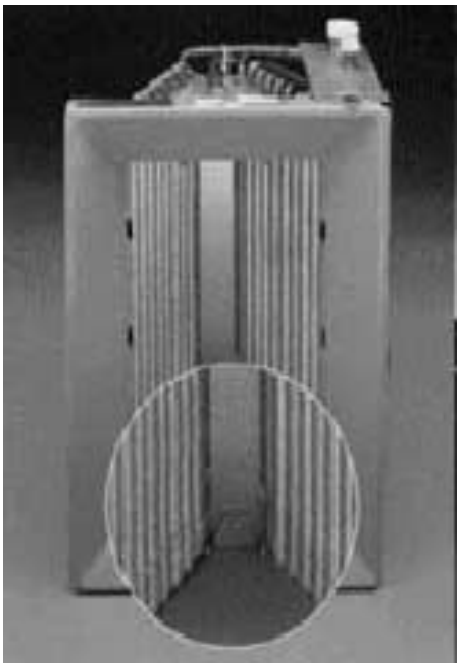
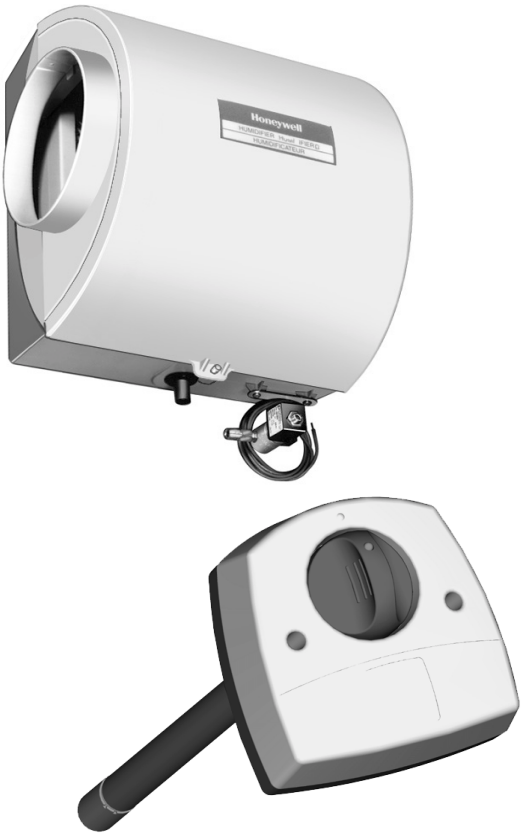
Honeywell

# Effect of UVC Exposure on Non-Metallic Materials in HVAC Systems





## I. Executive Summary

After conducting extensive testing of several materials, Honeywell has reached preliminary conclusions as to the effects of ultraviolet exposure on non-metallic materials.

- **Drain Pans**

  Testing has shown that no problems will result from the application of the Honeywell coil irradiation ultraviolet air treatment systems on coil/drain pans that contain the following materials. Additional details about the testing and statements of warranty are covered in the Appendix.

| System Component | Mfgr | Part Number | Material |
|---|---|---|---|
| Drain Pan | Rheem | RCBA3765GH17B | PET/ Polyester |
| Drain Pan | Rheem | | PET/ Polyester |
| Drain Pan | Lennox | | ABS / Polycarbonate |
| Drain Pan | Lennox | | Acrylic / Polystyrene Copolymer |
| Drain Pan | Amana | CCA36FCC | Styrene modified Polyester |
| Drain Pan | Lennox | | Styrene / Butadiene modified Polyester |
| Drain Pan | Carrier | | Styrene modified PPO |

**Table 1. Drain Pan Test Summary**

- **Flex Duct Liner**

  Testing has shown that the material properties of the below flex duct liners appear to be affected and are more easily torn when under direct exposure to ultraviolet light. At this time we do not recommend installation directly into plastic lined flex duct. A minimum of three feet between the ultraviolet lamps and plastic duct liner should be maintained. Additional details about the testing are covered in the Appendix.

| System Component | Mfg | Part Number | Material |
|---|---|---|---|
| Flex Duct | J.P. Lamborn | Class 1, ϕ 9” | |
| Flex Duct | Cal-Flex | Class 1, ϕ 18” | |

**Table 2. Flex Duct Test Summary**

- **Duct Board**
  Testing has shown that no problems will result from the exposure from Honeywell ultraviolet air treatment systems on the below duct board materials. A general comment not related to UV exposure - due to the lack of strength of the duct board material, we do not recommend mounting UV devices on a vertical duct board surface without additional structural supports. Additional details about the testing and statements of warranty are covered below.

| System Component | Mfg | Part Number | Material |
|---|---|---|---|
| Duct Board | Johns Manville | SuperDuct Type 800 | |
| Duct Board | Owens Corning | EnDuraCoat Type 800 | |

**Table 3. Duct Board Test Summary**

- **Humidifiers**
  Testing has shown that no problems will result from the exposure from Honeywell ultraviolet air treatment systems on Honeywell humidifiers mounted in the vicinity of the lamps. The pad frame (polypropylene) is most susceptible to changing material properties, though the lower portion of the frame is shielded from direct exposure, which will protect the area where the water drains, preventing potential water leakage. Additional details about the testing and statements of warranty are covered in the Appendix.

| System Component | Mfg | Part Number | Material |
|---|---|---|---|
| Humidifier | Honeywell | HE220/HE260/HE360 | • Tray<br>ABS<br>• Pad Frame<br>Polypropylene<br>• Humidifier Housing<br>ABS/Polycarbonate |

**Table 4. Humidifier Test Summary**

## II. Background

With the introduction of ultraviolet air treatment products to the residential markets, concerns have been raised over the impact on various plastics that may come in contact with ultraviolet energy. Because of the enormous benefits associated with ultraviolet irradiation of cooling coils, the impact on plastic drain pans in this application is of particular interest.

Honeywell has demonstrated a long history of standing behind its products and accepting responsibility for issues that arise in the HVAC system, if the product was installed and used in accordance with its recommendations. So initially, we took a conservative approach in this area, recommending in our installation literature that the installer "select mounting locations that prevents exposure to plastic flexible duct or other plastic components with unknown resistance to ultraviolet light."

Several months ago Honeywell began a substantial test effort to address this concern. Our goal is to reach a point in the testing where we are convinced that no component structural failure issues will result from extended exposure from Honeywell's ultraviolet air treatment systems.

## III. Ultraviolet Exposure Test Chamber

Testing was conducted in a chamber designed specifically for evaluating the effect of UVC exposure on various materials. Twelve 55-watt UVC lamps power the interior of the test chamber, shown below in Figure 1. The high UVC output of the lamps, the reflectivity


**Figure 1 – Ultraviolet Exposure Test Chamber**

of the interior of the chamber, and the geometry of the chamber result in a measured UVC intensity at the floor of the chamber that is *27 times* the intensity from a single coil irradiation lamp at an 18 inch distance. This is the assumed acceleration factor in the test.

## IV. Test Program

The test consists of placing material samples on the floor of the chamber and allowing long term exposure to take place, periodically evaluating the materials for changes from the control, unexposed samples. While the primary focus of the test was to evaluate drain pans from various manufacturers, at the request of customers we also included samples of lined flex duct, duct

board, wood studs, and wire insulation. Figure 2 shows a sampling of the materials under test. Detailed test results are shown in Appendix D.

**Figure 2 – Materials Under Test in Chamber**

## V. Conclusions

After conducting these tests we are confident that no problems will result from the application of Honeywell Ultraviolet Air Treatment Systems on systems that contain the drain pan materials, duct board materials, and Honeywell humidifiers tested. Additions to the limited warranty are shown in Appendix A.

If you have concerns about specific materials that are not discussed here, Honeywell is pleased to offer a *free* test service to evaluate the impact of exposure to ultraviolet light. Information on this service is in Appendix B.

In addition to Honeywell, we are aware that Advanced Distributor Products (ADP) has also conducted testing in this area. They have stated that they will stand behind their warranties on ADP drain pans when installed in systems with ultraviolet lamps. Honeywell recommends that you consider ADP products on installations where a coil/drain pan change out is taking place. ADP's position statement is included in Appendix C.

Detailed test results are shown in Appendix D.

In addition to the warranty statement included with the product “Limited Warranty”, Honeywell warrants the following:

If within a period of 10 years from the date of installation, the following drain pan models/materials are damaged by a Honeywell coil irradiation model ultraviolet air treatment system, Honeywell shall replace such drain pans at its expense and cover any direct expenses as a result of drain pan damage. Models/materials covered hereby:

| Manufacturer | Part Number | Material |
|---|---|---|
| Rheem | RCBA3765GH17B | PET/ Polyester |
| Rheem | | PET/ Polyester |
| Lennox | | ABS / Polycarbonate |
| Lennox | | Acrylic / Polystyrene Copolymer |
| Amana | CCA36FCC | Styrene modified Polyester |
| Lennox | | Styrene / Butadiene modified Polyester |
| Carrier | | Styrene modified PPO |

If within a period of 10 years from the date of installation, any Honeywell HE220/225/260/265/360/365 humidifier models are damaged by a Honeywell ultraviolet air treatment system, Honeywell shall replace damaged humidifier components at its expense and cover any direct expenses as a result of humidifier damage. Surface changes such as chalkiness or color shifts that do not affect humidifier function are not covered.

This does not change the Limited Warranty. All limitations and restrictions in the Limited Warranty apply.

## Appendix A – Limited Warranty Addition

# Ultraviolet Air Treatment System
# Request for Test

**Contact Information:**

Contact Name _____

Company Name _____

Address _____

City _____ State _____ Zip _____

Phone _____ Fax _____

E-Mail Address _____

**Test Sample Information:**

Product Type _____

Manufacturer _____

Model Number _____

Material (if known) _____

Application ☐ Return Air
☐ Supply/Coil

To request testing:

- Complete this form and send with product sample to:

UV Request for Test
Attention: D. Joyce
Dock 1
MN10-2525
Honeywell Inc.
1985 Douglas Drive North
Golden Valley, MN 55422

**DISCLAIMERS:**

- Any samples or materials submitted become the property of Honeywell and will not be returned.
- Honeywell will provide a written report of the results to the contact person listed above.
- Conducting tests does not imply a change to Honeywell's stated warranty position. Only express changes to the limited warranty in this document will be considered valid.
- Honeywell reserves the right to terminate this program at any time.

## Appendix B – Request for Additional Testing

Advanced ADP Distributor Products
Leading By Example

P.O. Box 219
1995 Air Industrial Park Road
Grenada, Mississippi 38901
Voice 601-229-3000
Fax: 601-229-3019

To: Sales/Marketing/Customers

From: A.D.P. Engineering

Reference: Ultraviolet Lighting

Date: May 19, 2000

We have researched the effects of Ultraviolet lighting when used in duct systems on A.D.P. coils. We will stand behind our warranty on coils when Ultraviolet lighting is used with our product. We do expect some discoloration over a period of time on both the drainpan and the insulation due to these lights. Also, a slight degradation in strength of the drainpan would be expected over a period of years. This degradation would not result in failure of this part during the normal operating life of the product. We have backup information and letters from our material suppliers to support the above information.

Sincerely,

Greg Goetzinger
Manager, Engineering, A.D.P.

## Appendix C – ADP Position Statement

## Appendix D. Detailed Test Results

Results of the test thus far are summarized in Table A-1. The length of time in the chamber (as of 10/6/00) for the drain pan samples varies from 86 to 144 days, for an equivalent exposure of 6.4 to 10.7 years. The effects on the materials have been limited to color changes and slight changes in the surface finish (surface chalkiness or crystallization). No brittleness or structural degradation was noted in any of the samples.

Honeywell continues to monitor the samples currently under test and will expose additional field materials, as they become available. In addition, where possible, Honeywell consults with leading plastic resin suppliers in North America regarding the effects of UVC exposure of materials on physical and visual properties.

- **Drain Pan Samples:**

| | | | | Visual Observations | | | | |
|---|---|---|---|---|---|---|---|---|
| Sample No. | Manufacturer | Model Number | Material | 5/15/00 | 7/12/00 | 8/8/00 | 9/8/00 | 10/6/00 |
| 1 | Rheem | RCBA3765GH17B | PET/ Polyester | | Begin exposure | Some surface chalkiness, little removed when rubbed. Bends ok. | Little change, some glass fiber "sparkle" appearance to surface. | No change |
| 2 | Rheem | Unknown | PET/ Polyester | | Begin exposure | Some surface chalkiness, little removed when rubbed. Bends ok. | Little change, some glass fiber "sparkle" appearance to surface. | No change |

- **Drain Pan Samples, continued:**

| | | | | Visual Observations | | | | |
|---|---|---|---|---|---|---|---|---|
| Sample No. | Manufacturer | Model Number | Material | 5/15/00 | 7/12/00 | 8/8/00 | 9/8/00 | 10/6/00 |
| 3 | Lennox | Unknown | ABS / Polycarbonate | | Begin exposure | Some surface chalkiness, little removed when rubbed. Bends ok. | Little change, some glass fiber "sparkle" appearance to surface. | Substantial surface sparkle, light chalk. |
| 4 | Lennox | Unknown | Acrylic / Polystyrene Copolymer | | Begin exposure | White chalky layer, could be blown off. | No change. | No change. |
| 5 | Amana | CCA36FCC | Styrene modified Polyester | | Begin exposure | Yellowed considerably. Very little chalkiness. Bends ok. | Golden yellow, small areas of darker brown spots. | More brown/yellow w/darker spots. Yellow chalk. |
| 6 | Lennox | Unknown | Styrene / Butadiene modified Polyester | | Begin exposure | Yellowed considerably. No chalkiness. Bends ok. | No change. | Butter yellow, white streaks, yellow chalk. |
| 7 | Carrier | Unknown | Styrene modified PPO | Begin exposure | Some surface chalkiness, little removed when rubbed. Bend ok. | No change. | No change. | More gray surface chalk. Easily wiped to reveal like-new surface. |

- **Flex Duct Samples:**

| Sample No. | Manufacturer | Model Number | Material | Visual Observations | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 8/31/00 | 09/08/00 | 10/06/00 | 10/13/00 | 10/23/00 |
| 1 | J.P. Lamborn | Class 1, ϕ 9” | | Begin exposure | Pink coloration gone. Plastic liner unchanged | Appearance unchanged, liner tears easily | Considerable yellow discoloration of liner | Liner is darker yellow, tears more easily |
| 2 | Cal-Flex | Class 1, ϕ 18” | | Begin exposure | Pink coloration gone. Plastic liner unchanged | Appearance unchanged, liner tears easily | No change | Tears more easily |

- **Duct Board Samples:**

| Sample No. | Manufacturer | Model Number | Material | Visual Observations | | | |
|---|---|---|---|---|---|---|---|
| | | | | 07/20/00 | 07/26/00 | 08/31/00 | 10/13/00 |
| 1 | Johns Manville | SuperDuct Type 800 | | Begin exposure | No change | Red layer is fading | Red layer has become dull pink, white fibrous appearance. Pulling wall plies apart shows original red color 1/16" in from exposed edge. More dust/debris released when scraped compared to unexposed. |
| 2 | Owens Corning | EnDuraCoat Type 800 | | | Begin exposure | No change | Black is slightly more gray. More debris released when scraped compared to unexposed. No dust. |

- **Humidifier Samples:**

| | | | | Visual Observations | | | | |
|---|---|---|---|---|---|---|---|---|
| Sample No. | Manufacturer | Model Number | Material | 6/1/00 | 6/22/00 | 7/13/00 | 8/9/00 | 10/6/00 |
| 1 | Honeywell | HE260 – Pad Frame | Polypropylene | Begin exposure | Some discoloration | Some brittleness on thin edges of part. | No change | Part edges brittle where exposed. No change to drain area which is shielded by base. |
| 2 | Honeywell | HE260 – Water Distribution Tray | ABS | Begin exposure | No change | No change | No change | No change |
| 3 | Honeywell | HE260 – Humidifier Housing | ABS / Polycarbonate | Begin exposure | Some discoloration of light colored parts (sidewalls, cover). No change to dark parts (base) | Additional color shift on side walls, cover | No change | No change |

**Table D-1. Test Results of Material Samples Exposed**