

Note Title	SAP Results (Part L 2021 Volume 1) – STAGE 4		
Note Date	08/11/2024	Note Author	BK
Note Circulation	External issue	Note Status	v.01

Dwyer Road is a proposed residential development based in Reading. The proposal will include a block of 15no. 1 & 2 bed residential flats along with 12no. 3 & 4 bed terraced houses, 4no. 4 bed semi-detached houses and 1no. 5 bed detached house.

The project is currently at Stage 4 and the SAP calculations that were carried out to show compliance with *Building Regulations Part L 2021: Volume 1* have been updated from Stage 3B.

Stage 4 SAP Results – CO2 Emissions & Fabric Efficiency Performance

The results for the assessed properties are presented in Table 1 and depicts compliance in terms of the following Part L 2021 criteria. In addition, the SAP rating has been presented for each dwelling.

- The Part L 'notional' target vs. dwelling primary energy rate (TPER>DPER)
- The Part L 'notional' target vs. dwelling CO2 emissions rate (TER>DER)
- The Part L 'notional' target vs. dwelling fabric energy efficiency rate (TFEE>DFEE).

The dwellings references for the terraced and semi-detached houses have been marked up within Figure 1 in line with information received from the client on 23.10.2024. The flats use the unit references in line with the floorplans by PDP Architecture LLP in July 2024.



Figure 1: Dwelling reference markup for terraced and semi-detached houses

Table 1. CO2 Emissions & Fabric Efficiency Performance

Dwelling Ref.	Primary Energy Rate			CO2 emissions rate (kgCO2/yr.m ²)			Fabric Energy Efficiency (kWh/m ² .yr)			SAP Rating
	DPER	TPER	Dwelling Primary Energy Improvement DPER < TPER (%)	DER	TER	Dwelling Emissions Improvement DER < TER (%)	DFEE	TFEE	Dwelling Fabric Improvement DFEE < TFEE (%)	
Block A-Unit 01- Flat-GF	13.14	84.04	84.37	0.06	15.81	99.62	42.44	44.57	4.78	96
Block A-Unit 02- Flat-GF	11.89	83.1	85.69	-0.07	15.63	100.45	39.62	43.47	8.85	97
Block A-Unit 03- Flat-GF	10.34	79.97	87.07	-0.23	15.04	101.53	35.18	39.68	11.34	97
Block A-Unit 04- Flat-1F	6.72	71.18	90.57	-0.6	13.42	104.47	28.38	33.85	16.17	98
Block A-Unit 05- Flat-1F	6.3	71.19	91.16	-0.64	13.42	104.77	27.39	33.67	18.66	99
Block A-Unit 06- Flat-1F	5.06	66.41	92.39	-0.77	12.52	106.15	22.36	28.27	20.89	99
Block A-Unit 07- Flat-1F	8.78	78.93	88.88	-0.39	14.85	102.63	31.74	39.05	18.72	98
Block A-Unit 08- Flat-2F	6.62	71.18	90.71	-0.61	13.42	104.55	28.13	33.84	16.89	98
Block A-Unit 09- Flat-2F	6.3	71.19	91.16	-0.64	13.42	104.77	27.39	33.67	18.66	99
Block A-Unit 10- Flat-2F	4.53	64.48	92.97	-0.82	12.16	106.74	20.76	26.62	22.02	99
Block A-Unit 11- Flat-2F	4.69	64.11	92.68	-0.81	12.1	106.69	21.3	26.55	19.78	99
Block A-Unit 12- Flat-3F	10.34	88.26	88.28	-0.23	16.59	101.39	36.61	48.09	23.88	97
Block A-Unit 13- Flat-3F	9.3	91.67	89.85	-0.33	17.22	101.92	34.21	50.68	32.5	98
Block A-Unit 14- Flat-3F	6.44	79.24	91.88	-0.63	14.9	104.23	26.11	39.1	33.22	98
Block A-Unit 15- Flat-3F	6.8	83.68	91.88	-0.59	15.73	103.75	27.03	43.03	37.18	98
Terrace Type A_4B-8P_16	9.41	58.96	84.04	0.96	11.25	91.47	33.91	43.06	21.25	96
Terrace Type B_4B-8P_17	6.79	49.93	86.4	0.7	9.55	92.67	28.95	35.37	18.16	97

Dwelling Ref.	Primary Energy Rate			CO2 emissions rate (kgCO2/yr.m ²)			Fabric Energy Efficiency (kWh/m ² ·yr)			SAP Rating
	DPER	TPER	Dwelling Primary Energy Improvement DPER < TPER (%)	DER	TER	Dwelling Emissions Improvement DER < TER (%)	DFEE	TFEE	Dwelling Fabric Improvement DFEE < TFEE (%)	
Terrace Type C_3B-5P_3-18-23	8.86	50.15	82.33	-0.1	9.65	101.04	29.12	31.42	7.33	97
Terrace Type B_4B-8P_24	6.79	49.93	86.4	0.7	9.55	92.67	28.95	35.37	18.16	97
Terrace Type A_4B-8P_25	9.41	58.96	84.04	0.96	11.25	91.47	33.91	43.06	21.25	96
Semi-detached Type D_4B-8P_27 & 29	11.38	58.76	80.63	1.15	11.19	89.72	35.82	46.87	23.58	95
Semi-detached Type D_4B-8P_26 & 28	11.38	58.76	80.63	1.15	11.19	89.72	35.82	46.87	23.58	95
Detached Type E_5B-10P_30	11.38	58.76	80.63	1.15	11.19	89.72	35.82	46.87	23.58	95

The results indicate that all dwellings meet the requirements of Part L 2021. The drawings, fabric details and building services inputs and information used within these calculations are presented within the following sections.

Stage 4 SAP Calculation Inputs & Information

Architectural Drawings & Information

The geometry of the Stage 4 SAP calculations is based on the drawings by PDP Architecture LLP dated July 2024. The drawings used are as follows.

Flats

- 28178-WD110-Flats-(block-4)-Plan-Rev.C; ground to third floors & roof plan
- 28178-WD210-Flats-(block-4)-Elevation-Rev.A; South, East & West
- 28178-WD212-Flats-(block-4)-North-Elevation-Rev.B
- 28178-WD310-Flats-(block-4)-Section-A-A-Rev -

Terraced Houses

- 28178-WD120-Terrace-(Block-1)-Sheet-01& 02-Ground-&-First-Floor-Plans-Rev.B
- 28178-WD122-Terrace-(block-1)-Sheet-01 & 02-Second-Floor-&-Roof-Plans-Rev.A

- 28178-WD220-Terrace-(block-1) -Elevation-Rev.- North, South, East & West
- 28178-WD320-Terrace-(block-1)-Section-A-A-&-B-B-Rev.- & Section C-C-Rev.-

Semi-Detached Houses

- 28178-WD130-Semi-detached-(block-2)-Floor-Plans-Rev.A
- 28178-WD230-Semi-detached-(block-2)-Elevations-Rev.A
- 28178-WD330-Semi-detached-(block-2)-Sections-Rev.-

Detached House

- 28178-WD140-Detached-Unit-(Block-3)-Floor-Plans-Rev.A
- 28178-WD240-Detached-Unit-(Block-3)-Elevations-Rev.-
- 28178-WD340-Detached-Unit-(Block-3)-Sections-Rev.-

Building Fabric Inputs & Information

The building fabric information used within the Stage 4 SAP calculations are presented below. U-values of all relevant thermal elements have been considered alongside the air permeability and thermal bridging aspects of the proposed scheme.

Table 2: Building Fabric inputs and information sources – U-values & Air Permeability.

Thermal Elements	Stage 4 Fabric Inputs		
	U-Values of Thermal Elements	Units	Information source
External wall (EW-02)	0.13	W/m ² K	Stage 3B drawings by HTA Design: RBC-DRR-HTA-A_DR_4200 - Element Types - External Walls-Rev A
Wall to unheated corridor (CW-03)	0.16	W/m ² K	RBC-DRR-HTA-A_DR_4210 - Element Types - Compartment Walls-Rev A
Wall to unheated spaces; plant, stores etc. (CW-04, CW-05)	0.16	W/m ² K	RBC-DRR-HTA-A_DR_4210 - Element Types - Compartment Walls-Rev A
Ground floor (GF-01)	0.13	W/m ² K	RBC-DRR-HTA-A_DR_4230 - Element Types - Ground Floor Types-Rev A
Exposed floor to unheated spaces; plant, stores etc. (IF-03)	0.16	W/m ² K	RBC-DRR-HTA-A_DR_4240 - Element Types - Intermediate Floor Types-Rev B

Thermal Elements	Stage 4 Fabric Inputs		
	U-Values of Thermal Elements	Units	Information source
Top Roof; Flat & Pitched roofs (RT-01, 03 & RT-02)	0.10	W/m ² K	RBC-DRR-HTA-A_DR_4260 - Element Types - Roof Types-Rev B
Openings - Glazing	Flats - 0.88 (g-value 0.50, frame factor 0.80) Houses - 0.88 (g-value 0.50, frame factor 0.80)	W/m ² K	Specification confirmed by client via email on 23.10.2024
Openings - Entrance Doors	1.0	W/m ² K	Specification tbc

Air Permeability - Terraced houses	0.60	m ³ /m ² .hour	Assumed - Confirmed target by Francis Construction on 18.09.2024
Air Permeability - Flats, Semi-detached and Detached Houses	1.00	m ³ /m ² .hour	

Table 3 presents the detailed thermal bridging inputs that have been incorporated within the Stage 4 SAP calculations. The psi-values included are based on 6no. details that were individually assessed at a previous stage and assumptions have been made for the remainder of the junctions.

The assumptions allow for half the heat losses of the 'default' figures noted in SAP 10.2 Appendix K. The performances of these junctions will require verification prior to carrying out the Stage 5 Construction / Post-construction SAP calculations.

It has been noted that using the 'default' psi-values from SAP 10.2 Appendix K for the junctions that have not been assessed will affect the performance of the flats and end-terrace houses so that they do not meet the Part L 2021 fabric efficiency (DFEE<TFEE) target.

Table 3: Thermal Bridging psi-value inputs

Junction SAP ID	Junction description	Assigned psi-value (W/mK)	Source or assumption
All dwellings			
E2	lintels	0.003	independently assessed
E3	sill	0.020	independently assessed
E4	jamb	0.020	independently assessed
E5	ground floor	0.268	independently assessed
E20	exposed floor (normal)	0.160	assumed - minimum required
E16	corner	0.090	assumed - minimum required

Junction SAP ID	Junction description	Assigned psi-value (W/mK)	Source or assumption
E17	inverted corner	-0.090	assumed - minimum required
E18	party wall between dwellings	0.120	assumed - minimum required
E25	staggered party wall between dwellings	0.120	assumed - minimum required
E14	flat roof	0.080	assumed - minimum required
E15	flat roof with parapet	0.150	assumed - minimum required
P1	party wall - ground floor	0.160	assumed - minimum required
P8	exposed floor (inverted)	0.240	assumed - minimum required
Flats only			
E7	party floor between dwellings (flats)	0.140	assumed - minimum required
E23	balcony within or between dwellings (balcony support penetrated wall insulation)	0.083	independently assessed
Houses only			
E6	intermediate floor within a dwelling	0.070	assumed - minimum required
E10	eaves (insulation at ceiling level)	0.060	assumed - minimum required
E11	eaves (insulation at rafter level)	0.016	independently assessed

Building Services & Renewables Inputs & Information

The building services and renewable energy generation information used within the Stage 4 SAP calculations are presented below. The space and hot water heating, ventilation and lighting elements have been considered alongside the renewable energy generation via PV panels to be installed throughout the proposed scheme.

Table 4: Building services inputs & information sources

Services Category	Specification	Information source
Flats		
Space Heating	Nilan Compact P unit per flat to provide heating and cooling (if needed), via underfloor heating (UFH). Performance - Split Efficiency; 307.07 (winter), 194.18 (summer) Controls - Time and temperature zone control by device in PCDB.	The following documents from Hydrock; 'Stage 4 MEP Performance Specification' (document ref: 26888-HYD-XX-XX-SP-ME-0001) 'Mechanical Equipment Schedule' (document ref: 26888-HYD-XX-XX-SH-M-0001)
Hot Water	Nilan Compact P unit to provide hot water - with 180 litre cylinder to each flat. Installation will have fully insulated primary pipework. Controls - Independent time control.	

Services Category	Specification	Information source
Ventilation	Nilan Compact P unit to have MVHR integrated with up to 95% heat recovery efficiency. Specific Fan Power (SFP) 0.73 W/L.s	
Lighting	Lighting to have minimum 75 lm/W luminous efficacy throughout.	Minimum Part L 2021 requirement
Renewables; PV panel performance	Total peak generation of 31.4 kWp for all flats.	Assumption from Stage 3B calculation. Confirmed by Francis Construction on 20.09.2024.
Terraced, Semi-detached, Detached Houses		
Space Heating	Mitsubishi - Ecodan - POUZ -WM85VAA (6 kW output) unit per dwelling to provide heating and cooling (if needed), via underfloor heating (UFH). Performance - Split Efficiency; 337.91 (winter), 188.72 (summer) Controls - Programmer and room thermostat.	The following documents from Hydrock; 'Stage 4 MEP Performance Specification' (document ref: 26888-HYD-XX-XX-SP-ME-0001) 'Mechanical Equipment Schedule' (document ref: 26888-HYD-XX-XX-SH-M-0001)
Hot Water	Mitsubishi - Ecodan - POUZ -WM85VAA (6 kW output) unit to provide hot water within storage cylinders as follows. - 210 litre cylinders for 3-bed houses - 250 litre cylinders for 4-bed houses - 300 litre cylinder for the 5-bedhouse. Installations will have fully insulated primary pipework. Controls - No independent time controls.	
Ventilation	Nuair MRXBOXECO5 MVHR units to be included with up to 95% heat recovery efficiency. SFP ranges from 0.61-0.68 W/L.s	
Lighting	Lighting to have minimum 75 lm/W luminous efficacy throughout.	Minimum Part L 2021 requirement
Renewables; PV panel performance	Peak generation from PV panels as follows. - 3-bed houses - 3.18 kWp - 4-bed houses - 4.83 kWp (Type A), 5.11 (Type B) - 5-bed house - 5.96 kWp	Assumption from Stage 3B calculation. Confirmed by Francis Construction on 20.09.2024.