

Project name

Shell and Core

Unit I

As built

Date: Tue Sep 13 08:40:14 2022

Administrative information

Building Details

Address: Unit I, Rochdale, OL16 4SY

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.15

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.15

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Max Stephenson

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Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	9.5
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	9.5
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	5.9
Are emissions from the building less than or equal to the target?	BER ≤ TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.24	0.24	WR000006:Surf[10]
Floor	0.25	0.08	0.38	GF000004:Surf[0]
Roof	0.25	0.18	0.23	RF000002:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.28	1.3	WR000000:Surf[61]
Personnel doors	2.2	1.76	1.8	WR000000:Surf[1]
Vehicle access & similar large doors	1.5	1.9	1.9	WR000000:Surf[13]
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

U_a-Limit = Limiting area-weighted average U-values [W/(m²K)]U_a-Calc = Calculated area-weighted average U-values [W/(m²K)]U_i-Calc = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

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

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	1.42

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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- HVAC 01b: LTHW EV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.93	-	0.3	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

2- HVAC 01a: LTHW NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.93	-	0.3	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

3- HVAC 02b: VRF MVHR FF/SF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.04	3.42	0	-	0.79
Standard value	2.5*	2.6	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

4- HVAC 02a: VRF MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.63	3.42	0	-	0.79
Standard value	2.5*	2.6	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

5- HVAC 01c: LTHW EV Hub

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.93	-	0.3	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

6- HVAC 02c: VRF MVHR Hub

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.93	3.42	0	-	0.83
Standard value	2.5*	2.6	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

1- DHW 01: Gas-Fired Boiler Office

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.93	0.01
Standard value	0.8	N/A

2- DHW 02: Gas-Fired Boiler Transport Office

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.99	0.004
Standard value	0.8	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
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 supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

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	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
GF.07 Male WC		-	-	0.3	-	-	-	-	-	-	-	N/A
GF.05 Female WC		-	-	0.3	-	-	-	-	-	-	-	N/A
FF.06 Tea Point		-	-	-	1.3	-	-	-	-	-	-	N/A
GF.08 Main Office		-	-	-	1.3	-	-	-	-	-	-	N/A
GF.08 Tea Point		-	-	-	1.3	-	-	-	-	-	-	N/A
SF.06 Tea Point		-	-	-	1.3	-	-	-	-	-	-	N/A
SF.06 Main Office		-	-	-	1.3	-	-	-	-	-	-	N/A
SF.03 Female WC		-	-	0.3	-	-	-	-	-	-	-	N/A
SF.05 Male WC		-	-	0.3	-	-	-	-	-	-	-	N/A
GF.02 Reception/Lobby		-	-	-	1.3	-	-	-	-	-	-	N/A
FF.03 Female WC		-	-	0.3	-	-	-	-	-	-	-	N/A
FF.05 Male WC		-	-	0.3	-	-	-	-	-	-	-	N/A
FF.06 Main Office		-	-	-	1.3	-	-	-	-	-	-	N/A
GF.14 Female		-	-	0.3	-	-	-	-	-	-	-	N/A
GF.13 Male		-	-	0.3	-	-	-	-	-	-	-	N/A
GF.15 Cleaners		-	-	0.3	-	-	-	-	-	-	-	N/A
FF.09 Transport Office		-	-	-	1	-	-	-	-	-	-	N/A
GF.11 Transport Office		-	-	-	1	-	-	-	-	-	-	N/A
FF.12 Female		-	-	0.3	-	-	-	-	-	-	-	N/A
FF.11 Male		-	-	0.3	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Excluded from calculation?
GF.07 Male WC	NO
GF.05 Female WC	NO

Shell and core configuration

Zone	Excluded from calculation?
GF.06 Disabled WC	NO
FF.01 Ciculation	NO
FF.06 Tea Point	NO
GF.08 Main Office	NO
GF.08 Tea Point	NO
SF.01 Ciculation	NO
SF.06 Tea Point	NO
SF.06 Main Office	NO
SF.03 Female WC	NO
SF.05 Male WC	NO
SF.04 Disabled WC	NO
GF.02 Reception/Lobby	NO
Warehouse	NO
GF.04 Cleaner	NO
GF.03 Stair 01	NO
FF.02 Stair 01	NO
SF.02 Stair 01	NO
FF.03 Female WC	NO
FF.04 Disbaled WC	NO
FF.05 Male WC	NO
FF.06 Main Office	NO
RF.02 Stair 01	NO
GF.10 Stair 2	NO
FF.08 Stair 02	NO
SF.08 Stair 02	NO
GF.14 Female	NO
GF.13 Male	NO
GF.15 Cleaners	NO
GF.16 Stair 03	NO
FF.14 Store	NO
FF.09 Transport Office	NO
GF.16 Stair Lobby 03	NO
GF.11 Transport Office	NO
FF.13 Stair Lobby 03	NO
FF.13 Stair 03	NO
FF.12 Female	NO
FF.11 Male	NO

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
GF.07 Male WC		-	103	-	54
GF.05 Female WC		-	103	-	50
GF.06 Disabled WC		-	93	-	25
FF.01 Ciculation		-	110	-	86

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
FF.06 Tea Point		114	-	-	15
GF.08 Main Office		114	-	-	1825
GF.08 Tea Point		114	-	-	15
SF.01 Ciculation		-	110	-	86
SF.06 Tea Point		114	-	-	15
SF.06 Main Office		114	-	-	1824
SF.03 Female WC		-	103	-	50
SF.05 Male WC		-	103	-	54
SF.04 Disabled WC		-	93	-	25
GF.02 Reception/Lobby		-	105	100	181
Warehouse		100	-	-	126598
GF.04 Cleaner		85	-	-	12
GF.03 Stair 01		-	85	-	39
FF.02 Stair 01		-	85	-	57
SF.02 Stair 01		-	85	-	57
FF.03 Female WC		-	103	-	50
FF.04 Disbaled WC		-	93	-	25
FF.05 Male WC		-	103	-	54
FF.06 Main Office		114	-	-	1824
RF.02 Stair 01		-	110	-	45
GF.10 Stair 2		-	85	-	62
FF.08 Stair 02		-	85	-	62
SF.08 Stair 02		-	110	-	48
GF.14 Female		-	103	-	21
GF.13 Male		-	103	-	21
GF.15 Cleaners		85	-	-	7
GF.16 Stair 03		-	85	-	39
FF.14 Store		85	-	-	4
FF.09 Transport Office		114	-	-	787
GF.16 Stair Lobby 03		-	110	-	25
GF.11 Transport Office		114	-	-	786
FF.13 Stair Lobby 03		-	110	-	22
FF.13 Stair 03		-	85	-	31
FF.12 Female		-	103	-	21
FF.11 Male		-	103	-	21

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
FF.06 Tea Point	NO (-24.9%)	NO
GF.08 Main Office	NO (-58.5%)	NO
GF.08 Tea Point	NO (-26.8%)	NO
SF.06 Tea Point	NO (-25%)	NO
SF.06 Main Office	NO (-57.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF.02 Reception/Lobby	NO (-56.9%)	NO
Warehouse	NO (-25.3%)	NO
FF.06 Main Office	NO (-57%)	NO
FF.09 Transport Office	NO (-75.3%)	NO
GF.11 Transport Office	NO (-74.5%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of 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
Area [m ²]	30785.4	30785.4
External area [m ²]	72286.3	72286.3
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	1	3
Average conductance [W/K]	15927.6	18625.8
Average U-value [W/m ² K]	0.22	0.26
Alpha value* [%]	9.96	10

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
100	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 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/m²]

	Actual	Notional
Heating	0.61	0.76
Cooling	0.22	0.34
Auxiliary	0.31	0.24
Lighting	8.3	15.86
Hot water	5.34	4.61
Equipment*	30.33	30.33
TOTAL**	14.78	21.81

* 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/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	6.28	8.26
Primary energy* [kWh/m ²]	34.64	56.13
Total emissions [kg/m ²]	5.9	9.5

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

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 SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	169.3	0	53.8	0	2.1	0.87	0	0.93	0
Notional	191.8	0	61.8	0	1.2	0.86	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	57.9	0	18.4	0	8.2	0.87	0	0.93	0
Notional	42.9	0	13.8	0	13.6	0.86	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	29.7	62	2.3	4.4	5.4	3.56	3.91	3.63	5.23
Notional	30.3	101.7	3.3	7.5	3.7	2.56	3.79	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	56.7	0	18	0	10.4	0.87	0	0.93	0
Notional	53.1	0	17.1	0	17.9	0.86	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	27.8	80.1	2	5.3	5.2	3.96	4.22	4.04	5.64
Notional	30.9	112.5	3.4	8.2	3.6	2.56	3.79	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	50.1	51.5	3.6	3.6	3.8	3.85	3.97	3.93	5.31
Notional	84	67.7	9.1	5	3.6	2.56	3.79	----	----
[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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.24	WR000006:Surf[10]
Floor	0.2	0.07	WR000000:Surf[0]
Roof	0.15	0.18	WR000002:Surf[2]
Windows, roof windows, and rooflights	1.5	1.1	WR000006:Surf[5]
Personnel doors	1.5	1.1	WR000010:Surf[13]
Vehicle access & similar large doors	1.5	1.9	WR000000:Surf[13]
High usage entrance doors	1.5	-	No High usage entrance doors in building
U _{i-Typ} = Typical individual element U-values [W/(m²K)]			U _{i-Min} = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	1.42