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INSULATING-WINDOWS AND SCREENS

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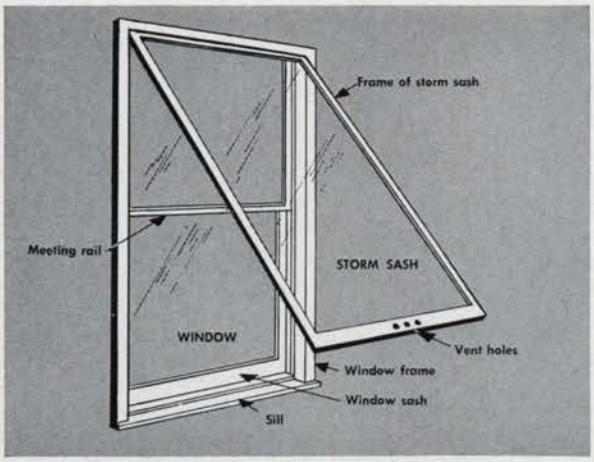
INSULATING-WINDOWS SMALL HOMES COUNCIL F11.2

INSULATING-WINDOWS

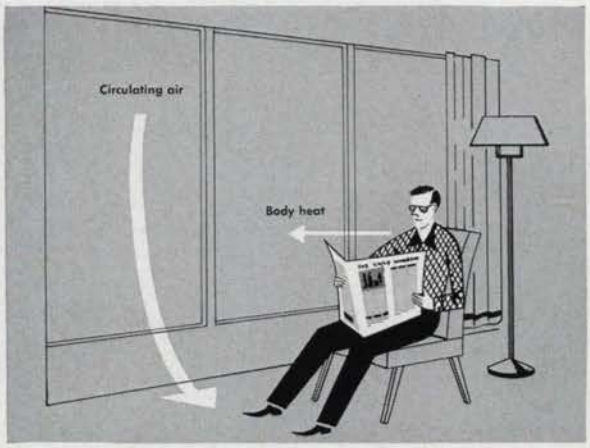
Insulating-windows reduce heat loss from the house in winter and also reduce heat gain from the outdoors in summer. Such windows consist of two layers of glass separated by an air space. (Three layers are sometimes used in an extremely cold climate.) Heat flows easily through the glass but is retarded by the air space which acts as insulation.

The air space can be achieved by the installation of a second sash (storm sash) or by sealing the edges of two panes of glass together at the factory. The type of insulating-window to be used should be determined when windows for the house are selected.*

Heat Loss: From the standpoints of comfort and heating costs, insulating-windows are recommended for areas where the average January temperature is 35°F. or colder.



The several parts of a window and a storm sash are shown.



If the inside glass of a window is warm, comfort is increased.

A house which has insulating-windows is more comfortable for the occupants than one which does not because the inside glass is warmer. As a result, less body heat is lost to the glass, and the air moving down from the window to the floor is warmer.

Insulating-windows can result in fuel savings of 20 per cent or more, depending on the climate and the amount of insulation and glass used in the house.†

Moisture Condensation: Since the inside surface of an insulating-window is warmer than that of a single-glazed window, the tendency of water vapor in the air to condense on the inside glass is lessened. If moisture condensation appears on this glass, there is too much moisture in the house and the amount should be reduced to avoid possible damage by condensation within the structure.*

Heat Gain: Because insulating-windows help to keep summer heat out of the house, they are particularly desirable for air-conditioned houses.* Their use may allow a reduction in the size of the air-conditioning equipment needed. In any case, insulating-windows reduce the number of hours the equipment must be operated.

Infiltration of Air, Dust and Soot: Storm sash are the only insulating-windows which help to reduce the infiltration of cold air, dust, and soot occurring around the sash of operating windows. Because storm sash, even when used, are not ordinarily in place the year around, it is recommended that all operating windows be weatherstripped (that is, the space around the sash be closed with strips of rubber, spring metal or other material). When windows are weatherstripped, heat loss is about the same for all types of double-glazed windows.

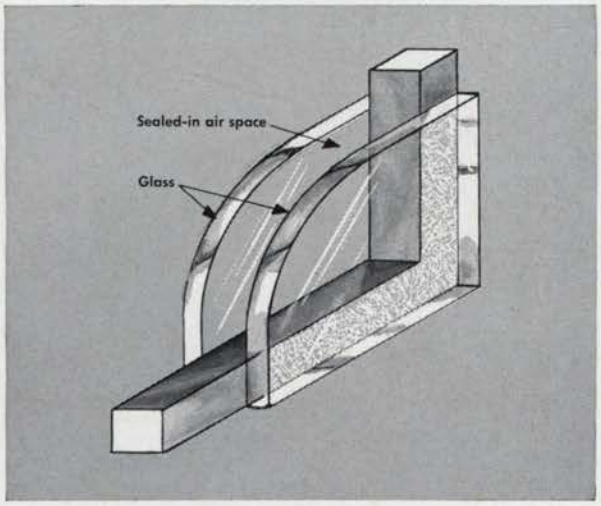
* See Small Homes Council circulars, F11.1, "Selecting Windows"; G6.0, "Summer Comfort"; and F6.2, "Moisture Condensation."

† Based on research studies at University of Illinois Engineering Experiment Station.

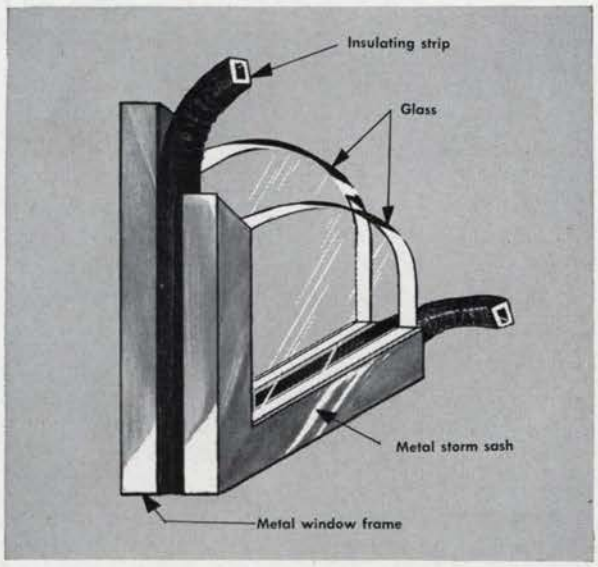
INSULATING-WINDOWS SAVE FUEL

Below are the fuel savings possible during a heating season for a house in Springfield, Illinois, under various conditions of winter protection for its 20 average-sized double-hung windows (3′-4″ x 4′-6″). Fuel necessary to offset the heat lost through 20 double-hung windows without storm sash or weatherstripping is estimated at 700 gallons of oil, 8,820 pounds of coal, or 860 therms of gas.

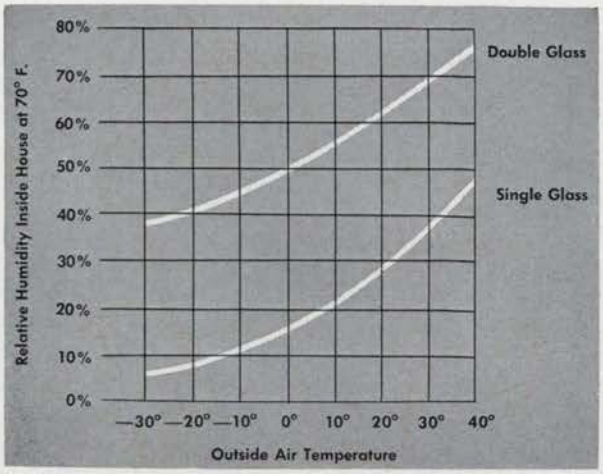
SAVINGS —	OIL	COAL	GAS
Single glass, weatherstripped	110 gal.	1,380 lbs.	135 therms
Sealed double-glass, no weatherstripping, or Storm panels, no weatherstripping	220 gal.	2,750 lbs.	270 therms
Sealed double-glass, weatherstripped, or Storm sash,-with or without weatherstripping, or Storm panel, weatherstripped	340 gal.	4,300 lbs.	415 therms
Triple glass, weatherstripped	410 gal.	5,110 lbs.	500 therms



Detail of Sealed Double Glass



A metal window frame should be separated from a metal storm sash or storm panel to lessen condensation on the metal. For storm sash, use strips of wood, rubber or other insulating material.



MOISTURE CONDENSATION ON SINGLE AND DOUBLE GLASS

The probability of moisture condensing on windows depends on the temperature of the glass and the amount of water vapor in the air within the house. The chart shows the point at which condensation occurs on the room-side surface of single-glass and double-glass windows for various percentages of indoor humidity and various outdoor temperatures. The humidity must be kept below this point to avoid condensation.

SEALED DOUBLE GLASS

Moisture and dust cannot get into the air space between double glass when the edges of the glass are sealed at the factory. During the sealing process, the air is dried so that there is no moisture to condense on the inside surfaces of the two thicknesses of glass.

Sealed double glass can be installed in an operating sash or can be set in a frame to form a fixed window. Most types of operating windows, but not all sizes, can be purchased with double glass.

Although the initial cost of sealed double-glazed windows is higher than that for single-glazed windows with storm sash or panels, the double-glazed windows offer the following advantages:

- **Convenience and easy maintenance:** Windows of sealed double glass are a permanent installation; they do not have to be put up and taken down with changing seasons as do storm sash. Because the two sheets of glass are sealed, only two surfaces need to be washed instead of four.
- **Ventilation:** When sealed double glass is used in an operating sash, there is no interference with ventilation. For this reason, sealed double glass is preferred to storm sash for year-round use, especially where it is desirable to have insulating-windows which can be opened at night.

STORM SASH

A storm sash (storm window) is a removable extra sash which is fastened to the frame of a window.

Since a storm sash is attached to the window frame and not to the operating sash, it cannot readily be opened to admit breezes in summer. A storm sash, thus, is not desirable for year-round use on an operating window. On the other hand, because the storm sash does extend to the window frame, it helps to prevent infiltration of cold air, soot, and dirt.

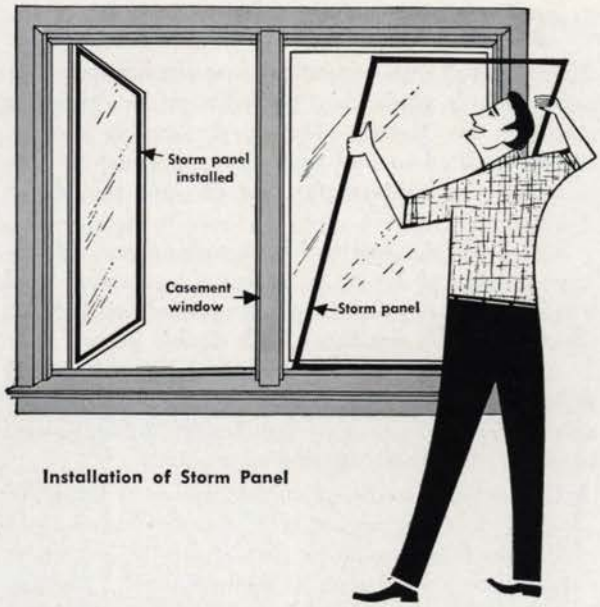
The initial cost of storm sash is low, but if service people must be hired to wash, install, and remove them, maintenance costs over a period of years may result in their being more expensive than sealed double-glazed windows.

Storm sash for sliding windows can be applied on either the inside or the outside of the house. Outswinging windows, such as casement or awning, usually need inside storm sash; inswinging windows, outside storm sash. Storm sash are most commonly used with double-hung and awning windows.*

Moisture Condensation: To reduce the likelihood of moisture condensation between the glass, the inside sash must fit more tightly than the outside sash. Storm sash installed on the inside should be weatherstripped.

Storm sash installed on the outside should fit rather loosely and the inner window sash should be weatherstripped. If storm sash are tight-fitting, drill three ¼-inch vent holes in their frame so that the outside air can circulate between the glass and, thus, reduce the possibility of condensation.

* See Small Homes Council circular, F11.1, "Selecting Windows."



Installation of Storm Panel

STORM PANELS

An easier-to-handle version of the storm sash is the storm panel — a pane of glass set in a narrow frame which can be clipped to either the outside or the inside of a window sash. Panels can be used only on sash which have special hardware or a groove into which the panels can be fitted. Panels are not commonly available for double-hung windows.

Unlike storm sash, storm panels move with the operating sash and, thus, do not interfere with operation of the window or with ventilation.

Panels can be applied on the inside or outside of the window sash. Inside panels are more convenient, but installation on the outside reduces the possibility of moisture condensation. Inside storm panels should have a good seal around the edge — *i.e.*, rubber strips if metal panels are used with metal windows; rubber or spring metal weatherstripping if panels or windows are of wood.

ROLL-UP SCREEN

Roll-up screen is installed on inside of house and operates similarly to a roll-up shade. When up, it permits full daylight and view. It can be left in place the year around. Screen is expensive and moving parts may require repair.

SCREENS

Only the opening in the window should be screened. To screen the rest of the window, or a window that is fixed, is an unnecessary expense and is undesirable since screens shut out daylight and interfere slightly with view. Full screens on a double-hung window block out approximately 50 per cent of the available daylight; half-screens, 15 per cent. Painted screens further reduce the amount of daylight admitted.*

To keep out insects, 18 x 14 mesh screen (minimum of 252 openings per square inch) is recommended. A metal louver-type screening which also cuts out heat from the sun is suggested for windows having no other type of sunshade; however, such screening interferes with vision.

Mesh of exterior screens should be of non-corrosive materials, such as aluminum, bronze, plastic, or stainless steel. These do not require painting.

Screens for sliding windows can be installed on the inside or the outside of a house. Outswinging windows must have inside screens. Outswinging windows which do not have an operating crank or bar require screens with sliding access panels or hinged screens. These must be opened each time the window is opened or closed.

Screens are either rigid or flexible in construction. The rigid have a wood or metal frame similar to that of storm sash; the flexible, which are designed to simplify the storage problem, are of a tension-type or a roll-up design.

A combination screen and storm sash which is self-storing can be purchased for double-hung windows. These units usually have one screen panel and two glass panels which can be moved up and down in tracks on the window frame. Combination units are costly and reduce the amount of daylight admitted since the screen must be left up in winter.

TENSION SCREEN

Tension-type screen is economical for it has no sideframe or sidetracks. It can be rolled up for easy storage. It is installed on the outside of the house, being fastened at the top with hooks. A tensioning device, easily released, holds the screen in place at the bottom. Screen is available in large sizes for porches.

* Based on research findings of the University of Michigan Engineering Research Institute, Ann Arbor, Michigan.