

Halton Chilled Beam Applications for Hotels



Hotel Enviroment

Needs

Solution

Benefits

Hotels are in the business of...

- Sleeping
- Eating
- Meeting
- Playing & relaxing
- Working



Hotels are in the business ...

Sleeping

- **low noise levels**
- **fresh air supply to room**
- **primary air temperature 16-18 deg °C**
- **NO draft and air velocities < 0.1 m/s above the bed**
- **even room temperature (+24 °C) and even air flow distribution...**

INDOOR CLIMATE QUALITY – ADAPTABILITY - ENERGY SAVING – LIFE CYCLE COST EFFICIENCY

Hotels are in the business ...

Meeting

- **Acceptable noise levels**
- **Enough fresh air supply to room: good indoor air quality,
ppm CO₂ (< 1000)**
- **good air movement: draft free**
- **controlled air temperature and fresh air rates**
- **flexibility: best use of space, different usage and layouts.**

INDOOR CLIMATE QUALITY – ADAPTABILITY - ENERGY SAVING – LIFE CYCLE COST EFFICIENCY

Hotels are in the business ...

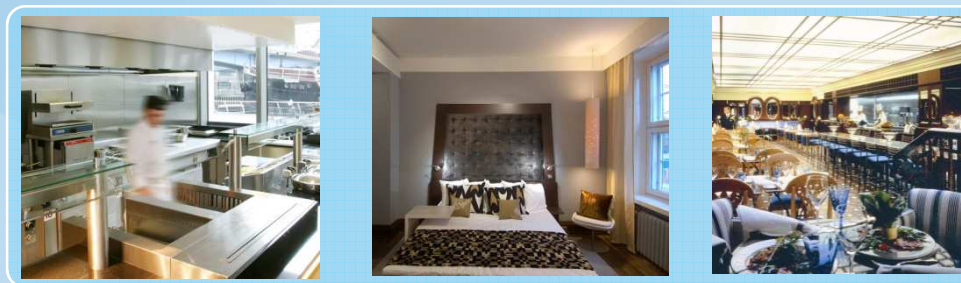
Dining

- **Even room temperature +24 °C**
- **Primary air temperature +16-18 °C**
- **NO draft and air velocities of < 0.25 m/s around the table**
- **adaptable according to the demand (daily schedule)**
- **...**

INDOOR CLIMATE QUALITY – ADAPTABILITY - ENERGY SAVING – LIFE CYCLE COST EFFICIENCY

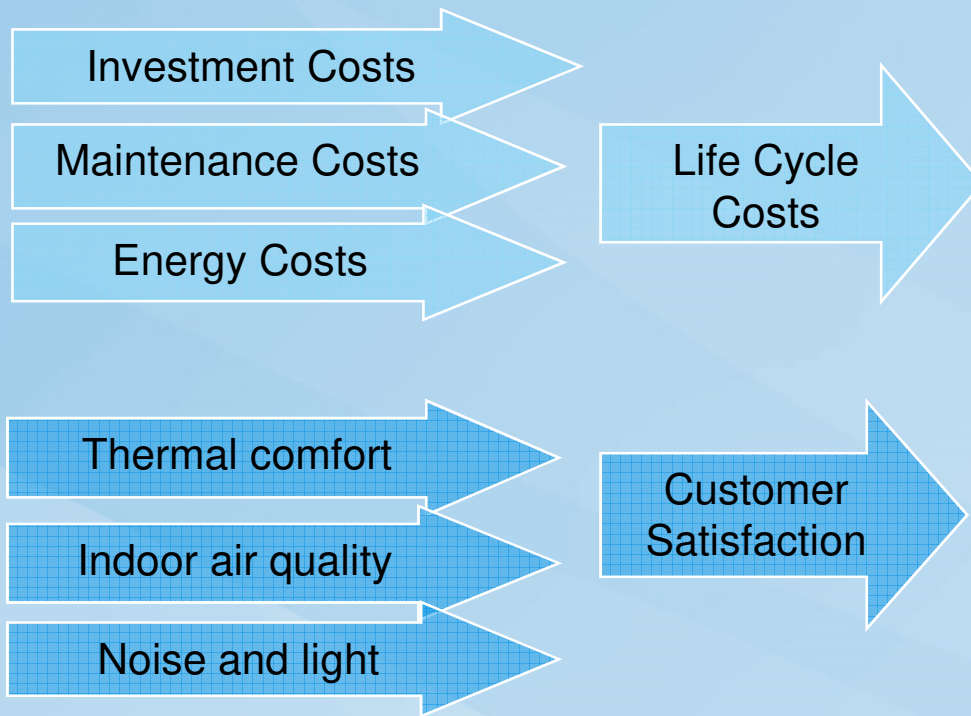
A Balance between Indoor Climate Quality and Economic Performance of the Building

- Comfortable and quiet conditions for high guest satisfaction
- Reduced running costs in all usage situations
- Optimum safety and health for hotel guests
- Simplified and low cost maintenance for both new and renovated premises
- Low energy usage of building and a solution that enables the use of sustainable energy sources
- Environmentally friendly, green solutions



INDOOR CLIMATE QUALITY – ADAPTABILITY - ENERGY SAVING – LIFE CYCLE COST EFFICIENCY

Halton Demand Based Indoors – Profitability of Hotel Investment



Hotel Environment:

Needs

Solution

Benefits

Halton Demand Based Indoors – Hotel Building: matching each space with suitable system

Sleeping
Meeting
Eating

Guest room:
Meeting room:
Kitchen:

Restaurant:
Public spaces:
Auditorium:

Chilled beams system

Chilled beams with HAQ

Capture jet hoods and ceilings with
displacement ventilation

Low velocity air supply with variable airflow

Displacement ventilation with variable airflow

Under seat supply with variable airflow



INDOOR CLIMATE QUALITY – ADAPTABILITY - ENERGY SAVING – LIFE CYCLE COST EFFICIENCY

Indoor Climate Solutions in Guest Rooms

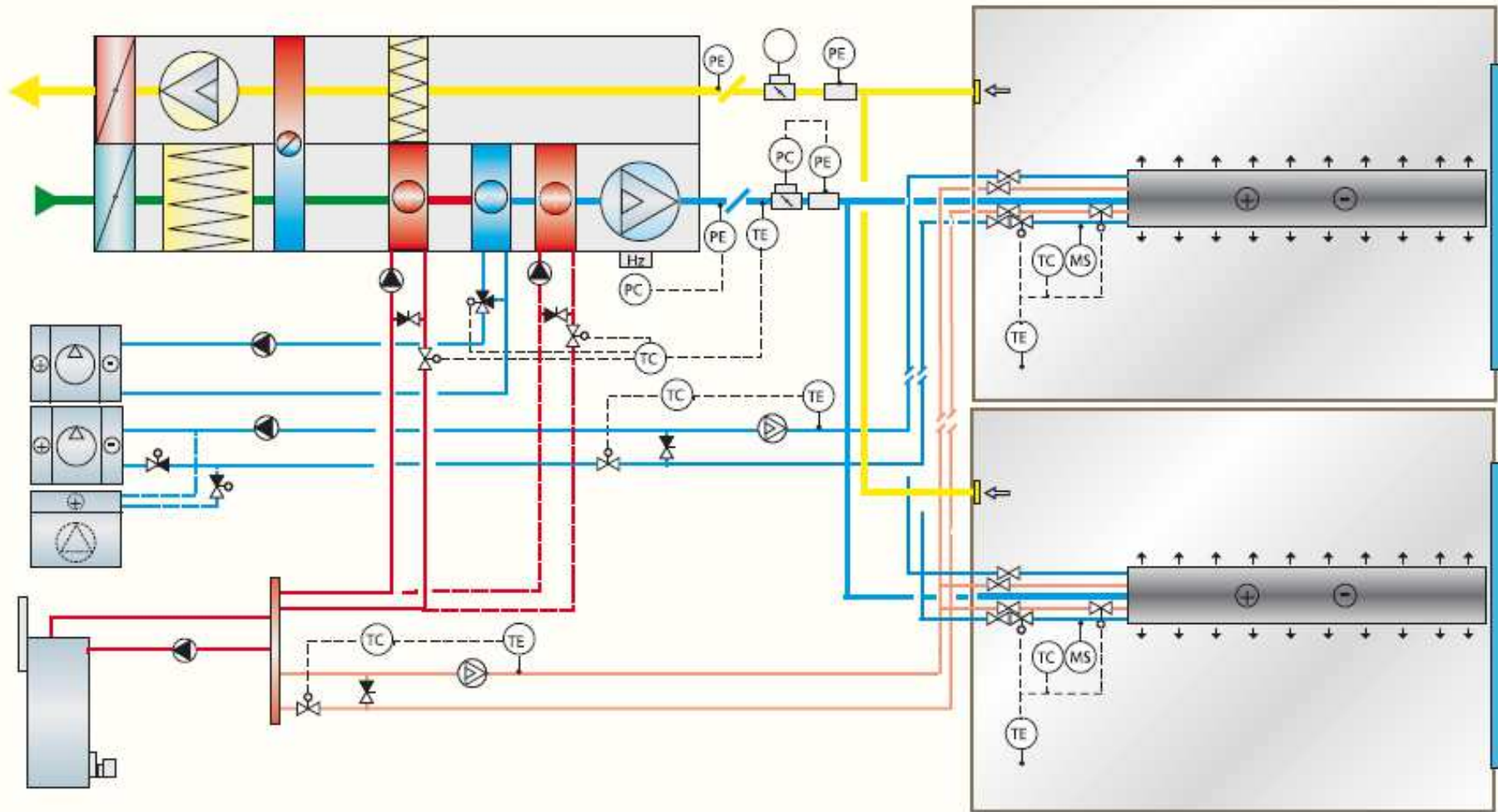
Guest satisfaction and comfort depend on indoor climate conditions and their control...

- **Comfortable room conditions, with individual control**
 - Temperature
 - Indoor air quality
 - Lighting
- **Good air movement: DRAFT FREE**
- **Ventilation system should operate quietly**
- **Ventilation system should match architectural requirements of the space**



Hotel Environment: Guest room solutions

Schematic Diagram of a Chilled Beam System



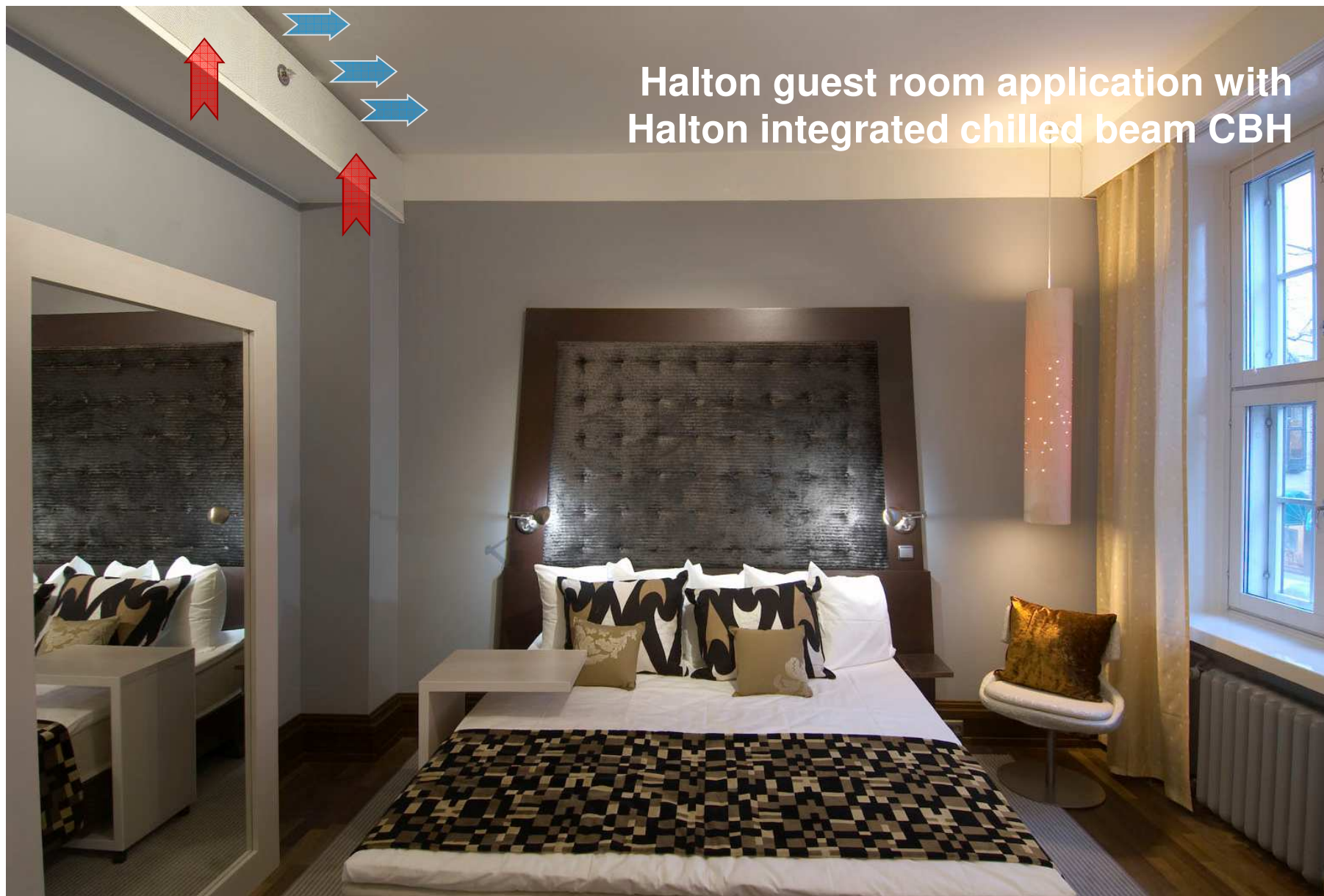
Condensation Must be Prevented

- Sufficiently high inlet water temperature
 - 14°C or higher
- Dehumidification of primary air
 - Especially when the outdoor air temperature is above 22°C
- Insulating valves and pipes
- Using condensation sensors on the pipe surface
- Raising the chilled water temperature or switching off valves locally if there is an increased risk of condensation (window).



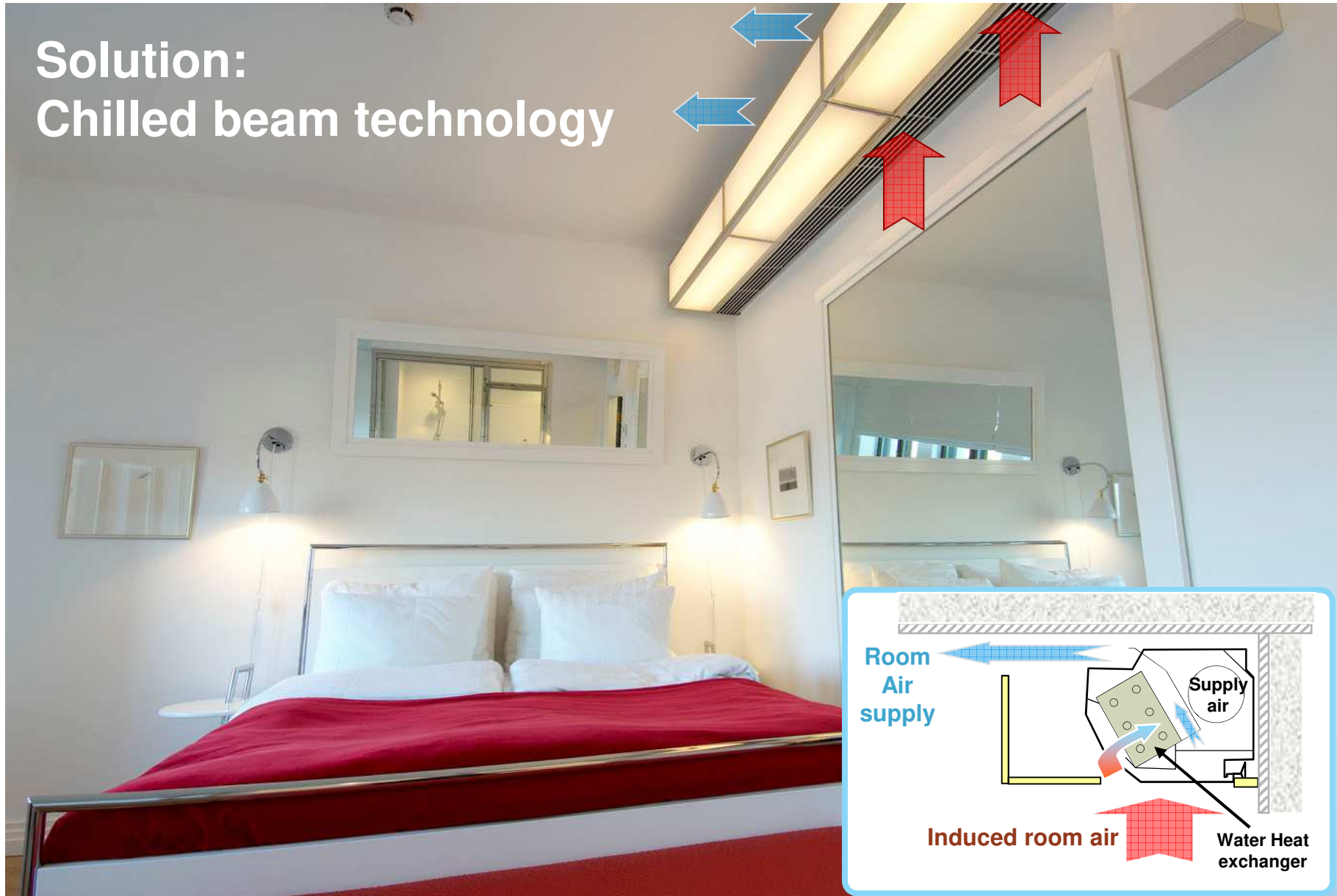
Choose Halton active chilled beams for hotels

Features		Active chilled beams for hotels		
				
		CBH	CHH	CHB
	Installation	Exposed or concealed	Bulkhead	Bulkhead
Dimensions	Width, mm	295	1000	800, 1000, 1200
	Height, mm	230	250	265
	Length, mm	1800...5000	925	925
Performance	Cooling capacity, W/m	...350	...800W	...920 (with boost 1240W)
	Heating capacity, W/m	150(200)	...500W (800W)	...575 (with boost 1080W)
	Airflow rate, l/s/m	5...12	15...59	15...59

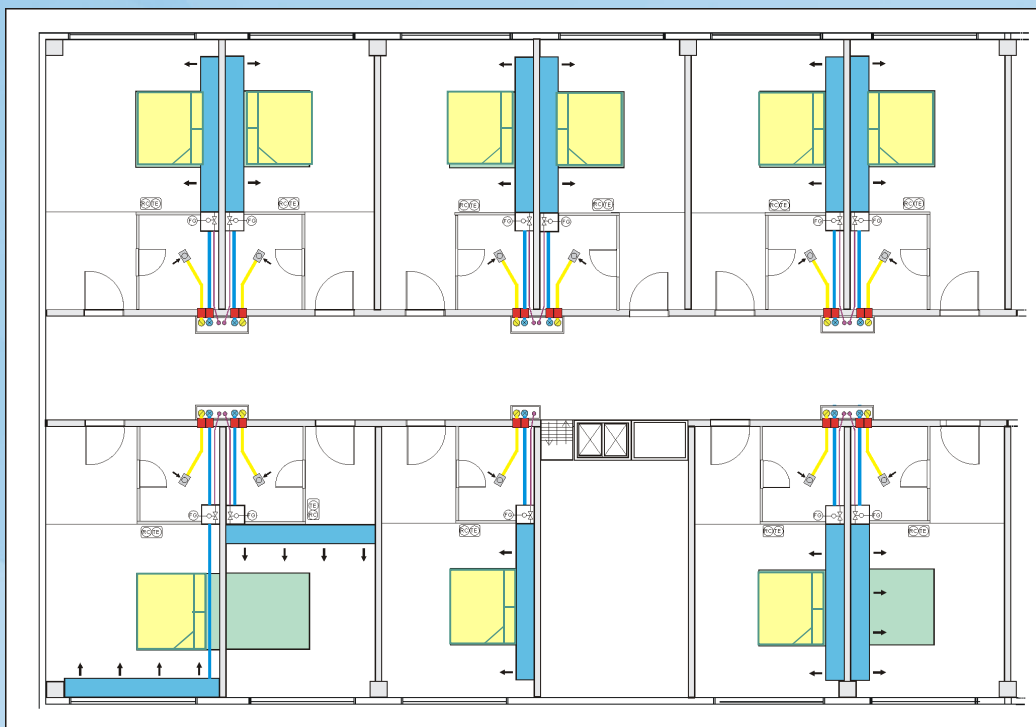


Halton guest room application with
Halton integrated chilled beam CBH

Solution: Chilled beam technology



Halton Guest Room Application with Halton CBH Chilled Beam



Supply:

CBH chilled beam

- Cooling and heating
- Automatically balanced control valve

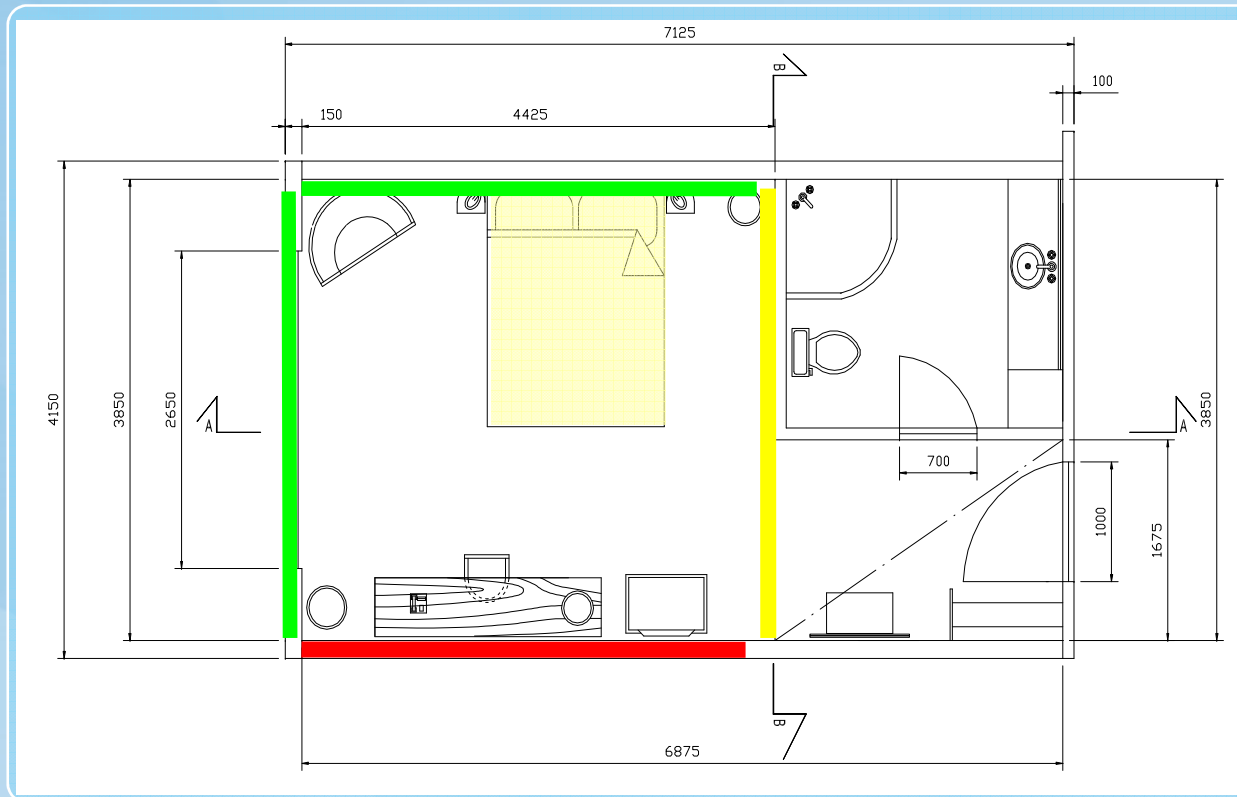
Extract:

URH exhaust valve

**Fire and smoke safety
FDE fire damper**

INDOOR CLIMATE QUALITY – ENERGY SAVING – LIFE CYCLE COST – ADAPTABILITY

Flexibility: Positioning of a CBH chilled beam



Typical Hotel Room layout:

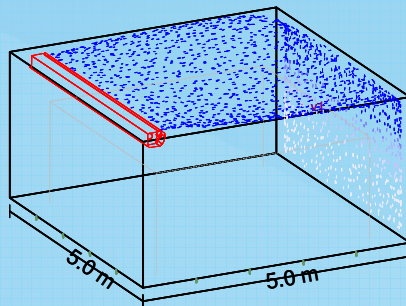
- Green preferred location
- Yellow = Good
- Red = not recommended (downflow to head of bed)

Halton Guest Room Application with Halton CBH Chilled Beam: example of design data

CBH 4500-3800 Cooling

$P_t = 1052 \text{ W}$
 $T_r = 24 \text{ }^\circ\text{C}$
 $q_{vs \text{ int}} = 25 \text{ l/s}$
 $T_s = 16 \text{ }^\circ\text{C}$
 $T_{W1} = 14 \text{ }^\circ\text{C}$
 $T_{W2} = 18 \text{ }^\circ\text{C}$

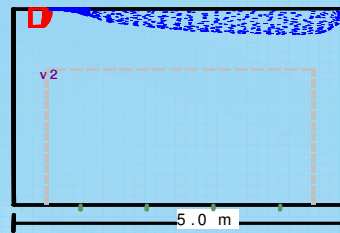
0.05 kg/s water flow rate



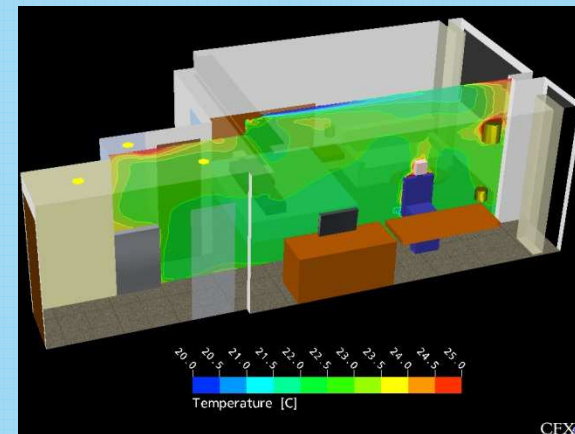
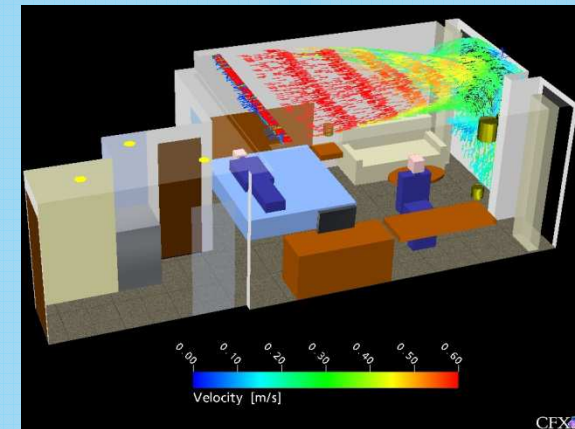
CBH 4500-3800 Heating

$P_t = 494 \text{ W}$
 $T_r = 21 \text{ }^\circ\text{C}$
 $q_{vs \text{ int}} = 25 \text{ l/s}$
 $T_s = 21 \text{ }^\circ\text{C}$
 $T_{W1} = 35 \text{ }^\circ\text{C}$
 $T_{W2} = 27 \text{ }^\circ\text{C}$

0.01 kg/s water flow rate



Source: CBH technical brochure and Halton HIT product selection software:

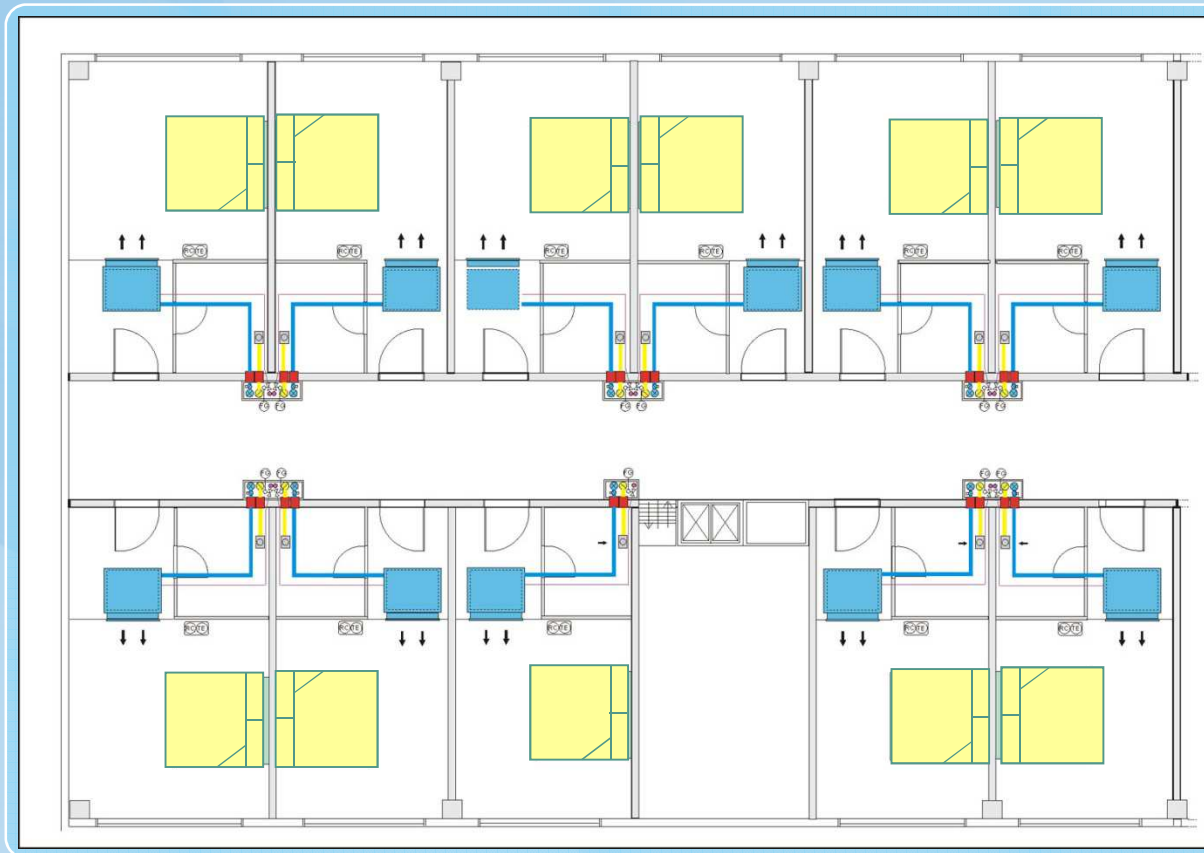


CFD calculations from Halton Solutions

Halton Guest Room Application with Halton CHH and CHB Chilled Beam



Halton Guest Room Application with Halton CHH and CHB Chilled Beam



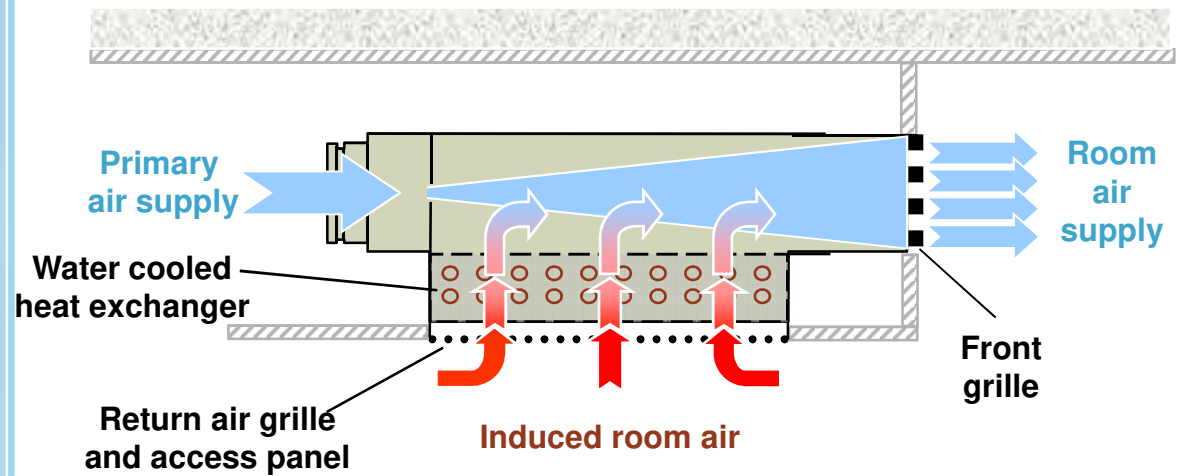
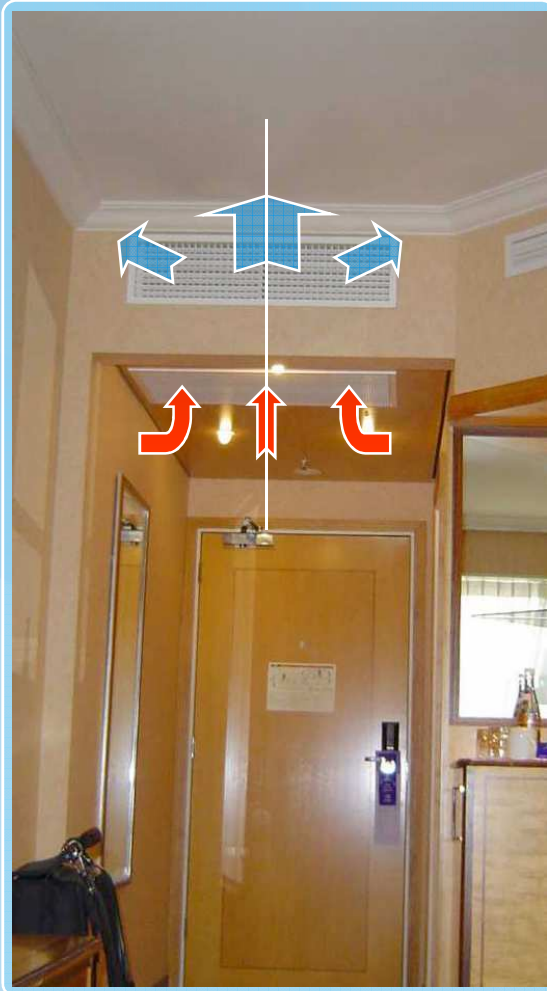
Supply:
CHH/CHB chilled
beam

- Cooling and heating
- Automatically balanced control valve

Extract:
URH exhaust valve

Fire and smoke safety
FDE fire damper

Halton CHH section view



Guest Room with CHH Chilled Beam: design example

- Total cooling capacity 700-1200 W
- Air flow rate 15-40 l/s
- Noise 15-30 dbA
- Height 300 mm
- Fit to space 1000 mm x 1000mm

CHH 1000-1000 Cooling

$$\begin{aligned}P_t &= 1059 \text{ W} \\T_r &= 24 \text{ }^{\circ}\text{C} \\q_{vs \text{ int}} &= 32 \text{ l/s} \\T_s &= 17 \text{ }^{\circ}\text{C} \\T_{w1} &= 14 \text{ }^{\circ}\text{C} \\T_{w2} &= 17.2 \text{ }^{\circ}\text{C} \\0.06 \text{ kg/s water flow rate}\end{aligned}$$

CHH 1000-1000 Heating

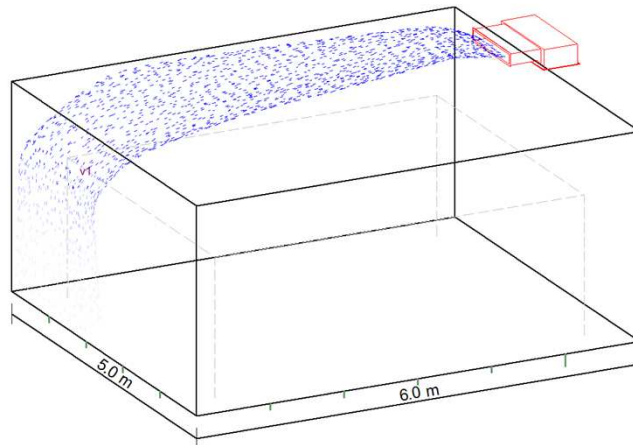
$$\begin{aligned}P_t &= 425 \text{ W} \\T_r &= 21 \text{ }^{\circ}\text{C} \\q_{vs \text{ int}} &= 32 \text{ l/s} \\T_s &= 21 \text{ }^{\circ}\text{C} \\T_{w1} &= 35 \text{ }^{\circ}\text{C} \\T_{w2} &= 27 \text{ }^{\circ}\text{C} \\0.16 \text{ kg/s water flow rate}\end{aligned}$$

Source: CHH technical brochure and Halton HIT
product selection software:

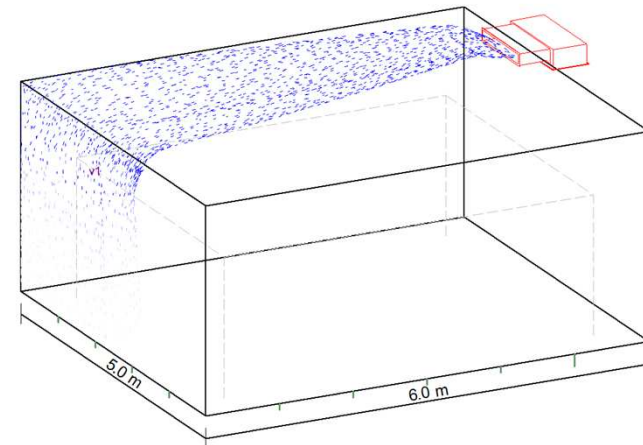


CBH Beam – Boost off / Boost on

Cooling CHB/B-1200-R-R, boost off 06.2017			
Room:		Supply air flow rate:	30 l/s
Room size:	6.0 x 5.0 x 2.7 m		1.0 l/(sm ²)
Occupied zone:	h=1.8 m / dw=0.5 m	Supply air temperature:	18.0 °C
Room air:	25.0 °C / 50 %	Static chamber pressure:	63 Pa
Heat gain:	-	Total pressure drop:	67 Pa
Installation height:	2.50 m	Unit sound pressure level:	24 dB(A) 10m ² sab
Inlet water temperature:	15.0 °C	Total sound pressure level:	20 dB(A)
Outlet water temperature:	19.0 °C	Primary air capacity:	255 W
Water flow rate:	0.039 kg/s	Total cooling capacity:	913 W
Coil capacity:	658 W		913 W/m, 30 W/m ²
	658 W/m	Dew point temperature:	13.8 °C
Water pressure drop:	2.1 kPa	Velocity control:	-
		Flow damper opening:	-
		L _d :	5.6 m
Velocity point	v1		
Nozzle jet	~0.20 m/s		
Nozzle jet, isothermal	~0.20 m/s		
dt (nozzle jet-room air)	-0.4 °C		
Heat sources and their location may influence the velocity and direction of the jet			
v _{lim} = 0.20 m/s			



Cooling CHB/B-1200-R-R, boost on 06.2017			
Room:		Supply air flow rate:	30 l/s
Room size:	6.0 x 5.0 x 2.7 m		1.0 l/(sm ²)
Occupied zone:	h=1.8 m / dw=0.5 m	Supply air temperature:	18.0 °C
Room air:	25.0 °C / 50 %	Static chamber pressure:	63 Pa
Heat gain:	-	Total pressure drop:	67 Pa
Installation height:	2.50 m	Unit sound pressure level:	43 dB(A) 10m ² sab
Inlet water temperature:	15.0 °C	Total sound pressure level:	38 dB(A)
Outlet water temperature:	19.0 °C	Primary air capacity:	255 W
Water flow rate:	0.073 kg/s	Total cooling capacity:	1485 W
Coil capacity:	1230 W		1485 W/m, 49 W/m ²
	1230 W/m	Dew point temperature:	13.8 °C
Water pressure drop:	6.7 kPa	Velocity control:	-
		Flow damper opening:	-
		L _d :	-
Velocity point	v1		
Nozzle jet	~0.35 m/s		
Nozzle jet, isothermal	~0.35 m/s		
dt (nozzle jet-room air)	-0.4 °C		
Heat sources and their location may influence the velocity and direction of the jet			
v _{lim} = 0.20 m/s			



Hotel Environment:

Needs

Solution

Benefits

Halton Guest Room Application with Halton Chilled Beam: Benefits

Indoor climate conditions

- Quiet and draught-free conditions with chilled beam technology
- Comfortable temperature distribution throughout the room

Flexibility

- choice of places for positioning beam
- outlook of the beam can be adapted to interior design
- symmetrical construction of beam, supply direction can be changed easily on site

Life Cycle costs

- Suspended ceilings not needed (CBH beam)
- No fan, no filters and dry chilled beam operation = low maintenance requirement. Easy access with opening front plate (without tools).
- Low energy consumption system in heating and cooling modes
- Fits to design of hotel, fits within space allocated for fan coil (CHH/CHB beam)

Hygiene and Safety

- Excellent Indoor air quality in all situations due to filter-free, dry operation
- Combination with fire dampers for improved fire and smoke safety

Halton Guest Room Application with Halton CHH/CHB Chilled Beam: Benefits

- **Comfort and Indoor air quality**
 - Quiet and draught-free conditions with chilled beam technology
 - Comfortable temperature distribution throughout the room, even temperature
- **Life cycle cost**
 - Low energy consumption in heating and cooling modes.
 - Simplified and low cost maintenance model for both new and renovated premises
 - No filters and dry chilled beam operation = low maintenance requirement. Easy access with opening front plate (without tools)
 - Fits to design of hotel, fits within space allocated for fan coil
- **Hygiene and Safety**
 - High indoor air quality in all situations due to filter-free dry operation
 - Combination with fire dampers for optimum fire and smoke safety
- **Booster fan option / CBH**

Flexible Chilled Beam Solutions with Variable Outlooks

- **Exposed installation or hidden installation in wall /ceiling structures**
- **Exposed chilled beam adapted to the interior design**
 - Shape of the unit, surface material, style of the perforation
- **Different building services can be integrated to the chilled beam:**
 - Light fittings, sprinklers, loud speakers



Hilton Charles de Gaulle, France



Hotel Katajanokka - Helsinki



Hilton-Scandic Hotel



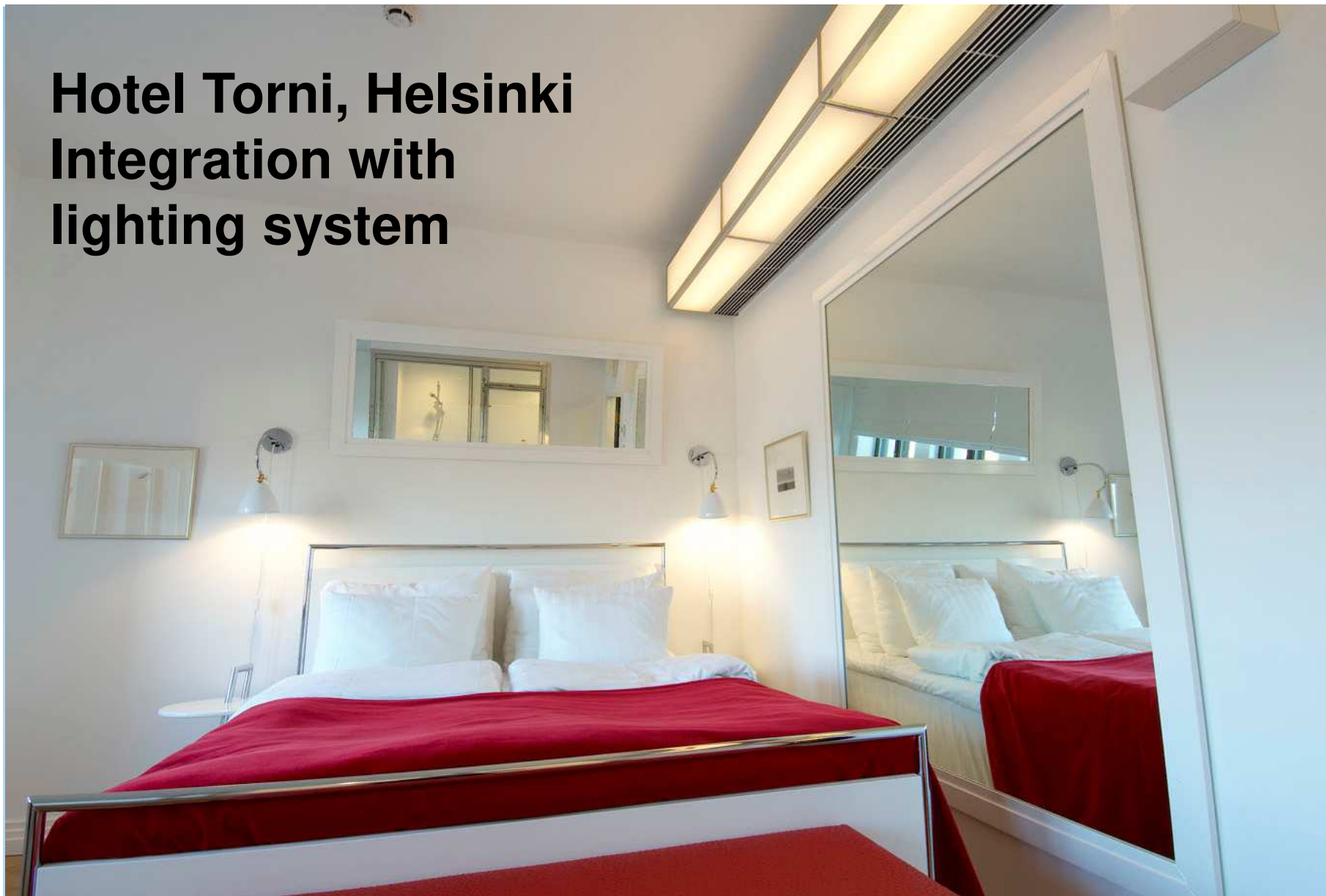
Hotel Klaus K, Helsinki

Refurbishment, CBH cooling only



Hotel Torni, Helsinki

Integration with lighting system





Hotel Vaakuna, Kouvola Integration with lighting system



Halton Chilled Beams Applications for Hotels

Hotel Europe – Tallinn, Estonia



Scandic Hotel



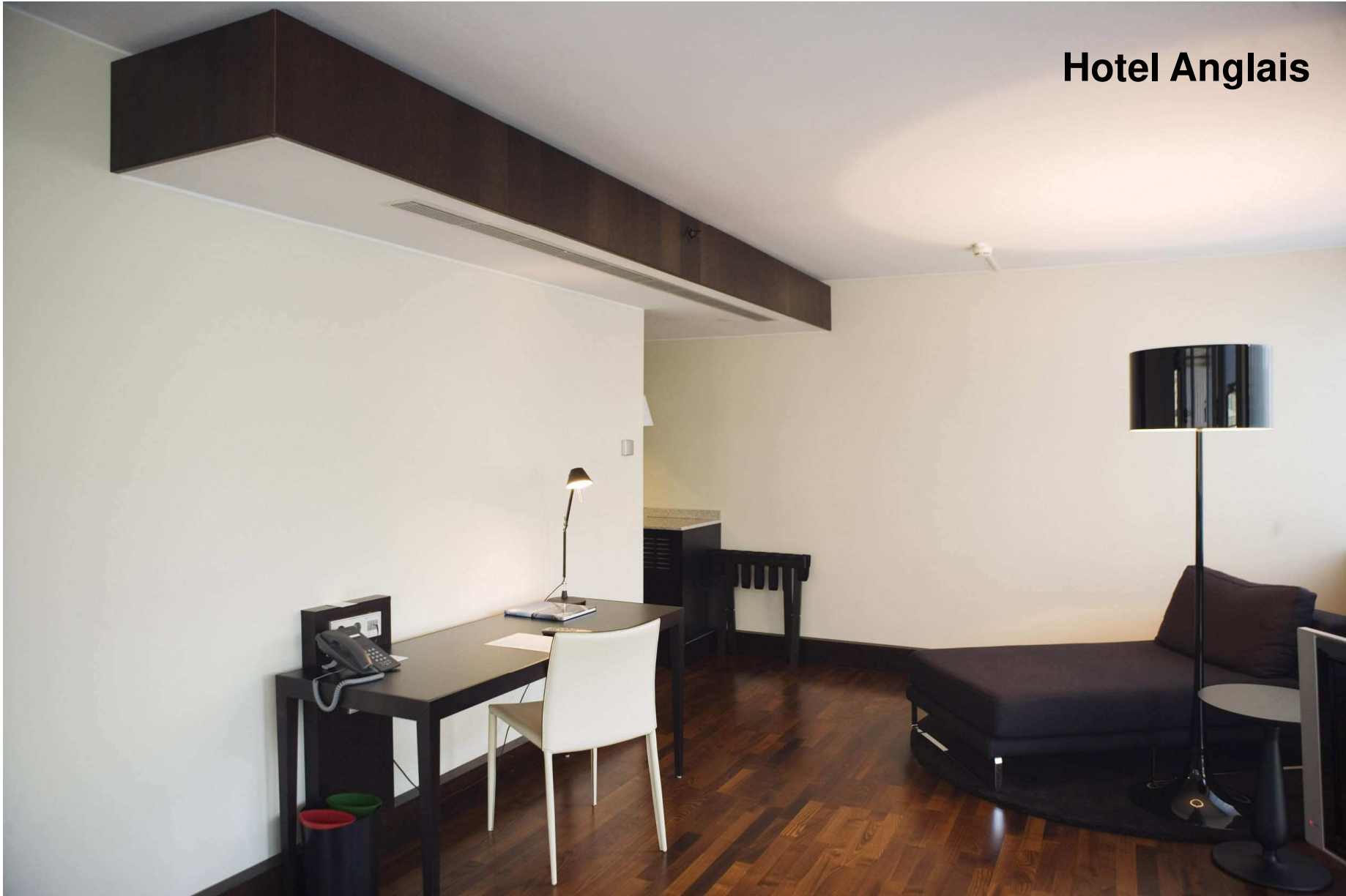
Halton Chilled Beams Applications for Hotels

Hotel Anglais



Halton Chilled Beams Applications for Hotels

Hotel Anglais



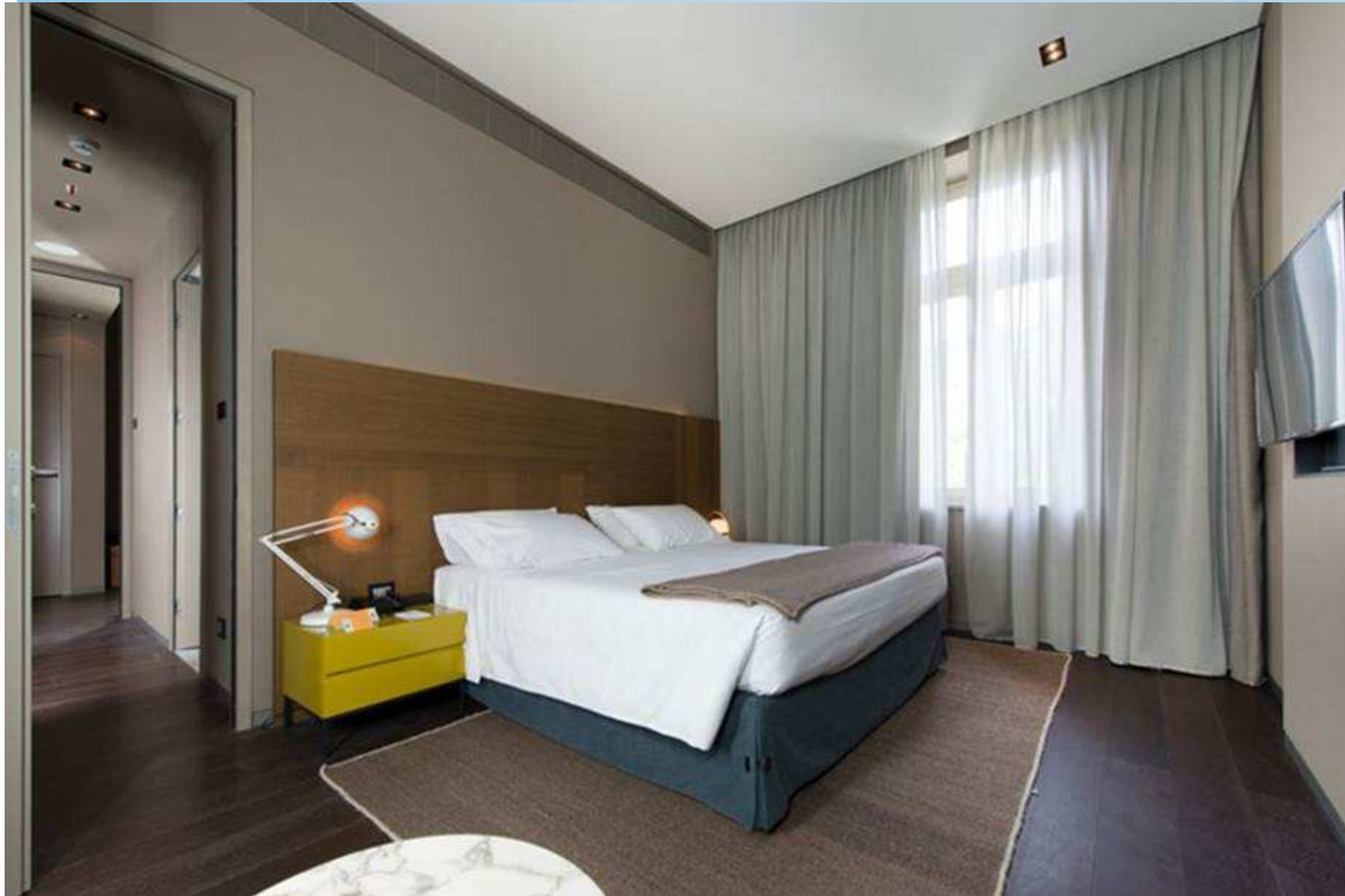
Grand Hotel Billia – Saint-Vincent, Italy



Grand Hotel Billia – Saint-Vincent, Italy



Grand Hotel Billia – Saint-Vincent, Italy



Halton Chilled Beams Applications for Hotels

Thank you for your attention

Halton 50 years