

NRC Publications Archive Archives des publications du CNRC

Some comments on the heating of houses and small buildings by electricity Beach, R. K.

For the publisher's version, please access the DOI link below. / Pour consulter la version de l'éditeur, utilisez le lien DOI ci-dessous.

Publisher's version / Version de l'éditeur:

<https://doi.org/10.4224/20338369>

Technical Note (National Research Council of Canada. Division of Building Research); no. TN-396, 1963-05-01

NRC Publications Archive Record / Notice des Archives des publications du CNRC :

<https://nrc-publications.canada.ca/eng/view/object/?id=bf330076-6983-4d85-abd3-6938f61cb1e4>

<https://publications-cnrc.canada.ca/fra/voir/objet/?id=bf330076-6983-4d85-abd3-6938f61cb1e4>

Access and use of this website and the material on it are subject to the Terms and Conditions set forth at

<https://nrc-publications.canada.ca/eng/copyright>

READ THESE TERMS AND CONDITIONS CAREFULLY BEFORE USING THIS WEBSITE.

L'accès à ce site Web et l'utilisation de son contenu sont assujettis aux conditions présentées dans le site

<https://publications-cnrc.canada.ca/fra/droits>

LISEZ CES CONDITIONS ATTENTIVEMENT AVANT D'UTILISER CE SITE WEB.

Questions? Contact the NRC Publications Archive team at

PublicationsArchive-ArchivesPublications@nrc-cnrc.gc.ca. If you wish to email the authors directly, please see the first page of the publication for their contact information.

Vous avez des questions? Nous pouvons vous aider. Pour communiquer directement avec un auteur, consultez la première page de la revue dans laquelle son article a été publié afin de trouver ses coordonnées. Si vous n'arrivez pas à les repérer, communiquez avec nous à PublicationsArchive-ArchivesPublications@nrc-cnrc.gc.ca.



NATIONAL RESEARCH COUNCIL OF CANADA

DIVISION OF BUILDING RESEARCH

No.

396

TECHNICAL NOTE

PREPARED BY R. K. Beach

CHECKED BY CRC

APPROVED BY NBH

DATE May 1963

PREPARED FOR General information

SUBJECT SOME COMMENTS ON THE HEATING OF HOUSES AND SMALL
BUILDINGS BY ELECTRICITY

In the last few years, the number of electrical heating systems installed in houses and other buildings in Canada has increased considerably. As a result of this increase, the Division of Building Research has received a number of inquiries which, for the most part, ask for information about the cost and performance of electric heating. The inquirers have usually been concerned with the baseboard convector system, because the electrical industry tends to promote the use of this system more than the others. The comments that follow have been set forth under headings, many of which have been featured in advertisements for electric heating.

CLEANLINESS

Dirt, dust, and grime in houses being built today can generally be traced to three major sources. Dirt is carried into a house on clothing and shoes, or it is brought in with the ventilating air. Dust is also carried into a house by ventilating air but, in general, most dust in a house comes from bedclothes, drapes, and other

furnishings. Oily grime on walls originates from cooking processes.

As the heating system itself is not a major source of dirt and grime in a house, it cannot be successfully argued that an electric heating system is significantly cleaner than other systems and that cleaning and redecorating costs are significantly lower. Exhaust fans are usually installed as part of an electric heating system. The kitchen exhaust fan, besides controlling cooking odours, also removes a large portion of the vapourized oils and fats from the air. This keeps the house much cleaner but requires periodic cleaning of the grease trap. Similarly, filters on forced air systems remove dust from the air but require servicing.

Cleanliness also includes the possibility of dirt markings on walls and, like other heating systems, the same problem may occur with electric baseboard convectors.

ODOUR

Combustion gases and odours are produced by fossil fuels but under normal conditions these are contained within the furnace and chimney and do not enter the building. Although there is no odour produced when electricity is converted to heat in a convector, it has been reported that odours have occurred as a result of the overheating of dust on the element.

CONTROL

Usually a typical baseboard convector system has a built-in line voltage thermostat in each room, except in large open areas such as the living room-dining room area where a low voltage wall-mounted thermostat is often used. This provides a simple way of controlling the individual room temperatures to precise requirements without affecting other rooms. It prevents under heating in rooms exposed to cold winds and reduces overheating in rooms exposed to solar radiation. If an individual is used to turning one thermostat down at night to save money by lowering the temperature of the whole house, he will find it inconvenient to do so with the built-in individual room thermostats. Also the line voltage thermostats do not have quite the same degree of temperature control that the low voltage wall thermostats have, but they are much cheaper to install.

CONVENIENCE

With electric heating there is no worry about the delivery of fuel or fuel storage. Interruptions in the power supply do occur but since practically all automatic heating systems are operated electrically it does not affect one system more than another. There is no inconvenience of having to arrange for yearly servicing and less likelihood of emergency service being required. Similarly there is less worry about leaving homes unattended for long periods when they are heated electrically. Since no large area is required for the heating equipment it is often possible to make better use of available space. Although baseboard units do not interfere with wall-to-wall carpets, there may be inconvenience in placing furniture and interference with drapes as with other systems.

FLEXIBILITY

Electric baseboard units come in a variety of standard sizes and are very easy to install. They can be added, removed, or rearranged at any time with little difficulty. This flexibility often makes it practical to use electric resistance units to heat additions to existing buildings when the extension of the existing heating system would be impossible or very expensive to achieve. Supplementary baseboard units may also be used to improve the performance of existing heating systems instead of providing a more expensive zone control system.

COMFORT

From the thermal standpoint, temperature is not the only factor that determines an individual's feeling of comfort. Humidity, air motion, and radiation must also be considered along with the air temperature. These may vary considerably without making a person feel uncomfortable. As far as thermal comfort alone is concerned, there is probably little to choose between the various heating systems when properly designed and installed.

VENTILATION

Comfort also requires that there be a continuous supply of fresh air at all times in order to control odours and humidity. This is usually provided by the infiltration and exfiltration of air through the

structure itself and accounts for a substantial portion of heat lost from the building. Because electricity is expensive, every effort is made to reduce this heat loss to a minimum. Today, buildings are being built so much tighter than previously, that the normal infiltration of air may be insufficient for ventilation purposes. An electrically heated house without a chimney or air circulating system would be the most susceptible to insufficient ventilation. Experience in housing bears this out, and most electrically heated houses are now equipped with exhaust fans which remove cooking odours and excess moisture, while increasing the amount of fresh air infiltrating into the building. Although this increases the capital and operating costs, it gives the occupant some control over the ventilation rate and, when not in use, keeps heat loss to a minimum.

HUMIDITY

Although electric heat is "dry," infiltration of cold dry air and exfiltration of hot moist air may be so low that moisture given off during cooking, laundering, and washing, and from the occupants themselves may build up to such an extent that high humidity may become a problem. To provide positive control of the maximum humidity specifications for electrically heated houses require that exhaust fans be installed wherever high moisture sources occur.

EFFICIENCY

Statements that electric baseboard heating is 100 per cent efficient are true, but may be misleading since it is the cost per unit of useful heat that is significant. A high efficiency of transforming fuel to heat is an advantage only when comparing systems using the same fuel. When different fuels are considered, the efficiency of the system multiplied by the cost of the fuel will show which fuel has an advantage over the other.

CAPITAL COST

The capital cost of a heating system for a typical house will vary widely from place to place in Canada, and it is not possible to state an average price with any degree of accuracy. At present, the installation costs of an electric baseboard system and a hot water heating system are about the same and both are more expensive than a warm air system.

This cost comparison is limited to the work carried out by the heating subcontractor and does not include work carried out by other trades, e. g. the provision of a chimney, installation of exhaust fans, and provision of additional insulation. Although in general such factors tend to offset one another, in any particular case they can form a significant part of the capital cost chargeable to the heating system. Another capital cost that may be significant is the cost of providing space for the heating system. This is rather difficult to assess and depends to a large extent on the type of house and the personal opinion of the owner. The space requirements tend to favour electrical heating particularly where basement-less construction is used. Taking into consideration all these factors, the cost of providing an electric baseboard heating system at the present time can be expected to run slightly higher than that of a warm air system.

OPERATING COST

In addition to the yearly fuel costs, the operating cost of a heating system must include the yearly servicing charge where applicable, and the cost of operating any supplemental equipment. In the case of electric resistance heating systems these costs are insignificant, and the operating costs can be taken as the yearly fuel costs. With other heating systems these factors may add another \$20.00 to \$30.00 to the fuel costs although in some areas this service is provided free by the fuel supplier.

When only the cost of fuel and the efficiency of the heating systems are considered, electric heating may cost $2 \frac{1}{2}$ times as much as other systems. Because of this there is a general requirement that additional insulation must be installed in an electrically heated house. When the effect of the extra insulation and the cost of servicing other heating systems are taken into consideration, the operating cost of an electrically heated house should run perhaps $1 \frac{1}{2}$ to $2 \frac{1}{2}$ times as much as with an oil-fired system. These ratios are based on an electricity rate of 1.25 cents net per kwh and oil at 18.5 cents per gallon. Where other rates apply or other fuels are used, the ratios can be adjusted accordingly.