

Struck-by Checklist for Architects and Design Engineers - Building Construction

[FINAL DRAFT SDCHOI]

Use this checklist to prevent-through-design many common struck-by exposures during the construction and maintenance of buildings. Prevention through Design (PtD) recognizes that architects and design engineers working closely with construction teams have the ability to proactively “design out” potential hazards to eliminate or minimize the risk and improve workers’ safety and health. Hence, this checklist, during the planning and design phase and beyond, should help architects and design engineers identify and eliminate commonly found hazards in building construction and maintenance.

Design Engineer Codes: CE = Civil, ME = Mechanical, SE = Structural, PE = Project

| Component | Design Risk | PtD Controls | Architect | Design Engineer |
|-------------------------------------|---|---|-----------|-----------------|
| Pipes/beams or overhead objects | Unmarked low beams or pipes can create struck-by hazards for workers. | • Route piping or overhead objects to avoid “head knockers” (6’-6” min. above grade) | ✓ | CE, ME |
| | | • Specify markings or warning signs on low-clearance overhead objects | ✓ | ME, SE |
| Piping and ductwork (erection) | Large pipe or ductwork sections, which lack adequate connection points for lifting and lack restraint from rolling, can lead to struck-by hazards for workers. | • Design large pipe or ductwork sections to be oval or have one flattened portion to prevent rolling | ✓ | ME, SE |
| Vehicles striking objects | Temporary structures, liquefied petroleum gas (LPG) storage areas, areas of limited headroom, electric cables, pipelines, etc. can lead to struck-by and other safety hazards while operating vehicles and machinery. | • Specify physical protection and warning signs in areas that have a higher potential to be struck by a vehicle | - | CE, PE, SE |
| | | • Specify safety barriers to protect LPG storage areas as well as goalposts, bunting and barriers where there is a risk of overhead services and other hazards being struck by vehicles | ✓ | ME, PE |
| | | • Specify reflective hazard markings on hard-to-see objects and structures | - | PE |
| | | • Designate vehicle traffic lanes for deliveries and for equipment used on site - Clearly mark travel lanes for both day and night operations | ✓ | PE |
| Vehicle and heavy equipment traffic | Pedestrians are at risk of being struck by heavy equipment, construction vehicles and their loads. | • Establish primary pedestrian routes that provide safe access to work areas away from main vehicle routes | ✓ | CE, PE |
| | | • Specify physical protection where pedestrians are at risk of being struck by vehicles or their loads | ✓ | PE |

| | | | | |
|--|---|--|---|--------|
| | | <ul style="list-style-type: none"> Establish pedestrian crossing points and pedestrian control measures where necessary | ✓ | PE |
| | | <ul style="list-style-type: none"> Establish an Internal Traffic Control Plan (ITCP) to route construction traffic away from pedestrians | ✓ | PE |
| | | <ul style="list-style-type: none"> Design ITCPs to minimize backing | ✓ | PE |
| | | <ul style="list-style-type: none"> Design temporary traffic control devices to slow vehicle traffic | - | PE |
| Powered industrial trucks (PIT) | Pedestrians or workers can be struck or crushed by PITs (forklifts), or hit by objects falling from a forklift. | <ul style="list-style-type: none"> Design pedestrian safety zones around PIT operation areas | ✓ | CE, PE |
| | | <ul style="list-style-type: none"> Specify bollards/guardrails at potential pedestrian/forklift conflict areas | ✓ | PE |
| Precast and Prefabrication Elements; Steel Beams and other structural elements | Large and heavy precast structures need a wide lifting radius and pose struck-by hazards. | <ul style="list-style-type: none"> Specify U-shaped precast beams with cast-in-situ infill concrete to reduce the crane load | ✓ | CE, SE |
| | | <ul style="list-style-type: none"> Design precast shell columns with cast-in-situ infill concrete to reduce the crane load | ✓ | CE, SE |
| Concrete Masonry Units (Concrete Blocks) | Crowded and confined areas below elevated masonry work increase the risk of workers being struck by falling bricks. | <ul style="list-style-type: none"> Specify large, limited access zones below elevated masonry work to minimize the risk of workers being struck by falling objects | ✓ | CE, PE |
| Hoists | Workers can be struck by the platform, the load, or other moving parts of the hoist. | <ul style="list-style-type: none"> Design an enclosed hoistway in areas where the worker could be struck (e.g., working platforms or window openings) | ✓ | CE, PE |
| | | <ul style="list-style-type: none"> Design adequate lighting and access to the hoist area | ✓ | PE |
| | | <ul style="list-style-type: none"> Design gates at all landings and at ground level | ✓ | PE |
| | | <ul style="list-style-type: none"> Design hoist controls at a location that will prevent being struck by a falling load, or a broken cable or chain in the case of a mechanical failure | ✓ | PE |
| | | <ul style="list-style-type: none"> Specify a hoist rated for all possible loads to be used, and include below-the-hook components to prevent the use of non-conforming components | - | ME, PE |
| | | <ul style="list-style-type: none"> Design hoists in areas that will minimize nearby foot traffic, or install guardrails to prevent anyone from walking beneath an elevated load | ✓ | PE |
| | | <ul style="list-style-type: none"> Specify misalignment detection to prevent lifting a load that is not | - | PE |

| | | | | |
|--------------------|--|---|---|--------|
| | | centered below the hoist which could result in uncontrolled swinging of the load | | |
| Building exterior | Loose materials and equipment can lead to struck-by and other safety hazards for workers. | <ul style="list-style-type: none"> Specify impact resistant windows, doors and shields at occupied spaces in high wind areas | ✓ | CE, PE |
| General (overhead) | Overhead construction can lead to struck-by or other safety hazards for workers. | <ul style="list-style-type: none"> Design components to facilitate prefabrication at grade and erection as complete assemblies | ✓ | CE, PE |
| | | <ul style="list-style-type: none"> Design adequate exclusion zones to prevent entry | ✓ | PE |
| Exits and doorways | Blind exit passageways, vehicular exit ways, or blind door swings can lead to struck-by or safety hazards for workers. | <ul style="list-style-type: none"> Specify mirrors, warning bells or other warning devices | ✓ | CE, PE |
| | | <ul style="list-style-type: none"> Specify bollards or physical barriers to protect workers on foot exiting blind passageways | ✓ | PE |
| | | <ul style="list-style-type: none"> Design one-way pathway where swinging doors are installed | ✓ | PE |

Sources/References

This checklist was in-part adapted from J. Timmerman's Prevention-Through-Design-Checklist (spread sheets), and subsequently modified and revised by Professor Sang D. Choi, PhD, MPH, MS, CSP, CPE (2023).

Construction Design and Management [CDM] 2015 (2019). Client Contractor Checklist, June 2019.

Health and Safety Executive [HSE] (2006). Health and safety in construction (Third Edition). The National Archives, Kew, London, U.K.

The Institution of Engineers, Singapore (n.d.). Technical Resources. Health & Safety Engineering. <https://www.ies.org.sg/Publication/Technical-Resources>

Occupational Safety and Health Administration (OSHA) (n.d.). Focus 4: Construction Safety & Health – 'Struck -By' Hazards Participant Guide. U.S. Department of Labor.

Health and Safety Executive (HSE) (n.d.). Traffic management on site. (<https://www.hse.gov.uk/construction/safetytopics/vehiclestrafficmanagement.htm#keeping>)

Pratt, S.G., Fosbroke, D.E., & Marsh, S.M. (2011) Building Safer Workzones: Measures to Prevent Worker Injuries from Vehicles and Equipment. NIOSH.