



Revision of International Specifications for Orienteering Maps 2000

Submission presented by Orienteering Australia 18 December 2008

Prepared by Adrian Uppill, Chair Mapping Committee, Orienteering Australia
Address: 11 Nicolle Ave, Hawthorndene, South Australia
Telephone: 08 8278 3017
Email: aruppill@chariot.net.au

General comments on International Specifications for Orienteering Maps 2000 (ISOM2000)

ISOM2000 has proved to be an invaluable and essential document for the international standardisation of orienteering maps.

Orienteering Australia (OA) supports the development of ISOM and whilst it has no substantive proposal to change the specifications, it does however propose a number of recommendations, improvements and amendments. Some of these proposed changes aim to accommodate some common mapping practice used in Australia that reflect in part the natural environment and climate of Australia, some relate to improved printing technologies while other proposals and suggestions aim to improve or compliment the current specifications.

Specific comments on ISOM2000

Specific comments are as follows and should be read in conjunction with the ISOM2000 specifications.

International Specifications for Orienteering Maps 2000

- 1 Introduction**
- 2 General requirements**
 - 2.1 Orienteering and the map
 - 2.2 Content
 - 2.3 Accuracy

Add further comments about accuracy, 4th paragraph:

This section needs to include further commentary to reflect the increasing use of digital technologies for map production such as CAD ie OCAD, digital photography, digital photogrammetry, LiDAR and GPS and other handheld devices. These new technologies are increasing the accuracy of maps particularly absolute accuracy. However absolute accuracy should not overlook the importance of relative accuracy which must be considered in respect to the mapping principles of simplification, displacement and exaggeration.



Further, it is considered that all maps should be georeferenced to take full advantage of these digital technologies. Also the use of GPS for tracking orienteers not only makes for spectacular viewing and analysis, but requires an accurate georeferenced map.

2.4 Generalization and legibility

Add: to the second paragraph, after the 3rd sentence

'The need for legibility of an orienteering map is above other requirements: content, the need for accuracy, the level of detail.'

Reason:

This sentence comes from the IOF "Check list for controlling the map making of major events" (under Principles). The sentence reinforces the importance of legibility and further, the necessity for generalisation.

The quote of Eduard Imhof (ISSOM, p4) may be appropriate to add to this section: 'A map with a few well chosen features will give a much better map than cluttered with many insignificant features'.

3 Map specification for foot-orienteering

Add new heading with commentary:

Cartography

Reason:

A new heading should be created to cover cartography; in particular, computer aided design (CAD), which has replaced the hand drawn skill of drafting orienteering maps.

OCAD is now the industry standard for the production of orienteering maps. At the local level OCAD's default symbol set and colour table influence the mapping standard to a much greater extent than does the ISOM, hence it is important that the IOF Mapping Committee work closely with OCAD and other software providers to ensure consistent standards. In particular the ISOM symbols and colour specifications (both CMYK and PMS) should also be provided in OCAD format and further, have a uniform numbering system.

3.1 Scale

General comments:

The new ISOM will establish standards for many years and needs to confirm the current scales or establish new requirements. Any decisions on scales have wider implications for the sport than mapping; rather they should be driven by competitors and technical considerations. To establish this point Orienteering Australia recommends that as part of the revision process the IOF Foot O Committee and the IOF Foot Orienteering Athletes Commission be requested to review map scales and make a recommendation for the future.

Specific comments:

Change by deleting in the first sentence 'fieldworked at a scale of 1:7500' so that the sentence reads:

"Terrain that cannot be legibly represented at a scale of 1:15000 is not suitable for international long and middle distance running orienteering events."



Reason:

Specifying the fieldwork scale is no longer relevant. When using OCAD to produce a base map, the map symbols can also be printed at the same scale thereby indicating to the mapper the exact size of symbols for field working. Whether the field work scale is 1:7500, 1:5000 or any other scale does not matter, the key requirement is to use the correct symbol size and apply the minimum dimensions needed to ensure legibility of the map when printed at a scale of 1:15000. The generalisation principle must also apply. A scale of 1:7500 could however be recommended for field work. Note that as Sprint has its own mapping specifications, this rule only applies to long and middle distance orienteering.

3.2 Contour interval

3.3 Dimensions of map symbols

Comments:

The given map dimensions are accepted as the standard for printing but noting that due to limitations in printing technology, the final map symbol dimensions may vary up to +/- 5%.

3.4 Enlargement of maps

To clarify the rule on enlarging maps, add or rephrase the paragraph to include:

The symbol size for 1:15000 scale maps shall not be used for larger scale maps ie 1:12500, 1:10000, 1:7500, 1:5000, etc.

Reason:

This statement is required to reinforce the rule that the size specification of symbols for 1:15000 scale maps must not be used on larger scale maps. Some competition maps have used the 1:15000 symbol sizes on 1:10000 scale maps, often for maps with complex terrain. Using small symbols on large scale maps will reduce map legibility and further, lead to over mapping and as a consequence, increase mapping time and cost. The remedy is to apply greater generalisation in mapping as per 2.4 Generalisation and legibility, thereby avoiding the need to use smaller symbols on a 1:10000 scale map.

3.5 Printing

Replace 2nd sentence of 2nd paragraph:

'Other printing methods may be used, if colours and line width have the same quality as printing with spot colours'.

with:

'Other printing methods may be used provided the map is legible and meets the print test requirement for the purpose of an orienteering competition'.

Reason:

The principle requiring maps to meet a high standard of legibility (to spot colour off-set printing) is essential for establishing the mapping and drawing specifications of orienteering maps.

However in respect to printing, rather than requiring other printing methods to produce maps having the 'same quality' as spot colour printing, the requirement should be a legibility test. Depending on the nature of the terrain, a digitally printed map may be suitable for a bland area with few features, but using the same printer may be unsuitable for a complex mapped area. Hence the emphasis for maps should be on the legibility of mapped features as distinct from the actual print quality.

See further discussion and reasons at section '3.5.3. Alternative printing methods'.



3.5.1 Spot colour printing

Add:

Spot printed colour blocks for all colour screens.

Reason:

There is a need for better colour control for digitally printed maps. Adding large colour blocks for all colour screens will provide a useful reference tool for colour comparisons and matching when adjusting CMYK settings.

A separate A4 spot printed sheet could also be printed similar to the OA example as shown.



Change:

The overprinting colour should be PMS Purple, not Violet.

Reason:

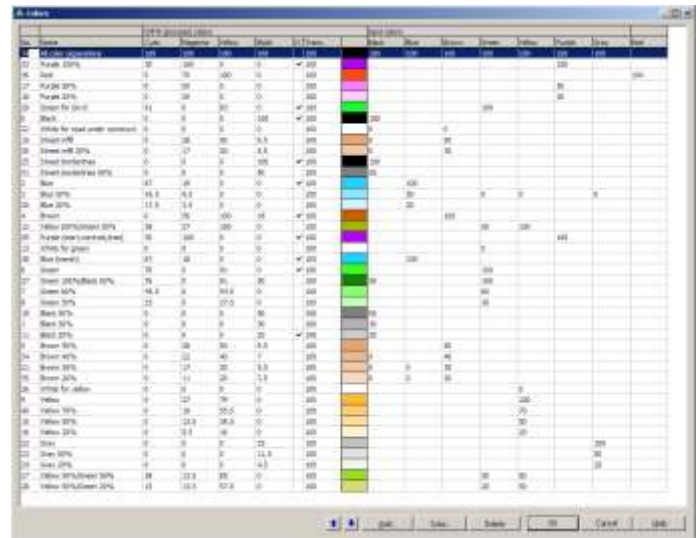
PMS Purple is the correct colour, and is generally preferred by orienteers with poor colour vision. See further comments on Purple below.

3.5.2 Four colour offset printing

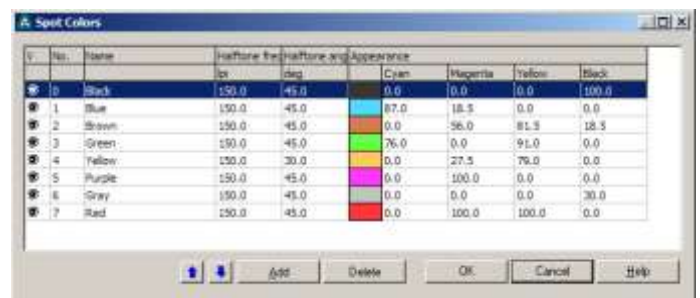
Comments

A recommended CMYK colour table should be printed here for all colours. This should include standardised numbering of colours, printing order and other settings as necessary.

The table should be provided in OCAD format.



The Spot Colour settings should also be specified and provided in OCAD format.





Change:

In the colour table on p6 the CMYK settings should be changed from 100% Magenta to PMS Purple with Adobe setting of CMYK 43 91 00 00.

Reason:

PMS Purple is the correct colour, and is generally preferred by orienteers with poor colour vision. However investigating other Purple settings to meet wider acceptance by both normal vision and colour impaired may be appropriate.

Orienteering Australia has a Purple Colour Swatch in OCAD format for use in print tests when selecting the best CMYK setting for the overprinting colour Purple. A setting is adopted that best matches the spot printed PMS Purple. As an indication on the suitability of purple settings for people with poor colour vision, the colour blocks on the right hand side of the colour swatch are more suitable than those on the left hand side.



Orienteering map colours:

There are currently sixteen colours (defined by the Pantone Matching System) and 46 permitted combinations of screens that can be used for orienteering maps.

The legibility and interpretation of these colours and screens by an orienteer 'on the run' can be a challenge particularly if map colours and screens have not been mapped or printed to specification. The legibility of colours impacts on fairness in competition as some colours may be easily discernable to some but not to others, and thus this will influence navigation decisions that are based on a colour coded map system.

There is evidence to suggest that 'only 5-8 different colours can be reliably discerned under good conditions by normal observers' as noted by Long & Junghans (2008). Whilst it would be rare for an orienteering map to have all 16 colours on the same map, it would appear unwise to add further colours. The careful selection of fewer colours may be better and thereby improve the legibility of colours to a wider group of people.

Based on an analysis of the ISOM2000 colour specifications and identified legibility difficulties that some orienteers have in using these colours, Long and Junghans (2008) recommend that the colour specifications be reviewed at the level of the International Orienteering Federation.

It is therefore recommended that all the colours be reviewed by a colour expert and in consultation with experienced orienteers provide a listing of colour specifications, both PMS and CMYK. The review of colours should also consider the various printing methods available for use particularly digital laser printing as this method is widely used in many countries including Australia.

Improving the Legibility for Orienteers with Poor Colour Vision:

To assist orienteers with poor colour vision the following points should be considered:

- 1 Course marking to be PMS Purple, with CMYK: 43 91 0 0 or other recommended setting(s). Course marking using 100% Magenta is generally unsuitable.



- 2 Avoid using green and brown crosses on the same map. Where this is not possible permit the use of thicker line widths (0.25) for the green cross so that it is physically different in shape to the brown cross or permit the use of a green asterisk.
- 3 Do not use the small green dot symbol 420 Special vegetation feature as it may be indistinguishable from the commonly used 112 Small knoll (small brown dot). Use alternative symbols 419 (small green circle) or 418 (small green cross).
- 4 Bare rock is often more discernable by using 40%K than 30%K, and is usually easier to distinguish against light green and mid green. The option of using 50% Purple on a map will greatly improve the legibility of Bare rock for some orienteers with poor colour vision.
- 5 Ensure there is sufficient colour differentiation between the three greens and the two yellows and or consider the use of a minor screen variation to give a textural contrast.
- 6 Permit orienteers with poor colour vision to view either the legend or part of the map and or to seek advice on the extent and use of symbols likely to cause legibility problems.
- 7 Review the colour specifications with the objective to improve the legibility of colours for a wider group of people

Reason:

8% of males and 1% of females have poor colour vision to a varying extent. Orienteers with poor colour vision may be severely disadvantaged when reading an orienteering map because it is based on a colour coding system. Colour vision impaired orienteers may have trouble distinguishing between certain colours, and it's only when the orienteer reaches that part of the map that they may become aware of the real situation. A textural or shade variation in colour may assist in identifying different colours. Orienteers with poor colour vision may wish to view part of the map before an event to check if they can tell the difference in colours and the extent of any confusing colours that have been used. A legend helps in this situation.

Long and Junghans (2008) provide a highly relevant and useful technical study of the problems encountered by orienteers with poor colour vision. In particular, Long and Junghans (2008) suggest that the colour code system should consider avoiding confusions for protans (RED/green defect) and deutans (red/GREEN defect). An abstract of the research paper is contained at Appendix 1.

Overprinting

Change:

The overprinting colour should be PMS Purple, not Violet.

Reason:

As previously stated.

Note: The provision of guidance notes on how to use OCAD in conjunction with other software for overprinting when using a digital laser printer would be useful.

3.5.3 Alternative printing methods

Review this section to include:

Any printing method may be used provided the map is legible and meets the print test requirement for the purpose of an orienteering competition.

Reason:

Since 2000 there have been significant advances in printing technology with some printing methods capable of printing maps equal or close to the print quality expected from the traditional spot colour offset printing method.



Laser printers are commonly used in Australia and many other countries. Laser printers are convenient to use and are cost efficient particularly when entrant numbers per course map (course and map printed at the same time) may be very low. For example, at an Australian Championship event there may be 700 to 900 competitors running on 24 courses and some courses may have fewer than 5 entrants. This is unlike many European events where there may be hundreds of competitors per course hence justifying the high set-up cost of offset printing ie 4000 maps were printed for each of the 17 courses at the public races of the 2008 World Orienteering Championships, Czech Republic.

Orienteering Australia allows digital printing for the Australian Championships (and other major events) where it can be demonstrated that there will be no significant loss of line quality, legibility and colour appearance as compared to a spot colour printed map. Printing test sheets developed by the Print Tech Project assist in assessing the legibility of a laser printed map. Further, a map which may be unsuitable for digital printing at 1:15000 may be suitable for digital printing at 1:10000. The decision to use a 1:10000 scale for the Australian Long Distance Championships may be granted if the map is particularly detailed, that is, the map has some or all of:

- significant areas of bare rock, especially small areas of bare rock amongst other detail
- complex patterns of contours & earth features ie gold mining terrain
- complex rock features
- complex areas of colour screens, especially yellow and green

The Print Tech project is proving to be a valuable service in evaluating alternative printing methods, particularly the development of the print test sheet. The Print Tech Project should continue and it is expected that its conclusions and recommendations on printing maps particularly in respect to legibility, will be presented in the revision process of ISOM2000.

As put forward at 3.5, orienteering maps should satisfy a legibility test in preference to maps having 'the same quality as printing with spot colours', that is, the map must be legible and meet a print test requirement for competition purposes. The Print Tech print test sheet and accompanying notes "Instructions for using the test sheet" provides a good basis for establishing a legibility criteria for maps.

It is emphasised that the map must still meet the fundamental legibility principle: the map is legible at a scale of 1:15000 if spot colour printed. If the map is not legible then the factors of generalisation and the suitability of the terrain for orienteering will need to be considered.

4 Explanation of symbols

(An OCAD list of symbol changes is provided at Appendix 2)

4.1 Land forms

104 Slope line

Permit shorter slope line, numbering:

104.0 Slope line (tag length 0.5)

104.1 Slope line (tag length 0.4)

Reason:

Permit shorter slope line (0.4), for use where space is limited

106 Earth bank

Add permitted variations to symbol set, numbering:

106.0 Earth bank with tags

106.1 Earth bank main line (0.18), no tags



106.2 Earth bank tag line (0.14), for free hand drawing to main line

106.3 Large Earth bank with tags, main line 0.25

Reason:

Regularises commonly used permitted symbols as standard symbols and to complement the OCAD symbol set.

107 Earth wall

Permit variation to existing symbol, numbering:

107.0 Earth wall (line 0.14)

107.1 Earth wall (line 0.18)

Reason:

Permit thicker Earth wall line (0.18), for use in exceptional circumstances where the earth wall is a genuine obstacle to orienteers and can not be shown by contours

117 Broken ground (0.18 – 0.25)

Add permitted variation to symbol set, numbering:

117.0 Broken ground (0.20)

117.1 Broken ground (0.25)

Reason:

Increase minimum dot size to 0.2 to improve legibility, and complement OCAD symbol set by having two standard dot sizes

118 Special landform feature.

Comment:

Generally used for termite mounds in Australia.

4.2 Rock & boulders

201 Impassable cliff:

Permit shorter tag and add permitted variations to symbol set, numbering:

201.0 Impassable cliff with tags (0.5)

201.1 Impassable cliff with short tags (0.4)

201.2 Impassable cliff without tags

201.3 Impassable cliff tags for free hand drawing

Reason:

Permit shorter tags to 0.4 where space is limited

Number and include standard variations for OCAD symbol set.

203 Passable rock face

Permit shorter tag and add permitted variations to symbol set, numbering

203.0 Passable rock face with tags (0.5)

203.1 Passable rock face with short tags (0.4)

203.2 Passable rock face without tags (line 0.25)

Reason:

Permit shorter tags to 0.4 where space is limited.

Number and include standard variations for OCAD symbol set

Add to the definition of 203 regarding minimum height:

A minimum height of 0.7m may apply where the rock face is obvious and isolated.

Reason:

The minimum height of 1.0m to remain as the general standard but permit an absolute minimum height of 0.7m (~ height of control stand with flag) where the rock face is obvious and easily identified on the ground. This would then allow some obvious rock faces to be



mapped in an otherwise bland or featureless area of the countryside thereby increasing the usability of such a map area, or potential map area.

206 Boulder

Add second boulder size to symbol set, numbering:

206.0 Small boulder, 0.4mm dot size

206.1 Medium boulder, 0.5mm dot size

Reason:

Maps often have two boulder sizes within the permitted range of 0.4 to 0.5mm, hence will standardise the symbol set.

Add to the definition of 206 as 3rd sentence:

A minimum height of 0.7m may apply where the boulder is also isolated.

Reason:

The minimum height of 1.0m to remain as the general standard but permit an absolute minimum height of 0.7m (~ height of control stand with flag) where the boulder is isolated and easily identified on the ground. This would then allow some isolated boulder features to be mapped in an otherwise bland or featureless area of the countryside thereby increasing the usability of such a map area, or potential map area.

208 Boulder field

Formalise two predefined area symbols, numbering:

208.1 Boulder field shape 1

208.2 Boulder field shape 2

Reason:

This will define two shapes that are permitted and commonly used for the Boulder field symbol. OCAD currently has two shapes in its symbol set, hence will formalise the use of these symbols.

Add area symbol for Boulder field to OCAD symbol set:

208.3 Boulder field, hand drawn

Reason:

Often the black area symbols for other features (ie Building or Rock pillar) are used to draw boulder fields. It is a symbol addition that will standardise the use of a specific area symbol for the freehand drawing of boulder fields.

209 Boulder cluster

Reduce the size of symbol and redefine as two standard symbols, numbering:

209.1 Boulder cluster: small boulders

209.2 Boulder cluster: large boulders (25% larger symbol)

Reason:

The symbol at 1:15,000 is bigger than required for legibility. The shape of the symbol is both distinctive and unambiguous on the map. The black area of the symbol on the map is larger than that of the large boulder and usually gives the orienteer a false picture. Reduction of the length of each side of the triangle from the current 0.8 to 0.7 will reduce the black area significantly yet still be over double the area of the small boulder symbol. The option of using a 25% larger symbol in certain situations is useful and should be continued

210 Stony ground (0.16 -0.2)

Increase the minimum size and number as two standard symbols:

210.0 Stony ground 0.18

210.1 Stony ground 0.20

Reason:

Increasing the dot size to 0.18 will improve legibility and provide two standard dot sizes (0.18 & 0.2) that are both within the permitted size range.



212 Bare rock (30% black)

Colour variation:

40% black

Reason:

The darker colour setting will improve legibility.

4.3 Water & marsh

General comments reflecting Australian conditions:

In an often low rainfall environment it has been necessary to use blue to show features associated with water rather than the actual presence of water. This works well with smaller streams and watercourses, however area water features such as dams and reservoirs give more problems.

In areas of unreliable or seasonal rainfall many water features may be dry, yet in the eyes of the orienteer are strongly associated with the blue water features. The standard symbols are used even though water may not be present. For area features 301, 302, 304 and 309 the following variations are used.

301 Lake or reservoir

New symbol and numbering to accommodate area symbol and bounding lines:

301.0 An area symbol, 50% Blue.

301.1 Uncrossable bank line (100% Black, line width of 0.18)

301.2 Crossable bank line (100% Blue, line width of 0.18)

301.3 Uncrossable Lake or reservoir – (50% blue infill with black bounding line and being a combination of 301.0 & 301.1 above)

(Same as current definition 301 Lake)

301.4 Crossable Lake or reservoir – (50% blue infill with a 100% blue bounding line and being a combination of 301.0 and 301.2 above)

A major reservoir or lake with a well defined high water line, may be dry or with water at any level. A blue bank line indicates that the high water line may be crossed. Event information must give the competitor information about the actual water level and the possibilities for running across blue areas.

Reason: Permit the use of a crossable bounding blue line showing the high water line (or the expected high water line if the map is made for a specific competition). The best running will usually be below the high water line, and arms of the reservoir may be crossed according to the current water level.

302 Pond

Add to definition:

May or may not have water.

Minimum dot size to 0.6, numbering:

302.0 (Free hand drawing symbol as per OCAD)

302.1 Pond or small dam

Use point symbol with dot size 0.6

Reason:

Farm dams and ponds vary in water level from full to empty depending on seasonal conditions. At a micro level the running below the high water level is similar to that of a reservoir but with less time impact on the competitor.

A minimum dot size of 0.6mm needs to be specified, any smaller will reduce legibility.



303 Waterhole

Reduce size of symbol:

Reason:

The 'V' shaped symbol takes up an area on the map of 66 sq. metres (sitting in a rectangle of 132 sq. metres) and is considered to be larger than is necessary; hence the symbol should be reduced in size. In some situations it may be better to use symbol 302 Pond which takes up less space.

304 River

Add new symbol, numbering:

304.0 Uncrossable river (as per existing 304)

304.1 Crossable river or River bed

A wide (>8m) river bed, usually dry for long periods, subject to flash flooding, generally with a sandy to stony bed. Mostly easy running, to slow. Symbols 210 Stony ground and 211 Open sandy ground may be overprinted.

Colour: Infill 50% blue; Bank lines 0.18, 100% blue (ie combination of 301.0 & 301.2 above)

Reason:

The variation using a crossable bank line is needed where the river is clearly obvious to the orienteer that it is a water course albeit dry hence crossable. The river may be very wide, have distinctive water lines at each side and may offer easy running (firm ground) to slow running (soft sand, stony or rocky). When flowing after rain the stream would be crossable except when actually in flood.

305 Crossable watercourse

Add permitted symbols as standard to symbol set, numbering:

305.0 Crossable watercourse (2-5m)

305.1 Crossable watercourse (5-8m)

Reason:

Watercourses wider than 5m may be drawn to scale, however it is convenient to use a 0.35 blue line for watercourses 5-8m wide.

306 Crossable small watercourse

Increase line width:

Line width to be 0.16

Reason:

Increase the line width to improve legibility particularly at the 1:15000 scale

307 Minor water channel

Increase line width:

Line width to be 0.16

Reason:

Increase the line width to improve legibility particularly at the 1:15000 scale

309 Uncrossable marsh

Variation for a seasonally uncrossable marsh, numbering:

309.0 Marsh infill (100% Blue stripe lines of 0.25)

309.1 Uncrossable marsh

(same as existing: Black bounding line of 0.18, infill 100% Blue stripe lines of 0.25)

309.2 Crossable marsh (100% Blue bounding line width of 0.18, infill 100% Blue stripe lines of 0.25)



A marsh normally uncrossable but may be crossable for significant periods of the year due to seasonal conditions, and or low or no rainfall. Event information must be given to the competitor about the actual existence of water and the possibilities for running across an otherwise 'uncrossable' marsh. The relevant vegetation screen may be combined with the symbol.

Reason:

Marshes which would be uncrossable in times of high rainfall but may also be completely free of water. When dry, crossing the marsh may be slowed by the presence of various thicknesses of vegetation.

4.4 Vegetation

410 Vegetation: very difficult to run, impassable

Variation and new symbol to be added:

410.0 Vegetation: very difficult to run

410.1 Vegetation: impassable

Reason:

The current symbol (410) shows runnability of less than 20%. The orienteer needs to know whether a narrow strip of vegetation is passable with great difficulty or is completely impassable. Rational route choice would allow one route but not the other. The new symbol would remove the element of chance. This problem has been recognised in the ISSOM by Symbol 421 "Impassable vegetation (forbidden to cross)" and is recommended for the new ISOM.

412.1 Orchard: single dot (0.45)

OCAD has this symbol but is not in ISOM. Should use 420.0 (0.50)

418 Special vegetation feature (small green cross)

Comment:

Avoid using 418 on the same map if 118 (small brown cross) is also used. Use alternative symbol 419 being a small green circle.

Reason:

To improve legibility for orienteers with poor colour vision as they may not be able to distinguish the green cross from the brown cross. Alternatively, thicken the line width (0.25) of the green cross so that it is physically different in shape to the brown cross (118), or permit a new symbol, a green asterisk.

420 Special vegetation feature (green dot 0.05)

Comment:

The use of small green dots should be avoided. Use alternative symbol 419 being a small green circle.

Reason: To assist orienteers with poor colour vision as they may not be able to distinguish green dots from brown dots (112 Small knoll), hence use a different shape symbol (419 Small circle) so as to be distinctive in shape from the small dot and small cross.

4.5 Man-made features

515 Railway

Use alternative symbol:

515.0 Railway

Use ISSOM symbol 515.1 - double black line with dashed black infill, say 0.40 line width

Reason:

The current symbol has a real world width of 16 metres. A single railway track with surrounds is less than four metres. The width of the symbol gives real problems to mappers if there is



any detail adjacent to the tracks. The solution adopted in the ISSOM (symbol 515.1) is recommended and gives a real world width of 6m or thereabouts.

519.0 Stone wall

Review definition:

The symbol is defined as 'A stone wall or stone-faced bank'. To the orienteer these are distinctly different features. A stone wall is a fence made of stone and to the orienteer will have to be climbed regardless of which side is approached. A stone-faced bank will involve climbing if approached from the down side but presents an easy scramble or jump from above. The orienteer needs to know whether it is a wall or bank to make a rational route choice. It is recommended that the definition be 'A stone wall which can be climbed from both sides'. The stone-bank should be drawn using either 106 Earth bank or 203 Passable rock face.

527 Settlement

Comment:

This symbol is now inconsistent with the Sprint specifications where it is an 'area with forbidden access.' It may cause confusion for competitors, hence needs resolution. It is suggested that 527 be the same as the ISSOM definition, and renumber both symbols to 527.0

527.1 Settlement: Alternative symbol where buildings are not shown.

Variation of symbol:

Currently exists as OCAD 527.1 which uses 100%K line.

The definition should be changed to include an area which is out of bounds to competitors.

Reason:

Will regularise numbering to OCAD, but use 32.5%K as currently specified.

It is a useful symbol for residential areas and indicates private land being out of bounds.

4.6 Technical symbols

4.7 Overprinting symbols

709 Out-of-bounds area.

Variation, numbering:

709.0

Colour: Purple

709.1

Colour: Black

Reason:

Using Black in lieu of Purple for spot colour off-set printing of maps will avoid the use of another colour plate.

711 Dangerous area.

Variations, numbering:

711.0 Dangerous area

Colour: Purple

Permit use of a bounding line (0.12).

711.1 Dangerous area

Colour: Black

Permit use of a bounding line (0.12).

Reason:

Using Black in lieu of Purple for spot colour off-set printing of maps will avoid the use of another colour plate.

It is essential that dangerous areas be readily identified and hence clearly marked on a map. A bounding line to the area symbol will highlight dangerous areas marked on the map.



5 Map specification for Ski-orienteeing

Delete as replaced by ISSkiOM

6 Map specification for Mountain Bike orienteeing

Delete as replaced by ISMTBO

7 Map specification for Trail orienteeing

8 Mapping guidelines for Park orienteeing

Delete as replaced by ISSOM

References

Long J A, Junghans B M 2008, Orienteers with poor colour vision require more than cunning running. *Clinical and Experimental Optometry*. Corresponding author: Barbara Junghans, School of Optometry and Vision Science, University of New South Wales, Sydney, NSW 2052 AUSTRALIA. E-mail: b.junghans@unsw.edu.au

Nb Barbara Junghans is an experienced orienteer, Sydney, Australia.

Appendix 1






































An abstract of the research paper by Long J A, Junghans B M 2008, may be found at <http://www.ncbi.nlm.nih.gov/pubmed/18637110> with a discussion:

Orienteers with more severe forms of abnormal colour vision are likely to be disadvantaged by their inability to differentiate some colours used on orienteeing maps. The IOF should choose different colours that are less likely to be confused or should employ a redundant code (such as a pattern or texture). There is need for better quality control of the colours of competition maps to ensure they do conform to the IOF standard colours.



Appendix 2 List of symbol changes

ISOM2000 Revision 100m

- 104.0 Slope line (tag length 0.05)
- 104.1 Slope line (tag length 0.04)
-  106.0 Earth bank with tags
-  106.1 Earth bank main line, no tags (line width 0.18)
-  106.2 Earth bank tag line, hand drawn (line width 0.14)
-  106.3 Earth bank with tags, main line 0.25
-  107.0 Earth wall (line width 0.14)
-  107.1 Earth wall (line width 0.18)
-  117.0 Broken ground (dot size 0.20)
-  117.1 Broken ground (dot size 0.25)
-  201.0 Impassable cliff with tags (tag length 0.5)
-  201.1 Impassable cliff with short tags (tag length 0.4)
-  201.2 Impassable cliff no tags
-  201.3 Impassable cliff tag line, hand drawn (line width 0.12)
-  203.0 Passable rock face (0.18) with tags (tag length 0.5)
-  203.1 Passable rock face short tags (tag length 0.4)
-  203.2 Passable rock face no tags (line 0.25)
- 206.0 Boulder: small (0.4)
- 206.1 Boulder: medium (0.5)
- 208.0 Boulder field shape 1
- 208.1 Boulder field shape 2
- 208.2 Boulder field, hand drawn
- ▲ 209.0 Boulder cluster: small
- ▲ 209.1 Boulder cluster: large (25% larger)
- ⊙ 210.0 Stony ground (0.18)
- ⊙ 210.1 Stony ground (0.20)
- 212.0 Bare rock (40%K)
- 301 Lake or Reservoir
 -  301.0 Lake or Reservoir infill (50% Blue infill)
 -  301.1 Uncrossable Bank line (bank line 0.18, Black)
 -  301.2 Crossable Bank line (bank line 0.18, 100% Blue)
 -  301.3 Uncrossable Lake or Reservoir (301.0 & 301.1)
 -  301.4 Crossable Lake or Reservoir (301.0 & 301.2)
- 302.0 Pond
- 302.1 Pond, minimum size (0.6)
-  304.0 Uncrossable river (301.0 & 301.1)
-  304.1 Crossable river (301.0 & 301.2)
-  305.0 Crossable watercourse (0.25)
-  305.1 Crossable watercourse (0.35)
-  306.0 Crossable small watercourse (0.16)
-  307.0 Minor water channel (0.16)
-  309.0 Marsh infill (100% Blue stripe infill)
-  309.1 Uncrossable marsh (309.0 & 301.1)
-  309.2 Crossable marsh (309.0 & 301.2)
-  401.0 Vegetation: very difficult to run
-  401.1 Vegetation : impassable
- * 418 Special vegetation feature
Suggested alternative symbols to assist orienteers with poor colour vision
- * Thicker lines (0.22)
- * Asterisk
-  515.0 Railway
-  527.1 Settlement: alternative symbol
-  709.0 Out of bounds
-  709.1 Out of bounds (Black)
-  711.0 Dangerous area
-  711.1 Dangerous area (Black)