

## HRAI Technical Commentary

The Heating, Refrigerating and Air Conditioning Institute of Canada (HRAI)

HRAI continues to work closely with OBOA and salutes the various municipalities across Canada who have joined the association as associate members. HRAI, through its national network of chapters, provides a means for building officials, contractors, wholesalers, manufacturers and consultants to work together.

OBOA members should note that HRAI offers a wide range of HVACR technical manuals, design manuals, and software for applications such as heat loss/gain, duct design and air handling, commercial and residential courses, brochures (CFC's/HCFC's, ventilation, and tips for choosing a contractor), as well as posters and videos.

HRAI's training program includes courses in Residential Mechanical Ventilation, Installation and Design. Together, the material which forms the basis of these courses is referred to as the "HRAI Ventilation Manual". HRAI will also conduct special courses arranged and designed just for building officials. For more information on materials and courses call HRAI at 416-602-4700 (fax 602-1197).

HRAI is pleased to provide the support for the timely and ongoing information in this column for OBOA members.

## Requirements for Supplementary Heat in Habitable Basements

It has come to the attention of HRAI is very concerned that many inspectors and contractors are not up to date with the changes in the 1992 edition of the HRAI Digest as to the requirements for residential duct design and supplementary heat in habitable basements. This article includes the reasoning behind, the wording of, and HRAI's interpretation of section 7.7 of the Residential Air Systems Design Technical Manual (found in the 1992 edition of the HRAI Digest) which deals with duct design requirements for habitable basements. In addition, this article will confirm that HRAI methods do not require baseboard electric heaters in habitable basements.

The reasoning behind this section of the manual is to overcome problems which may result in habitable basements which, at times during the heating season, are too cold. Outside air temperatures vary more widely over the heating season than do soil temperatures. Therefore, the amount of below grade heat loss increases or decreases at a slower rate than the above grade heat loss. To further complicate matters, solar radiation may decrease the heating requirements of the above grade portions of the building on a sunny winter day, but will not have much

effect on the below grade heat loss. As heat loss calculations are based on design conditions and thermostats are normally located away from the basement areas, the net effect is that, at times, the temperature of the basement may be below comfortable levels during the heating season.

Section 7.7 of the Residential Air Systems Design Technical Manual found in the 1992 edition of the HRAI Digest reads as follows:

### 7.7 Habitable Basement Living Quarters

Residential buildings having basement rooms that are finished so as to be habitable space (including walk-out basements) shall be heated by one of the following methods:

- (1) Thermostatically controlled supplementary heat with a total heat output sufficient to provide at least 20% of the heat loss of the space, to be used in conjunction with the main residential warm air heating system. In such applications, the supply outlets may be located in the ceiling and shall be sized to deliver 100% of the heat load.
- (2) A separate system or zone of a system which is controlled by it's own thermostat (located in the finished basement) and capable of delivering 100% of the heat required for the finished basement. Return and

supply openings should be located at or near the floor level.

The interpretation is broken into three parts; the opening statement, method #1, and method #2.

### Opening Statement

The opening statement of Section 7.7 defines the portions of a residential building which are addressed. Section 7.7 is concerned with habitable (finished) space in a conventional basement and "basement walk-outs" whether or not those "basement walk-outs" are finished. A "basement walk out" is a basement or area of a basement which has a significant portion of a wall(s) exposed to outside air temperatures at or near ground level. It is not unusual to have a habitable basement or "basement walk-out" and in the same basement have unfinished rooms. In such cases, the unfinished room(s) need only meet the requirements of sections 4.6 and 7.6 of this manual.

### Method #1

In this method, the heating requirements are met by a combination of two heating methods, a main warm air heating system and supplementary heat.

The majority of the heat comes from the main warm air heating system which is controlled by a thermostat not located in the basement. The basement supply

openings must be sized to carry the total heating required under design conditions and may be located in the ceiling. Please note that as per section 4.6, return air openings must be low wall.

The heat required to overcome temperature variances comes from the supplementary heat source(s) which shall have a minimum capacity of 20% of the calculated heat loss. This supplementary heat must be supplied to the finished area, and thermostatically controlled. The type of supplementary heat does not matter, only its output location, capacity and its ability to be controlled by a thermostat.

As an alternative to using supplementary heat, a similar effect can be achieved if the main warm air heating system is sized to carry 100% of the heating requirement, the supply registers and return grilles are low wall, and the heating system circulating fan is operated on a continuous basis.

### Method #2

In this method, the heating requirements are met with the use of a separate heating system or by the use of a zone system where the basement is a separate zone. This system or zone may heat either the entire basement, or, only the habitable and/or "basement walk-out" areas. The separate System or zone must be controlled by a

thermostat and be capable of delivering 100% of the heat required. With this system it is desirable but not essential that supply registers and return grilles are low wall and there is no requirement that the heating system circulating fan is operated on a continuous basis.

This interpretation should serve to give building officials and contractors a better understanding of the duct design requirements in the HRAI Digest 1992 for residential basements. For further information, contact HRAI at (416) 602-4700 (phone) or (416) 602-1197 (fax).

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