Architype Studies – Zero Carbon Pathways

1 SWT is creating c12 high level architype pathways to zero carbon (table 2) which also consider a properties form (bungalow, house, apartment). This strategy places significant emphasis on the architype studies to establish our base line, targets and pathways to zero carbon.

2 The importance of zero carbon pathway modelling is critical to understand the investment decisions including the sequence of investment based on a fabric first approach.

3 The Council has 14 SWT property architypes (Table 1). These high level studies cover 96% of SWT homes and will ultimately be transparent to allow tenants, staff and Members to understand how SWT plan to achieve zero carbon and reduce fuel usage for each home/architype. As more individual property studies are conducted baselines, targets and pathways will be refined.

Table 1 - Profile of SWT stock by architype

Architype	SWT Units
Conventional	4417
Easiform	407
Cornish PRC	359
Woolaway*	218
Airy	24
BISF	77
HSG REV AC	1
Relocat	10
Special PP	3
Rema PRC	43
Stanard WIC	8
Tru-steel	24
Concrete	63
Timber	52
	5706

* *Some woolaways are currently under demolition*

4 Table 2 is a summary of the baseline for architypes and the optimum reduced heat demand each architype could achieve following its Zero Carbon Pathway. Thes architype templates help officers understand the measures and sequence of investment to achieve zero carbon. These studies show the importance of considering each architype on its merit and these high level studies are followed

by whole house and block surveys often using the PAS 2035 assessment process.

Table 2 – Property Architype Studies

SWT Architype Studies 2022						
Architype		% of SMT Stock	Units	Heat demand Baseline (kWh/m2/yr)	Ambitious 2040 Heat demand (kWh/M2/yr)	Modelled 2040 heat demand as % of 2022 heat demand
1	Conventional House	77.40%	4417	130	49.75	30.62%
2	Conventional Apartment				25	
3	Conventional Bungalow				41.25	
4	Woolaway House semi	3.80%	218	170	37	29.41%
5	Woolaway House Terrace				37	
6	Cornish House	6.30%	359	160	65	40.63%
7	Cornish Apartment				65	
8	Cornish bungalow				65	
9	Easiform House	7.10%	407	139	57	38.13%
10	Easiform Apartment				53	
11	Easiform maisonette				53	
12	BISF House Semi	1.30%	77	159	56	35.22%
13	Others	4.10%	228	No Architype studies planned assume 130	50	38.46%
		100.00%	5706	135	42	32%

5 Below are a number of examples of Zero Carbon Pathways. Each pathway provides a guide to the investments required to achieve the optimum reduced heat demand.

6 The tables shown in the left hand column the main retrofit components and their baseline qualities. Reading to the right the low carbon qualities of the architype improve with the right hand column considered the best low carbon standard.

7 The strategy has set a heat demand of c50kWh/m2/yr and therefore the optimum investment and measures will be to the right of the table but not necessarily the furthest right. It must be remembered that if the architype is using electric heat and power then with a decarbonised grid the property will be Zero Carbon.

8 Architype studies are helpful in modelling and creating broad investment decisions. However each property will need to be surveyed and considered on its own merit and peculiarities. Individual property assessments will often lead to low carbon property designs.

9 The architype studies have identified some common requirements for example most of SWTs homes will require external wall insulation, double glazing with a minimum u value of 1.2 and doors with a U value of between 1 and 1.2, loft insulation to a depth of 450mm and some form of mechanical ventilation.

10 The architype studies have also identified that disruptive floor insulation can be avoided in all properties except bungalows if walls, windows, roofs and doors achieve the higher standard. Insulating under wooded floors is significantly more practical than insulating on top of concrete floors. Insulating concrete floors require surface insulation which raises the floor level and has an impact on many other components such as kitchen units, skirting, stairs and their falls, door heights and bathroom furniture.

11 On the following pages are a sample of architype studies and pathways to zero carbon

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Pathway to Zero Carbon – System Built non traditional semi-detached house

[redacted]	Baseline	Fabric <90 kWh/m²	EPC-B	EPC-A
EPC Information		EWI/DOORS & WINDOWS/AP50/MEV	...plus PV	...plus FLOOR/ASHP/MVHR/AP50
Existing EPC	**E-48**			
Full SAP EPC Rating	**E-48**	**C-73**	**B-89**	**A-95**
Final Heat Demand (kWh/m²/year)	**193**	**49.75**	**49.75**	**25**
Floor U Value	0.73	0.73	0.73	0.18
Wall U-Value (Sys Build)	2	0.2	0.2	0.2
Roof U-Value	2.4	0.13	0.13	0.13
Door U-Value	2.85	1.2	1.2	1.2
Window U-Value	2.7	1.2	1.2	1.2
Air Tightness	9.78	5	5	3
Solar PV KWP			3	3
ASHP				YES
Ventilation Type	IEV	MEV	MEV	MVHR
Thermal Efficiency				90%

Pathway to Zero Carbon – Easiform non traditional apartment

Property: Flat	Baseline	Phase 1A < 90kWh/m²/yr	Phase 1B – EPC C	Gas Option	Phase 2 – EPC B	Phase 3 – NET Zero Future
EPC Information		CWI + Openings	Phase 1A + MVHR	Phase 1B – Gas boiler** instead of ASHP	Phase 1B + Solar	Phase 2 + EWI
Existing EPC	**D-56**					
Full SAP EPC Rating	**D-60**	**C-69**	**C-72**	**C-73**	**B-82**	**B-85**
Final Heat Demand (kWh/m²/year)	**138.7**	**65.4**	**56.9**	**62.9**	**56.9**	**35.5**
Floor U Value	0.80	0.80	0.80	0.80	0.80	0.80
Wall U-Value Level*	1.23	**0.52**	0.52	0.52	0.52	**0.18**
Roof U-Value	N/A	N/A	N/A	N/A	N/A	N/A
Door U-Value	3.00	**1.20**	1.20	1.20	1.20	1.20
Window U-Value	2.80	**1.00**	1.00	1.00	1.00	1.00
Air Tightness (AP50)	4.99	**3.00**	3.00	3.00	3.00	3.00
Solar PV KWP					**1.5 (SW)**	1.5 (SW)
ASHP	Daikin	Daikin	Daikin		Daikin	Daikin
Ventilation Type	None	None	**MVHR**	MVHR	MVHR	MVHR
Thermal Efficiency						

Pathway to Zero Carbon – conventional brick built Bungalow

	Baseline	Fabric <90 kWh/m²	EPC-B	EPC-A
EPC Information		EWI/DOORS & WINDOWS/AP50/MEV	...plus PV	...plus FLOOR/MVHR
Existing EPC	E-43			
Full SAP EPC Rating	**E-45**	**C-73**	**B-91**	**A-96**
Final Heat Demand (kWh/m²/year)	**188**	**83.25**	**83.25**	**41.25**
Floor U Value	0.72	0.72	0.72	0.18
Wall U-Value	1.55	0.18	0.18	0.18
Roof U-Value	0.27	0.13	0.13	0.13
Door U-Value	3.05/4.5*	1.2	1.2	1.2
Window U-Value	2.8	1.2	1.2	1.2
Air Tightness	6.57	3	3	3
Solar PV KWP			2.5	2.5
ASHP	YES**	YES**	YES**	YES**
Ventilation Type	IEV	MEV	MEV	MVHR
Thermal Efficiency				90%

Pathway to Zero Carbon – Carvity Wall Semi detached Bungalow

	Baseline	Fabric <90 kWh/m^2	EPC-B	EPC-A
EPC Information		EWI/DOORS & WINDOWS/AP50/MEV	...plus PV	...plus FLOOR/ASHP/MVHR/AP50
Existing EPC	**D-65**			
Full SAP EPC Rating	**D-58**	**C-70**	**B-86**	**A-93**
Final Heat Demand (kWh/m^2/year)	**159.75**	**76.25**	**76.25**	**27.75**
Floor U Value	0.67	0.67	0.67	0.18
Wall U-Value	1.55	0.18	0.18	0.18
Roof U-Value	0.2	0.13	0.13	0.13
Door U-Value	2.9	1	1	1
Window U-Value	2.8	1	1	1
Air Tightness	7.82	3	3	3
Solar PV KWP			3	3
ASHP				YES
Ventilation Type	IEV	MEV	MEV	MVHR
Thermal Efficiency				90%

Pathway to Zero Carbon – conventional brick built Semi detached

Property: Drive	Baseline	Fabric <90 kWh/m²	EPC-B	EPC-A
EPC Information		EWI/DOORS & WINDOWS/AP50/MEV	...plus PV	,,,plus FLOOR/MVHR/ASHP/LOFT
Existing EPC	**D-68**			
Full SAP EPC Rating	**D-63**	**C-75**	**B-85**	**A-92**
Final Heat Demand (kWh/m²/year)	**110.75**	**45.5**	**45.5**	**24**
Floor U Value	0.5	0.5	0.5	0.18
Wall U-Value	1.55	0.18	0.18	0.18
Roof U-Value	0.2	0.2	0.2	0.13
Door U-Value	2.9	1.2	1.2	1.2
Window U-Value	2.8	1.2	1.2	1.2
Air Tightness	11.88	3	3	3
Solar PV KWP			3	3
ASHP				YES
Ventilation Type	IEV	MEV	MEV	MVHR
Thermal Efficiency				90%

Pathway to Zero Carbon – Top floor flat non traditional 3 story block

Property: Rd	Baseline	Fabric <90 kWh/m^2	EPC-B	EPC-A
EPC Information		CWI/FLAT ROOF/MEV	...plus Solar	....plus EWI/W&D/MVHR
Existing EPC	**D-64**			
Full SAP EPC Rating	**D-56**	**C-73**	**B-89**	**A-94**
Final Heat Demand (kWh/m^2/year)	**187**	**60**	**60**	**25**
Floor U Value	N/A	N/A	N/A	N/A
Wall U-Value	1.55	0.55	0.55	0.18
Roof U-Value	2.03	0.19	0.19	0.19
Door U-Value	2.9	2.9	2.9	1
Window U-Value	2.8	2.8	2.8	1
Air Tightness	4.17	4.17	4.17	3
Solar PV KWP			2.5	2.5
ASHP				
Ventilation Type	IEV	MEV	MEV	MVHR
Thermal Efficiency				90%

Pathway to Zero Carbon – Woolaway non traditional terrace

Property :	Baseline	Fabric <90 kWh/m^2	EPC-C	EPC-B	EPC-A	LETI – Best Practice	LETI - Exemplar	Net Zero
EPC Information		EWI, Windows, Doors, Roof & MEV	EWI, Windows, Doors, Roof & MEV	EWI, Windows, Doors, Roof, PV & MEV	EWI, Windows, Doors, Roof, Floor, PV & MVHR	LETI Retrofit Standard (Best Practice)	LETI Retrofit Standard (Exemplar)	LETI New Build Standard
Existing EPC	E-46							
Predicted EPC (as tested)	E-46							
Predicted EPC (with evidence)								
Full SAP EPC Rating	E-43	C-72	C-72	B-86	A-92	A-93	A-97	A-97
Heat Demand:								
Final Heat Demand (kWh/m^2/year)	222.43	80.4	83.6	83.6	52.14	47.02	44.03	42.17
Model Inputs:								
Floor U Value	0.77	0.77	0.77	0.77	0.2	0.15	0.15	0.15
Wall U-Value (System Build)	2.16	0.15	0.15	0.15	0.15	0.18	0.15	0.13
Roof U-Value	0.5	0.13	0.15	0.15	0.13	0.12	0.12	0.1
Door U-Value	3	1.2	1.6	1.6	1.4	1	0.8	0.8
Window U-Value	2.7	1.2	1.4	1.4	1.2	0.8	0.8	0.8
Air Tightness	11.92	3	3	3	3	2	1	1
Thermal Mass Parameter	High	High	High	High	High	High	High	High
Thermal Bridging	35.72	32.85	32.85	32.85	18.14	18.14	18.14	18.14
Solar PV KWP				2.5	2.5	2.5	2.5	3.0
Ventilation Inputs:								
Ventilation Type	IEV	MEV	MEV	MEV	MVHR	MVHR	MVHR	MVHR
Thermal Efficiency					90%	90%	90%	90%