**What is the EHS F.R.O.G. Tool?**

Prevention of workplace injuries and incidents begins with identifying hazards. TCU’s F.R.O.G. Tool is a risk assessment tool created to provide a practical approach for hazard identification and ways to reduce or eliminate those hazards from laboratories and procedures. It focuses on the relationship between the researcher, the experiment, the tools, and the work environment. Ideally, after the identification of uncontrolled hazards, steps will be taken to eliminate or reduce them to an acceptable risk level.

**What is a Hazard?**

A hazard is the potential for harm. In practical terms, a hazard is often associated with a material, condition, or activity that, if left uncontrolled, can result in an injury, illness, environmental release, property damage, and/or an interruption in work.

**What is Risk?**

A risk is the probability or likelihood that a hazard will cause harm. In practical terms, risk is the product of the likelihood of a hazard causing harm and the severity of that harm.

**What to Know Before Beginning a Risk Assessment?**

Before conducting a risk assessment, be sure to consult the Integrated Laboratory Management Plan (IMLP) for standards in research practices. Compliance with these standards is mandatory, and by incorporating these standards in the risk assessment, one can ensure that TCU policies and state / federal regulations are being met.

**When should the F.R.O.G Tool be used?**

TCU EHS recommends using the F.R.O.G. Tool for the development of a new experiment, procedure, or project. Although the intended use is as a laboratory assessment, this tool is also able to be applied to non-lab environments. The F.R.O.G. Tool focuses on hazard identification at each step or task level of an experiment or procedure. When conducting an assessment, always consider the full range of safety, health, and environmental hazards, from machine safety to high noise levels to chemical and biological exposures.

In ***Step 1*** of the assessment, one will identify the question to be answered, the intended approach to use, and general hazards associated with the materials, chemicals, equipment, and processes.

For ***Step 2*** of the assessment:

* Outline each step/task of the experiment or project;
* Talk with the PI and peers about routine and infrequent tasks, near misses, and safety concerns;
* Learn more about the hazards of all materials and chemicals involved in the experiment/project.

A risk assessment tool can provide essential information for enhancing safety practices, establishing proper procedures, and ensuring all lab members are properly trained. Assistance from experts about certain hazards involved may be needed. Consult EHS ([safety@tcu.edu](mailto:safety@tcu.edu)) if you have questions.

**How are Hazards Identified?**

The goal is to discover the following information before starting the experiment or project:

* What are the inherent hazards of the materials, equipment, and activity?
* What can go wrong?
* How could it happen?
* What are the worst-case, credible consequences?
* What are the contributing factors?

Documenting the answers to these questions in the F.R.O.G. Tool form, in a consistent manner, will help ensure that efforts to eliminate hazards and implement controls will target the most important contributors to risk. Rarely is a hazard a simple case of one singular cause resulting in one singular effect.

Good descriptions of hazards include:

* Where it would happen (environment)
* Who or what it would happen to (exposure)
* What precipitates it (trigger)
* The outcome that would occur (consequence)
* Any other contributing factors

**How are Hazards Reduced or Eliminated?**

After reviewing the list of hazards, use the Hierarchy of Controls to consider what methods will eliminate or reduce them. Think about the controls that need to be in place to address the severity of the worst-case, credible consequence. The higher the severity, the higher the level or number of controls needed to reduce the risk to an acceptable level.

Document the existing controls and ask, “How likely is it that the accident scenario will occur with these controls in place?”

For ***Step 3*** of the assessment, review the choices and question the methods intended to be used. Discuss decisions with the PI, supervisor, and any peers who perform the experiments or tasks being considered. Review incident data or information from co-workers on the likelihood that the accident scenario would occur with controls in place. Additional controls may be required based on experience.

If new or modified procedures are to be introduced, be sure everyone understands what is involved, what new risks are introduced, and the reasons for the changes.

**How to Assign Risk?**

First, ask, *“If a person is exposed to this hazard or accident scenario, how bad would the outcome or consequence be?”* Consider the worst-case, credible consequence without regard to having controls in place. The purpose of this exercise is not to imagine the worst outcome, but to evaluate the most probable level of severity. It is based on your judgment, experience, and knowledge of the subject matter. Consult with the PI, supervisors, and peers for input. Assign the severity level defined on the Risk Matrix.

The next question, *“How likely is this?”* refers to the likelihood of a malfunction or accident occurring with the existing controls in place. It is impossible to try to predict when and under what circumstances a system will fail. In this step, you should assume that the system will fail and that the researcher is exposed to the hazardous motion or process. The question is not, “When will the equipment or process fail unexpectedly?” The question is, “When the equipment or process fails unexpectedly, or there is a potential exposure during a hazardous process, how likely is it that someone will be injured given the controls currently in place?” Review accident data or lessons learned from both inside and outside of the University to help determine the likelihood that the hazard will result in the severity of the harm defined.

The answers to these questions and the risk rating matrix will help to determine the risk rating level for the experiment or project. The risk rating is subjective and based on knowledge and experience. The primary goal is to analyze and evaluate risks, mitigate them effectively, and differentiate unacceptable and high-level risk steps from those with a lower level of risk. This will help drive additional consultation and control measures where needed. You and the PI should decide if the risk level is acceptable before proceeding with a test run. If the risk level is not acceptable, then return to Step 2 of the F.R.O.G. Tool and use the hierarchy of controls to design a safer process.

**How to Test the Process?**

The experimental design can be tested by doing a dry run, doing a run with less hazardous materials, or testing the design on a smaller scale. It is particularly important to review the assessment if an accident or incident occurs. Based on the circumstances, it may be determined that a change to the procedure should be made to prevent similar incidents or near misses in the future. Record notes from any trial runs and evaluations of the experiment or procedure in Step 3 of the F.R.O.G. Tool.

**When is the Risk Assessment Complete?**

When it is time to run the new experiment or procedure, be sure to use the appropriate controls identified. In ***Step 4***, evaluate and critique all the controls and hazards as the work is being done.

If changes are needed, update the risk assessment tool and re-evaluate the process. Do this whenever there are changes in scale, reagent, equipment, or conditions that affect the hazard/risk level. Share the new version of the assessment with PI and colleagues for the next iteration of the experiment/procedure.

Periodically reviewing the risk assessment ensures that it remains current and continues to help reduce accidents and injuries. Even if the experiment or procedure has not changed, you may identify hazards during runs that were not identified initially. These findings should be documented and managed.

# **How to Start the Risk Assessment Process?**

Start your risk assessment by downloading the Functional Risk Observation Guidance (F.R.O.G.) Tool Form.