Swiss Cave Diving®
Swiss Cave Diving Instructors®

CAVE DIVING

Standards, Training System & Safety Rules

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Legal Notice

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Part I:

The SCD Cave Diving Training System

Legal Advice

- In all countries in which regional or national laws and regulations are imposed on diving in general or for particular diving activities (such as Nitrox, Trimix, Cave), those rules are strictly to be abided.
- It is self-understanding that such laws and regulations precede all similar rules from any private organizations (incl. all diving organizations such as SCD).
- Under no circumstances violations of such legal requirements will be endorsed or sup-ported by SCD.
- It is therefore the sole responsibility of each diver, dive guide, instructor and course director to procure such relevant legal information in due time. This responsibility cannot be waived or delegated.
- All divers and instructors must be aware of the fact that in case of an incident the present standards may be used by investigating authorities as a source for specified duties. Breach of such duties may be judged as negligence or gross negligence in court.

Notice to the terms and abbreviations used

All **units of measure** used and their conversions are listed and explained in Appendix 12, abbreviations and other special terms related to cave diving training in the **Glossary** (Ap-pendix 19).

Standards & Training System

1. Course classification and training scheme structure

1.1 Diver Level

A compressed overview on the Overall SCD Training System is presented in Appendix 1 ("General overview on the SCD Training System / Designations of Certificates".

1.2 SCD Cave Diving Training System

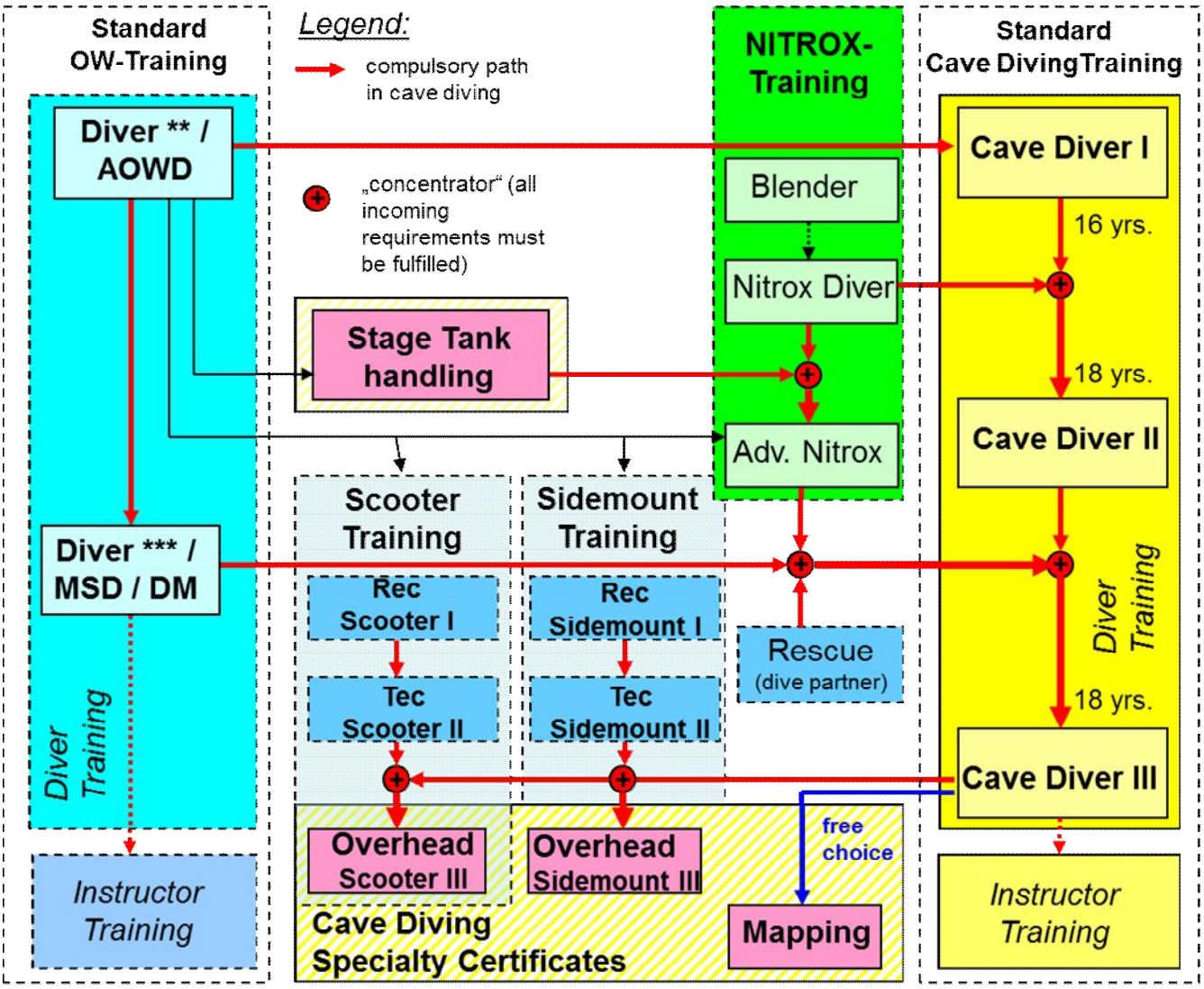
The SCD ***Cave Diving Training System*** is basically composed of the following 2 course types:

- Standard Cave Diving Courses
- Specialty Cave Diving Courses

The following diagrams show the structure of the training system and the links and interfaces between this and adjacent systems.

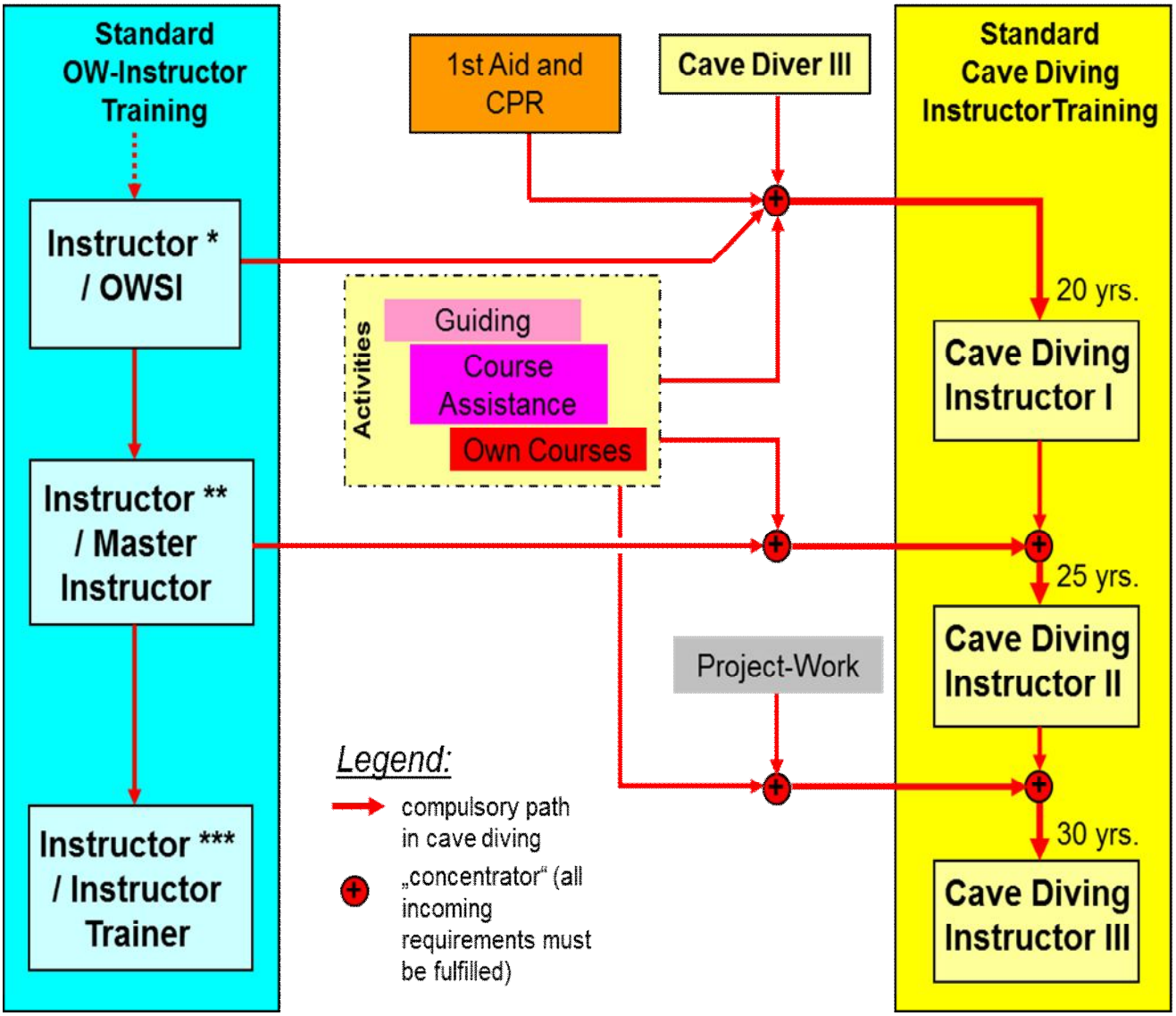
1.3 Diver Level

An overview of SCD cave diving certificates designations on diver level is presented in Appendix 3a.



1.4 Instructor Level

An overview of SCD cave diving certificates designations on diver level is presented in Appendix 3b.



1.5 International comparison

An international comparison of the different cave diver certifications systems is presented in Appendix 3c.

2. Standard Cave Diving Courses and -Certificates

2.1 General remarks concerning OC, CCR and Sidemount training

In principle, all SCD cave diving courses can be completed with OC or CC devices, with back- or sidemount, or with devices with connected tanks or Indi configuration. This is justified by the fact that in the cave diving courses, NOT the handling of the relevant devices per se is taught, but pure cave diving techniques.
To guarantee a clear differentiation, the cave diving certificates on all 3 levels are marked with an addition „**OC**" (open circuit) or „**CC**" (closed circuit).

In the case of the cave diving instructors on the Cavern and Full Cave Diving Instructor level, the person concerned may request an instructor card of his level with the addition "CC" if he has at least one user certification of a CE certified CCR device and has directed a complete cave diving course at level Cave Diver I (for Cavern Instructor) or Cave Diver II (for Full Cave Instructor) under the supervision of a representative of the SCD Training Commission, who has at least a Cave Diving Staff Instructor and a Full Cave Diving Instructor (CC) rating. The applicant has carried out this course with a positive overall evaluation.

To enable Cave Diving instructors to teach an **SCD Standard Cave Diver course (Level I to III)** but with **Sidemount configuration**, they must also be holders of a **Sidemount Full Cave Diver III** certificate, in addition to the required **Cave Diving Instructor certificate (Level I or II**).

In order for Cave Diving instructors to teach the **SCD Sidemount Diver III** course *(specialty course after the standard Full Cave Diver course*), they must at least be certified as **Full Cave Diving Instructor (Level II**) and be the owner of a **Sidemount Diver III** certificate. In addition, they must have directed a complete Sidemount Diver III course under the supervision of a representative of the SCD Training Commission who has at least a Cave Diving Staff Instructor and a Sidemount Diver III (or higher) rating. The applicant has carried out this course with a positive overall evaluation.

In order for the participants to be allowed to use CCR devices, they must meet the requirements set out in part IV, chap. 4 (Requirements for Divers and Equipment / Application- and Safety-Rules). The same holds true for students who want to use a sidemount configuration.

2.2 Cave Diver I (Cavern Diver)

(for detailed course content and prerequisites ref. to part I, chap. 1 of the standards)

Cavern diving is the exploration of an overhead environment while remaining within the portion of the light zone, which is illuminated by sunlight. It differs from cave diving in that, while cave divers may penetrate thousands of meters, cavern divers go no further than a linear distance of 50m from the surface. The maximum depth for diving in a cavern is 20m (nominal).

Objectives:
The course is designed to train the open water diver to dive safely in an overhead environment. This course is an extension of recreational diving designed for the use of a SINGLE TANK, and upon completing the course, a diver will possess the skills, knowledge, dive planning abilities, and problem solving techniques to safely cavern dive within no-decompression limits.
It is not the intention of such a cavern course of being a cave diving training beyond the daylight zone.
Upon successful completion, the candidate will be qualified as a SCD Cave Diver I (Cavern Diver).

Content:
Problem solving in cavern diving skill development includes, but is not limited to body positioning (trim), buoyancy control, emergency procedures, line following, the use of reels, and propulsion techniques. Accident analysis forms the basis of this first level of learning experience.

A minimum of four (4) dives are performed in zone 1 in a minimum of two different cave systems. Special emphasis on the unique environment includes on silting, entanglement, disorientation. Equipment modification is also an essential part of this course. *The Cavern Diver course is in no way intended to provide instruction for cave diving.*

Summary:

Prerequisites:	** Diver CMAS / Advanced Open Water Diver or equivalent, to EN14153-2 for at least 1 year, 25 OW dives of which are 5 night dives, valid diving medical
Duration:	min. 2.5 days
Classroom:	min. 3-4 hrs
Dives:	min. 4
Caverns:	min. 2 different systems
Constraints:	diver restricted to zone 1, single tank, linear distance of 50m to surface, max. depth 20m (nominal), no restrictions, no Ts, no jumps, no gaps.

2.3 Cave Diver II (Cave Diver, *Apprentice* Cave Diver)

(for detailed course content and prerequisites ref. to part I, chap. 2 of the standards)

The Cave Diver II course represents the second step of the training required to complete the SCD Cave Diver III level (Full Cave Diver) and develops basic cave diving skills with limited penetrations of the cave environment.
This program introduces students to the fundamental principles of full cave diving, but is not intended to cover all facets of full cave diving. Students are highly encouraged to move on to the next level of training before attempting to plan and execute more complex dives. The maximum depth for Cave Diver II level is 30m (nominal).

Objectives:

It is a recreational cave diving course. Emphasis is placed on dive planning and skill refinement through actual cave dives. Techniques learned through the earlier Cavern Diver course are critiqued and expanded. Exposure to different cave diving scenarios is the foundation of this training.

The course develops and establishes minimum skills, knowledge, dive planning and preparation, problem solving procedures, swimming techniques, emergency procedures and the basic abilities necessary to safely cave dive within limited penetrations, using DOUBLE TANKS throughout**.**
Perfectly mastering buoyancy control, working with a reel, a light, and awareness in the cave is necessary to safely enjoy another dimension in cave diving

The Cave Diver II course is not intended to prepare divers for evaluating all facets of cave diving. It is intended to expose students to different cave diving scenarios of dive planning and skill perfection. Although the student is introduced to more complex navigation techniques, students are encouraged to complete the next level of training before attempting complex dives.
Upon successful completion, the candidate will be qualified as a SCD Cave Diver II (*Apprentice* Cave Diver).

Content:

If deemed necessary, an open-water evaluation and orientation dive is completed to review cave diving techniques (preliminary assessment). A minimum of six (6) cave dives are performed in zone 2 in a minimum of three (3) different cave systems. These dives are intended to further develop the skills of the once cavern diver. Competencies are extended through exposure to more complex full cave diving techniques such as "jumps", "gaps", depth, limited decompression, increased distance, sump- and post-sump diving and the full use of accessible gas in a set of DOUBLE TANKS combined with a set of STAGE TANKS.

Emphasis in this course is upon dive planning and skill perfection through actual cave dives. Techniques learned through earlier courses are evaluated, rehearsed, critiqued and further developed.

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Summary:

Prerequisites:	** Diver CMAS / Advanced Open Water Diver or equivalent EN14153-2 for at least 2 years *and* Cave Diver I SCD, 50 OW dives of which are 10 night dives, 4 cavern dives since Cave Diver I certification, Nitrox Diver, valid diving medical
Duration:	min. 3.5 days
Classroom:	min. 4-6 hrs
Dives:	min. 6
Caves:	min. 3 different
Constraints:	diver restricted to zone 2, double tanks only (no stages), no restrictions, no (post-) sumps, max. depth 30m (nominal)

2.4 Cave Diver III (Full Cave Diver, Penetration Diver)

(for detailed course content and prerequisites ref. to part I, chap. 3 of the standards)

This is the third and final course in the standard cave diver development curriculum. Exposure to more sophisticated, demanding and complex cave diving scenarios is the foundation to "safe cave diving" at this level of training. The maximum depth for Cave Diver III level is 40m (EAD!), with Tmx 50m (nominal).

Objectives:

The Cave Diver III (Full Cave Diver) course is emphasizing advanced cave diving planning and execution. This is the final step in the progression from Cave Diver I (Cavern Diver) to Cave Diver III (Full Cave Diver).

Techniques learned through earlier courses are more fully developed and refined, with the cave diver exposed to more sophisticated cave diving scenarios. Relatively few divers in the world achieve this level of advanced capability and training.
Upon successful completion, the candidate will be qualified as a SCD Cave Diver III (Full Cave Diver).

Content:

If deemed necessary, an open-water evaluation and orientation dive is completed to review cave diving techniques (preliminary assessment). A minimum of eight cave dives are performed in zones 2 and 3 in a minimum of four different cave systems during the course.

Participants will perform and participate in line gaps/jumps, circuits, traverses, "Y's and T's", decompression procedures, restrictions, and low visibility situations, sump- and post-sump diving and the use of stage tanks (up to 2). These dives are intended to bring together all aspects and facets of preceding training and experience. All limitations of the previous levels of training are now obsolete.

Summary:

Prerequisites:	*** Diver CMAS / Master Scuba Diver / Divemaster or equivalent EN14153-3 *and* Cave Diver II SCD, 100 OW dives of which are 20 night dives, 8 cave dives since Cave Diver II certification, Rescue Diver certification or equivalent training/certification, Advanced Nitrox Diver, valid diving medical
Duration:	min. 5.5 days (incl. a diving pause of ½ day in mid-course)
Classroom:	min. 8 hrs
Dives:	min. 8
Caves:	min. 4 different
Constraints:	none (open for zone 3; incl. max. depth 40m / EAD !, with Tmx max. 50m (nominal)

3. SCD Specialty Cave Diving Courses and -Certificates

The detailed course contents (Course Outlines) and the training programs for each course are outlined in separate documents for each specific course.

3.1 Stage Tank Diving Specialty Course
(under development)

Objectives:
Stage Tank Diving is aimed equally at Advanced Open Water Divers *and* Cave Diver II who wish to learn the special techniques of rigging one or more stage tanks with the necessary hardware and regulators.
The Open Water Diver will participate in this course mainly as a preparation for a later nitrox- or trimix specialty course.

As already certified Cave Divers II are concerned, this course is intended to help develop the participant's skills and knowledge to execute extended penetration diving with the use of such stage tanks.

For this course all stage tanks may be filled either with air or EANx (for properly certified Nitrox diver) as required by the dive plan and if the participants are properly certified.
Note: This course is strongly recommended for potential Cave Divers III (full cave divers) candidates.

Content:
Concentration is on practical application and experience. Longer dive exposure, decompression, safety practices and procedures, advanced gas management, stage rigging (different configurations with 1 or more tanks), trim, streamlining, problem management, tank depots, stage tank exchange, task loading, and psychological aspects are covered.

A minimum of two (2) hours of theory lectures is covered during this course and a minimum of four dives utilizing stage tanks in *various configurations* is to be performed. These lectures also include discussion of motives, equipment, procedures, technique, task loading and decompression.

It is not necessary to execute these training dives in the true cave environment, even if this should be the preferred choice.

However, it is strictly prohibited to enter overhead environment beyond the zone where a free ascent is guaranteed within a horizontal distance of 10m at all times with divers who are not properly certified!
The practical part of this course should be done over a period of not less than two (2) days.

Summary:

Prerequisites:	** Diver CMAS / Advanced Open Water Diver or equivalent EN14153-2 *or* Cave Diver II or equivalent certificate of a recognized organization, valid diving medical
Duration:	min. 2 days
Classroom:	min. 2 hrs
Dives:	min. 4
Constraints:	restricted to zone 2 if performed in cave environment (with certified cave divers II only!), max. depth 30m (nominal)
Evaluation:	Written theory exam with 20 MC questions; passing score is 80% Permanent evaluation of practical key skills with standardized exercises

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3.2 Sidemount Diving Specialty Courses (Sidemount Diving)

SCD offers 3 levels of Sidemount Training Courses:

- SCD Sidemount Diver I (REC, OW)
  This is the beginners course for use in open water, with pure sports diving equipment, without stage tanks and air or EANx as breathing gases only.
  The course is designed to make the advanced open water diver familiar with alternative configurations of tanks and riggings, e.g. then, when backmount devices are not feasible or are not available.
- SCD Sidemount Diver II (TEC, OW)
  This is the follow-up Sidemount Course for the use of the Sidemount configuration in the open water with complete equipment for technical diving (including stage tanks and in combination with mixed gas such as EANx and Tmx).
- SCD Sidemount Diver III (TEC, Overhead,)
  An advanced Sidemount Course for the use in any natural or artificial overhead environment (grottoes, caves, mines, wrecks, under ice, flooded buildings), including mixed gas use.

Classification:

- The Sidemount Diver I Course (REC, OW) is a basic specialty course, based on the foregoing open water certificate (Advanced Open Water or equivalent).
- The Sidemount Diver II Course (TEC, OW) is an advanced specialty course, based on the foregoing open water certificates (Master Scuba Diver or equivalent) and additional open water specialty certificates (Stage Tank Handling, Ntx, Tmx) which themselves form the necessary fundament.
- The Sidemount Diver III Course (TEC, overhead) is a top level specialty course.
  This course has to be understood as an amendment to other top-level training courses (such as Cave Diver III, Wreck Diver III) which themselves form the necessary fundament.

Sidemount Diver III Course (Overhead Environment)

Objectives:

This course is designed to expose the experienced cave diver to alternative cylinder and harness configurations when back-mounted cylinders are not appropriate or available. Though considerably more complex than standard back-mount diving, side-mount has clear advantages. Only the sidemount cave diver is truly self reliant. But, the inherent gas management, trim and complexity of diving two totally independent cylinders present a challenge to even the most experienced back-mount diver.

<u>Note:</u> This course is strongly recommended for Cave Divers III (full cave divers) who want to further extend their range of exploration towards small caves or cave sections.

Content:

Safety practices, procedures, conservation, advanced gas management, equipment modification/philosophy, trim, streamlining, problem management, task loading, psychological aspects and how to build a "sidemount rig" are all covered in this comprehensive program.

Summary:

Prerequisites:	18 years, Master Scuba Diver / Divemaster or equivalent EN14153-3, Cave Diver III SCD or equivalent (Full Cave Diver), Sidemount Diver II SCD, valid diving medical
Duration:	min. 3.5 days
Classroom:	min. 4 hrs
Dives:	min. 6, of which min. 4 in zones 2 and 3
Caves:	min. 3 different caves
Constraints:	accord. to the regulations for Cave- or Wreck Zone 3, max. depth 40m (EAD), with Tmx max. 50m (nominal).
Evaluation:	Written theory exam with 30 MC and 10 open text questions; passing score is 80% Permanent evaluation of practical key skills with standardized exercises

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3.3 Scooter Diving Specialty Courses (Scooter Diving)

SCD offers 3 levels of Scooter Training Courses:

- SCD Scooter Diver I (REC, OW)
  This is the beginners course for use in open water, with pure sports diving equipment, with class 1 (or higher classified) scooters, without stage tanks and with air or EANx as breathing gases.
- SCD Scooter Diver II (TEC, OW)
- This is the follow-up Scooter Course for the use in the open water but with complete equipment for technical diving (including stage tanks and in combination with mixed gas such as EANx and Tmx) and exclusively with class 2 (or higher classified) scooters only.
.
- SCD Scooter Diver III (TEC, Overhead)
  An advanced Scooter Course for the use in any natural or artificial overhead environment (grottoes, caves, mines, wrecks, under ice, flooded buildings), including mixed gas use and exclusively with class 3 scooters only

Classification:

- The Scooter Diver I Course (REC, OW) is a basic specialty course, based on the foregoing open water certificate (Advanced Open Water or equivalent).
- The Scooter Diver II Course (TEC, OW) is an advanced specialty course, based on the foregoing open water certificates (Master Scuba Diver or equivalent) and additional open water specialty certificates (Stage Tank Handling, Ntx, Tmx) which themselves form the necessary fundament.
- The Scooter Diver Course III (TEC, overhead) is a top level specialty course.
  This course has to be understood as an amendment to other top-level training courses (such as Cave Diver III, Wreck Diver III) which themselves form the necessary fundament.

Scooter Diver III Course (Overhead Environment)

DPV's (Diver Propulsion Vehicles) are a favorite piece of equipment to many cave divers. DPV's allows the cave diver to explore the cavern and caves in depth (extended penetration). However, their use requires additional skills for a correct handling.

Objectives:
The purpose of the Scooter or DPV (Diver Propulsion Vehicle) course is to exposure the trained cave diver to the basic fundamentals of the safe operation of diver propulsion vehicles in underwater caves while under the direct supervision of a qualified DPV Instructor. Thus, the student is able to build practical experience in the field under controlled conditions.

Note: This course is strongly recommended for Cave Divers III (full cave divers) who want to extend their range of exploration (penetration distance)
Numerous manufacturers strongly recommend such a special training.

Requirements for training scooters in use:
All scooters used must fulfill at least all technical characteristics for class 3 rated scooters as defined in the "SCD construction standards for underwater scooters".

Content:
The three (3) day DPV's (scooters) specialty course covers how to use scooters (DPV's) in the overhead environment with the use of safe gas-management rules, handling of reels, negotiating restrictions, silt passages, and dealing with cave conservation.
Also, there are practice emergency techniques involving inoperative scooters and out of air situations.

In general, safety practices, procedures and techniques common to most DPV's used in the unique environment of a cave are covered. Conservation considerations such as low impact operation are emphasized. Potential emergency situations are simulated and practiced.

There is at least four (4) hours of lecture to include:

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1. The planning, organization, procedures, techniques, problems, and hazards of diving with an underwater propulsion vehicle (incl. electrical & mechanical advantages/disadvantages of DPV's).
2. Equipment considerations including but not limited to battery care, maintenance and precautions.
3. Gas planning and –management
4. Team-support and team back-up
5. General safety proper trouble shooting procedures for: determining a turnaround point, vehicle failure, runaway motor, descents and ascents and avoiding propeller entanglements.
6. Cave conservation and techniques to avoid harming fragile aquatic life.
7. Techniques for entering and exiting the water with a DPV

Training limits:
- **Training limits for cave zone 3 (40m EAD, 50m nominal)**
- **Within diver's other certification limits**
- **Within scooter's operational limits (depth and range); ref. to manufacturer's "User Manual for Operation"**

Summary:

Prerequisites:	Master Scuba Diver / Divemaster or equivalent EN14153-3, Cave Diver III SCD/ Wreck Diver III SCD or equivalent (Full Cave Diver /Adv. Penetration Wreck Diver), Scooter Diver II SCD, valid diving medical, private liability insurance with a minimum coverage of 3 Mio. CHF/Euros/USD
Duration:	min. 3.5 days
Classroom:	min. 4 hrs
Dives:	- min. 6, minimum total dive time 270min - min. 5 of the 6 dives must take place in true cave environment - min. 2 of the cave dives must be in cave-/wreck zone 2 and another 2 dives in zone 3 - 2 of the dives must include (simulated) decompression stops - No more than 2 dives per day are allowed
Caves:	min. 2 different caves or wrecks
Evaluation:	Written theory exam with 30 MC and 10 free text questions; passing score is 80% Permanent evaluation of practical key skills with standardized exercises

3.4 Underwater Cave Surveying & Mapping
(under development)

This course is to be elaborated and offered in cooperation and under the patronage of the local speleological society/association.

Objectives:
This course is designed to provide the participants with the fundamentals of surveying underwater caves. It is intended to motivate more divers to survey caves, encourage the use of cave maps in dive planning, and increase the quality of published cave maps.
Additionally, this course promotes standardization and normalization for further survey projects.

Note: This course is strongly recommended for Cave Divers III (full cave diver) who wish to extend their expertise towards the more scientific aspects of cave diving.

Content:
The training program is mainly based on previous survey projects and their results, the so far developed standards and procedures and carries them further on.

All phases of the survey process, from conception to completion of a survey, are discussed. Topics covered in full detail include accuracy standards, composition of a survey team, use and fabrication of special tools, survey techniques and methodology, safety considerations, data recording and mathematical calculations, symbols, cartography, and copyright and publication.

SCD Cave Diving

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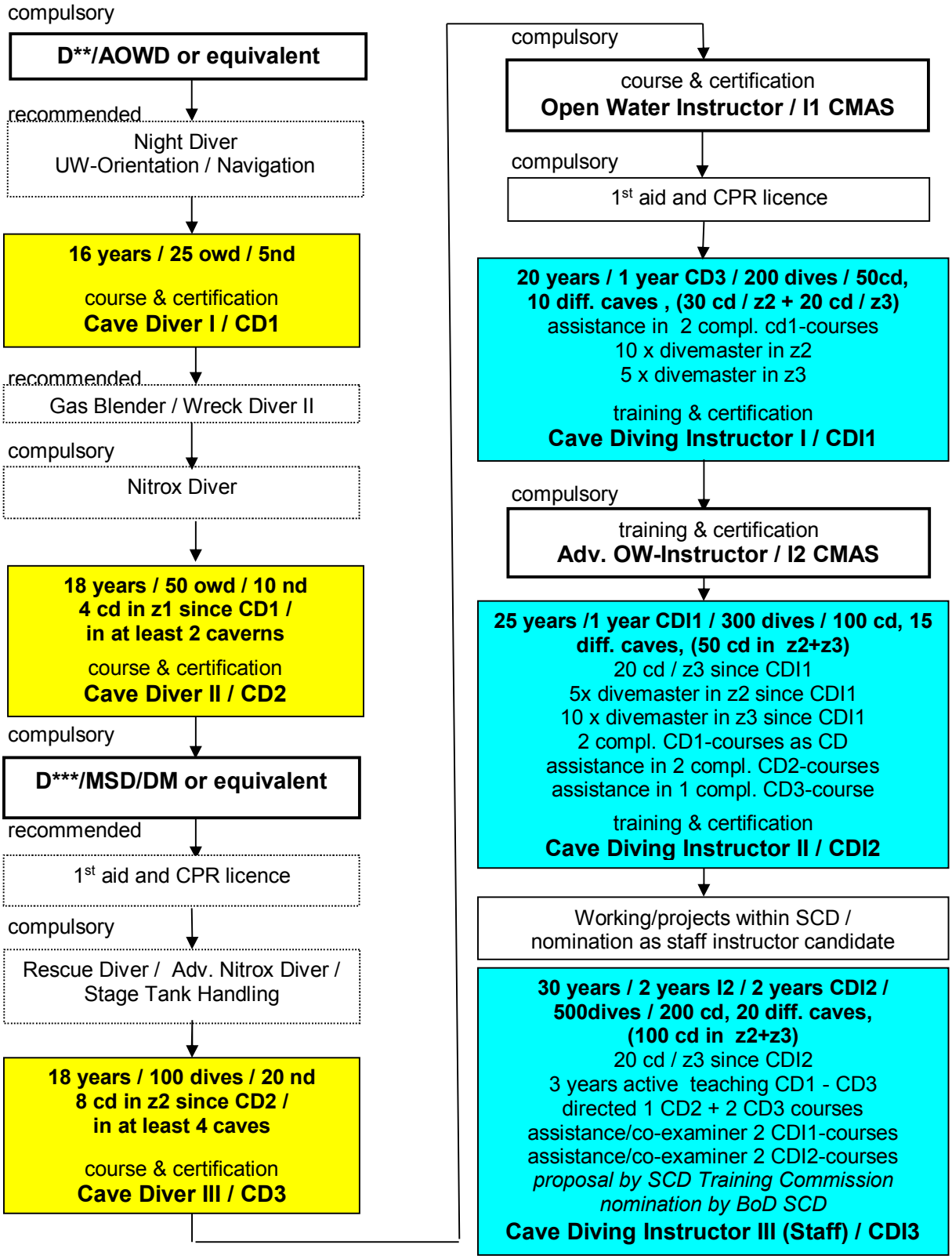
A minimum of one open water survey dive and three cave survey dives are performed over a period of no less than four days. A minimum of eight hours of theory is covered during this course, during which must enough time included for data evaluation and drawing work.

Summary:

Prerequisites:	Cave Diver III SCD or equivalent, valid diving medical
Duration:	min. 4 days
Classroom:	min. 8 hrs
Dives:	min. 1 open water dive + 3 cave dives
Evaluation:	Evaluation of a given specific task (project work)

4. Overview on SCD Cave Diving Training- and Certification System



Legend: d=(open water) dive / nd=ow-night dive / cd=cave dive / z1,2,3=cave zones 1,2,3 / CD 1,2,3=Cave Diver I, II, III / CDI 1,2,3=Cave Diving Instructor I, II, III / I1,2,3=Instructor1,2,3 / SCD= Swiss Cave Diving

Part II:

Certification Standards for Cave Divers

(worldwide used certificate level designations: ref. Appendix 3a)

1. SCD Cave Diver I / CD1 (Cavern Diver)

1.1a Diver's profile / skills and competences

This is an advanced open water diver on cave diving entry level with the required knowledge and skills for using and applying the appropriate equipment and procedures to safely plan and execute dives in a **cavern** or in the **cavern zone(daylight zone, zone 1)** of a cave.

Two (2) up to a maximum of four (4) certified Cave Divers 1 are competent to dive *without* supervision or guidance of a cave diver of higher qualification level, if:

a) the cavern or the cave has all the characteristics as defined for zone 1 (e.g. size of passages, guidelines etc.), otherwise diving is not permitted there.
b) the dive site is familiar to them
c) the actual circumstances at the dive site (e.g. visibility, current etc.) are identical or at least come close to those encountered during their training.

If only prerequisite **b)** is *not* fulfilled then it is mandatory that a certified cave diver with a higher qualification level (from Cave Diver II upwards) and who is *very familiar* with this specific dive site accompanies the group. The same applies for groups bigger than four divers.
If only **c)** is *not* fulfilled, then it is mandatory that a certified **cavern- or cave diving instructor** leads the group. Group size has to be limited to 4 cavern divers plus the instructor.

The diving perimeter is restricted to the cavern area in *any* case.

All dives have to be planned and executed in a way that any impairment of the flora and fauna of the cave is reduced to a bare minimum and the former state will be retained.

1.1b Diving parameters during course

- Zone: 1 (cavern zone; part IV, chap. 1, cave zones, Equipment and Safety Rules)
- Maximum depth: 20m (nominal)
- Max. penetration distance: 50m , resp. max. 1/3 of initial gas volume (whichever comes first)
- Gases:
  For OC: the use of nitrox mixtures up to is 40% within the framework of the Cave Diver I course is acceptable, if the student concerned has been certified as a *Nitrox Diver (level I)*.
  For CCR: it is mandatory to use air only as a diluent gas.
- Stage-tanks: none

1.2 Course prerequisites & requirements

Regarding the use of OC or CCR devices, backmount or sidemount configurations, the requirements under part IV, chap. 1-3 (cave zones) as well as part IV, chap. 4 (requirements for divers and equipment ....) have to be observed.

For CCR, the following applies, among other things: CE-certified devices only which have been owned by the diver for at least 6 months, certified training for the device used, at least 50 dives in the open water before the start of the course. Backmount and sidemount types are equally accepted.

Students with OC devices must not be mixed with CCR users in the same training group.

For sidemount, the following applies, among other things: certification as Sidemount Diver I (SMD1), at least 25 logged sidemount dives since certification as SMD1.

Full face masks (FFM) are not permitted in the entire training scheme of cave diving (Cave Diver I to III).

1.2.1 Requirements at start of course (admission)

- minimum 16 years old
- diver for minimum 1 year
- 2* Diver CMAS / Advanced Open Water Diver or equivalent EN 14153-2 (Appendix 2)
- 25 logged open water dives
- 5 logged open water night dives
- valid medical attest for diving fitness (<= 1 year)
- ev. successfully passed entry assessment (Appendix 7)

1.2.2 Recommended specialty certificates

- UW-Orientation / Navigation
- Night Diver CMAS or equivalent

1.2.3 Entry assessment (only if needed)

An entry assessment (Appendix 7) can be utilized to verify that candidates fulfill all prerequisites with regard to theoretical knowledge, practical skills and physical performance. Candidate must successfully pass all assessment requirements before being accepted to course.
All evaluation documents have to be safeguarded according to the legal requirements, however during a minimum of 5 years.

1.3 Minimum course duration

2.5 days
The individual lessons need not be completed seamlessly in one piece. However, the total course duration may not exceed 6 months.

1.4 Minimum course content

3 classroom lectures (3-4 hrs / 0.5 days)

- introduction: what is recreational cave diving
- development and types of karst phenomena, caverns and caves
- protection and preservation of such caves
- the SCD Cave Diver's Etiquette (ref. to Appendix 11)
- risks and dangers of water-filled caverns and caves in general
- definition of zone 1
- cavern- and cave diver training
- special diving equipment for zone 1
- objective, function and correct handling of the required equipment for zone 1
- general safety rules and procedures for caverns and caves
- planning and preparation of cavern dives
- gas-management:
  OC: Calculation of the air consumption and required gas supply, as well as the application of the 1/3-rule, as well as further deviating rules with their reasons
  CC: Calculation of the different dive times for O_2, scrubber and bailout, resp. determination of the quantities to be carried. Calculation of the OTU and CNS% load, as well as the ROT (Residual Oxygen Time) for repetitive dive.
- calculation of deco plans: only proof that dive is executed within NDL!
- briefings and debriefings
- UW-communication in cave diving (Appendix 4)
- refresher in diving physics and physiology
- special diving techniques for zone 1
- emergency procedures

4 practical lessons (2 days)

- 4 training dives in at least 2 different caverns or entry zones of caves (zone 1) incl. assessment dives. Another suitable overhead environment can be used as a substitute (swimming caissons) if the main characteristics of a cavern are retained.
- training dives: refer to part IV, chap. 4 "Requirements for Divers and Equipment / Application- and Safety-Rules"

1.5 Academic reference & documentation

Only training manuals which have been officially approved (accredited) by the SCD Training Commission may be used.

In the German speaking part of Europe, the official training manual „Cave Diving" from SCD/CMAS.ch is recommended.

1.6 Course leadership / assistance

Cave Diving Instructor 1 SCD in active teaching status. As assistants, Cave Diver III may be used, but not more than one (1) Cave Diver III per one (1) instructor.

1.7 Student : Instructor ratios (ref. to Appendix 10)

a) for OC divers:

- in open water, confined area: max. 6 students per 1 instructor/assistant
- in zone 1 : max. 3 students per 1 instructor/assistant under good or above average conditions
  or max. 2 students per 1 instructor/assistant under normal / average conditions but still within the frame (lower limit) of zone 1 definitions

b) for CCR divers:

- In the case of student groups with CCR, a maximum student : instructor ratio of 2: 1 must always be maintained.
- In the case of below-average conditions, but still within the definitions for zone 1, the ratio should be reduced to 1: 1.
- Device-specific emergency procedures must always be carried out by 1 student alone.

1.8 Evaluation

a) theory

Theoretical knowledge will be evaluated with one single, written MC-test, consisting of 20 questions on the following topics: standards / planning / emergencies / karst & cave development / cave diving techniques / equipment / hand + touch contact signals / physics / physiology.
In order to pass, the student must have a scoring of at least 80% (correct answers).

Timing of the theory exam:

The responsible instructor is obligated to ensure that each participant has proven to have the required theoretical knowledge BEFORE the first new practical exercises in the real overhead area are completed.
This can be done in the form of a small *preliminary or intermedi*ate test (e.g., quiz) or directly in the form of the *final theory exam*. In the second case, however, the student must have had enough time to familiarize himself with the material to the extent required.
In the case of the preliminary or intermediate examination, this should either be carried out in writing or, if orally, in the presence of a second instructor. The final exam, however, must always be carried out in writing.

b) practical skills

The s*tandard exercises/drills* for Cave Diver I have been added in Appendix 8a.
The skills evaluation is done within the framework of a continuous evaluation system. All required qualifications will be repeatedly assessed and evaluated during the training course. The certificate will only be given at a point when the candidate has finally passed all requirements.

c) Safeguarding of evaluation documents

All evaluation documents have to be safeguarded according to the legal requirements, however during a minimum of 5 years.

1.9 Certification

- SCD double-sided card
- wall certificate in A4 format
- designation: Cave Diver I (with addition OC or CC)

1.10 International comparison of certification level

This level corresponds to the classification Cavern Diver as defined by NACD, NSS, CDAA, PADI, NAUI, SSI, ANDI, TDI, IANTD and CDAA (incl. Sinkhole Class 1).

1.11 Activities and guiding/training competences

none

2. SCD Cave Diver II / CD2 (Cave Diver)

2.1a Diver's profile / skills and competences

This is a more experienced cave diver with the knowledge on the correct usage of the required equipment and the skills to safely plan and organize cave dives in **zone 2** and to execute them in the company of other certified cave divers of same or higher level.
The CD2 is trained for the use of twin tanks and for complex dives (more than 1 jump)!

The CD2 masters all techniques to orient himself even under zero visibility and total loss of light or during a silt-out and is able to find safely back to the entrance.

All dives have to be planned and executed in a way that any impairment of the flora and fauna of the cave is reduced to a bare minimum and the former state will be retained.

2.1b Diving parameters during course

- Zone: 2 (Cave; part IV, chap. 2: cave zones, Equipment and Safety Rules)
- Maximum depth: 30m (nominal)
- Max. penetration distance: 1/3 twin tank device (backmount), resp. 1/3 of 2 primary tanks (sidemount)
- Gases:
  For OC: the use of nitrox mixtures and O_2-decompression is acceptable within the framework of the nitrox certification (for the Cave Diver II course, the student concerned has to be certified as a *Nitrox Diver (level I)* for O_2 up to 40%).
  For CCR: it is mandatory to use air only as a diluent gas.
- Stage tanks: none (from 500m on: 1 addit. safety tank)

2.2 Course prerequisites & requirements

Regarding the use of OC or CCR devices, backmount or sidemount configurations, the requirements under part IV, chap. 1-3 (cave zones) as well as part IV, chap. 4 (requirements for divers and equipment ....) have to be observed.

For CCR, the following applies, among other things: CE-certified devices only which have been owned by the diver for at least 9 months, certified training for the device used, at least 100 dives in the open water BEFORE the start of the course. Backmount and sidemount types are equally accepted.

Students with OC devices must not be mixed with CCR users in the same training group.

For sidemount, the following applies, among other things: certification as Sidemount Diver II (SMD2), at least 25 logged sidemount dives since certification as SMD2.

Full face masks (FFM) are not permitted in the entire training scheme of cave diving (Cave Diver I to III).

2.2.1 Requirements at start of course (admission)

- minimum 18 years old
- diver for at least 2 years
- ** Diver CMAS / Advanced Open Water Diver or equivalent EN 14153-2; (Appendix 2)
- 50 logged open water dives
- 10 logged open water night dives
- Cave Diver I SCD (CD1, Cavern Diver) or equivalent or successfully passed entry-assessment (Appendix 7)
- Nitrox Diver CMAS or equivalent
- valid medical attest for diving fitness (<= 1 year)
- ev. successfully passed entry-assessment (Appendix 7)

2.2.2 Additional requirements to be fulfilled until end of course

- 4 cavern dives since CD1 certification in zone 1 in at least 2 different caverns

2.2.3 Other recommended specialty certificates

- Gas Blender CMAS or equivalent
- Stage Tank Handling SCD or equivalent
- Rescue Diver CMAS or equivalent
- Wreck Diver SCD (non-penetration) or equivalent

2.2.4 Entry assessment (only if needed)

An entry assessment (Appendix 7) can be utilized to verify that candidates fulfill all prerequisites with regard to theoretical knowledge, practical skills and physical performance. Candidates must successfully pass all assessment requirements before being accepted to course.
All evaluation documents have to be safeguarded according to the legal requirements, however during a minimum of 5 years.

2.3 Minimum course duration

3.5 days
The individual lessons need not be completed seamlessly in one piece. However, the total course duration may not exceed 9 months.

2.4 Minimum course content

4 classroom lectures (4-6 hours / 0.5+ day)

- definitions of zones 2 and 3
- SCD training standards and safety rules for the safe exploration of zones 2 and 3
- objective, function and correct handling of required special equipment for safe cave diving in zone 2 (incl. line work)
- special cave diving techniques in zones 1 an 2, incl. planning, organisation, preparation, briefing and debriefing
- UW-communication in cave diving (Appendix 4)
- Planning and organization of dives in zones 1 and 2
- special requirements of underwater orientation in caves
- causes, symptoms and effects for nitrogen narcosis and being out of breath
- causes, symptoms and effects of oxygen toxicity
- fundamentals of how to use Nitrox (with special focus on usage in caves)
- the governing parameters of decompression and the applied techniques with special focus on decompression with 100 % oxygen
- gas management:
  OC: Calculation of the air consumption and required gas supply, as well as the application of the 1/3-rule, as well as further deviating rules with their reasons
  CC: Calculation of the different dive times for O_2, scrubber and bailout, resp. determination of the quantities to be carried. Calculation of the OTU and CNS% load, as well as the ROT (Residual Oxygen Time) for repetitive dives.
- Calculation of deco-plans; for CC with 2 different SW-programs for cross-checking.
- analysis and assessment of a diving accident
- adequate 1st aid procedures and on-site care of a victim
- organisation of further support actions and alarming of rescue services
- cave mapping (cross-sections, distances, topology)
- the SCD Cave Diver's Etiquette (ref. to Appendix 11)
- application of the 10 most commonly used knots and hitches (Appendix 13)
- cave conservation and preservation

6 practical lessons (3 days)

- 6 dives in at least 3 different caves in zone 2
- training dives: refer to part IV, chapter 4 "Requirements for Divers and Equipment / Application- and Safety-Rules"

2.5 Academic reference & documentation

Only training manuals which have been officially approved (accredited) by the SCD Training Commission may be used.

In the German speaking part of Europe, the nationally accepted manual „Cave Diving“ from SCD/CMAS.ch is recommended.

2.6 Course leadership / assistance

At least one (1) SCD Cave Diving Instructor II in active teaching status. SCD Cave Diving Instructors I can be used as assistants, but max. two (2) Cave Diving Instructors I per one (1) Cave Diving Instructor II.
In reasonable cases Cave Diving Instructor I candidates can be used during their training. Such assistants must meet the following requirements: M* / 20 years old / 300 dives / 30 cave dives / zone 2 + 20 cave dives / zone 3 / in min. 10 different caves.

2.7 Student : Instructor ratios (ref. to Appendix 10)

a) for OC divers:

- in open water, confined area: max. 6 students per 1 instructor/assistant
- in zone 1 : max. 3 students per 1 instructor/assistant under good or above average conditions
  or max. 2 students per 1 instructor/assistant under normal / average conditions but still within the frame (lower limit) of zone 1 definitions
- in zone 2 : max. 2 students per 1 instructor/assistant under normal (average) to slightly reduced conditions at the lower limits for zone 2)
  or max. 3 students per 1 instructor/assistant under good or above average conditions with regard to visibility, current, percolation, temperature, simplicity of cave profile etc. AND when
  using air only as breathing medium (O_2-decompression does not count for)

b) for CCR divers::

- In the case of student groups with CCR, a maximum student : instructor ratio of 2: 1 must always be maintained.
- In the case of below-average conditions, but still within the definitions for zone 1, the ratio should be reduced to 1: 1.
- Device-specific emergency procedures must always be carried out by 1 student alone.

2.8 Evaluation

a) theory

Theoretical knowledge will be evaluated with one single, written MC-test, consisting of 30 questions on the following topics: standards / planning & organisation / emergencies / karst phenomena and cave development / zones / cave diving techniques / uw-orientation / hand signals+touch contact signals / equipment / gases / decompression / knots.
In order to pass, the student must have a scoring of at least 80% (correct answers).
Timing of the theory exam:
The responsible instructor is obligated to ensure that each participant has proven to have the required theoretical knowledge BEFORE the first new practical exercises in the real overhead area are completed.
This can be done in the form of a small *preliminary or intermedi*ate test (e.g., quiz) or directly in the form of the *final theory exam*. In the second case, however, the student must have had enough time to familiarize himself with the material to the extent required.
In the case of the preliminary or intermediate examination, this should either be carried out in writing or, if orally, in the presence of a second instructor. The final exam, however, must always be carried out in writing.

b) practical skills

The standard exercises/drills for Cave Diver II have been added in Appendix 8b.
The skills evaluation is done within the framework of a continuous evaluation system. The knowledge about the 10 most common knots and hitches (Appendix 13) and the practical demonstration of their application are also included. The candidate has to demonstrate the following 6 knots and hitches: figure eight knot, bowline, reef knot, sheet bend, fisherman’s knot and clove hitch.
All required qualifications will be repeatedly assessed and evaluated during the training course. The certificate will only be given at a point when the candidate has finally passed all requirements.

c) Safeguarding of evaluation documents
All evaluation documents have to be safeguarded according to the legal requirements, however during a minimum of 5 years.

2.9 Certification

- SCD double-sided card
- wall certificate in A4 format
- Designation: Cave Diver II (with addition OC or CC)

2.10 International comparison of certification level

This certification level corresponds as a MINIMUM with the ***Apprentice Cave Diver*** level from NACD, NSS, resp. CDAA Cave Diver (incl. Sinkhole Class 2).
However, the CD2 is already trained a) in the use of twin and b) for the execution of complex dives (more than just 1 jump).

2.11 Activities and guiding/training competences

- May act as a divemaster (guidance) with already certified Cave Divers I in zone 1 under the terms outlined in chapter “Cave Diver I / Diver's profile / skills and competences”.

3. SCD Cave Diver III / CD3 (Full Cave Diver)

3.1a Diver's profile / skills and competences

This is very experienced open water *and* cave diver on the highest competence level with the knowledge and the skills for the correct use of all required materials and equipment in order to plan, prepare and organize cave dives in **zone 3** and to safely execute such dives in the company of other certified cave divers of the same level.

He has the competence to act as a divemaster and to guide other certified cave divers of equal or lesser level into their appropriate zones.
In the presence of a designated back-up team, he is also able to carry out temporary single-diver explorations/penetrations.

The CD3 has the knowledge and the competence for mastering the specific techniques and procedures for planning and organizing tank deposits and usage of stage tanks, execution of long-distance penetration, mastering squeezes and post-sump diving, for the usage of Nitrox-mixtures and for O_2-decompression.

The CD3 masters all techniques to correctly lay a temporary or permanent cave line, to handling jumps, to repair gaps, to orient himself even under total loss of light or during a silt-out and to safely find back to the exit.

All dives have to be planned and executed in a way that any impairment of the flora and fauna of the cave is reduced to a bare minimum and the former state will be retained.

3.1b Diving parameters during course

- Zone: 3 (Full Cave; part IV, chap. 3: cave zones, Equipment and Safety Rules).
- Maximum depth: 40m EAD, resp. 50m nominal
- Max. penetration distance: 1/3 of the overall initial gas volume
- Gases:
- For OC: the use of nitrox mixtures and O_2-decompression is acceptable within the framework of the required *nitrox certification* (for the Cave Diver III course, the student concerned has to be certified as a *Advanced Nitrox Diver (level II)* for O_2 up to 100%).
- For CCR: during the real training part of the course it is mandatory to use air as diluent gas. For fun-dives accompanied by the instructor at the end of the course (after passing all practical exercises), other gases may also be used as diluent, insofar the CCR-student has the corresponding training and the authorization by the manufacturer and if the CCR device is configured accordingly.
- Stage tanks: up to a max. of 2

3.2 Course prerequisites & requirements

Regarding the use of OC or CCR devices, backmount or sidemount configurations, the requirements under part IV, chap. 1-3 (cave zones) as well as part IV, chap. 4 (requirements for divers and equipment ....) have to be observed.

For CCR, the following applies, among other things: CE-certified devices only which have been owned by the diver for at least 12 months, certified training for the device used, at least 120 dives with this device, of which min. 10 dives in zone 2 since certification as a Cave Diver II, ALL of this BEFORE the start of the course. Backmount and sidemount types are equally accepted.

Students with OC devices must not be mixed with CCR users in the same training group.

For sidemount, the following applies, among other things: certification as Sidemount Diver II (SMD2), at least 50 logged sidemount dives since certification as SMD2.

Full face masks (FFM) are not permitted in the entire training scheme of cave diving (Cave Diver I to III).

Standards & Training System

3.2.1 Requirements at start of course (admission)

- minimum 18 years old
- diver for at least 2 years
- 3* Diver CMAS/Master Scuba Diver/Divemaster or equivalent EN 14153-3; (Appendix 2)
- 100 logged open water dives
- 20 logged open water night dives
- SCD Cave Diver II (CD2) or equivalent or successfully passed entry-assessment
- Rescue Diver CMAS or equivalent (if not included in the 3* diver or equivalent training program!)
- Stage Tank Handling Specialty Course or Prep-Course to CD3
- Advanced Nitrox Diver CMAS or equivalent certificate of a recognized organization
- valid medical attest for diving fitness according to the concerning requirements of the national federation (<= 1 year)
- ev. successfully passed entry assessment (Appendix 7)

3.2.2 Additional requirements to be fulfilled until end of course

- 8 cave dives since CD2 certification in zone 2 in at least 4 different caves

3.2.3 Other recommended Specialty Certificates

- all recommended specialties from CD2 level
- valid 1st Aid and CPR certification from a nationally recognized organization

3.2.4 Entry assessment (only if needed)

An entry assessment (Appendix 7) can be utilized to verify that candidates fulfill all prerequisites with regard to theoretical knowledge, practical skills and physical performance. Candidate must successfully pass all assessment requirements before being accepted to course.
All evaluation documents have to be safeguarded according to the legal requirements, however during a minimum of 5 years.

3.3 Minimum course duration

5.5 days
The individual lessons need not be completed seamlessly in one piece. However, the total course duration may not exceed 6 months.

3.4 Minimum course content

8 classroom lectures (8 hours/ 1 full day)

- complete training standards & course scheme
- definitions of zones 1 to 3
- SCD training standards and safety rules for the safe exploration of zones 2 and 3
- objective, function and correct handling of all required special equipment for safe cave diving in zone 3 (incl. line work)
- special cave diving techniques in zones 2 an 3, incl. detailed procedures for planning, organisation, preparation, briefing and debriefing
- UW-communication in cave diving (Appendix 4)
- special aspects of underwater orientation in caves
- specific techniques and procedures such as organizing tank deposits, requirements for long-distance penetration, usage of stage tanks, mastering squeezes and post-sump diving
- fundamentals for the usage of DPVs and rebreather for cave diving
- fundamentals of usage of Nitrox- and Trimix mixtures
- causes, symptoms and effects of nitrogen narcosis, oxygen toxicity and being short of breath
- the governing parameters of decompression and the applied techniques with special focus on decompression with 100 % oxygen
- gas-management:
  OC: Calculation of the air consumption and required gas supply, as well as the application of the 1/3-rule, as well as further deviating rules with their reasons
  CC: Calculation of the different dive times for O_2, scrubber and bailout, resp. determination of the quantities to be carried. Calculation of the OTU and CNS% load, as well as the ROT (Residual

Oxygen Time) for repetitive dives.
- calculation of deco-plans; for CC with 2 different SW-programs for cross-checking.
- execution of rescue activities in the cave and complete accident management
- analysis and assessment of a diving accident
- adequate 1st aid procedures and on-site care of a victim
- organisation of further support actions and alarming of rescue squad
- cave mapping (cross-sections, distances, topology)
- the SCD Cave Diver's Etiquette (ref. to Appendix 11)
- application of the 10 most commonly used knots and hitches (ref. Appendix 13)
- cave conservation and preservation

8 practical lessons (distributed over min. 4.5 days)
- min. 8 dives in 4 different caves in zone 3; latest after 5 dives, a pause of ½ day has to be made!
- training dives: part IV, chap. 4, "Requirements for Divers and Equipment / Application- and Safety-Rules"

3.5 Academic reference & documentation

Only training manuals which have been officially approved (accredited) by the SCD Training Commission may be used.

In the German speaking part of Europe, the official training manual „Cave Diving" from SCD/CMAS.ch is recommended.

3.6 Course leadership / assistance

At least two (2) SCD Cave Diving Instructors 2 in active teaching status. In exceptional cases, one (1) of these two (2) instructors may have a certificate of another recognized cave diving organization (e.g. NACD, NSS). However, the responsible course director must always be an SCD instructor.
On at least 2 training days (of which min. 0.5 day during theory), both Cave Diving Instructors II must be present at the same time.
SCD Cave Diving Instructors I can be used as assistants, but max. two (2) Cave Diving Instructors I per one (1) Cave Diving Instructor II.

3.7 Student : Instructor ratios (ref. Appendix 10)

a) for OC divers:
- in open water, confined area: max. 4 students per 1 instructor/assistant
- in zone 1 : max. 3 students per 1 instructor/assistant (good or better conditions)
- in zone 2 : max. 2 students per 1 instructor/assistant under normal (average) conditions)
  or max. 3 students per 1 instructor/assistant under good or better conditions with regard to visibility, current, percolation, temperature, simplicity of cave profile etc.
  AND
  when using air only as breathing medium (O_2-decompression does not count for)
- in zone 3 : max. 2 students per 1 instructor/assistant under normal (average) conditions should be reduced to 1:1 if situation is considerably worse

b) for CCR divers:
- In the case of student groups with CCR, a maximum student : instructor ratio of 2: 1 must always be maintained.
- In the case of below-average conditions, but still within the definitions for zone 1, the ratio should be reduced to 1: 1.
- Device-specific emergency procedures must always be carried out by 1 student alone.

3.8 Evaluation

a) theory

Theoretical knowledge will be evaluated with one single, written test, consisting of 40 questions (30 MC and 10 open, free text) on the following topics: course structures and -schemes / standards / planning & organisation / emergencies / karst phenomena and cave development / underwater orientation / cave diving techniques / uw-orientation / hand signals+touch contact signals / equipment /

physics / physiology / decompression / gases / legal aspects / knots
In order to pass, the student must have a scoring of at least 80% (correct answers).
Timing of the theory exam:
The responsible instructor is obligated to ensure that each participant has proven to have the required theoretical knowledge BEFORE the first new practical exercises in the real overhead area are completed.
This can be done in the form of a small *preliminary or intermedi*ate test (e.g., quiz) or directly in the form of the *final theory exam*. In the second case, however, the student must have had enough time to familiarize himself with the material to the extent required.
In the case of the preliminary or intermediate examination, this should either be carried out in writing or, if orally, in the presence of a second instructor. The final exam, however, must always be carried out in writing.

b) practical skills
The standard exercises/drills for Cave Diver III have been added in Appendix 8c.
The skills evaluation is done within the framework of a continuous evaluation system. The knowledge about the 10 most common knots and hitches (Appendix 13) and the practical demonstration of their application are also included. The candidate has to demonstrate the following 10 knots and hitches: figure eight knot, bowline, reef knot, sheet bend, fisherman's knot, clove hitch, half hitch(es), round turn+half hitch(es), anchor bend, Garda-knot.
All required qualifications will be repeatedly assessed and evaluated during the training course. The certificate will only be given at a point when the candidate has finally passed all requirements.

c) Safeguarding of evaluation documents
All evaluation documents have to be safeguarded according to the legal requirements, however during a minimum of 5 years.

3.9 Certification

- SCD double-sided card
- wall certificate in A4 format
- Designation: Cave Diver III (with addition OC or CC)

3.10 International Comparison

This certification level corresponds with the Full Cave Diver level (incl. stage diving) from NACD, NSS and Advanced Cave / Penetration from CDAA (incl. Sinkhole Class 3).

3.11 Activities and guiding/training competences

- may act as a divemaster (guiding) with already certified cave divers on level 1-3 in the appropriate zones.
- may act as an assistant during Cave Diver I (cavern courses) under direct supervision and control of a SCD Cave Diving Instructor (any level) in active teaching status.
  Attention: for acting as an assistant during training, the diver in question must have a valid certification in 1st Aid and CPR from a nationally recognized organization
- as a Cave Instructor I *Candidate*, he may also act as an assistant during CD2 courses under direct supervision and control of a SCD Cave Diving Instructor II in active teaching status.

4. Overview on the governing parameters of the SCD standards for the levels CD1 to CD3

4.1 Admission- and certification requirements

SCD/CMAS designation american equivalence	Cave Diver I (CD1) Cavern Diver	Cave Diver II (CD2) (Intro-to../Apprentice) Cave Diver	Cave Diver III (CD3) Full Cave Diver
age (years)	16	18	18
certified diver for min. (years)	1	2	2
prerequisite standard diving certificate	2 star diver CMAS or equivalent	2 star diver CMAS or equivalent	3 star diver CMAS or equivalent
Recommended Specialties before	Night Diving, UW-Orientation/Navigation	Wreck Diving, Gas Blender, Rescue	1st aid & CPR
Mandatory Specialties before	---	Nitrox Diver	Advanced Nitrox, Rescue Diver
prerequisite cave diving certificate	---	Cave Diver I / CD1	Cave Diver II / CD2
min. number of OW-dives before	25	50	100
min. number of cave dives before	0	4 / zone 1 / 2 caverns since CD1	8 / zone 2 / 4 caves since CD2
min. course duration (days)	2.5	3.5	5.5
min. number classroom lectures	3	4	8
min. number practical lessons	4	6	8
min. number of training dives	4 / zone 1 / 2 caverns	6 / zone 2 / 3 caves	8 / zone 3 / 4 caves
Instructor:Students / free surface	1:6	1:6	1:4
Instructor:Students / overhead env.	1:3 (avrg. cond.) / 1:2 (< avrg.)	z1: 1:3 / z2: 1:2 (avrg. cond.) / 1:3 (> avrg.)	z1: 1:3 / z2: 1:2 (avrg.) & 1:3 (good/very good) / z3: 1:2 (max.)
permanent line in cave	yes	no	no
restrictions & squeezes	no (2 divers at same time)	no (2 divers at same time)	yes
min. sight (m)	>= 10	>=3 and <10	0 to <3
traversing jumps/gaps	no	yes	yes
max. depth (m)	20	30	40 (EAD)/50m absolut
max. penetration distance (m)	daylight zone entrance	up to 1/3 double tanks	up to 1/3 total supply
max. distance to surface (m)	50	unlimited	unlimited
type of gas for dive	air only	air / Nitrox *)	air / Nitrox, Trimix ***)
min. number of tanks / min. gas volume	1 / 2000bar*liter	2 / 3000 bar*liter %)	2 / 4000 bar*liter %)
stage tanks	no	no	yes
stage decompression allowed	no	yes	yes
type of gas for decompression	----	air / Nitrox / O2 **)	air / Nitrox / O2 **)
backup-mask	yes, 1 per group	yes, 1 per diver	yes, 1 per diver
intermed. pressure long-house (BM: approx. 2m/SM: 1.5m	yes (1)	yes (1)	yes (1)
Safety Reel size (m) per diver	1 x 50 (zone 1)	1 x 50 (zone 2)	1 x 50 (zone 3)
Gap/Jump Reel size (m) per diver	no	1 x 30 (zone 2)	1 x 30 (zone 3)
Primary Reel size (m) per group	1 x 50 (zone 1)	1 x 80 (zone 2)	1 x 80 (zone 3)
min. number of independent lights	2 (zone 1)	3 (zone 2)	3 (zone 3)
min. number of markers (non-directional/directional)	3 / 3	3 / 3	3 / 3
solo-diving (totally alone)	no	no	no, only independent tasks
divemastering allowed / level +)	no	no	yes (up to CD3)
course assistance	no	no	yes; (CD1, cavern)
Sidemount	yes	yes	yes
Rebreather	yes	yes	yes
DPVs, Scooters	no	no	no, Specialty Course
theory assessment / type	MC	MC	MC + FT ++)
number of questions	20	30	50: 40 (MC) + 10 (FT)
minimal scoring	80%	80%	80%

+) under supervision Cave Diving Instructor (any grade) | EAD: equivalent air depth | *) Nitrox Diver Certificate | ***) Trimix Diver Certificate
%) totally independent tanks or manifold with valve | ++) MC=Multiple Choice / FT=free text | **) Advanced Nitrox Diver Certificate | DPV=diver propulsion vehicles

4.2 Training Competences

certified as -------> V course-/diver-level	Cave Diver I	Cave Diver II	Cave Diver III	Cave Diving Instructor I CANDIDATE
Cave Diver I	***D (z1)***	***D (z1), G***	***D (z1), G, A***	***D (z1), G, A***
Cave Diver II	---	***D (z2)***	***D (z2), G***	***D (z2), G, A***
Cave Diver III	---	---	***D (z3), G***	***D (z3), G***
	Legend:			
	G: Guide		***D: Diver, team-member***	
	A: Assistant		***z1,2,3: zones 1,2,3***	
	CANDIDATE: all prerequisites fulfilled, theory passed			

Part III:

Certification Standards for Cave Diving Instructors

(worldwide used designation of certificates: ref. Appendix 3b)

1. SCD Cave Diving Instructor I / CDI1 (Cavern Diving Instructor)

1.1 Instructor's profile / skills and competences

This is a very proficient and experienced cave diver on cave instruction entry level who must have acquired beforehand the certifications as a SCD Cave Diver III (Full Cave Diver) and as an Open Water Instructor of a recognized Association (1* Instructor CMAS or equivalent) or presents proof of an equivalent professional experience in this field.
He has the required knowledge, the skills and the experience to teach in the classroom, in the swimming pool, in open water and in zone 1 of a cavern / cave and to organize and direct cave diving courses on level Cave Diver I (CD1) his own responsibility.
He may also act as an assistant during CD2 and CD3 courses.

1.2 Course prerequisites & requirements

1.2.1 Requirements at start of course (admission)

- minimum 20 years old
- diver for at least 3 years
- beneficiary of a liability insurance with a coverage of min. 4 Mio. CHF / EUR / USD per case and which also covers ALL kind of diver training activities as a diving instructor.
- no open/pending complaints/ethical or legal procedures or litigation against the candidate
- SCD membership for at least 1 year; cross-over candidates: min. 1 year membership as an instructor in active teaching status in previous recognized association
- certificate as an Open Water Instructor of a recognized OW-Training Association *) for at least 1 year (1* Instructor CMAS or equivalent norm EN 14113-1 / ISO 24802-1; Appendix 2) OR certificate as a Divemaster (or equivalent) of a recognized OW-Training Association for at least 3 years AND proof on the independent organizational, technical-operational and commercial management of a commercial diving school for at least 2 years.
) The candidate has only to prove that he/she has received such a training and has successfully terminated (certification). It is not requested that the candidate is still a member in that association or in active teaching status!
- certification as SCD Cave Diver III or equivalent (e.g. Full/Stage Cave Diver NACD/NSS or CDAA Penetration Diver, incl. Type 3 Sinkhole) for at least 1 year
- For cross-over candidates: Cave Diving Instructor I (Cavern) or equivalent, of another recognized association.
- a valid 1st Aid and CPR certification from a nationally recognized organization
- valid medical attest for diving fitness according to the concerning requirements of the national federation (<= 1 year)
- guiding: 10 cave dives in zone 2 and 5 cave dives in zone 3 as a divemaster during guided tours since receiving Full Cave Diver certification (written confirmation by responsible SCD Cave Diving Instructor II or III)
  For cross-over candidates: proof of requested activities in previous association or confirmation of divecenter.
- ev. successfully passed entry assessment (Appendix 7)

1.2.2 Additional requirements to be fulfilled until end of course

- min. 200 open water dives in total
- min. 50 cave dives in total, of which
  - min. 20 cave dives in zone 2 and
  - 10 cave dives in zone 3, of which min. 5 dives in the 40+m depth range
  - in at least 10 different caves

  (written confirmation by a SCD Cave Diving Instructor II)
- teaching/training experience:
  assistance in 2 complete SCD CD1 courses (written confirmation by responsible SCD course director / SCD Cave Diving Instructor I to III)

1.2.3 Recommended Specialty Certificates

- Vertical Climbing Techniques

1.2.4 Compulsory Specialty Certificates

- same as Cave Diver III

1.2.5 Entry assessment (only if needed)

An entry assessment (Appendix 7) can be utilized to verify that candidates fulfill all prerequisites with regard to theoretical knowledge, practical skills and physical performance.
Candidate must successfully pass all assessment requirements before being accepted to course.
All evaluation documents have to be safeguarded according to the legal requirements, however during a minimum of 5 years.

1.3 Minimum course content

- if not already covered by standard open water instructor course or an equivalent training as a teacher: the principles of teaching (methodology, teaching- & training aids etc.)
- standards and safety rules for cave diver I and II and zones 1 and 2
- specific training techniques for the exploration in zones 1
- the required equipment and material for zones 1 and 2
- all necessary diving techniques for zones 1 and 2
- the fundamentals of rescue and emergency management (techniques, organisation)
- legal aspects of instruction in general and in diver training

1.4 Evaluation

a) theory

Theoretical knowledge will be evaluated with one single test: a written theory test will be done in order to assure that theoretical knowledge meets the requirements outlined above. The test is a combination of 50 questions (40 MC+10 free text). Topics, structure and allotted questions of the theory exam are listed in Appendix 9.
In order to pass, the candidate must have a scoring of at least 80% (correct answers).

b) practical cave diving skills

The skills evaluation is done within the framework of a continuous evaluation system. All required qualifications will be repeatedly assessed and evaluated during the training course. The certificate will only be given at a point when the candidate has finally passed all requirements.
Generally speaking, the Cave Diving Instructor I candidate must be able to *perfectly* demonstrate all drills and exercises on cave diver I and II level.
The evaluation has to be done by at least two (2) different SCD Cave Diving Staff Instructors and with standardized evaluation forms.

c) classroom teaching

The candidate has to perform at least 2 evaluated classroom sessions during real cave diver courses on level 1 and 2 with real students with a grading of “C” (passed) or better.
The evaluation has to be done by at least two (2) different SCD Cave Diving Staff Instructors and with standardized evaluation forms.

d) practical teaching

The candidate has to perform at least 2 evaluated practical sessions during real cave diver I and II courses with real students with a grading of “C” (passed) or better.
The evaluation has to be done by at least two (2) different SCD Cave Diving Staff Instructors and with standardized evaluation forms.
For each lesson, resp. for each training session performed by the candidate under supervision, a detailed training plan / lesson plan for the previous inspection / approval must be sent to the evaluator at least 3 days prior to the appointment without further request.

e) general topics / overall competence level

Before being certified, the candidate must have shown proof of his ability to:

- to fully understand the complete SCD cave diving training system with special emphasis on the cave diver I and II level
- explain in detail all relevant rules for air-/gas-management and under which circumstances each specific rule should be applied
- explain the different requirements towards equipment and material beyond zone 1 and the reasons
- teach and demonstrate the complete theoretical and practical content of a CD1 course, in the classroom, in the open (land, water), and in zone 1 itself
- safely lead, supervise and control (guiding) a group of participants in zones 1 to 3
- teach/instruct a group of participants in zones 1 and 2
- communicate permanently and efficiently with a group under his control
- have the right mentality and attitude as a responsible SCD Cave Diving Instructor

f) Safeguarding of evaluation documents

All evaluation documents have to be safeguarded according to the legal requirements, however during a minimum of 5 years.

1.5 Activities and guiding/training competences

- may act as a divemaster (guidance) with already certified cave divers and instructors of any level in the appropriate zones.
- planning, organisation and execution of complete SCD Cave Diver I courses incl. classroom teaching, guiding, water work, examination and certification in his own responsibility. The SCD Training Director has the right to control the results of all evaluations at anytime.
- assistance during SCD Cave Diver II courses and evaluation under direct supervision and control of min. one (1) SCD Cave Diving Instructor II in active teaching status.
- assistance during SCD Cave Diver III courses (except for evaluations) under direct supervision and control of min. two (2) SCD Cave Diving Instructor II in active teaching status.
- In order to carry out cave diving courses with participants in CCR configuration and to issue cave diver certificates with the addition "**CC**", the instructor must at least be in possession of a user certificate for any CE-approved CCR device, resp. must have completed the additional training as specified in part I / chap. 2.

1.6 Training organisation

Training and certification will be planned and executed by a group of at least two (2) SCD Cave Diving Staff Instructors in active teaching status, themselves appointed by the SCD Training Commission.

Well experienced Cave Diving Instructors II in active teaching status can be used as assistants.

1.7 Certification

- SCD double-sided card
- wall certificate in A4 format
- designation: Cave Diving Instructor I (as per default with the addition „OC“; with appropriate additional training (ref. part I / chap. 2) also with the addition „CC“.

1.8 International comparison of certification level

With regard to the allotted competences, this certification level corresponds with the level Cavern Diving Instructor as defined by organizations such as NACD, NSS.

2. SCD Cave Diving Instructor II / CDI2 (Full Cave Diving Instructor)

2.1 Instructor's profile / skills and competences

This is an advanced and experienced cave diving instructor who must have acquired beforehand the certifications as a SCD Cave Diving Instructor I (Cavern Diving Instructor) and as an Advanced Open Water ter Instructor of a recognized association (2* Instructor CMAS or equivalent), OR presents proof of an equivalent professional experience in this field.

He has the required knowledge, the skills and the experience to teach in the classroom, in the swimming pool, in open water and in zones 1 to 3 on all cave diving levels and to organize and direct Cave Diver I and II courses in his own responsibility and Cave Diver III courses together with another Full Cave Diving Instructor in active teaching status.

2.2 Course prerequisites & requirements

2.2.1 Requirements at start of course (admission)

- minimum 25 years old
- diver for at least 5 years
- beneficiary of a liability insurance with a coverage of min. 4 Mio. CHF / EUR / USD per case which also covers ALL kind of diver training activities as a diving instructor
- no open/pending complaints/ethical or legal procedures or litigation against the candidate
- SCD membership for at least 2 years; cross-over candidates: min. 2 years membership as an instructor in active teaching status in previous recognized association.
- certificate as an Advanced Open Water Instructor of a recognized OW-Training Association *) for at least 2 years (2* Instructor CMAS or equivalent norm EN 14113-1 / ISO 24802-1; Appendix 2) OR
  certificate as a Divemaster (or equivalent) of a recognized OW-Training Association for at least 5 years AND proof on the independent organizational, technical-operational and commercial management of a commercial diving school for at least 3 years.
) The candidate has only to prove that he/she has received such a training and has successfully terminated (certification). It is not requested that the candidate is still a member in that association or in active teaching status!
- certification as SCD Cave Diving Instructor I or equivalent for at least 1 year in active teaching status
  For cross-over candidates: Cave Diving Instructor II (Full Cave Diving Instructor) or equivalent, of another recognized association.
- a valid 1st Aid and CPR certification from a nationally recognized organization
- valid medical attest for diving fitness according to the concerning requirements of the national federation (<= 1 year)
- guiding: 5 cave dives in zone 2 and 10 cave dives in zone 3 as a divemaster during guided tours (written confirmation by responsible SCD Cave Diving Instructor II or III) since certification as SCD Cave Diving Instructor I
  For cross-over candidates: proof of requested activities in previous association or confirmation of divecenter.
- ev. successfully passed entry assessment (Appendix 7)

2.2.2 Additional requirements to be fulfilled until end of course

- min. 300 open water dives in total
- min. 100 cavern- and cave dives in total
  - of which min. 50 in zone 2 and zone 3,
  - min. 20 cave dives in zone 3 since certification as SCD Cave Diving Instructor I, of which min. 5 dives in the 40m depth range
  - in min. 15 different caves

(written confirmation by another SCD Cave Diving Instructor II or III)
- teaching/training experience:
  - organisation and execution of at least 2 complete SCD CD1 courses
  - assistance in 2 complete SCD CD2 courses
  - assistance in 1 complete SCD CD3 course

  (written confirmation by the concerned responsible course director/SCD Cave Diving Instructor I to III)

2.2.3 Other Recommended Specialty Certificates

- same as for Cave Diving Instructor I

2.2.4 Compulsory Specialty Certificates

- same as for Cave Diving Instructor I

2.2.5 Entry assessment (only if needed)

An entry assessment (Appendix 7) can be utilized to verify that candidates fulfill all prerequisites with regard to theoretical knowledge, practical skills and physical performance. Candidate must successfully pass all assessment requirements before being accepted to course.

2.3 Minimum course content

- the principles of cave diving training in general, with specific focus on SCD Cave Diving Instructor II level
- teaching methodology for exploration of zones 1 to 3
- all required equipment and material for zones 1 to 3
- all necessary diving techniques for zone 3
- the fundamentals of rescue and emergency management (techniques, organisation)
- legal aspects of instruction in general and in diver training

2.4 Evaluation

a) theory

Theoretical knowledge will be evaluated with one single test: a written theory test will be done in order to assure that theoretical knowledge meets the requirements outlined above. The test is a combination of 40 MC- and 10 open (free-text) questions. Topics, structure and allotted questions of the theory exam are listed in Appendix 9.
In order to pass, the candidate must have a scoring of at least 80% (correct answers).

b) practical cave diving skills

The skills evaluation is done within the framework of a continuous evaluation system. All required qualifications will be repeatedly assessed and evaluated during the training course. The certificate will only be given at a point when the candidate has finally passed all requirements.
Generally speaking, the Cave Diving Instructor 2 candidate must be able to *perfectly* demonstrate all drills and exercises on Cave Diver I to 3 level.
The evaluation has to be done by at least two (2) different Cave Diving Staff Instructors and with standardized evaluation forms.

c) classroom teaching

The candidate has to perform at least 2 evaluated classroom sessions during real cave diver courses on level 2 and 3 with real students with a grading of “C” (passed) or better.
The evaluation has to be done by at least two (2) different Cave Diving Staff Instructors and with standardized evaluation forms.

d) practical teaching

The candidate has to perform at least 2 evaluated practical sessions during real cave diver courses on level 2 and 3 with real students with a grading of “C” (passed) or better.
The evaluation has to be done by at least two (2) different Cave Diving Staff Instructors and with standardized evaluation forms.

For each lesson, resp. for each training session performed by the candidate under supervision, a detailed training plan / lesson plan for the previous inspection / approval must be sent to the evaluator at least 3 days prior to the appointment without further request.

e) general topics / overall competence level
Before being certified, the candidate must have shown proof of his ability to:

- have a profound knowledge of the complete SCD cave diving training system with special emphasis on the cave diver level 1 to 3
- explain in detail all relevant rules for air-/gas-management and under which circumstances each specific rule should be applied
- explain the different requirements towards equipment and material of each zone and the reasons behind with special emphasis on zone 3
- safely lead, supervise and control a group of participants in zones 1 to 3
- teach/instruct a group of participants in zones 1 to 3
- teach the complete theoretical and practical content of cave diver level 1 to 3 courses, in the classroom, in the open (land and water) and in the zones 1 to 3
- communicate permanently and efficiently with a group under his control
- have the right mind and attitude as a responsible SCD Cave Diving Instructor
- cooperate and give support within the training of new SCD Cave Diving Instructors I

f) Safeguarding of evaluation documents
All evaluation documents have to be safeguarded according to the legal requirements, however during a minimum of 5 years.

2.5 Activities and guiding/training competences

- may act as a divemaster (guidance) with already certified cave divers and instructors of any level in the appropriate zones.
- planning, organisation and execution of complete SCD Cave Diver I and II courses incl. classroom teaching, guiding, water work, examination and certification in his own responsibility. The SCD Training Director has the right to control the results of all evaluations at anytime.
- min. two (2) SCD Cave Diving Instructors II (OR one (1) Cave Diving Instructor II and one (1) Cave Diving Instructor I together), both in active teaching status and after notification of the SCD Training Director, are empowered to jointly plan, organize and execute complete SCD CD3 courses incl. classroom teaching, water work, examination and certification. The SCD Training Director has the right to control the results of all evaluations at anytime.
- assistance during SCD Cave Diving Instructor I courses and evaluation under direct supervision and control of min. two (2) SCD Cave Diving Staff Instructors in active teaching status.
- designated (officially nominated) Staff Instructor *Candidates* may be used as assistants during Cave Diving Instructor II training courses (except for evaluations).
- In order to carry out cave diving courses with participants in CCR configuration and to issue cave diver certificates with the addition "**CC**", the instructor must at least be in possession of a user certificate for any CE-approved CCR device, resp. must have completed the additional training as specified in part I / chap. 2.

2.6 Training organisation

Training and certification will be planned and executed by a group of at least two (2) SCD Cave Diving Staff Instructors in active teaching status, after permission is granted by the SCD Training Commission.

2.7 Certification

- SCD double-sided card
- wall certificate in A4 format
- Designation: Cave Diving Instructor II (as per default with the addition „OC“; with appropriate additional training (ref. part I / chap. 2) also with the addition „CC“.

2.8 International comparison of certification level

This certification level corresponds to the level of a full cave diving instructor in organizations such as NACD, NSS. However in the SCD system a Cave Diving Instructor II has not the competence to act as a course director in Cave Diver III courses *on his/her own*.

3. SCD Cave Diving Instructor III / CDI3 (SCD Cave Diving Staff Instructor)

3.1 Instructor's profile / skills and competences

This is a most proficient and experienced cave diving instructor on highest competence level, who must have been certified beforehand as SCD Cave Diving Instructor II and as an Advanced Open Water Instructor of a recognized Association (2* Instructor CMAS or equivalent) and who can show proof of all required activities OR presents proof of an equivalent professional experience in this field.

The candidate has all required knowledge, skills, and experience to develop, organize, execute, direct, coordinate and control the training of cave divers and of cave diving instructors on all levels, nationally and internationally. He is the teacher of the cave diving instructor staff of SCD (in French: le formateur des formateurs).
In other Training Associations this level is often designated as ***Instructor Trainer.***

Normally candidates for the staff instructor level are nominated from the rows of Cave Diving Instructors II with a long-term and proven training and working experience on all levels of cave diving on a national and international level.

He must be most proficient in adapting existing present training schemes to new demands from the field, in developing new training structures and schemes, in working in different commissions on national and international level and in establishing and maintaining contacts to other federations or in negotiations with such organizations.

Training (if any is offered) and the proposal are made by the head of the SCD Training Director, the appointment is then made by the BoD of SCD.

3.2 Prerequisites for a potential nomination

3.2.1 Requirements for nomination as a *candidate* (admission)

(on this level there are no cross-over courses!)

- minimum 30 years old
- diver for at least 10 years
- beneficiary of a liability insurance with a coverage of min. 4 Mio. CHF / EUR / USD per case which also covers ALL kind of diver training activities as an instructor
- an actual extract from the criminal records not older than 1 year, free of entries, from his country of origin or from the country of residence
- no open/pending complaints/ethical or legal procedures or litigation against the candidate
- SCD membership as a cave diving instructor for at least 5 years and permanently in active teaching status.
- certificate as an Advanced Open Water Instructor of a recognized OW-Training Association *) for at least 2 years (2* Instructor CMAS or equivalent norm EN 14113-1 / ISO 24802-1; Appendix 2) OR
  certificate as a Divemaster (or equivalent) of a recognized OW-Training Association for at least 7 years AND proof on the independent organizational, technical-operational and commercial management of a commercial diving school for at least 5 years.
) The candidate has only to prove that he/she has received such a training and has successfully terminated (certification). It is not requested that the candidate is still a member in that association or in active teaching status!
- certification as SCD Cave Diving Instructor II for at least 2 years in active teaching status
- min. 500 open water dives in total
- min. 200 cave dives in total, of which
  - min. 100 in zone 2 and zone 3,
  - min. 50 cave dives in zone 3 since certification as SCD Cave Diving Instructor II, of which min. 10 dives in the 40+m depth range

- in min. 20 different caves
  (written confirmation by another SCD Cave Diving Instructor II or III)
- valid 1st Aid and CPR certification from a nationally recognized organization
- valid medical attest for diving fitness according to the concerning requirements of the national federation (<= 1 year)
- teaching/training experience:
  - min. 3 years of proven training experience on SCD CD1 to CD3 level.
  - must have planned, organized and directed in his own responsibility at least one (1) CD2 and two (2) CD3 courses since certification as a Cave Diving Instructor II
  - support as a course assistant and as a co-examiner during at least 2 SCD Cave Diving Instructor I courses under supervision and control of a SCD Cave Diving Staff Instructors.

  (written confirmation by the concerned responsible course director/SCD Cave Diving Instructor I to III)
- he must be familiar with the structures and cave diving training schemes of other federations on international level

3.2.2 Requirements to be fulfilled during the time in *candidate* status

- support as a course assistant and as a co-examiner during at least two (2) complete SCD Cave Diving Instructor II courses under supervision and control of two (2) SCD Cave Diving Staff Instructors.
- if required: successful execution of a assigned project, complete study/master thesis

3.2.3 Other recommended Specialty Certificates

- same as for Cave Diving Instructor II

3.2.4 Compulsory Specialty Certificates

- same as for Cave Diving Instructor II

3.3 Nomination and Promotion

Training (if any offered) and the proposal are made by the SCD Training Director, the appointment is then made by the BoD of SCD.
There is no granted right for nomination and promotion. The nomination is done entirely on the basis of the educational needs and are in the sole competency of the Training Director of SCD, after consultation of the other active instructors of the Training Commission. The BoD of SCD, on the other hand, decides on the proposal in free cognition. There is no recourse possibility.

3.4 Minimum course content

There is no defined „cave diving staff instructor course".
However, the guidelines for nomination and promotion are developed and given by the Standards Director of SCD in cooperation with the Training Commission of SCD and operatively executed by the latter.

3.5 Evaluation

a) theory and **b) practical skills**
Basically, there is neither a written test nor a practical skills evaluation anymore. The candidate must show proof of his overall competence by his work and the results out of it within the association and/or on a national and international level.
SCD strongly recommends to give the applicants a specific task in the form of a cave diving related project, whose results are presented in the form of a new training course, a study or master thesis. Evaluation of results has to be done by qualified members of the SCD Training Commission.

c) classroom teaching and **d) practical teaching**
Generally, the same holds true as outlined under a) and b). The candidate must show proof of his overall competence by his work and the results out of it within the association and/or on international level.

e) general topics / overall competence level
The candidate must be able to organize and direct the complete theoretical and practical training of Cave Diving Instructors I and II, incl. assessment and evaluation, from the planning to the certification. He must also be able AND willing to work on a national and international level.

3.6 Activities and guiding/training competences

- may act as a divemaster (guidance) with already certified cave divers and instructors of any level in the appropriate zones.
- organisation and execution of cave diver courses up to level 2 in his own responsibility and competence. The SCD Training Director has the right to control the results of all evaluations at anytime.
- one (1) SCD Cave Diving Staff Instructor, together with at least one (1) SCD Cave Diving Instructor II, both in active teaching status and after notification of the Training Director of SCD, are empowered to jointly plan, organize and execute complete SCD Cave Diver III courses incl. classroom teaching, water work, examination and certification. The Training Director of SCD has the right to control the results of all evaluations at anytime.
- min. two (2) SCD Cave Diving Staff Instructors in active teaching status are empowered to jointly plan, organize and execute complete SCD Cave Diving Instructor courses up to level 2, incl. examination and certification, after permission is granted by the Training Director of SCD. The Training Director of SCD has the right to control the results of all evaluations at anytime.
- designated (officially nominated) Staff Instructor *Candidates* may be used as assistants during Cave Diving Instructor II training courses
- project-leadership and/or assistance during development of new teaching and training standards, guidelines and safety rules for cave diving on national and international level.
- In order to carry out cave diving courses with participants in CCR configuration and to issue cave diver certificates with the addition "**CC**", the instructor must at least be in possession of a user certificate for any CE-approved CCR device, resp. must have completed the additional training as specified in part I / chap. 2.

3.7 Training organisation

There is no defined specific training.
Promotion/certification will be executed on national level by the corresponding SCD Training Commission.

3.8 Certification

- SCD double-sided card
- wall certificate in A4 format
- Designation: Cave Diving Instructor III (no more differentiation whether OC or CC, because the main focus of a Cave Diving Staff Instructor is on the training of other Cave Diving Instructors and not on skills and technical knowledge. In case that a Cave Diving Staff Instructor wishes to conduct courses on level Cave Diver I – III (CC) , then he/she must have the required instructor certificates with the addition „CC“.

3.9 International comparison of certification level

This certification level corresponds to the level of a course director / instructor trainer in organizations such as NACD, NSS.

4. Overview on the governing parameters of the SCD standards for CDI1 to CDI3

4.1 Admission- and certifications requirements

SCD/CMAS designation american equivalence	Cave Diver I (CD1) Cavern Diver	Cave Diver II (CD2) (Intro-to../Apprentice) Cave Diver	Cave Diver III (CD3) Full Cave Diver
age (years)	16	18	18
certified diver for min. (years)	1	2	2
prerequisite standard diving certificate	2 star diver CMAS or equivalent	2 star diver CMAS or equivalent	3 star diver CMAS or equivalent
Recommended Specialties before	Night Diving, UW-Orientation/Navigation	Wreck Diving, Gas Blender, Rescue	1st aid & CPR
Mandatory Specialties before	---	Nitrox Diver	Advanced Nitrox, Rescue Diver
prerequisite cave diving certificate	---	Cave Diver I / CD1	Cave Diver II / CD2
min. number of OW-dives before	25	50	100
min. number of cave dives before	0	4 / zone 1 / 2 caverns since CD1	8 / zone 2 / 4 caves since CD2
min. course duration (days)	2.5	3.5	5.5
min. number classroom lectures	3	4	8
min. number practical lessons	4	6	8
min. number of training dives	4 / zone 1 / 2 caverns	6 / zone 2 / 3 caves	8 / zone 3 / 4 caves
Instructor:Students / free surface	1:6	1:6	1:4
Instructor:Students / overhead env.	1:3 (avrg. cond.) / 1:2 (< avrg.)	z1: 1:3 / z2: 1:2 (avrg. cond.) / 1:3 (> avrg.)	z1: 1:3 / z2: 1:2 (avrg.) & 1:3 (good/very good) / z3: 1:2 (max.)
permanent line in cave	yes	no	no
restrictions & squeezes	no (2 divers at same time)	no (2 divers at same time)	yes
min. sight (m)	>= 10	>=3 and <10	0 to <3
traversing jumps/gaps	no	yes	yes
max. depth (m)	20	30	40 (EAD)/50m absolut
max. penetration distance (m)	daylight zone entrance	up to 1/3 double tanks	up to 1/3 total supply
max. distance to surface (m)	50	unlimited	unlimited
type of gas for dive	air only	air / Nitrox *)	air / Nitrox, Trimix ***)
min. number of tanks / min. gas volume	1 / 2000bar*liter	2 / 3000 bar*liter %)	2 / 4000 bar*liter %)
stage tanks	no	no	yes
stage decompression allowed	no	yes	yes
type of gas for decompression	----	air / Nitrox / O2 **)	air / Nitrox / O2 **)
backup-mask	yes, 1 per group	yes, 1 per diver	yes, 1 per diver
intermed. pressure long-house (BM: approx. 2m/SM: 1.5m	yes (1)	yes (1)	yes (1)
Safety Reel size (m) per diver	1 x 50 (zone 1)	1 x 50 (zone 2)	1 x 50 (zone 3)
Gap/Jump Reel size (m) per diver	no	1 x 30 (zone 2)	1 x 30 (zone 3)
Primary Reel size (m) per group	1 x 50 (zone 1)	1 x 80 (zone 2)	1 x 80 (zone 3)
min. number of independent lights	2 (zone 1)	3 (zone 2)	3 (zone 3)
min. number of markers (non-directional/directional)	3 / 3	3 / 3	3 / 3
solo-diving (totally alone)	no	no	no, only independent tasks
divemastering allowed / level +)	no	no	yes (up to CD3)
course assistance	no	no	yes; (CD1, cavern)
Sidemount	yes	yes	yes
Rebreather	yes	yes	yes
DPVs, Scooters	no	no	no, Specialty Course
theory assessment / type	MC	MC	MC + FT ++)
number of questions	20 (MC)	30 (MC)	40: 30 (MC) + 10 (FT)
minimal scoring	80%	80%	80%

+) under supervision Cave Diving Instructor (any grade) | EAD: equivalent air depth | *) Nitrox Diver Certificate | ***) Trimix Diver Certificate

%) totally independent tanks or manifold with valve | ++) MC=Multiple Choice / FT=free text | **) Advanced Nitrox Diver Certificate | DPV=diver propulsion vehicles

4.2 Training Competences

certified as -------> V course level	Cave Diving Instructor I	Cave Diving Instructor II	Cave Diving Instructor III CANDIDATE	Cave Diving Instructor III
Cave Diver I	***G, A, E, C(1)***	***G, A, E, C(1)***	<--------	<--------
Cave Diver II	***G, A, E***	***G, A, E, C(1)***	<--------	<--------
Cave Diver III	***G, A***	***G, A, E, C(2)***	<--------	***G, A, E, C (with 1 CDI2)***
Cave Diving Instructor I	***G***	***G, A, E***	<--------	***G, A, E, C(2)***
Cave Diving Instructor II	***G***	***G***	***G, A***	***G, A, E, C(2)***
Cave Diving Instructor III	No Course / Nomination and promotion by nat. commission			

Legend:

G: Guide ***C: respons. Course director***

A: Assistant ***(n): min. number of instructors***

E: Evaluator ***CANDIDATE: nominated by training commission***

Part IV:

Cave Zones, Equipment and Safety Rules

1. Cave Zone 1 (daylight zone)

1.1 Characteristics / Limits

This part is defined as the zone of the cave in the surroundings of the entry (cavern) and with the following characteristics:

- **direct visual contact and access to the water surface**, thus within the zone of natural daylight
- **no restrictions:** cross section area big enough for the **common passage of two divers** with their full equipment at the same time
- visibility of minimum **10m / 33ft**
- max. depth of **20m / 66ft**
- max. distance to the water surface of **50m / 166ft**
- **permanently** installed, uninterrupted (**continuous**) main line
- **no siphons (sumps), no sinks,** meaning **no caves with current pointing inwards** or periodically changing direction
- **no bifurcations, no jumps**, the main line must never be left
- **no traverses** (no start at one point, exit at another one)
- **no gaps** (interruption of the line means aborting the dive and returning)
- **circuits/loops** only if within the limits as defined above and if the “cavern line”, resp. the “cavern circuit” is a closed loop and well marked.
- All dives have to be executed within the NDL (Bühlmann ’86 as reference)
- The use of nitrox up to 40% is permitted, provided that the participants have the appropriate training and certification (Nitrox Diver) from a recognized association.
  Additional for CCR: authorization to use EANx as a diluent with the device used.

1.2 Specific requirements for equipment and divers

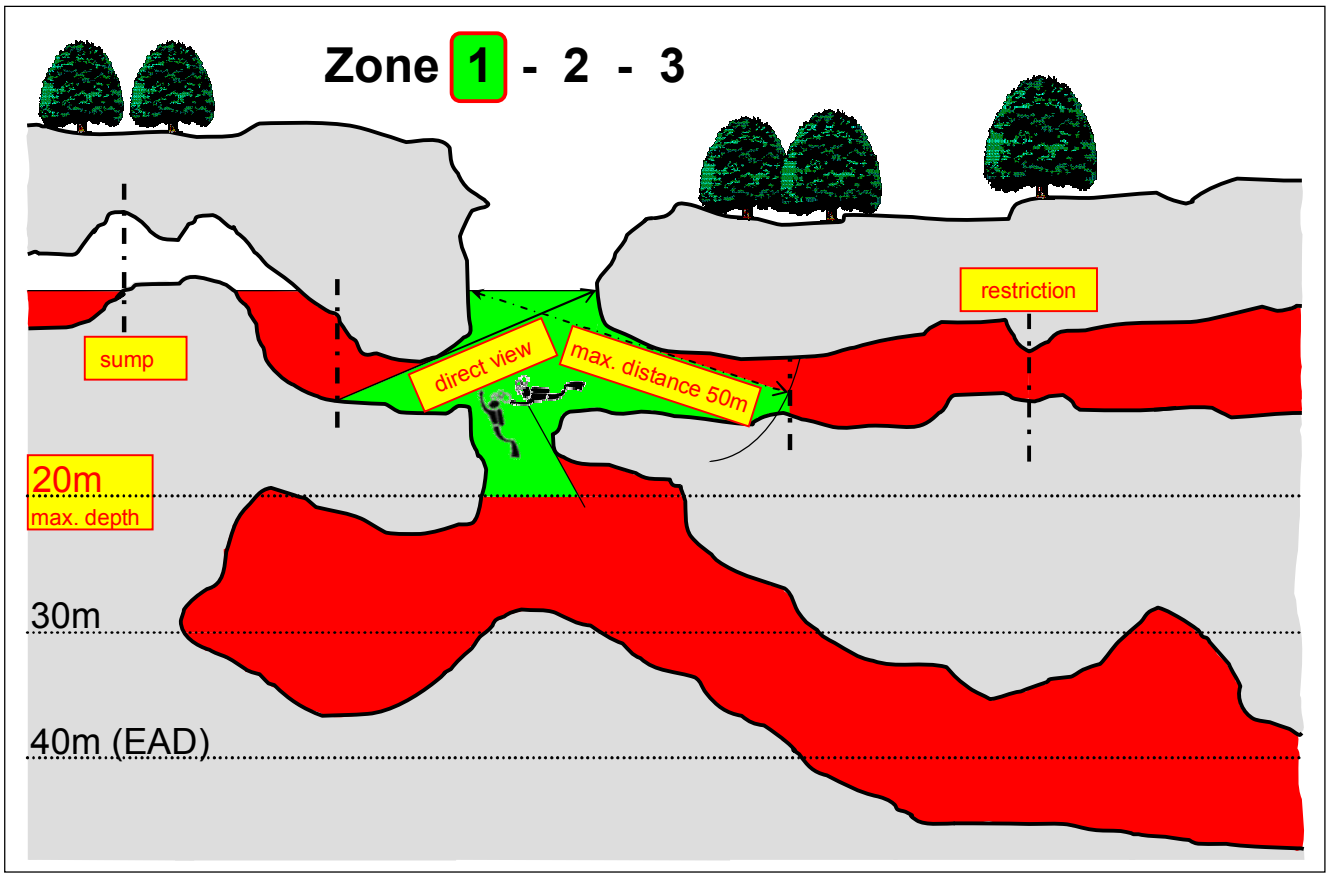
All related requirements as described in part IV, chapter 4 "general safety rules, equipment & procedures" are also applicable and strictly to be respected.

- one member per group has to have **a (1) second mask/backup mask** for the group
- For OC-devices (backmount or sidemount):
  - min. gas volume is **2000** bar*liter (e.g. 1x10 ltr /200 bar)
  - backmount mono tanks must compulsory have **2** separate outlets with **DIN** threading (G5/8)
  - sidemount tanks of a single tank configuration must also have **2** separate outlets with **DIN** threading (G5/8)
  - sidemount primary tanks of a 2-tank configuration must have a **single outlet** only with a **DIN** threading (G5/8)
  - **2** completely independent regulator rigs with pressure monitoring devices (SPG)
  - for backmount: one of the regulators must be equipped with a so-called longhose with a length of **1.8-2.1m / 6-7ft**.
  - for sidemount: one of the regulators must be equipped with a so-called longhose with a min. length of **1.5m / 5ft** .
- For CCR-devices:
  - Each CCR diver must carry an offboard/offline OC bailout system at all times.
  - The OC bailout regulator must have a longhose with a length of min. **1.5m/5 ft**.
  - There must always be enough OC bailout gas to allow each diver to return safely back to the entrance from the planned return point (max. penetration distance) in case of a catastrophic failure of the CCR right there.
- **1** solid cutting tool (knife, cutter, scissors), attached with a safety lanyard
- **1** uw-slate and pencil or wetnotes
- **2** totally independent underwater lights (1 main lamp, 1 emergency/backup lamp) of which one (1) uses non-rechargeable batteries
- **1** safety reel/spool per diver with at least **50m/166ft** of line; line color yellow or orange
- **min. 1** jump/gap reel per diver with at least **30m/100ft** of line; **NOT for Cavern Divers!**
- **min. 1** primary reel per group with at least **50m/166ft** of line
- **1** set of **3** directional and **3** non-directional line markers
- helmets: ref. to part IV, chapter 4 "general safety rules, equipment & procedures"

1.3 General remarks / required certification

- Penetration in this zone requires a specific training (SCD Cave Diver I / CD1 or equivalent) and a complete diving equipment for sport diving as a basis plus the additional required items
- All activities take place during daylight and within the no-decompression times
- **In case that cavern diving activities take place beyond an official training course, but under appropriate guidance, it is highly recommended to use the equipment required fore zone 2!**
- *This zone requires the level Cavern Diver as defined by other organizations such as NACD, NSS, PADI, NAUI, SSI, as well as CDAA (incl. Sinkhole Class 1).*

1.4 Graphic display of Cave Zone 1



2. Cave Zone 2 (zone of complete darkness)

2.1 Characteristics / Limits

It is defined as the zone beyond zone 1 with complete darkness and the following further characteristics:

- cross section area big enough for the **common passage of two divers** with their full equipment at the same time (**no restrictions, no squeezes**)
- max. depth is **30m / 100ft nominal**
- visibility has to be **>3m / 10ft** but can be **<10m / 33ft** (ref. to Appendix 10)
- penetration is limited by the consumption of maximum **1/3** of the total initial gas volume **without** any **tank depots or stage tanks** included
- **no sumps**
- **no sinks,** meaning **no caves with current pointing inwards** or periodically changing direction (**no estavelles**)
- **circuits and traverses** are possible, also without fixed lines
- The use of nitrox up to 40% is permitted, provided that the participants have the appropriate training and certification (Nitrox Diver) from a recognized association.
  Additional for CCR: authorization to use EANx as a diluent with the device used.
- profiles with required **stage decompression** are included
- a fixed permanent main-guideline ***may*** **be missing**

2.2 Specific equipment requirements

All related requirements as described in part IV, chapter 4 "general safety rules, equipment & procedures" are also applicable.

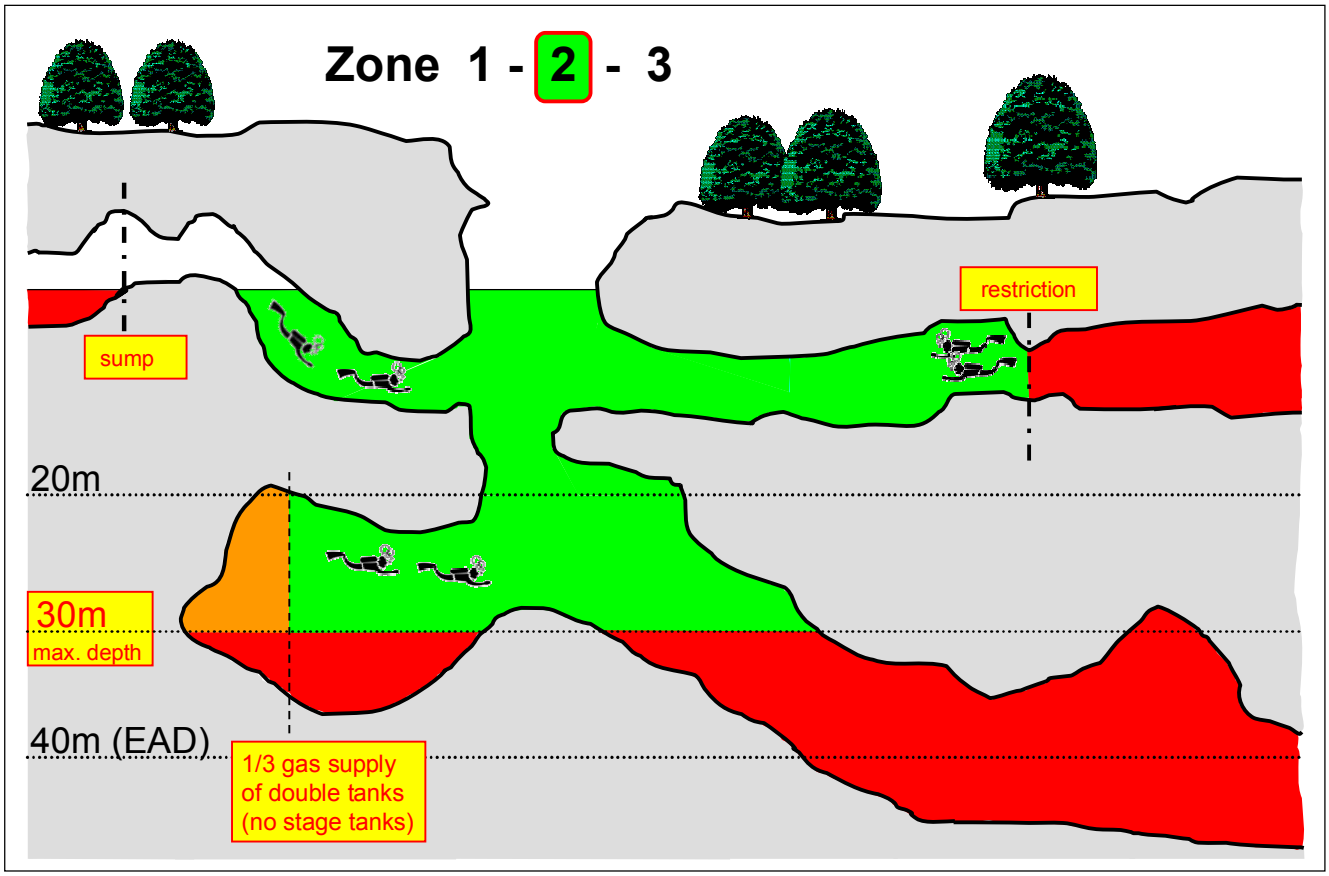
- every diver has to have a **personal second mask** (backup mask) at all times
- For OC-devices (backmount or sidemount):
  - min. gas volume is **3000** bar*liter (e.g. 2x7ltr /232 bar);
  - min. **2** primary tanks are mandatory at all times (backmount or sidemount)
  - each tank must only have one single outlet with a **DIN** threading (G5/8)
  - **2** completely independent regulator rigs with pressure monitoring devices (SPG)
  - for backmount: one of the regulators must be equipped with a so-called longhose with a length of **1.8-2.1m / 6-7ft**.
  - for sidemount: one of the regulators must be equipped with a so-called longhose with a min. length of **1.5m / 5ft** .
- For CCR-devices:
  - Each CCR diver must carry an offboard/offline OC bailout system at all times.
  - The OC bailout regulator must have a longhose with a length of min. **1.5m/5 ft**.
  - There must always be enough OC bailout gas to allow each diver to return safely back to the entrance from the planned return point (max. penetration distance) in case of a catastrophic failure of the CCR right there.
- **2** solid cutting tools (knife, cutter, scissors), ea. attached with a safety lanyard
- **1** uw-slate and pencil or wetnotes
- **3** totally independent underwater lights (1 main lamp, 2 emergency-/backup lamps OR 2 main lamps, 1 emergency-/backup lamp); one must be equipped with non-recharchable batteries
- **1** safety reel/spool per diver with at least **50m/166ft** of line; line color yellow or orange
- **min. 1** jump/gap reel or spool per diver with at least **30m/100ft** of line
- **min. 1** primary reel per group with at least **80m/266ft** of line
- **1** set of **3** directional and **3** non-directional line markers
- helmets: ref. to part IV, chap. 4 "general safety rules, equipment & procedures"

2.3 General remarks / required certification

- Diving in zone 2 does no longer belong to the area of „normal“ recreational diving, but definitely to cave diving in the true sense of the word. In this zone it is very common to have dives with longer decompression stops.

- Water filled passages at the end of an otherwise dry cave or cavern do no longer belong to zone 2, because more than not they require special techniques and equipment for further penetration.
- *This zone requires the level (Intro-to-) Cave Diver (without stage tank use) as defined by other organizations such as NACD, NSS, as well as CDAA (incl. Sinkhole Class 2).*

2.4 Graphic display of Cave Zone 2



3. Cave Zone 3 (highest competence level)

3.1 Characteristics

It is defined as the zone which does not correspond to the criteria of either zone 1 or zone 2, mainly in the following points:

- distance (ref. also to initial gas supply under "general safety rules, equipment and procedures")
- visibility **(< 3m / 10ft**)
- depth **(> 30m / 100ft** but **<=40m / 133ft [EAD!]**); SCD does neither recommend nor endorse diving deeper than 40m/133ft with compressed air! The maximum effective/nominal depth during courses is limited to **50m (with Tmx).**
- type or passage: as soon as diving takes place **in more than just one sump** (air filled sections which require surfacing, sometimes even an in-cave decompression)
- **size of the cross sectional area** (restrictions and squeezes to be included)
- as soon as **tank deposits** or **stage tanks** are used
- as soon as **Heliair, Heliox** or **Trimix** is used, provided that the participants have the appropriate training and certification (Advanced Nitrox Diver, min. Normoxic Trimix Diver) from a recognized association. Additional for CCR: authorization to use such mixtures as a diluent with the device used.
- as soon as - regardless of the motivation – a **single diver temporary push dive** is carried out

3.2 Specific equipment requirements

All related requirements as described in partIV, chap. 4 "General Safety Rules, Equipment & Procedures" are also applicable.

- **So far identical to those for zone 2**, but further adapted to the specific goals of the planned exploration (e.g. deep diving, squeezes, long distance penetration)
- For OC-devices (backmount or sidemount):
  - min. gas volume is **4000** bar*liter (e.g. 2x10ltr /200 bar);
  - min. **2** primary tanks are mandatory at all times (backmount or sidemount)
  - each tank must only have one single outlet with a **DIN** threading (G5/8)
  - **2** completely independent regulator rigs with pressure monitoring devices (SPG)
  - for backmount: one of the regulators must be equipped with a so-called longhose with a length of **1.8-2.1m / 6-7ft**.
  - for sidemount: one of the regulators must be equipped with a so-called longhose with a min. length of **1.5m / 5ft** .
- For CCR-devices:
  - Each CCR diver must carry an offboard/offline OC bailout system at all times.
  - The OC bailout regulator must have a longhose with a length of min. **1.5m/5 ft**.
  - There must always be enough OC bailout gas to allow each diver to return safely back to the entrance from the planned return point (max. penetration distance) in case of a catastrophic failure of the CCR right there.
- **2** solid cutting tools (knife, cutter, scissors), ea. attached with a safety lanyard
- **1** uw-slate and pencil or wetnotes
- **3** totally independent underwater lights (1 main lamp, 2 emergency-/backup lamps OR 2 main lamps, 1 emergency-/backup lamp); one must be equipped with non-rechargeable batteries
- **1** safety reel/spool per diver with at least **50m/166ft** of line; line color yellow or orange
- **min. 1** jump/gap reel or spool per diver with at least **30m/100ft** of line
- **min. 1** primary reel per group with at least **80m/266ft** of line
- **1** set of **3** directional and **3** non-directional line markers
- helmets: ref. to part IV, chap. 4 "general safety rules, equipment & procedures"

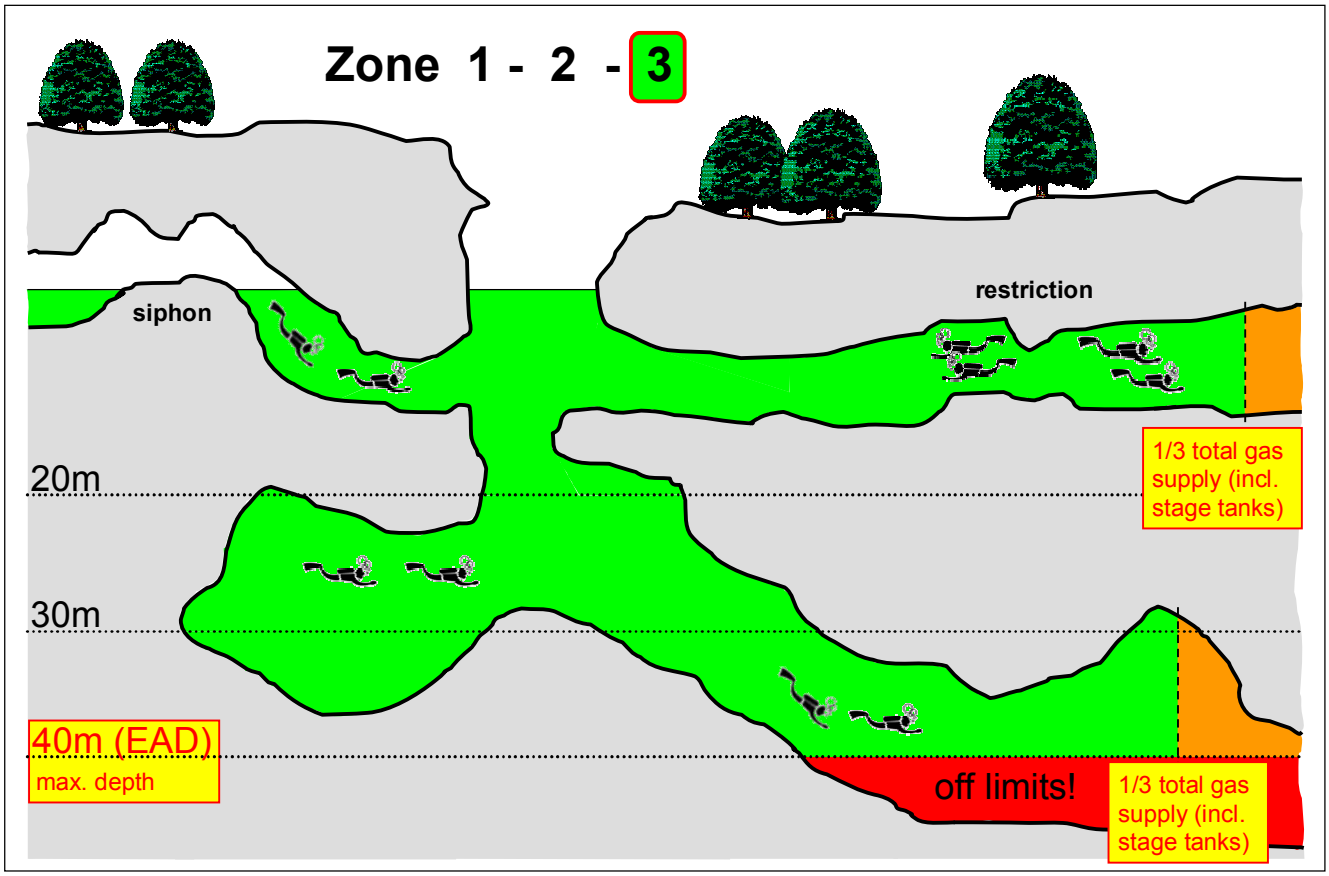
3.3 *Recommended* additional equipment

Please refer to part IV, chapter 4 "general safety rules, equipment & procedures / Application rules & procedures: Air- and Oxygen decompression stops".

3.4 General remarks / required certification

This zone requires the level Full Cave Diver as defined by other organizations such as NACD, NSS, or Penetration as with CDAA (incl. Sinkhole Class 3)

3.5 Graphic display of Cave Zone 3



4. Requirements for Divers and Equipment / Application- and Safety-Rules

The following requirements are an integral part of the whole SCD training- and certification system. Whereas the bare standards (chapters 6-9 and 10-13) only define the prerequisites and the requirements for obtaining a certain certificate, all relevant requirements to equipment, application- and safety rules and constraints are described in this chapter here.

4.1 Foreword / Introduction

- ***Cavern*** diving means that diving will take place in the entrance area of water-filled, natural or artificial cavities and in the zone with natural daylight.
- ***Cave*** diving means that diving will take place in water-filled, natural or artificial cavities and in zones beyond natural daylight (total darkness).
- The following rules apply to the self-dependent cave diver with no direct connection to surface installations.
- Knowledge and skills required for this type of diving exceed by far the common diving competences. It is absolutely compulsory to have a profound knowledge of the cave system, to be well trained in handling all required additional equipment and in the application of special diving techniques, as well as to have a very stable mental constitution.
- NO open water diving training - regardless how good it was - can prepare a diver adequately to the specific hazards, risks, and requirements of the overhead environment!
- *Disregarding one of the core rules concerning **air (gas) - line - light** will be automatically considered as gross negligence by SCD.*

4.2 Requirements to the diver

- Physical Fitness:
  - Diving requires for a certain level of physical fitness. This holds especially true for cave diving because here, due to the swimming distances, the weight of the equipment and even some climbing, the physical requirements are even higher.
  - For all SCD cave diving courses the participant has to present a valid medical attest (not older than 1 year) on his/her unrestricted fitness to dive and to participate on all training activities. This attest has to be presented latest before the first water lesson.
  - In case the responsible course director has any reasonable doubts (or proven facts) on the physical performance of a participant, then he/she is strongly requested to control these prerequisites by making an assessment (ref. to Certification Requirements and to Appendix 7, “Guidelines for Assessments”).
    This assessment consists of the fin swimming exercise with full gear and breathing through the snorkel on the surface as described under chapter Assessments. If the candidate is unable to pass this test before the first open water dive of the course, then he/she is to be rejected from any further participation.
- Mental Stability and -Attitude:
  - Safe cave diving requires for a certain level of mental stability and for a non-aggressive mental attitude concerning cave diving-related activities. In case the responsible course director has any reasonable doubts (or proven facts) about the fulfillment of these prerequisites by the candidate, he is free to reject the candidate, or expulse him/her from the training course. However the latter can only be done after the candidate has not complied with the expressed request of the course director to change his attitude or gives definite proof of his/her inability to scope with these prerequisites.

4.3 Permanent and temporary Installations in the cave

- The submerged part of the cave should be equipped with a state-of-the-art fixed main guideline. If this is not the case in a cavern zone, then this part of the cave will be automatically classified as zone 2 and cavern divers have to abort the dive and return.

- It is highly desirable that this main line is marked in regular intervals with directional line markers, pointing towards the exit. It may also be useful to add small tags with the distance from the exit written on them (métrage).
- Special attention has to be given to both ends of this line, to the installation and its fixation to the walls of the cave.
- The first fixation point (primary tie-off) and thus the start of the main line must be fixed either
  - on land (shore zone) or
  - at a point underwater where the diver can ascend straight to the surface and in way that it can not be easily reached by passers-by.
- The second fixation point (secondary tie-off) should be some 3-6m/10-20ft away from the first point whenever possible. Ideally still in the open water, but max. 5m from the entrance. Its function is purely to prevent undue stress and tension on the first point and as a secondary line of defense in case the first tie-off loosens (or is loosened by someone).
- At jumps - especially at longer ones - a last wrap should be made shortly before the new fixation point on the new main line (0.5 - 1m before) and from thereof the final end of the jump-line is to be placed in an almost rectangular way to the new mainline.
- Continuous Line Connection:
  - it's in every diver's own responsibility to always and everywhere establish a continuing line connection back to the entrance/exit of the cave. Violation of this rule will always be regarded as gross negligence.
  - in case the permanent line is broken somewhere, the diver has either to abort the dive and to return or to establish a temporary continuation by means of his jump-/gap-reel for this dive, or to repair the gap with his gap-reel.

- Line material and type (ref. also to part IV, chap. 4 and Appendix 13):
  - Line material for any kind of line must not rot while underwater, must not float (such as Polypropylene) and should not change its length itself too much or loose its mechanical properties while wet (Nylon is the preferred choice)
  - For some environment, it may even be advisable to use stainless steel wire.
  - Only braided lines should be used, not twisted one
  - Thickness for permanent main lines can vary from 2-4mm and with a breaking strength of not less than 1000Newton, depending on the cave conditions (e.g. currents) thus giving enough resistance against abrasion.
  - Color should be white or strong yellow for permanent main lines and white for all others in order to be seen even in low visibility conditions
- Use of markers on a permanent mainline:
  - Basically, from the focus of usage, two different types can be distinguished: permanent markers (being fixed permanently on the mainline like traffic signs) and personal, temporarily used markers, attached by the diver for the duration of his dive and being removed on the way out.
  - From the geometrical form, 3 different types can be distinguished: Directional markers/line arrows (permanently *and* temporarily used), non-directional markers / line cookies and clothespins (both temporarily used only). Clothespins should be used with caution and only if there is no better alternative.
  - For the usage of these markers the following rules and recommendations apply:
    * Marker should be used reluctantly with the least number possible and only at places with a high probability of otherwise orientation problems, preferably for circuits and traverses, at intersections, Ts and for jumps.
    * Whenever possible only markers of one color (red, white, yellow) should be used within one cave by one diver.
    * To avoid misunderstandings it is highly recommended to use markers of another color than the one used for the permanently fixed markers on the mainline in the cave just being explored.
    * As material, a not too hard plastic should be used, in no case metal. There should be no sharp edges which will sooner or later cut through the line.
    * Wherever possible (caution: line tension!), markers should always be secured with a double loop on a line

* In contrast to permanent markers, personal (temporary) markers should carry the initials of the owner in well readable writing.
* The mid-way point in a circuit or in a traverse passage should be marked with two arrows, pointing in opposite directions and being fixed 5-10cm from each other.
* At a bifurcation with an exit on each branch the closer one should be indicated with a pair of arrows pointing in this direction, the other one (which is farther away) marked with one single arrow only.
* Except for emergencies all personal (non-permanent) markers have to be taken from the line on the way back (no "dog-tags" to be left!).
* In order to avoid any confusion the joint between a jump line and a mainline should not be placed between a double arrow marking (mid-way point or closest exit).
* A marker should be fixed to the joint between the jump line and the mainline as a precaution against slipping sideway and in order to be seen well.
* For groups which will stay together partially only, each of the sub-formations must use their own reels and markers, totally independent of what the others do.

4.4 Requirements for personal cave diving equipment

The rules for required equipment follow the requirements of each zone and its characteristics, as each of these zones has its own special requirements.

- The general rules for ALL personal equipment are: *select only equipment which*
  - ***is of good quality***
  - ***is functional***
  - ***is easy to use***
  - ***is safe to use and robust***
  - ***you are familiar with***
  - ***fulfills exactly the intended tasks***
  - ***is conform with all SCD standards and requirements***
- Further SCD General Guidelines for equipment:
  - Take only equipment with you that is appropriate for the dive you just carry out; everything else leave at home! Too often only, less is more.
  - However, the really important pieces of equipment must be carried with the required redun dancy.
  - Within the cave diving environment, it is important to have a most streamlined outer profile.
  - If ever possible, there must not be any obstructive or dangling pieces of equipment, which can easily get caught from and entangled in the guideline.
  - ***The cave diver has to select his equipment configuration from the focus of a complex system, in which every module has to harmonize with all others or at least no piece must notice ably restrict any other piece in its functionality. As a cohesive and carefully arranged unit, it has to facilitate the dives and must be configured so as to provide the greatest support.***
- Instructor's equipment during training sessions:
  - During all SCD training courses a SCD cave diving instructor has to be equipped according to cave zone 3, regardless of the course level or actual zone.
  - For a group with the OC sidemount configuration, the instructor also has to dive in OC sidemount configuration.
  - **In the case of a training group, where the participants dive with CCR equipment, the instructor has to dive with an OC device.**
  - For each course, irrespective of the level, it is compulsory that the instructor will carry a safety tank (stage) for emergencies that is NOT included in the gas supply intended for use. The OC regulator on this auxiliary tank must be fitted with a long hose with a length of at least 1.5m.
- Mixed device configurations among the students:
  - Within a co-operating group, it is permissible during the training dives to mix OC backmount and sidemount configurations.

- Within a co-operating group, it is forbidden during the training dives to mix OC-CCR configurations (exception: instructor).
- It is basically permissible to have participants with different CCR types in one dive group (training & fun dive).
- For OC backmount configurations, it is explicitly permissible to use devices with bridges and independent devices mixed on the participant's side.
- In the cavern zone, it is permissible to use mixed OC mono- and twin-tank configurations on the participant's side.

In any case, each cave diver must carry the following additional equipment:

- Fins, mask(s), adequate protection against cold (wet- / dry-suit); NOTE: SCD does NOT request the compulsory use of dry suits. It is in the responsibility of each diver to choose an adequate thermal protection. However, for longer or deep dives, cold continental water temperatures and specially when using Trimix, a dry suit is highly recommended.
  For longer and deeper dives, as well as when using helium mixtures, the use of argon in a separately carried small tank (1.5-2ltr) for the inflation of the dry suit is strongly recommended.
  It is also permissible to use electrically operated heating vests and gloves as long as the power supply can be interrupted by the diver himself at any time.
- Fin Heel Straps:
  - Standard rubber fin heel straps are only tolerated in zone 1 (cavern), because they break easily and their overlapping ends have a great tendency to get entangled in the line.
  - If such rubber heel straps are still used in zone 1 then their overlapping ends on both sides must be cut back as much as possible AND must be secured with bright duct tape.
  - From zone 2 on, only metallic heel straps are acceptable, the so-called steel spring heel straps.
- Masks (generally):
  Full face masks (FFM) are not permitted in the entire training scheme of cave diving (Cave Diver I to III).
- Backup-diving mask:
  - In zone 1, it is compulsory that at least one (1) of the team members, preferably the team leader, has to have a backup mask. It should be tested before the dive that the mask fits every team member reasonably. All divers of the team MUST know who carries the backup mask (-> briefing).
  - In zone 2 AND 3, it is compulsory that every diver has to have his own personal backup mask
- Wrist-slates / wetnotes:
  In all zones it is mandatory to carry some suitable means for written messages (either in the form of a wrist-slate OR wetnotes).
- Thigh- or leg pockets (left and right) are highly recommended to store smaller pieces of equipment.
  - Such pockets may either be glued to the suit or may be carried with a daisy chain attached to the weight belt or the backplate harness and with an elastic leg band
  - In order to avoid confusion, their content should be divided in 2 groups and be stored in different pockets:
    * pieces for "normal usage", such as SMB, bolt-snaps, jump-spools and alike
    * material for safety purposes and emergencies like back-up mask, personal safety reel/spool, etc.
- Minimum 1-2 (depending on the zone) solid cutting tools (knife, cutter, scissors), secured against dropping with a safety lanyard.
- Line material and type (ref. also to part IV, chap. 4.3 and Appendix 12:
  - Concerning parameters such as type of material, resistance against rotting, type of webbing, the same holds true as outlined in part IV, chapter 4.3
  - Thickness for non-permanent primary-/safety-/gap-/jump-reels and spools may vary from 1.5-3.0mm because of its temporary installation use; requirements for physical strength and resistance against abrasion are lower than for a permanently installed main line
  - Color should be white in order to be seen even in low visibility conditions

Standards & Training System

- Line reels (and spools):
  - Cavern Zone (zone 1): every diver has to have at least 1 personal safety-reel/spool
  - Zone 2 and 3: every diver has to have at least 2 personal reels/spools (1 safety-reel/spool, 1 jump-/gap-reel/spool, line length corresponding to the zone)
  - 1 primary reel per group has always and in all zones to be carried with a line length corresponding to the zone
  - It is strongly recommended that every group and in all zones takes a gap-reel or -spool for repairing a damaged mainline.
  - If, due to the actual on-site conditions the responsible instructor in charge feels it to be necessary, he is free to rise the requirements for a specific dive with regard to number and types of reels to be carried with, as well as line lengths and thicknesses.
  - Materials used must be corrosion proof
  - Construction must be so that the line (if getting loose) can not block the drum
  - For reels with a handle, it must be made sure that the handle may not get entangled with a line
  - Reels should be clearly marked with the owner's name in good readable writing
  - Length of line on the reel should also be indicated in the same writing
- Required reel types and minimum line lengths:

	zone 1	zone 2	zone 3	number
Gap-Reel or Spool ***)**	**15m/50ft**	**15m/50ft**	**15m/50ft**	1 per group
Gap-Reel or -Spool ***)**	**15m/50ft**	**15m/50ft**	**15m/50ft**	per group
Jump-Reel or Spool	**30m/100ft **)**	**30m/100ft**	**30m/100ft**	1 per diver (but NOT for cavern divers)
Safety-Reel or -Spool	**50m/166ft**	**50m/166ft**	**50m/166ft**	1 per diver (all levels)
Primary-Reel	**50m/166ft**	**80m/266ft**	**80m/266ft**	1 per group
Penetration- / Exploration-Reel	**-----**	**according to planned tasks (>>100m/332ft)**		

*) This is just a recommendation; gap-reels/spools are NOT mandatory !
**)Cavern Divers are not entitled and not trained to actually bridging jumps and closing gaps in the permanent guideline, but have to return in such a case. Thus, Cavern Divers should NOT carry any Jump- or Gap Reels/Spools with them. However they have to have 1 Safety Reel/Spool so that a lost line could be searched for.
The line length on the Safety Reel/Spool corresponds to the maximum penetration distance for a Cavern Diver, so that theoretically it should always be possible to dive back to the free water surface by using the Safety Reel/Spool alone.

- Line markers:
  - Each diver -regardless of the zone - has to carry a reasonable set (min. 3 of EACH type) of directional line markers (arrows) AND non-directional markers (line cookies, cave cookies) ready for use.
  - All markers should be personalized with the initials of its owner in good readable writing.
- Regulators:
  - SCD strictly requires the use of regulators (or components thereof) which are EN250 certified (this European norm is worldwide accepted as governing standard for diving regulators).

Standards & Training System

- Longhose:
  - It is mandatory for all backmount configurations in all zones that one of the two regulators is equipped with a so-called longhose. The length of the intermediate pressure hose for backmount configurations must be within 1.8m - 2.1m (6ft - 7ft), for sidemount configurations approx. 1.5m. Even longer hoses are undesirable, except when using DPVs (s. there).

length	*comment*
1.5m / 5 ft	*Min. hose length in overhead environment for sidemount configuration WITHOUT scooter; for bailout- and safety tanks*
1.8m / 6ft	minimum length of longhose in overhead environment WITHOUT scooters
2.1m / 7ft	recommended length of longhose in overhead environment for *backmount-configurations* WITHOUT scooters = min. length in overhead environment WITH scooters
2.4m / 8ft	max. length of longhose in overhead environment WITHOUT scooters = recommended length of longhose in overhead environment WITH scooters
3m / 10ft	max. length of longhose in overhead environment WITH scooters

  - The longhose **must** be attached on the right shoulder's first stage (in the direction of the diver's view), whether for backmount- or sidemount configurations.
  - SCD ultimately requires a conspicuous, bright hose color (best yellow), which differs clearly and strikingly from the colors of the other hoses, ref. to chap. 4.5!
  - SCD does not require any specific way of storing the long hose. Under all circumstances, however, the following requirements must be fulfilled:
    * While stored, the hose must not protrude away from the diver's body so it could get hooked and should be tucked as close as possible to the diver's body or the tanks on the side.
    * The routing of the hose must be realized in a way that the hose is not laid through exposed areas where it could easily be damaged by contact with the cave environment.
    * In case of an emergency the regulator with the entire length of the longhose must be ready for use and able to be pulled out to full length within seconds even in confined spaces with a simple movement of either the donor or the receiver.
- Instrumentation (minimum):
  - Adequate instrumentation but at least 1 dive computer or dive table with watch and depth gauge
  - Dive computer should be adaptable to those gas mixtures actually used; if not, decompression stop times for air diving must be observed
  - At least 1 submersible compass with analogue display
  - At least 1 submersible pressure gauge per tank (ref. to tank monitoring)
  - Because of the easier reading even in total darkness an analogue display with self-luminous background is to be preferred.
- Buoyancy compensators (BC, BCD, vests,….):
  - Each diver has to be equipped at all times with a buoyancy compensation device (jacket, wings) of adequate lifting power, but with a volume of not less than 16 liters when fully inflated, (2-tank configuration, WITHOUT stage). If more lift volume is needed, it must be decided, resp. be calculated in situ!
  - SCD does NOT request the compulsory use of wings; if jackets of standard design also have the requested features, they may be used as well.
  - Considering the harsh treatment of cave diving gear, the use of a type with inner bladder and an outer protective shell is compulsory.
- (Power-)Inflators:
  - All personal buoyancy compensator devices (jackets, wings) and dry suits must be equipped with power inflators, connected to the 1st stage of a regulator.
  - Power inflator for buoyancy compensator and that for dry suit must not be connected to the same regulator 1st stage.
  - The inlet valve (quick connector) of the dry suit inflator must be rotatable.

- Backmount-configuration: the power-inflator intermediate pressure hose for the jacket/wings **must** be attached on the right shoulder's first stage (in the direction of the diver's view), the hose for the dry suit with the left first stage (if not via a separate tank).
  Sidemount-configuration: for the sake of shortness of hoses and to avoid hoses crossing each other, it is recommended to feed the harness inflator from the left primary tank and the suit inflator from the right primary tank.
- For Trimix and long duration dives it is highly recommended to use Argon from a separate tank for the inflation of the dry suit in order to avoid problems associated with isobaric counterdiffusion and thermal conductivity and related body heat loss. This supply has to be carried out by means of a separate, appropriately marked small tank (1.5-2ltr).
- In the case of a dry suit, the dimensions of the inlet valve (quick connection) should be identical to the ones used with the BCD / Wings. This means that both (BCD / Wings / Suit) can be supplied alternately even after the supplying primary tank has been closed.
- When using stage gases such as air or max. EAN36 (but not He-Mixtures) it may be appropriate to install an inflator hose on at least one (1) stage regulator so that the BC / wings / suit could also be supplied via this stage tank.

• Use of rebreathers during training courses:
- Only CE-approved (EN14143) CCR devices (manually operated or electronically controlled or a combination thereof) may be used; SCR devices are explicitly not allowed.
- CCR devices can either be used in backmount or sidemount configuration.
- Rebreathers should only be used if the user has completed a recognized course (special course) for this device and can demonstrate this. Such CCR training courses are NOT the subject of the SCD standard cave diving training.
- *In addition, the participant must prove by logbook entries that he/she has executed at least 50 dives / 25 hours (Cave Diver I) before the cave diving course, resp. 100 dives / 50 hours (Cave Diver II) with the device in the open water. For Cave Diver III courses, a further 20 dives / 10 hours have to be executed in zone 2 since certification as a Cave Diver II.*
- Before commencing the course, each instructor involved in the course must receive the CCR documents listed below for each CCR used by the participants. These documents must be compiled by the student concerned and handed over to the course director:
  a) the duly filled-out CCR questionnaire as an amendment to the standard course registration form (Appendix 16)
  b) a copy of the CE certificate by a Notified Body
  c) a copy of the CCR User-Manual
  d) a copy of the Pre-Dive and Post-Dive Checklist
- SCD and other relevant training organizations consider the use of on-board / in-line bailout systems already in the open water at depths of more than 30 m as basically unsafe and therefore unacceptable. In the overhead area there is - among other things - an additional difficulty in the usually much greater distance from the entrance.
  Onboard and inline bailout systems as sole bailout systems are therefore not permitted in all zones - regardless of the depth. Every CCR diver needs to have an offboard / offline bailout system everywhere.
- The OC regulator on this bailout system must have a long hose of at least 1.5m length. In addition, it must be possible to supply the BOV as well as BC / Wings / dry suit inflator with gas via external connections and a gas block / switch block.
- The operating / application temperatures specified by the manufacturer must be strictly adhered to. The same applies to the storage temperatures of the absorbent.
- The maximum usage time of a used absorbent specified by the manufacturer must be strictly adhered to. For SCD courses, the default is 12 hrs, afterwards the scrubber has to be refilled again in any case.
- Before any dives deeper than 40m (nominal), it is mandatory to completely replace the scrubber content (absorbent) in exchange with fresh one.
- Use only absorbent, which has been stored in the manufacturer's original packaging and in line with manufacturer's instructions. It is strictly forbidden to use absorbent of unknown type or unknown origin.
- In the original packaging, air-tight stored unused absorbent, which has exceeded the date indicated by the manufacturer, may no longer be used

- Use only absorbent, which has been explicitly approved by the CCR manufacturer for the relevant device.
- Various types of absorbents may under no circumstances be mixed with each other and used in this way.
- When filling the scrubber, the procedure and quantity prescribed by the CCR manufacturer must be strictly observed.
- A "re-packing" (re-filling) of already partially used absorbent into the scrubber (canister) is strictly forbidden!
- The minimum O_2 setpoint (setpoint_LOW) during the courses is 0.5bar, the maximum setpoint (setpoint_HIGH) 1.4bar (during travel and bottom). This also applies also if the device would accept lower or higher values.
- For deco-stops only, the setpoint can be increased to a maximum of 1.5bar on 6m, if the device allows this.
- For long and deep dives, the setpoint_HIGH is to be further reduced (to 1.2-1.3bar) according to the manufacturer's specifications.
- In any case, the manufacturer's instructions regarding the setpoints must be followed, resp. the stated limits have to be observed!

- Use of sidemount-configurations:
  - In order to use sidemount configurations at the SCD Cave Diving **standard** courses, participants must meet at least the following conditions:
    * Cave Diver I: certification as Sidemount Diver I (REC, OW) plus 25 dives with sidemount in open water since obtaining the Sidemount Diver I certificate
    * Cave Diver II: certification as Sidemount Diver II (TEC, OW) plus 25 dives with sidemount in open water since obtaining the Sidemount Diver II certificate
    * Cave Diver III: certification as Sidemount Diver II (TEC, OW) plus 50 dives with sidemount in open water since obtaining the Sidemount Diver II certificate
  - In a configuration with 1 primary tank, the tank must have two (2) outlets with DIN connection (G5/8) and each outlet has to have an independent regulator rig.
  - In a configuration with 2 primary tanks, the tanks must only have one (1) single outlet with DIN connection (G5/8).

- General rules for OC units (tanks) / tank volumes / filling pressures:
  - All tanks used during SCD cave diving training courses have to carry a valid (meaning not overdue) stamping of the visual inspection or of the hydro test by an authorized inspection authority or -company from the participant's country of residence or of the country where the course takes place.
  - Tanks with overdue testing- and acceptance dates must not be used during SCD cave diving courses.
  - Single tanks are permitted in zone 1 only; however, mono-tanks have always to be carried in backmount configuration.
  - From zone 2 on it is compulsory to use a minimum of 2 tanks of equal capacity, this can either be in backmount or sidemount configuration.

    Backmount configuration for zone 2 and 3:

    Within the SCD course framework, the 2 following systems are expressively accepted:

    * 2 connected tanks of equal size but with an isolator valve in between in order to make it possible to isolate one defective tank or regulator.
    * 2 completely independent tanks of equal capacity (without any kind of connection), so-called INDI-configuration

    Sidemount-configuration (all zones):

    * the 2 primary tanks have to be independent per se
    * any connection of these 2 primary tanks, e.g. by a high pressure hose, is forbidden
  - Minimum overall tank sizes are defined according to the relevant zones:
    * zone 1: min. 2000 bar*liter, single tank allowed (e.g. 1x10l / 200bar)
    * zone 2: min. 3000 bar*liter, min. double tank set (e.g. 2x7l / 232bar or 2 single tanks)
    * zone 3: min. 4000 bar*liter, min. double tank set (e.g. 2x10l / 200bar or 2 single tanks)
  - One exception accepted by SCD with regard to minimum tank size is for scientific oriented exploration in very confined parts of a cave (zone 3) where tank size has to be determined according to cave size and not vice versa.

However, this type of diving is no more part of the recreational cave diving and doesn't belong anymore to the training scope of SCD.

- If, due to the actual on-site conditions the responsible instructor in charge feels it to be necessary, he/she is free to raise the requirements for a specific dive with regard to the gas volumes to be carried with and the number of additional stage tanks (s. below).
- Steel tanks with a size of more than approx. 15l are not recommended by SCD for recreational cave diving, partly because of their weight and bulk, partly because of trim- and buoyancy problems associated, including the danger of capsizing.
- For the same reasons 300bar/4500psi steel tanks with a volume of more than 7 ltrs are also not recommended.
- Minimum size for O_2-tanks on decompression stops is 800 bar*liter (4l/200bars)
- For any additional tanks for the decompression stops there no specific rules with regard to size, except one: the total amount of gas must be sufficient to last for all required stops.
- The use of tanks with working pressure ratings below 200bar / 3000psi is prohibited
- For the sake of additional redundancy it's always better to distribute the gas volume to some tanks more but of smaller size than using some tanks less but of bigger size.
- Indicated working pressures, legal allowances for overfilling (if any) and on-site legislation must always be strictly observed
- To simplify the calculation of the thirds it is recommended that all divers within a group use tanks sets that contain about the same initial amount of gas at start of dive.
  If different sizes are used, the one with the least content will be taken as a base for recalculation of the individual return pressure for each group member
- Caution when using mixed gases:
  * It is strictly prohibited to fill different gases in a twin tank set if the tanks are connected with a manifold (bridge).
  * It is also strongly forbidden to fill different gases in an independent back mounted double tank set.

- Stage Tanks and Safety Tanks:
  - Except for deco stage tanks, SCD strongly recommends the use of aluminum stage tanks (travel, bottom), because of their buoyancy parameters. For deco tanks, steel may also be used.
  - Minimum size for travel/bottom gas stage tanks is 1400 bar*liter (e.g. 7l / 200bar); however, SCD strongly recommends to use aluminum 80cft tanks (11 liters, 200bar). For deco O_2-tanks, smaller sizes (e.g. 4l, 6l, 40, 50 cft, 60 cft) tanks may be used as well.
  - From a penetration distance of **500m/1500ft** or more without the possibility to re-surface, a **3rd tank** (safety tank, 3-tank rig) with a minimum capacity of 1400 bar*liters (e.g. 7 ltrs / 200bar) is compulsory to be carried by **each diver.** The gas volume of this tank must not be included in the standard gas planning, but is for emergencies only.
  - Stage and safety tanks must have ONE (1) DIN outlet valve (G5/8) only.
  - Each stage- or safety tank must be equipped with a complete regulator rig with a SPG.
  - The regulator on the safety tank must also be equipped with a long hose with a minimum length of 1.5m.
  - In order to avoid mix-ups of gases from the various stage tanks, it is strongly recommended – besides the usual standardized indicators (e.g. gas tags etc., see there) - to also use different tank sizes and shapes, as well as other valve outlet connections (e.g. G3/4" for O_2).
    The color of the intermediate-pressure hoses should also be chosen accordingly (e.g. white with green tape stripes for EANx, blue for O_2).
  - For the connecting threads, the technical norms EN ISO 11117 and EN 144-3 have to be observed!

- Tank valves & manifolds:
  - All tank valves used, be it for single- or for double tanks, must be configured in such a way (with special emphasis on the position of the valve knobs) that the diver is capable to carry out a shutdown-drill within reasonable time on his own and without the help of a partner and without being forced to take off the tank set.
    In the case of twin tank devices, therefore, the two valve handwheels must either be directed outwards or upwards in the longitudinal axis of the tanks.

- The only valve type allowed for the complete overhead environment is the **DIN** type. INT-international yokes are strictly prohibited.
- In all zones only valve types are permitted that allow each outlet to be closed/opened separately and independent of the others.
- In zone 1 and while using single tanks, a valve with 2 separate outlets has to be used (either Y- or H-type). An octopus regulator configuration (1 first stage with 2 second stages) is NOT acceptable. A submersible pressure gauge (SPG) must be connected to one of the regulator rigs.
- Any free/unused manifold openings on the tanks used underwater are highly undesirable and dangerous and must be closed with an appropriate metal screwed-in plug. Free openings and plugs fabricated from *other* than appropriate metal material are strictly prohibited.

- Tank manifold protection cages (brackets):
  For protection during rough transportation (post-sump), sometimes rigid valve protection cages are mounted around the necks of the tanks.
  - If done so, it must be in a way that good access to all tank valves is still guaranteed and that the diver is able to close and to open them HIMSELF/HERSELF without foreign assistance. If this can not be done properly, it is compulsory to remove the protective brackets, resp.to replace them by more suitable ones
  - The form of the protectors must guarantee that it is impossible to be caught by the line, this is especially important with double tank rigs!
- O_2-Compatibility of tanks, valves and regulators:
  - Up to a content of 40%O_2, no special manifolds or valves are requested
  - Inner walls of the tanks, manifolds and valves and the regulators have to be 100% O_2-compatible according to the corresponding regulations and laws. This is the task of the user (cleaning, use of correct grease). Each user carries the full responsibility alone.
    This holds true even more if pure O_2 is decanted during the blending process !
  - All maintenance and trouble shooting of regulators and all other personal equipment is in the sole responsibility of each diver.
    For the connection threading, the norms ISO 11117 and EN 144-3 have to be strictly observed! This means that from 40% O_2 on (and higher) the official oxygen threading G3/4a“ has to be used!
- Reserve mechanisms:
  - Mechanical reserves of all kinds are strictly prohibited.
  - The permanent control of the tank pressure has to be done with a submersible pressure gauge (SPG) with analogue or digital display (ref. to tank monitoring).
    So-called air- or gas-integrated dive computers may also be used.
- Helmets:
  a) are ***compulsory***, as soon as *dry passages* (sump/post-sump diving) have to be followed, during *climbing* or if *scooters (DPVs)* are used and during *rescue training* of all kind.
  The use of underwater scooters (DPV) WITHOUT helmet in the complete overhead environment is classified as gross negligence by SCD. In case of an accident, this well-founded opinion will be communicated to the investigation authorities (ref. to “Scooters”).
  b) are ***highly recommended*** in *strong currents*, *low visibility* less than 3m/10ft, *low passages*, cross section areas with *obstructions* (rock needles etc.) and during all kind of *line installation-* and *surveying/mapping activities* (manual work).
  - Helmets should be of lightweight design and of corrosion-proof material (plastics), should not (or only minimally) reduce the field of vision and the freedom of head movement and should give adequate mechanical head protection
  - SCD does expressively not recommend any specific type. All types of outdoor-activities such as ice-hockey, climbing, biking, canoeing, caving, construction, fulfilling the aforementioned criteria will be fine.
  - If lamps (primary or back-ups) are fixed to the helmet, it is recommended to use a fixation which allows turning the lamp thus eliminating the danger of blinding partners.
  - If for the sake of weight reduction or technical simplicity a fixation with no turning possibility is used, a clip-on type is to be preferred over a fixed one, so the lamp can be easily taken away from the helmet or put on whenever needed with one hand and no tools.

- If, due to the actual on-site conditions the responsible instructor in charge feels it to be necessary, he is free to require carrying helmets for all kind of activities, including those for which SCD standards only recommend the use of helmets.

- Lighting systems:
  - Technically speaking it is the required luminous flux (in lumen) that has to be reached, regardless of the technology behind. The additional reference to conventional Halogen power is only used because every diver has a clear understanding what to expect of a "30W Halogen lamp" (as an example).
  - Definitions:
    * Two or more lamps being connected to a *common, single* battery pack or container are regarded as one (1) *single* system!
    * The term "main lamp" will be used for a lamp which is suitable to give the diver the usually expected visual comfort, meaning to illuminate sufficiently the cave passage in its entity or parts thereof over several meters.
    * The effective 100% light output (luminous flux) of a so-called main/primary lamp must be at least 900 lumen (equivalent to the output of a conventional 30-50W halogen lamp). The available capacity (burning time) must at least be 50% more than the planned duration of the dive, but never less than two (2) hours.
    * The term "backup lamp" however is used for a lamp which will be used as a substitute after the main lamp has failed and with a luminous flux which is just sufficient
      a) to illuminate the cave passage ahead of the diver in close proximity of the cave line over a distance of 1 to 1.5m, allowing the diver to swim cautiously towards the exit
      b) and which can be used to clearly give and correctly interpret signals.
    * The effective 100% light output (luminous flux) of a so-called backup lamp must be at least 100 lumen (equivalent to the output of a conventional 4-5W halogen lamp). The available capacity (burning time) of such a backup lamp must be at least equal to the planned duration of the dive, but never less than two (2) hours.
    * capacity: the term available capacity (burning time under 100% output) is expressively used for the capacity resulting of the actual charging state of batteries and accumulators immediately before the planned dive.
  - ***The following numbers of required lamp systems and their required performance data have to be regarded as minimum that must never be undercut. Any infraction of this rule will be judged by SCD as negligence.***
  - ***SCD leaves it to the discretion of any particular diver to carry more lamps than the number specified here as a bare minimum, as long as he/she can handle this additional equipment without undue stress.***
  - If, due to the actual on-site conditions the responsible instructor in charge feels it to be necessary, he is free to set higher requirements concerning number of lamps, power output (luminous flux) and burning times.
  - Zone 1:
    * **Minimum 2 totally independent light systems must be carried at all times:**
      one (1) main lamp AND one (1) emergency/backup lamps as per SCD definition.
    * at least one (1) of the two (2) systems has to use non-rechargeable batteries
  - Zone 2 and 3:
    * **Minimum 3 totally independent light systems must be carried at all times:**
      ***EITHER* one (1) main lamp AND two (2) emergency/backup lamps as per SCD definition.**
      OR
      two (2) main lamps AND one (1) emergency/backup lamp as per SCD definition.
    * **at least one (1) of the three (3) systems has to use non-rechargeable batteries**
  - Long distance and -duration dives: for such cave dives which exceed the capacity of currently available single systems, the diver has to carry as much additional systems (main lamps and backup lamps) that
    a) the total available capacity of *all* main lamps together is at least 50% longer than the planned duration of the dive (but minimum 2 hrs for each main lamp).

b) the total available capacity of *all* backup lamps is at least equal to the planned duration of the dive (but minimum 2 hrs for each backup lamp).

- Lamps based on LED technology are accepted both for main lamps and backup lamps provided that they fulfill all above mentioned criteria for performance and burntime
- With a lot of suspended particles in the water, wide angle reflectors are not suitable. In such situations it is recommended to use spot reflectors.
- It must be possible to carry the lights in a way that both hands stay free for any manual activities (all fingers of the holding hand must be completely free for any manual work).
- Lamps with an output of more than that of a comparable 50W Halogen lamp are not recommended by SCD for the 3 following reasons:
  * danger of blinding other team members
  * it's only too easy to "cover" the signals of another team member with such strong beams so communication may become difficult
  * because battery tanks are limited in size, it is not unusual for very strong lamps that their battery capacity (burning time) is compromised
- ***Attention when using DPVs/scooters:***
  When using DPVs (scooters), two (2) main lamps with the defined performance data as mentioned above are required as soon as diving takes place in zone 2 or 3.
- ***Attention during push dives alone:***
  During push dives according to the definition of SCD, two (2) main lamps with the defined performance data as mentioned above are required as soon as diving takes place in zone 2 or 3.

- Hardware for attachments (carbines, bolt snaps, clips):
  - Straight action bolt-snaps are to be preferred over conventional clips/hooks or carbines.
  - Especially in salt-water, stainless steel (V2A, V4A) as material is to be preferred over brass.
  - Size has always to be big enough for handling with thick gloves.
- Scooters (DPVs):
  The operation and handling of an underwater scoooter, as well as the appropriate technical maintenance requires a certain minimum of technical understanding and knowledge, a certain minum level of diving skills and competence and an appropriate equipment configuration. As any moving object may represent a potential danger to other persons in its vicinity, the driver must also have a distinctive feeling of responsibility for all his/her doing.

  Therefore SCD does NOT endorse, promote or otherwise recommend the use of such devices,even at basic recreational scooter diver course level, for
  - *persons of less than 16 years of age*
  - *divers not having at least an Advanced Open Water Diver (CMAS 2star or equivalent) certificate*
  - *divers without the proper training as received in a SCD (or otherwise) sanctioned scooter pilot course at the appropriate level that corresponds to the environment and the planned dive and tasks*
  - *divers not meeting the minimum requirements for mandatory equipment and its configuration (ref. to standards and training program for SCD scooter diver courses)*
  - *diving beyond the limits as set by the pilot's certification level or the operational limits set by the manufacturer of such a device (whichever applies first)*

  Further requirements SCD is setting for the use of scooters are:
  - Having an appropriate private liability insurance with a minimum coverage of 4 Mio. CHF / EUR / USD for instructors and 3 Mio. CHF/EUR/USD for students is compulsory.
  - By no means and under no circumstances, scooters or any other towing devices must be used as a substitute for insufficient physical fitness or the lack of it.
  - In some countries/waters the use of scooters is restricted or even prohibited. It is in each divers own responsibility to gather for corresponding information. Such regulations must be strictly observed.
  - SCD strongly recommends to use or to let use DPVs only if the user can prove adequate training (specialty course) in the correct use and handling for this specific type of vehicle
  - Such specialty courses are not part of the standard SCD cave diving training

- Scooters should be used very reluctantly (on the grounds of safety- and environmental considerations) and only
  * if the goals are truly of scientific value (exploration of new passages) *or*
  * safety related tasks must be undertaken (laying new permanent mainlines, repair of gaps, „cleaning“ from superfluous lines) *and*
  * if such goals can not be reached by other means
- Scooters should not be used in silty passages and in tight areas (restrictions, squeezes)
- SCD does not endorse the use of scooters „just for fun“ in the cave environment, especially by divers who are not properly trained in the safe handling of such vehicles. The danger of damage to the cave environment, of imposing a threat to other cave divers being present in the same cave is too big to justify an unrestricted usage.
- When using scooters the rule of thirds for gas-management MUST NEVER be used. More restricting rules such as 1/6 must be applied, resp. the necessary amount of gas has to be determined by calculation under inclusion of the worst case scenario.
- To guarantee the safe return in case of a failure of scooter:
  * either additional tanks must be deposited underway (or stored at strategic points during preparation dives) or
  * per 2 scooter drivers, at least 1 additional backup scooter must be used, except for penetration distances that can be covered by swimming with the available gas volume.
  * depending on the actual situation and further specific requirements (safety requirements, tricky currents etc.) the two alternatives may also be combined
  * a safety tank has always to be carried with (min. volume: 11 liters, 200bar /80cft) which will not be deposited underway and which will not be accounted for in the total gas volume
- The mandatory long hose should have a length of between 2.10 – 2.40m (7-8 feet) to enable two DPV pilots to drive in a single file one behind the other in a gas-sharing situation.
- In case the diver has to swim back on his own power or the way back to the entrance has to be carried out at lower speed than planned the corresponding additional decompression gas has to be ready.
- As a rule of thumb, battery capacity (burntime) of each of the main scooters driven underway, should not be used to more than 1/3 (ONE THIRD) for one way (penetration / return), thus in total to not more than 2/3 (TWO THIRDS). The remaining capacity should be kept as an "iron" reserve for unforeseen events.
- The backup-/emergency scooter(s) is/are only to be used in case of a failure of another vehicle and remain unused otherways.
- Under the assumption of approx. equal speed, the capacity (burntime) of this backup-scooter must be of at least 50% of the capacity of the main-scooter to be replaced. In case that the backup-scooter is more than 10% slower, this must be taken into account with a correction factor (ref. Appendix 16)
- For longer dives, exceeding this limit for a single scooter, the diver has to take so many additional main scooters with her/him that the aforementioned limits will never be exceeded.
- These backup-/emergency scooters must never be deposited along the way, but must always be kept with the divers.
- For a specific dive every diver for himself should only use scooters of identical battery capacity (burntime, range) thus scooters can be exchanged easily without logistical problems.
- For scooter use in the complete overhead environment, wearing a helmet is mandatory
- Driving with scooters in the overhead environment without helmet is regarded as gross negligence by SCD (ref. to “helmets”).
- For open water scooter use, a deployable surface marker buoy (SMB) is strongly recommended (if not already requested by law). The scooter pilot must wear a harness with front crotch-strap D-ring where the scooter is clipped by means of special safety spring-clip and a tow line with proper length which enables him to be towed by the scooter. As a basic rule, no pulling forces must be transferred over the diver's arms.
- The scooter itself should be equipped with a second, stronger towline (tow leash) which is to be used in case another defective scooter must be towed back.
- The scooter should also be equipped with a "dead-man's handle / -switch", shutting down the engine instantly in case the pilot accidentally falls from the scooter.

- The diver's position during the dive must be more as horizontal as possible (posture and buoyancy always derive from correct equipment configuration and adequate training).
- Generally, gear configuration should guarantee a very good streamlining and no elements should protrude or be left dangling. Be especially careful that equipment does not dangle and that no parts can come into contact with the propeller or entangle themselves on the bottom or on your buddy, creating possibly a hazardous situation.
- Within the framework of the standard SCD CD1 to CD3 training program, the use of scooters by students is not permitted.

4.5 Application rules and procedures for use

- Classroom lectures:
  - A classroom lecture has a minimum duration of 45 minutes.
  - A break has to be made at least every 2 hrs.
- Training dives:
  - A training dive in the cavern area (zone 1) must have a minimum duration of 20 minutes.
  - A training dive in the cave (zone 2) or full cave area (zone 3) must have a minimum duration of 30 minutes.
  - A maximum of 3 training dives (within the no-decompression limits) per day may be done in the cavern area (zone 1), with adequate surface intervals (min. 1 hr. ea.).
  - A maximum of 2 training dives per day is permitted in zones 2 and 3, with adequate surface interval (min. 2 hrs). This holds especially true if CCR are used!
- Presence of instructors:
  - During all training lessons, whether classroom or water work, a SCD cave diving instructor of the required level and in active teaching status has to be personally present on-site. The presence of an assistant or an instructor candidate alone is not sufficient.
  - This rule does NOT apply for guided diving of already certified cave divers.
- Admission of the students:
  - No student must be admitted for the practical exercises in the water, resp. for any dives, whose equipment does not comply with ALL SCD regulations and requirements. Responsibility for compliance with this requirement is borne entirely by the onsite diving instructor in charge for this practical lesson.
- Safety on land:
  - Whenever possible a qualified person staying on land should be nominated as support person / safety officer
  - Should there be no such person available then the responsible dive leader/group leader should at least inform another trusted person about the planned activities and the governing parameters (especially the planned starting and termination times as well as the latest time for calling back)
  - In some countries the presence of such a qualified security person is requested by law. It is in the duty of the responsible organizer to gather the corresponding information in due time.
  - Responsibilities and tasks of this security officer:
    * stays in closest vicinity (at shouting distance) of the cave entrance or the pond to be able to take immediate and appropriate action in case this is needed
    * has a geographical map of the area with official coordinates available
    * has a list with all involved persons on-site, of all divers (dive roster) and their group assignments as well as all relevant parameters of the dives such as starting time, planned penetration, planned max. depth, duration, used gases incl. those for decompression
    * must be present in the pre-dive briefings and post-dive debriefings
    * must possess all relevant documentation such as emergency-checklists, list of mobile telephone numbers of other related groups or colleagues in the neighborhood, emergency numbers of police, fire fighters, cave diving rescue squads or any further, local rescue organization
    * must have access to all necessary equipment (1st aid box, oxygen etc.) as well as to parked cars of the team and must be able the seek for help with those vehicles in case this is impossible with mobiles and wireless communication
    * must be able to respond correctly to questions asked by on-site checks by authorities.

    * assures that lines fixed to points which are accessible from the shore will not be loosened or removed by unauthorized people.
  - Qualifications of the support person on land:
    * should know the geographical area and understand and speak the language of the country
    * should at least have a basic qualification in non-professional medical 1st aid. Formal training and certification in administering CPR is desirable.
    * must be able to correctly and efficiently use the rescue material available on-site.
    * must be familiar with the peculiarities of diving (incl. a basic understanding of the "classical" diving accidents and corresponding treatment) and with general 1st aid measures.
  - If requested by law or local ordnance start and termination of the dives must be communicated to the authorities concerned.

- Buoyancy control and trim:
  - Perfect mastering of buoyancy control is one of the basic prerequisites of cave diving and must be mastered before any cave diving training.
  - Basically, in horizontal caves it's more dangerous to be underweighted than to be overweighed. As a consequence, one of the primary rules of open water diving that the diver must be able to remove his weights has no validity in cave diving.
  - The amount of weight is to be selected so as at the end of a dive the diver can properly maintain his depth without undue stress at the 3m stage. If necessary the diver has to deposit so-called clip-on weights which can be fixed easily to the belt or a D-ring.
  - The diver has the free choice where and how to fix his weights. SCD expressively does whether require nor recommend a specific configuration.
    However, the following general guidelines have to be observed:
    * weights are to be secured so that they cannot be dropped unintentionally
    * a good trim is of paramount importance and a must (whether prominently head- nor feet weighted)
    * „luminous lead" is the preferred choice, meaning battery canisters serve very well also as weights
    * weights should be carried and fixed in a way that they cannot get entangled in a line
    * weights are to be carried in a way that the diver is not restricted in his movements and the weights are not creating any painful pressure point. This is of special importance during negotiation of dry passages.
  - The configuration that the whole weight is fixed onto the tanks or the backplate respectively, may create a serious problem in situations where the diver has to ditch - regardless of the reasons do to so - his tank with the backplate, especially in shallower waters.
  - In caves with dry passages, where tanks have to be ditched and transported separately, weights directly fixed to them are less suitable.
- Avoid using complex dive plans - keep it simple:
  In the infamous Calimba accident (Mexico) with two divers killed, it would appear that too many people were diving in too small a cave with too complex a dive plan while lacking the degree of awareness, ability and experience required to complete the dive safely.
  Cave diving itself is a complex activity, requiring the mastering of demanding diving techniques, sophisticated technical equipment, team management, difficult on-site situations etc., all this resulting in heavy task loading even for quite simple dives.
  An over-complex dive plan with too various tasks for each team-member, a complex sequence of pre-planned tasks, too many jumps, tanks, breathing mixtures etc. will put YOUR OWN safety and that of your TEAM in jeopardy!,
  Therefor keep dive plans straightforward and simple! Break up more complex dive projects into a sequence of well-structured simpler dives with just one or two specific tasks assigned to each of them.

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- Group-/Team size:
  - Group size must always be determined according to actual on-site circumstances, especially with regard to the requirements from cave environment, individual qualification levels and skills and planned activities.
  - Considering gas supply in emergencies, a group size of 2 divers only is not favorable.
  - Groups with more than 6 members are to be avoided!
- Diver's position within a group:
  - The general rule is: the group leader (instructor, divemaster, guide, etc.) is the first one to swim in and the last one to swim out (back). An automatic exception from this rule holds true for circuits and traverses.
  - For groups composed of divers of the same certification level
    a) the one who knows best the cave *or*
    b) if nobody knows the cave the most experienced cave diver among them should take the lead of the group
  - Diver with lesser experience or lower certification level should be positioned in the middle of a group
  - Whenever possible the last diver in (= the first diver out) should also be a diver of a higher skill- and experience level
  - In case a line is being placed it is the responsibility of the leading diver who is to be assisted by the following buddy (keeping line under tension, control of placements and wraps, correct laying out, illumination of passage etc.). On the way back it is the task of the last but one diver to loosen the line from such fixation points, to illuminate the passage without disturbing the last diver and to hold permanent visual contact to this buddy, while this one rolls up the line.
  - (Primary) light failure of a team diver
    a) group of 2 divers: the corresponding diver swims back as first one ahead of his partner, while that one tries to illuminate the passage in front of the leading diver.
    b) group of 3 or more divers: the corresponding diver will be positioned at second place
  - Out-of-air situation of a team diver or other gas-sharing situation
    the donor together with the air receiving diver will always swim back at the head of the group, setting the pace, while the rest of that group tries to illuminate the passage in front of these leading divers
    Depending on the size of the passage, the receiving diver swims either *besides* the donor (with touch-contact) or ahead, *but never behind him*.
- Sharing Critical Safety Equipment between Teams:
  This practice can easily (and quickly) lead to confusion and to potentially life threatening situations with reels, personal markers and other equipment (e.g. such as stage tanks, parked scooters) being removed by one team in the mistaken belief that other teams have already exited the cave.
  SCD therefore strongly recommends:
  - that all teams should be entirely self sufficient and self reliant and place all of their own critical safety equipment.
  - that no one touches any foreign equipment
  - that no one should ever rely on temporary markers that someone else has placed and this without our presence
  - that even within your own group, no one should entirely and blindly rely on the leader alone; if you feel better to additionally place your own marker, then DO IT!
- Negotiating jumps (ref. also to chapter „continuing line connection"):
  - All jumps, even if they are very small ("visual jumps") are only crossed with the own temporary jump-line
  - It must be made sure that the starting point on the main line and the fixation on the new permanent line are well secured against slipping sideways.
  - It must be also guaranteed that the new fixation is well marked visually or (in zero visibility) can be easily felt thus reducing the chance of being passed over by mistake.

- At the starting point of the jump-line from the main line, the direction to the exit has to be clearly marked with an arrow (or a non-directional marker which is positioned on the exit side of the connection)

- Gas partial pressures:
  - Should the dive take place in a country with any kind of diving legislation (e.g. partial pressures of different gases, max. depths, etc.) one must strictly abide.
  - If such legal constraints are missing, SCD *recommends* the following limits with regard to partial pressures for the use with OC units, which are *identical with those of CMAS International:*

$pN_{2\ max}$		≤ 4bar;	
$pO_{2\ min}$		≥ 0.18bar ≥ 0.20bar	no work, short dive times with work, longer dive times
$pO_{2\ max}$		≤ 1.60bar	good conditions, warm water, no work, short dives, during decompression at 6m and above
$pO_{2\ max}$		≤ 1.4bar	cold water, work, currents, longer dives
$pHe_{\ max}$		≤ 10bar	

  - The actual dive conditions and personal state of any diver may call for a further reduction of those upper limits.
    When CCR units are used, the maximum O_2 setpoints as specified either by the manufacturer itself or by recognized CCR training organizations have to be strictly observed.

- Tank markings (EANx, O_2, Tmx):
  - All tanks that may be deposited somewhere in the cave during the dive have to be clearly marked with the name of the owner
  - O_2 tanks must be stamped accordingly; color of outer wall according to legislation and must carry a good readable writing ("O_2"/"Oxygen"/"Sauerstoff")
  - All tanks containing other gases than air must carry a good readable tag with the following indications:
    * type of gas (EANx, Tmx)
    * O_2-fraction in % for Nitrox; fractions of O_2 / N_2 / He for Trimix. This analysis has to be done by the blender after the blending process is finished and once more at the dive site by the diver
    * Maximum Operation Depth (MOD) in meter (m) or feet (ft) with indicating the used units
    * Minimum Operation Depth (MinOD) in m/ft for Tmx with indicating the used units if a mixture is used with its O_2 content less than that of air (<20.8%)
    * [optional: EAN (Equivalent Air Depth)]
    * date of filling/ date of analysis
    * signature of the blender / tank owner
  - In addition to this easily removable tag, it is recommended to write the MOD in big size numbers (approx. 8-10cm / 3-4 in.) directly on the tank

  Caution: ***Before any tank measurements are made, oxygen analyzers have to be calibrated twice: once with normal air and a second time with pure oxygen (100% O_2).***

- Tank valves/outlets tanks in use:
  - Valves of tanks in actual use have to be FULLY opened. This, however, with a fingertip feeling, not with raw violence! The usual turning back by ¼ to ½ turn in the sports dive can lead to dangerous misinterpretations.

- Tank valves/outlets of unused tanks:
  - Tanks which are carried with a mounted regulator set and which are deposited later, the second stages should be held under pressure but the tank valves be closed. Thus, two goals can be achieved: a) the system's gas tightness can be checked at any time and b) any entry of water is impossible.

- Tank riggings (harness):
  - The way of how to carry the tanks (back mounted double, back mounted triple, side mounted, and stage rigging) is dependent of the specific requirements of the cave, of the planned diving activities and to a lesser extent, personal preferences.
  - ***There is no "SCD-rule" of how to carry tanks***. In view of the various requirements from the different cave environments and the planned activities, such a rule would not be reasonable.

- **For stage tanks the rule LEFT → LEAN and RIGHT → RICH should be followed. Stage tanks with a high O_2 content (> 40%) are carried on the right, those with a lower O_2 content on the left. It is hydrodynamically highly unfavorable, changes disadvantageously the trim around the longitudinal axis and is even dangerous in the case of restrictions, to carry all stage tanks only on one side.**
- If more than one stage tank has to be carried on one side, they must be arranged in the order of their use. First used tanks positioned outside, later used on inner side.
- If more than 2 stage tanks are required, it is recommended to attach the remaining tanks to bungees on the rear D-ring of the crotch strap and to tow them. This is especially recommended when returning empty tanks.
- Especially in tight spaces it is recommended that the attachment of such tanks (and other pieces of equipment) via bolt snaps and D-rings to the body of the diver should contain a flexible link (rubber, small cord/rope, O-ring, bungee cord etc.), so that in an emergency this connection can be quickly separated with a cutting tool.
  In other words: metal to metal connections are NOT acceptable.
- For mono tanks as well as for twin tank devices which are NOT screwed to the back plate, every single tank must be fastened with a double cam-band (redundancy).

- Tank pressure monitoring:
  - General rule: every diver must be able to visually check and monitor the content (=pressure) of all his attached tanks at any time, under any circumstances and instantly.
  - An independent submersible pressure gauge (SPG) with either analogue- or digital display must be connected to each tank in use underwater. Regardless whether this tank is carried by the diver himself or is deposited somewhere, whether the valve is open or closed or an isolator valve is used or not.
  - Because of the easier reading even in total darkness an analogue display with self-luminous background is to be preferred.
    So-called button-SPGs (solidly and directly screwed on 1st stage, mini display) are not acceptable due to their notorious inaccuracy und very limited readability. Minimum display diameter is 40mm.
  - A dive computer with a tank pressure sensor for air-integrated calculations and a display of the measured tank pressure is also accepted as a pressure gauge.
- Color coded pressure hoses (HP and LP):
  - All regulators and pressure hoses have to be marked with different colors (adhesive tape) so that a rapid and safe identification (valve - manifold - 1st stage - hose - regulator 2nd stage) is guaranteed even under low visibility conditions. If hoses with a colored outer lining are available, then those should be used.
  - The longhose (ref. to “longhose) for the right backmount or sidemount tank MUST always have a bright color, preferably a bright yellow or neon.
  - For stage tanks, SCD strongly recommends the following color codes at least for LP regulator hoses and/or for HP hoses:
    * black for air,
    * white with green tape bands or completely green for EANx mixtures up to 40%;
    * blue for any EANx mixture above 40% and for pure oxygen (deco tanks).

  Caution: nothing is more dangerous and has caused numerous deaths due to wrong gas switches and other faulty handling than having all hoses in black!
- Regulator marking:
  - To avoid any mismatch and if gas mixtures other than air are used and in low-visibility circumstances, each regulator *should* carry a well readable tag in the area of the second stage (on hose or ev. on 2nd stage casing) on which the gas type (EANx, Tmx) and its MOD is written.
  - To clearly distinguish the different gas mixtures used during the dive, not only MUST all tanks and regulators be properly tagged as indicated above, but for each mixture, another distinctive and easy to distinguish color should be used (color of the adhesive tape used for tagging).
  - Meanwhile, mouthpieces in different colors (yellow, red, green, blue) and in most common sizes are also available.

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- Rules for the gas management:
  a) for OC devices (incl. bailout):
  - For gas consumption calculations, resp. for the determination of the gas volume to be carried, it is advisable to make and use personal measurements wherever possible.
  - For such calculations, the largest measured consumption within the team must always be used.
  - If no measured values are available, a default value of 20-25 l / min / 1bar (SAC-rate; surface AMV) should be used.
  - For groups consisting of only 2 divers or whose members have different initial gas volumes in their tanks it is *compulsory* to apply the so-called „modified rule of thirds“ if not an even more stringent rule is applied. With the „modified rule of thirds“ the smallest third (or an ever smaller volume) of the initial gas volumes of all team members is calculated first and used for determination of the individual "return pressure" for each diver.
  - Purely from the view of the secured and sufficient gas supply, a group of 3 is therefore better than a group of 2.
  - The application of this modified rule of thirds is also *strongly recommended* for groups bigger than just 2 divers.
  - SCD *strongly recommends* the application of the ¼ rule at least in the following distinct cases:
    * generally for the first 5 self-dependent dives without any guide or instructor after each course on this higher level
    * generally if it is the first dive of a newly assembled group or for a group with a relatively low level expertise
    * for any new, unknown caves or caves the divers are not familiar with
    * for exploration dives of any kind,
    * bad visibility (<3m)
    * complex cave profiles (numerous side-passages, a lot of ups-and-downs, small passages)
    * generally for caves with other known "problem zones" (like haloclines, percolation)
    * caves with a change of the direction of the current somewhere inside
  - It is strictly forbidden and may even be deadly to apply the rule of thirds for caves with a current going inwards (into the cave). The same holds true if DPVs are used.
    For such cases a much more constraining rule (1/4, 1/5, 1/6 or even less) has to be applied in function of the measured current and other parameters. In the area of recreational cave diving SCD does not advocate nor endorse any diving in caves with the current pointing inwards or changing in periodic intervals (e.g. tidal currents).
  - Latest after the first diver has reached his agreed "return pressure", the sign ABORT (thumb up) has to be immediately given and all members of the group have to turn and to exit from the cave in an orderly fashion.

  b) for CCR devices:
  - By default, it can be assumed that 1 kg of current Scrubber products in fresh condition bind approx. 100-140 l CO_2. However, the manufacturer's information is crucial. Common devices have a recommended operating time of **2-3.5h**.
  - It can also be assumed by default that the O_2 consumption is approximately 1.0-2.0 l / min (light to medium-heavy work) and the CO_2 production is approx. 0.8-2.0 l / min (i.e., 80% - 100%). Both parameters are independent of depth! If there are reliable personal measurements, these measurements must, of course, be used
  - In order to estimate the maximum penetration distance via the calculated maximum penetration time (s. below), the knowledge of the average swimming speed is necessary. This can greatly change due to the cave topology (e.g. restrictions, flow, changes in visibility, jumps, application of tank depots, etc.).
    If you can dive without obstacles, you can start from about **18-20min / 300m**. If the cave and the approximate swimming times are known to certain points from previous OC dive, these actual values shall be used. Descents and ascent s, as well as the passage of restrictions, usually influence these swimming times in the sense of slowing down.

- If the remaining scrubber-time AND the manufacturing regulations permit this, the same material can be used again for a subsequent dive. For SCD courses, this must be done within a maximum of 12h. If the manufacturer specifies shorter time intervals, these must be observed. Otherwise, before each dive the scrubber must be filled with new and fresh absorbent. This is particularly true for deep dive in the range 40m and deeper.
- The storage of the device must also be carried out in accordance with the manufacturer's instructions, but in any case with a closed and air-tight loop.
- When used in waters with temperatures below 4 degrees Celsius, e.g. Dräger requires the following procedure to be applied: the intended absorbent is to be stored for at least 12 hours at room temperature (15 - 25 degrees Celsius) right up to the dive.
- Never store device in the blazing sun but in the shade only.
- Never expose sensors to a temperature below 0 ° C or above 40 ° C. Should this nevertheless have occurred, the sensor must be stored for at least 8 hours at room temperature before recalibration. Caution: the sensor could have been irreparably damaged!!
- Replace the sensors at least 2 hours before a dive, even if they have been stored correctly. Corresponding manufacturer's instructions prevail.
- The sensors must not be calibrated until an equilibrium between the sensor and its environment has been established (temperature, humidity). Corresponding manufacturer's instructions prevail.
- Determination of the return time (= max. penetration time)
  For the determination of the return time point, the remaining lifetime of the absorbent, which is available at the beginning of the dive, is usually decisive. Nevertheless, it should be taken into account the usable (residual) absorbent service life for the dive, the remaining absorbent usage time, the bailout time, the OTU / CNS% times as well as the "O_2 time". During the dive, the diluent turnpoint must also be observed.
  a) Usable (Residual-) endurance of the scrubber
     The total endurance of a fresh scrubber is always indicated by the equipment manufacturer, usually for different RMV, CO_2 emissions, diluent gas mixtures, temperatures and depths - possibly with additional special rules - and must never be exceeded. It is advisable to include a certain safety allowance for unforeseen events, especially at very low temperatures and at great depths.
     In the area of cave diving, the rule of thirds is also to be applied to the residual endurance available at the beginning of the dive (maximum penetration time = 1/3 available (residual) endurance at start of the dive).
  b) Remaining time of use
     Partially used absorbent must be consumed within a certain period of time according to manufacturer's specifications (time of use). The range goes from 3-24 hours; SCD regulation: max. 12 hrs. For longer surface intervals, this can limit the time of the 2nd dive.
  c) O_2-time
     The O_2 time is calculated from the assumed or measured O_2 consumption (see above) and the onboard and offboard O_2 supply (i.e. available) carried at the beginning.
     In the area of cave diving, the rule of thirds is also applicable to the starting (i.e. available) O_2-stock (disposable O_2 stock = 2/3 available O_2-stock at start of dive). Attention: of course, additional offboard O_2 tanks can be carried along if there is a connection to the loop. Within the framework of the SCD training courses, only onboard / inline O_2 bottles are used.
  d) Bailout-gas time
     Usually bailout gas can only be taken in a limited quantity. For each diver, there must always be enough OC-bailout gas available for the entire return journey. This also limits the maximum penetration time.
  e) Time limits for diving at elevated pO_2 (lung- and CNS-toxicity)
     The limiting values for oxygen action are set by the NOAA (National Oceanic and Atmospheric Administration). Accordingly, for a preset setpoint of 1.3 bar the dive time is restricted to max. 3 hours (or 3 ½ hours in total per day). This dive time limit changes when a different setpoint is selected.
     In principle, the corresponding REPEX tables for OTU and CNS% are to be used.

f) Maximum penetration time
The maximum penetration time is the shortest of all these times !

- Diluent
  * In principle, for SCD courses from HT1-HT3, the following rule applies: only air may be used as a diluent! Outside of the courses, but within the framework of SCD events, only diluent gases may be used with at least 18% O_2 content. This can always be breathed to the surface.
    Special case CD3 course: a Tmx for a fun-dive (40m EAD) can be used at the end of the course, provided that the diver is qualified accordingly. This leaves the pN_2 within insurance limits! Absolute depth limit (nominal) with such mixtures in the course is 50m.
  * The diluent gas must also be breathable at the maximum dive depth (for example for sanity breaths or a diluent flush). The O_2 component should be determined in such a way that the O_2 setpoint HIGH (1.2-1.4bar) is never exceeded at the maximum depth. Much more it should be about 0.2-0.4bar lower (i.e. at 1.0-1.2bar)! Reason: emergency operation of CCR as SCR to normalize the pO_2 in case of a hyperoxia.
  * Only those diluent gases may be used for which the diver is trained and certified on his CCR-device, for which the appropriate sensor technology is available and the corresponding evaluation, control and decompression-SW can be used (accepted by manufacturer).
  * The diluent should be used - except in emergencies - only for buoyancy adjustments and possibly for sanity breaths (although for the latter the gas from the external bailout should be used).
- Bailout-gas
  * The bailout gas (or at least part of it to the next depot) must also be breathable without any problems at the maximum dive depth. The O_2 content should be such that the generally accepted pO_2 limits (1.4-1.6bar) are not exceeded at this maximum depth.
  * It may also involve several different gas mixtures.
  * For onboard / inline bailout systems (diluent = bailout), the same requirements apply as for diluent (see above).
- Bailout system(s) and application
  * There must always be so much bailout gas, which allows each diver to dive back to the entrance (or to the nearest tank depot) without any problems after a total failure of the CCR at the planned return point (maximum penetration distance). Depending on the circumstances, additional tank depots must be installed on the way (see tank depots, staged bailout)).
  * For safety reasons and redundancy reasons, it is makes sometimes sense to divide the bailout gas into several tanks. Also the optimization of the decompression may make it necessary to place various bailout gases in different tanks each within its MOD (staged bailout). The distance from one depot to the next must not be greater than the range of the available bailout gas (minus a safety allowance).
  * For every buddy team (2 divers), in which there is at least one (1) CCR diver with onboard OR inline bailout system with BOV, there must be at least as much additional offboard / offline bailout gas with OC-rig (s), that one of the divers could be supplied with it throughout the return travel.
  * The valves of all bailout tanks that are carried but not directly in use are closed, but the hoses and connected OC regulators are pressurized.
  * The CCR diver has to carry a second dive computer on which the bailout mixes are stored and thus the decompression with those mixtures can be calculated.
  * Sanity breathing always has to be performed from an offboard / offline OC system with precisely defined and measured gas content.
  * For safety reasons, during the courses a bailout always has to be performed with an offboard / offline OC system. For filling, measuring and marking the same rules apply as for other stage tanks.

- Decompression with other gases
  * If further, high-percentage O_2 mixtures (80%, 100%) are used for decompression, these must always be provided in the form of deposited offboard / offline tanks with OC systems and used within their MOD. This is the only way to ensure that a precisely defined mixture is available. It also eliminates the need for a system flush.
- Return-Point
  Latest after the first diver has reached the first of his agreed return parameters, he has to give the sign ABORT (the dive) without delay. Afterwards, all team members have to turn back and leave the cave in an orderly manner, in analogy to OC divers.
- Surface intervall (SI)
  * If, after the 1st dive, the O2 clock (% CNS) has a value of 80% or higher, an SI of at least 2h must be observed.
  * If the NOAA "24 h time" is reached, a SI of at least 12 h should be observed.
  * If a pO_2 of 1.5bar has been exceeded (travel or bottom), a SI of at least 1.5h should be observed.
  * The Residual Oxygen Time ROT is taken from the corresponding SI table. The desaturation of O_2 on the surface is based on a half-time of 90min.

- Rules for the monitoring of pO_2 for CCR:
  - The CCR diver must be able to control his pO_2 in the loop at any time, either by reading the pO_2 values from the controller display or at least by interpreting the colored HUD LEDs.
  - If this is presumably not possible for more than 2 minutes, he must necessarily switch to the offboard OC-bailout system. At the same time, the controller / dive computer must be switched to OC mode.
  - Alternatively, the CCR can be temporarily used in SCR operation mode. At the same time, the controller / dive computer must be switched to OC mode.
  - Before a diver (after solving the underlying problem) returns from the bailout to the loop, he must first check the pO_2 in the loop. At the same time the controller / dive computer has to be switched back to CC mode.
  - Especially for rescue exercises: Already because of the strong physical effort in a rescue and the associated danger of the CCR's over-breathing resp. a hypercapnia, this exercise must always be performed in offboard OC configuration anyway.
- Stage tank depots:
  If any of the stage tanks are deposited or taken up underway (entry and exit), the following rules must be observed:
  - Time for depositing/taking up the tanks has to be included in the dive plan.
  - The topic „stage tank handling activities“ has to be addressed during the briefing.
  - Location of depot must be selected very carefully (not in zones with silt and sediments, enough space for all handling activities, not in close vicinity of a restriction).
  - If cave topology allows, depth of depot location should NOT be below MOD of gas in these tanks.
  - If more than one depot is established, distance between them must be selected in a way that it can be covered with the content of the tank taken from the preceding depot.
  - Tanks must be deposited in a stable position (especially with current) and securely attached to the mainline and whenever possible, parallel or near parallel to the main axis of the passage and on both sides, in order to not create additional obstacles.
  - There must be no additional weight or other tensile forces on the mainline from the attached tanks (tanks MUST NOT hang "free" on the mainline).
  - The spacing between the tanks of the same depot should be approx. 2m (6-7 ft), so that divers are not disturbing each other during tank handling
  - Tanks should be positioned so that tag with name of owner is pointing towards the approaching diver on the return way.
  - Hoses should be left under pressure, but tank valve has to be closed (gives indication for leakages).

- 2nd stage must be carefully positioned on top of the tank (not on the floor or in the mud/silt) or otherwise protected from percolation, other debris and sediments.
- All tank handling activities (depositing/taking up) in the cave must be carried out in the most decent way in order to not stirring up silt and sediments and in a well planned and organized sequence within the team, especially in confined passages.
- After taking up the tank and having attached it to the harness, the diver must immediately open the tank valve and check the pressure.
- After visually checking the „gas tag“ on the 2nd stage and only if within the MOD of this gas, take a breath from it for checking (even if this tank is not to be used immediately), before continuing the return.
- An „everything OK?“ team check must be performed before proceeding any further (entry and exit).

- Underwater gas switch:
  - Reminder: valves of all tanks not actually in use must be closed, however, all hoses and attached regulators are fully pressurized.
  - A gas switch is a very crucial and safety related activity!
  - Take your time and stay where you are; do neither descend nor ascend during this procedure. Hustling may kill you.
  - Check owner’s name and "gas tag" on tank (gas content); especially when you took this tank from a depot. If it’s not YOUR tank, even if the content might be correct, don’t breathe from it, except in a dead-or-alive emergency with no alternatives.
  - Check „gas-tag“ on regulator 2nd stage, if there is any. Indicated values must be congruent with the ones from the tag on the tank itself. If not, leave your fingers from this tank.
  - Check if you are within the indicated MinOD and MOD.
  - BEFORE opening the valve of the picked up tank, it should be checked whether the correct 2nd stage has been taken or not by taking 2-3 breaths. Latest by then, the intermediate pressure hose should be empty, meaning that the correct tank and the correct regulator has been taken.
  - Select new gas on your computer; make sure that it is the same mixture as indicated on the tank.
  - Breathe cautiously for 20-30 seconds on site, be prepared to switch back to former gas in case *anything* strange happens.
  - Select the new gas on your computer and make sure it is the same as indicated on the tank.
  - Only if everything is still OK, then proceed further on.
  - For security reasons, gas changes should always be made in the buddy team: one is the leader, the other is checking each step and giving his OK.
    Two approaches: either the first buddy performs the complete change before the second diver makes it, or every single step is executed first by one of the divers, afterwards – if everything is OK – followed by the second one.
- Air- and oxygen decompression stops:

  a) O_2-decompression
  - Prerequisite for oxygen decompression is an Advanced Nitrox Certificate
  - Usage is accepted also during training courses (Cave Diver II and above)
  - **Maximum operation depth: 6m/20ft**
  - Quality: (Medical) Oxygen 2.5 (ref. to Appendix 14)
  - Only "true" O_2-tanks are permitted; minimal size is 800 bar*liters (4L x 200bar)
  - Each tank must be equipped with 100% O_2-compatible regulator and submersible pressure gauge and must be deposited at the appropriate depth
  - It is recommendable to position the tank approx. 1m below the corresponding decompression stage, in order not to overshoot the ceiling (shallowest possible depth) during tank handling.
  - Divers who do not own a diving computer that allows for gas switches underwater must apply the decompression stop times for air or the used Nitrox mixture.

- Air breaks follow standard operation procedures for O_2-decompression.
- For cases with overall air-decompression stop times of more than 20 min, the use of O_2-decompression is *strongly recommended.*
  Reason:
  Explorations in and beyond zone 2 often result in very long decompression stop times with an increase risk of DCS. After appropriate training the cautious use of 100 % O_2 (with air-breaks) for the final stage decompression starting at 6m/20ft is the most efficient solution of the problem.

b) other gases for decompression

- SCD does not give any further recommendations or more restricting rules concerning the gases to be used for decompression, because the correct selection is totally dependent of the preceding dive profile and the gases used for it.
- In general terms, any breathable gas may be used that eliminates the accumulated tissue inert gas as quickly as possible by maintaining the oxygen window open to the maximum possible extent while observing all other physiological constraints and limits (such as pO_2_max, CNS, OTU).
- Commonly used mixtures are EAN50, EAN80 and 100% O_2.

- Attachment & securing small gear & regulators:
  - The second stage of any regulator in use has to be secured to the neck with a flexible rubber band or to a D-ring in the chest area in a way that it is ready for immediate use in an out-of-air situation.
  - Other small equipment parts and accessories such as emergency lights, cutters, compasses etc. are to be secured against dropping and loosing by a safety lanyard.
  - Instruments have to be fixed as close as possible to the diver's body; no “danglies” are allowed
- Briefings / debriefings:
  - It is compulsory that every cavern- or cave dive will be started with a thorough briefing by the responsible leader (guide, divemaster). This holds true even more, if different configurations are present within the same group (OC-CC, backmount-sidemount).
  - In so doing, device-specific information, arrangements, behavior, emergency measures etc. must be taken into account, especially when using CCR devices.
  - All team members have to attend the briefing.
  - The minimal content of a briefing is: site- and cave map presentation, specific characteristic of this cave (incl. dangers), group composition and buddy pair designation, agreed return point (turn pressure), intended tasks for each team member, required equipment, detailed dive plan (incl. gas switches), emergency plan, most important hand signals.
  - It is strongly recommended that every cavern/cave dive has to be terminated with a thorough debriefing.
  - If a debriefing is performed, all team members have to attend.
  - The minimal content of a debriefing is: discussion/evaluation of task-fulfilling, comments to specific situations and reactions, hints and advices for improved performance.
- Hand signals:
  - A least all 4 command- plus the most important information- and request-hand signals (as described in chapter „Communication….“), their meaning and the expected correct reaction have to be rehearsed during a briefing. This is especially important if divers from different organizations come together with differences in communication.
  - The same holds true for the 5 touch-contact signals (move forward, everything OK, move backwards, stop, emergency).
  - If any team- or situation- or task-specific signals are to be used, it must be assured that every team-member has fully understood their meaning

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- Material conditions and buddy checks:
  - At the beginning of every dive, all equipment and materials used has to be in good working condition.
  - Every diver is totally self-responsible for his own gear. This responsibility cannot be delegated.
  - The equipment check must always be performed carefully before each dive, but especially when using CCR devices (see below). It is recommended that the participants carry out their pre-dive equipment check under the supervision of a different group member and explain this procedure on an ongoing basis.
  - Any disturbance of the acting divers by third parties during this time period shall be omitted.
  - At the beginning of every dive an equipment check among the buddy pairs has to be carried out (type: Head-to-Toe), and an additional safety check (leakage) Check (Bubble-Check) at the surface and again at shallow depth (3-6m / 10-20ft). In case of any leakage, regardless how small it may be, the dive must be aborted and the cave must not be entered.
  - At start of a dive, CCR users have to perform some additional checks at shallow depth (3-6m) more checks. It is also necessary to exactly observe the manufacturing specifications.
  - With backmount configurations, where a long hose is worn around the body and around the neck, it is always necessary to carry out an S-drill at shallow depth in the entrance pool, which ensures that the hose has not hitched anywhere.
    This S-drill is not required if the long hose is secured on the side of the tank by bungees and when using CCR devices.
  - Preparation and special controls for rebreathers immediately before the dive at the dive site
    1. Before the O_2- and the diluent-tank are connected to the CCR, their contents must be measured and the tanks must be equipped with a standard gas-tag (see stage tanks). In addition, it is to be verified that the diluent gas is correct for the planned depth.
    2. With offboard / offline OC bailout tanks, the same measurement procedures and tagging should be carried out. It is also to be verified that the bailout gas is correct for the planned depth.
    3 Pre-dive checks (including pre-breathing) must always be carried out on land and outside of the water.
    4. Each pre-dive check must be carried out using the checklists prescribed by the CCR manufacturer.
       The course director, resp. teaching instructor or guide must be in possession of a copy of this/these checklist(s).
    5. Pre-dive checks must always be performed in the team so that the other team members can verify each step.
    6. CCR Instructors, resp. course directors must be in control at all times, and have to supervise the equipment, resp. their assembly and the pre-dive check with every student, no matter how experienced the student is.
    7. The so-called Pre-Dive Breathing before the dive on land only starts the chemical reaction of the absorbent. It is vital to ALWAYS carry this out.
    8. The duration is indicated by various sources to be about 5 minutes at low water temperatures and about 3 minutes at higher temperatures. If the manufacturer's information should be longer, then one has to stick to it.
    9. Additionally, the usual other partner checks must also be carried out (head-to-toe, etc.).
- Sump- and post-sump diving:
  - Post sump dives require a special planning (mainly with regard to emergency-planning) and an appropriate and detailed briefing
  - If necessary appropriate trekking material has to be carried with (ropes, carbines, ladders, additional lights, tackle bags)
  - The gas quality (breathability) in a dry passage or a gas-filled cavity has to be checked cautiously; a basic rule is: unless breathability of the gas has been proven beyond any doubt, one should breathe only from the own regulator
  - A thorough equipment check has to be carried out every time before diving into the next sump
  - during any climbing activities everybody concerned has to be properly secured with safety lines/ropes

- It is compulsory to wear a helmet under SCD safety regulations. Violation of this requirement will be regarded as gross negligence under all circumstances
- Because of the inherent danger of rising water (flooding) in otherwise dry passages the responsible leaders have the obligation to gather all relevant information well in advance from reliable and competent sources
- It is strongly recommended to carry boots with well profiled soles. The so-called „rock boots“ are a good choice. Use of boots with no profiles („slicks“) should be discouraged (it may even be dangerous)
- It must be made sure to have enough lighting equipment which is designed to be used outside the water
- Depending on the circumstances the use of special transportation means for the transport of heavy equipment and parts thereof should be foreseen.
- The weight of the equipment should be carefully reduced to the absolute minimum which is required by diving- and safety considerations
- Post-sump dives mostly are of longer duration and are physically demanding. It may be advisable to take some drinking water and even some food on the tour.
- During the crossing of dry passages, especially during transportation of equipment, special attention must be given to the cave environment in order to prevent any avoidable damage to it (breaking of stalactites, rubbish left behind, bat populations etc.)

- Solo diving / Push dives:
  - In the area of recreational cave diving SCD does not advocate nor endorse or support true solo cave diving (without backup).
  - The behavior of a non-professional recreational cave diver, performing a solo push-dive on his/her own in zone 2 or 3 without any team-backup, must be regarded as negligence or even as gross negligence.
  - For special conditions (tight squeezes, low visibility, depth etc.) it may be helpful and reasonable to carry out a temporary „one-man exploration“ from a certain point on. This is consistent with the understanding of autonomy that has developed over the years in the cave diving community. *Such procedures are then part of a well co-coordinated plan with a back-up group.*
  - In the area of professional working divers, no longer do these sport diver standards apply but other rules, mostly those of worker's unions or the applicable regulations of corresponding laws etc.
- Diving as part of a larger group (the danger of peer pressure):
  When diving together with a large number of other divers a group dynamic can take over and group members may plan and undertake dives that they would normally never plan themselves either because they do not wish to let other members of the group down by calling dives (aborting a dive) or because a false sense of security is engendered just because they are part of a large group and there is a feeling of safety in numbers.
  The group dynamic can lead to some in the group becoming “leaders” while others are “followers”, an unsafe situation for all concerned.
  This situation can be avoided if large groups are broken down into smaller teams and most importantly that each individual team is responsible for all aspects of the planning and execution of their respective dives.
  In the Calimba accident (Mexico) the more experienced divers with the better air consumption were all diving with the guide who installed the reels and personal markers for both teams. The group of lesser ability and experience were to follow behind.
  It is everyone's own responsibility in such a situation to say "NO, I want the group to be split up in more convenient (sub-)teams, easier to supervise and guided!"

- Diving beyond personal level of experience and competence:
  We have all heard of the “80 dive expert”: the diver who has just enough experience under their belt to become overconfident or complacent. A little bit of knowledge can be a dangerous thing and in the cave environment if you make a mistake you may not get any second chances.
  Accident analysis indicates that many fatalities occur to trained cave divers who have logged between roughly 80 and 120 cave dives.

In the Mexican Calimba accident one of the victims had 75 logged cave dives and the other 125. The two survivors both had 300 logged cave dives completed since their certification 32 years previously, an average of less than 10 logged cave dives per year.
Therefor, each diver should make an honest assessment of both their own and other team member's current abilities, level of experience and fitness to dive.
If a long time has passed since original training and certification, or if divers have not been actively cave diving for some time, then either retraining or some form of review with a Cave Diving Instructor would be highly recommended before re-engaging in cave diving activities.
Dives must be planned taking into account the least able member of the team. Group dynamics, peer pressure, ego threat, a false sense of security engendered by being part of a group or diving with a guide are all factors that can lead to divers either individually, or as a group, exceeding their level of experience and ability.
A large group of divers will always have varying degrees of experience and ability. Utilizing dive sites and conducting dives that cater only to the most experienced within the group is fraught with potential dangers and extremely damaging to the cave environment.
Breaking the group down into smaller teams and planning dives appropriate for each team allows all the divers to dive within their respective comfort zone. This may also necessitate different teams within a group utilizing different dive sites.

- Diving with a Guide:

  People hire a guide for many reasons but probably the two most basic ones are to facilitate logistically their diving vacation and to increase their feelings of safety and comfort.
  The perception of an increased level of safety may in fact be a false one depending on the planning and judgment of the guide and the attitude of the people being guided.
  Divers may undertake dives they would never normally attempt themselves just because they are with a guide. This is a very dangerous situation and one that should be guarded against both by the responsible guide and client.
  The fact that they are being guided may encourage some divers to abrogate some of their responsibilities during the dive to the guide becoming merely sightseers following the guide (ducklings following the mother duck) around rather than being full, active, participating members of the team, who remain self-sufficient and self-reliant at all times.
  This again is a dangerous and unsafe attitude and should be discouraged at all times.
  Guides must exercise a professional attitude at all times and bear in mind that they have a duty of care to and responsibility for their clients particularly when planning dives.
  The primary considerations for any guide when planning dives should be first and foremost diver safety and cave conservation. Good judgment should be exercised as well at all times and plans should err on the side of conservatism.
  It is very important that the guide plans all dives taking into account the experience levels and abilities of every person within the group and selects an appropriate dive site and dive plan with this in mind. As well as the makeup of the group the number of people in the team should be another very important consideration when planning both the dive site and the dive itself.
  Dive shops employing guides should ensure that their guides are meeting acceptable standards particularly with regards to Safety, Cave Conservation and Professionalism.

  As a potential client, when looking for a guide it may be worth asking some questions, including:
  - ***Is there absolutely no linguistic barrier; can you easily understand each other, even when speaking about complicated matters?***
  - ***Is the guide certified by a recognized organization of good reputation or of governing authorities ?***
  - ***What is the guide's level of qualification or certification?***
  - ***Can the guide show TO you a proof of his current status in this organization? (should be active, teaching)***
  - ***What other credentials can the guide present to you?***
  - ***How much cave diving experience (how long have they been cave diving and how many cave dives do they have logged) does the guide have?***
  - ***How much experience does the guide have in the actual location you will be diving?***
  - ***How many students did this guide certify and at what level during the past 6 months?***

- *Does the guide reside full time in the area or is he/she only a visitor like you?*
- *Can the guide give you names of other reputable cave diving exponents as references?*
- *Does the guide work for a well known and reputable dive center or is he/she working alone ? How do the premises look like?*
- *Has the guide ever been involved in a cave diving incident? If yes, what was his/her role then?*
- *Can you attend as guest one briefing this guide makes with other clients and if yes, what is your out-of-the-guts impression?*
- *Is he/she able to draw a sketch of the cave dive plan, with all relevant parameters such as Ts, jumps, important markers, switches of directional markers, restrictions, current, haloclines, further exits, and specific dangers (silt-out) as well as the approximate swimming times to these way-points?*
- *What is the maximum number of clients that the guide will take on a dive?*
- *Ask the guide about their guiding philosophy; can you agree with it?*
- *Does he show interest in your own certification- and -competence level? Does he ask you about your equipment, your configuration? Does he ask for a medical attest (fitness for diving)? Does he plan do to some kind of assessment or another suitable form of a quick check (safety drill etc.) with you?*
- *What is your personal feeling about the guide's personality, attitude and appearance and his professionalism?*

- **These iron rules may prevent your death:**
  1) **NEVER ever breath from a tank you have not filled or analyzed yourself and which is not marked with YOUR name**
  2) **NEVER ever breath in an „air-bell" inside the cave from the contained gas if you have not a 100% proof that the gas is really breathable**
  3) **NEVER ever leave a main line without using a jump reel, secured to the main line**
  4) **NEVER ever swim over a gap or pass over a jump without connecting the two ends with your gap/jump reel/spool**
  5) **NEVER adapt divers to the dive plan, but always adapt the plan to the cave and the divers**
  6) **ALWAYS plan your dive – ALWAYS dive your plan**

4.6 Deviations from the general safety rules

Based on the accepted fact that not all caves are the same and that other important parameters may vary to a great extent from country to country, incl. legal requirements, some SCD training partners may wish - under given circumstances – to be allowed to apply rules deviating from above requirements from the standards. However these modified rules must not be less demanding or less safe.

If such changes are desired, the corresponding training partner has to file a written request to the SCD Training Commission with detailed justification.

However the requested changes must not be put in effect before the SCD Training Commission has fully accepted the request and this decision has been communicated in written form to the corresponding SCD training partner.

4.7 Summary (the ALL-rule)

The most important 3 rules in cave diving are summarized under the following terms (in German: the famous 3L-rule):

Air (**L**uft) – **L**ine (**L**eine) – **L**ight (**L**icht)

In general:

Any incident, which makes it impossible to follow one of these rules and regardless for what reasons, has as a consequence the abortion of the dive and a return to the entry in orderly manner.

In very rare and special cases it may be more advisable to try to escape to a gas-filled cavity (pocket) of adequate size with breathable air, which is in closest proximity and known by all team-members.

Part V:

Administrative Regulations

1. Cross-overs and Exception Handling

1.1 Cross-over courses for cave diving instructors of other recognized organizations

For cave diving instructors from other recognized organizations (e.g. NACD, NSS, IANTD, CDAA) who wish to teach for SCD, there is the possibility to follow a cross-over protocol (refer to "**Cave Diving - Rules and procedures for Instructor Cross-over Courses**"). You may get more information from the SCD Training Director.

Generally speaking, the cross-over candidate must prove to fulfill all requirements of the intended level as defined by SCD-standards outlined here.
Note: SCD does NOT allow for cross-over courses at Cave Diving Instructor III level (staff).

1.2 Exception handling

It can be assumed that there are nationally or internationally known cave divers of outstanding reputation who would like to support or to be involved in the formal training of other cave divers or may be just interested to acquire a cave diver's certificate. It may also be assumed that the national federation itself is interested to get a benefit from the knowledge and the skills of such an expert. In both cases, sticking exactly to the letter of the standards and detailed procedures may be contraproductive and against common sense.

In such well defined exceptional cases it is within the competence of the BoD of SCD, on corresponding request filed by the SCD Training Director, to grant an individual deviation from the standard rules.

On instructor level the candidate has always to present a proof of his ability to teach from a recognized training organization (e.g. teacher's license, moniteur certificate etc.)

1.3 Detailed course-outlines and examination procedures

Detailed documentation for the preparation and procedures for all cave diving training courses may be obtained from the SCD Training Director or from the Director of Standards.

2. Maintaining active teaching status for SCD Cave Diving Instructors

2.1 General

Each federation has a vital interest that instructors and training staff permanently maintain their knowledge and skills on the top-most actual level. This requirement is even more important in safety-related areas.
It's for this reason that only cave diving instructors in active teaching status are allowed to train and certify students, regardless of the level.
The SCD Training Director will notify the cave diving instructor not fulfilling the requirements and will switch his/her status from “active”/“teaching” to "inactive"/"non-teaching".

2.2 Scope of validity and constraints

1. The following requirements are valid for ALL diving instructor levels.
2. Currently, SCD focuses 3 fields of training: Cave, Sidemount, DPV (Scooter)
3. There is a separate instructor status for each training field.
4. Other diving and training activities outside of cave diving DO NOT account for maintaining an active teaching status as a cave diving instructor.

2.3 Evaluation period

One evaluation period always covers two (2) years. In this period, the year of having received the instructor certificate is included.

2.4 Requirements

The requirements take into account (pt. 2 below) that there may be SCD cave diving instructors in one national federation, which at the same time, are NOT open water instructors within the same national federation.
To keep active teaching status, the instructor has to show proof of ALL of the following:

1. Valid SCD membership (annual fee paid)
2. Valid liability insurance which covers damages by diving instruction and with a coverage per case of minimum 4.0 Mio CHF/EUR/USD
3. Valid medical attest (fit for diving) not older than 1 year
4. Proof of at least 60 dives during the past 24 months, of which must be
   - for cave training: min. 20 cave dives (of which min. 10 in zones 2 and 3)
   - for sidemount training: min. 20 sidemount dives
   - for DPV training: min.20 DPV dives
   (privately or during courses)
5. Conduct an education course with the submission of SCD brevets in the last 24 months in those training areas for which the active status is desired. This as acourse director / organizer or as an assistant,
   or
   the participation on a complete SCD instructors training or continuing education course as a participant in said areas
   or
   the active project cooperation in a project in these areas at national or international level in the last 24 months
   Participation in the SCD training courses in France is considered as fulfillment of the requirements under point 5.
6. The annual activity reports (as per 31.12.) must have been filed, duly filled out and in due time until 15 January. The annual report can be found in Appendix 18.
7. There must not be any open/pending complaints/ethical or legal procedures (litigation) against the instructor.

In addition to these requirements, all SCD Staff Instructors (in all training areas) must submit a new criminal record extract every 2 years (not older than one year).

In exceptional cases, additional activities may be accepted as a substitute. In such cases, timely contact should be established with the Head of the Training Commission of SCD (Training Director).
If one or more of these requirements is not met, the instructor in question is automatically set to "inactive". He / she is still able to teach, but he can not order any certifications.

2.5. Regaining active teaching status

Inactive cave diving instructors (non-teaching status) wishing to regain active teaching status in one or more training areas may contact the **SCD Training Director.**
As soon as the required activities have been proved and controlled, the instructor concerned will be notified by the federation's administration of his regained teaching status with all associated duties and privileges.
An assessment before or a supervision during the first course may be imposed by the Training Director to insure the adequate competence level of the instructor in question.

2.5 Withdrawal of the educational power / exclusion

The authority for training (active teaching status) of an instructor who is charged for wrongdoing in the area of SCD training, and if these charges are legally proven, can be temporarily or permanently withdrawn by the BoD upon request of the Ethics Committee. If the case is so serious that the good reputation of SCD is at stake or other SCD members were directly harmed, the board may - once again at the request of the ethics committee - even apply for the exclusion as an SCD member at the GA.
In both cases, the respondent must be given the opportunity to comment and give a position statement before a decision is taken.
The following shall in particular be considered as misconduct to be sanctioned:

- Violation of safety-relevant training standards from SCD or other organizations for which the Instructor is also active
- Call for violation of standards
- Financial irregularities against students, assistants, SCD or third parties
- Unjustified refusal of the issuing of a certificate to a student who has fulfilled all requirements (theory, skills, payment)
- False indications for the unauthorized maintenance or recovery of the active teaching status
- Negligently and avoidably or even grossly negligently endangering or injure students
- Malicious defamation of SCD or its members
- False, i.e. untruthful accusation of another SCD instructor for alleged misconduct
- Civil or criminal convictions, which give legitimate doubts as to the suitability of the instructor concerned as a teaching person
- Non-observance of the obligation to provide information in the context of a QA procedure

The ethics committee is a 4-membered ad hoc body consisting, in each case, of one (1) representative of the board of directors and the instructors' staff as well as the standards director and headed by the head of the Training Commission (training director) ,
The BoD shall appoint its own representative. The representative of the instructors' staff shall be determined by the training director from the instructors who are available.
The decisions are made with simple majority. In the case of a tie, the Training Director has the casting decision.
Only persons can become members of the Ethics Commission if, in the case in question, they are not charged themselves, nor any family members or close relatives. In such a case, they are obliged to enter into a standoff.
Anyone can submit a complaint to the Ethics Commission; these must be addressed directly to the head of the Training Commission of SCD (Training Director), accompanied by evidence. The latter is obliged to compile an adhoc commission within two weeks, and to submit the complaint to the members with all evidence
At the same time, he has also to submit the complaint with evidence to the defendant and to request it to submit an opinion within ten days.

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Within a further two weeks of its constitution, a meeting of this commission is to be held, to discuss the complaint and to decide on further actions.
If the complaint is directed against the Training Director himself, the complaint shall be addressed to the Standards Director (and vice versa).

Part VI:

Appendices

Appendix 1: General overview on the SCD Training system / Certificate designations

1. Cave Diving

Diver Levels:
Cave Diver I (Cavern Diver, cave zone 1)
Cave Diver II (Intro-to-Cave Diver, cave zone 2)
Cave Diver III (Full Cave Diver, cave zone 3)

Instructor Levels:
Cave Diving Instructor I (Cavern Diving Instructor, cave zone 1)
Cave Diving Instructor II (Full Cave Diving Instructor, cave zones 1-3)
Cave Diving Instructor III (Cave Diving Staff Instructor)

2. Sidemount Diving

Diver Levels:
Sidemount Diver I (Recreational, OW)
Sidemount Diver II (TEC, OW)
Sidemount Diver III (TEC, Overhead, all cave-and wreck zones)

Instructor Levels:
Sidemount Diving Instructor I (Recreational+TEC, OW)
Sidemount Diving Instructor II (TEC, Overhead, all zones)
Sidemount Diving Instructor III (Sidemount Diving Staff Instructor)

3. Wreck Diving

Diver Levels:
Wreck Diver I (Non-Penetration Wreck Diver, wreck zone 1)
Wreck Diver II (Penetration Wreck Diver, wreck zone 2)
Wreck Diver III (Penetration Wreck Diver, wreck zone 3)

Instructor Levels:
Wreck Diving Instructor I (wreck zone 1)
Wreck Diving Instructor II (wreck zones 1-3)
Wreck Diving Instructor III (Wreck Diving Staff Instructor)

4. Scooter Diving

Diver Levels:
Scooter Diver I (Recreational, OW)
Scooter Diver II (TEC, OW)
Scooter Diver III (TEC, Overhead, all cave-and wreck zones)

Instructor Levels:
Scooter Diving Instructor I (Recreational+TEC, OW)
Scooter Diving Instructor II (TEC, Overhead, all zones
Scooter Diving Instructor III (Scooter Diving Staff Instructor)

5. Ice Diving

Diver Levels:
Ice Diver I (Recreational)
Ice Diver II (TEC)

Instructor Levels:
Ice Diving Instructor I (Recreational)
Ice Diving Instructor II (TEC)
Ice Diving Instructor III (Ice Diving Staff Instructor)

Appendix 2: Relevant international norms for equivalencies

These norms are binding for all European member countries of CEN (among them Ireland, UK, France, Benelux, Switzerland, Germany, Austria,….) and are therefor part of the relevant national legislation.

The term "…or equivalent.." always refers to these norms or to any bilateral agreement between SCD and the foreign organization concerned.

a) European norms
EN 14153-1 Definition of a 1* Diver
EN 14153-2 Definition of a 2* Diver
EN 14153-3 Definition of a 3* Diver

EN 14413-1 Definition of a 1* Instructor
EN 14413-2 Definition of a 2* Instructor

b) International norms
ISO 24802-1 Definition of a 1* Instructor
ISO 24802-2 Definition of a 2* Instructor ("advanced instructor")

In case the competence level of a student coming from another training agency is in question, the responsible course director has the right to ask the student
a) to be assessed (theoretically and practically); Appendix 7
b) to fill out a corresponding questionnaire on his/her former training
This rule applies for all diver and instructor levels.

The general rule by default is that certificates will be accepted of those agencies which in return also accept Swiss Cave Diving certificates.

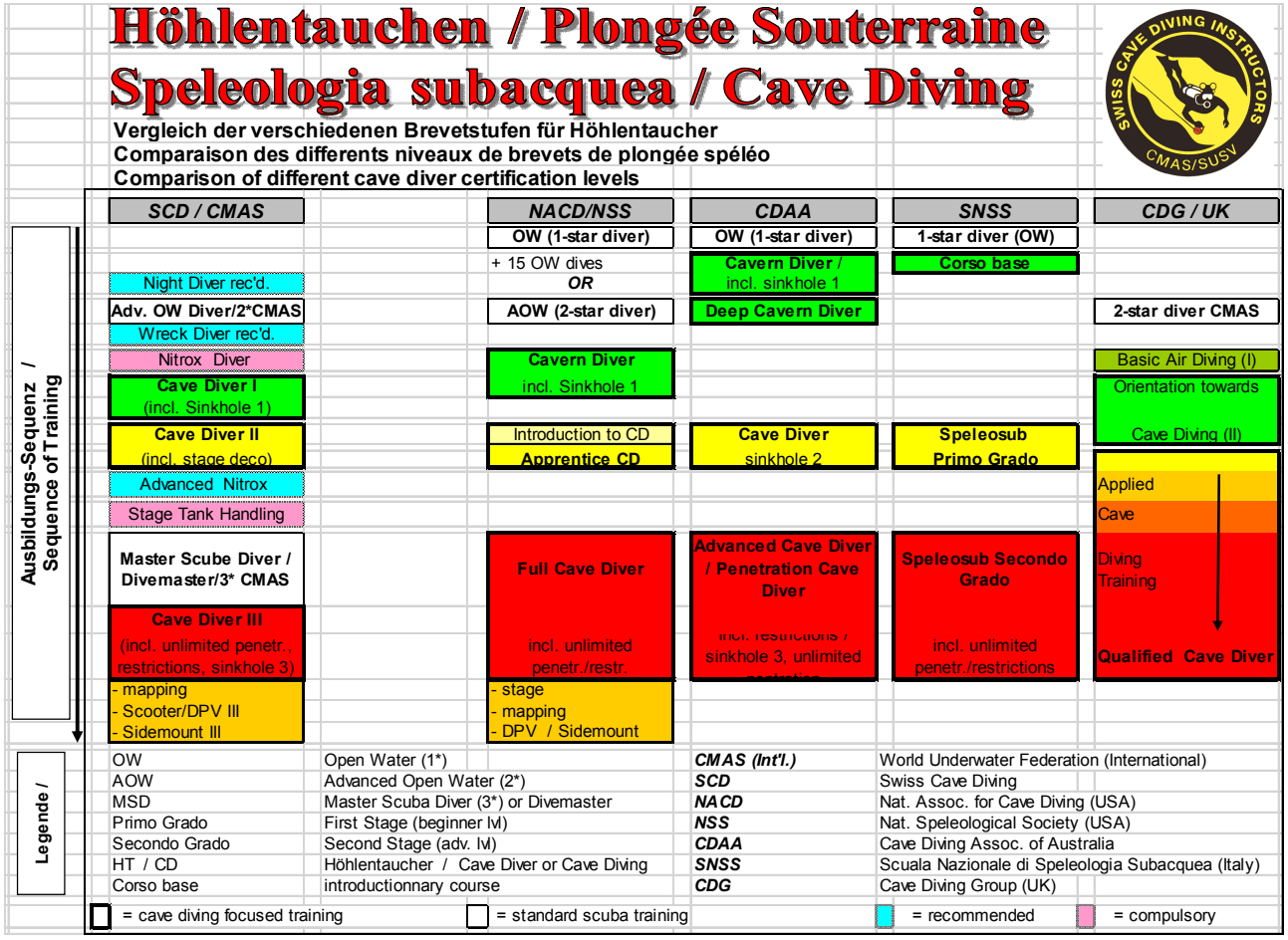
Appendix 3a: Designations of SCD cave diving certificates at diver level

				
	SCD / CMAS level designation (english)	**Cave Diver I / CD1**	**Cave Diver II / CD2**	**Cave Diver III / CD3**
	titres des brevets SCD/ CMAS (français)	**Plongeur Souterrain I / PS1** (plongeur en cavernes)	**Plongeur Souterrain II / PS2** (plongeur en grottes)	**Plongeur Souterrain III / PS3** (plongeur souterrain avancé)
	denominación SCD / CMAS (español)	**Buceador Subterraneo I / BS1** (buceador de cavernas)	**Buceador Subterraneo II / BS2** (buceodor de cuevas)	**Buceador Subterraneo III / BS3** (buceador de cuevas avanzado)
	american equivalence	Cavern Diver	(Apprentice) Cave Diver	Full Cave Diver
	british equivalence (CDG UK)	---------	orientation towards cave diving	qualified Cave Diver
	australian equivalence	Cavern Diver (incl. Sinkhole 1)	Cave Diver (incl. Sinkhole 2)	Advanced Cave Diver / Penetration Cave Diver (incl. Sinkhole 3)
	deutsch	Höhlentaucher I / HT1	Höhlentaucher II / HT2	Höhlentaucher III / HT3
	italiano	Speleosub I / SS1 (Speleosub in Caverne)	Speleosub II / SS2 (Speleosub in Grotte)	Speleosub III / SS3 (Speleosub in Grotte Avanzato)

Appendix 3b: Designations of SCD cave diving certificates at instructor level

				
	SCD / CMAS level designation (english)	**Cave Diving Instructor I (CDI 1)**	**Cave Diving Instructor II (CDI 2)**	**Cave Diving Instructor III (CDI 3)**
	titres des brevets SCD/ CMAS (français)	**Moniteur de Plongée Souterraine I (MPS1)**	**Moniteur de Plongée Souterraine II (MPS2)**	**Moniteur de Plongée Souterraine III (MPS3)**
	denominación SCD / CMAS (español)	**Instructor de Buceo Subterraneo I (IBS1)**	**Instructor de Buceo Subterraneo II (IBS2)**	**Instructor de Buceo Subterraneo III (IBS3)**
	american equivalence	Cavern Diving Instructor	(Full) Cave Diving Instructor	Cave Diving Staff Instructor / Instructor Trainer / Course Director
	british equivalence (CDG UK)	no specific instructor title	no specific instructor title	no specific instructor title
	australian equivalence	Cavern Diving Instructor	(Full) Cave Diving Instructor	Instructor Trainer / Course Director
	deutsch	Höhlentauch-Instruktor I (HTI1)	Höhlentauch-Instruktor II (HTI2)	Höhlentauch-Instruktor III / Staff Instruktor Höhlentauchen (HTI3)
	italiano	Istruttore speleosub I (IS1)	Istruttore speleosub II (IS2)	Istruttore speleosub III (IS3)

Appendix 3c: International comparison of different cave diver certification systems



Appendix 4: Underwater Communication in Cave Diving

A4.1 Cave Diving Hand Signals

Hand signals are one of the most efficient ways of underwater communication to quickly transfer detailed information. Thus, SCD has defined and published already long time ago a complete set of worldwide accepted underwater hand signals.
In cave diving, ***basically the same hand signals are used as for open water diving (those remain unchanged !***) ***plus a considerable collection of specific cave- and cave diving related additional signals***. This is the reason that in the following paragraph the main focus is on those *specific hand signals for cave diving*.

In view of the difficult conditions in cave diving and the probability of a catastrophic outcome after misunderstandings, it is unforgivable if the cave diver does not perfectly master hand signals.

A4.1.1 Command signals

There are four command signals. They are called this way, because there is only one correct and acceptable response and reaction. They have one point in common: they are NEVER to be questioned!

Those four signals are:

1. OK
2. STOP
3. RETURN (without abort)
4. SURFACE (ascent to) / ABORT dive !

			
OK! OK? (understood)	**CMAS: STOP !**	**RETURN (without abort)**	**SURFACE (ascent to) / ABORT dive !**

Remarks:

NACD, NSS: HOLD !

STOP (CMAS) / HOLD (NACD): In areas where American cave diving organizations such as NACD and NSS/CDS are strongly represented, the signal HOLD (at the left) is used instead of the CMAS STOP command (s. above).
Attention in order NOT to confuse the HOLD command (fist) with the CMAS signal "I have reached my reserve" (fist besides your head). From a legal standpoint it is obvious that in countries with the CMAS system and an official national federation, the existing CMAS STOP command must be used first.

Both signals have the same meaning: it means "stop", "wait" "go no further". Once given no diver may continue the dive, until cleared to do so by an OK or a RETURN.
An initial HOLD can mean that the diver giving the signal needs to stop briefly or he doesn't want to penetrate any further or that he wants to exchange more information (followed by additional hand signals).

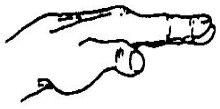
SURFACE (ascent do) / ABORT dive ! Because SURFACE is a command signal it must NEVER be questioned by anyone from the team. The only acceptable answer is the SURFACE signal from every diver from the team. In further correct response, all divers ascent to the surface - if there is any - or exit from the cave in an orderly fashion.

In cave diving, the sign SURFACE at the same time also means ABORT THE dive!

Standards & Training System

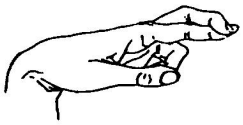
A4.1.2 Information signals (hints)


little, squeeze

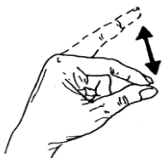

ceiling

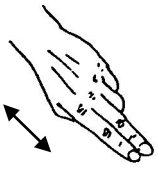

sediments, silt


depth reached (maintain)

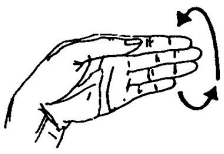

line (+action)

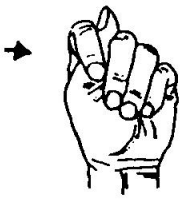

big, many

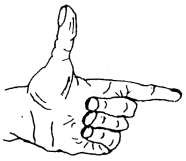

bubbles (e.g. during check)


knife (+action)


back-up light is on!


reel (+action)


(I'm) stuck

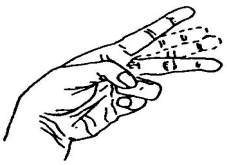

Exit (this way)

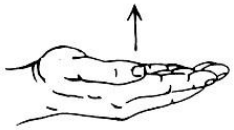

entanglement

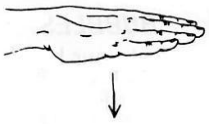
A4.1.3 Requests for actions/activities


attach/fix line (Tie-Off)


slow down / slow


cut (line)


higher up/upwards (ascent a little bit)


down/downwards (sink a little bit)

A4.1.4 Numbers

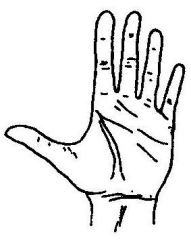

0


1


2


3


4


5


6


7


8


9

A4.2 Application of hand signals

Hand signals must be given clearly, distinctively and convincing. If there is not enough natural light at the site, try to illuminate your hand adequately so it can be better seen. Another way is to point the lamp towards

the own body and make the signals within the cone of light. However, it is still the best method to have your buddy within an arm's reach, so it is possible to establish immediate physical (touch-) contact.

A4.3 Touch-contact signals

In cases where it is advisable to dive with touch-contact (e.g. during a silt-out, an out-of-air situation), meaning that a direct eye-to-eye contact is not possible and both divers had to use one of their hands for negotiating this emergency, a minimum communication must be maintained with all means.

During this procedure one of the divers holds his buddy with a firm grip of his hand on the upper arm or leg. The following signals can be communicated:

One Squeeze	►	Hold, STOP
Two Squeezes	►	everything OK!
Forward Push	►	Move FORWARD
Backward Pull	►	Move BACKWARD
Four Squeezes	►	EMERGENCY situation, stuck or out-of-air situation

A4.4 Line/rope signals

Even in these days, during exploration of new passages, restrictions, short one-man explorations, all these activities under low to zero visibility conditions, a direct connection between a tender and the diver is still in use as a quick and cheap method to realize. This safety line is then also used for communication.

It is self-understanding that this technique can only be used for relatively short and preferably straight passages, because (e.g.) of the danger of line entanglement. It is also essential to reduce line slack to a minimum because otherwise line signals will be hard to understand.

While using line/rope signals the sender always announces his intention to the addressee with a pre-signal, given by a short pull. The addressee acknowledges by sending the same signal back. Only then the intended message is being transmitted. This procedure is almost identical to the one used in wireless communication.

The following, most common signals correspond to those used by the US-Navy:

ONE short pull	►	Tender: everything OK? A signal/message is to come! During diver's descent: STOP! Diver: everything OK; I await signal! Also: I have reached the bottom.
TWO long pulls	►	Tender: advance further/descend During diver's ascent: you have ascent too much; descend until being stopped Diver: I need more line
THREE long pulls	►	Tender: prepare to return/ascend Diver: take up slack (of line)
FOUR long pulls	►	Tender: Emergency, return/ascend immediately Diver: Emergency, pull me back/to the surface

Appendix 5: Guidelines for gases, rebreathers, stage tanks and DPVs during SCD standard cave diving courses

General

The rapid development in the area of sport diving in relation to the usage of special gas mixtures and re-breather didn't stop in cave diving.
However, for legal and technical reasons it is compulsory to control and regulate the use of such technology during the standard training courses within reasonable limits.
The following rules and regulations are compulsory for all participants of ***SCD standard cave diving seminars and courses*** and are an integrated part of the subscription.
Violation of those rules by the participants will lead to expulsion without compensation.

Usage of stage tanks (all types)

- from a penetration distance of 500m or more without the possibility to re-surface, a 3rd tank (safety tank) has to be carried with (stage tank, 3 tank rig) or to be deposited on a suitable place.
- minimum size for this tank is 7 liters. The rule of thirds (or a more restrictive one) has also to be applied. This tank must not be integrated in the “ordinary” gas-management.
- all tanks must be equipped with one complete regulator rig (incl. pressure gauge).
- The regulator on the safety tank must be equipped with a longhose of min. 1.5m length.
- all tanks that may be deposited somewhere in the cave during the dive have to be clearly marked with the name of the owner.
- in addition to this, in caves the gas is not air, it is strongly recommended to write the MOD in big sized numbers (approx. 8-10cm / 3-4 in.) directly on the tank
- With hypoxic mixtures (f_O_2 < 20.8%) it is compulsory to indicate the MinOD (Minimum Operation Depth) in big numbers (approx. 8-10 cm) on the tank.

Stage decompression with 100% oxygen

- prerequisite is Advanced Nitrox Certificate or medical recommendation
- usage is accepted also during training courses (Cave Diver II and above)
- maximum operation depth: 6m/20ft
- quality: Oxygen 2.5 (ref. Appendix 15)
- only "true" O_2-tanks are permitted; minimal size is 800 bar*liters (4L x 200bar)
- each tank must be equipped with 100% O_2-compatible regulator and submersible pressure gauge
- divers who do not own a diving computer that allows for gas switches underwater must apply the decompression stop times for air or the used Nitrox mixture.

Use of Nitrox

- not *necessarily* to be used during CD1 and CD2 courses; may be used during CD3 courses, accord. to dive requirements
- prerequisite is Nitrox-Diver certificate
- Nitrox-compatible dive computer required
- for MOD: max. pO_2 as set forth by law, by international mutual agreements or by SCD.
- no dive with a tank whose content has not been personally analyzed !

Use of Trimix

- **Because of the complex logistics and additional legal constraints in some countries, Trimix is NOT used within the framework of standard Cave Diver I to II training. At the end of Cave Diver III courses – provided the students are properly certified - one or two Tmx dives may be executed.**

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Use of DPVs (Diving Propulsion Vehicles)

- DPVs are **NOT** to be used within the framework of Cave Diver I to III training due to logistical and safety considerations (→ SCD Specialty Course Scooter Diver III (TEC, Overhead Environment)).

Usage of rebreathers and similar equipment

- The use of rebreathers is subject to the conditions set out in part IV, chap. 1-3 (cave zones) as well as in part IV, chap. 4 "requirements for divers and equipment ..." (approved user certification, minimum number of dives with the unit, CE-compliant CCR only). In this case, the use of these devices is NOT explicitly taught. This experience must have been acquired beforehand in the open water. In the CD1-CD3 courses, only the special diving techniques for cave diving are trained.
- SCR types are expressly not permitted on any SCD course.
- If CE compliant, both types of CCR configurations (backmount and sidemount) are allowed.

Blending of gas mixtures

- As a general rule, all participants fill their tanks themselves, regardless of their content. Thus each diver is fully responsible himself for it and for the correct use of the mixture. This responsibility cannot be delegated to anyone else.
- After each blending and filling, the blender has to analyze the content. This measurement has to be repeated *before* the briefing at the diving-site!
- The organizers reserve the right to control the indicated contents at any time.

Marking of O_2- / Nitrox- / Trimix- tanks

- O_2 tanks have to be properly stamped. Painting of outside tank walls has to be according to color code as set forth by national laws or international agreements. O_2 tanks must also carry a distinctive writing ("O_2"/"Oxygen"/"Sauerstoff")
- all Nitrox/Trimix-tanks have to be properly and clearly marked with the usual EANx / NITROX or TRIMIX stickers/tags.
- all tanks that may be deposited somewhere in the cave during the dive have to be clearly marked with the name of the owner
- the actual content has to be indicated on a good readable content sticker/tag:
  - once more type of gas (EANx, Tmx)
  - fraction %O_2 / % N_2 / %He. This analysis has to be done by the blender after the blending process is finished and once more at the dive site by the user
  - MOD (maximum operation depth) in m/ft with indicating the used units
  - [facultative: EAD (Equivalent Air Depth) in m]
  - Minimum Operation Depth in m/ft for Tmx with an O_2 content of <20.8%
  - filling date / date of analysis
  - signature of the blender / of the person who made the tank content analysis
- in addition to this easily removable tag it is recommended to write the MOD (in meter) in big size numbers (approx. -8-10cm / 3-4 in.) directly on the tank

O_2-Compatibility of tanks, valves and regulators

- Up to a content of 40%O_2 , no special manifolds or valves are requested
- Inner walls of the tanks, manifolds and valves and the regulators have to be 100% O_2-compatible according to the corresponding regulations and laws. This is the task of the user (cleaning, use of correct grease). Each user carries the full responsibility alone.
- This holds true even more if pure O_2 is decanted during the blending process !
- All maintenance and trouble shooting of regulators and all other personal equipment is in the sole responsibility of each participant.

Appendix 6: Compulsory equipment for SCD cave diving courses

Beyond the so-called standard diving equipment such as fins, masks, diving suit, there is the following list of specialized equipment that is compulsory for all international SCD cave diving courses:

OC:

Backmount: 2 mono tanks, 10-12L; DIN-double-outlets only; H- or Y-valve [CD1 only /zone1 only!]
Backmount: 2 x D10-12L, DIN-outlets; independent or connected with isolator valve [zones 2+3]
Sidemount: 4 x 10-12L tanks, Mono DIN-outlets, 2 complete regulator/SPG rigs [zones 2+3]
1-2 stage tanks (min. volume 7L) each with a complete regulator rig (incl. pressure gauge) [CD3 only]
Attention: - for penetrations beyond 500m (1500ft) a 3rd tank is compulsory (min. volume 1400NL)
- all tanks have to carry a valid stamp from **nationally recognized hydro testing institute**
- every tank has to be equipped with a pressure gauge
1 jacket or wings with a buoyancy of at least 16ltr [all courses, all zones]
2 complete regulator rigs, each with 1st/2nd stage, pressure gauge, inflator [all courses, all zones]
Attention: - inflator hoses for BC and drysuit must NOT be connected to the same 1st stage
- at least 1 pressure gauge must have a self illumination analogue display)
1 long hose (Backmount: 1.8-2.1m / Sidemount & Bailout: 1.5m) [all courses, all zones]
CCR: CCR with CE-conformity declaration and with enough bailout tanks [all courses, all zones]]
1 spare mask [from CD2 / from zone 2]
1 compass with self illuminating analogue display [all courses / all zones]
1 dive computer with stage decompression stop mode [all courses / all zones]
1 gap/jump-reel/spool with min. 30m line, dia. = 1.5 - 2mm [from CD2 / zone 2]
1 safety reel/spool with min. 50m line, dia. = 1.5-2mm, other, bright color [all courses; all zones]
1 helmet (pref. with lamps attached) [from zone 2 on]
1 main lamp, output approx. 900 Lumen (30-50W Halogen), min. burning time 2 hrs (to be carried that hands & fingers stay free for manual work) [all courses, all zones]
1 backup lamp, output min. 100 Lumen (4W Xenon), min. burning time 2 hrs [CD1 only / zone 1 only]
2 backup lamps, output min. 100 Lumen (4W Xenon), min. burning time ea. 2 hrs [from CD2 / from zone 2]
2 solid stainless cutting tools (knives, cutters, cutting pliers, scissors) [all courses, all zones]
3 directional markers / line arrows [all courses, all zones]
3 non-directional markers ("cave cookies" / "line cookies") [all courses, all zones]
3-4 D-rings on the jacket/wings and bolt-snaps to attach lamps, reels etc. [all courses, all zones]
for Nitrox users: certificate + decanting hose with high precision pressure gauge + own O_2-analyzer !

Recommended additional equipment for courses:

1 pair of fins
1 pair of gloves (specially for dry suits)
1 complete regulator rig (incl. hose)
1 spare parts set for main-regulator
1 mechanical depth gauge with self illuminating analogue display / watch / dive table
2-3 pc. spare lead weights
1 high pressure hose with pressure gauge for connection tanks for filling and decanting
1 high pressure hose for pressure gauge
spare straps for fins (steel spring-straps!) and masks
batteries, accumulators and chargers for uw-lamps, bulbs and fuses for lamps and chargers
plug boards and connectors for foreign sockets
suitable tools for all parts of the equipment
insulating tape of different colors
silicone grease / O_2-compatible lubrication material
Aquasure or similar neoprene glue
1st aid box / set
trekking-material (solid boots, rain coat, lines & ropes)
sun blocker, cap etc.; insect repellent

Further additional materials and **tools** according to personal needs and preferences.

Appendix 7: Guidelines for assessments

Standards allow the responsible course director - regardless of the type and level of certificate presented - not only to ask for an evaluation of the potential student's knowledge and skills but also of his/her physical performance (a so-called entry-assessment) if he feels the necessity to do so.

Requirements for an assessment:
- if student presents certificate from unknown organization or from one that is not recognized by SCD or has an otherwise doubtful reputation in the cave diving community.
- if the candidate has not been diving for a longer period, has received his training in a totally different environment (warm, clear waters, no currents, very shallow depths etc.)
- if there are doubts about the quality of the student's training, on the certifying organization or on the responsible instructor
- whenever the course director has reasonable doubts on the student's *physical* performance
- whenever the candidate wishes it

Areas to be checked:
- physical performance (only on CD2 and CD3 level
- practical skill (→ standard-drills)
- theoretical knowledge (→ MC-test)
- following / respecting safety rules

Equipment to be used:
- corresponding to level of certification and the zone
- especially for swimming drills: equipment corresponding to intended zone
- 100% conform with SCD standards

Evaluation / Grading:
Evaluation and grading has to correspond to the level of the certificate presented by the candidate.

Duration:
0.5 - max. 1 day (practical work *and* theory-test)

Suitable dive sites for practical assessment:
- level Cave Diver I: mainly open water or cave entry
- level Cave Diver II: overhead environment preferred; open water acceptable if results are not influenced by this environment
- level Cave Diver III: cave environment only (zones 2 and 3)

Fitness for diving:
A valid (< 1 year) medical attest for fitness for diving must be presented before the first entry into the water.

Distance fin swimming (endurance) test:
This evaluated exercise at the surface has to be carried out in full gear and by using a snorkel. It should be done in a lake or in a sheltered area in the sea (e.g. a bay). For safety reasons, individual buoyancy has to be adjusted so that the swimmer can stay without undue effort at the surface even with the jacket/wings completely deflated. The exercise has to be done only with a calm surface.

- ***CD2 + CD3 (equipment corresponds to zone 2): 300m in max. 20 minutes***

If the candidate does not pass this test before the first training dive of the course, then he has to be refused and his further participation to be cancelled.

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Standard-Drills and exercises:

drill / type of exercise	dive site	CD1	CD2
Donning complete equipment on land without help within reasonable time; equipm. conform with SCD standards	on land	**X**	**X**
buddy-check (gear match head-to-toe) + check for leakages on 3-5m, S-Drill	open water or cave entry	**X**	**X**
complete equipment donning at surface while swimming within reasonable time; equipment conform with SCD standards	open water or cave entry	**X**	**X**
taking off/on and clearing mask at depth 10-15m	cave zone 1 or open water	**X**	**---**
switch to back-up mask at depth 10-15m	cave zone 1 or similar overhead environment	**---**	**X**
buddy rescue from depth of 20m with transport 50m at the surface	open water	**---**	**X**
following a fixed line without light over 80-100m	cave zone 2 or open water with mask glass blackened	**---**	**X**
laying and fixing a line on a distance of approx. 50m	cave zonen 1 and 2 or open water	**---**	**X**
OC Shut-down Drill on a depth of 5 - 10m	cave zone 1 or open water	**X**	**X**
OC: Lanschlaucheinsatz über mind. 50m	Cave zone 2	**---**	**X**

Additional for CCR:

demonstration disassembly, cleaning all major parts, changing scrubber material, battery exchange, exchange of O_2-sensors, change of all gas-tanks, complete assembly with all checks of unit (calibration etc.)	on land	**all**	**courses**
All pre-dive functional checks required by manufacturer	on land / near shore	**all**	**courses**
demonstration of change to bailout	shallow depth open water and in overhead environment (zones 1 and 2)	**all**	**courses**

- **Caution:**
  The CCR student must be able to monitor his pO_2 during the entire dive, even during exercises. If this is not possible for more than about 2 minutes (silt-out, rescue, blindmask, Halocline etc.), he/she must immediately switch to the off-board OC bailout.
- Alternatively, it is also possible to switch to SC mode via BOV and periodic diluent flush.
- In both cases, do not forget to switch the controller to OC mode immediately.
- Already because of the strong physical exertion of a **rescue** and the associated danger of the CCR's over-breathing, resp. of a hypercapnia, this exercise must always be performed in offboard OC configuration.
- A change back to the loop may not take place until a) after the solution to the problem has been found and successfully executed and b) after prior control of the pO_2, the controller must also be switched back to CC mode.
- **An instructor must always supervise such exercises 1: 1 and in the immediate vicinity of the student (grip distance)!**

Appendix 8a: Standard drills & exercises for practical evaluation of SCD Cave Diver I / CD1

Remarks

To assure that cave diving training and evaluation within the SCD system is done in accordance with the standards and that the *required* level of competence of the students is as close together as possible, SCD has developed a number of standard drills and exercises for each level.

Every one of these exercises must be performed by the student at least once with a C grading (passed) or better during the course. Every exercise with a grading lower than C (not passed) must be repeated, until the student has attained *two consecutive* C gradings (or better).

Exercises with a binary Pass/Fail grading are safety related issues of great importance. Therefore, they are evaluated on every single training dive. Only two *Failed* gradings of these issues during the course are accepted.

Standard-Evaluation Scheme

All exercises are to be assessed following a uniform evaluation scheme, be it a grading with codes ranging from A - E or a digital Pass/Fail decision.

The standardized grading to be used is the following:

A	**very good; excellent**
B	**good**
C	**average, just passed**
D	**not passed (time, needed support etc.)**
E	**unable to finish drill; had to abort, emergency**

Passed	**(for PASS/FAIL-Exercises only)**
Failed	**(for PASS/FAIL-Exercises only)**

Remark: parts of the shut-down drill are: a) closing tank valve on the side of the leakage b) closing isolator valve, if any; c) switch to other regulator, d) pressure gauge control.

The following listed *standard exercises/drills* must be successfully performed at least once each:

no.	type of exercise	grading
1a	**complete partner-check (head-to-toe, no leakages)**	A - E
1b	Additionally for CCR: all of the pre-dive functional check required by manufacturer (before every dive; on land / on the shore in the water)	**Pass/Fail**
2	**shut-down drill in the entrance pool or open water in max. 45 sec.**	A - E
3	**correct laying a line (dist.=15-20m), starting at entrance**	A - E
4	**diving without light/visibility along a line (open water) with touch-contact, dist.=40-50m (blacked out mask glasses) as a PARTNER-EXERCISE**	A - E
5a	**OC: out-of-air situation; octopus-breathing towards the exit with touch-contact, dist.=40-50m ea. (as a donor/receiver) in overhead environment (zone 1) as a PARTNER-EXERCISE**	A - E
5b	**CCR: complete failure of CCR, gas-sharing via longhose with OC diver towards exit (with touch-contact), dist.=40-50m, (zone 1)**	A - E
5c	**CCR: switch to bailout, return to exit, distance 40-50m**	A - E
5d	**CCR: flush procedures with diluent and O_2 (=/<6m); distance 40-50m**	A - E
6	**UW-signs and signals (all 4 command signals and the most used 10 information- and actions signals)**	A - E
7	**uw distance swimming, dist.=250-300m, depth=10-20m, time = 15-20min; used to determine individual air consumption**	no grading

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In addition, the following personality- and safety aspects must be evaluated during all dives:

8	**ability to act as a fully integrated team member on land and underwater**	A - E
9	**observation/respect of SCD standards and safety rules**	A - E
10	**correctly gearing up; correct use of material; conform to SCD standards**	A - E

Additional for CCR:

demonstration disassembly, cleaning all major parts, changing scrubber material, battery exchange, exchange of O_2-sensors, change of all gas-tanks, complete assembly with all checks of unit (calibration etc.)	on land; at start of course (*passed* grading BEFORE first dive**!**)	**Pass/Fail**
first-demonstration of change to bailout	OW, shallow depth; first dive at start of course**!** (*passed* grading BEFORE first dive**!**)	**Pass/Fail**
first-demonstration of diluent- and O_2 flush procedures (=/<6m)	OW, shallow depth; first dive at start of course**!** (*passed* grading BEFORE further dives**!**)	**Pass/Fail**
after-dive maintenance	on land, after first dive; (*passed* grading BEFORE further dives**!**)	**Pass/Fail**
complete dive planning for at least 3 selected training dives during the course, including detailed gas management and decompression planning. The latter must be calculated with at least 2 different deco-SWs for cross-checking.	always on land on the day before the planned dive	**A - E**

Emergency Procedures for: - Low Oxygen Warning - High Oxygen Warning - Low Battery Warning - Battery Failure - Flooded Loop - Cell (Sensor) Warning/Error - Loss of pO_2 control	min. 1x ea. during course; min. grading = C.	A – E ea.

- **Caution:**
  The CCR student must be able to monitor his pO_2 during the entire dive, even during exercises. If this is not possible for more than about 2 minutes (silt-out, rescue, blindmask, Halocline etc.), he/she must immediately switch to the off-board OC bailout.
- Alternatively, it is also possible to switch to SC mode via BOV and periodic diluent flush.
- In both cases, do not forget to switch the controller to OC mode immediately.
- Already because of the strong physical exertion of a **rescue** and the associated danger of the CCR's over-breathing, resp. of a hypercapnia, this exercise must always be performed in offboard OC configuration.
- A change back to the loop may not take place until a) after the solution to the problem has been found and successfully executed and b) after prior control of the pO_2, the controller must also be switched back to CC mode.
- **An instructor must always supervise such exercises 1: 1 and in the immediate vicinity of the student (grip distance)!**

Appendix 8b: Standard drills & exercises for practical evaluation of SCD Cave Diver II / CD2

Remarks

To assure that cave diving training and evaluation within the SCD system is done in accordance with the standards and that the *required* level of competence of the students is as close together as possible, SCD has developed a number of standard drills and exercises for each level.

Every one of these exercises must be performed by the student at least once with a C grading (passed) or better during the course. Every exercise with a grading lower than C (not passed) must be repeated, until the student has attained *two consecutive* C gradings (or better).

Exercises with a binary Pass/Fail grading are safety related issues of great importance. Therefore, they are evaluated on every single training dive. Only two *Failed* gradings of these issues during the course are accepted.

Standard-Evaluation Scheme

All exercises are to be assessed following a uniform evaluation scheme, be it a grading with codes ranging from A - E or a digital Pass/Fail decision.

The standardized grading to be used is the following:

A	**very good; excellent**
B	**good**
C	**average, just passed**
D	**not passed (time, needed support etc.)**
E	**unable to finish drill; had to abort, emergency**

Passed	**(for PASS/FAIL-Exercises only)**
Failed	**(for PASS/FAIL-Exercises only)**

Remark: parts of the shut-down drill are: a) closing tank valve on the side of the leakage b) closing isolator valve, if any; c) switch to other regulator, d) pressure gauge control.

The following listed *standard exercises/drills* must be successfully performed at least once each:

no.	type of exercise	grading
1a	**complete partner-check (head-to-toe, no leakages)**	A - E
1b	Additionally for CCR: all of the pre-dive functional check required by manufacturer (before every dive; on land / on the shore in the water)	**Pass/Fail**
2	**correctly and completely donning equipment while swimming at the surface in max. 8minutes as a PARTNER-EXERCISE helping each other**	A - E
3	**shut-down drill in zone 1 (overhead) in max. 40 sec.**	A - E
4	**correct laying a line (dist.=25-30m), starting at entrance**	A - E
5	**diving without light/visibility along a line towards the cave exit with touch-contact, dist.=100-150m (blacked out mask glasses) as a PARTNER-EXERCISE (zone 2)**	A - E
6a	**OC: out-of-air situation; octopus-breathing towards the cave exit with touch-contact, dist.=150m ea. (as a donor/receiver) in overhead environment (zone 2) as a PARTNER-EXERCISE**	A - E
6b	**CCR: complete failure of CCR, gas-sharing via longhose with OC diver towards exit (with touch-contact), dist.=150m, (Zone 2)**	A - E
6c	**CCR: switch to bailout, return to exit, zone 2, distance 150m**	A - E
6d	**CCR: flush procedures with diluent (zone 2) and O_2 (=/<6m); max. distance 60-70m**	A - E
7	**UW-signs and signals (all 4 command signals and the most used 10 information- and actions signals)**	A - E
8	**buddy rescue, minimum up to safety stop at 6m; depth + horizontal distance = approx. 50m, permanently securing continuous air supply; as a TEAM-EXERCISE (start in zone 2)**	A - E
9	**switch to back-up mask (zone 2)**	A - E

10	**find a "lost" main line with the safety reel/spool (zone 2)**	A - E
11	**to cross and to close a jump with the jump-reel or spool (zone 2)**	A - E
12	**temporarily closing a gap by using a gap reel (zone 2)**	A - E
13	**continuously connecting all reels of a group and laying a temporary, continuous main line, starting at entrance (TEAM-EXERCISE)**	A - E
14	**uw distance swimming, dist.=250-300m, depth=10-20m, time = 15-20min; used to determine individual air consumption; comparison to CD1**	no grading

In addition, the following personality- and safety aspects must be evaluated during all dives:

15	**ability to act as a fully integrated team member on land and underwater**	A - E
16	**observation/respect of SCD standards and safety rules**	A - E
17	**correctly gearing up; correct use of material; conform to SCD standards**	A - E

Additionally for CCR:

demonstration disassembly, cleaning all major parts, changing scrubber material, battery exchange, exchange of O_2-sensors, change of all gas-tanks, complete assembly with all checks of unit (calibration etc.)	on land; at start of course (*passed* grading BEFORE first dive**!**)	**Pass/Fail**
first-demonstration of change to bailout	OW, shallow depth; first dive at start of course**!** (*passed* grading BEFORE first dive**!**)	**Pass/Fail**
first-demonstration of diluent- and O_2 flush procedures (=/<6m)	OW, shallow depth; first dive at start of course**!** (*passed* grading BEFORE further dives**!**)	**Pass/Fail**
After-dive maintenance	on land, after first dive; (*passed* grading BEFORE further dives**!**)	**Pass/Fail**
complete dive planning for at least 3 selected training dives during the course, including detailed gas management and decompression planning. The latter must be calculated with at least 2 different deco-SWs for cross-checking.	always on land on the day before the planned dive	**A - E**

Emergency Procedures für: - Low Oxygen Warning - High Oxygen Warning - Low Battery Warning - Battery Failure - Flooded Loop - Cell (Sensor) Warning/Error - Loss of pO_2 control	min. 1x ea. during course; min. grading = C.	A - E

- **Caution:**
  The CCR student must be able to monitor his pO_2 during the entire dive, even during exercises. If this is not possible for more than about 2 minutes (silt-out, rescue, blindmask, Halocline etc.), he/she must immediately switch to the off-board OC bailout.
- Alternatively, it is also possible to switch to SC mode via BOV and periodic diluent flush.
- In both cases, do not forget to switch the controller to OC mode immediately.
- Already because of the strong physical exertion of a **rescue** and the associated danger of the CCR's over-breathing, resp. of a hypercapnia, this exercise must always be performed in offboard OC configuration.
- A change back to the loop may not take place until a) after the solution to the problem has been found and successfully executed and b) after prior control of the pO_2, the controller must also be switched back to CC mode.
- **An instructor must always supervise such exercises 1: 1 and in the immediate vicinity of the student (grip distance)!**

Appendix 8c: Standard drills & exercises for practical evaluation of SCD Cave Diver III / CD3

Remarks

To assure that cave diving training and evaluation within the SCD system is done in accordance with the standards and that the *required* level of competence of the students is as close together as possible, SCD has developed a number of standard drills and exercises for each level.

Every one of these exercises must be performed by the student at least once with a C grading (passed) or better during the course. Every exercise with a grading lower than C (not passed) must be repeated, until the student has attained *two consecutive* C gradings (or better).

Exercises with a binary Pass/Fail grading are safety related issues of great importance. Therefore, they are evaluated on every single training dive. Only two *Failed* gradings of these issues during the course are accepted.

Standard-Evaluation Scheme

All exercises are to be assessed following a uniform evaluation scheme, be it a grading with codes ranging from A - E or a digital Pass/Fail decision.

The standardized grading to be used is the following:

A	**very good; excellent**
B	**good**
C	**average, just passed**
D	**not passed (time, needed support etc.)**
E	**unable to finish drill; had to abort, emergency**

Passed	**(for PASS/FAIL-Exercises only)**
Failed	**(for PASS/FAIL-Exercises only)**

Remark: parts of the shut-down drill are: a) closing tank valve on the side of the leakage b) closing isolator valve, if any; c) switch to other regulator, d) pressure gauge control.

The following listed *standard exercises/drills* must be successfully performed at least once each:

no.	type of exercise	grading
0	**Briefing of the entrusted CCR team for a dive**	A - E
1a	**complete partner-check (head-to-toe, no leakages)**	Pass/Fail
1b	Additionally for CCR: all of the pre-dive functional check required by manufacturer (before every dive; on land / on the shore in the water)	**Pass / Fail**
2	**correctly and completely donning equipment while swimming at the surface in max. 6minutes as a PARTNER-EXERCISE helping each other**	Pass/Fail
3	**Shut-down drill in zone 2 in max. 40 sec.**	A - E
4	**correct laying a line (dist.=50m), starting at entrance (TEAM-EXERCISE)**	A - E
5	**diving without light/visibility along a line towards the cave exit with touch-contact, dist.=APPROX. 200m (blacked out mask glasses) as a PARTNER-EXERCISE (zone 2)**	A - E
6a	**OC: out-of-air situation; octopus-breathing towards the cave exit with touch-contact, dist.=150m ea. (as a donor/receiver) in overhead environment (zone 2) as a PARTNER-EXERCISE**	A - E
6b	**CCR: complete failure of CCR, gas-sharing via longhose with OC diver towards exit (with touch-contact), dist.=150m, (Zone 2)**	A - E
6c	**CCR: switch to bailout, return to exit, zone 2, distance 150m**	A - E
6d	**CCR: flush procedures with diluent (zone 2) and O_2 (=/<6m); max. distance 60-70m**	A - E
7	**UW-signs and signals (all 4 command signals and the most used 10 information- and actions signals)**	Pass/Fail
8	**buddy rescue, minimum up to safety stop at 6m; depth + horizontal distance = approx. 80m, permanently securing continuous air supply; as a TEAM-EXERCISE (start in zone 2)**	A - E

9	**switch to back-up mask (zone 2)**	Pass/Fail
10	**find a "lost" main line with the safety reel/spool (zone 2)**	A - E
11	**to cross and to close a jump with the jump-reel/spool (zone 2)**	A - E
12	**temporarily closing a gap by using a gap reel (zone 2)**	A - E
13	**repairing a cut guideline (TEAM-WORK)**	A - E
14	**stage tank handling: deposits, selection of location, recollection (zone 2)**	A - E
15	**not announced emergency (zone 2); COMPLETE TEAM-EXERCISE**	A - E
16	**freeing him-/herself after entanglement in permanent line with tank manifold (zone 2).**	A - E
17	**guiding a group (leadership) (observing rule of thirds / teaming up / task assignments / buddy-checks, briefings/debriefings by student,)**	A - E

In addition, the following personality- and safety aspects must be evaluated during all dives:

18	**ability to act as a fully integrated team member on land and underwater**	A - E
19	**observation/respect of SCD standards and safety rules**	A - E
20	**correctly gearing up; correct use of material; conform to SCD standards**	A - E

Additionally for CCR:

demonstration disassembly, cleaning all major parts, changing scrubber material, battery exchange, exchange of O_2-sensors, change of all gas-tanks, complete assembly with all checks of unit (calibration etc.)	on land; at start of course (*passed* grading BEFORE first dive**!**)	**Pass/Fail**
first-demonstration of change to bailout	OW, shallow depth; first dive at start of course**!** (*passed* grading BEFORE first dive**!**)	**Pass/Fail**
first-demonstration of diluent- and O_2 flush procedures (=/<6m)	OW, shallow depth; first dive at start of course**!** (*passed* grading BEFORE further dives**!**)	**Pass/Fail**
After-dive maintenance	on land, after first dive; (*passed* grading BEFORE further dives**!**)	**Pass/Fail**
complete dive planning for at least 3 selected training dives during the course, including detailed gas management and decompression planning. The latter must be calculated with at least 2 different deco-SWs for cross-checking.	always on land on the day before the planned dive	**A - E**

Emergency Procedures für: - Low Oxygen Warning - High Oxygen Warning - Low Battery Warning - Battery Failure - Flooded Loop - Cell (Sensor) Warning/Error - Loss of pO_2 control	min. 1x ea. during course; min. grading = C..	A - E

- **Caution:**
  The CCR student must be able to monitor his pO_2 during the entire dive, even during exercises. If this is not possible for more than about 2 minutes (silt-out, rescue, blindmask, Halocline etc.), he/she must immediately switch to the off-board OC bailout.
- Alternatively, it is also possible to switch to SC mode via BOV and periodic diluent flush.
- In both cases, do not forget to switch the controller to OC mode immediately.
- Already because of the strong physical exertion of a **rescue** and the associated danger of the CCR's over-breathing, resp. of a hypercapnia, this exercise must always be performed in offboard OC configuration.
- A change back to the loop may not take place until a) after the solution to the problem has been found and successfully executed and b) after prior control of the pO_2, the controller must also be switched back to CC mode.
- **An instructor must always supervise such exercises 1: 1 and in the immediate vicinity of the student (grip distance)!**

Appendix 9: Theory tests (topics, structure, allocated questions)

A9.1 Cave Diver I to III (CD1 to CD3)

A9.1.1 types / overall content

SCD/CMAS certificate designation (english)	Cave Diver I / CD1	Cave Diver II / CD2	Cave Diver III / CD3
generally used english/international designation	Cavern Diver	Cave Diver	Full Cave Diver
type of test	MC only	MC only	MC+free text
MC: number of questions	20	30	30
open text: number of questions	----	----	10
passing ratio	80%	80%	80%
total number of questions	**20**	**30**	**40**

MC: multiple choice (4 answers per question; 1 or more can be correct)

Passing ratio: minimum number of correct answers

A9.1.2 topics / allocated questions

	SCD/CMAS certificate designation (english)	Cave Diver I / CD1	Cave Diver II / CD2	Cave Diver III / CD3
	generally used english/international designation	Cavern Diver	Cave Diver (Intro-to-Cave)	Full Cave Diver
	Topic			
1	Physics	2	2	2
2	Physiology	2	2	2
3	Gases / Dekompression	0	2	3
4	Cave Genesis / -Protection	2	2	3
5	Ethics (Diver's Etiquette)	1	1	2
6	Zones	1	2	2
7	CD Equipment	4	4	4
8	CD Techniques (Orient./Knots/Comm.)	4	4	4
9	Dive Organisation	0	2	3
10	Dive Planning	0	2	3
11	Emergencies / Emerg. Management	2	2	3
12	Legal Aspects	0	2	2
13	Course Structures / -Organisation	0	0	2
14	Teaching Methodology	0	0	1
15	Standards/Safety Rules	2	3	4
	Total:	***20***	***30***	***40***

A9.2 Cave Diving Instructor I to III (CDI1 to CDI3)

A9.2.1 types / overall content

SCD/CMAS certificate designation (english)	Cave Diving Instructor I / CDI1	Cave Diving Instructor II / CDI2	Cave Diving Instructor III / CDI3
generally used english/international designation	Cavern Diving Instructor	Full Cave Diving Instructor	Cave Diving Staff Instructor
type of test	MC only	MC+free text	no written exam / master thesis req.
MC: number of questions	50	40	
open text: number of questions	----	10	
passing ratio	80%	80%	
total number of questions	**50**	**50**	

MC: multiple choice (4 answers per question; 1 or more can be correct)

Passing ratio: minimum number of correct answers

A9.2.2 topics / allocated questions

	SCD/CMAS certificate designation (english)	Cave Diving Instructor I / CDI1	Cave Diving Instructor II / CDI2	Cave Diving Instructor III / CDI3
	generally used english/international designation	Cavern Diving Instructor	Full Cave Diving Instructor	Cave Diving Staff Instructor
	Topic			
1	Physics	2	1	no theory exam, but Master Thesis required
2	Physiology	2	1	
3	Gases / Dekompression	2	3	
4	Cave Genesis / -Protection	3	2	
5	Ethics (Diver's Etiquette)	2	2	
6	Zones	1	0	
7	CD Equipment	6	8	
8	CD Techniques (Orient./Knots/Comm.)	5	5	
9	Dive Organisation	2	1	
10	Dive Planning	2	1	
11	Emergencies / Emerg. Management	4	4	
12	Legal Aspects	4	4	
13	Course Structures / -Organisation	6	8	
14	Teaching Methodology	4	5	
15	Standards/Safety Rules	5	5	
	Total:	***50***	***50***	

Appendix 10: Visibility and Student:Instructor ratio

The ration between Students and Instructors is depending on various parameters, among them is the actual **visibility** at the dives site.

The following table defines how the student:instructor ratio **during training dives** has to be determined, based on the **training level** and **actual visibility**.

Visibility has to be estimated pragmatically, as it cannot be measured and checked down to the centimeter.

min. visibility from (m)	max. visibility to (m)	cave zone (visibility only)	Grading	max. Student:Instructor Ratio		
				CD1	CD2	CD3
0	<1	3	almost silt-out, not diveable during course	off-limits	off-limits	off-limits
1+	**<3**	**3**	strongly reduced, bad	off-limits	off-limits	1:1
3+	<6	**2**	reduced, sub-average	off-limits	1:1	2:1
6+	<10	2	average, OK	off-limits	2:1	3:1
10+	<15	**1**	good to very good	2:1	3:1	3:1
15+	unlimited	1	excellent, perfect	3:1	3:1	3:1

Legend:
CD1 Cave Diver I / cavern diver
CD2 Cave Diver II / intro to cave diver
CD3 Cave Diver III / full cave diver

Please note:

- With visibility of 1m or less, no more training dives must be executed
- Visibility is not the only parameter to be observed, but also current, planned dive profile & exercises, actual skill level of the students and their physical and mental state.
- every instructor is free to reduce the ratio to 1:1 at any time he deems necessary
- in case of any doubt the safer variant has to be chosen
- **It is not allowed to execute any dives with Cavern Divers (CD1), which - based on visibility alone would require a student:instructor ratio of 1:1!**

Appendix 11: The SCD cave diver's 10-point etiquette (code of conduct)

1) We want to be (and to stay) welcomed guests everywhere and thus show a corresponding attitude.

2) We use the least possible number of vehicles for transportation to our dive sites and at the site we do not block any roads, footpaths and entries or exits.

3) We are polite with local residents and other guests on site and respect their justified concerns and requests as well as we respect local legislation.

4) At the site we change our dresses discretely and always strive for showing a correct attitude and behavior in public.

5) We do not produce any unnecessary emissions, we don our equipment while keeping a low profile and in orderly manner, we do not leave any trash behind and we restrict our presence to the necessary minimum.

6) Our attitude towards other divers - regardless which organization they are coming from - is the one of good colleagues; there is no room for arrogance of any kind.

7) Safety in cave diving is our honest and most focused concern; we strictly abide to the standards, safety rules and procedures and are defensively diving.

8) I've got a top training, because I know: **every incident may create a dive ban more** and **without proper certification, there is no insurance coverage.**

9) Alcohol and drugs before diving activities are both deadly sins and are completely banned in our sport.

10) The underwater attitude is so that any impairment of the flora and fauna of the cave and its environment is reduced to a bare minimum and the former state of the delicate ecosystem will be retained.

Please keep in mind: ONE single disorderly behaviour can destroy the good reputation of a group which has been carefully built up over the years and may cause the closing of a site !

Appendix 12: Units of Measures / Conversion Tables

Those are the conversion units used throughout the SCD Cave Diving Standards:

Lengths

m	ft	comment
0.30480	1	ratio ft <-> m
1	3.28084	ratio m <-> ft
1.5	5	recommended length of longhose in ovhd. env. with sidemount but w/o scooter
1.8	6	Min. length of longhose in overhead environment with BM config., w/o scooter
2.1	7	recommended length of longhose in overhead environment WITHOUT scooters = min. length in overhead environment WITH scooters
2.4	8	max. length of longhose in caves WITHOUT scooters = recommended length of longhose in overhead environment WITH scooters
3	10	max. length of longhose in overhead environment WITH scooters
4.5	15	common depth for safety stop (with no deco-obligation)
6	20	depth limit for use of 100% O_2 mixture
10	33	10m/minute = standard ascent rate while breathing air / 33ft sea water or 34ft of fresh water correspond to 1 bar of pressure
18	60	
20	66	depth limit for Cavern Diver; depth limit for use of 50% O_2 mixture
30	100	depth limit for Cave Diver; minimum length for jump-/gap reels
40	133	depth limit for Full Cave Diver (EAD)
50	166	minimum line length for safety reels/spools; max. dist. to surface for Cavern Diver
80	266	minimum line length for primary reel
100	332	

Pressures

bar	psi	comment
0.06803	1	ratio psi <-> bar
1.013	14.7	standard atmospheric pressure at sea level
50	735	mostly used as „reserve-pressure“ during OW dives
180	2646	very old European norm for SCUBA tank filling pressure rating
200	2’940	longtime European norm for standard SCUBA tank filling pressure rating
232	3’410	new European norm for standard SCUBA tank filling pressure rating
300	4’410	current European norm for 300 bar systems

Volumes (liters of expanded gas at 1 bar)

For the sake of simplification, *ideal* gas behavior is assumed.

liters	cft	comment
1	0.03531	Ratio liter <-> cft
500	17.66	2.5l / 200bar (O_2-tank, Argon-tank)
800	28.25	4l / 200bar (classical O_2-tank)
1400	49.44	7l / 200bar
2000	70.63	10l / 200bar
2400	84.76	12l / 200bar
3000	105.94	15l / 200bar
4000	141.26	20l / 200bar

cft = cubic feet / effective content with compressed air reduced approx. by 5% at 200bars, reduced by 10% at 300bars

cft	liters	comment
1	28.3	ratio cft <-> liter
40	1’132.7	deco-tanks / O_2-tanks
50	1’415.8	deco-tanks / O_2-tanks
80	2’265.3	Aluminum-stage tank or backmount set; corresponds to 11.1l / 200 bar metric
100	2’831.7	
140	3'964.4	corresponds approx. to 20l / 200bar metric

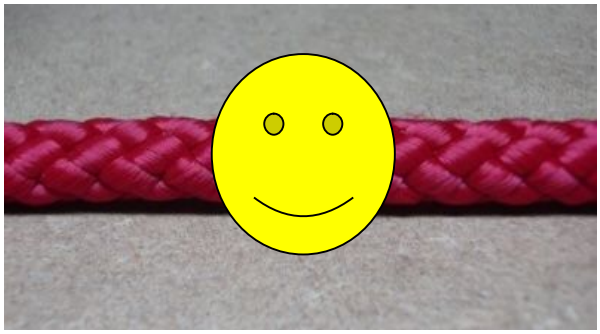
Appendix 13: Line material, line sizes, breaking points and US designation codes

Material

It has strictly to be observed that only lines made from Nylon are used, a fabric that is heavier than water and therefor will sink to the bottom.
Under no circumstances Polypropylene must be used or generally speaking, no fabrics which are lighter than water. In such cases, loose line ends will float and represent a considerable hazard for any divers.

Workmanship

Regardless of the size, *braided* lines only have to be used, not the cheaper *laid or twisted* lines. The values indicated below for tensile strength and breaking point are average values for Nylon.



Diameter and designation codes for lines

In Europe and in all other countries with the metric system in use, line size (diameter) is expressed in mm (1 Millimeter = 0.001 Meter). However, especially in the USA and some other countries, a numbering code is used, which is not easily readable for us Europeans. It expresses the diameter of the line as a fraction of an inch (1 in. = 25.4mm).

Following is a table with the most currently used sizes (the # - sign is spelled as "number", the sign “ means "inch" (25.4mm).
In countries with the metric system the following line sizes are used: 1.5mm / 2mm / 2.5mm / 3mm.

Code	Diameter in metric units [mm]	Diameter in US-units [in]	approx. tensile strength/breaking point (Nylon) [kg]	approx. tensile strength/breaking point (Nylon) [lbs]
#18	1.58	1/16" = 0.0625	65.4	144
#24	1.86	0.073	104	230-250
#36	2.11	0.083	150	330-360
#48	2.48	0.098	182	405-550
1/8“	3.18	0.125	331	728

The size mostly used is #24 or #36, very close to the sizes used in Europe. For caves with strong currents and walls with sharp cutting edges, even a #48 or 1/8" line may be preferable.

Appendix 14: Knots, Bends and Hitches

A knot is a method for fastening or securing linear material such as rope by tying or interweaving. It may consist of a length of one or more segments of rope, string, webbing, twine, strap or even chain interwoven so as to create in the line the ability to bind to itself or to some other object - the "load". It can be used to fix a piece of equipment (or any other suitable item) to a line or rope.
A knot can be generated by taking the loose end of a line (the working end), by pushing it through a loop and by tightening then, or by connecting different lines and ropes. The manual skill to make a correct knot and the knowledge about which knot to use for what purpose is absolutely essential for carrying out of several activities directly linked to cave-diving, especially for safety-related issues.

A14.1 Potential fields of use

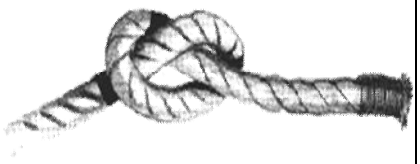
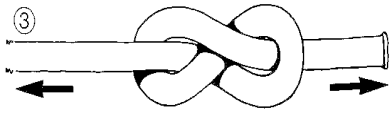
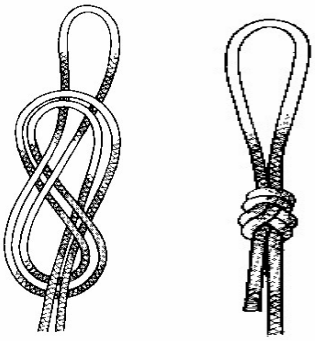
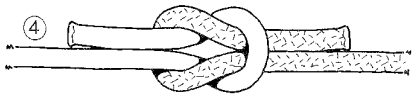
Knots are used for:

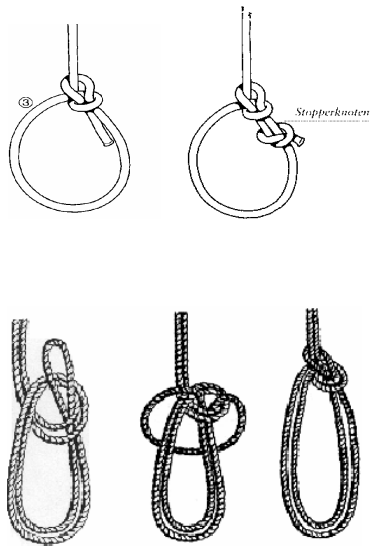
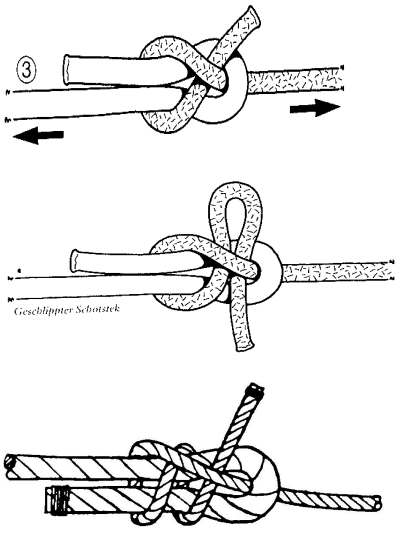
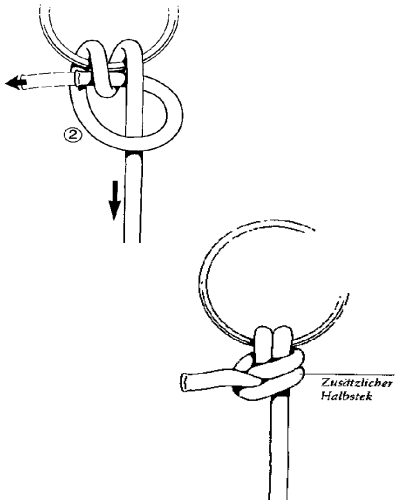
- ***securing and connecting persons***
- ***connecting lines and ropes***
- ***shortening of lines and ropes and putting them under tension***
- ***securing other knots and bends***
- ***securing and lifting of loads***
- ***securing equipment and parts thereof***
- ***anchoring on moorings***
- ***adding some weight on line ends***

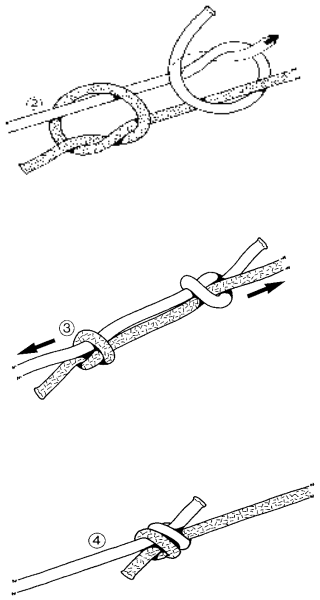
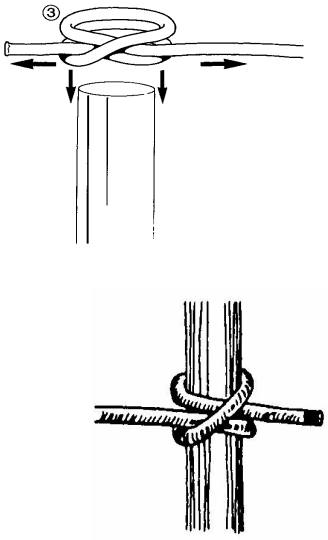
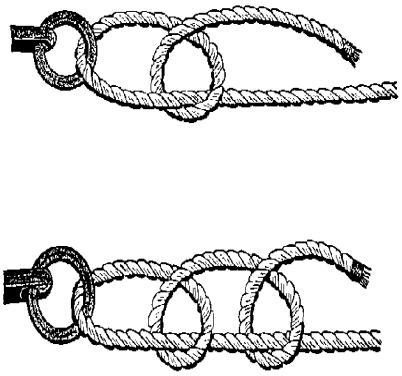
A14.2 Overview of most important knots, bends and hitches for divers

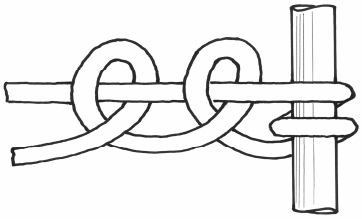
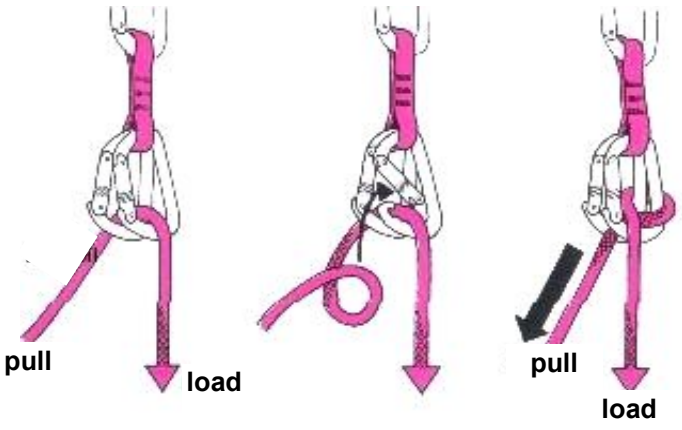
- ***Overhand Knot***
- ***Figure Eight Knot*** **(single / double)**
- ***Reef Knot***
- ***Bowline*** **(single / double)**
- ***Sheet Bend*** ***(single/double, on slip)***
- ***Anchor Bend***
- ***Clove Hitch***
- ***Fisherman's Knot***
- ***Half Hitch*** **/** ***2 Half Hitches***
- ***Round Turn with 2 Half Hitches***
- ***Garda-Knot***

A14.3 Knots for CD2 and CD3 training

English term		
Overhand Knot	***Figure Eight Knot (single / double)***	***Reef Knot***
	 	

Bowline (single / double)	***Sheet Bend (single / double)***	***Anchor Bend***
		

English term		
Fisherman's Knot	***Clove Hitch***	***Half Hitch / 2 Half Hitches***
		

Round turn + 2 Half Hitches	***Garda Knot***
	

Appendix 15: Purity of gases – Grade notation

It is worldwide establish to use the so-called grade- or point-notation for the indication of the purity of a gas.
This designation serves to give an abbreviated but nevertheless precise indication on the minimum content of a gas by means of two digits, separated by a (decimal) point.

Example:
The digit in front of the point indicates the number of „9“ within the purity percentage for the pure gas. It is assumed that there are always two „9“ in front of the decimal point, meaning that the purity is always greater than 99%.
.
The digit after the point, indicates the first digit that diverges from „9“ after the decimal point in the purity percentage.

purity grade-class	*grade-notation*	*min. content of pure gas*	*max. contamination [ppm]*
	2.0	99.0 %	
Pure gas	**2.5 (e.g. O_2)**	**99.5 %**	5000
	2.9	99.9 %	1000
	3.0	99.90 %	
High purity gas	3.5	99.95 %	500
	4.0	99.990%	100
	4.6 (e.g. He)	**99.996 %**	400
	4.9	99.999%	10
	5.0	99.9990%	
Ultra high purity gas	5.5	99.9995 %	5
	5.8	99.9998 %	
	6.0	99.99990 %	1

Sources: http://www.top-gas.de/web/media/pdf/Reinheit_von_Gasen.pdf
http://www.gasetechnik24.de/Infos/gasreinheit.htm

Appendix16: Diving with scooters during Swiss Cave Diving events (outside courses)

1) Only **class 3 scooters according to SCD/CMAS classification may** be used in the overhead area (ref. to SCD / CMAS Technical Specifications for Scooters).
Note: these are such types from Suex, Bonex, Silent Submerge and Gavin (not conclusive).

2) At least a Cave Diver II certificate (CD2) plus a Sidemount Diver II (TEC, OW) certificate is required for the use of a scooter in the cavern area (zone 1). From zone 2 on, a Cave Diver III certificate (CD3) plus a Sidemount Diver III (TEC, Overhead) certificate is required.

3) Scooters may only be used in such caves, which *all* divers of the team have **already dived at least two (2) times by fins.**

4) From **zone 2 onwards**, scooters may only be used if *all* divers of the team can prove **at least 20 scooter dives (also in open water**)

5) The **rule of thirds (1/3 in, 1/3 out, 1/3 reserve)** also applies to the use of the **battery capacity for the main scooter.** The **burntime of the backup scooter** must last so long that it can be used for the entire **return journey to a maximum of 2/3**. This results in a mathematical calculation that the **burntime of the backup scooter must be at least 50% of the burntime of the main scooter** of the diver, if both are about equally fast (otherwise this must also be taken into account, see last part of this appendix).

6) The **maximum penetration** distance is determined by the scooter in the team with the shortest burn time (provided that not other parameters such as decompression or gas supply are more restrictive!).

7) **Distance Range 1 (close range):** If the maximum penetration distance in the planned cave is within the distance that all members of the dive team have reached at least twice (2x) with finning, then **no backup scooter** is required *(although generally recommended).*
The gas planning for each individual diver must however be designed to ensure that an *autonomous* return by finning (incl. deco) from the furthest point is still ensured.

8) **Distance range 2 (intermediate range):** When exceeding the penetration distance already reached by *all* participants with fins in the cave to be penetrated, but within a radius in which the individual gas planning reveals that an autonomous return with fins (incl. deco) is still guaranteed, the following *minimum criteria* are applicable **(principle: at least 1 backup per GROUP)** :

no. divers	no. backup scooters	total scooters	max. scooter failure WITHOUT towing	max. scooter failure WITHOUT finning	comments
1	1	2	1	2	not acceptable!
2	1	3	1	2	
3	1	4	1	2	
4	1	5	1	3	
>4					not acceptable; too big!

9) **Distance range 3 (long-distance range):** For *all* other dives with an even greater penetration distance, without the possibility to return by finning from the furthest point (including deco), the following *minimum criteria* must be applied **(principle: at least 1 backup per 2 divers):**

no. divers	no. backup scooters	total scooters	max. scooter failure WITHOUT towing	max. scooter failure WITHOUT finning	comments
1	1	2	1	1	not acceptable!
2	1	3	1	2	
3	2	5	2	3	
4	2	6	2	4	
>4					not acceptable; too big!

10) The **dive plan** to be submitted in writing must cover the following **worst case scenarios** with regard to a safe return to the entrance:
- for dives under point 7) and + 8) / distance range 1 and 2: the return of one (1) diver by finning incl. deco-stops must be guaranteed by the gas supply (proved by calculation).
- for dives under point 9) / distance range 3: the towing of a (1) diver including deco-stops has to be guaranteed by the gas supply (proved by calculation).
- at the most distant point, one (1) diver at the *same time* completely loses the contents of one (1) tank with the mixture currently being used.
  It must now be proved by calculation that there is still enough gas for the diver to return safely (incl. deco-stops), possibly by means of a longhose with another team member. For this, each diver must have enough gas to be able to help one (1) other team member in this scenario.

Parameter for dive planning (with and w/o scooter / s. pt. 10)

With the following guidelines (which are based on our own measurements and experiences from the last 8 years of our cave diving seminars), a realistic and comparable dive planning is ensured.

The following values should be used for dive planning:
- specific consumption while finning: **25 l/min/bar**
- specific consumption while scootering: **20 l/min/bar**
  If you have your own experience and measured values, which are higher, you must use them.

- swimming speed with fins: **300m / 20 min. (approx. 18m/min)**
  If you have your own experience and measured values, which are lower, you must use them.

- scooter speed with one (1) towed diver: **80% of manufacturer's claim** for the maximum speed
- scooter speed with two (2) towed divers: **25% slower** than with 1 diver

  As a *non-binding statements* (the corresponding tests have been taken from diving publications and websites), it can be said that most recent class 3 scooters with one (1) towed diver with backmount twin tanks and max. 1 stage, attain maximum speeds of 50-60 m / min.

  If you have your own experience and measured values, which are lower, you must use them.

All speeds given above are measured and experience-based values which apply to unhindered swimming, if the profile of the cave passage is appropriately spacious. If, as is known, the course size, the profile, etc., do not allow such a movement (i.e. due to restrictions etc.), then this must be taken into account accordingly.

Standards & Training System

Calculation of the required burntime of the backup scooter (scooter / pt. 5)

The required burntime will be calculated as follows:

$$\mathbf{BT}\_back\ \mathbf{(req.)} = 0.5\ *\ \mathbf{BT}\_main\ *\ \frac{\mathbf{v}\_main}{\mathbf{v}\_back\ *\ \mathbf{f}\_tow}$$

whereas:

BT_main	*burntime of main scooter (in minutes)*
BT_back	*burntime of backup scooter (in minutes)*
v_main	*maximum speed (with 1 diver) of main scooter (in m/min); measured or manufacturer's data*
v_back	*maximum speed (with 1 diver) of backup scooter (in m/min); measured or manufacturer's data*
f_tow	*speed reduction factor for towing;* *1 diver alone (standard): **f_tow = 1**;* *1 add. diver: **f_tow = 0.80*** *2 add. divers: **f_tow = 0.60***

Appendix 17: Additional registration form für CCR-diver

Use of CCR during SCD
Cave Diving Training Courses

Dear Course-Participant / Student
You signed up for a cave diver training course of Swiss Cave Diving have expressed the intention to use a CCR throughout this course.
Thank you very much for your confidence. You have already received the standard registration documents for the general course administration (or you get everything together with this form). Please fill out duly and completely the questionnaire and return it in due time to the course administration.
We kindly remind you, that all types of SC, CC- or even OC-units fall under die **European Directive 2016/425** for PSE (personal safety equipment), which is also valid in Switzerland. In Switzerland, it's governed by the **"Law on Product Safety"**, **PrSG SR 930.11** and in its ordnance **PrSV SR 930.111** , in the **„Law on the Safety of Technical Installations and Equipment", STEG, SR 819.1**, as well as in the corresponding ordnance **STEV, SR 819.11.**
All diving apparatus', whether OC, SC or CC fall into the **PSE Category III**, they must not be brought onto the market without a CE Declaration of Conformity. The technical examination for CCR follows the rules of **SN EN 14143** (harmonized European testing norm for „**Breathing Apparatus' - Autonomous Regeneration Breathing Apparatus'**" which has been fully integrated into Swiss legislation also).

In order to give the course director all necessary technical information in due time before the course, we kindly ask you to give the data below. This sheet is an integral part of your registration.

Manufacturer: .....

Type / model / Trade name: .....

Serial-No.: .....

CE-Declaration of Conformity (ID/# of certifying body): CE .....

Type of function (eCCR, mCCR, hCCR, other): .....

Scrubber time accord. to EN 14143 (manufacturers declaration): .....

Used absorber material, authorized by manufacturer: .....

Used offboard/offline OC-bailout system (EN250:2014): .....
(number / tank volumes / filling pressure / EANx-compatibility)

Minimum/maximum operation temperature (manufacturers data): ..... °C / ..... °C

Authorized diluent-gases / max. depth accord. to CCR training: ..... / ..... m

I own this unit since: ..... months purchased as new ☐ used ☐

Do you have a complete Owner's Manual in your possession? yes ☐ no ☐

I fulfill ALL other requirements for the CCR use in the course: yes ☐ no ☐
(50 dives->CD1 / 100 dives->CD2 OW experience with unit, CCR-training certificate)

The undersigned confirms to have fully understood the legal basis, that all above statements are true and correct and given to the best of his/her knowledge.

Place/Date: ..... Signature: .....

Attachments: copy of CE Declaration of Conformity / confirmation from supplier (facultative, if CE-# is present)
copy of training certificate from manufacturer or from authorized training center / instructor
copy of Pre-Dive AND Post-Dive Checklist from manufacturer

Beat Müller, Cave Diving Staff Instruktor SCD/CMAS.CH, Grossmattstr. 8, CH-8964 Rudolfstetten
Tel. +41 (0)56 631 25 25 - e-mail: btmueller@bluewin.ch

Appendix 18: Annual Report for Instructors of Swiss Cave Diving

Annual report for Swiss Cave Diving Instructors

Passed year: .....

Family name: ..... First name: .....

Address: ..... eMail: .....

CIP/Town: ..... Country: .....

(please all entries in BOLD letters!

A) Administration:

Annual membership fee paid (CHF 20.-)	yes ☐	no ☐
Valid diver's medical <= 1 year	yes ☐	no ☐
Liability insurance CHF 4+ Mio. (or corresp. amount in other currency)	yes ☐	no ☐
Extract from judicial record, max. 1 year old (Staff-Instructors only; every 2 years)	yes ☐	no ☐

B) Private dives: Total ..... (min. 50 during the past year)

in the following environm.: cave ☐ mine ☐ wreck ☐ under ice ☐ OW(lake/sea) ☐

with the following configuration backmount ☐ sidemount ☐ DPV ☐

with following type: OC ☐ SCR ☐ CCR ☐ (please tick as appropriate)

C) SCD-courses:

		no. courses	no. stds.	function/position CD	function/position A	
Cave Diving OC	CD1-3	.....	.....	.....	.....	requested status: for next year ☐
Cave Diving CC	CD1-3	.....	.....	.....	.....	requested status: for next year ☐
Sidemount Diving	SMD1-3	.....	.....	.....	.....	requested status: for next year ☐
DPV Diving	DPVD1-3	.....	.....	.....	.....	requested status: for next year ☐

CD: Course Director
A: Assistant

A: active
I: inactive

D) Other projects/acitivities for SCD:

.....

.....

The undersigned instructor confirms, that all above statements are true and correct and given to the best of his/her knowledge.

Place/date: ..... / ..... **Signature:** .....

Duly filled out form has to be sent with all attachments to the Training Director walter.gallmann@swissonline.ch until 5 January. Thank you!

Appendix 19: Glossary

SCD / SCDI	Swiss Cave Diving / Swiss Cave Diving Instructors
CMAS	Confédération Mondiale des Activités Subaquatiques / World Underwater Federation
NACD	National Association of Cave Divers
NSS/CDS	National Speleological Society / Cave Diving Section
CDAA	Cave Diving Association of Australia
CDG (UK)	Cave Diving Group (UK)
SNSS	Scuola Nazionale di Speleologia Subacquea
NAUI	National Association of Underwater Instructors
PADI	Professional Association of Diving Instructors
IANTD	International Association of Nitrox and Technical Divers
TDI	Technical Diver International
SSI	Scuba Schools International
CMAS.CH	CMAS Switzerland, member TC of CMAS International
TD	Technical Diving (Nitrox, Trimix, Caves)
HT (German)	Höhlentaucher (cave diver)
CD	Cave Diver, but also used for: Course Director (Staff Instructor); synonym: Instructor Trainer
Staff Instructor	Diving instructor who is primarily responsible for the training of other instructors (also as a course director of ITCs). Also termed Instructor Trainer in other training agencies.
TG/HTG	(German: Tauchgang / Höhlentauchgang); a dive, a cave dive
z1, 2, 3	Cave zone 1 (Cavern), 2 (Cave), 3 (Full Cave, Penetration)
CD1, 2, 3	Cave Diver I (Cavern Diver) / II (Cave Diver) / III (Full Cave Diver)
CDI 1, 2, 3	Cave Diving Instructor I (Cavern Diving Instructor) / II (Full Cave Diving Instructor) / III (Cave Diving Staff Instructor)
D* / ** / ***	CMAS (Open Water) Diver 1-star / 2-star / 3-star
old: M* / ** / ***	old: CMAS (Open Water) Moniteur (Instructor) 1-star / 2-star / 3-star
new: I1 / 2 / 3	new: CMAS (Open Water) Instructor 1 / 2 / 3
OWD	Open Water Diver (CMAS 1*)
AOWD	Advanced Open Water Diver (CMAS 2*)
DM	Divemaster / Diveguide on level CMAS Diver 3*
penetration zone	SCD zone 3 (after restriction / squeeze)
sinkhole	a round shaped cavity (dome), with an opening created by the collapsed ceiling
sump	Sumps are defined as water filled sections of a cave within an otherwise air-filled passage (German word: "siphon").
spring; effluent cave, outflow cave	A spring is defined as the entrance to a cavern or cave system in which the water flows out of the ground. For cave divers it's of the safer type because for returning, much less physical exertion is needed combined with less gas consumption as during penetration.
estavelle; intermittent resurgence /-exsurgence	Water filled caves with the current periodically changing from inflow to outflow and vice versa. Like this the caves has the characteristic of a

	spring at one time and the one of a sinkhole another time. Reasons may be tides (caves on the coast) or seasonal changes of the water table in relation to the receiving water level. This kind of cave can be very malicious, especially with a change of current during the dive.
siphon, sink, swallow hole, swallet water	A siphon is defined as the entrance to a cavern or cave system in which the water flows into ground. Diving in siphons is discouraged, but if done then only with great caution and with adequate technical support (scooter, safety lines etc.). Rule of Thirds MUST NOT be applied.
penetration- (zone)	SCD zone 3 (after a minor restriction or even smaller)
minor restriction	A cross section area that does not permit 2 divers to pass with their equipment at the same time (threshold zone 2 -> zone 3).
major restriction	A cross section area that a single diver can just negotiate in a back-mount configuration
squeeze	A cross section area that a single diver can negotiate with a side-mount configuration
tight squeeze	A cross section area that a single diver can only negotiate with a no-mount, single- tank configuration, while pushing this tank in front of him.
gap	(unplanned/unintended) interruption of a main line
jump	(intended) gap at a junction/bifurcation from main line to a side passage
visual jump	generally a small jump (ranging from some centimeters to meters) which has been traversed without a jump-line (strictly forbidden)
reel	generic designation for a line reel
spool	very small reel without handle
primary reel/spool	main reel; mostly 1 per group with 50m in zone 1 to 80m (zone 2+3) of line
safety reel/spool	personal reel/spool; for finding lost line etc. with approx. 50m of line; never to be given away (the spool type is more preferable)
gap reel/spool	a reel/spool for crossing/repairing/fixing a gap; approx. 30m of line
jump reel/spool	a reel/spool for temporary crossing a jump; approx. 30m of line
directional marker	a colored marker in the form of an arrow or a rectangle which may be attached to the line, always pointing to the entry/exit.
non-directional marker	a colored marker in the form of a round disk which may be attached to the line. Because of their form sometimes called cave-cookies or line-cookies.
distance marker	(in French: métrage) generally a piece of duct tape permanently attached to the line
isolator valve	valve in the middle of a double-tank manifold, used in emergencies for interrupting the connection between the two tanks
stage tank	additional tank, carried during the dive and/or deposited in the cave
primary tanks	Used term for the two main tanks of a sidemount configuration; can also be used for the twin tanks of a backmount rig.
HID	High Intensity Discharge light

Standards & Training System

LED	Light Emission Diode (lighting system based on this technology)
EAD	Equivalent Air Depth: depth with equivalent pN_2 as for air-breathing
MOD	Maximum Operation Depth: max. operation depth of a normoxic or hyperoxic gas with $pO_2 = pO_2$_max.tol. (1.4-1.6bar)
MinOD	Minimum Operation Depth: min. operation depth of a hypoxic gas with $pO_2 = pO_2$min.tol (mostly 0.18 bar)
Ceiling	a) the upper part ("roof") of a cave passage b) the shallowest possible ascent depth which may be reached due to the actual decompression requirements
BC, BCD	Buoyancy Compensator Device (vest, jacket)
SPGS	Submersible Pressure Gauge (finimeter)
SMB	Surface Marker Buoy
a dangly	a piece of equipment loosely hanging down, not closely attached to the body
(UW-)Scooter	a submersible diver operated vehicle, with the pilot being towed behind or riding on top
DPV	Diver Propulsion Vehicle (mainly used in US for uw-scooter)
ADV	Advanced Diving Vehicle (used by SUEX)
UPV	Underwater Propulsion Vehicle
propulseur	French term for underwater scooter
OOA-situation	Out-of-Air situation
OOG-situation	Out-of-Gas situation (same; more general term for any gases)
CPR	Cardiopulmonary Resuscitation
BLS	Basic Life Support
MC	Multiple Choice (-test)
CCR	Closed Circuit Rebreather
SCR	Semi-closed Circuit Rebreather
mCCR	manual CCR; manually operated CCR by diver (O_2-supervision and injection)
eCCR	electronically-controlled / electronic CCR; (O_2-addition) via sensors and microprocessor
hCCR	hybrid CCR; O_2 base consumption covered by constant-flow, remaining part added/injected manually on demand by diver
paSCR	passive addition Semi-closed Circuit Rebreather
Diluent / DIL	Diluent gas (in the loop)
Bailout	Bailout; procedure how to switch to an external (offboard) breathing system after serious failure of the loop.
Staged Bailout (Gas)	Sometimes, the bailout gas will be deposited at various locations within the appropriate MOD
Flush	Scavenging of the loop with diluent (from inboard/offboard tank)
Loop	Everything that is inside the closed system; mostly the gas volume in the inhalation part (inhalation hose and inhalation counter lung)

Standards & Training System

Setpoint (_LOW; _HIGH)	Setpoint for the desired minimum/maximum pO_2 in the loop; will be maintained as constant as possible by permanent measures and manually/electronically governed injection of O_2.
Scrubber / „breathing chalk“	CO_2-absorbent („soda lime“), based on mixture of NOH, KOH, Ca(OH)2, silicates, moisture; chemical transformation of CO_2 into carbonates. Most often in the form of granules.
Cannister	Container with absorbent material, gas passages, sensors and injection valves
O_2-sensors	Galvanic cells, which measure the pO_2 present in the loop; usually 2 or 3 times redundant; measuring signals control the O_2 solenoid via the control unit
Gas-/Switchblock	Block of metal with mostly several inputs and outputs; usually separated for O_2 and DIL. Either fixed screwed connections or by means of quick couplings (e.g., Schrader Valve, Swagelok QC4 / 6). Connections to offboard Bailout / O_2 possible (so-called offboard connection). Supply lines, e.g. individually shut-off (inline shutoff-off valves).
Solenoid	Electro-mechanical valve, which is governed by the control unit and which injects O_2 according to the predetermined setpoints
ADV	Automatic Diluent Valve; automatic injection valve for diluent gas; reacts on the volume reduction of the counter lung
OC/DSV	Open circuit integrated second stage in Dive Surface Valve aka BOV
BOV	Bailout Valve; a complete 2nd regulator stage integrated in the mouth piece with gas feeding via diluent or offboard bailout-gas
CL	Counter Lung; volume approx. 4-5 Liter
Minimum Loop volume	The loop volume is about equal to a comfortable inhalation breath (more gas would be a nuisance and wasted)
Bottom-out	s. Minimum Loop Volume; loop (counter lung) is completely empty after one inhalation breath
CU	control units; micropressors; control of the sensors, decompression-calculation. Mostly 2 independent units (master/slave)
HUD	head-up-display; display system, in which the user can maintain his or her head orientation, because the information is projected into his field of vision. Here: color LED for controlling the pO_2, mounted on the DSV
Sanity Breath / Anxiety Breath	One or more breaths from the diluent gas; if BOV directly connected to diluent, one can be breathe from this one; if from loop, then a repeated flush with diluent (risky) should be made first. Reasons: too high / too low a pO_2. The safest method is the sanity breath from an offboard / offline OC system with precisely defined gas content!
Pre-Dive Check	All compulsory controls BEFORE the dive on land
Pre-dive breathing or pre-breathe	Breathing cycle from CCR on land immediately before the dive, part of the pre-dive check. By doing so, the chemical absorption process in the scrubber is properly started. Should be at least 5 'at low water temperatures, approx. 3' at higher temperatures.
ROT	Residual Oxygen Time; remaining (absorbed) O_2 after a certain surface interval
SI	Surface intervall (-time)

Standards & Training System

OTU	Oxygen Toxicity Unit; unit for whole-body uptake of O_2, especially of the lungs
CNS%	Percentage of O_2-saturation of the central nervous system
EN 250:2014-07	Respiratory equipment - Open-circuit self-contained compressed air diving apparatus - Requirements, testing and marking
(SN) EN 14143:2013-10	harmonized European Testing Norm for „Breathing Apparatus - Autonomous Regeneration Diving Apparatus“; has been transferred into Swiss legislation (SN = Swiss-Norm)