



TEXAS WOMAN'S UNIVERSITY™

Heavy Equipment Safety Program

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Table of Contents

I.	Purpose	1
II.	Scope	1
III.	Responsibilities	1
IV.	Classifications	2
V.	Hazards	4
VI.	Operator Requirements	4
VII.	Heavy Equipment Requirements	5
VIII.	Unique Hazards	5
IX.	Inspections	7
X.	Training	7
XI.	Recordkeeping	10
XII.	Appendix 1 – Daily Heavy Equipment Inspection Form	11
XIII.	Appendix 2 – Heavy Equipment Practical Training Form	12
XIV.	Appendix 3 – Backhoe Operator Performance Evaluation Form	14
XV.	Appendix 4 – Skid Steer Operator Performance Evaluation Form	16

I. Purpose

Heavy equipment, including, but not limited to, excavators, tractors, backhoes, and skid steers, are essential tools for maintaining and improving facilities, landscaping, and grounds on campus. There are numerous opportunities for injuries and property damage to occur during the operation of this machinery due to their sheer size and power, and operating locations adjacent to easily damaged equipment or installed utilities. Unsafe practices by either the operator of the equipment or those around the equipment can create very dangerous situations. Serious injuries can occur if the equipment strikes a worker or if the equipment is rolled over.

This program has been created to minimize the risk of injury to employees or bystanders and avoid damaging university property. These requirements are established under OSHA's 29 CFR 1926.600 Equipment Standard.

II. Scope

This program, in accordance with [University Regulation and Procedure Number 04.430](#), applies to the operation of all heavy equipment operated on Texas Woman's University property by staff, faculty, or students.

III. Responsibilities

A. Risk Management

- Assist departments with implementing a regulatory-compliant heavy equipment program.
- Assist with heavy equipment training.
- Provide consultation and guidance when necessary.
- Periodically review and revise this program and reflect changes in regulatory requirements as necessary.
- Periodically evaluate the work site usage of heavy equipment.
- Investigate related injuries and damage.

B. Departments and Supervisors

- Designate and identify personnel authorized to operate heavy equipment (do not allow unauthorized use of the equipment).

- Ensure authorized operators, and supervisors who directly supervise operators, have received proper training and certification before operating equipment. This includes hands-on training, as needed. Review and ensure understanding of this program and its applicability to your department.
- Assist with hands-on training.
- Ensure all safety and manufacturer regulations and instructions are followed.
- Ensure heavy equipment is maintained in proper working order and repaired when necessary.
- Ensure employees comply with all provisions of this program.
- Ensure employees are provided with and use appropriate personal protective equipment (PPE).
- Take prompt action, including disciplinary action as appropriate, when unsafe conditions or acts are observed.
- Investigate (along with Risk Management) related injuries and damage.
- Contact Risk Management to evaluate any safety concerns, or as specified in this program.

C. Operators

- Complete lecture training, hands-on training, and in-person evaluation of competence training before operating heavy equipment.
- Perform and document heavy equipment pre-use inspections (see Appendix 1 - Daily Heavy Equipment Inspection Form).
- Report all vehicle maintenance issues to their supervisor and remove the equipment from service if necessary.
- Always operate and maintain equipment in a safe manner.
- Adhere to the owner's manual and all provisions in this program.
- Consult with supervisor and/or Risk Management regarding any unusual hazards.

IV. Classifications

Heavy equipment can be classified into the following categories based on the type of operation:

- Excavating equipment
- Lifting equipment

- Loading and hauling equipment

Depending upon their versatility, heavy equipment may be used for multiple purposes. For example, backhoes are normally used for excavating but they can also load the excavated material into trucks.

A. Excavation Equipment

An excavator is a power-driven machine mostly used in earthmoving operations. Heavy equipment typically used for excavating include the following:

- Backhoes are used for surface or subsurface excavation of solids and sludge. Backhoes are used to dig below the surface, such as trenches, building footings, and foundations. The backhoe is attached to the loader frame with a ridged coupling.
- Excavators are large backhoes. They can be truck-mounted, truck carrier mounted, or self-propelled wheel mounted. They are hydraulically powered and consist of three structures: the revolving unit, the travel base, and the attachment.
- Front-end loaders are self-contained units mounted on rubber tires or tracks and are one of the most versatile and capable pieces of equipment used in excavation work as well as loading. The front-end loader can be equipped to operate as a loader, dozer, scraper, clamshell, forklift, backhoe, crane, auger, or sweeper.

B. Lifting Equipment

Cranes are used for raising, shifting, and lowering loads. For more information, please see [TWU's Crane, Hoist, and Rigging Safety Program](#).

C. Loading and Hauling Equipment

- Loaders are used to excavate and move soft materials and load/unload trucks.
- Dozers (bulldozers) are used for pushing and pulling loads, typically used in earthwork operations and demolition work.
- Scrapers are used for loading, hauling, dumping, and spreading loose materials.
- Dump trucks are the most common type of hauling equipment due to their versatility.

- Wagons are earth-moving trailers pulled by tractors.

V. Hazards

Unauthorized or unwise use of heavy equipment can result in personal injury, loss of life, or severe loss of materials needed to complete a project. Hazards related to heavy machinery can be caused by:

- Poor repair or service (may include repair by an unauthorized person)
- Obstructed view while backing
- Striking people and collision with other equipment
- Workers caught between equipment and objects
- Riders falling off equipment or buckets
- Overturning of equipment
- Driving at excessive speeds
- Unexpected electrical shock
- Failure of lifting mechanisms/operational failures
- Injuries to operators due to ingress/egress difficulties
- Runaway machines
- Overhead obstructions

VI. Operator Requirements

Only highly skilled operators who have demonstrated adequate knowledge, ability, and skills to safely operate heavy equipment should be authorized for operation. In addition:

- Operators shall review and follow the manufacturer's operating manual. A copy of the manual must be readily available.
- Only trained operators shall operate heavy machinery and must be specifically trained on the equipment they will use.
- Operators shall follow safe work practices when operating heavy machinery.
- Operators shall check vehicles at the beginning of each shift to ensure that the parts, equipment, and accessories are in safe operating condition (see Appendix 1 - Daily Heavy Equipment Inspection Form). Operators shall repair or replace any defective parts of equipment prior to use, or report defects to their supervisor and place the equipment out of service until maintenance is performed.

- Operators shall NOT operate equipment in reverse with an obstructed rear view unless it has a reverse signal alarm capable of being heard above ambient noise levels, or a signal observer indicates that it is safe to move.
- Operators should not overload heavy equipment and must ensure that loads are balanced and fully contained within the vehicle. Loads should be secured and covered before moving the vehicle.

VII. Heavy Equipment Requirements

- All heavy equipment that qualifies as a vehicle must have:
 - A service brake, an emergency brake, and a parking brake system
 - Working headlights, taillights, and brake lights
 - An audible warning device (horn)
 - An intact windshield with working windshield wipers
- Vehicles loaded from the top (e.g., dump trucks) must have cab shields or canopies to protect the operator while loading.
- Ensure that vehicles used to transport workers have seats with operable seat belts firmly secured, and adequate for the number of workers to be carried.
- Equipment should have roll-over protection and protection from falling debris hazards, as needed.
- Equipment should not be modified in terms of its capacity or safety features without the manufacturer's written approval.
- Where possible, do not allow debris collection work or other operations involving heavy equipment under overhead lines.
- Heavy equipment will be kept in clean condition, and free of excess dirt, oil, and grease.

VIII. Unique Hazards

A. Diesel Exhaust/Diesel Particulate Matter (DE/DPM)

Diesel engines provide power to a wide variety of vehicles, heavy equipment, and other machinery. The exhaust from diesel engines contains a mixture of gases and very small particles that can create a health hazard when not properly controlled. Short-term exposure to high concentrations of DE/DPM can cause headaches, dizziness, and irritation of the eye, nose, and throat severe enough to distract or disable workers.

Prolonged DE/DPM exposure can increase the risk of cardiovascular, cardiopulmonary, and respiratory disease and lung cancer. In June 2012, the International Agency for Cancer Research (IARC) classified DE (including DPM) as a known human carcinogen (Group 1).

Engineering controls are the most effective strategy for minimizing worker exposure to DE/DPM. Using a combination of controls is often required. Examples include:

- Performing routine preventative maintenance of diesel engines to minimize emissions
- Installing engine exhaust filters
- Installing cleaner burning engines
- Installing diesel oxidation catalysts
- Using special fuels or fuel additives (e.g., biodiesel)
- Providing equipment cabs with filtered air
- Installing or upgrading main or auxiliary ventilation systems, such as tailpipe or stack exhaust vents, to capture and remove emissions in maintenance shops and other indoor locations

Administrative controls refer to changes in the way work tasks are performed to reduce or eliminate the hazard. Examples include:

- Limiting speeds and using one-way travel routes to minimize traffic congestion
- Prohibiting and/or restricting unnecessary idling or lugging of engines
- Restricting the amount of diesel-powered equipment and total engine horsepower operating in a given area and ensuring that the number of vehicles operating in an area does not exceed the capacity of the ventilation system
- Designate areas that are off-limits for diesel engine operation and/or personnel travel

Additional information on the hazards posed by diesel exhaust can be found via OSHA's [Hazard Alert - Diesel Exhaust/Diesel Particulate](#) Matter factsheet.

B. Pedestrians

Each piece of heavy equipment on campus was purchased for a specific purpose and will function in a specific area most of the time. Occasionally, equipment must be used in locations shared with pedestrians. The operator will always keep a lookout for ALL pedestrians and drive defensively.

IX. Inspections

A. Pre-Use Inspection

- Operators should approach equipment, walk fully around it, and look for hazards on or near equipment (see Appendix 1 - Daily Heavy Equipment Inspection Form).
- Inside the cab, remove the trash, make sure cab windows are clean, adjust mirrors, check the fire extinguisher (if present), turn on all exterior lights, and make sure the seatbelt is ready to use.
- Check lights, tires, suspension and steering system, exterior hoses, and filters. Look for cracks in the metal structure, unguarded moving parts, or other unsafe conditions. Check engine compartment and belts. Make sure fluid levels are correct.
- Check all gauges and warning lights before starting the equipment. Make sure the parking brake is set and other manufacturer's engine start-up guidelines are followed. Start the engine, check gauges and warning lights again. Check engine sounds.
- Before moving, warn people in the area. Test the equipment's movements and make sure the backup alarms can be heard.

X. Training

A. Initial Training

Supervisors must ensure all operators are adequately trained before operating heavy equipment. Training shall consist of a combination of formal instruction (e.g., lecture, online training, etc.), practical training (demonstrations performed by the trainer and practical exercises performed by the trainee), and practical evaluation of the operator's performance in the workplace.

Operator training shall be conducted by persons who have the knowledge, training, and experience to train heavy equipment operators. Formal instruction is the prerequisite for practical training.

i. Formal Instruction

Formal instruction includes online training, available in TWU's employee learning management system, Bridge, as well as equipment-specific training by a competent person familiar with the machine. Formal training consists of the following elements:

- Specific operating instructions, warnings, limitations, and precautions specific to the type of equipment to be utilized by the operator
- Differences between heavy equipment and a vehicle
- Equipment controls and instrumentation, including their location and proper operation
- Operating the motor/engine
- Steering and maneuverability
- Visibility, including limitations when loading/unloading
- Attachment use and adaptation, operation, and limitations (when applicable)
- Vehicle capacity and stability limitations
- Completing equipment pre-use inspections
- Refueling and/or battery changing/charging
- Specific workplace operation of the heavy equipment, including the following:
 - Handling loads specific to the operation
 - Operating in narrow spaces and/or around pedestrian traffic
 - Operating on sloped surfaces
 - Ventilation while using heavy equipment
 - Use restrictions based on hazardous locations

ii. Practical Training

Practical training includes demonstration performed by the trainer and practical exercises performed by the trainee to ensure competence by the operator when utilizing heavy equipment. See Appendix 2 - Heavy Equipment Practical Training Form for more details. Practical training should simulate typical work to be conducted with heavy-equipment and may consist of the following:

- Location and purpose of various levers, gages, etc.

- How to move the heavy equipment in multiple directions, on an incline (if applicable), navigating tight spaces, etc.
- How to pick up, transport, and place loads
- How to properly refuel or recharge the equipment
- How/where to properly park and turn off the truck

iii. Practical Evaluation

An evaluation of each heavy equipment operator's performance shall be conducted after initial training and at least once every three years thereafter. Practical evaluations shall be conducted by persons who have the knowledge, training, and experience to evaluate the competence of heavy equipment operators. Practical evaluation should be conducted utilizing the heavy equipment to be used by the operator. See the appropriate appendix (Appendix 3 - Backhoe Operator Performance Evaluation Form, Appendix 4 - Skid Steer Operator Performance Evaluation Form) for details.

Practical evaluation should simulate typical work to be conducted with heavy-equipment and may consist of the following:

- Performing pre-use inspections
- Safe operation of heavy equipment
- Handling a load (if applicable)
- Maneuverability

B. Refresher Training

Refresher training may be necessary due to certain circumstances as follows:

- The operator is observed operating the vehicle in an unsafe manner
- The operator is involved in an accident or near-miss incident
- The operator receives an evaluation revealing unsafe practices
- There is a change in workplace conditions affecting the operation of heavy equipment
- There is a change in the type of heavy equipment being utilized in the workplace.

C. Certification/Recertification

Heavy equipment operators shall be certified before operating heavy equipment. This certification must be documented and include the following:

- Operator name
- Date of training
- Date of evaluation
- Evaluator name

XI. Recordkeeping

Departments and units are responsible for maintaining the following records:

- Training certifications for all heavy equipment operators, including names and dates of training, and the equipment they are certified to operate.
- Pre-use inspection checklists.
- Maintenance records for each piece of heavy equipment.
- Accident reports involving heavy equipment.

Unless otherwise specified in this program, all records must be retained and made available for at least 5 years.

XII. Appendix 1 - Daily Heavy Equipment Inspection Form

Inspector Name: _____ Date: _____ Equipment Inspected: _____

Inspection Item	Pass	Fail	Comment
Surrounding Equipment - Are there hazards on or near the equipment that should be removed?			
Inside Cab (if applicable) - Is the cab clean, windows clear and visible, mirrors adjusted, and seatbelt ready to use?			
Guards/Covers - Are there broken welds, missing bolts, or damaged areas? Are there any unguarded moving parts?			
Tires/Tracks - Are the tires/tracks in good condition (no cracks, flats, or obvious wear)? Are there large pieces of rubber missing or separated from the rim?			
Battery Check - Are the cell caps and terminal covers in place? Are the cables missing insulation? Any signs of battery acid leaks?			
Horn/Lights - Does the horn work (if equipped)? Are the lights functioning and free of damage?			
Engine - Is there any obvious damage in the engine compartment? Do belts look loose or worn? Are there any cracked hoses or tubing? Are fluid levels correct? Any signs of leaks? When started, does the engine sound normal? Are gauges/lights functioning properly?			
Before Moving - Are the forward and reverse controls functioning properly? Can the backup alarm be heard by people around the equipment? Have people in the area been warned that the equipment will be moving?			
Notes:			

XIII. Appendix 2 - Heavy Equipment Practical Training Form

What Trainer Should Demonstrate

Show trainees the various types of heavy equipment that they will be expected to use in their normal course of work. Identify whether they are gasoline, diesel, LP, or electrically powered. With each piece of heavy equipment, show the location and function of all gauges, levers, pedals, switches, and safety features.

Demonstrate:

- Pre-use inspection
- Starting the engine of heavy equipment
- Adding and removing attachments from heavy equipment (if applicable)
- Performing tasks with the attachments (if applicable)
- Moving heavy equipment in a straight line, in both a forward and backward direction
- Moving heavy equipment in a circle, in both a forward and backward direction
- Moving heavy equipment in a cross shape, making clean turns, in both a forward and backward direction
- Moving heavy equipment in tight spots, making smooth turns, in both a forward and backward direction
- Moving heavy equipment up and down an incline without a load
- Picking up a load
- Moving up and down an incline with a load
- Parking and shutting down heavy equipment
- Each step required to refuel or recharge the heavy equipment used in your organization; emphasize precautions that must be followed for safe refueling and recharging
- Other unique tasks for a respective piece of equipment determined by the trainer/supervisor

Summary:

- Summarize the session and emphasize the importance of safety
- Answer any questions trainees may have
- Distribute any printed literature you may feel is necessary

What Trainees Should Practice and Be Able to Do

Have trainees identify and name the different types of heavy equipment used in your organization, and identify and explain the function of all gauges, levers, pedals, switches, and safety features.

Have trainees practice:

- Pre-use inspection
- Starting the engine(s) of heavy equipment
- Adding and removing attachments from heavy equipment (if applicable)
- Performing simulated tasks with the attachments (if applicable)
- Moving heavy equipment in a straight line, in both a forward and backward direction
- Moving heavy equipment in a circle, in both a forward and backward direction
- Moving heavy equipment in a cross shape, making clean turns, in both a forward and backward direction
- Moving heavy equipment in tight spots, making smooth turns, in both a forward and backward direction
- Moving up and down an incline without a load
- Picking up a load

- Moving up and down an incline with a load
- Parking and shutting down heavy equipment
- Each step required to refuel or recharge the heavy equipment used in your organization; emphasize precautions that must be followed for safe refueling and recharging
- Other unique tasks for a respective piece of equipment determined by the trainer/supervisor

XIV. Appendix 3 - Backhoe Operator Performance Evaluation Form

OPERATOR NAME: _____ DATE _____ TIME _____ a.m./p.m.

Preventative Maintenance	Acceptable	Unacceptable	N/A
Checked fluid levels - cold check			
Checked air cleaner system - serviced if required			
Checked tire pressures			
Inspected tires for cuts/tread wear/proper mounting			
Inspected loader bucket for wear			
Inspected backhoe attachment for wear			
Inspected hydraulic lines and connections			
Lubricated machine			
Mounted machine properly			
Started engine - verified fluid levels			
Operated controls to warm-up hydraulics			
Checked lights and other safety items			
Comments:			
Roading the Machine	Acceptable	Unacceptable	N/A
Put backhoe attachment in travel position			
Raised stabilizers and secured			
Checked for vehicle slow moving emblem			
Locked brake pedals together			
Maintained loader bucket height			
Maintained safe road speed			
Used accelerator pedal, not hand throttle			
Used signals when turning			
Used flashing lights and rotating beacon			
Wore seat belt			
Comments:			
Trenching with Backhoe	Acceptable	Unacceptable	N/A
Checked utilities locations			
Positioned the backhoe for excavating			
Oriented one edge of backhoe bucket along excavation			
Lowered stabilizers			
Lowered loader bucket			
Throttled backhoe for operation			
Let backhoe bucket teeth lead into cut			
Made small, sweeping cuts			
Used boom, stick, and bucket controls for cutting			
Positioned spoil material away from excavation			
Cleaned side of excavation			
Moved to each of four corners - continued digging			
Wore seat belt			
Comments:			
Backfilling	Acceptable	Unacceptable	N/A
Readied the backhoe for backfilling			
Maintained loader bucket position			
Loaded bucket			
Carried load to fill area			

Pushed fill material into fill area			
Dumped load into excavation			
Compacted material (when feasible)			
Used proper gear and speed			
Wore seat belt			
Comments:			
Authorization of Operator (circle one)	Pass	Fail	
Comments:			
Evaluator Name:			
Evaluator Signature:			

XV. Appendix 4 - Skid Steer Operator Performance Evaluation Form

OPERATOR NAME: _____ DATE _____ TIME _____ a.m./p.m.

Preventative Maintenance	Acceptable	Unacceptable	N/A
Checked fluid levels - cold and hot			
Checked air cleaner system - serviced if required			
Checked tire pressures			
Inspected tires for cuts/tread wear/proper mounting			
Inspected bucket for wear			
Inspected safety latches on tool attachment arms			
Inspected hydraulic lines and connections			
Lubricated machine			
Mounted machine properly			
Checked steering/brakes			
Operated controls to warm-up hydraulics			
Wore seat belt			
Comments:			
Carrying a Load	Acceptable	Unacceptable	N/A
Loaded bucket			
Maintained bucket load capacity			
Maintained bucket height			
Dumped load at proper height			
Wore seat belt			
Comments:			
Stockpiling	Acceptable	Unacceptable	N/A
Approached stockpile			
Loaded bucket			
Maintained smooth loader cycle			
Stockpiled material properly			
Dressed side of stockpile			
Keep work area smooth			
Wore seat belt			
Comments:			
Excavating a Work Site	Acceptable	Unacceptable	N/A
Started the cut at correct bucket angle			
Made shallow/long cuts			
Carried bucket at proper height to stockpile area			
Stockpiled materials away from excavation			
Operated machine at correct speed for site conditions			
Wore seat belt			
Comments:			
Backfilling	Acceptable	Unacceptable	N/A
Approached stockpiled fill material			
Maintained bucket position			
Loaded bucket			
Carried load to fill area			
Dumped load into excavation			
Compacted material (when feasible)			

Maintained proper ground speed for site conditions			
Wore seat belt			
Comments:			
Implement Change Out	Acceptable	Unacceptable	N/A
Approached staging area properly			
Placed off load implement in proper position			
Unlatched safety latches			
Approached new implement at proper angle			
Hooked up new implement to lift arms/set safety latch			
Attached hydraulic lines (if required)			
Tested new implement for proper operation			
Carried new implement at proper height as required			
Wore seat belt			
Comments:			
Operation of Auger	Acceptable	Unacceptable	N/A
Approached work site correctly			
Positioned auger at proper angle			
Applied proper downward pressure			
Maintained proper RPM to operate auger			
Cleaned hole properly			
Wore seat belt			
Comments:			
Operation of Forklift Attachment	Acceptable	Unacceptable	N/A
Set forks at proper width for pick			
Estimated weight of load to be picked			
Ensured machine could pick/carry load			
Approached pallet at proper speed and angle			
Lifted and carried load at proper height and speed			
Approached off-load site properly			
Off-loaded pallet properly			
Wore seat belt			
Comments:			
Driving Course	Acceptable	Unacceptable	N/A
Entered course at proper speed: 1/1, V2, full			
Maintained proper height of implement while on course			
Maneuvered through course properly			
Wore seat belt			
Comments:			
Authorization of Operator (circle one)	Pass	Fail	
Comments:			
Evaluator Name:			
Evaluator Signature:			