Conversions:

Feet of Salt Water (fsw) Atmospheric Pressure *(**NOTE:** Values increase at approximately every 33 fsw adding a single atmosphere of pressure (14.7 psi).)*			
0 fsw	14.7 psi	99 fsw	58.8 psi)
33 fsw	29.4 psi	132 fsw	73.5 psi
66 fsw	44.1 psi	165 fsw	88.2 psi

**Commercial Dive Tables (*NOTE:* *These are conversion tables used by dive teams to account for depth, time and required decompression.)*

Table – 1 – No-Decompression Limits / Repetitive Group Designation

Table – 2 – Surface Interval Credit Table

Table – 3 – Residual Nitrogen Times or Repetitive Dive Times

Temperature: *Fahrenheit = Celsius* *(℉ = 9/5 ℃ + 32 and ℃ = 5/9 (℉ – 32))*

0	=	-17.8	80	=	26.7	200	=	93.3
32	=	0	90	=	32.2	250	=	121.1
40	=	4.4	100	=	37.8	300	=	148.9
50	=	10.0	110	=	43.3	400	=	204.4
60	=	15.6	120	=	48.9	500	=	260
70	=	21.1	150	=	65.6	1000	=	537.8

Pressure: *Bars = Pounds per square inch*

1 Bar	=	14.5 psi	5 Bars	=	72.5 psi	9 Bars	=	130.5 psi
2 bars	=	29.0 psi	6 Bars	=	87.0 psi	10 Bars	=	145.0 psi
3 Bars	=	43.5 psi	7 Bars	=	101.5 psi			
4 Bars	=	58.0 psi	8 Bars	=	116.0 psi			

United States Coast Guard

Commercial Diving Addendum
Job Aid

Name of Vessel	
Official Number	**Activity Number**
Date Completed	**Class**
Location	

Commercial Diving Operation & Decompression Method

❑ SCUBA ❑ Surface Supplied Air ❑ Surface Supplied Mixed Gas

❑ In-Water Decompression ❑ On-Deck Decompression

Vessel or Facility Type

❑ U.S. Vessel/MODU ❑ U.S. Barge Manned/Ocean-Going

❑ Foreign Flagged Vessel ❑ Floating Production Facility

❑ Fixed Facility ❑ Deepwater Port

Inspectors

1. _____ **3.** _____

2. _____ **4.** _____

Job Aid CDA
Rev. Sep 2016

Use of Commercial Diving Addendum (CDA) Job Aid:

This Job Aid is intended for use by qualified Coast Guard Marine Inspectors during the inspection and/or observation of commercial dive operations. It is not a standalone document and should be used in conjunction with the applicable vessel's Job Aid.

The "applicability" identified in 46 CFR 197.202 should be carefully reviewed to ensure that you apply the regulations as intended. This includes the appropriate vessels, facilities or units conducting these commercial diving operations and in the correct geographical locations.

The tasks contained within this Job Aid are not intended to limit the scope or depth of inspection. A checked box should be a running record of what has been inspected and does not imply that the entire system has been inspected or that all or any items are in full compliance. This Job Aid does not constitute part of the official inspection record.

This document does not establish or change federal laws or regulations and references given are only general guidance to the Marine Inspector. The Marine Inspector will need to refer to other publications such as the U.S. Codes of Federal Regulation (CFR), industry standards and/or locally produced guidance during the course of inspection for specific regulatory references. Not all items in this Job Aid are applicable to all commercial diving operations.

NOTE: *Additional guidance can be found in MSM Volume II, Section C, Chapter 1.E: Commercial Diving Equipment.*

Pre-inspection Items

- Review MISLE records to determine if PVHO's are ASME compliant
- Review MISLE records to determine if PHVO's have been issued an Equivalency by the Marine Safety Center
- Review Dive Operations Manual for compliance and information

Notes:

Notes:

Table of Contents:

Administrative Items

Involved Parties 3
Dive Equipment 4
References 5

Commercial Diving 6

Appendices

Boyle's Law 8
Charles' Law 9
Dalton's Law 10
Henry's Law 11
Notes 12
Conversions 15

Administrative Items

Involved Parties

Person-in-Charge:

Person-in-Charge:
Phone Numbers:

Dive Supervisor:

Dive Supervisor:
Phone Numbers:

Dive Company:

Company Representative:
Phone Numbers:

Notes:

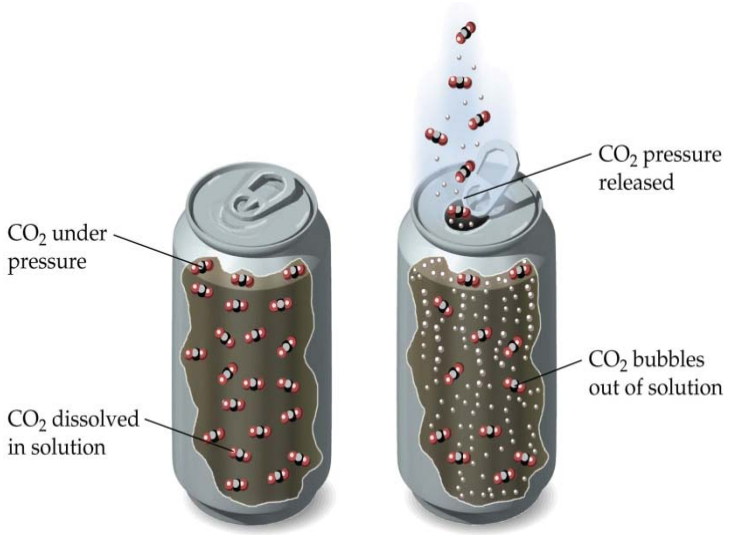
Henry's Law (1803)

- At a constant temperature the amount of a given gas that dissolves in a given type and volume of liquid is directly proportional to the partial pressure of that gas in equilibrium with that liquid

- This is why divers must decompress slowly to allow the entrained gasses within the body to come out of solution while not forming large enough gas bubbles to cause physical and medical problems/ complications (aka "The Bends")

This "Law" provides for and explains the amount of any given gas that will dissolve into a liquid (in this case blood) at a given temperature. Likewise, if the pressure is suddenly removed, the dissolved gas will rapidly expand.

This is why a diver must decompress slowly, which allows for these dissolved gases to exit the blood stream. When these gases are not allowed to come out of the bloodstream under controlled conditions, bubbles formed within the bloodstream directly result in the diver being "Bent" (aka The Bends).



Dive Equipment

Pressure Vessels for Human Occupancy (PVHO)		Number Aboard	
Type of PVHO (number aboard)			
Dive Bell Open/Closed	Dive Decompression	Emergency Evacuation	
Dive Bell			
Standard	Manufacturer	MAWP	Temperature
Dive Decompression			
Standard	Manufacturer	MAWP	Temperature
Emergency Evacuation			
Standard	Manufacturer	MAWP	Temperature
Portable Fire Extinguishers			
PVHO Protected	Capacity	Agent	Last Serviced
Compressor Volume Tank			
Standard	Manufacturer	MAWP	Temperature

References

- 46 Code of Federal Regulations (CFR):
  a) Part 54, Pressure Vessels
  b) Part 197, Subpart B – Commercial Diving Operations

- American National Standards Institute (ANSI), Code for Pressure Piping

- American Society of Mechanical Engineers (ASME):
  a) Section VIII, Division 1
  b) Section VIII, Division 2
  c) PVHO-1

- National Board Inspection Code (NBIC):
  a) Part 3, Repairs and Alterations

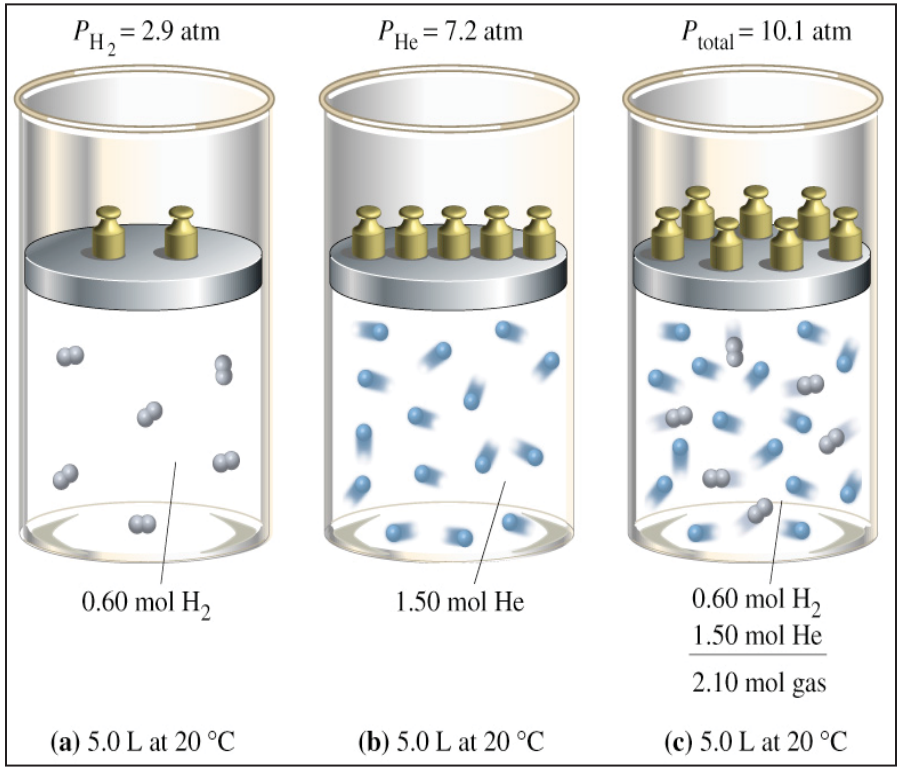
Dalton's Law (1801)

- The total pressure of a mixture of gasses is equal to the sum of the pressures exerted by each gas

- Each gas acts as if it is the only gas occupying that space
  - If gas A exerts 2.9 atm of pressure;
  - If gas B exerts 7.2 atm of pressure;
  - The gas mixture (A + B) exerts 10.1 atm of pressure in that space

This "Law" provides for and explains partial pressures. The deeper a diver descends requires decrease in specific gases by percentage (%).This is why there is a need to reduce gases, such as oxygen as the depth of a dive increases.

Oxygen becomes toxic the deeper a diver descends and therefore less oxygen is needed. Oxygen will be replaced by a different gas (such as Helium).

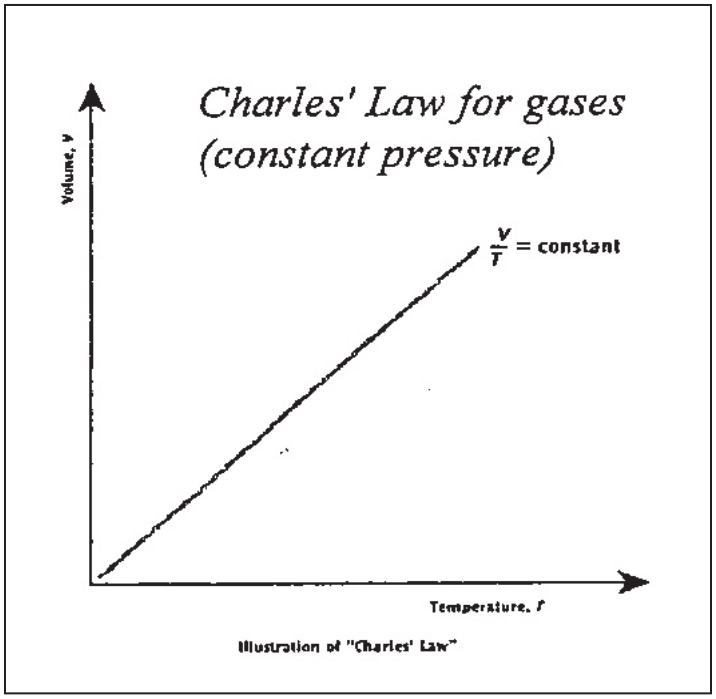


Charles' Law (1787)

- At a constant pressure, the volume of a given mass varies directly with the change of absolute temperature (isobaric)

This "Law" provides for and explains the warmer a gas becomes, its volume increases. Conversely, the colder a gas becomes, its volume decreases. This is why it is very important for the dive supervisor and other support personnel to carefully monitor the breathing gas flows to divers.

This law is also called the Temperature-Volume Law.



Commercial Diving

☐	1.	Examine person in charge (PIC) designation	46 CFR 197.208
☐	2.	Examine diving supervisor's designation	46 CFR 197.210
☐	3.	Examine dive operations manual	46 CFR 197.420(a)(1)
☐	4.	Examine official logbook	46 CFR 197.480 46 USC 11301
☐	5.	Review equipment maintenance record	46 CFR 197.482(d)(1) 46 CFR 197.454
☐	6.	Review diving supervisor's report	46 CFR 197.404(a)(4) 46 CFR 197.402(a)(2)(ii)
☐	7.	Inspect air compressor system	46 CFR 197.310(a)(1)
☐	8.	Inspect breathing supply hoses	46 CFR 197.312(a)(1)
☐	9.	Inspect first aid and treatment equipment	46 CFR 197.314(a)(1)
☐	10.	Inspect gages and timekeeping devices	46 CFR 197.318(a) Dive Operations Manual
☐	11.	Inspect diving ladder and stage	46 CFR 197.320(a)
☐	12.	Inspect surface supplied helmets and masks	46 CFR 197.322(a)(1)
☐	13.	Inspect diver's safety harness	46 CFR 197.324(a)
☐	14.	Inspect Pressure Vessel for Human Occupancy (PVHO)	46 CFR 197.328(a) ASME PVHO-1
☐	15.	Inspect Pressure Vessel for Human Occupancy (PVHO)	46 CFR 197.328(d)(15)
☐	16.	Inspect Pressure Vessel for Human Occupancy (PVHO) - Closed Bell	46 CFR 197.330(a) 46 CFR 197.328
☐	17.	Inspect Pressure Vessel for Human Occupancy (PVHO) - Decompression Chamber	46 CFR 197.332(a) 46 CFR 197.328
☐	18.	Inspect open diving bell	46 CFR 197.334(a)
☐	19.	Inspect pressure piping	46 CFR 197.336(a) ANSI B31.1
☐	20.	Inspect compressed gas cylinders	46 CFR 197.338(e) MSM II/C.1.E.3.g
☐	21.	Inspect breathing gas supply	46 CFR 197.340(a) 46 CFR 197.314(c)(3)
☐	22.	Verify SCUBA air supply	46 CFR 197.340(d)
☐	23.	Inspect diver's equipment	46 CFR 197.346(a)(1)
☐	24.	Inspect diver's equipment	46 CFR 197.346(b) 46 CFR 197.346(c)
☐	25.	Witness SCUBA diving operation	46 CFR 197.430(a)(1) 46 CFR 197.430(a)(2)
☐	26.	Witness surface-supplied air diving operation	46 CFR 197.432(a)

☐	27.	Witness surface-supplied mixed gas diving operation	46 CFR 197.434(a) 46 CFR 197.434(b)
☐	28.	Witness live-boating operation	46 CFR 197.436(a)

Appendices

Boyle's Law (1662)

- At a constant temperature, the volume of a given mass varies inversely to its absolute pressure (isothermal)
- Half the volume, the pressure will double
- Double the volume, half the pressure

This "Law" provides for and explains the Pressure and Volume relationship. As the volume is compressed, the pressure increases. As the pressure decreases, the volume increases. This is why a diver must carefully consider all depth changes because the gas volume in his/her lungs will rapidly increase as he/she ascends (pop).