

DOAS OUTDOOR AIR FOR GUESTROOMS AND CORRIDORS

CENTRAL DEHUMIDIFICATION + REHEAT · URBAN HOTEL, ~150 GUESTROOMS
References: ASHRAE 62.1-2022 · ASHRAE 90.1-2022 · IMC 2021 · IBC (not brand standards)

EXAMPLE DESIGN BASIS

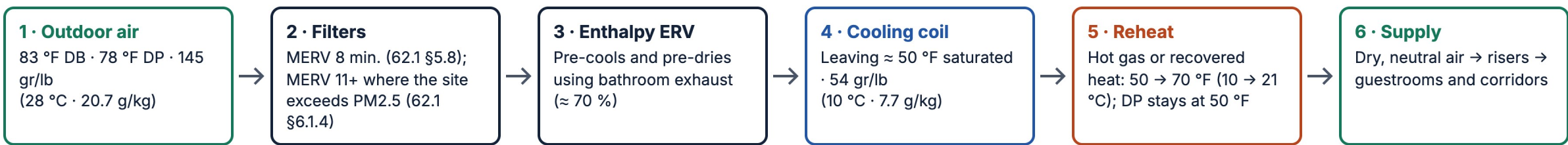
- 150 guestrooms: 10 typical floors × 15 rooms, double-loaded corridor
- Guestroom ≈ 325 ft² (30 m²) including bath; 2 design occupants
- Corridor ≈ 1,100 ft² (100 m²) per floor
- Hot-humid climate (example ASHRAE 1A): OA design 0.4 % dehumidification ≈ 83 °F DB / 78 °F DP (28 / 25.5 °C)
- Indoor: 75 °F / 50 % RH (24 °C) → DP 55 °F (13 °C)
- Rooftop 100 % OA DOAS, 24 h operation; one fan coil per room (chilled water or VRF) for sensible load only

Illustrative values: recalculate with the project climate and architecture.

OUTDOOR AIR CALCULATION (ASHRAE 62.1 VRP / IMC 403)

Item	Formula / criterion	IP	SI
Minimum OA per guestroom	$V_{bz} = 5 \times 2 \text{ people} + 0.06 \times 325 \text{ ft}^2$; $E_z = 1.0$	29.5 → 30 cfm	14 L/s
Bathroom exhaust	Min. 25 cfm continuous (62.1 / IMC); design	30 cfm	14 L/s
Design OA per guestroom	≥ V_{oz} and > exhaust (+10 cfm for positive pressure)	40 cfm	19 L/s
Corridor OA	$V_{bz} = 0.06 \times 1,100 \text{ ft}^2 = 66 \text{ cfm}$; design per floor	100 cfm/floor	47 L/s
Branch per floor	$15 \times 40 + 100$	700 cfm	330 L/s
Total DOAS airflow	$150 \times 40 + 10 \times 100$	7,000 cfm	3,300 L/s
Total bathroom exhaust	$150 \times 30 \rightarrow$ tower balance OA – EA = +2,500 cfm	4,500 cfm	2,125 L/s
Latent absorbed per room	$0.68 \times 40 \times (64 - 54 \text{ gr/lb})$	≈ 270 Btu/h	≈ 80 W
Cooling coil	$4.5 \times 7,000 \times \Delta h$ (no ERV → with 70 % ERV)	≈ 58 → 41 tons	≈ 205 → 145 kW
Reheat	$1.08 \times 7,000 \times (70 - 50 \text{ °F})$	≈ 151,000 Btu/h	≈ 44 kW

DOAS AIR PROCESS



Guestroom at 75 °F / 50 % RH → DP 55 °F (13 °C), 64 gr/lb. DOAS air at ≈ 50 °F DP absorbs the occupant latent load; the fan coil handles only sensible load and runs with a nearly dry coil.

FIGURE 1 · TYPICAL FLOOR DISTRIBUTION (PARTIAL PLAN)

OA branch in the corridor ceiling, Ø4" takeoff to each guestroom and exhaust risers shared by back-to-back bathrooms

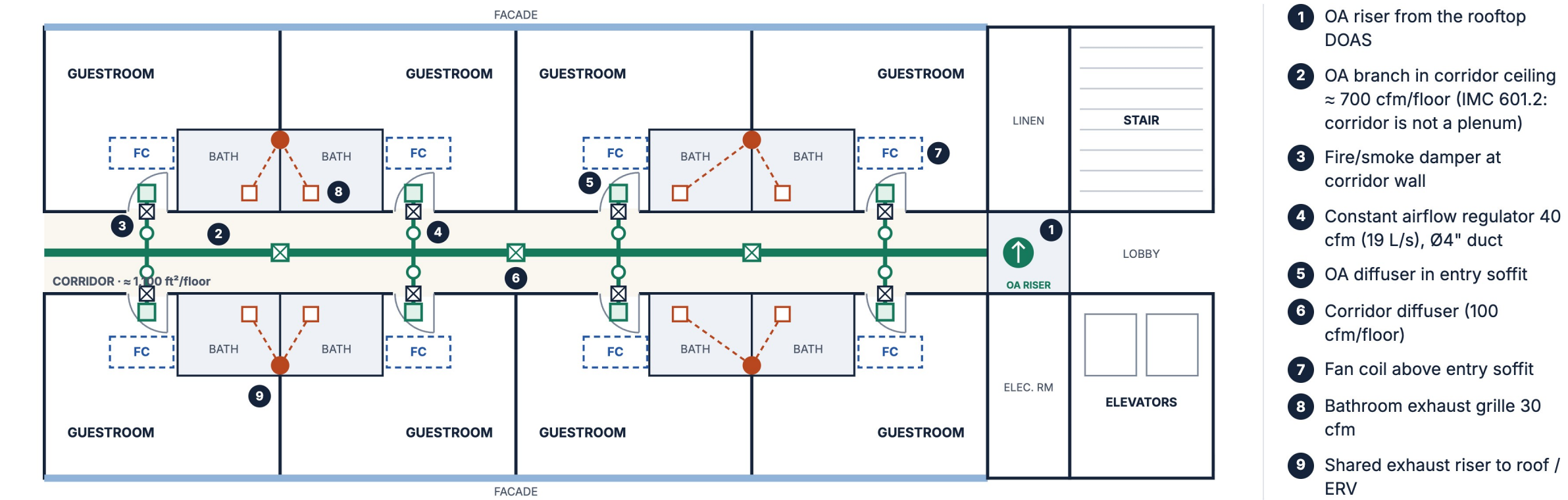
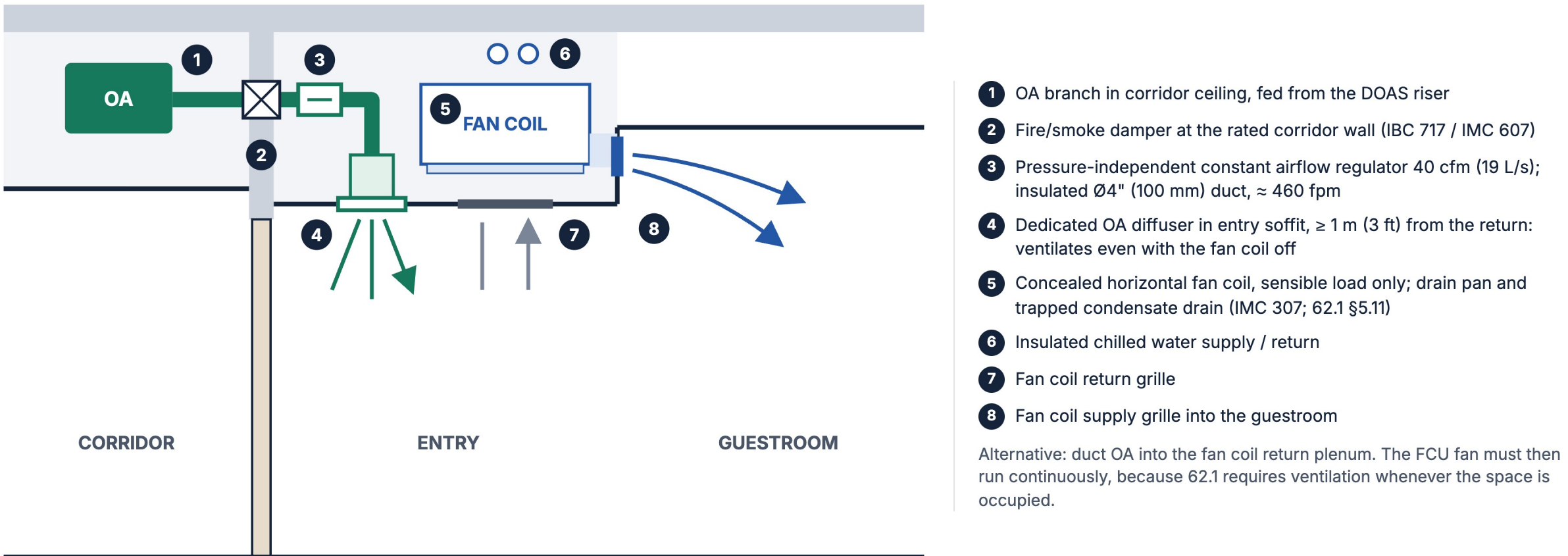


FIGURE 2 · ENTRY FAN COIL AND OA DUCT

Longitudinal section corridor → entry → guestroom



DEHUMIDIFICATION AND REHEAT

- Supply DP ≈ 5 °F (3 °C) below room DP to absorb occupant latent load
- Indoor RH ≤ 65 % at design conditions (62.1 §5.10)
- Reheat to neutral (68–72 °F / 20–22 °C): avoids overcooling and condensation on diffusers and ducts
- Reheat with hot gas or recovered heat (ASHRAE 90.1

DISTRIBUTION AND BALANCING

- OA duct to each room with a constant airflow regulator: balances 150 rooms without fine tuning
- OA diffuser independent of the fan coil
- Room OA > bathroom exhaust → room under positive pressure
- Sealed, insulated OA ducts (IMC 604; 90.1 §6.4.4)

CODE AND LIFE SAFETY

- Corridor may not be used as a supply or return plenum (IMC 601.2)
- Dampers at rated corridor penetrations (IBC 717 / IMC 607), unless excepted
- Intakes ≥ 10 ft (3 m) from exhaust outlets and vents (IMC 401.4; 62.1 Table 5-1)