

Bleacher Safety

Introduction:

Whether bleachers are inside a gymnasium or outside at your soccer or football field, bleachers should be inspected. The frequency of inspection may depend on your state laws, local ordinances, local fire department, or the manufacturer. We recommend that inspections be conducted seasonally – or quarterly – and certainly before large events where attendance is expected to be high. You may be asking yourself at this point, “Is there really a hazard associated with bleachers?” The simple answer is “yes,” according to the Consumer Product Safety Commission (CPSC).

The Consumer Product Safety Commission completed a roundtable meeting on bleacher safety in 1999. They reported that there were at least nineteen deaths involving falls from bleachers from 1991 to 2003; four of them were children under the age of fifteen. Injuries are much more common. In 1999, for example, there were 22,100 bleacher-associated injuries requiring emergency room treatment, according to the agency. Twenty-eight percent of those injuries were the result of falls from the bleachers onto a surface below. There were 4,910 falls that involved children under the age of 15. Serious injuries typically result from falls between seats and floorboards and between guardrails. Renovations would have prevented many of those deaths and injuries. Repairs, renovations, and the installation of non-skid surfaces on floorboards, stairs, and walkways would also have reduced slips and trips, two of the other leading causes of injuries in school bleachers.

Although infrequent, there is also the danger of a section of the bleachers collapsing. This can occur from design errors, improper installation or setup, missing fittings or fasteners, deterioration or corrosion, sabotage, natural disasters, vehicle-related damage, such as from a forklift, truck, or excessive loading.

There are three types of bleachers common to schools: portable, permanent, and telescopic. Portable units are smaller, roughly 20 feet in width, and four to five rows deep. They can be moved, for example, from the soccer field in the fall to the softball field in the spring. Permanent bleachers are the classic, large structures on the side of a football or baseball field. Telescopic bleachers typically are used in a gymnasium and can be closed to utilize the entire gym. Slips, trips, and falls can occur while using any of the above bleacher systems. Listed below are the common hazards associated with falls and collapse, and some measures that can be taken to prevent accidents and injuries.

Bleacher System Hazards:

Fall Hazards

Most injuries are associated with one of the following causes:

- (a) Missing or defective guardrails: on the sides, the back, or (if elevated) the front
- (b) Large openings between components: typically between the seating and the guardrails, or between seats and floorboards that are big enough for a child or adult to pass through. Openings should be four inches or less in railings, or gaps. Openings in fencing should be 1 and ¼ inches or less.
- (c) Excessive guardrail space: e.g., between the bottom rail and the mid-rail (four inches or less).
- (d) Unprotected spaces between guardrails: open areas neither fenced nor provided with vertical rails (four inches or less),

- (e) Access steps to seating: missing or no handrails for support
- (f) Structural collapse or tipping of the structure: failure to properly install or anchor system
- (g) Incomplete work: hazard areas not protected or secured between work shifts

Structural Collapse:

Entire bleacher sections or systems have collapsed because of design flaws, manufacturing and installation, misuse, or lack of adherence to or compliance with an inspection and maintenance schedule.

Design flaws may be based on misinformation, such as who will be using the bleachers – children or adults – where the edifice will be used, snow and ice loading, maintenance instructions, and miscalculations.

Manufacturing and installation may create flaws where design did not. Misuse usually involves overloading – static or dynamic – including exceeding occupancy or weight limits. Each bleacher is designed to hold a certain amount of people. When hosting events you must keep track of how many people have entered the facility and limit the number entering to the number or occupancy limit of the bleachers.

Each system is designed to hold a certain amount of weight, i.e., a static load. If overloaded, the bleachers could fail, or in some cases, tip over. Check with the manufacturer and your local building inspector or fire department to determine your bleacher occupancy limit.

Live or dynamic loads are an equal concern. Most people have been to a high school basketball game and sat on the telescopic bleachers. When the game got close, the home team fans stamped their feet to support or cheer their team. When that is done in unison, there is a tremendous live load on the system. Nuts and bolts, even welds, can loosen or crack over time from live loads. Dynamic loading is why quarterly or even more frequent inspections are advisable.

Photo shows a small, fixed or portable unit.

Note the mesh fencing on the side and back.



Note the riser space is filled in.

Close up of prior photo showing the riser protection, fencing and bottom rails.



The gap between the side fence and the back fence should not be larger than four inches



This is an older, permanent bleacher system at a high school football field. This system has been retrofitted to some degree. There is no riser fall protection and no hand rails in the aisle walkway. However, fencing has been added to the top and sides reducing the potential for falls from the bleachers. Riser gaps should be closed to reduce the potential for falls between the seat and walking surfaces, especially for children. The installation of aisle railings is recommended.



This photo shows a newer, permanent bleacher system at a town recreational baseball field. The system has aisle railings, riser protection, and top and side guardrails with mesh fencing. The risers should prevent falls between the seat-boards and the floorboards and should also prevent objects from falling from the floorboards onto anyone beneath the bleachers.

Recommendations for Preventing Falls

The following are some of the recommendations that have been made by the CPSC and various authorities on safety or found in nationally recognized building codes.

- Guardrails should be present on the backs and portions of the open ends of bleachers where the footboard, seat board, or aisle is 30 inches or more above the floor or ground below. Bleachers with the top row nominally 30 inches above the ground may be exempt from this recommendation.
- The top surface of the guardrail should be at least 42 inches above the leading edge of the footboard, seat board, or aisle, whichever is adjacent.
- When bleachers are used adjacent to a wall that is at least as high as the recommended guardrail height, a guardrail is not needed if a 4-inch diameter sphere fails to pass between the bleachers and the wall.
- Any opening between components of the guardrail or under the guardrail should prevent passage of a 4-inch sphere.
- Any openings between the components in the seating – such as between the footboard, seat board, and riser – should prevent passage of a 4 inch diameter sphere where the footboard is 30 inches or more above the ground and where the openings would permit a fall of 30 inches or more.
- Aisles, handrails, non-skid surfaces, and other items that assist in access and egress on bleachers should be incorporated into any retrofit project where feasible.
- The preferable guardrail design uses only vertical members as in-fill between the top and bottom rails. Openings in the fencing that could provide a foothold for climbing should be limited to a maximum of 1.75 inches. Opening patterns that provide a ladder effect should be avoided. If chain link fencing is used on guardrails, it should have mesh size of 1.25 inch square or less.
- The option of replacing bleachers as opposed to retrofitting should be considered.
- Design, materials, methods, and workmanship used for retrofitting should prevent the introduction of new hazards, such as bleacher tip-over, bleacher collapse, guardrail failure, and contact or tripping hazards. Eliminate sharp edges or protrusions.
- Bleachers should be thoroughly inspected at least quarterly by trained personnel, and problems corrected immediately.
- A licensed professional engineer, registered architect, or company that is qualified to provide bleacher products and services should inspect the bleachers at least every two years. Obtain a written certification that the bleachers are fit for use.
- Records of all inspections, modifications, incidents, and injuries should be compiled, retained, and reviewed. Corrective action should be taken to prevent reoccurrences.

Inspections and Maintenance

There are many wooden outdoor systems still in place. Wood as well as aluminum bleachers need to be inspected quarterly. The inspection should identify structural damage to or deterioration of supports, bracing, seating boards, steps, railings, and fencing. Mechanical fasteners should be checked for tightness (torque) and welds for cracking or rust.

Repairs should be made immediately. Inspection and repair efforts should be documented, including the date of the inspection and the signature of the person conducting each inspection. In addition to the school's self-inspection of the bleachers, it is recommended that a professional engineer, architect, or manufacturer's representative inspect the bleachers biennially.

National Codes

If your school, town recreational department, or facility is considering buying a bleacher system, it is recommended that you check with the local building inspector to learn which building codes the town follows and what they will require of your bleacher system in terms of design, appropriate building materials, placement, safety controls (e.g., securing or anchoring the structure against tipping, capacity loadings, and inspections), and maintenance. Documents summarizing various design codes for the manufacture or retrofitting of bleacher systems can be found at the Consumer Product Safety Commission's website. This site also contains information on retrofitting existing bleacher systems.

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