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ARUP

Dear Michael

**Fraser's Broadway
Block 2: BASIX Assessment levels 4 to 28**

On the 18th of March 2010 Arup completed the BASIX assessment of Block 2. At this stage of the project the targeted thermal performance was governed by the Green Star pilot tool. This stipulated a conditional requirement for all apartments to meet a 7 Stars NatHERS rating. This ambition resulted in apartments that performed extremely well thermally and well above the minimum BASIX requirement. Green Star has since revised the conditional requirement to be a 10% improvement on the BASIX minimum requirements. Since completing the BASIX assessment there have been changes to the design that in some cases have impacted the performance of units. We have done a comprehensive review of the changes to the architecture and modelled all of the impacts on the BASIX thermal comfort performance based on the 'Final GMP Issue' architectural. A review was also conducted on the impact of the changes in unit performance on the overall BASIX calculation. The letter below summarises the changes in design, the results of units modelled and the impact on BASIX.

The changes to the Block 2 architecture that impact BASIX thermal comfort include:

- 1) Additional apartments added on level 4 and 16
- 2) On all apartments balustrades are now glass construction rather than cable as previously documented for the same apartment, providing reduced ventilation area in some locations
- 3) Insulation level in external wall and roofs has been reduced to more buildable thicknesses.
- 4) Shading from overhangs has changed for various units
- 5) Roll and shutter privacy screens have been removed from the scheme.
- 6) Minor layout changes are prevalent in most units

Items 5 and 6 above were found to have negligible impact on the thermal comfort results of apartments. In order to assess items 1 to 4 thermal comfort modelling to BASIX protocols using AccuRate software was performed for 42 units. Apartments that were modelled included:

- A large sample of units with reduced insulation
- All new apartments types
- All units types with restricted airflow
- All units types with significant shading changes

Reduced Insulation Assessment

Based on this study it was established that the thicknesses of insulation could be reduced from the levels provided in the original BASIX assessment. This reduction was required because the thicknesses developed in the early stages were driven by the Green Star conditional requirement and were difficult to build. It was determined that BASIX compliance could be achieved with the following material insulation values:

- External walls generally - R1.5

- External Green Wall - R1.5
- Concrete Column to external - no insulation is required
- Exposed roof to apartments on Level 15 west tower - R3.0 is required.
- Exposed ceiling / roof generally - R1.5
- Ceiling to plant room - R1.5
- Floors to non-conditioned spaces - R0.5

New Apartments Assessment

All new apartment types were modelled. Studio's 04, 05, 07, 10, 11, 14, 16 and 17 on level 4 require a small improvement in performance to meet the individual unit BASIX cap. Two options are currently being considered for these apartments:

- Provision of a ceiling fan in the living room
- Design of additional open area in the glass balustrade.

Both options can adequately provide the performance to meet the individual unit BASIX cap and Frasers have undertaken to adopt either of these options. All other new units passed BASIX requirements.

Units with Restricted Air Flow and Significant Overhang Changes

Unit types with either restricted airflow or significant shading changes were assessed carefully to ensure that modelling done gave a representation of units on all levels from level 5 to 28. Based on the 'Final GMP Issue' architectural all units with these modifications meet the BASIX thermal comfort requirements.

Conclusion

Based on Arup's review of the 'Final GMP Issue' architectural dated the 31st August 2010 we can confirm that all units on level 5 to level 28 do not exceed the permissible BASIX thermal loads as an individual unit and as an average for the east tower and west tower. All units on level 4 will pass BASIX thermal loads once either ceiling fans or additional opening area is adopted. The overall BASIX calculation was also found to pass based on the architectural changes. Therefore the Block 2 development based on the plans being resubmitted for level 5 to level 28 are compliant with BASIX requirements. All units on level 4 will be compliant with BASIX requirements once an adequate method is adopted to improve the thermal performance.

Yours sincerely



Steve Drane
Mechanical Engineer