



**HODKINSON**



**Condition 10  
Technical Note**

Application Ref: 2013/7130/P

Designated Contractors Ltd

**65-69 Holmes Road**

Draft

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Dip Arch, MSc

Date: Feb 2017



## DOCUMENT CONTROL RECORD

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We are able to advise at all stages of projects from planning applications to handover.

Our emphasis is to provide innovative and cost effective solutions that respond to increasing demands for quality and construction efficiency.

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## 1. INTRODUCTION

- 1.1 This document has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development to address the comments on the initial Condition 10 clearance Technical Note (Combined Cooling Heat and Power) of planning decision notice 2013/7130/P.
- 1.2 This document is supplementary to “Condition 10 Technical Note/June 2016” previously submitted.
- 1.3 This report provides an outline specification of the combined Heat and Power technologies that will be implemented at the site. The specification of the technologies differs from what was outlined in the initial report, as the detailed design has developed.
- 1.4 A detailed SBEM calculation has been undertaken to develop a low or zero carbon energy strategy that will achieve the project requirements. The strategy is presented below in Section 2, with the accompanying SBEM output document attached as Appendix A.

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## 2. CONDITION 10

- 2.1 **Condition 10: (Combined Cooling Heat and Power)**, of the Decision Notice states:

*“Before the development commences, details of the proposed Combined Cooling Heat and Power technology shall be submitted to and approved by the Council. The approved facility shall thereafter be provided in its entirety prior to the first occupation of any of the new units and permanently retained thereafter.”*

- 2.2 Additional comments for the clearance of Condition 10 were received from the sustainability officer (30/11/2016) of Camden Council, requiring the applicant to provide further information as quoted below:

*“1. Could the applicant provide the percentage of CO<sup>2</sup> reduction over the baseline as a result of the CHP and details on how this compares to what was agreed at planning stage”.*

*“2. Could the applicant provide details on any air quality impacts”.*

*“3. There is a feasibility study for a wider decentralised energy network which would encompass Holmes Road – we would like to give the developer the opportunity to be involved in the study free of charge”.*

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### **3. METHODOLOGY**

- 3.1** While the planning condition does not require any specific CO<sub>2</sub>, the Initial Energy Statement proposed to incorporate a CHP system to provide space heating and hot water for the development.
  - 3.2** A 26% reduction in Regulated CO<sub>2</sub> emissions over Part L 2010 was predicted in the approved Energy Statement (22<sup>nd</sup> October 2013).
  - 3.3** A CHP system is ideally suited to the development due to the high heat demand and will be utilised to provide low carbon heating and electricity.
  - 3.4** The combined Heat and Power capacity detailed in this report has been calculated using detailed information from the current design inputs that have been provided by the developers (Designated Contractors Ltd).
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### **4. COMMENT 1**

- 4.1** The CHP capacity for the development has been calculated as 80.6kWth.
- 4.2** This is based on sizing the CHP engine to meet 73% of the development's hot water demand. The remaining 27% will be met by efficient gas boilers (91%) on site.
- 4.3** Hot water demand based on the SBEM calculations is 83.85kWh/m<sup>2</sup>/year.
- 4.4** This load will be met with a single VITOBLOC 200 EM-50/81 CHP gas engine, running for 7232 operational hours per year.
- 4.5** This will be supported by thermal stores, to maximise the use of the CHP engine, by balancing supply with demand.
- 4.6** The CHP engine will be located in the plant room at lower basement level.

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## 5. BUILDING CO<sub>2</sub> PERFORMANCE

- 5.1 The table below outlines the CO<sub>2</sub> reductions that the proposed strategy outlined in this Low or Zero Carbon Energy Statement achieves. This demonstrates the improvement in the buildings estimated carbon emission rate that can be achieved through the specification of the CHP engine in conjunction with the boiler.

CO <sub>2</sub> Reduction Achieved	
	Regulated CO <sub>2</sub> Emissions (kg/m <sup>2</sup> )
Building Regulations (2010) Baseline Target Emission Rate	30.4
Building Emission Rates with CHP	22.4
<b>Improvement over Target Emission Rate</b>	<b>26.3%</b>

- 5.2 As presented above, by utilizing the specified CHP engine, the scheme meets the CO<sub>2</sub> reduction from the consented Energy Statement.

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## 6. COMMENTS 2&3

- 6.1 As an Air Quality Assessment has not been undertaken and is not conditioned to be required, it is not possible to provide tangible evidence that the CHP is acceptable in terms of air quality impacts.
- 6.2 However, as Camden Council's Air Quality Planning Checklist refers to GLA's Sustainable Design Construction SPG document, the proposed CHP engine is compliant with the pollutant emission limitations.
- 6.3 For natural gas appliances, the maximum allowed NO<sub>x</sub> emissions for developments that fall within Band B is 125mg/Nm<sup>3</sup>.
- 6.4 The proposed CHP engine has a NO<sub>x</sub> emissions rate of <125mg/Nm<sup>3</sup>, as presented in Appendix B.
- 6.5 While there is a feasibility study for a wider decentralised energy network which would encompass Holmes Road, the Developer states that they do not wish to participate at this stage.

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## **7. CONCLUSION**

- 7.1** This technical note provides details of the proposed CHP technology as required to address additional comments on the initial discharging note of Condition 10 of the Decision Notice (Application Ref: 2013/7130/P).
- 7.2** The specified CHP engine enables the CO<sub>2</sub> that is outlined in planning Energy Statement to be achieved.



## **APPENDICES**

### **Appendix A**

#### **SBEM BRUKL Document**

## Project name

**Holmes Rode Student hall****As designed**

Date: Tue Feb 07 11:05:14 2017

## Administrative information

## Building Details

Address: ,

## Certification tool

Calculation engine: SBEM

Calculation engine version: v4.1.e.5

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v4.7.0

BRUKL compliance check version: v4.1.e.5

## Owner Details

Name:

Telephone number:

Address: , ,

## Certifier details

Name:

Telephone number:

Address: , ,

Criterion 1: The calculated CO<sub>2</sub> emission rate for the building should not exceed the target

1.1	CO <sub>2</sub> emission rate from the notional building, kgCO <sub>2</sub> /m <sup>2</sup> .annum	30.4
1.2	Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	30.4
1.3	Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	22.4
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

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

## 2.a Building fabric

Element	U <sub>a</sub> -Limit	U <sub>a</sub> -Calc	U <sub>i</sub> -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.22	0.22	03 Ground Floor - Reception_W_4
Floor	0.25	0.15	0.15	03 Ground Floor - Reception_S_17
Roof	0.25	0.15	0.15	01 Upper Basement - Bedrooms 15_R_4
Windows***, roof windows, and rooflights	2.2	1.5	1.5	03 Ground Floor - Reception_G_6
Personnel doors	2.2	1.6	1.6	05 First Floor North - Circulation_D_26
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U <sub>a</sub> -Limit = Limiting area-weighted average U-values [W/(m <sup>2</sup> K)] U <sub>a</sub> -Calc = Calculated area-weighted average U-values [W/(m <sup>2</sup> K)] U <sub>i</sub> -Calc = Calculated maximum individual element U-values [W/(m <sup>2</sup> K)] * 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 <sup>3</sup> /(h.m <sup>2</sup> ) at 50 Pa	10	7

## 2.b Building services

The building services parameters listed below are expected to be checked by the BCO against guidance. No automatic checking is performed by the tool.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

### 1- Communal Heating CHP underfloor

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
0.91	-	-	-
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

### 2- Electric Radiators for Pods

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
1	-	-	-
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			NO

### 3- VRF with Ventilation

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
4	3.8	-	-
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

### 1- Project DHW

Heating seasonal efficiency	Hot water storage loss factor [kWh/litre per day]
Hot water provided by HVAC system	0

### Local mechanical ventilation and exhaust

Zone	Supply/extract SFP [W/(l/s)]	HR seasonal efficiency	Exhaust SFP [W/(l/s)]
03 Ground Floor - Reception	1.5	0.85	-
01 Upper Basement - Bedrooms	-15	-	0.4
01 Upper Basement - Bathroom	-1	-	0.3
01 Upper Basement - Student Cooking	-	-	0.4
01 Upper Basement - Bathroom	-12	-	0.3
01 Upper Basement - Bedrooms	-	-	0.4
01 Upper Basement - Bathroom	-14	-	0.3
01 Upper Basement - Bathroom	-15	-	0.3
01 Upper Basement - Bathroom	-16	-	0.3
01 Upper Basement - Bathroom	-17	-	0.3
01 Upper Basement - Bathroom	-2	-	0.3
01 Upper Basement - Bathroom	-3	-	0.3
01 Upper Basement - Bathroom	-7	-	0.3
01 Upper Basement - Bathroom	-8	-	0.3
01 Upper Basement - Student Cooking	-	-	0.4
05 First Floor North - Bedroom	2	-	0.4
05 First Floor North - Student Cooking	-	-	0.4
05 First Floor North - Bathroom	1	-	0.3
05 First Floor North - Bathroom	2	-	0.3
05 First Floor North - Bathroom	3	-	0.3
05 First Floor North - Bathroom	4	-	0.3
05 First Floor North - Bathroom	5	-	0.3
05 First Floor North - Bathroom	23	-	0.3
05 First Floor North - Bathroom	6	-	0.3

### Local mechanical ventilation and exhaust

Zone	Supply/extract SFP [W/(l/s)]	HR seasonal efficiency	Exhaust SFP [W/(l/s)]
05 First Floor North - Bathroom	7	-	0.3
05 First Floor North - Bathroom	8	-	0.3
05 First Floor North - Bedrooms	-1	-	0.4
05 First Floor North - Bathroom	9	-	0.3
05 First Floor North - Bathroom	10	-	0.3
05 First Floor North - Bathroom	11	-	0.3
05 First Floor North - Bathroom	12	-	0.3
05 First Floor North - Bathroom	15	-	0.3
05 First Floor North - Bathroom	14	-	0.3
05 First Floor North - Bathroom	13	-	0.3
05 First Floor North - Bathroom	22	-	0.3
05 First Floor North - Bathroom	17	-	0.3
05 First Floor North - Bathroom	18	-	0.3
05 First Floor North - Bathrooms	-	-	0.3
05 First Floor North - Bathroom	19	-	0.3
05 First Floor North - Bathroom	16	-	0.3
05 First Floor North - Bathroom	20	-	0.3
05 First Floor North - Bedrooms	-	-	0.4
05 First Floor North - Bathroom	21	-	0.3
05 First Floor North - Bathroom	-	-	0.3
06 First Floor South - Rooms	16-	-	0.4
06 First Floor South - Bathroom	-1	-	0.3
06 First Floor South - Rooms	10- 6	-	0.4
06 First Floor South - Bathroom	2	-	0.3
06 First Floor South - Bathroom	3	-	0.3
06 First Floor South - Bathroom	4	-	0.3
06 First Floor South - Bathroom	5	-	0.3
06 First Floor South - Bathroom	-	-	0.3
06 First Floor South - Rooms	2 -	-	0.4
06 First Floor South - Bathroom	7	-	0.3
06 First Floor South - Bathroom	6	-	0.3
06 First Floor South - Bathroom	-	-	0.3
08 Second Floor south - Bathroom	1	-	0.3
08 Second Floor south - Bedrooms	10	-	0.4
08 Second Floor south - Bathroom	2	-	0.3
08 Second Floor south - Bathroom	3	-	0.3
08 Second Floor south - Bathroom	4	-	0.3
08 Second Floor south - Bedrooms	4	-	0.4
08 Second Floor south - Bathroom	5	-	0.3
08 Second Floor south - Bathroom		-	0.3
08 Second Floor south - Bedrooms	8	-	0.4
08 Second Floor south - Bathroom	7	-	0.3
12 Sixth Floor - Bathroom	1 -	-	0.3
12 Sixth Floor - Bedrooms	1 -	-	0.4
12 Sixth Floor - Bathroom	2 -	-	0.3
12 Sixth Floor - Student Cooking	-	-	0.4
12 Sixth Floor - Bathroom	24 -	-	0.3

### Local mechanical ventilation and exhaust

Zone	Supply/extract SFP [W/(l/s)]	HR seasonal efficiency	Exhaust SFP [W/(l/s)]
12 Sixth Floor - Bathroom 3	-	-	0.3
12 Sixth Floor - Bathroom 4	-	-	0.3
12 Sixth Floor - Bathroom 5	-	-	0.3
12 Sixth Floor - Bathroom 6	-	-	0.3
12 Sixth Floor - Bathroom 7	-	-	0.3
12 Sixth Floor - Bathroom 8	-	-	0.3
12 Sixth Floor - Bathroom 9	-	-	0.3
12 Sixth Floor - Bathroom 10	-	-	0.3
12 Sixth Floor - Bathroom 11	-	-	0.3
12 Sixth Floor - Bedrooms	-	-	0.4
12 Sixth Floor - Bathroom 12	-	-	0.3
12 Sixth Floor - Bathroom 13	-	-	0.3
12 Sixth Floor - Bathroom 14	-	-	0.3
12 Sixth Floor - Bathroom 15	-	-	0.3
12 Sixth Floor - Bathroom 16	-	-	0.3
12 Sixth Floor - Bathroom 17	-	-	0.3
12 Sixth Floor - Bathroom 18	-	-	0.3
12 Sixth Floor - Bathroom 19	-	-	0.3
12 Sixth Floor - Bathroom 20	-	-	0.3
12 Sixth Floor - Bathroom 21	-	-	0.3
12 Sixth Floor - Bathroom 22	-	-	0.3
12 Sixth Floor - Bathroom 23	-	-	0.3
12 Sixth Floor - Bathroom 25	-	-	0.3
12 Sixth Floor - Bathroom	-	-	0.3
07 Second Floor North - Rooms -22	-	-	0.4
07 Second Floor North - Rooms -20 3	-	-	0.4
07 Second Floor North - Bathroom 1	-	-	0.3
07 Second Floor North - Bathroom 2	-	-	0.3
07 Second Floor North - Bathroom 3	-	-	0.3
07 Second Floor North - Bathroom 5	-	-	0.3
07 Second Floor North - Bathroom 4	-	-	0.3
07 Second Floor North - Bathroom 12	-	-	0.3
07 Second Floor North - Bedroom 1	-	-	0.4
07 Second Floor North - Bathroom 6	-	-	0.3
07 Second Floor North - Bathroom 7	-	-	0.3
07 Second Floor North - Bathroom 8	-	-	0.3
07 Second Floor North - Bathroom 9	-	-	0.3
07 Second Floor North - Bathroom 10	-	-	0.3
07 Second Floor North - Bathroom 11	-	-	0.3
07 Second Floor North - Rooms -20 5	-	-	0.4
07 Second Floor North - Bathroom 13	-	-	0.3
07 Second Floor North - Bathroom 14	-	-	0.3
07 Second Floor North - Bathroom	-	-	0.3
07 Second Floor North - Bathroom 16	-	-	0.3
07 Second Floor North - Bathroom 17	-	-	0.3
07 Second Floor North - Bathroom 18	-	-	0.3
07 Second Floor North - Bathroom 19	-	-	0.3

### Local mechanical ventilation and exhaust

Zone	Supply/extract SFP [W/(l/s)]	HR seasonal efficiency	Exhaust SFP [W/(l/s)]
07 Second Floor North - Bathroom 21	-	-	0.3
07 Second Floor North - Bathroom 20	-	-	0.3
07 Second Floor North - Bathroom 22	-	-	0.3
07 Second Floor North - Bathroom 23	-	-	0.3
07 Second Floor North - Bathroom 24	-	-	0.3
07 Second Floor North - Bathroom 25	-	-	0.3
07 Second Floor North - Bathroom 26	-	-	0.3
07 Second Floor North - Bathroom 27	-	-	0.3
07 Second Floor North - Student-Cooking	-	-	0.4
03 Ground Floor - student cooking	-	-	0.4
03 Ground Floor - Bathroom 6	-	-	0.3
03 Ground Floor - Bathroom 7	-	-	0.3
03 Ground Floor - Bathroom 8	-	-	0.3
03 Ground Floor - Bedroom	-	-	0.4
03 Ground Floor - Bathroom	-	-	0.3
03 Ground Floor - Bathroom 1	-	-	0.3
03 Ground Floor - Bathroom 5	-	-	0.3
03 Ground Floor - Bathroom 4	-	-	0.3
03 Ground Floor - Bathroom 3	-	-	0.3
03 Ground Floor - Bathroom 2	-	-	0.3
09 Third Floor - Rooms 22	-	-	0.4
09 Third Floor - Bedroom 1	-	-	0.4
09 Third Floor - Bathroom 5	-	-	0.3
09 Third Floor - Bathroom 4	-	-	0.3
09 Third Floor - Bathroom 11	-	-	0.3
09 Third Floor - Bedrooms 1	-	-	0.4
09 Third Floor - Bathroom 10	-	-	0.3
09 Third Floor - Bathroom 12	-	-	0.3
09 Third Floor - Bathroom 15	-	-	0.3
09 Third Floor - Bathroom 16	-	-	0.3
09 Third Floor - Bathroom 18	-	-	0.3
09 Third Floor - Bathroom 19	-	-	0.3
09 Third Floor - Bathroom 20	-	-	0.3
09 Third Floor - Bathroom 25	-	-	0.3
09 Third Floor - Student Cooking	-	-	0.4
10 Fourth Floor - Rooms 22	-	-	0.4
10 Fourth Floor - Bedrooms 1	-	-	0.4
10 Fourth Floor - Bathroom 5	-	-	0.3
10 Fourth Floor - Bathroom	-	-	0.3
10 Fourth Floor - Bedrooms 2	-	-	0.4
10 Fourth Floor - Bathroom 20	-	-	0.3
10 Fourth Floor - Bathroom 21	-	-	0.3
10 Fourth Floor - Bathroom 22	-	-	0.3
10 Fourth Floor - Bathroom 24	-	-	0.3
10 Fourth Floor - Student Cooking	-	-	0.4
11 Fifth Floor - Rooms 22	-	-	0.4
11 Fifth Floor - Bedrooms 1	-	-	0.4

### Local mechanical ventilation and exhaust

Zone	Supply/extract SFP [W/(l/s)]	HR seasonal efficiency	Exhaust SFP [W/(l/s)]
11 Fifth Floor - Bathroom 1	-	-	0.3
11 Fifth Floor - Bathroom 2	-	-	0.3
11 Fifth Floor - Bathroom 3	-	-	0.3
11 Fifth Floor - Bedrooms 2	-	-	0.4
11 Fifth Floor - Bathroom	-	-	0.3
11 Fifth Floor - Bathroom 6	-	-	0.3
11 Fifth Floor - Bathroom 12	-	-	0.3
11 Fifth Floor - Bathroom 18	-	-	0.3
11 Fifth Floor - Bathroom 19	-	-	0.3
11 Fifth Floor - Bathroom 22	-	-	0.3
11 Fifth Floor - Bathroom 25	-	-	0.3
11 Fifth Floor - Bathroom 26	-	-	0.3
11 Fifth Floor - Student Cooking	-	-	0.4
0 Lower Basement - Laundry Small	1.2	0.85	-
0 Lower Basement - Plant Room	1.2	-	-
0 Lower Basement - Screen Room	1.2	0.85	-
0 Lower Basement - Gym 1	1.2	0.85	-
0 Lower Basement - Classroom	11.2	0.85	-
0 Lower Basement - Classroom	2.2	0.85	-
0 Lower Basement - Study area	1.2	0.85	-
0 Lower Basement - Classroom	11.2	0.85	-
0 Lower Basement - Toilet	1.2	0.85	-
0 Lower Basement - Classroom	3.2	0.85	-
0 Lower Basement - Toilets	1.2	0.85	-
0 Lower Basement - Classroom	7.2	0.85	-
0 Lower Basement - Classroom	6.2	0.85	-
0 Lower Basement - Classroom	5.2	0.85	-
0 Lower Basement - Classroom	4.2	0.85	-
0 Lower Basement - Classroom	11.2	0.85	-
0 Lower Basement - Classroom	9.2	0.85	-
0 Lower Basement - Classroom	8.2	0.85	-
03 Ground Floor - Student Cooking	-	-	0.4
03 Ground Floor - WC	1.5	0.85	-
03 Ground Floor - Bedrooms	-	-	0.4
03 Ground Floor - Social Space	1.5	0.85	-
03 Ground Floor - Study	1.5	0.85	-
03 Ground Floor - Study 1	1.5	0.85	-

### General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
03 Ground Floor - Reception	260	50
01 Upper Basement - Bedrooms 15	910	-
01 Upper Basement - Bathroom 1	10	-
01 Upper Basement - Student Cooking	80	-
01 Upper Basement - Bathroom 12	10	-
01 Upper Basement - Bedrooms	300	-
01 Upper Basement - Bathroom 14	10	-

### General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
01 Upper Basement - Bathroom 15	10	-
01 Upper Basement - Bathroom 16	10	-
01 Upper Basement - Bathroom 17	10	-
01 Upper Basement - Bathroom 2	10	-
01 Upper Basement - Bathroom 3	10	-
01 Upper Basement - Bathroom 7	10	-
01 Upper Basement - Bathroom 8	10	-
01 Upper Basement - Student Cooking	130	-
05 First Floor North - Bedroom 2	420	-
05 First Floor North - Student Cooking	290	-
05 First Floor North - Bathroom 1	10	-
05 First Floor North - Bathroom 2	20	-
05 First Floor North - Bathroom 3	20	-
05 First Floor North - Bathroom 4	10	-
05 First Floor North - Bathroom 5	10	-
05 First Floor North - Bathroom 23	20	-
05 First Floor North - Bathroom 6	20	-
05 First Floor North - Bathroom 7	20	-
05 First Floor North - Bathroom 8	20	-
05 First Floor North - Bedrooms 1	620	-
05 First Floor North - Bathroom 9	10	-
05 First Floor North - Bathroom 10	10	-
05 First Floor North - Bathroom 11	10	-
05 First Floor North - Bathroom 12	20	-
05 First Floor North - Bathroom 15	20	-
05 First Floor North - Bathroom 14	10	-
05 First Floor North - Bathroom 13	20	-
05 First Floor North - Bathroom 22	10	-
05 First Floor North - Bathroom 17	10	-
05 First Floor North - Bathroom 18	10	-
05 First Floor North - Bathrooms	10	-
05 First Floor North - Bathroom 19	10	-
05 First Floor North - Bathroom 16	10	-
05 First Floor North - Bathroom 20	10	-
05 First Floor North - Bedrooms	60	-
05 First Floor North - Bathroom 21	10	-
05 First Floor North - Bathroom	10	-
06 First Floor South - Rooms 16	120	-
06 First Floor South - Bathroom 1	10	-
06 First Floor South - Rooms 10 6	250	-
06 First Floor South - Bathroom 2	10	-
06 First Floor South - Bathroom 3	10	-
06 First Floor South - Bathroom 4	10	-
06 First Floor South - Bathroom 5	10	-
06 First Floor South - Bathroom	10	-
06 First Floor South - Rooms 2	110	-
06 First Floor South - Bathroom 7	10	-



### General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
06 First Floor South - Bathroom 6	10	-
06 First Floor South - Bathroom	10	-
08 Second Floor south - Bathroom 1	10	-
08 Second Floor south - Bedrooms 10	200	-
08 Second Floor south - Bathroom 2	10	-
08 Second Floor south - Bathroom 3	10	-
08 Second Floor south - Bathroom 4	10	-
08 Second Floor south - Bedrooms 4	90	-
08 Second Floor south - Bathroom 5	10	-
08 Second Floor south - Bathroom	10	-
08 Second Floor south - Bedrooms 8	80	-
08 Second Floor south - Bathroom 7	10	-
12 Sixth Floor - Bathroom 1	10	-
12 Sixth Floor - Bedrooms 1	510	-
12 Sixth Floor - Bathroom 2	10	-
12 Sixth Floor - Student Cooking	220	-
12 Sixth Floor - Bathroom 24	10	-
12 Sixth Floor - Bathroom 3	10	-
12 Sixth Floor - Bathroom 4	20	-
12 Sixth Floor - Bathroom 5	20	-
12 Sixth Floor - Bathroom 6	10	-
12 Sixth Floor - Bathroom 7	10	-
12 Sixth Floor - Bathroom 8	30	-
12 Sixth Floor - Bathroom 9	20	-
12 Sixth Floor - Bathroom 10	10	-
12 Sixth Floor - Bathroom 11	10	-
12 Sixth Floor - Bedrooms	540	-
12 Sixth Floor - Bathroom 12	10	-
12 Sixth Floor - Bathroom 13	10	-
12 Sixth Floor - Bathroom 14	10	-
12 Sixth Floor - Bathroom 15	10	-
12 Sixth Floor - Bathroom 16	10	-
12 Sixth Floor - Bathroom 17	10	-
12 Sixth Floor - Bathroom 18	10	-
12 Sixth Floor - Bathroom 19	10	-
12 Sixth Floor - Bathroom 20	10	-
12 Sixth Floor - Bathroom 21	10	-
12 Sixth Floor - Bathroom 22	10	-
12 Sixth Floor - Bathroom 23	10	-
12 Sixth Floor - Bathroom 25	10	-
12 Sixth Floor - Bathroom	10	-
07 Second Floor North - Rooms 22	170	-
07 Second Floor North - Rooms 20	3540	-
07 Second Floor North - Bathroom 1	10	-
07 Second Floor North - Bathroom 2	10	-
07 Second Floor North - Bathroom 3	10	-
07 Second Floor North - Bathroom 5	10	-

### General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
07 Second Floor North - Bathroom 4	10	-
07 Second Floor North - Bathroom 12	10	-
07 Second Floor North - Bedroom 1	560	-
07 Second Floor North - Bathroom 6	10	-
07 Second Floor North - Bathroom 7	10	-
07 Second Floor North - Bathroom 8	10	-
07 Second Floor North - Bathroom 9	10	-
07 Second Floor North - Bathroom 10	20	-
07 Second Floor North - Bathroom 11	10	-
07 Second Floor North - Rooms 20	520	-
07 Second Floor North - Bathroom 13	10	-
07 Second Floor North - Bathroom 14	10	-
07 Second Floor North - Bathroom	10	-
07 Second Floor North - Bathroom 16	20	-
07 Second Floor North - Bathroom 17	10	-
07 Second Floor North - Bathroom 18	30	-
07 Second Floor North - Bathroom 19	10	-
07 Second Floor North - Bathroom 21	20	-
07 Second Floor North - Bathroom 20	20	-
07 Second Floor North - Bathroom 22	30	-
07 Second Floor North - Bathroom 23	20	-
07 Second Floor North - Bathroom 24	10	-
07 Second Floor North - Bathroom 25	10	-
07 Second Floor North - Bathroom 26	10	-
07 Second Floor North - Bathroom 27	10	-
07 Second Floor North - Student Cooking	80	-
03 Ground Floor - student cooking	80	-
03 Ground Floor - Bathroom 6	10	-
03 Ground Floor - Bathroom 7	10	-
03 Ground Floor - Bathroom 8	10	-
03 Ground Floor - Bedroom	280	-
03 Ground Floor - Bathroom	10	-
03 Ground Floor - Bathroom 1	10	-
03 Ground Floor - Bathroom 5	10	-
03 Ground Floor - Bathroom 4	10	-
03 Ground Floor - Bathroom 3	10	-
03 Ground Floor - Bathroom 2	10	-
09 Third Floor - Rooms 22	170	-
09 Third Floor - Bedroom 1	540	-
09 Third Floor - Bathroom 5	10	-
09 Third Floor - Bathroom 4	10	-
09 Third Floor - Bathroom 11	10	-
09 Third Floor - Bedrooms 1	570	-
09 Third Floor - Bathroom 10	20	-
09 Third Floor - Bathroom 12	20	-
09 Third Floor - Bathroom 15	10	-
09 Third Floor - Bathroom 16	20	-

### General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
09 Third Floor - Bathroom 18	30	-
09 Third Floor - Bathroom 19	10	-
09 Third Floor - Bathroom 20	20	-
09 Third Floor - Bathroom 25	10	-
09 Third Floor - Student Cooking	250	-
10 Fourth Floor - Rooms 22	170	-
10 Fourth Floor - Bedrooms 1	540	-
10 Fourth Floor - Bathroom 5	10	-
10 Fourth Floor - Bathroom	10	-
10 Fourth Floor - Bedrooms 2	570	-
10 Fourth Floor - Bathroom 20	20	-
10 Fourth Floor - Bathroom 21	10	-
10 Fourth Floor - Bathroom 22	10	-
10 Fourth Floor - Bathroom 24	10	-
10 Fourth Floor - Student Cooking	250	-
11 Fifth Floor - Rooms 22	170	-
11 Fifth Floor - Bedrooms 1	540	-
11 Fifth Floor - Bathroom 1	10	-
11 Fifth Floor - Bathroom 2	10	-
11 Fifth Floor - Bathroom 3	10	-
11 Fifth Floor - Bedrooms 2	570	-
11 Fifth Floor - Bathroom	10	-
11 Fifth Floor - Bathroom 6	10	-
11 Fifth Floor - Bathroom 12	20	-
11 Fifth Floor - Bathroom 18	30	-
11 Fifth Floor - Bathroom 19	10	-
11 Fifth Floor - Bathroom 22	10	-
11 Fifth Floor - Bathroom 25	10	-
11 Fifth Floor - Bathroom 26	10	-
11 Fifth Floor - Student Cooking	250	-
0 Lower Basement - Cycle Parking 1	140	-
0 Lower Basement - Laundry Small	130	-
0 Lower Basement - Plant Room	390	-
0 Lower Basement - Circulation Non-Resi	250	-
0 Lower Basement - Screen Room	380	-
0 Lower Basement - Circulation Non-Resi	250	-
0 Lower Basement - Gym 1	250	-
0 Lower Basement - Classroom1	150	-
0 Lower Basement - Classroom 2	140	-
0 Lower Basement - Study area	810	-
0 Lower Basement - Classroom 11	160	-
0 Lower Basement - Toilet	80	-
0 Lower Basement - Circulation Resi	50	-
0 Lower Basement - Classroom 3	130	-
0 Lower Basement - Toilets	60	-
0 Lower Basement - Classroom 7	150	-
0 Lower Basement - Classroom 6	220	-

### General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
0 Lower Basement - Classroom 5	120	-
0 Lower Basement - Classroom 4	140	-
0 Lower Basement - Classroom 10	150	-
0 Lower Basement - Classroom 9	150	-
0 Lower Basement - Classroom 8	150	-
01 Upper Basement - Circulation	390	-
05 First Floor North - Circulation	310	-
05 First Floor North - Storage	10	-
06 First Floor South - Circulation	100	-
08 Second Floor south - Circulation	80	-
13 South Block Staircase - Circulation	30	-
12 Sixth Floor - Circulation	240	-
07 Second Floor North - Circulation	330	-
03 Ground Floor - Student Cooking	80	-
03 Ground Floor - Storage 1	0	-
03 Ground Floor - Circulation 4	10	-
03 Ground Floor - Storage 2	0	-
03 Ground Floor - WC	20	-
03 Ground Floor - Bedrooms	260	-
03 Ground Floor - Stairs	20	-
03 Ground Floor - Storage	10	-
03 Ground Floor - Circulation 2	130	-
03 Ground Floor - Circulation 1	20	-
03 Ground Floor - Social Space 1	1340	-
03 Ground Floor - Bin Store	40	-
03 Ground Floor - Circulation Non-Res	180	-
03 Ground Floor - Study	590	-
03 Ground Floor - Circulation	110	-
03 Ground Floor - Study 1	360	-
09 Third Floor - Circulation	330	-
10 Fourth Floor - Circulation	310	-
11 Fifth Floor - Circulation	310	-

### 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?
03 Ground Floor - Reception	NO (-53.6%)	NO
01 Upper Basement - Bedrooms 15	NO (-83.6%)	NO
01 Upper Basement - Bedrooms	NO (-74.9%)	NO
05 First Floor North - Bedroom 2	NO (-78%)	NO
05 First Floor North - Bedrooms 1	NO (-87.3%)	NO
05 First Floor North - Bedrooms	NO (-74.3%)	NO
06 First Floor South - Rooms 16	NO (-88.7%)	NO
06 First Floor South - Rooms 10 6	NO (-82.3%)	NO
06 First Floor South - Rooms 2	NO (-88.8%)	NO
08 Second Floor south - Bedrooms 1	NO (-84%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
08 Second Floor south - Bedrooms 4	NO (-88.1%)	NO
08 Second Floor south - Bedrooms 8	NO (-88.2%)	NO
12 Sixth Floor - Bedrooms 1	NO (-79.8%)	NO
12 Sixth Floor - Bedrooms	NO (-86.5%)	NO
07 Second Floor North - Rooms 22	NO (-83.5%)	NO
07 Second Floor North - Rooms 20	NO (-81%)	NO
07 Second Floor North - Bedroom 1	NO (-87.3%)	NO
07 Second Floor North - Rooms 20	N/A	N/A
03 Ground Floor - Bedroom	NO (-82.8%)	NO
09 Third Floor - Rooms 22	NO (-83.5%)	NO
09 Third Floor - Bedroom 1	NO (-81.5%)	NO
09 Third Floor - Bedrooms 1	NO (-87.9%)	NO
10 Fourth Floor - Rooms 22	NO (-83.5%)	NO
10 Fourth Floor - Bedrooms 1	NO (-81%)	NO
10 Fourth Floor - Bedrooms 2	NO (-88%)	NO
11 Fifth Floor - Rooms 22	NO (-83.5%)	NO
11 Fifth Floor - Bedrooms 1	NO (-81%)	NO
11 Fifth Floor - Bedrooms 2	NO (-88%)	NO
0 Lower Basement - Screen Room	N/A	N/A
0 Lower Basement - Gym 1	N/A	N/A
0 Lower Basement - Classroom1	N/A	N/A
0 Lower Basement - Classroom 2	N/A	N/A
0 Lower Basement - Study area	YES (+49.6%)	NO
0 Lower Basement - Classroom 11	N/A	N/A
0 Lower Basement - Classroom 3	N/A	N/A
0 Lower Basement - Classroom 7	N/A	N/A
0 Lower Basement - Classroom 6	YES (+16.4%)	NO
0 Lower Basement - Classroom 5	YES (+44.5%)	NO
0 Lower Basement - Classroom 4	N/A	N/A
0 Lower Basement - Classroom 10	N/A	N/A
0 Lower Basement - Classroom 9	N/A	N/A
0 Lower Basement - Classroom 8	N/A	N/A
03 Ground Floor - Bedrooms	NO (-84.6%)	NO
03 Ground Floor - Social Space 1	YES (+40.5%)	NO
03 Ground Floor - Study	NO (-81.6%)	NO
03 Ground Floor - Study 1	NO (-87.8%)	NO

#### Criterion 4: The performance of the building, as built, should be consistent with the 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?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

# Technical Data Sheet (Actual vs. Notional Building)

## Building Global Parameters

	Actual	Notional
Area [m <sup>2</sup> ]	10472.8	10472.8
External area [m <sup>2</sup> ]	7942.5	7942.5
Weather	LON	LON
Infiltration [m <sup>3</sup> /hm <sup>2</sup> @ 50Pa]	7	5
Average conductance [W/K]	2677.32	4230.15
Average U-value [W/m <sup>2</sup> K]	0.34	0.53
Alpha value* [%]	19.33	17.54

\* 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  
B8 Storage or Distribution  
C1 Hotels  
C2 Residential Inst.: Hospitals and Care Homes  
**99 C2 Residential Inst.: Residential schools**  
C2 Residential Inst.: Universities and colleges  
C2A Secure Residential Inst.  
Residential spaces  
D1 Non-residential Inst.: Community/Day Centre  
D1 Non-residential Inst.: Libraries, Museums, and Galleries  
D1 Non-residential Inst.: Education  
D1 Non-residential Inst.: Primary Health Care Building  
D1 Non-residential Inst.: Crown and County Courts

### 1 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/m<sup>2</sup>]

	Actual	Notional
Heating	16.15	14.96
Cooling	1.09	1.3
Auxiliary	5.71	5.87
Lighting	6.26	10.1
Hot water	126.32	86.54
Equipment*	15.99	15.99
<b>TOTAL **</b>	<b>122.89</b>	<b>118.77</b>

\* Energy used by equipment does not count towards the total for calculating emissions.

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

## Energy Production by Technology [kWh/m<sup>2</sup>]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	32.65	0
Solar thermal systems	0	0

## Energy & CO<sub>2</sub> Emissions Summary

	Actual	Indicative Target
Heating + cooling demand [MJ/m <sup>2</sup> ]	83.72	99.81
Primary energy* [kWh/m <sup>2</sup> ]	116.38	154.6
Total emissions [kg/m <sup>2</sup> ]	22.4	30.4

\* 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: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Natural Gas										
Actual	10.5	24.1	3.4	0	4.4	0.86	0	0.91	0	
Notional	10.7	42.3	3.8	0	2.5	0.79 / 0.81	0	----	----	
[ST] Other local room heater - unfanned, [HS] Room heater, [HFT] Electricity, [CFT] Natural Gas										
Actual	71.4	25.4	24.8	0	6.6	0.8	0	1	0	
Notional	64.6	56.9	22.7	0	7.6	0.79 / 0.81	0	----	----	
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	17.6	44.2	1.2	3	4.3	3.92	4.11	4	5.5	
Notional	17.4	46.2	2	3.6	3	2.43	3.6	----	----	

### 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 BCO can give particular attention to items with specifications that are better than typically expected.

## Building fabric

Element	U <sub>i-Typ</sub>	U <sub>i-Min</sub>	Surface where the minimum value occurs*
Wall	0.23	0.22	03 Ground Floor - Reception_W_4
Floor	0.2	0.15	03 Ground Floor - Reception_S_17
Roof	0.15	0.15	01 Upper Basement - Bedrooms_15_R_4
Windows, roof windows, and rooflights	1.5	1.5	03 Ground Floor - Reception_G_6
Personnel doors	1.5	1.6	05 First Floor North - Circulation_D_26
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U <sub>i-Typ</sub> = Typical individual element U-values [W/(m²K)]		U <sub>i-Min</sub> = 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	7



## **Appendix B**

### VITOBLOC 200 EM-50/81 CHP Technical Specification

# Assembly instructions

for the specialist



## VITOBLOC 200

model EM-50/81

Block-type thermal power plant for natural gas operation



# Specifications

## 2 Specifications

All planning and operating data below refer to one cogeneration module in each case.

Detailed information on the planning and execution is available in „Natural gas block-type thermal power plant series – Project management“.

### 2.1 Cogeneration module operating parameters

Cogeneration module operating parameters			Vitobloc 200 EM-50/81		
Continuous output <sup>1)</sup> parallel with network			50% Load	75% Load	100% Load
Electrical output	cannot be overloaded	kW	25	38	50
Heat output	Tolerance 5 %	kW	46	64	81
Fuel consumption	Tolerance 5 %	kW	86	118	145
Power-to-heat ratio acc. to AGFW FW308			0.62		
Primary energy factor ENEC 2007 f <sub>PE</sub>			0.74		
Primary energy saving PEE purs, directive 2004/8/EC Promotion of cogeneration			25.0		
Efficiency in parallel operation with network					
Electrical efficiency		%	29.1	32.2	34.5
Thermal efficiency		%	53.5	54.2	55.9
Total efficiency		%	82.6	86.4	90.3
Energy generation					
Electricity	Voltage	V	400		
	Frequency	Hz	50		
Internal power consumption <sup>2)</sup>		kW	1.65		
Thermal energy (for heating) without emergency generation function	Flow / return temperature	°C	90/70		
Thermal energy (for heating) with emergency generation function	Flow / return temperature	°C	90/65		
Consumables and filling volumes					
Quality of fuel, lubricating oil, cooling water, heating water			see latest operating regulations		
Filling volume	Lubricating oil	litr.	14		
	Fresh oil tank	litr.	70		
	Cooling water	litr.	55		
	Heating water	litr.	10		
Gas supply pressure <sup>3)</sup>		mbar	25 - 50		
Heat generation (heating)					
Return temperature upstream the module	min./max.	°C	60/70		
Standard temperature difference	Return/flow	K	20		
Heating water flow	Standard	m³/h	3.5		
Highest permitted operating pressure		bar	16		
Pressure loss at standard flow rate in module		bar	0.1		
Pollutant emissions <sup>4)</sup> acc.to TA-Luft 2002					
NOx content	measured as NO <sub>2</sub>	mg/Nm³	< 125		
CO content		mg/Nm³	< 150		
		mg/kWh	< 137		
Formaldehyde CH <sub>2</sub> O		mg/Nm³	< 60		

## Specifications

Noise pressure level at 1 m distance, open field, acc. to DIN 45635 (Tolerance of the above values: 3 dB(A)) Exhaust noise 1 m measured downstream the duct			
Machine	with noise cover	dB(A)	62
Exhaust fan <sup>5)</sup>	without silencer	dB(A)	53
Exhaust <sup>6)</sup>	without silencer	dB(A)	56
	with silencer	dB(A)	41
Combustion air and ventilation			
Heat radiated by module	without connecting line	kW	8
Ventilation of installation room	Supply air flow	m³/h	>1500
	Exhaust flow, set point	m³/h	1,350
	Exhaust flow, max.	m³/h	2,500
Combustion air flow rate	at 25 °C and 1000 mbar	m³/h	146
Supply air temperature	min./max.	°C	10/25
Temperature difference	supply air/exhaust air	K	< 20
Compression of the integrated exhaust fan	at min. flow rate	Pa	350
	at target flow rate	Pa	250
Exhaust			
Exhaust flow rate, wet	at 120 °C	m³/h	225
Exhaust mass flux, wet		kg/h	183
Exhaust flow rate, dry	0 % O <sub>2</sub> (0 °C; 1012 mbar)	Nm³/h	132
Max. permitted backpressure	downstream the module	mbar	15

- 1) Values acc. to DIN ISO 3046 part 1,  
(at 1000 mbar atmospheric pressure, 25 °C air temperature, 30 % relative humidity and  $\cos \varphi = 1$ )  
All other data of the module are for operation in parallel with the network; data for other conditions on request
- 2) Cooling water pump, fan, battery charger, control transformer
- 3) Acc. to DVGW-TRGI 1986/96, the gas connection pressure is the pressure of the gas flow at the beginning of the gas controlling system of the module
- 4) Emissions downstream the catalytic converter, relative to dry exhaust;
- 5) at 250 Pa compression, 100% thermostat setting
- 6) Insertion loss of the exhaust secondary silencer on request

Tab. 4 Operating parameters of a complete cogeneration module