

Facility Echelon - structured blueprint

(textual representation)

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1. general overview

The facility consists of an underground and above-ground structure with multiple levels that are functionally separated. This document describes, in technical terms, the structural layout, primary passage routes, ventilation and climate-control systems, security zones and relevant distances. The purpose is to provide a reference for engineering, maintenance and audit purposes. This document contains no operational tactics or access protocols.

2. spatial layout

- level 0: entrance and logistics center
- primary entrance hall dimensions: 18.0 m x 12.5 m x 6.0 m (l x w x h)
- goods elevator capacity: 2.5 tons, travel time level 0-level 2: 28 s
- service corridor width primary: 1.2 m, secondary: 0.75 m
- floor type: industrial concrete slab 250 mm, load class C40/50
- wall finish: polished concrete with vapor barrier and epoxy topcoat
- level 1: cell complex A through C
- cells per complex: 12 (standard cell 2.5 m x 3.2 m)
- corridor width: 1.6 m with emergency-service ducting above ceiling
- central access gate metrics: hydraulic gate type HG-8, response time 1.8 s
- level 2: central AI control room (biometrically secured)
- server racks: 8 x 42u chassis, redundant power supply N+1
- cooling mechanism: liquid cooling interfaced with secondary chiller
- operator console: 3 positioned consoles, ergonomic arrangement
- security: biometric gate set B-2 with two-factor authentication (badge + heart rate/temperature)
- level 3: maintenance zone and ventilation system
- main ventilation ducts: duct set V-A through V-D, internal diameter 0.45 m
- fans: 4 x SCV-200 (variable frequency), nominal flow per unit: 1.8 m³/s
- maintenance access hatches: dimensions 0.6 m x 0.4 m, positioned at 6 m intervals along primary ducts
- traversable routes: ladder access every 12 m, fall protection according to standard EN 353
- level 4: experimental labs
- laboratory modules: 6 with buffer zones and scrubber units
- HVAC segregation: full air-side separation by means of local AHUs

3. primary connecting routes and distances

- level 3 to level 1 via ventilation duct (accessibility): 30.0 m (approximately 12 bends), internal clearance margin: 0.04 m
- level 1 to level 2 via central stairway: 20.0 m from cell door A1 to control room entry zone
- level 2 to exit zone B (coordinate reference present in appendices): 50.0 m via south aisle, including 3 door openings and 2 security checkpoints
- emergency exit secondary walking route: 38.6 m with anti-panic door set and light guidance

4. structural specifications and tolerances

- concrete and foundation
- load-bearing wall thickness: primary 350 mm, secondary 220 mm
- foundation depth below level 0: 4.2 m, anchor points with M30 bolts
- seismic isolation: elastomer pads between columns, maximum allowed displacement: 12 mm
- metal structures
- support beams: IPE 600 for primary spans, allowable tensile force 420 kN
- fasteners: stainless steel A4-70 where corrosion risk exists
- tolerances
- door finishing margin: +/-3 mm, overall floor flatness: +/-5 mm per 10 m

5. ventilation and environmental parameterization

- duct design
- primary ducts V-A through V-D carry air from level 3 to levels 1 and 2, material: spiro steel 0.8 mm seamed, internal coating for condensation prevention
- connection points to the cell complex are fitted with silencers with insertion loss 12 dB at 500 Hz
- flow profiles
- nominal velocity in main ducts: 3.4 m/s at nominal load
- pressure loss estimate: 120 Pa over primary route of 30 m including 12 bends
- turbulence regimes: laminar-turbulent transition expected at junctions; Reynolds calculation performed on section 0.45 m diameter
- monitoring and sensorization in ventilation
- differential pressure meters: PD-100 units placed at intervals of 6 m
- microvibration pick-ups: MV-3 placed near maintenance cabinets M7 and M9
- temperature and humidity sensors: RH/T probe type T450, accuracy +/-0.3°C / +/-2% RH
- maintenance access
- hatches and ladder positions described in appendix a table
- periodic inspection interval: visual every month, full internal clean every 6 months

6. security and detection systems (hardware layout)

- camera and image processing
- camera 17-19 series: low-light CMOS, IR supplement, mounted at 2.4 m height in corridors 1-4

- camera fusion node: CFN-3 at level 2 with edge inferencing, model update mode: weekly
 - motion and sound sensors
 - motion-cam cluster 17-19 linked to ruleset 14
 - sound detector 3A placed near access gate B12, sensitivity adjustable between 0.1-1.5 amplitude units
 - biometric gates and badges
 - gate set B-2 measures heart rate via galvanic sensors and surface temperature via thermistor
 - badge readers: type BR-400 with fallback proximity and anti-clone checks
 - redundancy and failover
 - network architecture: separated control and data VLANs with physical separation via fiber ring topology
 - power supply: dual UPS with automatic transfer switch, N+1 generator fallback
 - logging and cold storage: forensic dump replication to FS-775 every capture event
7. cable routing and communication lines
- backbone topology
 - fiber backbone: OM4 multimode loop, 10/40/100 Gbps capable, separated rings per zone
 - copper runs: cat6a for edge devices, maximum run length 90 m
 - cable trays and conduits
 - primary conduit diameter 100 mm, marked with color code blue for power and orange for data
 - conduit entries watertight sealed with compression couplers
 - EMC and grounding
 - grounding scheme: TN-S with local equipotential bonding bars on each level
 - RFI filters installed for power supply to sensitive sensor arrays
8. maintenance access routes and restrictions
- physical access
 - maintenance hatches every 6 m along V-A, ladder intervals 12 m
 - maximum passage width in ventilation duct: 0.32 m net free space for maintenance profiles
 - weight limits
 - traversable duct load rating: 120 kg per ladder point
 - max hand-tool weight allowed in ducts: 4.5 kg without additional fastening
 - personal protective equipment
 - prescribed: fall harness type H-2, breathing filter P3 for dust particles, hearing protection at >85 dB
9. environmental monitoring and climate rules
- climate targets
 - server room: 18-22°C, +/-1°C tolerances, relative humidity 45% +/-5%
 - cell complex: 19-24°C, +/-2°C tolerances
 - sensor network
 - temp probes per zone: minimum 3 per 100 m², redundantly measured and aggregated
 - particle counters: PC-2 units placed at laboratory entrances
 - data logging and retention
 - logging cadence: 1 s for critical sensors, 10 s for secondary sensors
 - retention policy: 90 days hot storage, 3 years cold archive
10. maintenance schedule and inspection protocols
- daily
 - quickwalk sensor health check by on-site technician, control panel status check
 - weekly
 - validate integrity of badge readers and camera feed sync
 - monthly
 - visual inspection of ventilation channels, check for microvibrations and particulate accumulation
 - semiannually
 - deep clean ventilation, replace pre-filters, calibrate PD meters and RH/T probes
 - annually
 - full structural survey, test of emergency power generator and ATS
11. interface points with security AI and operational systems
- data endpoints
 - telemetry push endpoints: ops-collector.internal:9200 over TLS1.2, payload format: protobuf v3
 - event bus: kafka cluster ek-cluster, topics: events.zoneB.*, telemetry.zoneB.*
 - sync and timestamps
 - ntp servers: internal cluster time-sync via ntp-servers.local with stratum 2, max drift allowed 0.5 s
 - timestamp resolution: milliseconds for critical events
 - forensics
 - forensic snapshots trigger on anomaly events and are pushed to FS-775. snapshots include full telemetry window +/-300 s of event
12. appendix a - tables and references (selection)
- ventilation access table (excerpt)
 - V-A hatch 01: coord internal grid (x: 12.0 m, y: -3.4 m), ladder pos: 0 m, service id: H-V-A-01
 - V-A hatch 02: coord internal grid (x: 18.0 m, y: -3.4 m), ladder pos: 12 m, service id: H-V-A-02
 - material specs (excerpt)
 - spiro steel 0.8 mm, galvanised g30, coating: epoxy 80 micron
 - fasteners: A4-70 bolts size M8-M30
13. safety warnings and limits
- maximum assigned working time in confined spaces: 90 minutes per shift
 - required buddy procedure: two persons required for all access to ducts
 - smoke and gas detection: verify local scrubbers and air samples before access

14. revision history

- rev 01: baseline 2025-05-21 initial release

- rev 02: ventilation adjustments 2025-06-10

- rev 03: sensor relocation 2025-06-25

- rev 04: documentation expansions and format revision 2025-07-04

end of document - for full technical drawings and graphical schematics, consult the CAD archives (reference: <cadvault:/projects/Echelon/blueprints>)