

Risk navigator

Challenge courses and climbing walls



Primary casualty

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About Markel's Risk Solution Services team

Risk Solution Services provides technical insight related to existing and potential insured risk at Markel. The team partners with our customers, claims, and underwriters to educate on both current and future risk trends and supports our clients with a comprehensive offering of risk management solutions.

We do this by engaging with clients, underwriting, and claims teams.

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The risk management practices for challenge courses and climbing walls continue to evolve. Construction, operation, and inspection standards have been established and continue to reflect improvements in equipment and safety practices.

This safety guide highlights program areas for consideration by program administrators as they look to create a new program and support effective operation of their existing program.

Setting a budget

A challenge course or climbing wall is a significant financial investment, with ongoing expenses for inspections and repairs, equipment replacement, and staff training.

Selecting a site

Consider these factors when you select a site for your challenge course and determine where to place individual course elements:

- Terrain and erosion potential: Make sure the ground is clear of branches, brush, roots, stumps, and poisonous plants.
- Trees: Include only healthy, easily accessible, structurally appropriate trees in your course. Consult an arborist, if necessary.
- Poles: Use decay-resistant lumber, such as cedar, for poles. As a general guideline, install poles in the ground to a minimum depth of 4 feet or to a depth of 10 percent of their length plus 2 feet; whichever is greater.
- Existing structures and utilities: Your vendor must carefully assess existing buildings to ensure they are suitable for use in a challenge course.
- Accessibility: Your challenge course needs to provide access for emergency response and rescue. Access to overhead and underground utilities also needs to be provided.



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Selecting vendors

Vendor selection is one of the most important and overlooked aspects of creating an exciting and rewarding challenge course or climbing wall program. Vendors have their own specialties, personalities, and philosophies. Although they may build similar products, vendors' training techniques and construction methods vary tremendously. Some vendors willingly explain inspection deficiencies and recommend ways to fix them; others do not. (Note that an inspection deficiency doesn't necessarily mean a course or element is unsafe; it means that it doesn't conform to standards.)

The Association for Challenge Course Technology (ACCT), along with the American National Standard Institute (ANSI) sets minimum standards for challenge course installation, operation, and inspection. Some vendors may have higher inspection standards or training requirements than those set by ACCT. As with any construction project, choosing an experienced, conscientious vendor who uses quality materials and workmanship is the best way to ensure a safe challenge course.

Carefully examine your organization's objectives for establishing a challenge course or climbing wall program, and then discuss your objectives with various vendors. A good place to start your search for the right vendor is the ACCT web site (www.acctinfo.org).



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Check references

Be sure to check the vendor's references. Keep in mind that an individual who worked for a firm may not fairly represent the firm's usual performance. If you find a negative reference, talk about it with the vendor, and find out how they responded to customer complaints or concerns.

Experience counts

It's important to ask about the years of experience of not just the vendor, but also the person who is assigned to build or inspect your course or climbing wall. ACCT recommends that the vendor have a minimum of five years of full-time experience in providing the services you need. Ask prospective vendors these questions:

- What is the vendor's involvement with organizations such as ACCT, Association for Experiential Education (AEE), and American Camp Association (ACA)?
- How many courses has the person assigned to build your course built?
- How much experience does the trainer have?

Vendor's insurance

Ask your vendor for a certificate of insurance. Your vendor's insurance should cover general liability, completed operations and product liability, workers compensation, and vehicle liability. When you get a copy of the vendor's certificate of insurance, check the limits of liability insurance to verify that they meet your program's needs or expectations.

It's advisable for your contractor to carry builders risk insurance, which covers structures under construction. In most cases, if a fire or vandalism occurs during the construction stage, the builder incurs the loss. However, if an injury occurs, particularly to someone you invited onto your site, both your organization and the vendor may have liability.

In today's insurance market, it's a good idea to check the financial stability of the vendor's insurance company. You can do so by going to A.M. Best Company's web site (www.ambest.com). Make sure the vendor's insurance company has a Best rating of "A Excellent" or better.

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Using subcontractors

Many vendors use subcontractors to perform some of their work. Ask your vendor these questions:

- Do you use subcontractors? If so, what parts of the job do you subcontract?
- Do your subcontractors have insurance?
- Whose insurance is primary?
- Is subcontractors' work guaranteed to meet ACCT construction standards and state regulations?
- How will subcontractors' work be supervised?

Discuss the use of subcontractors with your insurance agent or carrier to make sure you are properly protected.

Reviewing the contract

Before you sign a contract or a vendor begins work, have your attorney review the contract. Do not sign a contract that states the contractor is not responsible for a subcontractor's work!



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Protecting participants

The ANSI/ACCT standards describe in broad terms recommended practices for challenge course installation, operation, and inspection.

Keeping participants safe on your challenge course and climbing wall requires a combination of techniques:

- Quality construction
- Staff and participant training
- Regularly scheduled equipment inspection, maintenance, and replacement
- Use of spotters
- Use of ground surfacing materials and mats



Protecting participants from sudden cardiac arrest

Despite the increasing number of challenge courses and climbing walls, the frequency of injuries and death remains relatively low. According to research conducted by Project Adventure, the primary cause of death on challenge courses is sudden cardiac arrest (SCA), involving men age 30 and older*. Programs that work extensively with adults should consider adding an automatic external defibrillator (AED) and portable oxygen to the first-aid equipment on their challenge course.

In cases of SCA, or in any other emergency, staff may be required to perform emergency take-downs. Staff training and extensive practice in take-downs is critical; it can mean the difference between a full recovery and permanent disability or even death. Note that OSHA standards require facilitators to wear a full-body harness while conducting a rescue.



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Protecting participants on zip wires

Falls from zip wires are the second major cause of severe injury and death on challenge courses, and staff members are the participants most often injured or killed. The most traumatic injuries occur to the upper body, resulting in neck, spine, and rib fractures.

Zip wires require extra vigilance because:

- No other high-course element, except the pumper pole, commits the participant so fully the moment they leave the platform.
- Staff facilitators may be unable to remain alert and vigilant for long periods of time, particularly regarding their own safety.
- Many factors can contribute to an accident. Participants are exposed in four dimensions (forward, sideways, height, and time), over a large area. Other factors include obstacles in the participant's path, as well as the dynamics of the cable.



You can follow these recommendations to increase participants' safety on the zip wire:

- Unless the zip wire is designed for standing launch, ensure participants leave the zip line platform from a sitting position. Make sure the static lines from the pulley to the harness are snug. Position carabiners to prevent participants from falling onto a gate.
- Ensure that facilitators frequently check their own safety systems. When appropriate, such as on the zip-wire platform, ensure facilitators are connected to two independent anchor points.
- Use only one rope at the zip wire platform for emergency take-downs or equipment retrieval. Multiple ropes can cause confusion.
- Ensure at least 10 feet of clearance on each side of the zip line; if trees are in the way, cut them back. A pendulum swing can move the participant far outside the cable's normal path.

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Auto-belay systems

Auto-belay systems are used primarily on climbing walls, although some high-ropes courses also use them. Some programs use auto-belay systems as a long-term cost-cutting measure; installing a system can be less expensive than hiring additional staff. Although the concept of taking the human element out of the belay system has merit in some cases, there remain some concerns:

- Automation may result in complacency in inspecting, maintaining, and using the equipment.
- Auto-belay systems require annual (or more frequent if heavily used) calibration back at the manufacturer. This could result in an interruption in business if another unit is unavailable.
- Auto-belay systems do not teach belay skills and take the human interaction out of the climb.

Of significant concern is the recent use of auto-belay systems on zip wires. Auto-belay systems use a thinner cable than the standard 3/8-inch rope wire used on standard belay systems. The thinner cable is an issue for a number of reasons:

- Thinner cable is more likely to break.
- Thinner cable wears out more quickly, and requires more frequent replacement.
- Thinner cable may cause the zip wire pulley to wear out or no longer fit properly.
- There may be legal issues about using auto-belay equipment in ways that the manufacturer neither intends nor warrants.
- Thinner cable may not be able to support the weight of very heavy participants. The cable manufacturer's specifications should indicate the maximum number of pounds the cable can safely carry; communicate this to your challenge course staff.

Spotters are the first line of defense

Spotters are one of the primary means for protecting participants on challenge courses and climbing walls. However, spotters can fail to adequately break a participant's fall, so it's a good idea to provide soft surfaces to cushion falls. The use of ground surfacing materials can go a long way in preventing or minimizing injuries.



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Protecting participants on belay systems

Belay systems fail primarily for two reasons: human error or equipment failure/misused equipment. Human error is by far the most frequent cause of belay system failure and participant injury. You can reduce the number of accidents and injuries by following these safety practices:

- Train staff to be constantly vigilant and alert.
- Rotate staff positions, including the supervisor, frequently to prevent fatigue.
- Never use staff-modified equipment. If this equipment is proven to have caused an injury, your organization and the person who modified the equipment can be sued. Your procedures manual should specifically exclude the use of staff-modified equipment.

How much ground surfacing material is enough?



The use of ground surfacing materials on outdoor courses is a complicated issue, and there's no "one size fits all" answer.

ACCT/ANSI standards do not provide guidelines for protective ground surfacing materials. Currently, there is no national standard for fall protection materials that specifically addresses challenge courses and climbing walls.

Ideally, each element should have some sort of impact-absorbing surfacing material; this is especially important for elements such as swing-to-platforms, boson's chairs, and trust falls.

Many factors affect the type and depth of ground surfacing materials to use. Check with your vendor to determine exactly what's needed for your site. Some factors to consider are as follows:

- Local conditions: Climate and soil composition play a role in determining how much ground surfacing material to use. If your course is on very hard ground, you may need to use more ground surfacing material.
- Indoor courses: It's advisable to use mats or other impact-absorbing materials on elements in your indoor course.
- Low challenge courses: Injuries can occur on low courses, where elements are typically between 2 and 12 feet high. The use of ground surfacing materials can help to alleviate the severity of an injury.



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Critical height

Critical height can be considered as an approximation of the fall height below which a life-threatening head injury would not be expected to occur. The surfacing material you use under and around an element in your challenge course or climbing wall should have a critical height value of at least the height of the element where a free fall of less than 10-feet may occur. (Markel requires that any challenge course element and climbing walls above 8-feet be supported by a belay system.) The Consumer Product Safety Commission (CPSC) publishes standards for fall protection on playgrounds. Although playgrounds differ significantly from challenge courses, the CPSC guidelines are a good source for general information about ground surfacing materials.

The following table, from the CPSC’s handbook for public playground safety, shows the minimum required depths of loose-fill material needed based on material type and fall height. The depths shown assume the materials have been compressed due to use and weathering and are properly maintained to the given level. For example, wood chips at an uncompressed depth of 9 inches should provide head impact attenuation for a critical height of 10 feet.

Critical heights (in feet) of tested materials

Inches	Of	(Loose-Fill Material)	Protects to	Fall Height (feet)
6*		Shredded/recycled rubber		10
9		Sand		4
9		Pea Gravel		5
9		Wood mulch (non-CCA)		7
9		Wood chips		10

*Shredded/recycled rubber loose-fit surfacing does not compress in the same manner as other loose-fill materials. However, care should be taken to maintain a constant depth as displacement may still occur.

In most cases, Markel recommends using fall-protection materials at a depth of 9 to 12 inches. Materials maintained at this depth will reduce the amount of maintenance required to preserve an adequate depth. Participants frequently kick materials away from the elements or tower, rain washes away some materials, and wood chips decompose. Discuss this recommendation with your challenge course vendor or an arborist.

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Protecting participants on high-ropes courses

OSHA has fall protection guidelines for high-ropes courses that staff must follow. Depending on their activities, staff members are covered under construction standards (for builders) or general industry standards (for operators).

OSHA standards require facilitators on high-ropes courses to wear full-body harnesses, not climbing harnesses, when conducting rescue operations.

Common injuries

The type of fall-protection materials you install should protect participants from the most common types of injuries. On climbing walls, injuries to the lower leg and foot are most common, and include compression and spiral fractures.

Participants can be injured when they fall from a height of 2 to 4 feet and the belay rope is too slack to break the fall. Injuries can also occur when participants slip on matting during or after a fall. More severe injuries to the head and spine can occur when participants fall from the highest part of the climbing wall.

Mat thickness and composition

Talk with your climbing wall builder and several mat manufacturing companies to determine the type and thickness of mat best suited for your program. Many facilities use a high-density foam mat 12 inches thick underneath areas where climbers are inverted and not on belay, and matting 2 to 4 inches thick in other areas. Mats should extend a minimum distance of 8 feet (preferably 10 to 12 feet) from the base of the climbing wall and a minimum distance of 6 feet to the sides of the climbing wall for adequate zone coverage. It's important to use mats that don't separate easily; many lower-leg injuries have been directly attributed to mats that have separated.

You'll also need to determine a retirement schedule for your mats, as they will compress over time.



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Protecting participants on trails and paths

The trails leading to course elements and between activities should have adequate fall protection. Use adequate ground surfacing materials on trails; keep trails free of tripping hazards like dead branches and stumps; and clear trails of poison ivy, bees, and mosquitoes.

Use a pre-course inspection checklist to examine the course before use. Throughout the season, inspect trails and correct problems as needed.



Staples on high-ropes courses

Staples can pull free from trees and utility poles at any time and under a variety of conditions. The ACCT has recommended that the use of staples as anchors should be strictly limited to those situations where it can reasonably be verified that such anchors comply with ANSI/ACCT standards.

Consult your vendor about when to use and replace staples, and what to use in their place. Suitable replacements include nut eye-bolts, cable-grab systems with vertical life lines, or the use of a second staff person to belay the climbing staff member.

Any new type of belay system requires proper training and practice. Each system has advantages and disadvantages, and your staff needs to know how to operate the new system safely and understand its limitations. Training is critical—document it.

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Conducting staff training



Professional training, conducted by a qualified vendor, is crucial to the safety of your challenge course program. Internal training, conducted by your own staff, is a supplement to professional training, but should never be your primary training method. Sole reliance on internal staff training is dangerous because it ignores unsafe practices that have developed, and does not address equipment or practice improvements.

At a minimum, your challenge course and climbing wall staff should have completed a basic first aid and CPR course. Depending on the response time of your rescue squad and location of your challenge course or climbing tower, more advanced emergency medical training may be desirable. Carefully evaluate your program's needs, and choose a training vendor whose curriculum meets your requirements.

Make sure everyone who works on your course attends the professional training classes, regardless of how much training they've had elsewhere. Site-specific training is critical—your program's safety depends on it.

Challenge by choiceSM

An integral part of your training program is your staff's understanding of "challenge by choice." Never allow staff to coerce, however subtly, a participant into an activity. Not only is coercion a practice that violates the principles of the challenge course experience, it can invalidate a liability waiver or release. Note that the phrase "challenge by choice" is a service mark of Project Adventure; ask for permission before using it in your written materials.

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Using liability releases and waivers

It's a good practice to have all participants sign liability releases and waivers before they use your course. Releases and waivers can protect you from liability if you are sued. Ask your attorney to draft releases and waivers that are specific to your program. Every state has specific language and format for a waiver or release, as well as laws regarding the types of programs (education versus recreation) for which releases are valid. Each state's laws differ regarding a parent's right to sign away a minor's right to sue. Also ask your attorney how long you must keep the releases and waivers after the program is over. It's a good practice to have your attorney review your waivers annually to ensure they remain effective.

Getting the right insurance coverage

In addition to general liability insurance, it's a good idea to get property insurance to cover your challenge course and climbing wall. This is usually available as an endorsement to your policy.

When you add a climbing wall to an existing building, you increase the value of that building. Make sure that your insurance reflects this increase in property value. If you add a wall to a leased building, tenants improvements and betterments insurance will protect your investment. Talk with your insurance agent to ensure that your coverage is adequate to protect the investment you've made in the facility.

Ref:

*Thomas R. Welch and Robert Ryan. "Sudden unexpected Death on Challenge Courses". Journal of Wilderness and Environmental Medicine. V.13, 140-142. 2020

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**"Public Playground Safety Handbook".2015. U.S. Consumer Product Safety Commission. 4330 East West Highway. Bethesda, MD 20814

**"ANSI/ACCT 03-2019 Challenge Courses and Canopy/ Zip Line Tours Standards".2019. Association for challenge Course Technology. Deerfield, IL 60015

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