TunnelStructural Isolation accident Case Studies

1) Shinsan Line Gwangmyeong Underground Tunnel Collapse

— April 2025, Gwangmyeong, Gyeonggi Province *(Yonhap News & official statements)*

1. Incident Overview

- Date/Location: April 11, 2025, 3:13 PM, Section 5-2 underground tunnel of Shinsan Line, Iljik-dong, Gwangmyeong City, Gyeonggi Province.
- Type: Complex collapse of tunnel and overlying roadway due to failure of central tunnel pillar.
- Casualties:
    - Two workers trapped (one in his 50s, one in his 20s).
    - Excavator operator in 20s rescued after 13 hours.
    - Worker in 50s (POSCO E&C) recovered deceased after 5 days.
    - 17 workers evacuated.
    - Multiple aftershocks, secondary collapses, and ground subsidence hampered rescue.

2. Causes and Features

- Day before (April 10, 9:50 PM): pillar damage detected, workers evacuated, reinforcement attempted.
- Reporting to local government delayed until midnight.
- Collapse occurred ~17 hours after damage first identified.
- Root causes: poor site management, insufficient ground investigation and monitoring.
- Prior Environmental Impact Assessment had already warned of subsidence risk, but follow-up management was lacking.

3. Reporting & Initial Response

- Incident Reporting: Site manager → 119 & fire authorities.
- Evacuation/Control: Workers evacuated, 30m exclusion zone established, access restricted.
- Site Analysis: Endoscope cameras, hazard assessment, access restrictions applied.

4. Rescue & Emergency Response

- Heavy equipment (cranes, excavators) used to remove debris progressively.
- Rescue dogs, endoscope cameras, acoustic sensors deployed.
- One worker rescued after 13 hours via cell phone contact.
- Search hampered by further collapses and ground subsidence.
- Weather worsened, triggering collapse sensors during rescue attempts.

2) Osong Underpass Flood Disaster

— July 15, 2023, Osong, Cheongju, North Chungcheong *(Yonhap & official reports)*

1. Incident Overview

- Date/Location: July 15, 2023, 7–9 AM, Gungpyeong 2 Underpass, Osong-eup, Cheongju, North Chungcheong Province.
- Type: Rapid inundation of underpass due to torrential rain and river overflow.
- Casualties:
    - 17 vehicles submerged.
    - 14 fatalities, 9 survivors rescued.

2. Causes & Sequence

- Rainstorm & flood warning issued earlier; Mihogang levee collapsed.
- Inadequate road closures, underpass remained open.
- Warning/closure systems failed to operate.
- Inflow from river overflow and storm drains submerged underpass within minutes (5–6 m depth).
- Core causes: delayed closure, poor alerts, ineffective interagency coordination.

3. Reporting & Initial Actions

- Recognition: Residents reported “water rushing in,” called 112/119.
- Emergency Response: Fire/police dispatched, attempted levee check, air-pocket search.
- Control: Underpass sealed off, divers and pumps deployed.

4. Rescue & Emergency Care

- Fire divers, K9s, drones deployed.
- Endoscopes, sonar, oxygen supplies used.
- Sequential draining and vehicle-by-vehicle search.
- Victims given oxygen, hypothermia prevention, psychological support.
- Extended searches for remaining missing persons.

3) Typhoon Hinnamnor Pohang Underground Parking Flooding

— September 6, 2022, Pohang, North Gyeongsang *(Yonhap & official reports)*

1. Incident Overview

- Date/Location: Sept 6, 2022, underground parking of an apartment complex, Nam-gu, Pohang.
- Type: Flash flooding from typhoon rainfall and river overflow.
- Casualties:
    - ≥7 vehicles submerged.
    - 7 dead, 2 survived after 14-hour entrapment.

2. Causes & Sequence

- Torrential rain, river overflow, strong currents.
- Lack of entry block or alarm; residents entered basement to move vehicles.
- Within 3 minutes, strong currents blocked exits.
- Survivors trapped in air pockets near pipes, endured until rescue.

3. Reporting & Initial Response

- Residents/building management reported flooding to 119.
- Fire/police attempted entry, delayed by current.
- Marine Corps & specialist teams deployed.

4. Rescue & Emergency Response

- Multiple delayed rescue attempts due to flood currents.
- Endoscope cameras, small openings, air pocket signals used.
- Survivors tapped pipes, maintained breathing through gaps.
- After 14 hrs, survivors rescued, given oxygen, hypothermia care.

5. Agency Roles

- Fire Dept: Site command, rescues.
- Police: Traffic restriction, site access control.
- Military: Search & rescue reinforcements.
- Local Gov't: Safety oversight, recovery planning.
- Medical: Survivor stabilization, emergency care.

6. Safety Guidelines

- Prohibit entry into basements during typhoons.
- Auto-barriers, alarms linked to rainfall.
- Mandatory evacuations from submerged areas.
- Rescue teams: waterproof PPE, oxygen equipment.

4) Wilmington, Los Angeles Industrial Tunnel Collapse

— July 10, 2025 *(Korea Daily US & incident records)*

1. Incident Overview

- Date/Location: July 10, 2025, Wilmington district, Los Angeles, industrial tunnel ~300–400 ft underground, 6 miles from portal.
- Type: Partial tunnel collapse trapping 31 workers.
- Casualties: All 31 workers rescued without injury.

2. Sequence & Features

- Collapse occurred during sewer tunnel rehabilitation.
- Workers trapped deep inside, some climbed over 121–215 ft soil piles to reach safety zones.
- ~100 urban search & rescue firefighters deployed.
- Rescue used 18-ft-diameter capsule hoisted by crane.
- By 9:20 PM, all workers safely rescued, health confirmed stable.

3. Rescue Method & On-Site Response

- Heavy equipment and capsule-lift devices deployed.
- Rapid and coordinated response prevented casualties.
- Medical teams on standby at site for health checks.
- LA Mayor visited site, praised responders.

4. Cause & Follow-Up

- Cause under investigation.
- Part of LA County Sanitation District's "Clearwater Project" (7-mile sewer tunnel).
- Further investigation and safety recommendations to follow.

5. Key Takeaways

- Recorded as a zero-casualty major tunnel rescue success case.
- Highlights importance of rapid mobilization and coordinated teamwork.
- Validated equipment and procedures for underground rescues.