DuPont Refrigerants

Technical Information

Safety of DuPont™ Suva® and ISCEON® Refrigerants (AS-1)

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DuPont Answers Your Questions About the Safe Handling and Use of DuPont™ Suva® and DuPont™ ISCEON® Refrigerants

Introduction

This technical bulletin answers common safety questions, discusses potential symptoms of overexposure, and provides first aid and medical advice for effects of overexposure that may occur from improper use or handling of Suva® and ISCEON® Refrigerants.

DuPont™ Suva® Refrigerants

DuPont™ Suva® refrigerants, which are composed of hydrochlorofluorocarbon (HCFC), hydrofluorocarbon (HFC) compounds and hydrocarbons were developed as safe, effective alternatives to existing chlorofluorocarbon (CFC) and hydrochlorofluorocarbon (HCFC) refrigerants.

Suva® 123 (R-123) is the DuPont brand name for HCFC-123 refrigerant, which is a replacement for CFC-11 in centrifugal chillers.

Suva® 124 (R-124) is the DuPont brand name for HCFC-124 refrigerant, which has application in some CFC-114 systems and is also a component of Suva® MP blends.

Suva® 125 (R-125) is the DuPont brand name for HFC-125, which is a component of some Suva® and ISCEON® blends.

Suva® 134a (R-134a) and Suva® 134a Auto are DuPont brand names for HFC-134a refrigerant, which is a primary replacement for CFC-12 in automotive applications.

Suva® MP service refrigerants are ternary blends of HCFC-22, HFC-152a, and HCFC-124 that have been developed as replacements for CFC-12 and R-500 in a variety of applications.

- Suva® MP39 (R-401A) is a replacement for CFC-12 in medium-temperature stationary positive displacement air-conditioning and refrigeration systems.
- Suva® MP66 (R-401B) is a replacement for CFC-12 in low-temperature stationary refrigeration applications and in some transport refrigeration equipment. Suva® MP66 is also the recommended alternative for existing R-500 systems.

Suva® 409A (R-409A) is a ternary blend of HCFC-22, HCFC-124, and HCFC-142b that has been developed as a replacement for CFC-12 in stationary positive displacement air-conditioning and refrigeration equipment.

Suva® 404A is a ternary blend of HFC-125, HFC-143a, and HFC-134a that has been developed as a long-term replacement for R-502 and some R-22 refrigeration applications in high-, medium-, and low-temperature ranges. Suva® 404A (HP62) can also be used to retrofit existing R-502 equipment.

Suva® 507 (R-507) is a binary blend of HFC-125 and HFC-143a that has been developed as a long-term replacement for R-502 in commercial refrigeration equipment. It can be used in new or existing R-502 systems.

Suva® HP service refrigerants are ternary blends of HFC-125, HC-290, and HCFC-22 that have been developed as replacements for R-502 primarily for retrofitting existing systems.

- Suva® HP80 (R-402A) is a primary service refrigerant replacement for R-502 in medium- and low-temperature refrigeration; it has discharge temperatures equivalent to R-502.
- Suva® HP81 (R-402B) is the preferred replacement for R-502 in limited applications where a 10 to 20°F increase in compressor discharge temperature is desirable, such as some ice machines and other self-contained equipment.

Table 1
Physical Properties of DuPont™ Suva® Refrigerants

Product	Composition, wt %	Average Boiling Point, °C (°F) at 1 atm	Occupational Exposure Limit*, ppm v/v
Suva® 123	100% HCFC-123	27.8 (82)	50
Suva® 124	100% HCFC-124	–10.8 (12.2)	1,000
Suva® 125	100% HFC-125	–48.3 (–55.3)	1,000
Suva® 134a	100% HFC-134a	–26 (–15)	1,000
Suva® MP39 (R-401A)	53% HCFC-22/13% HFC-152a/34% HCFC-124	–36.1 (–33)	1,000
Suva® MP66 (R-401B)	61% HCFC-22/11% HFC-152a/28% HCFC-124	–34.7 (–30.4)	1,000
Suva® 409A	60% HCFC-22/25% HCFC-124/15% HCFC-142b	–34 (–30)	1,000
Suva® 404A	44% HFC-125/52% HFC-143/4% HFC-134a	–46.4 (–51.6)	1,000
Suva® 507	50% HFC-125/50% HFC-143a	–46.7 (–52.1)	1,000
Suva® HP80 (R-402A)	60% HFC-125/2% HC-290/38% HCFC-22	–49.2 (–56.5)	1,000
Suva® HP81 (R-402B)	38% HFC-125/2% HC-290/60% HCFC-22	–47.3 (–53.2)	1,000
Suva® 408A	7% HFC-125/46% HFC-143a/47% HCFC-22	–44 (–46.3)	1,000
Suva® 407A	20% HFC-32/40% HFC-125/40% HFC-134a	–45.2 (–49.4)	1,000
Suva® 407C	23% HFC-32/25% HFC-125/52% HFC-134a	–43.6 (–46.4)	1,000
Suva® 410A	50% HFC-32/50% HFC-125	–51.5 (–60.8)	1,000
Suva® 95 (R-508B)	46% HFC-23/54% FC-116	–88 (–126.5)	1,000
DuPont™ R-403B	56% HCFC-22/39%HFC-218/5% HC-290	–48 (–54)	1,000

*The occupational exposure limits listed are either the DuPont Acceptable Exposure Limit (AEL), the American Industrial Hygiene Association Workplace Environmental Exposure Level (AIHA WEEL), OSHA Permissible Exposure Limit (PEL), or Threshold Limit Value (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH).

Table 2
Physical Properties of DuPont™ ISCEON® Refrigerants

Product	Composition, wt %	Average Boiling Point, °C (°F) at 1 atm	Occupational Exposure Limit*, ppm v/v
ISCEON® MO29 (R-422D)	65.1% HFC-125/31.5% HFC-134a/3.4% HC-600a	–43 (–46)	1000
ISCEON® 39TC® (R-423A)	52.5% HFC-134a/47.5% HFC-227ea	–24 (–11)	1000
ISCEON® MO49Plus™ (R-437A)	19.5% HFC-125/78.5% HFC-134a/1.6% HC-600/0.4% HC-601	–29 (–20)	994
ISCEON® MO59 (R-417A)	46.6% HFC-125/50% HFC-134a/3.4% HC-600	–39 (–39)	1000
ISCEON® MO79 (R-422A)	85.1% HFC-125/11.5% HFC-134a/3.4% HC-600a	–47 (–52)	1000
ISCEON® MO89	86% HFC-125/9% HFC-218/5% HC-290	–48 (–54)	1000
ISCEON® MO99™ (R-438A)	8.5% HFC-32/45% HFC-125/44.2% HFC-134a/1.7% HC-600/0.6% HC-601a	–43 (–45)	995

* The occupational exposure limits listed are either the DuPont Acceptable Exposure Limit (AEL), the American Industrial Hygiene Association Workplace Environmental Exposure Level (AIHA WEEL), OSHA Permissible Exposure Limit (PEL), or Threshold Limit Value (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH).

Suva® 408A (R-408A) is a ternary blend of HFC-125, HFC-143a, and HCFC-22. It has been developed as a replacement for R-502 in existing low- and medium-temperature commercial refrigeration equipment. It is an option to Suva® HP80 where lower operating pressures are desired; however, it does have higher compressor discharge temperatures.

Suva® 407A is a ternary blend of HFC-32, HFC-125, and HFC-134a. It has been formulated as a similar pressure replacement for HCFC-22 in existing low-temperature refrigeration applications.

Suva® 407C is a ternary blend of HFC-32, HFC-125, and HFC-134a. It has been formulated as a similar pressure replacement for HCFC-22 in new or existing air-conditioning equipment and heat pumps.

Suva® 410A is a binary blend of HFC-32 and HFC-125. It is a high-pressure replacement for HCFC-22 for new air-conditioning applications.

Suva® 95 (R-508B) is an azeotropic mixture of HFC-23 and PFC-116, designed as a replacement for R-503, CFC-13, and HFC-23 in very low-temperature applications (below –40°F [–40°C] evaporator temperature).

DuPont™ R-403B is a ternary blend of HCFC-22, HFC-218 and HC-290 that has been developed as an interim replacement for CFC-502 in commercial and transport refrigeration systems.

Table 1 provides a quick summary of these refrigerants, including composition, boiling point, and acceptable exposure limit (AEL) information.

DuPont™ ISCEON® Refrigerants

DuPont™ ISCEON® Refrigerants, which are composed of hydrofluorocarbons (HFC) and hydrocarbons, were developed as efficient and cost-effective retrofit refrigerants for existing direct expansion chlorofluorocarbon (CFC) and hydrochlorofluorocarbon (HCFC) air conditioning and refrigeration systems.

ISCEON® MO29 is a ternary blend of HFC-125, HFC-134a and HC-600a that has been developed as a multipurpose non ozone depleting replacement for R-22 that can be used in low- and medium-temperature refrigeration systems.

ISCEON® 39TC® is a binary blend of HFC-134a and HFC-227ea that has been developed as a non ozone depleting replacement for CFC-12 in centrifugal chillers.

ISCEON® MO49Plus™ is a quaternary blend of HFC-125, HFC-134a, HC-600 and HC-601 that has been developed as a non ozone depleting replacement for CFC-12 in automotive air conditioning and for CFC-12 and HCFC-containing refrigerant blends (e.g., MP39, MP66 and R-409A) in automotive air-conditioning (AC) and medium- and low-temperature stationary refrigeration systems.

ISCEON® MO59 is a ternary blend of HFC-125, HFC-134a and HC-600 that has been developed as a non ozone depleting replacement for HCFC-22 in air conditioning applications.

ISCEON® MO79 is a ternary blend of HFC-125, HFC-134a and HC-600a that has been developed as a non ozone depleting replacement for CFC-502, HCFC-22, and HCFC-containing blend refrigerants (e.g., HP80, HP81 and R-408A) in a wide variety of low- and medium-temperature refrigeration applications.

ISCEON® MO89 is a ternary blend of HFC-125, HFC-218 and HC-290 that has been developed as a non ozone depleting replacement for R-13B1 in very low temperature refrigeration applications.

ISCEON® MO99™ is a pentary blend of HFC-32, HFC-125, HFC-134a, HC 600 and HC-601a that has been developed as a multipurpose non ozone depleting replacement for R-22 that can be used in low, medium and high temperature refrigeration systems and in residential and commercial air conditioning (AC) systems.

Table 2 provides a quick summary of these refrigerants, including composition, boiling point, and acceptable exposure limit (AEL) information

Users must read and understand the Material Safety Data Sheets (MSDS) before handling or using Suva® or ISCEON® Refrigerants. Failure to follow the MSDS instructions could result in injury or death. An MSDS can be obtained for any DuPont refrigerant from the DuPont web site or locations listed on the last page of this technical bulletin, or from any DuPont refrigerants Distributor.

Flammability

Are these refrigerants flammable?

Suva® and ISCEON® Refrigerants (with the exception of ISCEON® MO89) are nonflammable in air at temperatures up to 100°C (212°F) at atmospheric pressure, and under normal use conditions, and have an A1 ASHRAE safety classification. ISCEON® MO89 can become flammable under worst case fractionation scenarios.

ISCEON® MO89 has not been submitted to ASHRAE for safety classification. Independent testing has determined that as formulated, ISCEON® MO89 is non-flammable at atmospheric pressure in air at temperatures up to 100°C (212°F). Additional testing was conducted to determine if the refrigerant will become flammable due to fractionation (change in composition from the original). These tests, as well as computer model calculations indicate it is possible for the vapor to become flammable under certain leak conditions at normal use and handling temperatures. For the product to ignite, the volume % of the vapor in air would have to exceed 6% and an ignition source of sufficient energy (e.g. an open flame or an electric spark) would need to be present. Take appropriate precautions to avoid these conditions.

DuPont Suva® and ISCEON® Refrigerants should not be mixed with any flammable gases or liquids for any reason because these mixtures can have unpredictable flammability properties and could be unsafe.

Mixtures of some Suva® and ISCEON® Refrigerants with high concentrations of air at elevated pressure and/or temperature can become combustible in the presence of an ignition source. These products can also become combustible in an oxygen-enriched environment (oxygen concentrations greater than that in air). Whether a mixture containing these refrigerant products and air, or these refrigerant products in an oxygen-enriched atmosphere, become combustible depends on the inter-relationship of 1) the temperature, 2) the pressure, and 3) the proportion of oxygen in the mixture. In general, these products should not be allowed to exist with air above atmospheric pres-sure or at high temperatures; or in an oxygen- enriched environment. **These products should NOT be mixed with air under pressure for leak testing or other purposes**.

Experimental data has also been reported which indicate combustibility of HCFC-22 and HFC-134a in the presence of chlorine. These two products are used either as pure refrigerants or as components in some of the Suva® and ISCEON® blend refrigerants.

Refrigerants should not be exposed to open flames or electrical heating elements. High temperatures and flames can cause the refrigerants to decompose, releasing toxic and irritating fumes. In addition, a flame (such as a cutting torch) can become dramatically larger or change color if used in high concentrations of many refrigerants, including R-500 or R-22, as well as many alternative refrigerants. This flame enhancement can cause surprise or even injury. When heated with a torch flame, residual lubricant in the system can also contribute to the flame appearance if heated to its flash point. Rapid heating of the lubricant can cause degassing of any dissolved refrigerant in the oil, creating an oil mist which can further affect the appearance of a flame. Always recover refrigerants, evacuate equipment, and purge the equipment to remove any residual refrigerant and lubricant, and ventilate work areas properly before using any open flames.

Decomposition

What causes decomposition?

Refrigerants will decompose when exposed to high temperatures from flames or electric resistance heaters. Decomposition may produce toxic and irritating compounds, such as hydrogen chloride and hydrogen fluoride.

How can I tell if a refrigerant has decomposed?

The strong odors released from the decomposed refrigerant will irritate the nose and throat. The irritating fumes released from decomposition will provide early warning and will likely result in an attempt to evacuate the area. Follow all DuPont recommendations for refrigerant handling to prevent refrigerant decomposition and other hazards.

Are decomposition products hazardous?

Yes. The acidic vapors produced are dangerous and the area should be evacuated immediately and ventilated to prevent exposure to personnel. Anyone exposed to the decomposition products should be taken to fresh air and medical treatment sought immediately. The exposure area should not be re-entered until it is deemed safe by the appropriate authorities.

Inhalation Toxicity

Are Suva® or ISCEON® Refrigerants toxic?

These refrigerants have an excellent safety profile and can be safely used when they are handled in accordance with DuPont recommendations, and when exposures are maintained at or below recommended exposure limits, such as the DuPont Acceptable Exposure Limit (AEL).

What is an AEL?

An AEL is an acceptable exposure limit established by DuPont. AELs specify a time-weighted average (TWA) airborne concentration for which nearly all workers may be repeatedly exposed without adverse effects during an 8- or 12-hour day or 40-hour workweek, throughout a working lifetime. In practice, short-term exposures should not exceed three times the established exposure limit (AEL, PEL, TLV, or other index), or 1,250 ppm, – for more than 30 total minutes during a workday, whichever is lower.

What is a STEL or EEL?

A short-term exposure limit (STEL) is a 15-minute TWA exposure, which should not be exceeded at any time during the workday. Emergency exposure limits (EEL) specify airborne concentrations for brief periods which should not result in permanent adverse health effects during emergencies. The EEL are established by DuPont for time periods of up to one hour. These limits should be considered as aids in planning for emergencies or spills, but should not be considered a substitute for proper engineering controls. For the Suva® refrigerants, an EEL has been set for Suva® 123 only. The EEL is 1,000 ppm with a ceiling limit of 2,500 ppm – a concentration which must not be exceeded.

What are common symptoms of overexposure?

Inhaling high concentrations of refrigerant vapors may with time cause temporary central nervous system depression with narcosis (sleepiness), lethargy, and weakness. Other effects that may occur include dizziness, a feeling of well-being or intoxication, and a loss of coordination. Continued inhalation of refrigerant vapors at high concentrations may produce heartbeat irregularities (cardiac sensitization), unconsciousness and, with gross overexposure, even death.

A person experiencing any of the initial symptoms should be moved to fresh air immediately and kept calm and quiet. If not breathing, give artificial respiration. If breathing is difficult, use oxygen. Call a physician immediately.

Mechanical Equipment Room Requirements

- Install an air monitor capable of detecting the refrigerant(s) used in concentrations up to the EEL or STEL.
- Install suitable alarms that activate at or below the refrigerant's AEL, and that will alert persons outside of the equipment room that a leak condition exists.
- Route relief valve discharge headers and purge units outdoors, away from all air intakes to building.
- Install local exhaust to ventilate the work area in the event that the air monitor alarm point is exceeded.
- Follow minimum standards for refrigerants as required and specified by ASHRAE Standard 15–2000 (or the most recent revision).

Refer to DuPont technical bulletin AS-5 for more detailed guidelines for using HCFC-123 in refrigeration and air-conditioning applications.

What is cardiac sensitization?

As with many other halocarbons or hydrocarbons, inhalation of high concentrations of Suva® and ISCEON® Refrigerants in the presence of high blood levels of the body's adrenaline may result in serious heart irregularities and possible death, an effect known as cardiac sensitization.

In experimental cardiac sensitization screening studies, test animals were exposed to various levels of refrigerant vapor followed by injection of high levels of epinephrine (adrenaline). Cardiac sensitization associated with Suva® and ISCEON® Refrigerant components is well above any concentrations expected in the workplace, and ranges from 20,000 to 150,000 ppm or higher in laboratory animals. By comparison, a cardiac sensitization response is observed with CFC-11 and CFC-12 under similar experimental conditions at approximately 5,000 and 50,000 ppm and higher, respectively.

Because of possible disturbances of cardiac rhythm, catecholamine drugs such as epinephrine should be considered only as a last resort in life-threatening emergencies.

General Precautions for Handling DuPont™ Suva® and DuPont™ ISCEON® Refrigerants

- Never pressurize systems or vessels containing these refrigerants with air for leak testing or any other purpose.
- Never heat cylinders above 52°C (125°F). Do not place cylinders near flames or heat sources, or discard into fires.
- Never use torches or open flames to heat cylinders during refrigerant charging operations.
- Never tamper with valves or pressure relief devices.
- Never refill disposable cylinders with anything. Any refrigerant heels should be used or transferred to recovery containers, and the empty cylinder should be properly disposed of.
- Never refill disposable or returnable cylinders with reclaimed refrigerants or lubricants. Use only proper recovery cylinders for this purpose. It is illegal to ship original cylinders with used refrigerants.
- Never use disposable refrigerant cylinders as compressed air tanks. Refrigerant cylinders are not coated properly on the inside, and moisture from compressed air will cause corrosion. This can weaken the cylinder and cause a violent rupture. There may be NO evidence of cylinder weakening until it fails.
- Always store refrigerant cylinders in a dry area. Storage in damp areas may permit corrosion, which will weaken the cylinders over time. Also do not store in direct sunlight where cylinder temperatures can exceed 52°C (125°F).

Can inhaling Suva® or ISCEON® Refrigerant vapors cause suffocation?

If a large release of refrigerant occurs, vapors can concentrate near the floor or in low areas and displace available oxygen, causing suffocation. In the event of a large spill or leak, always wear proper respiratory and other personal protective equipment. Canister-type respiratory masks do not provide adequate protection when entering an enclosed space with high levels of refrigerant vapors. These should be used for escape purposes only. Use self-contained breathing apparatus or an air-line respirator when entering confined areas such as tanks or basement areas where vapors may have accumulated. Test all work areas for available oxygen using appropriate monitoring equipment before entering. Place a second employee outside the work area when you enter, and use a lifeline to that employee.

How can I work safely on systems in enclosed areas?

1. Make sure all relief and purge vent piping is routed outdoors, and away from all air intakes to the building.
2. Make certain the area is well ventilated. Use auxiliary ventilation such as blowers or fans, if necessary, to disperse refrigerant vapors.
3. Test the work area for available oxygen before entering enclosed areas. Do not use a leak monitor to test for oxygen. A refrigerant leak detector will not tell you if adequate oxygen is present to sustain life.
4. Install refrigerant leakage detection and oxygen monitoring equipment in the work areas. For a discussion of leak detection equipment, see DuPont technical bulletin ARTD-27A. Also, refer to ASHRAE Standard 15-2000 (or most recent version), "Safety Code for Mechanical Ventilation," for ventilation and air monitoring requirements for equipment rooms.

What should I do if a large refrigerant leak or spill occurs?

Do not attempt to enter the area to repair equipment until the vapors are dispersed, OR until you are equipped with proper breathing apparatus. Evacuate everyone until the area has been ventilated. Use blowers or fans to circulate air at the floor level and in any basement or low areas.

1. Appropriate respiratory protection equipment should be readily available in case of a large release.
2. Personnel should be trained how to use this equipment.
3. Consult the most recent version of ASHRAE Standard 15 for additional information.

Is the deliberate inhalation of Suva® or ISCEON® Refrigerant dangerous?

Intentional misuse or deliberate inhalation of these refrigerants may disrupt heart rhythm and cause death without warning. This practice is extremely dangerous.

Can I smell Suva® or ISCEON® Refrigerants?

Most refrigerants have such a faint odor that they can be difficult to detect even at dangerous levels. Do not use smell as a test for safe levels of refrigerants in a work area. Frequent leak checks and air monitoring are the only adequate ways to determine that areas are safe for entry and work.

Skin and Eye Contact

Is skin or eye contact with Suva® or ISCEON® Refrigerants hazardous?

At room temperature, these refrigerant vapors have little effect on skin or eyes.

Always wear protective clothing, including long-sleeve clothing and gloves, when there is a risk of exposure to liquid refrigerants. Protection should include goggles and face shield to protect the eyes. If liquid refrigerant enters your eyes, flush them with plenty or water, then seek medical attention immediately.

Is frostbite a possible hazard?

In liquid form, these refrigerants can freeze skin or eyes on contact, causing frostbite. If you are splashed with liquid, immediately remove all clothing that contains refrigerant to prevent additional freezing. Soak the exposed area in lukewarm water, not cold or hot. Do not use dressings or ointments. Then seek medical attention immediately.

Pressure and Cylinder Safety

Can pressurized refrigerants ever cause a hazard?

Yes. Some of the potential hazards may include:

- In an overfilled container, vessel, or pipeline where temperature increases may become "liquid full" and immediately cause a dangerous increase in hydrostatic pressure, which can cause high-pressure leaks or even rupture of the vessel.
- A correctly filled returnable or disposable cylinder that is heated above the recommended maximum temperature of 52°C (125°F) could result in dangerously high pressures, possibly in excess of the cylinder design pressures.
- A returnable or disposable refrigerant cylinder connected to the discharge side of refrigeration or air-conditioning equipment may be exposed to pressures that can exceed the capacity of the cylinder relief devices, causing the cylinder to rupture or shatter. DuPont owns returnable refrigerant cylinders and ton tanks. No returnable container may be refilled by a user without DuPont consent. The United States Department of Transportation regulations forbid transportation of returnable cylinders refilled without DuPont authorization.

What are the proper procedures for safely handling disposable and returnable cylinders?

- Remove liquid from the cylinder when charging any Suva® or ISCEON® Refrigerant blend. Once removed from the cylinder, it can be flashed to vapor for charging.
- Verify proper hookup of charging hoses. Do not charge to the discharge side of the compressor.
- Open valves slowly.
- Protect cylinders from moisture and rusting during storage.
- Verify that the refrigerant label matches any color code or labeling used on the equipment.
- Do not tamper with any relief devices on cylinders or refrigerant equipment.
- Do not drop, dent, or mechanically abuse containers.
- Do not recharge disposable or refillable cylinders with used refrigerants.
- Do not use disposable cylinders as compressed air tanks.
- Do not force connections.
- Do not use flame on cylinders to heat them. Never expose cylinders to temperatures above 52°C (125°F).

How should I correctly braze or weld piping on refrigeration or air-conditioning equipment?

- Make certain there is adequate ventilation in the work area and that you have tested the air space for safe levels of refrigerant vapor and oxygen.
- Evacuate the Suva® or ISCEON® Refrigerant from the equipment you will be repairing. Recover the refrigerant into a proper recovery cylinder. Do not vent refrigerant.
- Purge system with nitrogen if available. If not, open the system and ensure no residual pressure is present. Drain all lubricant possible from the area to be welded to prevent fires. If not removed from the system, residual lubricant will continue to degas soluble refrigerant as the isolated system heats up, so evacuation time will need to be longer to remove residual degassed refrigerant vapors from the system.
- Leave system open during repair to prevent pressure buildup.
- Use auxiliary ventilation to disperse any fumes or decomposing refrigerant that may have remained in the piping or equipment during the repair process.
- If you notice an increase in the size or shape of the open flame, or the flame changes color, stop work immediately and re-ventilate the equipment. This flame enhancement effect should be a warning that too much refrigerant vapor is still present around or in the equipment. Also check to make sure any residual oil has been removed from the system. Rapid heating of oil can cause degassing of any dissolved refrigerant in the oil, creating an oil mist which can further affect the appearance of an open flame.

General Precautions for Handling DuPont™ Suva® and DuPont™ ISCEON® Refrigerants

- **Never** pressurize systems or vessels containing these refrigerants with air for leak testing or any other purpose.
- **Never** heat cylinders above 52°C (125°F). Do not place cylinders near flames or heat sources, or discard into fires.
- **Never** use torches or open flames to heat cylinders during refrigerant charging operations.
- **Never** tamper with valves or pressure relief devices.
- **Never** refill disposable cylinders with anything. Any refrigerant heels should be used or transferred to recovery containers, and the empty cylinder should be properly disposed of.
- **Never** refill disposable or returnable cylinders with reclaimed refrigerants or lubricants. Use only proper recovery cylinders for this purpose. It is illegal to ship original cylinders with used refrigerants.
- **Never** use disposable refrigerant cylinders as compressed air tanks. Refrigerant cylinders are not coated properly on the inside, and moisture from compressed air will cause corrosion. This can weaken the cylinder and cause a violent rupture. There may be NO evidence of cylinder weakening until it fails.
- **Always** store refrigerant cylinders in a dry area. Storage in damp areas may permit corrosion, which will weaken the cylinders over time. Also do not store in direct sunlight where cylinder temperatures can exceed 52°C (125°F).

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