
Infrastructure Health and Safety Association

List of Solutions and/or Controls for the Top Primary Causal Factors Identified for Rough Framing and Carpentry Trades

Defined Risk Statement: Working at heights can pose serious unintended and adverse effects to the safety and well-being of Rough Framing and Carpentry trade workers, and other nearby fellow trade workers.

Background:

Originally in 2015 and then again in 2019, IHSA partnered with the Ministry of Labour, Training and Skills Development (MLTSD) and industry-recognized subject matter experts to conduct a root-cause analysis on the causes construction workers in residential roofing falling while working at heights.

A total of **48 primary causal factors** were identified, ranked, and prioritized. All 48 primary causal factors were voted on, and based on the votes, a **Top 10** list was created. This collective process was open, transparent, and collaborative. The ranking and prioritization of causal factors was done using employer and worker votes only. The MLTSD and IHSA did not participate in voting.

Based on the results of the Phase One Working at Heights Root Cause sector workshop, it was determined that the most effective way to complete the solutions and controls portion was to conduct individual trade specific workshops. Having Phase 2 split out into specific trades allowed for more targeted solutions and recommendations to emerge to reflect the uniqueness and complexity of the varied work tasks involved in working at heights during residential construction

Residential Rough Framing and Carpentry trades Root Cause Control Workshop

Introduction:

On July 22, 2021, IHSA hosted an in-person, Trade Specific, Root Cause Control Workshop to determine the top health and safety concerns within the **Residential rough framing and carpentry trades**.

This workshop included peer-recognized subject matter experts from labour and management, who came together in person to identify and prioritize causal factors for Rough Framing and Carpentry Trades in Residential construction. Then most importantly the group identified solutions and controls for the top ranked causal factors. Note that the scope of this exercise did not include assessment of the listed solutions/controls. This list provides information on specific controls or activities that can be undertaken by the industry and/or regulator for the development or the support of a control. Although not part of the scope, it is understood that control performance should be specified, observable, measurable and auditable.

This is a supporting document for [the root-cause control workshop](#) report (a separate document) that should be referred to when using this information.

Framing / Carpentry Trades

Top 10 Root-Causes: Worker Falls When Working at Heights

Priority	Category	Root-Causes
1	Process, People	Task, trade specific work procedures (methods too generic) not being followed.
2	Process, Culture, Tools & Machines	Training
3	Environment, Culture, People	Enforcement and Government Oversight, (Enforcement, Regulation)
4	People, Process	Safety Culture
5	Tools & Machines, People	Equipment
6	Process, People, Culture	Procedure / Techniques
7	Process, People, Culture	Old Practices / Lack of innovation
8	People	Fit for Duty / Mental health
9	Process, Culture, Tools	Personal Protective Equipment (PPE) Project Cost
10	Environment	Site Conditions

Root-Cause details & Solutions/Controls that may reduce risk

- 1. Lack of task, trade specific work procedures (methods too generic) – (Process & People)**
 - a) At present there are no specific work procedure and method for the trade.
 - b) Lacking of awareness or adoption of industry best practices for the trade.
 - c) There is often no practical point to tie off (no anchor point).
 - d) MLTSD inspector comes on site and issues violation for non-compliance.
 - e) MLTSD inspectors are not experienced in the trade and unfamiliar with best practices with respect to regulatory compliance. (Recognized by MLTSD in 2009 but OHSA supercedes. Acknowledged but still not formally adopted by MLTSD)
 - f) Framing tasks not being completed on a safety priority basis appropriate to the various steps of the build. (Truss placement, erection, joist assembly, etc.).
 - g) There is a difference between green book contents and work practices.
 - h) MLTSD will advise to tie off in instances when not possible (on a truss that has not yet been installed).
 - i) Most inspectors do not have an answer due to unfamiliarity with the work.

Solutions:

Item	Suggested Controls and Solutions
1	Utilize best practice guideline (developed through trade association) “Residential Framing Best Practice Guideline”.
2	Revisit Best Practice guideline and have it adopted by MLTSD, labour and management.
3	Have the Best Practice Guideline achieve similar status as EU Rulebook.
4	Piloting and evaluating effectiveness of Framing Guideline.
5	Utilizing specific data relative to Framing Best Practice guideline.
6	New training guidelines are required for the trade.
7	Get Task specific methods accepted by MLTSD.
8	Tasks need to be completed on a construction priority basis with consideration to safety (by steps of the build - e.g. Installing floor joist from ground up, then roof trusses truss placement and erection, leading edge work, installation of temporary stairs etc.).
9	MLTSD should hire inspectors with specific experience in the trade.
10	Best practices should identify the way the work should be completed.
11	Engineering guidelines must be followed with respect to temporary work platforms etc.
12	The development of a Best Practice guideline to be referenced by MLTSD inspectors during inspection.

2. Training (Process, Culture, Tools & Machines)

- a) Trade specific training modules (e.g. rule book) are required.
- b) Need tripartite participation in the development of worker training guidelines.
- c) Training is limited to government requirements.
- d) Proper training is required to prevent use of old methods/bad work habits.
- e) Workers must work in safe manner/attitude.
- f) Some sections of green book are impossible for framing to comply.
- g) Green book is often too vague and generic.
- h) Worker and supervisor competency & compliance training is lacking.
- i) Sector transitioning from older experienced workers to newer young workers (aging workforce).
- j) No mentorship program with respect to worker training is in place.
- k) Workers retire and new workers entering the trade has created an increased lack of experience resulting in mistakes, hazards, and incidents.
- l) Language is often a problem with respect to training instruction.
- m) Lack of worker retention is creating a lag in training of new workers in the trade.
- n) What guidelines do workers have to build frame, truss etc.

Solutions:

Item	Suggested Controls and Solutions
1	Trade/task/sector specific WAH training program (vs. generic) requirement (methodology).
2	Refresher Training on accepted guidelines is needed.
3	Task specific training for framers is needed.
4	Supervisor task specific, training is required.
5	Re-implement foreman competency training specific to framing (previously developed).
6	Establish a standard of training BOS, Supervisor Competency training etc.
7	Refresher training with expiry (i.e. 3 yrs.).
8	Video, picture based, info graphic and site specific training with scenarios.
9	Make training available in various languages.
10	Adopt use of Residential Framing Best Practice Guidelines.

3. Enforcement and Government Oversight & Regulation (Environment, Culture & People)

- a) MLTSD inspectors don't know the work/trade.
- b) MLTSD inspector interpretation of the regulations only versus how to apply and comply information.
- c) More MLTSD inspectors to support "prevention" and compliance assistance.
- d) Standardize MLTSD enforcement is needed.
- e) Consistent MLTSD enforcement is needed.
- f) MLTSD response time on non-compliance reporting is too slow.
- g) Framing should be a skill based trade.
- h) MLTSD inspectors don't know the work/trade.
- i) Where is a practical anchor point to tie off?

- j) Some inspectors like work completed a certain way (platform vs. ladder etc.).
- k) Need guidance on how to complete specific tasks of framing.
- l) When leading edge work is laid out, MLTSD will advise that a work platform could slip and the worker could fall.

Solutions:

Item	Suggested Controls and Solutions
1	Hire and assign MLTSD Inspectors with a background in the framing trade.
2	Mandate a requirement for scaffold to be set up around complete house.
3	MLTSD inspectors should include prevention information into enforcement.
4	Establish guidelines for MLTSD inspectors to reference with respect to compliance.
5	MLTSD needs to respond faster when advised of violations taking place.
6	Make framing a skilled trade
7	Make supervisor accountable for non-compliance.
8	Make MLTSD accountable for quality/accuracy of enforcement.
9	Develop a practical solution with respect to anchor points for tie off.
10	IRS needs strengthening through foreman/supervisor on-site authority.
11	There has been some innovation regarding wall construction etc. (panelized / prefab) - use it.

4. Safety Culture (People, Process)

- a) Workers often do not utilize the safe practices they are taught during training.
- b) Internal responsibility system not working.
- c) Piece-work emphasis is on cost productivity over safety (get work done and is not safety driven).
- d) Piecework encourages rushing of work.
- e) Pieceworkers paid specific amount for a job – pay a premium for added safety.
- f) Supervisor has competing priorities.
- g) Lack of compliance monitoring by supervisor / foreman.
- h) Old work practices (bad habits) are a problem.
- i) Workers are not tied off because there is no anchor.
- j) WAH harness equipment should be changed to use of self-retracting lanyard.
- k) Lack of supervision from management at site.
- l) Poor attitude of workers and foreman etc. at site.
- m) Failing to comply happens on a regular basis by both the company and workers.
- n) Railing or temporary stairs are often NOT installed and not in good condition.
- o) Employers’ responsibility to repair (railing and temporary stairs) and worker responsibility to install railing and temporary stairs.
- p) Supervisor and worker are often not sure how to repair railings and temporary stairs properly.
- q) Jobsites with mixture of high-rise and low-rise buildings results in too many trades on site and unsafe conditions. Piece-work encourages speed of work (and not safe work).
- r) Piece-work system contributes to unsafe conditions - if it is bad at the railing stage it is bad at the roof stage.
- s) Workers want to get the work completed and do not see the value of safety in it for them.

Solutions:

Item	Suggested Controls and Solutions
1	Employers and supervisors to regularly communicate to work safe because it is the right thing to do.
2	Worker / employer must reinforce the mindset that everyone is responsible (IRS) for safety.
3	Greater emphasis is need on “what’s in it for me” regarding work safety.
4	Make all workplace parties accountable for non-compliance.
5	Develop safety driven work practices and incentives.
6	Build safety incentives into contracts for workers and supervisors.
7	Develop an improved work practice culture with emphasis on safety to eliminate bad habits (old work practices).
8	Job quotations and flat rate contracts must include sufficient cost for safety.
9	More discussion, education and collaboration with workers re non-compliance.
10	Adopting industry guidelines and standards.
11	Require the provision of anchor points for each step of construction.
12	Require use of self-retracting lanyard for leading edge work.
13	Use of SRL will not be cumbersome and workers will wear it.

5. Equipment (Tools & Machines, People)

- a) Various trades use their own scaffold which required installation and setup each time instead of erecting a scaffold around the house for use by all trades.
- b) Problem to erect the trusses and a crane would help.
- c) Trusses and roof can be assembled on the ground and hoisted into position but ground surface must be level and space is needed.
- d) Workers do not like assembling roof on the ground.
- e) Mandated standard would not always work, equipment setup and use time must be costed into work.
- f) Workers have no place to tie off fall arrest equipment.
- g) Framers must start with open space (nowhere to tie off).

Solutions:

Item	Suggested Controls and Solutions
1	Mandate use of a scaffold constructed around the house with required specifications for use by all trades.
2	Have the option to consider a bracket scaffold for used by various trades.
3	Require a specific area of space for use by hoisting equipment on the construction site and for roof assembly.
4	Require the provision of an anchor point for workers to tie off when beginning frame work.

6. Procedure / Techniques (Process, People, Culture)

- a) Supply, accountability, maintenance, design, logistics, qualifications, engineering, liability cost, supplier set-up/engineered must be factored into use of equipment.
- b) Leading edge work – no platform below to stand on.
- c) Temporary stairs installations and railings now require very precise construction.
- d) Should be a monetary section for some of these requirements where workers should get a little more money for doing this work.
- e) MLTSD to take a look at guidelines outlined in a Best Practices document and have them reference it during inspections.
- f) IHSA Best Practice on roof truss (3 methods).
- g) Floor joists installation never received blessing from MLTSD.
- h) MLTSD shuts occasionally shuts down site when joists and leading edge work do not comply with Green book.
- i) Multi Trade Scaffolding use - a pilot project on exterior scaffolding (setup by Mattamy homes) failed due to jurisdictional issues. There were issues around who is buying the scaffold, setting it up, scaffold storage, scaffold inspection, liability issues and paying additional cost for scaffold setup. Although this was a practical work task procedure, the various parties could not agree on the concept.
- j) Innovation is lacking in the trade and the industry has no appetite to resolve a scaffold around the house concept with respect to assembly and dismantling.

Solutions:

Item	Suggested Controls and Solutions
1	Trade needs to adopt innovative ideas with respect to platforms and scaffolds. (I.e. installation of a multi-trade scaffold erected around a house and/or Bracket Scaffold hung on top of wall, inside or outside the house).
2	Factor in all related costs into the work in respect of scaffolding and use of other equipment.
3	Ensure that temporary stairs and railings are installed as outlined in the Regulations.
4	Develop a pay/cost structure for workers to complete construction of railings and stairs when required.
5	Get MLTSD buy-in of Framing Best Practices guideline.
6	Utilize IHSA Best Practice re Roof Truss methods.
7	Get MLTSD input and approval on a process for floor joist installation.
8	Adopt practice and use of multi trade scaffold setup around residential home construction or Bracket Scaffold hung on top of walls, inside or outside the house.
9	Utilitze an innovative approach in panelization, on site and offsite, to construct floors, roofs, porches, balconies and other house components.

7. Old Practices / Lack of innovation (Process, People, Culture)

- a) Old school culture.
- b) Floor Joists / Roof Truss construction has the highest risk.
- a) Lack of practice and space to erect joists/truss on the ground then hoist up.
- b) Data / Building codes (need updating).

Solutions:

Item	Suggested Controls and Solutions
1	Consider piloting a new technique or procedure (research innovation grant).
2	Get manufacturer involved in innovative, new improved products via Trade Working Groups.
3	Convene trade or working groups with focus on innovation.
4	Develop a structure regarding ownership of cost (development of new products).
5	Defining accountability and liability.
6	Engage research on innovation and business ROI.
7	Builder ownership re cost of innovation.
8	Install exterior scaffold around the house or install Bracket Scaffolding.
9	Industry wide accepted guidelines and standards for installation of roof trusses.
10	Encourage the assembly of prefabricated trusses offsite or on the ground.
11	Factor in the cost of making the work task and site safe.
12	Establish a requirement to provide safe access for practice and erection of joists/truss on the ground and then hoisted.

8. Fit for Duty – Mental health (People)

- a) Addiction substances being used recreationally and for medication purposes.
- b) Unfit workers, working around others (operation of tools/equipment).

Solutions:

Item	Suggested Controls and Solutions
1	Provide worker access to information and support resources.
2	Educational information on substance use, addiction and where to get support.
3	Awareness info is available by employers and should be included in orientation.
4	Make it easier to discuss the topic (peer support program etc.).
5	Make workers aware of industry high risk on this.
6	Worker education re opioid alternatives.
7	More research re substance use.

9. Personal Protective Equipment (PPE) (Process, Culture, Tools)

- a) Use and setup of scaffold equipment is often inefficient.
- b) SRL versus tie off.
- c) Often nowhere to tie off.

Solutions:

Item	Suggested Controls and Solutions
1	Use of an outside scaffold around the house would eliminate the requirement to tie-off.
2	Use Bracket Scaffold hanging over top side of wall.
3	Incorporate use of brackets for scaffold into design of house.
4	Building design and engineering to support structural requirements for scaffold.
5	Use of self-retracting lanyard (SRL) would eliminate some anchor point requirements.
6	Construct floor and roof components on the ground and hoist them in place.
7	Need to develop and review existing guidelines on how tasks are done.

9b. Project Costs (Process)

- a) Contract does not give consideration to work timelines, pressure to complete tasks, safe work practices and procedures.
- b) Supply chain costs and procurement often cause disruption to work due to material delays and related cost.
- c) Builder requirements to meet standards needs to be factored into cost.
- d) Scaffold installation, setup and safety maintenance is often time consuming.

Solutions:

Item	Suggested Controls and Solutions
1	Establish a rate per job/task with safety incentives rather than piecework pay structure.
2	Contract needs to factor in work delays due and unexpected supply chain costs and procurement.
3	Need a level playing field with respect to the cost of doing work.
4	Need to develop a business case for Return on Investment (ROI).
5	Explore further research on use of exterior bracket type scaffold project by all trades on site.
6	Development of a sub-trade to handle install and setup of scaffold only.

10. Site conditions (Environment)

- a) Multi-trades working on-site create congestion for people and equipment.
- b) Site access is often a problem due to physical condition and congestion.
- c) Conditions often not suitable to carry out best practices.
- d) Multi -trades working on the same house, sometimes on top of each other, creating unsafe work condition.

Solutions:

Item	Suggested Controls and Solutions
1	Coordinate work schedule of the various trades in a more orderly manner to avoid overcrowding of worksite areas.
2	Make supervisor accountable for inspecting ground conditions to ensure that it can accommodate equipment and worker access
3	Ensure in processes that suitable space is available for trades to function using best practices (e.g. joist, truss, construction on ground etc.).

Recommendations and Conclusions:

The controls and solutions listed in this document are for the top primary causal factors that may contribute to workers falling, while working at heights, in the Rough Framing and Carpentry trades in the Low-Rise Residential Construction sector. Given recent fatalities in the sector, along with injury/fatality data available from the Workplace Safety and Insurance Board (WSIB) for the Residential Roofing, it is important that specific solutions targeting systemic weaknesses be implemented immediately.

Based on the list of controls/solutions provided by the subject matter experts from industry, research and government (regulator), the following five action items are recommended:

- 1. Address the lack of political will through greater enforcement of non-compliance and collaboration to focus on top industry issues identified in this workshop report (i.e. underground economy, equipment use and practices)**
 - ✓ Sector must address the identified key issues impacting safety in the sector.

- 2. Promotion of industry specific fit for duty, mental health and wellness resources.**
 - ✓ Provide tailored support to workers, supervisors and other support staff.

- 3. Greater implementation and enforcement of trade specific working at heights training.**
 - ✓ Trade and or site specific training and practices to be adopted and enforced.

- 4. Address the negative impacts of the piecework culture**
 - ✓ Adverse effects of the piecework culture must be addressed.

- 5. Requirement/Adoption/Implementation for a framing, multi-trade, best practices and procedures for job sites.**
 - ✓ Adoption and requirement of a Best Practices document (RCFA or equivalent) by all related trades.

The above five recommendations provide a systemic foundation for reduction in fall related incidents while working at heights in the Rough Framing and Carpentry trades. If ignored, the solutions listed for the top ranked primary causal factors will just serve as “band-aid” solutions. Based on the Swiss Cheese model of accident causation, risk assessment and root-cause analysis theory, we must focus on the causal factors and not just the symptoms.