Communities and Local Government

Air Conditioning Inspection Report

Site Details

Site Address (where inspection was carried out)	West End Surgery, Sample, Sample, Sample, NG10 5GW						
City	Sample	Postcode	NG10 5GW	RRN	0950-7996-0532-4340-2090	Related RRN	9749-6045-0923-0200-3691

Report Information

Inspection Date	2012-05-17	Issue Date	2012-06-21	UPRN	012345678910		

Assessor Details

Assessor Name	Robert Coombes	Assessor ID	STRO005334
Employer/Trading Name	Green Future Services		
Employer/Trading Address	The Orchard,Foxhills,Kegworth, Derbyshire, DE742FD		
Accreditation Scheme Name	Stroma Accreditation		

Communities and Local Government

Air Conditioning Inspection Report

Executive Summary

This report has been prepared in accordance with Part 4 of the Energy Performance of Buildings (Certificates and Inspections) (England and Wales) Regulations 2007, which implements Article 9 of the Energy Performance of Buildings Directive. The inspection has been carried out by an Accredited Air Conditioning Assessor using the Department for Communities and Local Government approved inspection and reporting methodology

The West End Surgery building originally dates from the late 1800's with an additional single storey extension added to the front of the building around 1982. The Victorian part of the building is constructed from double brick (un insulated) walls with a pitched slate roof. Window units are single glazed. The later additional section is constructed from block and brick with possible cavity insulation. Windows are again single glazed units and the roof is ptched slate.
By the end of 2012, the Government will be launching the new CO2 reduction programme called the Green Deal. This will replace the earlier Carbon Trust scheme. Full details have not yet been released, however a key componant of the Green Deal is a Pay As You Save financial mechanism designed to assist businesses to pay the upfront costs of their energy efficiency measures (increased insulation levels, double glazing and energy efficient equipment including lighting, heating and air conditioning heat pump systems). Following an assessment by a Green Deal Advisor, finance for the project will be advanced, to be repaid over an agreed period, whilst savings on running costs through reduced energy consumption are available from day one. I would recommend that you give consideration to the options that will be open to you to improve the thermal quality of the building and subsiquently reduce your building operating costs.
The building has an independant gas fired heating system which serves radiators to all rooms and area's. In addition to this, there are also 14 x Air Conditioning systems (1 x Twin split & 13 x Mono splits) of varying manufacturers and ages. 12 x of the systems were found to be of the early DOL type systems still operating with the HCFC R22 refrigerant. This refrigerant is currently being phased out. Please see the attached R22 Audit Report at the back of the main report that explains the current position and the options open to you regarding this type of system. The report also compares the operating costs and CO2 emissions for your existing systems compared against modern replacement Inverter type systems. Please see the Key Recommendations section for the details concerning your systems.
It was noted that there are no proceedures or controls in place to ensure that the independant heating system and the air conditioning systems are not operated at the same time (in conflicting modes) in the rooms served by both . Also the windows are able to open freely in some of the rooms and no warning notices advising to switch off the air conditioning systems (when windows are opened) were displayed on site. This is a potential area where operating costs and energy may be wasted.
I would strongly recommend that in the rooms where both heat pump air conditioining systems and heating radiators are installed together, the air conditioning systems should be used as the primary heat source in place of the existing gas fired heating system . Radiators should be isolated and it may also be possible to down rate the boiler output to compensate. Heat pump air conditioning systems operate with a minimum COP (coefficient of performance) of 3 This means that for every 1kw of energy consumed, the systems will produce a minimum of 3kw of heat (300% efficient). If you compare this to the gas fired heating system which operates with a COP of around 0.7 (1kw of energy consumed producing only 0.7kw of heat), substantial reductions in the operating costs and CO2 emissions can be made. In addition to the benefits mentioned, the air conditioning systems would also reduce the warm up time of the building when compared to a radiator heating system.
It was also noted that only a couple of the air conditioning systems are maintained. The remainder are only looked at in the event of a problem. This is due in part to bad advice from the time of the initial installation. The systems that are maintained are covered by a 6 monthly PPM scheme carried out by Filedair Ltd of Nottingham. It is important to ensure that the systems are checked and cleaned regularly to maintain the optimum operating efficiency. In addition to the efficiency of the systems, it is also important from an electrical safety point. Electrical connections are known to work loose at times due to the vibration of the system and part of the maintenance program includes the checking and re tightening of all electrical terminals. A rare but real risk is that of Legionellosis. This is normally associated with chilled water plant and water tower systems, however there is a slight risk with other types of air conditioning systems where condensate water sits in the drain tray. The PPM includes the use of cleaning agents and disinfectants to eliminate any risk of this type of problem. I would strongly recommend that the remaining systems are added to the planned maintenance program to cover the aformentioned concerns.
An F Gas log is not required for this site as all of the systems contain below the 3kg limit of refrigerant.
The air conditioning systems were inspected and sampled in accordance with the Energy Performance of Buildings Directive and the TM44 2012 document which states that a minimum of 10% of the systems / area's should be fully inspected. The following systems were inspected in depth to allow a full representation of the equipment type, age and refrigerant types to be taken into consideration with all other systems inspected to a lesser degree.

System Number 012 (SYS012)

Executive Summary

Fujitsu AOY 17ANA DOL mono split high wall system serving Room Number 5 (Dr Hunter). This system was found to be operational at the time of the inspection. The external heat exchanger was relatively clean but with the first signs of oxidisation present. The aluminium fins are still solid and active. The external pipe work insulation is deteriorating and becoming porous and although still complete, the joints have opened up in places. This will be reducing the efficiency and increasing the operating costs for the system. It was noted that standard 2.5mm twin and earth cable has been used on this system. This type of cable should not be used for this application.
Internally the system was found to be set at a lower than expected temperature of 19 degs C. The recognised ideal temperature setting for a working environment would be around 22 / 23degs C (Auto). By changing the settings to 22 / 23degs C, operating costs would be reduced along with CO2 emissions and also occupancy comfort levels would be improved.
The room cooling demand calculates to 2.17kw when the CIBSE benchmark of 160wm2 is used (high solar gain). The installed system has a cooling output of 4.75kw. This exceeds the normal allowable 20% margin. I would recommend that when the time comes to replace the system, the room should be re checked to ensure that the replacement system is accurately matched.

System Number 008 (SYS008)
IMI system. (Identification label is missing from the system). This is a mono split cassette system (DOL) of around 3.5kw which serves the Reception Office.
This system was found to be operational at the time of the inspection. The external heat exchanger was relatively clean but with the first signs of oxidisation present. The aluminium fins are still solid and active. The external pipe work insulation is deteriorating and becoming porous and although still complete, the joints have opened up in places. The entry point into the building has not been sealed and is open to the elements. This will be reducing the efficiency and increasing the operating costs for the system. There is an inline filter drier fitted to the system that looks to have been in place for several years. This should be replaced or removed completely to ensure the free flow of refrigerant around the system.
Internally the system was found to be set at a lower than expected temperature of 18 degs C. The recognised ideal temperature setting for a working environment would be around 22 / 23degs C (Auto). By changing the settings to 22 / 23degs C, operating costs would be reduced along with CO2 emissions and also occupancy comfort levels would be improved. The control is of the early design with limited functions.
The room cooling demand calculates to 2.9kw when the CIBSE benchmark of 125wm2 is used (normal for this type of room). the installed system has a cooling output of around 3.5kw. This is correctly matched for the room.

System Number 013 (SYS013)
LG SW12AW mono split high wall system serving the First Floor Staff Room. This system was found to be operational at the time of the inspection. The external heat exchanger was relatively clean and free from oxydisation. The pipe work insulation was found to be in a relatively good, complete and active condition.
Internally the system was found to be set at a lower than expected temperature of 18 degs C. The recognised ideal temperature setting for a working environment would be around 22 / 23degs C (Auto). By changing the settings to 22 / 23degs C, operating costs would be reduced along with CO2 emissions and also occupancy comfort levels would be improved.
The room cooling demand calculates to 2.8kw when the CIBSE benchmark of 160wm2 is used (high solar gain). The installed system has a cooling output of 3.4kw. This system is correctly matched to the room.

System Number 001 (SYS001)
Fujitsu AOY 12ASGC mono split high wall cooling only system (DOL) serving Nurse Room 3. This system was found to be operational at the time of the inspection. The external heat exchanger was found to be very dirty and partially blocked with dust. The aluminium fins also have signs of oxydisation. The pipe work insulation was found to be in a very poor and deteriorated condition with large sections of bare pipe work visable. This will be effecting the operating efficiency of the system and increasing the operating costs. The unit should be cleaned and the insulation checked and replaced where necessary.
Internally the system was found to be set at a lower than expected temperature of 18 degs C. The recognised ideal temperature setting for a working environment would be around 22 / 23degs C (Auto). By changing the settings to 22 / 23degs C, operating costs would be reduced along with CO2 emissions and also occupancy comfort levels would be improved.
The room cooling demand calculates to 2.04kw when the CIBSE benchmark of 125wm2 is used (normal for this type of room). The installed system has a cooling output of 3.4kw. This exceeds the normal allowable 20% margin. I would recommend that when the time comes to replace the system, the room should be re checked to ensure that the replacement system is accurately matched.

Executive Summary

System Number 007 (SYS007)
LG LM1460H22 twin split high wall system (DOL) serving Room Number 8 and Room Number 9. This system was found to be operational at the time of the inspection. The external heat exchanger was relatively clean but with the first signs of oxidisation present. The aluminium fins are still solid and active. The external pipe work insulation is deteriorating and becoming porous and although still complete. Although no visable sign of oil stains or refrigerant leaks were found, the evaporating temperature for the system looked to be lower than would be expected (air on at 17.6 degs C and air off at 4.6 degs C). This would indicate that the system may be slightly short of refrigerant. The system should be fully leak tested to ensure that refrigerant is not being lost.
Internally the system was found to be set at a lower than expected temperature of 18 degs C. The recognised ideal temperature setting for a working environment would be around 22 / 23degs C (Auto). By changing the settings to 22 / 23degs C, operating costs would be reduced along with CO2 emissions and also occupancy comfort levels would be improved.
The room cooling demand calculates to 2.1kw when the CIBSE benchmark of 125wm2 is used. The installed system has a cooling output of 1.6kw. This is just below the accepted 20% margin. Wehn the time comes to replace the system, the rooms served should be re calculated to ensure that any replacement system is better matched.

The air conditioning system power supplies are not currently sub metered to allow accurate monitoring or control of the operating costs (and subsiquent CO2 emissions). Guidance Notices offering operating instructions and good practice advice such as a company standard (allowable minimum and maximum temperature settings) were not found to be displayed on site.

All of the above systems were inspected in depth with all other systems and area's being checked to a lesser degree.
Further recommendations are available later in the report regarding the following points :
• Sub metering.
• Primary heat source.
• Guidance notices.
• Pipe work insulation
• Free cooling.
• Timer function.
• Temperature settings.

Summary
Parts of the site are operated relatively well and there are some good practices are in operation, however there are area's where improvements in the control, type and usage of the air conditioning system could potentially reduce both the building operating costs and the subsiquent CO2 emmissions.
1/ Although there is a planned maintenance programme in place for some of the systems on site, it is essential to ensure that this opened out for all systems and the plan followed correctly to maintain the systems to their optimum operating efficiencies at all times. This will reduce operating costs and increase the life expectancy of the systems.
2/ Utilizing the heat pump air conditioning systems for heating (in place of the gas fired central heating system) where possible will reduce operating costs.
3/ Replacing the older DOL type systems operating with primarily R22 and also R407c with modern inverter drive type systems can reduce operating costs by as much as 60%.
4/ By adjusting the set temperatures even as little as one degree will reduce operating costs.

Key Recommendations:

Advice and comments on the efficiencies of the AC sub system(s)

By increasing insulation levels within a building (cavity wall, above ceiling grid etc...) operating costs would be reduced. Insulating a building is a cost effective way of reducing both the operating costs and CO2 emissions and this is due to the insulation acting in two ways. Firstly an insulated room will retain the heat for longer (produced by the air conditioning heat pump systems or the building heating system) in the winter months. This will also help to reduce the warm up times at the start of the day as the building internal temperature will be higher over night. Secondly the insulation also acts to protect the room from external heat gains in the summer months when the air conditioning systems are being used to cool the rooms. In rooms situated at the top of buildings, it is normal to find that ceiling grids are left un insulated. The space above the ceiling (ceiling void) will be open right up to the roof of the building and this space can become extremely hot in sunny conditions due to the solar gain across the roof (and very cold in winter). By installing bagged insulation on top of the ceiling grid, the room can be protected.

The older systems are known as DOL (Direct On Line) models and they are the least efficient types on site, especially when compared to modern Inverter type systems. DOL system operate by switching the compressor on and off as required which means that it is either operating at 100% capacity or 0% capacity. This requires high starting currents and the operating costs reflect this. Inverter systems are the most efficient types if used correctly. Inverter systems operate by slowly winding up to speed, hence the high current is not required. They also speed up and slow down (modulate) to match the cooling / heating requirements at any one time which means that they always operate at their most efficient possible. It is possible to gain ECA (Enhanced Capital Allowance) for most modern inverter type systems.This means that unlike previously, you would be able to offset 100% of the whole cost(including labour and ancillaries) in the first year for new systems installed.

By the end of 2012, the Government will be launching the new CO2 reduction programme called the Green Deal. This will replace the earlier Carbon Trust scheme. Full details have not yet been released, however a key componant of the Green Deal is a Pay As You Save financial mechanism designed to assist businesses to pay the upfront costs of their energy efficiency measures (increased insulation levels, double glazing and energy efficient equipment including lighting, heating and air conditioning heat pump systems). Following an assessment by a Green Deal Advisor, finance for the project willbe advanced, to be repaid over an agreed period, whilst savings on running costs through reduced energy consumption are available from day one.

Advice and comments on the maintenance of the AC sub system(s)

It was found that some of the older pipe work insulation has started to deteriorate and to break away. Area's of bare pipe work were found at the time of the inspection. Insulation joints have also opened up. This will effect the operating efficiency of the systems. The insulation should be checked and replaced where necessary to ensure that the systems operate to their best ability.

Some of the older system heat exchangers were found to be showing signs of deterioration and oxydisation, however the aluminium fins are still intact and active. This will be reducing the ability of the heat exchanger to reject heat and subsiquently the system will be working harder than normal to try to achieve the room temperature. It is possible in extreme cases to obtain and replace the heat exchanger section, however this is a costly exercise and would not be recommended. The system should be regularly checked and monitored for further deterioration.

It was noted that only a couple of the air conditioning systems are maintained. The remainder are only looked at in the event of a problem. This is due in part to bad advice from the time of the initial installation. The systems that are maintained are covered by a 6 monthly PPM scheme carried out by Filedair Ltd of Nottingham. It is important to ensure that the systems are checked and cleaned regularly to maintain the optimum operating efficiency. In addition to the efficiency of the systems, it is also important from an electrical safety point. Electrical connections are known to work loose at times due to the vibration of the system and part of the maintenance program includes the checking and re tightening of all electrical terminals. A rare but real risk is that of Legionellosis. This is normally associated with chilled water plant and water tower systems, however there is a slight risk with other types of air conditioning systems where condensate water

Key Recommendations:

sits in the drain tray. The PPM includes the use of cleaning agents and disinfectants to eliminate any risk of this type of problem. I would strongly recommend that the remaining systems are added to the planned maintenance program to cover the aformentioned concerns.

Advice and comments on the control of AC sub system(s)

The temperature settings on site varied from a lower than expected 18 degs C through to 20 degs C. The recognised ideal temperature setting for a working environment would be around 22 / 23degs C (Auto). By changing the settings to 22 / 23degs C, operating costs would be reduced along with CO2 emissions and also occupancy comfort levels would be improved.

Using the timer functions on the air conditioning systems can help to control operating costs and improve comfort levels. Systems can be set to pre condition rooms prior to occupancy. It can also reduce or eliminate the risk of systems being left switched on after hours or in unoccupied rooms. If a centralised timer control is used, it is possible to set second Off times to enable a second sweep of the building after hours to ensure that all systems are definately off even if staff have been working late.

Advice and comments on the management of AC sub system(s)

It may be possible to obtain Free Cooling by opening windows (when ambient conditions are suitable) and this should always be the first choice before utilising air conditioning systems. However it must be stressed that if it is found that the fresh air is not offering sufficient cooling and air conditioning systems are required, please ensure that windows are closed before switching the systems on.

It was noted that there are no proceedures or controls in place to ensure that the independant heating system and the air conditioning systems are not operated at the same time (in conflicting modes). Also the windows are able to open freely and no warning notices advising to switch off the air conditioning systems (when windows are opened) were displayed on site. This is a potential area where operating costs and energy may be wasted. The simplest and most cost effective remedy would be to implement a staff training program and to display Guidance Notices in each room advising staff.

By sub metering the individual air conditioning power supplies, it would be possible to collate the information gained and to use it to monitor and control the operating costs closely. It will be very difficult to recognise or confirm the results of any changes or improvements made unless this information can be monitored. Further information is available in the TM39 document.

Posting guidance notices in each room that offer both dedicated operating instructions (for the room air conditioning systems in that particular room) and also offering good practice advise such as maximum and minimum allowable temperature settings and warnings to remember to switch off the air conditioning systems at the end of the day or when rooms are vacated (or windows are opened), would ensure that each system is operated correctly and efficiently at all times.

I would strongly recommend that in the rooms where both heat pump air conditioining systems and heating radiators are installed together, the air conditioning systems should be used as the primary heat source in place of the existing gas fired heating system . Radiators should be isolated and it may also be possible to down rate the boiler output to compensate. Heat pump air conditioning systems operate with a minimum COP (coefficient of performance) of 3 This means that for every 1kw of energy consumed, the systems will produce a minimum of 3kw of heat (300% efficient). If you compare this to the gas fired heating system which operates with a COP of around 0.7 (1kw of energy consumed producing only 0.7kw of heat), substantial reductions in the operating costs and CO2 emissions can be made. In addition to the benefits mentioned, the air conditioning systems would also reduce the warm up time of the building when compared to a radiator heating system.

Sub System Index	
Volume Definitions	VOL001 = Building with a gas fired heating system serving radiators and 14 x air conditioning systems
Sub System ID	VOL001/SYS012
Sub System Description	Mono split high wall DOL system.
Effective Rated Cooling Output of Sub System (kW)	4
Sub System Area Served	Room Number 5 (Dr Hunter)
Inspection Date	2012-05-17
Cooling Plant Count	1
AHU Count	0
Terminal Units Count	1
Sub System Controls Count	1

Sub System Index	
Volume Definitions	VOL001 = Building with a gas fired heating system serving radiators and 14 x air conditioning systems
Sub System ID	VOL001/SYS008
Sub System Description	Mono split cassette DOL system.
Effective Rated Cooling Output of Sub System (kW)	3
Sub System Area Served	Reception Office
Inspection Date	2012-05-17
Cooling Plant Count	1
AHU Count	0
Terminal Units Count	1
Sub System Controls Count	1

Sub System Index	
Volume Definitions	VOL001 = Building with a gas fired heating system serving radiators and 14 x air conditioning systems
Sub System ID	VOL001/SYS013
Sub System Description	Mono split high wall inverter system.
Effective Rated Cooling Output of Sub System (kW)	3
Sub System Area Served	FF Staff Room
Inspection Date	2012-05-17
Cooling Plant Count	1
AHU Count	0
Terminal Units Count	1
Sub System Controls Count	1

Sub System Index	
Volume Definitions	VOL001 = Building with a gas fired heating system serving radiators and 14 x air conditioning systems
Sub System ID	VOL001/SYS001
Sub System Description	Mono split high wall DOL system.
Effective Rated Cooling Output of Sub System (kW)	3
Sub System Area Served	Nurse Room 3
Inspection Date	2012-05-17
Cooling Plant Count	1
AHU Count	0
Terminal Units Count	1
Sub System Controls Count	1

Sub System Index	
Volume Definitions	VOL001 = Building with a gas fired heating system serving radiators and 14 x air conditioning systems
Sub System ID	VOL001/SYS007
Sub System Description	Twin split high wall DOL system.
Effective Rated Cooling Output of Sub System (kW)	2
Sub System Area Served	Room Number 8 (& Room Number 9)
Inspection Date	2012-05-17
Cooling Plant Count	1
AHU Count	0
Terminal Units Count	2
Sub System Controls Count	2

Note: Request the following information from client and complete the following checklist. The assessor should examine the relevant documentation and systems as far as possible to check that the installed equipment is as described. If the documentation is not available, then an additional part of this procedure is to locate the equipment and assemble a portfolio of relevant documentation which should include all 'Essential' items as a minimum.

Record Checklist Pre Inspection Information

Level	Information Required	Reviewed	Not Available
Essential	Itemised list of installed air conditioning and refrigeration plant including product makes, models and identification numbers.	[ ]	[x]
	Cooling capacities, with locations of the indoor and outdoor components of each plant.	[ ]	[x]
	Description of system control zones, with schematic drawings.	[ ]	[x]
	Description of method of control of temperature.	[ ]	[x]
	Description of method of control of periods of operation.	[ ]	[x]
	Floor plans and schematics of air conditioning systems.	[ ]	[x]
Desirable	Reports from earlier inspections of air conditioning systems, and for the generation of an energy performance certificate.	[ ]	[x]
	Records of maintenance operations carried out on refrigeration systems, including cleaning indoor and outdoor heat exchangers, refrigerant leakage tests, repairs to refrigeration components replenishing with refrigerant.	[x]	[ ]
	Records of maintenance operations carried out on air delivery systems, including filter cleaning and changing, and cleaning of heat exchangers.	[x]	[ ]
	Records of calibration and maintenance operations carried out on control systems and sensors, or BMS systems and sensors.	[ ]	[x]
	Records of sub-metered air conditioning plant use or energy consumption.	[ ]	[x]
	For relevant air supply and extract systems, commissioning results of measured absorbed power at normal air delivery and extract rates, and commissioning results for normal delivered delivery and extract air flow rates (or independently calculated specific fan power for the systems).	[ ]	[x]
Optional	An estimate of the design cooling load for each system (if available). Otherwise, a brief description of the occupation of the cooled spaces, and of power consuming equipment normally used in those spaces.	[ ]	[x]
	Records of any issues or complaints that have been raised concerning the indoor comfort conditions achieved in the treated spaces.	[ ]	[x]
	Where a BMS is used the manager should arrange for a short statement to be provided describing its capabilities, the plant it is connected to control, the set points for the control of temperature, the frequency with which it is maintained, and the date of the last inspection and maintenance.	[ ]	[x]

Record Checklist Pre Inspection Information			
Level	**Information Required**	**Reviewed**	**Not Available**
	Where a monitoring station, or remote monitoring facility, is used to continually observe the performance of equipment such as chillers, the manager should arrange for a statement to be provided describing the parameters monitored, and a statement reviewing the operating efficiency of the equipment.	[ ]	[x]

Cooling Plant Equipment Inspected	
Unit Identifier	VOL001/SYS012/Outdoor
Component Identifier	Outdoor DOL unit serving a single high wall indoor unit.
Manufacturer	Fujitsu
Description (type/details)	Outdoor DOL unit linked to a single high wall type indoor unit
Model/Reference	AOY 17ANA
Serial Number	T000203
Year Plant Installed	1999
Rated Cooling Capacity (kW)	4
Refrigerant Type	HCFC 22
Refrigerant Charge (kg)	1
Location of Cooling Plant	Rear of the building. Second unit up of three mounted centrally on the wall.
Areas/Systems Served	Room Number 5 (Dr Hunter)
Note below any discrepancy between information provided by client and on site information collected, or any information of additional relevance to the cooling plant/system: None found.	

This section applies to the following unit: Outdoor DOL unit serving a single high wall indoor unit.

Cooling Plant Equipment Visual Inspection

Item Ref	Inspection Item	Finding	Notes and Recommendations
CS2.1	Is the refrigeration plant operational?	Yes [x] No [ ]	The refrigeration plant operated correctly at the time of the inspection. Temperatures taken at the time of the inspection support this. No action or guidance required.
CS2.2/a	Is the area around the refrigeration plant clear of obstructions & debris?	Yes [x] No [ ]	The area around the outdoor unit was found to be clean and clear of obstructions. It is important to ensure that the area around the outdoor unit is kept clean and clear of obstructions to keep the air flow unrestricted and to allow good access for maintenance.
CS2.2/b	Is the general condition of refrigeration and any associated central plant in good order?	Yes [x] No [ ]	The general condition of the complete system was found to be okay. No guidance required.
CS2.2/c	Is the condenser placed clear from warm air discharge louvres?	Yes [x] No [ ]	No localised louvres were found. No guidance required.
CS2.3/a	Are compressors operational or can they be brought into operation?	Yes [x] No [ ]	The compressor was found to operate correctly at the time of the inspection. No guidance required.
CS3.1/a	Is the heat rejection plant operational?	Yes [x] No [ ]	The heat rejection plant was found to be working correctly at the time of the inspection. Temperatures were taken from different points and the results confirmed the operation of the heat exchanger. It is important that the heat rejection plant is kept clean and operational to enable the system to operate to its most efficient possible.
CS3.1/b	Are condenser heat exchangers undamaged/ un-corroded and clean?	Yes [ ] No [x]	The heat exchanger was found to be relatively clean, however the aluminium fins (although still solid and active) are showing the first signs of oxidisation. The condition of the heat exchanger should be monitored for further signs of deterioration.

Cooling Plant Equipment Visual Inspection			
Item Ref	**Inspection Item**	**Finding**	**Notes and Recommendations**
CS3.2/a	Is the area around the heat rejection plant clear of obstructions & debris?	Yes [x] No [ ]	The outdoor unit is installed on gallows brackets on the wall. The area around the unit was found to be totally clear of obstructions and debris. No guidance required.
CS3.2/b	Is the condenser free of any possibility of air recirculation?	Yes [x] No [ ]	The outdoor unit has been correctly poistioned to avoid any risk of recirculation. No guidance required.
CS4.1	Is the insulation on circulation pipe work well fitted and in good order?	Yes [ ] No [x]	The insulation is starting to deteriorate and become porous, however it is still complete at this time. Some of the joints have opened up. This will be reducing the efficiency and increasing the operating costs. The insulation should be checked and replaced where necessary and the joints resealed to restore efficiencies.

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding		Notes and Recommendations
CS1.1	**Refrigerant Used**		Refrigerant Type	HCFC 22	An F Gas log is not required for the systems on site as they contain less than the 3kg limit of refrigerant. Although this system is not covered by the F Gas regulations, it is important to have a leak test at least once a year to ensure that the system remains gas tight.
			Montreal/ODS/F-Gas controlled?	Yes [x] No [ ]	
CS1.3	**Regular Maintenance**	Is there evidence of regular maintenance?	Yes [ ]	No [x]	This system is not currently part of the site PPM. Maintenance is not currently undertaken for this system. It is important to ensure that the systems are checked and cleaned regularly to maintain the optimum operating efficiency. In addition to the efficiency of the systems, it is also important from an electrical safety point. Electrical connections are known to work loose at times due to the vibration of the system and part of the maintenance program includes the checking and re tightening of all electrical terminals. A rare but real risk is that of Legionellosis. This is normally associated with chilled water plant and water tower systems, however there is a slight risk with other types of air conditioning systems where condensate water sits in the drain tray. The PPM includes the use of cleaning agents and disinfectants to eliminate any risk of this type of problem. I would strongly recommend that the remaining systems are added to the planned maintenance program to cover the aforementioned concerns.
		Is the maintenance undertaken by suitably competent people and in accordance to industry guidelines?	Yes [ ]	No [x]	
CS1.4 CL1.1	**Appropriately Sized Cooling Plant**		**Following Information Required:**		*Building Regulations Approved Document Part L 2nd tier documentation provides guidance suggesting that the plant should not be more than 20% oversized. This should be adopted as means of comparison to stay in line with current standards.* The room area calculates to 13.59m2 and the cooling demand equates to 2.17kw when the CIBSE benchmark of 160wm2 is used (high solar gains). The installed system has a cooling output of 4.75kw. This system is slightly over sized for the room.
			Total Occupants served by this plant	2	
			Total Floor Area served by this plant(m²)	13	
			Occupant Density (m²/person)	6.5	
			Maximum Instantaneous Heat Gain (W/m²)	160	

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
			Installed Cooling Capacity (kW) 4	I would recommend that when the time comes to replace the system, the room should be recalculated to ensure that the new system matches the requirements closer.
			The Installed Size is Deemed: More than Expected [x] Less than Expected [ ] As Expected [ ]	
CS1.6	**Metering Comparison to appropriate energy benchmarks**	Is metering installed to enable monitoring of energy consumption of refrigeration plant?	Yes [ ] No [x]	
			Recorded meter reading: The air conditioning system power supply is not currently sub metered.	
		Is the refrigeration plant connected to a BEMS that can provide out of range alarms?	Yes [ ] No [x]	The system was not linked to a BMS control or temperature alarm system. The system operates independantly via a dedicated controller.
		Are there any records of air conditioning plant usage or sub-metered energy consumption with expected hours of use per year for the plant?	Yes [ ] No [x]	Records of this type of information are not currently kept.
		Is the energy consumption or hours of use excessive?	Yes [ ] No [x]	The energy consumption figures were not available for inspection, however the hours of use do not appear to be excessive. By sub metering the individual air conditioning power supplies, it would be possible to collate the information gained and to use it to monitor and control the operating costs closely. It will be very difficult to recognise or confirm the results of any changes or improvements made unless this information can be monitored. Further information is available in the TM39 document.

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
CS2.2/d	**Refrigeration Leaks**	Are there any signs of a refrigerant leak?	Yes [ ] No [x]	No signs of refrigerant leaks were found at the time of the inspection. Although this system is not covered by the F Gas regulations, it is important to have a leak test at least once a year to ensure that the system remains gas tight.
CL1.3	**Refrigeration**		**Refrigeration Temperature:** Pre Compressor(°C) 14 Post Compressor(°C) 24 Ambient(°C) 10 **The Temperature is Deemed:** More than Expected [ ] Less than Expected [ ] As Expected [x]	No further guidance required.
		Assess the refrigeration compressor(s) and the method of refrigeration capacity control	This is a DOL type system that cycles on and off to try to achieve and maintain the room requirements.	The older systems are known as DOL (Direct On Line) models and they are the least efficient types on site, especially when compared to modern Inverter type systems. DOL system operate by switching the compressor on and off as required which means that it is either operating at 100% capacity or 0% capacity. This requires high starting currents and the operating costs reflect this. Inverter systems are the most efficient types if used correctly. Inverter systems operate by slowly winding up to speed, hence the high current is not required. They also speed up and slow down (modulate) to match the cooling / heating requirements at any one time which means that they always operate at their most efficient possible. It is possible to gain ECA (Enhanced Capital Allowance) for most modern inverter type systems.This means that unlike previously, you would be able to offset 100% of the whole cost(including labour and ancillaries) in the first year for new systems installed.

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
CS3.5	**Water Cooled Chillers (Cooling Towers & Evaporative Condensers)**	Is the water flow through cooling towers or evaporative coolers even and efficient, and there is no loss of water?	Yes [ ] No [x]	Not Applicable
		Is there a management regime in place to ensure that water is regularly checked and treated to ensure that there is no Legionella risk?	Yes [ ] No [x]	Not Applicable This information does not relate to the types of systems installed on site.
	Humidity Control	Is there separate equipment installed for humidity control?	Yes [ ] No [x]	Humidity control equipment is not required for this application. No guidance required.

Cooling Plant Equipment Inspected	
Unit Identifier	VOL001/SYS008/Outdoor
Component Identifier	Outdoor DOL unit serving a cassette indoor unit
Manufacturer	IMI
Description (type/details)	Outdoor DOL unit linked to a single cassette type indoor unit
Model/Reference	Model details missing
Serial Number	Serial number missing
Year Plant Installed	1996
Rated Cooling Capacity (kW)	3
Refrigerant Type	HCFC 22
Refrigerant Charge (kg)	1
Location of Cooling Plant	On the roof of the later extension to the side of the fire escape.
Areas/Systems Served	Reception Office
Note below any discrepancy between information provided by client and on site information collected, or any information of additional relevance to the cooling plant/system: None found.	

This section applies to the following unit: Outdoor DOL unit serving a cassette indoor unit

Cooling Plant Equipment Visual Inspection

Item Ref	Inspection Item	Finding	Notes and Recommendations
CS2.1	Is the refrigeration plant operational?	Yes [x] No [ ]	The refrigeration plant operated correctly at the time of the inspection. It was noted that the unit has an inline filter drier fitted that has been in the circuit for a considerable amount of time. The drier should be replaced or ideally removed completely. Failure to do so could result in a restriction or blockage in the system leading to expensive repairs.
CS2.2/a	Is the area around the refrigeration plant clear of obstructions & debris?	Yes [x] No [ ]	The area around the outdoor unit was found to be clean and clear of obstructions. It is important to ensure that the area around the outdoor unit is kept clean and clear of obstructions to keep the air flow unrestricted and to allow good access for maintenance.
CS2.2/b	Is the general condition of refrigeration and any associated central plant in good order?	Yes [x] No [ ]	The general condition of the complete system was found to be okay. No guidance required.
CS2.2/c	Is the condenser placed clear from warm air discharge louvres?	Yes [x] No [ ]	No localised louvres were found. No guidance required.
CS2.3/a	Are compressors operational or can they be brought into operation?	Yes [x] No [ ]	The compressor was found to operate correctly at the time of the inspection. No guidance required.
CS3.1/a	Is the heat rejection plant operational?	Yes [x] No [ ]	The heat rejection plant was found to be working correctly at the time of the inspection. Temperatures were taken from different points and the results confirmed the operation of the heat exchanger. It is important that the heat rejection plant is kept clean and operational to enable the system to operate to its most efficient possible.
CS3.1/b	Are condenser heat exchangers undamaged/ un-corroded and clean?	Yes [ ] No [x]	The heat exchanger was found to be relatively clean, however the aluminium fins (although still solid and active) are showing the first signs of oxidisation.

Cooling Plant Equipment Visual Inspection

Item Ref	Inspection Item	Finding	Notes and Recommendations
			The condition of the heat exchanger should be monitored for further signs of deterioration.
CS3.2/a	Is the area around the heat rejection plant clear of obstructions & debris?	Yes [x] No [ ]	The area around the unit was found to be totally clear of obstructions and debris. No guidance required.
CS3.2/b	Is the condenser free of any possibility of air recirculation?	Yes [x] No [ ]	The outdoor unit has been correctly poistioned to avoid any risk of recirculation. No guidance required.
CS4.1	Is the insulation on circulation pipe work well fitted and in good order?	Yes [ ] No [x]	The insulation is starting to deteriorate and become porous, however it is still complete at this time. Some of the joints have opened up. This will be reducing the efficiency and increasing the operating costs. The entry point into the building is open to the elements. The insulation should be checked and replaced where necessary and the joints resealed to restore efficiencies. the entry point into the building should be made weather tight.

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding		Notes and Recommendations
CS1.1	**Refrigerant Used**		Refrigerant Type	HCFC 22	An F Gas log is not required for the systems on site as they contain less than the 3kg limit of refrigerant. Although this system is not covered by the F Gas regulations, it is important to have a leak test at least once a year to ensure that the system remains gas tight.
			Montreal/ODS/F-Gas controlled?	Yes [x] No [ ]	
CS1.3	**Regular Maintenance**	Is there evidence of regular maintenance?	Yes [x]	No [ ]	This system is part of the PPM. Fieldair maintain this system every 6 months. It is important to ensure that the systems are checked and cleaned regularly to maintain the optimum operating efficiency. In addition to the efficiency of the systems, it is also important from an electrical safety point. Electrical connections are known to work loose at times due to the vibration of the system and part of the maintenance program includes the checking and re tightening of all electrical terminals. A rare but real risk is that of Legionellosis. This is normally associated with chilled water plant and water tower systems, however there is a slight risk with other types of air conditioning systems where condensate water sits in the drain tray. The PPM includes the use of cleaning agents and disinfectants to eliminate any risk of this type of problem. I would strongly recommend that the remaining systems are added to the planned maintenance program to cover the aforementioned concerns.
		Is the maintenance undertaken by suitably competent people and in accordance to industry guidelines?	Yes [x]	No [ ]	
CS1.4 CL1.1	**Appropriately Sized Cooling Plant**		**Following Information Required:**		*Building Regulations Approved Document Part L 2nd tier documentation provides guidance suggesting that the plant should not be more than 20% oversized. This should be adopted as means of comparison to stay in line with current standards.* The room area calculates to 23.89m2 and the cooling demand equates to 2.9kw when the CIBSE benchmark of 125wm2 is used. The installed system has a cooling output of 3.4kw. This system is correctly sized for the room.
			Total Occupants served by this plant	3	
			Total Floor Area served by this plant(m²)	23	
			Occupant Density (m²/person)	7.66	
			Maximum Instantaneous Heat Gain (W/m²)	125	

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
			Installed Cooling Capacity (kW) 3	
			The Installed Size is Deemed: More than Expected [ ] Less than Expected [ ] As Expected [x]	
CS1.6	**Metering Comparison to appropriate energy benchmarks**	Is metering installed to enable monitoring of energy consumption of refrigeration plant?	Yes [ ] No [x] Recorded meter reading: The air conditioning system power supply is not currently sub metered.	
		Is the refrigeration plant connected to a BEMS that can provide out of range alarms?	Yes [ ] No [x]	The system was not linked to a BMS control or temperature alarm system. The system operates independantly via a dedicated controller.
		Are there any records of air conditioning plant usage or sub-metered energy consumption with expected hours of use per year for the plant?	Yes [ ] No [x]	Records of this type of information are not currently kept.
		Is the energy consumption or hours of use excessive?	Yes [ ] No [x]	The energy consumption figures were not available for inspection, however the hours of use do not appear to be excessive. By sub metering the individual air conditioning power supplies, it would be possible to collate the information gained and to use it to monitor and control the operating costs closely. It will be very difficult to recognise or confirm the results of any changes or improvements made unless this information can be monitored. Further information is available in the TM39 document.

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
CS2.2/d	**Refrigeration Leaks**	Are there any signs of a refrigerant leak?	Yes [ ] No [x]	No signs of refrigerant leaks were found at the time of the inspection. Although this system is not covered by the F Gas regulations, it is important to have a leak test at least once a year to ensure that the system remains gas tight.
CL1.3	**Refrigeration**		**Refrigeration Temperature:** Pre Compressor(°C): 13 Post Compressor(°C): 22 Ambient(°C): 10 **The Temperature is Deemed:** More than Expected [ ] Less than Expected [ ] As Expected [x]	No further guidance required.
		Assess the refrigeration compressor(s) and the method of refrigeration capacity control	This is a DOL type system that cycles on and off to try to achieve and maintain the room requirements.	The older systems are known as DOL (Direct On Line) models and they are the least efficient types on site, especially when compared to modern Inverter type systems. DOL system operate by switching the compressor on and off as required which means that it is either operating at 100% capacity or 0% capacity. This requires high starting currents and the operating costs reflect this. Inverter systems are the most efficient types if used correctly. Inverter systems operate by slowly winding up to speed, hence the high current is not required. They also speed up and slow down (modulate) to match the cooling / heating requirements at any one time which means that they always operate at their most efficient possible. It is possible to gain ECA (Enhanced Capital Allowance) for most modern inverter type systems.This means that unlike previously, you would be able to offset 100% of the whole cost(including labour and ancillaries) in the first year for new systems installed.

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
CS3.5	**Water Cooled Chillers (Cooling Towers & Evaporative Condensers)**	Is the water flow through cooling towers or evaporative coolers even and efficient, and there is no loss of water?	Yes [ ] No [x]	Not Applicable
		Is there a management regime in place to ensure that water is regularly checked and treated to ensure that there is no Legionella risk?	Yes [ ] No [x]	Not Applicable This information does not relate to the types of systems installed on site.
	Humidity Control	Is there separate equipment installed for humidity control?	Yes [ ] No [x]	Humidity control equipment is not required for this application. No guidance required.

Cooling Plant Equipment Inspected	
Unit Identifier	VOL001/SYS013/Outdoor
Component Identifier	Outdoor inverter system
Manufacturer	LG
Description (type/details)	Outdoor inverter unit linked to a single high wall type indoor unit
Model/Reference	SW 12AW
Serial Number	312KA00472
Year Plant Installed	2006
Rated Cooling Capacity (kW)	3
Refrigerant Type	R410A
Refrigerant Charge (kg)	1
Location of Cooling Plant	Rear of the building far RH unit.
Areas/Systems Served	FF Staff Room
Note below any discrepancy between information provided by client and on site information collected, or any information of additional relevance to the cooling plant/system: None found.	

This section applies to the following unit: Outdoor inverter system

Cooling Plant Equipment Visual Inspection

Item Ref	Inspection Item	Finding	Notes and Recommendations
CS2.1	Is the refrigeration plant operational?	Yes [x] No [ ]	The refrigeration plant operated correctly at the time of the inspection. No guidance required.
CS2.2/a	Is the area around the refrigeration plant clear of obstructions & debris?	Yes [x] No [ ]	The area around the outdoor unit was found to be clean and clear of obstructions. It is important to ensure that the area around the outdoor unit is kept clean and clear of obstructions to keep the air flow unrestricted and to allow good access for maintenance.
CS2.2/b	Is the general condition of refrigeration and any associated central plant in good order?	Yes [x] No [ ]	The general condition of the complete system was found to be okay. No guidance required.
CS2.2/c	Is the condenser placed clear from warm air discharge louvres?	Yes [x] No [ ]	No localised louvres were found. No guidance required.
CS2.3/a	Are compressors operational or can they be brought into operation?	Yes [x] No [ ]	The compressor was found to operate correctly at the time of the inspection. No guidance required.
CS3.1/a	Is the heat rejection plant operational?	Yes [x] No [ ]	The heat rejection plant was found to be working correctly at the time of the inspection. Temperatures were taken from different points and the results confirmed the operation of the heat exchanger. It is important that the heat rejection plant is kept clean and operational to enable the system to operate to its most efficient possible.
CS3.1/b	Are condenser heat exchangers undamaged/ un-corroded and clean?	Yes [x] No [ ]	The heat exchanger was found to be relatively clean and free from oxidisation. No guidance required.
CS3.2/a	Is the area around the heat rejection plant clear of obstructions & debris?	Yes [x] No [ ]	The area around the unit was found to be totally clear of obstructions and debris.

Cooling Plant Equipment Visual Inspection			
Item Ref	**Inspection Item**	**Finding**	**Notes and Recommendations**
			No guidance required.
CS3.2/b	Is the condenser free of any possibility of air recirculation?	Yes [x] No [ ]	The outdoor unit has been correctly poistioned to avoid any risk of recirculation. No guidance required.
CS4.1	Is the insulation on circulation pipe work well fitted and in good order?	Yes [x] No [ ]	The insulation is in a good active and complete condition.s No action required.

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding		Notes and Recommendations
CS1.1	**Refrigerant Used**		Refrigerant Type	R410A	An F Gas log is not required for the systems on site as they contain less than the 3kg limit of refrigerant. Although this system is not covered by the F Gas regulations, it is important to have a leak test at least once a year to ensure that the system remains gas tight.
			Montreal/ODS/F-Gas controlled?	Yes [x] No [ ]	
CS1.3	**Regular Maintenance**	Is there evidence of regular maintenance?	Yes [x]	No [ ]	This system is not part of the PPM. This system is not currently maintained. It is important to ensure that the systems are checked and cleaned regularly to maintain the optimum operating efficiency. In addition to the efficiency of the systems, it is also important from an electrical safety point. Electrical connections are known to work loose at times due to the vibration of the system and part of the maintenance program includes the checking and re tightening of all electrical terminals. A rare but real risk is that of Legionellosis. This is normally associated with chilled water plant and water tower systems, however there is a slight risk with other types of air conditioning systems where condensate water sits in the drain tray. The PPM includes the use of cleaning agents and disinfectants to eliminate any risk of this type of problem. I would strongly recommend that the remaining systems are added to the planned maintenance program to cover the aforementioned concerns.
		Is the maintenance undertaken by suitably competent people and in accordance to industry guidelines?	Yes [ ]	No [x]	
CS1.4 CL1.1	**Appropriately Sized Cooling Plant**		**Following Information Required:**		*Building Regulations Approved Document Part L 2nd tier documentation provides guidance suggesting that the plant should not be more than 20% oversized. This should be adopted as means of comparison to stay in line with current standards.* The room area calculates to 18.01m2 and the cooling demand equates to 2.8kw when the CIBSE benchmark of 160wm2 is used. The installed system has a cooling output of 3.4kw. This system is correctly sized for the room.
			Total Occupants served by this plant	6	
			Total Floor Area served by this plant(m²)	18	
			Occupant Density (m²/person)	3	
			Maximum Instantaneous Heat Gain (W/m²)	160	

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding		Notes and Recommendations
			Installed Cooling Capacity (kW)	3	
			The Installed Size is Deemed:		
			More than Expected	[ ]	
			Less than Expected	[ ]	
			As Expected	[x]	
CS1.6	**Metering Comparison to appropriate energy benchmarks**	Is metering installed to enable monitoring of energy consumption of refrigeration plant?	Yes [ ]	No [x]	
			Recorded meter reading	The air conditioning system power supply is not currently sub metered.	
		Is the refrigeration plant connected to a BEMS that can provide out of range alarms?	Yes [ ]	No [x]	The system was not linked to a BMS control or temperature alarm system. The system operates independantly via a dedicated controller.
		Are there any records of air conditioning plant usage or sub-metered energy consumption with expected hours of use per year for the plant?	Yes [ ]	No [x]	Records of this type of information are not currently kept.
		Is the energy consumption or hours of use excessive?	Yes [ ]	No [x]	The energy consumption figures were not available for inspection, however the hours of use do not appear to be excessive. By sub metering the individual air conditioning power supplies, it would be possible to collate the information gained and to use it to monitor and control the operating costs closely. It will be very difficult to recognise or confirm the results of any changes or improvements made unless this information can be monitored. Further information is available in the TM39 document.

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
CS2.2/d	**Refrigeration Leaks**	Are there any signs of a refrigerant leak?	Yes [ ] No [x]	No signs of refrigerant leaks were found at the time of the inspection. Although this system is not covered by the F Gas regulations, it is important to have a leak test at least once a year to ensure that the system remains gas tight.
CL1.3	**Refrigeration**		**Refrigeration Temperature:** Pre Compressor(°C): 10 Post Compressor(°C): 22 Ambient(°C): 10 **The Temperature is Deemed:** More than Expected [ ] Less than Expected [ ] As Expected [x]	No further guidance required.
		Assess the refrigeration compressor(s) and the method of refrigeration capacity control	This is an efficient inverter type system that modulates the output to accurately match the room requirements at any one time. If used correctly this system can offer the maximum efficiencies.	Inverter systems are the most efficient types if used correctly. Inverter systems operate by slowly winding up to speed, hence the high current is not required. They also speed up and slow down (modulate) to match the cooling / heating requirements at any one time which means that they always operate at their most efficient possible.
CS3.5	**Water Cooled Chillers (Cooling Towers & Evaporative Condensers)**	Is the water flow through cooling towers or evaporative coolers even and efficient, and there is no loss of water?	Yes [ ] No [x]	Not Applicable
		Is there a management regime in place to ensure that water is regularly checked and treated to ensure that there is no Legionella risk?	Yes [ ] No [x]	Not Applicable This information does not relate to the types of systems installed on site.
	Humidity Control	Is there separate equipment installed for humidity control?	Yes [ ] No [x]	Humidity control equipment is not required for this application.

Cooling Plant Detailed Inspection Notes				
Item Ref	**Item**	**Inspection Item**	**Finding**	**Notes and Recommendations**
				No guidance required.

Cooling Plant Equipment Inspected	
Unit Identifier	VOL001/SYS001/Outdoor
Component Identifier	Outdoor DOL unit
Manufacturer	Fujitsu
Description (type/details)	Outdoor DOL unit linked to a single high wall type indoor unit
Model/Reference	AOY 12ASGC
Serial Number	Not legible
Year Plant Installed	1999
Rated Cooling Capacity (kW)	3
Refrigerant Type	HCFC 22
Refrigerant Charge (kg)	1
Location of Cooling Plant	Roof of the front extension. Far left hand unit.
Areas/Systems Served	Nurse Room 3
Note below any discrepancy between information provided by client and on site information collected, or any information of additional relevance to the cooling plant/system: None found.	

This section applies to the following unit: Outdoor DOL unit

Cooling Plant Equipment Visual Inspection

Item Ref	Inspection Item	Finding	Notes and Recommendations
CS2.1	Is the refrigeration plant operational?	Yes [x] No [ ]	The refrigeration plant operated correctly at the time of the inspection. Temperatures taken at the time of the inspection support this. No action or guidance required.
CS2.2/a	Is the area around the refrigeration plant clear of obstructions & debris?	Yes [x] No [ ]	The area around the outdoor unit was found to be clean and clear of obstructions. It is important to ensure that the area around the outdoor unit is kept clean and clear of obstructions to keep the air flow unrestricted and to allow good access for maintenance.
CS2.2/b	Is the general condition of refrigeration and any associated central plant in good order?	Yes [x] No [ ]	The general condition of the complete system was found to be okay. No guidance required.
CS2.2/c	Is the condenser placed clear from warm air discharge louvres?	Yes [x] No [ ]	No localised louvres were found. No guidance required.
CS2.3/a	Are compressors operational or can they be brought into operation?	Yes [x] No [ ]	The compressor was found to operate correctly at the time of the inspection. No guidance required.
CS3.1/a	Is the heat rejection plant operational?	Yes [x] No [ ]	The heat rejection plant was found to be working correctly at the time of the inspection. Temperatures were taken from different points and the results confirmed the operation of the heat exchanger. It is important that the heat rejection plant is kept clean and operational to enable the system to operate to its most efficient possible.
CS3.1/b	Are condenser heat exchangers undamaged/ un-corroded and clean?	Yes [ ] No [x]	The heat exchanger was found to be dirty and the aluminium fins (although still solid and active) are showing the first signs of oxidisation. The condition of the heat exchanger should be monitored for further signs of deterioration.

Cooling Plant Equipment Visual Inspection			
Item Ref	**Inspection Item**	**Finding**	**Notes and Recommendations**
CS3.2/a	Is the area around the heat rejection plant clear of obstructions & debris?	Yes [x] No [ ]	The area around the unit was found to be totally clear of obstructions and debris. No guidance required.
CS3.2/b	Is the condenser free of any possibility of air recirculation?	Yes [x] No [ ]	The outdoor unit has been correctly poistioned to avoid any risk of recirculation. No guidance required.
CS4.1	Is the insulation on circulation pipe work well fitted and in good order?	Yes [ ] No [x]	The insulation is starting to deteriorate badly and become porous, however it is still complete at this time. This will be reducing the efficiency and increasing the operating costs. The insulation should be checked and replaced where necessary and the joints resealed to restore efficiencies.

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding		Notes and Recommendations
CS1.1	**Refrigerant Used**		Refrigerant Type	HCFC 22	An F Gas log is not required for the systems on site as they contain less than the 3kg limit of refrigerant. Although this system is not covered by the F Gas regulations, it is important to have a leak test at least once a year to ensure that the system remains gas tight.
			Montreal/ODS/F-Gas controlled?	Yes [x] No [ ]	
CS1.3	**Regular Maintenance**	Is there evidence of regular maintenance?	Yes [ ]	No [x]	This system is not currently part of the site PPM. Maintenance is not currently undertaken for this system. It is important to ensure that the systems are checked and cleaned regularly to maintain the optimum operating efficiency. In addition to the efficiency of the systems, it is also important from an electrical safety point. Electrical connections are known to work loose at times due to the vibration of the system and part of the maintenance program includes the checking and re tightening of all electrical terminals. A rare but real risk is that of Legionellosis. This is normally associated with chilled water plant and water tower systems, however there is a slight risk with other types of air conditioning systems where condensate water sits in the drain tray. The PPM includes the use of cleaning agents and disinfectants to eliminate any risk of this type of problem. I would strongly recommend that the remaining systems are added to the planned maintenance program to cover the aforementioned concerns.
		Is the maintenance undertaken by suitably competent people and in accordance to industry guidelines?	Yes [ ]	No [x]	
CS1.4 CL1.1	**Appropriately Sized Cooling Plant**		**Following Information Required:**		*Building Regulations Approved Document Part L 2nd tier documentation provides guidance suggesting that the plant should not be more than 20% oversized. This should be adopted as means of comparison to stay in line with current standards.* The room area calculates to 16.35m2 and the cooling demand equates to 2.04kw when the CIBSE benchmark of 160wm2 is used (high solar gains). The installed system has a cooling output of 3.4kw. This system is slightly over sized for the room.
			Total Occupants served by this plant	2	
			Total Floor Area served by this plant(m²)	16	
			Occupant Density (m²/person)	8	
			Maximum Instantaneous Heat Gain (W/m²)	125	

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding		Notes and Recommendations
			Installed Cooling Capacity (kW)	3	I would recommend that when the time comes to replace the system, the room should be recalculated to ensure that the new system matches the requirements closer.
			The Installed Size is Deemed:		
			More than Expected	[x]	
			Less than Expected	[ ]	
			As Expected	[ ]	
CS1.6	**Metering Comparison to appropriate energy benchmarks**	Is metering installed to enable monitoring of energy consumption of refrigeration plant?	Yes [ ]	No [x]	
			Recorded meter reading	The air conditioning system power supply is not currently sub metered.	
		Is the refrigeration plant connected to a BEMS that can provide out of range alarms?	Yes [ ]	No [x]	The system was not linked to a BMS control or temperature alarm system. The system operates independantly via a dedicated controller.
		Are there any records of air conditioning plant usage or sub-metered energy consumption with expected hours of use per year for the plant?	Yes [ ]	No [x]	Records of this type of information are not currently kept.
		Is the energy consumption or hours of use excessive?	Yes [ ]	No [x]	The energy consumption figures were not available for inspection, however the hours of use do not appear to be excessive. By sub metering the individual air conditioning power supplies, it would be possible to collate the information gained and to use it to monitor and control the operating costs closely. It will be very difficult to recognise or confirm the results of any changes or improvements made unless this information can be monitored. Further information is available in the TM39 document.

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
CS2.2/d	**Refrigeration Leaks**	Are there any signs of a refrigerant leak?	Yes [ ] No [x]	No signs of refrigerant leaks were found at the time of the inspection. Although this system is not covered by the F Gas regulations, it is important to have a leak test at least once a year to ensure that the system remains gas tight.
CL1.3	**Refrigeration**		**Refrigeration Temperature:** Pre Compressor(°C): 13 Post Compressor(°C): 27 Ambient(°C): 10 **The Temperature is Deemed:** More than Expected [ ] Less than Expected [ ] As Expected [x]	No further guidance required.
		Assess the refrigeration compressor(s) and the method of refrigeration capacity control	This is a DOL type system that cycles on and off to try to achieve and maintain the room requirements.	The older systems are known as DOL (Direct On Line) models and they are the least efficient types on site, especially when compared to modern Inverter type systems. DOL system operate by switching the compressor on and off as required which means that it is either operating at 100% capacity or 0% capacity. This requires high starting currents and the operating costs reflect this. Inverter systems are the most efficient types if used correctly. Inverter systems operate by slowly winding up to speed, hence the high current is not required. They also speed up and slow down (modulate) to match the cooling / heating requirements at any one time which means that they always operate at their most efficient possible. It is possible to gain ECA (Enhanced Capital Allowance) for most modern inverter type systems.This means that unlike previously, you would be able to offset 100% of the whole cost(including labour and ancillaries) in the first year for new systems installed.

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
CS3.5	**Water Cooled Chillers (Cooling Towers & Evaporative Condensers)**	Is the water flow through cooling towers or evaporative coolers even and efficient, and there is no loss of water?	Yes [ ] No [x]	Not Applicable
		Is there a management regime in place to ensure that water is regularly checked and treated to ensure that there is no Legionella risk?	Yes [ ] No [x]	Not Applicable This information does not relate to the types of systems installed on site.
	Humidity Control	Is there separate equipment installed for humidity control?	Yes [ ] No [x]	Humidity control equipment is not required for this application. No guidance required.

Cooling Plant Equipment Inspected	
Unit Identifier	VOL001/SYS007/Outdoor
Component Identifier	High wall
Manufacturer	LG
Description (type/details)	Outdoor DOL unit linked to two high wall type indoor units
Model/Reference	LM1460H2L
Serial Number	102KA00825
Year Plant Installed	2000
Rated Cooling Capacity (kW)	3
Refrigerant Type	HCFC 22
Refrigerant Charge (kg)	1
Location of Cooling Plant	RH side of the building looking from the front.
Areas/Systems Served	Room 8
Note below any discrepancy between information provided by client and on site information collected, or any information of additional relevance to the cooling plant/system: None found.	

This section applies to the following unit: High wall

Cooling Plant Equipment Visual Inspection

Item Ref	Inspection Item	Finding	Notes and Recommendations
CS2.1	Is the refrigeration plant operational?	Yes [x] No [ ]	The refrigeration plant operated correctly at the time of the inspection. Temperatures taken at the time of the inspection support this. No action or guidance required.
CS2.2/a	Is the area around the refrigeration plant clear of obstructions & debris?	Yes [x] No [ ]	The area around the outdoor unit was found to be clean and clear of obstructions. It is important to ensure that the area around the outdoor unit is kept clean and clear of obstructions to keep the air flow unrestricted and to allow good access for maintenance.
CS2.2/b	Is the general condition of refrigeration and any associated central plant in good order?	Yes [x] No [ ]	The general condition of the complete system was found to be okay. No guidance required.
CS2.2/c	Is the condenser placed clear from warm air discharge louvres?	Yes [x] No [ ]	No localised louvres were found. No guidance required.
CS2.3/a	Are compressors operational or can they be brought into operation?	Yes [x] No [ ]	The compressor was found to operate correctly at the time of the inspection. No guidance required.
CS3.1/a	Is the heat rejection plant operational?	Yes [x] No [ ]	The heat rejection plant was found to be working correctly at the time of the inspection. Temperatures were taken from different points and the results confirmed the operation of the heat exchanger. It is important that the heat rejection plant is kept clean and operational to enable the system to operate to its most efficient possible.
CS3.1/b	Are condenser heat exchangers undamaged/ un-corroded and clean?	Yes [ ] No [x]	The heat exchanger was found to be relatively clean. The aluminium fins (although still solid and active) are showing the first signs of oxidisation. The condition of the heat exchanger should be monitored for further signs of deterioration.

Cooling Plant Equipment Visual Inspection			
Item Ref	**Inspection Item**	**Finding**	**Notes and Recommendations**
CS3.2/a	Is the area around the heat rejection plant clear of obstructions & debris?	Yes [x] No [ ]	The area around the unit was found to be totally clear of obstructions and debris. No guidance required.
CS3.2/b	Is the condenser free of any possibility of air recirculation?	Yes [x] No [ ]	The outdoor unit has been correctly poistioned to avoid any risk of recirculation. No guidance required.
CS4.1	Is the insulation on circulation pipe work well fitted and in good order?	Yes [ ] No [x]	The insulation is starting to deteriorate badly and become porous, however it is still complete at this time. This will be reducing the efficiency and increasing the operating costs. The insulation should be checked and replaced where necessary and the joints resealed to restore efficiencies.

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding		Notes and Recommendations
CS1.1	**Refrigerant Used**		Refrigerant Type	HCFC 22	An F Gas log is not required for the systems on site as they contain less than the 3kg limit of refrigerant. Although this system is not covered by the F Gas regulations, it is important to have a leak test at least once a year to ensure that the system remains gas tight.
			Montreal/ODS/F-Gas controlled?	Yes [x] No [ ]	
CS1.3	**Regular Maintenance**	Is there evidence of regular maintenance?	Yes [ ]	No [x]	This system is not currently part of the site PPM. Maintenance is not currently undertaken for this system. It is important to ensure that the systems are checked and cleaned regularly to maintain the optimum operating efficiency. In addition to the efficiency of the systems, it is also important from an electrical safety point. Electrical connections are known to work loose at times due to the vibration of the system and part of the maintenance program includes the checking and re tightening of all electrical terminals. A rare but real risk is that of Legionellosis. This is normally associated with chilled water plant and water tower systems, however there is a slight risk with other types of air conditioning systems where condensate water sits in the drain tray. The PPM includes the use of cleaning agents and disinfectants to eliminate any risk of this type of problem. I would strongly recommend that the remaining systems are added to the planned maintenance program to cover the aforementioned concerns.
		Is the maintenance undertaken by suitably competent people and in accordance to industry guidelines?	Yes [ ]	No [x]	
CS1.4 CL1.1	**Appropriately Sized Cooling Plant**		**Following Information Required:**		*Building Regulations Approved Document Part L 2nd tier documentation provides guidance suggesting that the plant should not be more than 20% oversized. This should be adopted as means of comparison to stay in line with current standards.* The room area calculates to 16.87m2 and the cooling demand equates to 2.1kw when the CIBSE benchmark of 125wm2 is used. The installed system has a cooling output of 1.6kw. This
			Total Occupants served by this plant	2	
			Total Floor Area served by this plant(m²)	16	
			Occupant Density (m²/person)	8	
			Maximum Instantaneous Heat Gain (W/m²)	125	

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
			Installed Cooling Capacity (kW) 3	system is correctly matched to the room and within the 20% allowable margin.
			The Installed Size is Deemed: More than Expected [ ] Less than Expected [ ] As Expected [x]	
CS1.6	**Metering Comparison to appropriate energy benchmarks**	Is metering installed to enable monitoring of energy consumption of refrigeration plant?	Yes [ ] No [x] Recorded meter reading: The air conditioning system power supply is not currently sub metered.	
		Is the refrigeration plant connected to a BEMS that can provide out of range alarms?	Yes [ ] No [x]	The system was not linked to a BMS control or temperature alarm system. The system operates independantly via a dedicated controller.
		Are there any records of air conditioning plant usage or sub-metered energy consumption with expected hours of use per year for the plant?	Yes [ ] No [x]	Records of this type of information are not currently kept.
		Is the energy consumption or hours of use excessive?	Yes [ ] No [x]	The energy consumption figures were not available for inspection, however the hours of use do not appear to be excessive. By sub metering the individual air conditioning power supplies, it would be possible to collate the information gained and to use it to monitor and control the operating costs closely. It will be very difficult to recognise or confirm the results of any changes or improvements made unless this information can be monitored. Further information is available in the TM39 document.

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
CS2.2/d	**Refrigeration Leaks**	Are there any signs of a refrigerant leak?	Yes [x] No [ ]	No signs of refrigerant leaks were found at the time of the inspection however the evaporating temperature appears to be lower than expected at 4.6 degs C. The system should be fully leak tested asap to ensure that it is gas tight.
CL1.3	**Refrigeration**		**Refrigeration Temperature:**	No further guidance required.
			Pre Compressor(°C): 10 Post Compressor(°C): 27 Ambient(°C): 10	
			The Temperature is Deemed: More than Expected [ ] Less than Expected [ ] As Expected [x]	
		Assess the refrigeration compressor(s) and the method of refrigeration capacity control	This is a DOL type system that cycles on and off to try to achieve and maintain the room requirements.	The older systems are known as DOL (Direct On Line) models and they are the least efficient types on site, especially when compared to modern Inverter type systems. DOL system operate by switching the compressor on and off as required which means that it is either operating at 100% capacity or 0% capacity. This requires high starting currents and the operating costs reflect this. Inverter systems are the most efficient types if used correctly. Inverter systems operate by slowly winding up to speed, hence the high current is not required. They also speed up and slow down (modulate) to match the cooling / heating requirements at any one time which means that they always operate at their most efficient possible. It is possible to gain ECA (Enhanced Capital Allowance) for most modern inverter type systems.This means that unlike previously, you would be able to offset 100% of the whole cost(including labour and ancillaries) in the first year for new systems installed.

Cooling Plant Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
CS3.5	**Water Cooled Chillers (Cooling Towers & Evaporative Condensers)**	Is the water flow through cooling towers or evaporative coolers even and efficient, and there is no loss of water?	Yes [ ] No [x]	Not Applicable
		Is there a management regime in place to ensure that water is regularly checked and treated to ensure that there is no Legionella risk?	Yes [ ] No [x]	Not Applicable This information does not relate to the types of systems installed on site.
	Humidity Control	Is there separate equipment installed for humidity control?	Yes [ ] No [x]	Humidity control equipment is not required for this application. No guidance required.

Air Handling Systems:

Note: For safety reasons, it will be necessary for air handling fans in air distribution systems to be turned off in order to gain access inside air handlers or ductwork to examine components such as fans, drives, filters, heat exchangers and control dampers. The building manager should arrange safe access for the inspector.

Terminal Units:

Terminal Unit Equipment Inspection	
Unit Identifier	VOL001/SYS012
Component Identifier	High wall type indoor unit.
Description of Unit	VOL001/SYS012/Indoor
Identify Cooling Plant Serving Terminal Unit	AOY 17ANA
Manufacturer	Fujitsu
Year Terminal Unit Installed	1999
Terminal Unit Location	RH Wall
Area Served	Room 5 (Dr Hunter)
Note below any discrepancy between information provided by client and on site information collected, or any information of additional relevance to the terminal unit/system: None found.	

This section applies to the following unit:High wall type indoor unit.

Terminal Unit Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
CS4.1	**Insulation**	Is the pipework adequately insulated?	Yes [x] No [ ]	Both the suction and discharge pipes are correctly insulated.
		Is the ductwork adequately insulated?	Yes [ ] No [x]	Not applicable. All of the pipe work on the system should be fully insulated to help to maintain the correct refrigerant temperatures at each point of the cycle.
CS4.2	**Unit Condition**	Are the terminal units in good working order?	Yes [x] No [ ]	The indoor high wall unit was found to be operating correctly at the time of the inspection. It is important to keep the internal unit dust filter clean to allow unrestricted air through the heat exchanger to allow the system to operate correctly and efficiently.
CS5.1	**Grilles & Air Flow**	Do air delivery openings provide good distribution?	Yes [x] No [ ]	The air distribution was found to be good throughout the room.
		Is there evidence of tampering with diffusers?	Yes [ ] No [x]	No evidence of tampering were found at the time of the inspection.
		Are chilled and hot water being supplied to terminals simultaneously?	Yes [ ] No [x]	Not applicable to this type of system.
CS5.2		Are there are any records of occupant complaints regarding air distribution	Yes [ ] No [x]	No records of complaints were available for inspection. No guidance required.
CS5.3	**Diffuser Positions**	Is there potential for air to short-circuit from supply to extract?	Yes [ ] No [x]	The indoor unit has been correctly positioned to avoid any risk of recirculation.
CS5.4		Is the position of partitioning or furniture adversely affecting performance?	Yes [ ] No [x]	Nothing within the room is effecting the air distribution from the indoor unit.
CS5.5		Is the control and operation adequate?	Yes [x] No [ ]	The controller is an infra red remote type. Anything that can cause an obstruction to airflow must be avoided. Obstructions can cause the discharge air to recirculate back into the unit prematurely. This effects the room temperature and the control of the system.

Terminal Unit Equipment Inspection	
Unit Identifier	VOL001/SYS008
Component Identifier	Cassette
Description of Unit	VOL001/SYS008/Indoor
Identify Cooling Plant Serving Terminal Unit	Details missing
Manufacturer	IMI
Year Terminal Unit Installed	1996
Terminal Unit Location	Ceiling of the room
Area Served	Reception Office
Note below any discrepancy between information provided by client and on site information collected, or any information of additional relevance to the terminal unit/system: None found.	

This section applies to the following unit:Cassette

Terminal Unit Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
CS4.1	**Insulation**	Is the pipework adequately insulated?	Yes [x] No [ ]	Both the suction and discharge pipes are correctly insulated.
		Is the ductwork adequately insulated?	Yes [ ] No [x]	Not applicable. All of the pipe work on the system should be fully insulated to help to maintain the correct refrigerant temperatures at each point of the cycle.
CS4.2	**Unit Condition**	Are the terminal units in good working order?	Yes [x] No [ ]	The indoor cassette unit was found to be operating correctly at the time of the inspection. The internal dust filter was found to be badly blocked. It is important to keep the internal unit dust filter clean to allow unrestricted air through the heat exchanger to allow the system to operate correctly and efficiently.
CS5.1	**Grilles & Air Flow**	Do air delivery openings provide good distribution?	Yes [x] No [ ]	The air distribution was found to be good throughout the room.
		Is there evidence of tampering with diffusers?	Yes [ ] No [x]	No evidence of tampering were found at the time of the inspection.
		Are chilled and hot water being supplied to terminals simultaneously?	Yes [ ] No [x]	Not applicable to this type of system.
CS5.2		Are there are any records of occupant complaints regarding air distribution	Yes [ ] No [x]	No records of complaints were available for inspection. No guidance required.
CS5.3	**Diffuser Positions**	Is there potential for air to short-circuit from supply to extract?	Yes [ ] No [x]	The indoor unit has been correctly positioned to avoid any risk of recirculation.
CS5.4		Is the position of partitioning or furniture adversely affecting performance?	Yes [ ] No [x]	Nothing within the room is effecting the air distribution from the indoor unit.
CS5.5		Is the control and operation adequate?	Yes [ ] No [x]	The controller is an early type with limited functions.

Terminal Unit Detailed Inspection Notes				
Item Ref	**Item**	**Inspection Item**	**Finding**	**Notes and Recommendations**
				Anything that can cause an obstruction to airflow must be avoided. Obstructions can cause the discharge air to recirculate back into the unit prematurely. This effects the room temperature and the control of the system.

Terminal Unit Equipment Inspection	
Unit Identifier	VOL001/SYS013
Component Identifier	High wall
Description of Unit	VOL001/SYS013/Indoor
Identify Cooling Plant Serving Terminal Unit	SW12AW
Manufacturer	LG
Year Terminal Unit Installed	2006
Terminal Unit Location	Internal wall
Area Served	FF Staff Room
Note below any discrepancy between information provided by client and on site information collected, or any information of additional relevance to the terminal unit/system: None found.	

This section applies to the following unit:High wall

Terminal Unit Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
CS4.1	**Insulation**	Is the pipework adequately insulated?	Yes [x] No [ ]	Both the suction and discharge pipes are correctly insulated.
		Is the ductwork adequately insulated?	Yes [ ] No [x]	Not applicable. All of the pipe work on the system should be fully insulated to help to maintain the correct refrigerant temperatures at each point of the cycle.
CS4.2	**Unit Condition**	Are the terminal units in good working order?	Yes [x] No [ ]	The indoor high wall unit was found to be operating correctly at the time of the inspection. It is important to keep the internal unit dust filter clean to allow unrestricted air through the heat exchanger to allow the system to operate correctly and efficiently.
CS5.1	**Grilles & Air Flow**	Do air delivery openings provide good distribution?	Yes [x] No [ ]	The air distribution was found to be good throughout the room.
		Is there evidence of tampering with diffusers?	Yes [ ] No [x]	No evidence of tampering were found at the time of the inspection.
		Are chilled and hot water being supplied to terminals simultaneously?	Yes [ ] No [x]	Not applicable to this type of system.
CS5.2		Are there are any records of occupant complaints regarding air distribution	Yes [ ] No [x]	No records of complaints were available for inspection. No guidance required.
CS5.3	**Diffuser Positions**	Is there potential for air to short-circuit from supply to extract?	Yes [ ] No [x]	The indoor unit has been correctly positioned to avoid any risk of recirculation.
CS5.4		Is the position of partitioning or furniture adversely affecting performance?	Yes [ ] No [x]	Nothing within the room is effecting the air distribution from the indoor unit.
CS5.5		Is the control and operation adequate?	Yes [x] No [ ]	The controller is an infra red remote type. Anything that can cause an obstruction to airflow must be avoided. Obstructions can cause the discharge air to recirculate back into the unit prematurely. This effects the room temperature and the control of the system.

Terminal Unit Equipment Inspection	
Unit Identifier	VOL001/SYS001
Component Identifier	High wall
Description of Unit	VOL001/SYS001/Indoor
Identify Cooling Plant Serving Terminal Unit	AOY 12ASGC
Manufacturer	Fujitsu
Year Terminal Unit Installed	1999
Terminal Unit Location	RH Wall
Area Served	Nurse Room 3
Note below any discrepancy between information provided by client and on site information collected, or any information of additional relevance to the terminal unit/system: None found.	

This section applies to the following unit:High wall

Terminal Unit Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
CS4.1	**Insulation**	Is the pipework adequately insulated?	Yes [x] No [ ]	Both the suction and discharge pipes are correctly insulated.
		Is the ductwork adequately insulated?	Yes [ ] No [x]	Not applicable. All of the pipe work on the system should be fully insulated to help to maintain the correct refrigerant temperatures at each point of the cycle.
CS4.2	**Unit Condition**	Are the terminal units in good working order?	Yes [x] No [ ]	The indoor high wall unit was found to be operating correctly at the time of the inspection. It is important to keep the internal unit dust filter clean to allow unrestricted air through the heat exchanger to allow the system to operate correctly and efficiently.
CS5.1	**Grilles & Air Flow**	Do air delivery openings provide good distribution?	Yes [x] No [ ]	The air distribution was found to be good throughout the room.
		Is there evidence of tampering with diffusers?	Yes [ ] No [x]	No evidence of tampering were found at the time of the inspection.
		Are chilled and hot water being supplied to terminals simultaneously?	Yes [ ] No [x]	Not applicable to this type of system.
CS5.2		Are there are any records of occupant complaints regarding air distribution	Yes [ ] No [x]	No records of complaints were available for inspection. No guidance required.
CS5.3	**Diffuser Positions**	Is there potential for air to short-circuit from supply to extract?	Yes [ ] No [x]	The indoor unit has been correctly positioned to avoid any risk of recirculation.
CS5.4		Is the position of partitioning or furniture adversely affecting performance?	Yes [ ] No [x]	Nothing within the room is effecting the air distribution from the indoor unit.
CS5.5		Is the control and operation adequate?	Yes [x] No [ ]	The controller is an infra red remote type. Anything that can cause an obstruction to airflow must be avoided. Obstructions can cause the discharge air to recirculate back into the unit prematurely. This effects the room temperature and the control of the system.

Terminal Unit Equipment Inspection	
Unit Identifier	VOL001/SYS007
Component Identifier	High wall
Description of Unit	VOL001/SYS007/Indoor
Identify Cooling Plant Serving Terminal Unit	LM1460 H2L
Manufacturer	LG
Year Terminal Unit Installed	2000
Terminal Unit Location	RH Wall
Area Served	Room Number 8
Note below any discrepancy between information provided by client and on site information collected, or any information of additional relevance to the terminal unit/system: None found.	

This section applies to the following unit:High wall

Terminal Unit Detailed Inspection Notes

Item Ref	Item	Inspection Item	Finding	Notes and Recommendations
CS4.1	**Insulation**	Is the pipework adequately insulated?	Yes [x] No [ ]	Both the suction and discharge pipes are correctly insulated.
		Is the ductwork adequately insulated?	Yes [ ] No [x]	Not applicable. All of the pipe work on the system should be fully insulated to help to maintain the correct refrigerant temperatures at each point of the cycle.
CS4.2	**Unit Condition**	Are the terminal units in good working order?	Yes [x] No [ ]	The indoor high wall unit was found to be operating correctly at the time of the inspection. It is important to keep the internal unit dust filter clean to allow unrestricted air through the heat exchanger to allow the system to operate correctly and efficiently.
CS5.1	**Grilles & Air Flow**	Do air delivery openings provide good distribution?	Yes [x] No [ ]	The air distribution was found to be good throughout the room.
		Is there evidence of tampering with diffusers?	Yes [ ] No [x]	No evidence of tampering were found at the time of the inspection.
		Are chilled and hot water being supplied to terminals simultaneously?	Yes [ ] No [x]	Not applicable to this type of system.
CS5.2		Are there are any records of occupant complaints regarding air distribution	Yes [ ] No [x]	No records of complaints were available for inspection. No guidance required.
CS5.3	**Diffuser Positions**	Is there potential for air to short-circuit from supply to extract?	Yes [ ] No [x]	The indoor unit has been correctly positioned to avoid any risk of recirculation.
CS5.4		Is the position of partitioning or furniture adversely affecting performance?	Yes [ ] No [x]	Nothing within the room is effecting the air distribution from the indoor unit.
CS5.5		Is the control and operation adequate?	Yes [x] No [ ]	The controller is an infra red remote type. Anything that can cause an obstruction to airflow must be avoided. Obstructions can cause the discharge air to recirculate back into the unit prematurely. This effects the room temperature and the control of the system.

System Controls:

System Controls			
Item Ref	**Inspection Item**	**Finding**	**Notes and Recommendations**
n/a	Sub System Identifier (if applicable)	VOL001/SYS012/ Control	
CS8.1	Is the zoning appropriate in relation to anticipated cooling demand?	Yes [x] No [ ]	The room is a single zone with even heat gains throughout. No guidance required. The room is a single zone with a single indoor unit installed.
CS8.2	Note the current indicated weekday and time of day on controllers or BMS against the actual time.	the incorrect time was found to be set on the controller, however the timer function is not currently used.	
CS8.3/a	Note the set on and off periods (for weekday and weekend if this facility is available with the timer).	No on/off times had been set on the controller at the time of the inspection as the timer function is not currently used.	Using the timer functions on the air conditioning systems can help to control operating costs and improve comfort levels. Systems can be set to pre condition rooms prior to occupancy. It can also reduce or eliminate the risk of systems being left switched on after hours or in unoccupied rooms. If a centralised timer control is used, it is possible to set second Off times to enable a second sweep of the building after hours to ensure that all systems are definately off even if staff have been working late.
CS8.3/b	Is there a shortfall in timer capabilities?	Yes [ ] No [x]	The system has a daily count down style timer function. No guidance required.
CS8.4	Identify and assess zone heating and cooling temperature control sensors. Are the sensor types and locations appropriate in relation to heating and cooling emitters, heat flows or likely temperature distributions in the zone or space?	Yes [x] No [ ]	The air conditioning system samples and controls the temperature via the return air to the unit. The central heating system operates by checking the return water temperature to the boiler and also by thermastatic radiator valves that restrict the water supply to the radiator as the room reaches temperature. I would strongly recommend that in the rooms where both heat pump air conditioining systems and heating radiators are installed together, the air conditioning systems should be used as the primary heat source in place of the existing gas fired heating system . Radiators should be isolated and it may also be possible to down rate

System Controls

Item Ref	Inspection Item	Finding	Notes and Recommendations
			the boiler output to compensate. Heat pump air conditioning systems operate with a minimum COP (coefficient of performance) of 3 This means that for every 1kw of energy consumed, the systems will produce a minimum of 3kw of heat (300% efficient). If you compare this to the gas fired heating system which operates with a COP of around 0.7 (1kw of energy consumed producing only 0.7kw of heat), substantial reductions in the operating costs and CO2 emissions can be made. In addition to the benefits mentioned, the air conditioning systems would also reduce the warm up time of the building when compared to a radiator heating system.
CS8.5	Note the set temperature in each zone for heating and cooling in relation to the activities and occupancy of zones and spaces in relation to the manager's intent.	The system was found to be set at a lower than expected 19 degs C (cooling).	The recognised ideal temperature setting for a working environment would be around 22 / 23degs C (Auto). By changing the settings to 22 / 23degs C, operating costs would be reduced along with CO2 emissions and also occupancy comfort levels would be improved.
CS8.6	Note whether a 'dead band' is, or can be, set between heating and cooling.	This is a cooling only system. A dead band cannot be set.	No guidance required.
CS8.7	Do the sub system controls integrate effectively with the overall system control strategy?	Yes [ ] No [x]	The simplest and most cost effective remedy would be to implement a staff training program and to display Guidance Notices in each room advising staff.
CS8.8	Assess the means of modulating or controlling air flow rate through the air supply and exhaust ducts.	Not applicable.	No guidance required.
PS3.6	Are guidance notices visible or controls available to inhibit use of cooling equipment whilst windows are open or cooling/heating is on?	Yes [ ] No [x]	Guidance notices were not displayed at any point on site. Posting guidance notices in each room that offer both dedicated operating instructions (for the room air conditioning systems in that particular room) and also offering good practice advise such as maximum and minimum allowable temperature settings and warnings to remember to switch off the air conditioning systems at the end of the day or when rooms are vacated (or windows are opened), would ensure that each system is operated correctly and efficiently at all times.

System Controls

Item Ref	Inspection Item	Finding	Notes and Recommendations
n/a	Sub System Identifier (if applicable)	VOL001/SYS008/ Control	
CS8.1	Is the zoning appropriate in relation to anticipated cooling demand?	Yes [x] No [ ]	The room is a single zone with even heat gains throughout. No guidance required. The room is a single zone with a single indoor unit installed.
CS8.2	Note the current indicated weekday and time of day on controllers or BMS against the actual time.	The controller does not have a real time operation or display.	
CS8.3/a	Note the set on and off periods (for weekday and weekend if this facility is available with the timer).	The system does not have a timer function.	No guidance required.
CS8.3/b	Is there a shortfall in timer capabilities?	Yes [x] No [ ]	The controller is an early type that has very limited functions No guidance required. It is not possible to fit later controls to this type of system.
CS8.4	Identify and assess zone heating and cooling temperature control sensors. Are the sensor types and locations appropriate in relation to heating and cooling emitters, heat flows or likely temperature distributions in the zone or space?	Yes [x] No [ ]	The air conditioning system samples and controls the temperature via the return air to the unit. The central heating system operates by checking the return water temperature to the boiler and also by thermastatic radiator valves that restrict the water supply to the radiator as the room reaches temperature. I would strongly recommend that in the rooms where both heat pump air conditioining systems and heating radiators are installed together, the air conditioning systems should be used as the primary heat source in place of the existing gas fired heating system . Radiators should be isolated and it may also be possible to down rate the boiler output to compensate. Heat pump air conditioning systems operate with a minimum COP (coefficient of performance) of 3 This means that for every 1kw of energy consumed, the systems will produce a minimum of 3kw of heat (300% efficient). If you compare this to the gas fired heating system which operates with a COP of around 0.7 (1kw of energy consumed producing only 0.7kw of heat), substantial reductions in the operating costs and CO2 emissions can be made. In addition to the benefits mentioned, the air conditioning systems would also reduce the warm up time of the building when compared to a radiator heating system.

System Controls

Item Ref	Inspection Item	Finding	Notes and Recommendations
CS8.5	Note the set temperature in each zone for heating and cooling in relation to the activities and occupancy of zones and spaces in relation to the manager's intent.	The system was found to be set at a lower than expected 18 degs C (cooling).	The recognised ideal temperature setting for a working environment would be around 22 / 23degs C (Auto). By changing the settings to 22 / 23degs C, operating costs would be reduced along with CO2 emissions and also occupancy comfort levels would be improved.
CS8.6	Note whether a 'dead band' is, or can be, set between heating and cooling.	Not applicable.	No guidance required.
CS8.7	Do the sub system controls integrate effectively with the overall system control strategy?	Yes [ ] No [x]	The simplest and most cost effective remedy would be to implement a staff training program and to display Guidance Notices in each room advising staff.
CS8.8	Assess the means of modulating or controlling air flow rate through the air supply and exhaust ducts.	Not applicable.	No guidance required.
PS3.6	Are guidance notices visible or controls available to inhibit use of cooling equipment whilst windows are open or cooling/heating is on?	Yes [ ] No [x]	Guidance notices were not displayed at any point on site. Posting guidance notices in each room that offer both dedicated operating instructions (for the room air conditioning systems in that particular room) and also offering good practice advise such as maximum and minimum allowable temperature settings and warnings to remember to switch off the air conditioning systems at the end of the day or when rooms are vacated (or windows are opened), would ensure that each system is operated correctly and efficiently at all times.

System Controls

Item Ref	Inspection Item	Finding	Notes and Recommendations
n/a	Sub System Identifier (if applicable)	VOL001/SYS013/ Control	
CS8.1	Is the zoning appropriate in relation to anticipated cooling demand?	Yes [x] No [ ]	The room is a single zone with even heat gains throughout. No guidance required. The room is a single zone with a single indoor unit installed.
CS8.2	Note the current indicated weekday and time of day on controllers or BMS against the actual time.	the incorrect time was found on the controller	
CS8.3/a	Note the set on and off periods (for weekday and weekend if this facility is available with the timer).	No on/off times had been set on the controller at the time of the inspection as the timer function is not currently used	Using the timer functions on the air conditioning systems can help to control operating costs and improve comfort levels. Systems can be set to pre condition rooms prior to occupancy. It can also reduce or eliminate the risk of systems being left switched on after hours or in unoccupied rooms. If a centralised timer control is used, it is possible to set second Off times to enable a second sweep of the building after hours to ensure that all systems are definately off even if staff have been working late.
CS8.3/b	Is there a shortfall in timer capabilities?	Yes [ ] No [x]	The controller is suitable. No guidance required.
CS8.4	Identify and assess zone heating and cooling temperature control sensors. Are the sensor types and locations appropriate in relation to heating and cooling emitters, heat flows or likely temperature distributions in the zone or space?	Yes [x] No [ ]	The air conditioning system samples and controls the temperature via the return air to the unit. The central heating system operates by checking the return water temperature to the boiler and also by thermastatic radiator valves that restrict the water supply to the radiator as the room reaches temperature. I would strongly recommend that in the rooms where both heat pump air conditioining systems and heating radiators are installed together, the air conditioning systems should be used as the primary heat source in place of the existing gas fired heating system . Radiators should be isolated and it may also be possible to down rate the boiler output to compensate. Heat pump air conditioning systems operate with a minimum COP (coefficient of performance) of 3 This means that for every 1kw of energy consumed, the systems will produce a minimum of 3kw of heat (300% efficient). If you compare this to the gas fired heating system which operates with a COP of around 0.7 (1kw of energy consumed producing only 0.7kw of heat), substantial reductions in the operating costs and CO2 emissions can be made. In addition to the benefits mentioned, the air conditioning systems would also reduce the warm up time of the building when compared to a radiator heating system.

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Item Ref	Inspection Item	Finding	Notes and Recommendations
CS8.5	Note the set temperature in each zone for heating and cooling in relation to the activities and occupancy of zones and spaces in relation to the manager's intent.	The system was found to be set at a lower than expected 18 degs C (cooling).	The recognised ideal temperature setting for a working environment would be around 22 / 23degs C (Auto). By changing the settings to 22 / 23degs C, operating costs would be reduced along with CO2 emissions and also occupancy comfort levels would be improved.
CS8.6	Note whether a 'dead band' is, or can be, set between heating and cooling.	A factory set dead band of 4 degs C comes into operation when the system is set in the Auto mode.	No guidance required.
CS8.7	Do the sub system controls integrate effectively with the overall system control strategy?	Yes [ ] No [x]	The simplest and most cost effective remedy would be to implement a staff training program and to display Guidance Notices in each room advising staff.
CS8.8	Assess the means of modulating or controlling air flow rate through the air supply and exhaust ducts.	Not applicable.	No guidance required.
PS3.6	Are guidance notices visible or controls available to inhibit use of cooling equipment whilst windows are open or cooling/heating is on?	Yes [ ] No [x]	Guidance notices were not displayed at any point on site. Posting guidance notices in each room that offer both dedicated operating instructions (for the room air conditioning systems in that particular room) and also offering good practice advise such as maximum and minimum allowable temperature settings and warnings to remember to switch off the air conditioning systems at the end of the day or when rooms are vacated (or windows are opened), would ensure that each system is operated correctly and efficiently at all times.

System Controls

Item Ref	Inspection Item	Finding	Notes and Recommendations
n/a	Sub System Identifier (if applicable)	VOL001/SYS001/ Control	
CS8.1	Is the zoning appropriate in relation to anticipated cooling demand?	Yes [x] No [ ]	The room is a single zone with even heat gains throughout. No guidance required. The room is a single zone with a single indoor unit installed.
CS8.2	Note the current indicated weekday and time of day on controllers or BMS against the actual time.	the incorrect time was found to be set on the controller, however the timer function is not currently used.	
CS8.3/a	Note the set on and off periods (for weekday and weekend if this facility is available with the timer).	No on/off times had been set on the controller at the time of the inspection as the timer function is not currently used.	Using the timer functions on the air conditioning systems can help to control operating costs and improve comfort levels. Systems can be set to pre condition rooms prior to occupancy. It can also reduce or eliminate the risk of systems being left switched on after hours or in unoccupied rooms. If a centralised timer control is used, it is possible to set second Off times to enable a second sweep of the building after hours to ensure that all systems are definately off even if staff have been working late.
CS8.3/b	Is there a shortfall in timer capabilities?	Yes [ ] No [x]	The system has a daily count down style timer function. No guidance required.
CS8.4	Identify and assess zone heating and cooling temperature control sensors. Are the sensor types and locations appropriate in relation to heating and cooling emitters, heat flows or likely temperature distributions in the zone or space?	Yes [x] No [ ]	The air conditioning system samples and controls the temperature via the return air to the unit. The central heating system operates by checking the return water temperature to the boiler and also by thermastatic radiator valves that restrict the water supply to the radiator as the room reaches temperature. I would strongly recommend that in the rooms where both heat pump air conditioining systems and heating radiators are installed together, the air conditioning systems should be used as the primary heat source in place of the existing gas fired heating system . Radiators should be isolated and it may also be possible to down rate the boiler output to compensate. Heat pump air conditioning systems operate with a minimum COP (coefficient of performance) of 3 This means that for every 1kw of energy consumed, the systems will produce a minimum of

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Item Ref	Inspection Item	Finding	Notes and Recommendations
			3kw of heat (300% efficient). If you compare this to the gas fired heating system which operates with a COP of around 0.7 (1kw of energy consumed producing only 0.7kw of heat), substantial reductions in the operating costs and CO2 emissions can be made. In addition to the benefits mentioned, the air conditioning systems would also reduce the warm up time of the building when compared to a radiator heating system.
CS8.5	Note the set temperature in each zone for heating and cooling in relation to the activities and occupancy of zones and spaces in relation to the manager's intent.	The system was found to be set at a lower than expected 18 degs C (cooling).	The recognised ideal temperature setting for a working environment would be around 22 / 23degs C (Auto). By changing the settings to 22 / 23degs C, operating costs would be reduced along with CO2 emissions and also occupancy comfort levels would be improved.
CS8.6	Note whether a 'dead band' is, or can be, set between heating and cooling.	A dead band of 4 degs C comes into operation when the system is set in the Auto mode.	No guidance required.
CS8.7	Do the sub system controls integrate effectively with the overall system control strategy?	Yes [ ] No [x]	The simplest and most cost effective remedy would be to implement a staff training program and to display Guidance Notices in each room advising staff.
CS8.8	Assess the means of modulating or controlling air flow rate through the air supply and exhaust ducts.	Not applicable.	No guidance required.
PS3.6	Are guidance notices visible or controls available to inhibit use of cooling equipment whilst windows are open or cooling/heating is on?	Yes [ ] No [x]	Guidance notices were not displayed at any point on site. Posting guidance notices in each room that offer both dedicated operating instructions (for the room air conditioning systems in that particular room) and also offering good practice advise such as maximum and minimum allowable temperature settings and warnings to remember to switch off the air conditioning systems at the end of the day or when rooms are vacated (or windows are opened), would ensure that each system is operated correctly and efficiently at all times.

System Controls

Item Ref	Inspection Item	Finding	Notes and Recommendations
n/a	Sub System Identifier (if applicable)	VOL001/SYS007	
CS8.1	Is the zoning appropriate in relation to anticipated cooling demand?	Yes [x] No [ ]	The room is a single zone with even heat gains throughout. No guidance required. The room is a single zone with a single indoor unit installed.
CS8.2	Note the current indicated weekday and time of day on controllers or BMS against the actual time.	the incorrect time was found to be set on the controller, however the timer function is not currently used.	
CS8.3/a	Note the set on and off periods (for weekday and weekend if this facility is available with the timer).	No on/off times had been set on the controller at the time of the inspection as the timer function is not currently used.	Using the timer functions on the air conditioning systems can help to control operating costs and improve comfort levels. Systems can be set to pre condition rooms prior to occupancy. It can also reduce or eliminate the risk of systems being left switched on after hours or in unoccupied rooms. If a centralised timer control is used, it is possible to set second Off times to enable a second sweep of the building after hours to ensure that all systems are definately off even if staff have been working late.
CS8.3/b	Is there a shortfall in timer capabilities?	Yes [ ] No [x]	The system has a daily count down style timer function. No guidance required.
CS8.4	Identify and assess zone heating and cooling temperature control sensors. Are the sensor types and locations appropriate in relation to heating and cooling emitters, heat flows or likely temperature distributions in the zone or space?	Yes [x] No [ ]	The air conditioning system samples and controls the temperature via the return air to the unit. The central heating system operates by checking the return water temperature to the boiler and also by thermastatic radiator valves that restrict the water supply to the radiator as the room reaches temperature. I would strongly recommend that in the rooms where both heat pump air conditioining systems and heating radiators are installed together, the air conditioning systems should be used as the primary heat source in place of the existing gas fired heating system . Radiators should be isolated and it may also be possible to down rate the boiler output to compensate. Heat pump air conditioning systems operate with a minimum COP (coefficient of performance) of 3 This means that for every 1kw of energy consumed, the systems will produce a minimum of 3kw of heat (300% efficient). If you compare this to the gas fired heating system which operates with a COP of

System Controls

Item Ref	Inspection Item	Finding	Notes and Recommendations
			around 0.7 (1kw of energy consumed producing only 0.7kw of heat), substantial reductions in the operating costs and CO2 emissions can be made. In addition to the benefits mentioned, the air conditioning systems would also reduce the warm up time of the building when compared to a radiator heating system.
CS8.5	Note the set temperature in each zone for heating and cooling in relation to the activities and occupancy of zones and spaces in relation to the manager's intent.	The system was found to be set at a lower than expected 18 degs C (cooling).	The recognised ideal temperature setting for a working environment would be around 22 / 23degs C (Auto). By changing the settings to 22 / 23degs C, operating costs would be reduced along with CO2 emissions and also occupancy comfort levels would be improved.
CS8.6	Note whether a 'dead band' is, or can be, set between heating and cooling.	A dead band of 4 degs C comes into operation when the system is set in the Auto mode.	No guidance required.
CS8.7	Do the sub system controls integrate effectively with the overall system control strategy?	Yes [ ] No [x]	The simplest and most cost effective remedy would be to implement a staff training program and to display Guidance Notices in each room advising staff.
CS8.8	Assess the means of modulating or controlling air flow rate through the air supply and exhaust ducts.	Not applicable.	No guidance required.
PS3.6	Are guidance notices visible or controls available to inhibit use of cooling equipment whilst windows are open or cooling/heating is on?	Yes [ ] No [x]	Guidance notices were not displayed at any point on site. Posting guidance notices in each room that offer both dedicated operating instructions (for the room air conditioning systems in that particular room) and also offering good practice advise such as maximum and minimum allowable temperature settings and warnings to remember to switch off the air conditioning systems at the end of the day or when rooms are vacated (or windows are opened), would ensure that each system is operated correctly and efficiently at all times.