



# Gullwing retrofit for Dublin City Council

Summary by Simon McGuinness, MRIAI

# Project brief

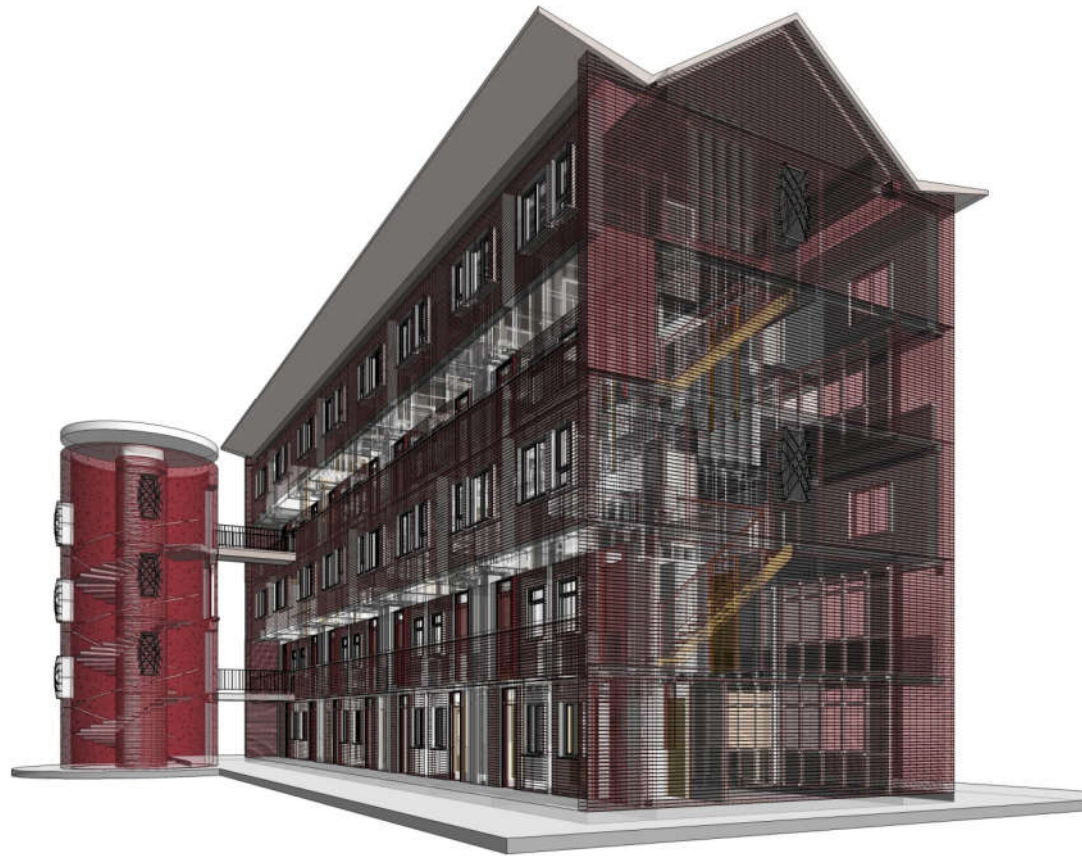
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- ▶ Achieve a BER of A3
- ▶ Achieve compliance with Part L, 2011 (new build)
- ▶ Condensation risk
- ▶ Surface temperatures
- ▶ Calculated linear thermal bridges



# Investigation

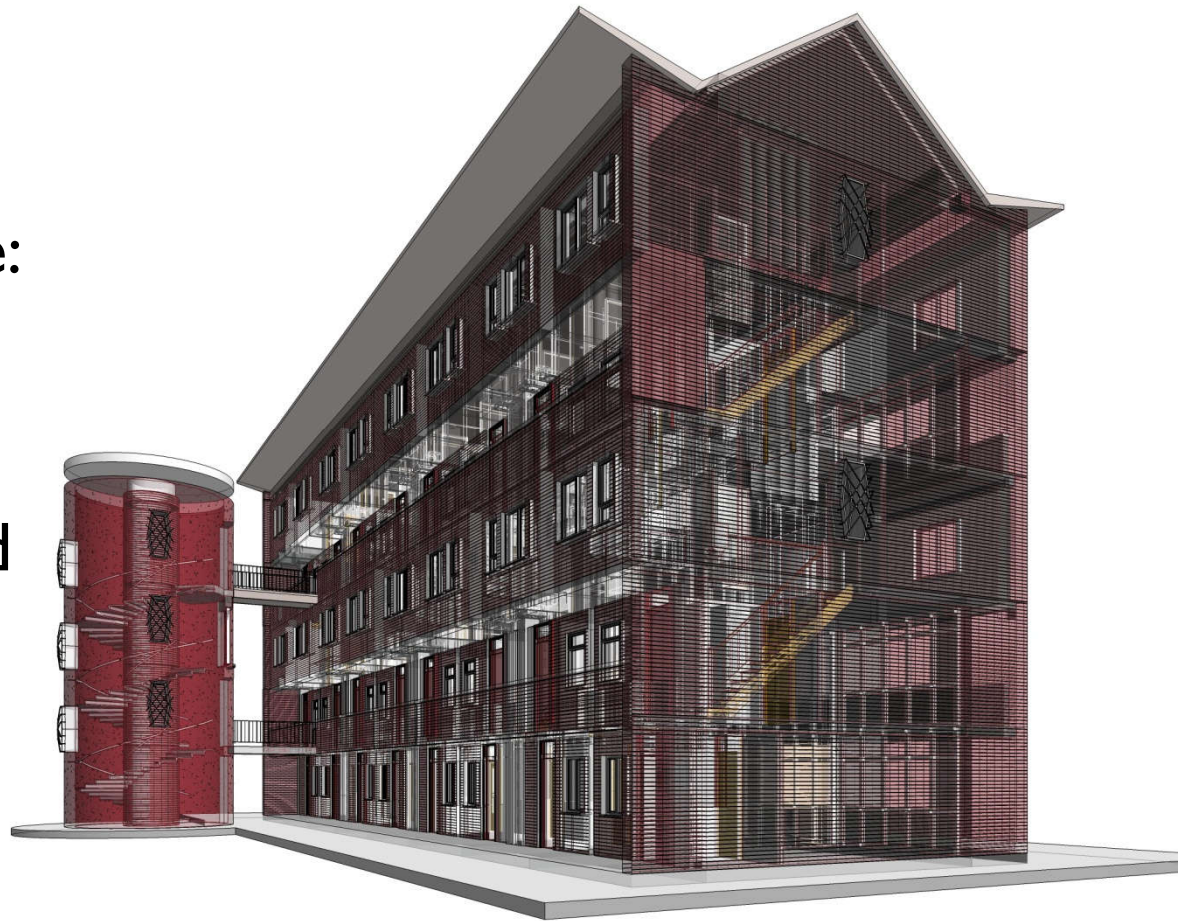
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# Investigation

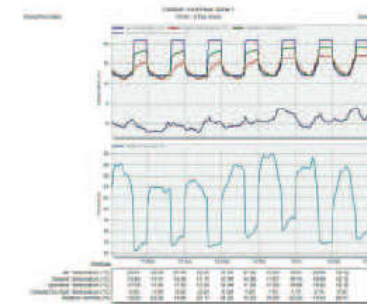
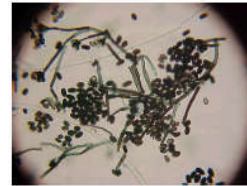
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- ▶ The buildings are:
- ▶ Well designed
- ▶ Robustly detailed
- ▶ Resilient
- ▶ Upgraded
- ▶ Well located

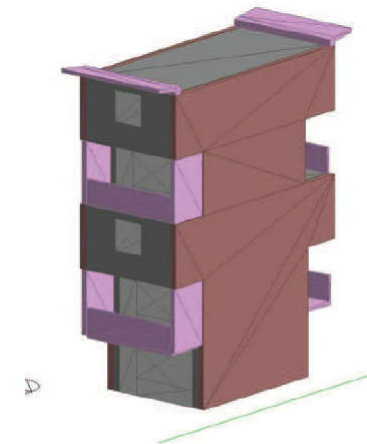


# Analysis

- ▶ The buildings are also:
- ▶ Un-heatable (Part L)
- ▶ Un-healthy (Parts L&F)
- ▶ Un-visitable (Part M)
- ▶ Un-comfortable
- ▶ Non-compliant (Part B)



EXISTING LIVING ROOM  
WINTER COMFORT



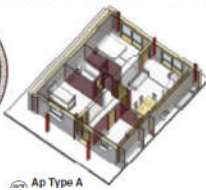
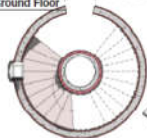
DESIGNBUILDER MODEL EXISTING BUILDING (2 BAYS)

DESIGNBUILDER ANALYSIS - OVERHEATING  
AND WINTER COMFORT LEVELS

# Team A (insitu retrofit)



1 Dep 1/50 - 1 - Slab Level Ground Floor



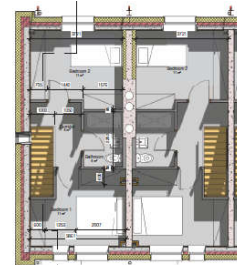
Ap Type A



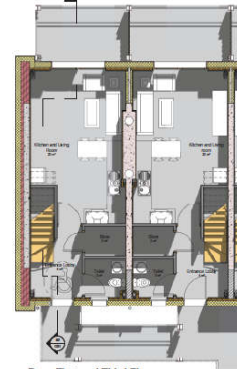
Ap Type B - Ground Floor



Ap Type C - Ground Floor



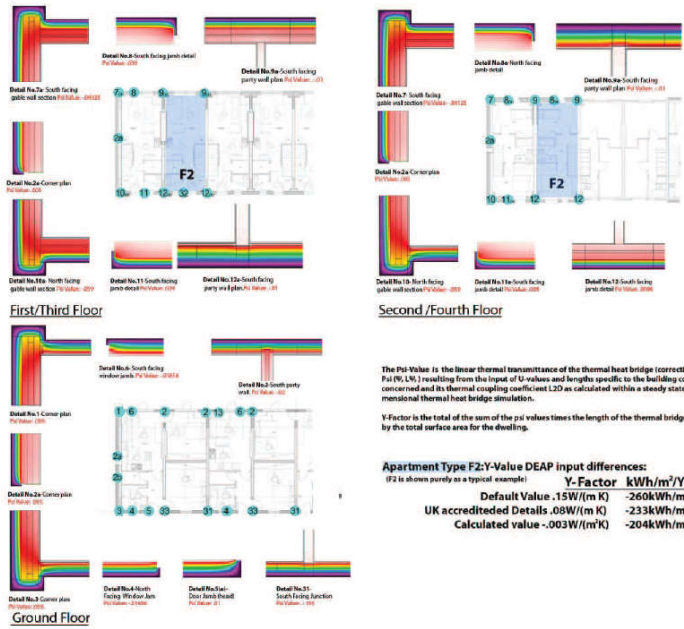
3 Bay - Second and Fourth Floor



2 Bay - First and Third Floor



# Team A (insitu retrofit)



The Psi Value is the linear thermal transmittance of the thermal heat bridge (correction factor Psi (W, LK)) resulting from the input of U-values and lengths specific to the building component concerned and its thermal coupling coefficient L2D as calculated within a steady state, two-dimensional thermal heat bridge simulation.

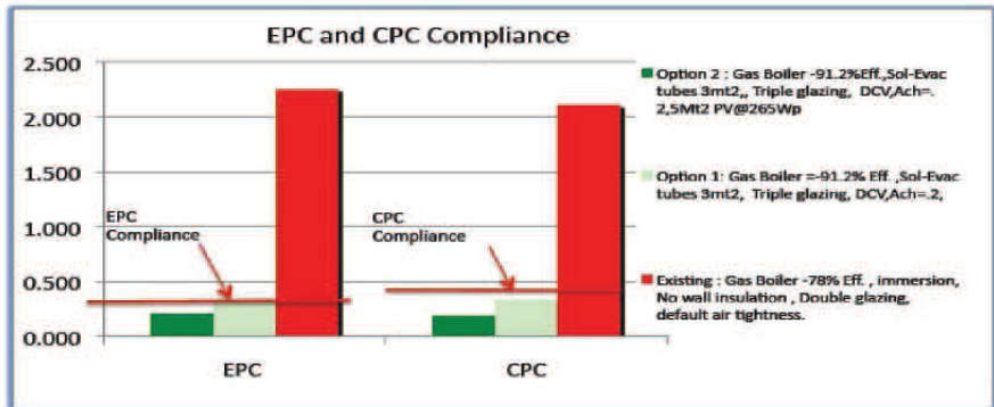
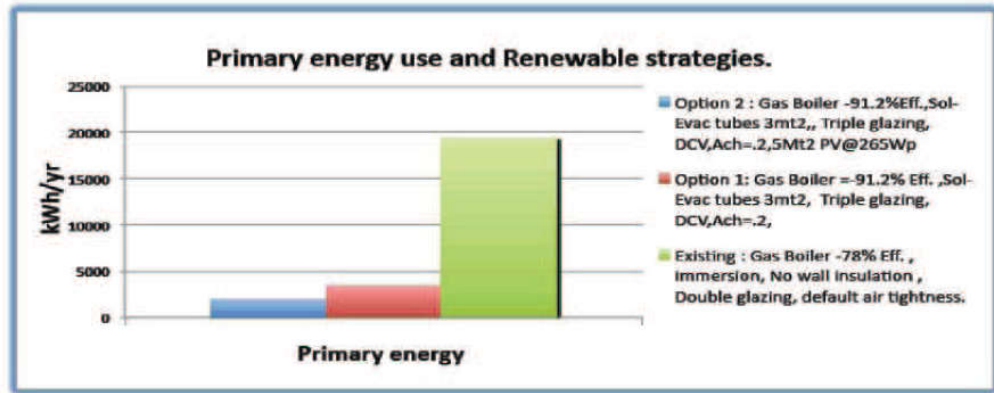
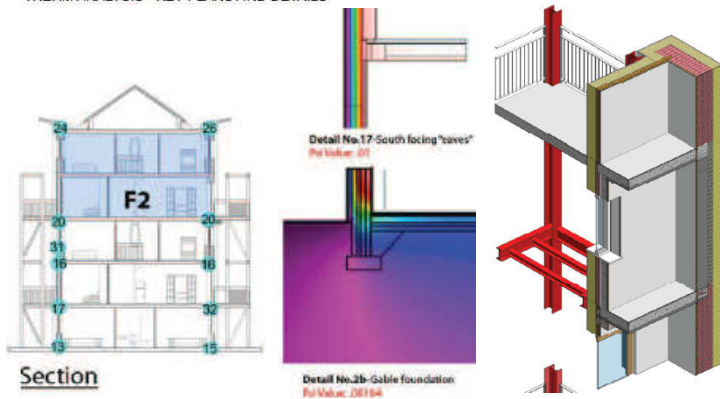
Y-Factor is the total of the sum of the psi values times the length of the thermal bridge, divided by the total surface area for the dwelling.

Apartment Type F2: Y-Value DEAP input differences:

F2 is shown purely as a typical example!

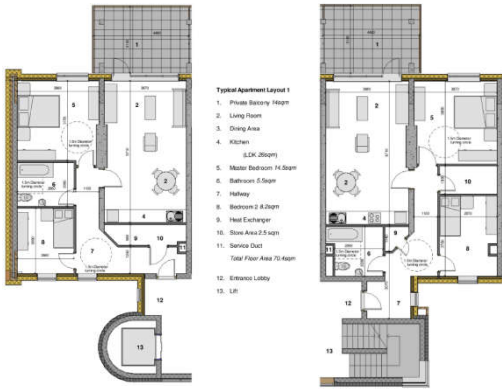
Default Value:  $15W/(m^2K)$  Y-Factor:  $kWh/m^2/Yr$   
 UK accredited Details:  $0.08W/(m^2K)$   $-233kWh/m^2/Yr$   
 Calculated value:  $-0.03W/(m^2K)$   $-204kWh/m^2/Yr$

## THERM ANALYSIS - KEY PLANS AND DETAILS



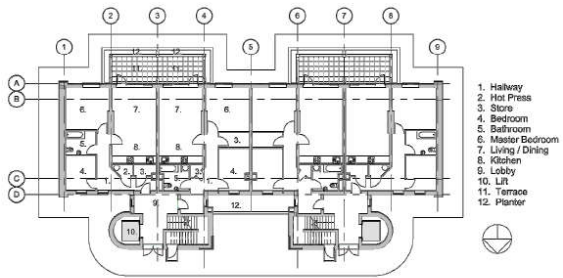
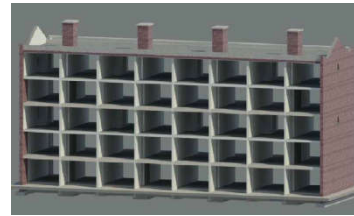
Apartment Type	Apartment Description	Appt. Floor Area (m²)	No. of Appts. of this Type	Total Area of Total Area (m²)	Function	kWh/m²/yr	BER Rating	EPC	CPC	Primary energy
F1	Flat 2 bed	58	8	464	0.31	17	2,246	2.2	2092	2092
F1	Flat 2 bed Garden	58	2	116	0.30	17	2,151	1.96	2188	2188
F1	Upst 2 Bed mid	58	8	464	0.31	17	2,247	2.26	2096	2096
F1	Upst 2 Bed garden	58	2	116	0.30	17	2,249	2.13	2067	2067
F1	Residual - gable	24	8	192	0.13	16	1,712	1.81	1331	1331
F1	Residual - gable	24	2	48	0.17	16	1,584	1.83	1268	1268
Total Area = 1,516 m²										
Weighted Average BER Rating: 2.02										
Weighted Average kWh/yr to Weighted Average BER Rating: 2,152										
Average weighted EPC rating: 2.02										
Average weighted CPC rating: 2.02										
Average weighted Primary energy: 2,152										
Weighted Average kWh/yr to Weighted Average BER Rating: 2,152										
Weighted Average CPC Rating: 2.02										
Weighted Average Primary energy: 2,152										
Total primary energy: 2,152										

# Team B (south orientation)



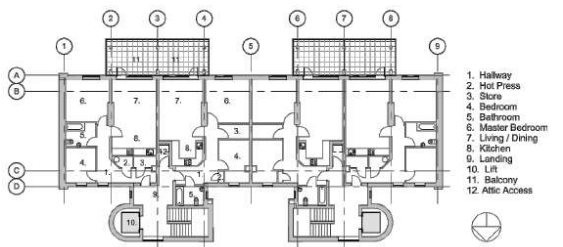
- Typical Apartment Layout 1**
1. Private Balcony 14sqm
  2. Living Room
  3. Dining Area
  4. Kitchen
  5. Master Bedroom 14.5sqm
  6. Bathroom 5.5sqm
  7. Hallway
  8. Bedroom 2 8.2sqm
  9. Heat Exchanger
  10. Store Area 2.5 sqm
  11. Service Duct
  - Total Floor Area 75 sqm
  12. Entrance Lobby
  13. Lift

- Typical Apartment Layout 2**
1. Private Balcony 14sqm
  2. Living Room
  3. Dining Area
  4. Kitchen
  5. Master Bedroom 15sqm
  6. Bathroom 5.5sqm
  7. Hallway
  8. Bedroom 2 8.2sqm
  9. Heat Exchanger 1.2sqm
  10. Store Room 4.4 sqm
  11. Service Duct
  - Total Floor Area 75 sqm
  12. Entrance Lobby
  13. Store



1. Hallway
2. Hot Press
3. Store
4. Bedroom
5. Bedroom
6. Master Bedroom
7. Living / Dining
8. Kitchen
9. Lobby
10. Lift
11. Terrace
12. Planter

**2 Ground Floor Plan**  
1:200



1. Hallway
2. Hot Press
3. Store
4. Bedroom
5. Bathroom
6. Master Bedroom
7. Living / Dining
8. Kitchen
9. Landing
10. Lift
11. Balcony
12. Attic Access

**3 Fourth Floor Plan**  
1:200

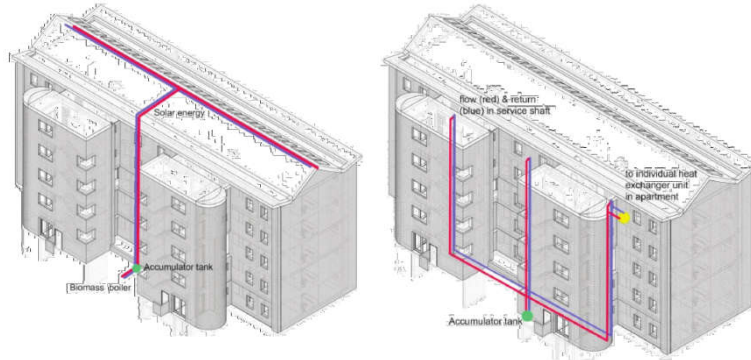


Section

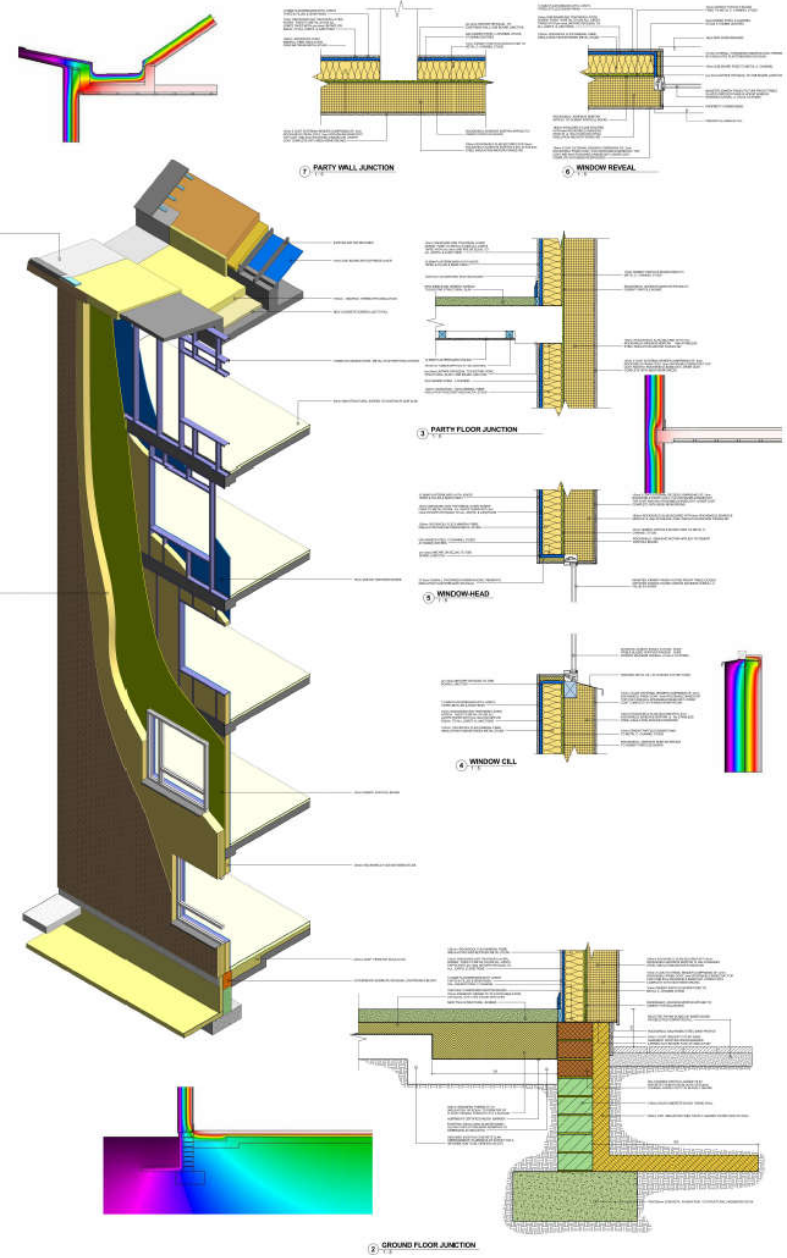
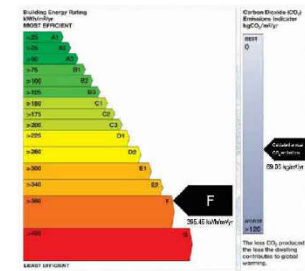
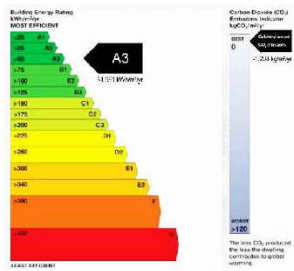




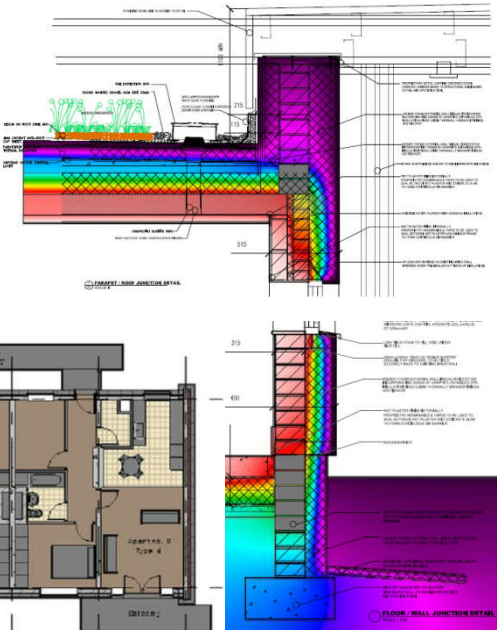
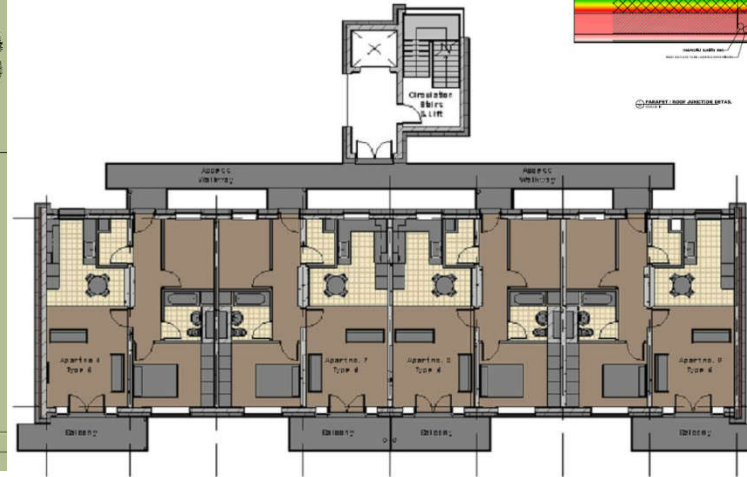
# Team B (south)



BER Summary- Average BER and Compliance Figures									
Apartment	Floor Area m <sup>2</sup>	No Of Units	Total Floor Area m <sup>2</sup>	BER per Unit kWh/m <sup>2</sup> /yr	Primary Energy kWh/yr	EPC per Unit	Total EPC	CPC per Unit	Total CPC
Type 1	70	2	141	59	8265	0.350	49.320	0.001	0.124
Type 2	70	6	423	37	15582	0.264	111.656	0.049	20.670
Type 3	70	2	141	46	6521	0.276	38.910	0.023	3.277
Type 4	74	2	147	64	9380	0.406	59.743	0.036	5.296
Type 5	74	6	441	45	19731	0.346	152.695	0.046	20.219
Type 6	74	2	147	83	12284	0.557	81.894	0.015	2.164
			0		0		0.000		0.000
			0		0		0.000		0.000
			0		0		0.000		0.000
Totals		20	1440		71762		494.217		51.751
Average						50	343		036
					MPEPC	0.400	MPCPC	0.460	



# Team C (north orientation)



# Team C (north orientation)

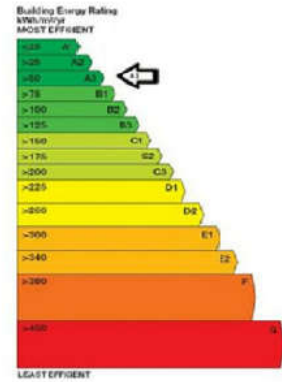
Proposed Average Building BER Rating:

Table 1: Apartment Types BER Ratings

Floor	Unit Type	No.	Area	Primary Energy	EPC kWh/y	CPC kg/y	BER rating
Ground	Apartment Type 1 – 1 bed, ground floor end Apart	1	53 m <sup>2</sup>	73 kWh/m <sup>2</sup> y	0.395	0.413	A3
	Apartment Type 2 – 1 bed, ground floor mid Apart	2	51 m <sup>2</sup>	70 kWh/m <sup>2</sup> y	0.395	0.414	A3
	Apartment Type 2 – 1 bed, ground floor mid Apart	1	53 m <sup>2</sup>	68 kWh/m <sup>2</sup> y	0.394	0.413	A3
	Apartment Type 4 – 2 bed, ground floor end Apart	1	71 m <sup>2</sup>	68 kWh/m <sup>2</sup> y	0.396	0.412	A3
1 <sup>st</sup> & 3 <sup>rd</sup>	Apartment Type 5 – 2 bed, mid floors end Apart	4	71 m <sup>2</sup>	57 kWh/m <sup>2</sup> y	0.40	0.419	A3
	Apartment Type 6 – 2 bed, mid floors mid Apart	4	71 m <sup>2</sup>	53 kWh/m <sup>2</sup> y	0.396	0.418	A3
2 <sup>nd</sup>	Apartment Type 7 – 2 bed, mid floors end Apart	2	70.6 m <sup>2</sup>	56 kWh/m <sup>2</sup> y	0.394	0.414	A3
	Apartment Type 8 – 2 bed, mid floors mid Apart	2	70.6 m <sup>2</sup>	53 kWh/m <sup>2</sup> y	0.397	0.419	A3
4 <sup>th</sup>	Apartment Type 9 – 2 bed, upper floors end Apart	2	70.6 m <sup>2</sup>	65 kWh/m <sup>2</sup> y	0.399	0.415	A3
	Apartment Type 10 – 2 bed, upper floors mid Apart	2	70.6 m <sup>2</sup>	61 kWh/m <sup>2</sup> y	0.395	0.413	A3

Table 2: Individual Apartment BER Ratings

Floor	No.	Type	BER rating
Ground	D1	Type 1	A3
	D2	Type 2	A3
	D3	Type 2	A3
	D4	Type 3	A3
	D5	Type 4	A3
1 <sup>st</sup>	D6	Type 5	A3
	D7	Type 6	A3
	D8	Type 6	A3
	D9	Type 6	A3
	D10	Type 7	A3
2 <sup>nd</sup>	D11	Type 8	A3
	D12	Type 8	A3
	D13	Type 7	A3
3 <sup>rd</sup>	D14	Type 5	A3
	D15	Type 6	A3
	D16	Type 6	A3
	D17	Type 5	A3
4 <sup>th</sup>	D18	Type 9	A3
	D19	Type 10	A3
	D20	Type 10	A3
	D21	Type 9	A3



Average Building BER Rating:

Total Building Energy use (86986 kWh/y) / Total 21 Apartments area (1353m<sup>2</sup>) = 64.05 kWh/m<sup>2</sup> y A3

Average Building EPC & CPC's:

Performance coefficients	Primary energy [kWh/y]	CO <sub>2</sub> emissions [kg/y]
Maximum permitted	0.3961	0.415
	0.400	0.460
	Complies	Complies



Outstanding benefits over traditional boilers:

- 50% reduction in CO<sub>2</sub> emissions
- Low running costs
- Heat is created, self contained and can instantly warm water and electricity/underfloor heating
- No gas supply, flues or ventilation required
- No need for gas installation or vent pipes
- Simple space saving installation in the building envelope
- Ideal for smaller heating or hot water requirements
- Low maintenance
- Reduced risk from 100% to 0% for renewable customers
- Guaranteed maintenance with a modern part replacement policy
- Low noise

**PRIMARY HEATING SYSTEM:**  
ECODAN: Air to water heat pump



An intelligent and energy efficient motor

The VAM is driven by an asynchronous synchronous motor in which the number of revolutions is maintained at a constant rate within the limits of available power, whatever the airflow required by the extract units. Thanks to a softstarter and an electronic board, the power is adapted and optimized to the noise and energy consumption at every instant.



Installation in close proximity to the occupant

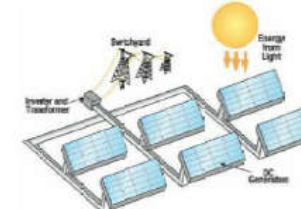
The silent running and compact construction of the VAM make it easy to install directly in the extracted space of the building, in a well-ventilated, well-lit area. Maintenance is then facilitated by its location within the building.

AERECO wall vent



AERECO VAM fan

**AERECO:**  
Mechanical Demand Control Ventilation

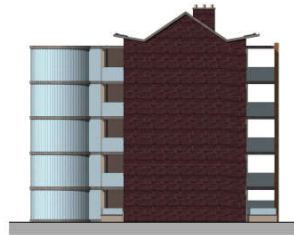


**WATER HEATING:**  
PV solar panels

# Team D (west orientation)



**PROPOSED WEST ELEVATION**  
SCALE 1:100



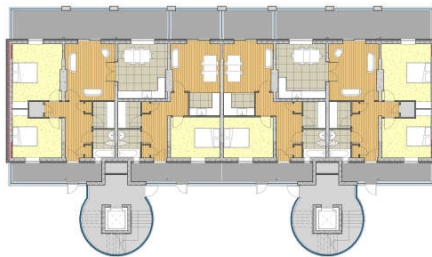
**PROPOSED NORTH ELEVATION**  
SCALE 1:100



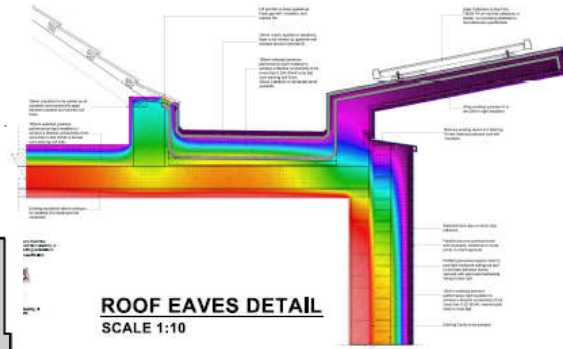
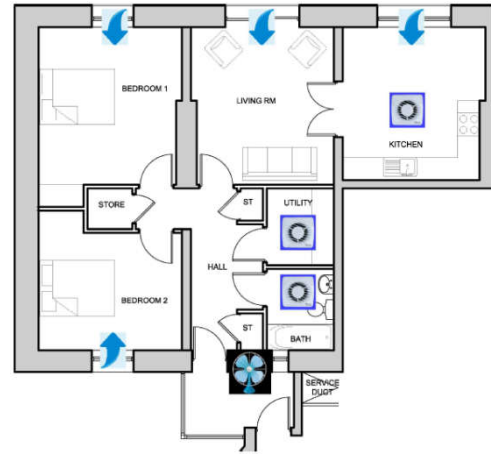
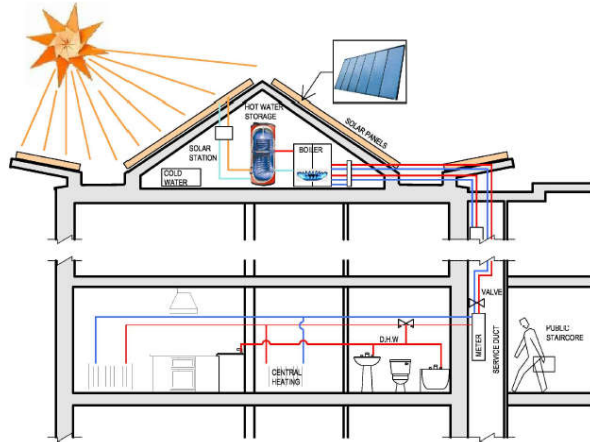
**PROPOSED EAST ELEVATION**  
SCALE 1:100



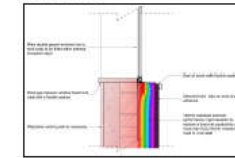
**PROPOSED SOUTH ELEVATION**  
SCALE 1:100



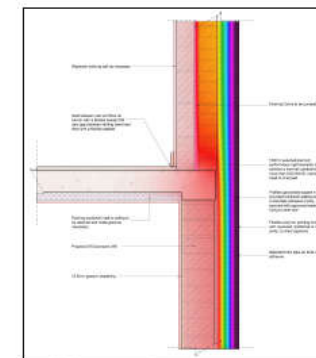
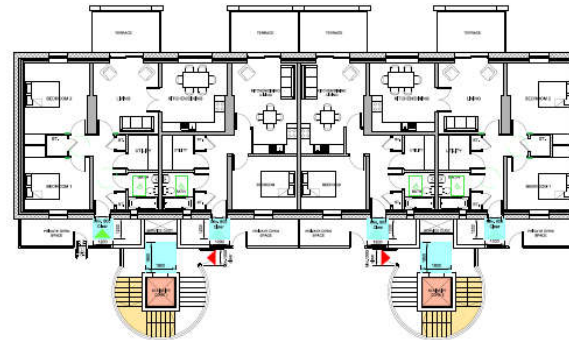
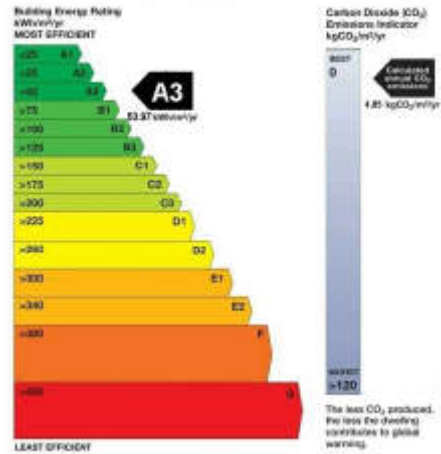
# Team D (west orientation)



**WINDOW HEAD DETAIL**  
SCALE 1:10



**WINDOW CILL DETAIL**  
SCALE 1:10



**FLOOR JUNCTION DETAIL**  
SCALE 1:10



**Retrofit to A3, accessible, safe, healthy,  
comfortable, self-funding, sustainable, replicable.**

Post-Graduate Certificate in Digital Modelling and Energy Retrofit