Apache Specification Information

Scottish Building Regulations 2022 Section 6 Guidance

Carbon Dioxide Emissions, Energy Consumption, U-Values, Air Permeability, and HVAC

Project name

Draft - WOSFC Training Centre

Date: Fri Jan 26 17:00:39 2024

Administrative information

Building Details

Address: 71 Glasgow Road, Milngavie, G62 6HX

Agent details

Name: Harley Haddow

Telephone number: 0131 226 3331

Address: 124-125 Princes Street, Edinburgh, EH2 4AD

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.23.0

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.23.0

Compliance module version: v6.1.e.1

Foundation area [m^2]: 390.26

1- The predicted CO_2 emissions and energy consumption

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	16.6	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	14.5	
Target delivered energy rate (TDER), kWh/m^2.annum	115.93	
Building delivered energy rate (BDER), kWh/m^2.annum	99.33	
Do the building's emission and delivered energy rates exceed the targets?	TER N/A	BDER =< TDER

2- The performance of the building fabric and the building services systems

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls	0.21	0.14	0.7	0.14	0T000001:Surf[7]
Floors	0.18	0.1	0.7	0.1	0T000001:Surf[0]
Roofs	0.16	0.1	0.35	0.1	0T000001:Surf[23]
Windows* and roof windows	1.6	1	3.3	1	0T000001:Surf[1]
Rooflights**	2.2	-	3.8	-	No roof lights in building
Personnel doors	1.4	-	3.3	-	No personnel doors in building
Vehicle access & similar large doors	1.5	-	3.3	-	No vehicle access doors in building
High usage entrance doors	3	-	N/A	-	No high usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

$U_{i\text{-}Limit}$ = Limiting individual element U-values [$W/(m^2K)$]

$U_{i\text{-}Calc}$ = Calculated individual element U-values [$W/(m^2K)$]

* Display windows and similar glazing are excluded from the U-value check.

** Values for rooflights refer to the horizontal position.

Air Permeability	This building's value
m3/(h.m2) at 50 Pa	3

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Training Studio - VRF & MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.53	4.37	0	1.5	0.8
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

2- Changing Room 1 - Split System & MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.7	7.5	0	-	0.82
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

3- Panel Heaters

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.67	0	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

4- Changing Room 2 - Split System & MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.7	7.5	0	-	0.82
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

1- DHW - Heat Pump

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	2.25	0.004
Standard value	2*	N/A

* Standard shown is for all types except absorption and gas engine heat pumps.

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
0. Showers 1	-	-	-	1	-	-	-	-	-	-	N/A
0. WC 3 (single)	-	-	1	-	-	-	-	-	-	-	N/A
0. Changing Room 2	-	-	-	1	-	-	-	-	-	-	N/A
0. Changing Room 1	-	-	-	1	-	-	-	-	-	-	N/A
0. Showers 2	-	-	-	1	-	-	-	-	-	-	N/A
0. Accessible WC	-	-	1	-	-	-	-	-	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
0. Training Studio	95	-	-
0. Plant Room	86	-	-
0. Showers 1	95	-	-
0. WC 3 (single)	95	-	-
0. Changing Room 2	95	-	-
0. Changing Room 1	95	-	-
0. Showers 2	95	-	-
0. Cleaning Store	86	-	-
0. Accessible WC	95	-	-
0. WC 2	95	-	-
0. WC 1	95	-	-
0. Entrance Corridor	95	-	-

3- The solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
0. Training Studio	NO (-68.8%)	NO
0. Showers 1	NO (-35.7%)	NO
0. Changing Room 2	NO (-98.5%)	NO
0. Changing Room 1	NO (-99.6%)	NO
0. Showers 2	NO (-36.5%)	NO

Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	424.6	424.6
External area [m^2]	1239.2	1239.2
Weather	GLA	GLA
Infiltration [m^3/hm^2@ 50Pa]	3	4
Average conductance [W/K]	183.25	0
Average U-value [W/m^2K]	0.15	0
Alpha value* [%]	25	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
100	**General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	6.09	7.84
Cooling	0.47	0.54
Auxiliary	22.05	31.26
Lighting	14.68	9.67
Hot water	97.69	74.97
Equipment*	28.23	28.23
TOTAL**	**140.99**	**124.27**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	41.66	8.34
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*41.66*	*8.34*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	49.03	65.82
Primary energy [kWh_{PE}/m^2]	411.7	354.71
Total emissions [kg/m^2]	14.5	16.56

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	182.9	0	50.8	0	7.1	1	0	1	0
	Notional	174.9	0	49.6	0	2.7	0.98	0	----	----
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	36.5	34.8	2.3	2.5	3.4	4.47	3.85	4.7	7.5
	Notional	35	32.6	3.1	1.7	2.5	3.16	5.37	----	----
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	67.9	22.6	4.2	1.6	3.4	4.47	3.85	4.7	7.5
	Notional	31.2	27.8	2.7	1.4	2.5	3.16	5.37	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	25	0.3	1.6	0	30.4	4.3	2.7	4.53	4.37
	Notional	53.9	6.1	4.7	0.3	44.8	3.16	5.37	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type