8-12 Newton Street Manchester

VRF Installation Report

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INTRODUCTION

8-16 Newton Street, Manchester is a currently a vacant building owned by Eastern Green Ltd.

The intended works for the building will include the conversion of the first to fourth floor into office spaces, with ground and basement being reserved for retail development.

The scope of this report is to outline the options available for the location of the external condensers as part of the VRF heating and cooling system and to advise the area of louvres required to assist the planning application. The report will look into three available options as follows; first floor plantroom, fourth floor plantroom and roof level plant deck.

The retail space will not be included within this report and will not explore the requirements for 8-12 Newton Street, Manchester.

OPTION A (Equivalent to Option 4 by Atelier MB's 'Option Analysis for Plantroom' document)

The first option is to consider the viability of installing 4No. floor mounted condensers in the first floor plantroom, taking into consideration the supply and discharge air requirements.

Each condenser will require a maximum airflow across them of 5.33m³/s and a total for the plantroom of 21.32m³/s. The louvre size required to allow each condenser to get the air flow required would be an area of 4.27m² (per condenser). This is based upon a face velocity across the louvre of 2.5m/s and a free area of 50%. This would mean that a total area of 17.06m² of louvre space would be required to provide all 4No. condensers with the fresh air they needed to ensure efficient operation. Utilising the existing window spaces and replacing these with external louvres gives a total of 12.37m², which gives a shortfall of 4.68m².

The same volume of air (21.32m³/s) is required to be removed from the space. The adjacent lift shaft measures approximately 2100 x 1450 mm and rises up 3 floors, circa 13m in height. With a flow rate of 21.32m²/s and maximum duct size of 2000 x 1350 (allowing some space around the duct system), there are two options which have been explored below; using the built in condenser fans and using an additional extract fan.

Condenser Fans

The condensers typically have an external static pressure of 80Pa (maximum). When taking into consideration the length of ductwork with all associated bends and roof top termination point, the resistance in the system will likely be higher than the discharge fans can overcome.

Additional Extract Fan

Consideration has been given to installing an extract fan to assist in the discharge from the condensers. This however does cause a number of problems, including fitment, noise generation, cost, and controllability. The installation of an additional extract fan may also have an adverse effect on the performance outputs from the condensers. Sizing the ductwork at 2000 x 1350 mm and using an air flow rate of 21.32m³/s gives an air velocity in the duct of 8 m/s. This air velocity is considered very high and has the capacity of producing a very noise system and breaking out into the adjacent occupied and external areas.

Another risk with this solution is that the air flow may be too quick across the units to provide optimum performance.

Considering the above points, the first floor plantroom does not provide a suitable solution for the condenser location with one main obstacle being very little scope to increase the total area of the intake louvres.

OPTION B (Equivalent to Option 5 by Atelier MB's 'Option Analysis for Plantroom' document)

The second option available is to site all the condenser plant on the fourth floor. This location would give us easy access for the intake and discharge air by utilising the existing windows and gaining the remaining air flow via the roof, with the same size and layout as Option A.

The required intake louvre area would remain the same at 17.06m² with a face velocity of 2.5 m/s and a 50% free area. Utilising the existing windows to achieve some of the area required would provide an area of 5.42m², leaving a further 5.82m² of *free* area to achieve the remaining air flow. The best option available with the fourth floor plantroom is to bring the

remaining required fresh air through the roof. The area of 5.82m² is the remaining *free* area required and this would equate to 11.62m² (17.06m² - 5.42m² = 11.62m², 11.62m² / 2 = 5.82m²) louvre area based on 50% free area. With a roof turret type arrangement used, the free area will differ to that of a standard louvre. This should be taken into account when sizing intake positions.

The discharge from the condenser units can be exhausted through the roof in the same way the fresh air is brought in. The size of the free area on the exhaust side would however be larger, as there are no available louvre positions. A total of 8.53m² free area would be required for the exhaust side (this is half of the total louvre area required – louvre area sized with 50% free area). The free area noted should be taken into consideration when sizing exhaust positions.

OPTION C (Equivalent to Option 1 by Atelier MB's 'Option Analysis for Plantroom' document)

The third option is to install a roof level plant deck to mount the external condensers. This strategy would negate the need for louvres and/or roof intake/exhaust across the whole building and the performance of the condensers would be at their optimum with no performance drops. Access would be required to roof level and sufficient spacing between units should be considered, as is usual for performance and maintenance.

The discharge would be directly routed from the top of the unit straight to atmosphere with no ductwork required.

CONCLUSION

An assessment should be carried out to determine the number of roof terminals needed to achieve a free area of 5.82m² on the intake side and 8.53m² on the discharge side. If the free area cannot be achieved by means of roof penetrations, option C would likely be the only available solution to ensure the efficient operation of the external condensers.

Trying to relocate the external condensers to another room other than the two named above (option A and B) would likely be met with similar difficulties due to the very large air flow that the condensers require.

Both option B and option C offer good solutions for the locations of the external condensers.