CLIMBING WALL ASSOCIATION, INC.

WORK-AT-HEIGHT CERTIFICATION PROGRAM STUDENT MANUAL

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I. Introduction

The Climbing Wall Association, Inc. (CWA), a non-profit corporation, sponsors the "Work-at-Height Certification Program" (WaH). The purpose of the certification program is to establish a voluntary certification for Climbing Wall Workers (CWWs) and a uniform set of consensus performance standards that can be easily and integrated into existing staff training programs and adopted anywhere.

Climbing gym employees, like all workers, are subject to health and safety regulations covering common workplace risks and hazards. The law demands that employers have a plan to manage these risks, provide training to employees regarding minimizing these risks, ensure the use of adequate and appropriate equipment, and keep appropriate records of these activities. The CWA sponsors the Work-at-Height Certification Program to assist employers in meeting these existing requirements.

Federal, provincial and state regulations in both the US and Canada, and in many other countries around the world, include a 'General Duty' or a 'Worker's Rights' clause requiring that employers must provide for safe and healthful working conditions for employees. Employers are required to meet minimum standards for worker safety, training and documentation. If an employee is exposed to a hazard in the workplace, the employer has an established legal duty to protect the worker from the hazard.

In addition, climbing gym employees who work off the ground may be classified as "working-at-height" (as defined by local law) and are subject to additional requirements regarding hazard assessment, fall protection planning, administrative controls, staff training, record keeping, and equipment use to safeguard workers. This program addresses these specific work-at-height requirements in a commercial climbing gym setting.

Climbing Wall Workers may also be exposed to general workplace hazards involving the use of chemicals, the use of tools, and the risk of injuries to head, eyes, ears and extremities. The "Work-at-Height Certification Program" focuses mainly on the risks and hazards associated with falls from height.

A. Work-at-Height Certification

Certification refers to the confirmation of certain characteristics, knowledge, and/or skills of a person at a particular place and time. This confirmation is often provided by some form of educational preparation, review, and assessment. *The focus of the Climbing Wall Worker certification program is to train and assess the ability of the candidate to access work positions and perform work-at-height operations in climbing facilities according to accepted industry practices and the CWA Work-at-Height Standard. The program also trains and assesses the candidate's ability to perform a prompt and effective rescue at-height.*

B. Levels of Training and Certification

Generally, professional certification must be maintained on an ongoing basis and renewed after a certain period of time. The CWA Work-at-Height Certification must be renewed every three years. Also, certifications can differ within a profession by level or specific area of expertise. The Work-at-Height Certification Program includes four levels of training and three levels of certification:

1. Authorized Climbing Wall Workers

Authorized Climbing Wall Workers are trained to access elevated work zones in their climbing facility using the employer's prescribed Personal Protective Equipment (PPE) and access methods for that

facility. Authorized Climbing Wall Workers are also aware of the fall hazards and fall protection systems in place in their facility and are trained to activate the employer's rescue plan. Authorized Climbing Wall workers are trained by the employer and not certified by the CWA.

2. Competent Climbing Wall Workers

Competent Climbing Wall Workers are trained and certified to access all elevated work zones in a climbing facility using a combination of belayed climbing, industrial work positioning and fall protection techniques. Competent Climbing Wall Workers are also trained to perform both self and partner rescue from Work-at-Height zones in a climbing facility.

3. Qualified Climbing Wall Workers

Qualified Climbing Wall Workers are trained and certified to develop and administer a written fall protection plan for all work-at-height tasks in the climbing facility. Qualified Climbing Wall Workers are trained to supervise Competent Climbing Wall Workers in the selection of appropriate access, positioning, fall protection, and rescue methods for work-at-height operations in a commercial climbing facility.

4. CWA Work-at-Height Certification Program Provider

CWA Work-at-Height Certification Program Providers are selected, trained, and certified to deliver CWA climbing wall worker certification training and assessment programs. Providers must have extensive prior training and experience and must have completed both Competent and Qualified Climbing Wall Worker Certifications at a minimum.

C. Goals of the Work-at-Height Certification Program

The primary goals of the CWA Work-at-Height Certification Program are:

1. To establish acceptable criteria for an employer's managed work-at-height program for recreational climbing facilities.
2. To assist employers in proactively identifying, evaluating, eliminating or controlling risks and hazards related to work-at-height in a climbing facility to the extent possible.
3. To improve the level of compliance, consistency, and competency in workplace practices for work-at-height in recreational climbing facilities.
4. To define a training pathway for climbing wall workers.
5. To define a consistent standard of practice for employees working at height in climbing facilities, in the following areas:
    - job hazard analysis.
    - use of Personal Protective Equipment (PPE) for Work-at-Height.
    - methods for accessing elevated work zones.
    - methods for fall protection in elevated work zones.
    - methods for work positioning in elevated work zones.
    - methods for worker rescue in elevated work zones.
    - written fall protection plans.
6. To provide a means for evaluating the technical skills of climbing wall workers.
7. To provide climbing wall workers with guidance for professional development.

The Work-at-Height Certification Program focuses on education, review and skills evaluation of individual candidates using consensus performance standards developed by leading professionals in the

field of recreational climbing sports which have been subjected to public review. Certification standards are intended to address the minimum criteria a candidate should meet to be certified as a Competent Climbing Wall Worker, Qualified Climbing Wall Worker, or Work-at-Height Certification Program Provider.

D. Eligibility

The CWA Work-at-Height Certification Program maintains program eligibility requirements and recommendations. Eligibility requirements and recommendations are overseen by the CWA Work-at-Height Certification Standards Committee. The committee is required to take stakeholders into account when developing, evaluating, or modifying eligibility requirements and recommendations.

Any person meeting the pre-requisites for Climbing Wall Worker Certification may stand as a candidate for certification. Eligibility is determined based upon review of the pre-requisites by the course provider.

Pre-requisites for the Competent Climbing Wall Worker Certification include:

1. The candidate will be at least 18 years of age by the conclusion of the course.
2. The candidate can demonstrate proficient belay technique.
3. The candidate can lead climb 5.9 on artificial terrain.
4. The candidate has, or is provided with, appropriate equipment in good condition.
5. The candidate can demonstrate proper care, use, and inspection of Personal Protective Equipment.
6. The candidate can ascend a rope.
7. The candidate has knowledge of the regulatory requirements of the code of local adoption.
8. The candidate has the physical ability to successfully complete the assessment.

Pre-requisites for the Qualified Climbing Wall Worker Certification include:

1. The candidate will be at least 18 years of age by the conclusion of the course.
2. The candidate can demonstrate proficient belay technique.
3. The candidate can lead climb 5.9 on artificial terrain.
4. The candidate has, or is provided with, appropriate equipment in good condition.
5. The candidate can demonstrate proper care, use, and inspection of Personal Protective Equipment.
6. The candidate has two-years work-at-height experience routesetting, or equivalent experience.
7. The candidate has completed the “Work at Height for Competent Persons” certification or has equivalent training and experience.
8. The candidate can build an equalized anchor.
9. The candidate can tie the following knots: figure eight, figure eight on a bight, Munter hitch, clove hitch, prusik, and an alpine butterfly.
10. The candidate can secure and escape a belay.
11. The candidate can ascend a rope.
12. The candidate can demonstrate the ability to haul material using a drop-proof system.
13. The candidate has knowledge of the regulatory requirements of the code of local adoption.
14. The candidate has knowledge of the fall protection hierarchy and can apply that knowledge effectively.

15. The candidate can facilitate a prompt and efficient rescue on a climbing wall.

A determination that the candidate is eligible to apply for certification in no way expresses or implies that the candidate will meet the requirements for certification.

E. Climbing Wall Worker Training Courses

The CWA climbing wall worker training courses will address the technical and administrative skills necessary to participate in, or supervise, a work-at-height program at a recreational climbing facility the courses address the following general topic areas:
The primary objectives of the CWW training courses are:

- To understand local workplace safety requirements.
- To understand the Fall Protection Hierarchy in the context of climbing facility operations.
- To competently select and apply appropriate access methods and work-at-height techniques for Climbing Wall Workers.
- To provide guidance in the development and administration of a Written Fall Protection Plan and Rescue Plan for a climbing facility.

The technical skills necessary to participate in and pass the Competent or Qualified Climbing Wall Worker Course include practical experience with: personal protective equipment used for climbing and work-at-height; experience identifying, selecting and constructing anchors; ability to tie a variety of knots and hitches; familiarity with a wide range of belay devices and methods; knowledge of and experience with various rope ascension techniques, and experience with drop-proof equipment raising and lowering methods.

The CWA ***Competent Climbing Wall Worker Course*** addresses the technical skills necessary to supervise authorized climbing wall workers in elevated work zones according to the employer's managed fall protection program and includes the following general topic areas:

- Requirements for workplace safety.
- Risk Management and the Job Hazard Analysis (JHA).
- Access, Fall Protection and Positioning Methods used for climbing and work-at-height.
- PPE used for climbing and work-at-height.
- Rescue Methods used for work-at-height.
- Implementing Written Fall Protection Plans.

The CWA ***Qualified Climbing Wall Worker Course*** addresses the technical and administrative skills necessary for developing, administering, and monitoring the effectiveness of the facility's Written Fall Protection Program and will include the following general topic areas:

- Requirements for workplace safety.
- Risk Management and Job Hazard Analysis (JHA).
- The Fall Protection Hierarchy.
- Written Fall Protection Plans.
- Access and positioning plans for climbing and work-at-height.
- Rescue plans for work-at-height.
- PPE selection and management for climbing and work-at-height.

- Employee training and supervision.
- Managed work-at-height program administration.

F. Assessment

The CWA Work-at-Height Certification focuses on education, review, and skills evaluation of individual candidates using consensus performance standards developed by leading professionals in the field of climbing sports, industrial rope access, and fall protection which have been subjected to public review. Certification standards are intended to address the minimum criteria a candidate should meet to be able to comply with prevailing industry practices and standards of care. Compliance with the certification standards is determined by Certified Program Providers, who work in the field and maintain their provider status.

Compliance with the certification standards must be observed directly, and an informed conclusion should be reached by the provider(s) with respect to the candidates' compliance with the current certification standards. A person's compliance with the standards is assessed through a variety of methods including: interviews, knowledge of written material, reasonable inference, and most importantly, *direct observation of the candidate's performance of skills and tasks listed on the evaluation instrument*. The CWI certification program providers evaluate the candidates' actual performance with the understanding that if these skills and tasks are performed adequately, then the candidate has the requisite knowledge, skills, and abilities and may be certified as a Competent or Qualified Climbing Wall Worker.

G. Certifying Organization Authority

The CWA Work-at-Height Certification Program is the responsibility of the CWA. Responsibility for oversight of the program, program policy, day-to-day administration, and development and support of Program Providers is the responsibility of the CWA. Responsibility for maintenance of the certification standards is delegated to a chartered committee of the CWA called the CWA Work-at-Height Certification Standards Committee. The program and committee have been established and empowered by the CWA Board of Directors.

The CWA is responsible for safeguarding the integrity of the Work-at-Height Certification Program. Therefore, the CWA reserves the right to confer, deny, temporarily suspend, or permanently withdraw certification or program provider status at any time for any reason. The CWI certification program's decision to confer, deny, temporarily suspend, or permanently withdraw certification or program provider status is in no way intended as a judgment by the CWA on any aspect of the certificant's or program provider's programs or services other than the ability to participate in the Climbing Wall Worker Certification Program.

H. Certification Limitations & Disclaimer

Certification is a voluntary process of training and evaluation that credits an individual with conforming to a prescribed set of standards that existed at the time of the evaluation or examination. The Work-at-Height Certification Program is employed as a means of industry self-regulation. Neither the CWA nor program personnel have the authority to bar or ban an individual from the practice of his or her chosen profession. The Work-at-Height Certification Program only has the authority to confer, deny, suspend, or remove certified status within the program.

While certification is a credential conferred to an individual by the Work-at-Height Certification Program

Provider, this credential has limits. Certification is an assessment by the provider that an individual has met, or appears to meet, the specific minimum standards current at the time of the examination. These certification standards are contained in a published document which is readily available to applicants and the public.

The certification credential is further limited by other factors. Given the varied prior experience of the candidates, the varied experience and perspectives of the providers, the finite time available to complete the courses and evaluations, and the nature of the performance standards, it is not possible to guarantee absolute consistency from provider to provider, course to course, or certification decisions from different providers. However, identical course materials, evaluation instruments, and performance standards are adopted, made available, and applied throughout the program. A certain degree of consistency is the goal of the certification program and therefore, the number of providers is limited.

While certification standards focus on the performance of technical skills, abilities, sound work-at-height techniques, and risk management practices; Work-at-Height certification is not a guarantee that certified individuals or their colleagues will be free from harm. In fact, risks are inherent in work-at-height operations in a commercial climbing facility.

II. Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) is extremely important in work-at-height operations in a commercial climbing facility. PPE includes the climbing wall worker's life safety equipment. As a climbing wall worker, you should possess a thorough knowledge of the manufacturers' instructions for use, care, storage and inspection of the climbing equipment you use. Adequate knowledge of inspection procedures comes from formal training, reading and understanding the manufacturers' instructions, and hands on experience.

Your employer has certain duties to you regarding PPE. For example, your employer must provide, use, and maintain protective equipment in a "sanitary and reliable condition" where necessary to protect you from workplace hazards. Personal protective equipment includes equipment for eyes, face, head, and extremities, protective clothing, shields or barriers, or respiratory devices necessary to protect you where you could be injured or impaired on the job. In the USA, there are some limitations on the employer's duty regarding PPE, for example an employer would not be required to provide you with certain footwear or prescription eyewear. However, where you provide your own equipment, your employer is responsible for insuring it is adequate, it fits, is properly maintained, and is inspected.

Your employer also has a duty to train you in the proper use of Personal Protective Equipment in the workplace. PPE training topics include:

- When PPE is necessary;
- What PPE is necessary;
- How to properly put on, remove, adjust, and wear PPE;
- The limitations of the PPE; and,
- The proper use, care, maintenance, lifetime and disposal of the PPE.

Each worker should have an understanding of the required PPE and demonstrate he or she knows how to use it before being allowed to work. If you have reason to believe that a worker who has already been trained does not have an adequate understanding of the PPE, or does not use it properly, retraining the worker promptly would be appropriate.

The use of personal climbing equipment is common in climbing facilities. Regardless, all personal equipment used must be manufactured specifically for climbing use and used in accordance with the original equipment manufacturer's instructions. This applies to all equipment, including but not limited to ropes, harnesses, belay devices, ascenders, carabiners, quick-draws, etc. Personal equipment used for work must be subject to regular inspection by the owner. Furthermore, the employer should be sure that the equipment is inspected, inspection records are kept. and that those records are available for review upon request.

Presumably, your employer has a life-safety equipment management and inspection program. The equipment management and inspection system should cover routine ongoing inspection and periodic close inspection of facility-owned life safety equipment. As a climbing wall worker, you should have access to the OEM's published material for equipment such as product information and instructions for use. Your employer will also have quality assurance records such as purchase records, inspection records, or other logs as appropriate for all facility-owned equipment.

All personal protective equipment should be used and inspected in accordance with the original equipment manufacturer's instructions. You should be able to recognize if equipment is intended for climbing use, is of sound design and construction, and is not defective or damaged. You should also record the results of your PPE inspections in a log or register.

Please see Annex A PPE inspection for more information.

III. Overview of Fall Protection Systems

A. Hazard Control Methods

The Climbing Wall Association's Work-at-Height Standard is intended to provide employers and employees with guidance and standardized industry work practices used to accomplish these work tasks while minimizing or 'controlling' the potential fall hazard. However, the most effective controls may be *eliminating fall hazards altogether* or *substituting* a lesser hazard for a greater hazard. Elimination and substitution are considered types of engineered controls and prevent the worker from being exposed to the hazard in the first place. An example of elimination might be completing work at ground level (if possible) and an example of substitution might be using a lift instead of climbing. Other controls include: passive fall protection, travel or fall restraint, fall arrest, and administrative controls. Examples of administrative controls might include prohibiting the use of certain equipment or techniques; limiting access to elevated work zones to certain roles or persons; and careful selection of appropriate access methods. We will focus on the managed use of prescribed access methods and personal protective equipment for individual workers. See Annex B for a summary of hazard controls.

B. Personal Fall Protection in Climbing Facilities

The fundamental principle of personal fall protection systems is the continuous connection of the worker to an appropriate strength anchor in order to prevent the worker from being exposed to a fall hazard at all (travel restraint), or to prevent a falling worker from a hazardous fall onto an obstacle, a working surface below, or to the ground (positioning, suspension, fall arrest, attended belays, and auto belays).

Personal fall protection is most often accomplished with use of a rope or lanyard and connectors. However, in the event of a fall, any slack in the connection system between worker and anchor may result in surprisingly high impact forces on the worker, anchor, and connection system – especially with static systems.

In a worst-case scenario, the worker falls from directly above their anchor connection a distance of twice the full length of their connection system (a factor two fall) which can result in potentially damaging or dangerous impact forces on the system and/or the worker.

To minimize these potential impact forces, fall protection systems are based on two fundamental principles:

- *The climber or worker continuously positions or suspends below the highest anchor attachment or maintains the attachment point above their position, minimizing both fall distance and potential impact force.*
- *The potential length of the fall is always managed to be less than the amount of rope or lanyard in the system.*
- *The fall protection system employs an energy absorbing component to minimize potential impact forces in the system.*

C. Sport Fall Protection Systems

Common fall protection systems employed in climbing facilities for both customers and workers utilizes

sport climbing systems, or an attended belay system, with engineered anchors, dynamic climbing ropes for energy absorption, harnesses, connectors, a belay device, and a 'dynamic' belay provided by a partner who also aids in energy absorption and minimizing fall distance.

1. Top-rope belay systems

Top-rope belays use counterbalance rope systems pre-directed through an anchor point at the top of the climbing structure, with one end of the rope attached directly to the climber, and the other end controlled by a belay device attached to and attended by the belayer. If the climber is exposed to a fall, the belayer controls the rope system with friction through a belay device. When the climber is unable to maintain position on the wall, the climber is simply suspended on the rope system and held by the belayer and can be lowered, *with control,* to a work position or the ground at any time.
Additional friction may be provided by a second loop of rope around the top redirect anchor if it is a belay bar, and the climber may be adequately supported by the counterbalance of the belayer's weight. If a counterbalance is not sufficient to maintain the attended belay, the belayer may choose to also connect to an anchor at floor level to maintain position. If the climber may be suspended for a period of time, the attended top-rope belay may be provided directly from an appropriate anchor.

2. Lead climbing belay systems

While top-rope climbing systems require a rope system to be installed through an anchor at the top of the climbing zone, lead climbing systems are used to control the fall hazard for a climber progressing from the floor upwards on a climbing structure, with a series of engineered protection anchors and connectors pre-installed on the climbing structure for this purpose. One end of the dynamic rope is attached directly to the lead climber. The belayer maintains control of the rope with a belay device and feeds rope into the system. As the climber ascends, the belay rope is installed through a series of engineered anchors and actively attended by the belayer, so that the potential fall hazard is continuously managed by the climber and belayer. *Because the climber may fall from above an anchor point, in lead climbing systems there is the potential for some impact forces on the climber, anchor, and belayer.*

Based on the climbers' risk assessment, the belayer may be unsecured to allow for a dynamic response to a lead climber's fall, or if the belayer may not be able to maintain adequate control, the belayer may be secured to a ground anchor and pre-positioned in-line with the anticipated direction of loading.

In either top-rope or lead climbing systems, the climber may use an additional positioning lanyard to support his/herself directly, supplemental to the belay system.

D. Industrial Fall Protection Systems

Industrial systems incorporate engineered energy absorbers to minimize the potential impact force on a falling worker.

1. Fall Arrest Lanyards

Fall arrest lanyards incorporate two lanyards with large-opening reinforced gate connectors (designed for unpredictable loading when connected to structural anchors) and connected to the worker with a shared energy absorber in a 'y' shaped configuration. In the event the worker falls, the energy absorbing lanyard is designed to extend, reducing impact force on the climber, but adding to the fall distance and potential impact with the climbing structure. Fall arrest lanyards provide the worker with a means of continuous attachment to an appropriate anchor and allow for flexible progression in any direction

through climbing structures. However, care must be taken by the worker to select compatible anchors and continuously manage the potential fall distance and clearance, as fall arrest lanyards do not protect against hazardous impacts to the structure. Additionally, an incapacitated worker suspended on a deployed fall arrest lanyard will need to be raised, transferred onto a new system, and then released from the lanyard for rescue, which can make the rescue more complicated and time-consuming.

2. Temporary Lifelines

Temporary lifelines may be installed and used in a horizontal or vertical configuration to provide continuous fall protection for workers.

a) Vertical Lifelines

Vertical lifelines or 'backup' lines in dual rope systems are installed on an appropriate anchor at the top of the work zone. An engineered mobile fall arrest device, specifically designed for this application, is installed on the vertical lifeline and allows the worker to ascend or descend as necessary. If the device is tensioned by the worker or rapidly accelerated by a worker's fall, it securely clamps onto the lifeline and suspends the worker. If an additional lanyard is used between the worker and fall arrest device, an integral energy absorber is included to minimize the impact force on a worker falling from above the attachment point. An incapacitated worker suspended on a deployed fall arrestor may need to be raised to release the device. Alternatively, the vertical lifeline may be pre-rigged for release and rescue, allowing for the direct lower of a worker suspended on a loaded fall arrest device.

b) Horizontal Lifelines

Horizontal lifelines may be installed temporarily between appropriate anchors as continuous fall protection for horizontal movement in the climbing structure. Because the wide angle of loading considerably increases the potential force on the anchors, terminal anchorages must be of appropriate strength. Proper installation positions the lifeline above but within reach of the work zone, so that the worker may use fall arrest lanyards or adjustable positioning lanyards to minimize fall distance. A minimum of two lanyards (or a single 'y' shaped fall arrest lanyard) allow for continuous connection when passing intermediate anchors. Additionally, an incapacitated worker suspended on a horizontal lifeline will need to be raised and released from the lanyard for rescue.

E. Rescue Fall Protection Systems

Improvised partner or worker rescue systems will incorporate similar methods for fall protection, but system strength requirements should be capable of supporting two-person loads. Technical rescue systems used for suspending packaged litters and confined spaces typically incorporate secondary redundant ropes to protect against the risk of rope damage with higher loads under tension.

F. Equipment and Work Process Standards

Standards provide a measure of conformity of a product or work process with regards to stated performance requirements or safety regulations.

Member committees of technical experts, with representatives from industry, government and manufacturers produce draft standards, which are subject to public review and comment, then published. Standards may be harmonized among participating standard setting organizations, countries, states or provinces.

Standards are typically voluntary- *unless* specified or required by a regulator, insurer or employer. Conformity with equipment performance standards is verified by a qualified and independent testing laboratory, most often Underwriter's Laboratory (UL) in North America. Conformity should be verified in the manufacturer's product information and should be visible in the original manufacturer's marking on the equipment.

PPE used for fall protection and work-at-height in climbing facilities may be qualified by meeting the equipment standards specified for:

- climbing equipment, as indicated by UIAA or EN standards;
- industrial fall protection equipment, as indicated by ANSI, CSA or EN standards;
- technical rescue equipment, as indicated by NFPA or EN standards;
- artificial climbing wall structures, as indicated by CWA or EN standards.

G. Standard Work Practices

Work practices may also be standardized by an industry trade association. The CWA Work-at-Height Certification Standard identifies accepted practices and procedures developed by consensus among a group of experts, equipment manufacturers, and climbing wall operators. The CWA Work-at-Height Certification Standard also draws upon accepted work practices and standards used in:

- commercial and institutional mountain guiding programs;
- commercial aerial adventure parks standards for training and certification;
- industrial rope access standards for worker training and certification;
- commercial arboriculture standards for training and certification; and
- general industrial fall protection.

IV. Risk Management for Work-at-Height

As a climbing wall worker, you must be aware of the risks involved when working at height. Risk is defined by Webster's dictionary as the "possibility of loss or injury." For a climbing wall worker, risk may include: medical expenses, loss of income, injury or death (you or someone else). When working at-height, the question is not necessarily if you will face a risk, but rather how often and with what consequences. Risks must be assessed by the climbing wall worker each and every time he or she works at-height.

Applied risk management is a proactive approach to preventing or reducing all types of incidents, injuries, losses or potential losses (i.e. reducing frequency, severity, or both frequency and severity of an incident). Practically speaking, a risk management system can be thought of having three aspects:

1. identification, description, and prioritization of risks and hazards (the Job Hazard Analysis or Job Safety Analysis)
2. intervention or mitigation, (the Fall Protection and Rescue Plans), and
3. monitoring (administration, management, and process improvement)

The first aspect of risk management, identification of risks, is important because it dictates what you will be occupying your time with as a climbing wall worker. It makes sense to focus some effort on identifying, describing, and prioritizing the most likely and the most severe types of risks you will face. Accurately identifying and prioritizing risks in your workplace will be the key to a successful risk management program.

A. Fundamental Risk Management Strategies

Once risks have been identified, it is time to intervene or mitigate the risks you might face. There are four basic strategies generally employed to address risks. These strategies are at the heart of practical risk management: 1) elimination, 2) reduction or mitigation, 3) transfer, and 4) retention.

Elimination. Some risks can be eliminated by avoiding or discontinuing a work practice altogether. Risks that are deemed to be too great or "unacceptable" should be eliminated. Eliminating risks involves identifying occurrences beforehand and modifying or curtailing your activities accordingly. An example of this strategy might be prohibiting working from the top rung of a portable ladder, forbidding the use of certain techniques (e.g. a body belay), or eliminating the use of certain equipment under specific circumstances.

Reduction or Mitigation. Many risks cannot be eliminated, some are unpredictable (e.g. earthquakes or "acts of God"), and some are inherent – they just come with the territory. Inherent risks are those that cannot be eliminated without fundamentally changing the nature of the work or task. Many work-at-height risks are inherent, they are obvious and unavoidable. For example, if you climb, you can fall. If you fall, you can get hurt or killed. Falling is an inherent risk of working-at-height. Therefore, taking steps to minimize the risks by defining appropriate work practices for certain tasks is important.

Transfer. Transfer is a strategy that attempts to re-allocate financial or legal risk to another party by means of a contract or some form of agreement. Examples include: purchasing insurance contracts such as workers' compensation insurance, health insurance, or short and long-term disability insurance for

employees. Another example might include employing legal documents, such as exculpatory agreements, that employees must sign before they climb in the facility after work. Transfer is a strategy of spreading the risk around or attempting to give it to someone else.

Retention. Retention is the strategy of keeping of risk, either in whole or in part. For example, one might understand the risks associated with a work task, such as inspecting the back of the climbing wall, and continue to do it regardless of the risks. Presumably there is some compelling purpose, rationale, or justification for retaining the risk – some benefit - such as the safety and enjoyment of your patrons. As a business owner or climbing wall worker, you want to be clear with your employees or colleagues regarding the risks they face and what they should be responsible for in managing those risks. The key point is that one is intentional about the risks one is willing to retain.

B. Risk Reduction

Arguably, the most important strategy for a climbing wall worker is the strategy of risk reduction or mitigation. We spend most of our time thinking about how to reduce the risks to our employees, our colleagues, and ourselves. We can intervene effectively to address workplace risks. Risks that cannot be eliminated can be managed by minimizing the frequency and/or severity of incidents or close calls. A good example of this strategy might be making sure that there is a robust staff training program in place for new employees or prescribing the use of certain types of equipment or access techniques for specific job tasks because the risks associated with the equipment and the access techniques are well understood and the interventions are effective.

The most important risk to mitigate in a work-at-height setting is a 'fall.' A fall in this setting, is: 1) involuntary, 2) has little or no means to reduce the force of impact, and 3) has a hazardous, or potentially hazardous, landing.

C. Job Safety Analysis or Job Hazard Analysis

All work tasks in a climbing facility begin with a Job Safety Analysis (JSA) or sometimes called a Job Hazard Analysis (JHA), which includes:

- Identification and description of the work tasks in the facility where the workers may be exposed to a fall (or falling object) hazard, and
- Identification and management of the appropriate administrative controls, training, protective equipment, and access methods the Authorized and Competent Wall Workers will use to perform the work.

See Annexes C and D for a sample Job Hazard Analysis forms.

D. Hazard and Work Zones

In the Job Safety Analysis, the Qualified Wall Worker should identify the hazard zone - the area where any person or equipment may be exposed to the hazard of a fall or a falling or dropped object. Travel through this area should be restricted with a temporary barrier, for example portable stanchions with flagging or traffic cones, and signage or even an attendant in high traffic work zones. This area is also sometimes referred to as an exclusion zone.

Climbing wall workers may then use one or several access methods in combination to position in the work zone - the area in which the work task will be completed. Examples of work might include: setting

a climbing route, maintenance work on an air filter or a light fixture in an elevated position, or installation or inspection of the climbing wall structure itself.

Due to the risk of falling or dropped objects, workers should wear PPE (for example, helmets) in the hazard and work zones, whenever persons and/or materials (for example tools, hold buckets and volumes) are raised more than 2M (6 ft) above the floor or above other workers.

E. Fall Protection Hierarchy

Once the Job Safety Analysis or Job Hazard Analysis has been completed, the Written Fall Protection Plan- administered by a Qualified Climbing Wall Worker - will prescribe progressive control methods for accessing a work zone to protect against the fall hazard as either the exposure and/or consequence increases. This is known as the Fall Protection Hierarchy:

1. **Elimination or Substitution**. The Qualified Climbing Wall Worker must first consider if the fall hazard can be eliminated, removed or substituted. For example, if you don't need to climb to complete the task – don't climb -- change the light bulb with an extension pole. If you can complete the work, or some of the work, at ground level do so. If you can use a lift for the work instead of climbing, it might be a better option.
2. **Passive Fall Protection**. Second the Qualified Climbing Wall Worker should consider if passive fall protection, such as a physical barrier, guardrails around unprotected edges, or covers over holes a person could fall through would address the risk. Passive fall protection involves isolating the worker from the hazard.
3. **Fall Restraint or Travel Restraint**. Third the Qualified Climbing Wall Worker should consider the use of travel restraint or fall restraint systems to restrict the workers' range of movement, so they cannot reach an edge and fall. Travel restraint systems require the use of PPE and training.
4. **Fall Arrest**. Fourth, the Qualified Climbing Wall Worker should consider the use of suspension, positioning, attended belay, auto belay or fall arrest systems – the use of PPE to prevent or arrest a fall within acceptable force and clearance margins. These systems stop a fall after it has begun and require the use of PPE, training and rescue planning.
5. **Administrative Controls**. Lastly, the Qualified Climbing Wall Worker should consider what administrative controls exist to manage work practices and procedures to increase a worker's awareness of a fall hazard or safeguard workers. Administrative controls are preventative measures taken to reduce the likelihood of a fall, but do not necessarily provide a physical or positive means of protection from a fall, examples include warnings, signage, training, limiting work hours at height, alarms, etc. See Annex E for a summary of the fall protection hierarchy.

F. Engineered Controls

The hazard may be controlled with an engineered solution, for example the use of a mobile elevated work platform or lift to position a worker for routesetting on overhanging terrain or where the wall is stripped clean of holds. Engineered controls may also be 'collective' protection for all workers. For example, the employer may install a permanent ladder with a vertical lifeline that any worker may use to access an elevated work zone behind the climbing wall structure.

If the hazard cannot otherwise be managed, individual workers will use Personal Protective Equipment and fall arrest systems to control the fall hazard. For example, climbing wall workers may use rope systems for an attended belay, suspension, fall arrest or supplemental work positioning for most tasks on the climbing structure.

V. Technical Skills

The fall protection and work positioning systems identified in the CWA Work-at-Height Standard are qualified by similar applications and standard work practices used in commercial climbing, arboriculture, tower and rope access industries.

Before applying these technical access and rescue skills, Competent Climbing Wall Workers should master a baseline of technical proficiency, including the ability to:

- Identify and construct multiple component, equalized, and focal-point anchors capable of supporting multi-person rescue or material loads.
- Assume or escape an attended belay system and transfer the loaded belay to an appropriate anchor in a releasable configuration.
- Ascend and descend on an anchored and compatibly designed rope system, using improvised and/or mechanical devices and maintaining continuous attachment to the rope system while minimizing fall distance and impact loads.
- Apply improvised and mechanical advantage rope systems for worker, tool, and material positioning, as well as assisted rescues of workers who may be entrapped or suspended by a fall protection system that requires a 'pickoff' or a 'raise and release' to disconnect them from the system.

A. Anchor Construction

The CWA standard specifies the use of anchors capable of supporting a minimum of 'twice the anticipated load.' For anchors used for positioning, suspension, attended belays and improvised rescues, this may be as much as 3000 pounds (13.3 kN) for industrial fall arrest systems, this should be 5000 pounds (22.2 kN). Installed anchors should be specifically designed and engineered for life safety applications and accessible for regular inspection.

The climbing wall worker should be able to identify the basic components of climbing wall construction. Climbing hold anchors ('T-nuts') installed only through the surface sheathing material are not of sufficient strength for life safety purposes and should not be used to suspend or rescue workers.

Engineered and inspected anchorages of verifiable strength may be used alone. Single anchor points whose strength is estimated or less than required strength, should be equalized together to distribute the load and to minimize the potential of accidental disconnection from a single anchor point, particularly in systems that are repeatedly loaded and unloaded.

Acceptable anchors on the front of the climbing wall include the designated protection anchor points which are connected to engineered structural components behind the wall. These are to be assembled according to the engineer's design, the manufacturer's specifications and inspected regularly by the wall operator.

In facilities without existing engineered floor anchors, two configurations are most commonly used to establish 'ground accessible' anchors for work or rescue:

- Serial equalization - The climbing wall worker may use the end of a rope to equalize two

protection points in series, with a figure 8 and locking carabiner on the terminal end of the rope, and an in-line clove hitch onto a carabiner on the next in-line anchor point.
- Shared equalization - The climbing wall worker may use anchor slings of differing lengths or a large loop adjusted by an overhand knot to connect two (or more) anchor points to a common, shared focal point. To distribute the load properly, the angle between the slings at the focal point should be 90 degrees or less, and not more than 120 degrees.

Engineered belay bars and similarly designed structural anchors installed by the manufacturer on top of the wall for such purposes may also be used for work and rescue anchors.

The climbing wall worker should be able to identify structural support members and engineered anchorages on the back of the wall that are capable of supporting comparable work and rescue loads. The worker should also be able to assess and protect anchor material and rope systems from damage due to exposed or sharp edges, using rope protection, cable slings or chain meeting comparable minimum strength standards - up to 5000 lbs. for fall arrest anchors and 3000 lbs. for positioning and suspension anchors. Examples of anchors behind a climbing wall include:

- Encircling junctions at structural vertical posts provide the strongest anchor points.
- Anchor slings may be folded or 'basketed' around a structural member to achieve the strongest configuration, yet care should be taken to minimize slack, shifting and potential abrasion on the anchor sling.
- Anchor slings may also be girth-hitched, woven through structural members or padded with protective material to minimize abrasion and shifting under load. Anchor strength should still be assessed to meet the minimum strength requirements.

Floor anchors may also be used for worker suspension and rescue systems, provided that they are engineered, or certified life safety anchors have been installed according to the manufacturer's instructions for use, are installed in a compatible material of engineered strength, and are accessible for regular inspection and maintenance.

B. Ropes

The climbing wall worker should be able to identify and select an appropriate rope for the intended application and compatibility with other components. Workers should be careful to avoid accidental misuse of ropes for the intended application, and ropes should be clearly labeled, or easily identifiable, to avoid confusion.

Types of ropes used for work-at-height in a commercial climbing gym:

- Dynamic climbing ropes should be used with attended belay systems and can be used for suspension when there is no risk of abrasion to the loaded rope system. Dynamic ropes should be labelled as meeting the UIAA 101 or EN 892 standard for 'single' climbing ropes and may incorporate a colored 'tracer' strand for identification, woven into the core of the rope.
- Low-stretch or 'static' life safety ropes should be used for work under suspension and on lifelines to minimize the risk of abrasion caused by rope stretch, and to increase durability and efficiency. Due to the potential for higher impact forces, these ropes should not be used in lead climbing belay systems. Ropes meeting the NFPA 1983 'Life Safety' or EN 1891 standard will be indicated on the label and by an identifying 'tracer' label woven into the core of the rope.

C. Knots and Hitches

The climbing wall worker should be able to apply a variety of knots and hitches for attachment to rope safety systems. A worker should be able to:

- tie a retraced or follow through figure-eight knot to attach a worker or climber's harness to the end of the rope, or through a closed anchor point.
- tie a figure-eight on a bight to attach a worker, climber, anchor or materials to a rope with a compatible, locking gate connector.
- tie an overhand barrel-knot to attach and properly orient a locking connector to the end of a rope system for direct attachment to a climber, tools or material, or as a blocking knot on the end of a rope.
- tie an alpine butterfly knot to establish a multi-directional knotted loop for a mid-rope connection or equalize two anchor points with the rope.
- tie a clove-hitch to secure a rope to a connector in a means that is secure, but easily adjustable and releasable after disconnection.
- tie a Munter hitch on a rope and carabiner as an alternative belay method and/or as part of a releasable load transfer system.
- tie a mule-knot or slip-hitch to secure or block the rope through a belay device in a 'hands free' but readily releasable configuration.

D. Connectors ('Carabiners')

The climbing wall worker should be able to select appropriate connectors for life safety systems, and be familiar with the compatibility of different connectors, frame shape, and gate-function:

- Single point connectors used in life safety rope systems should have locking gates of either screw-type or 'auto-locking' type.
- Steel connectors with locking gates capable of withstanding 16kn (3600 lbs.) cross-loading should be used in connections to industrial fall arrest systems and considered for any attachments or applications where a connector may be unintentionally loaded across the gate, or a high degree of abrasion resistance is required.
- Connector shapes should be chosen for compatibility with other items of PPE and the intended function. For example, HMS ('pear shaped') connectors should be used to connect wider slings, and oval or HMS connectors should be used on pulleys and ascenders to minimize the risk of improper loading on the attachment point.

E. Friction Hitches and Rope Clamps

A climbing wall worker may need to establish a secure 'grip' or an adjustable attachment onto a rope that may already be under tension. The worker should be able to:

- Install a prussik-hitch onto a rope using compatible cordage.
- Install an auto-bloc onto a rope using compatible cordage or textile slings.
- Install a klemheist on a rope system using compatible cordage or textile slings.
- Install a mechanical rope grab (or 'ascender') onto a rope using compatible connectors.

F. Belay, Descent and Lowering Devices

A climbing wall worker must pass the facility belay tests and have demonstrated the effective use of an attended belay off their harness waist attachment (belay loop) for a lead and top-rope climber. The

worker may use belay and lowering devices directly off an anchor to support larger loads and should also be able to secure the brake strand of the rope in a *releasable configuration* to allow for belay escape and 'hands free' operations as necessary.

Devices available to the climbing wall worker include:

- the use of a Munter-hitch in a compatible 'pear shaped' locking carabiner. The Munter-hitch is releasably secured with the addition of an overhand slip-hitch (a.k.a. 'mule-hitch') as a blocking knot on the brake strand of the rope, just behind the loaded Munter hitch. The blocked Munter-Mule may be additionally secured with an overhand on the remaining bight of rope.
- the use of a conventional 'slot style' or 'passive' belay device (BD) for belaying, descending and lowering. This may be secured by girth-hitching the brake strand around the spine of the associated carabiner, and additionally secured with an overhand knot on the remaining bight of rope.
- the use of an assisted braking belay device (ABD) for belaying, descending, and lowering. Assisted braking belay devices used in climbing require additional securing of the brake strand to allow for hands free operation. ABDs may be secured by the addition of a blocking carabiner through a releasable slip-hitch on the brake strand of the climbing rope, just behind the device.
- industrial descent control devices (DCDs), used on compatible diameter ropes, include a designated 'locking' function. These allow for simple, effective, and releasable 'hands free' operations when the handle is returned to the locking position.
- the addition of a secondary carabiner to redirect the brake strand behind the BD/ABD/DCD to apply additional friction and control when lowering larger loads.

G. Ascending Systems

The CWW may also use assisted braking belay devices or industrial descent control devices ABDs/DCDs to ascend anchored ropes in a manner that is easily reversible and releasable. The most common method for climbing wall workers to ascend a rope is with a raise and descend system or 'RAD' using a rope clamp and foot loop in combination with an ABD/DCD. The RAD system, step by step:

- The worker installs the anchored and compatible rope through an ABD/DCD on their harness belay loop or ventral connection ring.
- The worker installs a rope clamp and foot sling onto the rope above the ABD/DCD.
- The worker may choose to also attach a lanyard to the ascender to manage the drop hazard. If a lanyard is used, it should be adjusted to keep the ascender within arm's length and above the worker. Care should be taken to avoid a potential fall onto the lanyard and ascender.
- The ascender and foot sling are pushed up the rope as high as possible.
- The worker stands up in the foot loop and pulls the loop of rope slack that is created through the ABD/DCD.
- The worker then leans back and is suspended by the secured ABD/DCD while the ascender is unweighted and progressed up the rope.
- To descend, the CWW simply removes the ascender and lowers with the ABD/DCD.

Trained rope access technicians and cavers may employ ascending systems utilizing two rope clamps for faster ascent. However, these systems require more complex transitions to descent and more complex rescues. These are taught in standard rope access training programs affiliated with either SPRAT or IRATA. Workers seeking these technical skills should consider participating in a formal rope access

training program. *The CWA standard specifies workers use only RAD style (descender-based) systems to remove these relatively complicated transitions from standard work practices in the climbing gym.*

H. Belay Transfers

For situations where the climbing wall worker may need to provide a lead belay to another worker for access or rescue, but then support the additional weight of a two-person lower, or the additional load of larger materials like an auto belay device, a full hold bucket, or a large volume, the climbing wall worker may belay directly off an anchor, such as a floor anchor, in-line with the direction of pull when loaded. The device may be positioned in front of the belayer with an additional carabiner to facilitate handling, but in such a way that the belayer can be disconnected to escape the system once loaded.

The climbing wall worker must also be prepared to 'take over' and assume the belay of any climber should the belayer become unable to perform their duty; or for example, become overwhelmed by an injured lead climber or a medical emergency. To perform a belay 'take over,' the worker:

- selects a bight of slack rope below the belayer's brake hand
- installs the slack rope into their belay device and connects their belay device with a carabiner to their own belay loop
- secures the brake strand of the rope behind their belay device with a releasable slip-hitch, blocking knot or hand wraps
- installs a friction hitch or ascender - with a shoulder length sling or foot loop- onto the loaded climber's rope strand above the original belayer's device
- either stands in the foot loop or connects it to their own harness belay loop and applies full body weight to assume the load of the suspended climber
- this should slacken the rope between the friction hitch or ascender and the worker's secured belay device, allowing the original belayer to disconnect from the system
- the worker then slowly releases their body weight on the friction hitch or ascender and assumes the belay on their own belay device.

This process may also be used to transfer the belay from an unsecured belayer to an accessible direct anchor belay. Larger loads may not be transferrable by body-weight alone and may require the use of a releasable lanyard to transfer the load from a securely tied-off belay device to a direct anchor.

A cordelette is a dedicated piece of 6 to 7 mm diameter life safety cordage which is 15 to 20 feet in length and is used with an HMS (pear shaped) carabiner. A worker may use a cordelette to 'escape the belay' and transfer the load directly to an anchor. To perform a belay 'take over' with a cordelette and carabiner the worker will:

- Position themselves or the belayer within reach of a suitable anchor.
- Secure the brake strand of the loaded belay device for hands-free operation.
- Select a cordelette with a compatible HMS ('pear shaped') locking connector.
- Attach the cordelette with a friction-hitch (for example, prussik or klemheist) to the loaded strand of rope, just above the belay device
- Attach a connector to the chosen anchor and secure the other end of the cordelette to the connector with no additional slack and a secured, releasable hitch (for example, a secured 'Munter-Mule' hitch)
- The original belay device may now be carefully released, and the load lowered onto the

cordelette with Munter-mule
- Before removing the original belay device, a secondary belay device or a Munter-mule hitch is installed on the brake strand of rope and (releasably) secured to the anchor.
- Once secure, the original belay device and the attended belay may be removed from the rope system.
- With the load secured by a releasable hitch, the worker may now perform a controlled lower or install a raising system as circumstances dictate.

An adjustable and releasable positioning lanyard (for example, the Petzl Grillon) and a rope clamp (ascender) may also be used as simple mechanical solution for the same controlled transfer of a loaded belay in place of the friction hitch, cordelette, and connector.

I. Hauling and Mechanical Advantage Systems

Climbing wall workers may use several hauling and mechanical advantage systems for hauling, raising, positioning, and lowering. Pulleys with integrated rope clamps are simple and effective tools to raise or position a worker, equipment, tools or volumes, or to assist in the raise and release ('pick off') of an entrapped or suspended worker or climber.

Climbing wall workers using hauling systems to move people or materials at height should consider:

- In simple systems, changes of direction on the object being raised/lowered act as a pulley and will offer mechanical advantage.
- In simple systems, changes of direction on the stationary anchor offer no mechanical advantage and are simply a change of direction (and source of friction.)
- A dedicated rope system should be used to suspend and position the worker. Tools and materials weighing more than 25 pounds should be suspended on a separate rope system.
- In order to avoid accidental misuse, facilitate redundant connections and have resources readily available for rescue, both rope systems for the worker and materials should be designed for life safety purposes.
- Access to the entire 'hazard zone' - where others in the facility may be exposed to dropped or swinging objects, should be restricted.
- Mechanical advantage systems may increase forces on anchors and require identifying appropriate strength anchorages.
- Hauling systems lifting anything above 2M (6 feet) should employ a method of progress capture while raising, allow for secure 'hands free' suspension, drop-proofing, and a means for controlled lowering on descent.

1. 1:1 Haul Systems Using an Anchored ABD or DCD

The mechanism in the device acts as a ratchet for progress capture, can be tied off and/or locked for 'hands free' operation, and enables a simple reversal to lower or descend at any time. However, the additional friction in the system causes an observable reduction in efficiency.

An example of this system uses a life safety rope and a compatible locking descender (DCD), or a longer adjustable positioning lanyard, like the Petzl Grillon. This system is best used to raise, hold and lower light loads (for example, less than a quarter bodyweight), such as tools or volumes. Two or three of these systems may be combined in a 'cross-haul' to position objects in space. When lowering larger loads directly off an anchor, the brake strand should be redirected through an additional carabiner on

the anchor.

2. 1:1 Haul Systems Using a Progress-capture Pulley

The substitution of a pulley and rope clamp - often combined into a single device - is noticeably more efficient for hauling and allows a worker to raise tools or materials by pulling rope through the pulley with a rope grab or by simple counterbalancing with a foot sling or bodyweight. However, this system is harder to reverse, requiring coordinated tension on the tailing strand and manipulated release of the rope clamp by hand to lower. A longer lower may require a complete load transfer to a descender or belay device.

This is an efficient way to raise light to moderate loads (for example, less than half-bodyweight) that should not need to be lowered, such as a small volume, hold bucket or an auto belay device being installed.

An example of this system uses the Petzl Pro Traxion progress capture pulley, which also allows installation of the rope through the device without removing it from the anchor, minimizing the risk of dropping.

3. 2:1 Mechanical Advantage Systems Using a 'Drop-loop'

In this system, the end of the rope is anchored at the top anchor and a loop of rope is lowered and attached to the load below- through a locking carabiner or pulley and redirected back up to progress capture at the top anchor (tended by the worker.) An alternate version of this system places the ADB/DCD on the load, and the progress capture pulley on the anchor. While this alternate version is less efficient for hauling it keeps the descender in reach of the worker. Note however that the rope length in this system must be twice (2x) the total height of the work zone. This system is an efficient and reversible means of raising and lowering a load but does require worker positioning at the anchor to make adjustments and transitions.

A variation of the 2:1 drop loop system can be used for a 'bottom up' work plan: The worker installs a rope clamp on the dedicated tool and materials rope. The tail end of that rope is attached to the ascender and used to build a 2:1 drop loop off of the ascender and connected to the load through a progress capture pulley (for example, a Petzl micro-traxion) and then back up to a redirect carabiner (or ABD/DCD) at the ascender. The two ascenders in the system allow the worker to alternately raise the load and then raise the drop loop system as the worker progresses upwards.

4. 3:1 Mechanical Advantage Systems Using an Anchored ABD/DCD

To raise moderate loads directly through an anchored ABD or DCD, the additional friction through the device may be overcome by adding more mechanical advantage. A rope clamp or friction hitch is installed on the working rope in front of the ABD/DCD. The brake strand behind the ABD/DCD is then redirected forward and through a pulley point (either a carabiner or compatible pulley) and pulled back towards the anchor in the direction of work.

With access to a ground or floor-level anchor, this is the easiest way to turn an existing top-rope climbing or worker suspension system into a raising system, and is easy to reset, install and remove. Note that top-ropes with an additional friction wrap over a top anchor bar will have considerable friction, negating much of the mechanical advantage.

5. 4:1 Mechanical Advantage Systems

A 4:1 mechanical advantage system (often pre-rigged as a ‘set of fours’) is constructed similar to a 2:1 system but uses double pulleys at each end of the system, resulting in twice the mechanical advantage. These may be available or improvised as a separate ‘bolt on’ haul system with attachment holes for connectors, rope clamps or DCDs at each end and include an integrated progress capture rope clamp or friction hitch.

These systems may be used directly to provide mechanical advantage for short raises, for example to position an auto belay for attachment to an anchor, or for raising a suspended worker for rescue. These systems may also be used in serial connection with an ABD/DCD as part of a pre-packaged ‘raise and release’ rescue system.

VI. Access Methods & Work Positioning

The Competent Wall Worker (CWW) is responsible for the supervision and practical implementation of work tasks in accordance with the written fall protection plan. As the designated technicians in a climbing facility, climbing wall workers should be capable of accessing all elevated work zones and performing both self - and partner rescue from these zones.

A. Principles for the Selection of Appropriate Access Methods

The access methods available to climbing wall workers are based on industry work practices used in professional recreational climbing facilities, industrial rope access systems, and industrial fall protection systems. The Qualified Climbing Wall Worker may choose one method or specify a combination of access methods to reach elevated work zones.

Selection of appropriate access methods prescribed by the Qualified Climbing Wall Worker is based on these principles:

- *Continuous protection of the worker*. For example, on easier climbing terrain, and on the backside of the climbing wall structure, the worker may be able to maintain self-support with three points of hand & foot contact at all times, with a horizontal or vertical lifeline providing continuous supplemental fall protection. Likewise, the use of two legs on a fall arrest lanyard allow the worker to maintain continuous attachment to the system while progressing past an intermediate anchor.
- *Redundant protection for the worker* when there is a considerable risk of abrasion or damage to the primary suspension rope or lanyards. The QWW's and CWW's risk assessment includes the use of dual rope systems or supplemental lanyards to allow for redundant protection when using suspended rope systems around sharp edges, cutting, grinding and installations.
- *The location of the work zone*. Work on the front of the wall may be best accessed with climbing or rope ascent/descent systems. Work on the back side of the climbing wall structure may require industrial fall protection systems used in tower climbing, for example the use of energy absorbing lanyards with large auto-locking connectors, or a temporary vertical lifeline with a mobile fall arresting device.
- *The characteristics of the work zone* (i.e. 'terrain'). For example, complex overhanging walls with roofs may require different methods than a simple vertical wall. In addition to the more strenuous progression, ropes used for suspension, fall arrest and attended belays may be exposed to abrasion when repeatedly loaded (and unloaded) over sharp edges, holds, and roofs, or when positioning large volumes. The backside of the climbing structure is an example of where fall arrest lanyards or adjustable positioning lanyards may provide more versatile protection for structure climbing.
- *The worker's level of training and experience*. Workers must be trained in the prescribed access methods as determined by the Qualified Wall Worker. New workers may be more competent with basic recreational climbing systems for access, such as attended top-rope or lead belays, with the direct assistance of a partner, while more experienced workers may be trained to work using aid-climbing methods or the use of industrial dual rope systems on more complex tasks and work zones.
- *The inventory of appropriate PPE available to the worker*. The Qualified Climbing Wall Worker will prescribe PPE in that is compatible with the access methods described in the fall protection

plan. Workers must be trained in the use of the PPE. Choice of access method may be dictated by available equipment, and/or documented training in the use of the PPE.

- *Ease of rescue in the event of an incident*. For example, a worker that is injured or incapacitated while suspended under an overhanging arch on an anchored rope with loaded positioning lanyards may require a 'raise & release' to unweight the system and be lowered. A climber on straightforward vertical terrain ascending a single anchored rope may be easily lowered, especially if the suspension rope used for work is redirected through a top anchor and 'pre-rigged for release' at a ground accessible anchor.

Based on these considerations, the Climbing Wall Worker may use any of (or any combination of) the following methods to access a work zone:

B. Mobile Elevated Work Platforms

A mechanical lift may be used to access and position the worker in the work zone. The Qualified Climbing Wall Worker should refer to the lift manufacturer's Instructions for use regarding the prescribed use of either travel restraint or fall protection for the elevated worker. Typically scissor-style lifts use railings or travel restraint lanyards to keep the Worker within the platform, while lifts with articulating arms require fall arrest lanyards or properly adjusted positioning lanyards to protect the worker from a fall out of the platform. Workers should follow the lift manufacturer's Instructions for use, and carefully move the lift when a worker is positioned on the extended lift arm.

C. Portable and Fixed Ladders

Ladders may be used by the worker to access a work zone. Based on the worker's tasks and risk assessment, final work positioning may require transition onto rope suspension, an attended belay, or a fall arrest system.

The use of ladders is recognized and regulated specifically in federal, state, provincial general industry regulations. Workers should also follow the ladder manufacturer's instructions for use, and consider accepted industry work practices:

- When climbing or descending ladders, workers should face the ladder.
- The feet of a self-supporting portable step-ladder, up to 20 feet in length, should be placed on a level, stable surface, with a locking spreader used to maintain it an open position.
- Common stabilization practices include temporary removal of padded flooring or use of a full plywood sheet over the flooring. If not prohibited in the ladder's Instructions for use and qualified in the fall protection plan, another method employs the installation of 'foot boards' on each frame, parallel with the ladder rungs and extending wider than the ladder rails on each side.
- Mechanical lifts or rope suspension systems are recommended above step-ladder height.
- Fixed-ladders, permanently attached to the back of the climbing wall structure or building, may be used to provide access to an elevated work zone. If the Qualified Climbing Wall Worker's risk assessment identifies a fall hazard, or if the fixed ladder extends beyond a certain height (24 feet in the U.S.) fixed ladders should be equipped with a fall-arrest system, which may include appropriate anchors for fall arrest lanyards, or an engineered ladder safety system. The preferred pitch of a fixed ladder is between 75 degrees and 90 degrees. See Annex F for portable ladder safety.

D. Structure Climbing with Fall Arrest Lanyards

Climbing Wall Workers may use Y-shaped fall arrest lanyards with a common energy absorber and equipped with large connectors with reinforced auto-locking gates on each leg, for fall protection while accessing work zones using structure climbing techniques.

- Workers must be trained in the selection and compatible use of appropriate anchor points sufficient for fall arrest (5000 lbs. or 23 kN) on the structure, as indicated in the operation's Written Fall Protection plan.
- In order to minimize impact forces, fall arrest lanyards are designed to extend upon deployment. This increases the clearance requirements and the hazard of impacting the structure in the event of a fall. Care should be taken by the worker to maintain the lanyard connections as high as possible at all times. The lanyard connections should be level with or above the harness connection point.
- Alternatively, the Qualified Climbing Wall Worker may prescribe direct aid climbing in the structure or the installation of a vertical lifeline with mobile fall arrestor to better minimize potential total fall clearance (see below).
- Fall arrest lanyards should only be used on compatible full-body harnesses with dorsal attachment points designed by the manufacturer for fall arrest. Workers may also use a fall arrest harness placed over a recreational seat harness to provide appropriate attachment points for fall arrest systems.
- Note: North American (ANSI) standards specify only the use of conventional dorsal attachments for fall arrest lanyards. However, in the climbing wall setting, where there may be limited fall clearance inside the structure, dorsal attachment positions the worker for a 'face-first' fall into the structure and may be difficult for the worker to attach and detach on his or her own. Many manufacturer's sell full body harnesses with sternal (chest) attachment points designated for fall-arrest, as allowed for by certain international standards. Training in the use of fall arrest lanyards should review this distinction, and the Qualified Climbing Wall Worker may include sternal fall arrest attachments with compatible systems in the Written Fall Protection Plan if they are qualified as providing an informed, well-reasoned, and more appropriate method of control for the specific hazard.
- Energy absorbing lanyards must be deployable at all times. Care must be taken in order to allow the shared energy absorber to completely extend if loaded. While progressing, each large connector (aka 'snap hook') should be either connected to a compatible anchor point, placed on a shared anchor point along with the other connector, or left unattached. A lanyard should not be attached to the harness while the other is in active use for fall protection due to the risk of limiting the energy absorber deployment in the event of a fall.
- Workers should use the two lanyards in alternating fashion to remain continuously attached to the structure (or temporary horizontal lifeline) when bypassing intermediate anchor points.
- If the work task requires 'hands free' operation, the Worker should use an additional positioning lanyard for direct suspension. Fall arrest lanyards are intended only for fall arrest, not work positioning.

E. Temporary Lifelines

If the work zone requires regular access by several workers, the Qualified Climbing Wall Worker may prescribe the installation of a temporary horizontal or vertical lifeline, to allow several workers to access a structure with continuous fall protection.

If a temporary lifeline is used these precautions should be observed:

- Only one worker at a time should be using the lifeline for fall protection.
- Due to the wide angle of loading potentially increasing the forces, horizontal lifelines require terminal and intermediate anchors that meet or exceed 5000lbs / 23kN strength requirements, as indicated in the Written Fall Protection Plan and prescribed by the Qualified Climbing Wall Worker.
- Mobile fall arrest devices should be used on compatible rope or cable fall protection systems, according to the manufacturer's instructions for use. Fall arrestors may be connected directly to the Workers' sternal harness attachment. If a lanyard is used for extension, the lanyard must be compatibly designed for energy absorption in the event the Worker falls from above the device.

F. Auto Belay Devices

Auto belay devices may also be used to protect a worker from the fall hazard while ascending the front of the climbing wall structure to access an elevated work zone.

- Because an auto belay provides a controlled but continuous descent, the hazard zone and landing area below the worker must be clear of any obstructions or structure. Auto belays are only appropriate for use in work zones with a clear descent pathway. An auto belay should not be used in work zones where there is a possibility of entrapment.
- A supplemental positioning lanyard may be used on available protection anchors to allow for hands-free positioning, in addition to the auto belay.
- Workers must follow the manufacturer's instructions for use, including mounting instructions, regular inspection, and maintenance of the device.
- There are load limitations on auto belays which may make them inappropriate for two-person loads - for example in the case of an accompanied rescue.

G. Self-Retracting Lifelines (SRLs)

Self-Retracting Lifelines (SRLs)- which unlike an auto belay device, arrest the fall and leave the worker suspended, may be used for fall protection for structure climbing on the back of the wall, but require specific training in the raise and release of a suspended worker, and may require re-inspection and/or retirement of any fall indicators or energy absorbers activated by the arrested fall. If prescribed in a work zone, workers must be trained in the appropriate use of SRLs, and their differences from auto belay devices must be clearly understood by the wall workers.

H. Attended Belays

An attended top-rope or lead climbing belay given by a partner and utilizing existing top-rope or lead climbing protection systems and climbing surfaces, is a simple, effective away to position a worker, but does require an additional worker to belay.

The belayer may be unanchored, but if the worker will be suspended for a long period, or will assume additional weight- for example, the shared weight of an assisted climber, auto belay device or work materials, the system may be transferred to a direct anchor belay while the worker is suspended on a supplemental adjustable lanyard.

The worker can use a positioning lanyard connected to an appropriately designated wall or structure anchor, to suspend their weight and allow the belayer to slacken the belay rope (while still maintaining

continuous control.) The brake strand of the climbing rope (below the belayer's brake hand) can be installed through a compatible belay device (BD, ABD, DCD or Munter-Mule hitch) and connected to an appropriate floor level anchor. Once secured to the new belay system, the belayer can remove their initial belay device, tension the rope through the system, and assume a direct belay or secure it with either a releasable hitch, ABD or a compatible locking industrial DCD. In this method, the worker is suspended by redundant connections throughout the entire transfer.

The belayer may also use a direct belay with a compatible BD or ABD and a suitably designed anchor as the primary belay, with positioning of the anchored device by an additional carabiner in the front waist attachment of the belayer's harness. This facilitates proper handling, but the belayer should also be able to open the carabiner to 'escape' from their position in the loaded system, *without ever opening the belay device connector*.

I. Direct Aid Climbing

Direct aid climbing may be used by the Climbing Wall Worker to access work zones that are overhanging, technically difficult or lacking free-climbing holds. In compliance with the fall protection hierarchy of controls, progress and positioning is achieved by the use and continuous adjustment of positioning lanyards, with at least one connected on a suitable anchor at all times and supplemented by either an attended belay or an adjustable rope suspension system.

The Climbing Wall Worker uses the two adjustable positioning lanyards, possibly augmented by attached foot loops and/or work seats, for alternating suspension and progress. Due to the high impact forces resulting from falls onto static lanyards, the Climbing Wall Worker must be careful to continually adjust the lanyard lengths and remain in suspension. *CWWs should be aware that not all adjustable positioning lanyards are rated for life safety, and a single adjustable lanyard without an energy absorber is not considered fall protection. An additional belay or suspension system should also be used when aid climbing.*

Supplemental fall protection can be provided by either a separate attended belay rope, suspension rope or an auto belay device. For the single worker ascending alone, fall protection can be provided by continuous adjustment of a dynamic climbing rope, appropriately anchored at floor level and installed through an ABD/DCD connected to the worker's waist harness attachment and redirected through intermediate anchor points as the worker ascends, as in lead climbing systems.

It is important for the worker to follow manufacturers instruction on the use of the ABD/DCD, as most belay devices are specifically contraindicated by the manufacturer for self-belay, and there is a risk of higher impact forces and improper loading if the worker falls onto a slackened rope through an ascender or belay device.

J. Doubled Rope Technique

In Doubled Rope Technique, known as 'DRT' in arborist rope systems, a single worker may use an existing top-rope system for a counterbalanced ascent, by securing one end of the rope with a figure-eight knot to their waist harness attachment and installing the redirected strand through an ABD or DCD, also connected to their waist attachment. The worker may use an ascender and foot loop on the strand above the ABD/DCD to assist in upwards progress, and as slack is pulled through the ABD/DCD, the suspended worker ascends.

- The DRT system requires moving double the length of rope for progress and can also be inefficient due to friction. However, it may be used in facilities with no floor level anchors, no intermediate protection anchors, and only existing top-rope climbing systems.

- A preferred alternative method uses a retrievable or 'pull-through' hitch through a butterfly knot to secure a single strand of rope but allow retrieval with the other strand (see below).

K. Single Rope Suspension

The most commonly used access method utilizes a compatible low-stretch ('life safety') rope securely anchored with a figure eight knot either at the top of the work zone or redirected and secured to an accessible ground level anchor - potentially in a releasable configuration. The Worker ascends and descends on the anchored rope using 'RAD- raise and descend' technique on an ABD/DCD in conjunction with a tethered handled ascender, and a foot loop.

CWA Work-at-Height Standard work practice allows the use of belay device or descender-based systems that: completely capture the rope, are readily releasable and reversible, and do not require transitions for descent. (If necessary, these skills are specifically covered in standardized industrial Rope Access training programs.)

- As specifically indicated by some manufacturers and in accordance with the CWA Work-at-Height Standard, single rope suspension systems are not to be used for 'self-belay.' The worker should remain in continuous suspension, or if using supplemental positioning lanyards, the worker should allow no more than two feet of slack above the ABD/DCD in the suspension system. Forerunning of climbing routes should be accomplished as a separate work task with an attended belay system. If working on an attended belay, a supplemental positioning lanyard can be used for 'hands-free' positioning as necessary.
- If the rope under tension is subject to abrasion, rope protection should be applied at appropriate places. A low-stretch 'life safety' (NFPA 1983) rope allows more efficient progression and is less subject to abrasion with extension and contraction.
- A positioning lanyard connected to the handled ascender ensures a secondary redundant connection to the suspension rope and minimizes the falling object hazard.
- In overhanging or more complex work zones, climbing wall workers may also use adjustable positioning lanyards to assist with positioning or provide secondary redundant connections to life safety anchors (for example, when using tools or reconfiguring rope systems.)
- The single rope is dedicated exclusively to the suspension and positioning of the worker. Tools and materials should be suspended on a secondary life safety line.
- If the work task requires cutting or grinding tools, or positioning of materials around ropes under tension, the use of a dual rope system (see below) should be considered.

L. Dual Rope Systems

Dual rope systems offer the highest degree of security for the climbing wall worker, employing two life safety ropes in parallel- with one rope dedicated exclusively to the suspension and positioning of the worker, and a second life safety rope providing continuous and redundant fall protection for the worker, either through the use of a mobile fall arresting device, or by providing a secondary means of attachment for the worker.

- The dual rope system offers a much higher degree of security if there is a risk of abrasion to the primary suspension rope, or when using cutting or drilling tools, or when positioning large volumes adjacent to ropes under tension.
- Both strands of rope should be installed through directional anchors as necessary to minimize the pendulum potential should either rope be damaged. Pendulum potential should be limited

to no more than 6 ft (2M) from the plumb line.

- Attachments to the secondary rope should include a compatible energy absorber designed to be minimize impact to less than 2kN on the worker. If used as a secondary direct attachment point, an adjustable lanyard provides a means of continuous adjustment with minimal slack (under 2 feet), while remaining below the attachment point.
- An activated fall arrestor or a loaded secondary attachment suspending the Worker will require a 'raise and release' to lower a worker. If prescribed, workers must be trained to perform rescues from dual rope systems but may take advantage of adjacent anchors and rope systems to simplify the process.

VII. Rescue

As outlined in the Written Fall Protection Plan, workers trained in respective access methods should also be trained in the accompanied and unaccompanied rescue of workers from the work zone. These techniques may also be used to assist customers in the climbing facility. Examples of work scenarios requiring rescue might include: injuries or impairment of workers due to grinding or cutting tools, physical damage to a workers' rope system from tools or material positioning, medical or physical emergencies while in the work zone, or improper use of a belay system resulting in loss of fall protection (for example, accidental disconnection from a belay system.)

A. Rescue Approaches

In choosing the appropriate rescue methods, the Qualified Climbing Wall Worker may consider a hierarchy of rescue approaches, with increasing levels of control:

1. Rigged-for-Release System

A r*igged-for-release system* uses a secured Munter-hitch, BD or ABD to anchor the worker's suspension line(s), often redirected to accessible floor level anchors. An authorized and trained worker should be able to release the device and lower the worker to the ground if necessary. *Note that this system requires three times (3x) rope length as measured from the ground to the anchor to complete a full lower from any height.* An alternative solution is to tie a compatible second rope (2X height of wall) to the existing line and position the knot just in front of the secured ABD or DCD. This allows enough slack for a complete lower from full height.

2. Assisted Rescue

In an *assisted rescue*, the injured worker is able to self-rescue, but requires a worker to assist, for example by providing a secondary belay or lowering system, or positioning a secondary rope for belay, lower, or descent.

3. Unaccompanied Rescue

In an *unaccompanied rescue*, the injured worker may also be able to assist in the installation of a secondary rope system (if necessary), and the release or disconnection of their primary protection system before being lowered. The unaccompanied injured worker should be free from entrapment hazards, or able to manage his/herself, while being lowered.

4. Accompanied Rescue

In an *accompanied rescue*, the injured worker is incapable or unable to assist or effect a self-rescue, and the climbing wall worker must first access the injured worker, and then improvise and implement a rescue system. Because the injured worker is incapable of assisting, these systems may require the direct release or pickoff of the worker, and onto the worker's shared ABD/DCD before lowering or descending.

B. Requirements for Rescue Systems

Rescue systems used by climbing wall workers should meet the following requirements:

- Be capable of supporting a rescue load.

- Be capable of stopping and supporting the load in a 'hands-free' and releasable configuration, at any time.
- Be capable of reversal and used for either raising or lowering.
- Require additional friction to control a two-person load with a redirect on the brake strand of the belay rope.

C. Rescue Kits

Rescue equipment may incorporate existing rope and climbing belay systems or may be provided as pre-packaged kits and placed in a central, accessible location available to all workers. Pre-packaged rescue kits typically incorporate a sufficient length of low-stretch life safety rope of sufficient length for the work zone and the rescue technique, a locking industrial DCD, and a pre-packaged 4:1 pulley system.

D. Rescue with climbing ropes

Using the existing top-rope and lead climbing equipment that is readily available provides the simplest means of accessing and lowering an injured worker. Direct anchor belays should be used to support the load (or a load transfer may be required) and allow for improvised 3:1 hauling systems. Note that dynamic climbing ropes elongate considerably, and additional friction wraps on the top belay bar may require significant mechanical advantage and/or rope progress through the system before the load is effectively raised. In many instances, the worker may be able to release their own positioning lanyard, or lower on their own ABD/DCD to escape their initial system, and a raise is not required. Pre-packaged 4:1 pulleys may also be used with a rope grab on the rope 'in parallel' with the DCD for repetitive hauling, with progress capture through the DCD.

E. Unaccompanied Rescue with a 4:1 Mechanical Advantage System

Rescue kits may be used 'in series' for an unaccompanied rescue:

- The progress capture end of the 4:1 system is connected to an appropriate anchor point above the suspended injured worker (or redirected from the ground through a pulley installed on an anchor above the injured worker.)
- The rope is installed through the DCD and connected to the lower attachment point on the 4:1.
- A connector is tied securely to the working (load) end of the rope and enough slack is introduced to pass the connector (possibly with a rigid 'stick-clip' pole or assisted by another worker if necessary) to the injured worker and securely attached to the injured worker's waist or chest harness attachment point.
- The 4:1 system is fully extended, and slack is removed from the working line until taught on the DCD, and then the DCD is secured in locking position.
- The 4:1 system is compressed, until either fully retracted and there is no more slack in the system or the injured worker is lifted and suspended on the new system.
- The injured worker may then be disconnected from their primary suspension and positioning and/or fall arrest system.
- - A secondary 'tag line' may be connected to the injured worker and used to guide them around potential entanglement in the structure
- In extreme circumstances, such as impalement on a connector, the climbing wall worker may choose to cut the lanyard under tension instead of a 'pickoff.' Ropes under tension may cut very easily, and there is a risk of serious error under duress. 'Cut aways' should only be considered as the final option, and the worker should verify the continued security of the primary belay system and confirm the proper action with the belayer *before implementing* a cut away.

F. Accompanied Rescue with a 4:1 Mechanical Advantage System

Rescue kits may also be used in two stages for an accompanied rescue:

- The terminal end of the rope is connected to an appropriate anchor above the injured worker.
- The DCD is installed in the correct orientation on the rope and connected to the climbing wall worker's waist harness attachment.
- The climbing wall worker fully extends the 4:1 system and connects it to the spine of their DCD connector, with the progress capture pulley at the unattached end.
- The climbing wall worker descends the rope until just able to reach the injured worker's waist or chest harness attachment, stops and locks the DCD. Proper adjustment and minimal slack in the system is important, as too much slack in the system- especially with dynamic ropes- may limit the effective raise of the 4:1 system.
- The climbing wall worker hauls upward on the 4:1 system, raising the injured worker until also suspended from the shared DCD in a 'tandem' configuration. The injured worker may be additionally secured with a second lanyard.
- The climbing wall worker disconnects the injured worker's attachments to their original suspension or fall arrest system.
- The climbing wall worker redirects the brake strand of the rope through a lower carabiner for additional friction, and uses the handle to descend with control, navigating obstacles as necessary.

G. Confined Spaces

In many climbing facilities, the interior space behind the wall, accessed periodically for installation, inspection and maintenance of the climbing wall structure and climbing anchors, could be considered a 'non-permitted' confined space.

OSHA defines a 'confined space' as large enough for an employee to enter and perform the assigned task but has limited or restricted means of entry or exit and is not designed for continuous occupancy by employees. Examples of confined spaces include underground vaults, storage bins, tanks, trenches, tunnels, pits, vessels, silos and manholes. 'Non-permit' confined spaces typically do not contain an atmospheric or environmental hazard that may cause serious physical harm or death to the personnel entering them. Confined spaces that also present a dangerous atmospheric or environmental hazard - for example, large oil tanks or grain silos, require a Written Confined Space Plan and a permitted entry process controlled by a trained supervisor.

Work tasks behind the wall may require structure climbing to access to an elevated work zone, or edge transitions to the exterior wall. The nature of the work, for example using edge tools or grinding equipment, poses some hazards to the worker's protection systems. There may also be a fall hazard while accessing an elevated work area behind the wall and the potential difficulty of properly stabilizing, packaging, and removing an injured worker should be considered.

In order to minimize the likelihood and the consequence of injuries to workers, the Qualified Climbing Wall Worker should outline a hierarchy of controls in the Written Fall Protection Plan for access and rescue 'behind the wall':

Administrative controls can be used to restrict access only to trained and qualified employees:

- All Authorized Climbing Wall Workers should be trained in awareness of the confined space

hazard behind the wall and should be trained to activate the rescue plan in the event a worker gets injured behind the wall.
- Climbing wall workers performing work tasks behind the wall should consider working in teams or be in regular communication with an authorized worker on site, who is aware of the worker's location and scope of work.
- The Rescue Plan should identify the availability and technical capabilities of local emergency response services in the event of an injury and/or entrapment requiring technical rescue of a stabilized patient.

Engineered controls can be used to simplify entry and exit and facilitate movement through the structure with adequate fall protection:

- The design of the wall structure may incorporate locking access doors or removable panels to allow easier entry/exit and multiple access points.
- Fixed ladders (with fall protection) may be installed for regular access.
- Wall design may include engineered 5,000 lb. / 23 kN fall protection anchors for use with temporary horizontal and vertical lifelines inside the structure.

Personal Protective Equipment can be used to control the hazard at the individual level:

- Helmets, hand, eye (and possibly ear protection if appropriate) should be required for access and work behind the wall.
- The Written Fall Protection Plan should identify acceptable anchorages and training in fall protection systems for climbing wall workers to use in accessing elevated positions behind the wall.
- Fall-arrest lanyards allow easier and improvised progress horizontally through the structure, but there may be limited clearance for deployment of the energy absorber. Workers may alternatively choose to climb using supplemental direct aid (suspension) on adjustable lanyards, limiting the risk of falling from above an anchor or impact with the structure.
- Temporary vertical and horizontal lifelines may be installed by the Qualified Climbing Wall Worker as collective protection for regular worker access to and through elevated work zones.

H. Confined Space Rescue

Many climbing structures are designed to create overhanging surfaces on the exterior of the wall, leaving little room behind the wall to maneuver at floor level. Progress through or across the structure may be easiest and least restricted at the higher levels of the structure, requiring complex rigging systems to suspend and safely extricate a packaged litter.

A practical solution identifies (and may specify the installation of) additional entry/exit doors, removable panels, or 'cut away' areas, where an injured worker who has been lowered to the ground can be removed from the confined space in an emergency.

- The Rescue Plan should identify the equipment and training used by workers for assisted and accompanied partner rescue behind the wall.
- A demolition saw may be used to make an emergency entry/exit in a confined space.
- Moving an injured and stabilized worker through the structure may require advanced technical rescue skills, including patient packaging and the use of two-rope systems.

- Workers should be able to identify injuries requiring immediate stabilization of an injured worker, and work locations where professional rescue assistance may be required to complete a rescue.

VIII. Written Fall Protection Plan

The Qualified Climbing Wall Worker (QWW) is responsible for developing and administering the facility's Written Fall Protection Program, including Job Safety or Job Hazard Analysis, worker training, management of Personal Protective Equipment (PPE), and documentation. Part of this fall protection program is the employer's written fall protection plan. The fall protection plan may include sections in a master operations document or may be provided as a separate document. The fall protection plan should be available for review by employees in the course of their work. The fall protection plan should also be available to inspectors, underwriters or loss control specialists in the event of an incident or inspection. Qualified Climbing Wall Workers should have a thorough working understanding of access and rescue methods used by Competent Wall Workers in order to prescribe appropriate controls and supervise climbing wall workers.

The Written Fall Protection Plan should document all aspects of the employer's program, including:

A. Job Safety or Job Hazard Analysis (JSA/JHA)

A detailed Job Safety Analysis (JSA) should be completed for all work-at-height activities in the facility, including:

- Work site(s)
- Work task(s) and scope
- Names of workers assigned to the task and their respective qualifications and roles
- Emergency contacts for rescue services.
- Employee and employee next-of-kin contact information, if needed.
- Communication procedures (as applicable, for example before and after work behind the wall)
- PPE and group safety equipment to be used
- Management of the hazard zone and work zone
- Considerations for the lockout of electrical breakers (if applicable, for example, air filter or light fixture maintenance)
- Identification of work hazards
- Identification of the specific controls used for each hazard
- Prescribed access and work methods
- Rescue plan for the work task or zone

An alternative format may incorporate a 'generic' JSA document, covering all work in the facility, accompanied by a simpler and focused document - often called a 'Toolbox Talk', to be reviewed before individual work tasks, including:

- Work task
- Assigned workers
- Hazards
- Controls
- Signed acknowledgement by worker and supervisor

B. PPE Register

A PPE register and log of regular inspections of all personal protective equipment used in the employer's managed fall protection program. *Personal equipment voluntarily provided by the individual worker and used at other job sites or outside the workplace should be also be regularly inspected and documented*.

The PPE register should include:

- Product, model, type/identification and trade name
- Name and contact information of the manufacturer or supplier
- Manufacturer's 'instructions for use' (aka 'Technical Notice') and related technical information or statements provided by manufacturer
- Unique identification - traceable to manufacturer's production batch or individual serial number
- Dates of: manufacture, purchase, in-service and expiration (if applicable)
- Notes on maintenance
- Notes on frequency (type) of use and work environment
- Record of previous inspections and defects and any repairs or maintenance
- Classification decision: 'fit for service,' 'to retire,' or 'to monitor'
- Date of next inspection
- Name and signature of the PPE Competent Person performing the inspection or repair

C. Technical Training

Documentation and administration of technical training in the use of fall protection systems delivered to employees, including:

- Worker rights and the law.
- Hazard identification.
- Workplace policies, procedures, and practices (accessible to the workers).
- Reporting for workplace safety issues and workplace incidents.
- Identification of workers authorized to perform or assist with work tasks at-height and their respective level of training and experience.
- Identification of appropriate anchors to be used for access and rescue.
- Issuance, or specification, of the fall protection PPE to be used by the worker.
- Instruction or guidance for storage, care and maintenance of PPE.
- Proper use of fall protection systems necessary to access and position in the work zone.
- Identification of potential fall distances, clearance requirements, and limitations of the fall protection system.
- Training should include the specific procedures for access and rescue.

D. Access Plan

The Access Plan for each work zone in the facility, identifying:

- Selected access method and associated equipment.
- Appropriate anchors available in the work zone.
- Considerations for rescue from that work zone.

E. Rescue Plan

The Rescue Plan should include the following components:

- A communication plan for notifying emergency first responders, management, staff and insurance company.
- Names and emergency contact information of all workers on site.
- The names of all Authorized, Competent and Qualified Climbing Wall Workers trained and

authorized to conduct rescue, and their respective roles.

- Documentation of the date, location, and provider of worker rescue training and any related credentials or certifications.
- Identification, management records and location of PPE inventory to be used for rescues.
- A survey of work zones and work tasks in the facility that may require rescue, including:
    - The recommended access method to reach an injured worker in the work zone.
    - The recommended rescue method (for example - assisted, unaccompanied and accompanied) to affect a rescue in the work zone.

Annex A – Informative – PPE Inspection

Periodic visual and close inspection of personal protective equipment should be conducted by a person competent to inspect the equipment. A close inspection is considered to be a "hands on" inspection. Equipment should be retired and replaced at the end of its operational lifetime which is determined after consideration of combination of factors, including but not limited to:

1. the age of the equipment,
2. length of time in storage,
3. length of time in use,
4. amount of use,
5. type of use,
6. deterioration from use, and
7. the overall condition and functioning of the equipment.

Equipment should be, stored, maintained, inspected, repaired (if appropriate), retired and replaced as per the manufacturer's instructions.

Equipment that is excessively worn or damaged and is not in proper working order must be repaired (if appropriate) or retired. Equipment that is obsolete or recalled must be retired. Retired equipment should be disposed of, so it cannot be used inadvertently.

Note: In some cases, repair of equipment is not possible or advisable. Consult the manufacturer's instructions for use or manufacturer's recommendations regarding equipment repair.

Inspection, maintenance, and repair activities should be recorded in appropriate quality assurance records or logs.

Rope Inspection Criteria

- Conduct a visual inspection of the entire length of the rope.
- Verify there are no burns, glazing, cuts, nicks, tears, excessive wear, fraying, exposed cores, severe discoloration or stains, changes in diameter, changes in texture, etc.
- Conduct a hands-on inspection of the entire length of the rope.
- Verify there are no flat sections, soft sections, stiff sections, breaks, bulges, marked angles or areas where the radius of a bend changes abruptly.
- Check that the length of the rope has not changed significantly.
- Retire any rope that experienced extreme heat damage, chemical damage, exceeded the rated number of lead falls, or has reached the end of its service life.

Quickdraw Inspection Criteria

- Remove the carabiners from the quickdraw.
- Conduct a visual inspection of the quickdraw.
- Check the woven portion, verify there are no burns, glazing, cuts, nicks, tears, excessive wear, fraying, fuzzing, severe discoloration or stains. Also verify there are no flat sections, soft sections, stiff sections, breaks, bulges, runs, or changes in width, changes in texture, etc.
- Verify the condition of the safety stitching, check for cut, loose, worn, frayed, or severely

discolored or faded threads, etc.
- Retire any quickdraw that has experienced extreme heat damage, chemical damage or has reached the end of its service life.

Harness Inspection Criteria
- Check all of the safety elements of the harness, including:
- Verify the condition of the webbing and bias tapes, check for burns, glazing, cuts, nicks, tears, excessive wear, fraying, fuzzing, excessive softness or stiffness, severe discoloration or stains, etc.
- Verify the webbing in the area of the adjustment buckle or buckles is not excessively worn.
- Verify the condition of the safety stitching, check for cut, loose, worn, frayed, or severely discolored or faded threads, etc.
- Verify the condition of the belay loop (if applicable) check for burns, glazing, cuts, nicks, tears, excessive wear, fraying, fuzzing, excessive softness or stiffness, severe discoloration or stains, etc.
- Verify the condition of the tie-in point check for burns, glazing, cuts, nicks, tears, excessive wear, fraying, fuzzing, excessive softness or stiffness, severe discoloration or stains, etc.
- Verify the condition of the d-rings or other connection points, check for cracks, deformation, heavy marks or scoring
- Verify the condition of the buckles check for cracks, deformation, heavy marks or scoring, excessive wear, corrosion, etc.
- Verify the webbing is or can be properly threaded through the buckles.
- Assess the overall condition of the harness.

Locking Carabiner Inspection Criteria
- Verify that the frame, gate and locking sleeve have no cracks, deformation, heavy marks or scoring, excessive wear, corrosion, etc.
- Verify the condition of the rivet and locking sleeve.
- Verify proper gate alignment with the nose of the carabiner.
- Verify that the open gate closes automatically when released.
- Verify the gate is not sticky, blocked or obstructed by deformation or foreign matter.
- Verify the locking mechanism is working properly.

Passive Belay Device Inspection Criteria (plate, tube, etc.)
- Verify that the device has no cracks, deformation, heavy marks or scoring, excessive wear, corrosion, etc.
- Verify there are no burrs or sharp edges on the frame that might affect the rope.
- Verify the condition of the friction grooves and rope passages.
- Verify that the cable or cord is firmly attached to the tube or plate and that the cable is not frayed.
- Conduct a function test on the ground with the device rigged.

Mechanical Assist Belay Device Inspection Criteria
- Verify that the device has no cracks, deformation, heavy marks or scoring, excessive wear, corrosion, etc.
- Verify that the attachment holes are not damaged.
- Verify that the moving side plate opens and closes freely.
- Verify that the rope path is not damaged.

- Verify that the cam and friction bushing are not excessively warn.
- Verify that the cam and release handle move freely and that the return springs are working properly.
- Check the condition of the rivets, fixing screw, cam and the friction plate.
- Verify there are no foreign objects (sand, etc.) in the mechanism and no lubricant in the rope path.
- Conduct a function test on the ground with the device rigged.

Annex B – Informative – Hazard Control Measures

Information obtained from a job hazard analysis is used to develop hazard control measures which are incorporated into the tasks. Climbing wall worker should recognize that not all hazard controls are equal. Some are more effective than others at reducing the risk. Elimination of hazards takes precedence.

The order of precedence and effectiveness of hazard control is the following:

1. Engineering controls.
2. Administrative controls (includes training).
3. Personal protective equipment.

Engineering controls include the following:

- Elimination/minimization of the hazard—Designing the facility, equipment, or process to remove the hazard, or substituting processes, equipment, materials, or other factors to lessen the hazard;
- Enclosure of the hazard using enclosures, barriers, or other means;
- Isolation of the hazard with interlocks, machine guards,
- blast shields, welding curtains, or other means; and
- Removal or redirection of the hazard such as with ventilation.

Administrative controls include the following:

- Written operating procedures and practices;
- Exposure time limitations (used most commonly to
- control temperature extremes and ergonomic hazards);
- Monitoring the use of highly hazardous materials;
- Alarms, signs, and warnings;
- Buddy system; and
- Training.

Personal Protective Equipment—such as respirators, hearing protection, protective clothing, safety glasses, ropes, connectors, harnesses, and helmets. PPE is acceptable as a control method in the following circumstances:

- When engineering controls are not feasible or do not
- totally eliminate the hazard;
- While engineering controls are being developed;
- When work practices do not provide sufficient additional protection; and
- During emergencies when engineering controls may not be feasible.

Use of one hazard control method over another higher in the control precedence may be appropriate for providing interim protection until the hazard is abated permanently. If the hazard cannot be eliminated entirely, the adopted control measures will likely be a combination of all three approaches.

Annex C – Informative – Sample Job Hazard Analysis Form 1 (Simple)

Date:

Job Title:

Job Location:

Analyst:

Work or Task No.	Work or Task Description:
Hazard Type:	Hazard Description:
Consequence:	Hazard Controls:
Rationale or Comment:	

Annex D – Informative – Sample Job Hazard Analysis Form 2 (Simple)

Date:

Description of Work:

Location of Work:

Analyst:

Directions: Identify a work process and list the steps involved in performing the process. Then identify the potential hazards associated with each step. Finally, identify some controls that can protect you from the hazards.

Work Process Steps	Hazards/Potential Hazards	Controls
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		

Annex E – Informative – Fall Protection Hierarchy

1. **Hazard Elimination or Substitution.** Eliminate exposure to the fall hazard.

2. **Passive Fall Protection**. Physical barriers to limit exposure to the fall hazard.

3. **Travel Restraint or Fall Restraint Systems**. The use of PPE to restrict the worker's movement so they are not exposed to the fall hazard. Training required.

4. **Fall Arrest System**. The use of PPE to prevent or arrest a fall within acceptable force and clearance margins. Training required.

5. **Administrative Controls**. Increase the awareness of the fall hazard. Administrative controls are preventative measures taken to reduce the likelihood of a fall, but do not necessarily provide a physical or positive means of protection from a fall, examples include warnings, signage, training, limiting work hours at height, alarms, etc.

Annex F – Informative – Portable Ladder Safety

Falls from portable ladders (step, straight, combination and extension) are one of the leading causes of occupational fatalities and injuries.

- Read and follow all labels/markings on the ladder.
- Avoid electrical hazards! – Look for overhead power lines before handling a ladder. Avoid using a metal ladder near power lines or exposed energized electrical equipment.
- Always inspect the ladder prior to using it. If the ladder is damaged, it must be removed from service and tagged until repaired or discarded.
- Always maintain a 3-point (two hands and a foot, or two feet and a hand) contact on the ladder when climbing. Keep your body near the middle of the step and always face the ladder while climbing.
- Only use ladders and appropriate accessories (ladder levelers, jacks, hooks, or footboards) for their designed purposes.
- Ladders must be free of any slippery material on the rungs, steps or feet.
- Do not use a self-supporting ladder (e.g., step ladder) as a single ladder or in a partially closed position.
- Do not use the top step/rung of a ladder as a step/rung unless it was designed for that purpose.
- Use a ladder only on a stable and level surface, unless it has been secured (top or bottom) to prevent displacement.
- Do not place a ladder on boxes, barrels or other unstable bases to obtain additional height.
- Do not move or shift a ladder while a person or equipment is on the ladder.
- An extension or straight ladder used to access an elevated surface must extend at least 3 feet above the point of support. Do not stand on the three top rungs of a straight, single or extension ladder.
- The proper angle for setting up a ladder is to place its base a quarter of the working length of the ladder from the wall or other vertical surface.
- A ladder placed in any location where it can be displaced by other work activities must be secured to prevent displacement or a barricade must be erected to keep traffic away from the ladder.
- Be sure that all locks on an extension ladder are properly engaged.
- Do not exceed the maximum load rating of a ladder. Be aware of the ladder's load rating and of the weight it is supporting, including the weight of any tools or equipment.

https://www.osha.gov/Publications/portable_ladder_qc.html