

# LOS ANGELES POLICE DEPARTMENT UNDERWATER DIVE UNIT OPERATIONS GUIDE



**Los Angeles Police Department  
Underwater Dive Unit  
Operations Guide**

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## **Volume 1 General Provisions**

### **1.0 Underwater Dive Unit Operations Guide Established**

The Operations Guide of the Los Angeles Police Department's Underwater Dive Unit is hereby established and shall hereafter be referred to as "the Operations Guide." It is and shall be a composite of current policies, procedures, and rules pertaining to Underwater Dive Unit (UDU) operations.

#### **1.1 Organization of the Underwater Dive Unit Operations Guide**

Volume 1, "General Provisions." This section is composed of general statements concerning the objectives and principles, outlines the organizational structure and defines the responsibilities and functions of every position.

Volume 2, "Diving Regulations." This section outlines general diving regulations, depth limits and the use of diving tables and computers.

Volume 3, "Operations." This section outlines the policies, rules, and regulations pertaining to a dive operation.

Volume 4, "Minimum Requirements for Testing and Tryouts." This section outlines the policies, rules, and regulations pertaining to the testing and evaluation of candidates.

Volume 5, "Annual Requalification Requirements." This section outlines the policies, eligibility requirements, and requalification standards for divers.

Volume 6, "Equipment." This section outlines the requirements for dive equipment and breathing gas.

#### **1.2 Responsibilities for Maintaining the Underwater Dive Unit Operations Guide**

The UDU Operations Guide shall be periodically reviewed by UDU supervisory personnel to ensure that the policies and procedures delineated within remain current and up to date.

#### **1.3 Amendments to the Underwater Dive Unit Operations Guide**

##### **1.3.1 Requests for Amendments**

A request for amendments to the Operations Guide shall be prepared on an Employee's Report, Form 15.7, and forwarded through the chain of command to the Officer-in-Charge. All amendments shall be approved by the Commanding Officer, Metropolitan Division, or their designee.

### **1.3.2 Issuance of Amendments**

Amendments to the Underwater Dive Unit Operations Guide shall be issued and distributed per paragraph 1.2.

## **1.4 Issuance of Notices**

### **1.4.1 Authorization**

Notices shall be issued at the direction of the Officer-in-Charge or their designee.

### **1.4.2 Definition**

Notices are defined as publications for the circulation of routine notification, schedules, maintenance schedules, training, and medical exams.

### **1.4.3 Issuance**

Notices may be issued electronically or via paper document.

## **1.5 Responsibilities of the Underwater Dive Unit**

It is the responsibility of the Los Angeles Police Department's Underwater Dive Unit to conduct the following:

- Underwater criminal investigations
- Search and recovery of criminal evidence, both underwater and land-based, via the use of metal detectors or other special equipment
- Recovery of lost or stolen property, including vehicles, vessels, aircraft, etc.
- Underwater photography and videography
- Body recoveries
- Removal of conditions which pose a threat to life and property, or where City liability exists
- Suspect apprehension
- Homeland security, including critical site surveys of piers and ship hulls, critical site threat assessments, mutual aid requests, and other duties related to waterborne homeland security issues
- Support of Divisional requests such as transportation, undercover operations, etc.
- Support of Tactical Waterborne elements
- Support of Air Support Division maritime related operations
- Support of Hazardous Materials Section maritime related operations
- Other specific missions as directed by the Commanding Officer, Metropolitan Division.

## **1.6 Organization**

The Underwater Dive Unit shall consist of the following leadership positions:

- Officer-in-Charge
- Assistant Officer-in-Charge
- Instructor Cadre
- Squad Leader
- Assistant Squad Leader
- Logistics Officer
- Boat Crew Supervisor

### **1.6.1 Officer-in-Charge**

The Officer-in-Charge shall be appointed by the Commanding Officer, Metropolitan Division.

The Officer-in-Charge shall have the responsibility and authority to manage day to day operations within the framework of the mission, policies, procedures, goals and objectives of the Los Angeles Police Department. The Officer-in-Charge reports directly to the Commanding Officer, Metropolitan Division and shall be responsible for the following:

- Selection and training of personnel
- Development and management of the annual budget
- Maintain records and files, including personnel files for all dive team members.
- Incident Command of all diving related accidents and injuries
- Suspend and remove personnel
- Review and approve all requests for dive operations
- Conduct periodic meetings with supervisory personnel
- Develop policy and procedure
- Approve all equipment that is utilized by UDU personnel
- Coordinate and distribute all written material, including but not limited to amendments to the Operations Guide, notices, and incident reports
- Supervise liaison efforts with other Department entities
- Maintain liaison with other public safety agencies and the Port Dive Operations Group (PDOG)
- Periodically inspect all UDU personnel and equipment
- Ensure all current UDU members meet annual requalification requirements

### **1.6.2 Assistant Officer-in-Charge**

The Assistant Officer-in-Charge shall be selected in accordance with Department procedures.

The Assistant Officer-in-Charge shall have the responsibility and authority to manage operations in the absence of, or at the direction of, the Officer-in-Charge. The Assistant Officer-in-Charge reports directly to the Officer-in-Charge. The Assistant Officer-in-Charge shall be responsible for the following, subject to the approval of the Officer-in-Charge:

- Management of diving operations
- Supervision of dive unit members
- Selection of personnel for diving operations
- Document all diving related accidents and injuries
- Review all requests for dive operations and make appropriate recommendations to the Officer-in-Charge regarding the approval of such requests
- Selection, testing and maintenance of all UDU equipment
- Review and approve all training plans
- Perform other duties as directed by the Officer-in-Charge

### **1.6.3 Instructor Cadre**

The Instructor Cadre shall be appointed by the Officer-in-Charge or their designee. The Instructor Cadre will perform the following tasks:

- Plan and organize all regular UDU training days
- Regularly provide the Officer-in-Charge with an evaluation of the dive training within the Underwater Dive Unit.
- Periodically review the diving qualifications of all UDU members and provide the results of the review to the Officer-in-Charge
- Train and certify UDU members in various diving specialties
- Complete other specific duties as specified by the Officer-in-Charge or their designee.

#### **1.6.3.1 Instructor Cadre Qualifications**

All personnel involved in diving instruction shall be qualified for the type of instruction being given. The Instructor Cadre shall consist of UDU members who are certified diving instructors from an approved certifying agency.

### **1.6.4 Squad Leader**

The Squad Leaders shall be selected by the Officer-in-Charge or their designee. The Squad Leaders will:

- Be responsible for the in-water direction of all dive unit members
- Contact the Assistant Officer-in-Charge prior to training days and other operations to obtain updated information.
- Disseminate information to the Assistant Squad Leader and other squad members.
- Complete other specific duties as specified by the Officer-in-Charge, Assistant Officer-in-Charge, or their designee.

### **1.6.5 Assistant Squad Leader**

The Assistant Squad Leader shall be selected by the Officer-in-Charge or their designee. The Assistant Squad Leader will:

- Be responsible for the in-water direction of all dive unit members, as designated by the Squad Leader
- Contact the Squad Leader prior to training days and other operations to obtain pertinent information for distribution to squad members.
- Complete other specific duties as specified by the Officer-in-Charge or their designee.

#### **1.6.6 Logistics Officer**

The Logistics Officer shall be selected in accordance with Department procedures. The Logistics Officer will conduct the following duties:

- Maintain all UDU equipment.
- Provide logistics to the dive site.
- Operate UDU response vehicles.
- Complete other specific duties as specified by the Officer-in-Charge or Assistant Officer-in-Charge.

#### **1.6.7 Boat Crew Supervisor**

The Boat Crew Supervisor shall be selected in accordance with Department procedures. The Boat Crew Supervisor will conduct the following duties:

- Manage all boat operations.
- Supervise the boat operators.
- Complete other specific duties as specified by the Officer-in-Charge or Assistant Officer-in-Charge.

### **1.7 Medical Examination**

All divers shall pass a diving medical examination, which shall be administered by the City of Los Angeles, Personnel Department, Medical Services Division, to determine fitness to dive. The expiration date of the examination shall be maintained in the individual diver's records. Each diver shall be examined annually, after any serious medical episode, after treatment in a hyperbaric facility following a diving accident, after a serious illness or injury, or when directed by the Officer-in-Charge.

### **1.8 Police Reserve Program**

The Underwater Dive Unit may utilize reserve police officers when their expertise may be of benefit to the Underwater Dive Unit.

## **1.9 Standard of Conduct**

All members of the Underwater Dive Unit shall participate in all Underwater Dive Unit functions, including training and call outs, unless prior exemption has been granted by the Officer-in-Charge or their designee. Members who fail to attend without prior approval may have their diving status suspended or may be removed from the Underwater Dive Unit, at the discretion of the Officer-in-Charge or their designee.

## **1.10 Physical Fitness**

All Underwater Dive Unit personnel shall maintain themselves in good physical condition. Each member shall be required to pass an annual Physical Fitness Qualification Test (PFQ). Personnel who fail to achieve a passing score on the PFQ shall have their diving status suspended and will be removed from the Underwater Dive Unit.

## **1.11 Requests for Call Out**

All requests for the use of Underwater Dive Unit personnel shall be directed to the Officer-in-Charge or, in their absence, their designee. During off hours all requests should be made through RACR Division. RACR Division shall immediately notify the Officer-in-Charge, or in their absence, their designee. In their absence, all requests shall be directed to Metropolitan Division. The Officer-in-Charge, or their designee, will direct the appropriate response of UDU personnel..

When it is determined that a dive should be performed, a notification will be made to the Commanding Officer, Metropolitan Division, when feasible.

## **Volume 2 Diving Regulations**

### **2.1 General Policy**

No person shall engage in diving operations under the auspices of the Underwater Dive Unit unless they have satisfactorily met the requirements for fitness to dive and have the approval of the Officer-in-Charge or their designee.

Diving shall not be conducted unless emergency procedures have been established to initially treat and transport divers to an operational hyperbaric facility or appropriate emergency medical facility.

At all times that divers are in the water there shall be at least one standby diver, 90 percent capable and ready to assist divers in the water. The standby diver shall be fully briefed on the operation. The standby diver shall be equipped with a detachable air cylinder, various types of cutting tools, and a tending line. Deviations to this paragraph may be approved during rescue or lifesaving operations, or at the discretion of the Officer-in-Charge or their designee.

### **2.2 Diving Procedures**

#### **2.2.1 Tended Dives**

Prior to engaging in tended diving, all involved personnel (diver and tender) shall have received sufficient training in the various aspects and techniques of tended diving. During a solo, line-tended diving operation, a 100 percent ready and a 90 percent ready standby diver shall be utilized.

##### **2.2.1.1 Exception**

In rare circumstances, such as shallow water conditions, a fully equipped safety diver may not be necessary. This determination will be made by the Safety Officer and the Diving Supervisor.

#### **2.2.2 Enclosed or Confined Spaces**

Where an enclosed or confined space is not large enough for two divers, a diver shall be stationed at the underwater point of entry and a line reel shall be utilized. Only personnel with appropriate training and certifications shall be permitted to conduct penetration diving. A remote operated vehicle (ROV) should also be considered as an option for this type of operation.

#### **2.2.3 Diver's Flag**

During all diving operations in an open water environment, a red and white "Diver Down" flag and an international Alpha flag shall be prominently displayed when feasible.

#### **2.2.4 Flotation Devices**

During every dive, all divers shall possess the capability of attaining and maintaining positive buoyancy. An inflatable exposure suit by itself shall not be used as the sole source of buoyancy.

#### **2.2.5 Timing Devices, Depth and Pressure Gauges**

During every dive, all divers shall have their own underwater timekeeping device, an approved depth indicator, and a submersible pressure gauge. During surface supplied air operations, depth and dive time may be delegated to the operator of the surface supplied air system, if appropriately equipped to perform said functions.

#### **2.2.6 Decompression Tables and Computers**

Divers may utilize a dive computer to track cylinder pressure, depth, and dive time. However, the Diving Safety Officer shall utilize one of the following tables to plan dives and calculate ending pressure groups and surface intervals:

- U.S. Navy, No-Decompression Air Dive Tables
- U.S. Navy, No-Decompression – Shallow Water Tables
- NOAA, No-Decompression Air Dive Tables
- NOAA, No-Decompression Nitrox 32% Tables
- NOAA, No-Decompression Nitrox 36% Tables
- U.S. Navy Air Decompression Dive Tables

#### **General Provisions**

Only those dive computers which have been approved by the Officer-in-Charge, or their designee may be utilized within the Underwater Dive Unit diving program.

Each diver utilizing a dive computer must be trained to understand basic decompression theory and how to properly and safely operate the dive computer with which they dive. Documentation of this training shall be maintained in the diver's permanent diving record.

Each diver relying on a dive computer to plan dives and determine decompression status must have their own unit. A diver who is not using a personal dive computer is prohibited from relying on a computer used by another diver.

If a diver experiences a computer failure, the dive shall be immediately terminated using appropriate surfacing procedures.

Repetitive and multi-level diving procedures dictate that divers should start the dive or series of dives at the maximum planned depth followed by subsequently shallower exposures. Deviations to this procedure shall be approved by the Diving Supervisor.

Multiple deep dives that approach the no-decompression limits of the dive computer or dive table require special consideration and planning.

During dives in which dive computers are used, the diver shall have the capability for redundant time and depth measurements. Throughout all dives, the diver shall maintain awareness of maximum depth and bottom time.

### **Table Rules**

A single dive is any dive made more than 12 hours following a previous dive. A repetitive dive is any dive made less than 12 hours after surfacing from a prior dive.

Dives that are less than 10 minutes apart will be considered to be the same dive. The bottom times of both dives shall be added together for the total bottom time. The deepest depth achieved during either portion of the dive will be the maximum depth for the dive.

The diving ascent rate for a non-altitude dive shall not exceed 30 feet per minute.

Divers shall make a three minute safety stop at 15 feet, for dives deeper than 60 feet and when the pressure group at the end of a dive is within three pressure groups of the no-decompression limit. However, a diver may opt to make a safety stop on any dive that the diver deems necessary.

Divers shall not exceed the no-decompression limits of the dive computer or dive table at any time during the dive unless certified to conduct decompression diving, and only with the authorization of the Officer-in-Charge or their designee.

### **Omitted Decompression**

Should a diver realize that they have exceeded the no-decompression limits prior to reaching the surface, they should stop their ascent at 10 to 15 feet, notify the Safety Officer via communications, and provide maximum depth and bottom time. The Safety Officer will consult the U.S. Navy Air Decompression Dive Tables for the appropriate decompression time.

If the diver does not have communications with the surface, the diver should conduct the following:

- Stop their ascent between 10 and 15 feet
- Remain for a minimum of 15 minutes or until 300 psi in their cylinder, whichever comes first.
- Upon surfacing, consult the U.S. Navy Air Decompression Tables to determine if the amount of time spent at 10 to 15 feet met or exceeded the amount of decompression time required by the Tables.

- If the time was not met or exceeded, the diver should be placed on oxygen for a minimum of 30 minutes, observed, and restricted from diving for 12 hours.
- If the diver becomes symptomatic they should remain on oxygen and be transported to the nearest medical facility for treatment.

If a diver does not realize that they have exceeded the no-decompression limits prior to reaching the surface, or the diver does not have a sufficient gas supply to be able to conduct a decompression stop, the following steps should be taken:

- Ascend at a normal rate.
- Upon surfacing notify the Safety Officer.
- If asymptomatic and able to be safely returned to the water within five minutes, return to the depth of omitted decompression and remain for 1 ½ times the required decompression stop time.
- If unable to be safely returned to the water within five minutes of surfacing, the diver should be placed on oxygen for a minimum of 60 minutes
- If asymptomatic after breathing oxygen for 60 minutes, the diver should be observed for a minimum of 12 hours for signs and symptoms of DCS and restricted from diving during this observational period.
- If the diver becomes symptomatic, he should remain on oxygen and be transported to the nearest medical facility for treatment.

### **2.2.7 Altitude Diving**

Additional considerations apply when conducting a dive at an altitude of 1000 feet above sea level or higher, or when travelling to such an altitude following a dive.

The cross correction technique should be used for all altitude dives. This technique will yield a sea level equivalent depth that is greater than the actual dive and will provide the extra decompression needed to offset the effects of diving at altitude.

To correct the depth of a dive at altitude, the following formula should be used:

$$\text{Equivalent Depth (fsw)} = \text{Altitude Depth (fsw)} \times \frac{\text{Pressure at Sea Level (psi)}}{\text{Pressure at Altitude (psi)}}$$

Use the Sea Level Equivalent Depth Table (Table A.8) to figure the altitude depth. Use the Pressure Variations with Altitude Table (Table A.9) to figure the pressure at altitude and the starting repetitive group designation.

#### **Travelling to Altitude Following a Dive**

Prior to making an ascent to altitude following a dive, divers should consult Table A.5 to obtain their required surface interval.

### **2.2.8 Depth Limits**

An Underwater Dive Unit diver under the auspices of the Underwater Dive Unit organization shall not exceed the depth limit of their certification except as follows:

- A diver may exceed the depth limit of their training, only while accompanied by an instructor, who is certified to the planned depth, and only on a training dive.

Dives exceeding 130 feet in depth may only be conducted by divers who have been trained to conduct extended range decompression diving, and then only with the approval of the Officer-in-Charge or their designee.

Any violation of this provision will result in the immediate suspension of dive status and a review by the UDU Instructor Cadre, Officer-in-Charge, and Assistant Officer-in-Charge.

### **2.2.9 NITROX Diving**

Enriched Air NITROX (EAN) Diving may only be conducted by UDU divers who have been NITROX certified by a UDU instructor or through a nationally recognized training organization.

Any mixture between 21% and 40% EAN may be utilized as a primary breathing gas.

Every cylinder containing a NITROX mixture shall be analyzed for oxygen content prior to its use as a breathing gas. The oxygen percentage shall be affixed to the cylinder using adhesive tape.

When conducting NITROX Dives, the NOAA NITROX Tables (Tables A.4 and A.5) shall be utilized. Alternately, the U.S Navy No-Decompression Air Dive Tables may be used with the Equivalent Air Depth Table (Table A.6).

### **2.2.10 Decision to Dive**

The ultimate decision to dive rests with the individual diver. Diving shall not be conducted whenever the diver determines that it is unsafe to make a dive or that it is beyond their capabilities as a diver.

Ultimate responsibility for safety rests with the individual diver. It is the diver's responsibility and duty to terminate a dive if, in their judgment, conditions are unsafe, or if diving would violate the precepts of their training or the standards of this Operations Guide.

### **2.2.11 Termination of a Dive**

Unless it compromises the safety of another diver already in the water, it is the responsibility of the diver to terminate the dive, whenever the diver determines that it is unsafe to continue.

The dive shall be terminated while there is still sufficient tank pressure to permit the diver to:

- Safely reach the surface, including decompression time; or
- Safely reach an additional air source at a planned decompression station.

Divers shall endeavor at all times to surface with no less than 500 psi of air in their main cylinder.

The Diving Supervisor shall terminate the dive at any time that they believe there is an unmanageable risk to divers.

## **Volume 3 Operations**

### **3.1 General Policy**

All diving activities under the auspices of the Underwater Dive unit shall conform to the guidelines contained in this volume.

### **3.2 Diving Operations**

The success of any dive mission is directly related to thorough planning. The nature of each operation will determine the scope of the planning effort. The below listed considerations shall be applied to every operation:

- Divers should not be used if the objective can be more efficiently accomplished by another means.
- Bottom time is always at a premium and any planning inputs, which will conserve bottom time or increase the effectiveness of the diver, should be given high priority.
- Diving operations should not be conducted under extreme environmental conditions or whenever the safety of the divers or of the support personnel will be unnecessarily compromised.
- Diving operations that are to be carried out in extreme environments, such as high and low temperatures and contaminated or polluted water, must be planned to ensure that all appropriate safety equipment and protocols are utilized.
- All dive plans shall include the means for treating an injured diver, including all nearby operational hyperbaric and emergency medical facilities, and the transportation plan to a hyperbaric or emergency medical facility.
- The equipment and supplies being used must be appropriate for the operation and adequate to complete the operation unless approved by the Dive Supervisor.

### **3.3 Preliminary Diving Plan**

Upon receiving a request for the services of the Underwater Dive Unit, the Officer-in-Charge, or their designee, will designate a Diving Supervisor and appropriate personnel, to respond to the site of the proposed mission.

The Diving Supervisor shall complete a site survey and prepare a preliminary plan of action to determine if the operation will require a land based operation (such as deployment of metal detectors, transportation of Officers via boats, etc.) or an underwater diving operation.

Once it is determined that an operation should be conducted, a diving/ operations plan will be prepared and submitted to the Officer-in-Charge or their designee. The Officer-in-Charge, or their designee, will then review the plan for approval and implementation.

### **3.4 Dive Planning**

This section provides a comprehensive guide to effective dive planning. The following steps should be considered while planning diving operations:

- Define objectives
- Collect and analyze data
- Establish operational tasks
- Select diving technique
- Select equipment and supplies
- Determine the necessity of boat assets
- Determine the necessity of additional assets or personnel
- Select and assemble the diving team
- Brief the diving team
- Make final preparation and check all safety precautions
- Dry rehearsal of the dive scenario
- Equipment inspection of all divers prior to entering the water

#### **3.4.1 Define Objectives**

Establish a clear statement of the objective. Why is the operation being undertaken, and what is to be accomplished?

#### **3.4.2 Collect and Analyze Data**

Pertinent information should be acquired and studied. This will aid in the selection of techniques, equipment, divers and support personnel, identification of potential hazards, emergency procedures, and contingency procedures.

The extent of and type of information, which must be gathered, will be influenced by such factors as the size of the operation, the location of the dive site, and the time of the year.

If the operation involves the recovery of an object from the bottom, the Underwater Dive Unit will need to know the dimensions and weight of the object. Additional information might include floodable volume, established lifting points, construction material, length of time on the bottom, probable degree the item is embedded in the mud or silt and the type and degree of damage to the object. This data will help define the type of lift to be used.

For any operation, which will involve a search for an object or underwater site, data gathered in advance will help to minimize the time required for the search.

Whenever the object of a search has been found, the site should be marked with a buoy, which has been rigged in advance, ready for immediate use.

Detailed information must be collected as an aid in identifying hazards. If a diver will be working around or under a ship they must know the location of all sea-suction and discharge points and of propellers, rudders, bow thrusters, azi-pods, recent repair work, sonar transducers, cathodic protection, etc. In addition, the Safety Officer shall ensure that proper lockout/ tagout procedures are conducted and completed on the ship to be searched, in accordance with UDU standards.

A diver should know in advance what sort of underwater conditions to expect ranging from the temperature to the type of marine growth common to the area.

Most of the data gathered in the planning phase of the operation will come from outside sources or surface observations and will be gathered before the actual diving phase begins. If time and conditions permit, survey dives or surface swims can be of great value in refining the database and in improving the dive plan. For all diving operations, data should be collected and analyzed in the following general categories:

- Surface Conditions
- Underwater Conditions and hazards
- Overhead and confined space hazards
- Resources
- Assistance and Emergencies

### **Surface Conditions**

Conditions on the surface in the operating area will affect the divers, boat crew, and all topside personnel. These conditions are influenced by the location, weather, tides and currents, temperature, visibility, and maritime traffic.

### **Underwater Conditions**

Underwater conditions will have an influence on the selection of the divers, dive techniques, and the equipment to be utilized. Conditions of particular concern include:

- Depth
- Tide and currents
- Visibility
- Temperature
- Contaminants and Pollution
- Obstacles or other underwater hazards
- Type of bottom and bottom composition

Three basic types of currents affect diving operations. These currents include river and major ocean currents; currents produced by the ebb and flow of the

tides, which may contribute to, or abate, existing currents; and undertow or rip currents.

Underwater visibility varies with depth and turbulence. The degree of underwater visibility will influence selection of dive technique and may greatly influence the time required for a diver to complete a given task.

Water temperature can drastically affect the diver's performance. In cold water, their ability to concentrate and their working efficiency will diminish rapidly.

The temperature range at most Los Angeles area dive sites will be constant throughout the year. Specific man-made facilities may have depressed or elevated water temperatures. Water temperature should be known prior to the dive, to allow for the application of appropriate protective equipment.

Divers may encounter dangerous forms of pollution, which can cause severe medical problems. A diver working near sewer outlets or industrial discharges may be exposed to the hazards of disease or chemical poisoning. Toxic materials or volatile fuels leaking from barges or tanks or just after a heavy rain can irritate the skin and corrode equipment. When using SCUBA a diver may inadvertently take polluting materials into their mouth, posing both physical and psychological problems. The diver is especially vulnerable to ear and skin infections.

### **Hazardous Conditions**

When planning for operations in water known or suspected to be polluted, full protective clothing (i.e. dry suit and full face mask), appropriate preventative medical procedures and a decontamination station must be provided and shall be utilized by each diver.

Operational obstacles and hazards include electric shock, explosions, sonar, nuclear radiation, marine life, entanglement, underwater structures, and other underwater hazards.

The type of bottom may have a decided effect upon a diver's ability to move and work efficiently and safely. Advance knowledge of bottom conditions and profile is important for the selection of diving techniques and the equipment to be used.

### **3.4.3 Establish Operational Tasks**

With the objectives of the operation defined and data gathered and studied to properly establish conditions under which a dive will take place, a basic outline for the operation itself can be prepared. Each task should be identified, and placed in the context of an overall schedule, or job profile so that the interrelationship of all tasks will be apparent. This should be done for even the most routine operations.

All phases of an operation are important. A common failure in planning is to put all of the emphasis on the actual dive phases, while not fully considering boat operations, pre-dive and post-dive activities. Another common failure is to treat the operation, especially those of a recurring nature with an indifference to safety that comes with familiarity of procedures.

A diving operation is not completed once the objective has been met. Good planning must carry the dive team through debriefing the operation, individual gear clean up and maintenance, team gear and response truck clean up and maintenance, boat clean up, maintenance and loading, and the proper filing of records and reports. The schedule should allocate sufficient time for the preparation of equipment, transit to the site, rendezvous with the other vessels or units, establishment of a secure site, pre-dive brief and safety brief.

A complete dive plan should include the following:

- Recovery, inspection, repair, storage and cleaning of all equipment.
- Disposition of any materials recovered during the operation.
- De-briefing of divers, other team members, and support personnel
- Analysis of the success of the operation, as planned and actually carried out.
- Preparation and submission of all required reports.
- Re-stocking of expended materials.
- Ensuring the readiness of the Underwater Dive Unit to respond to the next assignment.

#### **3.4.4 Selecting the Diving Technique**

There are two basic types of diving equipment in current use by the Underwater Dive Unit. These techniques are Self-Contained Underwater Breathing Apparatus (SCUBA) and Surface Supplied Air (SSA). During certain operations both techniques may be suitable. In other operations, one option may be preferred over the other. The selection of the technique will depend upon the availability of equipment, trained personnel, the dive location, and the objective of the dive.

#### **3.4.5 Selecting and Assembling the Diving Team**

When planning diving assignments and matching the qualifications and experience of diving personnel to specific requirements of the operation, a thorough knowledge of the duties responsibilities and relationships of the various members of the diving team is essential.

The ultimate responsibility for the safe and effective conduct of all diving operations rests with the Officer-in-Charge. The Officer-in-Charge delegates appropriate authority to selected members of the Underwater Dive Unit. These members and subordinate personnel make up the Underwater Dive Unit. These include the assistant Officer-in-Charge, the dive supervisor, squad leaders and the divers.

### **3.4.6 Diving Personnel**

The Diver must be qualified for the diving technique used, the particular equipment involved, and for diving to the depth required. While working, the diver must keep topside personnel informed of the conditions on the bottom, of their progress, and of any developing problems that may indicate the need for changes in the plan or a call for assistance from other divers.

Divers are responsible for the dive gear they will use and must be sure that it is complete, in good repair, configured according to unit protocol and ready for use at any time.

Divers must be qualified and designated in accordance with instructions issued by the Officer-in-Charge, or their designee, and this Operations Guide.

#### **3.4.6.1 Standby Diver (Safety Diver)**

A standby diver is a primary requirement for all diving operations. The standby diver is a fully qualified diver, assigned for back-up or to provide emergency assistance and immediately ready to enter the water. A standby diver shall wear the apparatus and be completely ready for quick deployment. The standby diver receives the same briefings and instructions as the working diver and monitors the progress of the work as reported by the diver on the bottom, so that if called upon for assistance, they are fully prepared to respond.

In rare circumstances, when deemed appropriate by the Safety Officer and the Diving Supervisor, a standby diver may not be a necessary requirement.

#### **3.4.6.2 Team Leader**

The team leader will be selected by the Diving Supervisor and will direct all in-water diving personnel. Generally the team leader will be one of the squad leaders. However, a senior diver who has the requisite training and experience may be assigned as a team leader, at the discretion of the Diving Supervisor.

The team leader will select the diving team and will assign each diver to a specific task. The team leader will conduct a pre-dive operational briefing with all assigned personnel and will ensure that each participant understands their duties.

#### **3.4.6.3 Divers**

Divers will be selected for specific tasks based upon their training, experience, and their ability to perform the necessary task. Divers must assess their own abilities and should defer from conducting a dive that they believe to be beyond their capabilities.

#### **3.4.6.4 Buddy Diving**

A buddy diver is the dive partner for a scuba operation when the divers are working in pairs or teams. Each of the divers is the buddy for the other. The buddy divers are jointly responsible for the assigned mission and each keeps track of the depth and time factors for the dive. Each diver has a particular responsibility for the safety and well-being of the other.

#### **3.4.7 The Dive Briefing**

Each member of the dive team must fully understand the plan, their role in the plan, and the roles of the other members of the team and support personnel.

For each Diving Operation there will be two briefings provided to all involved personnel.

##### **3.4.7.1 Operational Briefing**

The operational briefing will be provided by the Team Leader and will include the following information:

- Intelligence
- Mission objectives
- Conditions in the operating area
- Diving technique and equipment to be used
- Assignments
- Method of deployment
- In-water movement
- Method of extraction
- Other information that is pertinent to the mission or mission specific

##### **3.4.7.2 Safety Briefing**

The safety briefing will be provided by the Safety Officer. The briefing will be conducted from a standardized written or Power Point format. The Safety Briefing will take place prior to divers departing the staging area unless an exigency exists as determined by the Dive Supervisor.

#### **3.4.8 De-Briefing the Diving Team**

Prompt de-briefing of divers returning to the surface will provide the Diving Supervisor with information that may influence or alter the next phase of the operation. Divers should be interviewed regarding the progress of the work, bottom conditions and anticipated problems. They should also be asked for any suggestions they might have for changes to the dive plan.

After all diving operations have ceased, all personnel shall be assembled for a general de-briefing.

### **3.5 Diving Operations Assignments and Duties**

For each operation that requires diving, a Diving Supervisor and a Safety Officer shall be designated.

#### **3.5.1 Diving Supervisor**

The Diving Supervisor shall be appointed by the Officer-in-Charge or their designee to be in charge of a diving operation as the Incident Commander.

The Diving Supervisor will appoint individuals to perform the functions of a surface crew. These functions may include logistics, tender, timekeeper, safety officer, safety diver(s), emergency medical technician personnel, surface supplied air personnel, lock out and tag out team, and other duties as dictated by the needs of the operation. In addition, the dive supervisor will work in tandem with the boat crew supervisor to support the overall mission of the diving operation.

The Diving Supervisor shall:

- Be a qualified member of the Underwater Dive Unit, as defined by this Operations Guide, with the appropriate training and experience to assume operational responsibility of an incident
- Hold a certification by a nationally recognized dive training organization as a SCUBA instructor, assistant instructor, or divemaster.
- Be accountable to the Officer-in-Charge for the conduct of a diving operation
- Manage all diving operations and be responsible for the safe diving practices of all divers assigned to an operation
- Have the authority to suspend or terminate diving operations
- Be the on-site liaison with other law enforcement representatives or public safety agencies
- Be responsible for the preparation of the basic plan for the diving operation
- Ensure that all personnel that are participating in the diving mission are thoroughly briefed on the mission and that they know and understand all applicable safety regulations and emergency procedures as outlined in the dive-briefing
- Designate a team leader(s) for the diving operation
- Determine equipment requirements, recommend diving assignments, search patterns, diving technique and establish contingency requirements for the operation
- Control all diving operations upon commencement of a dive
- Monitor progress, de-brief divers returning to the surface, update instructions to working divers, and ensure that the Officer-in-Charge is advised of the progress and of any changes to the original plan

- Gather appropriate data for analyzing the results of the operation and for use in preparing reports
- Ensure completion of post-dive incident reports

### **3.5.2 Safety Officer**

The Safety Officer shall be appointed by the Dive Supervisor. The Safety Officer shall:

- Be responsible for the management of safety programs
- Check the status of medical facilities and medical assets prior the commencement of any diving operation
- Ensure that all divers participating in a diving operation are medically fit to dive
- Gather and maintain safety information regarding contaminants and hazards, diving accidents, decontamination procedures, and equipment maintenance
- Be responsible for the assessment of safety related issues during the planning and execution of training and operational dives.
- Maintain a liaison with local law enforcement, emergency medical agencies, and other municipal entities where an operation is taking place, for the purpose of support and information gathering.
- Ensure that all emergency medical equipment is available at the dive site and is operational. This includes oxygen, first aid kit, and automated electronic defibrillator
- Ensure that all safety diver equipment is inspected and is available to the safety diver at the dive site
- Inspect all equipment that is to be used for the operation, conduct pre-dive safety briefings, and conduct a final equipment safety check on all divers
- Ensure that proper lockout/ tagout procedures were conducted and completed on the ship to be searched, in accordance with UDU standards.
- During diving operations, maintain dive profile information, operate underwater communications with the divers and coordinate with the boat crew.

### **3.5.3 Surface Crew**

The dive supervisor will appoint individuals to perform the functions of a surface crew. These functions may include logistics, tender or timekeeper, lock out and tag out team, safety diver(s), emergency medical technician personnel, boat operators, safety officer, surface supplied air operators, and other duties as dictated by the operation.

#### **3.5.4 Boat Operators**

A boat squad supervisor will be responsible for the planning and operation of UDU vessels and requisite personnel. Refer to the Boat Operations Procedures Guide for additional information.

## Volume 4 Minimum Requirements for Testing and Tryouts

### 4.1 Entry Level Requirements

All applicants shall meet the following requirements prior to testing for the position of Police Diver.

- Active non-probationary employment as a sworn member of the Los Angeles Police Department.
- Hold a minimum of an Open Water SCUBA Diving certification, issued by a nationally recognized SCUBA training agency.
- Hold a CPR certification at the Basic Life Support level, issued by a nationally recognized training agency.

### 4.2 Testing Requirements

All applicants shall receive a passing score on all phases of testing in order to be considered for an assignment to the Underwater Dive Unit. Testing shall include the following phases:

- Physical Fitness Qualification Exam
- Written Examination
- Confined water SCUBA skills evaluation
- Open Water SCUBA skills evaluation
- Oral Interview
- Background Investigation

#### 4.2.1 Physical Fitness Qualification Exam

All applicants shall pass a physical fitness qualification (PFQ). All PFQ tasks will be administered on the first day of the tryouts except for the Open Water Swim. All Day One PFQ tasks shall be completed with a passing score in order to continue on in the tryout process.

Applicants will perform all of the following physical fitness tasks:

#### Day One

- **Toe Touch** – Applicants will bend at the waist with their knees locked out and touch their toes with the tips of their fingers.
- **Push Ups** – Applicants will complete a minimum of 30 push ups
- **Sit Ups** – Applicants will complete a minimum of 50 sit-ups.
- **400 meter swim** – Applicants will complete a 400 meter swim, in a pool, in no longer than 13 minutes. The swim must be continuous. Applicants who stop or rest prior to completing 400 meters will be disqualified.

- **800 meter swim** – Applicants must complete an 800 meter swim in a pool. The ending times of each diver will be ranked and will contribute to an overall score. There is no minimum time for completion of the swim. Applicants shall use a mask, fins, and a snorkel.
- **25 yard underwater swim** - This swim will be conducted underwater, on one breath hold, and without the use of any swimming aids.
- **Tread Water** – Applicants will tread water for no less than 15 minutes. During this task applicants may not touch the wall or use any object that aids flotation.

### **Day Two**

- **Open water swim** – This swim will be conducted in full diving gear and will be timed. The ending times of each diver will be ranked and will contribute to an overall score. There is no minimum time for completion of the swim.

#### **4.2.2 Written Examination**

Applicants must achieve a passing score of 70 percent on a written examination that demonstrates knowledge of the following:

- Function, care, use, and maintenance of diving equipment
- Physics and physiology of diving
- Environmental maritime conditions
- Dangerous marine animals
- Emergency procedures
- Decompression theory and the use of Decompression tables
- Underwater communications
- Basic aspects of freshwater versus saltwater diving
- Basic aspects of altitude diving
- Planning and supervision of diving operations
- Diving hazards
- Prevention, causes, signs and symptoms, and field treatment of diving related maladies and environmental illnesses

#### **4.2.3 Confined Water SCUBA Skills Evaluation**

The applicant must satisfactorily demonstrate the ability to perform the following skills in a pool or confined area with similar conditions:

- Entering and leaving the water wearing full SCUBA equipment
- Understand underwater signs and signals
- Clear a flooded and partially flooded mask
- Recover and clear a regulator
- Remove and replace all SCUBA equipment, while submerged and on the surface

- Achieve neutral buoyancy, while performing a fin pivot, hover, or other technique designated by an instructor
- Buddy Breathing while stationary and while swimming
- Alternate air source breathing (donor and recipient)
- Controlled Emergency Swimming Ascent
- Other watermanship abilities acceptable to the examiner and as determined by the Officer-in-Charge or their designee.

#### **4.2.4 Open Water SCUBA Skills Evaluation**

The applicant must satisfactorily demonstrate the ability to perform the following skills in an open water environment:

- Entering and leaving the water or surf while wearing SCUBA gear
- Clear a flooded and partially flooded mask
- Recover and clear a regulator
- Remove and replace all SCUBA equipment, while submerged and on the surface
- Achieve neutral buoyancy, while performing a fin pivot, hover, or other technique designated by an instructor
- Buddy breathing while stationary and while swimming
- Alternate air source breathing (donor and recipient)
- Controlled Emergency Swimming Ascent
- Other watermanship abilities acceptable to the examiner and as determined by the Officer-in-Charge or their designee
- Ability to plan and execute a dive
- Judgment adequate for safe diving

#### **4.2.5 Oral Interview**

The applicant will submit to an oral interview in accordance with Department procedures.

#### **4.2.6 Background Investigation**

The applicant will undergo a background investigation that is consistent with the standards set forth by the Commanding Officer, Metropolitan Division.

## Volume 5 Annual Diver Qualification Requirements

### 5.1 General Policy and Prerequisites

#### 5.1.1 Eligibility

Only persons currently assigned to the Underwater Dive Unit shall be eligible to participate in Underwater Dive Unit training and operations. All UDU divers shall be required to satisfactorily complete periodic re-qualification requirements

### 5.2 Requirements for Annual Requalification of Active Dive Status

Divers must demonstrate they possess the necessary skills and judgment for all diving activities, as set forth by the Officer-in-Charge or their designee. Upon approval, divers will be renewed as active status.

#### 5.2.1 Requirements

The diver shall complete the following tasks periodically and at minimum, annually:

- Information/ Roster update
- Medical certification of fitness to dive
- Proof of bi-annual CPR certification at the Basic Life Support level and Standard First Aid, from a nationally recognized training agency or a UDU Instructor
- Inspection of all UDU issued equipment to ensure accountability and working order
- Physical Fitness Qualification

#### 5.2.2 Required Training

The diver must periodically complete any additional theoretical and practical training or certifications beyond the Open Water Diver level that the UDU requires.

Theoretical aspects combined with appropriate, practical training should include the following topics:

- Underwater Dive Unit Team Operations
- Advanced Diver Certification
- Rescue Diver Certification
- Underwater Navigation
- Search and Recovery
- Underwater Working and Rigging
- Underwater Salvage
- Underwater Lift Tools and Applications
- Underwater Lifting and Recovery

- Surface Craft Operations
- Surface and Underwater Imagery
- Underwater Surveys
- Underwater Crime Scene and Body Recovery
- Night Diving
- Limited Visibility and Blackout Diving
- Ordnance Familiarization and procedures
- Hull and Pier Searches, including lock-out/ tag-out
- Underwater Communications Devices
- Freshwater Diving
- Deep Diving
- Wreck Diving
- Underwater Tools
- Surface Supplied Air Operations
- Dry Suit Diving
- Equipment Maintenance
- Helicopter Operations
- Enriched Air Familiarization
- Metal Detector Usage
- Search Techniques
- Port Dive Operations Group
- Suspect Apprehension
- Sonar and Remote Operated Vehicle Operations
- Other training deemed necessary by the Officer-in-Charge

### **5.2.3 Required Examinations**

The following examinations are required to gain additional certifications or if deemed necessary by the Officer-in-Charge or their designee:

- Appropriate written examinations for the certification level
- Confined water skills evaluation, including emergency ascent techniques
- Open water skills evaluation

## **5.3 Night Dive Requirements**

During any 12 month period each UDU diver must log at least one night dive in conjunction with a UDU operation or training. The UDU Officer-in-Charge will determine the description of Night Dive conditions.

## **5.4 Depth Certification and Requirements**

During any 12 month period each UDU diver must log at least one dive at or near the maximum depth of the diver's certification.

Authorization to dive below a specific depth is based upon the certification level and training experience of the individual diver and the approval of the Officer-in-Charge or their designee. The UDU training program shall seek to certify all UDU divers to the level of Deep Diving Specialty. At least one training day per year shall be conducted in the area of Deep Diving Operations. The certifications and their corresponding depth levels are as follows:

#### **5.4.1 Open Water Diver Certification**

A diver certified to the level of Open Water Diver may dive to a depth, not to exceed 60 feet without the accompaniment of a UDU instructor.

#### **5.4.2 Advanced Open Water Diver Certification**

A diver certified to the level of Advanced Open Water Diver may dive to a depth, not to exceed 100 feet without the accompaniment of a UDU instructor.

#### **5.4.3 Deep Diving Specialty**

A diver certified to the level of Advanced Open Water Diver, who holds a Deep Diving Specialty certification, may dive to a depth, not to exceed 130 feet without the accompaniment of a UDU instructor.

#### **5.4.4 Additional Training**

A diver who holds a deep diving certification, who attends additional training, or has experience in extended range and or decompression procedures, may exceed 130 feet and dive to the limits of their certification level, only with the express approval of the Officer-in-Charge, or their designee, and within the guidelines of this Operations Guide.

### **5.5 Maintaining Active Dive Status**

#### **5.5.1 Requirements to Maintain Active Dive Status**

A diver must meet the following requirements to maintain active dive status:

##### **Attendance**

Each certified Underwater Dive Unit diver must attend all UDU training days, unless excused for court, vacation, sickness, work conflict, or another valid reason deemed appropriate by the Officer-in-Charge or their designee.

There may be times when unforeseen work conflicts arise that preclude a diver from attending training or call outs. This should be the rare exception. Absence at training significantly reduces the level of performance required by the UDU from its members. Failure to respond to a call out when notified impacts the level of service provided by the UDU and can reduce the overall safety of the mission.

If the diver's current assignment or personal commitments cause them to be unable to meet the requirements of a UDU assignment, a determination will be

made by the OIC of the UDU to remove them from the ancillary duty of the UDU assignment.

A diver who fails to conduct at least one training dive or call out dive during a consecutive six week period may be placed on inactive dive status.

### **Dive Proficiency Requirement**

Divers must log a minimum of three dives during each quarter of the calendar year. Divers who fail to log three dives per quarter will be placed on inactive dive status.

Requirements for maintaining active dive status may be waived by the Officer-in-Charge, or their designee, based upon the operational necessities of the UDU. Failure to abide by the preceding conditions may result in a diver being placed on inactive dive status and possibly removed from the UDU.

### **Re-activation of Active Dive Status**

A diver who is placed on inactive dive status due to a major illness, injury; or at the direction of the Officer-in-Charge, or their designee, may achieve active dive status through the following procedures:

- Conduct one or more training dives with a UDU Instructor, displaying proficiency in all aspects of UDU operational diving.
- Be approved for UDU operational diving by the Officer-in-Charge or their designee.

A diver who is placed on inactive dive status for a period exceeding six months, may be subject to removal from the UDU.

## **5.6 Physical Fitness Qualification Test (PFQ)**

All divers shall be required to pass a periodic PFQ as determined and scheduled by the Officer-in-Charge or their designee. Divers shall achieve a minimum passing score as determined by the Officer-in-Charge or their designee.

### **5.6.1 Failure to Pass the PFQ**

Divers who fail to take or pass the regularly scheduled PFQ shall be placed on inactive dive status and be required to pass a make-up test within 30 days. Divers shall be required to retake the entire PFQ. Any diver, who is unable to take the PFQ due to vacation, sick or IOD, shall be required to take the PFQ within 30 days after returning to full duty status.

## **5.7 Annual Medical Examination**

All Underwater Dive Unit divers shall submit to and pass an annual medical examination performed by a licensed physician with the City of Los Angeles, Personnel Department, Medical Services Section. After each major illness, injury, or at the direction of the Officer-in-Charge, or their designee, a diver shall submit to a medical interview or examination before resuming diving activities.

## **5.8 Suspension and Revocation of Active Dive Status**

### **5.8.1 General**

UDU active dive status may be temporarily suspended or permanently revoked for cause.

The temporary suspension of UDU active dive status may result for medical reasons or from minor infractions of UDU diving regulations, policies, or procedures.

Permanent revocation of dive status may result from serious conditions or violations of UDU diving regulations, policies, or procedures.

### **5.8.2 Temporary Suspension**

Representative examples of situations and infractions leading to temporary suspension include, but are not limited to:

- Failure of a diver to maintain minimum diving proficiency on a recurring basis;
- A lapse of CPR, first aid, and/or oxygen administration;
- Failure to pass the annual Physical Fitness Qualification;
- Failure of a diver to pass a UDU diving medical examination within the prescribed, age-based interval, as determined by Medical Services Section;
- Failure of a diver to properly use or maintain UDU-issued diving gear or support equipment;
- Failure of a diver to comply with the policies and procedures of this operations guide;
- Committing a significant safety violation.

Dive certifications can be temporarily suspended for cause by the Officer-in-Charge or their designee.

### **5.8.3 Permanent Revocation**

Representative examples of situations and infractions leading to permanent revocation include, but are not limited to:

- Flagrant violation of LAPD or UDU standards, regulations, and policies; (e.g., diving solo without a tender, diving after notification of a lapsed physical exam without obtaining reauthorization); or

- A not-fit-for-duty determination has been made by the Officer-in-Charge or their designee, following the conclusion of an Individualized Assessment Period (probationary divers).
- Serious Department misconduct which would preclude an officer or supervisor from working a field assignment.

## **Volume 6 Diving Equipment**

### **6.1 General Policy**

All equipment used by Underwater Dive Unit personnel shall meet Underwater Dive Unit standards.

### **6.2 Equipment Maintenance**

An approved technician or facility must accomplish all inspections, tests, and maintenance procedures.

#### **6.2.1 Recordkeeping**

Each equipment modification, repair, test, calibration, or maintenance shall be logged, including the date and nature of work performed, serial number of item, and the name of the person performing the work for the following equipment:

- Air Filtration Systems
- Air Storage Cylinders
- Analytical Instruments
- Compressors
- Cylinder Valves
- Depth Gauges
- Dive Computers
- Gas Control Panels
- Regulators
- Scuba Cylinders
- Full Face Mask Apparatus
- Submersible Pressure Gauges
- Sonar Systems
- Remote Operated Vehicles

### **6.3 Regulators**

SCUBA regulators used in the Underwater Dive Unit diving program shall be inspected prior to the first use and once per year thereafter.

### **6.4 Full Face Masks**

Full Face Masks shall have the following features:

- A non-return valve at the attachment point between the mask hose, which shall close readily and positively
- An exhaust valve

- Minimum ventilation rates capable of maintaining the diver at the depth to which they are diving.

## **6.5 SCUBA Cylinders**

SCUBA cylinders shall be designed, constructed, and maintained in accordance with the applicable provisions of the Unified Pressure Vessel Safety Orders. SCUBA cylinders must be hydrostatically tested at least every 5 years. SCUBA cylinders must have a visual cylinder inspection at intervals not to exceed 12 months. SCUBA cylinder valves shall be functionally tested at intervals not to exceed 12 months.

## **6.6 Auxiliary Equipment**

All auxiliary equipment shall be of the type approved by the Officer-in-Charge or their designee.

- Buoyancy Compensators and weight systems shall be regularly inspected by the person to whom they are issued and being used. Additionally, these systems shall be equipped with quick release mechanisms which allow for single handed, single motion jettisoning.
- All personnel involved in the diving operation should wear personal flotation devices (PFD) appropriate to the task that they are performing. Personal flotation systems, buoyancy compensators, dry suits, or other variable-volume buoyancy compensation devices shall be equipped with a reliable, rapid exhaust valve which can be operated in a horizontal swimming position. These devices as well as any associated auto-inflation devices shall be functionally inspected and tested prior to their first use and as recommended by the manufacturer. An inflatable exposure suit by itself shall not be used as the sole source of buoyancy. Dry suits shall be equipped with a hands free exhaust valve.
- Gauges shall be inspected, tested, and calibrated prior to their use and every six months thereafter. A diver shall be aware of the calibration curve of any depth gauge that they utilize.
- A first aid kit, adequate for the diving operation shall be available at the dive site. This kit will contain a demand type oxygen system.
- Lift bags and other devices designed to lift objects from underwater shall be inspected prior to and after each use.
- All issued personal equipment shall be cleaned following each use in accordance with the manufacturer's recommendations.
- Personal equipment that is lost or unserviceable shall be reported to the Officer-in-Charge or their designee, on an Employee's Report, form 15.7.

## **6.7 Breathing Gas**

### **6.7.1 Minimal Standards for Air Operations**

Compressed air used for all diving activities shall meet the following specifications as well as the air quality standards:

- Minimum Oxygen Requirement: Atmospheric
- Maximum Carbon Monoxide: 0.001 % (10 ppm)
- Maximum Carbon Dioxide: 0.10 % (1000 ppm)
- Dust, Oil, and Water: None
- Odors and Vapors: None

### **6.7.2 Minimal Standards for Enriched Air NITROX Operations**

All divers engaging in the use of Enriched Air NITROX, as a primary breathing gas, shall be properly trained and certified for the mixture being used. Prior to employing Enriched Air NITROX as a primary breathing gas, a risk assessment shall be conducted to determine the feasibility of using the gas. Enriched Air NITROX shall only be used, as a primary breathing gas, with the approval of the Officer-in-Charge or their designee. The maximum oxygen content for Enriched Air NITROX Operations is 40%.

Nothing in this section precludes the use of breathing gas with higher oxygen contents, from being used during planned decompression diving operations.

### **6.7.3 Compressor Systems Operated by the Underwater Dive Unit**

The design and location of the system shall meet the following requirements:

- Low pressures used to supply air to the diver shall be equipped with a volume tank with a check valve on the inlet side, pressure gauge, a relief valve, and a drain valve
- Compressed air systems over 500 PSIG shall have slow opening shut-off valves.
- All air compressor intakes shall be located away from areas containing exhaust or other contaminants.
- Gas analyses and air tests shall be performed on each UDU controlled air compressor that is used to pump breathing air. These tests and analyses shall be conducted at regular intervals of no more than 200 hours of operation or annually, whichever occurs first. This will ensure compliance with minimum breathing air standards. The results of these tests shall be entered in a formal log and maintained by the Assistant Officer-in-Charge.
- Compressor operation and air test records shall be maintained for accountability.

All personnel who operate a Department air or NITROX fill station shall be certified according to nationally recognized standards.

## **6.8 Oxygen Safety**

The following requirements regarding the use of oxygen shall be followed:

- Equipment used in oxygen or in mixtures containing over 40% oxygen shall be designated and maintained for oxygen service.
- Components exposed to oxygen or mixtures containing over 40% oxygen shall be cleaned of flammable materials prior to being placed into service.
- Oxygen systems over 125 PSIG shall have slow-opening shut-off valves.

## **Volume 7 Boats**

### **7.1 Responsibilities**

It is the responsibility of the boat crew to support the following (but not limited to) missions below:

- Support Underwater Dive Unit (UDU) missions
- Support Tactical Waterborne (TWB) missions
- Support HAZMAT missions
- Support United States Coast Guard (USCG) missions
- Support the Los Angeles Border Enforcement Security Team (LABEST)
- Support the Central California Maritime Agency Coordination Group (CenCal MAC)
- Support additional military units when called upon
- Support additional missions deemed necessary by the Commanding Officers, Metropolitan Division

### **7.2 Operations**

The following considerations shall be taken into account prior to all missions. The Boat Crew supervisor shall be responsible for making underway decisions as it pertains to crew and passenger safety. If the Boat Crew supervisor is not on scene, a Boat Crew member deemed certified by the UDU Officer-in-Charge, or their designee, shall be responsible for making underway decisions as it pertains to crew and passenger safety, regardless of rank. In these critical situations, experience outweighs all other factors.

### **7.3 Planning**

The below listed considerations shall be taken into account when planning any mission, whether it is inside a harbor or offshore:

- Weather shall be checked, both current and anticipated within the time frame of the mission.
- Equipment as it is suited for the conditions anticipated and to support the mission. Additionally, any mechanical issues affecting safety or the mission shall deem a vessel unusable.
- Personnel experience and ability shall be taken into consideration when planning a mission.
- When supporting a dive related mission, assure that all dive related safety equipment is on board prior to departure.

## **7.4 Minimum Requirements**

The following requirements shall be met for all Boat Crew personnel. Although prior boat experience is not required, it is highly preferred:

- Active non-probationary employment as a sworn member of the Los Angeles Police Department.
- Hold a CPR certification at the Basic Life Support level, issued by a nationally recognized training agency.
- Complete the 2 week Basic Maritime Operators Course (BMOC) at the Maritime Law Enforcement Training Center (MLETC). This must be completed prior to appointment to the Boat Crew.
- Complete the 1 week Anti-Terrorism Boat Operators Course (ATBOC) tactical coxswain class during six month probation period.
- Become familiar with and understand all aspects of the Boat Crew Manual.
- Successfully perform all duties of a boat crew member during a six month probation period.

### **7.4.1 Oral Interview**

The applicant will submit to an oral interview in accordance with Department procedures.

### **7.4.2 Background Investigation**

The applicant will undergo a background investigation that is consistent with the standards set forth by the Commanding Officer, Metropolitan Division.

## **Appendix A Diving Tables**

### **Contents**

- A.1** U.S. Navy, No-Decompression Air Dive Tables
- A.2** U.S. Navy, No-Decompression Shallow Water Tables
- A.3** NOAA, No-Decompression Air Dive Tables
- A.4** NOAA NITROX 32, No-Decompression Dive Table
- A.5** NOAA NITROX 36, No-Decompression Dive Table
- A.6** U.S. Navy Equivalent Air Depth Table
- A.7** Ascent to Altitude After Diving Table
- A.8** Sea Level Equivalent Depth Table
- A.9** Pressure Variation with Altitude Table

## A.1 U.S. Navy No-Decompression Air Dive Tables

**Table 9-7.** No-Decompression Limits and Repetitive Group Designators for No-Decompression Air Dives.

Depth (fsw)	No-Stop Limit	Repetitive Group Designation															
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Z
10	Unlimited	57	101	158	245	426	*										
15	Unlimited	36	60	88	121	163	217	297	449	*							
20	Unlimited	26	43	61	82	106	133	165	205	256	330	461	*				
25	595	20	33	47	62	78	97	117	140	166	198	236	285	354	469	595	
30	371	17	27	38	50	62	76	91	107	125	145	167	193	223	260	307	371
35	232	14	23	32	42	52	63	74	87	100	115	131	148	168	190	215	232
40	163	12	20	27	36	44	53	63	73	84	95	108	121	135	151	163	
45	125	11	17	24	31	39	46	55	63	72	82	92	102	114	125		
50	92	9	15	21	28	34	41	48	56	63	71	80	89	92			
55	74	8	14	19	25	31	37	43	50	56	63	71	74				
60	60	7	12	17	22	28	33	39	45	51	57	60					
70	48	6	10	14	19	23	28	32	37	42	47	48					
80	39	5	9	12	16	20	24	28	32	36	39						
90	30	4	7	11	14	17	21	24	28	30							
100	25	4	6	9	12	15	18	21	25								
110	20	3	6	8	11	14	16	19	20								
120	15	3	5	7	10	12	15										
130	10	2	4	6	9	10											
140	10	2	4	6	8	10											
150	5	2	3	5													
160	5		3	5													
170	5			4	5												
180	5			4	5												
190	5			3	5												

\* Highest repetitive group that can be achieved at this depth regardless of bottom time.

**Table 9-8. Residual Nitrogen Time Table for Repetitive Air Dives.**

Locate the diver's repetitive group designation from his previous dive along the diagonal line above the table. Read horizontally to the interval in which the diver's surface interval lies.

Next, read vertically downward to the new repetitive group designation. Continue downward in this same column to the row that represents the depth of the repetitive dive. The time given at the intersection is residual nitrogen time, in minutes, to be applied to the repetitive dive.

\* Dives following surface intervals longer than this are not repetitive dives. Use actual bottom times in the Air Decompression Tables to compute decompression for such dives.

		Repetitive Group at Beginning of Surface Interval																
		Z	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	
Dive Depth	10	**	**	**	**	**	**	**	**	**	**	**	**	427	246	159	101	58
	15	**	**	**	**	**	**	**	**	450	298	218	184	122	89	61	37	
20	**	**	**	**	**	462	331	257	208	166	134	106	83	62	44	27		
25	†	†	470	354	288	237	188	167	141	118	98	79	63	48	34	21		
30	372	308	261	224	194	168	146	126	108	92	77	63	51	38	28	18		
35	245	218	191	169	149	132	116	101	88	75	64	53	43	33	24	15		
40	188	169	152	136	122	109	97	85	74	64	55	45	37	29	21	13		
45	154	140	127	115	104	93	83	73	64	56	48	40	32	25	18	12		
50	131	120	109	99	90	81	73	65	57	49	42	35	29	23	17	11		
55	114	105	96	88	80	72	65	58	51	44	38	32	26	20	15	10		
60	101	93	86	79	72	65	58	52	46	40	35	29	24	19	14	9		
70	83	77	71	65	59	54	49	44	39	34	29	25	20	16	12	8		
80	70	65	60	55	51	46	42	38	33	29	25	22	18	14	10	7		
90	61	57	52	48	44	41	37	33	29	26	22	19	16	12	9	6		
100	54	50	47	43	40	36	33	30	26	23	20	17	14	11	8	5		
110	48	45	42	39	36	33	30	27	24	21	18	16	13	10	8	5		
120	44	41	38	35	32	30	27	24	22	19	17	14	12	9	7	5		
130	40	37	35	32	30	27	25	22	20	18	15	13	11	9	6	4		
140	37	34	32	30	27	25	23	21	19	16	14	12	10	8	6	4		
150	34	32	30	28	26	23	21	19	17	15	13	11	9	8	6	4		
160	32	30	28	26	24	22	20	18	16	14	13	11	9	7	5	4		
170	30	28	26	24	22	21	19	17	15	14	12	10	8	7	5	3		
180	28	26	25	23	21	19	18	16	14	13	11	10	8	6	5	3		
190	26	25	23	22	20	18	17	15	14	12	11	9	8	6	5	3		

Residual Nitrogen Times (Minutes)

\*\* Residual Nitrogen Time cannot be determined using this table (see paragraph 9-2.1 subparagraph 8 for instructions).

† Read vertically downward to the 30 fsw repetitive dive depth. Use the corresponding residual nitrogen times to compute the equivalent single dive time. Decompress using the 30 fsw air decompression table.

## A.2 U.S. Navy, No-Decompression – Shallow Water Tables

### Optional Shallow Water Diving Tables

- 2-A1.1 Introduction. At the shallow depths typical of ship husbandry diving, a small change in the diver's maximum depth can make a significant difference in the allowable no-decompression time. For example, at 35 fsw the no-decompression time on air is 232 minutes; at 40 fsw it is only 163 minutes, more than an hour less. When the diver's maximum depth is accurately known at the beginning of the dive, e.g., in ballast tank dives, or when continuous electronic depth recording is available, e.g., with a decompression computer, use of a decompression table with depth listed in one-foot increments rather than five-foot increments may result in a significant gain in no-decompression time.

Shallow Water Diving Tables covering the depth range of 30–50 fsw in one-foot increments are given in Tables 2A-1 and 2A-2. These tables are simply an expansion of Tables 9-7 and 9-8 and the rules for using Tables 2A-1 and 2A-2 are identical to the rules for using Tables 9-7 and 9-8. These Shallow Water Diving Tables are optional. They may be used instead of Tables 9-7 and 9-8 if they offer a gain in no-decompression time. The Optional Shallow Water Diving Tables are most suited to ship husbandry diving, but can be used in other shallow air diving applications as well.

**Table 2A-1. No-Decompression Limits and Repetitive Group Designators for Shallow Water Air No-Decompression Dives.**

Depth (fsw)	No-Stop Limit (min)	Repetitive Group Designation															
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Z
30	371	17	27	38	50	62	76	91	107	125	145	167	193	223	260	307	371
31	334	16	26	37	48	60	73	87	102	119	138	158	182	209	242	282	334
32	304	15	25	35	46	58	70	83	98	114	131	150	172	197	226	261	304
33	281	15	24	34	45	56	67	80	94	109	125	143	163	186	212	243	281
34	256	14	23	33	43	54	65	77	90	104	120	137	155	176	200	228	256
35	232	14	23	32	42	52	63	74	87	100	115	131	148	168	190	215	232
36	212	14	22	31	40	50	61	72	84	97	110	125	142	160	180	204	212
37	197	13	21	30	39	49	59	69	81	93	106	120	136	153	172	193	197
38	184	13	21	29	38	47	57	67	78	90	102	116	131	147	164	184	
39	173	12	20	28	37	46	55	65	76	87	99	112	126	141	157	173	
40	163	12	20	27	36	44	53	63	73	84	95	108	121	135	151	163	
41	155	12	19	27	35	43	52	61	71	81	92	104	117	130	145	155	
42	147	11	19	26	34	42	50	59	69	79	89	101	113	126	140	147	
43	140	11	18	25	33	41	49	58	67	76	87	98	109	122	135	140	
44	134	11	18	25	32	40	48	56	65	74	84	95	106	118	130	134	
45	125	11	17	24	31	39	46	55	63	72	82	92	102	114	125		
46	116	10	17	23	30	38	45	53	61	70	79	89	99	110	116		
47	109	10	16	23	30	37	44	52	60	68	77	87	97	107	109		
48	102	10	16	22	29	36	43	51	58	67	75	84	94	102			
49	97	10	16	22	28	35	42	49	57	65	73	82	91	97			
50	92	9	15	21	28	34	41	48	56	63	71	80	89	92			

**Table 2A-2. Residual Nitrogen Time Table for Repetitive Shallow Water Air Dives.**

Locate the diver's repetitive group designation from his previous dive along the diagonal line above the table. Read horizontally to the interval in which the diver's surface interval lies.

Next, read vertically downward to the new repetitive group designation. Continue downward in this same column to the row that represents the depth of the repetitive dive. The time given at the intersection is residual nitrogen time, in minutes, to be applied to the repetitive dive.

\* Dives following surface intervals longer than this are not repetitive dives. Use actual bottom times in the Air Decompression Tables to compute decompression for such dives.

Dive Depth	Repetitive Group at Beginning of Surface Interval															
	Z	O	N	M	L	K	J	I	H	G	F	E	D	C	A	
30	372	308	261	224	194	168	146	126	108	92	77	63	51	39	28	18
31	334	282	243	210	183	159	139	120	103	88	74	61	49	38	27	17
32	305	262	227	198	173	151	132	115	99	85	71	59	47	36	26	17
33	282	244	213	187	164	144	126	110	95	81	69	57	46	35	25	16
34	262	229	201	177	156	138	121	105	91	78	66	55	44	34	25	16
35	245	216	191	169	149	132	116	101	88	75	64	53	43	33	24	15
36	231	204	181	161	143	126	111	98	85	73	62	51	41	32	23	15
37	218	194	173	154	137	122	107	94	82	70	60	50	40	31	23	14
38	207	185	165	148	132	117	103	91	79	68	58	48	39	30	22	14
39	197	177	158	142	127	113	100	88	77	66	56	47	38	29	21	14
40	188	169	152	136	122	109	97	85	74	64	55	45	37	29	21	13
41	180	163	146	132	118	105	93	82	72	62	53	44	36	28	20	13
42	173	156	141	127	114	102	91	80	70	61	52	43	35	27	20	13
43	166	150	136	123	110	99	88	78	68	59	50	42	34	26	19	12
44	160	145	131	119	107	96	85	75	66	57	49	41	33	26	19	12
45	154	140	127	115	104	93	83	73	64	56	48	40	32	25	18	12
46	149	136	123	111	101	90	81	71	63	54	46	39	32	25	18	12
47	144	131	119	108	98	88	78	70	61	53	45	38	31	24	18	11
48	139	127	116	105	95	85	76	68	60	52	44	37	30	24	17	11
49	135	123	112	102	92	83	74	66	58	51	43	36	30	23	17	11
50	131	120	109	99	90	81	73	65	57	49	42	35	29	23	17	11

Residual Nitrogen Times (Minutes)

# A.3 NOAA No-Decompression Multiple Dive Table



## NOAA NO-DECOMPRESSION TABLE MULTIPLE AIR DIVES

CHART 1 – DIVE TIMES WITH END-OF-DIVE GROUP LETTER

**WARNING: EVEN STRICT COMPLIANCE WITH THESE CHARTS WILL NOT GUARANTEE AVOIDANCE OF DECOMPRESSION SICKNESS. CONSERVATIVE USAGE IS STRONGLY RECOMMENDED.**

**RNT** RESIDUAL NITROGEN TIME  
**+ ABT** ACTUAL BOTTOM TIME  
**ESDT** EQUIVALENT SINGLE DIVE TIME  
 (USE ESDT TO DETERMINE END-OF-DIVE LETTER GROUP)

THESE CHARTS ARE BASED ON THE U.S. NAVY AIR DECOMPRESSION TABLES 7, 8, & 9 REV. 6

DEPTH	00		MAXIMUM NO-STOP TIME																DIVE TIME REQUIRING DECOMPRESSION STOP	
	msw	fsw	12	20	27	36	44	53	63	73	84	95	108	121	135	151	163	180	00	06
12.2	40	12	20	27	36	44	53	63	73	84	95	108	121	135	151	163	180	14	20	
15.2	50	9	15	21	28	34	41	48	56	63	71	80	89	92	100	110	130	4	8	
16.8	55	8	14	19	25	31	37	43	50	56	63	71	74	80	90	100	110	4	8	
18.3	60	7	12	17	22	28	33	39	45	51	57	60	65	70	80	90	100	2	4	
21.4	70	6	10	14	19	23	28	32	37	42	47	48	55	60	70	80	90	1	2	
24.4	80	5	9	12	16	20	24	28	32	36	39	45	50	55	60	70	80	1	2	
27.4	90	4	7	11	14	17	21	24	28	30	35	40	45	50	60	70	80	1	2	
30.5	100	4	6	9	12	15	18	21	25	28	33	38	43	48	55	60	70	1	2	
33.6	110	3	6	8	11	14	16	19	20	25	30	35	40	45	55	60	70	1	2	
36.6	120	3	5	7	10	12	15	18	20	25	30	35	40	45	55	60	70	1	2	
39.6	130	2	4	6	9	10	15	20	25	30	35	40	45	55	60	70	80	1	2	

GROUP LETTER	DIVE TIMES (hours:minutes)															
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Z
13	2:20	3:36	4:31	5:23	6:15	7:08	8:00	8:52	9:44	10:36	11:29	12:21	13:13	14:05	14:58	15:50
150	1:16	2:11	3:00	3:55	4:48	5:40	6:32	7:24	8:16	9:09	10:01	10:53	11:45	12:37	13:30	14:22
21	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
142	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
29	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
134	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
37	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
126	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
43	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
118	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
55	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
108	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
64	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
99	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
74	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
89	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
85	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
78	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
97	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
66	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
109	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
54	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
122	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
41	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
136	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
27	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
152	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05
11	1:02	1:47	2:29	3:11	3:53	4:35	5:16	6:00	6:44	7:28	8:14	9:00	9:46	10:32	11:19	12:05

**CHART 3 – REPETITIVE DIVE TIME**  
 00 RED NUMBERS (TOP) ARE RESIDUAL NITROGEN TIMES (RNT)  
 00 BLACK NUMBERS (BOTTOM) ARE ADJUSTED NO STOP REPETITIVE DIVE TIME  
 AND THE FOLLOWING BOTTOM TIME SHOULD NOT EXCEED THIS NUMBER

**CHART 2 – SURFACE INTERVAL TIME**  
 Time Ranges in hours: minutes  
 Enter Chart 2 from the top,  
 move down to find surface interval time,  
 move left to find the next repetitive group letter.

# A.4 NOAA NITROX 32, No-Decompression Dive Table



## NOAA NITROX 32 NO-DECOMPRESSION DIVE TABLE - Abbreviated USE ONLY WITH 32% OXYGEN 68% NITROGEN MIXTURES

WARNING: EVEN STRICT COMPLIANCE WITH THESE CHARTS WILL NOT GUARANTEE AVOIDANCE OF DECOMPRESSION SICKNESS. CONSERVATIVE USAGE IS STRONGLY RECOMMENDED

RNT RESIDUAL NITROGEN TIME  
+ABT ACTUAL BOTTOM TIME  
ESDT EQUIVALENT SINGLE  
DIVE TIME

PO<sub>2</sub> has been rounded  
to the next highest value

**CHART 1 - DIVE TIMES WITH END-OF-DIVE GROUP LETTER**

PO <sub>2</sub>	START DEPTH		DIVE TIME REQUIRING DECOMPRESSION															00
	msw	fsw	MINUTES REQUIRED AT 10 fsw STOP (3 msw)															
0.8	12	40	15	30	45	60	75	95	120	145	170	205	250	310	344	402	250	
0.9	15	50	5	15	25	30	40	50	70	80	100	110	130	150	170	200	150	
1.0	18	60		10	15	25	30	40	50	60	70	80	90	100	110	120	150	
1.1	22	70		10	15	20	25	30	40	50	55	60	70	80	90	100	120	
1.2	25	80		5	10	15	20	30	35	40	45	50	60	70	80	90	110	
1.3	28	90		5	10	15	20	25	30	35	40	45	50	60	70	80	100	
1.4	31	100		5	10	12	15	20	25	30	35	40	45	50	60	70	90	
1.5	34	110		5	10	12	15	20	25	30	35	40	45	50	60	70	80	
1.6	37	120		5	7	10	15	20	22	25	30	35	40	45	50	60	70	
	40	130		5	10	13	15	20	22	25	30	35	40	45	50	60	70	

**CHART 3 - REPETITIVE DIVE TIME**

PO <sub>2</sub>	0.8	0.9	1.0	1.0	1.1	1.2	1.3	1.4	1.5	1.6	Group Letter
msw	12	15	18	22	25	28	31	34	37	40	
fsw	40	50	60	70	80	90	100	110	120	130	
	7	6	5	4	4	3	3	3	3	3	A
	193	94	56	46	36	27	27	22	17	17	B
	17	13	11	9	8	7	7	7	6	6	C
	183	87	49	41	32	23	23	18	14	14	D
	25	21	17	15	13	11	11	10	10	10	E
	175	79	43	36	27	19	19	15	10	10	F
	37	29	24	20	18	16	16	14	13	13	G
	163	71	36	30	22	14	14	11	7	7	H
	49	38	30	26	23	20	20	18	16	16	I
	151	62	30	24	17	10	10	7	4	4	J
	61	47	36	31	28	24	24	21	20	20	K
	139	53	24	19	12	6	6	3	3	3	L
	73	56	44	37	31	29	29	26	24	24	M
	127	44	16	13	8	1	1	1	1	1	N
	87	66	52	43	38	33	33	30	27	27	O
	113	34	8	7	2						
	101	76	61	50	43	38	38	34	31	31	
	99	24									
	116	87	70	67	68	63	63	58	54	54	
	84	13									
	138	99	79	64	54	47	47	43	38	38	
	62	1									
	161	111	88	72	61	53	53	48	42	42	
	39										
	187	124	97	80	68	58	58	51	47	47	
	13										
	213	142	107	87	73	64	64	57	51	51	
	241	160	117	96	80	70	70	61	55	55	

CHART 3 - REPETITIVE DIVE TIME  
RED NUMBERS (TOP) ARE RESIDUAL NITROGEN TIMES (RNT)  
BLACK NUMBERS (BOTTOM) ARE ADJUSTED NO-STOP REPETITIVE DIVE TIMES. ACTUAL DIVE TIME SHOULD NOT EXCEED THIS NUMBER.

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**CHART 2 - SURFACE INTERVAL TIME**  
TIME RANGES IN HOURS:MINUTES  
ENTER FROM THE TOP, MOVE DOWN TO FIND SURFACE INTERVAL TIME  
MOVE TO LEFT TO FIND THE NEXT REPETITIVE GROUP LETTER

# A.5 NOAA NITROX 36, No-Decompression Dive Table



## NOAA NITROX 36 NO DECOMPRESSION TABLE - Abbreviated USE ONLY WITH 36% OXYGEN 64% NITROGEN MIXTURES

WARNING: EVEN STRICT COMPLIANCE WITH THESE CHARTS WILL NOT GUARANTEE AVOIDANCE OF DECOMPRESSION SICKNESS. CONSERVATIVE USAGE IS STRONGLY RECOMMENDED

RNT RESIDUAL NITROGEN TIME  
+ABT ACTUAL BOTTOM TIME  
ESDT EQUIVALENT SINGLE DIVE TIME

PO<sub>2</sub> has been rounded to the next highest value

**CHART 1 - DIVE TIMES WITH END-OF-DIVE GROUP LETTER**

PO <sub>2</sub>	START DEPTH		DIVE TIME REQUIRING DECOMPRESSION															
	m <sub>sw</sub>	f <sub>sw</sub>	NO-STOP TIME								MINUTES REQUIRED AT 10 f <sub>sw</sub> STOP (3 m <sub>sw</sub> )							
0.8	12	40	15	30	45	60	75	95	120	145	170	205	250	310	344	405		
1.0	15	50	5	15	25	40	50	60	80	100	120	140	160	190	220	270		
1.1	18	60		10	15	25	30	40	50	60	70	80	90	100	120	160		
1.2	22	70		10	15	25	30	40	50	60	70	80	90	100	120	160		
1.25	25	80		10	15	20	25	30	40	50	55	60	70	80	100	160		
1.35	28	90		5	10	15	20	30	35	40	45	50	60	70	80	100		
1.5	31	100		5	10	15	20	25	30	35	40	45	50	60	70	80		
1.6	34	110		5	10	12	15	20	25	30	35	40	45	50	60	70		

PO <sub>2</sub>	0.8	1.0	1.1	1.2	1.25	1.35	1.5	1.6	Group
m <sub>sw</sub>	12	15	18	22	25	28	31	34	Letter
f <sub>sw</sub>	40	50	60	70	80	90	100	110	
	7	6	6	5	4	4	3	3	A
	303	94	94	55	46	36	27	27	
	17	13	13	11	9	8	7	7	B
	293	87	87	49	41	32	23	23	
	25	21	21	17	15	13	11	11	C
	285	79	79	43	35	27	19	19	
	37	29	29	24	20	18	16	16	D
	273	71	71	36	30	22	14	14	
	49	38	38	30	26	23	20	20	E
	261	62	62	30	24	17	10	10	
	61	47	47	36	31	28	24	24	F
	249	53	53	24	19	12	6	6	
	73	66	66	44	37	32	29	29	G
	237	44	44	16	13	8	1	1	
	87	66	66	52	43	38	33	33	H
	223	34	34	8	7	2			
	101	76	76	61	50	43	38	38	I
	209	24	24						
	116	87	87	70	57	49	43	43	J
	194	13	13						
	138	99	99	79	64	54	47	47	K
	172	1	1						
	161	111	111	88	72	61	53	53	L
	149								
	187	124	124	97	80	68	58	58	M
	123								
	213	142	142	107	87	73	64	64	N
	97								
	241	160	160	117	96	80	70	70	O
	69								

### CHART 3 - REPETITIVE DIVE TIME

00 RED NUMBER (TOP) ARE RESIDUAL NITROGEN TIMES (RNT)  
00 BLACK NUMBERS (BOTTOM) ARE ADJUSTED NO-STOP REPETITIVE DIVE TIMES. ACTUAL DIVE TIME SHOULD NOT EXCEED THIS NUMBER.

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### CHART 2 - SURFACE INTERVAL TIME

TIME RANGES IN HOURS:MINUTES  
ENTER FROM THE TOP, MOVE DOWN TO FIND SURFACE INTERVAL TIME  
MOVE TO LEFT TO FIND THE NEXT REPETITIVE GROUP LETTER

## A.6 U.S. Navy Equivalent Air Depth Table

**Table 10-1. Equivalent Air Depth Table.**

Diver's Actual Depth (fsw)	EAD Feet															
	25% O <sub>2</sub>	26% O <sub>2</sub>	27% O <sub>2</sub>	28% O <sub>2</sub>	29% O <sub>2</sub>	30% O <sub>2</sub>	31% O <sub>2</sub>	32% O <sub>2</sub>	33% O <sub>2</sub>	34% O <sub>2</sub>	35% O <sub>2</sub>	36% O <sub>2</sub>	37% O <sub>2</sub>	38% O <sub>2</sub>	39% O <sub>2</sub>	40% O <sub>2</sub>
20	20	20	20	20	20	20	20	15	15	15	15	15	10	10	10	10
30	30	30	30	30	30	30	30	25	25	25	20	20	20	20	20	20
40	40	40	40	40	40	40	40	35	30	30	30	30	30	30	25	25
50	50	50	50	50	50	50	50	40	40	40	40	40	35	35	35	35
60	60	60	60	60	60	60	50	50	50	50	50	50	50	50	40	40
70	70	70	70	70	70	60	60	60	60	60	60	60	50	50	50	50
80	80	80	80	80	70	70	70	70	70	70	70	60	60	60	60	60
90	90	90	90	90	80	80	80	80	80	80	70	70	70 (:107)	70 (:80)	70 (:61)	70 (:47)
100	100	100	100	90	90	90	90	90	90	80 (:113)	80 (:82)	80 (:61)	80 (:46)	80 (:36)	80 (:29)	70 (:23)
110	110	110	110	100	100	100	100	100 (:96)	100 (:69)	90 (:51)	90 (:39)	90 (:30)				
120	120	120	120	110	110	110 (:91)	110 (:64)	110 (:47)	100 (:35)	100 (:27)						
130	130	130	120	120 (:95)	120 (:65)	120 (:47)	120 (:35)	110 (:26)								
140	140 (:109)	140 (:73)	130 (:50)	130 (:38)												
150	150 (:89)	150 (:59)	140 (:41)													
160	160 (:50)	160 (:35)														

EAD = Equivalent Air Depth - For Decompression Table Selection Only Rounded to Next Greater Depth

= 1.4 ata Normal working limit.

= Depth exceeds the normal working limit, requires the Commanding Officer's authorization and surface-supplied equipment. Repetitive dives are not authorized. Times listed in parentheses indicate maximum allowable exposure.

**Note<sup>1</sup>:** Depths not listed are considered beyond the safe limits of NITROX diving.

**Note<sup>2</sup>:** The EAD, 1.4 ata Normal Working Limit Line and Maximum Allowable Exposure Time for dives deeper than the Normal Working Limit Line are calculated assuming the diver rounds the oxygen percentage in the gas mixture using the standard rounding rule discussed in paragraph 10-4.1. The calculations also take into account the allowable ± 0.5 percent error in gas analysis.

## A.7 Ascent to Altitude After Diving

**Table 9-6.** Required Surface Interval Before Ascent to Altitude After Diving.

Repetitive Group Designator	Increase in Altitude (feet)									
	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
A	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00
B	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	1:42
C	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	1:48	6:23
D	0:00	0:00	0:00	0:00	0:00	0:00	0:00	1:45	5:24	9:59
E	0:00	0:00	0:00	0:00	0:00	0:00	1:37	4:39	8:18	12:54
F	0:00	0:00	0:00	0:00	0:00	1:32	4:04	7:06	10:45	15:20
G	0:00	0:00	0:00	0:00	1:19	3:38	6:10	9:13	12:52	17:27
H	0:00	0:00	0:00	1:06	3:10	5:29	8:02	11:04	14:43	19:18
I	0:00	0:00	0:56	2:45	4:50	7:09	9:41	12:44	16:22	20:58
J	0:00	0:41	2:25	4:15	6:19	8:39	11:11	14:13	17:52	22:27
K	0:30	2:03	3:47	5:37	7:41	10:00	12:33	15:35	19:14	23:49
L	1:45	3:18	5:02	6:52	8:56	11:15	13:48	16:50	20:29	25:04
M	2:54	4:28	6:12	8:01	10:06	12:25	14:57	18:00	21:38	26:14
N	3:59	5:32	7:16	9:06	11:10	13:29	16:02	19:04	22:43	27:18
O	4:59	6:33	8:17	10:06	12:11	14:30	17:02	20:05	23:43	28:19
Z	5:56	7:29	9:13	11:03	13:07	15:26	17:59	21:01	24:40	29:15
Exceptional Exposure	Wait 48 hours before ascent									

**NOTE 1** When using Table 9-6, use the highest repetitive group designator obtained in the previous 24-hour period.

**NOTE 2** Table 9-6 may only be used when the maximum altitude achieved is 10,000 feet or less. For ascents above 10,000 feet, consult NAVSEA 00C for guidance.

**NOTE 3** The cabin pressure in commercial aircraft is maintained at a constant value regardless of the actual altitude of the flight. Though cabin pressure varies somewhat with aircraft type, the nominal value is 8,000 feet. For commercial flights, use a final altitude of 8,000 feet to compute the required surface interval before flying.

**NOTE 4** No surface interval is required before taking a commercial flight if the dive site is at 8,000 feet or higher. In this case, flying results in an increase in atmospheric pressure rather than a decrease.

**NOTE 5** For ascent to altitude following a non-saturation helium-oxygen dive, wait 12 hours if the dive was a no-decompression dive. Wait 24 hours if the dive was a decompression dive.

## A.8 Sea Level Equivalent Depth Table

**Table 9-4.** Sea Level Equivalent Depth (fsw).

Actual Depth (fsw)	Altitude (feet)									
	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
10	10	15	15	15	15	15	15	15	15	15
15	15	20	20	20	20	20	20	25	25	25
20	20	25	25	25	25	25	30	30	30	30
25	25	30	30	30	35	35	35	35	35	40
30	30	35	35	35	40	40	40	45	45	45
35	35	40	40	45	45	45	50	50	50	60
40	40	45	45	50	50	50	55	55	60	60
45	45	50	55	55	55	60	60	70	70	70
50	50	55	60	60	70	70	70	70	70	80
55	55	60	70	70	70	70	80	80	80	80
60	60	70	70	70	80	80	80	90	90	90
65	65	70	80	80	80	90	90	90	100	100
70	70	80	80	90	90	90	100	100	100	110
75	75	90	90	90	100	100	100	110	110	110
80	80	90	90	100	100	100	110	110	120	120
85	85	100	100	100	110	110	120	120	120	130
90	90	100	110	110	110	120	120	130	130	140
95	95	110	110	110	120	120	130	130	140	140
100	100	110	120	120	130	130	130	140	140	150
105	105	120	120	130	130	140	140	150	150	160
110	110	120	130	130	140	140	150	150	160	160
115	115	130	130	140	140	150	150	160	170	170
120	120	130	140	140	150	150	160	170	170	180
125	125	140	140	150	160	160	170	170	180	190
130	130	140	150	160	160	170	170	180	190	190
135	135	150	160	160	170	170	180	190	190	200
140	140	160	160	170	170	180	190	190	200	210
145	145	160	170	170	180	190	190	200	210	
150	160	170	170	180	190	190	200	210		
155	170	170	180	180	190	200	210			
160	170	180	180	190	200	200				
165	180	180	190	200	200					
170	180	190	190	200						
175	190	190	200							
180	190	200	210							
185	200	200								
190	200									
<b>Table Water Stops</b>	<b>Equivalent Stop Depths (fsw)</b>									
10	10	9	9	9	8	8	8	7	7	7
20	19	19	18	17	17	16	15	15	14	14
30	29	28	27	26	25	24	23	22	21	21
40	39	37	36	35	33	32	31	30	29	28
50	48	47	45	43	42	40	39	37	36	34
60	58	56	54	52	50	48	46	45	43	41

Note:   = Exceptional Exposure Limit

## A.9 Pressure Variations with Altitude Table

**Table 9-5.** *Repetitive Groups Associated with Initial Ascent to Altitude.*

Altitude (feet)	Repetitive Group
1000	A
2000	A
3000	B
4000	C
5000	D
6000	E
7000	F
8000	G
9000	H
10000	I