



## Ultra-sorb improves absorption and reduces operating and maintenance costs

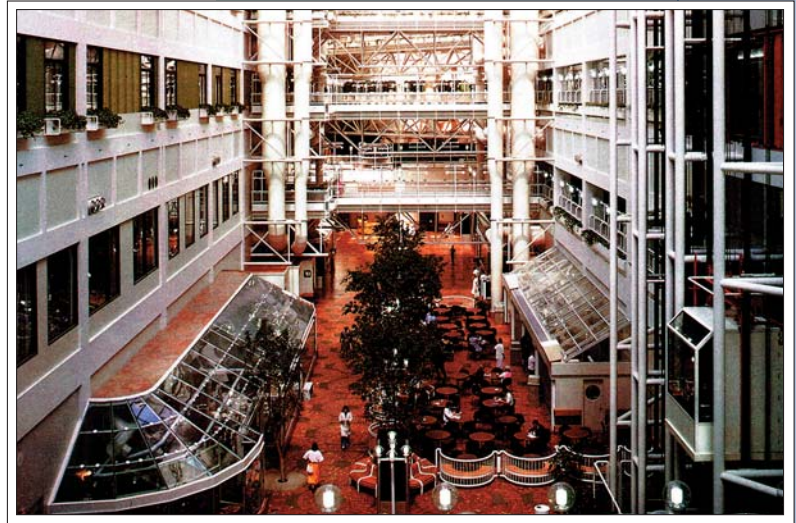
*Walter MacKenzie Center  
Steam Humidification Project  
August, 1995*

The Walter MacKenzie Center of the University of Alberta Hospitals is the primary teaching and research institution in the Province of Alberta. With 950 beds for patients, research laboratories and the Provincial Laboratory of Public Health, this is a very large building by any standard.

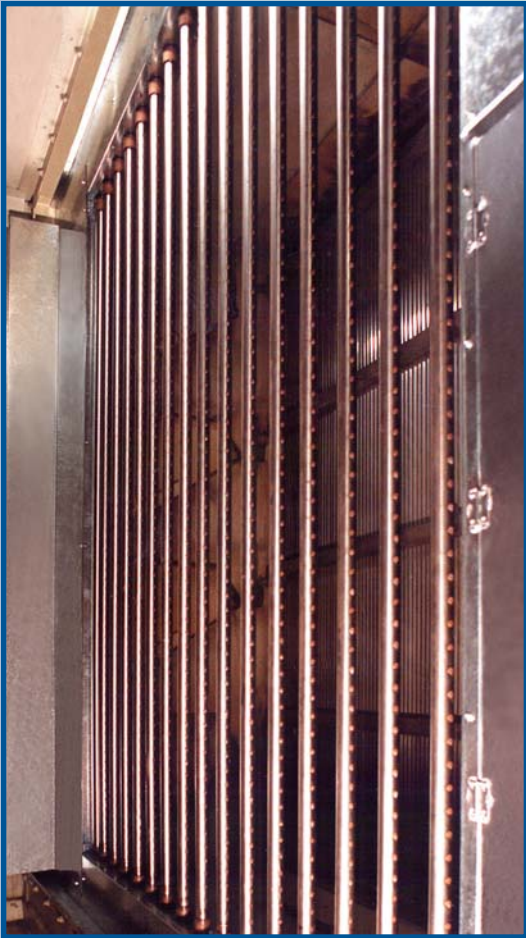
Twenty-six air systems serve this facility of which 21 had been utilizing capillary air wash technology for humidification since the completion of the second phase of the hospital in 1982. The remaining units used horizontal steam grid technology for humidification. The steam grid units served operating suites and a recent pharmacy addition.

### **Air washers replaced**

Reid Crowther and Partners Ltd. were engaged in 1994 to design the conversion of capillary air wash systems to steam grid humidifiers. Working with Mr. Jim Thompson and Mr. Mike Prasek of the Hospital Physical Plant it was determined that the hospital desired replacing the capillary air wash systems for a number of reasons. The first and foremost reason was the operating cost of producing and delivering demineralized water for the air wash system estimated at \$200,000 per year. The yearly replacement of the air wash cells at approximately \$23,000 per unit also contributed to the financial component of the replacement. Odors from the air wash cells and the cooling effect provided from the air wash system in winter conditions also contributed to the case for replacing the air wash systems.



*West Atrium, Walter Mackenzie Health Sciences Center*



Ultra-sorb LV steam dispersion tube panel installed at Walter Mackenzie Health Sciences Center

### Large air handlers required special needs

The configuration of the air handling units caused a great deal of concern for this humidification project as can be seen in Figure 3-1 on the next page. These units move on average 60,000 CFM of air each. In some cases close to 100% outdoor air is moved resulting in enormous humidification requirements in winter when ambient temperatures drop to -40° F. The proposed steam grid was to be located upstream of the system cooling coils and supply air fan in the same location as the capillary air wash system. This was the only available location to install the units since downstream of the cooling coils sufficient space was not available prior to the final filters, and downstream of the final filters the distribution ductwork decreased in size to deliver air at high velocity to the building.

The design conditions of the new steam humidification system dictated that up to 1200 lbs/hr of steam would be required for some units during winter ambient design conditions or the free cooling conditions of spring and fall. Each unit differs in the season for peak steam use since the amount of outdoor air used for ventilation varies for each unit and could be changed at any time to suit renovation within the hospital.

### Steam absorption was critical

Another critical design criteria based on the proposed location for the new steam grid system was the short absorption non-wetting distance available prior to the moisture eliminators. Obviously it is desirable to have steam absorption prior to the eliminators since the object of humidification is to add moisture to the airstream. Non-wetting distances greater than 4 feet would result in inefficient humidification and moisture carry over into the supply fan cabinet.

### Several options were considered

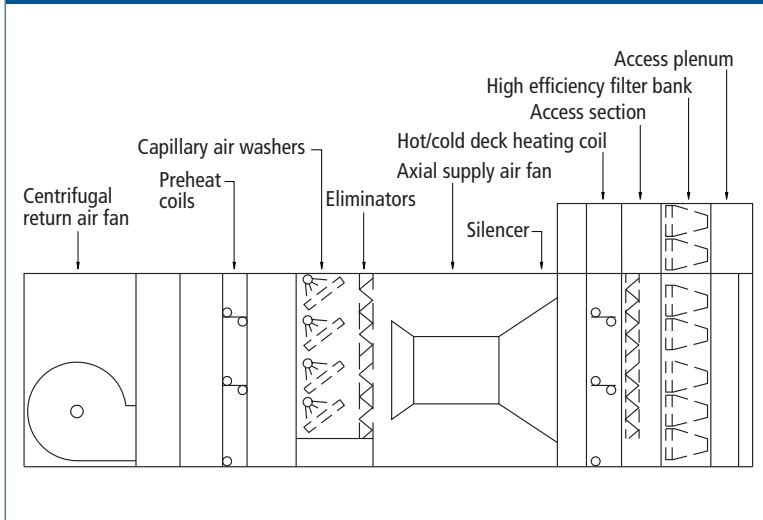
A number of steam humidification systems were investigated to meet the design criteria for this project based on a desire to keep the per unit cost of the new grid to below \$10,000, the value at which it was determined the feasibility of the new installation compared against operating cost was acceptable. A traditional horizontal grid system was investigated but non-wetting distances of up to 16 feet were calculated. An atomizing system was reviewed but resulted in uneven fog distribution across the cross section of the unit. Finally the DRI-STEEM Ultra-sorb® system was investigated.

### Ultra-sorb provided the solution

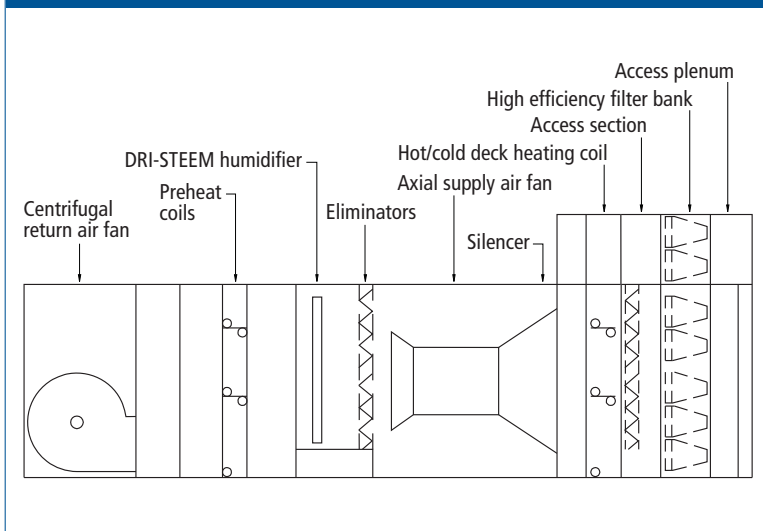
The Ultra-sorb system offered many advantages to this installation. The 12 feet high and 9 feet wide unit was expected to provide even steam distribution. Comparing a different number of tubes and center to center dimensions resulted in an optimized steam distribution manifold for this application. Absorption distances of as little as 15 inches were possible with the 6 inch center to center tube spacing. The system required only a modulating steam control valve. Steam pots or separators were not required which simplified and reduced

long term maintenance. It is remarkable that the capital cost of each grid was approximately \$7,000 - the lowest priced option studied. The installation is shown in Figure 3-2 below.

**Figure 3-1:  
Existing central air conditioning unit**



**Figure 3-2:  
Upgraded central air conditioning unit**



Other features of the vertical Ultra-sorb system which were considered beneficial included:

- The ability to positively shut off steam to the grid when steam was not required thereby eliminating standby steam normally required to maintain the jacket temperature of steam jacketed dispersion tubes (horizontal grids).
- The ability to characterize tubelets in the vertical tube to provide even steam distribution across the unit cross section.

## Job Summary

### Concerns

- Operating cost of \$200,000/yr for DI water.
- Replacement air wash cell cost of \$12,000/yr.
- Complaints of odors from the wash cells.
- Excessive unwanted "free cooling" increasing the preheat coil load.
- Maintain new per unit replacement cost under \$10,000.

### Solution

- Install Ultra-sorb LV dispersion tube panels in the same sectional space as the previous air wash cells.

### Operational results

- Minimized odor complaints from building occupants.
- Eliminated the evaporative cooling effect and greatly lowered the preheat coil load.
- Improved control of the air handling system and increased occupant satisfaction.

### Financial results

- Elimination of the excessive yearly cost of \$12,000 for replacement air wash cells.
- No net increase in the cost of steam since the reduction in preheat load matches the consumption used for humidification.

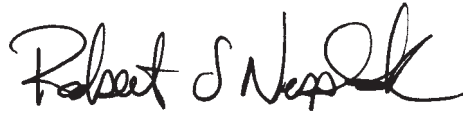
**Payback:** Less than 1/2 year

**Increase in operating cost:** None

- The ability to guarantee drip-free operation because of the tubelets' insertion distance into the steam supply tubes. Condensate travels along the walls of the supply tubes and never reaches the distribution tubelet orifice.

Operational tests on the units have shown dramatic results. First, the quality of the humidification improved, with less odor complaints from building occupants. Operationally, removal of the air wash system and installation of the steam humidification system has resulted in little increase in steam use by the hospital. Steam is used for the preheat coils of the system, less preheat is now required to counteract the air wash cooling effect. In fact, the amount of steam used by the new steam humidification system is almost identical to the amount of steam used to generate the extra preheat previously required. Controllability of the air handling system is also improved with more predictable characteristics resulting from the steam humidification system.

This project has been a great success due to the efforts of the entire team including the Physical Plant department of the hospital and by DRI-STEEM through our local representatives Bart Bartlett and Darren McPherson of Kehoe Equipment in Edmonton.



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Your DRI-STEEM representative is:

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