NSW Bridge Association Supplementary Air Conditioning Proposal
Level 1, 162 Goulburn St, Sydney 2010

Stage 2a – Summary Report and Recommendations
22nd October 2007

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INTRODUCTION

This report provides an overview of the NSW Bridge Association air conditioning upgrade proposal, outlining findings to date, further work to be conducted and recommendations for the NSWBA Council to decide on the next appropriate course of action. It is an adjunct to the document entitled “Stage 2a - Technical Report on Base building System” and makes reference to that document.

BACKGROUND

The NSWBA has found that the existing base building air conditioning system is not adequate to meet peak demand, especially during warmer weather. Both the cooling capacity of the system, and the fresh air supply are below standards required for the designated use of the space. An upgrade to bring these figures up to standards was specified as a condition of the original development application for use of the space.

Southland was appointed and asked to put together a tender specification to obtain quotes for consideration by the Council, and to manage the implementation of the project, should NSWBA decide to proceed.

Southland procured to obtain three separate quotations from Genesis Air Services, DazAir and Grosvenor Air Services (the incumbent air services contractor for the building for the previous 2 years). Southland has had considerable industry contact with these three parties, and recommends all of them as competent and cost effective air services consultants. DazAir has also had contact with the building, having performed installations and various other services to existing building equipment over a period of many years.

IMPLEMENTATION OPTIONS

A number of means of achieving NSWBA’s requirements are available, and are listed below in order of decreasing preference:

1) **Condensor water packs** mounted in the roof of the tenancy.

   These units extract heat from the local environment and dissipate it into a dedicated water circuit that runs the entire length of the building. This water circuit connects directly to the evaporative cooling tower on the roof of the building and is available for tenancies to connect to, subject to an approval process laid down in specific Strata By-Laws. Currently, two other tenancies in the building have deployed air conditioning based on this option. Additional fresh air would need to be supplied from a supplementary fan mounted on Level 1 and vented from the outside.

This option is the cheapest in terms of implementation, and has relatively simple requirements in terms of DA approval, as the entire installation resides in the tenancy. The efficiency of such a system increases marginally on hot or dry days, as the cooling tower evaporates at a greater rate

2) Refrigerant based **VRF split system.** (Variable Refrigerant Flow).

   This option involves the installation of local cooler units in the tenancy, and compressor units on the open rooftop. Electrical cabling and refrigerant lines that run the entire height of the building from the tenancy to the rooftop connect the two sets of units.

   Such a system is more expensive to install, has greater interference with building structures, and stricter requirements in terms of DA approval, as it involves installation of components that are visible from the outside of the building. Currently, two other tenancies in the building have installations of this nature.

   The efficiency of such a system decreases marginally on hot days, as it must dissipate heat onto a hotter external environment. Additional fresh air would need to be supplied from a supplementary fan mounted on Level 1 and vented from the outside.

3) **Air coupled conditioning units.**

   These comprise standard modular units of a similar principle to an ordinary window mounted air conditioner. NSWBA currently has floor-mounted units of this type, however they have been incorrectly installed. The quantity of units required, and the impact of these outside the building in terms of aesthetic and environmental impact make approval by either the Body Corporate or local Council unlikely.

   Whilst this would be the least costly option, the units would need to be installed along the windows to the north of the tenancy, and would have considerable visual impact - NSWBA has indicated that the visual impact of the current units is unacceptable. One other tenancy in the building has used such a system in the past, however it had not been formally approved by the Body Corporate, and its performance was poor. The tenant has since moved out of the building, partly for this reason.

   The efficiency of such a system decreases considerably on hot days, as it must dissipate system heat onto a hotter external environment. Additional fresh air would need to be supplied from a supplementary fan mounted on Level 1 and vented from the outside. This would still require DA approval.

4) Expansion or modification to the **existing building air conditioning.**

This is the least desirable option for a number of reasons. Apart from having the greatest cost, the existing plant on Level 1 is dependent on common property infrastructure, and modification of the plant would have an impact on other tenants in the building. The degree of work involved in establishing technical feasibility and re-engineering the design would incur very high consultant costs, and especially with a lack of documented By-Law procedures or precedent, would be very unlikely to be approved by the Body Corporate.

Southland's experience with the existing system suggests that on hot days, the common property chiller infrastructure is already operating at full capacity, and that further enhancement of performance anywhere in the building is not possible without impacting other tenants.

INITIAL CONSULTATION WITH CONTRACTORS

All contractors/consultants felt that the use of condenser water packs (Option 1), connected to the available condenser water circuit, was a viable and the most sensible option. They provided an indicative pricing based on their recommended technical specification, but indicated that the exact specification (and hence price) was contingent on a number of factors that had to be confirmed with certainty, as follows:

1) Designated use and classification of the space, as defined under the Environmental Assessment Act.

The classification of the space has a great bearing on the applicable standards for fresh air and cooling capacity. Two of the contractors believed that a card playing room could constitute a 9B Place of Public Entertainment space, and stated that their quotations would be far greater were that the case. Furthermore, they indicated that under those circumstances, at a first glance, the existing condenser water system would not likely have the required capacity.

2) The current actual quantity of fresh air supplied to the tenancy, under a range of conditions.

The quantity of additional air required has a direct bearing on the amount of cooling capacity required, due to the extra hot air being drawn in from the external environment.

During hot weather, the existing system will restrict fresh airflow, to reduce the impact on cooling capacity. The degree to which this occurs was not

known, and the capacity had to be confirmed by a number of formal tests. All consultants confirmed that on first observation of the existing plant, and the size of the tenancy, that this was unlikely to be an issue.

3) **The current actual quantity of condenser water available for removal of heat from the cooler packs.**

This will determine the maximum possible upper capacity of the system, and determines how many cooler packs may be connected. The number of required packs is determined by the quantity of persons, plus the amount of extra fresh air required.

Based on the diameter of the condenser water supply pipes, and experience with installation to the RedAnt tenancy on Level 2, DazAir estimated that a condenser water flow rate of 2.0-2.5 litres per second was a conservative estimate for the Level 1 tenancy. This would be sufficient to supply 40-50kW of condenser water packs, which was the upper level of capacity demand estimated by all three contractors, based on their estimates of required supplementary airflow.

RECOMMENDATIONS

After several rounds of meetings with consultants, it became evident that there was considerable variation between their recommendations for the tenancy, and all three recommended that the services of a calibrated flow testing specialist be employed to determine both the demand and supply as dictated by the required additional fresh air and available water flow rates respectively.

DazAir and Genesis Air Services both suggested that the possibility of Place of Public Entertainment standards applying to the tenancy would have a far greater bearing on the feasibility, whilst Grosvenor did not comment.

As the scope for establishing feasibility became apparent, Southland developed a staged proposal, with early attention to the most likely barriers and most cost effective research in order to minimise consultant costs to NSWBA. This was to minimise consulting costs if at any stage NSWBA decided not to proceed further.

Flow testing was delayed until other potential barriers were exhaustively investigated, and represents the final component of research required to establish the parameters of the project.

The results of the ultrasonic flow testing have revealed several unexpected results:

- Airflow under normal circumstances is around 30-40% of those estimated, increasing the thermal load in the tenancy by approximately 100%,
- The available water flow is around 40-50% of those estimated, reducing the maximum available cooling capacity by a proportionate amount.
- The condenser water pump has been fitted with a non-standard impeller, which means its efficiency will vary as more loads are connected to the circuit, thus the future validity of these figures is not guaranteed.

CONCLUSION

The intended outcome of Stage 1 was aimed at identifying any firm barriers to the project, whilst Stage 2a was to perform measurements to ascertain the technical specifications for the purposes of costing. The outcome of these investigations has revealed that the project is technically feasible, however, an alternative system other than the initial preferred option on cost and simplicity must form the basis of the specification for tender.

Up until this point, NSWBA has not indicated a firm total budget for the project, so Southland has offered indicative pricing as far as possible, with respect to what is learned at each stage, to allow NSWBA to reassess their financial position should the expected plant installation costs become prohibitive.

Genesis Air Services have provided a quotation for a typical VRF system that could be used to satisfy NSWBA's requirements. As the cost for this system is higher than the original quotes based on a condenser water pack system, NSWBA must now consider their budgetary restraints, and whether the cost involved is justified before continuing.

Southland confirms that although the workload of the consultancy increases by going to a more complex option, there is NO CHANGE to our consultation, report and project management fee.