

Construction Site Communications

Large construction sites present the same communication challenges as wilderness SAR operations: large area, no existing infrastructure, frequently changing layout, and need for resilient communications that works when cellular is congested or attenuated by metal structures.

The Construction Site Communication Problem

Modern construction sites cover large areas - a commercial building site might span multiple city blocks, and a highway project might stretch for miles. Challenges include:

- Metal structures (rebar, framing, equipment) can significantly attenuate or block cellular signal inside buildings under construction (reinforced concrete and steel framing attenuate rather than uniformly block, and the effect is highly variable)
- Large metal equipment (cranes, concrete pumps) can shadow or reflect cellular signal locally
- Temporary cellular coverage varies as towers are installed and removed during site development
- Workers spread across multiple floors, structures, or areas need rapid communication for safety and logistics

Mesh Applications on Construction Sites

Important: LoRa mesh is a best-effort, low-bandwidth text/telemetry layer with no guaranteed delivery and seconds-scale latency under load. It is a supplementary channel only and must never replace OSHA-compliant life-safety controls (audible alarms, spotters, confined-space attendants, and dedicated lone-worker systems).

- **Crew foreman coordination** - Foremen on different sections of a large site maintain text communication when walkie-talkie range or cellular fails
- **Safety advisories** - Rapid broadcast of non-time-critical safety advisories. Mesh is best-effort and must **not** be the primary alerting system for imminent crush/struck-by hazards (crane swing, equipment movement) - those require OSHA-compliant audible alarms, spotters, and direct line-of-sight signaling. Use mesh only to supplement, never to replace, dedicated hazard-warning controls; a dropped packet means a worker may never receive the alert.
- **Material delivery coordination** - Gate guards, receiving teams, and crane operators coordinating lifts and deliveries
- **Equipment tracking** - GPS nodes on high-value mobile equipment (generators, compressors, specialized tools) visible on site map
- **Worker check-in** - Position check-ins can **supplement** but not replace OSHA-required confined-space attendants and dedicated lone-worker safety systems. Confined-space entry is OSHA 1910.146-regulated and requires an attendant and reliable two-way comms. LoRa frequently cannot transmit out of metal-enclosed or below-grade confined spaces, and a missed check-in is not a reliable indicator of distress - it may simply be a dropped packet, so do not rely on mesh as the safety-monitoring system for isolated or confined-space work.

Implementation Considerations

Construction sites present unique challenges for mesh deployment:

- **Moving infrastructure** - The site layout changes weekly or monthly. Repeater placement should use temporary mounts (pipe clamps on scaffolding, magnetic mounts) rather than permanent installations.
- **Power availability** - Most construction sites have temporary power; use solar for outdoor nodes and plug-in power for indoor or semi-permanent nodes.
- **Equipment theft risk** - Secure repeater nodes in locked weatherproof enclosures or in existing locked site equipment rooms.
- **Dust and vibration** - Construction environments are hard on electronics. Use robust IP67 enclosures and inspect connections after major demolition or paving work.

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