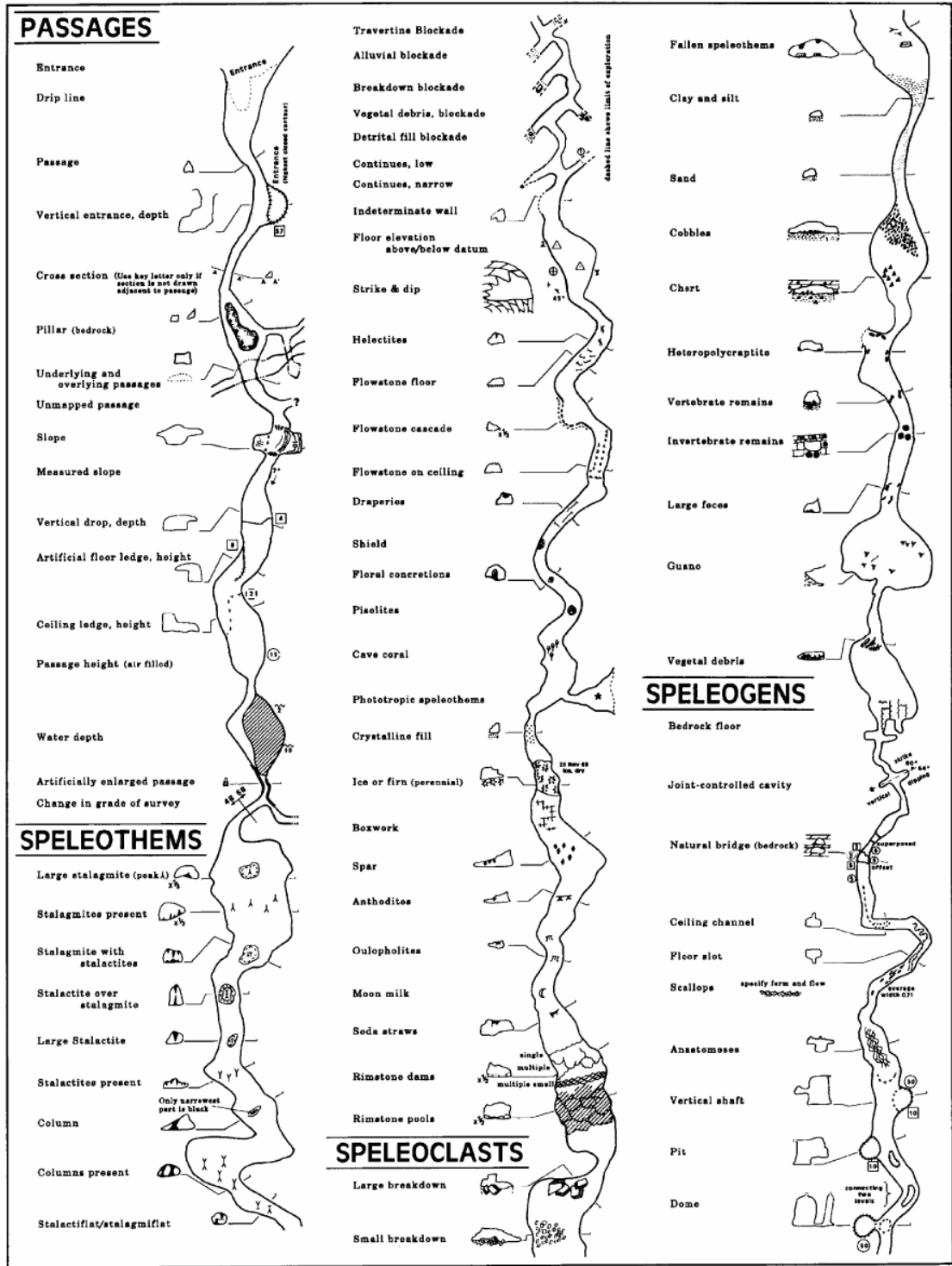
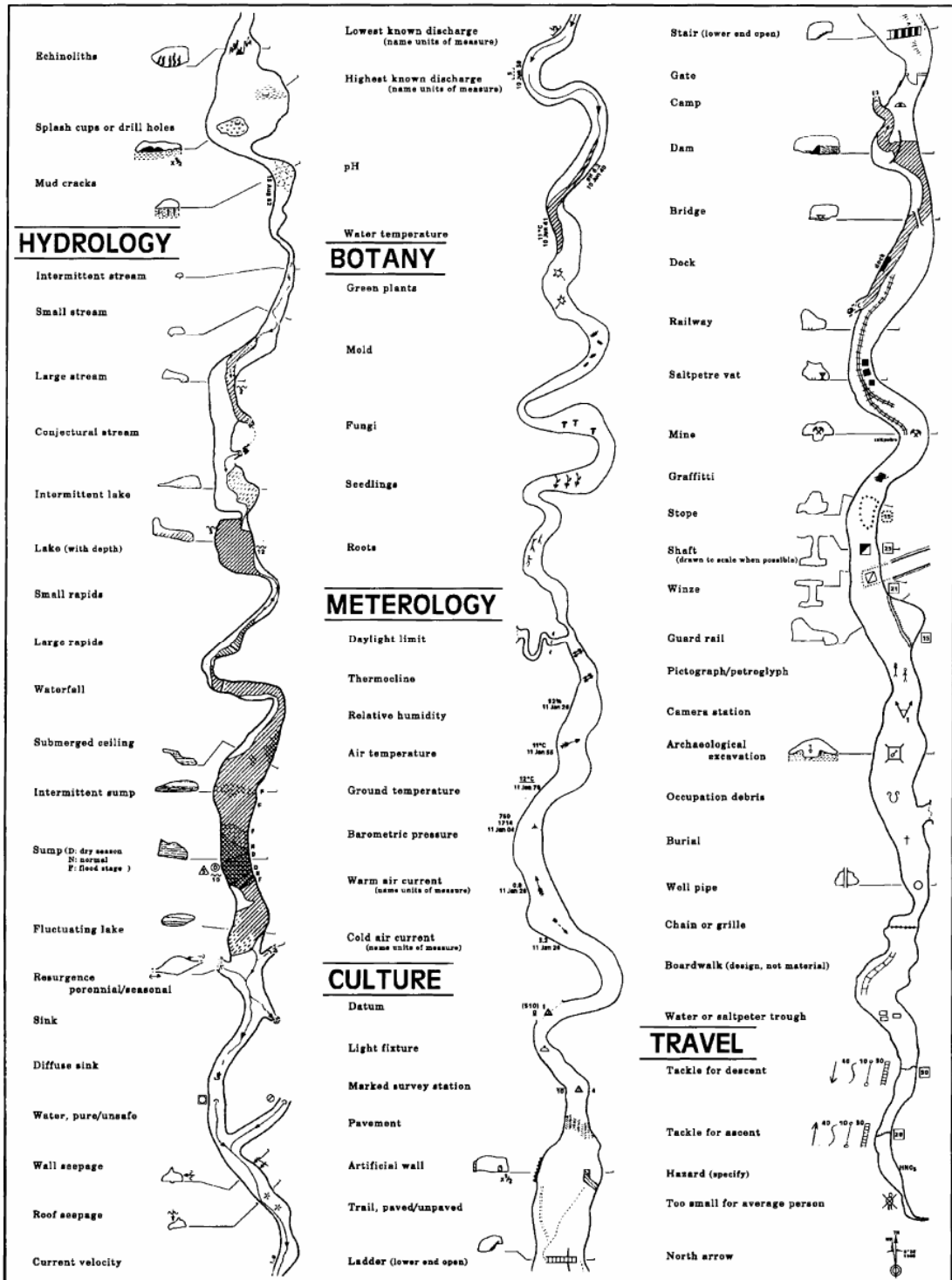


Appendix B

National Speleological Society Map Symbols



NSS Map symbols reprinted with permission of the National Speleological Society (Dasher 1994)



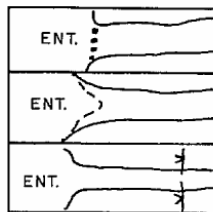
Appendix C

Missouri Speleological Survey Map Symbols

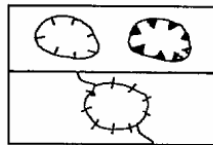
CAVE MAP SYMBOLS

An effective cave map is one in which its viewer can understand in some detail what the cave is like. Thus, each symbol used on the map should look much like the feature which it represents. In 1960, the Missouri Speleological Survey formally adopted a set of symbols which is still being used in the state of Missouri and in 1976, the National Speleological Survey published a slightly different list of symbols. The following list is a combination of the lists from the Missouri Speleological Survey, the National Speleological Society, the British Caving Association, and others. All variations of the symbols are shown that may be of use to the surveyor. Special symbols can be created by the surveyor as needed, but these should be explained on the final map sheet.

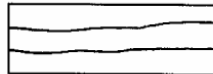
CAVE PASSAGES



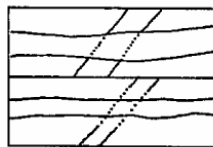
Cave entrance showing dripline. The entrance should be labelled and the dripline should be configured as closely as possible to the actual alignment. The MSS uses a dotted line and the NSS uses a dashed line. The British delineates the limit of penetration of daylight under most favorable conditions.



Vertical cave entrance showing depth. The MSS uses either a sinkhole symbol or a symbol with black triangles. The NSS uses a pattern with tick marks all the way through the line. In all cases, show the depth.

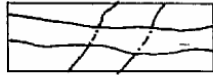


Surveyed cave passage. The line width varies with the scale, but is always greater than widths for passage details.

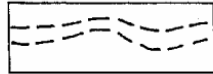


Underlying cave passage. Dotted lines indicate lower level only where the levels are superimposed. Letters "U" and "L" may be added. British symbols have the lower passage dotted at the intersection and slightly outside of the superimposed area.

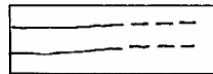
MSS Map symbols reprinted with permission of the Missouri Speleological Survey (Thomson and Taylor 1991)



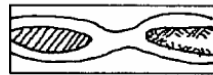
Overlying cave passage. Dotted-dashed lines indicate upper level only where the levels are superimposed.



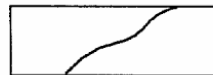
Unsurveyed cave passage. This symbol applies also where the passage wall is obscured by fill or the ceiling height is so low that the passage wall cannot be determined.



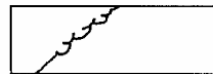
Unexplored cave passage. This symbol should be used where the unexplored cave passage can be seen to continue.



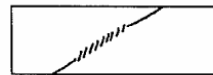
Bedrock or solid areas between cave passages. The solid areas are rock pillars. The MSS uses a cross hatch pattern and the NSS uses a two directional hatching to indicate the solid rock area.



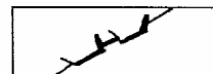
Bedrock walls in cave passage. This is the same symbol as that used for the cave passage. It is shown here again for completeness.



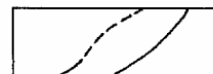
Flowstone covered cave walls. This should be used in areas where the bedrock is obscured by secondary mineralization.



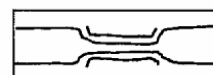
Sediment cave walls. This symbol indicates areas in which the passage is totally filled with sediment along the side of the passage.



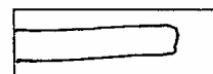
Cave wall in breakdown. The symbol indicates areas in which the side of the passage is totally in breakdown. The blocks of breakdown should be drawn to scale if possible.



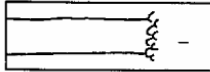
Indeterminate cave wall. This symbol indicates areas in which the passage height is so low that the edge cannot be seen. The symbol is the same as shown above as an unsurveyed passage.



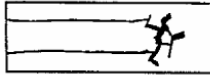
Artificially enlarged cave passage. This is generally found in a commercial or developed cave in which someone has blasted and mined the cave to enlarge the passage.



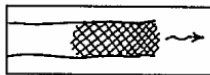
Cave passage terminates in solid rock. Use this symbol when you can actually see that the passage ends in solid rock.



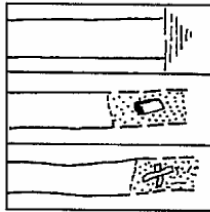
Cave passage terminates in flowstone. Passage is totally blocked by flowstone.



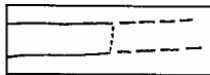
Cave passage terminates in breakdown. Continued passage is stopped by breakdown. Draw the breakdown blocks to scale if possible.



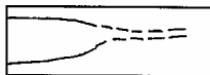
Cave passage terminates in a siphon. The cave cannot be mapped further because water fills the passage to the ceiling.



Cave passage terminates in sediment or other detritus. The cave passage is totally choked by cave mud or other sediment. MSS symbol only indicates mud fill. NSS symbols designate other types of fill such as detrital and vegetal debris. Two varieties of the NSS representation are shown.



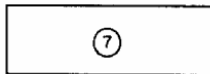
Cave passage continues, but low. This is generally used where the passage may be too low to enter by the cave surveyor. Someone else may be able to continue the survey beyond this point later.



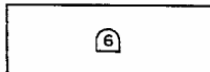
Cave passage continues, but narrow. This is generally used where the passage may be too narrow for the surveyor to continue. Someone else may be able to continue the survey beyond this point later.

DIMENSIONS

All dimensions should be in the same units. Consistently use either metric or English systems throughout the entire map. Also, use either feet and tenths of feet or feet and inches on any one map.



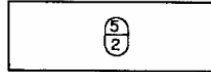
Ceiling height. This is the distance measured from the apparent cave floor to the ceiling. The British use a ^ over the dimension number.



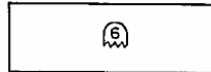
Ceiling height over water. This is the distance measured from the water surface to the ceiling.



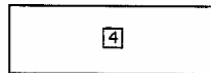
Water depth. This is measured from the water surface to the apparent cave floor. The British use a "v" under the dimension to indicate water depth.



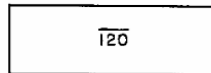
Height of air space over depth of water. This is related to the water surface and measured both from the water surface to the ceiling and to the apparent cave floor.



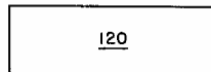
Ceiling height over traversable breakdown. This is the average distance from the breakdown blocks to the ceiling.



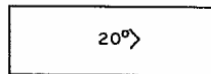
Vertical difference in floor elevation. Use this symbol in combination with the symbol for ledge, waterfall, or pit. The British simply indicate a line and put a negative number on the drop side of the line or a plus number on the upper side of the line.



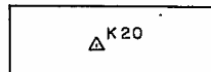
Depth of cave floor below primary cave entrance. If more than one entrance, designate the primary entrance.



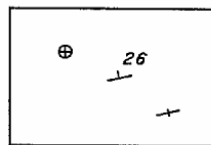
Elevation of cave floor above primary cave entrance. If more than one entrance, designate the primary entrance.



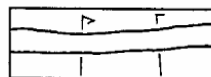
Degree and direction of floor slope. In the symbol, the arrow or point indicates the downslope direction.



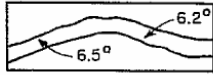
Marked or fixed survey station. These are permanent stations which can be recovered within the cave.



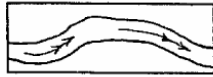
Strike and dip of beds. The symbols are designed to indicate the attitude of the rock units within the cave. The number indicates the degree of slope of the beds perpendicular to the elongated line. The circle with the plus indicates horizontal beds and the line with the small cross indicates vertical beds.



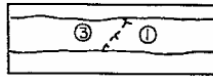
Line of cross section. The exact location of the cross section is shown by the line. The direction of view is indicated by the arrow or point on the end of the section line. Some cross sections indicate this by using numbers or letters.



Water and air temperatures. These are given in either degrees celsius (°C) or degrees fahrenheit (°F). This should be indicated unless stated in the explanation or legend.

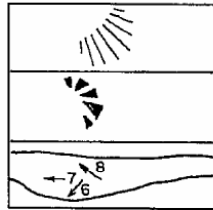


Direction of air flow. This should be shown by a double pointed arrow.

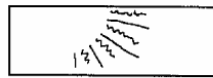


Change in ceiling height. Hachure in the line symbol points to the lower side of the ceiling.

PASSAGE FEATURES



Slope, arcuate. Convex side downslope, non-arcuate slopes have a single line at the top of the slope. MSS uses straight lines for the slope and NSS uses long black triangles to show the slopes. The British indicate slopes with an arrow along with the angular dimension.



Steeply dipping flowstone.



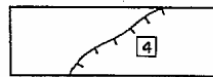
Slope, non-arcuate.



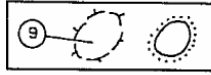
Slip off slope. (Towards the Passage Wall). Use this symbol for such features as sumps, tops of long uniform slopes, or for earth slides. The straight line indicates the top of the slope.



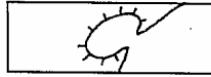
Semi-dome. Slope is away from the passage wall.



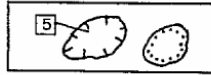
Ledge or pit rim with depth. Use the symbol for vertical change in floor elevation. Hachures and dimension symbol are on the lower side. This is the same symbol as listed above under vertical difference in floor elevation.



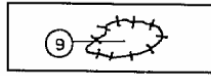
Dome in the ceiling (with height shown). The height is measured from the floor to the ceiling. The British illustrate this with a circle surrounded by dots.



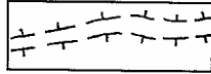
Dome in bedrock. This is generally shown outside of the passage lines.



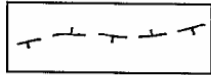
Pit, sink, or well (with depth shown). Depth measured from the floor of the pit to the level of the floor of the cave. The British use a circle with dots lining the inside for this symbol.



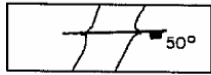
Dome pit (with vertical dimensions shown). The distance here is measured from the floor to the ceiling. This feature must extend both below the cave floor and above the cave ceiling.



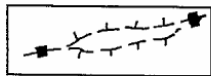
Ceiling channel (large). Hachure marks point away from the channel.



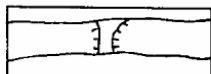
Ceiling channel (narrow). Hachure marks point away from the channel.



Joint in the ceiling. Dip of the joint is indicated on the side of the joint symbol.

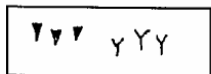


Enlarged joint in the ceiling. This is basically the same as an elongated dome, with joint orientation shown.

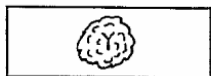


Rock span or natural bridge. Draw this symbol to scale as much as possible.

SECONDARY MINERALIZATION



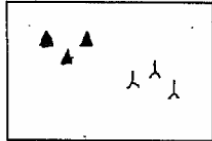
Stalactite. Symbol size can be used to indicate relative size of the formation. Use notations when the stalactites are profuse. MSS symbol is a simple black triangle with the point in the direction of gravity. NSS symbol is a "Y" likewise oriented.



Large stalactite. NSS symbol outline to show the size of the area that connects with the ceiling.



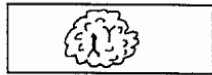
Stalactite over stalagmite. NSS symbol shows the size of connection to the ceiling and the diameter of the base of the stalagmite. This is not a column.



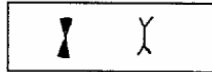
Stalagmite. Symbol size can be used to indicate relative size of the formation. Both MSS and NSS symbols are inverted versions of the stalactite symbol.



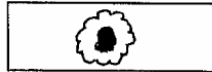
Large stalagmite. Outline shows the relative size of the base. NSS symbol of inverted "Y" shows the peak.



Large stalagmite with stalactites. The outline shows the relative size of the base. The NSS symbol indicates both the stalagmites and stalactites.



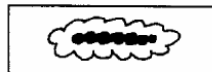
Small column. NSS and MSS symbols are matched stalactite and stalagmite symbols.



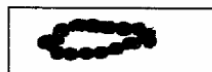
Large column, smaller ceiling juncture. Cross section of the column at the floor is denoted by the outline of the column symbol. Interior area indicates juncture with the ceiling as compared to the juncture with the floor.



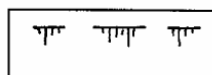
Large column, larger ceiling juncture. Outline of column symbols denotes approximate cross section of the column at the ceiling juncture. Interior area indicates that juncture with the floor as compared with the juncture with the ceiling.



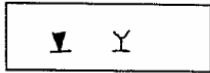
Compound column with smaller ceiling juncture. The outline of column symbols denotes the approximate average cross section of the column. Interior area indicates juncture with the ceiling as compared with juncture with the floor.



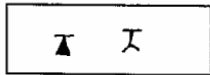
Compound column with larger ceiling juncture. The outline of the column symbols denotes approximate cross section of the column. Interior area indicates juncture with the floor as compared with juncture on the ceiling.



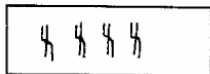
Soda straws.



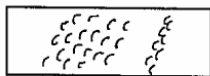
Stalactiflat. The MSS symbol is the same as the stalactite symbol with a base line added. The NSS symbol likewise is the same as the stalactite with a base line added.



Stalagmiflat. The MSS and NSS symbols are the same as the stalagmite symbols with a base line added.



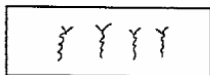
Helictites.



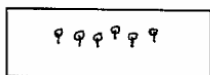
Flowstone covered floor.



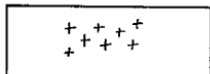
Shield.



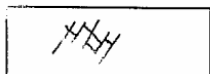
Draperies



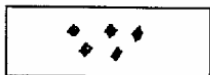
Cave coral.



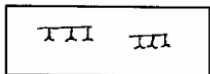
Crystallizations. This symbol has also been used for helictites, anthodites, gypsum, spathites, etc.



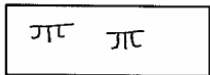
Boxwork.



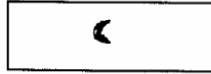
Areas of spar.



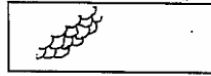
Anthodites.



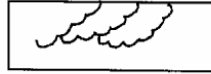
Oulopholites.



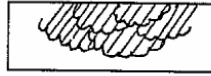
Moon milk.



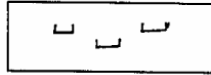
Flowstone. Convex side of the symbol is downslope.



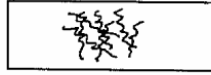
Rimstone dams (gours). Convex side of the symbol is downstream.



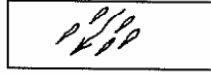
Rimstone pools.



Splash cups or drill holes.



Anastomoses areas.



Scallops. Specify form and direction.

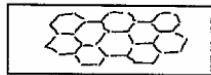


Flowstone covered breakdown blocks.

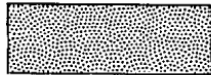
CAVE SEDIMENT AND OTHER FLOOR MATERIALS



Clay or silt floors.



Mudcracks.



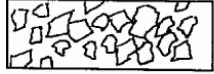
Sand.



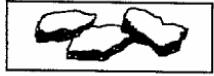
Gravel. This symbol represents any larger sized floor fragments.



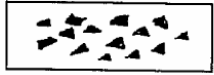
Angular rock fragments.



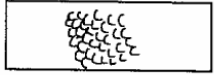
Rubble.



Breakdown. Symbols should be drawn to scale as much as possible.



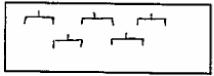
Chert.



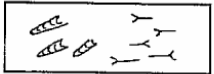
Flowstone floor.



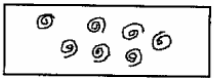
Bedrock floor surrounded by sediment or water.



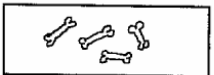
Bedrock floor (NSS symbol).



Fallen speleothems. Can be drawn diagrammatically or using the "Y" symbol of the NSS.



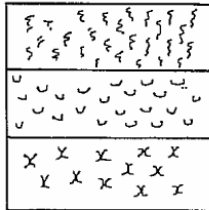
Invertebrate remains.



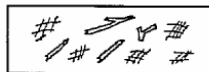
Vertebrate remains.



Large feces. This is an NSS symbol which could be used to show areas of bear or raccoon droppings.

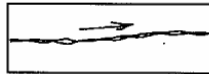


Guano. The MSS, NSS, and British symbols are shown in order from top to bottom.

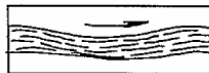


Vegetal debris.

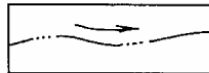
HYDROLOGICAL SYMBOLS



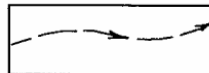
Small stream. Arrows indicate direction of flow.



Large stream. Arrows indicate direction of flow.



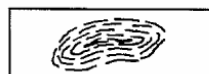
Intermittent stream. Arrows indicate direction of flow.



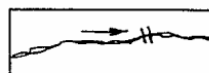
Conjectural stream. Projected location of the cave stream.



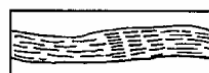
Pool. MSS and NSS symbols are similar. The British use a parallel line pattern for their symbol.



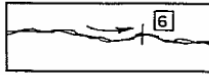
Intermittent pool.



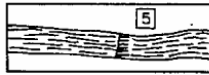
Small rapids.



Large rapids.



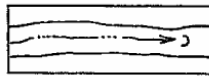
Small waterfall showing height.



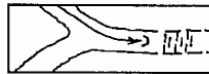
Large waterfall showing height.



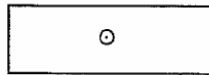
Perennial or seasonal resurgence.



Diffuse sinking stream.

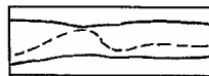


Sinking stream.

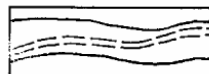


Well pipe or casing.

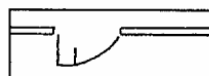
SYMBOLS FOR MAN-MADE FEATURES



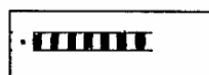
Trail. Dashes in this symbol should be much shorter than the symbol used for an unsurveyed passage.



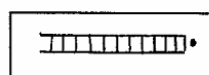
Paved trail.



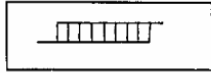
Gate.



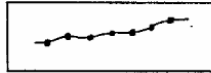
Stairs. Dot indicates the top end in MSS symbols. Open part of the NSS symbol indicates the lower end.



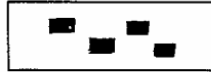
Ladder. Dot on the MSS symbol indicates the top of the ladder. Open part of the NSS symbol shows the lower end.



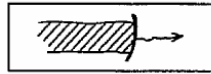
Boardwalk.



Guardrail.



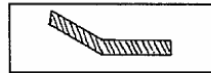
Saltpetre vats.



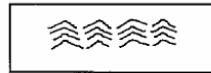
Dam. Lake Symbol indicates the upstream lake.



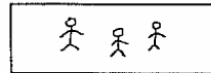
Bridge. Small bridge is on the right, large bridge on the left.



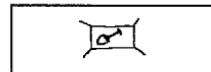
Artificial wall.



Pavement.

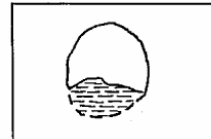


Pictograph or petroglyph

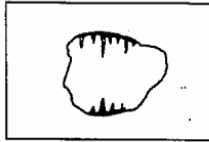


Archaeological excavation.

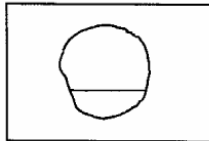
CROSS SECTIONS



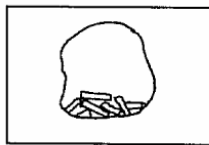
Cross section showing cave fill. Cross sections are drawn to scale. Dashed line shows area obscured by fill. Use appropriate symbols for the type of fill.



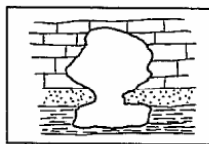
Cross section showing speleothems. Speleothems are drawn to approximate scale.



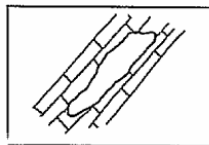
Cross section showing water. Water surface drawn with a straight edge.



Cross section showing breakdown. Symbol size and shape indicates the nature of and type of breakdown.



Cross section showing lithologic control. Use appropriate geologic symbols for various rock types.



Cross section showing structural control.