SAE International™ SURFACE VEHICLE STANDARD

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R134a Refrigerant Automotive Air-Conditioned Hose

RATIONALE

Changes made to this document include:

- Title: changed to include R-1234yf and assemblies
- Scope: Changed to include R-1234yf. Hose labeling requirements added.
- Permeation: Acceptance criteria added for R-1234yf.
- Moisture Ingression: Steady state redefined to allow more variation in data when average results are below 50% of specification limit after 28 days.
- Field assembled hoses section added.

1. SCOPE

This SAE Standard covers hose and hose assemblies intended for conducting liquid and gaseous R134a and/or R-1234yf refrigerant in automotive air-conditioning systems. The hose shall be designed to minimize permeation of the refrigerant, contamination of the system, and to be functional over a temperature range of -30 to 125 °C. Specific construction details are to be agreed upon between user and supplier. A hose marked “J2064 - R134a”, “J2064 - R-1234yf” or “J2064 - R134a/R-1234yf” signifies that it has been coupled, tested, and has met the requirements of SAE J2064 for the marked refrigerant(s). A hose marked “J2064” without any reference to refrigerant signifies that it has been coupled, tested, and has met the requirements of SAE J2064 for R134a only. It is the hose assembly manufacturer’s responsibility to see that the assemblies meet the specified acceptance criteria for this specification.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J639 Safety Standards for Motor Vehicle Refrigerant Vapor Compression Systems

2.1.2 ASTM Publication

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D 380 Methods of Testing Rubber Hose

3. MANUFACTURE

3.1 Size

Standard dimensions are given in the first column of Table 1. Other sizes are permitted as long as section 4.1 Bulk Hose Identification is satisfied.

3.2 Types

Including, but not limited to the following:

3.2.1 Type A - Elastomeric, Textile Reinforced

The hose shall be built having a suitable seamless synthetic elastomeric tube. The reinforcement shall consist of textile yarn, cord, or fabric adhered to the tube and cover. The outer cover shall be heat- and ozone-resistant synthetic elastomer.

3.2.2 Type B - Elastomeric, Wire Reinforced

The hose shall be built having a suitable seamless synthetic elastomeric tube. The reinforcement shall consist of steel wire adhered to the elastomeric tube. The cover shall consist of a heat-resistant textile yarn impregnated with a synthetic elastomeric cement.

3.2.3 Type C - Barrier, Textile Reinforced

The hose shall have a suitable thermoplastic barrier between elastomeric layers. The reinforcement shall consist of suitable textile yarn, cord, or fabric adhered to the tube and cover. The outer cover shall be heat- and ozone-resistant synthetic elastomer.

3.2.4 Type D - Thermoplastic, Textile Reinforced, Elastomeric Cover

The hose shall have a suitable thermoplastic tube. The reinforcement shall consist of a suitable textile yarn, cord, or fabric adhered to the tube and cover. The outer cover shall be heat- and ozone-resistant synthetic elastomer.

3.2.5 Type E - Veneer, Textile Reinforced

The hose shall have a suitable thermoplastic veneer lining the inside diameter with an elastomeric tube outer layer. The reinforcement shall consist of a textile yarn, cord, or fabric adhered to the tube and cover. The cover shall be heat- and ozone-resistant synthetic elastomer.

3.2.6 Type F - Veneer, Barrier, Thermoplastic Liner

The hose shall have a suitable thermoplastic veneer liner with a thermoplastic barrier between elastomeric layers. The reinforcement shall consist of a suitable textile yarn, cord, or fabric adhered to the tube and cover. The cover shall be heat- and ozone-resistant elastomer.

3.3 Moisture Vapor Ingression Hose Classes

The following classes are established based upon hose material configuration.

Class I - Not greater than 0.039 g/cm^2/year
Class II - Not greater than 0.111 g/cm^2/year

4. HOSE IDENTIFICATION

4.1 Bulk Hose Identification

The hose shall be identified with the SAE number, refrigerant, type, class, and size of inside diameter in fraction of inches and/or metric millimeter equivalents, and hose manufacturer's code marking. This marking shall appear on the outer cover of the hose at intervals not greater than 380 mm.

4.2 Hose Assembly Identification

A hose marked "J2064 - R134a", "J2064 - R-1234yf" or "J2064 - R134a/R-1234yf" signifies that it has been coupled, tested, and has met the requirements of SAE J2064 for the marked refrigerant(s). A hose marked "J2064" without any reference to refrigerant signifies that it has been coupled, tested, and has met the requirements of SAE J2064 for R134a only.

Hose Assemblies may be fabricated by the manufacturer, an agent for or customer of the manufacturer, or by the user. Fabrication of permanently attached fittings to refrigerant hose requires specialized assembly equipment. Refrigerant hose from one manufacturer may not be compatible with fittings supplied by another manufacturer. Similarly, assembly equipment from one manufacturer may not be interchangeable with that of another manufacturer.

5. TESTING

The test procedures described in the current issue of ASTM D 380 shall be followed whenever applicable.

5.1 Sample Conditioning

Charged Samples shall be stabilized for 24 h at 23 °C ± 2 °C prior to testing. Samples shall be checked to ensure specified charge and identify charge loss.

5.2 Permeation Test

5.2.1 Test Specimens - 107 cm Samples

The test specimens are to consist of four coupled hose assemblies that have 107 cm ± 1.2 cm of exposed hose between couplings. Three of the coupled hose assemblies are to be used for determining the permeation rate through the hose at a specific temperature. The fourth coupled and plugged hose assembly is to be used for a control hose.

One end of each hose assembly is to be fitted with a capped charge fitting. The other end is to be attached to a canister (optional) or plugged with a fitting. If a canister is used, the coupled hose assemblies are to be connected to canisters each having an internal volume of 510 cm^3 ± 25 cm^3 and having a minimum burst strength of 8.6 MPa.

5.2.2 Charging Procedure and Initial Weights

The coupled hose assemblies are to be weighed and recorded to 0.01 g to establish an initial weight prior to charging. The test samples (control sample not charged) are to be evacuated then charged with refrigerant to 70% ± 3% of the internal volume of the assembly and then reweighed. Cooling of samples is recommended for ease of charging.

5.2.3 Temperature Exposure

The test temperature is 80 °C ± 2 °C.

5.2.4 Establish Constant Loss Rate

Weigh the samples at the end of the first 24 h temperature exposure and weighing at periodic intervals (minimum period must be 24 h). The weighings shall be reported in net loss of grams, charged sample weight loss minus control sample weight loss. The net weight loss versus time shall continue to be recorded until steady state is reached. Steady state is reached when the last four readings are within 10% of the lowest reading or after 25 days, whichever comes first.

5.2.5 Loss Rate Determination

No charged specimen may lose more than 40 g during the first 24 h period. The permeation rate for each specimen may be determined as follows:

a. For Samples that Meet the 10% Rule - Establish the slope of steady-state net loss in grams per day for the 107 cm length specimen and multiply by factors in Table 1 to obtain permeation rate.

b. For Samples that Run for 25 Days - The final weighing period, in which the data recorded will be used to determine the permeation rate, shall be the last 5 days or 7 days of the test period. The samples during the final period shall be weighed 5 times at least 24 h apart. The total net weight loss for the final period, divided by the number of days in the period is multiplied by the factors in Table 1 to obtain the permeation rate.

At the end of the temperature exposure period, the refrigerant charge remaining shall be 50% of the original charge minimum. At the conclusion of the test, the refrigerant charge in each specimen shall be exhausted to a suitable reclamation container.

TABLE 1 - CONVERSION FACTORS

Nominal Hose Size mm (in)	Mean Hose ID mm (in)	Multiply g/day by Factor Shown to Obtain kg/m^2/year	Multiply g/day to Obtain lb/ft^2/ year
8 (5/16)	8.1 (0.320)	13.414	2.748
10 (13/32)	10.6 (0.418)	10.251	2.100
13 (1/2)	13.0 (0.510)	8.358	1.713
16 (5/8)	16.1 (0.635)	6.749	1.383
19 (3/4)	19.4 (0.765)	5.601	1.148

In order to obtain conversion factor for hoses not listed in Table 1, use the following equations:

$$\text{for kg/m}^2\text{/year, Factor} = 108.66/D$$

where:
D = Inner Diameter (mm)

$$\text{for lb/ft}^2\text{/year, Factor} = 0.877/D$$

where:
D = Inner Diameter (inches)

5.2.6 Acceptance Determination

The coupled hose assembly shall not be permeable to a refrigerant loss at a rate greater than those listed in Table 1A below.

TABLE 1A - PERMEATION LIMITS

	Refrigerant	
Hose Type	R-134a	R-1234yf
A, B	15 $kg/m^2/year$	18 $kg/m^2/year$
C, D, E, F	5 $kg/m^2/year$	5 $kg/m^2/year$

5.3 Coupling Integrity

It is the hose coupler's responsibility to ensure that the combination of coupling type and specific Hose Manufacturer's Hose Material will meet the following acceptance criteria at all possible combinations of dimensional tolerances.

5.3.1 Test Specimens

Six coupled assemblies shall have 76 mm ± 3 mm of exposed hose and 56 mm ± 8 mm of straight tubing between the couplings with suitable connector and sealed at the other (pinch-welding permitted). Each assembly is attached to a canister with a minimum internal volume of 900 cm^3 and equipped with a charging fitting. The minimum canister volume ensures a maximum pressure loss of 0.10 MPa between recharges. A seventh coupled assembly is used as a volatility sample to account for weight losses not associated with refrigerant losses.

5.3.2 Test Procedure with the Appropriate Refrigerant

5.3.2.1 Charging

Calculate the internal volume of the hose and canister assembly. Charge the canister assembly with an amount of refrigerant compatible lubricant equivalent to half of the internal volume of the hose assembly. Calculate the charge weight of refrigerant by multiplying the system volume less the lubricant volume by using the table below. Evacuate the sample, without removing the lubricant, and add the charge weight ±1 g of refrigerant and record original weight. Check all fittings to ensure against extraneous refrigerant leakage. After charging, agitate the assembly to insure mixing with the lubricant and wetting of all internal surfaces. Hoses need to be dry to obtain accurate weighings. All weighings are to be made at 18 to 29 °C to the nearest 0.01 g.

TABLE 3 - CHARGE DENSITY

	Temperature [deg C]	Pressure [MPa]	Density [g/cm^3]
R134a	125	2.07	0.0783
HFO1234yf	125	2.07	0.085

Example:

Hose Assembly Volume 19.8 cm^3

Canister Volume 1260 cm^3

Lubricant Volume = (Hose Assembly Volume) / 2

= 9.9 cm^3

Charge Weight = (Canister Volume + Hose Assembly Volume - Lubricant Volume) x 0.0783 g/cm^3

= (1260 cm^3 + 19.8 cm^3 - 9.9 cm^3) x 0.0783 g/cm^3

= 1269.9 cm^3 x 0.0783 g/cm^3

= 99.4 g

5.3.2.2 Test Exposure

The assembly shall be oriented such that the liquid phase will always drain into the test coupling assembly. The test shall include four exposure intervals with Test Option 1 or six exposure intervals with Test Option 2, each followed by a leakage evaluation and possible recharging before the next exposure.

Test Option 1 - The four exposure intervals in sequential order are as follows:

a. Exposure 1 - 96 h at 125 °C ± 2 °C with canister pressure at 2.07 MPa.

b. Exposure 2 - 48 h thermal cycling from -30 to 125 °C in a timer-controlled chamber. The chamber temperature shall change every 4 h and canisters shall reach the desired temperature within 3 h after a temperature change.

c. Exposure 3 - 96 h at 125 °C ± 2 °C with canister pressure at 2.07 MPa.

d. Exposure 4 - 48 h thermal cycling from -30 to 125 °C in a timer-controlled chamber. The chamber temperature shall change every 4 h and canisters shall reach the desired temperature within 3 h after a temperature change.

Test Option 2 - The six exposure intervals in sequential order are as follows:

a. Exposure 1 - 96 h at 121 °C ± 2 °C with canister pressure at 2.0 MPa.

b. Exposure 2 - 48 h at -29 to 121 °C in a timer-controlled chamber. The chamber temperature shall change every 4 h and canisters shall reach the desired temperature within 3 h after a temperature change.

c. Exposure 3 - 96 h at 121 °C ± 2 °C with canister pressure at 2.0 MPa.

d. Exposure 4 - 48 h at -29 to 121 °C in a timer-controlled chamber. The chamber temperature shall change every 4 h and canisters shall reach the desired temperature within 3 h after a temperature change.

e. Exposure 5 - 96 h at 121 °C ± 2 °C with canister pressure at 2.0 MPa.

f. Exposure 6 - 48 h at -29 to 121 °C in a timer-controlled chamber. The chamber temperature shall change every 4 h and canisters shall reach the desired temperature within 3 h after a temperature change.

5.3.2.3 Leakage Evaluation

At the end of each exposure interval, as soon as a canister assembly reaches room temperature of 18 to 29 °C, it shall be evaluated as follows:

a. Examine each sample and note any sign of leakage or abnormalities.

b. Wipe any visible fluid from the hose assembly, then weigh and record the loss in grams for the interval (less the volatility loss).

c. If the net loss is greater than 7 g, terminate the test.

d. Flex test the coupled assembly on the canister to ±15 degrees (±8 degrees for hoses 19 mm ID or greater). Make 10 flex cycles in approximately 10 s in each of two perpendicular planes on a coupling assembly. Immediately evaluate and note the presence of hissing (charge loss) or fluid leakage at each coupling.

e. Wipe any visible fluid from the hose assembly and reweigh. Continue with the next exposure interval if the weight is within 7 g of original weight. If not, recharge to original weight before continuing. Maintaining the weight within 7 g of original weight insures that the canister assembly Refrigerant restarting pressure shall be no less than 2.0 MPa at 125 °C.

5.3.3 Acceptance Determination

a. Applies to six canister assemblies (12 couplings).

b. Maximum net weight loss per canister (2 couplings) per Test Option 1 or Test Option 2 shall not exceed 10 g.

5.4 Aging Test

The hose shall show no cracks or other disintegration when tested as specified after aging at 125 °C ± 2 °C for 168 h. The mandrel used shall have a diameter eight times the nominal OD of the hose. The test unit shall have a free hose length not less than 300 mm or more than 1000 mm.

5.4.1 Procedure

Capped hose assembly shall be evacuated and charged with one atmosphere of refrigerant or nitrogen before coiling around the mandrel of the designated size. Place in a circulating air oven for the time and at the temperature specified. Allow the hose assembly to cool to room temperature, after removal from the oven. Open the hose assembly to a straight length and examine the hose for internal and external cracks visible to the naked eye for exposed hose only.

5.5 Cold Test

The hose shall show no evidence of cracking or breaking when tested as specified. The mandrel used for the hose shall have a diameter eight times the nominal OD of the hose. The test hose assembly shall have a free hose length not less than 600 mm or more than 1000 mm.

5.5.1 Procedure

Load the test hose assembly to 70% of capacity with refrigerant at room temperature. For convenience, the hose assembly and refrigerant may be chilled below the boiling point of the refrigerant in order that the refrigerant may be handled in the liquid state. Place the loaded hose assembly in an air oven at 70 °C ± 2 °C for 48 h. Remove hose assembly from the air oven and allow to cool to room temperature.

Place the hose assembly in a straight position along with designated size mandrel in a cold chamber at -30 °C for 24 h. The cold chamber shall be capable of maintaining a uniform atmosphere of cold dry or a mixture of air and carbon dioxide at the specified temperature with a tolerance of ±2 °C. Without removing the hose assembly from the cold chamber, bend it through 180 degrees over the mandrel of the designated size at a uniform rate within a time period of 4 to 8 s. The refrigerant charge in each specimen shall be exhausted into a suitable reclamation container. Examine the hose for internal or external cracks or disintegration.

5.6 Vacuum Flattening

5.6.1 Scope

Flattening of a hose restricts internal fluid flow. This test evaluates the hose construction at room temperature condition for its ability to resist internal area reduction under vacuum conditions.

5.6.2 The coupled hose assembly shall be bent (with the natural curvature of the hose) at room temperature into a “U” shape, with the inside radius of the “U” equal to five times (six times for 19 mm and greater nominal ID) the normal outside diameter of the hose. Measure the minimum outside diameter of the hose in any plane at the base of the “U” (hose OD shall not be less than 80% of original OD). Evacuate the hose to an absolute pressure of 10 mm Hg ± 5 mm Hg. Maintain this pressure in the bent hose specimen for 2 min. At the end of this period, while the hose is still under vacuum, measure the minimum outside diameter in any place at the base of the “U”.

5.6.3 Acceptance Criteria

a. The minimum diameter dimension shall not be less than 80% of the minimum hose outside diameter as measured in 5.6.2 in the "U" shape prior to the application of the vacuum.

b. Examine the hose externally for cracks or loose cover. If these imperfections exist, the hose fails.

c. If the hose passes (5.6.3.a and b) cut the hose off at the coupling and section longitudinally. Check the hose internally for blisters, delamination, cracks, or other surface imperfections. Any such imperfections result in hose failure.

5.7 Length Change

All hose types shall not contract in length more than 4% or elongate more than 2% when subjected to a pressure of 2.4 MPa for suction hose and 2.7 MPa for liquid and discharge hose. Test in accordance with ASTM D 380.

5.8 Bursting Strength

The minimum bursting strength for hose and hose assemblies shall be 8.3 MPa for discharge and liquid line, 8.3 MPa for suction hose. Test in accordance with ASTM D 380.

5.9 Proof Test

All hose shall satisfactorily withstand a hydrostatic proof test with a minimum hydrostatic pressure equal to 50% of the minimum required burst strength for a period not less than 30 s or more than 5 min.

5.10 Extraction Test

The extractables of the inside surface of the hose tube shall not exceed 118 g/m^2 and any extractables shall be oily or soft/greasy in nature. The test hose assembly shall have a free hose length not less than 450 mm or more than 1000 mm.

5.10.1 Procedure

Fill the hose assembly to capacity with suitable solvent and then empty it immediately to remove any surface material. Load the hose assembly to approximately 70% capacity with refrigerant at room temperature. For convenience, the hose assembly and refrigerant may be chilled below the boiling point of refrigerant in order that the refrigerant may be handled in the liquid state. Place the loaded hose assembly in the air oven at 70 °C ± 2 °C for 24 h. At the end of the aging period, chill the hose assembly to –30 °C or colder and pour the liquid refrigerant into a weighed vacuum flask, chilled to –30 °C or colder, then attach the flask to an appropriate refrigerant recovery unit and recover all refrigerant. After the refrigerant has evaporated, condition the beaker at approximately 70 °C for 1 h to remove condensed moisture, then weigh the beaker again. Report the extract in terms of grams per square meter (milligrams per square inch) of the hose inner surface based on the nominal inside diameter of the hose.

5.11 Ozone Test

When the hose is bent around a mandrel with a diameter 8 times the nominal diameter of the hose and exposed for 70 h to ozone air atmosphere in which the ozone partial pressure is 50 MPa ± 5 MPa at 40 °C ± 2 °C, the outer cover of the hose shall show no cracks when examined under 7X magnification. The test hose shall be about 250 mm longer than the mandrel circumference. Test in accordance with ASTM D 380.

5.12 Cleanliness Test

The bore of all hose and hose assemblies shall be clean and dry. When subjected to this test, there shall not be more than 270 mg/m^2 of foreign material. The test hose shall not be less than 300 mm.

5.12.1 Procedure

Bend the hose or hose assembly to a “U” shape, the legs of the “U” being of equal length. Position the hose in a vertical plane and fill the hose to capacity with suitable solvent. Then filter the suitable solvent through a prepared Gooch crucible, sintered glass crucible, or 0.8 µm filter of known weight. After drying at approximately 70 °C for 20 min, determine by weight difference of the insoluble contamination.

5.13 Moisture Ingression

The purpose of the moisture ingression test is to measure the amount of moisture that permeates the hose samples when the hose samples are subjected to a humid environment with vacuum being drawn on the ID of the hose samples.

5.13.1 Test Apparatus

See Figure 1.

a. Humidity chamber

b. Methanol cold bath maintained at –70 °C or lower (see Figure 1)

c. Vacuum/cold trap system

d. Vacuum pump

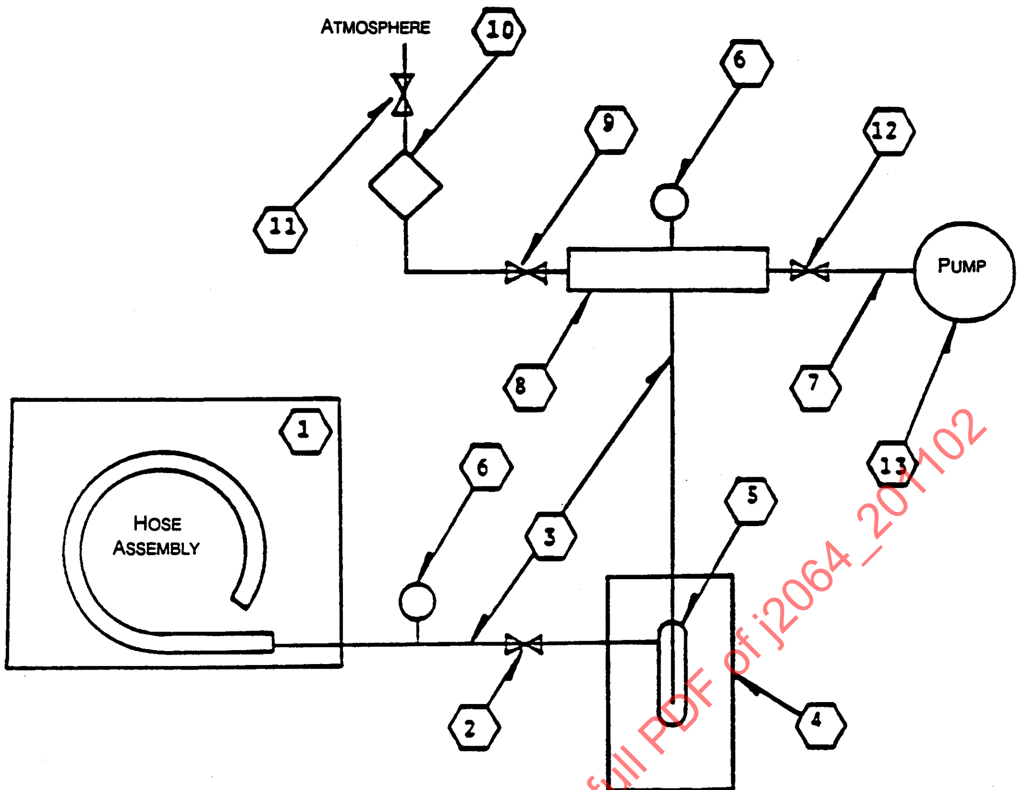
e. Nitrogen gas or dry air supply

f. Distilled water

g. Oven capable of 80 °C

h. Drying desiccator

i. Balance capable of 0.1 mg accuracy



LEGEND

Item Description

1 Humidity Chamber
2 Stainless Steel Valve
3 Copper or Stainless Tubing
4 Methanol/Dry Ice Bath
5 Glass Vacuum Traps
6 Vacuum Gauges
7 Vacuum Hose
8 Vacuum Manifold
9 Stainless Steel Valve
10 Desiccant Dryer (Indicating Silica Gel)
11 Quick Open Valve
12 Vacuum Valve
13 Vacuum Pump

FIGURE 1 - MOISTURE INGRESSION TEST SCHEMATIC

5.13.2 Test Samples

a. Install test assemblies in the humidity cabinet by plugging one end fitting and attaching the other end to the vacuum lines located in the cabinet. Arrange the test assemblies to maximize surface exposure to environmental conditions (see Figure 1).

b. Seal the humidity cabinet and set the dry bulb temperature at 50 °C and wet at 47.2 °C. Allow cabinet to stabilize for at least 4 h at the specified temperatures and 85% ± 5% relative humidity.

c. Thoroughly clean all vacuum traps, inside and out, by using compressed air and suitable solvent.

d. Wipe off traps and then place in an oven set at 80 °C minimum for 1 h.

e. Upon removing the traps from the oven, immediately transfer to a drying desiccator for stabilization to room temperature.

f. After the traps reach room temperature, remove one at a time, wipe trap exterior with lint-free towels, and immediately weigh to the nearest 0.1 mg. Plug the end of the trap immediately. Record these weighs.

g. Immediately after weighing, install the traps (Item 3 in Figure 1) in a bath maintained at -70 °C and attach traps to connecting lines using vacuum grease on all O-ring connections.

h. After all connections are made, turn on the vacuum pump and open valve no. 12 and then valve no. 2 and no. 11.

1. A quick vacuum check can be done by closing valve no.12.

2. Shut off the pump for approximately 5 min noting any vacuum drop. If there is any loss, the leak shall be sealed and then rechecked.

3. Restart the vacuum pump and open valve no. 12.

4. After running system for 1 h, close valve no. 12 and turn off the vacuum pump for 30 min. If there is any loss of vacuum, the test is to be discontinued. Leak is to be sealed and the technician is to return to step c.

i. Once the system is evacuated and integrity is ensured, maintain vacuum pump with a maximum pressure of 50 mm of Hg (95 kPa). Record time and temperatures.

j. After a 24 h time duration has taken place, proceed to the sequence of operation in step k. Longer periods may be used as long as the data is adjusted for the specified time period (96 h and 72 h periods recommended).

k. Sequence of operation (for installation of new moisture traps).

1. Record time and temperatures.

2. Close valve no. 2.

3. Close valve no. 12.

4. Turn off vacuum pump.

5. Slowly open valve no. 9 and then valve no. 11. This sequence is necessary to ensure the traps are charged with dry nitrogen or dry air atmospheric pressure. (Nitrogen source should have regulator set at 1 psi.)

6. Remove traps one at a time and immediately plug all tubing connections.

7. Install another set of traps that were already prepared from steps d through g.

8. Allow traps to return to room temperature in a desiccator.

9. Wipe the trap exterior with lint-free towels, remove plugs, and immediately weigh each.

10. Calculate the change in weight and record.

l. Repeat steps h, k, and l at 96 h and 72 h intervals until steady state conditions are achieved. Steady-state is reached when one of the two following conditions have been met:

1. The last four readings are all within 10% of the lowest reading of the last four.

2. 28 days have passed and the calculated ingression rate is less than 50% of the assigned specification limit.

m. Calculate the rate of moisture ingression to the test specification that has been assigned (see examples 1 and 2) reading.

Example 1:

$$\text{Average Condensate Weight} = \frac{\text{Reading 1} + \text{Reading 2} + \text{Reading 3} + \text{Reading 4}}{4} \quad \text{(Eq. 1)}$$

NOTE: Last four readings after steady state is achieved are used for calculation of rate. Reading is for a 2-h reading or adjusted reading time, and for a 152 cm exposed hose lengths as taken from the moisture ingression test data sheet.

Example 2:

To convert the average condensate weight from g/24 h/152 cm length, multiply the average condensate weight by the following number, depending on hose ID to arrive at g/cm^2/year (see Table 2).

n. Acceptance Determination

Class I - Moisture Resistant = 0.039 g/cm^2/year

Class II - Medium Moisture Resistant = 0.111 g/cm^2/year

TABLE 2 - MOISTURE INGRESSION RATE CONVERSION TABLE

Nominal Hose Size mm (in)	Mean Hose ID mm (in)	Multiply g/day by Factor Shown to Obtain g/in^2/year	Multiply g/day by Factor Shown to Obtain g/cm^2/ year
8 (5/16)	8.1 (0.320)	6.092	0.9443
10 (13/32)	10.6 (0.418)	4.655	0.7216
13 (1/2)	13.0 (0.510)	3.796	0.5884
16 (5/8)	16.1 (0.635)	3.065	0.4751
19 (3/4)	19.4 (0.765)	2.544	0.3943

In order to obtain conversion factor for hoses not listed in table 1, use the following equations:

for kg/m^2/year, Factor = 7.649/D

where:
D = Inner Diameter (mm)

for lb/ft^2/year, Factor = 1.943/D

where:
D = Inner Diameter (inches)