CONTENT:

1.0 SCOPE:

1.1 In order to implement Saudi Aramco's Environmental Protection Policy; INT-5, and in compliance with the Montreal Protocol and its amendments, as ratified by the Kingdom of Saudi Arabia, intentional venting of ozone-depleting substances such as ChloroFluoroCarbon (CFC) and HydroChloroFluoroCarbon (HCFC) refrigerants is prohibited.

1.2 This General Instruction (G.I.) establishes uniform company-wide mandatory requirements for the management and conservation of CFC and HCFC refrigerants in a manner that is safe, cost-effective, and consistent with Saudi Aramco's existing operations.

1.3 Specifically, the following refrigerants are covered by this G.I.:

- CFC-11 (R-11)
- CFC-12 (R-12)
- CFC-502 (R-502)
- HCFC-22 (R-22)

1.4 Any other refrigerant compounds, containing CFCs or HCFCs, are also covered by this G.I., refer to Table-1 in Appendix-A.

1.5 The requirements of this G.I. are applicable to both existing and new HVAC/refrigeration equipment, unless it is specifically noted otherwise.

1.6 It is not the intent of this G.I. to promote the premature replacement or retrofitting of any existing Heating, ventilating and Air conditioning (HVAC)/refrigeration equipment.

1.7 The replacement or retrofitting decisions of any HVAC/refrigeration equipment shall be based on the economic evaluation of maintenance and replacement costs.

1.8 For HVAC/refrigeration equipment using CFC refrigerant the availability of the refrigerant may become the overriding factor in the decision making for replacement or retrofitting.

2.0 DEFINITIONS:

2.1 CFC Refrigerants:

Fully halogenated ChloroFluoroCarbon(CFC) refrigerants. In the hydrocarbon molecules of these refrigerants all hydrogen atoms are replaced with chlorine or fluorine.

2.2 HCFC Refrigerants:

Partially halogenated HydroChloroFluoroCarbon (HCFC) refrigerants. In the hydrocarbon molecules of these refrigerants not all hydrogen atoms are replaced with chlorine or fluorine.

2.3 HFC Refrigerants:

HydroFluoroCarbon (HFC) refrigerants which do not contain any chlorine.

2.4 HVAC/Refrigeration Equipment:

Any equipment which contains and uses refrigerant and which is used for household, commercial or industrial purposes, including any air conditioner, refrigerator, water cooler, chiller, freezer or process refrigeration system.

2.5 Low Pressure Chillers:

Chillers having evaporators operating at or below atmospheric pressure.

2.6 Purge Unit:

Equipment used to remove non-condensable gases from a refrigeration system.

2.7 Refrigerant Disposal:

An environmentally sound and approved process of refrigerant disposal as per Air-Conditioning & Refrigeration Institute (ARI) Standard 700 Specifications for Fluorocarbon Refrigerants.

2.8 Refrigerant Reclaiming:

Reprocessing of refrigerant to at least the purity specified in the ARI Standard 700 Specification for Fluorocarbon Refrigerants, and the verification of this purity, using analytical methodology prescribed in ARI Standard 700. This term usually implies the use of processes available at a dedicated re-processing facility.

2.9 Refrigerant Recovery:

Removal of refrigerant in any condition from an HVAC/refrigeration equipment and storing it in an external container without necessarily testing or processing it in any way.

2.10 Refrigerant Recycling:

The cleaning of refrigerant for reuse without meeting all of the requirements for reclaiming. In general, recycled refrigerant is refrigerant that is cleaned, using oil separation and single or multiple passes through devices, such as replaceable core filter-dryers, which reduce moisture, acidity, and particulate matter. This term usually applies to procedures implemented at the field or at a local service center.

2.11 Rupture Disk:

Valve or rupture membrane designed to relieve excessive pressure by mechanical failure of disc.

2.12 Refrigerant Leak:

Unintentional release of refrigerant from a refrigeration system to the ambient.

2.13 Approved CFC Disposal Plant:

An approved CFC disposal plant of refrigerant in compliance with Environmental Protection Agency (EPA) guidelines.

3.0 GENERAL REQUIREMENTS:

3.1 The phase out of CFCs and HCFCs shall be as per Table-1 in Appendix-A.

3.2 Intentional venting of CFC or HCFC refrigerants is prohibited.

3.3 The use of CFC refrigerants as cleaning agents is prohibited, unless the refrigerant is recovered.

3.4 CFC refrigerants shall not be used for flushing, purging, leak testing, dehydration or evacuation of HVAC/refrigeration systems, unless the refrigerant is recovered.

3.5 New HVAC/refrigeration equipment, using CFC refrigerant, shall not be purchased. All new equipment shall use HCFC or HFC refrigerant.

4.0 INSTALLATION:

4.1 To comply with Saudi Aramco's Environmental Protection Policy; INT-5, and in compliance with the Montreal Protocol the company will no longer install new R-11, R-12 or R-502 refrigeration systems.

4.2 In new HCFC systems, shut-off valves shall be installed (in accordance with manufacturers' recommendations) between those components of the system that may need to be isolated for servicing.

4.3 All low pressure (R-11) chillers shall be equipped with the following refrigerant containment devices:

4.3.1 High efficiency purge unit, to reduce refrigerant purge losses by at least 95%.

4.3.2 Pressure sealing system to prevent air infiltration when the chiller is shut down.

4.3.3 Rupture disk and relief valve assembly, approved by the chiller manufacturer, to prevent the loss of entire refrigerant charge in case of overpressure emergencies in compliance with ANSI/ASHRAE Standard 15 “Safety Standard for Refrigeration Systems”.

5.0 OPERATION AND MAINTENANCE:

5.1 Use of recovery/recycling equipment is mandatory during the servicing or maintenance of all Saudi Aramco HVAC/refrigeration equipment using CFC or HCFC refrigerant.

5.2 Recovery/recycling equipment shall be used in accordance with the recommendations of equipment manufacturer.

5.3 Portable leak detectors shall be made available to all groups that are responsible for the operation or maintenance of HVAC/refrigeration equipment.

5.4 Leak detectors shall be calibrated at least once a year, in accordance with manufacturer's recommendation.

5.5 Whenever refrigerant leakage in any HVAC/refrigeration system is suspected, the system shall be thoroughly inspected for leaks and sealed as per HVAC/refrigeration system manufacturer.

5.6 All systems, containing more than 50 lbs of refrigerant charge shall be inspected for leaks at least once a year regardless of their susceptibility for the leakage.

5.7 A Refrigerant Charge Log (RCL) shall be established by the proponent organizations for all HVAC/refrigeration systems that contain 50 lbs of refrigerant or more. All subsequent recharges and topping-up must be logged in the RCL.

5.8 Copies of the RCL shall be maintained by the proponent organizations and shall be available upon request.

5.9 The RCL shall, at least, contain all of the following (refer to Table-2 in Appendix-C):

- Equipment Tag No.
- Location
- Equipment Age
- Cumulative Maintenance Costs Yearly
- Refrigerant Type
- Total Refrigerant Charge Quantity (lbs)
- Refrigerant added (lbs) & Date
- Leak Source
- Reason for Leak
- Actions Taken to Prevent Future Leaks

5.10 The RCLs shall be reviewed by the proponent organizations for signs of excessive refrigerant recharging and topping-up.

5.11 All substantial leaks of CFC refrigerants, (annual leakage greater than 10% of total charge) as determined by the RCL or other approved means shall be repaired or the leaking component shall be replaced at the next scheduled T&I, unless it is more economical to do that earlier.

5.12 All refrigerant shall be recovered before discarding refrigerant containing equipment.

5.13 Recovery/recycling equipment shall be used to decontaminate recovered refrigerant to a reusable level.

5.14 Recovered refrigerant shall be stored only in containers designated and labeled for that purpose.

5.15 Containers designated for one type of refrigerant shall not be used to store any other type of refrigerant.

5.16 Recovered refrigerant that can not be recycled to a reusable quality shall be stored in containers, designated and properly labeled for that purpose. Afterwards this refrigerant shall be shipped to an off-site facility to either:

a. Reclaim refrigerant to the purity specified in ARI Standard 700, in an economical sound manner. However, if this is not possible then:

b. Dispose of this refrigerant in an environmentally approved safe method.

5.17 Disposal or reclamation of refrigerant stated above shall be performed only by vendors approved by Saudi Aramco. For disposal of refrigerant refer to Supply Chain Management Manual # 20 tilted “Material Return and Disposal”.

5.18 Refrigerant disposal manifest shall be prepared and submitted by the proponent and vendor for record keeping.

6.0 QUALITY CONTROL OF REFRIGERANT RESERVES:

6.1 All strategic refrigerant reserves shall be subjected to an initial quality control test by the Quality Assurance Unit (QAU) of Analytical Services Div./Research & Development Center, as follows:

6.1.1 In accordance with the existing practice of the QAU, the refrigerant reserves shall be tested for purity and moisture content in compliance with the current issue of ARI Standard 700 Specifications for Fluorocarbon Refrigerants.

6.1.2 From each shipment a representative sample of the containers (10%) shall be tested. If more than 10% of the sample batch fails the test, a second sample batch of the same size shall be tested. If more than 10% of the second sample batch also fails the test, the whole shipment shall be rejected. If less than 10% of the second sample batch fails the test, the shipment shall be accepted. Any cylinders that failed during these tests shall be returned to the Vendor for replacement and the replacement cylinders shall all be tested.

6.1.3 The laboratory test reports of rejected shipments shall be submitted to Substandard Materials Coordinator/Material Logistics Department for follow-up with the Vendor for replacement of material of material or reimbursement.

6.1.4 When replacement of a batch is not feasible, due to the unavailability of refrigerant, or not advisable because the replacement refrigerant may be of the same or lower quality, the subject batch of refrigerant shall be tagged for recycling, reclaiming or disposal as stipulated in 5.16 above.

7.0 STORAGE AND HANDLING OF REFRIGERANT RESERVES:

7.1 Where refrigerants are being handled and or stored, post Chemical Hazard Bulletin No.140 and HAZ-COM label (see Appendix-B) in Conspicuous and non-obstructed locations.

7.2 Drums, containing R-11, shall be stored upright in an air-conditioned facility.

7.3 Refrigerant cylinders containing R-12 or R-502 shall be stored upright and off the ground in order to minimize their external corrosion.

7.4 Refrigerant cylinders containing R-12 or R-502 shall be tested for leaks on quarterly basis. A portable leak detector shall be used to scan the outer surfaces of each cylinder, with emphasis on joints, valves, relief devices, and other points where leaks may initially develop.

7.5 The content of a drum or cylinder, in which any leak is detected, shall be transferred into another drum or cylinder as soon as the leak is detected.

7.6 For the purpose of estimating the quantity of lost refrigerant reserves, due to undetected leakage, a ten percent (10%) random sample of cylinders containing R-12 and R-502, shall be weighed prior to the initial usage of the strategic reserves. The cylinders selected for weighing shall be properly identified (marked), so that they can be reweighed periodically in the future. These selected cylinders shall be weighed at least once every three years.

7.7 Refrigerants required by refrigerant manufacture to be stored and /or handled in means more stringent than those stated above shall be implemented accordingly.

8.0 ACCOUNTABILITY REQUIREMENTS:

8.1 Based on the periodic leak detection and weighing of cylinders, the lost quantity of the strategic refrigerant reserves shall be estimated and recorded by the Gas Cylinder Coordinator in Materials Supply (MS).

8.2 All organizations can obtain a Refrigerant Usage Log (RUL) report on the annual issue of CFC & HCFC refrigerants by requesting via Materials Supply (MS) website Materials Reporting System (http://ms/request/).

9.0 TRAINING REQUIREMENTS:

9.1 Training and Career Development Organization shall conduct a Training Course that will provide familiarization with the requirements of this G.I., and with the refrigerant recovery/recycling techniques that are necessary for the implementation of these requirements.

9.2 All personnel, involved with the operation or maintenance of HVAC/Refrigeration equipment of Saudi Aramco facilities, including Saudi Aramco and Contractor Supervisors and Technicians, shall complete the above Training Course.

Recommended:

Manager
Consulting Services Department

Concurred:

Manager
Environmental Protection Department

Manager
Research & Development Center

Vice President
Engineering Services

Vice President
Material Supply

Sr. Vice President
Gas Operations

Sr. Vice President
Industrial Relations

Sr. Vice President
Exploration & Producing

Sr. Vice President
Refining, Marketing & International

Approved:

Sr. Vice President
Engineering & Operations Svcs.

10.0 Appendix -A

Table-1 Montreal Protocol Phase out schedule of CFCs and HCFC for Article 5 (Developing) Countries [#]

Controlled Substances	Year	Control Measures
Annex-A, group 1: CFCs (CFC-11, CFC-12, CFC-113, CFC-114, CFC-115)	Average Yearly Consumption Over 1995-1997	Base level (BL)
	July 1st , 1999	Production/ Import Cap at BL + 10% of BL
	January 1st , 2005	Production/ Import Reduced by 50% of BL + 10% of BL
	January 1st , 2007	Production/ Import Reduced by 85% of BL + 10% of BL
	January 1st , 2010	Production/ Import Reduced by 100% of BL + 15% of BL
Annex B, group 1: CFCs (CFC-13, CFC-111, CFC-112, CFC-211, CFC-212, CFC-213, CFC-214, CFC-215, CFC-216, CFC-217)	Average Yearly Consumption Over 1998-2000	Base level (BL)
	January 1st , 2003	Production/ Import Reduced by 20% of BL + 10% of BL
	January 1st , 2007	Production/ Import Reduced by 85% of BL + 10% of BL
	January 1st , 2010	Production/ Import Reduced by 100% of BL + 15% of BL
Annex C, group 1: HCFCs includes R-22	Consumption in 2005	Base level (BL)
	January 1st , 2006 till December 31st , 2039	Production/ Import at BL
	January 1st , 2040	Production/ Import Reduced by 100% of BL

[#] UNEP Ozone Secretariat Montreal Protocol "Control Measures Status, April 11, 1997". ISBN: 92-807-1888-6

11.0 Appendix –B

Refer to Chemical Hazard Bulletin (CHB) No. 140 and HAZCOM Label for chemical containers posted in the Environmental Protection Department web site http://engsvcs.aramco.com.sa/epd/Publications/Hazcom/default.asp)for updated information.

12.0 Appendix –C

Table-2

Equipment Tag No.	Location	Equipment Age	Cumulative Maintenance Costs Yearly	Refrigerant Type	Total Refrigerant Charge Quantity (lbs)	Refrigerant added (lbs) & Receiving Date	Leak Source	Reason for Leak	Actions Taken to Prevent Future Leaks