

# Surveying Guide and Standards

## Guide to: Equipment

### 1. Instruments

- Method to record entrance location
  - GPS or equivalent
- Method to record distances underground
  - Fiber glass tape measure, electronic device, or equivalent capable to measure to the centimetre
- Method to record bearing (azimuth) underground
  - Compass, electronic device, or equivalent capable to measure to the 1/2 degree
- Method to record slope (inclination) underground
  - Inclinometer, electronic device, or equivalent capable to measure to the 1/2 degree

### 2. Recording methods permitted:

- Paper - use Duksback or equivalent
- Electronic

## Minimum grade to achieve

- Dry - UIS Grade 4 Details 4
- Diving - Equivalent to UIS Grade 3 Details 3

## Guide to: Surveying

Before you go underground

1. Calibrate survey instruments.

Survey stations

2. Mark all stations with red paint.
3. Flag (yellow) and label junctions and important stations in paint (ie. NV23).
4. Avoid cairns. Use stations on the wall above the flood line.

Session notes

1. Each session should have a cover sheet.
2. For horizontal passages or short pitches sketch plan, extended elevation (running vertical profile), and cross sections.
3. For shafts sketch 1 or 2 projected elevations/longitudinal profiles (90° to each other) and horizontal cross sections (horizontal slices through the shaft). For complicated shafts, show the generalized shape of the shaft on the plan, and more complicated aspects in the horizontal cross sections.
4. Record LRUD passage dimensions at each station.
  - Use the bisector of the angle between the two survey legs.
  - On pitches record NSEW (or appropriate angles); also record U or D if meaningful (on ledges/at bottom of pitch).
  - In boulder chokes record LRUD for the farthest you can see through the boulders in each direction.
5. Label and number the top of each sheet of session notes with:  
Date, Cave Number, Cave Name, Session Name, Sheet Number. (i.e.2013.02.12 48H-G1-100 Gargantua Cave "Muddy Rift" 1 of 6 )
6. Sketch to scale using a protractor/compass/PDA. Draw a scale bar on each page. The plan should also have a north arrow.

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7. If recording both foresights and backsights for each survey leg. make sure they agree within 2 degrees.

## Sketching style

1. Number all stations on the sketch.
2. Sketch the rigging for each pitch on or beside the profile. Show anchor types, rope length, and pitch length.
3. Plumb pitches and climbs and record them on the drawing (ie. p7, c6)
4. Note, grade (A=good, C=poor, D=dig), and describe all leads (ie. Station NV23 "A lead" 4m tall by 6m wide, a 6m climb).
5. Record air flow directions with date and time.
6. Note the location of any cave life seen.

## Guide to: UIS Mapping Grades

Go to the link provided for the information.

<http://www.uisic.uis-speleo.org/UISmappingGrades.pdf>

## Guide to: Survey Cover Sheets

1. Cave number (i.e. 48H-G1-100)
2. Cave name (if any) (i.e. Gargantua Cave)
3. Date
4. Session name (i.e. Muddy Rift Series).
5. Team members' full names and jobs during the session
6. Instruments used (serial numbers + make i.e. Suunto Clino 24515612)
7. Tape calibration (i.e. "Tape missing 50cm at start" not the ambiguous "Tape = Tape - 50cm")
8. Instrument calibration (if done) or at least a note of any problems such as bubbles or sticking.
9. UIS grade of survey (UISv1 4-2-BC, UISv1 5-4BCE, etc.).
10. A clear description of any tie-in stations used (i.e. "1 = Gargantua Entrance Series station 35")

## Guide to: Drawing-up Sessions

1. Use a sharp pencil.
2. Write the number of *\*every\** survey station clearly.
3. Symbols:
  - Use standard UIS symbols drawn in the standard way. If you are using your own, idiosyncratic symbol or you are using a shorthand version of a standard symbol, write this in on each page (eg arrow pointing to your symbol and "bedrock" or whatever).
  - For narrow/cluttered passage, draw the stal, etc. symbols outside the passage walls.
  - Clearly distinguish confusable symbols - sand from mud, pebbles from boulders.
  - Take care to distinguish between large boulders versus rock pillars - if necessary, draw an arrow and explain which it is.
  - Clearly distinguish between random boulder symbols and boulders which you have drawn in (the latter are specified to be at that particular shape, size and location and will need to be drawn in by hand - this is time-consuming but useful for distinctive or large boulders).
  - Where possible, draw clear boundaries around areas of fill (water, sand, cobbles, mud)
  - Double check that you're using the change in ceiling height symbols correctly – the bottom of the T is on the side with the lower ceiling.

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## 4. Make your sketch easy for others to understand

- It can be difficult to spot pitch and ceiling boundaries in complex areas. Try to keep them clear of other detail and use enough symbols so it is easy to spot which direction they face.
- If there isn't much room it is better to reduce the number of symbols (or put them outside passage walls) in order to make each one clear rather than shoving them all on top of each other.
- It can be tempting to shove in all the floor detail symbols since there is often a bit of everything in caves. If the floor is predominantly of one type consider simplifying and only drawing that fill.
- Distinguish carefully between:
  - A solid patch of one floor type next to a patch of a different type
  - A mixture of the two types throughout.
  - The first should be drawn with boundaries around the patches if possible. The second should be drawn with regularly interspersed symbols (ie mud dashes regularly spaced between boulders.) If it's not clear, write a note.
- If there are two or more partial sketches of the same complex junction, then inevitably, there will be discrepancies between the sketches. In such cases, the surveyors must combine all sketches of the junction into a single set of printouts before the end of the expedition.

## 5. Printing out the line plot (if necessary):

- Adjust the printout to fit as much as possible onto a single piece of paper (it is very time-consuming to add three or four leg survey onto another sketch and it can take much longer than for a big sketch to work out where it fits in)
- Whenever possible draw up on printouts as opposed to graph paper as this makes the computer-based drawing up much easier.

## 6. Check the elevation, plan and cross-section for consistency (i.e. don't draw the passage 10m wide in the elevation and 5m wide in the plan [Cross sections].)

7. If two passages overlap, draw them on separate sheets for clarity. This makes the computer work easier.

8. If there's enough space, draw the rigging directly on the elevation printout. Also note pitch locations and lengths on the plan.

9. Above all it's better to get it done sooner rather than later. All surveys must be drawn up as clean copies (on printouts or in the computer) before you leave the expedition.