

## CONTROL SYSTEM TECHNICAL SCHEDULES

### DDC POINTS LIST, SCHEDULE OF CONTROL EQUIPMENT AND CONTROL PANEL DETAILS

The following DDC Points List shall be the minimum requirement of the control systems. It shall be the responsibility of the nominated control system specialist to confirm and re-submit a detailed DDC point list, control schedule and control system strategy write-up that shall achieve stable control performance together with thorough and complete system monitoring. All of which shall be agreed and approved by the Engineer.

The following abbreviations shall apply :-

- AI = Analogue Input**
- DI = Digital Input**
- DO = Digital Output**
- AO = Analogue Output**

All electrical loads, number of phases, flow rates and all other selection detail in the attached Technical Schedules must be checked and verified at tender by the nominated control system specialist.

### Systems Associated with South West Roof Plant Room Control Panel Reference MCC1 (Core E)

<b>DDC POINT LIST</b>	<b>AI</b>	<b>DI</b>	<b>DO</b>	<b>AO</b>
<b>Boiler Plant</b>				
LTHW Pressurisation Unit fault & independent pressure sensor	1	1		
Common Boiler flow & return temp sensors	2			
Boiler enable & common fault per module		4	4	
Gas Safety Circuit monitoring		1		
Boiler Shunt Pumps st/sp & individual WFS's		4	4	
VT Heating Pumps st/sp & common WFS		1	2	
VT Heating flow temp sensor & 0.10VDC control valve	1			1
CT Heating Pumps st/sp & common WFS		1	2	
<b>HWS Plant</b>				
HWS Cylinder temp sensor	1			
HWS Primary Pumps st/sp & common trip		1	2	
HWS Primary 2-port on/off valve with aux switch		1	1	
HWS high limit stat		1		
HWS Secondary Pump st/sp & trip		1	1	
<b>Chiller Plant</b>				
ChW Pressurisation Unit fault & independent pressure sensor	1	1		
ChW Primary Pumps st/sp & common WFS		1	2	
ChW Secondary flow & return temp sensors	2			
ChW Secondary Pumps st/sp & common WFS		1	2	
<b>Toilet Ventilation Plant</b>				
Intake damper motor op/cl & aux switch		1	2	
Supply Fan st/sp & AFS		1	1	
Frost Coil duct temp sensor	1			
Frost Coil raise/lower control valve			2	

# TOTAL CONTROL

DDC POINT LIST Continued	AI	DI	DO	AO
<b>Toilet Ventilation Plant</b>				
Fan Hold-Off frost stat		1		
Supply & Extract duct temp sensors	2			
LTHW Re-Heater Battery 0..10VDC control valve				1
Dirty filter switch		1		
Twin Toilet Extract Fan Unit st/sp & fault		1	1	
<b>Miscellaneous</b>				
Level D Core E Extract damper & aux switch (in Plant Room)		1	1	
Outside temp sensor	1			
<b>SUB TOTAL</b>	<b>12</b>	<b>25</b>	<b>27</b>	<b>2</b>

## CONTROL SCHEDULE

Item	Quant	Reference	Description
1	4	TI+B	Immersion temperature sensor
2	2	TI+SS	Immersion temperature sensor for Ch W
3	3	TD	Duct temperature sensor
4	1	TO	Outside air temperature sensor
5	2	EWT-##	Static hydraulic pressure sensor various ranges up to 25bar
6	8	FD 113S	Water DP switch 0.15..4 Bar
7	1	CPS 330	DP switch for air flow 0.2..3 mBar with duct kit
8	1	CPS 330	DP switch for dirty filters 0.2..3 mBar
9	1	SFS2	Fan hold-off capillary frost stat with manual reset -15..+15°C
10	1	EBS-8	Immersion stat c/w reset 60.95°C
11	4	ETL	Electro thermal link
12	1	KOB	Emergency knock off button
13	1	VMR 8	Electrogas 80mm Gas solenoid valve
14	2	DAS1/2	24V or 240V 2-3 point damper motor for 2m <sup>2</sup> max
15	2	AUX SWITCH	Twin auxiliary switch option for valve actuator or damper motor
16	1	3G50 + ET2 + DMS1.1	3-port 50mm rotating shoe valve Kvs 44 & 0..10VDC modulating actuator
		<i>size to be confirmed</i>	VT Heating Control Valve
17	1	2JOVC + DAS	2-port 1" BSP (25mm) ball valve Kvs 47 & 24V or 240V 2-3 point actuator
18	1	AUX SWITCH	Twin auxiliary switch option for valve actuator or damper motor
		<i>size to be confirmed</i>	HWS 2-port On/Off Valve
19	1	3MG25 + ET1 + DAN1/2	3-port 25mm rotating shoe valve Kvs 8/12 & 24V or 240V 2-3 point actuator
		<i>size to be confirmed</i>	Toilet AHU Frost Coil Control Valve
20	1	3MG20 + ET1 + DMN1.2N	3-port 20mm rotating shoe valve Kvs 4/6.3 & 0..10VDC modulating actuator
		<i>size to be confirmed</i>	Toilet AHU Main Heater Coil Control Valve
21	2	VLC 16160C3	BACnet Class 3 BACtalk Controller with 16 Universal inputs and 16 Binary outputs
22	1	VLC 853C3	BACnet Class 3 BACtalk Controller with 8 Universal inputs, 5 Binary outputs and 3 Analogue outputs

## CONTROL PANEL DETAIL - MCC1 (CORE E ROOF PLANT ROOM)

1No	Plant Item	Elect. Load	Phase
	<b>Floor standing single compartment wardrobe type control panel. Unless detailed below the control panel shall be to the requirements of the general electrical specification and shall house the following equipment, wired in LSF cable to klippon type terminals within Noryl trunking or protected cable looms, with switches low voltage lamps and engraved labels mounted on the control panel door.</b>		
	<b>Approximate size : 1800mmH x 1200mmW x 400mmD</b>		

## CONTROL PANEL DETAIL - MCC1 (CORE E ROOF PLANT ROOM) Continued

Plant Item	Elect. Load	Phase
<b>Main isolator up to 135A interlocked with panel door including control circuit MCB and control circuit live lamp.</b>		

**Direct On Line starter complete with MCBs, switches, run and trip lamps for the following**

1	HWS Secondary Pump	up to 2.0KW	1ph
1	Toilet AHU Supply Fan	0.75KW	1ph

**Contactor switched MCB protected feed complete with control circuit switches and lamps for the following**

1	Toilet Extract Fan Set (c/w auto-changeover unit)	1.5KW	3ph
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**Permanent MCB protected feed complete with necessary control circuit switches and lamps for the following**

1	LTHW Pressurisation Unit	up to 2.0KW	1ph
4	LTHW Boilers	up to 12A	1ph
4	Boiler Shunt Pumps (c/w integral inverters)	0.75KW	3ph
2	Run/S'by VT Heating Pumps (c/w integral inverter)	0.55KW	3ph
2	Run/S'by CT Heating Pumps (c/w integral inverter)	1.1KW	3ph
2	Run/S'by HWS Primary Pumps (c/w integral inverter)	0.55KW	3ph
1	ChW Pressurisation Unit	up to 2.0KW	1ph
2	Run/S'by ChW Prim Pumps (c/w integral inverter)	4.0KW	3ph
2	Run/S'by ChW Sec Pumps (c/w integral inverter)	7.5KW	3ph

**Control circuit only feed complete with necessary switches and lamps for the following**

1	Gas Solenoid Valve	240VAC	c/c
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**Additional equipment and facilities as follows**

- 8 Water flow fail alarm lamp and interlock
  - 1 Air flow fail alarm lamp and interlock
  - 1 Dirty filter switch alarm lamp
  - 1 Fan hold-off alarm lamp and interlock
  - 1 HWS high limit stat alarm lamp
  - 1 24VAC control circuit transformers complete with secondary circuit protection
- All control circuit cabling to have numbered and ferruled connections  
 Where suitable, interlocks, time delays and sequence functions shall be carried out in DDC software  
 All necessary plug-in relays to perform the general control function as known to us at time of tender  
 Where applicable status/alarm indication and plant override shall be carried out via the system access Keypad/Display Unit or the BMS Operator's Terminal

**Fit control equipment as follows**

- 3 DDC Controllers

## Systems Associated with North East Roof Plant Room Control Panel Reference MCC2 (Core F)

DDC POINT LIST	AI	DI	DO	AO
<b>Office Area AHU No2 &amp; Office Extract Fan (Core F)</b>				
Intake damper motor op/cl & aux switch		1	2	
Supply Fan st/sp, 0..10VDC inverter, inverter fault & AFS		2	1	1
Supply duct air velocity flow grid	1			
Run Around Coil Pump st/sp & trip		1	1	
Air Off Run Around Coil duct temp sensor	1			
Bag & panel dirty filter switches		2		
Frost Coil duct temp sensor & raise/lower control valve	1		2	

# TOTAL CONTROL

DDC POINT LIST Continued	AI	DI	DO	AO
<b>Office Area AHU No2 &amp; Office Extract Fan (Core F)</b>				
Fan hold-off frost stat		1		
Supply & Extract duct temp sensors	2			
ChW Cooling Coil 0..10VDC control valve				1
LTHW Heating Coil 0..10VDC control valve				1
<b>Core F Office Extract Fan</b>				
Office Ext. Fan st/sp, 0..10VDC inverter, inverter fault & AFS		2	1	1
Extract duct air velocity flow grid	1			
<b>Core F Local Floor Controls</b>				
Level A FA Supply on/off damper motor & aux switch		1	1	
Level A Extract on/off damper motor & aux switch		1	1	
Level B FA Supply on/off damper motor & aux switch		1	1	
Level B Extract on/off damper motor & aux switch		1	1	
Level C FA Supply on/off damper motor & aux switch		1	1	
Level C Extract on/off damper motor & aux switch		1	1	
Level D Extract only on/off damper motor & aux switch		1	1	
Level D LPHW on/off 2-port valve & aux switch		1	1	
Level D ChW on/off 2-port valve & aux switch		1	1	
<b>Comms Rooms (2No each with 3No A/C Units)</b>				
Level B Comms Room space temp	1			
Level B Comms Room A/C Units enable & fault		3	3	
Level C Comms Room space temp	1			
Level C Comms Room A/C Units enable & fault		3	3	
<b>SUB TOTAL</b>	<b>8</b>	<b>24</b>	<b>22</b>	<b>4</b>

## CONTROL SCHEDULE

Item	Quant	Reference	Description
23	4	TD	Duct temperature sensor
24	2	TR1	Room temperature sensor
25	1	VELO-PROBE	Duct mounted air velocity sensor
26	2	CPS 330	DP switch for air flow 0.2..3 mBar with duct kit
27	1	SFS2	Fan hold-off capillary frost stat with manual reset -15..+15°C
28	2	CPS 330	DP switch for dirty filters 0.2..3 mBar
29	1	605/0055/400/RFI	7.5KW Inverter / speed controller with filter
30	1	605/040/400/RFI	3.7KW Inverter / speed controller with filter
31	8	DAS1/2	24V or 240V 2-3 point damper motor for 2m <sup>2</sup> max
32	8	AUX SWITCH	Twin auxiliary switch option for valve actuator or damper motor
33	1	3MG20 + ET1 + DAN1/2 <i>size to be confirmed</i>	3-port 20mm rotating shoe valve Kvs 4/6.3 & 24V or 240V 2-3 point actuator
34	1	40S/M : VE411 + DMS1.1 <i>size to be confirmed</i>	Office AHU No2 Frost Coil Control Valve 3-port 1 1/4" BSP (40mm) lift & lay valve Kvs 13.3 & 0..10VDC modulating actuator
35	1	20/M : VE411 + DMS1.1 <i>size to be confirmed</i>	Office AHU No2 ChW Coil Control Valve 3-port 3/4" BSP (20mm) lift & lay valve Kvs 5 & 0..10VDC modulating actuator
36	1	2JOVC + DAS	Office AHU No2 LTHW Coil Control Valve 2-port 1" BSP (25mm) ball valve Kvs 47 & 24V or 240V 2-3 point actuator
37	1	AUX SWITCH	Twin auxiliary switch option for valve actuator or damper motor
38	1	2JOVF + DA <i>size to be confirmed</i>	Level D Core F LPHW Isolating Valve 2-port 2" BSP (50mm) ball valve Kvs 191 & 24V or 240V 2-3 point actuator
39	1	AUX SWITCH <i>size to be confirmed</i>	Twin auxiliary switch option for valve actuator or damper motor Level D Core F ChW Isolating Valve

# TOTAL CONTROL

## CONTROL SCHEDULE Continued

Item	Quant	Reference	Description
40	1	VLC 1188C3	BACnet Class 3 BACtalk Controller with 11 Universal inputs, 8 Binary outputs and 8 Analogue outputs
41	1	VLC 16160C3	BACnet Class 3 BACtalk Controller with 16 Universal inputs and 16 Binary outputs
42	1	VLC 550C3	BACnet Class 3 BACtalk Controller with 5 Universal inputs and 5 Binary outputs

## CONTROL PANEL DETAIL - MCC2 (CORE F ROOF PLANT ROOM)

Plant Item	Elect. Load	Phase																
<p><b>1No Wall mounting single compartment wardrobe type control panel. Unless detailed below the control panel shall be to the requirements of the general electrical specification and shall house the following equipment, wired in LSF cable to klippon type terminals within Noryl trunking or protected cable looms, with switches low voltage lamps and engraved labels mounted on the control panel door.</b></p> <p style="text-align: center;"><b>Approximate size : 1200mmH x 800mmW x 300mmD</b></p> <p><b>Main isolator up to 55A interlocked with panel door including control circuit MCB and control circuit live lamp.</b></p> <p><b>Direct On Line starter complete with MCBs, switches, run and trip lamps for the following</b></p> <table border="1"> <tr> <td>1</td> <td>Office AHU No2 Run Around Coil Pump</td> <td>up to 2.0KW</td> <td>3ph</td> </tr> </table> <p><b>Permanent MCB protected feed complete with necessary control circuit switches and lamps for the following</b></p> <table border="1"> <tr> <td>1</td> <td>Office AHU No2 Supply Fan (Inverter Cont'd)</td> <td>4.0KW</td> <td>3ph</td> </tr> <tr> <td>1</td> <td>Core F Office Extract Fan (Inverter Cont'd)</td> <td>2.7KW</td> <td>3ph</td> </tr> </table> <p><b>Additional equipment and facilities as follows</b></p> <ul style="list-style-type: none"> <li>2 Air flow fail alarm lamp and interlock</li> <li>1 Fan hold-off alarm lamp and interlock</li> <li>2 Dirty filter switch alarm lamp</li> <li>1 24VAC control circuit transformers complete with secondary circuit protection</li> </ul> <p>All control circuit cabling to have numbered and ferruled connections Where suitable, interlocks, time delays and sequence functions shall be carried out in DDC software All necessary plug-in relays to perform the general control function as known to us at time of tender Where applicable status/alarm indication and plant override shall be carried out via the system access Keypad/Display Unit or the BMS Operator's Terminal</p> <p><b>Fit control equipment as follows</b></p> <table border="1"> <tr> <td>3</td> <td>DDC Controllers</td> <td></td> <td></td> </tr> </table>	1	Office AHU No2 Run Around Coil Pump	up to 2.0KW	3ph	1	Office AHU No2 Supply Fan (Inverter Cont'd)	4.0KW	3ph	1	Core F Office Extract Fan (Inverter Cont'd)	2.7KW	3ph	3	DDC Controllers				
1	Office AHU No2 Run Around Coil Pump	up to 2.0KW	3ph															
1	Office AHU No2 Supply Fan (Inverter Cont'd)	4.0KW	3ph															
1	Core F Office Extract Fan (Inverter Cont'd)	2.7KW	3ph															
3	DDC Controllers																	

## Systems Associated with Ph3 Level 3 Roof Control Panel Reference MCC3

DDC POINT LIST	AI	DI	DO	AO
<b>Chiller Plant</b>				
Packaged Chiller No1 enable, common fault & paddle WFS		2	1	
Packaged Chiller No2 enable, common fault & paddle WFS		2	1	
<b>Core E Meeting Rooms AHU No3</b>				
Intake damper motor op/cl & aux switch		1	2	
Supply Fan st/sp & AFS		1	1	
Frost Coil duct temp sensor	1			
Frost Coil Electric Heater Battery 3-step & H/T cutout		1	3	

# TOTAL CONTROL

DDC POINT LIST	AI	DI	DO	AO
<b>Core E Meeting Rooms AHU No3</b>				
Supply duct temp sensor	1			
LTHW Re-Heater Battery 0..10VDC control valve				1
ChW Cooler Battery 0..10VDC control valve				1
Bag & panel dirty filter switches		2		
<b>Core E Office Extract Fan &amp; Run Around Coil</b>				
Office Ext. Fan st/sp, 0..10VDC inverter, inverter fault & AFS		2	1	1
Extract duct air velocity flow grid	1			
Air On Run Around Coil duct temp sensor	1			
<b>SUB TOTAL</b>	<b>4</b>	<b>11</b>	<b>9</b>	<b>3</b>

## CONTROL SCHEDULE

Item	Quant	Reference	Description
43	3	TD	Duct temperature sensor
44	1	VELO-PROBE	Duct mounted air velocity sensor
45	2	ELF-2	Paddle type water flow switch
46	2	CPS 330	DP switch for air flow 0.2..3 mBar with duct kit
47	2	CPS 330	DP switch for dirty filters 0.2..3 mBar
48	1	DAS1/2	24V or 240V 2-3 point damper motor for 2m <sup>2</sup> max
49	1	AUX SWITCH	Twin auxiliary switch option for valve actuator or damper motor
50	1	3MG25 + ET1 + DMN1.2N <i>size to be confirmed</i>	3-port 25mm rotating shoe valve Kvs 8/12 & 0..10VDC modulating actuator Meeting Rooms AHU No3 ChW Coil Control Valve
51	1	3MG20 + ET1 + DMN1.2N <i>size to be confirmed</i>	3-port 20mm rotating shoe valve Kvs 4/6.3 & 0..10VDC modulating actuator Meeting Rooms AHU No3 LTHW Coil Control Valve
52	1	605/0055/400/RFI	7.5KW Inverter / speed controller with filter
53	1	VLC 853C3	BACnet Class 3 BACtalk Controller with 8 Universal inputs, 5 Binary outputs and 3 Analogue outputs
54	1	VLC 550C3	BACnet Class 3 BACtalk Controller with 5 Universal inputs and 5 Binary outputs

## CONTROL PANEL DETAIL - MCC3 (CORE E PH3 LEVEL 3 ROOF PLANT AREA)

Plant Item	Elect. Load	Phase
<b>1No Wall mounting weatherproof single compartment wardrobe type control panel with inner and outer doors. Unless detailed below the control panel shall be to the requirements of the general electrical specification and shall house the following equipment, wired in LSF cable to klippon type terminals within Noryl trunking or protected cable looms, with switches low voltage lamps and engraved labels mounted on an inner control panel door.</b>		
<b>Approximate size : 1200mmH x 600mmW x 300mmD</b>		
<b>Main isolator up to 55A interlocked with panel door including control circuit MCB and control circuit live lamp.</b>		
<b>Direct On Line starter complete with MCBs, switches, run and trip lamps for the following</b>		
1 Meeting Rooms AHU No3 Supply Fan	1.1KW	3ph
<b>Permanent MCB protected feed complete with necessary control circuit switches and lamps for the following</b>		
1 Core E Office Extract Fan (Inverter Cont'd)	3.8KW	3ph

# TOTAL CONTROL

## CONTROL PANEL DETAIL - MCC3 (CORE E PH3 LEVEL 3 ROOF PLANT AREA) Continued

Plant Item	Elect. Load	Phase
<b>Contactor switched MCB protected feed complete with control circuit switches and lamps for the following</b>		
1 Meeting Rooms AHU No3 Electric Frost H/B (3-step)	3x3.0KW	1ph/step
<b>Control circuit only feed complete with necessary switches and lamps for the following</b>		
2 Packaged Air Cooled Chillers (power by EC)	-	c/c
<b>Additional equipment and facilities as follows</b>		
2 Water flow fail alarm lamp and interlock		
1 Air flow fail alarm lamp and interlock		
2 Dirty filter switch alarm lamp		
1 24VAC control circuit transformer complete with secondary circuit protection		
All control circuit cabling to have numbered and ferruled connections		
Where suitable, interlocks, time delays and sequence functions shall be carried out in DDC software		
All necessary plug-in relays to perform the general control function as known to us at time of tender		
Where applicable status/alarm indication and plant override shall be carried out via the system access Keypad/Display Unit or the BMS Operator's Terminal		
<b>Fit control equipment as follows</b>		
2 DDC Controller		

## Systems Associated with Basement Car Park Control Panel Reference MCC4

DDC POINT LIST	AI	DI	DO	AO
<b>Office Area AHU No1 &amp; Office Extract Fan (Core E)</b>				
Intake damper motor op/cl & aux switch		1	2	
Run/S'by Fan motors st/sp, 0..10VDC inverter, inverter fault		2	2	2
Supply Fan AFS		1		
Supply duct air velocity flow grid	1			
Run Around Coil Pump st/sp & trip		1	1	
Air Off Run Around Coil duct temp sensor	1			
Bag & panel dirty filter switches		2		
Frost Coil duct temp sensor & raise/lower control valve	1		2	
Fan hold-off frost stat		1		
Supply duct temp sensor	1			
ChW Cooling Coil 0..10VDC control valve				1
LTHW Heating Coil 0..10VDC control valve				1
<b>Miscellaneous</b>				
Comms Room A/C Outdoor Units (6No) voltfree fault signals		6		
Car Park Extract Fan st/sp & AFS		1	1	
Space temp sensor near Comms Room A/C Units	1			
<b>SUB TOTAL</b>	<b>5</b>	<b>15</b>	<b>8</b>	<b>4</b>

## CONTROL SCHEDULE

Item	Quant	Reference	Description
55	3	TD	Duct temperature sensor
56	2	TR1	Room temperature sensor
57	2	CPS 330	DP switch for air flow 0.2..3 mBar with duct kit
58	1	SFS2	Fan hold-off capillary frost stat with manual reset -15..+15°C
59	2	CPS 330	DP switch for dirty filters 0.2..3 mBar

# TOTAL CONTROL

## CONTROL SCHEDULE Continued

Item	Quant	Reference	Description
60	2	605/0055/400/RFI	7.5KW Inverter / speed controller with filter
61	1	DAS1/2	24V or 240V 2-3 point damper motor for 2m <sup>2</sup> max
62	1	AUX SWITCH	Twin auxiliary switch option for valve actuator or damper motor
63	1	3MG25 + ET1 + DAN1/2	3-port 25mm rotating shoe valve Kvs 8/12 & 24V or 240V 2-3 point actuator
64	1	<b>size to be confirmed</b> 50/M : VE411 + DMS1.1	Office AHU No1 Frost Coil Control Valve 3-port 2" BSP (50mm) lift & lay valve Kvs 29.2/37.5 & 0..10VDC modulating actuator
65	1	<b>size to be confirmed</b> 25/M : VE411 + DMS1.1	Office AHU No1 ChW Coil Control Valve 3-port 1" BSP (25mm) lift & lay valve Kvs 9.2 & 0..10VDC modulating actuator
66	1	VLC 1188C3	Office AHU No1 LTHW Coil Control Valve BACnet Class 3 BACtalk Controller with 11 Universal inputs, 8 Binary outputs and 8 Analogue outputs
67	1	VLC 550C3	BACnet Class 3 BACtalk Controller with 5 Universal inputs and 5 Binary outputs

## CONTROL PANEL DETAIL - MCC4 (CORE E BASEMENT PLANT ROOM)

Plant Item	Elect. Load	Phase
<b>1No Wall mounting single compartment wardrobe type control panel. Unless detailed below the control panel shall be to the requirements of the general electrical specification and shall house the following equipment, wired in LSF cable to klippon type terminals within Noryl trunking or protected cable looms, with switches low voltage lamps and engraved labels mounted on the control panel door.</b> <b>Approximate size : 1200mmH x 800mmW x 300mmD</b> <b>Main isolator up to 135A interlocked with panel door including control circuit MCB and control circuit live lamp.</b>		
<b>Direct On Line starter complete with MCBs, switches, run and trip lamps for the following</b>		
1 Office AHU No1 Run Around Coil Pump	up to 4.0KW	3ph
<b>Permanent MCB protected feed complete with necessary control circuit switches and lamps for the following</b>		
1 Office AHU No1 Run/S'by Sup. Fan (Inverter Cont'd)	7.5KW	3ph
6 Comms Room A/C Units Condensers	10KW	3ph
<b>Additional equipment and facilities as follows</b>		
6 Comms Room A/C Outdoor Unit alarm lamps		
2 Air flow fail alarm lamp and interlock		
2 Dirty filter switch alarm lamp		
1 Fan hold-off alarm lamp and interlock		
2 24VAC control circuit transformers complete with secondary circuit protection		
All control circuit cabling to have numbered and ferruled connections		
Where suitable, interlocks, time delays and sequence functions shall be carried out in DDC software		
All necessary plug-in relays to perform the general control function as known to us at time of tender		
Where applicable status/alarm indication and plant override shall be carried out via the system access Keypad/Display Unit or the BMS Operator's Terminal		
<b>Fit control equipment as follows</b>		
1 DDC Controllers		

# TOTAL CONTROL

## Core E VLC-Boxes Levels A, B, C & D

### DDC POINT LIST

	AI	DI	DO	AO
<b>Typical Riser VLC-Box per General Office Floor (4off)</b>				
MICROTOUCH temp sensor & master setpoint	2			
Floor "Out-of-Hours" override backlit pushbutton		1	1	
FA Supply on/off damper motor & aux switch (not Level D)		1	1	
Extract on/off damper motor & aux switch (not Level D)		1	1	
LPHW on/off 2-port valve & aux switch		1	1	
ChW on/off 2-port valve & aux switch		1	1	
<b>SUB TOTAL</b>	<b>2</b>	<b>5</b>	<b>5</b>	

### OFFICE RISER VLC-BOX CONTROL SCHEDULE (4off)

Item	Quant	Reference	Description
68	4	TS 1050 BT	BACtalk MICROTOUCH space temperature sensor with setpoint adjustment, tenant override switch and service jack.
69	4	Push-button	Local Floor Backlit Override Push-button
70	6	DAS1/2	24V or 240V 2-3 point damper motor for 2m <sup>2</sup> max
71	6	AUX SWITCH	Twin auxiliary switch option for valve actuator or damper motor
72	1	2JOVC + DAS	2-port 1" BSP (25mm) ball valve Kvs 47 & 24V or 240V 2-3 point actuator
73	1	AUX SWITCH	Twin auxiliary switch option for valve actuator or damper motor
74	1	<i>size to be confirmed</i> 2JOVF + DA	Level A LPHW Isolating Valve 2-port 2" BSP (50mm) ball valve Kvs 191 & 24V or 240V 2-3 point actuator
75	1	AUX SWITCH	Twin auxiliary switch option for valve actuator or damper motor
76	1	<i>size to be confirmed</i> 2JOVC + DAS	Level A ChW Isolating Valve 2-port 1" BSP (25mm) ball valve Kvs 47 & 24V or 240V 2-3 point actuator
77	1	AUX SWITCH	Twin auxiliary switch option for valve actuator or damper motor
78	1	<i>size to be confirmed</i> 2JOVF + DA	Level B LPHW Isolating Valve 2-port 2" BSP (50mm) ball valve Kvs 191 & 24V or 240V 2-3 point actuator
79	1	AUX SWITCH	Twin auxiliary switch option for valve actuator or damper motor
80	1	<i>size to be confirmed</i> 2JOVC + DAS	Level B ChW Isolating Valve 2-port 1" BSP (25mm) ball valve Kvs 47 & 24V or 240V 2-3 point actuator
81	1	AUX SWITCH	Twin auxiliary switch option for valve actuator or damper motor
82	1	<i>size to be confirmed</i> 2JOVF + DA	Level C LPHW Isolating Valve 2-port 2" BSP (50mm) ball valve Kvs 191 & 24V or 240V 2-3 point actuator
83	1	AUX SWITCH	Twin auxiliary switch option for valve actuator or damper motor
84	1	<i>size to be confirmed</i> 2JOVC + DAS	Level C ChW Isolating Valve 2-port 1" BSP (25mm) ball valve Kvs 47 & 24V or 240V 2-3 point actuator
85	1	AUX SWITCH	Twin auxiliary switch option for valve actuator or damper motor
86	1	<i>size to be confirmed</i> 2JOVF + DA	Level D Core F LPHW Isolating Valve 2-port 2" BSP (50mm) ball valve Kvs 191 & 24V or 240V 2-3 point actuator

# TOTAL CONTROL

## OFFICE RISER VLC-BOX CONTROL SCHEDULE (4off) Continued

Item	Quant	Reference	Description
87	1	AUX SWITCH	Twin auxiliary switch option for valve actuator or damper motor
88	4	<i>size to be confirmed</i> VLC 550C3	Level D Core F ChW Isolating Valve BACnet Class 3 BACtalk Controller with 5 Universal inputs and 5 Binary outputs
89	4	VLC-BOX	Small enclosure for terminal unit DDC controller complete with 24V transformer & fan on/off relay

## Reception Systems

DDC POINT LIST	AI	DI	DO	AO
<b>The Reception is served by 2No FCUs (included in FCU Schedule) and 3No Overdoor Heaters each with site fitted VLCs as below :-</b>				
Supply & return air temp sensors	2			
2-speed Fan st/sp			2	
Pulse proportional 2-port heating valve			1	
<b>1No FCU or Overdoor Heater shall be fitted with :-</b>				
Receptionist Local Control with on/off & +/-4C adjustment	2			
Reception Area room temp sensor	1			
<b>SUB TOTAL</b>	<b>5</b>		<b>3</b>	

## CONTROL SCHEDULE

Item	Quant	Reference	Description
90	6	TF	Flying lead temperature sensor
91	1	TR1	Room temperature sensor
92	3	213134/E20C	2-port 20mm terminal unit valve Kvs 3.2 & 24V thermic actuator WITHOUT COUPLINGS
93	3	<i>size to be confirmed</i> VLC 660RC3	Overdoor Heater Control Valve BACnet Class 3 BACtalk Controller with 6 Universal inputs and 6 Binary outputs (3 for direct fan speed switching)
94	3	VLC-BOX	Small enclosure for terminal unit DDC controller complete with 24V transformer
95	3	Sets	Overdoor Heater DDC Programming
96	3	Sets	Overdoor Heater FCU Commissioning

## Fan Coil Units

DDC POINT LIST	AI	DI	DO	AO
<b>Standard Fan Coil Unit</b>				
Supply & return air temp sensors	2			
Fan st/sp (3-speed in Meeting Rooms)			1(3)	
Pulse proportional 2-port heating valve			1	
Pulse proportional 2-port cooling valve			1	
<b>Optional DDC Points</b>				
MICROSET (for 10No Meeting Rooms & 1No First Aid Room)	2			
PIR Input (for 10No Meeting Rooms & 1No First Aid Room)		1		
c/c output to st/sp Extract Fan to First Aid Room			1	
Open Plan room temp sensors (3 per floor - 12No in total)	1			
<b>SUB TOTAL</b>	<b>5</b>	<b>1</b>	<b>3</b>	

# TOTAL CONTROL

## **FCU's CONTROL EQUIPMENT (FACTORY FITTED)**

<b>Item</b>	<b>Quant</b>	<b>Reference</b>	<b>Description</b>
97	356	TF	Flying lead temperature sensor
98	178	213112/E20C	2-port 15mm terminal unit valve Kvs 1.8 & 24V thermic actuator WITHOUT COUPLINGS
99	178	<i>size to be confirmed</i> 213134/E20C	FCU Heating Control Valve 2-port 20mm terminal unit valve Kvs 3.2 & 24V thermic actuator WITHOUT COUPLINGS
100	178	<i>size to be confirmed</i> VLC 660RC3	FCU Cooling Control Valve BACnet Class 3 BACtalk Controller with 6 Universal inputs and 6 Binary outputs (3 for direct fan speed switching)
101	178	Sets	FCU DDC Programming
102	178	Sets	FCU Commissioning

## **MISCELLANEOUS FCU's CONTROL EQUIPMENT (SITE INSTALLED)**

<b>Item</b>	<b>Quant</b>	<b>Reference</b>	<b>Description</b>
103	11	MS 1030 BT	BACtalk MICROSET space temperature sensor with digital readout and function keys for three speed fan
104	11	PIR	Gardscan MX movement detector
105	12	TR1	Room temperature sensor
106	12	Sets	Special Meeting Room DDC Programming

## **PC-Based BMS Operator's Terminal**

### **EQUIPMENT AND SERVICES SCHEDULE**

<b>Item</b>	<b>Quant</b>	<b>Reference</b>	<b>Description</b>
107	2	BTI	BACtalk BTI Integrator with BACnet Ethernet, MS/TP and PTP ports. Supports up to a maximum of 265 VLC controllers on 4x64 MS/TP trunks
108	2	Enclosure	Small enclosure for mounting Apex's in remote locations
109	1	PC	PC for BACtalk for Windows system software the required specification
110	1	PRINTER	System colour printer to the required specification
111	1	BTW KEY3+	BACtalk for Windows software protection key for BACnet system with unlimited Workstation BACnet devices
112	1	LTBT MAN OP	BACtalk for Windows Operators Manual
113	1	BTW CD	BACtalk for Windows installation & operating system software on CD-ROM
114	20	Screens	Head End System graphics preparation