



I'm not robot



Next

allows faster charging or simultaneous charging of multiple cylinders, and allows for provision of more economical high-pressure air by recharging the storage banks from a low-power compressor, or using lower cost off-peak electrical power. The quality of compressed breathing air for diving is usually specified by national or organisational standards, and the steps generally taken to assure the air quality include: [1] use of a compressor lubricant rated for breathing air, use compressor lubricant rated for breathing air, filtration of intake air, removal of particulate contamination, conditioning of the compressor intake to clean air, clear known sources of contaminants such as interna combustion exhaust fumes, sewer vents etc. removal of condensate from the compressed air by water separators. This may be done between stages on the compressor as well as after compression, filtration after compression to remove remaining water, and other contaminants using specialized filter media such as desiccants, molecular sieve or activated carbon. Traces of carbon monoxide may be catalyzed to carbon dioxide by Hopalcite, periodical air quality tests, scheduled filter changes and maintenance of the compressor. Filling from high-pressure storage Main article: Cascade filling system Cylinders may also be filled directly from high-pressure storage systems by decanting, with or without pressure boosting to reach the desired charging pressure. Cascade filling may be used for efficiency when multiple storage cylinders are available. High-pressure storage is commonly used when blending nitrox, heliox and trimix diving gases, and for oxygen for rebreathers and decompression gas.[82] Nitrox and trimix blending may include decanting the oxygen and/or helium, and topping up to working pressure using a compressor, after which the gas mixture must be analysed and the cylinder labeled with the gas composition.[82] Temperature change during filling Compression of ambient air causes a temperature rise of the gas, proportional to the pressure increase. Ambient air is typically compressed in stages, and the gas temperature rises during each stage. Intercoolers and water cooling heat exchangers can remove this heat between stages. Charging an empty dive cylinder also causes a temperature rise as the gas inside the cylinder is compressed by the inflow of higher pressure gas, though this temperature rise may initially be tempered because compressed gas from a storage bank at room temperature decreases in temperature when it decreases in pressure, so at first the empty cylinder is charged with cold gas, but the temperature of the gas in the cylinder then increases to above ambient as the cylinder fills to the working pressure. Wet filling: Excess heat can be removed by immersion of the cylinder in a cold water bath while filling. However, immersion for cooling can also increase the risk of water contamination the valve orifice of a completely depressurized tank and being blown into the cylinder during filling.[83] Dry filling: Cylinders may also be filled without water-bath cooling, and may be charged to above the nominal working pressure to the developed pressure appropriate to the temperature when filled. As the gas cools to ambient temperature, the pressure decreases, and will reach rated charging pressure at the rated temperature.[83] Safety and legal issues Legal constraints to filling scuba cylinders will vary by jurisdiction. In South Africa cylinders may be filled for commercial purposes by a person who is competent in the use of the filling equipment to be used, who knows the relevant sections of the applicable standards and regulations, and has written permission from the owner of the cylinder to fill it. The cylinder must be in test and suitable for the gas to be filled, and the cylinder may not be filled above the developed pressure for the temperature reached when it is filled. An external inspection of the cylinder must be made, and specified details of the cylinder and fill must be recorded. If the fill is of a gas other than air, the analysis of the completed fill must be recorded by the filler and signed by the customer. [46] If the residual pressure in a cylinder presented for filling does not produce a reasonably strong outflow of gas from the valve when opened the filler may refuse to fill the cylinder unless an acceptable reason is given for it being empty, as there is no way for the filler to check if it has been contaminated. Gas purity and testing Diving cylinders should only be filled with suitably filtered air from diving air compressors or with other breathing gases using gas blending or decanting techniques.[81] In some jurisdictions, suppliers of breathing gases are required by legislation to periodically test the quality of compressed air produced by their equipment and to display the test results for public information.[46] The standards for industrial gas purity and filling equipment and procedures may allow some contaminants at levels unsafe for breathing.[41] and their use in breathing gas mixtures at high pressure could be harmful or fatal. Handling of specialty gases Special precautions need to be taken with gases other than air: oxygen in high concentrations is a major cause of fire and rust.[82] oxygen should be very carefully transferred from one cylinder to another and only ever stored in containers that are cleaned and labeled for oxygen service.[82] Gas mixtures containing proportions of oxygen other than 21% could be extremely dangerous to divers who are unaware of the proportion of oxygen in them. All cylinders should be labeled with their composition, cylinders containing a high oxygen content must be cleaned for the use of oxygen and their valves lubricated only with oxygen service grease to reduce the chance of combustion.[82] Specialty mixed gas charging will almost always involve supply cylinders of high purity gas sourced from an industrial gas supplier. Oxygen and helium should be stored, mixed and compressed in well ventilated spaces. Oxygen because any leaks could constitute a fire hazard, and helium because it is an asphyxiant. Neither gas can be identified by the unaided human body. Gas contamination Contaminated breathing gas at depth can be fatal. Concentrations which are acceptable at the surface ambient pressure will be increased by the pressure of depth and may then exceed acceptable or tolerable limits. Common contaminants are: carbon monoxide - a by-product of combustion, carbon dioxide - a product of metabolism, and oil and lubricants from the compressor.[81] Keeping the cylinder slightly pressurized at all times during storage and transportation reduces the possibility of inadvertently contaminating the inside of the cylinder with corrosive agents, such as sea water, or toxic material, such as oils, poisonous gases, fungi or bacteria.[43] A normal dive will end with some pressure remaining in the cylinder; if an emergency ascent has been made due to an out-of-gas incident, the cylinder will normally still contain some pressure and unless the cylinder had been submerged deeper than where the last gas was used it is not possible for water to get in during the dive. Contamination by water during filling may be due to two causes. Inadequate filtration and drying of the compressed air can introduce small quantities of fresh water condensate, or an emulsion of water and compressor lubricant, and failing to clear the cylinder valve orifice of water which may have dripped from wet dive gear, which can allow contamination by fresh or seawater. Both cause corrosion, but seawater contamination can cause a cylinder to corrode rapidly to the extent that it may be unsafe or condemned after even a fairly short period. This problem is exacerbated in hot climates, where chemical reactions are faster, and is more prevalent where filling staff are badly trained or overworked.[84] Catastrophic failures during filling The blast caused by a sudden release of the gas pressure inside a diving cylinder makes them very dangerous if mismanaged. The greatest risk of explosion exists while filling.[85] but cylinders have also been known to burst when overheated.[86] The cause of failure can range from reduced wall thickness or deep pitting due to internal corrosion, neck thread failure due to incompatible valve threads, or cracking due to fatigue, sustained high stresses, or overheating effects in aluminum.[43][87] Tank bursting due to overpressure may be prevented by a pressure-relief burst disc fitted to the cylinder valve, which bursts if the cylinder is overpressurised and vents air at a rapid controlled rate to prevent catastrophic tank failure. Accidental rupture of the burst disc can also occur during filling, due to corrosive weakening or stress from repeated pressurization cycles, but is remedied by replacement of the disc. Bursting discs are not required in all jurisdictions. Other failure modes that are a hazard while filling include valve thread failure, which can cause the valve to blow out of the cylinder neck, and filling whip failure.[34][35][36][37] Periodic inspection and testing of diving cylinders Condemned diving cylinders set aside for metal recycling See also: Testing and inspection of diving cylinders Most countries require diving cylinders to be checked on a regular basis. This usually consists of an internal visual inspection and a hydrostatic test. The inspection and testing requirements for scuba cylinders may be very different from the requirements for other compressed gas containers due to the more corrosive environment.[46] Water jacket hydrostatic test test diagram A hydrostatic test involves pressurising the cylinder to its test pressure (usually 5/3 or 3/2 of the working pressure) and measuring its volume before and after the test. A permanent increase in volume above the tolerated level means the cylinder fails the test and must be permanently removed from service.[44] An inspection includes external and internal inspection for damage, corrosion, and correct colour and markings. The failure criteria vary according to the published standards of the relevant authority, but may include inspection for bulges, overheating, dents, gouges, electrical arc scars, pitting, line corrosion, general corrosion, cracks, thread damage, defacing of permanent markings, and colour coding.[4146] Very few cylinders are failed by the hydrostatic test. Almost all cylinders that fail are failed according to visual inspection criteria.[86] When a cylinder is manufactured, its specification, including manufacturer, working pressure, test pressure, date of manufacture, capacity and weight are stamped on the cylinder.[26] After a cylinder passes the test, the test date, (or the test expiry date in some countries such as Germany), is punched into the shoulder of the cylinder for easy verification at fill time. [note 1] The international standard for the stamp format is ISO 13769, Gas cylinders - Stamp marking.[26] Filling station operators may be required to check these details before filling the cylinder and may refuse to fill non-standard or out-of-test cylinders. [note 2] Intervals between inspections and tests A cylinder is due to be inspected and tested at the first time it is to be filled after the expiry of the interval as specified by the United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations, or as specified by national or international standards applicable in the region of use.[88][89] In the United States, an annual visual inspection is not required by the USA DOT, though they do require a hydrostatic test every five years. The visual inspection requirement is a diving industry standard based on observations made during a review by the National Underwater Accident Data Center.[90] In European Union countries a visual inspection is required every 2.5 years, and a hydrostatic test every five years.[91][92] In Norway a hydrostatic test (including a visual inspection) is required 3 years after production date, then every 2 years. Legislation in Australia requires that cylinders are hydrostatically tested every twelve months.[93] In South Africa a hydrostatic test is required every 4 years, and a visual inspection every 2 years. Eddy current testing of neck threads must be done according to the manufacturer's recommendations.[46] Procedures for periodic inspections and tests to be used for cylinders are listed below. [11] Before filling, the listed procedures, but the condition remains doubtful, further tests can be applied to ensure that the cylinder is fit for use. Cylinders that fail the tests or are found to be contaminated after refilling must be removed after depressurising and verifying that the valve is open. Cylinders containing breathing gases do not need special precautions for discharge except that high oxygen fraction gases should not be released in an enclosed space because of the fire hazard.[98][99] Before inspection the cylinder must be clean and free of loose coatings, corrosion products and other materials which may obscure the surface.[100] The cylinder is inspected externally for dents, cracks, gouges, cuts, bulges, laminations and excessive wear, heat damage, torch or electric arc burns, corrosion damage, illegible, incorrect or unauthorised permanent stamp markings, and unauthorised additions or modifications.[101] [102] Unless the cylinder walls are examined by ultrasonic methods, the interior must be visually inspected using sufficient illumination to identify any damage and defects, particularly corrosion. If the inner surface is not clearly visible it should first be cleaned by an approved method which does not remove a significant amount of wall material.[103] [104] When there is uncertainty whether a defect found during visual inspection meets the rejection criteria, additional tests may be applied, such as ultrasonic measurement of pitting wall thickness, or weight checks to establish total weight loss to corrosion.[105] While the valve is off, the threads of cylinder and valve are checked to identify the thread type and condition. The threads of cylinder and valve must be of matching thread specification, clean and full form, undamaged and free of cracks, burrs and other imperfections.[106][107] Ultrasonic inspection may be substituted for the pressure test, which is usually a hydrostatic test, which may be either a proof test or a volumetric expansion test depending on the cylinder design specification. Test pressure is specified in the stamp markings of the cylinder. [98][108] Valves that fail the tests are inspected and repaired as necessary. Valves ejected due to mis fit with valve threads 3/4" NPSM and 3/4" BSP (F) caused damage to a dive gas compressor room.[87] A valve ejected during filling due to incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel thread and cylinder was a 3/4"x14 BSP parallel thread. [124][125] A valve ejected due to incompatible thread (metric valve in imperial cylinder) injured commercial diver by impact on the back of the helmet during preparations for a dive. Cylinder had been under pressure for several days following hydrostatic testing, and no particular triggering event was identified. Diver was knocked down and bruised but protected from serious injury by the helmet.[126] Diving instructor's leg nearly amputated by ejected valve while attempting to remove valve from pressurised cylinder.[87] Valve ejected during filling due to thread failure, sank dive boat. Vented bursting disc retainers in the cylinder valves had been replaced by solid screws.[87] Filling hose failure severely injured operator when the hose hit his face. The wound exposed the jaw bone, and 14 stitches were needed to close the wound.[87] Cases of lateral epicondylitis have been reported caused by the handling of diving cylinders.[127] Handling Cylinders should not be left standing unattended unless secured[46] so that they can not fall in reasonably foreseeable circumstances as an impact could damage the cylinder valve mechanism, and conceivably fracture the valve at the neck threads, and when it happens most of the energy of the compressed gas is released within a second, and can accelerate the cylinder to speeds which can cause severe injury or damage to the surroundings.[41][128] Long-term storage Breathing quality gases do not normally deteriorate during storage in steel or aluminium cylinders. Provided there is insufficient water content to promote internal corrosion, the stored gas will remain unchanged for years if stored at temperatures within the allowed working range of the cylinder. The typical range is between 55 °C and 15 °C. If there is any doubt, the presence of oxygen fraction will indicate whether the gas has changed (the other components are inert). Any unusual smells would be an indication that the cylinder or gas was contaminated at the time of filling. However, some authorities recommend that cylinders be stored in a well ventilated area, away from heat, and away from incompatible thread killed the operator by impact to the chest.[37] A valve failed on a diver's emergency cylinder on a diving support vessel during preparation for a dive injuriny five divers. The cylinder valve was ejected at 180 bar due to incompatible thread. Pillar valve was M25x2 parallel

