Passive ventilation to dwellings with Condensation

Building Technology & Energy use in Housing Study Group - 1986

NCHA

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NCHA NORTHERN CONSORTIUM OF HOUSING AUTHORITIES
STUDY GROUP BUILDING TECHNOLOGY AND ENERGY USE IN HOUSING
TECHNICAL NOTE PASSIVE VENTILATION TO DWELLINGS WITH CONDENSATION

INTRODUCTION

The reader is referred to BRE Digest 110 'Condensation' for a detailed explanation of the causes and principles of Condensation.*

The two most simple and effective means of reducing the occurrence of condensation are ventilation and insulation. This technical note is to inform members of recent theoretical design work and practical applications which have been undertaken by The Building Technology and Energy Study Group to improve the ventilation rate in domestic properties.

The occurrences of condensation appear to have increased over the last two decades and certainly were not as prevalent in traditional inter war housing when first constructed. It is probable that in these dwellings both stack and cross ventilation systems were active without designers or occupiers being aware, i.e. flues to open fires and unsealed doors and windows. The recent changes to central heating, increased energy awareness and higher expected comfort levels have often stopped or severely limited these forms of ventilation.

Description of Ventilation Systems

The two systems for reducing condensation are referred to as stack ventilation and cross ventilation. They are not mechanical in any form. The systems assist the transfer of moisture vapour from the inside of the dwelling to the exterior, and are equally applicable to existing or new dwellings. The systems are different and should not be mixed.

Stack Ventilation

Stack ventilation is most suitable for two storey houses or single storey houses with pitched roofs and a number of separate rooms.

Stack ventilation occurs when a vent pipe is installed in a dwelling from the ceiling level of a room to the ridge of a pitched roof. As the air inside the dwelling will normally be at a higher temperature than the external air due to the difference in air density the internal air will flow up the pipe by convection. As the internal production of moisture vapour, by cooking or washing involves increased heat production, the rate of moisture vapour extracted is related to the rate of moisture vapour production.

The major advantages of the stack ventilation system are, no mechanical or moving elements and all installation materials are available from builders merchants. The ventilation system is not affected by wind speed or direction and is highly responsive to the dwellings use.

Cross Ventilation

Cross ventilation is suitable for dwellings with open plan room layouts, or with flat or severely limited roof access.

The room layout of any dwelling fitted with the cross ventilation system should have a configuration that allows the two opposite facades to have ventilators incorporated in the wall cavity and not be adjustable. Location of the ventilators is critical, they should be diagonally opposite.

The ventilators are designed to have a high moisture vapour porosity and a high air resistance. The ventilator allows the moisture to be expelled to the outside of the dwelling without draughts or excessive heat loss.

Air Input

Both systems of ventilation require an air input. This is facilitated by window head slot ventilators, one to each room of the dwelling.

*See also BRE Digest 206, 210, 270, 297.

DESIGN GUIDE FOR STACK AND CROSS VENTILATION SYSTEMS

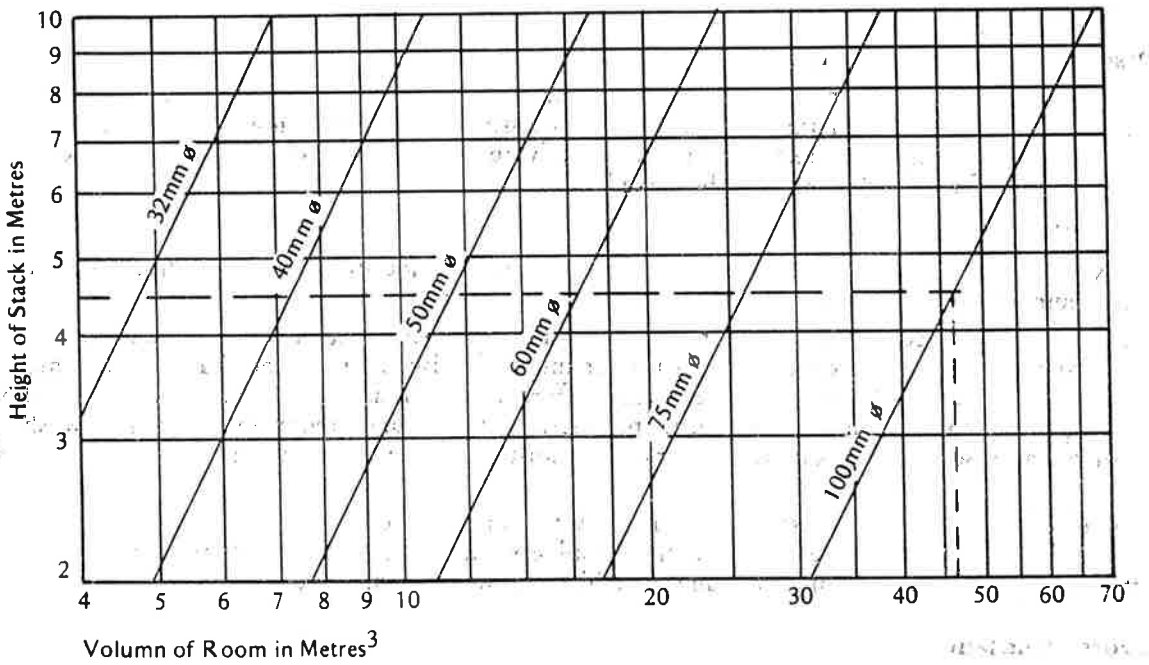
These notes are intended to be read in conjunction with sketches A and B.

Determination of Ventilation System

The dwelling room layout determines its suitability for the use of stack or cross ventilation. Dwellings with a series of rooms being suitable for stack ventilation, dwellings with through rooms from opposite facades suiting cross ventilation.

Detailed Design of Stack Ventilation

The designer is referred to Sketch A. The two ceiling level ventilators and the routes of the pipes are positioned by considered examination of the dwelling for the most suitable locations. Recommended positions are kitchens, bathrooms and utility rooms. In this example one ventilator is in the kitchen over the cooker position, with its service pipe in a first floor cupboard to the roof space. The remaining ventilator is in the first floor bathroom with its service pipe leading directly into the roof space. The size of the service pipe required is determined by using the table below, it does not matter if the vent pipe diameters are in excess of those taken from the Table, most standard components being available in 100m diameter,



For a given stack height read horizontally across the graph and vertically upwards for the room volume, e.g for a stack height of 4.5m a 100mm dia. pipe will serve a room of 47m³.

There are a number of readily available plastic pipes in the following internal diameters, 19mm, 32mm, 40mm, 50mm, 60mm, 75mm, 100mm.

The service pipes must be air sealed at all joints and not inclined at a gradient less than 45° to the horizontal. They should be supported in a similar manner to soil and vent pipes. All pipes must have separate roof terminals. All rooms should have one fixed ventilator preferably in a window with a free air space of 4.800mm².

Detailed Design of Cross Ventilation

The designer is referred to sketch B. The wall ventilators are positioned to ensure that effective through/cross ventilation occurs within the individual rooms. The ventilators 200mm × 130mm should be positioned within 300mm of the ceiling and be installed at the rate of one pair of vents for each facade. It is recommended that at least one ventilator should be installed in the kitchen area. All rooms should have one fixed window ventilator with a slot area not less than 4800mm².

Cost

Each dwelling installation cost will be different depending on the size of the dwelling, construction and number of ventilators used. It is estimated that the cross ventilation system is approximately half the cost of the stack ventilation system. Designers should be able to estimate the cost quite easily as all components are readily available from builders merchants and straightforward in form and construction.

COMPONENT SPECIFICATION

Window ventilators — fixed open slot ventilator with a free area of at least 48 00mm².

Pipes — PVC pipework with sealed joints to diameters required.

Ceiling level grilles — grille fitting 'semi'flush to ceiling with free air space equal to adjoining pipe.

Ridge terminal outlet — Soil vent pipe ridge terminal to suit roof and ridge materials.

Air porous ventilator — PVC rectangular through the wall duct approx. 200mm × 130mm. Containing air resistant/moisture vapour process media.

EXAMPLES OF COMPONENT MANUFACTURERS

Window Head Ventilators

Greenwood Airvac
P.O. Box 3
Brookside Industrial Estate
Dustington
Littlehampton
West Sussex
BN16 3LH

Ridge Terminal Outlets

Redland Roof Tiles Limited
Reigate
Surrey
RH2 0SJ

Ceiling Level Grilles

Bahco Ventilation
Bourne End
Southam
Leamington Spa
Warwickshire
CV33 0DJ

This technical note has been produced by the Consortiums Building Technology and Energy Use Study Group, the members of which are as follows:

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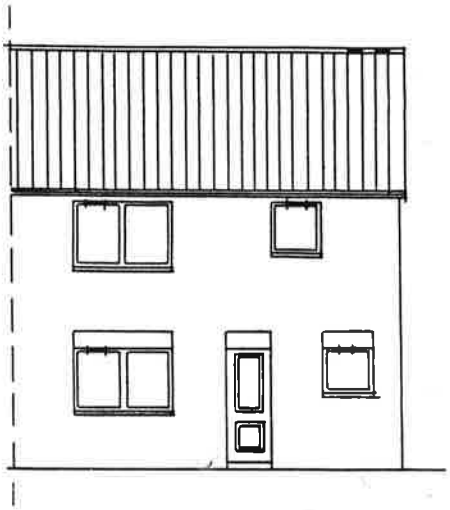
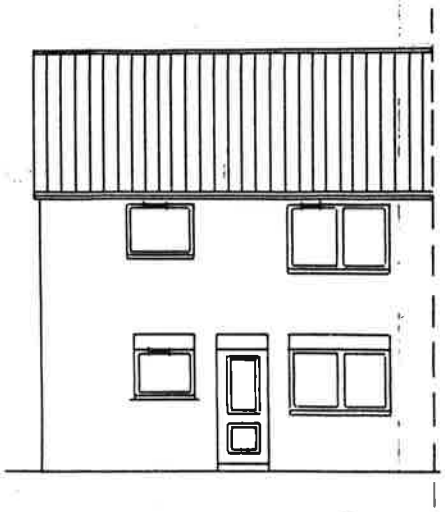
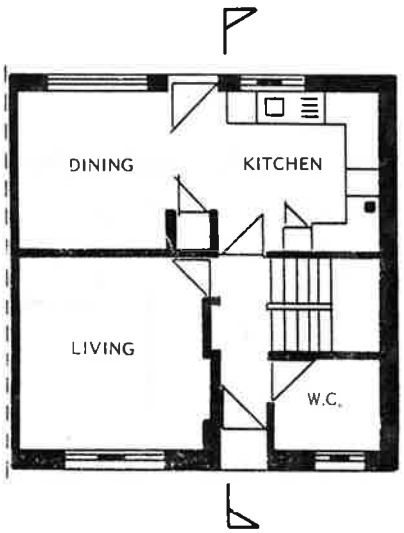
The Northern Consortium of Housing Authorities serves as a technical forum for local authority and central government officers, together with representatives of private practices, voluntary organisations and the building industry to exchange information and help resolve common problems relating to housing and the built environment.



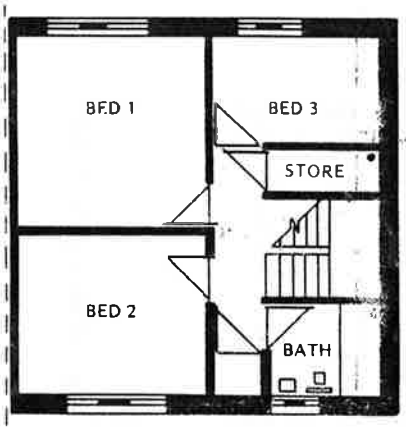
FRONT ELEVATION



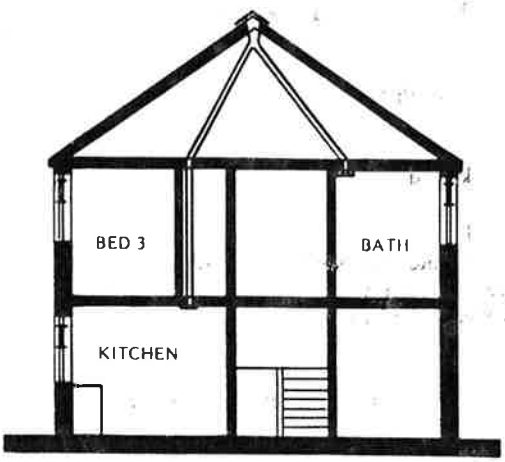
REAR ELEVATION



GROUND FLOOR PLAN



FIRST FLOOR PLAN



SECTION

- JOINT SEALED P.V.C. PIPE
- WINDOW VENTILATOR
- CEILING LEVEL GRILLE
- RIDGE VENTILATOR

TO BE READ IN CONJUNCTION WITH DESIGN NOTES AND SPECIFICATION

TYPICAL STACK VENTILATION SYSTEM
SKETCH A

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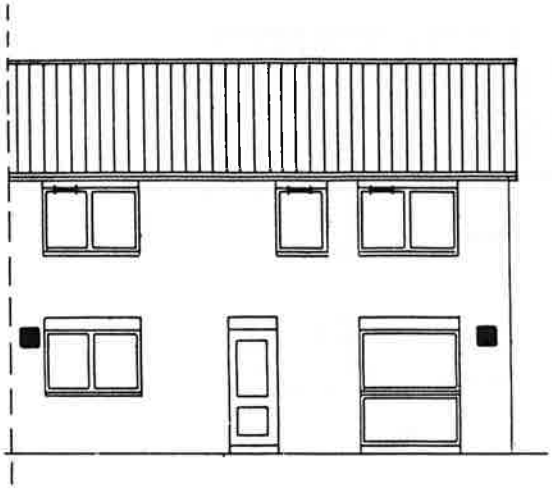

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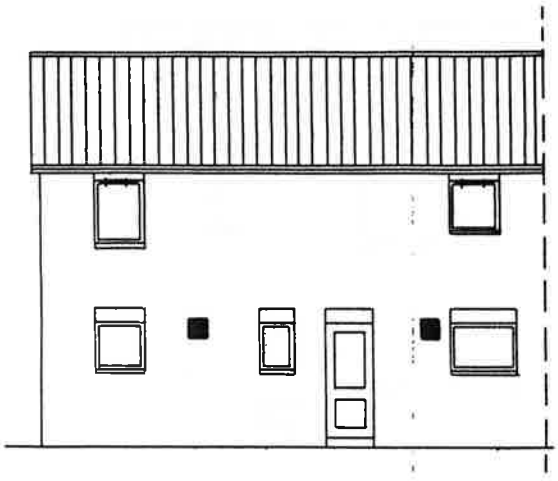

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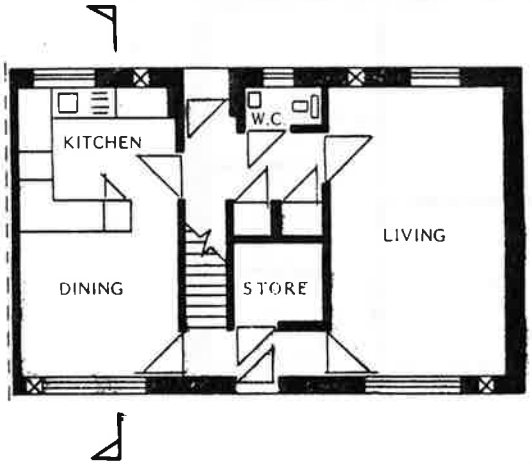
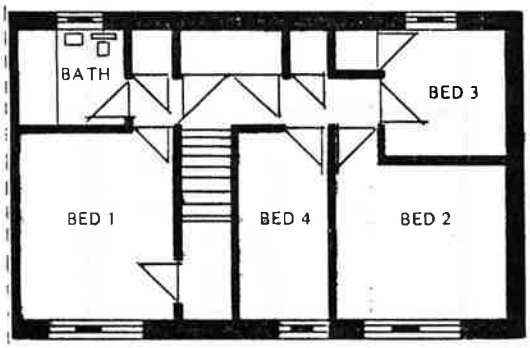
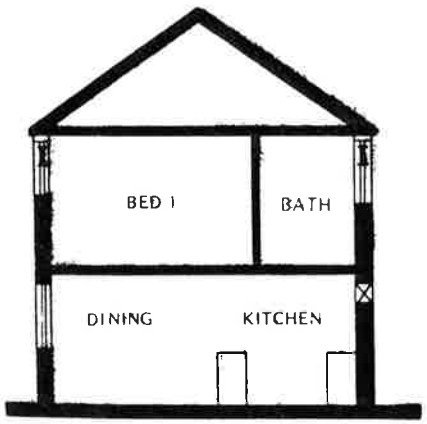


FIRST FLOOR PLAN



GROUND FLOOR PLAN



SECTION

WINDOW VENTILATOR

AIR POROUS VENTILATOR

TO BE READ IN CONJUNCTION WITH DESIGN NOTES AND SPECIFICATION

TYPICAL CROSS VENTILATION SYSTEM
SKETCH B

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