 <b>THOMPSON RIVERS UNIVERSITY</b> Occupational Health & Safety	<b>Number:</b>	OH&S 18.121.1
	<b>Revision Date:</b>	09/15/2014
	<b>Fall Protection Procedures</b>	

Printed copies of this document are uncontrolled.

**1. PURPOSE**


- 1.1. To inform employees and contractors of the requirements and responsibilities of employees when working at height.

**2. SCOPE**

- 2.1. This procedure applies to all employees and contractors working at Thompson Rivers University (TRU) required to work at height or who may be exposed to a risk of falling in the course of performing work.

**3. PRECAUTIONS**

**POTENTIAL HEALTH & SAFETY HAZARDS**

HAZARD		TO PROTECT YOURSELF
<b>Fall from Height</b>		Ensure: lanyard is attached to anchor point. guardrails are in place

**4. ASSOCIATED DOCUMENTATION**

<u>Doc. Number</u>	<u>Doc. Title</u>
OH&S 18.13.1	Fall Arrest Checklist Form (appendix “A”)

**5. PROCEDURES AND RESPONSIBILITIES**

**5.1. TRU will:**

- 5.1.1. ensure all engineering and administrative control options have been explored by a competent person before controlling fall hazards with personal protective equipment,
- 5.1.2. establish adequate measures and procedures for fall protection for situations in which engineering and control measures are not available,
- 5.1.3. appoint competent supervisors who have been trained and are adequately knowledgeable with respect to Fall Protection,
- 5.1.4. ensure workers are adequately trained in the Fall Protection Procedures

- 5.1.5. ensure workers are adequately trained in the limitations and proper use of fall protection systems,
  - 5.1.6. develop written procedures for rescuing a worker after his/her fall has been arrested,
  - 5.1.7. properly implement and annually audit the Fall Protection Procedure, and
  - 5.1.8. discipline personnel who fail to reasonably comply with this procedure.
- 5.2. Supervisors whose workers work at height will:**
- 5.2.0 work with TRU safety to perform a risk assessment for any work at a height over 10 feet. Using the assessment determine what controls are required to prevent an incident.
  - 5.2.1. relay potential and actual hazards associated with the work to be performed to the workers,
  - 5.2.2. apply and enforce the Fall Protection Procedure for all affected personnel in the workplace,
  - 5.2.3. apply, audit and recommend discipline compliance specific to the Fall Protection Procedure,
  - 5.2.4. ensure that workers using fall protection equipment are using appropriate equipment in the correct manner,
  - 5.2.5. provide TRU employees with fall protection equipment as required, and
  - 5.2.6. notify the Assistant Director of Facilities when fall protection equipment is purchased so it can be added to the Fall Protection Equipment Inventory.
- 5.3. Workers will:**
- 5.3.1. comply with the Fall Protection Procedure,
  - 5.3.2. use the fall protection equipment required in the correct manner,
  - 5.3.3. inspect, maintain and store the fall protection equipment as required,
  - 5.3.4. notify their Supervisor of any questions or concerns with Fall Protection or associated equipment, and
  - 5.3.5. notify their Supervisor of any contraventions of the Act, regulations or this Procedure.

- 5.4. Contractors will:**
- 5.4.1.** provide proof of fall protection training prior to performing any work that requires fall protection,
  - 5.4.2.** provide written fall protection strategies, procedures or measures to their TRU contact person prior to the commencement of work,
  - 5.4.3.** provide their own fall protection equipment in good working condition,
  - 5.4.4.** use the fall protection equipment required in the correct manner,
  - 5.4.5.** inspect, maintain and store the fall protection equipment as required, and
  - 5.4.6.** notify their Supervisor with any questions or concerns with Fall Protection or associated equipment.
- 5.5.** At least one method of fall protection must be used to adequately protect a worker from any one of the following:
- 5.5.1.** falling more than 3 meters (10 feet),
  - 5.5.2.** falling into operating machinery,
  - 5.5.3.** falling into water or another liquid,
  - 5.5.4.** falling into or onto a hazardous substance or object, or
  - 5.5.5.** falling through an opening on a work surface.
- 5.6.** The approach to fall protection is:
- 5.6.1.** whenever possible, eliminate the need for work at elevations that present a fall hazard and/or implement engineering solutions to create safe work environments for employees and contractors,
  - 5.6.2.** if unable to eliminate fall hazards, prevent a fall-from-height by using barriers, guardrail systems, protective coverings, work platforms, or travel restraint systems, and
  - 5.6.3.** employ fall restricting or fall-arrest systems when the first two approaches are not feasible.

### **Guardrail Systems and Covers**

- 5.7. A guardrail system or protective covering shall be used to prevent a worker from falling through an opening on a work surface.
- 5.8. The protective covering must:
  - 5.8.1. completely cover the opening,
  - 5.8.2. be securely fastened,
  - 5.8.3. be adequately identified as covering an opening, and
  - 5.8.4. be made from material adequate to support all loads to which the covering may be subjected.
- 5.9. A guardrail shall be used if a worker has access to the perimeter of an open side of a floor (including balcony and mezzanine), surface of a roof, a scaffold platform or other work platform, runway or ramp and is exposed to a fall of 2.4 meters (8 feet) or more.
- 5.10. A guardrail shall have a top rail not less than 91 centimeters (36 inches) and no more than 107 centimeters (42 inches) above the surface to be guarded; have a mid-rail; a toe board of at least 125 millimeters (5 inches) if objects can fall on a person; and be free of splinters and protruding nails.
- 5.11. A guardrail shall be constructed to meet the structural requirements for guards as set out in the BC Building Code.

### **General Fall Protection**

- 5.12. Under no circumstances is a waist safety belt permitted for use as part of a fall arrest, fall restricting or travel restraint system.
- 5.13. All workers using fall protection must use the buddy system.

### **Travel Restraint Systems**

- 5.14. Travel restraint systems are an assembly of components arranged to restrict a workers movement so as to prevent the worker from reaching a location from which he or she could fall.
- 5.15. Travel restraint systems incorporate a full-body harness and a lanyard attached to an anchor point capable of withstanding a force of at least 3.5 kNs (800 lbs. force). Employ a safety factor of two for the design load rating of temporary anchor points (i.e. anchor points should be designed and installed to bear 22 kNs ( 5000 lbs. force)).
- 5.16. Horizontal lifelines are used in travel restraint systems. A self-retracting lifeline may be used if the fully deployed lifeline does not permit a worker to fall off of the surface

he/she is working on.

### **Fall Restraint Systems**

- 5.17.** Fall restraint systems are engineered components designed to prevent a worker's fall from exceeding 30 centimeters (1 foot) of free fall.
- 5.18.** Fall restricting systems must be adequately installed, inspected and used in accordance with the manufacturer's instructions.
- 5.19.** The support or anchor points used for a fall restricting system must be capable of supporting a static force of at least 3 kNs (800 lbs. force). Where a rope grab is used as a fall restricting system:
  - 5.19.1.** ensure it is installed right side up. Most grabs feature a directional arrow to indicate proper orientation,
  - 5.19.2.** ensure that the proper size lifeline is used. The required size is marked on the rope grab, and
  - 5.19.3.** after mounting the grab on the lifeline, pull the grab down sharply. The grab should lock within 30 centimeters (12 inches).
- 5.20.** Lifelines must be at least 16 millimeters in diameter and of adequate strength.
- 5.21.** A competent worker must inspect all lines from end to end before installation, looking for cuts, burns, fraying, and chemical or heat damage. Signs of decreased diameter may indicate that the line has been involved in a fall arrest and should be discarded.
- 5.22.** Ensure that lifelines are securely attached to solid anchor points.
- 5.23.** Attach only one lifeline to each anchor point. Never anchor to bundles of material that may be moved or depleted through use. Do not anchor to exposed rebar unless embedment length is adequate.

### **Fall Arrest Systems**

- 5.24.** Fall arrest systems are used when travel restraint or fall restricting systems are not feasible.
- 5.25.** Fall arrest systems consist of approved full-body harnesses, connecting subsystems, and anchor points.
- 5.26.** An energy absorbing lanyard is used with fall arrest systems unless the use of the shock absorber will allow the worker to hit the ground or other object below the workers position.
- 5.27.** Fall arrest systems must be professionally designed to provide vertical fall arrest,

horizontal travel restraint, or a combination of both for work on sloped surfaces.

- 5.28. Fall arrest systems require the use of anchor points that will bear at least 22 kNs (5000 lbs. force) of force.
- 5.29. Safety belts must never be used in fall arrest systems.
- 5.30. A fall arrest system must be arranged so that the worker cannot hit the ground or an object or level below the work.
- 5.31. A fall arrest system must be configured so as to minimize swing fall hazards.

### **Harnesses**

- 5.32. There are several varieties of harnesses (e.g. the H-style and the X-style), but they must all be equipped with a dorsal mounted “D”-ring for fall arrest.
- 5.33. Connecting two safety hooks to a single “D” ring, on a safety harness is **not** permitted.
- 5.34. Employees must have two (2) Miller Relief Step safety devices attached to their harness.
- 5.35. The user must inspect harnesses before each use as follows and complete the Fall Arrest Checklist form.
- 5.36. Always check the tag for date of manufacture. Most harnesses have a service life of five years. If the harness doesn't have a tag, seek a replacement harness.
- 5.37. Look for cuts, fraying, broken stitching, and other damage to webbing. Check for chemical or heat damage.
- 5.38. Inspect metal buckles for distortion, cracks, and sharp or rough edges. All buckles should slide easily for adjustment.
- 5.39. Check for worn, cut, or frayed fibers where buckles attach to harness.
- 5.40. Inspect D-ring for distortion, cracks, sharp or rough edges, and chemical or heat damage.
- 5.41. Ensure that the plate holding the D-ring in position is free from cracks, heat damage, and other defects. The plate must keep the D-ring from sliding out of place.
- 5.42. The manufacturer's label will indicate classification. Harnesses are classified as follows:
  - 5.42.1. **Group A** harnesses are for fall arresting,
  - 5.42.2. **Group D** harnesses are for controlled descent,

**5.42.3. Group E** harnesses are for confined space entry (raising and lowering),

**5.42.4. Group L** harnesses are for ladder climbing, and

**5.42.5. Group P** harnesses are for work positioning or travel restraint.

- 5.43.** Harnesses must be suitable for fall arrest (Group A) and must be CSA approved.
- 5.44.** To accommodate upper body anatomical differences, females must wear X-style harnesses. H-style harness (with a chest strap that crosses the chest from shoulder strap to shoulder strap) may cause serious injury to a female worker should she experience a fall. Males may choose X-style harness at their discretion.

### **Lanyards**

- 5.45.** A lanyard is used to secure a full body harness to a lifeline or anchor.
- 5.46.** A fall arrest lanyard must have an energy absorber which prevents energy from being transferred to the worker's body via the fall-arrest process. Shock absorbing lanyards may be used with rope grab systems in accordance with manufacturer's instructions.
- 5.47.** Energy-absorbing lanyards stop a fall within 1.5 meters (5 feet) and are designed to limit body forces to 4 kNs (~900 lbs. force) when applied via the harness through the worker's sub-pelvic area.
- 5.48.** Only one person may use a lanyard at a time.
- 5.49.** Connecting two or more lanyards in sequence is not permitted (incompatible hardware).
- 5.50.** The snap hook on a lanyard must be self-locking.
- 5.51.** Lanyards must be kept free of splices and knots.
- 5.52.** Lanyards must not be used in a manner that is likely to cut, chafe or abrade it.
- 5.53.** The free end of the lanyard must be kept free of equipment and machinery.
- 5.54.** Inspection of a lanyard must be performed by the user before each use as follows and complete the Fall Arrest Checklist:
- 5.54.1.** most lanyards have a service life of five years. Check tag for date of manufacture. Inspect lanyard for worn, broken, or cut fibers; signs of stretching; evidence of chemical or heat damage; and cracked or distorted connecting hardware,
  - 5.54.2.** the connecting ends of a lanyard must be wrapped around a protective thimble and securely fastened with a swaged fitting or eye splice, and
  - 5.54.3.** if the absorber is made with tear-away stitching designed to absorb fall-arrest

load, make sure stitching is intact.

- 5.55.** Inspection for snap hooks includes:
- 5.55.1.** check for cracks and corroded or pitted surfaces,
  - 5.55.2.** ensure that bill and eye sections are not twisted or bent,
  - 5.55.3.** check that locking mechanism works properly. Push the keeper into the open position with the mechanism still engaged. If the keeper opens, immediately and permanently remove the lanyard from service,
  - 5.55.4.** ensure that spring has enough tension to close keeper securely, and
  - 5.55.5.** open the keeper and release. The keeper should sit into the bill without binding.

### **Anchor Points**

- 5.56.** Existing structural features or equipment that were not placed nor designed to be used as anchor points, but have been verified to be adequate by an engineer or competent person to serve as an anchor point can be used. Existing structural features or equipment must support at least 22 kN (~5000 lbs. force) for vertical fall arrest.
- 5.57.** Every anchor point for the fall-arrest system must have adequate strength, stability and location.
- 5.58.** Designated fixed supports are load rated anchors that are designed and permanently installed for fall protection purposes. A designed fixed support must support at least 22 kN (~5000 lbs. force) for vertical fall arrest.
- 5.59.** Temporary fixed supports are anchor systems designed to be connected to the structure using manufacturer's instructions and must support at least 16 kN (~3600 lbs. force) without exceeding the allowable unit stress for each material used.
- 5.60.** If used for fall arrest system with a shock absorbing lanyard the temporary fixed support must support 12 kN (~2700 lbs. force) without exceeding the allowable unit stress for each material used and if used with a travel restraint system must support at least 4 kN (~900 lbs. force) without exceeding the allowable unit stress for each material used.
- 5.61. DO NOT** tie off to:
- 5.61.1.** any plastic pipe,
  - 5.61.2.** gas lines,
  - 5.61.3.** sprinkler pipes,
  - 5.61.4.** electrical conduit of any size, or



- 5.61.5. valves or other control points.
- 5.62. Anchor points for horizontal lifelines must be designed by a professional engineer according to good engineering practice. The design should state:
  - 5.62.1. inspection, installation and maintenance,
  - 5.62.2. required components,
  - 5.62.3. the maximum number of attached workers, and
  - 5.62.4. design loads.
- 5.63. Anchor points for vertical lifelines must comply with the current CSA standard ensuring that:
  - 5.63.1. only one person at a time may use the lifeline,
  - 5.63.2. the lifeline must reach the ground or a level to which the worker would safely descend, and
  - 5.63.3. the rope grab must encounter a positive stop so as not to run off the end of the rope.
- 5.64. Assess the location of the anchor point for potential swing-fall and subsequent contact with neighboring objects.
- 5.65. Consider the deployment of the shock absorber, your height, sliding of the D-ring, and the elastic stretch of the lifeline.
- 5.66. Direct tying off around sharp edged structures can reduce breaking strength by 70% therefore; chafing pads or abrasion resistant straps must be used around sharp edged structures to prevent cutting action against safety lanyards or lifelines.

#### **Rescue Plan**

- 5.67. A written rescue plan must be developed in advance of work that involves the use of a fall arrest system.
- 5.68. A review of rescue procedures must be undertaken with all personnel involved with the work prior to work commencing.
- 5.69. Fall victims must be rescued promptly. Prolonged suspension in fall arrest equipment can cause serious injury.
- 5.70. Rescue Plans can include:
  - 5.70.1. self-rescue,

**5.70.2.** rescue by co-workers, and/or

**5.70.3.** rescue by a rescue team.

### **Fall Protection Equipment, Inspection and Storage**

**5.71.** All fall protection equipment must be CSA approved.

**5.72.** All fall protection equipment must be inspected by a competent worker before each use in accordance with the manufacturer's instructions.

**5.73.** The fall protection equipment must be inspected yearly or more frequently by a trained and competent person. A written record of such inspection and approval for continued use should be retained in the Occupational Health and Safety department and may be subject to audits.

**5.74.** Any fall protection equipment subjected to a fall must immediately be removed from service until a competent worker has inspected each component of the fall protection system. Any such equipment that cannot be competently inspected by TRU personnel shall be returned to the manufacturer for inspection and or recertification.

**5.75.** Store equipment in a clean dry environment; away from sun and temperature extremes.

**5.76.** Fall protection equipment must not be exposed to flame, abrasive or corrosive material, or other hazardous environments or physical stress that may damage it.

**5.77.** The manufacturer's instructions regarding marking/labeling the nylon or polyester components (webbing) of fall protection equipment shall be followed. Marking webbing is not recommended as the solvents in some markers damage nylon and polyester webbing.

### **Fixed Access Ladder Inspection**

**5.78.** Fixed access ladder installations must be periodically inspected by a competent person for rust, corrosion and structural integrity, and must be maintained in good condition, not likely to endanger any worker. These inspections should be conducted at least once per year.

**5.79.** Records of inspections and maintenance to fixed access ladder systems shall be maintained by the Maintenance Department.

### **SCAFFOLDING**

**5.80.** All scaffolding must be erected, altered or dismantled only under the supervision of a competent worker. It must be securely fastened with all braces, pins, screw jacks, base plates and other fittings installed as required by the manufacturer.

**5.81.** Guardrails consist of a top rail, a mid-rail and a toe board. Guardrails must be provided

around work platforms on all scaffolds, floor openings, ramps and open areas where a worker can fall 2.4 metres (8 feet) or more. When guardrails or opening covers are temporarily removed, workers in the area must be protected by a fall arrest system, tied off to a secure anchor point. Barricades, guardrails and covers must be replaced in a proper manner immediately after work is completed.

### **Scaffolding General Information**

- 5.82.** Only trained workers can use scaffolding.
- 5.83.** Scaffolding must be used only for its intended purpose.
- 5.84.** Scaffolds must be maintained in a safe condition at all times in accordance with the manufacturer's recommendations.
- 5.85.** Any damaged or weakened scaffold must be immediately taken out of service and repaired or replaced. It must not be used until repairs have been completed.
- 5.86.** The footing and or anchorage for scaffolds must be sound, rigid, and capable of carrying the maximum intended load without settling or displacement.
- 5.87.** Unstable objects (barrels, boxes, loose brick, or concrete blocks) must not be used to support scaffolds or planks.
- 5.88.** Fixed scaffolds must not be altered or moved when they are in use or have workers on them.
- 5.89.** Scaffolds must not be loaded in excess of the load for which they are intended.
- 5.90.** All planking or platforms will be secured from movement.
- 5.91.** Scaffold planks will extend over their end supports between 15 to 40 centimeters (6-16 inches).
- 5.92.** The poles, legs, or uprights of scaffolds will be plumb, and securely and rigidly braced to prevent swaying and displacement.
- 5.93.** Materials being hoisted onto a scaffold will have a tag line.
- 5.94.** If there are overhead hazards all workers will be provided with appropriate head protection.
- 5.95.** Work will not be conducted on scaffolds which are covered with ice or snow, unless all ice or snow is removed and planking sanded to prevent slipping.

### **Working on scaffolding near electrical lines**

- 5.96.** Scaffolding must be erected and used in a manner to keep a safe distance away from electrical wires.

- 5.97.** Full or partial dismantling of the scaffolding may be required when moving the scaffolding near power lines.
- 5.98.** Fall Protection and guardrails on scaffolding
- 5.99.** All scaffolding will have guardrails if the worker has access to an open side and is exposed to a fall of 2.4 meters (8 feet) or more.
- 5.100.** A guardrail will consist of :
- 5.100.1.** a top rail about 1 meter (3.3 feet) above the platform,
  - 5.100.2.** mid rail about half way between the platform and the top rails, and
  - 5.100.3.** a toe board at least 8.9 centimeters (3.5 inches) high from the surface level and made from wood.
- 5.101.** If guardrails must be removed to receive material any workers on the scaffold must use a fall arrest system.
- 5.102.** Any guardrails that are removed to receive material must be replaced immediately.
- 5.103.** Lifelines or lanyards must be attached to a suitable anchor point other than the scaffold.

#### **Working safely on scaffolding**

- 5.104.** Maintain three points of contact when on the ladder.
- 5.105.** Never stand on an object (box etc.) placed on the platform.
- 5.106.** Never overload a scaffold.
- 5.107.** Keep tools, equipment, material and debris to a minimum.
- 5.108.** Keep the scaffold clean.
- 5.109.** Do not “over-lean” from a scaffold.

#### **Mobile (Rolling) Scaffolding**

- 5.110.** Wheels or casters. Wheels or casters will be inspected to ensure that they are provided with strength and dimensions to support four times the design working load.
- 5.111.** All scaffold casters will be inspected to ensure that they are provided with a positive wheel and/or swivel lock to prevent movement.
- 5.112.** Where leveling of the elevated work platform is required, screw jacks or other suitable means for adjusting the height will be used.

- 5.113. Workers are not permitted to ride rolling scaffolds during relocation.
- 5.114. Adjusting screws may not be extended more than 30 centimeters (1 foot).
- 5.115. Before moving the platform, secure all equipment and loose material.
- 5.116. Be aware of overhead obstructions when moving scaffolds.
- 5.117. Never run over electrical cords.
- 5.118. Never pull scaffolds from the top, always push at base level.
- 5.119. Work only from the platform area and never extend work beyond guardrails.
- 5.120. A scaffold mounted on pneumatic tires must not be supported by the pneumatic tires while the scaffold is being erected, used or dismantled.
- 5.121. A scaffold mounted on castors or wheels must be equipped with an adequate braking device on each castor or wheel.
- 5.122. Must have the brakes applied when a worker is on the scaffold.

## 6. DEFINITIONS

- 6.1. **Anchor** - a secure point of attachment for a lifeline or lanyard.
- 6.2. **Fall arrest system** - a system that will stop a worker's fall before the worker hits the surface below.
- 6.3. **Fall protection system** -
  - 6.3.1. fall restraint system,
  - 6.3.2. fall arrest system, or
  - 6.3.3. work procedures that are acceptable to Work Safe BC and minimize the risk of injury to a worker from a fall.
- 6.4. **Fall restraint system** - a system to prevent a worker from falling from a work position, or from travelling to an unguarded edge from which the worker could fall.
- 6.5. **Full body harness** - means a body support device consisting of connected straps designed to distribute the force resulting from a fall over at least the thigh, shoulders and pelvis, with provision for attaching a lanyard, lifeline or other components.
- 6.6. **Horizontal lifeline system** - a system composed of a synthetic or wire rope, installed horizontally between 2 anchors, to which a worker attaches a personal fall protection system.

- 6.7. Lanyard** - a flexible line of webbing, or synthetic or wire rope, which is used to secure a safety belt or full body harness to a lifeline or anchor.
- 6.8. Lifeline** - a synthetic or wire rope, rigged from one or more anchors, to which a worker's lanyard or other part of personal fall protection system is attached.
- 6.9. Personal fall protection** -
  - 6.9.1.** A safety belt or full body harness, or
  - 6.9.2.** Lanyard, lifeline and any other connecting equipment individual to the worker that is used to secure the worker to an individual point of anchorage or to a horizontal lifeline system.
- 6.10. Safety belt** - a body support device consisting of a strap with a means for securing it about the waist and attaching it to other components.

**7. RECORDS/VERIFICATION OF UNDERSTANDING**

**7.1. Records:**

- 7.1.1.** Fall Arrest Checklist Forms

**7.2. Verification of Understanding:**

- 7.2.1.** A training master log will be maintained by the Worker's Supervisor and a copy of training records forwarded to TRU Safety for file records.

**8. SUMMARY OF CHANGES**

Revision #	Date	Change (include section #)	Issued By
1	09/15/2014	NEW	OHS Officer

Appendix “A”



Occupational Health & Safety

TRU FALL ARREST CHECKLIST - Pre-Use Inspection

Equipment ID # \_\_\_\_\_ Description \_\_\_\_\_

Harness	Before Use		On Return		Remarks
	Yes	No	Yes	No	
Excessive fabric wear					
Seam tears					
Seat belt clasp on leg & chest					
“D” Rings in good condition					
Rivets loose					
Other conditions as noted					

Lanyards	Before Use		On Return		Remarks
	Yes	No	Yes	No	
Safety snaps & latches working properly					
End splices okay					
Fabric wear or tears					
Shock absorber					
Other conditions as noted					

Inspected by: \_\_\_\_\_

Date: \_\_\_\_\_