IOF Map Commission

BEST PRACTICES FOR SPRINT MAPPING

May 2025

This document has been compiled and edited by the **IOF Map Commission** (January-May 2025).

Introduction

The past decade has seen a significant development of sprint disciplines in orienteering. Accordingly, the orienteering sprint map specification has been updated to better meet current needs and be applicable to increasingly complex urban environments. In a way, we are building here on the document Guidelines for sprint mapping and course planning in complex urban structures on sprint orienteering published in 2022. At that time, several new symbols for mapping multi-level structures were introduced and their use needed to be explained to the orienteering community. While the use of the new symbols has since become sufficiently established, a number of issues related to the generalization and legibility of sprint orienteering maps have persisted. This document, entitled **Best practices for sprint mapping**, aims to educate the mapping community and has the following objectives:

- to reinforce awareness of the importance of generalization and legibility in sprint orienteering maps
- to briefly describe aspects of orienteering sprint map production
- to illustrate the most common mistakes through graphical examples and suggest appropriate solutions

The document is intended for beginners as well as advanced mappers and develops some principles that may not be obvious at first glance after reading the ISSprOM 2019-2 map specification, as the specification defines map symbols as such and does not deal with the real-world situation where many combinations and spatial relationships between map symbols occur. The above means that one of the main conditions for working with this document is at least a basic knowledge of the ISSprOM 2019-2 map specification.

The document is the collective work of all members of the IOF Mapping Commission. It includes both real and fictional map examples. The authors would welcome constructive comments leading to further improvement of this document.

Requirements for orienteering sprint maps

Sprint orienteering requires high speed route navigation typically in urban environment. This means that high demands are placed on the athlete in terms of running speed and also in terms of the speed of his decision making, which is based on reading information from the map. Typical urban sprint terrain is a labyrinth of passages between massive obstacles and barriers. It is essential to provide such information in a way that is as easy to understand as possible. This means that map legibility and the related level of generalization play a crucial role.

The map area with all existing features is generally too complex to present everything on the map using defined symbol sizes and minimal gaps. The same is with the runner; while fast running one can’t even notice all features on the ground. That’s why generalization is needed, and their goal is to reduce the graphical complexity of the map, making the map readable and legible. On the other side, with the generalization, the mapmaker must ensure that all important and to the runners' obvious objects are presented on the map, while the less visible or less important are neglected. Generalization is a complex procedure, consists of eliminating smaller or less important features, graphical simplification

of lines and area borders, exaggeration, enhancement and finally displacement from the original exact position, but preserving relative spatial relations.

Harmonisation is also an integral part of the mapping process. It primarily means maintaining a consistent approach to generalization across the map area. Its importance increases if one map is prepared by several mappers - individual parts of the map should be as consistent as possible in terms of mapping approach so that the runner does not notice any differences in the inclusion or omission of mapped objects.

Mapping process

It is the responsibility of the event organisation (especially the course planner, controller and event adviser) to make sure that the map and terrain are suitable and fair for all competitors. During the preparation of the map, it is standard practice to consult with the course setter and event advisor on a number of situations. These may include not only decisions about which private areas will be accessible to competitors and need to be mapped, but also decisions about the ability to cross certain features. It is common that modifications to an already finished map can take place shortly before the event, for example due to course construction (closing/opening some parts of the map) or due to external influences (reconstruction or other restrictions).

When creating a map, the mapmaker must first select suitable objects to be included in the map (selective generalization). Only significant objects which are important for navigation are selected and only enough objects are selected to keep the resulting situation legible on the map. Overlapping or too close proximity of map symbols under the defined minimum gaps must be avoided. In some cases, it is preferable to represent objects by unifying them into area symbols instead of individual point symbols (for example, instead of mapping individual shrubs/trees in the park, the area can be simplified into an area symbol representing open land with scattered trees).

The use of digital mapping directly in the field offers direct work with the real size of map symbols and can help the mapmaker to decide which objects to include in the map and which not to include, as they would overwhelm the map. It is essential to try to resolve maximum of spatial conflicts that arise between mapped objects directly in the field. During this process, the mapper should also keep in mind that minimum gaps between map symbols are required.

Particular attention must be paid to mapping of multilevel structures. This means that it should be possible to understand from the map (generally while running at high speed) where it is possible to enter and exit the structure, on which level, and how to move from one level to another. It is also important to be able to identify quickly and easily which detail is on the upper level (the upper level is mapped by default) and what is the shape of lower level, and also to identify if steps go up to the upper level, or down to the lower level. Only two running levels can be mapped, even if the structure offers more levels (entry to other levels must be taped during the race). If understanding of the situation is a problem, you need to discuss it with course setter/event advisor. The solution can be detailed and illustrative explanation of the situation in the competition bulletin or mapping of the upper level only.

The next step after the mapping in the field is to finalize drawing of the objects appropriately on the map. This often means that the object to be mapped is drawn in a simplified shape, with a shift or enlargement to the required minimum size (graphical generalization). Example can be removal of small and unimportant shapes from buildings, straightening of minor shape changes on various line objects and simplification of contours for easier understanding of height differences. Typically, most of this process is done at home on a desktop computer. Drawing of sprint maps is very demanding in terms of time, accuracy and clarity of drawing. Drawing of barriers and passages has the biggest importance,

but it is also important to ensure that styled lines such as uncrossable fences, passable walls, small footpaths etc. are appropriately drawn, especially in places where they bend sharply.

When finalizing the map, it is highly advisable to make a test print in scale 1:4000 to assess the legibility of individual parts of the map. Particular attention must be paid to areas of high complexity, and it is advisable to consult such areas with the opponent (elite runner, experienced mapmaker) and the course setter. It must be remembered that the map must contain sufficient information for the competing orienteer and at the same time be legible at the running speed and in different weather and light conditions.

Principles of generalization and legibility in a nutshell

Selective generalization

- only important objects
- unique objects (e.g. fountains, statues), passages and all barriers are mapped
- small and frequented objects are not mapped (trash bins, lamps, poles, benches, advertising banners, small bushes)
- do not map private yards (even with open gate), boundaries between houses, fences inside private gardens
- only big houses, big water features and railways are drawn inside private areas (areas that shall not be entered)

Graphical generalization

- simplification - straightening of curls, elimination of jagged lines, simplification of shape
- shifting - so that the symbols do not overlap, do not touch and have sufficiently large gaps between them
- enlargement - to make everything legible and understandable, especially the passages!!
- established practices - the main running level is mapped (the base of the building, the height of the house does not decide), the upper level in detail, the lower only schematics

Legibility

- always use the correct symbol sizes according to the map scale,
- strictly adhere to the minimum areas and lengths of symbols,
- keep the defined minimum gaps,
- provide a clean and precise map drawing.

"Perfection is achieved, not when there is nothing more to add, but when there is nothing left to take away."

— Antoine de Saint-Exupéry, Airman's Odyssey

Graphical examples

Content

Terminology

To simplify the text, sometimes we use the following terms, which are either abbreviations or names used in the community:

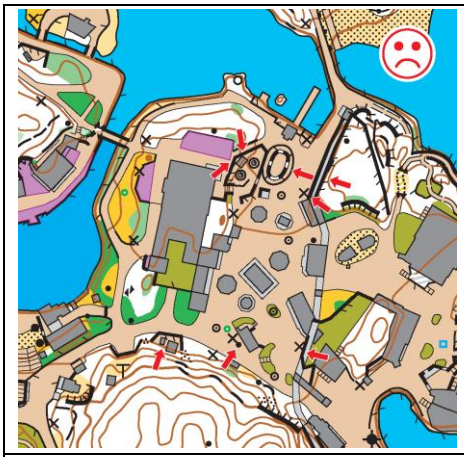
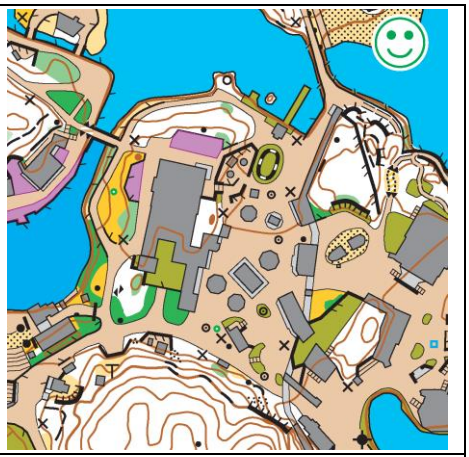
- *OB* — Out of Bounds, sometimes abbreviated to OB, to denote any area or surface that runners are forbidden to enter according to the competition rules.
- *Shark teeth* - term used in the community to name the 512.1 Bridge or tunnel entrance map symbol

Example schema

No. Issue name

Graphics Bad example 😔 It refers to the following possible situations: ineffective, poorly designed, inaccurate, misleading, user-unfriendly, low-quality, illegible Sample approximately 5 x 5 cm Arrows or text can be used to indicate exact position of error	**Graphics** Good example 😀 It refers to the following possible situations: effective, well-designed, clear, accurate, user-friendly, high-quality, legible Sample approximately 5 x 5 cm Arrows or text can be used to indicate exact position of correction
Description Bad example description (what is wrong)	**Description** Good example description (what is correct)
Additional information Photos, link to Street View or other information if needed	

1 Passages and cartographic gaps

	
This map is drawn without due consideration to the 0.15 mm rule for cartographic gap between features of same colour and 0.4 mm rule for passages between symbols representing uncrossable features.	Obeying these rules is detrimental to the clarity and legibility of the map. To check for passages, define yourself two symbols with 0.15 and 0.4 mm diameter respectively, and check it fits in the required space. If you have Ocad 2018 or a later version, you should also be able to use the legibility checker.

2 Openings in uncrossable walls and fences

	
Too small opening in wall. Gates/openings may reduce readability, do not use openings above fence lines, if gate is closed.	Clear openings on walls and fences. Closed gates are not mapped to improve legibility. Use openings carefully, only in situations where there is space on the map and it will help runner to show opening. Uncrossable fence and opening is rarely good together on sprint maps, due of similar layout of these symbols.
Kalajoki dunes and water park, Finland	

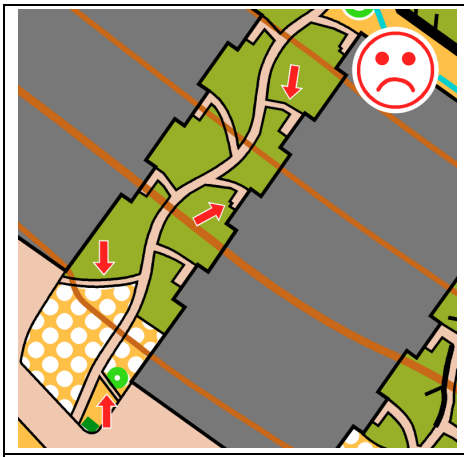
3 Widening narrow passages and streets

	
Even if you comply with minimum gaps and dimensions, there is great potential to improve legibility.	Typical strategy for improving legibility is widening the narrow streets, stairways and passages by adjusting the size of the buildings and OB areas.
This example is partially contrived.	

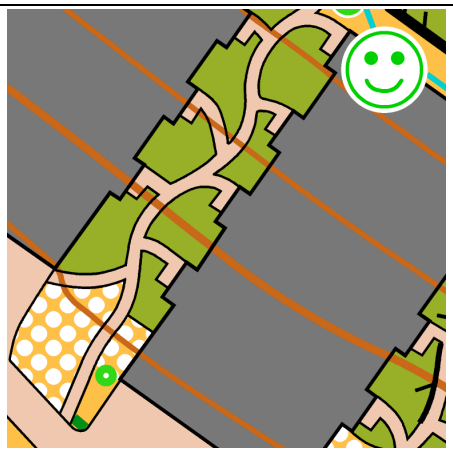
4 Minimum width footpath and retaining wall or passable wall

	
A sidewalk or footpath with a passable retained wall, passable wall or passable fence on the side requires full minimum width to clearly show if there is a runnable gap	Exaggerate the size of the footpath or move/generalise other objects to achieve minimum footpath width
This example is partially contrived.	

5 Large scale survey basemap vs. final map



Direct conversion/redrawing of large-scale survey data can produce very narrow paths and add unnecessary details to the map. This method can result in a number of problems with map legibility.



The mapper was aware of the problem of the small width of the footpaths in the basemap and drew the paved footpaths wider to meet the minimum required width. He omitted very short and narrow footpaths and small details entirely.

Basemap example.

6 Canopies in wall gates

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Here, the mapper wanted to indicate that gates through walls are portals by adding a canopy over the opening (See link below). However, the canopies this narrow “pollutes” the openings and make them harder to see on the map.</td><td>Removing the canopies makes all the gates and openings much easier to see, and the runners do just as well without them.
A similar problem applies to those who try to fit a small stair in the gate.</td></tr>
<tr><td colspan="2">The leftmost gate in the map above: Link to Google Street View</td></tr>
</table>

7 Paths through Area that shall not be entered (520)

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>This is asking for trouble. Is it legal to run this path? Some runners may think so, others might not. Some juries may disqualify runners that use them, other juries may not.</td><td>Discontinuing the olive green makes this clear for everyone. Technically, the gap may also be yellow if it is grassy, but white gives the best contrast, and is clearly visible for colour blind runners. Paths inside 520 that are meant to be forbidden must not be drawn.</td></tr>
<tr><td colspan="2">This example is contrived.</td></tr>
</table>

8 Overdetailed buildings

<table>
<tr>
<td> 
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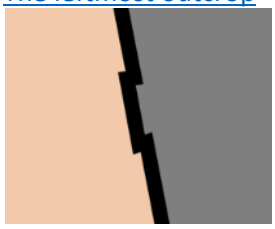
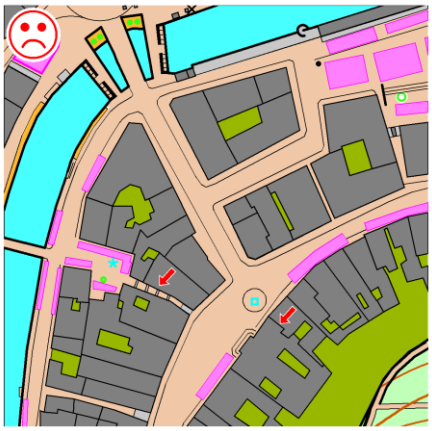
<tr>
<td>1) Building details in backyards are not just unnecessary as runners can’t see them. They would also make control numbers harder to read if they are placed there.
2) Minor outcrops on buildings also add unnecessary details to the map. Often, the walls are completely straight while the outcrop is at roof level.</td>
<td>Generally, removing detail that the runners do not need or can see will result in a cleaner map that is easier to read for the runners.</td>
</tr>
<tr>
<td colspan="2">Link to StreetView:
1) Looking into the backyard
2) The leftmost outcrop
  </td>
</tr>
</table>

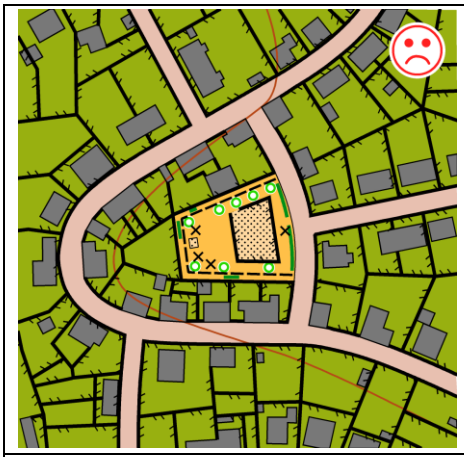
9 Do not show boundaries between adjacent buildings

	
Boundaries between building blocks give no additional information.	Eliminating boundaries between building blocks makes the map much clearer and easier to read in competition speed.
Ljubljana city center	

10 Inaccessible areas inside building blocks

	
The inaccessible areas inside the building blocks are information that is unnecessary for the competitor.	Inaccessible areas are removed, the volume of information is reduced, the map is clearer and easier to read.

11 Don't draw fences and borders inside 520

	
Fences and borders between gardens inside 520 Area that shall not be entered is useless information polluting the map.	No fences inside means more legible map.
	
	Even more pure style where the fences on the border of 520 are completely omitted.
Link to Google Street View	

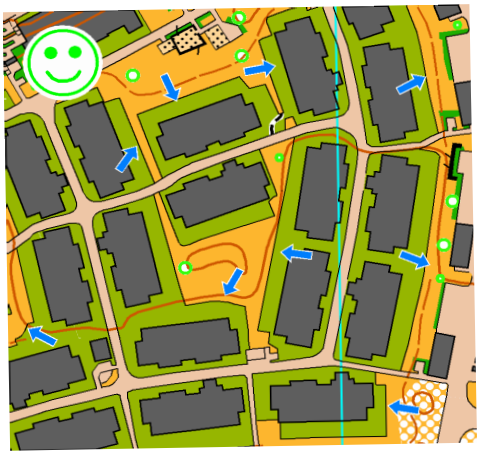
12 Don't draw objects inside forbidden areas

	
ISSPrOM says that only prominent buildings, railways, and prominent trees shall be drawn inside 520. Other objects only make the map more complex and can confuse the runner that the area can be crossed or entered.	A “clean” 520 makes it clear that the area shall not be entered, and makes the map much easier to understand.

13 Don't draw objects inside forbidden areas 2

	
Another example typically found in Norwegian residential areas. Here the mapper has imported map data as-is into the map and symbolized it without any generalization.	Also remove smaller buildings (eg. shelters) in the backyards.

14 How to handle boundaries along forbidden areas

	
For the runner the most important information is where it is possible to run or not. Showing exact types of boundaries around 520 only may make the map more difficult to read	The map here is much easier to read, making gaps and passages easier to spot. In general, borders to 520 shall be drawn as simple as possible.

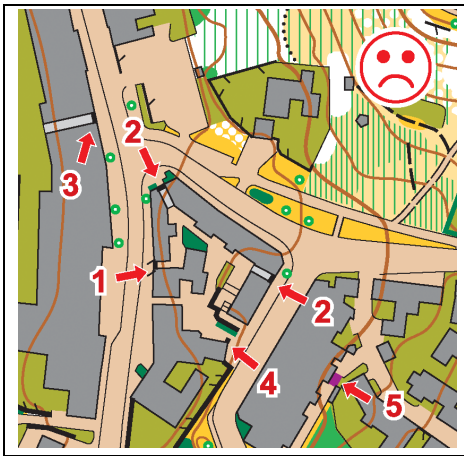
15 The 520 must be surrounded by some kind of boundary line

	
An area of 520 must always be totally surrounded by an outline. Also bear in mind that colour blind runners have great difficulties in discriminating 100% yellow from olive green.	Here the border to 520 is much clearer, this is mandatory even if the border in real is hard to identify. Such a line is helpful for colour blind runners.

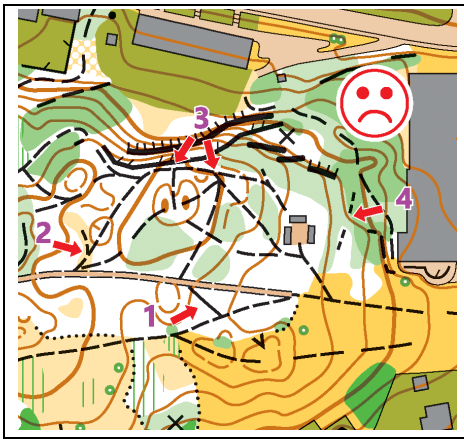
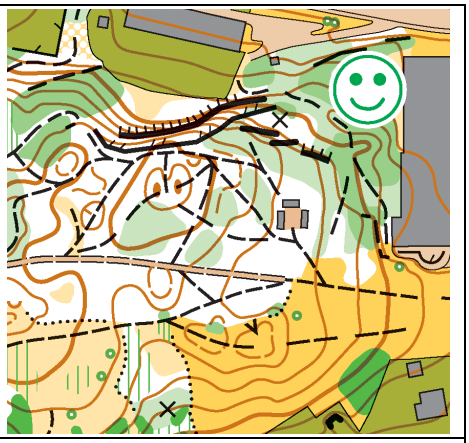
16 Mapping inaccessible areas

	
Areas that are entirely enclosed within uncrossable features such as hedges and fences, should be filled with symbol 520 – Area that shall not be entered.	This makes it easier for the runners to see where they can run and not.

17 Short walls, uncrossable fences or railings

	
1) Short fence with tags. Remove tags. 2) Short wall (gate) difficult to see. Extend to increase visibility on map. 3) Gate into OB canopy. Consider make into building. 4) Very short fence and too small opening beyond its end. 5) Artificial barrier difficult to see. Should be exaggerated.	For short fences tags may be removed all together to improve legibility. Gates or walls at end of narrow passages through buildings can be hard to see for the runners, and they are shorter than the minimum length. Extending these along the building will make them much more visible to the runners. This also applies to artificial barriers drawn using symbol 708.
Note: Parts of this map is contrived.	

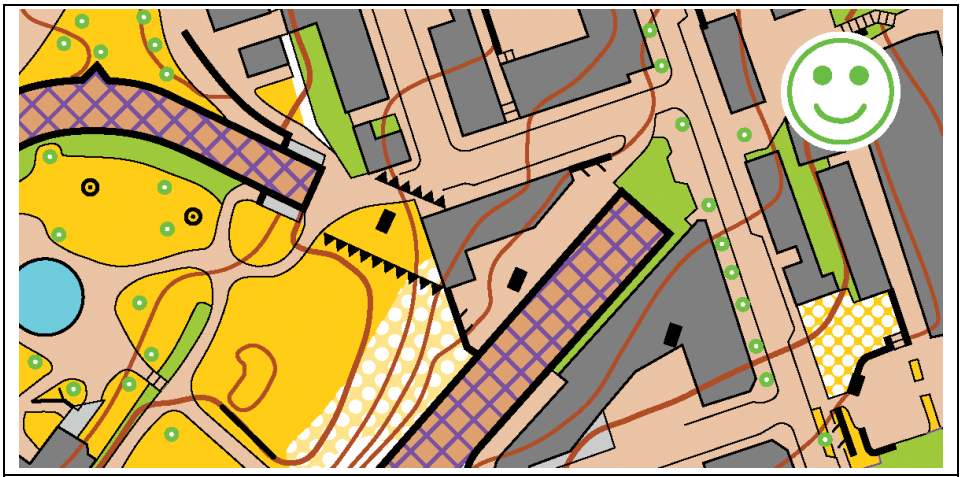
18 Short Paths

	
1) No gap in path (typically a Mapper problem) 2) Unfavourable junction 3) Paths ends in gap of another path. 4) Too short indistinct paths. Ocad allows you to draw these paths this short, but the dashes can sometimes be so short that legibility is compromised. Replace with normal path with two or three dashes in these cases.	Careful placement of dash points and selection of path symbols is necessary to make a path network legible.

19 Bridges or underpasses only runnable at lower level

	
1) When upper level of a bridge is entirely Out of Bounds, only the lower level shall be mapped. Here there are details on the lower running level that may be important to the runners. 2) Here the upper level is only partly Out of Bounds, then white stripes (512.3) must be used.	The upper railway line should always be cut over underpasses to make the underpass more visible to the runners.
Link to Google Street View.	

20 High bridges, which are not naturally part of the competition plane

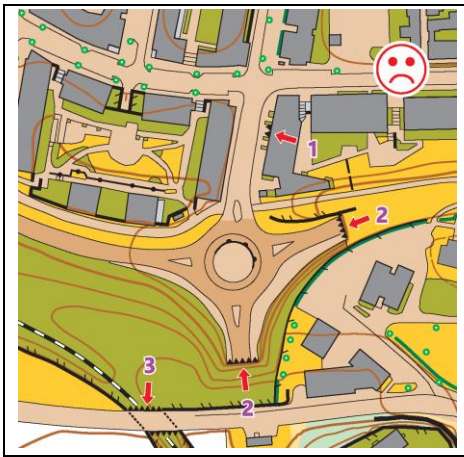


In cases with high bridges, which are not naturally part of the competition plane, there may be so much going on underneath that the symbol 512.2 Bridge or tunnel entrance may be omitted altogether (See Google Street View - this map is rotated 90 degrees CV)

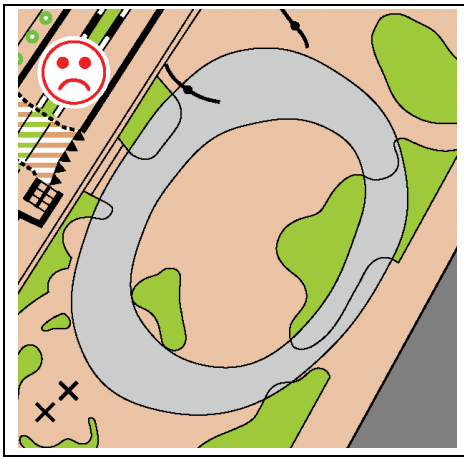
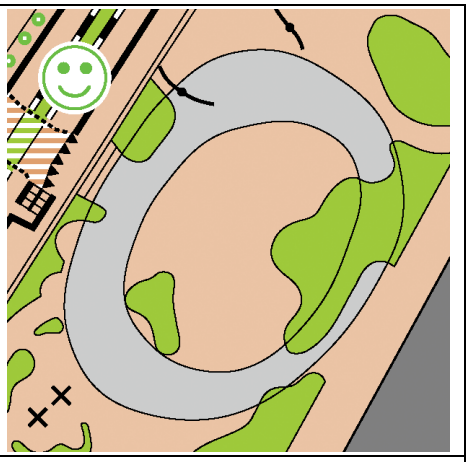
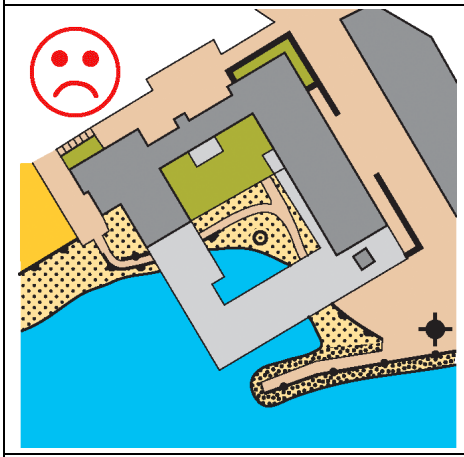
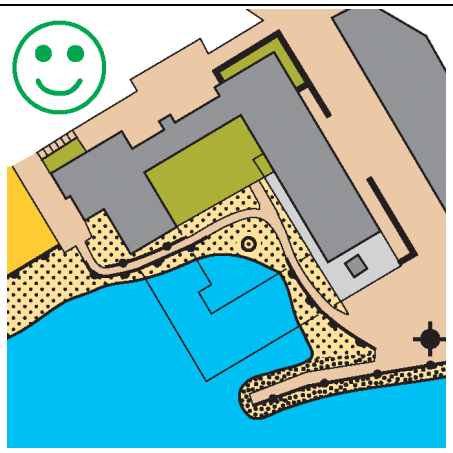
21 Bridges – other cases

In other cases, it is better to draw OB bridges as canopies. This map shows an OB walkway crossing through an amusement park. (This map is also rotated 90 degrees CV) See Google Street View:

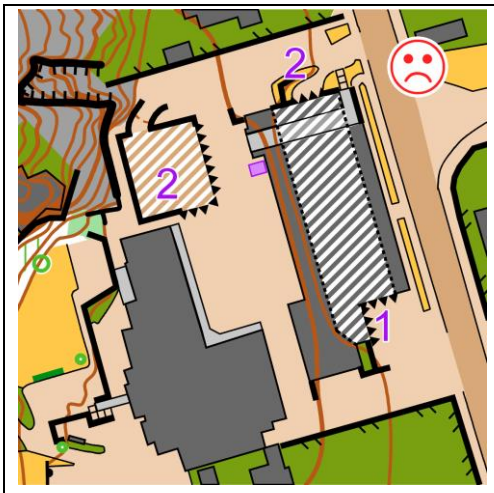
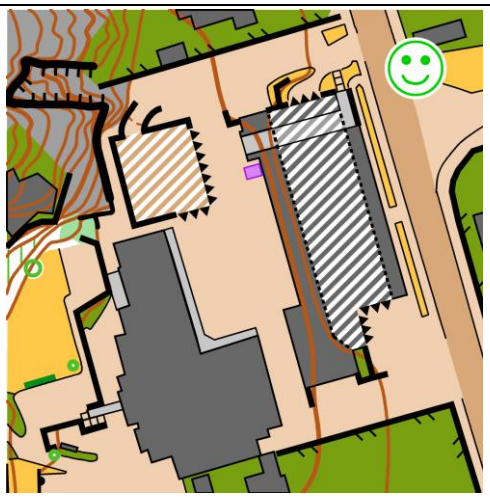
22 Tunnel entrance into out-of-bounds area

	
The “Shark teeth” symbol (512.1) means that there’s a runnable area underneath. Here it is used to map: 1) Entrance to a parking cellar 2) Entrance to road tunnel that is out of bounds. 3) Bridge over railway with underpass marking (512.2)	1) Entrances to tunnels should be mapped using a wall symbol that you are not to cross. 2) Entrances to parking cellars may be completely removed. In some cases, if they are deep, they can be mapped as canopy. 3) Bridges over OB shall be marked by wall symbol.
Link to Google Street View. Note: The railway part of this map is entirely contrived.	

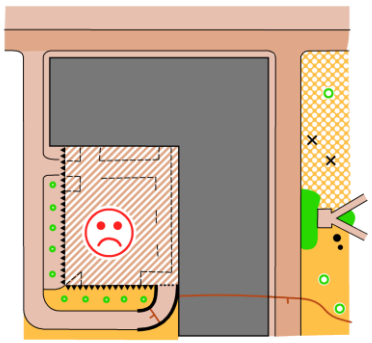
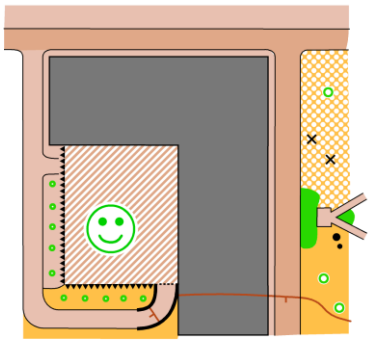
23 Canopies over out-of-bounds areas

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>What is going on at ground level is more important than the canopy above. Here it is unclear where the runners can go or not. Recall that a canopy indicates a runnable (usually paved) area underneath.</td><td>Here, the ground level detail takes precedence over the canopy. The canopy boundary over olive green has been drawn using the canopy outline symbol.</td></tr>
<tr><td colspan="2">Link to Google Street View
This sample is slightly contrived.</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Also here, what’s going on under the canopy is much more important than the canopy itself.
Also note the removal of the canopy inside the olive green.</td><td>Link to Google StreetView.</td></tr>
</table>

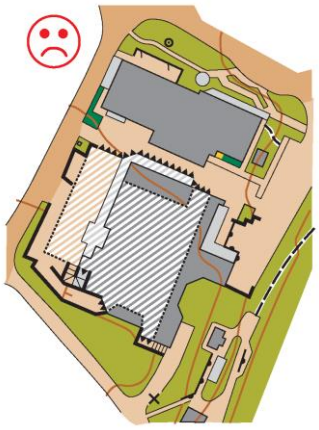
24 Shark teeth generally inner corner

<table>
<tr><td> 
</td><td>  </td></tr>
<tr><td>Shark teeth in inner corner must be drawn as two separate objects some distance apart to avoid overlap of triangles.</td><td>Shark teeth must not overlap other black objects.</td></tr>
<tr><td colspan="2">These examples are contrived.</td></tr>
</table>

25 Step or edge of paved area at lower level – limit the use for the short sections

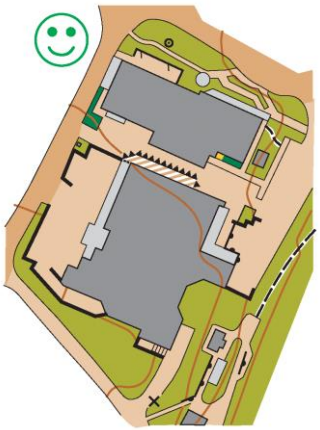
<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Steps or edges on two level areas are not necessary, especially small ones at the lower level should not be mapped.</td><td></td></tr>
<tr><td colspan="2">This example is contrived.</td></tr>
</table>

26 Overly use of 512.3 - area passable at two levels



Here, the mapper wanted to map the parking cellar below a shopping center. Indeed, it is possible to run through the cellar along several paths. However, the overall picture is very confusing to the runners, particularly understanding what's going on at the upper level. Besides, the white stripes is a distracting symbol making the map less legible.

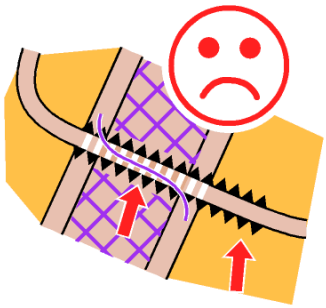
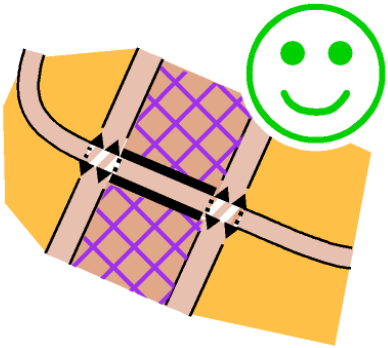
It is tempting to add complexity for the runners by mapping multiple levels this way, but it is questionable whether it provides fair competitions.



Not mapping the parking cellar effectively renders any route choice through the cellar as forbidden, which is perfectly OK. You are not obliged to map it. Instead, it becomes much clearer to the runner what is going on at the upper level.

Northern side of the shopping center.

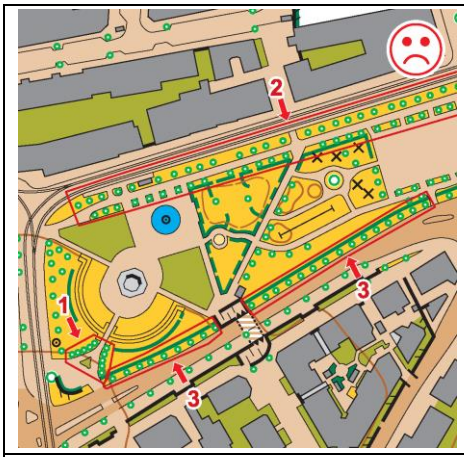
27 Bridge with underpasses

	
It is not possible to cross the purple street under the bridge. “Shark teeth” and two- level symbols do not match.	Use one level symbol on the bridge, if under bridge is not allowed to run.
This example is contrived.	

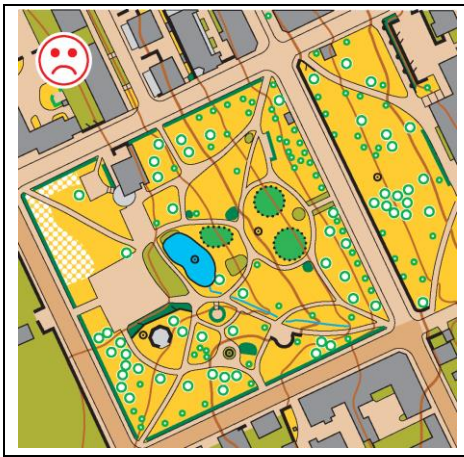
28 Entrances to underpass

	
Here the mapper has mapped some short walls leading into two underpasses. They were even exaggerated in size.	These walls are totally unnecessary and can in many cases be omitted altogether to make the map cleaner, and the underpass more visible on the map.
Link to Google Street view	

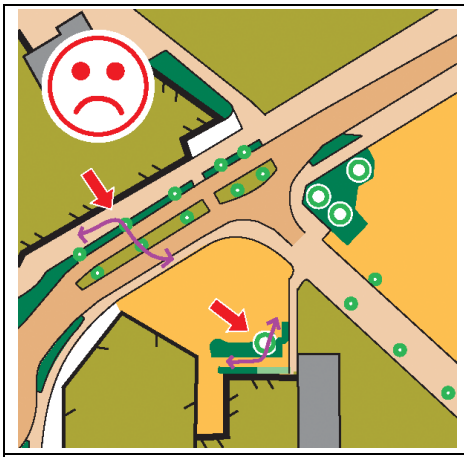
29 Mapping single trees vs area symbols

<table>
<tr><td> 
</td><td>  </td></tr>
<tr><td>1) Trees too dense and 0.15 mm cartographic gap not observed. Better to use white
2) When there are many trees, each individual tree loses its significance. Then consider using 402 or 404. However, this requires some width to be legible.
3) Hence, in narrow areas, consider just using white forest.</td><td>Individual trees when there are many of them, are not important to navigation, neither are they suitable as control features. With less green dots on the map, the features that are important, become more visible in the map.</td></tr>
<tr><td colspan="2">Link to area in Google Street View. Note: This map is partly contrived.
Also see this video by Jeff Teutsch.</td></tr>
</table>

30 Mapping single trees vs area symbols 2

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Here, the mapper has mapped every single tree, except in the Western corner of the park. Moreover, the threshold for classifying a tree as “large” has been too liberal, making the trees too close to each other.</td><td>Here, only the largest and most conspicuous trees have been mapped, and the remaining areas have been mapped using symbol 402.</td></tr>
<tr><td colspan="2">Another example (left is from an older map). Link to park in Google Street View.</td></tr>
</table>

31 Trees in uncrossable areas

	
Putting trees inside small areas that are out of bounds can be problematic if it makes some areas that are not to be crossed look crossable on the map.	Removing these trees makes the barriers and other important features on the map become much clearer to the runners.

32 Overdetailed contours

	
1) Contour lines do not cross streets at right angles 2) Hills on streets 3) Bad generalization of contour lines 4) Wrong order of colour 5) Bad generalization of buildings	Contour lines shall be drawn at right angles crossing streets. Contour lines of hills and depressions shall not be on streets. Contour lines shall be generalized in a broad manner. The order of colours shall be obtained. Buildings shall be generalized.

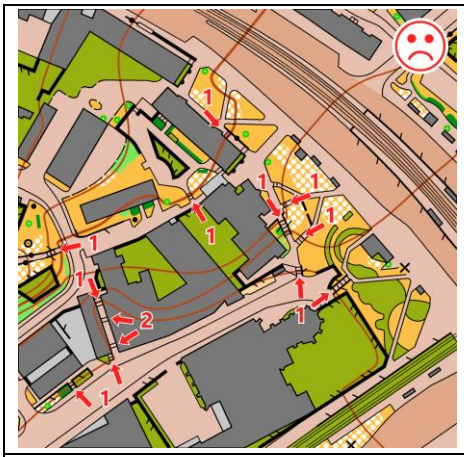
33 Jagged unsmoothed contours

	
Rugged contour lines give too much unnecessary information	Smooth contours give a calm and easily readable map.
Lysheim kindergarden, near Stavern	

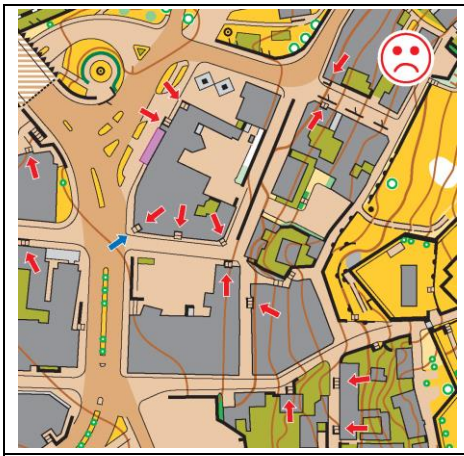
34 Total simplification of contours where not visible

	
1) Contour lines do not cross streets at right angles 2) Contour lines cross stairs 3) Information might mislead 4) Unnecessary information	1) Contour lines shall be straightened when crossing street 2) Contour lines shall be cut when crossing stairs 3) Contour lines shall be removed on what appears as flat surface 4) Contour lines shell be totally simplified when crossing surfaces that are not visible and not reachable
Google Street view link Upper level panorama link Lower level panorama link	

35 Contours crossing stairs

	
1) Contour lines crossing stairs are not cut 2) Minimum number of lines for stairs is not obtained	Contour lines shall be cut when crossing stairs. Minimum number of lines for stairs is 3.

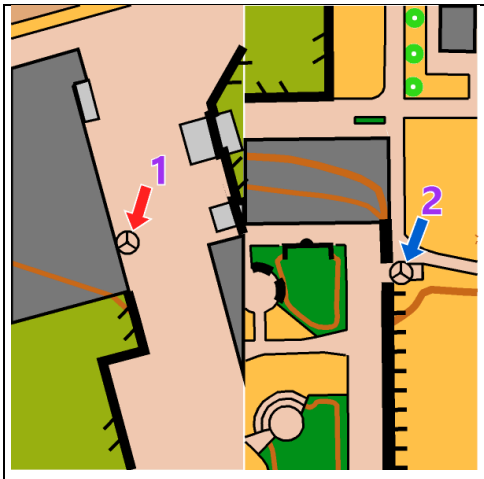
36 Minor stairs to entrances

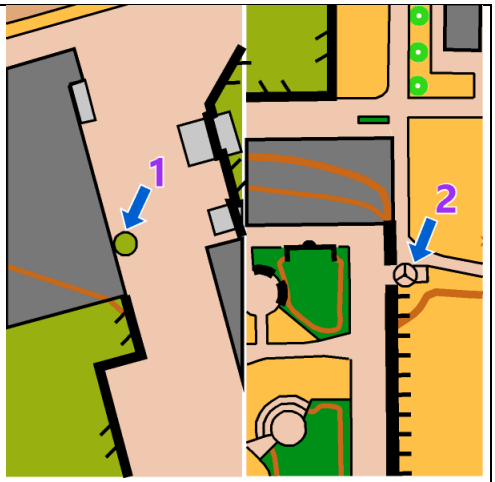
	
Here, the mapper has included small stairs in front of entrances. To map them legally and legible some exaggeration had to be done. This "polluted" the map with detail that the runners do not need, and in some cases even at the expense of other, possibly more important detail or making passages too narrow.	Most of these stairs are minor and negligible and can be removed to make the map cleaner. There are two stairs that were considered conspicuous enough to be included (judged from Google Street View and marked with red arrow above). These were drawn using 520 to simplify its footprint.
Link to Google StreetView (located at blue arrow)	

37 Stairs and steps

Stairs can be misinterpreted as obstacles if not mapped clearly. Common issues include: 1) Mapping stairs with fewer than 3 steps. 2) Steps spaced closer than 0.4 mm on the map. 3) Central railings that clutter the stair symbol. 4) Mapping very low or minor ground-level steps.	To improve the map and make sure it is ISSprOM-compliant: 1) Short stairs are lengthened to include 3 steps. 2) If steps are too close, making fewer steps will lighten the map. 3) Removing unnecessary mid-railings also lightens the map 4) Minor stairs can be removed all together
Link to StreetView	

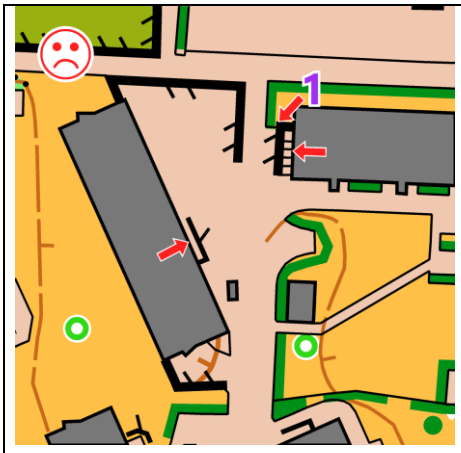
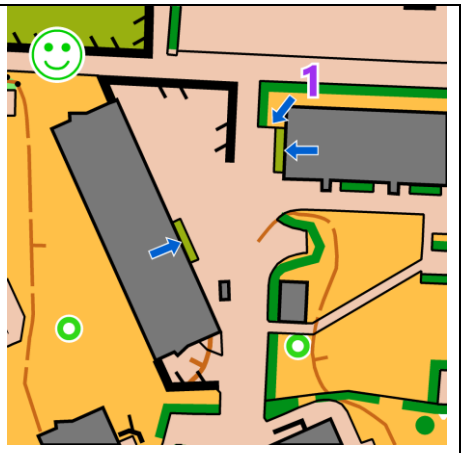
38 Spiral stairs



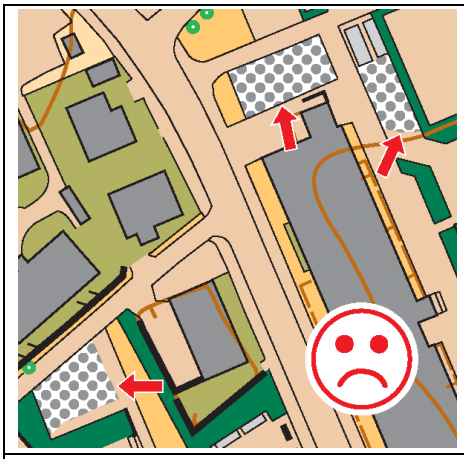


1) Spiral stairs that are forbidden to access or does not lead any further, should be drawn as forbidden entry/area (520)	2) Spiral stairs that runners are allowed to use, and that leads the runner further, should be represented as shown above to the right.
Left stair: https://maps.app.goo.gl/aycuuYRLYgTq9HpC7 Right stair: https://maps.app.goo.gl/QLsgAhbyGeU8Zude9	

39 Unnecessary stairs

	
Small/short stairs that are forbidden to access or does not lead the runner any further, should be mapped as “Area that shall not be entered” (520)	Showing stairs this way makes the map clearer and easier to understand. You will also avoid the problem with stairs that will “take too much space”. As an example, look at the gap at (1).
https://maps.app.goo.gl/RXiiaL2uUMNS3qLH6	

40 Area with obstacles (533)

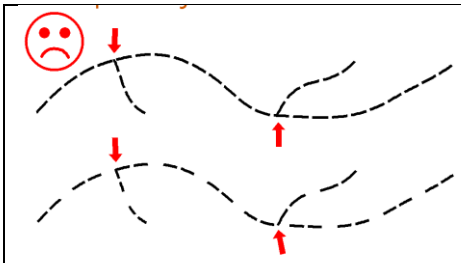
	
Due to the illustration in the specification, the mapper believed that this symbol shall have a white background. Additionally, the diagram in ISSprOM section 3.5 was not updated with the new symbol corroborated this view.	It is the intent that symbol 533 is to be combined with any colour, such as 30% brown, 100% yellow, 50% yellow or white forest.
Link to Google Street View.	

41 Mapping sidewalks in area without traffic

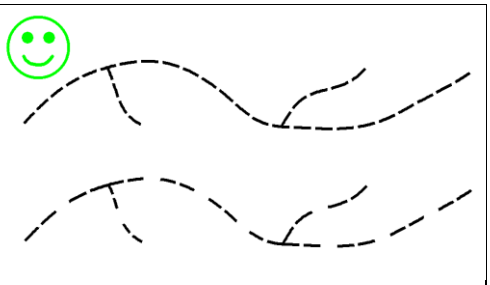
Step or edge (501.1) shall not be drawn inside Paved area (501) if it´s not very important for navigation. Sidewalks along street with heavy traffic should be mapped

Eliminating unnecessary step or edges makes the map much clearer and easier to read in competition speed.

42 Footpath – junction from the centre of the dash



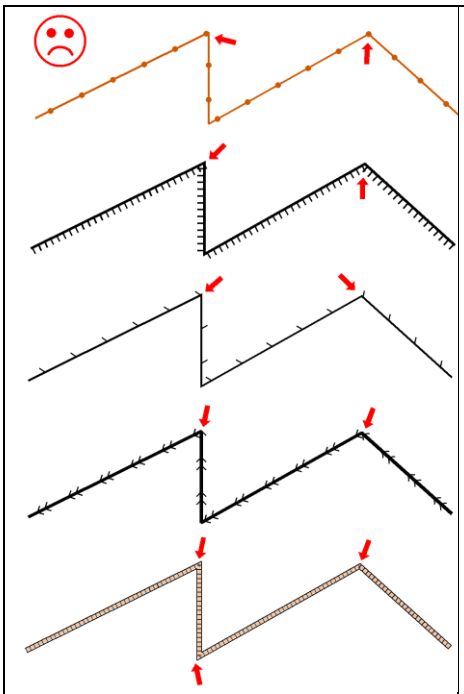
Junction is not defined.



Here the junction is clearly defined.

These examples are contrived.

43 Styled lines - sharp corners with corner point

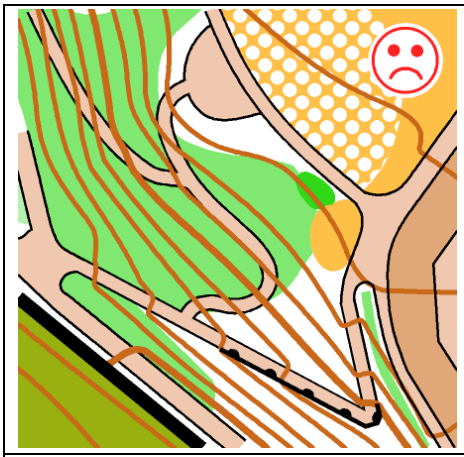


At the lines sharp corners points on the line symbols shouldn't be placed at the corner	Sharp corners with no point symbols on them look much clearer
These examples are contrived.	

44 Dash points and corner points

1) Corner points (corner vertex) can be used to start the distance to next object over again in order to avoid conflicting objects. 2) Corner points can be used on any line symbol. 3) Use corner points instead of dash points to avoid strange corner incidents.	By adding corner points the tags are shifted avoiding too small gaps to other objects.
Stavern school, Norway.	

45 Drawing of paved footpaths in steep slopes

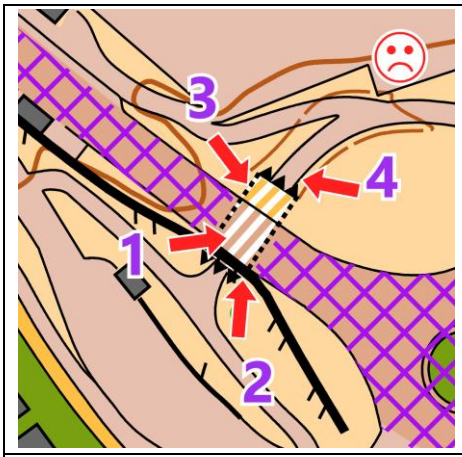


Predefined symbols for paved footpaths allow easy drawing including creation of junctions, but in steep slopes ends with an unsatisfactory result where black sidelines are drawn under the brown for contours and legibility is reduced.

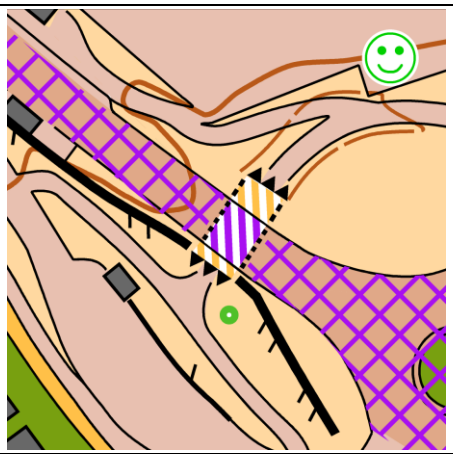
On steep slopes it is recommended to redraw sidelines with 501.1 Step or edge of paved area to improve legibility of the situation (sidelines are above contours). Other measures include adjusting the contour lines around the footpaths.

This example is partially contrived.

46 Shark teeth cartographic gap



1) Since the road is marked forbidden, the hash should also display so.
2) Tall fence behind shark teeth is removed to enhance readability. This also removes the two tags being tangled up within the triangles.
3) Underpass walls are pulled back for better readability.
4) Outline of paved area is pulled back for better readability.



Allow gap in between black elements.

Please also note the angle direction of the white hashes for the underpass having been turned to 45° of the underpass direction.

Solstad, near Stavern, Norway

Errata (changes to the document):

Date	Description