

## **4123:1-3-21 Diving operations.**

(A) Reserved.

(B) Reserved.

(C) Diving procedures.

(1) Supervision.

A diver, lead diver, or dive supervisor, hereafter referred to only as ' supervisor', shall be designated and shall be in charge of all diving operations.

(2) Timekeeper.

One member selected from within the crew shall be designated and instructed by the supervisor to perform the duties of timekeeper for each dive.

(3) Activities of others.

All parties whose activities in the area could create a hazard to the diving operations shall be so notified by the supervisor and be kept informed when such operations commence and when they are concluded.

(D) Personnel.

All diving personnel shall be properly qualified physically and by training or experience to safely conduct a diving operation.

(1) Diver physical condition.

Divers suffering from severe colds, sinus infections, ear trouble, alcoholic intoxication or its after-effects, acute illness or under the influence of drugs shall not be required to dive.

(a) Frequency of examination.

All diving personnel must undergo a thorough physical examination prior to initial exposure to hyperbaric conditions. Subsequent to initial exam, all diving personnel shall be re-examined at twelve-month intervals.

(b) Physician statement.

A statement is to be provided to the diver's employer certifying the diver's physical qualification or lack of qualification to engage in diving activities. The statement is to include the name of the diver, date and location of the examination, name of examining physician, address of location at which the medical record is stored, and the qualification or disqualification of the diver.

(2) Diver equipment.

Divers shall only use equipment with which they have been thoroughly trained.

(E) Equipment.

(1) Responsibility.

The employer shall be responsible for furnishing all safety equipment. Where divers provide their own protective equipment, such equipment shall give equal or greater protection than that furnished by the employer.

(2) Operating conditions.

All equipment used in diving operations shall be in proper operating condition and thoroughly tested, under the supervision of the diving supervisor, prior to use.

(3) Gas supply.

There shall be both a primary and a secondary source of compressed air for each dive.

(4) Protection of hoses.

All hoses leading to and from the diver's life support which are exposed to potential damage as a result of falling objects, personnel, traffic, etc., shall be protected.

(5) Decompression chambers.

(a) For any dives in excess of one hundred feet of water requiring stage decompression a decompression chamber and a qualified attendant shall be available at the job site.

(b) The decompression chamber shall be located to provide easy access and allow for recompression to the required depth within a maximum of five minutes unless the decompression schedule in use requires a shorter surface interval.

(F) Procedures during dive.

(1) Water entry and exit.

(a) A means capable of supporting the diver shall be provided for entering and exiting the water.

(b) The means provided for exiting the water shall extend below the water surface.

(c) A means shall be provided to assist an injured diver from the water or into a bell.

(2) In the absence of a physician, an employee who has a valid certificate in first aid training, including training in oxygen resuscitation equipment, shall be available at the job site at all times.

(3) The diver's hose shall be attached to a safety harness and not the weight belt except on deep-sea gear.

(4) The diver shall carry a sharp knife as a standard piece of diving equipment.

(G) Surface-supplied diving operations.

(1) Topside jobsite.

- (a) Warning signals, such as an international "A" flag, shall be displayed during diving operations.
- (b) All diving compressors must be situated so that exhaust fumes or other harmful contaminants do not enter the compressor intake.
- (c) An accurate method of determining the depth of each dive must be provided.
- (d) Divers shall not be required to dive if work is being performed by other personnel overhead where such overhead work creates a hazard to the diver.
- (e) A set of appropriate decompression tables shall be available at the diving site. (For examples, see appendix to this rule).
- (f) At the job site there shall be a list of telephone numbers and locations for: nearest decompression chamber, medical doctor, and transportation.
- (g) A propeller guard shall be installed on all craft used in all live-boating operations.
- (h) Voice communications shall be provided between the dive

(2) Underwater jobsite.

- (a) A diver's bottom time, or the "residual nitrogen time", from repetitive dives must not exceed "O" group limit as shown in the appendix to this rule. If a diver becomes an "O" group diver twice in a twelve-hour period, he shall not be permitted to dive again for twelve hours. (See the appendix to this rule for tables).
- (b) A diver shall wear a bail-out bottle during all liveboating operations (boat underway).
- (c) Prior to all lifting operations a signal system shall be established and reviewed with all personnel involved with the dive.

(3) Standby diver.

- (a) A standby diver must be ready to reach the primary diver when the operation involves dives in excess of one hundred feet, any dive requiring stage decompression, or during any operation where the primary diver cannot surface by straight ascent. When two divers are in the water working together, they can be considered as standing by for each other if one can reach the other within three minutes.

- (b) The standby diver is required to tend the primary diver at the point of entry into wrecks, tunnels, etc.

(H) Self-contained diving (scuba).

(1) Basic in-water requirements.

Scuba procedures may only be used in situations in which one of the following techniques is provided:

- (a) A "buddy" system, i.e. two divers in the water maintaining constant visual or physical contact with each other; or
- (b) Voice communications between the scuba diver and the surface and if wireless communications are used, a locating means must be provided; or
- (c) A safety line between the diver and a surface tender which provides a means of communications through the use of pull signals on the safety line.

(2) Equipment.

- (a) Equipment shall be the open circuit, demand regulator type with a valid interstate commerce commission (ICC) stamp on the air tank.
- (b) Both tank and weight belt shall be equipped with quick release buckles.
- (c) A knife and safety vest are required to be used.

(I) Emergency procedures.

Emergency procedures shall be established to provide for such of the following circumstances as may be applicable and shall be reviewed by the diver and the surface support crew before the dive:

- (1) Loss of voice communications in the water or in the chamber;
- (2) Interruption of the surface gas supply;
- (3) Severance of the diver's hose bundle;
- (4) Entanglement or entrapment;
- (5) Occurrence of oxygen poisoning;
- (6) Occurrence of decompression sickness;
- (7) Occurrence of unplanned buoyant ascent.

(J) Underwater cutting and welding.

- (1) Disconnect switch.

A disconnect switch shall be used in the electrical circuit and shall be located in such a position that the diving tender on the intercommunication system can operate or oversee its operation at all times when the diver is below the surface. The disconnect switch shall be in the open position except when the diver is actually cutting

- (2) Insulated gloves.

Rubber or other insulated gloves shall be provided and shall be used by the diver during underwater electric cutting and welding operations.

(K) Record keeping – diving operations.

An individual record or log entry for each diving exposure including the following data is to be maintained:

- (1) Location;
- (2) Divers, tenders' and supervisor's names;
- (3) Water depth;
- (4) Bottom time;
- (5) Type of equipment used;
- (6) Estimated environmental conditions;
- (7) Decompression schedule used;
- (8) Gas used and composition;
- (9) Type of work performed;
- (10) Unusual conditions; and
- (11) Repetitive dive designations or time of last exposure.

(L) Hose and fittings.

- (1) Testing and replacement.
  - (a) Hose and fittings shall be tested at least once a year to one and one-half times their maximum working pressure. If exposed to rough usage or unusual conditions it shall be inspected more frequently.
  - (b) Hose showing abrasion of outer cover which exposes the reinforcement, shall be replaced.

- (c) Couplings that are distorted, have damaged threads, or show an excessive amount of corrosion shall be replaced.
  - (d) Hose which has sustained other damage must be pressure tested to one and one-half times the maximum working pressure plus one hundred pounds per square inch, prior to use.
  - (e) Records shall be kept of all pressure tests and the test dates; and they shall be signed by the individual responsible for each of them.
- (2) **Marking.**  
Each hose section shall be given a serial number for record keeping purposes.
  - (3) **Fittings.**  
Connections shall be of a type that cannot be accidentally disengaged from the gas supply.
  - (4) **Oxygen piping.**  
Hard piping systems, fittings and tubings carrying pure, high pressure (up to two thousand five hundred pounds per square inch) oxygen shall be of corrosion resistant metals, such as copper, brass, "300" series stainless steel or monel.

#### **APPENDIX TO RULE 4123: 1-3-21**

Taken from

**U.S. Navy Diving Manual**

Prepared by

**National Association of Underwater Instructors**

Table 1-9.—Decompression procedures

General Instructions for Air Diving  
*Need for Decompression*

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A quantity of nitrogen is taken up by the body during every dive. The amount absorbed depends upon the depth of the dive and the exposure (bottom) time. If the quantity of nitrogen dissolved in the body tissues exceeds a certain critical amount, the ascent must be delayed to allow the body tissue to remove the excess nitrogen. Decompression sickness results from failure to delay the ascent and to allow this process of gradual desaturation. A specified time at a specific depth for purposes of desaturation is called a decompression stop.

#### *No-Decompression Schedules*

Dives that are not long or deep enough to require decompression stops are no-decompression dives. Dives to 33 feet or less do not require decompression stops. As the depth increases, the allowable bottom time for no-decompression dives decreases. Five minutes at 190 feet is the deepest no-decompression schedule. These dives are all listed in the No-Decompression Limits and Repetitive

Group Designation Table for No-Decompression Dives (No-Decompression Table (table 1-11)), and only require compliance with the 60-feet-per-minute rate of ascent.

### *Schedules That Require Decompression Stops*

All dives beyond the limits of the No-Decompression Table require decompression stops. These dives are listed in the Navy Standard Air Decompression Table (table 1-10). Comply exactly with instructions except as modified by surface decompression procedures.

### *Variations in Rate of Ascent*

Ascend from all dives at the rate of 60 feet per minute.

In the event you are unable to maintain the 60-feet-per-minute rate of ascent:

- (a) If the delay was at a depth greater than 50 feet: increase the bottom time by the difference between the time used in ascent and the time that should have been used at a rate of 60 feet per minute. Decompress according to the requirements of the new total bottom time.
- (b) If the delay was at a depth less than 50 feet: increase the first stop by the difference between the time used in ascent and the time that should have been used at the rate of 60 feet per minute.

### *Repetitive Dive Procedure*

A dive performed within 12 hours of surfacing from a previous dive is a repetitive dive. The period between dives is the surface interval. Excess nitrogen requires 12 hours to be effectively lost from the body. These tables are designed to protect the diver from the effects of this residual nitrogen. Allow a minimum surface interval of 10 minutes between all dives. For any interval under 10 minutes, add the bottom time of the previous dives to that of the repetitive dive and choose the decompression schedule for the total bottom time and the deepest dive. Specific instructions are given for the use of each table in the following order:

- (1) The *No-Decompression* Table or the Navy Standard Air *Decompression* Table gives the repetitive group designation for all schedules which may precede a repetitive dive.
- (2) The *Surface Interval Credit Table* gives credit for the desaturation occurring during the surface interval.
- (3) *The Repetitive Dive Timetable* gives the number of minutes of residual nitrogen time to add to the actual bottom time of the repetitive dive to obtain decompression for the residual nitrogen.
- (4) *The No-Decompression* Table or the Navy Standard Air Decompression Table gives the decompression required for the repetitive dive.

### *U.S. Navy Standard Air Decompression Table Instructions for Use*

Time of decompression stops in the table is in minutes.

Enter the table at the exact or the next greater depth than the maximum depth attained during the dive. Select the listed bottom time that is exactly equal to or is next greater than the bottom time of the dive. Maintain the diver's chest as close as possible to each decompression depth for the number of

minutes listed. The rate of ascent *between* stops is not critical for stops of 50 feet or less. Commence timing each stop on arrival at the decompression depth and resume ascent when the specified time has lapsed.

For example—a dive to 82 feet for 36 minutes. To determine the proper decompression procedure: The next greater depth listed in this table is 90 feet. The next greater bottom time listed opposite 90 feet is 40. Stop 7 minutes at 10 feet in accordance with the 90/40 schedule.

For example—a dive to 100 feet for 30 minutes. It is known that the depth did not exceed 110 feet. To determine the proper decompression schedule: The exact depth of 110 feet is listed. The exact bottom time of 30 minutes is listed opposite 110 feet. Decompress according to the 110/30 schedule unless the dive was particularly cold or arduous. In that case, go to the schedule for the next deeper and longer dive, i.e., 120/40.

## **NOTES ON DECOMPRESSION AND REPETITIVE DIVING PREPARED BY NAUI**

### **Decompression Sickness**

1. All scuba divers should know the cause, symptoms, treatment, and prevention of decompression sickness, plus have available the telephone number, location and method of transportation to the nearest chamber. Call ahead to the chamber to be sure it is operational.
2. Factors which increase the likelihood of decompression sickness are: Extreme water temperatures, dehydration, age, obesity, poor physical condition, fatigue, alcoholic indulgence, old injuries which cause poor circulation, and heavy work during the dive.
3. The most frequent errors related to the treatment of decompression sickness are the failure: To report symptoms or signs early, to treat doubtful cases, to treat promptly, to treat adequately, to recognize serious symptoms, and to keep the patient near the chamber after treatment.

### **Decompression Tables**

4. There is no safety factor built into the U.S. Navy Standard Air Decompression Table.
5. A "no decompression dive" is a dive which requires no decompression stops; it still causes nitrogen to go into solution within the body. This nitrogen must be taken into account as residual nitrogen in repetitive diving. The ascent rate of 60 feet per minute is a form of decompression.
6. Bottom time starts when the diver leaves the surface and ends only when the diver starts a direct ascent back to the surface.
7. If a dive was particularly cold or arduous, or the depth/time determination may be inaccurate, or some factor increases the likelihood of decompression sickness, decompress for the next deeper and longer dive.
8. After diving, do not fly for 12 hours, or, if you must fly, use the tables for altitude diving (see *Skin Diver Magazine*, November 1970).
9. An exception to the tables occurs when a repetitive dive is to the same or greater depth than the previous dive and the surface interval is short enough that the residual nitrogen time from Table 11-13 is greater than the actual bottom time of the previous dive. In this case, add the actual bottom time of the previous dive to the actual bottom time of the repetitive dive and decompress for the total bottom time and deepest dive.

10. Plan repetitive dives so that each successive dive is to a lesser depth. This will aid in the elimination of nitrogen and decrease the need for decompression stops. Always keep surface intervals as long as possible.
- 11 Plan your dive and dive your plan; always having an alternate plan if the actual depth and/or time of the dive is greater than planned.

**Reasons for Repetitive Dive Planning**

12. To avoid decompression stops.
  - a. Be able to use tables to compute maximum time of a repetitive dive without decompression stops.
  - b. Be able to use tables to compute minimum surface interval needed to avoid decompression stops.
13. To stay within a particular decompression schedule or repetitive group.
14. To dive maximum depth or time on limited air.
15. To make minimum decompression stops.
16. To make the dive and take whatever decompression stops are required.

**EMERGENCY INFORMATION AND NUMBERS**

**USCG: Telephone** ..... **Radio** .....

**POLICE: State** ..... **County** ..... **City** .....

**FIRE DEPARTMENT** ..... **AMBULANCE** ..... **HARBOR PATROL** .....

**CHAMBERS:**

1. **Location** ..... **Day** ..... **Night** .....

2. **Location** ..... **Day** ..... **Night** .....

**M.D. QUALIFIED IN UNDERWATER MEDICINE:**

**Name** ..... **Day** ..... **Night** .....



Table 1-10.—U.S. Navy Standard Air Decompression Table

Depth (feet)	Bottom Time (min)	Time to first stop (min: sec)	Decompression stops (feet)					Total ascent (min: sec)	Repetitive group
			50	40	30	20	10		
40	200						0	0:40	(*)
	210	0:30					2	2:40	N
	230	0:30					7	7:40	N
	250	0:30					11	11:40	O
	270	0:30					15	15:40	O
	300	0:30					19	19:40	Z
50	100						0	0:50	(*)
	110	0:40					3	3:50	L
	120	0:40					5	5:50	M
	140	0:40					10	10:50	M
	160	0:40					21	21:50	N
	180	0:40					29	29:50	O
	200	0:40					35	35:50	O
	220	0:40					40	40:50	Z
60	240	0:40					47	47:50	Z
	60						0	1:00	(*)
	70	0:50					2	3:00	K
	80	0:50					7	8:00	L
	100	0:50					14	15:00	M
	120	0:50					26	27:00	N
	140	0:50					39	40:00	O
	160	0:50					48	49:00	Z
70	180	0:50					56	57:00	Z
	200	0:40				1	69	71:00	Z
	50						0	1:10	(*)
	60	1:00					8	9:10	K
	70	1:00					14	15:10	L
	80	1:00					18	19:10	M
	90	1:00					23	24:10	N
	100	1:00					33	34:10	N
80	110	0:50				2	41	44:10	O
	120	0:50				4	47	52:10	O
	130	0:50				6	52	59:10	O
	140	0:50				8	56	65:10	Z
	150	0:50				9	61	71:10	Z
	160	0:50				13	72	86:10	Z
	170	0:50				19	79	99:10	Z
	40						0	1:20	(*)
	50	1:10					10	11:20	K
	60	1:10					17	18:20	L
90	70	1:10					23	24:20	M
	80	1:00				2	31	34:20	N
	90	1:00				7	39	47:20	N
	100	1:00				11	46	58:20	O
	110	1:00				13	53	67:20	O
	120	1:00				17	56	74:20	Z
	130	1:00				19	63	83:20	Z
	140	1:00				26	69	96:20	Z
	150	1:00				32	77	110:20	Z
	30						0	1:30	(*)
40	1:20					7	8:30	J	
50	1:20					18	19:30	L	
60	1:20					25	26:30	M	
70	1:10				7	30	38:30	N	
80	1:10				13	40	54:30	N	
90	1:10				18	48	67:30	O	
100	1:10				21	54	76:30	Z	

Table 1-10.—U.S. Navy Standard Air Decompression Table—Continued

Depth (feet)	Bottom Time (min)	Time to first stop (min: sec)	Decompression stops (feet)					Total ascent (min: sec)	Repetitive group	
			50	40	30	20	10			
100	110	1:10				24	61	86:30	Z	
	120	1:10				32	68	101:30	Z	
	130	1:00			5	36	74	116:30	Z	
	25						0	1:40	(*)	
	30	1:30					3	4:40	I	
	40	1:30					15	16:40	K	
	50	1:20				2	24	27:40	L	
	60	1:20				9	28	38:40	N	
	70	1:20				17	39	57:40	O	
	80	1:20				23	48	72:40	O	
	90	1:10			3	23	57	84:40	Z	
	100	1:10			7	23	66	97:40	Z	
110	110	1:10			10	34	72	117:40	Z	
	120	1:10			12	41	78	132:40	Z	
	20						0	1:50	(*)	
	25	1:40					3	4:50	H	
	30	1:40					7	8:50	J	
	40	1:30				2	21	24:50	L	
	50	1:30				8	26	35:50	M	
	60	1:30				18	36	55:50	N	
	70	1:20			1	23	48	73:50	O	
	80	1:20			7	23	57	88:50	Z	
	90	1:20			12	30	64	107:50	Z	
	100	1:20			15	37	72	125:50	Z	
120	15						0	2:00	(*)	
	20	1:50					2	4:00	H	
	25	1:50					6	8:00	I	
	30	1:50					14	16:00	J	
	40	1:40				5	25	32:00	L	
	50	1:40				15	31	48:00	N	
	60	1:30			2	22	45	71:00	O	
	70	1:30			9	23	55	89:00	O	
	80	1:30			15	27	63	107:00	Z	
	90	1:30			19	37	74	132:00	Z	
	100	1:30			23	45	80	150:00	Z	
	130	10						0	2:10	(*)
15		2:00					1	3:10	F	
20		2:00					4	6:10	H	
25		2:00					10	12:10	J	
30		1:50				3	18	23:10	M	
40		1:50				10	25	37:10	N	
50		1:40			3	21	37	63:10	O	
60		1:40			9	23	52	86:10	Z	
70		1:40			16	24	61	103:10	Z	
80		1:30		3	19	35	72	131:10	Z	
90		1:30		8	19	45	80	154:10	Z	
140		10						0	2:20	(*)
	15	2:10					2	4:20	G	
	20	2:10					6	8:20	I	
	25	2:00				2	14	18:20	J	
	30	2:00				5	21	28:20	K	
	40	1:50			2	16	26	46:20	N	
	50	1:50			6	24	44	76:20	O	
	60	1:50			16	23	56	97:20	Z	
	70	1:40		4	19	32	68	125:20	Z	
	80	1:40		10	23	41	79	155:20	Z	
	150	5						0	2:30	C

Table 1-10.—U.S. Navy Standard Air Decompression Table—Continued

Depth (feet)	Bottom Time (min)	Time to first stop (min: sec)	Decompression stops (feet)					Total ascent (min: sec)	Repetitive group
			50	40	30	20	10		
	10	2:20					1	3:30	E
	15	2:20					3	5:30	G
	20	2:10				2	7	11:30	H
	25	2:10				4	17	23:30	K
	30	2:10				8	24	34:30	L
	40	2:00			5	19	33	59:30	N
	50	2:00			12	23	51	88:30	O
	60	1:50		3	19	26	62	112:30	Z
	70	1:50		11	19	39	75	146:30	Z
	80	1:40	1	17	19	50	84	173:30	Z
160	5						0	2:40	D
	10	2:30					1	3:40	F
	15	2:20				1	4	7:40	H
	20	2:20				3	11	16:40	J
	25	2:20				7	20	29:40	K
	30	2:10			2	11	25	40:40	M
	40	2:10			7	23	39	71:40	N
	50	2:00		2	16	23	55	98:40	Z
	60	2:00		9	19	33	69	132:40	Z
	70	1:50	1	17	22	44	80	166:40	Z
170	5						0	2:50	D
	10	2:40					2	4:50	F
	15	2:30				2	5	9:50	H
	20	2:30				4	15	21:50	J
	25	2:20			2	7	23	34:50	L
	30	2:20			4	13	26	45:50	M
	40	2:10		1	10	23	45	81:50	O
	50	2:10		5	18	23	61	109:50	Z
	60	2:00	2	15	22	37	74	152:50	Z
	70	2:00	8	17	19	51	86	183:50	Z
180	5						0	3:00	D
	10	2:50					3	6:00	F
	15	2:40				3	6	12:00	I
	20	2:30			1	5	17	26:00	K
	25	2:30			3	10	24	40:00	L
	30	2:30			6	17	27	53:00	N
	40	2:20		3	14	23	50	93:00	O
	50	2:10	2	9	19	30	65	128:00	Z
	60	2:10	5	16	19	44	81	168:00	Z
190	5						0	3:10	D
	10	2:50				1	3	7:10	G
	15	2:50				4	7	14:10	I
	20	2:40			2	6	20	31:10	K
	25	2:40			5	11	25	44:10	M
	30	2:30		1	8	19	32	63:10	N
	40	2:30		8	14	23	55	103:10	O
	50	2:20	4	13	22	33	72	147:10	Z
	60	2:20	10	17	19	50	84	183:10	Z

\*See table 1-11 for repetitive groups in no-decompression dives.

Table 1-11.—No-decompression limits and repetitive group designation table for no-decompression air dives

Depth (feet)	No-decompression limits (min)	Repetitive groups (air dives)														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
10	.....	60	120	210	300	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
15	.....	35	70	110	160	225	350	.....	.....	.....	.....	.....	.....	.....	.....	.....
20	.....	25	50	75	100	135	180	240	325	.....	.....	.....	.....	.....	.....	.....
25	.....	20	35	55	75	100	125	160	195	245	315	.....	.....	.....	.....	.....
30	.....	15	30	45	60	75	95	120	145	170	205	250	310	.....	.....	.....
35	310	5	15	25	40	50	60	80	100	120	140	160	190	220	270	310
40	200	5	15	25	30	40	50	70	80	100	110	130	150	170	200	.....
50	100	.....	10	15	25	30	40	50	60	70	80	90	100	.....	.....	.....
60	60	.....	10	15	20	25	30	40	50	55	60	.....	.....	.....	.....	.....
70	50	.....	5	10	15	20	30	35	40	45	50	.....	.....	.....	.....	.....
80	40	.....	5	10	15	20	25	30	35	40	.....	.....	.....	.....	.....	.....
90	30	.....	5	10	12	15	20	25	30	.....	.....	.....	.....	.....	.....	.....
100	25	.....	5	7	10	15	20	22	25	.....	.....	.....	.....	.....	.....	.....
110	20	.....	.....	5	10	13	15	20	.....	.....	.....	.....	.....	.....	.....	.....
120	15	.....	.....	5	10	12	15	.....	.....	.....	.....	.....	.....	.....	.....	.....
130	10	.....	.....	5	8	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
140	10	.....	.....	5	7	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
150	5	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
160	5	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
170	5	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
180	5	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
190	5	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

*Instructions for Use*

I. No-decompression limits:

This column shows at various depths greater than 30 feet the allowable diving times (in minutes) which permit surfacing directly at 60 feet a minute with no decompression stops. Longer exposure times require the use of the Standard Air Decompression Table (table 1-10).

II. Repetitive group designation table:

The tabulated exposure times (or bottom times) are in minutes. The times at the various depths in each vertical column are the maximum exposures during which a diver will remain within the group listed at the head of the column.

To find the repetitive group designation at surfacing for dives involving exposures up to and including the no-decompression limits: Enter the table on the exact or next greater depth than that to which exposed and select the listed exposure time exact or next greater than the actual exposure time. The repetitive group designation is indicated by the letter at the head of the vertical column where the selected exposure time is listed.

For example: A dive was to 32 feet for 45 minutes. Enter the table along the 35-foot-depth line since it is next greater than 32 feet. The table shows that since group D is left after 40 minutes' exposure and group E after 50 minutes, group E (at the head of the column where the 50-minute exposure is listed) is the proper selection.

Exposure times for depths less than 40 feet are listed only up to approximately 5 hours since this is considered to be beyond field requirements for this table.

Table 1-12.—*Surface Interval Credit Table for air decompression dives*  
 [Repetitive group at the end of the surface interval (air dive)]

Z	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A
0:10	0:23	0:35	0:49	1:03	1:19	1:37	1:56	2:18	2:43	3:11	3:46	4:30	5:28	6:57	10:00
0:22	0:34	0:48	1:02	1:18	1:36	1:55	2:17	2:42	3:10	3:45	4:29	5:27	6:56	10:05	12:00*
O	0:10	0:24	0:37	0:52	1:08	1:25	1:44	2:05	2:30	3:00	3:34	4:18	5:17	6:45	9:55
	0:23	0:36	0:51	1:07	1:24	1:43	2:04	2:29	2:59	3:33	4:17	5:16	6:44	9:54	12:00*
	N	0:10	0:25	0:40	0:55	1:12	1:31	1:54	2:19	2:48	3:23	4:05	5:04	6:33	9:44
		0:24	0:39	0:54	1:11	1:30	1:53	2:18	2:47	3:22	4:04	5:03	6:32	9:43	12:00*
		M	0:10	0:26	0:43	1:00	1:19	1:40	2:06	2:35	3:09	3:53	4:50	6:19	9:29
			0:25	0:42	0:59	1:18	1:39	2:05	2:34	3:08	3:52	4:49	6:18	9:28	12:00*
			L	0:10	0:27	0:46	1:05	1:26	1:50	2:20	2:54	3:37	4:36	6:03	9:13
				0:26	0:45	1:04	1:25	1:49	2:19	2:53	3:36	4:35	6:02	9:12	12:00*
				K	0:10	0:29	0:50	1:12	1:36	2:04	2:39	3:22	4:20	5:49	8:59
					0:28	0:49	1:11	1:35	2:03	2:38	3:21	4:19	5:48	8:58	12:00*
					J	0:10	0:32	0:55	1:20	1:48	2:21	3:05	4:03	5:41	8:41
						0:31	0:54	1:19	1:47	2:20	3:04	4:02	5:40	8:40	12:00*
						I	0:10	0:34	1:00	1:30	2:03	2:45	3:44	5:13	8:22
							0:33	0:59	1:29	2:02	2:44	3:43	5:12	8:21	12:00*
							H	0:10	0:37	1:07	1:42	2:24	3:21	4:50	8:00
								0:36	1:06	1:41	2:23	3:20	4:49	7:59	12:00*
								G	0:10	0:41	1:16	2:00	2:59	4:26	7:36
									0:40	1:15	1:59	2:58	4:25	7:35	12:00*
									F	0:10	0:46	1:30	2:29	3:58	7:06
										0:45	1:29	2:28	3:57	7:05	12:00*
										E	0:10	0:55	1:58	3:23	6:33
											0:54	1:57	3:22	6:32	12:00*
											D	0:10	1:10	2:39	5:49
												1:09	2:38	5:48	12:00*
												C	0:10	1:40	2:50
													1:39	2:49	12:00*
													B	0:10	2:11
														2:10	12:00*
														A	0:10
															12:00*

Repetitive group at the beginning of the surface interval from previous dive

*Instructions for Use*

Surface interval time in the table is in hours and minutes (7:59 means 7 hours and 59 minutes). The surface interval must be at least 10 minutes.

Find the repetitive group designation letter (from the previous dive schedule) on the diagonal slope. Enter the table horizontally to select the surface interval time that is exactly between the actual surface interval times shown. The repetitive group designation for the end of the surface interval is at the head of the vertical column where the selected surface interval time is listed. For example, a previous dive was to 110 feet for 30 minutes. The diver remains on the surface 1 hour and 30 minutes and wishes to find the new repetitive group designation: The repetitive group from the last column of the 110/30 schedule in the Standard Air Decompression Tables is "J." Enter the surface interval credit table along the horizontal line labeled "J." The 1-hour-and-30-minute surface interval lies between the times 1:20 and 1:47. Therefore, the diver has lost sufficient inert gas to place him in group "G" (at the head of the vertical column selected).

"Note.—Dives following surface intervals of more than 12 hours are not considered repetitive dives. Actual bottom times in the Standard Air Decompression Tables may be used in computing decompression for such dives.

**TABLE 1-13.—Repetitive dive timetable for air dives**

Repetitive groups	Repetitive dive depth (ft) (air dives)															
	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190
A	7	6	5	4	4	3	3	3	3	3	2	2	2	2	2	2
B	17	13	11	9	8	7	7	6	6	6	5	5	4	4	4	4
C	25	21	17	15	13	11	10	10	9	8	7	7	6	6	6	6
D	37	29	24	20	18	16	14	13	12	11	10	9	9	8	8	8
E	49	38	30	26	23	20	18	16	15	13	12	12	11	10	10	10
F	61	47	36	31	28	24	22	20	18	16	15	14	13	13	12	11
G	73	56	44	37	32	29	26	24	21	19	18	17	16	15	14	13
H	87	66	52	43	38	33	30	27	25	22	20	19	18	17	16	15
I	101	76	61	50	43	38	34	31	28	25	23	22	20	19	18	17
J	116	87	70	57	48	43	38	34	32	28	26	24	23	22	20	19
K	138	99	79	64	54	47	43	38	35	31	29	27	26	24	22	21
L	161	111	88	72	61	53	48	42	39	35	32	30	28	26	25	24
M	187	124	97	80	68	58	52	47	43	38	35	32	31	29	27	26
N	213	142	107	87	73	64	57	51	46	40	38	35	33	31	29	28
O	241	160	117	96	80	70	62	55	50	44	40	38	36	34	31	30
Z	257	169	122	100	84	73	64	57	52	46	42	40	37	35	32	31

*Instructions for Use*

The bottom times listed in this table are called "residual nitrogen times" and are the times a diver is to consider he has already spent on bottom when he starts a repetitive dive to a specific depth. They are in minutes.

Enter the table horizontally with the repetitive group designation from the Surface Interval Credit Table. The time in each vertical column is the number of minutes that would be required (at the depth listed at the head of the column) to saturate to the particular group.

For example: The final group designation from the Surface Interval Credit Table, on the basis of a previous dive and surface interval, is "H." To plan a dive to 110 feet, determine the residual nitrogen time for this depth required by the repetitive group designation: Enter this table along the horizontal line labeled "H." The table shows that one must start a dive to 110 feet as though he had already been on the bottom for 27 minutes. This information can then be applied to the Standard Air Decompression Table or No-Decompression Table in a number of ways:

- (1) Assuming a diver is going to finish a job and take whatever decompression is required, he must add 27 minutes to his actual bottom time and be prepared to take decompression according to the 110-foot schedules for the sum or equivalent single dive time.
- (2) Assuming one wishes to make a quick inspection dive for the minimum decompression, he will decompress according to the 110/30 schedule for a dive of 3 minutes or less (27

+ 3 = 30). For a dive of over 3 minutes but less than 13, he will decompress according to the 110/40 schedule ( $27+13=40$ ).

- (3) Assuming that one does not want to exceed the 110/50 schedule and the amount of decompression it requires, he will have to start ascent before 23 minutes of actual bottom time ( $50-27=23$ ).
- (4) Assuming that a diver has air for approximately 45 minutes bottom time and decompression stops, the possible dives can be computed: A dive of 13 minutes will require 23 minutes of decompression (110/40 schedule), for a total submerged time of 36 minutes. A dive of 13 to 23 minutes will require 34 minutes of decompression (110/50 schedule), for a total submerged time of 47 to 57 minutes. Therefore, to be safe, the diver will have to start ascent before 13 minutes or a standby air source will have to be provided.

# A NU-WAY TO USE THE U.S. NAVY REPETITIVE DIVE TABLES

## TABLE 1-12 (1-7) SURFACE INTERVAL CREDIT TABLE

12:00 0:10	12:00 2:11	12:00 2:50	12:00 5:49	12:00 6:33	12:00 7:06	12:00 7:36	12:00 8:00	12:00 8:22	12:00 8:41	12:00 8:59	12:00 9:13	12:00 9:29	12:00 9:44	12:00 9:55	12:00 10:06
<b>A</b>	2:10 0:10	2:49 1:40	5:48 2:39	6:32 3:23	7:05 3:58	7:35 4:26	7:59 4:50	8:21 5:13	8:40 5:41	8:58 5:49	9:12 6:03	9:28 6:19	9:43 6:33	9:54 6:45	10:05 6:57
	<b>B</b>	1:39 0:10	2:38 1:10	3:22 1:58	3:57 2:29	4:25 2:59	4:49 3:21	5:12 3:44	5:40 4:03	5:48 4:20	6:02 4:36	6:18 4:50	6:32 5:04	6:44 5:17	6:56 5:28
		<b>C</b>	1:09 0:10	1:57 0:55	2:28 1:30	2:58 2:00	3:20 2:24	3:43 2:45	4:02 3:05	4:19 3:22	4:35 3:37	4:49 3:53	5:03 4:05	5:16 4:18	5:27 4:30
			<b>D</b>	0:54 0:10	1:29 0:46	1:59 1:16	2:23 1:42	2:44 2:03	3:04 2:21	3:21 2:39	3:36 2:54	3:52 3:09	4:04 3:23	4:17 3:34	4:29 3:46
				<b>E</b>	0:45 0:10	1:15 0:41	1:41 1:07	2:02 1:30	2:20 1:48	2:38 2:04	2:53 2:20	3:08 2:35	3:22 2:48	3:33 3:00	3:45 3:11
					<b>F</b>	0:40 0:10	1:06 0:37	1:29 1:00	1:47 1:20	2:03 1:36	2:19 1:50	2:34 2:06	2:47 2:19	2:59 2:30	3:10 2:43
						<b>G</b>	0:36 0:10	0:59 0:34	1:19 0:55	1:35 1:12	1:49 1:26	2:05 1:40	2:18 1:54	2:29 2:05	2:42 2:18
							<b>H</b>	0:33 0:10	0:54 0:32	1:11 0:50	1:25 1:05	1:39 1:19	1:53 1:31	2:04 1:44	2:17 1:56
								<b>I</b>	0:31 0:10	0:49 0:29	1:04 0:46	1:18 1:00	1:30 1:12	1:43 1:25	1:55 1:37
									<b>J</b>	0:28 0:10	0:45 0:27	0:59 0:43	1:11 0:55	1:24 1:08	1:36 1:19
										<b>K</b>	0:26 0:10	0:42 0:26	0:54 0:40	1:07 0:52	1:18 1:03
											<b>L</b>	0:25 0:10	0:39 0:25	0:51 0:37	1:02 0:49
												<b>M</b>	0:24 0:10	0:36 0:24	0:48 0:35
													<b>N</b>	0:23 0:10	0:34 0:23
														<b>O</b>	0:22 0:10
															<b>Z</b>

DEPTH (FEET)	NO DECOM PRESSION LIMITS	REPETITIVE GROUPS														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
10	—	60	120	210	300											
15	—	35	70	110	160	225	350									
20	—	25	50	75	100	135	180	240	325							
25	—	20	35	55	75	100	125	160	195	245	315					
30	—	15	30	45	60	75	95	120	145	170	205	250	310			
35	310	5	15	25	40	50	60	80	100	120	140	160	190	220	270	310
40	200	5	15	25	30	40	50	70	80	100	110	130	150	170	200	
50	100	—	10	15	25	30	40	50	60	70	80	90	100			
60	60	—	10	15	20	25	30	40	50	55	60					
70	50	—	5	10	15	20	30	35	40	45	50					
80	40	—	5	10	15	20	25	30	35	40						
90	30	—	5	10	12	15	20	25	30							
100	25	—	5	7	10	15	20	22	25							
110	20	—	—	5	10	13	15	20								
120	15	—	—	5	10	12	15									
130	10	—	—	5	8	10										
140	10	—	—	5	7	10										
150	5	—	—	5												
160	5	—	—	—	5											
170	5	—	—	—	5											
180	5	—	—	—	5											
190	5	—	—	—	5											

TABLE 1-11 (1-6) "NO DECOMPRESSION" LIMITS AND REPETITIVE GROUP DESIGNATION TABLE FOR "NO DECOMPRESSION" DIVES

**TABLE 1-13 (1-8) REPETITIVE DIVE TABLE**

A	7	6	5	4	4	3	3	3	3	3	2	2	2	2	2	
B	17	13	11	9	8	7	7	6	6	6	5	5	4	4	4	
C	25	21	17	15	13	11	10	10	9	8	7	7	6	6	6	
D	37	29	24	20	18	16	14	13	12	11	10	9	9	8	8	
E	49	38	30	26	23	20	18	16	15	13	12	12	11	10	10	
F	61	47	36	31	28	24	22	20	18	16	15	14	13	13	12	
G	73	56	44	37	32	29	26	24	21	19	18	17	16	15	14	
H	87	66	52	43	38	33	30	27	25	22	20	19	18	17	16	
I	101	76	61	50	43	38	34	31	28	25	23	22	20	19	18	
J	116	87	70	57	48	43	38	34	32	28	26	24	23	22	20	
K	138	99	79	64	54	47	43	38	35	31	29	27	26	24	22	
L	161	111	88	72	61	53	48	42	39	35	32	30	28	26	25	
M	187	124	97	80	68	58	52	47	43	38	35	32	31	29	27	
N	213	142	107	87	73	64	57	51	46	40	38	35	33	31	29	
O	241	160	117	96	80	70	62	55	50	44	40	38	36	34	31	
Z	257	169	122	100	84	73	64	57	52	46	42	40	37	35	32	
NEW GROUP																
	40'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	150'	160'	170'	180'	
REPETITIVE DIVE DEPTH (FT)																

*INSTRUCTIONS FOR USE*

Use of table 1-11

All tabulated bottom times are in minutes: all tabulated depths are in feet  
 To find the repetitive group designation at surfacing for dives involving exposures up to and including the "no decompression limits": enter table 1-11 on the exact or next greater depth than that to which exposed, and select the listed exposure time exact or next greater than the actual exposure time. The repetitive group designation is indicated by the letter at the head of the vertical column where the selected exposure time is listed.

Use of table 1-12

Continue the vertical motion along the straight line joining the repetitive group designation on table 1-11 to the repetitive group designation on table 1-12. Enter the table vertically to select the elapsed surface interval time. The new repetitive group designation for the surface interval is to the right of the horizontal column where the elapsed surface interval time is listed.

Use of table 1-13

Continue the righthanded motion to enter table 1-13 on the horizontal column to the right of the new repetitive group designation. The time in each vertical column is the number of minutes that would be required (at

the depth listed at the bottom of the column) to saturate to the particular group.

Effective: 4/1/99

Prior Effective Dates: 1/1/67; 11/1/79; 4/1/99