Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.84
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	3.4	20
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2	2

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	10

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	67495	67495
External area (m2)	52245	52245
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	10	10
Average conductance (W/K)	31580.6	21403.7
Average U-value (W/m2K)	0.6	0.41
Alpha value (%)	5.79	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
	Retail
	Warehouse and storage
1	**Theatres/cinemas/music halls and auditoria**
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
	Bus station/train station/seaport terminal
	Workshops/maintenance depot
	Telephone exchanges
95	**Industrial process building**
2	**Launderette**
	Dwelling
	Retail warehouses
1	**Miscellaneous 24hr activities**

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	1.8	160.4	0.5	20.7	9.2	1.04	2.15	0.84	4.1
	Notional	22.2	145	7.4	24.1	23.7	0.83	1.67	----	----
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	5.5	200.3	2.1	20.2	8.4	0.73	2.75	0.84	4.1
	Notional	10.6	197.9	3.6	32.9	23.7	0.83	1.67	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	0	15378.9	0	335.1	5.6	0.76	12.75	0.84	20
	Notional	0	15092	0	2510.3	21.7	0.83	1.67	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	94.4	219	34.7	23.3	6.1	0.76	2.61	0.84	4.1
	Notional	90.6	118.8	30.3	19.8	21.9	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	1.7	232.6	0.4	30	9.2	1.04	2.15	0.84	4.1
	Notional	4.9	251.2	1.6	41.8	23.7	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	126.7	70.9	33.7	9.1	6.6	1.04	2.15	0.84	4.1
	Notional	131.3	47.5	43.9	7.9	20.3	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0.8	189.6	0.2	24.4	9.2	1.04	2.15	0.84	4.1
	Notional	19.6	166.7	6.6	27.7	23.7	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	14.8	81.9	3.9	10.6	9.2	1.04	2.15	0.84	4.1
	Notional	46.7	88.1	15.6	14.6	23.7	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0	261.1	0	30.6	9.7	0.99	2.37	0.84	4.1
	Notional	2.4	227.6	0.8	37.9	21.5	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	93.8	26.5	25	3.4	27.4	1.04	2.15	0.84	4.1
	Notional	323.5	24.3	108.3	4	46.6	0.83	1.67	----	----

Technical Data Sheet (Actual vs. Notional Building) (cont.)

HVAC Systems Performance (cont.)

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat kWh/m2	Cool kWh/m2	Aux kWh/m2	Heat SSEEF	Cool SSEER	Heat G SEFF	Cool G SEER
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0	619.5	0	79.9	14.3	1.04	2.15	0.84	4.1
	Notional	0	616.2	0	102.5	37	0.83	1.67	----	----
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	0	0	0	0	4.5	0.72	2.8	0.84	4.1
	Notional	0	0	0	0	17.2	0.83	1.67	----	----
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	17.6	8.7	6.8	0.9	0.8	0.72	2.8	0.84	4.1
	Notional	9.9	10	3.3	1.7	34.4	0.83	1.67	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which s due to thermal bridging
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
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

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

UKCMRI

'Be Lean' Scheme

As designed

Date: Tue Jul 27 16:55:02 2010

Administrative information

Building Details

Address: London, NW1

Certification tool

Calculation engine: Apache

Calculation engine version: 6.0.6

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 6.0.6

BRUKL compliance check version: v3.5.a.0

Owner Details

Name: Owner

Telephone number: Phone

Address: , , Postcode

Certifier details

Name: URS

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	54.2 KgCO2/m2.annum
1.2	Improvement factor	0.2
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	39.1 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	34.9 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.18	0.7	0.58	B2ML0006:Surf[4]
Floor	0.25	0.2	0.7	0.25	B2ML0009:Surf[0]
Roof	0.25	0.16	0.35	0.16	B1CR0004:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.68	3.3	2.23	L0CR0026:Surf[3]
Personnel doors	2.2	0	3	0	No Personnel doors in building
Vehicle access & similar large doors	1.5	0	4	0	No Vehicle access doors in building
High usage entrance doors	6	0	6	0	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)] $U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)] $U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.

*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 BRF CV system HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3b- "No HWS in project, or hot water is provided by HVAC system"

2.3a-2 CL3+ CV System HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3a-3 General CV system - Atrium, Writeup, Tertiary Area HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3a-4 Plantroom Mech System HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2	2

2.3a-5 Primary/Secondary Lab- single duct VAV — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.3

2.3a-6 BRF Tertiary CV system — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3a-7 General FCU system - Offices, Meeting Rooms, Restaurant, SER — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2	2

2.3a-8 Imaging CV System — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3a-9 Lecture Theatre - CV System — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3a-10 Kitchen CV system — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2	2

2.3a-11 Loading Bay Mech System — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2	2

2.3a-12 CL3 CV System — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	3.4	20
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2	2

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	67495	67495
External area (m2)	52245	52245
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	26066.7	21403.7
Average U-value (W/m2K)	0.5	0.41
Alpha value (%)	7.01	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
	Retail
	Warehouse and storage
1	**Theatres/cinemas/music halls and auditoria**
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
	Bus station/train station/seaport terminal
	Workshops/maintenance depot
	Telephone exchanges
95	**Industrial process building**
2	**Launderette**
	Dwelling
	Retail warehouses
1	**Miscellaneous 24hr activities**

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0.2	191.4	0.1	9.7	9.2	0.8	5.5	0.85	6.8
	Notional	22.2	145	7.4	24.1	23.7	0.83	1.67	----	----
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	2.5	239.4	0.9	12.1	8.4	0.8	5.5	0.85	6.8
	Notional	10.6	197.9	3.6	32.9	23.7	0.83	1.67	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	0	15606.3	0	788.2	5.6	0.8	5.5	0.85	20
	Notional	0	15092	0	2510.3	21.7	0.83	1.67	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	69.6	181.3	24.2	9.2	6.1	0.8	5.5	0.85	6.8
	Notional	90.6	118.8	30.3	19.8	21.9	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0	298.7	0	15.1	9.2	0.8	5.5	0.85	6.8
	Notional	4.9	251.2	1.6	41.8	23.7	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	84.7	55.8	29.4	2.8	6.6	0.8	5.5	0.85	6.8
	Notional	131.3	47.5	43.9	7.9	20.3	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0	236.8	0	12	9.2	0.8	5.5	0.85	6.8
	Notional	19.6	166.7	6.6	27.7	23.7	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	5.8	104.6	2	5.3	9.2	0.8	5.5	0.85	6.8
	Notional	46.7	88.1	15.6	14.6	23.7	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0	292.6	0	14.8	9.7	0.8	5.5	0.85	6.8
	Notional	2.4	227.6	0.8	37.9	21.5	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	53.2	32.2	18.5	1.6	27.4	0.8	5.5	0.85	6.8
	Notional	323.5	24.3	108.3	4	46.6	0.83	1.67	----	----

Technical Data Sheet (Actual vs. Notional Building) (cont.)

HVAC Systems Performance (cont.)

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat kWh/m2	Cool kWh/m2	Aux kWh/m2	Heat SSEEF	Cool SSEER	Heat G SEFF	Cool G SEER
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0	700.3	0	35.4	14.3	0.8	5.5	0.85	6.8
	Notional	0	616.2	0	102.5	37	0.83	1.67	----	----
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	0	0	0	0	4.5	0.8	5.5	0.85	6.8
	Notional	0	0	0	0	17.2	0.83	1.67	----	----
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	1.1	17.2	0.4	0.9	0.8	0.8	5.5	0.85	6.8
	Notional	9.9	10	3.3	1.7	34.4	0.83	1.67	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which s due to thermal bridging
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
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

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

UKCMRI

'Be Clean' Scheme

As designed

Date: Fri Jul 30 00:52:52 2010

Administrative information

Building Details

Address: London, NW1

Certification tool

Calculation engine: Apache

Calculation engine version: 6.0.6

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 6.0.6

BRUKL compliance check version: v3.5.a.0

Owner Details

Name: Owner

Telephone number: Phone

Address: , , Postcode

Certifier details

Name: URS

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	54.2 KgCO2/m2.annum
1.2	Improvement factor	0.2
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	39.1 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	21.1 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.18	0.7	0.58	B2ML0006:Surf[4]
Floor	0.25	0.2	0.7	0.25	B2ML0009:Surf[0]
Roof	0.25	0.16	0.35	0.16	B1CR0004:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.68	3.3	2.23	L0CR0026:Surf[3]
Personnel doors	2.2	0	3	0	No Personnel doors in building
Vehicle access & similar large doors	1.5	0	4	0	No Vehicle access doors in building
High usage entrance doors	6	0	6	0	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)] $U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)] $U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.

*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 BRF CV system HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3b- "No HWS in project, or hot water is provided by HVAC system"

2.3a-2 CL3+ CV System HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3a-3 General CV system - Atrium, Writeup, Tertiary Area HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3a-4 Plantroom Mech System HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2	2

2.3a-5 Primary/Secondary Lab- single duct VAV — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.3

2.3a-6 BRF Tertiary CV system — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3a-7 General FCU system - Offices, Meeting Rooms, Restaurant, SER — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2	2

2.3a-8 Imaging CV System — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3a-9 Lecture Theatre - CV System — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3a-10 Kitchen CV system — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2	2

2.3a-11 Loading Bay Mech System — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2	2

2.3a-12 CL3 CV System — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	3.4	20
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2	2

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	67495	67495
External area (m2)	52245	52245
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	26066.7	21403.7
Average U-value (W/m2K)	0.5	0.41
Alpha value (%)	7.01	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
	Retail
	Warehouse and storage
1	**Theatres/cinemas/music halls and auditoria**
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
	Bus station/train station/seaport terminal
	Workshops/maintenance depot
	Telephone exchanges
95	**Industrial process building**
2	**Launderette**
	Dwelling
	Retail warehouses
1	**Miscellaneous 24hr activities**

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0.2	191.4	0	9.7	9.2	0.8	5.5	0.85	6.8
	Notional	22.2	145	7.4	24.1	23.7	0.83	1.67	----	----
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	2.5	239.4	0.3	12.1	8.4	0.8	5.5	0.85	6.8
	Notional	10.6	197.9	3.6	32.9	23.7	0.83	1.67	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	0	15606.3	0	788.2	5.6	0.8	5.5	0.85	20
	Notional	0	15092	0	2510.3	21.7	0.83	1.67	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	69.6	181.3	5.9	9.2	6.1	0.8	5.5	0.85	6.8
	Notional	90.6	118.8	30.3	19.8	21.9	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0	298.7	0	15.1	9.2	0.8	5.5	0.85	6.8
	Notional	4.9	251.2	1.6	41.8	23.7	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	84.7	55.8	8	2.8	6.6	0.8	5.5	0.85	6.8
	Notional	131.3	47.5	43.9	7.9	20.3	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0	236.8	0	12	9.2	0.8	5.5	0.85	6.8
	Notional	19.6	166.7	6.6	27.7	23.7	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	5.8	104.6	0.8	5.3	9.2	0.8	5.5	0.85	6.8
	Notional	46.7	88.1	15.6	14.6	23.7	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0	292.6	0	14.8	9.7	0.8	5.5	0.85	6.8
	Notional	2.4	227.6	0.8	37.9	21.5	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	53.2	32.2	1.6	1.6	27.4	0.8	5.5	0.85	6.8
	Notional	323.5	24.3	108.3	4	46.6	0.83	1.67	----	----

Technical Data Sheet (Actual vs. Notional Building) (cont.)

HVAC Systems Performance (cont.)

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat kWh/m2	Cool kWh/m2	Aux kWh/m2	Heat SSEEF	Cool SSEER	Heat G SEFF	Cool G SEER
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0	700.3	0	35.4	14.3	0.8	5.5	0.85	6.8
	Notional	0	616.2	0	102.5	37	0.83	1.67	----	----
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	0	0	0	0	4.5	0.8	5.5	0.85	6.8
	Notional	0	0	0	0	17.2	0.83	1.67	----	----
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	1.1	17.2	0.2	0.9	0.8	0.8	5.5	0.85	6.8
	Notional	9.9	10	3.3	1.7	34.4	0.83	1.67	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which s due to thermal bridging
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
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

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

UKCMRI

'Be Green' Scheme

As designed

Date: Mon Jul 26 17:21:56 2010

Administrative information

Building Details

Address: London, NW1

Certification tool

Calculation engine: Apache

Calculation engine version: 6.0.6

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 6.0.6

BRUKL compliance check version: v3.5.a.0

Owner Details

Name: Owner

Telephone number: Phone

Address: , , Postcode

Certifier details

Name: URS

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	53.7 KgCO2/m2.annum
1.2	Improvement factor	0.2
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	38.7 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	19.9 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.18	0.7	0.58	B2ML0006:Surf[4]
Floor	0.25	0.2	0.7	0.25	B2ML0009:Surf[0]
Roof	0.25	0.16	0.35	0.16	B1CR0004:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.68	3.3	2.23	L0CR0026:Surf[3]
Personnel doors	2.2	0	3	0	No Personnel doors in building
Vehicle access & similar large doors	1.5	0	4	0	No Vehicle access doors in building
High usage entrance doors	6	0	6	0	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)] $U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)] $U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.

*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 BRF CV system HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3b- "No HWS in project, or hot water is provided by HVAC system"

2.3a-2 CL3+ CV System HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3a-3 General CV system - Atrium, Writeup, Tertiary Area HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3a-4 Plantroom Mech System HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2	2

2.3a-5 Primary/Secondary Lab- single duct VAV — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.3

2.3a-6 BRF Tertiary CV system — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3a-7 General FCU system - Offices, Meeting Rooms, Restaurant, SER — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2	2

2.3a-8 Imaging CV System — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3a-9 Lecture Theatre - CV System — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

2.3a-10 Kitchen CV system — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2	2

2.3a-11 Loading Bay Mech System — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2	2

2.3a-12 CL3 CV System — HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.25	7.2
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2.5	2.5

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.85
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	3.4	20
Efficiency check	**Limiting Specific Fan Power**	**This building**
SFP	2	2

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	67495	67495
External area (m2)	52245	52245
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	26066.7	21403.7
Average U-value (W/m2K)	0.5	0.41
Alpha value (%)	7.01	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
	Retail
	Warehouse and storage
1	**Theatres/cinemas/music halls and auditoria**
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
	Bus station/train station/seaport terminal
	Workshops/maintenance depot
	Telephone exchanges
95	**Industrial process building**
2	**Launderette**
	Dwelling
	Retail warehouses
1	**Miscellaneous 24hr activities**

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0.2	191.4	0	9.7	9.2	0.8	5.5	0.85	6.8
	Notional	22.2	144.8	7.4	24.1	23.7	0.83	1.67	----	----
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	2.5	239.4	0.3	12.1	8.4	0.8	5.5	0.85	6.8
	Notional	12.2	181.7	4.1	30.2	23.7	0.83	1.67	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	0	15606.3	0	788.2	5.6	0.8	5.5	0.85	20
	Notional	0	14880.7	0	2475.2	21.7	0.83	1.67	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	69.6	181.3	5.9	9.2	6.1	0.8	5.5	0.85	6.8
	Notional	101.9	95.7	34.1	15.9	21.9	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0	298.7	0	15.1	9.2	0.8	5.5	0.85	6.8
	Notional	6.5	215.1	2.2	35.8	23.7	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	84.7	55.8	8	2.8	6.6	0.8	5.5	0.85	6.8
	Notional	140.8	33.9	47.1	5.6	20.3	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0	236.8	0	12	9.2	0.8	5.5	0.85	6.8
	Notional	19.8	165.1	6.6	27.5	23.7	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	5.8	104.6	0.8	5.3	9.2	0.8	5.5	0.85	6.8
	Notional	46.8	87.8	15.7	14.6	23.7	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0	292.6	0	14.8	9.7	0.8	5.5	0.85	6.8
	Notional	2.6	226	0.9	37.6	21.5	0.83	1.67	----	----
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	53.2	32.2	1.6	1.6	27.4	0.8	5.5	0.85	6.8
	Notional	328.2	22.1	109.8	3.7	46.6	0.83	1.67	----	----

Technical Data Sheet (Actual vs. Notional Building) (cont.)

HVAC Systems Performance (cont.)

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat kWh/m2	Cool kWh/m2	Aux kWh/m2	Heat SSEEF	Cool SSEER	Heat G SEFF	Cool G SEER
[ST] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electric										
	Actual	0	700.3	0	35.4	14.3	0.8	5.5	0.85	6.8
	Notional	0	607.2	0	101	37	0.83	1.67	----	----
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	0	0	0	0	4.5	0.8	5.5	0.85	6.8
	Notional	0	0	0	0	17.2	0.83	1.67	----	----
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	1.1	17.2	0.2	0.9	0.8	0.8	5.5	0.85	6.8
	Notional	12.3	3.2	4.1	0.5	34.4	0.83	1.67	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which s due to thermal bridging
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
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

Appendix

APPENDIX C

Energy Efficiency Measures Calculations

Appendix

Energy Efficiency Measures Calculations

Cooling System - Free Cooling & Water Cooling

	Standard Air-Cooled Chillers	Free Cooling Air-Cooled Chillers	Water Cooled Chillers
CoP	3.84	4.87	5.94
Energy Usage (kWh/year)	3,230,000	2,560,000	2,080,000
Energy Cost (£/year)	387,000	307,000	250,000
Capital Cost (£)	3,367,250	3,439,750	4,000,000
CO_2 emissions ($kgCO_2$/year)	1,363,060	1,080,320	877,760
Energy Saving (kWh/year)	-	670,000	1,150,000
CO_2 Saving ($kgCO_2$/year)	-	282,740	485,300

Variable Volume Systems

	CHW	LTHW
Peak pump load (kWe)	157	29
Annual Constant Volume Load (kWeh/year)	1,375,320	254,040
Annual Pump Load with VSDs (kWeh/year)	131,962	76,708
Annual Cost Saving (£/year)	148,816	30,000
Energy Saving (kWh/year)	1,243,358	177,332
CO_2 Saving ($kgCO_2$/year)	524,697	74,834

Reverse Osmosis (RO) Boiler Feedwater Treatment

	Softened Water	RO
Feedwater TDS (PPM)	338	8
Blowdown Proportion	0.11	0.0027
Blowdown Volume (kg/year)	2,682,648	63,495
Blowdown Energy (kWh/year)	488,249	11,556
Water Saving (m^3/year)	-	2,619
Operating Cost (£/year)	-	19,800
Energy Saving (kWh/year)	-	476,693
CO_2 Saving ($kgCO_2$/year)	-	92,478

Data Centre

	Water-Cooler Chillers + CRACs	Water-Cooler Chillers + Chilled Cabinets	Cooling Tower Pre-Cooling + AHUs	Air Cooled Data Centre
Utility Consumption				
Chiller (kWh/yr)	1,220,000	1,220,000	470,000	230,000
CHW Pump (kWh/yr)	189,000	189,000	37,000	31,000
CDW Pump (kWh/yr)	240,000	240,000	126,000	41,000
Tower Fan (kWh/yr)	186,000	186,000	167,000	31,000
AHU Fans (kWh/yr)	-	-	-	1,090,000
Total Power (kWh/yr)	2,500,000	2,470,000	1,900,000	1,430,000
Water (m^3/yr)	24,000	24,000	16,600	15,700
Steam (m^3/yr)	-	-	-	16,000
Gas (kWh/yr)	-	-	-	1,500,000
Costs				
Annual Power (£/yr)	300,000	296,000	230,000	171,000
Annual Water (£/yr)	29,000	29,000	20,000	18,000
Gas (£/yr)	-	-	-	52,000
Total Utility Cost (£)	330,000	326,000	250,000	242,000
CO_2 Emissions				
Power 2006 CO_2 factor ($kgCO_2$/yr)	1,055,000	1,042,340	801,800	603,460
Total ($kgCO_2$/yr)	1,055,000	1,042,340	801,800	894,460
Energy Saving (kWh/year)	-	30,000	600,000	-430,000
CO_2 Saving ($kgCO_2$/yr)	-	12,660	253,200	160,540

Energy Efficient measures –Summary Table

	CO_2 Saving 2006 ($kgCO_2$)			Energy Saving (MWh)		
Energy Efficient measure	TOTAL	Gas	Electricity	TOTAL	Gas	Electricity
Heat recovery on ventilation syst.	2,396,000	1,552,000	844,000	10,000	8,000	2,000
Free cooling chillers	282,740	0	282,740	670	0	670
Water cooled chillers	485,300	0	485,300	1,150	0	1,150
Variable volume chilled water syst.	524,697	0	524,697	1,243	0	1,243
Variable volume LTHW system	74,834	0	74,834	177	0	177
Boiler feedwater RO treatment	92,478	92,478	0	477	477	0
Data centre – Water Cooled Cabs	12,660	0	12,660	30	0	30
Data centre – Dual Coil CRAC units	253,200	0	253,200	600	0	600
Data centre – Outside air	160,540	0	160,540	-430	0	-430
Low grade heat recovery	146,741	33,132	113,609	440	171	269
Energy efficient lifts	31,650	0	31,650	75	0	75
Energy efficient lighting	514,236	0	514,236	1,220	0	1,220
Power Factor Correction	145,590	0	145,590	345	0	345
Metering and Alarm Limit Targeting	717,400	0	717,400	1,700	0	1,700

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