

385 Bourke Street Case Study – Phased Renovation of an Induction System with Active Chilled Beams with the Building Occupied during Renovation

Overview

The 385 Bourke Street project was a renovation of a 42 story multi-tenant office building in Melbourne, Australia. The building had floor-mounted induction units along the perimeter on all four exposures. The interior zones were served by a separate single duct VAV system. Each of the floors had approximately 15,000 sq. ft. of rentable area (630,000 sq. ft. total).

Over time the building's cooling loads had increased due to more internal equipment heat gains and higher occupancies. The perimeter sensible cooling loads had increased 25% from 307 Mbh per floor (12,900 MBH total) to 395 Mbh per floor (16,600 Mbh total).

The existing interior VAV and perimeter induction systems were not capable of delivering the higher cooling capacities required. The existing VAV system was replaced with a new VAV system with higher airflows/capacities. The existing induction system was replaced with a ceiling-mounted active chilled beam system providing the higher cooling capacities required.



Perimeter System Design Issues

- The owner wanted to eliminate the floor-mounted units and find a HVAC system solution from the ceiling.
- There was insufficient refrigeration and pumping capacity to satisfy the new cooling loads which required the installation of new chillers and pumps.
- The primary airflow and pressure were limited by the existing central air handlers and ductwork, and an important design objective was to use the existing air handlers, vertical risers and ductwork in the new perimeter system.
- The existing induction system utilized a primary air temperature of 57 °F and a secondary water temperature of 49 °F. At this water temperature some condensation occurred within the existing induction units, which was piped to a drain.
- Space above the suspended ceiling was adequate to accommodate ceiling-mounted units.
- The building would be renovated floor by floor, so the building would be occupied throughout the project. As such the existing system would need to remain operational on the floors yet to be renovated that were occupied, while the other floors were renovated.

Design Solution

Dadanco was able to offer a new active chilled beam perimeter system design that met the design objectives.

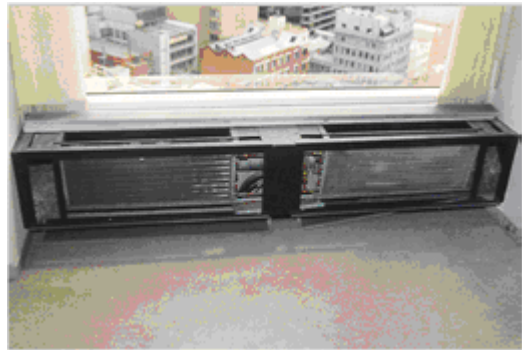
- The take-offs at each floor off the vertical risers and the secondary water piping were relocated from the floor to the ceiling plenum.
- (96) ACB35 concealed ceiling-mounted active chilled beams were installed on each floor in place of the existing floor-mounted induction units. The new ACB units were sized at the same primary airflows as the existing induction units, but at 1.0-1.5" w.c. lower inlet static pressures and at a higher 54 °F secondary water temperature.
- During the construction phase as each floor was renovated, the original primary airflows and secondary water temperatures had to be maintained for the proper operation of the induction units that had yet to be replaced on the other floors in the building.

To accomplish this a damper was installed at the take-off from the vertical riser for each completed floor to reduce the incoming pressure of the primary air to the new lower design pressure.

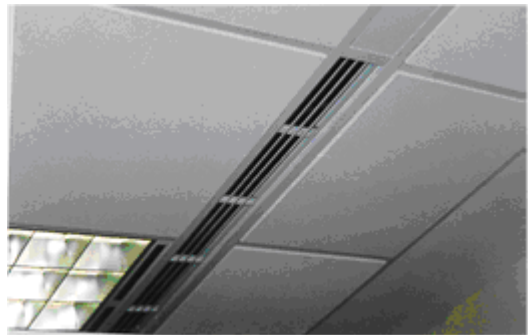
The water temperature was maintained at 49 °F which resulted in some condensation forming in the active chilled beams. This could be accommodated as the active chilled beams had drip trays to capture and drain the condensate.

- Once all floor had been renovated the dampers at each floor were adjusted to a fully open position, and new drives were installed in the existing central air handlers to provide the primary airflow at the new lower operating pressure. The secondary chilled water temperature was then reset upwards to the new 54 °F design temperature.

Existing Floor-Mounted Induction Units



New Ceiling-mounted Active Chilled Beams



Benefits

- Cooling capacities were increased by 28% in the perimeter zones.
- Fan energy consumption was reduced due to the lower fan operating pressure.
- Pump energy consumption increased slightly due to the higher secondary water flows.
- Floor space was gained, appearances improved and the office space upgraded to premium grade with the removal of the floor-mounted induction units and installation of the ceiling-mounted Active Chilled Beams
- Costs were avoided as there was no need to purchase new custom enclosures which would have been required if the existing units had been replaced with new floor-mounted units.
- Noise levels were reduced through the performance of DADANCO's patented nozzle technology and lower static pressures.

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