

CASE STUDY 2 – MEP + FP Narrative

Vertical Enlargement

Project Description

Case Study 2 illustrates a 2-story vertical addition for office use (Occupancy Group B – Business) to a 3-story + cellar prior code department store (Occupancy Group M – Mercantile) constructed in 1925. The project includes an Alteration Level 1 in the existing building to accommodate the addition.

The existing building has three exit stairs (Stairs A, B and C), three elevators (two passenger and one service), and two escalators. The existing cellar is sprinklered; the 1st, 2nd and 3rd floors are unsprinklered. Stair C has a standpipe, but Stairs A and B do not have standpipes. The building is served by a gas-fired boiler in the cellar (converted from steam in a previous alteration) with hot water heating. Air-conditioning is provided by chillers and cooling tower installed on the roof.

The footprint of the addition is 200 ft. by 80 ft., or 16,117 SF per floor and 33,038 SF floor area including bulkheads. The total gross floor area of the existing building plus the addition is 113,672 SF. The addition is Construction Type IB. The structure is steel frame with concrete slabs on metal deck floors and roof. The addition 4th and 5th floors are sprinklered as well as the existing cellar, but the building is considered "unsprinklered" because the entire building is not sprinklered. Existing Stairs A and B are extended to provide two means of egress for the addition. Standpipes are added at Stairs A and B. Two new elevators serve the addition.

An Alteration Level 1 to the existing building is provided to accommodate the addition. Alterations include the new office entrance and lobby, new elevators, column reinforcement, partial floor slab repairs, and MEP/FP alterations. The roof slab above the existing 3rd floor is removed, but the existing steel framing is maintained. A new 4th floor slab is provided as part of the addition. Existing bulkheads are modified to match the new 4th floor level.

Scope of Work

Mechanical Systems. The Mechanical scope of work for this application includes:

- Replace and relocate existing roof-mounted cooling tower and dedicated outside air unit on the roof of addition to accommodate 4th floor platform construction.
- Extend existing cooling tower system to serve new 4th and 5th floor addition spaces.
- Provide new rooftop units for addition (Occupancy Group B - office use) in accordance with NYC Mechanical Code Chapter 4 for new construction, including minimum outdoor air rates for Group B occupancy.
- Provide new ductwork, air distribution devices, fire/smoke dampers, and balancing for addition floors.
- Provide new air conditioning system for new lobby at ground floor, inclusive of ventilation air.
- Provide new HVAC controls for addition.

- Provide new rooftop mechanical equipment supports and enclosures as required. Design all rooftop equipment to resist wind pressures per NYC BC Chapter 16.
- Within existing building Level 1 Alteration work area: modify ductwork and mechanical systems as required to accommodate new lobby, elevator, and stair configurations at 1st floor.
- New fuel pump system for new emergency generator required by addition of fire pump.
- All spaces in the building will be within 100' of an operable opening. Smoke purge is not required.

EBC Mechanical Applicability

I. **ADDITION** (New Construction Standard)

- **EBC 1108.4 → 309.1:** All new and extended mechanical systems serving the addition must comply with the NYC Mechanical Code as new construction.
- **EBC 809.1.1 — 50% Terminal Capacity Trigger:** The existing cooling, heating, and ventilation systems are being extended to serve the addition (33,038 SF new / 80,634 SF existing = 41% of served area). For each system, the MEP engineer must verify that the new terminal distribution elements added do not exceed 50% of the existing system's terminal capacity. If the 50% threshold is exceeded for any system, that entire system must comply with the NYC Mechanical Code as new construction throughout the building.
 - Independent HVAC systems are for the addition (Group B) and existing building (Group M) given differing occupancy ventilation requirements. This eliminates the §809.1.1 trigger for the ventilation system entirely.
- **EBC 309.2.3 — Cooling Tower Vibration Isolators:** Where the replacement/relocated cooling tower cannot comply with vibration isolator requirements of NYC MC 313.3.7 due to physical limitations, isolators may be omitted. The RDP must document field conditions, calculations, and manufacturer specifications.
- **EBC 309.2.4 — Cooling Tower Combustible Fill:** Where the replacement cooling tower is located within 15 ft of the lot line, combustible fill is permitted.

II. **EXISTING BUILDING** (Alteration Level 1)

- **EBC 809.1 / 309:** Mechanical elements within the Level 1 work area must comply with 809 and 309. The work area is well below 50% of any floor or system served; the 809.1.1 system-wide upgrade threshold is not triggered.
- **EBC 809.6 → NFPA 80 / 809.7 → NFPA 105:** All new and existing fire dampers and smoke dampers within the work area must be operationally tested.
- **EBC 309.2.1 — Air Duct and Transfer Openings (Prior Code Building):** Since the existing building is not fully sprinklered, damper ratings in rated construction may not be reduced in accordance with 303.2.
- **EBC 809.13 → NYC MC Chapter 12 — Hydronic Piping:** All new hydronic piping for the extended hot water heating system must comply with NYC Mechanical Code Chapter 12.

- **EBC 809.3 → NYC MC Chapter 4 — Ventilation:** New ventilation systems serving the addition must comply with NYC Mechanical Code Chapter 4 for new construction, including minimum outdoor air rates for Group B occupancy.
- **EBC 809.5 → NYC MC Chapter 6 — Duct Systems:** All new ductwork must comply with NYC MC Chapter 6. New duct penetrations through the existing roof slab and rated assemblies must include compliant fire/smoke dampers.
- **EBC 809.2.2 / 307.2 — Wind and Seismic:** Rooftop equipment and supports (cooling tower, air handling units, exhaust fans) must be designed to resist wind pressures per NYC BC Chapter 16. Seismic supports must be evaluated per 307.2.
- **EBC 809.4 – Exhaust Systems:** Exhaust systems shall comply with NYC MC Chapter 5.

Plumbing Systems. The Plumbing scope of work for this application includes:

- Provide new plumbing for toilet rooms (water closets, lavatories) and drinking fountains at 4th and 5th floors of addition. Connect to existing building risers.
- Provide new roof drainage system for addition roof, 4th floor terraces, and bulkhead roofs. Design primary and secondary (emergency overflow) roof drains.
- No addition of impervious area.
- Evaluate existing domestic water service capacity to serve both the existing department store and new addition floors. Provide secondary water service for sprinkler / standpipe requirements.
- Within existing building: modify plumbing as required to accommodate new 1st floor lobby, elevator pits, and stair modifications.
- Replace 3rd floor fixtures as required due to roof replacement.

EBC Plumbing Applicability

I. ADDITION (New Construction Standard)

- **EBC 1108.2 → 310:** All new plumbing systems and additions to existing plumbing systems must comply with the NYC Plumbing Code as new construction.
- **EBC §310.7 → NYC PC Chapter 7 — Sanitary Drainage:** New sanitary drainage connecting to the existing building system must comply with NYC Plumbing Code Chapter 7 and DEP requirements.
- **EBC §310.8 — Storm Drainage:** The addition is constructed entirely over the existing building footprint; total impervious area on the tax lot is not increased. The §310.8 stormwater compliance trigger and DEP stormwater detention requirements do not apply.
- **EBC §310.9 — Secondary (Emergency) Roof Drains:** Secondary overflow drains are required on the addition roof and must not be removed or reduced in capacity. The existing building's secondary roof drains cannot be removed or reduced as part of the 4th floor platform construction.

II. **EXISTING BUILDING** (Alteration Level 1)

- **EBC 310.1:** Plumbing alterations within the work area must meet new construction requirements; the entire existing system is not required to be upgraded.
- **EBC 310.2:** No increase in occupant load greater than 10% is anticipated for the existing building work area; no additional plumbing fixtures are required in the existing building.
- **EBC 310.3 — Existing Piping Used for Grounding:** Existing metallic water service piping used for electrical grounding shall not be replaced with nonmetallic pipe until alternate approved grounding is provided.
- **EBC 310.4 — Rehabilitation of Piping:** Cured-in-place pipe (CIPP) and epoxy spray pipe lining systems are prohibited.

Fire Protection Systems. The Fire Protection scope of work for this application includes:

- Provide full automatic sprinkler coverage for 4th and 5th floors of addition. Provide new sprinkler service connection and new sprinkler risers for the addition, independent of the existing cellar-only system.
- Provide new fire pump to supply the addition sprinkler and standpipe systems at the required pressure and flow for floors at 46–74 ft height.
- Provide new emergency power system (generator) to serve the new fire pump.
- Provide new standpipe risers to the 4th and 5th floors through all required stairways (Stairs A and B).
- Existing cellar sprinkler system requires modification to accommodate new floor openings and elevator/stair penetrations through the cellar ceiling.
- Provide new fire alarm system for entire building and addition, connected to a new Fire Alarm Control Panel.

EBC Sprinkler Applicability

I. **ADDITION** (New Construction Standard)

- **EBC 1104.1 / 1104.2:** The addition must be fully sprinklered as required for new construction at this occupancy and size. Note that the existing building is only sprinklered at the cellar level; the 1st through 3rd floors are unsprinklered. The addition does not require the existing unsprinklered upper floors to be retroactively sprinklered per EBC §1101.1, which provides that an addition shall comply with the NYC BC as new construction without requiring the existing building to be altered to meet new construction requirements.
- **EBC 1101.2 — No Extension of Noncompliance:** The addition shall not create or extend any noncompliance in the existing building with regard to fire safety. The new addition sprinkler and standpipe systems must be designed as independent systems with their own service connection and risers, so that the addition's fire protection is fully self-sufficient and does not rely on the limited cellar-only existing system.
- **EBC §308.4.2 — New Fire Pump / Emergency Power:** A new fire pump is required to provide adequate pressure and flow to the addition sprinkler and standpipe systems at

heights up to 74 ft. Since the existing building has no emergency power system, a new emergency power system must be installed to supply the new fire pump.

- Exception under §308.4.2 does not apply here, as this is a new fire pump installation (not a replacement of an existing pump) and the scope involves a new occupancy (Group B addition) above the existing building.

II. **EXISTING BUILDING** (Alteration Level 1)

- **EBC 804.2.2 — Level 1 Alteration Work Area (1st Floor Lobby):** For the Level 1 Alteration work area, sprinkler protection would be required if: (1) the work area exceeds 50% of the floor area, and (2) sufficient water supply is available without a new fire pump. Since the existing building has no fire pump and the upper floors have no sprinkler water supply, condition (2) is not met for the existing floors. Sprinkler protection in the existing Level 1 work area is therefore not triggered by §804.2.2. However, any new lobby or corridor spaces created at the 1st floor that are served by the new addition sprinkler system should be sprinklered as part of the addition scope.

EBC Standpipe Applicability

I. **ADDITION** (New Construction Standard)

- **EBC 1104.3 — Prior Code Building:** Standpipes must be provided in the addition as required by NYC BC Chapter 9. Since the existing building is only partially sprinklered (cellar only), the existence of a complete standpipe system in the upper floors must be verified through field investigation.
- **EBC 1104.3.1 — If existing standpipe system is present:** Because more than one story is being added, the single-story exception does not apply. Standpipes must be extended to the 4th and 5th floors in all required stairways. If any required stair shaft does not currently have a standpipe, standpipes must be provided in all required stairways. Standpipe risers must be run through Stairs A and B to serve the 4th and 5th floors, supplied by the new fire pump and dedicated service connection.

II. **EXISTING BUILDING**

- ***EBC Designer Note (not applicable to this scope): EBC 1104.3.2 — If no existing standpipe system:*** *New standpipes must be provided in all required stairways (Stairs A, B, and C) in accordance with NYC BC Chapter 9. The exception for single-story additions not exceeding 6 stories and 85 ft does not apply — two stories are being added and the completed building reaches 74 ft.*

EBC Fire Alarm Applicability

- **EBC 1104.4:** A new fire alarm system is required for the entire building and addition. Fire alarm components for the addition must be connected to the system serving the main use or dominant occupancy of the existing building.
- **EBC 1104.4.1.2 — Auxiliary Radio Communication System:** Total building area of 113,672 SF is below the 250,000 SF threshold. An auxiliary radio communication system is not required on this basis.
- **EBC 1104.4.2 — High-Rise Fire Alarm Requirements:** Total building height of 74 ft is below the 75 ft high-rise threshold of NYC BC §403. High-rise fire alarm requirements of 907.2.13 do not apply.
- **EBC 1104.5:** Alteration work within the existing building must comply with the fire protection requirements of EBC Chapter 8 as applicable.

Electrical Systems. The electrical scope of work for this application includes:

- **EBC 1108.5 → 308.1:** All new electrical systems serving the addition must comply with the NYC Electrical Code as new construction.
- **EBC 308.1 — New Electrical Service:** The addition adds 33,038 SF of Group B office space, two new elevators, new HVAC loads, a relocated cooling tower, and a likely new fire pump. The existing electrical service was evaluated for capacity. A new or upgraded service is required and must comply with the NYC Electrical Code.
- **EBC 308.4 / 308.3.1 — Emergency and Standby Power:** If a new fire pump is required, it must be served by an emergency power system. Any optional standby system installed must supply loads per NYC BC §2702.4. If natural gas is used to fuel an optional standby system supplying emergency or standby loads, the gas supply must be taken ahead of the main with a dedicated outside cut-off valve per NYC Fuel Gas Code Appendix E §E.6.
- **EBC 1107.1 → NYC ECC — Lighting Controls:** Lighting controls for the addition must comply with the NYC Energy Conservation Code as new construction.
- **EBC 808.1:** All new electrical installations within the Level 1 Alteration work area must comply with the NYC Electrical Code.
- **EBC 808.2 — Defective Wiring:** Mandatory upgrade of existing defective wiring applies only to Group A-1, A-2, A-5, H, and I occupancies. Group M (existing department store) is not included; existing wiring in the work area is not required to be corrected unless it presents imminent danger.
- **EBC 908.1.1 — 75% Threshold:** The Level 1 Alteration work area is a small fraction of the building. The 75% threshold triggering full electrical system upgrade to new construction is not met.

ENERGY CODE COMPLIANCE

- **EBC §1107.1:** The addition must comply with the NYC Energy Conservation Code as new construction for all systems, including envelope, mechanical, and lighting.
- **EBC §912.1 / NYC ECC Chapter C5:** The Level 1 Alteration in the existing building complies with NYCECC Chapter C5 — Existing Buildings. Only altered systems are required to meet current energy code requirements.

CONSTRUCTION SAFEGUARDS

- All work must comply with applicable requirements of EBC Chapter 15, including maintenance of active fire protection systems, occupant protection measures, and continuous maintenance of required means of egress during construction.

SUMMARY

- The proposed MEP/FP scope is governed by the NYC Existing Building Code requirements. All newly installed systems must comply with current NYC Construction Codes, and supplemental compliance is provided where required.