GRAPHICAL SYMBOLS

Test methods for judged comprehensibility and for comprehension

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The increasing amount of international travel and trade mean that ever more people are faced with the problem of understanding information written by people who speak a different language from themselves. Although very many people can understand simple information in a number of languages (for example, most Europeans probably understand some English in addition to their own language), people are increasingly likely to visit or buy products from parts of the world where they have no understanding of the indigeneous language: few Europeans know even simple phrases of Japanese or Cantonese.

One way to deal with this problem is to provide messages in a number of languages, but this means that the message has to be repeated and can produce a cluttered environment. An alternative is to use a form of communication which does not use verbal language but can be understood by speakers of all languages. The most obvious way of doing this is to use a system of graphical symbols. This has the added advantage of universality by being immediately accessible to those that do not read even in their own languages.

Jeremy J. Foster, Convenor of ISO/TC 145, SC 1, Public information symbols, *WG 1,* Evaluation and testing of public information symbols, *examines below how ISO 9186:2001 determines symbols best suited to communicate the intended message effectively by means of proposing a procedure for testing graphical symbols allowing for two tests, a comprehensibility judgment test and a comprehension test.*

The benefits of using symbols include not only their supra-language characteristic, but also the fact that they can express a message in a compact form, may be more noticeable in a 'busy' environment than a written message, may have more impact than words and – according to some evidence – can be understood more quickly than messages which have to be read.

The potential advantages of using symbols have long been recognized, and many graphic designers in many countries have created graphical symbols for communicating simple messages. This enthusiasm for graphical symbols has led to a potentially confusing situation where there are different symbols with the same intended meaning (e.g. Fig 1 where both the symbols are intended to indicate that ear protection should be worn) and some symbols in common use which do not prompt the correct interpretation (e.g. the symbol in Fig. 2 is intended to give a warning that lasers are in operation but many people see it as a warning of explosive materials).

***Figure 1** – Both these symbols, offered to sign-users by sign manufacturers in the United Kingdom, are intended to mean "ear protectors must be worn". When the comprehension test described in the text was carried out on a group of 50 respondents in the United Kingdom, the one showing a head with earphones was found to be very well understood, with an overall score of 90. The symbol showing an earplug inserted in an ear also scored a creditable 74.*
As the "headphone" symbol obtained the higher score, it is the one which would be recommended as a standard symbol for this referent. The author of this article initially found the earplug symbol quite baffling, which demonstrates that one cannot always rely on "experts" to judge how well a symbol can be understood.

***Figure 2** – This symbol is intended to mean "beware of lasers". But even when people were told they would see it on a piece of equipment, most of them interpreted it as meaning "beware of explosions or sparks" or "do not spill liquid". This demonstrates the difficulty of designing an unambiguous symbol for a referent which the public may come across comparatively infrequently. Versions of this symbol are often used to warn people that a laser is included when they purchase items such as CD players and computers with CD Roms. The fact that it is not widely understood (it scored only 19) suggests that mere exposure to a symbol does not mean that people readily learn and remember its meaning. It is likely that for many referents it will be impossible to design a symbol which can be understood intuitively and a deliberate process of teaching symbol meanings will be needed.*

The aim of having standard graphical symbols is to reduce these sources of confusion, to produce a set of symbols which are accepted internationally so that everyone can understand the information wherever they go in the world.

Which symbols to accept?

Although the desirability of having internationally accepted symbols is widely appreciated, it is not obvious how one should decide which symbols to accept. One way to answer this question is to go back to basics: the symbol is intended to communicate a certain message (known as the referent). So it seems reasonable to argue that when there are alternative symbols for the referent, one should take as the standard the one which does communicate the intended meaning most readily to most people.

This is the fundamental idea underlying ISO 9186: alternative symbols (known as variants) for a particular referent are tested to see how readily they are understood, and the one which performs most successfully, so long as it surpasses a minimum standard, is recommended to be the internationally standard graphical symbol for that referent.

The basic principle of accepting as standard graphical symbols those which can be shown to communicate the intended message effectively is not new; it was the foundation for the original edition of ISO 9186 which appeared in 1989. It was found in practice, however, that the procedures laid down in the 1989 version had certain drawbacks. Symbols were presented without any indication of the context in which they might be seen, the tests were costly and time consuming and quite frequently failed to yield a standard. Also, when a standard was obtained it was a verbal description of the symbol which had been tested and not the particular graphical implementation itself. These drawbacks have meant that since 1989 very few standard symbols have been produced.

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But this did not mean that the problems which had led to the original ISO 9186 had gone away. If anything, they had become more acute. So the 2001 version of ISO 9186 has been written with the intention of accepting the general principle that standard graphical symbols should be those that are demonstrably successful at communicating their intended message, while making the demonstration of this success easier, quicker and cheaper.

Testing graphical symbols via two tests

The ISO 9186:2001 procedure for testing graphical symbols allows for two tests, a comprehensibility judgment test (which will be referred to as the judgement test) and a comprehension test, both of which can be administered using either printed materials or computer presentation. In the judgement test, people are shown the variants for a particular referent, told what the referent is, and asked to estimate the percentage of the population that they expect would understand this meaning when shown each variant. The criterion of acceptability is not stated in ISO 9186 itself, as the procedures are intended to apply to different types of referent. The criterion for public information symbols is likely to be less strict than for safety symbols where it is by definition more important that people do not misinterpret them. For the judgement test, the criterion will be in terms of the mean of the estimated percentages which the respondents provide. If a variant reaches the criterion of acceptability, it can be recommended as the international standard symbol without more ado. So this provides the opportunity for rapid testing and the possibility of finding a symbol which can be recommended as an international standard very cheaply. If no variant reaches the criterion of acceptability on the judgement test, the comprehension test can be carried out.

What do you think the symbol means?

In the comprehension test, one of the variants is shown together with a statement of the general context in which one would expect to see the graphical symbol. Respondents are asked to say what they think the symbol means and what action they would take in response to it. The comprehension test for each variant has to be conducted with at least 50 respondents who can be expected to be familiar with the referent. A respondent sees only one variant for any referent, but up to 20 variants can be tested by one group of respondents.

The analysis of the results of the comprehension test involves having three judges, working independently, who assign each response to one of the seven standard categories shown in Table 1.

Table 1 *– The seven categories to which comprehension test responses are assigned*

Category 1	Correct understanding of the symbol is certain (estimated probability of correct understanding over 80 %)
Category 2	Correct understanding of the symbol is very probable (estimated probability of correct understanding between 66 % and 80 %)
Category 3	Correct understanding of the symbol is probable (estimated probability of correct understanding between 50 % and 65 %)
Category 4	The meaning which is stated is the opposite to that intended
Category 5	Any other response
Category 6	The response given is "Don't know"
Category 7	No response is given

The category assignments are inserted in a matrix and for each variant the number of responses in each category are counted and converted into percentages of the number of responses in categories 1 to 6. An overall score for each variant is obtained by weighting and summing the percentages of responses in the different categories. A list of the five most common responses for each variant in each of categories 1-5 also has to be made.

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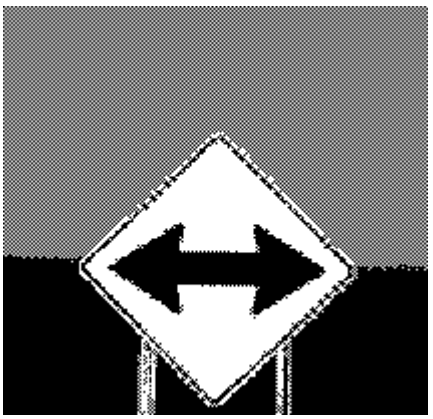
The variant with the highest overall score is the most comprehensible variant. If the overall score for this variant exceeds the criterion of acceptability, then it may be recommended as the standard graphical symbol for the referent. Where two variants exceed the criterion of acceptability on the comprehension test and have the same overall score, the one least likely to be confused with an existing standard graphical symbol is selected. If no variant obtained an overall score exceeding the criterion of acceptability on the comprehension test, it is necessary to collect new designs and re-commence the test procedure.



First goal of the procedures: for application as public information and safety symbols

The ISO 9186:2001 procedures are initially designed to apply to public information and safety symbols. But it is hoped they will prove useful for many areas in which symbols are being created and used, where it is necessary to develop symbols which are demonstrably effective in communicating their intended meaning and to avoid potential confusion.

As ISO 9186:2001 has only just been published, only a few graphical symbols have been tested in this way so far. Workers in Austria, the Netherlands, the USA and the United Kingdom who cooperated in writing the new version of ISO 9186 have had experience of using the procedures, and found them to be faster and simpler than those which they replaced. It is hoped they will find widespread application wherever graphical symbols are being used.