NSAI

National Standards Authority of Ireland

Ventilation Validation Registration Scheme

Gary O'Sullivan

November 2021

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Irish Building Regulations

On the **1st November 2019** the Department of Housing, Planning and Local Government (DHPLG) published updates to <u>two</u> Irish Building Regulations namely

Part L - Conservation of Fuel and Energy - Dwellings
Part F – Ventilation

In addition to the updated regulations, the DHPLG published updated Technical Guidance Document (TGD) Part L and Part F

Subject to transitional arrangements the updated regulations came into full effect 1st November 2020

November 2021

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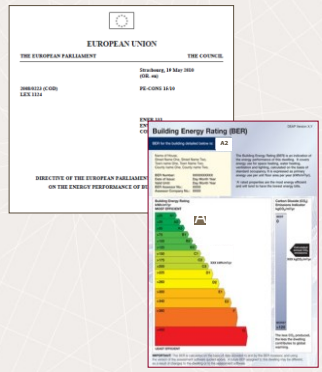
Building Regulations updates

Under the Energy Performance of Buildings Directive 2010 (EPBD),

Article 9 requires

Member states to ensure that all new buildings are "**Nearly Zero Energy Buildings**" by 31st Dec 2020

"Nearly Zero Energy Buildings" or **NZEB** equates to a Building Energy Rating (BER) of typically an A2



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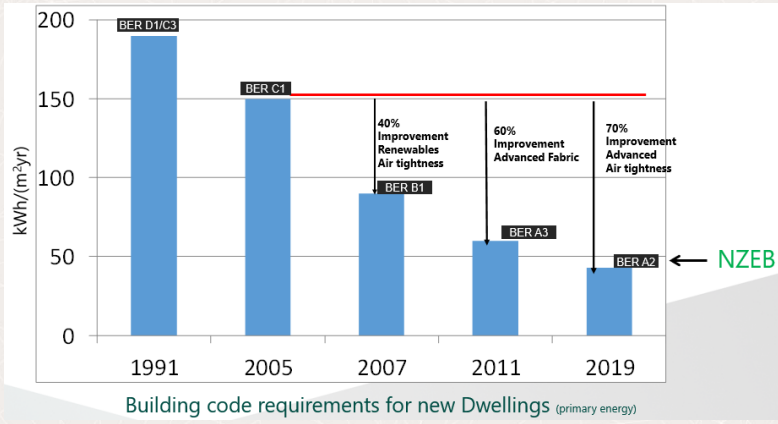
NZEB in Building Codes



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Some impacts of Part L Dwelling & Part F 2019

TGD L Dwelling 2019

- BER A2 or Better
- Renewable Energy Ratio =0.20
- MPEPC (0.3) and MPCPC(0.35) (equivalent to 70% Reduction on 2005)
- Upper Air permeability now 5 $m^3/(h.m^2)$
- Elemental backstop U-values improved
- All dwelling require an airtight test

Table 1 Maximum elemental U-value (W/m^2K)[1, 2]

Column 1 Fabric Elements	Column 2 Area-weighted Average Elemental U-value (Um)	Column 3 Average Elemental U-value – individual element or section of element
Roofs		
Pitched roof - Insulation at ceiling - Insulation on slope	0.16 0.16	0.3
Flat roof	0.20	
Walls	0.18	0.6
Ground floors[3]	0.18	0.6
Other exposed floors	0.18	0.6
External doors, windows and rooflights	1.4[4,5]	3.0

Notes:
1. The U-value includes the effect of unheated voids or other spaces.
2. For alternative method of showing compliance see paragraph 1.3.2.3.
3. For insulation of ground floors and exposed floors incorporating underfloor heating, see paragraph 1.3.2.2.
4. Windows, doors and rooflights should have a maximum U-value of 1.4 W/m^2K.
5. The NSAI Window Energy Performance Scheme (WEPS) provides a rating for windows combining heat loss and solar transmittance. The solar transmittance value $g_{(wo)}$ measures the solar energy through the window.

TGD F 2019

- Air permeability index < 5 $m^3/(h.m^2)$
- Dwelling with < 3 $m^3/(h.m^2)$ must have some form on mechanical extract ventilation i.e. natural ventilation will not be acceptable
- All ventilation systems to be validated by an **independent competent person** certified by NSAI or equivalent.

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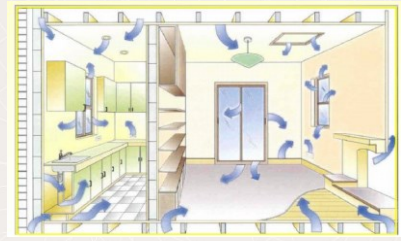
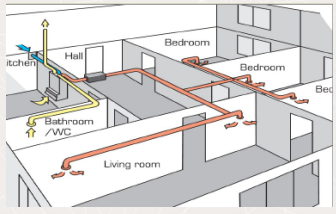
Ventilation Heat Loss

Domestic Energy Assessment Procedure (DEAP) considers both designed and un-designed Ventilation Heat Loss when calculating the BER for a Dwelling

Un-designed

Air tightness Testing Scheme
70 NSAI Registered testers





Designed

This new scheme
Ventilation Validation Registration Scheme

Has been developed to drive compliance in this area

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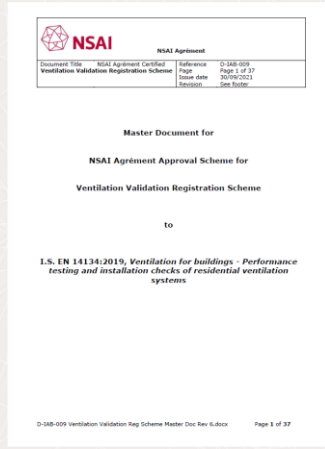
Ventilation Validation Registration Scheme

NSAI has established a registration scheme that certifies an individual as a **competent independent third party** to validate that a ventilation system has been installed, balanced and commissioned to meet the minimum requirements of Technical Guidance Document F - Ventilation (2019) to the Irish Building Regulations.

D-IAB-009 Ventilation Validation Reg Scheme Master Doc Rev 6.docx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NSAI Agrément

Document Title	NSAI Agrément Certified Ventilation Validation Registration Scheme	Reference	D-IAB-009
		Page	Page 1 of 37
		Issue date	30/09/2021
		Revision	See footer

Master Document for

NSAI Agrément Approval Scheme for

Ventilation Validation Registration Scheme

to

I.S. EN 14134:2019, *Ventilation for buildings - Performance testing and installation checks of residential ventilation systems*

D-IAB-009 Ventilation Validation Reg Scheme Master Doc Rev 6.docx Page 1 of 37

NSAI Certification

Ventilation Validation Registration Scheme

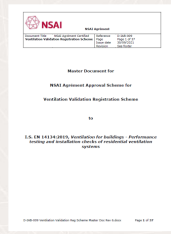
Reference documents

NSAI Ventilation Validation Registration Scheme Master Document give guidance on the scheme requirements and design examples

I.S. EN 14134:2019, *Ventilation for buildings - Performance testing and installation checks of residential ventilation systems*

Department of Housing, Planning and Local Government (DHPLG) have published a guidance document on "Installation and Commissioning of Ventilation Systems for Dwellings - Achieving Compliance with Part F 2019"

BSRIA - Domestic Ventilation Systems, a guide to measuring airflow rates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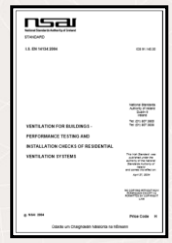
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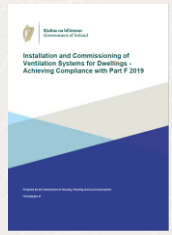
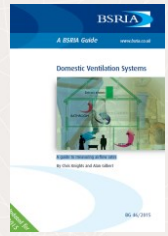
VENTILATION FOR BUILDINGS -

PERFORMANCE TESTING AND

INSTALLATION CHECKS OF RESIDENTIAL

VENTILATION SYSTEMS


Installation and Commissioning of Ventilation Systems for Dwellings - Achieving Compliance with Part F 2019


BSRIA

A BSRIA Guide

Domestic Ventilation Systems

NSAI Certification

Ventilation Validation Registration Scheme

Ventilations systems must be designed and commissioned to provide adequate and effective means of ventilation to satisfy the minimum requirements of TGD to Part F of the Irish Building Regulations.

This shall be achieved by:

(a) limiting the moisture content of the air within the building so that it does not contribute to condensation and mould growth, and

(b) limiting the concentration of harmful pollutants in the air within the building.

The primary purpose of a residential ventilation system is to supply air to and extract air from the rooms in a dwelling.

Ventilation Validation Registration Scheme

The NSAI Certified Ventilation validator will be expected to validate that a ventilation system has been installed, balanced and commissioned to meet the **minimum requirements** of TGD to Part F of the Building regulations.

- On arrival to a site, the Ventilation validator shall be presented with a **ventilation design** and installers commissioning certificate.
- The Ventilation validator will assess that the presented design will satisfy the minimum requirements of TGD to Part F.
- They shall then proceed to take measurements to establish that the commissioned system complies with the satisfactory presented design.

- The Ventilation validator will issue a "Ventilation validation Certificate"

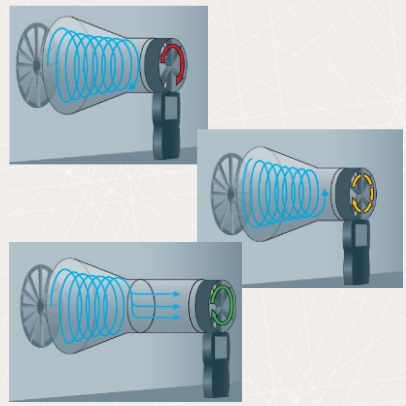
Ventilation Validation Registration Scheme Development

During the development of the scheme, we made it a requirement that all instrumentation must be calibrated annually by an accredited laboratory such as INAB, UKAS or similar approved.

Despite having calibrated equipment, flow measurement reading on a control house varied greatly.

It was clear that operatives did not know how to correctly configure their equipment to record accurate reading.

Furthermore flow straightener were not being used



Waterford and Wexford Education and Training Board NZEB

In recognition of the challenges facing the construction sector Waterford and Wexford Education and Training Board (WWETB) has developed a number of training courses which are designed to up skill construction workers with knowledge of how to achieve the NZEB standard.

The WWETB National NZEB Training Centre is the first facility in Europe to offer a suite of trade-specific NZEB courses

Training modules cover all trades including a course on Ventilation delivered in a purposed building facility in Enniscorthy

Waterford and Wexford Education and Training Board NZEB

Fundamental principles of ventilation systems

This 3 day course aims to provide participants with the principles and practices required to effectively **design** ventilation flowrates, **install** ventilation systems and **commission** ventilation systems, in accordance with Technical Guidance Document Part F 2019.

This course provides an excellent understanding of the fundamental principles of ventilation systems.

It is recommended that Ventilation validators attend this course.

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Ventilation Validation Registration Scheme Development and WWETB

As mentioned previously operatives did not know how to correctly configure their equipment to record accurate reading.

To this end a "Proficiency testing unit" was built by Lindab and is located at WWETB.

The unit consists of two lines (line A and B) with a supply and extract grill on each line.

Each line contains a UltraLink flow monitor and a fan with 5 speed settings (4-20L/s).

Ventilation Validators must successfully complete and pass a proficiency test which establishes that they can measure flow rates accurately.

Lindab

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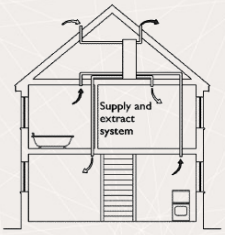
Typical designed ventilation approaches in Ireland

TGD to Part F 2019 gives guidance on minimum ventilation design for dwellings for

Natural Ventilation with intermittent fans mechanical extract

Only suitable for dwelling air permeability index is greater than 3 $m^3/(h.m^2)$ and less than 5 $m^3/(h.m^2)$
Difficult to design for.

Passive Stack



Mechanical ventilation

Centralized Continuous Mechanical Extract Ventilation (CMEV)
Centralized Mechanical Ventilation with Heat Recovery (MVHR)

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TGD to Part F 2019 - Ventilation

Let's consider a

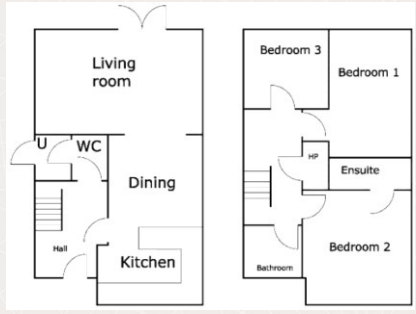
Centralized Continuous Mechanical Extract Ventilation (**CMEV**)

or

Centralized Mechanical Ventilation with Heat Recovery (**MVHR**)

Take a

- 122 m^2
- 3 bedrooms
- 2.4m floor to ceiling height



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TGD to Part F 2019 - Ventilation

Centralized Continuous Mechanical Extract Ventilation (**CMEV**)
or
Centralized Mechanical Ventilation with Heat Recovery (**MVHR**)

TGD requires us to calculate the **general supply ventilation** rate.

- Occupancy
- 0.3 l/s per m^2 internal floor area

NSAI - MEV MVHR Design Sheet Issue 7th.xlsx

Ventilation design sheet

Dwelling address					**Example 9**		
Dwelling type					**Semi-detached house**		
Total floor area					122.0	m^2	
Ventilation system					Centralised Supply & Extract Mechanical Ventilation		
Date of test							
Installer/builder (if applicable)							
Validation certificate number					1.91.0xx.21.001		
Air permeability <					5	$m^3/h.m$	
Select rooms			**Area**		**Height**		
Kitchen	No.	1					
Utility room	No.	1					
Bathroom/Ensuite (1)	No.	1					
Sanitary accommodation (no bath or shower) (1)	No.	1					
Bathroom/Ensuite (2)	No.	1					
	No.						
	No.						
Living room (1)	No.	1	24	m^2	2.4	m	
Dining room	No.	1	10	m^2	2.4	m	
Playroom	No.			m^2		m	
Study room	No.			m^2		m	
Reception room	No.			m^2		m	
Bedroom 1	No.	1	14	m^2	2.4	m	
Bedroom 2	No.	1	16.4	m^2	2.4	m	
Bedroom 3	No.	1	9.3	m^2	2.4	m	
Bedroom 4	No.			m^2		m	
Bedroom 5	No.			m^2		m	
Bedroom 6	No.			m^2		m	
	No.			m^2		m	
	No.			m^2		m	
	No.			m^2		m	

Step 1 - General ventilation rate

Calculated general ventilation rate based on occupancy of the dwelling [TGD F - 1.2.3.2]:		Calculated general ventilation rate based on internal floor area of the dwelling [TGD F - 1.2.3.2]:
5 l/s plus 4 l/s x Persons		Floor Area m^2 at 0.3 l/s/m^2
Persons =	5	
5 l/s + (4 l/s x Persons) =	25.0 l/s	36.6 l/s
(Assume 2 people in main bedroom and second bedroom and 1 person in third bedroom)		

General ventilation rate of the dwelling is the greater of the above = 36.6 l/s

General continuous supply ventilation rate of the dwelling is = 36.6 l/s

General continuous extract ventilation rate of the dwelling is = 36.6 l/s

TGD to Part F 2019 - Ventilation

Next we must establish the **minimum boost extract** ventilation rate.

In this example the General ventilation Rate < Overall Minimum boost extract rate

TGD F give minimum boost extract rate

Step 2 – Overall minimum boost extract ventilation rate

Overall minimum boost extract ventilation rate requirement [TGD F - Table 2]:

Kitchen	1	x	13	=	13
Utility room	1	x	8	=	8
Bathroom/Ensuite (1)	1	x	8	=	8
Sanitary accommodation (no bath or shower) (1)	1	x	6	=	6
Bathroom/Ensuite (2)	1	x	8	=	8
	0	x	0	=	0
	0	x	0	=	0
					43.0 l/s

Step 3 – Ventilation system capacity

25% capacity requirement over general ventilation rate of the dwelling [TGD F - 1.2.3.4]:

Greater of overall minimum boost extract rate and (General ventilation rate * 1.25) = 45.8 l/s

The total capacity of the ventilation system required is = 45.8 l/s

This is the total capacity of the ventilation system that is required.

Table 1: Centralised continuous mechanical extract ventilation systems: minimum extract rates[1]

Wet rooms	Minimum extract rate (l/s)
Kitchen	13[3]
Utility room	8
Bathroom	8
Sanitary accommodation (no bath or shower)	6[3]

Notes:
1 The above are minimum boost extract rates and may need to be increased to achieve the general ventilation rate.
2. Excludes cooker hood extract.
3. As an alternative, an opening window provided for purge ventilation may be relied on for extract.

Table 2: MVHR Systems: Minimum extract rates

Wet rooms	Minimum extract rate (l/s)
Kitchen	13
Utility room	8
Bathroom	8
Sanitary accommodation (no bath or shower)	6[1]

Notes:
1. As an alternative, an opening window provided for purge ventilation may be relied on for extract.

TGD to Part F 2019 - Ventilation

- From above the General continuous supply ventilation rate of the dwelling is = 36.6l/s
- Supplies are into habitable room (except kitchen) with extracts from wet rooms.
- Upper table takes the total supply ventilation rate and redistributes that supply to the habitable rooms in the ratio of the volume of those rooms.
- The second table takes the base line extract rates from Table 1 or 2 and proportionately decreases (or increases) the base line extract rates to achieve a balanced ventilation system.

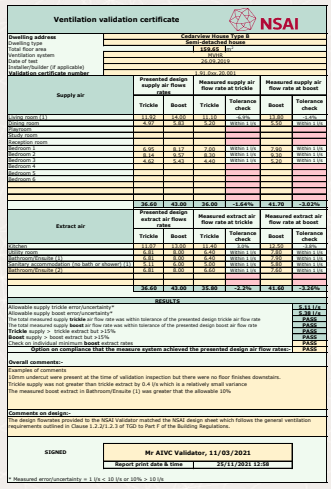
Room with MVHR supply terminal(s)	Room area (m^2)	Room volume (m^3)	Room general supply airflow rate (l/s)		
			Supply	% Vol	Total
Living room (1)	24	57.6	36.60	32.6%	11.9 l/s
Dining room	10	24.0	36.60	13.6%	5.0 l/s
Playroom					
Study room					
Reception room					
Bedroom 1	14	33.6	36.60	19.0%	7.0 l/s
Bedroom 2	16.4	39.4	36.60	22.3%	8.1 l/s
Bedroom 3	9.3	22.3	36.60	12.6%	4.6 l/s
Bedroom 4					
Bedroom 5					
Bedroom 6					
Total	73.70	176.9	Σ Balance check =		36.6 l/s

Room with MEV/MVHR extract terminal(s)	General Room extract airflow rate (l/s)				
	Extract	% Ext	Per Room	No.	Total
Kitchen	36.6	30%	11.1 l/s	x 1.0	11.1 l/s
Utility room	36.6	19%	6.8 l/s	x 1.0	6.8 l/s
Bathroom/Ensuite (1)	36.6	19%	6.8 l/s	x 1.0	6.8 l/s
Sanitary accommodation (no bath or shower) (1)	36.6	14%	5.1 l/s	x 1.0	5.1 l/s
Bathroom/Ensuite (2)	36.6	19%	6.8 l/s	x 1.0	6.8 l/s
		100%	Σ Balance check =		36.6 l/s

Room with MVHR supply terminal(s)	Room area (m^2)	Room volume (m^3)	Room Minimum Boost supply airflow rate (l/s)		
			Supply	% Vol	Total
Living room (1)	24	57.6	43.00	32.6%	14.0 l/s
Dining room	10	24.0	43.00	13.6%	5.8 l/s
Playroom					
Study room					
Reception room					
Bedroom 1	14	33.6	43.00	19.0%	8.2 l/s
Bedroom 2	16.4	39.4	43.00	22.3%	9.6 l/s
Bedroom 3	9.3	22.3	43.00	12.6%	5.4 l/s
Bedroom 4					
Bedroom 5					
Bedroom 6					
Total	73.7	176.9	Σ Balance check =		43.0 l/s

Room with MEV/MVHR extract terminal(s)	Room Minimum Boost extract airflow rate (l/s)				
	Extract	% Ext	Per Room	No.	Total
Kitchen	43.00	30%	13.0 l/s	x 1.0	13.0 l/s
Utility room	43.00	19%	8.0 l/s	x 1.0	8.0 l/s
Bathroom/Ensuite (1)	43.00	19%	8.0 l/s	x 1.0	8.0 l/s
Sanitary accommodation (no bath or shower) (1)	43.00	14%	6.0 l/s	x 1.0	6.0 l/s
Bathroom/Ensuite (2)	43.00	19%	8.0 l/s	x 1.0	8.0 l/s
		100%	Σ Balance check =		43.0 l/s

Sample Ventilation Validation Certificate



Ventilation validation certificate — NSAI

Dwelling address	**Cedarview House Type B**
Dwelling type	**Semi-detached house**
Total floor area	**159.65** m^2
Ventilation system	**MVHR**
Date of test	**26.09.2019**
Installer/builder (if applicable)	
Validation certificate number	**I_01 Rev 26 001**

Supply air	**Presented design supply air flows rates**		**Measured supply air flow rate at trickle**		**Measured supply air flow rate at boost**	
	Trickle	**Boost**	**Trickle**	**Tolerance check**	**Boost**	**Tolerance check**
Living room (1)	11.92	14.00	11.10	-6.9%	13.80	-1.4%
Dining room	4.97	5.83	5.20	Within 1 l/s	5.50	Within 1 l/s
Playroom						
Study room						
Reception room						
Bedroom 1	6.95	8.17	7.60	Within 1 l/s	7.50	Within 1 l/s
Bedroom 2	8.14	9.57	8.30	Within 1 l/s	9.30	Within 1 l/s
Bedroom 3	4.62	5.43	4.40	Within 1 l/s	5.20	Within 1 l/s
Bedroom 4						
Bedroom 5						
Bedroom 6						
	36.60	**43.00**	**36.00**	**-1.64%**	**41.70**	**-3.02%**

Extract air	**Presented design extract air flows rates**		**Measured extract air flow rate at trickle**		**Measured extract air flow rate at boost**	
	Trickle	**Boost**	**Trickle**	**Tolerance check**	**Boost**	**Tolerance check**
Kitchen	11.07	13.00	11.40	-2.0%	12.50	-3.8%
Utility room	6.81	8.00	6.40	Within 1 l/s	7.40	Within 1 l/s
Bathroom/Ensuite (1)	6.81	8.00	6.40	Within 1 l/s	7.40	Within 1 l/s
Sanitary accommodation (no bath or shower) (1)	5.11	6.00	4.90	Within 1 l/s	5.80	Within 1 l/s
Bathroom/Ensuite (2)	6.81	8.00	6.60	Within 1 l/s	7.60	Within 1 l/s
	36.60	**43.00**	**35.80**	**-2.2%**	**41.40**	**-3.26%**

RESULTS

Allowable supply trickle error/uncertainty*	**0.11 l/s**
Allowable supply boost error/uncertainty*	**0.38 l/s**
The total measured supply **trickle** air flow rate was within tolerance of the presented design trickle air flow rate	**PASS**
The total measured supply **boost** air flow rate was within tolerance of the presented design boost air flow rate	**PASS**
Trickle supply - variable extract is ≥15%	**PASS**
Boost supply - boost extract is ≥15%	**PASS**
Check on individual minimum **boost** extract rates	**PASS**
Option on compliance that the measure system achieved the presented design air flow rates:-	**PASS**

Overall comments:-

Examples of comments
10mm undercut were present at the time of validation inspection but there were no floor finishes downstairs.
Trickle supply was not greater than trickle extract by 0.4 l/s which is a relatively small variance
The measured boost extract in Bathroom/Ensuite (1) was greater that the allowable 10%

Comments on design:-

The design flowrates provided to the NSAI Validator matched the NSAI design sheet which follows the general ventilation requirements outlined in Clause 1.2.2/1.2.3 of TGD to Part F of the Building Regulations.

SIGNED — **Mr AIVC Validator, 11/03/2021**

Report print date & time — **25/11/2021 12:58**

* Measured error/uncertainty = ± 1 l/s < 10 l/s or 10% > 10 l/s

Sample Ventilation Validation Certificate

Ventilation validation certificate

Dwelling address	**Cedarview House Type B**
Dwelling type	**Semi-detached house**
Total floor area	**159.65** m^2
Ventilation system	MVHR
Date of test	26.09.2019
Installer/builder (if applicable)	
Validation certificate number	1.91.0xx.20.001

Supply air	Presented design supply air flows rates		Measured supply air flow rate at trickle		Measured supply air flow rate at boost	
	Trickle	Boost	Trickle	Tolerance check	Boost	Tolerance check
Living room (1)	11.92	14.00	11.10	-6.9%	13.80	-1.4%
Dining room	4.97	5.83	5.20	Within 1 l/s	5.50	Within 1 l/s
Playroom						
Study room						
Reception room						
Bedroom 1	6.95	8.17	7.00	Within 1 l/s	7.90	Within 1 l/s
Bedroom 2	8.14	9.57	8.30	Within 1 l/s	9.30	Within 1 l/s
Bedroom 3	4.62	5.43	4.40	Within 1 l/s	5.20	Within 1 l/s
Bedroom 4						
Bedroom 5						
Bedroom 6						
	36.60	**43.00**	**36.00**	**-1.64%**	**41.70**	**-3.02%**

Sample Ventilation Validation Certificate

Extract air	Presented design extract air flows rates		Measured extract air flow rate at trickle		Measured extract air flow rate at boost	
	Trickle	Boost	Trickle	Tolerance check	Boost	Tolerance check
Kitchen	11.07	13.00	11.40	3.0%	12.50	-3.8%
Utility room	6.81	8.00	6.40	Within 1 l/s	7.80	Within 1 l/s
Bathroom/Ensuite (1)	6.81	8.00	6.40	Within 1 l/s	7.90	Within 1 l/s
Sanitary accommodation (no bath or shower) (1)	5.11	6.00	5.00	Within 1 l/s	5.80	Within 1 l/s
Bathroom/Ensuite (2)	6.81	8.00	6.60	Within 1 l/s	7.60	Within 1 l/s
	36.60	**43.00**	**35.80**	**-2.2%**	**41.60**	**-3.26%**

RESULTS	
Allowable supply trickle error/uncertainty*	**5.11 l/s**
Allowable supply boost error/uncertainty*	**5.38 l/s**
The total measured supply **trickle** air flow rate was within tolerance of the presented design trickle air flow rate	**PASS**
The total measured supply **boost** air flow rate was within tolerance of the presented design boost air flow rate	**PASS**
Trickle supply > trickle extract but ≥15%	**PASS**
Boost supply > boost extract but ≥15%	**PASS**
Check on individual minimum **boost** extract rates	**PASS**
Option on compliance that the measure system achieved the presented design air flow rates:-	**PASS**

Overall comments:-

Examples of comments

10mm undercut were present at the time of validation inspection but there were no floor finishes downstairs.

Trickle supply was not greater than trickle extract by 0.4 l/s which is a relatively small variance

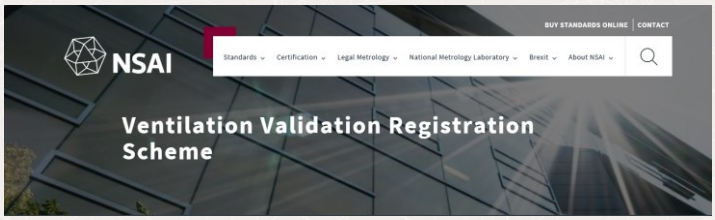
The measured boost extract in Bathroom/Ensuite (1) was greater that the allowable 10%

Comments on design:-

The design flowrates provided to the NSAI Validator matched the NSAI design sheet which follows the general ventilation requirements outlined in Clause 1.2.2/1.2.3 of TGD to Part F of the Building Regulations.

SIGNED	**Mr AIVC Validator, 11/03/2021**	
	Report print date & time	**25/11/2021 12:58**

* Measured error/uncertainty = 1 l/s < 10 l/s or 10% > 10 l/s



Ventilation Validation Registration Scheme

Website

Thank You

November 2021

NSAI Certification