the line of intersection of a fault should be shown, the following symbol should be used :

Fault with the direction of sinistral or dextral movement : ⇌

Table 1 — Basic symbols

Phenomenon to be represented	Certain	Uncertain	
		Probable	Possible
Traces of surfaces	———	— — —	— — ? —
Projection of lines	———	— — —	— — ? —

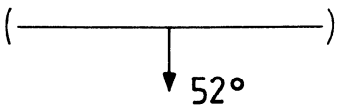


Figure 1 — Information obtained from another document

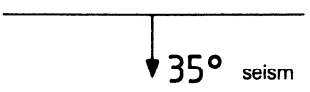


Figure 2 — Information obtained by a geophysical method

Table 2 — Representation of special planes

Phenomenon to be represented	Symbol
Trace of a stratum plane	
Trace of an irregular fault of unknown origin	
Trace of a normal fault	
Trace of a reverse fault (> 45°) or overthrust (⩽ 45°)	
Trace of a strike-slip fault	
Projection of the line of intersection of a normal fault	
Projection of the line of intersection of a reverse fault (> 45°) or overthrust (⩽ 45°)	
Projection of the line of intersection of a strike-slip fault	
Trace of a joint in the walls of a deposit	
Trace of a joint in the deposit	
Trace of a plane of schistosity	

3.1 Strata

The traces of strata planes are represented by a single line without any additional symbol.

On plans, the slope is shown by means of an arrow in accordance with 2.2.3 and table 3.

Table 3 — Slopes

Phenomenon to be represented		Symbol
Dip of planes	normal	52°
	inverted	87°
Plunge of lines		5°

The horizontal position of the strata can be shown by a cross with arms of equal length (twice the length of the arrow), and the vertical position by means of a short line without an arrow point which intersects the line.

3.2 Planes of irregularity

The term "irregularity" in the sense of this part of ISO 710 refers to any interruption of the initial connection of the rock accompanied by displacement of the adjacent walls.

Traces of irregularity planes are represented by a line twice as thick as the lines used for strata planes.

When an irregularity is of a general (or unknown) nature, no additional symbols are used.

For representation purposes, three main types of irregularity are distinguished, which are illustrated by additional symbols.

3.2.1 Normal fault

A normal fault is a fault where the part located above the fault plane is situated at a lower level than the part located below the fault plane, i.e. the part above the plane has undergone a relative downward shift (see figure 3).

Additional symbols in the form of short lines arranged at regular intervals on the side of the upper wall characterize these faults.

In a plan view, this is the side of the direction of the slope.

3.2.2 Reverse fault and overthrust

A reverse fault is a fault where the part located above the fault plane is situated at a higher level than the part located below the fault plane, i.e. the part below the plane has undergone relative downwards movement (see figure 4), the angle of downward slope is greater than 45°. If the angle of downward slope is less than or equal to 45°, the term used to describe the fault plane is overthrust.

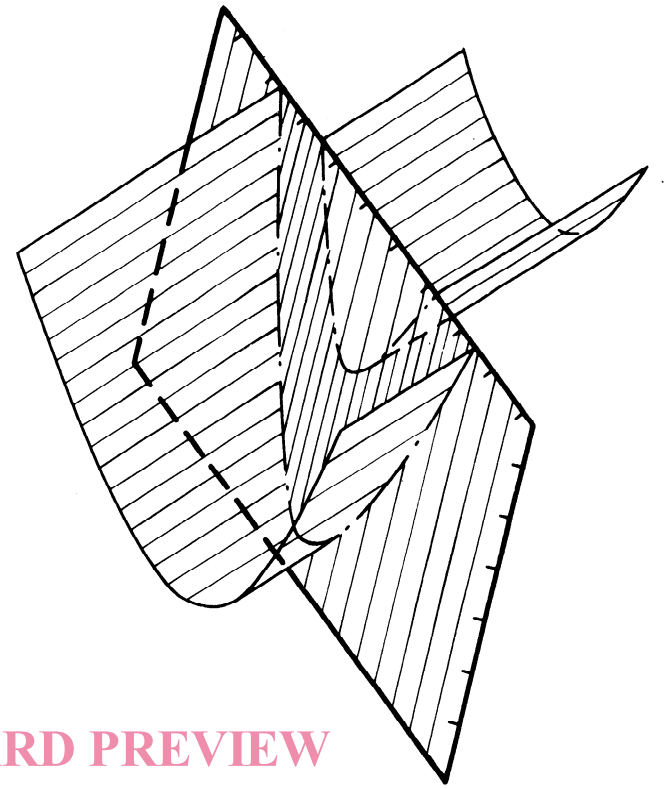


Figure 3 — Normal fault

For reverse faults, an additional symbol is used, i.e. solid triangles arranged at regular intervals on the side of the upper wall.

In a plan view, this is the side of the direction of the slope.

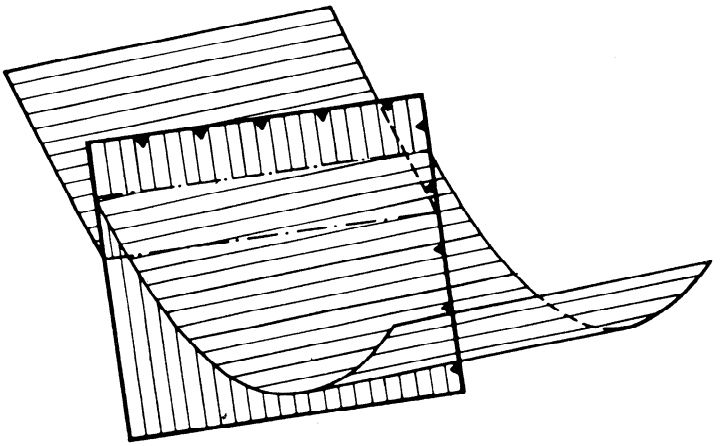


Figure 4 — Reverse fault

3.2.3 Strike-slip fault

A strike-slip fault is a fault where the walls have undergone relative horizontal displacement (see figure 5).

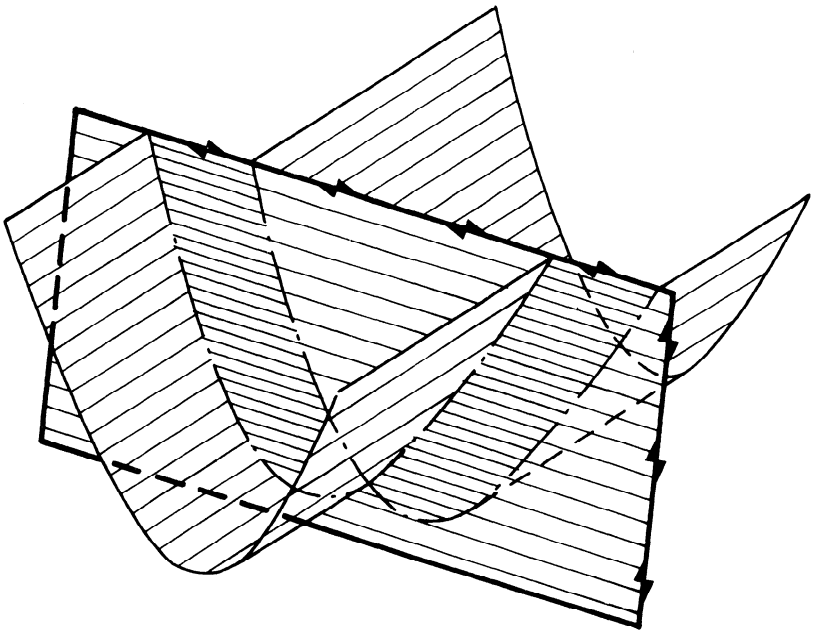


Figure 5 — Strike-slip fault

To represent strike-slip faults, right-angled triangles offset from one another are placed on both sides of the line.

3.2.4 Mixed types

Mixed types of irregularity which do not clearly belong to one of the three basic types can be characterized by a combination of the corresponding additional symbols. Depending on the preponderance of one or other basic type, the different symbols may be varied (see figure 6).

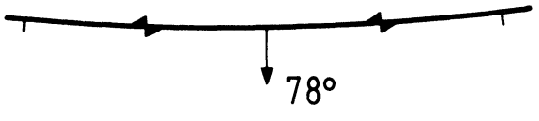


Figure 6 — Representation of mixed types

3.2.5 Irregularity zones

The nature of an irregularity zone limited by the irregularity planes can be indicated by means of additional symbols (see figure 7). The symbols may not be used, if they agree with equal or similiar petrographic symbols in the same plan.

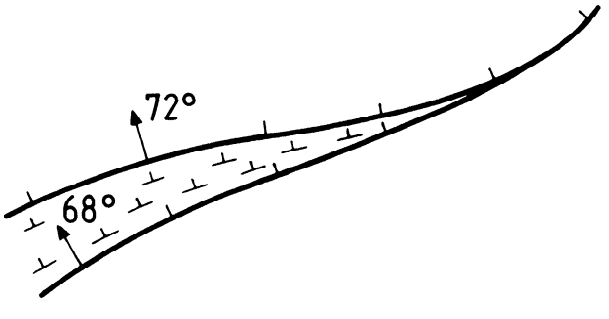


Figure 7 — Irregularity zone

3.2.6 Lines of intersection of fault planes

Frequently, simply representing the traces of a fault plane and stratum planes is not sufficient as a basis for drawing up a mining plan and it is rather the intersection of the fault plane with a certain stratum plane (for example, a vein) which is of prime importance.

These lines are termed "lines of intersection". They are shown on maps and plans in accordance with the principles given in clause 2 and as shown in figure 8. For the additional symbols, the same ones are used as for the fault planes in question. The additional symbols shall also be placed beside the upper wall.

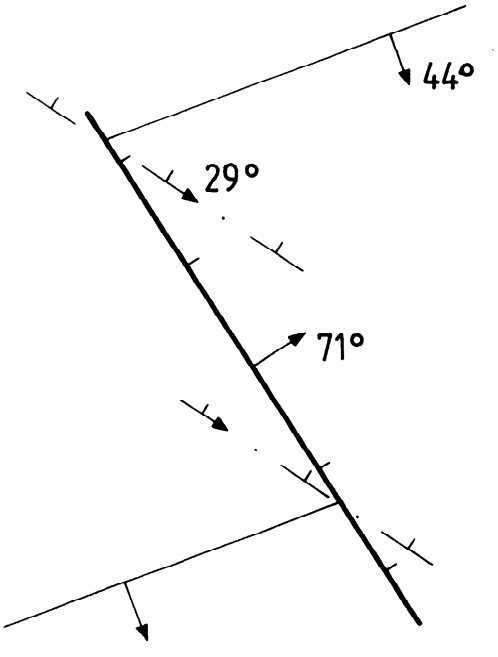


Figure 8 — Lines of intersection

3.3 Joint planes

3.3.1 As regards joints, a distinction has been made, owing to their importance in mining, according to their location, either in walls of a deposit or in one deposit itself (for example, cleavages in a coal seam).

So as to eliminate any confusion, in the case of a plan view, between joints in a deposit and planes of strata, the slope is indicated by a short line without an arrow.

Owing to their importance in mining, special symbols are used for planes of joints which indicate their horizontal or vertical arrangements (see figure 9).

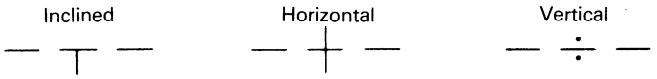


Figure 9 — Planes of joints

3.3.2 A system of joints, i.e. a series of joints of different orientations, can be represented as a whole (see figure 10).

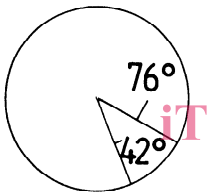


Figure 10 — System of joints

3.3.3 The frequency of joints can be expressed by means of parallel repetition of the symbol (see figure 11).

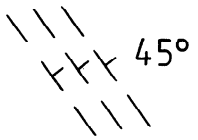


Figure 11 — Frequency of joints

3.4 Schistosity planes

3.4.1 The basic symbol used to represent schistosity is a double line which imitates the parallel texture.

In order to indicate the slope of schistosity planes (inclined, horizontal or vertical arrangement) in a plan representation, the same symbols are used as for joints.

3.4.2 Moreover, the basic symbol is used for variations of all kinds allowing different types of schistosity phenomena to be characterized on the same plan (see figure 12).

Figure 12 — Schistosity planes

4 Representation of folds and monoclines

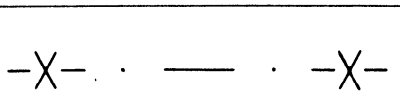
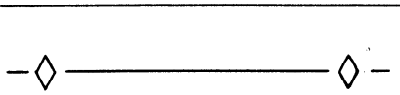
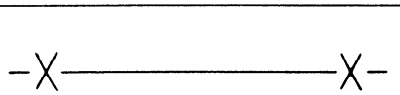
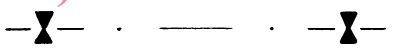
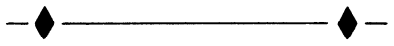
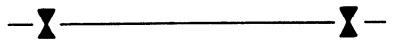
The symbols for the representation of folds and monoclines which are derived from the basic symbols for planes and lines are grouped together in table 4. Variations of the symbols are possible here in accordance with the degree of certainty.

4.1 Folds

There are a number of possible ways of representing folds. Inasmuch as the direction of the folded layers is characteristic enough for representation, the symbols used for planes of strata should be used.

However, folds are characterized, on the one hand, by their axes and, on the other hand, by their crest lines (trough lines). When the stratigraphic succession is not clearly known, the terms "antiform" and "synform" may be used instead of the terms "anticline" and "syncline".

Table 4 — Representation of folds and monoclines

Phenomenon to be represented	Symbol
Projection of a crest line	
Projection of a trough line	
Trace of a crest plane	
Trace of a trough plane	
Projection of the axis of an anticline	
Projection of the axis of a syncline	
Trace of the axial plane of an anticline	
Trace of the axial plane of a syncline	
Trace of a monocline	
Monocline zone