



PERS 253 COMPREHENSION OF ISO INDUSTRIAL SAFETY
SIGNNS AMONG WHITE, BLACK LITERATE AND
BLACK ILLITERATE INDUSTRIAL WORKERS

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SUMMARY

A set of industrial safety signs, proposed for international use by the International Standards Organisation (ISO), was submitted to the South African Bureau of Standards (SABS) for implementation in South Africa. A Working Committee was set up by SABS to evaluate the suitability of the ISO signs for South African conditions. The Working Committee decided at its first meeting that the suitability of the ISO signs should be investigated under practical conditions. For this purpose a Specialist Committee was appointed to advise on the project and the National Institute for Personnel Research (NIPR) was approached to carry out the investigation.

The aims of the investigation were:

1. To test the comprehension of the ISO signs among groups of workers of varying levels of literacy and with different cultural backgrounds.
2. To evaluate the need for modification of the ISO signs for South African conditions.
3. To assess the need for training in the implementation of the ISO signs as proposed or as modified.

The sample of twenty four safety signs, as submitted to the Specialist Committee, were photographed in colour slides and a special questionnaire was designed to elicit the responses of testees to the signs. A pilot study was carried out with a sample of 100 White school pupils on which basis the design of the study was finalised. The South African Iron and Steel Corporation (ISCOR) provided a sample for the investigation, comprising 38 Whites, 42 Black Literates and 13 Black Illiterates. The Whites and Black Literates were tested in groups, while the Black Illiterates were tested individually by trained Black interviewers supplied by ISCOR and the NIPR.

The results of the study showed that while none of the groups was able to comprehend all the signs perfectly, significant differences emerged between the groups. Whites scored an average of "nearly correct" in response to the signs, Black Literates averaged between "nearly correct"

and "nearly incorrect" and Black Illiterates averaged "nearly incorrect". Several other biographical variables were related to sign comprehension, such as education, ethnic group and urban and industrial experience. Among the four groups of signs, the mandatory signs were the most easily comprehended, the warning signs were the most difficult and the prohibitory and information signs ranged between easy and difficult in comprehension.

The differences found between respondents at varying levels of education, and with differing amounts of industrial and other relevant experience, clearly indicate that training would be of great value in the successful implementation of the existing ISO signs in South Africa. Differences in the relative difficulty of the groups of signs suggested that several signs require modification for South African conditions. While the system of colours and shapes employed in the ISO signs was found to be satisfactory, problems in comprehension appeared to arise from ambiguous graphics and the use of abstract symbols in the "difficult" signs.

Following the indications of the investigation, it has been decided by the Specialist Committee that the problematic signs be modified in conjunction with the Design Institute of the SABS. Guidelines for this modification are presented in this report, in the form of actual responses to each sign used in the study. It was decided that further investigations be undertaken by the NIPR to test the comprehension of the modified signs in a broader sample representing females as well as males, different ethnic groups, different regions and levels of industrial, urban and other relevant experience.

The need for training in the comprehension of the ISO signs suggests that a training programme should be devised specifically for this purpose and an evaluation of the training programme should be carried out. Vaal Reefs Explorations have offered the facilities of their training staff for the planning of a training programme, while the Training Studies Division at NIPR would offer consultative assistance in the development of a training programme. The Temperament and Personality Studies Division would undertake the evaluation study.

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1. INTRODUCTION

1.1 Background to the study

A series of language-free safety signs has been devised by the International Standards Organization (ISO) for international use in industry.

The ISO series of safety signs was submitted to the South African Bureau of Standards (SABS) for implementation in South Africa. A Working Committee was convened by the SABS to consider the implementation of ISO signs in South African industry entailing the proposed revision of existing SABS industrial safety signs.

The Working Committee, comprising representatives of the SABS, government departments and industrial organizations, decided at its first meeting that the ISO signs should be tested under practical conditions with industrial workers. A Specialist Committee was appointed to set up an investigation of the suitability of the ISO signs for South African conditions. The National Institute for Personnel Research (NIPR) was approached to carry out this investigation.

1.2 Theoretical Considerations

Interest in symbol and sign communication has grown in the past decade, with the increasing rate of intercultural contact that is being made universally.

Despite the primary focus of this study on practical and empirical concerns, several theoretical issues ought to be clarified. In addition, a study of practical value is of necessity also of theoretical value, so that the theoretical implications of this study should be considered.

1.2.1 Definitions

The following scheme of definitions is used loosely throughout this report. The scheme should be compared with others in use.

1.2.1.1 Signs are taken to indicate any presentation (in this case visual) of material intended to represent an object, event, person or

idea and intended to communicate a message about that object, event, person or idea. In the present investigation, a sign refers to the background material, shape and colour of a visual representation including the picture depicted against that background.

- 1.2.1.2 The term pictogram refers to any pictorial representation of an object, event, person or idea within a sign.
- 1.2.1.3 A pictograph refers to a pictogram which is intended to resemble the depicted object, event or person by means of either a hand graphic or a photo graphic.
- 1.2.1.4 A symbol refers to a pictogram which is intended to convey an object, event person or idea by means other than representational resemblance. Symbols are considered more abstract than pictographs in their representations. (cf. H. Krampen, 1965, pp 11-13)¹⁾

1.2.2 Theoretical Issues

Among the theoretical issues raised in this study are the following:

- 1.2.2.1 Is there a variation in comprehension of ISO Safety Signs in terms of either subjects or signs? A variation in sign comprehension would allow tendencies to be revealed for different types of signs to be acceptable to different types of people. The factors accounting for such variations, whether in terms of individual differences or inter-sign differences should illuminate some of the issues of the nature of sign, symbol and pictographic acquisition.
- 1.2.2.2 A particularly appropriate issue in this study is the extent to which culture affects sign comprehension. Groups, matched to a certain degree from different cultures are used to clarify this issue. This issue will have an important bearing on the success of international implementation of ISO signs or other sign systems.
- 1.2.2.3 A third issue, also particularly appropriate to this study is the effect of literacy on sign comprehension. Although the ISO signs are ostensibly "language free" it is considered that the familiarity of symbols in the use of language should enable literate

subjects to exceed the comprehension capacity of illiterates from the same cultural groups.

1.2.2.4 A fourth issue is the degree to which a set of signs can be modified graphically to reach optimum acceptability. The alternative or complementary proposition is that all signs, regardless of their graphic excellence, require training for their effective comprehension and use.

1.2.2.5 A final issue, among the many which could be raised, is the question of the appropriateness of certain methods of stimulus presentation and response elicitation for the effective study of behavioural responses to actual Safety Signs. This question (See Section 2) has theoretical implications in that it bears on the questions of context and the independent interpretability of the signs. (M-C. Cahill, 1975, pp 376-380)²⁾

The above issues are not to be seen in the form of formal theoretical hypotheses, due to lack of experimental control in this study.

Rather the issues above are reflected on at various points in the study with a view to their clarification.

1.3 Aims of the Study

The aims of the study are as follows:

- 1.3.1 To test the nature and extent of comprehension of the ISO safety signs among groups of workers at varying levels of literacy and with different cultural backgrounds.
- 1.3.2 To evaluate the need for modification of the ISO safety signs for South African conditions.
- 1.3.3 To assess the need for training in the implementation of the ISO safety signs as proposed or as modified.

The aims of the present study were limited to a preliminary investigation of a sample of ISO signs in a limited population.

1.4 Scope of the Study

The scope of the present study may therefore be delineated as follows:

- 1.4.1 The safety signs to be tested in this study comprise a sample of the larger set of ISO industrial safety signs. Further investigation is required to test the entire set of ISO signs.
- 1.4.2 The study can only be viewed as suggestive with regard to the need for ISO sign modification and for training. Further investigation is required to evaluate the effects of modification and of training.
- 1.4.3 The sample tested comprises White and Black groups, literates as well as illiterates and several occupational categories in one particular industrial organization. Future samples should be representative of different industries, geographical regions and various other groups which were not samples in this study, for example, women and workers of a wider range of ethnic groups, industrial and urban experience.

2. METHOD

2.1 Stimulus Presentation

Several alternative methods of stimulus presentation were considered for this study.

2.1.1 The most realistic method of presenting the safety signs would be in the form of actual signs manufactured for this purpose and placed in the actual context of industry. However, the costs of this method were considered prohibitive. Moreover, the problems of experimental control inherent in a field study would have proved detrimental to the aims of the project. While the industrial context is essential to the comprehension of the ISO safety signs, distractions in a realistic field study could have led to contamination of the presentation of the signs as discrete stimuli.

2.1.2 A similar method considered was the presentation of actual manufactured signs in a controlled experimental situation. This method was also judged too costly and cumbersome for the present study.

2.1.3 The most practical method considered and adopted for this study was the presentation of the safety signs in the form of colour slides in a controlled laboratory situation. The advantage of this method is that it allows maximum exposure of individual signs in a uniform manner to all subjects with a minimum of uncontrolled distraction.

A sample of 24 ISO safety signs as submitted to the SABS Specialist Committee were photographed individually and developed in the form of colour slides. Slides were also made of the four separate groups of signs, namely, the prohibitory, warning, mandatory and information signs.

Consideration was given to the dimensions of the slides and their positioning with respect to the testees. In so far as possible, the procedure ensured slide dimensions approximating those recommended by SABS. Subjects were positioned at a comfortable distance from and angle to the slides projected.

2.2 Response Questionnaire

In a similar manner to the question of stimulus presentation, various alternatives were considered for response recording.

2.2.1 The most valid response form would be to test the actual effectiveness of the ISO safety signs in controlling manpower loss and accidents over a long-term period. However, the aim of the study was to investigate the suitability of the ISO signs before implementation. Since numerous problems, such as the underlying logic of the signs and their graphic aspects could be identified without recourse to a long-term study, this method of response testing was not deemed necessary or suitable for this study.

2.2.2 A second method, also aimed at achieving high validity would be to observe the behaviour of testees in the context of industry, to actual signs made for this purpose. However, since the field experiment was rejected as a method of stimulus presentation on the grounds of cost and poor experimental control (see 2.1.1), behavioural responses to the signs could not feasibly have been tested in response to a slide presentation. This is so because testees would not be confronted with a realistic situation requiring behaviour appropriate to any particular safety sign.

2.2.3 Working on the basis of a slide presentation of the ISO safety signs, vocal responses in an interview situation could be considered. For illiterate subjects, this method was the only one considered suitable, allowing free expression to the guided questions of the interviewers. However, for literate subjects it was considered too costly to test the subjects individually, the length of each interview being approximately two hours. Furthermore, while some subjects could conceivably express their responses best in a vocal manner, other subjects were expected to be more articulate in the written medium. Thus, the testing of literates in groups of a convenient size with a written response questionnaire was not considered to be inherently less valid than the method of individual vocal responses.

2.2.4 The most suitable method of response for this study was considered to be the questionnaire. This method allows for individual testing of illiterates and group testing with literates. In the case of the illiterate subjects, interviewers were trained in both the administration of the questionnaire and in the recording of responses. While it is acknowledged that responses in a questionnaire may not be entirely valid predictors of behaviour in the industrial context, this method accorded with the aims of the study as a preliminary investigation of ISO sign suitability for South African cultural groups.

A further issue in considering the response format was to decide on whether the questionnaire should be of the "open" or "closed" type. A "closed" format, providing a multiple choice of responses to each sign, would have the advantages of simplicity in administration, scoring and quantification. However, the range of possible responses to each sign was found to be so large in trial runs with even sophisticated subjects, that a multiple choice format would have posed an undesired restriction on the data. Furthermore, since the aims of the study are not merely to quantify the extent of sign comprehension, but also to explore the nature of responses to each sign, the "closed" question format was rejected as unsuitable.

The "open" question format allowed a scoring scheme to be devised whereby responses could be quantified on a four-point scale, ranging from "correct" to "incorrect", while the range of responses could be utilized in a qualitative analysis.

The questionnaire format adopted after the pilot study comprised a set of six open questions posed for each sign. Initially, it was intended that each question be analysed as a separate piece of information. (See Appendix, page 61). However, the possibility was provided for all six questions to provide two related sets of information, viz. a numerical score ranging from (1) "completely correct" to (4) "completely incorrect", and a brief description of the subjects' qualitative response to each sign. In practice, time limitations in the test administration as well as difficulty encountered by subjects in responding to all the questions necessitated the two overall scores to be utilised in favour of six separate scores. The final questions used for each sign were devised in consultation with personnel at the NIPR and at ISCOR as well as on the basis of the pilot study and trial runs with Black and White staff at the NIPR.

The first question was designed to elicit the overall message, if any, comprehended, viz. "What does this sign tell you?" This phrasing was preferred to the use of phrases such as "What does this sign mean?" as the latter could appear to encourage testees to believe that there is a single meaning which they either do or do not know. The preferred format was considered to encourage testees to respond with their own interpretations. This preference was confirmed by subjects' reactions in the pre-tests and pilot study.

The second question, "What things in this sign tell you this?" was intended to elicit the cues which respondents use to interpret the signs. This information, where obtained, proved valuable in detecting sources of comprehension or misunderstanding.

Question three, "What should you do or should you not do if you saw this sign?", was directed at a level of response approximating behaviour. While responses to the first two questions were frequently descriptive this question produced a more meaningful interpretation of the signs.

Question four, "What else could this sign mean?", provided information as to the possible ambiguity of the signs. Question five, "Is this sign easy or difficult to understand?" was intended as a subjective comparison of the degree of difficulty in actual comprehension. Question six, "Have you ever seen this or a similar sign before?" was intended to ascertain, firstly, to what extent the ISO signs are familiar in content to the subjects. Secondly, this question was intended to ascertain whether previous experience with the signs is related to the degree and nature of their comprehension.

In addition to the questions devised for sign comprehension, various biographical questions were included in a multiple choice format. These variables were chosen for their possible relevance to sign comprehension, including age, education, ethnic group and urban and industrial experience. (See Appendix p.60)

Finally, in order to maximise the validity of the test situation, careful attention was given to impressing upon all the subjects that the safety signs presented should be seen in the context of industry, whether in a factory or a building. This measure was not entirely successful, in that responses frequently indicated that several signs were viewed in the context of road safety rather than in the industrial context.

2.3 The Pilot Study

A Pilot study on the sign comprehension test was undertaken at the NIPR during 1975. The pilot study was conducted on a sample of 100 White school pupils ranging from Standards 8 to 10.

Several points of value emerged from the pilot study, namely, the successful use of slides and a questionnaire in group testing, indications as to the approximate length of the test administration and suggestions as to how the questionnaire could be constructed more economically by the elimination of certain redundant questions.

The results of the pilot study proved that ISO sign perception was by no means perfect even in literate white subjects.

3. PROCEDURE

3.1 Interviewer training

Two Black Sotho-speaking NIPR staff members were trained in the administration of the ISO sign comprehension test to literate and illiterate Black subjects.

The two interviewers were administered the test by the author, during and after which detailed discussions were held on different aspects of the test and the procedure. Care was taken to arrive at translations of the questions which would conform accurately with the original questions. Similarly, it was emphasised that subjects should not be misled by the interviewers' own comprehension, although provision was made for a certain degree of probing. This latter allowance was felt necessary as pre-tests with Black colleagues revealed a tendency to simple description, even when subjects were able to interpret the signs more meaningfully.

The interviewers gained practice in the test administration by administering it to several other Black colleagues. Both interviewers were previously experienced in the administration of psychological tests and questionnaires to Black subjects.

A similar although more brief procedure was adopted in training eleven literate Black ISCOR staff members for the administration of the test to illiterate subjects. After the literate subjects had been tested eleven were selected by their White Supervisor to assist in the administration of the signs to illiterates. These interviewers were briefed on the purpose of the experiment, and given precise instructions as to its administration. Special emphasis was given to the prevention of interviewer biases, particularly since the interviewers had themselves been tested shortly before. The interviewers were therefore instructed to ask the questions and record the responses word for word with no alterations or interpretations. Prompting was resorted to only if the subject failed to respond.

3.2 Samples

The aim of the sampling procedure was to compare White, Black literate and Black illiterate industrial workers in ISO safety sign comprehension. Since the study was directed towards a preliminary assessment of the value of the signs to workers in these groups, rather than on a comprehensive basis for sign modification and the design of a training course, it was not considered necessary to sample South African industrial workers comprehensively. Further investigations, particularly those geared towards modification and training should, however, sample the industrial population more comprehensively.

The 38 White workers sampled comprised 10 clerks, 10 apprentices, 13 operators and 5 supervisors: the clerks and apprentices were tested together in a group administration lasting two hours. A second group session lasting two hours included the operator and supervisor groups.

The Black literate sample, comprising 42 workers in clerical, supervisory and operator categories, was tested in a single group.

The Black illiterate sample of 13 workers was drawn from the labourer job category and were tested individually by separate interviewers.

The three samples were all chosen with a view to convenience of time availability rather than by a random method. The sampling emphasis was on the three representative groups rather than on randomness within the groups. Although the latter consideration may have added value for statistical generalisation from the sample it was not considered necessary to go to the lengths required for this purpose.

The sampling is limited in a more serious respect, however, in that the Black illiterate sample comprised a small number of subjects. Further investigations should attempt to gain a larger number of subjects in this category.

Finally, the criterion of literacy was set, for practical purposes, according to the ability of the subjects to complete the questionnaire independently. Judgement on this criterion was made by the White Supervisors concerned with the particular groups of workers.

3.3 Test Administration

The White sample was tested in two groups, the first comprised 10 clerks and 10 apprentices and the second comprised 13 apprentices and 5 supervisors. The test was administered in a large room within the safety section on the ISCOR Pretoria plant.

The slides were presented individually and in the same order to both groups. The time allowed for each sign varied according to the time needed to complete the questions. No need was felt to limit the time until all the subjects had responded fully to each sign. Both test sessions were completed in a period of approximately two hours.

The Black literate sample was tested in a single group. The test was administered in a large recreation hall within the company compound. The testing was conducted by the two trained Black NIPR interviewers with the assistance of the White Personnel Officer concerned with the study.

The Black illiterate group was tested in the same recreation hall. The slides were projected before the whole group, while the responses were obtained from the individual testees by their respective interviewers.

In the cases of all the groups, the slides were projected from a distance of approximately 15 metres behind the group of subjects. The subjects sat in rows of benches at distances from the screen which did not differ substantially. The dimensions of the signs conformed approximately to the SABS standards for this purpose, with the signs being judged clearly visible to all subjects.

In order to obtain the maximum effects of colour and slide clarity, the lights were dimmed for a period of roughly 60 seconds. Thereafter, the

lights were slightly brighter to allow for comfortable completion of the relevant questions.

As indicated above (Section 2.2.4), problems were encountered in the completion of all 6 questions related to each sign. In the case of the White samples, no such problems were encountered. However, in the case of the Black literate sample, subjects were instructed during the test to complete as many of the questions as they could within a time limit of 3 minutes. The interviewers for the Black illiterate group were instructed to ask questions 1 and 6 first (See Appendix) and to ask the remaining questions only if the time limit of 3 minutes had not yet expired. Since the period of approximately 2 hours used for the testing of all groups was the maximum time available, a time limit for each sign was necessary.

3.4 Sample Characteristics

The characteristics of the three samples in this study are presented in Table 1, below.

There were no significant differences between the three samples in age or industrial experience. However, while all the Blacks had had some factory experience, 20 per cent of the Whites had never worked on the factory floor.

Whites were significantly more urbanised, and better educated than both Black groups. The Black samples did not differ in respect of their birthplaces, being predominantly rural, or in respect of their urban experience. However, the literates reported an average of 8 years of schooling, while the illiterates averaged only 1 year. While all the Whites possessed driver's licences, 33% of the Black literates had tried for a licence with 13% possessing one and only one of the Black illiterates had tried for a driver's licence.

Among the Black groups, roughly two thirds were of the Sotho ethnic group, with some 20% of the Zulu ethnic group, and the remainder belonging to other ethnic groups. While the literates were distributed in the same proportions according to their home languages as their ethnic group distribution, the illiterates claimed either Sotho (61,5%) or Zulu (38,5%) as their home language.

The White sample was predominantly Afrikaans-speaking (78,9%) with 13,2% English-speaking. Nevertheless, all subjects were able to speak, read and write both official languages.

TABLE 1

SAMPLE CHARATERISTICS FOR WHITE, BLACK LITERATE AND BLACK ILLITERATE
ISCOR SAMPLES

Information	Whites	Black Literates	Black Illiterates
Age (years)	Mean = 31,08 SD = 11,66	Mean = 30,24 SD = 7,56	Mean = 33,54 SD = 10,73
Years living in the city	Mean = 14,03 SD = 12,56	Mean = 7,41 SD = 7,31	Mean = 8,85 SD = 9,77
Years factory experience	Mean = 9,37 SD = 11,51	Mean = 7,74 SD = 7,31	Mean = 8,08 SD = 7,60
Education (years)	Mean = 10,86 SD = 1,38	Mean = 7,83 SD = 2,00	Mean = 0,92 SD = 1,19
Ethnic Group (percentages)			
White	100,00	-	-
Nguni	-	19,04	23,08
Sotho	-	61,90	69,23
Venda	-	2,38	-
Tsonga	-	11,90	-
Asian	-	2,38	-
Other	-	-	7,69
Missing*	-	2,38	-
Total	100,00 (N=38)	100,00 (N=42)	100,00 (N=13)
Home Language (percentage)			
English	13,17	-	-
Afrikaans	78,94	2,38	-
Zulu	-	19,05	38,50
Sotho	-	64,29	61,50
Other	-	11,90	-
Missing*	7,89	2,38	-
Total	100,00 (N=38)	100,00 (N=42)	100,00 (N=13)
Birth place			
Urban	57,90	14,29	23,10
Rural	36,84	83,33	76,90
Missing*	5,26	2,38	-
Total	100,00 (N=38)	100,00 (N=42)	100,00 (N=13)

* "Missing" indicates no relevant information given

4. RESULTS AND DISCUSSION

4.1 Response scoring

Owing to the difficulties encountered in obtaining full responses to all six questions for each sign (See Section 3.3), it was decided to extract two items of information for each sign (See Section 2.2.4)

The first item of information extracted, yielded a score on a quantitative four-point scale, ranging from (1) "completely correct" to (4) "completely incorrect". Scores were assigned on the basis of the overall response of subjects to each sign. Scoring for this purpose was carried out by two White Staff members and one Black staff member at NIPR each working independently. Differences in scores assigned were resolved by joint consultation afterwards. In the cases of Black illiterates, only one response to each sign was most frequently given, namely a response to the first question. While the responses of the Black literates varied between answers to one question and answers to all six, the majority of White subjects completed the entire questionnaire.

The scores on the quantitative scale were assigned as follows:

- (1) "Completely correct" - if the overall meaning of the sign was comprehended correctly, including the interpretation of colour and shape and of the pictogram.
- (2) "Nearly correct" - if the overall meaning of the sign was not accurately comprehended, but if both colour and shape and the pictogram were correctly interpreted.
- (3) "Nearly incorrect" - if the overall meaning of the sign was not accurately comprehended, but either shape and colour or pictogram was correctly interpreted.
- (4) "Completely incorrect" - if the overall meaning of the sign was not comprehended and neither colour and shape nor pictogram correctly interpreted.

Reference to the overall meaning of the sign was flexible in so far as language and phrasing were concerned. However, the criterion was strictly applied with regard to the basic concept of the sign, the colour and shape and the pictogram.

Colour and shape are used in the signs to denote four general concepts: prohibition, warning, mandatory instruction or information.

The term pictogram refers to either the abstract symbols, or the pictographs depicted on the signs.

An example of the scoring procedure may be given as follows:

Sign 6: Water prohibited for extinguishing of fires

- (1) "Completely correct" - do not use water for putting out fires.
- (2) "Nearly correct" - danger of water and fires.
- (3) "Nearly incorrect" - no fires or fire and water.
- (4) "Completely incorrect" - hand and tree

The three judges reached consensus on the scoring, taking care to maintain consistency in the scoring scheme.

Various tables in the results following have been drawn up with grouped score categories. For convenience and in terms of statistical criteria, scores of "completely correct" and "nearly correct" have been grouped as have scores of "nearly incorrect" and "completely incorrect". This procedure was followed in cases where the score distributions did not adequately cover the range of scores from (1) to (4).

The second item of information extracted from the responses was the actual qualitative response to each sign. This procedure involved the summarising of responses into nominal categories with brief descriptive labels. The qualitative information obtained in this manner proved of value in detecting the cues of comprehension or miscomprehension in each sign, compensating for the difficulty encountered in obtaining responses to all six questions.

4.2 Distributions of Responses to ISO Safety Signs

TABLE 2

RESPONSES OF WHITE, BLACK LITERATE AND BLACK ILLITERATE ISCCR WORKERS TO ISO INDUSTRIAL SAFETY SIGNS

Group code: W = Whites (N = 38); BL = Black Literates (N = 42); BI = Black Illiterates (N = 13)

Scoring code:

- 1 = Correct: overall meaning, colour and shape and pictogram correctly interpreted
- 2 = Nearly Correct: colour and shape and pictogram correctly interpreted, overall meaning incorrect
- 3 = Nearly Incorrect: colour, shape or pictogram correctly interpreted, overall meaning incorrect
- 4 = Incorrect: overall meaning, shape and colour and pictogram incorrectly interpreted

No.	SAFETY SIGNS	1			2			3			4			TOTALS		
		W	BL	BI	W	BL	BI	W	BL	BI	W	BL	BI	W	BL	BI
1	No Smoking	34	24	0	0	0	0	48	23	0	26	77	36	42	13	
2	No Open Fires	100	26	0	0	10	8	0	31	8	0	33	36	42	13	
3	No Pedestrians	97	26	0	3	12	0	0	62	77	0	0	35	42	13	
4	No Entry - Stop	94	83	54	3	7	0	0	7	39	3	3	36	42	13	
5	No Drinking Water	89	29	8	3	17	8	3	50	76	5	4	36	42	13	
6	No Water to Extinguish Fires	67	10	0	17	2	0	11	81	85	6	7	36	42	13	
7	Wear Safety Glasses	91	76	71	3	12	54	3	0	8	3	12	36	41	13	
8	Wear Safety Mask	89	51	15	0	0	23	0	12	8	11	37	36	41	13	
9	Wear Safety Helmet	97	88	54	0	5	31	0	5	8	3	2	36	41	13	
10	Wear Safety Ear Protectors	34	66	27	0	2	31	0	20	8	6	12	36	41	13	
11	Wear Safety Gloves	100	88	70	0	7	62	0	5	0	0	0	35	41	13	
12	Wear Safety Boots	100	93	54	0	7	38	0	0	0	0	0	35	41	13	
13	Warning - General	46	15	8	11	31	15	11	26	23	32	28	35	39	13	
14	Warning of Fire	94	45	8	3	23	61	0	20	0	3	12	35	40	13	
15	Warning of Intoxication	6	3	0	0	3	0	91	90	92	3	4	35	40	13	
16	Warning of Ionising Radiation	9	0	0	0	3	0	82	67	77	9	30	35	39	13	
17	Warning of Corrosive Materials	66	8	0	17	20	23	6	35	39	11	37	35	40	13	
18	Warning of Explosive Materials	74	5	0	23	15	0	3	39	8	0	41	35	39	13	
19	Warning of Electric Shock	41	0	0	15	3	0	28	13	0	16	84	35	39	13	
20	Warning of Overhead Load	100	65	8	0	23	35	0	7	0	0	5	35	40	13	
21	First Aid	88	72	33	0	5	0	3	0	0	3	23	35	40	12	
22	First Aid Direction	91	63	25	6	7	17	3	17	17	0	13	35	40	12	
23	Emergency Escape Route	26	7	0	17	5	8	14	60	67	43	28	35	40	12	
24	Emergency Escape Direction	26	7	0	26	0	8	28	80	67	20	13	35	40	12	
25	Red Circle - Prohibition Signs	77	25	15	23	49	54	0	13	8	0	13	35	39	13	
26	Blue Circle - Mandatory Signs	63	38	8	34	20	15	3	22	31	0	20	35	40	13	
27	Yellow Triangle - Warning Signs	83	57	46	11	7	0	3	16	31	3	18	35	40	13	
28	Green Rectangle - Information	37	18	15	54	33	23	3	23	23	6	26	35	39	13	

Whites: N = 38; Mean = 1,4994
SD = 0,2510

Black Literates: N = 42; Mean = 2,261
SD = 0,4940

Illiterates: N = 13; Mean = 2,835
SD = 0,3920

4.2.1 Red Circle with Red Oblique line - Prohibition Signs

(Sign Nos. 1-6,25)

The White Sample achieved between 89 and 100 percent completely correct comprehension for five out of the six prohibition signs. Sign No. 6 "Water prohibited as an extinguishing agent" yielded 67 percent completely correct responses. The reason for this relatively lower rate of comprehension in Sign 6 is probably due to the double negative concept contained in the sign. While fire is generally perceived as a negative concept the prohibition of water as an extinguishing agent is also a negative concept. Respondents may have had difficulty in reconciling this apparent paradox.

In the Black Literate Sample, the frequency of completely correct responses ranged between 24 and 29 percent for four of the six signs. Sign 6 yielded only 10 percent completely correct responses, confirming the difficulty encountered by the White Sample. Sign 4 "Stop-entry prohibited" produced 83 percent completely correct responses, which seems to result from the familiarity or intuitive appeal of the pictograph.

The Black Illiterate Sample had 0 and in one case 8 percent completely correct responses to five of the six signs. In the case of the "Stop" sign (No. 4) 54 percent completely correct responses were obtained, which corroborates the high level of comprehension of this sign in the Black Literate Sample.

The prohibition concept was completely correctly identified in the group of prohibition signs (No. 25) by 77, 25 and 15 percent of the samples respectively. Including "nearly correct" responses, the concept was correctly identified by 100, 74 and 69 percent of the respective samples.

The above results show that:

- (a) Significant differences exist in the comprehension of the ISO prohibition signs, between Whites, Black Literates and Black Illiterates.
- (b) Whites average 90 percent completely correct comprehension of the prohibition signs, Black Literates average 33 percent and Black Illiterates 10 percent.

- (c) Exceptions to the pattern of responses include the difficulty in all groups in comprehending the "prohibition of water as an extinguishing agent" (Sign 6) with the samples scoring 67, 10 and 0 percent completely correct respectively. The double negative contained in this sign is the apparent source of difficulty, although unfamiliarity with the sign may possibly be a contributing cause.
- (d) Responses to the "Stop-entry prohibited" sign (No. 4) indicate the relatively high level of acceptability for this sign in all the groups. Whites scored 94, Black Literates 83 and Black Illiterates 54 percent completely correct responses. Familiarity and/or the intuitive appeal of the pictograph in this sign could be responsible for its higher rate of comprehension.
- (e) While the prohibition concept is relatively frequently identified in all the groups, and at least one sign with familiar graphics is easily comprehended, the problems arising in this group of signs would appear to be graphics and familiarity with the signs.
- (f) The possible benefits of training are implicit in the differences between the groups differing in levels of literacy and education.
- (g) The significant differences between Whites and Black Literates suggests that either the cultural reference in the signs is biased, or that other intervening variables, such as education and urbanisation are responsible for this difference.

4.2.2 Blue Circle - Mandatory Signs

The six mandatory signs were completely comprehended by between 89 and 100 percent of the White Sample.

In the Black Literate Sample, four signs obtained between 76 and 93 percent completely correct responses. Relatively lower rates of comprehension were revealed for Sign 8 "wear safety mask" and Sign 10 "wear ear protection". These two signs had 51 and 66 percent completely correct responses respectively.

In the Black Illiterate sample, the same four signs as in the Black Literate group yielded completely correct responses of between 30 and 54 percent. Sign 8 yielded 15 percent and Sign 10 yielded 23 percent completely correct responses, which corroborates the trend in the Literate Sample.

The mandatory concept in the group of signs (No. 26) was completely correctly identified by 63, 38 and 8 percent of the three samples respectively.

The results obtained for mandatory sign comprehension suggest the following:

- (a) Significant differences in the samples exist for the mandatory signs, but these are not as pronounced as for the prohibition signs.
- (b) The overall level of comprehension is the highest in all the samples for the mandatory signs relative to the other groups of signs.
- (c) The mandatory principle is not as frequently identified as the prohibition or warning principles nor as high as the comprehension of the individual mandatory signs.
- (d) The relatively high level of comprehension of the individual signs and the relatively lower level of principle identification suggest that the effectiveness of the signs depends more on their familiar or acceptable graphics than on their background presentation.
- (e) The problem signs, numbers 8 and 10 appear to have ambiguous and otherwise unsatisfactory graphic characteristics.

4.2.3 Yellow Triangle Warning Signs

A wide variation in responses to the warning signs is found in the White Sample. Two signs, Nos 14 and 20, have 94 and 100 percent completely correct responses respectively. Two signs, Nos 17 and 18, have levels of 66 and 74 percent respectively, with sign 19 at 41 percent completely correct responses. The two remaining signs, Nos 15 and 16 have only 6 and 9 percent completely correct responses respectively. Furthermore, 83 percent completely correctly identified the warning concept in Slide No. 27.

The explanation suggested in these figures is that, while the warning principle presents little difficulty in the White sample, the signs vary in difficulty according to the level of abstraction of their graphics. Thus overhead loads (No. 20) and fire (No.14) are relatively effective pictographic in nature, signs 17 and 18 are pictographic but intermediate in effectiveness, while signs 13, 15, 16 and 19 contain abstract symbols and are correspondingly less effective. Even in the case of the skull and cross-bones (Sign No. 15), which is an abstract although familiar symbol, the level of comprehension is low. This is clearly due to the difference between the popular interpretation of the symbol as a general warning or warning of electric shock and the sense in which the symbol is used in the ISO signs, i.e. for poisonous substances. This suggests that symbols, where used at all should be consistently used.

These observations are corroborated in the Black Literate and Illiterate Samples. In the cases of the fire and overhead load warnings (Nos 14 and 20) 45 and 65 percents respectively of the Black Literates scored "completely correct". In the Black Illiterate Sample, 69 and 93 percent scored at least "nearly correct" on the 2 respective signs. The remaining signs were either intermediate (Nos 13, 17 and 18) or minimal in their levels of correct comprehension.

Following the pattern of the White Sample, 64 and 46 percent of the respective Black Samples scored at least "nearly correct" in response to the group of signs (No. 27).

The data with respect to the Yellow Triangle warning Signs suggest the following:

- (a) Whites average 55 percent completely correct responses to the signs, Black Literates 18 percent and Illiterates 2,3 percent. These differences are significant.
- (b) Wide variations in the levels of comprehension of the warning signs are observed in all three samples.
- (c) While the levels of identification of the warning principle in the signs is satisfactory, the variation in sign comprehension corresponds with the quality of the pictogram varying from effective pictorial representation to ineffective abstract symbols.

4.2.4 Green Rectangle/Square - Information Signs

The Green information signs yield a dichotomy of comprehension in all three groups. While the levels of comprehension for the First Aid (No. 21) and First Aid direction (No. 22) signs are high in all the groups, the Emergency Escape Route (No. 23) and Escape Direction (No. 24) are correspondingly low. The scores for the two First Aid signs in the respective samples were 88, 72, 33 and 91, 63, and 25 percent completely correct. For the two emergency exit signs, the figures in the three groups were respectively, 26, 7, 0 and 26, 7, 0.

The information concept in Slide 28 was not frequently completely correctly comprehended in any of the groups, although actual responses indicated close to correct interpretations in most cases. (The problem with Slide 28 seems to have been too small a number of signs for a general principle to be easily extracted).

The data for the green information signs suggests the following:

- (a) Differences between the samples persist in relation to the information signs.
- (b) The difference in comprehension between the first aid signs and the emergency escape signs is apparently due to the differences either in their familiarity and/or in their graphic characteristics.
- (c) The green background and square shape for information signs is not as readily identified as the other three sign-colour-shape concepts, but is comprehended in essence by most respondents.

4.3 Differences between the three samples in the comprehension of ISO Safety Signs.

TABLE 3

T-TESTS OF THE DIFFERENCES BETWEEN THE MEAN RESPONSES OF WHITE AND BLACK ISCOR WORKERS TO 28 ISO SAFETY SIGNS

Sample	N	Mean	SD	SE	Variance Test		Pooled Variance			Separate Variance		
					F	p	t	df	p	t	df	p
1 White Clerks	10	1,4250	0,121	0,038	3,84	0,058	0,04	18	0,967	0,04	13,38	0,967
2 White Apprentices	10	1,4214	0,237	0,075								
1 White Clerks	10	1,4250	0,121	0,038	5,64	0,015**	-1,88	21	0,075	-2,06	16,97	0,055*
3 White Operators	13	1,6071	0,287	0,080								
2 White Apprentices	10	1,4214	0,237	0,075	1,47	0,572	-1,66	21	0,112	-1,70	20,86	0,104
3 White Operators	13	1,6071	0,287	0,080								
4 All White Groups	36	1,4994	0,251	0,042	3,87	0,001***	-8,35	76	0,001	-8,75	62,78	0,001***
5 Black Literates	42	2,2606	0,494	0,076								
4 All White Groups	36	1,4994	0,251	0,042	2,43	0,041**	-14,06	47	0,001	-11,47	15,72	0,001***
6 Black Illiterates	13	2,8352	0,392	0,109								
5 Black Literates	42	2,2606	0,494	0,076	1,59	>0,05	3,83	53	0,001			
6 Black Illiterates	13	2,8352	0,392	0,109								

* : significant at the 0,10 level; * : significant at the 0,05 level ; *** : significant at the 0,001 level

Table 3 indicates highly significant differences between Whites and Black Literates ($p < 0,001$) and between Black Literates and Black Illiterates ($p < 0,001$). Whites averaged a score of 1,5 on all the signs, representing an average response lying between "completely correct" and "nearly correct." Black Literates averaged a score of 2,3 which represents an average response of "nearly correct" and Black Illiterates averaged 2,8 which represents an average response of "nearly incorrect."

The above results for the entire sample of signs are consistent with in the individual signs and the four groups of signs. The differences between the three samples tested are significant across the four groups of signs, although the relative scores vary according to the actual sign categories. (See Table 4 below).

TABLE 4

T-TESTS OF THE DIFFERENCES BETWEEN THE MEAN RESPONSES OF WHITE, BLACK LITERATE AND BLACK ILLITERATE ISCOR WORKERS TO FOUR GROUPS OF ISO SAFETY SIGNS.

Sign Groups	Samples	N	Mean	Rank	SD	p*
Prohibitory Signs (n=6)	Whites	36	1,1575	(2)	0,2141	0,001
	Black literates	42	2,3810	(2)	0,5811	0,001
	Black illiterates	13	3,1282	(3)	0,6611	
Mandatory Signs (n=6)	Whites	36	1,1250	(1)	0,1264	0,001
	Black literates	42	1,5122	(1)	0,4807	0,001
	Black illiterates	13	2,1154	(1)	0,5605	
Warning Signs (n=8)	Whites	36	1,9214	(4)	0,7736	0,001
	Black literates	42	2,7772	(4)	0,7307	0,10
	Black illiterates	13	3,1535	(4)	0,6396	
Information Signs (n=4)	Whites	36	1,8714	(3)	0,8354	0,01
	Black literates	42	2,3625	(3)	0,7663	0,001
	Black illiterates	13	3,0208	(2)	0,1969	

* "p" indicate significant beyond the relevant level

Table 4 indicates that for all three samples, the Mandatory Signs are the most easily comprehended. Whites score an average of 1,1250, close to "completely correct." Black Literates score 1,5122, between "completely correct" and "nearly correct." Black Illiterates score 2,1154, "nearly correct".

The Prohibition Signs are second in their ease of comprehension for the Whites (1,1250) and Black Literates (2,3810) while the Black Illiterates score (3,1282) ranks third in ease of comprehension.

The Information Signs rank third in comprehension for the Whites (1,8710) and Black Literates (2,3625) and second for the Black Illiterates (3,0208).

The most difficult signs for all three samples are the warning signs. Whites score an average of 1,9214, "nearly correct." Black Literates score 2,7772, "nearly incorrect" and Black Illiterates score 3,1535, also "nearly incorrect".

4.4 Qualitative Responses of the Black Literate and Black Illiterate Samples to ISO Safety Signs.

It was considered necessary to extract the qualitative responses to the ISO Safety Signs for the Black Literate and Illiterate samples. The White sample's responses were not considered to be useful in providing key information as to sources of cultural misunderstanding of the signs, and were therefore not included in this analysis.

The range of qualitative responses indicates that most often at least one aspect of each sign is comprehensible to Black Literates as well as Illiterates. While it is suggested that the general scheme of the ISO Safety Signs is potentially acceptable to all the groups tested, the ambiguity of the graphics is prevalent in a large number of cases.

It is suggested that Tables 5.1 through 5.28 be studied carefully with a view to the need and methods for their modification. These tables should also provide directives for the development of a training program for the use of the ISO Safety Signs.

RESPONSES OF BLACK LITERATE (N=42) AND ILLITERATE (N=13) ISCOR WORKERS
TO 24 ISO INDUSTRIAL SAFETY SIGNS

TABLE 5

SCORING KEY :

- 1 = Completely correct : meaning, background and pictogram correct
 2 = Nearly correct : background and pictogram correct, meaning incorrect
 3 = Nearly incorrect : background or pictogram correct, meaning incorrect
 4 = Completely incorrect : meaning, background, pictogram incorrect

5.1 NO SMOKING

1	2	3	4	TOTAL
18%	2%	42%	38%	100%
10	1	23	21	55N
	Don't use the test tube....1	Danger..... 11 Fire..... 7 Light..... 1 Cigarette.. 1 No parking. 1 Beware load 1 Don't hang- on the hook 1 <hr/> 23	No response... 9 Hook..... 2 Say something. 1 Read..... 1 Cross..... 1 Whip..... 1 Iron..... 1 Bottle..... 1 Chain lock.... 1 Ask..... 1 Parking..... 1 Ball..... 1 <hr/> 21	

5.2 NO OPEN FIRES

1	2	3	4	TOTAL
20%	9%	25%	46%	100 %
11	5	14	25	55 N
	Near correct. 2	Fire..... 7	No response.. 7	
	Fire&matches. 2	Danger..... 4	Bird..... 4	
	Put out fire. 1	Candle..... 2	Flag..... 3	
	<hr/>	Go slow..... 1	Bosveld..... 1	
	5	<hr/>	Road sign.... 1	
		14	Letter..... 1	
			Free..... 1	
			Flower..... 1	
			Filling statn 1	
			Garden fork.. 1	
			Bottle..... 1	
			Go to rt side 1	
			No parking... 1	
			Red&black.... 1	
			<hr/>	
			25	
			<hr/>	

5.3 NO PEDESTRIANS

1	2	3	4	TOTAL
20%	9%	65%	6%	100 %
11	5	36	3	55 N
	Near correct. 1	Pedestrians..19	No response.. 2	
	Don't cross.. 1	Man walking.. 9	Person pulling 1	
	Danger people	Man at robot. 1	<hr/>	
	crossing.... 1	Very brave man 1	3	
	Person-avoid	Danger..... 1	<hr/>	
	danger..... 1	People beware. 1		
	Stop & look.. 1	People, stop		
	<hr/>	walking..... 1		
	5	Go..... 1		
		Always walk.. 1		
		Road open.... 1		
		<hr/>		
		36		
		<hr/>		

5.4 STOP

1	2	3	4	TOTAL
76%	6%	15%	3%	100 %
42	3	8	2	55 N
	Near correct. 1	Hand..... 7	Handcuffs.... 1	
	Danger..... 1	Drive slowly 1	No response.. 1	
	Traffic cont. 1			
	<hr/>	<hr/>	<hr/>	
	3	8	2	
	<hr/>	<hr/>	<hr/>	

5.5 NO DRINKING WATER

1	2	3	4	TOTAL
24%	15%	55%	6%	100 %
13	8	30	4	55 N
	Near correct. 4	Water, tap,	No response.. 4	
	No water pipe 1	cup.....25		
	Pour till full 1	Water, tap,	<hr/>	
	Close tap.... 1	bucket.... 3	4	
	Safe water... 1	Look for		
	<hr/>	water..... 1		
	8	Hot drinks. 1		
	<hr/>	<hr/>		
		30		
		<hr/>		

5.11 WEAR SAFETY GLOVES

1	2	3	4	TOTAL
74%	20%	4%	2%	100 %
40	11	2	1	54 N
	Near correct. 9	Hand..... 2	Person.. 1	
	Gloves for cold..... 1		1	
	Gloves..... 1			
	11			

5.12 WEAR SAFETY BOOTS

1	2	3	4	TOTAL
83%	15%	0%	2%	100 %
45	8	0	1	54
	Near correct. 8		White things	
	8		... 1	
			1	

5.13 FIRE WARNING

1	2	3	4	TOTAL
36%	32%	15%	17%	100 %
19	17	8	9	53
	Near correct. 0	Match fac-	No response 2	
	Fire.....17	tory..... 1	Road sign.. 1	
	17	Fire for	Flowers.... 3	
		cooking.... 1	Stop sign.. 1	
		Flame..... 1	Cross..... 1	
		Make fire... 1	Plantation. 1	
		Danger..... 2		
		Stop..... 1		9
		Noise..... 1		
		8		

5.14 GENERAL WARNING

1	2	3	4	TOTAL
14%	27%	23%	36%	100 %
7	14	12	18	53 N
	Near correct. 1	Crane.....10	No response.10	
	Danger..... 4	Danger-	3 corner	
	Stop..... 4	tram..... 1	sign..... 3	
	Yield..... 3	Demanding	Road sign... 2	
	Look both ways 2	answer... 1	Isco sign.. 1	
	<hr/>	<hr/>	Type of sign 1	
	14	12	Parking..... 1	
			<hr/>	
			18	

5.15 WARNING OF INTOXICATION

1	2	3	4	TOTAL
2%	2%	89%	7%	100 %
1	1	48	3	54 N
	<u>Danger of gas 1</u>	Danger....38	Machine..... 1	
	1	Skeleton.. 6	Number..... 1	
		Danger of	Only pass... 1	
		electric. 4	<hr/>	
		48	3	
		<hr/>	<hr/>	

5.16 WARNING OF IONISING RADIATION

1	2	3	4	TOTAL
0%	2%	69%	29%	100 %
0	1	36	15	52 N
	Dynamite..... 1	Danger....10	No response. 8	
	<hr/>	Fan.....10	Flower..... 1	
	1	Flywheel.. 9	Robots..... 1	
		Windmill.. 4	Points..... 1	
		Stop..... 2	Train stop.. 1	
		Knife..... 1	String tie.. 1	
		<hr/>	Turnstiles.. 1	
		36	Curtains.... 1	
		<hr/>	<hr/>	
			15	

5. 17 WARNING OF CORROSION

1	2	3	4	TOTAL
5%	21%	36%	38%	100 %
3	11	19	20	53 N
	Hand cut- beware.... 9	Danger..... 4	No response.. 7	
	Hand cut- gloves.... 2	Hand&stick. 3	Train rail... 1	
	<hr/> 11	Falling objects... 3	Roads..... 3	
		No entry... 2	How to get it 1	
		Hail..... 1	Stop..... 1	
		Water drops 1	Accident.... 1	
		Machines... 1	Ship..... 1	
		Pour in ... 1	School..... 1	
		Hands..... 1	Blood..... 1	
		Wash hands. 1	River..... 1	
		Report it.. 1	Robots..... 1	
		<hr/> 19	Worktools.... 2	
			<hr/> 20	

5. 18 WARNING OF EXPLOSIVE MATERIALS

1	2	3	4	TOTAL
4%	12%	30%	54%	100 %
2	6	16	28	52
	Danger- burning iron..2	Danger....5	No response..11	
	Danger-stone...1	Feathers..2	Crossroads... 3	
	Fire shooting..1	Packing...1	Sun..... 3	
	Fire from ball.1	Rocks.....1	Box of papers 1	
	Cracked stone..1	Kill stonel	Water..... 1	
	<hr/> 6	Flame.....1	Motorway..... 1	
		Gas.....1	Falling irons 1	
		Bright lts1	Blackboard... 1	
		Machine...1	Iscor..... 1	
		Falling...1	Smelting..... 1	
		Smoke.....1	Tunnel..... 1	
		<hr/> 16	Wind..... 1	
			Fuel gauge... 1	
			Flowers..... 1	
			<hr/> 28	

5.19 WARNING OF ELECTRIC SHOCK

1	2	3	4	TOTAL
0%	2%	10%	88%	100 %
0	1	5	46	52 N
	Near Correct... 1	Danger..... 5	Road Direc- tion.....43	
	<hr/> 1	<hr/> 5	Assegai..... 1	
			No response. 2	
			<hr/> 46	

5.20 WARNING OF OVERHEAD LOAD

1	2	3	4	TOTAL
50%	38%	6%	6%	100 %
27	20	3	3	53 N
	Crane.....19	Danger..... 3	Tram..... 1	
	Loose rope.... 1	<hr/> 3	Train..... 1	
	<hr/> 20		Suitcase.... 1	
			<hr/> 3	

5.21 FIRST AID

1	2	3	4	TOTAL
63%	4%	0%	33%	100 %
33	2	0	17	52 N
	Ambulance.... 2		Crossroads..16	
	<hr/> 2		Danger..... 1	
			<hr/> 17	

5.22 FIRST AID DIRECTION

1	2	3	4	TOTAL
54%	10%	17%	19%	100 %
28	5	9	10	52 N
	Near Correct... 1 Ambulance direc 4	Direction.... 8 l-way road... 1	Crossroads.. 3 No response. 2 Straight.... 1 Sign&cross.. 1 Go slow..... 1 Spears..... 1 Assegai..... 1	
	<hr/> 5	<hr/> 9	<hr/> 10	

5.23 EMERGENCY EXIT ROUTE

1	2	3	4	TOTAL
6%	6%	62%	26%	100 %
3	3	32	14	52 N
	Man running to hospital..... 2 Entrance..... 1	Pedestrians..28 Playing field 3 Post office.. 1	No response. 5 People..... 3 Road end.... 2 Resting placel Danger..... 1 Filling stn. 1 Fields..... 1	
	<hr/> 3	<hr/> 32	<hr/> 14	

5.24 EMERGENCY EXIT DIRECTION

1	2	3	4	TOTAL
6%	2%	73%	19%	100 %
3	1	38	10	52 N
	Entrance far... 1	Direction....31 Pedestrians.. 7	No response. 6 Road sign... 2 No entry.... 2	
	<hr/> 1	<hr/> 38	<hr/> 10	

5.25 RED CIRCLES : PROHIBITORY SIGNS

1	2	3	4	TCTAL
23%	50%	12%	15%	100 %
12	26	6	8	52 N
	Danger.....15	Red Circle... 6	No response. 5	
	Road stop.....10		List..... 3	
	Prevention..... 1	6	8	
	26			

5.26 BLUE CIRCLES : MANDATORY SAFETY EQUIPMENT SIGNS

1	2	3	4	TOTAL
30%	19%	25%	26%	100 %
16	10	13	14	53 N
	Near correct... 1	Colour&shape. 8	No response. 4	
	Safety..... 4	Danger..... 4	List..... 6	
	Danger&safety.. 2	Use for work. 1	Darkness.... 2	
	Permitted..... 2		Sky..... 1	
	Information.... 1	13	Traffic cir. 1	
	10		14	

5.27 YELLOW TRIANGLES : WARNING SIGNS

1	2	3	4	TOTAL
55%	6%	20%	19%	100 %
29	3	11	10	53 N
	Safety..... 1	Colour&shape. 5	No response. 4	
	Restriction.... 1	Stop/yeild... 3	List..... 3	
	Look at road... 1	List-warns... 2	Road signs.. 2	
	3	Broken things 1	Blood..... 1	
		11	10	

5.28 GREEN RECTANGLES AND SQUARE : INFORMATION SIGNS

1	2	3	4	TOTAL
17%	31%	23%	29%	100 %
9	16	12	15	52 N
	Near correct.16	Colour&shape. 6	No response.7	
	16	Specifics.... 6	List.....5	
		12	Pasture.....1	
			Youth.....1	
			Blue.....1	
			15	

Sign 1 - No Smoking

The No Smoking Sign has only 20% of the Black Samples with scores of "1" and "2". Thus, for 80 percent of the respondents this sign is not adequately comprehensive.

42 percent were able to comprehend at least the prohibitory message or the cigarette depiction.

38 percent were unable to comprehend any aspect of the sign.

Care should be taken to remove possibly ambiguous cues suggested in columns 3 and 4 of Table 5.1, for example, a "hook" or a "whip". Graphic modification of the sign is recommended to eliminate ambiguities in the sign .

Sign 2 - No Open Fires

71 percent of the Black Samples were either "nearly incorrect" or "completely incorrect" in their interpretations of Sign 2.

Among the 46 percent who scored "completely incorrect", the following ambiguities are suggested (See Table 5.2): The burning match might be seen as a bird, flag, and as a flower among other depictions.

Clarification of the graphic representation of a burning match is recommended.

Sign 3 - No Pedestrians

Only six percent of the Black Sample were unable to comprehend Sign 3 at all.

The majority (65 percent) seemed to have problems with the prohibitory aspect of the sign. However, it is clear that at least 94 percent of the subjects saw the same object depicted in the sign.

No graphic modifications for Sign 3 are suggested.

Sign 4 - Stop

Only 2 out of 55 Black respondents were completely incorrect in their interpretations of the Stop Sign.

Very little modification could be suggested for the Stop sign, except perhaps to test the effectiveness of the octagonal shape.

Sign 5 - No Drinking Water

The precise message of Sign 5 is communicated to only 24 percent of the sample. The majority 55 percent were unable to grasp the prohibitory instruction, while 15 percent had difficulty in integrating the message.

Experimentation with a reinforcement to the standard prohibition message is recommended for this sign, such as the use of a snake or a skull and crossed bones symbol.

Sign 6 - No Water to Extinguish Fires

Only 8 percent of the Black Samples correctly or nearly correctly comprehended Sign 6 (See Table 5.6)

The vast majority 92 percent of the Blacks display problems in the perception of the graphics of the Sign, although some respondents experienced difficulty in resolving the double negative concept in the sign.

The White Sample also had difficulty in comprehending the double negative in the Sign, where only 67 percent scored completely correct as opposed to over 89 percent in the cases of the other five prohibition signs.

Graphic modifications are clearly required for the sign, and the double negative could be reinforced by an additional symbol in the sign.

Sign 7 - Wear Safety Glasses

87 percent of the Black Samples were able to correctly identify Sign 7.

Graphic improvement may be required as suggested by a small number of responses in Table 5.7.

Sign 8 - Wear Safety Mask

Of the 6 Mandatory Safety Signs tested this sign was the most problematic. A majority of 51 percent of the Black Samples revealed ambiguity in the graphic representation of the sign.

Modification of the graphics of Sign 8 is regarded as essential. The guidelines for the elimination of ambiguity in the sign are clearly listed in Table 5.8.

Sign 9 - Wear Safety Helmet

At least 91 percent comprehend Sign 9 correctly and no modifications are suggested.

Sign 10 - Wear Safety Earphones

35 percent of the Black Samples display difficulty with the graphics of Sign 10.

Graphic modification of this sign is suggested following the guidelines in Table 5.10.

Sign 11 - Wear Safety Gloves

94 percent of the Black Sample score either "1" or "2" on Sign 11.

No modifications are suggested.

Sign 12 - Wear Safety Boots

98 percent of the Black Sample scored either "1" or "2".

No modifications are suggested.

Sign 13 - Fire Warning

At least 83 percent of the Black Samples have no difficulties in perceiving the fire and/or warning messages. (Scores "1", "2" and "3", Table 5.13).

Modification may be considered to eliminate responses such as "flowers" indicated in Table 5.13.

Sign 14 - General Warning

69 percent of the Black Samples are unable to comprehend Sign 14 nearly or completely correctly.

The sign is comprehended completely correctly by only 46 percent of the White Sample (Table 2).

It is recommended that Sign 14 be abandoned in its present form. The abstract exclamation mark as a symbol for danger appears to detract rather than add to the Plain Yellow Triangle as a general warning sign.

Sign 15 - Warning of Intoxication

Sign 15 is the best example of a sign having a different meaning in the ISO system to that in common use.

The skull and cross bones represent danger or danger of electricity to 89 percent of the Black Samples (Table 5.15) and to 90 percent of the White Sample (Table 2)

The sign is therefore not appropriate for the communication of poisonous substances in its present format.

It is recommended, firstly that the skull and cross-bones be tested for the purpose of a general warning sign. Secondly, it is suggested that the colour red be incorporated into the sign as one possible representation of poisonous substances.

Sign 16 - Warning of Ionising Radiation

Sign 16 is incomprehensible to 98 percent of the Black Samples and 91 percent of the White Samples.

The majority of respondents in all the samples were, however, able to identify danger in the signs.

It is suggested that , in view of the lack of a suitable pictographic alternative to the symbol used in Sign 16, and used internationally, the sign be adopted.

One possible addition to the sign might be the skull and cross-bones which may reinforce the danger message.

Sign 17 - Warning of Corrosion

74 percent of the Black Samples experienced difficulty with the graphics of Sign 17.

It is recommended that Sign 17 be redrawn along the lines suggested in Table 5.17. Specifically, greater clarity is needed to depict the corroded hand and bar. The size of the pictogram in Sign 17 should be increased for greater clarity.

Sign 18 - Warning of Explosive Materials

84 percent of the Black Sample did not comprehend this sign correctly or nearly correctly. While 30 percent of these appeared to perceive the pictogram correctly, without the correct interpretation, 54 percent displayed completely mistaken responses to Sign 18. (See Table 5.18).

Graphic modification of Sign 18 is recommended to eliminate the ambiguities revealed in Table 5.18, column 4.

Sign 19 - Warning of Electric Shock

88 percent of the Black Sample were unable to comprehend any aspect of Sign 19.

This clearly indicated that the flashing arrow symbol in Sign 19 detracts from its communication value. This symbol should be eliminated from the sign and replaced by the more familiar skull and cross-bones or by a more satisfactory pictogram.

Sign 20 - Warning of Overhead Load

At least 88 percent of the Black Sample succeeded in comprehending Sign 20 at least "nearly correctly."

No modifications to Sign 20 are suggested.

Sign 21 - First Aid

Sign 21 appears to yield an "all or nothing response." While 67 percent of the Black Samples comprehended the sign at least nearly correctly, 33% had completely erroneous interpretations.

The confusion evident in the responses to Sign 21 (Table 5.21) appears to indicate a certain ambiguity of meaning attributed to the white cross against a green backing. For at least one third of the sample, this symbol was taken to represent "crossroads" in a road safety context.

It is therefore recommended that the sign be modified by the colouring of the cross red within a white circle against a rectangular green background. These suggested modifications would conform to the sign currently in Municipal road traffic use to represent hospitals.

Sign 22 - First Aid Direction

Of the 33 percent of the Black Samples who were unable to correctly comprehend the first aid sign, roughly one half were able to identify the arrow in Sign 22. However approximately the same one third of the sample interpret the white cross in Sign 22 as crossroads.

The same modification is suggested for Sign 22 as for Sign 21, namely, to colour the cross red, within a white circle against a green rectangular background.

Sign 23 - Emergency escape (Exit) Route

88 percent of the Black Samples and 57 percent of the Whites Sample are

unable to identify the escape route concept in Sign 23.

It is recommended that the sign be modified graphically to convey the message more effectively. An addition to the door pictograph could be one modification, while the removal of the door from the sign might improve the sign better than an addition.

Sign 24 - Emergency Escape (Exit) Direction

The same difficulty is experienced in Sign 24 as in Sign 23. Only 6 percent of the Black Sample and 26 percent of the White Sample comprehended the sign completely correctly.

Similar modifications are accordingly suggested for Sign 24, namely, either the addition of part of a door or the removal of the door from the pictogram.

Sign 25 - Prohibition Signs

73 percent of Blacks and 100 percent of Whites comprehended the concept of prohibition in the group of signs at least nearly correctly.

It is recommended that a Red circle with an oblique red line, white background and black pictogram be accepted for implementation as prohibition signs.

Sign 26 - Mandatory Signs

Some 74 percent of the Black Sample at least partially identified the mandatory message conveyed in the group of signs (scoring between "1" and "3")

The only modifications suggested to the blue circle as a mandatory sign is the testing of different hues of blue for maximum acceptability and effectiveness (See Table 5.26).

Sign 27 - Warning Signs

Although a great many problems emerged in the responses of all the samples to the eight warning signs, the principle of the warning signs is comprehended by some 81 percent of the Black Samples and over 90 percent in the White Sample.

The only modifications proposed to the ISO Warning Sign principle is the testing of the skull and cross-bones as a supplement to the yellow triangle in the case of each or some specific warning signs.

Sign 28 - Information Signs

Some 71 percent of the Black Sample and 94 percent of the White Sample were able to identify the basic concept in the information signs (Scores of "1" to "3") (See Tables 5.28 and 2).

No modifications are proposed to the existing representation of information signs.

No modifications have been suggested to the ISO convention for depicting the four categories of signs tested.

Modifications of certain ambiguous graphics in a number of signs have been suggested in this section.

4.5 Relationships between biographical variables and responses to ISO Safety Signs.

Tables 6 to 13 represent the relationships between biographical variables and average responses to ISO Safety Signs in the three samples.

In the White Sample, the only significant relationship observed is between number of years of education and average sign responses. The higher the education, the higher the level of ISO Safety Sign comprehension. Those subjects having 8 or 9 years schooling all scored "nearly correct" on average while those with 13 years schooling all scored an average of "completely correct".

TABLE 6

RELATIONSHIP BETWEEN NUMBER OF YEARS SCHOOLING AND AVERAGE RESPONSES TO ISO SAFETY SIGNS IN WHITE ISCOR WORKERS.

(Frequencies and percentages by Rows)					
Number of Years schooling	1 completely correct		2 nearly correct		TOTAL
	N	(%)	N	(%)	
8	0	(0)	3	(100)	3
9	0	(0)	2	(100)	2
10	4	(44)	5	(56)	9
11	6	(75)	2	(25)	8
12	9	(82)	2	(18)	11
13	3	(100)	0	(0)	3
TOTAL	22		14		36

$$\chi^2 = 13,43$$

$$df = 5$$

$$p < 0,02$$

TABLE 7

RELATIONSHIP BETWEEN AGE AND AVERAGE RESPONSES TO ISO SAFETY SIGNS IN BLACK LITERATE ISCOR WORKERS.

AVERAGE SCORE

A G E	AVERAGE SCORE			TOTAL
	N ¹ (%)	N ² (%)	N ³ (%)	
19 - 28	2 (9,52)	8 (38,10)	11 (52,38)	21
29 - 38	0 (0,00)	10 (76,92)	3 (23,08)	13
39 - 50	2 (28,57)	2 (28,57)	3 (42,86)	7
TOTAL	4 (9,76)	20 (48,78)	17 (41,46)	41

$$\chi^2 = 8,705$$

$$df = 4$$

$$p < 0,05$$

Among Black Literate workers, age was positively related to average responses. Subjects aged between 19 and 28 years scored "nearly incorrect" (2) more often than expected, those aged between 29 and 38 scored "nearly correct" (2) more often than expected and those in the group - 39 to 50 years scored "correct" (1) more often than expected. (See Table 7 above)

TABLE 8

RELATIONSHIP BETWEEN ETHNIC GROUP AND AVERAGE RESPONSES TO ISO SAFETY SIGNS IN BLACK LITERATE ISCOR WORKERS.

AVERAGE SCORE

ETHNIC GROUP	1 + 2		3		TOTAL
	N	(%)	N	(%)	
NGUNI	3	(37,5)	5	(62,5)	8
SOTHO	20	(76,92)	6	(23,08)	26
TSONGA	1	(20,0)	4	(80,0)	5
TOTAL	24	(61,53)	15	(38,47)	39

$\chi^2 = 8,16$

df = 2

p = 0,02

The ethnic group comparison in Table 8 above indicates that Sotho in the Black Literate Sample scored "1" or "2" more often than Nguni or Tsonga subjects, 77 percent as opposed to 38 and 20 percent respectively. This comparison could have been influenced by uncontrolled factors biased in favour of the Sotho subjects.

TABLE 9.

RELATIONSHIP BETWEEN HOME LANGUAGE AND AVERAGE RESPONSES TO ISO SAFETY SIGNS IN BLACK LITERATE ISCOR WORKERS.

AVERAGE SCORE

H O M E L A N G U A G E	1 + 2	3	TOTAL
	N (%)	N (%)	
ZULU	3 (37,5)	5 (62,5)	8
SOTHO	20 (74,07)	7 (25,93)	27
TOTAL	23 (65,71)	12 (34,29)	35 (100%)

$$\chi^2 = 3,67$$

$$df = 1$$

$$p \approx 0,05 \text{ (1 tailed)}$$

In a similar manner to the ethnic group factor, home language is significantly related to average sign comprehension. Nearly three quarters (74 percent) of the Sotho group scored an average of 1 or 2, whereas only 38 percent of the Zulu group had scores of 1 or 2.

TABLE 10

RELATIONSHIP BETWEEN HAVING TRIED FOR A DRIVER'S LICENCE AND AVERAGE RESPONSES TO ISO SAFETY SIGNS IN BLACK LITERATE ISCOR WORKERS.

AVERAGE SCORE

		N ¹ (%)	N ² (%)	N ³ (%)	TOTAL
TRIED FOR DRIVER'S LICENCE	YES	2 (15,38)	10 (76,92)	1 (7,69)	13
	NO	2 (7,69)	11 (42,31)	13 (50,00)	26
	TOTAL	4 (10,26)	21 (53,85)	14 (35,29)	39

$$\chi^2 = 6,74$$

$$df = 2$$

$$p = 0,025 \text{ (one tailed)}$$

Table 10 shows a significant positive relationship among Black Literates between having tried for a driver's licence and average sign comprehension scores. Among those one third of the group who had tried for a driver's licence, average sign comprehension scores were more often "1" and "2" than in the remainder of the group.

TABLE 11

RELATIONSHIP BETWEEN NUMBER OF YEARS SCHOOLING AND AVERAGE RESPONSES
TO ISO SAFETY SIGNS IN BLACK LITERATE ISCOR WORKERS.

AVERAGE SCORE

	AVERAGE SCORE			TOTAL
	1 N (%)	2 N (%)	3 N (%)	
NO. OF YEARS SCHOOLING				
1 - 5	3 (15,79)	7 (36,84)	9 (47,37)	19
6 - 10	1 (4,55)	14 (63,64)	7 (31,82)	22
TOTAL	4 (9,76)	21 (51,22)	16 (39,02)	41 (100%)

$\chi^2 = 4,32$

df = 2

p < 0,10

Table 11 above, shows a significant though inconsistent relationship between number of years schooling and sign comprehension. Of the nineteen subjects who had between one and five years schooling, more than expected had scores of "1" and "3" while less than the number expected had scores of "2". Similarly, of the group of twenty-two with 6 to 10 years schooling, more than expected scored "2" while fewer than expected scored "1" or "3". Possibly different groupings of the number of years schooling variable could reveal a more meaningful pattern.

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TABLE 12

RELATIONSHIP BETWEEN HAVING TRIED FOR A DRIVER'S LICENCE AND AVERAGE RESPONSES TO ISO SAFETY SIGNS IN BLACK LITERATE AND BLACK ILLITERATE ISCOR WORKERS.

AVERAGE SCORE

	1	2	3 + 4	TOTAL	
	N	N	N		
TRIED FOR A DRIVER'S LICENCE	YES	2 (14,29)	10 (71,43)	2 (14,29)	14
	NO	2 (5,56)	13 (36,11)	23 (63,89)	36
	TOTAL	4 (7,69)	23 (44,23)	25 (48,08)	52

$$\chi^2 = 8,53$$

$$df = 2$$

$$p = 0,02$$

In a similar manner to the results in the Black Literate Sample, a significant relationship is revealed in Table 12 above between having tried for a driver's licence and average sign scores in the combined Black sample. Those respondents who had tried for a licence comprehended the signs more accurately than the rest of the group.

TABLE 13

RELATIONSHIP BETWEEN NUMBER OF YEARS SCHOOLING AND AVERAGE RESPONSES TO ISO SAFETY SIGNS IN BLACK LITERATE AND BLACK ILLITERATE ISCOR WORKERS.

AVERAGE SCORE

NO. OF YEARS SCHOOLING	1 + 2	3 + 4	TOTAL
	N (%)	N (%)	
0 - 3	4 (25)	12 (75)	16
4 - 6	13 (54,17)	11 (45,83)	24
7 - 10	11 (91,67)	1 (8,33)	12
TOTAL	28 (53,85)	24 (46,15)	52

$$\chi^2 = 12,86$$

$$df = 2$$

$$p = 0,2$$

Table 13 above shows a more meaningful relationship in the combined Black Sample than in the Literate group alone, between education and sign comprehension. The more years completed at school, the better the scores on sign comprehension.

Thus, aside from the differences revealed in the previous section between Blacks and Whites and Literates and Illiterates in ISO sign comprehension, the following tendencies emerged from the study.

Among the White sample, education was significantly and positively related to sign comprehension. (Table 6)

Among the Black Literate Sample, education was significantly but not meaningfully related to sign comprehension (Table 11). Subjects of the Sotho ethnic group, speaking the Sotho language were significantly more accurate in sign comprehension than the Zulus or Tsonga and speakers of these respective languages (Tables 8 and 9)

Having tried for a driver's licence is significantly and positively related to sign comprehension in both the Black Literate and combined Literate and Illiterate Black Samples (Tables 10 and 12).

Education is significantly and positively related to sign comprehension in the combined Black Sample (Table 13).

While it is difficult to state any of the above relationships categorically, particularly those relating to Ethnic groups and home languages, the tendency observed in the results is for a certain cluster of variables to be related to sign comprehension. In general, education and driver's test experience are related to sign comprehension. Since both these variables are concerned with training, it must be tentatively concluded that training is indispensable to the implementation of the ISO Safety Signs in all the groups of workers tested.

A more extensive and systematically chosen sample is needed to test the extent of the relationship between sign comprehension and other biographical variables, such as urban-rural experience, factory experience, sex and a more representative sampling of ethnic groups.

Similarly, the effects of training on ISO sign comprehension requires a further study in which these effects are directly assessed in a controlled before and after experiment.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 The Sample

The sample for this study comprised 38 White, 42 Black Literate and 13 Black Illiterate male ISCOR employees, working in Pretoria.

It is recommended that a further study on ISO sign comprehension in South Africa should draw a sample more representative in respect of ethnic and language groups, female workers, workers with varying levels of urban, industrial, educational and training experience. The variations observed between and within the three groups sampled here is great enough to suggest that a more extensive sample will yield even greater variations in quantitative and qualitative responses to the ISO Safety Signs.

It is also clear that the numbers of subjects tested here, particularly in the case of the Illiterate group, should be increased in future studies.

5.2 The Method

5.2.1 Stimulus Presentation

The method adopted for stimulus presentation by means of coloured slides has proved useful to the task set in this study. However, further studies should attempt a more realistic method of stimulus presentation. One suggestion for a more realistic presentation, which should not prove costly, is the use of specially designed placards (suggested by Mr. R. Collins, Design Institute, SABS, 29/11/76, personal communication).

5.2.2 The Response Questionnaire

The Response Questionnaire proved too lengthy to administer efficiently in the space of up to 2 hours. However, several important items of information were lost as a result of the abbreviated administration of the questionnaire.

It is therefore suggested that further research in this problem should limit the number of questions per sign to 3 or 4, and to gain satisfactory responses to all these questions.

5.3 The Procedure

Group administration proved to be a valuable procedure in obtaining a large number of responses within a limited time and at a limited cost. Use of a more realistic stimulus presentation, for example, using printed cards, should be compatible with the group administration procedure used here.

Individual administration proved successful too, since the testroom used allowed up to twenty or thirty subjects to be individually tested simultaneously.

Interviewers should be more thoroughly trained for further studies, particularly where these are made available by the industrial organisation concerned with the particular sample.

The administration procedure should be more rigorously delineated in further studies. Such questions as the time allowed for each sign or for each question should be carefully considered for further research purposes.

5.4 Results

The following conclusions may be drawn from the results of this study.

5.4.1 A great deal of variation exists within and between the groups of White, Black Literate and Black Illiterate workers in terms of their responses to the sample of ISO Safety Signs shown. Whites average between "completely correct" and "nearly correct", Black Literates average "nearly correct" and Black Illiterates average between "nearly correct" and "nearly incorrect".

5.4.2 Differences between the three samples tested are consistent across the four groups of signs tested.

5.4.3 Significant differences are revealed between the four different categories of signs tested. The mandatory signs were most easily and the warning signs the least easily comprehended in all three samples.

- 5.5.4 The design of a training programme for inclusion in the standardisation specifications of the signs, is recommended. This training programme should be developed in consultation with the findings of the present report and the findings of the Second Study to be carried out in the near future.
- 5.5.5 It is recommended that the direct effects of training on comprehension of ISO Safety Signs should be assessed in a future study. This study should take the form of a "before-and-after" type experiment with a representative sample of workers in South African industry.
- 5.5.6 It is recommended that provision be made for an ongoing system for updating the ISO signs, that is, within the existing ISO system of signs, graphics should be added as the needs arise, along with those which should already be standardised.
- 5.5.7 Postscript

The aims and scope of the present study are considered to have been satisfactorily achieved. Further studies have been proposed and recommendations made towards the implementation and standardisation of ISO signs for use in South African industry.

The most important aspect of this study for more general research purposes is the value demonstrated herein of empirical research for practical purposes.

The theoretical implications of this study and those proposed are difficult to evaluate. Primarily, very little theory has been developed in the field of symbol sign communication. More scientifically oriented and controlled studies are required to investigate such questions as the innate or environmentally learned meanings of signs in general, pictograms and symbols in particular.

It is hoped that further studies, geared towards a highly practical purpose, should contribute also to the development of more useful theories in communication. Ultimately, as Kurt Lewin once put it, "there is nothing so practical as a good theory."

APPENDIX

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SIGNS QUESTIONNAIRE

You are about to be shown a number of signs which may be found inside a factory or building. For each sign there will be a few questions which you may answer in your own time after carefully studying the sign. Before viewing the signs, please complete the following questions in BLOCK LETTERS.

1. NAME:.....
2. AGE:.....(years)
3. SEX: Male or Female (Mark correct answer with a cross)
4. ETHNIC GROUP: (A) White or (B) Coloured or (C) Asian or (D) Nguni or (E) Sotho or (F) Venda or (G) Tsonga or (H) Other (Specify) (Mark with a cross).
5. WHERE DO YOU LIVE ? (Name the city, town, township or area):
.....
6. HOW LONG HAVE YOU LIVED IN THIS PLACE ? (years).
7. WHERE WERE YOU BORN ? (Name the city, town, township or area):
.....
8. HOW LONG DID YOU LIVE IN YOUR BIRTH PLACE ?(years).
9. HAVE YOU EVER WORKED IN A FACTORY ? Yes or No
10. HOW LONG HAVE YOU WORKED IN A FACTORY ?(years).
11. PLEASE LIST THE LANGUAGES WHICH YOU KNOW AND MARK WHETHER YOU CAN SPEAK, READ AND WRITE THE LANGUAGES BELOW:

	<u>Speak</u>	<u>Read</u>	<u>Write</u>
A. Home language
B. Other languages: English
C. Afrikaans
D. Zulu
E. Sotho
F. Other (Specify)

12. HAVE YOU EVER TRIED FOR A DRIVER'S LICENSE ? Yes or No
13. DO YOU POSSESS A DRIVER'S LICENSE ? Yes or No
14. WHAT IS THE HIGHEST SCHOOL STANDARD YOU HAVE PASSED ?

Please study each of the following signs carefully before answering the questions which follow each sign. After answering the questions for each sign, please wait until the next sign is displayed on the screen. Please note that there are six questions for each sign, and that the questions are printed on both sides of the page.

SIGN 1

1. WHAT DOES THIS SIGN TELL YOU ?
.....
.....
.....
2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
.....
.....
3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
.....
.....
4. WHAT ELSE COULD THIS SIGN MEAN ?
.....
.....
5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 2

1. WHAT DOES THIS SIGN TELL YOU ?
.....
.....
.....
2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
.....
.....
3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
.....
.....
4. WHAT ELSE COULD THIS SIGN MEAN ?
.....
.....
5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 3

1. WHAT DOES THIS SIGN TELL YOU ?
.....
.....
.....
.....
2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
.....
.....
3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
.....
.....
.....
4. WHAT ELSE COULD THIS SIGN MEAN ?
.....
.....
5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 4

1. WHAT DOES THIS SIGN TELL YOU ?
.....
.....
.....
.....
2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
.....
.....
3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
.....
.....
.....
4. WHAT ELSE COULD THIS SIGN MEAN ?
.....
.....
5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 5

1. WHAT DOES THIS SIGN TELL YOU ?
.....
.....
.....
2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
.....
.....
3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
.....
.....
4. WHAT ELSE COULD THIS SIGN MEAN ?
.....
.....
5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 6

1. WHAT DOES THIS SIGN TELL YOU ?
.....
.....
.....
2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
.....
.....
3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
.....
.....
4. WHAT ELSE COULD THIS SIGN MEAN ?
.....
.....
5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 7

1. WHAT DOES THIS SIGN TELL YOU ?
.....
.....
.....
.....
2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
.....
.....
3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
.....
.....
.....
4. WHAT ELSE COULD THIS SIGN MEAN ?
.....
.....
5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 8

1. WHAT DOES THIS SIGN TELL YOU ?
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2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
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3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
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4. WHAT ELSE COULD THIS SIGN MEAN ?
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5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 9

1. WHAT DOES THIS SIGN TELL YOU ?
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2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
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3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
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4. WHAT ELSE COULD THIS SIGN MEAN ?
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5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 10

1. WHAT DOES THIS SIGN TELL YOU ?
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2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
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3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
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4. WHAT ELSE COULD THIS SIGN MEAN ?
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5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 11

1. WHAT DOES THIS SIGN TELL YOU ?
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2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
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3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
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4. WHAT ELSE COULD THIS SIGN MEAN ?
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5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 12

1. WHAT DOES THIS SIGN TELL YOU ?
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2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
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3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
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4. WHAT ELSE COULD THIS SIGN MEAN ?
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.....
5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 13

1. WHAT DOES THIS SIGN TELL YOU ?
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2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
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3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
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4. WHAT ELSE COULD THIS SIGN MEAN ?
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5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
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6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?
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SIGN 14

1. WHAT DOES THIS SIGN TELL YOU ?
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2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
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3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
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4. WHAT ELSE COULD THIS SIGN MEAN ?
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5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
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6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?
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SIGN 15

1. WHAT DOES THIS SIGN TELL YOU ?
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2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
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3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
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4. WHAT ELSE COULD THIS SIGN MEAN ?
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5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 16

1. WHAT DOES THIS SIGN TELL YOU ?
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2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
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3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
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4. WHAT ELSE COULD THIS SIGN MEAN ?
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5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 17

1. WHAT DOES THIS SIGN TELL YOU ?
2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
4. WHAT ELSE COULD THIS SIGN MEAN ?
5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 18

1. WHAT DOES THIS SIGN TELL YOU ?
2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
4. WHAT ELSE COULD THIS SIGN MEAN ?
5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 19

1. WHAT DOES THIS SIGN TELL YOU ?
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2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
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3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
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4. WHAT ELSE COULD THIS SIGN MEAN ?
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5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 20

1. WHAT DOES THIS SIGN TELL YOU ?
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2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
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3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
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4. WHAT ELSE COULD THIS SIGN MEAN ?
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.....
5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 21

1. WHAT DOES THIS SIGN TELL YOU ?
2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
4. WHAT ELSE COULD THIS SIGN MEAN ?
5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 22

1. WHAT DOES THIS SIGN TELL YOU ?
2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
4. WHAT ELSE COULD THIS SIGN MEAN ?
5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 23

1. WHAT DOES THIS SIGN TELL YOU ?
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.....
.....
2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
.....
.....
3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
.....
.....
.....
4. WHAT ELSE COULD THIS SIGN MEAN ?
.....
.....
5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 24

1. WHAT DOES THIS SIGN TELL YOU ?
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2. WHAT THINGS IN THIS SIGN TELL YOU THIS ?
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.....
3. WHAT SHOULD YOU DO OR SHOULD YOU NOT DO IF YOU SAW THIS SIGN ?
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.....
.....
4. WHAT ELSE COULD THIS SIGN MEAN ?
.....
.....
5. IS THIS SIGN EASY OR DIFFICULT TO UNDERSTAND ?
6. HAVE YOU EVER SEEN THIS OR A SIMILAR SIGN BEFORE ?

SIGN 26

1. What can you see that is similar in all these signs ?

.....
.....
.....
.....

2. What does the yellow triangle in these signs tell you ?

.....
.....
.....
.....

SIGN 27

3. What can you see that is similar in all these signs ?

.....
.....
.....
.....

4. What does the blue circle in these signs tell you ?

.....
.....
.....
.....

SIGN 27

1. What can you see that is similar in all these signs ?

.....
.....
.....
.....

2. What does the red circle in these signs tell you ?

.....
.....
.....
.....

SIGN 28

3. What can you see that is similar in all these signs ?

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.....
.....
.....

4. What does the green in these signs tell you ?

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.....
.....
.....

APPENDIX 2

Prohibitory Safety Signs

Colours

Ring - signal red

Oblique line - signal red

Symbol - black

Background - white

1.



Smoking
Prohibited

6.



Water as
extinguish-
ing agent
prohibited

2.



Fire and open
lights pro-
hibited

5.



Water for
drinking
purposes
prohibited

3.



Thoroughfare
for pedestrians
prohibited

4.



Proceeding
beyond this
sign
prohibited.

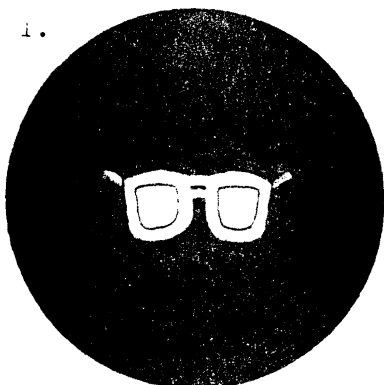
Mandatory Safety Signs

Colours

Symbol - white

Background - ultramarine

1.



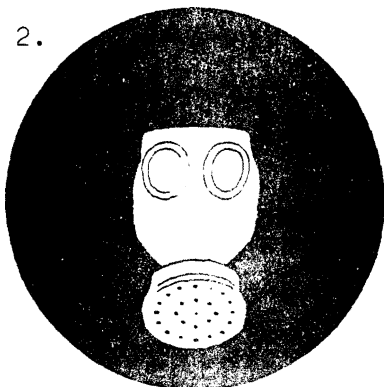
Eye protection shall be worn

4.



Hearing protection shall be worn

2.



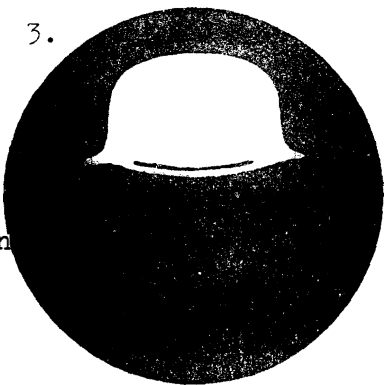
Respiratory protection shall be worn

5.



Hand protection shall be worn

3.



Head protection shall be worn

6.



Foot protection shall be worn

Warning safety signs

Colours

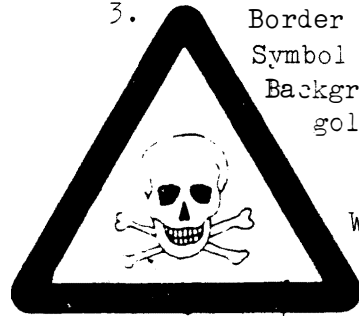
Border - Black
Symbol - black
Background -
golden yellow

1.



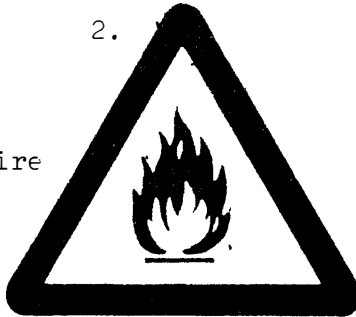
General warning of danger

3.



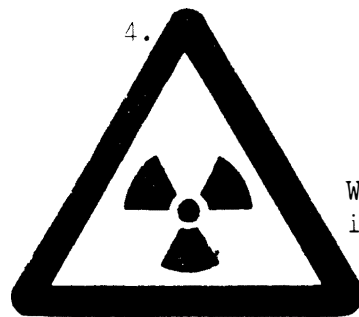
Warning of poisonous substances

2.



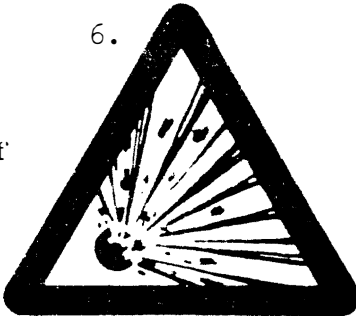
Warning of fire

4.



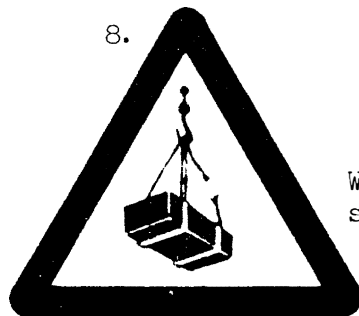
Warning of ionizing radiation

6.



Warning of explosion

8.



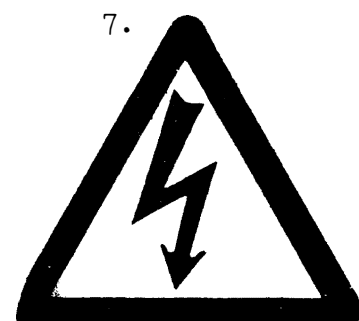
Warning of suspended loads

5.



Warning of corrosion

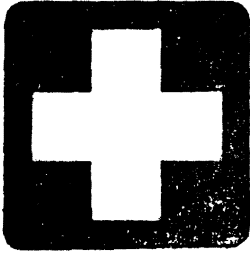
7.



Warning of electric shock

Informatory Safety Signs

1.



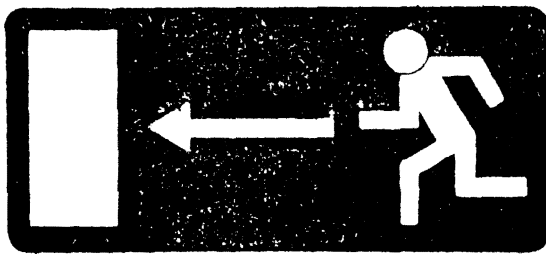
Indication
of first
aid

Colours

Symbol - white

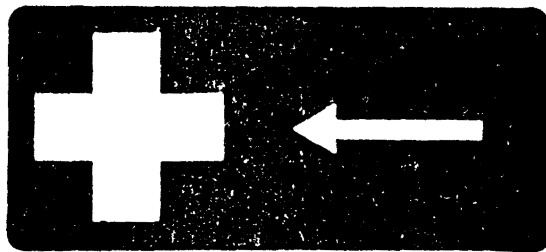
Background - emerald
green

2.



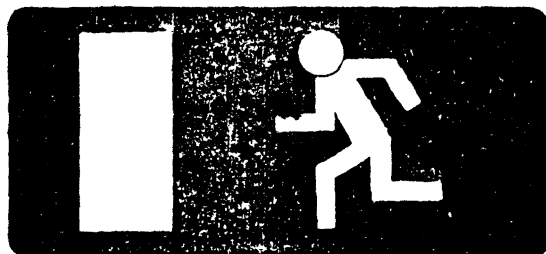
Direction to
Escape route

3.



Direction to
first aid

4.



Indication of
escape route

