# Certified Diver Medic®

# Instructor Application Criteria

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**National Board of Diving & Hyperbaric Medical Technology**
www.nbdhmt.org

## Diver Medic Instructor Application Criteria

**Pre-requisites**
Applicants are required to provide written documentation of formal and appropriate training in the physics, physiology and anatomic aspects of diving medicine. *This should be identified as Exhibit A.*

Applicants must provide written documentation of previous teaching experience. Examples included ACLS and ATLS Instructor status; graduation from military instructor medical training programs, with subsequent assignment to duties utilizing these skills; faculty from previous diving medical training programs, such as the NOAA/UHMS Diving Medical Officer Course; and other teaching responsibilities as approved by the Board. *This should be identified as Exhibit B.*

Applicants must provide written documentation of previous training in multiplace chamber operations. Further, such documentation should include multiplace chamber operational experience. *This should be identified as Exhibit C.*

Applicants must provide written documentation of clinical case management experience involving diving and related decompression accidents, with particular reference on onsite/early patient assessment and therapeutic compression. *This should be identified as Exhibit D.*

**Application Procedure**
Individuals applying for certification as a DMT Instructor must apply in writing to Board headquarters.

The letter of application must include a detailed curriculum vitae (resume), a recent (within two years) passport size photograph, signed on its reverse, and an applicant fee of $150.00.

Each applicant is required to submit a DMT training course curriculum that the applicant intends to teach. The curriculum must utilize the guidelines provided on page 2 as minimum course content. Each topic must reconcile the DMT certification examination content criteria noted in Appendix I. The curriculum should include a list of topics, subject matter to be covered, subject time frames, the CVs (resumes) of any additional faculty members, and a description of the teaching facility, including chamber type.

Further, the application package must include a narrative of how and where the prospective DMT Instructor intends to provide diver medic training, and with what estimated frequency. Specific reference to program promotion and the likely source of DMT students will be helpful to the Board's deliberations.

**Review Procedure**
Once the completed application package has been received by Board headquarters it will be forwarded to the Committee on DMT Instructor Certification, for review and disposition. A decision will be made, and the applicant notified, within forty-five (45) days of Board receipt of a fully completed application package.

Where the applicant is successful, they will be designated provisional DMT Instructor status. A probationary period of two years will take effect from the application approval date. At the completion of the probationary period the DMT Instructor Committee will consider full DMT Instructor status, based upon DMT student course/instructor critiques, teaching activities and an on-site program audit.

Should the Committee consider an extension of probationary period for any reason the Instructor will be notified in writing. Specific concerns will be identified and recommendations to address shortcomings.

The extended probationary period will again last for two years. During this time it is anticipated that the Instructor will work to resolve any considered deficiencies. Upon completion of this probationary period, the DMT Instructor Certification Committee will again take the activities of the Instructor under review.

Disposition will be to either advance to full Instructor status or, if in the opinion of the Committee, delinquencies have not been resolved, withdraw the individuals DMT Instructor certification. If this latter step is deemed necessary, the Instructor will be notified in writing and provided with specific supportive documentation.

**Instructor Re-registration**
DMT Instructors are required to re-register every two years. Re-registration is based upon teaching activities and documentation of diving medicine-specific continuing education. Each DMT Instructor will be provided with appropriate compilation forms, in this regard. These completed forms, and a $150.00 re-registration fee, must be forwarded to Board headquarters 30 days prior to the registration expiration date.

**Appeal Procedure**
Where an applicant is denied DMT Instructor status and does not agree with the written assessment provided by the DMT Instructor Certification Committee, the applicant may appeal this decision. Any appeal should be made in writing and forwarded to the attention of the 'Appeals Committee' at Board headquarters. The applicant should clearly outline the basis for their disagreement, and provide supportive documentation, where appropriate.

The Appeals Committee (nominated by the Board's president) will take this disagreement under review. The majority decision of the three person Appeals Board is necessary to overrule the DMT Instructor Certification Committee. The applicant will be provided with a decision within forty-five (45) days of the Board's receipt of the appeal.

## Instructor Approval Requirements

1. Written application
2. Curriculum vitae/resume
3. Reverse signed passport photograph
4. Application fee of $150.00
5. DMT course curriculum
6. Narrative summary of plans to teach
7. Exhibit A: diving medical training verification
8. Exhibit B: documentation of teaching activities
9. Exhibit C: multiplace chamber training
10. Exhibit D: clinical case management experience
11. Exhibit E: list of professional references

## Curriculum – Diver Medic Training

The following material outlines the content of an NBDHMT approved course in diving medicine. The material is organized into three sections.

1. Instructor Responsibilities
2. Content Outline

**Instructor Responsibilities**

1. Provide or require adequate reading material for class work and respective study
    a. Appropriate chapters from USN (and/or NOAA) Diving Manuals
    b. Daugherty's Field Guide for the Diver Medic (2013 edition)
    c. Recognized books on diving medicine
    d. Specific articles from related medical textbooks and/or journals
2. Prepare lectures and demonstrations based on Content Outline and Knowledge and Skills Objectives
3. Inform students as to instructor's policies and expectations concerning reading assignments, any required homework, lectures and demonstrations
4. Coordinate DMT certification examination proctorship with the Board
5. Prepare skills demonstrations and practice sessions
6. Prepare a series of interim and final sham treatments of realistic simulated diving emergencies to demonstrate assessment, triage, diagnosis management and sequencing of treatment steps, records and reporting
7. Assemble adequate diagnostic equipment and materials
    a. Pen light, blood pressure cuff, stethoscope, otoscope, tuning fork
    b. Sample records forms, treatment sheets, neuro sheets
    c. Audiovisual equipment, handouts, case histories, books, manuals, journals

**NBDHMT Approved Course Outline**

This content outline addresses the core aspects of diving medicine and related operations. It represents the scope of information that should be taught. The outline summarizes a standardized curriculum in diving accident management. It is designed to prepare the prospective DMT to evaluate and initiate treatment of diving accidents and injuries and follow directions from medical control physicians.

**1. Introduction**

- a. Preview of skill and knowledge objectives, major course topics
- b. Preview of demonstrations and sham treatments
- c. Attendance, grading, evaluation and examination policies
- d. Review of gas laws, diving physics and physiology related to diving medicine

**2. Role of the Medic**

- a. Responsibilities
    - i. Responsibilities as a diver (where applicable)
        - follow safe practice standards
        - set example
        - teach and instruct others
    - ii. Responsibilities as a medic
        - emergency care, basic life support, stabilize
        - report accidents and treatment to medical authorities
        - perform tasks and give aid as directed by proper authorities
        - in absence of specific orders, carry out treatment and triage according to training and ability
        - encourage fitness in diving community
        - maintain proficiency in diving (where applicable) and emergency medicine
        - keep accurate, informative records (send with patient as applicable)
- b. Liaison with others
    - i. Medical control physicians, medic's company/region-protocols, standing orders
    - ii. Local hospitals and chamber facilities
    - iii. Local EMS system

iv. Law enforcement, fire departments, U.S. Coast Guard, etc.
v. Communications system
vi. Divers Alert Network (DAN)

**3. Records and Fitness (variable according to medic's status, industry standards, and employer)**

a. Baseline records
   i. Knowledge of disqualifying conditions (permanent and temporary)
   ii. Review of diver's medical history or previous physicals
   iii. Record family and emergency data
   iv. Routine exam (basic)
      - vital signs
      - ENT
      - heart and lungs

b. Pre-dive evaluation (where applicable)
   i. Current or recent medical conditions
   ii. Current prescribed drugs or medications
   iii. Recent lifestyle and personal habits
   iv. Recent dive history
   v. Brief physical exam (vital signs, ENT, heart and lungs)

c. Post-dive evaluation (where applicable)
   i. Dive and decompression history
   ii. Brief physical as indicated
   iii. Neuro and mental status evaluation as indicated

**4. Decompression Sickness (DCS)**

a. Pathophysiology
   i. Insert gas uptake and elimination
   ii. Evolution of inert gas from soluble phase to gas phase
      - intravascular bubbles
      - tissue/extravascular bubbles
   iii. Bubble effects
      - direct – possible obstructed blood flow, ischemia; possible effects on tissue, including nervous system tissue
      - indirect – hematological reactions to bubble surface, platelet and other effects, capillary permeability, hemoconcentration and edema, hypovolemia
   iv. Complications
      - cardiopulmonary – bubbles clogging pulmonary artery, right-to-left shunting of bubbles, tachypnea, reduced cardiac output
      - neurological – possible cerebral and spinal emboli

b. Predisposing factors – concept of lowered resistance to DCS
   i. Dehydration
   ii. Poor physical fitness
   iii. Related illnesses
   iv. Role of exercise during dive and decompression
   v. Increasing age
   vi. Temperature variances
   vii. Rapid inert gas switching

c. Signs and Symptoms
   i. "Type I" – "minor"
      - pain only – joint pain (rule out central or peripheral nervous system involvement)
      - skin – itching, mild rash
   ii. "Type II" – serious

- sensory abnormalities, radicular pain
- weakness, paralysis
- vestibular symptoms – hearing, balance
- mood, intellect, personality changes
- visual symptoms
- 'cutis marmarata'

iii. Vague, generalized symptoms
- flu-like symptoms
- unusual fatigue
- headache, difficulty concentrating
- DCS as "great imitator" – may mimic everyday illnesses
- index of suspicion

d. Treatment

i. Treatment tables
- USN tables – 5, 6, 6-A, 7, 8, 9 and saturation decompression sickness table
- Comex 30
- concept that treatment tables are specialized decompressions, treatment table is dose of medicine (oxygen). Respective treatments for variable severity of DCS

ii. Fluids and drugs
- importance of hydration – oral or IV fluids, good urine output
- possible use/role of drugs, usual doses (Valium, Decadron, Ringers Lactate, Normal Saline, Dextran, etc)
- emphasize basic treatment for DCS is pressure, oxygen, fluids, and time; possible role of medications

iii. In-water oxygen treatment (controversies)

iv. Role of the monoplace hyperbaric chamber, limitations, etc (optional)

**5. Barotrauma**

a. Squeeze

i. Sinus – signs and symptoms, need approximately 3-10 days to resolve; possible secondary sinus infection

ii. Middle ear – signs and symptoms; eardrum perforation possible secondary otitis media other squeeze – suit, "reverse" squeeze, etc.

iii. Inner ear (differential diagnosis)

b. Lung overpressure

i. Review usual causes – rapid ascent, pressure reduction with wave surge, panic and breath holding; underlying lung diseases

ii. Pathology – rupture alveolus, expanding air transects to pleural surface, or tracks along tissue planes, or enters pulmonary circulation and into left ventricle

iii. Mediastinal emphysema
- air tracks along lung tissue planes and ruptures into mediastinal space or pericardial sac
- signs and symptoms – midchest pain or pressure, resonant or crunching heart sounds, cardiac tamponade (distended veins, narrow pulse pressure, low blood pressure and cardiac output), possible mild cyanosis, irregular pulse
- treatment – varies from none (observation), to breathing oxygen, to recompression (seldom), according to patient's status and symptoms

iv. Subcutaneous emphysema
- lung trauma, leads to air tracking along upper bronchi, into and above clavicle

- signs and symptoms – pain in neck or upper chest “sore throat”, pain with swallowing, change in voice, palpable air under skin (“rice crispies”)

v. Pneumothorax
- expanding air ruptures through lung surface; free air present in chest cavity, outside lung
- small leak and/or occurring near surface will be simple pneumothorax
- if not near surface, any pneumothorax during decompression may become a tension pneumothorax
- signs and symptoms of simple and tension pneumothorax same as non-diving causes (chest pain, splinting, dyspnea, shortness-of-breath, cyanosis, tracheal deviation, hypotension diminished breath sounds); *improves with compression*
- treatment of simple pneumothorax – varies from observation only to 100% oxygen
- treatment of tension pneumothorax:
  - recompression to depths of significant relief if already under pressure
  - needle decompression
  - after compression, use of saturation decompression schedule and oxygen breathing to resorb trapped air
  - insertion of indwelling cannula or chest tube with seal or one-way valve

vi. Cerebral arterial air embolism
- expanding alveolar air secondary to pulmonary barotrauma enters tributaries of pulmonary vein, transported to left heart, into aorta and on to cerebral arteries, causing stroke-like injury
- signs and symptoms – usually rapid and dramatic; unconsciousness; convulsion; apnea; paralysis and hemiparesis; hemiplegia; hemoptysis
- possible concurrent pneumothorax
- paradoxical cerebral arterial gas embolism from venous gas
- treatment standards

**6. Oxygen Toxicity**

a. Current and generally accepted concepts of oxygen toxicity
b. Concepts of oxygen limits
   i. Lung vs. CNS
   ii. Dry vs. in-water, working vs. at-rest
c. Pulmonary toxicity
   i. Disruption of alveolar surfactant, small airway and alveolar closure, lung edema, disrupts gas transfer by lung
   ii. Results are similar to pneumonia or respiratory distress syndrome
   iii. Signs and symptoms - varies from mild tracheal irritation, cough, painful breathing, dyspnea, cyanosis, death
   iv. Lungs sound relatively normal until advanced toxicity is in an advanced stage
   v. Treatment – lower pO2 unless end of treatment or decompression is near
   vi. UPTD as historical concept, no clinical value today
d. CNS toxicity
   i. state of cerebral irritability
   ii. sign and symptoms – restlessness, irritability, twitching, tingling, visual symptoms, nausea, hiccups, convulsion; CON “VENTID”

iii. management – remove mask/lower pO2, protect from harm during seizure, resume treatment fifteen minutes after resolution and from point of interruption

**7. Marine Hazards**

a. common marine life hazards
b. bites, stings, envenomations, other
c. signs, symptoms, immediate management

**8. Environmental Accidents**

a. emergency management of near-drowning
b. emergency management of hyper- and hypo-thermia

**9. Carbon Dioxide Toxicity**

Concerning review material, instructors may prefer to utilize assignments sent to the students prior to class, particularly for diving physics and gas laws

**1. Role of the Medic**

a. similarities and differences compared to non-diving
b. record keeping
c. relationship to medical control physicians and others in the medical support system

**2. Medical/Fitness to Dive**

a. baseline, pre- and post-dive exams
b. disqualifying conditions, temporary and permanent

**3. Decompression Sickness**

a. possible predisposing conditions, concept of susceptibility to an environmentally-caused diseases
b. physiologic events leading to DCS, initial and later phases of DCS, hematologic and other effects of tissue and intravascular bubbles
c. common and unusual signs and symptoms of DCS, mild (Type 1) and serious (Type II) DCS, major forms of DCS (skin, vestibular, joint, CNS, pulmonary, saturation)
d. concept of treatment table as a treatment or medication (ie, a dose); tables USN 5, USN 6, USN 6-A, USN 7, 8 and 9, saturation tables; usual application of the treatment tables; follow-up after treatment

**4. Barotrauma**

a. anatomy and physiology of the air-containing spaces, mechanism of squeeze and pulmonary over-inflation (air embolism, pneumothorax, mediastinal emphysema, subcutaneous emphysema)
b. the principle signs and symptoms of squeeze and overpressure injuries and distinguishing features between them
c. routine and emergency management of squeeze and over-pressure, understanding of pneumothorax and tension pneumothorax

**5. Oxygen Toxicity**

a. simple concepts of causes of oxygen toxicity, signs and symptoms of CNS and pulmonary toxicity, usual CNS and pulmonary oxygen limits
b. understanding the conceptual difference between oxygen percentage and oxygen partial pressure

**Skills Objective**
The student should satisfy the instructor staff that they have mastered the following:

1. **Physical Examinations**
    a. an adequate emergency baseline assessment, obtain and evaluate vital signs, provide basic life support, properly use basic equipment such as pen light, stethoscope, blood pressure cuff, tuning fork
    b. use of the otoscope in performing ear exams
    c. ability to maintain adequate records of exams and treatments

2. **Neurological Exams (student or instructor posing as patient)**
    a. ability to complete an adequate field neuro exam
    b. intellectual functions, cranial nerves, sensory function, motor function, and balance/coordination
    c. ability to conduct exams inside and outside chamber and as follow-up during and after treatment

3. **Sham treatments (student or instructor posing as accident victim)**
    a. ability to elicit symptoms of simulated DCS or barotrauma
    b. ability to identify signs of above
    c. ability to use diagnostic and medical kit at surface and in chamber
    d. ability to function effectively while in chamber
    e. ability to formulate and conduct a basic treatment plan
    f. ability to keep adequate records and make accurate reports to the medical control physician
    g. ability to recognize and manage simulated symptoms of oxygen toxicity

4. **Essential and Valuable Invasive Skills (Appendix II)**

## Chamber Operations Module

The usual role of a DMT is to attend to the medical needs of the injured diver. Therefore, the primary goal of DMT training is provision of emergency medical care in and outside the chamber; there is no primary intent to make the medic competent regarding chamber operations.

Since chambers in many areas are thinly staffed, perhaps by persons of limited competence, the major goal of the Chamber Operations Module is to enable the DMT to see to the safety of himself and his patient while in the chamber. Secondarily, the medic is taught the rudiments of chamber operations, time-keeping, dive recording, pre- and post- dive checklists, and the conduct of a chamber treatment.

## Appendix I
**DMT Certification Examination Guidelines**

DMT certification is based upon a series on mandatory pre-requisites. They include:

1. Completion of a NBDHMT approved DMT training course
2. Completion of a DOT recognized EMT curriculum.
3. Medical determination of fitness to work in pressurized environments

Once all of the above have been satisfactory undertaken the DMT can apply to take the DMT certification examination.

The DMT examination test bank comprised of questions from seven categories. All questions are multiple-choice and have only one correct answer. No questions are designed to trick the examinee. Listed below are the seven categories, topics covered within each category, the percentage of questions from the entire examination that are derived from each category, and how many questions each respective percentage represents. Numerous variations of the DMT examination question bank are in use at any given time.

A scientific calculator may be used.

Category 1: **Physics and Physiology**

Defining pressure (absolute, gauge, barometric); measuring pressure (standard/imperial, metric); converting pressure (absolute to gauge - gauge to absolute in fsw, msw, ATA); converting between degrees Fahrenheit and degrees Celsius; gas law definitions and computations (Boyle's, Dalton's, Henry's and Charles's/Guy-Lussac's); computing oxygen percent and oxygen/nitrogen partial pressures involving various depths and various breathing mixtures; factors influencing inert gas uptake and elimination; USN definitions of treatment and emergency gases.

***Nine Category 1 questions are selected from the examination question bank. They represent 7.5% of the total questions in each individual examination.***

Category 2: **Decompression Sickness & Cerebral Arterial Gas Embolism**

Basic pathophysiology of decompression illness; surface orientated and saturation diving induced cases; symptom presentation; differential diagnosis Type 1 vs. Type 2 DCS, DCS-CAGE, inner ear DCS-inner ear barotrauma; risk factors;

***Eighteen Category 2 questions are selected from the examination question bank. They represent 15% of the total questions in each individual examination***.

Category 3: **Patient Assessment**

Shock; Glasgow Coma Scale; extremity injuries; anticipated physical and/or neurological findings in DCS, CAGE, ear and other barotraumas, pneumothorax, tension pneumothorax, subcutaneous emphysema; differential diagnosis; tuning fork hearing acuity testing; otoscopic findings in barotrauma and infection; omitted decompression.

***Thirty Category 3 questions are selected from the examination question bank. They represent 25% of the total questions in each individual examination.***

Category 4: **Recompression Treatment & Decompression Procedures**

US Navy treatment of surface orientated and saturation diving-induced DCS; US Navy treatment procedures for CAGE; incomplete relief of DCS during treatment and upon surfacing; omitted decompression.

***Twenty-seven Category 4 questions are selected from the examination question bank. They represent 22.5% of the total questions in each individual examination.***

Category 5: **Invasive Procedures**

Emergent/field management of pneumothorax; routes of medication administration; nasogastric tubes; wound closure; sterile technique; airway control; Foley catheters; intravenous fluid administration and drip rate calculations; endotracheal tubes; dosing conversions, mg to ml; potential compression complications for ampoules, vials and fluid infusion bottles; Heimlich valves.

***Twelve Category 5 questions are selected from the examination question bank. They represent 10% of the total questions in each individual examination.***

Category 6: **Other Diving Related Injuries, Side Effects & Complications**

Central nervous system oxygen toxicity; pulmonary oxygen toxicity; barotraumas; marine envenomation, stings and bites; nitrogen narcosis; hypothermia.

***Eighteen Category 6 questions are selected from the examination question bank. They represent 15% of the total questions in each individual examination.***

Category 7: **Chamber, Equipment and Operational Safety**

Diagnostic equipment precautions under pressure; chamber ventilation; chamber fire precautions; atmospheric sampling; tender/medic decompression safety, locking in drugs and fluids.

***Six Category 7 questions are selected from the examination question bank. They represent 5% of the total questions in each individual examination.***

## Appendix II

**Essential Invasive Skills (*Required* for DMT certification)**

1. Intravenous access
    a. Fluid infusions
    b. Drug administration
    c. Blood draws

2. Intramuscular injection

3. Subcutaneous injection

4. Insertion of urinary catheter

5. Insertion of nasogastric/orogastric tube

6. Manual or battery powered oropharynx/orogastric suction

7. Airway control; one or more of the following:
    a. Laryngeal mask airway
    b. Pharyngeal-tracheal lumen
    c. Endotracheal intubation
    d. Needle cricothyroidotomy

8. Chest decompression capability; one or both of the following:
    a. Pneumothorax needle
    b. Chest tube

9. Basic Life Support

**Valuable Optional Skills (*Not required* for DMT certification)**

1. Use of the 'Easy IO Drill'

2. Simple suture repairs or alternate of wound closure option, e.g.
    a. Dermagel/Dermabond
    b. Quickclot
    c. Celox gauze

3. Splinting of simple dislocations and fractures

4. Advanced Cardiac Life Support

5. CO2 scrubber installation for chamber under pressure

6. Operation of a CO2 analyzer