

Air Conditioning Validation

Project Address	-Withheld-
Client	-Withheld-
Date of Validation	-Withheld-
Equipment Manufacturer	Mitsubishi Electric

Validation Type	
<p>Non Invasive</p> <ul style="list-style-type: none"> • Surface analysis of services installed general overview. • Operational testing via temperature and pressure monitoring. • General suitability analysis. • Overview of condensate services as installed. • Overview of controls services as installed. • Longevity analysis. 	<p>Intrusive</p> <ul style="list-style-type: none"> • All items included in 'Non-Intrusive' Validation. • In-depth metre-by-metre analysis of services installed. • Removal and weighing of refrigerant charge. • Metre-by-metre refrigeration pipework calculation to establish required refrigerant charge. • Design and load calculations including system diversity analysis. • Fan-Coil Unit port-to-port checks. • BMS → AC Controls integration analysis. • Longevity and spare part availability analysis.

General Analysis:

A Validation Survey was carried out to 8 Mitsubishi Electric VRF-Type Air Conditioning Systems serving 8 floors, on -date withheld-.

The general condition and standard of the Air Conditioning installation (where complete) is satisfactory throughout Floors 1 to 8. In general, pipework is well supported, well insulated and well formed using correct forming equipment. Cabling and drainage is of correct type and size and fit for purpose.

In some parts, services are less than adequately installed - sections of insulation is missing or damaged on the mains refrigerant pipework, notably at roof level. Insulation has not been installed to some unused BC Box ports / stub-ends.

The majority of Fan Coil Units are in a generally damaged and poor condition with the exclusion of one Fan Coil Unit which has signs of previous water damage, as well as missing panel screws. On the contrary, the Condenser Units all have significant damage to the coils, which need to be addressed in the first instance. It was also noted that some pipework has been incorrectly insulated at roof level.

The 7th Floor Condenser Coil appears to be pierced and damaged beyond repair. This requires addressing urgently.

It would be reasonable to assume that none of the eight systems have been fully commissioned and tested by the original installer. At the time of our validation, system 7 was not fully powered on and as such testing was extremely limited. Also, of the 24 Fan Coil Units across the eight floors, only 3 have had their condensate line correctly terminated. As such, testing was further restricted, particularly in cooling mode.

System diversity across floors 1, 2, 3, 4, 5, 6 and 7 is acceptable. However, System 8 (3th floor) has a diversity index in excess of 20%. It would be reasonable to assume that system performance may be impacted, particularly in extreme weather.

General cleanliness of the system is adequate, whilst Fan Coil Units are generally clean, return air filters are fairly heavily deposited.

It is strongly recommended that a further validation survey is carried out prior to any modification works to any systems. This validation should take place after the following has been carried out:

- Termination or replacement of all condensate drainage.
- Repairs to (or replacement of) Condenser Unit coils.
- Detail of total system refrigerant charges: these should be detailed on each Condenser Unit.
- Repairs to refrigerant pipework insulation where necessary.
- A full system maintenance.
- Full flood test of the drainage network to ensure water-tightness, with certification.
- Full system commissioning, with commissioning certificates issued for each system.

Failing this, we recommend the original installer carries out any modification works.

We returned to site on -date withheld- to carry out port-to-port checking on all Fan Coil Units on all systems, utilising the Mitsubishi Electric service checker tool via laptop plugin. All port checking was complete with no issues to report on the following floors: 1, 3, 4, 6 and 8. However, Floors 2, 5 and 7 were not tested due to various issues.

We returned to site on -date withheld- to carry out port-to-port checking on all Fan Coil Units on systems 2 and 5. All checking was complete with no issues to report.

Asset Collection

System One (Floor 1):

Condenser Unit:

PURY-P550YNWA [0XW00788]
R410A 10.80KG* (Installed 2022)
*Base charge; total charge unknown.

Fan Coil Units:

[FCU 01] PEFY-M100VMA-A [0J01277] [Ducted]
[FCU 02] PEFY-M100VMA-A [0J01272] [Ducted]
[FCU 03] PEFY-M100VMA-A [0L01807] [Ducted]
[FCU 04] PEFY-M100VMA-A [0L01808] [Ducted]
[FCU 05] PEFY-M100VMA-A [0M04470] [Ducted]
[BC 01] CMB-M1012V-JA1 [16W03050]

System Two (Floor 2):

Condenser Unit:

PURY-P550YNWA [0XW00803]
R410A 10.80KG* (Installed 2022)
*Base charge; total charge unknown.

Fan Coil Units:

[FCU 01] PEFY-M63VMA-A [0M04641] [Ducted]
[FCU 02] PEFY-M100VMA-A [0H01047] [Ducted]
[FCU 03] PEFY-M100VMA-A [0H01099] [Ducted]
[FCU 04] PEFY-M100VMA-A [0H01095] [Ducted]
[FCU 05] PEFY-M100VMA-A [0H01090] [Ducted]
[FCU 06] PEFY-M100VMA-A [0H01024] [Ducted]
[BC 01] CMB-M1012V-JA1 [UNCLEAR]

System Three (Floor 3):

Condenser Unit:

PURY-P550YNWA [0XW00781]
R410A 10.80KG* (Installed 2022)
*Base charge; total charge unknown.

Fan Coil Units:

[FCU 01] PEFY-M63VMA-A [0M04642] [Ducted]
[FCU 02] PEFY-M100VMA-A [0H01044] [Ducted]
[FCU 03] PEFY-M100VMA-A [0H01045] [Ducted]
[FCU 04] PEFY-M100VMA-A [0H01043] [Ducted]
[FCU 05] PEFY-M100VMA-A [0H01049] [Ducted]
[FCU 06] PEFY-M100VMA-A [0H01046] [Ducted]
[BC 01] CMB-M1012V-JA1 [08w01355]

Asset Collection (continued)

System Four (Floor 4):

Condenser Unit:

PURY-P550YNWA [0XW00757]
R410A 10.80KG* (Installed 2022)
*Base charge; total charge unknown.

Fan Coil Units:

[FCU 01] PEFY-M63VMA-A [0M04638] [Ducted]
[FCU 02] PEFY-M100VMA-A [0H01088] [Ducted]
[FCU 03] PEFY-M100VMA-A [0H01079] [Ducted]
[FCU 04] PEFY-M100VMA-A [0H01083] [Ducted]
[FCU 05] PEFY-M100VMA-A [0H01081] [Ducted]
[FCU 06] PEFY-M100VMA-A [0H01082] [Ducted]
[BC 01] CMB-M1012V-JA1 [09W01475]

System Five (Floor 5):

Condenser Unit:

PURY-P550YNWA [0XW00757]
R410A 10.80KG* (Installed 2022)
*Base charge; total charge unknown.

Fan Coil Units:

[FCU 01] PEFY-M63VMA-A [0M04468] [Ducted]
[FCU 02] PEFY-M100VMA-A [0J01251] [Ducted]
[FCU 03] PEFY-M100VMA-A [0J01274] [Ducted]
[FCU 04] PEFY-M100VMA-A [0J01273] [Ducted]
[FCU 05] PEFY-M100VMA-A [0H01028] [Ducted]
[FCU 06] PEFY-M100VMA-A [0H01097] [Ducted]
[BC 01] CMB-M1012V-JA1 [09W01537]

System Six (Floor 6):

Condenser Unit:

PURY-P550YNWA [0XW00785]
R410A 10.80KG* (Installed 2022)
*Base charge; total charge unknown.

Fan Coil Units:

[FCU 01] PEFY-M63VMA-A [0M04469] [Ducted]
[FCU 02] PEFY-M100VMA-A [0H01090] [Ducted]
[FCU 03] PEFY-M100VMA-A [0H01091] [Ducted]
[FCU 04] PEFY-M100VMA-A [0H01089] [Ducted]
[FCU 05] PEFY-M100VMA-A [0H01092] [Ducted]
[FCU 06] PEFY-M100VMA-A [0H01088] [Ducted]
[BC 01] CMB-M1012V-JA1 [09W01535]

Asset Collection (continued)

System Seven (Floor 7):

Condenser Unit:

PURY-P550YNWA [0XW00789]
R410A 10.80KG* (Installed 2022)
*Base charge; total charge unknown.

Fan Coil Units:

[FCU 01] PEFY-M63VMA-A [0M04465] [Ducted]
[FCU 02] PEFY-M100VMA-A [0L01775] [Ducted]
[FCU 03] PEFY-M100VMA-A [0L01806] [Ducted]
[FCU 04] PEFY-M100VMA-A [0L01786] [Ducted]
[FCU 05] PEFY-M100VMA-A [0L01809] [Ducted]
[FCU 06] PEFY-M100VMA-A [0L01810] [Ducted]
[BC 01] CMB-M1012V-JA1 [19W03057]

System Eight (Floor 8):

Condenser Unit:

PURY-P550YNWA [0XW00789]
R410A 10.80KG* (Installed 2022)
*Base charge; total charge unknown.

Fan Coil Units:

[FCU 01] PEFY-M125VMA-A [1H00913] [Ducted]
[FCU 02] PEFY-M63VMA-A [0M04639] [Ducted]
[FCU 03] PEFY-M100VMA-A [0J01276] [Ducted]
[FCU 04] PEFY-M125VMA-A [1H01131] [Ducted]
[FCU 05] PEFY-M125VMA-A [1G00002] [Ducted]
[FCU 06] PEFY-M125VMA-A [1G00811] [Ducted]
[BC 01] CMB-M1012V-JA1 [19W03046]

Longevity

All systems would have an expected minimum life span of 15-20 years from date of commissioning. This is a 'tail-park' estimate and would depend on frequency of use, efficient maintenance and use of genuine manufacturer approved replacement parts in the event of remedial works. This would estimate the end-of-life to be as follows:

- System One [installed 2022] up to circa 2037-2042
- System Two [installed 2022] up to circa 2037-2042
- System Three [installed 2022] up to circa 2037-2042
- System Four [installed 2022] up to circa 2037-2042
- System Five [installed 2022] up to circa 2037-2042
- System Six [installed 2022] up to circa 2037-2042
- System Seven [installed 2022] up to circa 2037-2042
- System Eight [installed 2022] up to circa 2037-2042

It would be reasonable to assume that this estimate could be exceeded should the aforementioned be well implemented.

Photographic Report

Condenser Unit coil damage



Condenser Unit coil damage continued



EXAMPLE
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Condenser Unit coil damage continued



Debris around Condenser Units



Debris around Condenser Units



Condensate to Fan Coil Unit unfinished.



As above



As above



Where condensate drainage has been terminated, the incorrect size 'sock' adapter has been used. It is recommended that the correct size adaptor is installed.



Uninsulated service valves to BC Control Boxes



Uninsulated pipework at BC Control Boxes



No power to AE200 (pictured: 5th Floor)



Metal drop rod is causing damage to pipework insulation.



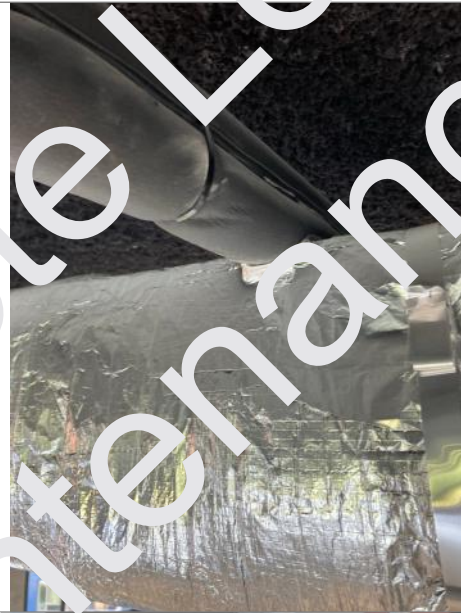
Large amount of insulation tape have been used to cover damaged insulation.



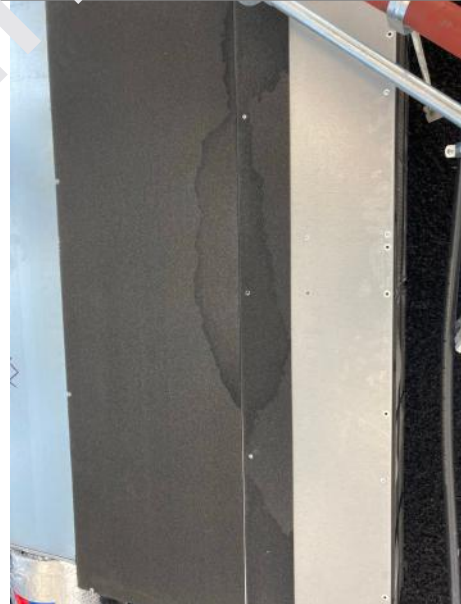
Typical return air filter condition



Pipework is resting on ductwork, damaging insulation.



Signs of water damage on Fan Coil Unit.



Fan Coil Unit Overview

Unit Ref	Location	Condensate	Filter Condition	Heating Test	Cooling Test
AC 1.01	First Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 1.02	First Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 1.03	First Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 1.04	First Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 1.05	First Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 2.01	Second Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 2.02	Second Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 2.03	Second Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 2.04	Second Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 2.05	Second Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 2.06	Second Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 3.01	Third Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 3.02	Third Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 3.03	Third Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 3.04	Third Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 3.05	Third Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 3.06	Third Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 4.01	Fourth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 4.02	Fourth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 4.03	Fourth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 4.04	Fourth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 4.05	Fourth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 4.06	Fourth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)

AC 5.01	Fifth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 5.02	Fifth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 5.03	Fifth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 5.04	Fifth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 5.05	Fifth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 5.06	Fifth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 6.01	Sixth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 6.02	Sixth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 6.03	Sixth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 6.04	Sixth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 6.05	Sixth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 6.06	Sixth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 7.01	Seventh Floor	Gravity (Not tested)	Poor	N/A	N/A
AC 7.02	Seventh Floor	Gravity (Not tested)	Poor	N/A	N/A
AC 7.03	Seventh Floor	Gravity (Not tested)	Poor	N/A	N/A
AC 7.04	Seventh Floor	Gravity (Not tested)	Poor	N/A	N/A
AC 7.05	Seventh Floor	Gravity (Not tested)	Poor	N/A	N/A
AC 7.06	Seventh Floor	Gravity (Not tested)	Poor	N/A	N/A
AC 8.01	Eighth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 8.02	Eighth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 8.03	Eighth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 8.04	Eighth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 8.05	Eighth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)
AC 8.06	Eighth Floor	Gravity (Not tested)	Poor	Pass	Pass (Limited)

Performance Testing - Fan Coil Units

Unit Ref	Heating Coil On (deg C)	Heating Coil Off (deg C)	Cooling Coil On (deg C)	Cooling Coil Off (deg C)
AC 1.01	19.8	37.7	19.3	8.6
AC 1.02	20.3	38.8	20.3	8.2
AC 1.03	20.2	38.9	19.5	7.9
AC 1.04	20.6	37.4	19.5	8.4
AC 1.05	20.8	37.1	20.5	6.7
AC 2.01	20.7	39	20.5	7.2
AC 2.02	20.2	37.1	20.3	6.7
AC 2.03	19.9	37.3	19.2	6.7
AC 2.04	20.4	37.7	19.8	7.7
AC 2.05	19.6	37.5	19.9	8.5
AC 2.06	19.6	36.2	20.8	8.1
AC 3.01	20.6	38.6	21	6.4
AC 3.02	19.7	38.6	19.8	7.5
AC 3.03	21	37.4	20.3	6.7
AC 3.04	20.5	39.3	20.5	8.3
AC 3.05	19.9	36.7	20.4	8.4
AC 3.06	19.4	37.1	19.9	7.2
AC 4.01	19.8	37.5	21.1	6.5
AC 4.02	20.9	38.8	20.5	6.9
AC 4.03	19.6	39.1	19.6	7.6
AC 4.04	20.7	37.6	20.7	8.8
AC 4.05	21	36.7	19.6	7.4
AC 4.06	20.4	37.4	19.3	8.5
AC 5.01	19.6	38.8	19.4	7
AC 5.02	20.4	36.4	20.2	8.2
AC 5.03	19.8	39.3	20.6	7.5
AC 5.04	19.4	38.3	19.9	6.3
AC 5.05	21	38.1	20.8	7.5
AC 5.06	20.7	36.2	19.7	6.5
AC 6.01	20.9	38.4	19.2	6.2

AC 6.02	20.2	37.6	20.6	7.5
AC 6.03	20.2	38.9	20.3	8.5
AC 6.04	19.3	37.7	20.6	8.3
AC 6.05	19.1	39.1	20	8.2
AC 6.06	20.6	38.5	19.2	7.2
AC 7.01	Not Tested	Not Tested	Not Tested	Not Tested
AC 7.02	Not Tested	Not Tested	Not Tested	Not Tested
AC 7.03	Not Tested	Not Tested	Not Tested	Not Tested
AC 7.04	Not Tested	Not Tested	Not Tested	Not Tested
AC 7.05	Not Tested	Not Tested	Not Tested	Not Tested
AC 7.06	Not Tested	Not Tested	Not Tested	Not Tested
AC 8.01	20.6	38.9	19.7	7.9
AC 8.02	19.1	39.7	21.1	8.4
AC 8.03	19	37.4	19.4	6.7
AC 8.04	20.4	36.9	20.4	6.6
AC 8.05	20.1	38.2	20.1	7.6
AC 8.06	19.9	39.6	19.4	7.9

Summary of Identified Issues

- 7th Floor system was found to have no power to the Condenser Unit. This system was not tested. The Condenser Coil appears damaged beyond repair.
- All return air filters for all Fan Coil Units are deposited and need to be cleaned.
- Insulation requires repair across several areas, notably at roof level.
- 6th Floor BC Box Branch 4 has no pipework support from the Fan Coil Unit to the BC Control Box (approx. 2 metres).
- 1st Floor BC Control Box was abnormally noisy on startup for approximately 10 minutes. It would appear that there is vibration within the Control Box.
- Service valves (ball valves) on all BC Control Boxes are not insulated.
- All Condenser Unit coils are significantly damaged.
- Fan Coil Unit condensate drainage has not been terminated across the entire building, excluding three units.
- No detail of total system refrigerant charges; these should be detailed on each Condenser Unit or within commissioning certificates.
- Condensate networks require flood testing.
- All systems require full commissioning, with certification.

Disclaimer: NON-INTRUSIVE VALIDATIONS: Whilst we endeavour to provide a complete and true validation, we cannot be held liable for any existing installation works that do not comply with general Air Conditioning standards as set out by the equipment manufacturer, a copy of which standards can be issued upon request.