

# HERITAGE VILLAGE ENERGY STUDY

Note: The following informational bulletin was originally released by Uniroyal Chemical following a comparative test of insulation systems in March 1970. The significance of this test can be summarized by quoting the fifth paragraph:

It was concluded that the use of a monolithic rigid urethane spray foam will allow a 20% reduction in the required R – factor (which measures resistance to the flow of heat in the total structure and is directly related to material thicknesses) with no increase in the energy use as compared with standard glass fiber insulation. This is due to the draft sealing effect of the seamless rigid urethane foam.

## NEW SPRAYED URETHANE FOAM INSULATION STANDARDS

### NORTHEAST UTILITIES ESTABLISHES THICKNESS OF FOAM FOR ELECTRICALLY-HEATED RESIDENCES

Standards for thickness of rigid urethane foam used for the insulation of walls, floors and ceilings in electrically-heated structures have been adopted by Northeast Utilities. The organization represents a group of four New England power companies.

The following urethane foam thicknesses have been established by the group's Electric Heating Standards Committee as desirable insulation: 1¼ inches in walls, 2 inches in floors and 2½ inches in ceilings.

Comparative tests conducted at Heritage Village, Southbury, Connecticut, a \$100-million planned housing community were the basis for determining the standards. Thermal efficiency data were accumulated on two types of insulations: all-glass fiber and all urethane.

Apartments sprayed with urethane foam (at thicknesses of 2 inches to ceilings, 1½ inches to walls, and 2½ inches to floors)\* were found to require only 81.4 percent of the energy used in the units insulated with glass fiber (6½ inches in ceilings and floors and 3e inches in walls) to maintain the same temperature.

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\*This installation took place prior to the establishment of insulation standards by Northeast Utilities.

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The tests were conducted in four Heritage Village apartments (uninhabited) by the Connecticut Light and Power Company during the week of March 6–13 [1970]. Conditions included an average outdoor temperature of 32°F., average wind of 9 mph, and a 60°F. indoor temperature setting. The urethane foam system used in the tests was formulated with "Rubinate® M" isocyanate supplied by Rubicon Chemicals, Inc. Rubicon is jointly owned by Uniroyal, Inc., and Imperial Chemical Industries, Ltd. Complete description of the test is given in Table 1.

Test results were reviewed and reported by the Hartford Electric Light Company. The Northeast Utilities group, which has a basic interest in recommending efficient methods of conserving electric heat for the region served by its members, is comprised of Connecticut Light & Power Company, Hartford Electric Light Company, Western Massachusetts Electric Company and Holyoke Water Power Company.

### **Urethane Foam Insulation**

Rigid urethane foam is recognized for its insulating properties. Its low aged K-factor of 0.15 to 0.16 (measuring thermal conductivity) provides two to four times the insulation value, inch to inch, of other materials conventionally used for this purpose.

When applied as a liquid chemical system, urethane foam adheres tightly to virtually all building materials, filling and sealing the space where it is applied. Highly resistant to water and water vapor, it also provides a moisture sealant function and eliminates heat leaks.

### **Definitions**

**Thermal Resistance (R factor):** The resistance to the flow of heat. Insulations are rated by their resistance per inch of material times the number of inches of thickness.

**Thermal Conductivity (k):** The rate at which heat will flow through an inch thickness of material, in BTU per hour for one square foot of area for a one degree Fahrenheit temperature difference. Conductivity is the reciprocal of the resistance per inch ( $k = 1/R$ ).

Coefficient of Heat Transmission (U factor): The rate of heat flow through a square foot of a building section for a one degree Fahrenheit temperature difference. This is the reciprocal of the total resistance of all the materials in the building section ( $U = 1/\text{Total } R$ ).

TABLE 1

**COMPARATIVE INSULATION TEST  
SPRAYED URETHANE v GLASS FIBER BATT**

Heritage Village  
Southbury, Connecticut

Description of Units Tested:

4 Apartments

One bedroom (Carriage House) 924 sq. ft.

Heat loss - 6.0 Kw

Single story, garage below

Two apartments per building

Wood frame construction, truss roof

Vertical wood siding, sheathing, insulation, sheetrock

All-Glass Fiber Insulation in Two Apartments

Apts #315A (north, with fireplace) and B (south, no fireplace)

6½ (R-22) batt in ceiling

3" (R-12) batt in wall, polyethylene vapor barrier

6½ (R-22) batt in floor

All-Urethane Insulation in Two Apartments

Apts #340A (east, with fireplace) and B (west, with fireplace)

2½" (R-20) sprayed from above in ceiling

1¼" (R-12) sprayed from inside in wall, no sheathing

2" (R-20) sprayed urethane in floor

TABLE 1 (Continued)

Test Results:

Week of March 6–13, 1970 (264 degree days)

Average temperature 32°F.  
Average wind 9 mph  
60° inside temperature setting

<u>All-Glass Fiber</u>		<u>All-Urethane</u>	
315A	315B	340A	340B
690 Hwh	670 Hwh	545 Hwh	562 Hwh