911 - The emergency system activated by dialing 911 on a telephone to call the police, fire department, or ambulance. The introduction of the 911 system has saved many lives by saving time in an emergency because people do not have to search for their local emergency phone numbers.

**ABC Fire Extinguisher** - an extinguisher that can be used for all types of fires. The “A” rating is for wood, textiles (material and clothing), paper, and rubbish. The “B” rating is for burning liquids, and the “C” rating is for electrical equipment. Use of an ABC-type fire extinguisher is recommended for tractors because tractor fires can be of any type.

**Absorption Rate** - the speed at which the process of “sucking up” or “taking up” occurs. The absorption rate of some pesticides though the skin is so rapid that nearly-instant illness may occur. The absorption rate of some parts of the body, such as the arm pits or eyes, is higher than other parts.

**AC** - an abbreviation referring to alternating electrical current. Electricity that arrives at a farm or ranch over transmission lines is AC or alternating current. Nearly all power tools that plug into a wall receptacle are powered by AC current. Contact with overhead wiring or power tools with faulty wiring may cause electrocution or death, especially in a wet environment.

**Accident** - an unexpected event with undesirable results. Accidents are not the same as injuries. Unexpected and undesirable events may occur that do not result in injuries but cause extensive property damage.

**Accumulator** - a strong container that stores hydraulic fluid under pressure and is used to maintain constant pressure in the hydraulic system. An accumulator can also be used as a shock absorber in the system or as a means of providing pressure to power brakes and steering if the engine stalls. Only trained service technicians should be allowed to service an accumulator because of high pressure and hot oil hazards. The pressure in these containers can exceed 3000 psi.

**Acid** - a characteristic of a substance which is sour or biting to the taste. Sulfuric acid used in tractor and auto batteries is very acidic and may cause severe eye injuries or burns to the skin. Eye protection should always be worn when servicing or charging a battery.

**Age-appropriate work** - work activities that are suitable based upon physical and mental capabilities. Operating a combine or bulldozer is not age-appropriate work for a seven-year-old child; feeding chickens or gathering eggs would be more appropriate. Check out information on age-appropriate tasks at www.marshfieldresearch.org/nccrahs.

**Age Restriction** - refers to a minimum age required to perform a work-related task. The U.S. Department of Labor has imposed age restrictions on youth employed to operate tractors, and youth under age 16 are not allowed to be employed to operate a chain saw or handle anhydrous ammonia. For age restrictions for employment in agriculture visit www.agsafety4youth.info.
Agriculture - the industry that involves the production of crops and livestock, including agricultural services, forestry, and fishing. Farming, ranching, and commercial application of agricultural chemicals are examples of agriculture.

Agricultural Employer - any person, corporation, association, or other legal entity that owns or operates an agricultural establishment; contracts with the owner or operator of an agricultural establishment in advance of production for the purchase of a crop and exercises substantial control over production; or recruits and supervises employees or is responsible for the management and condition of an agricultural establishment. For additional legal guidance contact the State Department of Labor.

Agricultural Hazardous Occupation Order (AgHOs) - a term used by some organizations to identify an amendment to the 1938 Fair Labor Standards Act. See Hazardous Occupations Orders for Agriculture (HOOA).

Air Pressure - the force exerted onto a surface or enclosed container by the weight of the air. Air pressure measurements may be expressed in Pounds per Square Inch (PSI). Average atmospheric air pressure at sea level is about 14.7 PSI. As air is compressed into a confined area (such as a tire), pressure increases. See Tire Pressure.

Airborne Particles - A solid or liquid material suspended in the air. Commonly found in agriculture in the form of dust, chemical spray, biological material, or other pollutants. These particles can irritate eyes, nose, throat, or lungs and pose minor to severe health risks. Respiratory protection should be worn when there is excessive exposure to airborne particles.

Alcohol - a chemical that when ingested or consumed will affect human behavior including coordination and response time. Just as with operation of motor vehicles, agricultural equipment operators should not be under the influence of alcohol because alcohol negatively affects reaction time and reasoning ability.

Ammonia - a chemical, which is a gas in its natural state, consisting of one molecule of nitrogen and three molecules of hydrogen (NH3). Ammonia has a sharp, pungent odor and is very irritating to the eyes, nose, throat, and lungs. Ammonia is widely used in agriculture as a fertilizer. Youth under 16 cannot be employed to transport, transfer, or apply anhydrous ammonia under the Hazardous Occupation Order for Agriculture (HOOA).

Analog Gauge - a gauge that indicates a value by means of a dial-hand pointing to a number or location. Older tractors and trucks, and some newer ones, use analog gauges to display coolant temperature, battery charge indicator, travel speed, and other vehicle functions.

Angle Grinder - a hand held grinder used to prepare metal for welding and to smooth metal for surface finishing, including painting. Equipped with various types of abrasive wheels or disks, high speed grinders are commonly found in farm shops. Because they throw sparks and other debris at high speed, a face mask and eye protection should always be worn when operating these tools, and bystanders should be kept a safe distance away.

Angle of Repose - is the angle formed between the ground and the surface of a free-standing pile of grain. As grain is piled up, its characteristics cause it to flow down and reach a stable point. The drier the grain, or the smaller (corn vs. canola) the smaller the angle. For example, dry corn will form an angle 25-30°, while wet corn will form a steeper angle. Disturbing the base of a free-standing pile of grain can cause an avalanche that can bury bystanders.
Anhydrous Ammonia - a common source of nitrogen fertilizer on farms. Anhydrous ammonia, or NH₃, is an undiluted form of ammonia that is highly caustic. Anhydrous means “without water.” It is a liquid when stored in pressurized tanks, but rapidly vaporizes to a gas at atmospheric pressure. Exposure to ammonia may cause blindness, lung damage, freeze burns, and death. Flooding the eyes and skin with water is the most effective first-aid measure in the event of exposure. Youth under 16 are not allowed to be employed to transport, transfer, or apply anhydrous ammonia under the Agricultural Hazardous Occupation Orders (HOOA).

Antidote - a remedy to counteract the effects of a poison. If the antidote for a poison can be administered quickly after a poison has been ingested, serious health consequences may be avoided. For information concerning poisoning call the local Poison Control Center or if someone has been exposed to a hazardous chemical call 911.

ASABE—American Society of Agricultural and Biological Engineers - a society that promotes science and engineering in agricultural, food, and biological systems. The ASABE encourages research, education, and cooperation among its members; publishes technical reports; and develops standards, codes, formulas, and recommended safety practices. For example, the ASABE publishes safety standards for the SMV emblem, the proper use of guards on farm equipment to prevent operator injuries, and safe grain bin entry.

Asbestos - a material that has been used for many years to manufacture parts that must absorb a lot of heat such as brake pads, clutch plates, linings and gaskets. Respiratory protection should be worn when handling asbestos or servicing areas where asbestos fibers may be present. Servicing the brake shoes on a tractor may cause inhalation exposure to airborne asbestos and result in lung damage.

Asphyxiation - to become unconscious due to a lack of oxygen, which may result in death. Asphyxiation may occur in manure-storage pits, fruit-storage structures, and oxygen-limiting silos. Youth under age 16 are not allowed by federal law to be hired to work in structures such as silos that can be oxygen deficient or contain toxic gases.

Attachment Lock - a system for securing various attachments (bucket, pallet forks, etc.) to the front loader arms of a skid steer loader, telehandler, or tractor. Attachment locks may be manually operated, requiring the operator or helper to engage the mechanism, or may be hydraulically or electrically powered from the operator’s seat.

ATV—All Terrain Vehicle - self-propelled vehicles designed for rough terrain, commonly called three-wheelers or four-wheelers. Three-wheeled ATVs have been involved in many rollover incidents; consequently, the sale of new three-wheeled ATVs is now prohibited in the United States. ATVs are widely used on farms.

Auger - a rotating metal spiral, usually inside a metal tube, that transports loose material such as grain and feed. Augers are also used at the inlet of combines, windrowers, and balers to pull the crop into the feeder housing. Guards are used on auger inlets and PTO drivelines to prevent operator entanglement in case of a slip or fall into the moving machinery.

Auger Wagon - a wagon (similar to a gravity wagon) used to transport free flowing material such as grain or feed. An auger wagon is equipped with a powered auger unloading system designed to elevate and unload the material. These wagons are often used to transfer grain from a combine in the field to a grain truck parked on nearby roadways. Auger wagons present the potential for engulfment in flowing grain, as well as entanglement in powered components such as the PTO driveline and the auger.
**Auto-steer** - a system that automatically steers a vehicle without the constant need for a human operator. The system relies on signals from orbiting satellites to determine the position of the vehicle and make needed corrections to keep the vehicle on course. The human operator is still needed to initiate the system and to manually steer under certain circumstances, such as when encountering unexpected obstacles.

**Back Belt** - a device worn around the lower back and waist to provide support for the back. There is no conclusive evidence that back belts protect from lower back injuries caused by heavy or repeated lifting. The best ways to avoid back injury are to avoid lifting heavy objects and using safe lifting techniques.

**Baler** - a farm machine used to compress, package, and tie hay and other roughage crops into a bundle which is called a bale. Many farm injuries are caused by misuse of balers, which aggressively pull in and compress anything in their path. Balers are designed to make small rectangular bales that can be manually carried, large square bales, or large round bales. The large bales may weigh hundreds of pounds and require special handling equipment.

**Ballast** - a heavy substance or weight used to improve the stability, control, or traction of a vehicle. Liquid calcium chloride or beet juice is often used for ballast inside tractor tires, and a bag of sand in the bed of a pickup truck is another form of ballast. The heavy weights used for ballast on tractor wheels or on the front rack can easily cause crushing injuries when mishandled.

**Barrier** - a guard such as a rail, fence, or frame. A fence around a farm pond is a barrier that prevents water pollution from livestock entry and protects a wayward child from drowning. A rail or fence around a pasture or farm creates a barrier protecting both humans and animals from roadway collisions.

**Base of Stability** - the area that supports an object. The base of stability of a vehicle is the area formed by the points where the tires touch the ground. A wide front-end tractor provides a larger base of stability than a narrow front-end tractor. Vehicles with a larger base of stability are less likely to tip over.

**Battery** - a chemical storage device for electrical energy used to power the starter of a tractor and to power lights, gauges, and other electrical equipment. Caution is demanded when working around batteries due to the possibility for sparks, fires, explosions, and exposure to acid. Eye protection should always be worn when servicing the battery on a tractor, car, or truck. Proper training in jump starting vehicles with discharged batteries will reduce the potential for fires and explosions. See Jump Starting.

**Battery Charge Indicator** - a light or gauge showing how well the battery is charged or how well the charging system is operating. The battery charge indicator on some vehicles shows the battery voltage when the engine is off and the charging system voltage when the engine is running.

**Bearing** - A component in many machines that reduces rotational friction while supporting various dimensional loads. Bearings are commonly found in between wheels and the axle to allow for smooth rolling.

**Bio-security** - refers to the policies, and measures taken, for protecting a nation’s food supply and agricultural resources from both accidental contamination and bio-terrorism. The federal government is now increasing its efforts to improve bio-security to prevent bio-terrorism. Limiting access to livestock areas and use of disposable boots are two ways to enhance biosecurity. See Bio-terrorism.
**Bio-terrorism** - deliberate attacks of bio-terrorism might include such acts as introducing a substance intended to kill food crops; spreading a virulent disease among animal production facilities; and poisoning water, food, and blood supplies. Bio-terrorism is now viewed as an emerging threat. See Bio-security.

**Blind Intersection** - an intersection of roads, lanes, paths, railroads, or aisles where a driver's view of crossing traffic is almost totally obscured. To prevent crashes, a driver should proceed very slowly at blind intersections. Some farmers cut back tall crops at intersections to improve visibility.

**Blind Spot** - an area or a direction around equipment in which vision is obscured. Large tractors have many blind spots due to the overall size of the equipment and cab framework. Before starting a tractor, walk around it to make sure there are no hidden hazards or bystanders.

**Body Harness** - a form of personal protective equipment that is designed to prevent or reduce the severity of falls in the workplace. They are worn by roofers, construction workers and others who work in high places. They are also required by OSHA to be worn by some workers who enter confined spaces such as grain bins to prevent entrapment. For more information on uses visit www.OSHA.gov.

**Bucking** - process of sawing a felled tree into sections or logs. Bucking on a slope must be done from the uphill side to prevent crushing injuries from cut logs rolling down the slope. Youth under the age of 16 are not allowed by federal law to be employed to saw logs with a chainsaw or to handle logs with a butt diameter greater than 6 inches. See Felling.

**Bump Cap** - protective head gear without an interior suspension system that is designed to protect the head from minor impacts. A bump cap should be used when repairing machinery to prevent bumps on the head but should not be used where the possibility of heavy falling objects occurs.

**Bunk Silo** - a structure found on farms to store large quantities of silage with access at ground level. A bunk silo is fabricated with a flat smooth floor (often concrete), two side walls, and usually a “back” wall. The space between the side walls is filled with chopped forage, which is packed into a dense mass to remove oxygen and covered with plastic to allow natural fermentation. These structures can allow the silage to be piled 20–40 feet high with the capacity for hundreds of tons of silage. The silage can be easily removed with a large front-end loader. Injuries around these structures have been caused by falls, overturns of packing equipment, and being buried under avalanches from the face of the silage. Workers should never approach the face of the silage during unloading.

**By-pass Starting** - an attempt to start the tractor by using a conductor to jump across the terminals of the starter while standing on the ground. This unsafe practice by-passes the built-in safety interlocks that prevent the tractor from starting in gear. Operators have been run over and killed when the tractor started and jumped forward. Most tractors now come with shields over the starter to prevent by-pass starting.

**Bystander** - a person present at or near a farm or ranch worksite who does not actually participate in the work. Children should not be allowed in the vicinity of operating farm machinery as injury or death may occur to unsuspecting bystanders.
**Calcium Chloride** - a salt composed of calcium and chlorine. A liquid solution of calcium chloride is used as ballast in farm tractor tires to create better traction and increase stability while lowering the freeze point of the solution. A special air pressure gauge is needed to check the air pressure of a tire loaded with calcium chloride.

**Carcinogenic** - describing a substance or agent that has the potential of causing cancer. Certain restricted-use agricultural chemicals and exposure to excessive sunlight have been shown to be carcinogenic. Tobacco products also contain carcinogens.

**Car Seat** - a seat for small children that has straps and buckles to secure a child in case of a crash. Car seats must be certified to conform to federal motor vehicle safety standards. State laws require that small children be secured in a car seat while being transported.

**Carbon Dioxide** - a colorless, odorless, non-toxic gas formed during the combustion of many fuels or the fermentation of crops. Its chemical formula is CO₂. It is heavier than air. Although non-toxic, it may replace the oxygen consumed during combustion or fermentation in an enclosed environment, causing health problems associated with oxygen deficiency or even death. Carbon dioxide is used to make dry ice and as an extinguishing agent in some fire extinguishers.

**Carbon Monoxide** - a colorless, odorless, and toxic gas formed during the incomplete combustion of many fuels. Its chemical symbol is CO. Carbon monoxide inhibits the absorption of oxygen into the bloodstream and may cause headaches, nausea, sleepiness, and death. Operating a tractor or high-pressure washer inside a closed building may lead to a dangerous build-up of carbon monoxide.

**Caustic** - a characteristic of a material to eat away or burn by chemical action. Anhydrous ammonia and drain cleaners are caustic chemicals. Flushing with water is an appropriate first aid response for skin exposure to caustic materials such as anhydrous ammonia.

**Caution** - indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It can also be used to alert against unsafe practices. Caution signs are typically black and yellow.

**CC (cubic centimeter)** - a measure of volume represented by a cube with a length, width, and height of one-centimeter. One cubic inch equals 16.4 cubic centimeters. Most small engines used in agriculture use cubic centimeters to measure the combustion chamber or the size of the engine, i.e. 70 CCs.

**Center of Gravity** - the point at which the entire weight of the tractor can be considered concentrated so that if it were supported at this point, the tractor would be perfectly balanced, regardless of whether the tractor was upright, on its side, or at any other orientation. The addition or removal of ballast and the raising or lowering of a front-end loader alters the location of the center of gravity.

**Centrifugal Force** - the force that tends to propel an object outward from the center of a curve. When a tractor or ATV is driven around a curve, centrifugal force can cause it to slide toward the outside of the curve or roll over. Centrifugal force can also cause the rider to be thrown from a truck bed during a sharp turn.

**Chain Hoist** - a device used to lift heavy objects by means of a long chain and multiple pulleys. Before hanging a chain hoist in his or her shop, a farmer must ensure that the overhead mount is strong enough to safely support the load capacity of the hoist. All chain hoists should be labeled with their maximum load capacity.
**Chemical Energy** - energy stored in chemicals (compounds) and energy released or absorbed in chemical reactions is called chemical energy. Batteries produce electrical energy through a chemical process. Chemical energy is also produced through the process of photosynthesis. Plants grow by using the energy in light to build organic molecules out of CO2 from the air and H2O from the ground water.

**Cholinesterase Test** - a test to determine the level of the cholinesterase enzyme in the blood. A cholinesterase test can determine if a farmer has been exposed to too much organophosphate or carbamate pesticides such as Malathion or Sevin. Cholinesterase inhibition is associated with a variety of acute symptoms such as nausea, vomiting, blurred vision, stomach cramps, and rapid heart rate.

**Circuit Breaker** - a device in an electrical circuit that deactivates the power supply if the circuit fails or becomes overloaded. A circuit breaker helps prevent fires from overloaded circuits. Circuit breakers have replaced screw-in fuses on most farms.

**Class A Fire** - a fire involving wood, textiles (material and clothing), paper, or rubbish. The smoke from a Class A fire may be extremely hazardous if chemically treated lumber is involved. Class A fires are generally extinguished with water. The universal symbol associated with Class A fires is a triangle with the letter “A” inside it. Most farm and ranch fires are Class A.

**Class B Fire** - a fire involving burning liquids such as gasoline or oil. Water must not be used on a Class B fire because it may cause the fire to spread. Class B fires are extinguished with CO2, dry chemical, foam, or Halon agents. The universal symbol associated with Class B fires is a square with the letter “B” inside it. Fire extinguishers with a Class B rating should be located near fuel storage facilities.

**Class C Fire** - a fire involving electrical equipment. Water must not be used on a Class C fire because of the electrical shock hazard. Class C fires are extinguished with CO2, Halon, or dry chemical agents. The universal symbol associated with Class C fires is a circle with the letter “C” inside it.

**Class D Fire** - a fire involving combustible metals such as: magnesium, sodium, potassium, zirconium, titanium, lithium, aluminum, and uranium. Water and other conventional fire-fighting agents can intensify Class D fires. Class D fires are best fought by a DRY POWDER extinguishing agent, which must not be confused with DRY CHEMICAL agents found in many common fire extinguishers. The universal symbol associated with Class D fires is a star with the letter “D” inside it.

**Clutch** - the foot pedal or other mechanism that disengages the engine's power from the drive wheels. When the clutch pedal is depressed, the power is disconnected from the drive wheels. It is important that the seat of the tractor be properly adjusted so that the operator can comfortably and rapidly reach the clutch with his or her foot during an emergency stop. Clutches, including hand clutches, are found on other powered equipment.

**Combine** - a harvesting machine (usually self-propelled) that threshes and separates seed or grain from the leaves and stems of the crop. Combines are very large machines that aggressively cut, beat, and pull-in crop material and can seriously injure farmers who inadvertently make contact with the operating parts of the machinery. Due to their height, falls are one of the most common causes of injury around combines. The term comes from the two processes of cutting the crop and separating the grain from the plant being “combined” in the same machine. Safely operating or maintaining a combine requires extensive training because it has many aggressive components and hazardous points of operation.
**Come-A-Long** - also called Power-Pull – a device with a cable, two hooks, handle, and ratcheting mechanism used to pull or tie down heavy objects. A come-a-long must be inspected frequently for damage to its cable, hook, and pulley components to prevent injury to the user.

**Commercial Driver's License—CDL** - license which authorizes an individual to operate commercial motor vehicles and buses over 26,000 pounds gross vehicle weight rating. For operators of freight-hauling trucks, the maximum size which may be driven without a CDL is Class 6 (maximum 26,000 pounds gross vehicle weight rating). In some states, farmers are exempt from CDL requirements when hauling agricultural crops. You must be at least 18 to receive a CDL. Check with the State Department of Motor Vehicles for licensing requirements.

**Communication Device** - any device that people use to communicate, such as: telephone, cell phone, business-band radio, citizens-band radio, and walkie-talkie. In case of injury, a communication device to call for help can be a lifesaver for a farmer working alone.

**Compressed Air** - air under pressure which can be used to power air tools, inflate tires, and clean parts. Regulations require that air pressure at a nozzle for cleaning parts must be reduced to 30 pounds per square inch (psi) to prevent injury from flying debris. Eye protection should always be worn when cleaning parts with compressed air. Compressed air tanks should be equipped with a pressure relief valve to prevent overpressuring and exploding.

**Confined Space** - a space that is large enough that an employee can enter and perform assigned work, but has limited or restricted means for entry, and is not designed for continuous employee occupancy. Asphyxiation and entrapment can occur in confined spaces such as tanks, silos, grain bins, feed hoppers, and manure pits on farms and ranches. If you need to use your hands to enter a space, it is most likely a confined space. For more information on the hazards of agricultural confined spaces visit www.agconfinedspaces.org.

**Conveyor Screw** - the rotating metal spiral in an auger. A conveyor screw may cause serious entanglement and amputation if all shields and guards are not kept in place. Augers are used on many farms to transport granular material. See Auger and Portable Auger.

**CPR—Cardio Pulmonary Resuscitation** - a procedure that applies a series of alternating chest compressions and assisted breathing cycles for a person whose heart and breathing has stopped. If CPR is not started within four minutes after the heart and breathing have stopped, serious brain damage may occur. Most local hospitals and the American Red Cross offer training to perform CPR. Every farm or ranch should have someone trained in CPR. See www.redcross.org.

**Crankcase** - the metal casing that encloses the crankshaft and bottom of an internal-combustion engine. Pulling the dipstick to check the oil in the crankcase of an engine should be done only after the engine has cooled to prevent burns from hot oil.

**Crankshaft** - the shaft in an engine that transfers the engine's power from combustion to a drive shaft. Crankshafts can break during tractor pulling contests, and flying metal parts may injure spectators.
Crop Residue - the portion of plant material or crop left in the field after harvest. Crop residue helps prevent soil erosion but provides a ready source of fuel for field fires. Crop residue can also build up on equipment such as combines and be ignited. Daily cleaning should be done to remove crop residue.

Crush Point - a location on machinery where a person or body part could be crushed. The area below the bucket of a skid steer loader or combine header is a crush point, but using the header support safety locks will prevent crushing injuries. Appropriate jack stands should be used to support equipment when working under it.

Cumulative Trauma - injuries caused by repeated stress on body parts. Repetitive work activities such as milking cows or stooping to harvest crops may cause cumulative trauma.

Current - Electrical current, measured in amps, is the flow of electrons, often through a wire. Overloading electrical circuits poses a safety/fire risk by the heat generated from the electrical current.

Cutting Point - a location on machinery where the danger of getting cut can occur. The sharp edge of replaceable points, shovels on tillage implements, and the knives on forage harvesters are cutting points that must only be handled with protective gloves. The use of razor knives to cut open sacks and to remove the strings or netting from round bales is another source of being cut.

Danger - indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. This signal word is limited to the most extreme situations, typically for machine components that for functional purposes cannot be guarded. Danger signs typically have a red background.

DC - an abbreviation for direct electrical current. Tractors and other off-highway equipment with batteries operate by DC or direct current; and even though they are usually rated at only 12 or 24 volts, electrical shorts still can cause operator burns and equipment fires. Flashlights operate on DC.

Decibel - a unit used to measure the intensity of sound. A sound level of 130 decibels will cause physical pain in the ears of most individuals. A noisy lawn mower or tractor produces about 100 decibels of sound. To prevent permanent hearing loss, ear protection should be worn when operating equipment that produces more than 85 decibels for long periods of time.

Department of Transportation—DOT - the federal agency which develops and enforces rules and regulations governing the transportation industry. The DOT conducts safety inspections of large trucks operated on highways to ensure that all their safety features are functional, and their load capacity is not exceeded. The DOT regulates the transport of hazardous material such as anhydrous ammonia used by farmers. Visit www.DOT.gov for more information.

Dermal Exposure - exposure to a hazardous substance that can enter the body through the skin. Handling pesticides without protective gloves may lead to dermal exposure. Some pesticides, such as organophosphates, exhibit high levels of dermal toxicity. Exposure to poison ivy can also result in serious skin inflammation.

Diesel - used to define an engine that uses diesel fuel and ignites the fuel-air mixture with the heat of compression rather than the spark from a spark plug. Studies have shown that diesel-exhaust fumes are more carcinogenic (cancer causing) than previously thought. Nearly all large engines used to operate agricultural and construction equipment are diesel because they are more efficient than gasoline engines and last longer.
**Diesel Exhaust Fluid (DEF)** - a non-hazardous solution consisting of urea and de-ionized water that is sprayed into the exhaust stream of diesel vehicles to break down dangerous emissions. Newer model diesel tractors and other self-propelled equipment, heavy trucks, and pickups use DEF. DEF should never be mixed with diesel or put into a diesel tank. It is stored in a separate tank on the vehicle, usually with a blue filler cap. Do not mix DEF with additives such as chemicals to prevent freezing or allow it to become contaminated with other substances.

**Diesel Fuel** - a heavy petroleum fuel used to operate diesel engines. Diesel fuel should be stored in yellow or green containers so that it is never confused with gasoline. Diesel fuel is not as volatile or explosive as gasoline, but once ignited creates a hot fire that can be difficult to extinguish. Workers should avoid exposing their skin to diesel fuel.

**Differential Lock** - a mechanism that "locks" both wheels on an axle together, causing both wheels to turn in unison. When a differential is unlocked, each wheel can rotate at different speeds and preventing tire scuffing when making turns. Locking the differential causes both wheels to turn at the same speed. Engaging the differential lock can increase traction in muddy or slippery conditions.

**Digital Gauge** - a gauge that indicates a value by using numerical digits as opposed to a dial. Digital gauges measure values in discrete increments; they measure more accurately and are easier to read than analog gauges. Many modern farm tractors and combines come equipped with digital gauges.

**Double-Acting Cylinder** - a hydraulic cylinder that operates or exerts force in both directions by the force of oil pressurized by a pump. Double-acting cylinders require one high pressure line connected to each end of the cylinder in order to apply force in both directions. Cylinders used on front-end loaders are typically double-acting. See Hydraulic Cylinder.

**Double Insulated** - a power tool design that encases the tool with multiple layers of insulating material that prevents the user from contacting metal parts that might conduct electricity. Double-insulated tools provide added protection against an electrical shock.

**Downwind** - being in a position that is in the opposite direction from which the wind is blowing. When spraying chemicals or working in a dusty setting, being downwind from the source can increase exposure. No one should be allowed to be in an area where he or she could be exposed to windblown chemicals, or chemical drift.

**Drawbar** - the steel bar at the rear of a tractor where wagon tongues and implements are attached. When any object is pulled with a chain, the chain should always be attached to the drawbar of the tractor to prevent an overturn to the rear. Hitching even a light load above the drawbar can cause the tractor to overturn to the rear. On most modern tractors the drawbar length is not adjustable.

**Drawbar Length** - the distance between the end of the PTO stub shaft of a tractor and the center of the drawbar hole. Changing the drawbar length or height can affect the handling characteristics and center of gravity of a tractor.

**Drift** - chemical spray droplets or particles that are moved outside the intended application area by wind. Chemical spray drift can cause toxic exposure to individuals living near treated fields and cause damage to crops adjacent to the sprayed field. Pesticides should not be applied on windy days in order to avoid drift. The applicator has a legal responsibility to prevent drift-related damage. For additional information on preventing chemical drift visit [www.EPA.gov](http://www.EPA.gov).
**Duals** - a second set of tires mounted beside the original set. Duals can be added to the front and/or rear of a tractor to increase traction and stability. Adding duals substantially increases the width of the tractor requiring, special precautions when the tractor is operated on public roads.

**Electric Fence** - Fencing installed around livestock containment areas that is insulated from the ground and energized with high voltage (low current) to keep the animals from escaping. The livestock touch the fencing and the shock trains them to stay away from the fence. Electric fences are charged either by 120 volt electric fence chargers, or by charges that operate off solar-powered rechargeable batteries.

**Electrocution** - the act of causing death by electrical shock. Working with electrical equipment in a wet environment increases the risk of electrocution. A frequent cause of electrocution on farms occurs when portable grain augers come into contact with overhead power lines.

**Emergency** - a situation that calls for immediate action. Loss of consciousness, heavy bleeding, and fires are three types of farm emergencies. Being prepared for an emergency by posting the phone numbers for local fire department, police department, hospital, and poison control center can save lives. Completing a basic first aid class can also help prepare for a medical emergency.

**Emergency Medical Technician (EMT)** - a trained first responder who is able to provide emergency medical treatment until the injured person reaches the hospital. Many EMT’s in rural communities are volunteers.

**Enclosure** - a guard that provides protection on all sides of a hazard. A circuit breaker box, which is an enclosure that provides protection from electrical shock, should be kept locked to prevent unauthorized access. Other forms of enclosures include guarding around a grain bin ladder or a stub shaft shield over the tractors PTO.

**Engulfment** - becoming trapped in flowing material such as grain or feed. Grain engulfment can occur very quickly during the unloading of grain bins, gravity wagons, and grain trucks. Consequently, no one should be on the grain surface when unloading equipment is operating. Youth under age 16 are not allowed by federal law to be employed to work inside a grain bin. To learn more visit [www.agconfinedspaces.org](http://www.agconfinedspaces.org).

**Enhanced 911** - an improved version of basic 911 service that displays the telephone number and address of the emergency call location to the dispatcher. If a person becomes hysterical or unconscious after dialing 911, the dispatcher can still send emergency personnel to the address if the local dispatch has an enhanced 911 system.

**Environmentally Controlled** - refers to conditions in a structure where the temperature, humidity, and/or the gases in the atmosphere are controlled. Fruits and vegetables are often stored and ripened in environmentally controlled rooms that can be hazardous to workers who enter due to low oxygen levels. Greenhouses are environmentally controlled to allow for optimum growth of plants.
**Environmental Protection Agency (EPA)** - an agency of the federal government whose mission is to protect health and safeguard the natural environment. The EPA’s mission is to protect human health and the environment. It regulates the marketing of all pesticides in the U.S. and the contents of the label found on pesticide containers. The EPA also has the authority to fine businesses and individuals that emit excessive pollutants into the air or water. Agriculture must work with the EPA to minimize harm to people and the environment through pollution. To learn more visit [www.EPA.gov](http://www.EPA.gov).

**Ergonomics** - the study of human characteristics for use in designing tools, work and living environments, clothing, and other items used by humans. Tractor manufacturers use ergonomics to design tractor seats and operator controls that are more comfortable and less fatiguing.

**Escort Vehicle** - a vehicle with flashing lights and/or flags to warn motorists that they are approaching an oversized vehicle or load. Escort vehicles are often used in front of and behind wide agricultural machinery that is moved on roadways. In some states, escort vehicles are required when moving large machinery. Check with local law enforcement to learn more about applicable regulations.

**Exhaust** - the gases, liquids, and particles formed during the combustion of fuel and released into the atmosphere. The exhaust from motor vehicles, tractors, and planes contains many chemical compounds that are hazardous to human health and to the atmosphere. Carbon monoxide is a toxic gas given off during tractor operation.

**Explosion** - an explosion requires four elements or ingredients: fuel, oxygen, ignition source, and containment. The most widely recognize type of explosion in agriculture is dust explosions, which generate considerable force and can do great damage. Explosions can also occur due to leaking propane or natural gas inside farm buildings, or a buildup of methane or manure gas in livestock confinement buildings. Gasoline vapors in the correct proportion can burn so fast that it appears to be an explosion. Explosions can cause severe burns almost instantly due to the high temperatures involved.

**Exposure** - a circumstance in which a person comes into contact with a hazard that can result in injury or disease. To reduce the level of exposure to pesticides, personal protective equipment such as gloves, safety goggles, and disposable coveralls should be worn. One good protection from exposure is frequent hand washing.

**Extra Riders** - riders in addition to the operator of farm vehicles or machinery. For safety purposes, an extra rider should not be allowed on a tractor or other piece of equipment unless the tractor is equipped with an instructional seat. One of the leading causes of farm-related fatalities is extra riders falling off tractors and being run over by the tractor or trailing implement.

**Eye Protection** - personal protective equipment designed specifically to protect the eyes. Eye protection, such as goggles or safety glasses, should always be worn when handling pesticides, grinding metal, welding, or sawing.
**Fair Labor Standards Act** - a federal law governing worker safety and benefits, such as overtime pay, minimum wage, child labor, and equal pay for equal work. Most hourly workers are governed by this law, but there are some exceptions. For example, many truck drivers and railroad workers are not covered by this law, and many agricultural workers are not covered by the overtime pay regulations of this law. Check with the State Department of Labor to learn more about applicable regulations, or visit [www.OSHA.gov](http://www.OSHA.gov).

**Falling Object Protective Structure**—**FOPS** - the overhead protection system used to prevent objects from falling on the operator of agricultural, construction, and industrial equipment. A FOPS consists of a post structure with a roof made of solid or mesh material. Most skid steer loaders used on farms today are equipped with FOPS.

**Farm** - a plot of land and/or buildings used to raise crops and/or livestock. The U.S. Department of Agriculture considers any place that produces and sells over $1,000 worth of agricultural products each year to be a farm.

**Farmstead** - the buildings and adjacent service areas of a farm. A farmstead often consists of a home, storage buildings, shop, and livestock buildings. The space or area surrounding the buildings is often referred to as the farmyard.

**Fatigue** - mental or physical exhaustion that causes extreme tiredness or weariness during and after lengthy or strenuous physical or mental activity. Many farmers and farm workers become fatigued during harvest season due to working long hours trying to get the crop in from the field. Fatigue often contributes to human error and injuries. Workers require adequate rest to be safe when performing hazardous jobs.

**Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)** - a law that governs the approval process for all pesticides sold in the U.S. The law assigns the responsibility of registering all pesticides to the Environmental Protection Agency (EPA) and gives the EPA authority to regulate the use of all pesticides. For more information see [www.EPA.gov](http://www.EPA.gov).

**Feeder housing** - a front mounted gatherer on a combine or forage harvester that carries and delivers crop material to the machine. Typically, augers convey the crop material to a central inlet leading to the chopping knives or separator where grain and crop debris are separated. When conducting maintenance or cleaning the feeder housing, always turn off the engine, be sure that all movement has stopped, and secure the header locks before proceeding.

**Feeder Mechanism** - the portion of a machine which pushes or pulls crops into harvesting equipment. The aggressive feeding mechanism of a forage harvester will cause severe injury or death to anyone in its path. Because of the work done by the feeder mechanism they cannot be fully guarded.

**Felling** - cutting a tree down so that it falls in the desired direction. More people are killed while felling trees than during any other logging activity. Youth under age 16 are not allowed by federal law to be employed to fell timber greater than 6 inches in diameter or to operate a chain saw.

**Fermentation** - The process in which sugars are converted into ethyl alcohol, such as the production of grape juice into wine, or corn into whiskey. Fermentation also occurs in the production of silage for a more palatable and digestible livestock feed in the confines of a silo or bunker. The process of fermentation produces harmful gases.
**Fertilizer** - a substance such as manure or a chemical mixture that provides nutrients to plants. Potash, phosphate, and nitrogen are the three most common fertilizers. Some fertilizers such as anhydrous ammonia require special handling in order to prevent injuries.

**Field Lights** - the lights in the front and/or back of farm machinery which a farmer uses to work at night. Good field lights are necessary to prevent collisions with obstacles or falling into holes in a field at night. Field lights should not be used when equipment is operated on the highway to prevent blinding other motorists.

**First Aid** - medical treatment given to a person with minor injuries or illness, or the initial treatment provided before professional medical personnel arrive to treat major injuries or illness. Bystanders often provide lifesaving first aid to injury victims before the ambulance arrives. Many hospitals and the American Red Cross offer basic first aid training.

**First Aid Kit** - a portable package containing bandaging materials, antiseptic, and other medical supplies. First aid kits should be located in farm and school shops and be carried in farm tractors so that immediate medical care can be provided in case of injury.

**First Responder** - in general, the person who is the first to arrive at the scene of an injury, but specifically a person who has passed a first-responder education class in first aid and often carries a pager so that he or she can respond rapidly to emergency incidents in the community. First responders often save lives by providing first aid until emergency medical services arrive.

**Fishtail** - the rapid back-and-forth weaving action of an implement or trailer being towed by a truck or tractor. Worn components on the running gear of a wagon can cause it to fishtail at high rates of speed and cause the operator to lose control of the towing vehicle.

**Flammable** - capable of being easily ignited and burning quickly. Gasoline is highly flammable and should never be used as a cleaning solvent or to start fires because explosions and serious burns can occur. Gasoline should be transported in well-marked red containers.

**Flash Point** - the lowest temperature of a liquid at which its vapors will ignite in air when exposed to a flame. Gasoline is much more explosive than diesel fuel because the flash point of gasoline is a much lower temperature than that of diesel fuel. Safety Data Sheets contain flash point temperatures for all substances.

**Foldable ROPS** - are designed to be used in orchards, vineyards, and low-clearance buildings where a standard ROPS would not provide adequate clearance or would interfere with tree branches. When in the “folded-down” position, the foldable ROPS does not provide protection to the operator in the event of an overturn. When low-clearance activities are completed, the foldable ROPS should be returned to its upright positions. If the ROPS is in the “folded-down” position, the operator should not use the seat belt.

**Forage** - grass, corn, and other roughage crops used for animal feed. Fermenting forage can release carbon dioxide, nitrogen oxides, and other silo gases that are very toxic to man and animals.

**Forage Harvester** - a farm implement used to harvest grass, corn, and other roughage crops by chopping the crop into small pieces for silage. The sharp rotating knives of a forage harvester can cause serious injury or death to an operator who gets too close. The speed of the chopped material being discharged from a forage harvester can also result in injury.
Forklift Truck - a self-propelled machine with two flat steel bars (called forks) on the front used for lifting and loading pallets of supplies and machines. OSHA requires extensive safety training for forklift operators because of their involvement in many injuries. Youth under the age of 16 cannot be employed to operate forklift trucks. See www.OSHA.gov.

Four-Wheel Drive - a vehicle with power supplied to both the front and rear wheels. Four-wheel-drive tractors usually have the same size tires on the front and rear which provide a smooth ride over rough terrain and extra traction to pull large tillage equipment.

Frame-Mounted - refers to attachments on the frame of the tractor. Frame-mounted sprayer tanks on the sides of a tractor often severely obstruct the operator’s view, thus requiring special caution to prevent collisions and runovers. Loaded sprayer tanks can also change the center of gravity and the stability of the tractor.

Free-Wheeling Component - a part of machinery that continues to operate or coast after the power source to the machinery has been shut off. Mower blades on rotary mowers and flywheels on balers are dangerous because they are free-wheeling components that can cause injury even after the tractor is shut off.

Front-End Loader - a loader attached to the front end of a tractor that is used to load or move dirt, stone, manure, feed, and other loose materials. When the bucket of a front-end loader is raised, the center of gravity of the tractor moves higher, reducing stability and contributing to side overturns. To increase stability, tractors equipped with front-end loaders are often equipped with additional ballast.

Front-End Weights - metal weights hung on a bracket at the front of a tractor. Front-end weights are used, in part, to prevent overturns to the rear when a tractor is lifting or pulling heavy loads from the drawbar or three-point hitch. Front-end weights also keep weight on the front-tires on front wheel assist tractors to improve traction.

Front-Mounted - refers to attachments on the front of a tractor. A front-mounted implement provides the operator with a better view of the implement’s operation, but it can obstruct the operator’s view of bystanders and field obstacles.

Front Wheel Assist - refers to tractors that are equipped with powered front wheels that can be engaged during heavy field work or in wet conditions. During transport or when pulling lighter loads, the power to the front wheels can be turned off resulting in greater fuel efficiency. Front wheel assist is also referred to as Mechanical Front Wheel Drive (MFWD).

Frostbite - an injury caused by freezing that results in damage to body extremities. Frostbite is caused by a prolonged exposure to freezing conditions and is characterized by numbness, tissue death, and gangrene. Frostbite requires immediate medical attention.

Fuel Filter - a filter in the fuel line that screens out dirt and rust particles from the fuel. Fuel filters are found on most internal combustion engines, and typically consist of a cartridge and filter paper. Fuel filters for diesel engines often are of a bowl-like design, allowing water to collect in the bottom (water is heavier than diesel). The water can be drained as necessary. To protect engine components, fuel filters should be changed regularly, based on operator’s manual recommendations and operating conditions.
**Fuel Shut-Off** - a valve in the fuel line of an engine that stops the flow of fuel through the line when the valve is in the closed position. Manual fuel shut-offs are often placed near fuel filters and also at the bottom of the fuel tank. Automatic, electronically operated, fuel shut-offs are installed on most newer engines to prevent damage when coolant temperature rises, oil pressure drops, or any other monitored engine parameters move into a danger zone.

**Fully-Shielded Driveline** - a PTO driveline that has all components shielded on all four sides. Fully-shielded drivelines are the safest because they make it nearly impossible for a farmer to make contact with the revolving shaft and become entangled.

**Fumigant** - a chemical compound used in the gaseous state as a pesticide or disinfectant. Fumigants, such as methyl bromide, that are used to kill insects in grain are so dangerous that the applicator must be trained and must possess a special fumigant license. Youth under age 16 are restricted by federal law from handling or applying restricted use fumigants and other chemicals labeled with the words DANGER or WARNING.

**Fungicide** - a product used to kill a fungus or inhibit its growth. Fungicides are used on many fruit crops to control fungal diseases. Youth under age 16 are restricted by federal law from handling or applying restricted use fungicides and other chemicals labeled with the words DANGER or WARNING.

**Fuse** - a “weak link” in an electrical circuit that is designed to fail if the circuit becomes overloaded and begins to heat up. All electrical circuits on the farm or ranch should be protected against overloading. Most modern fuses are load-sensitive circuit breakers. However, on many farms, screw-in fuses are still common. If a fuse fails repeatedly, it is a sign of a serious fault in the circuit that can cause fire if not corrected. See Circuit Breaker.

**Gasoline** - a highly flammable petroleum fuel used to operate internal combustion engines. Gasoline should only be transported in approved safety cans that are red in color and clearly labeled. When mixed with the right amount of air, one gallon of gasoline has several times the explosive force of dynamite.

**Gear Shift** - the lever or electronic control used to switch between gear sets in the transmission. The gear shift allows for travel at different speeds with the same throttle position. The gear shift lever must be in the neutral position before starting the engine to prevent runovers and collisions.

**GFCI—Ground Fault Circuit Interrupter** - same as GFI. See GFI.

**GFI—Ground-Fault Interrupter** - an electrical circuit breaker that senses the difference between the electrical currents flowing through the hot and neutral wires of an AC circuit. When it senses a difference, it trips very rapidly (in about ten milliseconds) thus preventing a serious electrical shock if a person is touching an energized part of the circuit. GFIs are required by building codes in bathrooms and outdoor receptacles where water or moisture is likely to be present. Farm shop receptacles should be equipped with GFIs.

**Global Positioning Satellite** - a system of orbiting satellites that can be used to determine a position on the earth with very high accuracy. An electronic device sends and receives signals from the satellites to establish a location. All new cell phones contain a GPS function, and many large self-propelled agricultural vehicles are equipped with GPS to aid in more accurate planting, chemical or fertilizer application, and harvesting.
**Gore** - to pierce or wound with a horn or tusk. A ranch worker must be very alert to the aggressive nature of male breeding stock and protective nature of female livestock with young offspring to avoid a goring injury. Some farmers and ranchers choose to raise “polled” cattle that naturally have no horns or dehorn the cattle shortly after birth.

**Grain Bridge** - a layer of spoiled grain at the top of a grain bin. When grain is unloaded from the bottom of the bin, a spoiled layer at the top can remain in place without any supporting grain beneath it, thus forming a bridge. An unsuspecting worker who walks on this bridge may fall through and become buried in the collapse of grain.

**Grain Rescue Tube** - a devise used by trained emergency first responders to form a cofferdam around a grain entrapment victim. It is designed to provide a way of separating the victim from the pressure of the surrounding grain. These forces on the victim prevent him or her from being pulled from the grain without injury. See Engulfment. To learn more visit www.agconfinedspaces.org.

**Gravity** - a fundamental law of physics that explains the attraction of objects to the earth. Here on earth, the force of gravity causes all objects to be pulled toward the center of the earth (creating weight) and consequently, prevents humans from falling off the earth. The force of gravity causes a combine header to fall in the event of hydraulic hose failure. Falls are one of the most common type of injury for farm workers.

**Gravity Wagon** - a wagon designed to transport free-flowing grain that unloads using only the forces of gravity. These wagons, widely used to transport grain between the field and grain storage sites, can range in capacity from under 100 bushels to several hundred bushels. If used on the highway, gravity wagons should be equipped with SMV emblems. Due to the potential of engulfment and suffocation in grain flowing in or out of the wagons, children and workers should never be allowed to ride in or on gravity wagons.

**Grinder Mixer** - a farm machine used to grind feed for livestock and mix nutritional additives with the feed. To prevent injury farmers must avoid contacting any of the operating components of a grinder mixer. It uses rapidly-rotating knives or hammers to grind feed into a powder-like consistency and augers to move the finished feed.

**Guard** - a device used to protect a person from a hazard. There are three types of guards: shields, enclosures, and barriers. To prevent entanglement injuries, shields over belts, pulleys, and PTO components should always be replaced after removal for maintenance of the machine.

**Grounding** - the procedure of connecting a wire in an electrical circuit to the earth – usually by an eight-foot copper ground rod driven into the soil. Grounding makes using electrical devices safer because a broken or bare energized wire that contacts any grounded part will deactivate the circuit breaker, thus preventing a fire or electrical shock.
Hand Signals - motions made with the hands to communicate messages to another person. Hand signals are often used by two farm workers who are in an environment that is too noisy to communicate by voice. Hand signals used properly can also be used to summon help in an emergency.

Hard Hat - a protective helmet designed to protect workers from falling objects. Hard hats are worn on almost every construction site to comply with OSHA workplace safety standards. However, they are rarely seen on agricultural worksites. The use of hard hats in agriculture would prevent many serious head injuries that occur each year.

Harvester (cotton, pea viners, potato, etc.) - a machine used to gather and separate the desirable part of the plants from the waste. Harvesters have aggressive and dangerous machinery components that must be well-shielded to prevent injury from inadvertent contact. A cotton harvester separates the bolls of cotton from the plant.

Hazard - anything that can cause injury or harm. The many hazards associated with farm work make the farming industry one of the most dangerous of all industrial occupations. An example of a hazard is an exposed belt or chain during operation.

Hazard Communication Standard (HCS) - a regulation found in the Occupational Safety and Health Act (OSH Act) requiring employers to provide protection for their workers who may be exposed to hazardous chemicals. The regulation also requires that employers maintain Material Safety Data Sheets (MSDS) for all hazardous chemicals in the workplace, label all hazardous chemicals, and train employees on the safe use of hazardous chemicals. The HCS applies to agricultural chemicals used on farms and ranches. See www.OSHA.gov.

Hazard Lights - a pair of lights, usually the blinkers, that flash on and off to warn other drivers of potential danger. When moving agricultural equipment on public roadways, farmers and farm workers should use the hazard lights to alert other drivers of wide and slow moving equipment. Check with load law enforcement to obtain information on the required lighting and marking for transporting farm equipment on a public highway.

Hazardous Occupations Order for Agriculture (HOOA) - the term HOOA is used in the GEARING UP FOR SAFETY curriculum to identify the portion of the Fair Labor Standards Act that applies to the employment of children and youth in agriculture. See Agricultural Hazardous Occupations Order (AgHOs). To learn more about the provisions of HOOA visit www.agsafety4youth.info or www.OSHA.gov.

Hazardous Waste - any solid, liquid, or contained gaseous material that is no longer used or needed, which has the potential to cause injury or death, or pollute the environment. Used oil from a tractor is a hazardous waste and should be disposed of properly by recycling; it should never be dumped on the ground or used to suppress dust around the farm.

Header - the machinery attached to the front of a harvester that cuts and gathers the crop. Various headers are available for combines that are used to harvest different crops, every header has many aggressive components to pull in, cut, or crush anything, or anyone, that comes into contact with it. Modern headers on combines have become so wide they need to be removed from the combine for transport.

Header Safety Lock - a mechanical device that locks the header of a harvester in the raised position so that farmers and farm workers can safely work under the header to perform maintenance and repairs. A steel u-channel that is pinned in place over the rod of a hydraulic cylinder provides the header safety lock for a combine head. See Safety Locks.
**Health** - the absence of disease or injury. A farm worker should make positive choices to protect his or her health, such as using personal protective equipment, avoiding smoking that causes heart disease and lung cancer, and receiving recommended inoculations to prevent disease. Adequate rest and exercise are also important for good health.

**Heat Exhaustion** - a physical condition caused by excessive heat and dehydration, with possible symptoms of moderately elevated temperature, weakness, nausea, dizziness, and profuse sweating. If a farm worker experiences the symptoms of heat exhaustion, he or she should immediately move, or be moved, to a cool area and drink cool liquids without caffeine or alcohol. Seek medical attention immediately if the victim becomes unconscious.

**Heat Stress** - a general term used to refer to the effect of heat on mental and physical well-being. Heat stress on the farm often leads to general tiredness and can result in injuries due to the lack of alertness and ability to concentrate. Adequate rest breaks and plenty of liquids are important to prevent heat stress. See Heat Stroke and Heat Exhaustion.

**Heat Stroke** - a physical condition caused by excessive heat and dehydration which prevents the body from regulating its temperature. Symptoms of heat stroke are high body temperature, lack of perspiration, disorientation, and in later stages, collapse, unconsciousness, and death. Any stage of heat stroke is an extremely dangerous condition and must be treated as quickly as possible by emergency medical personnel. Call 911 immediately.

**Helmet** - a form of personal protective equipment (PPE) worn on the head to provide protection to the skull and brain in the event of impact. Helmets should be worn to prevent head injuries when riding ATV’s, motorcycles, snow mobiles, and horses. Most construction sites require the use of hard hats, which can protect the worker from head injuries.

**Herbicide** - an agent used to kill a plant or inhibit its growth. Atrazine was one of the first herbicides used extensively in the Corn Belt and is now sometimes found as a contaminant in well water in rural farming communities. Consequently, its use and rate of application is now closely regulated by the Environmental Protection Agency. To learn more about the hazards of certain herbicides visit [www.EPA.gov](http://www.EPA.gov).

**High Pressure** - the state of liquid or air that has been highly pressurized by a pump. The powerful jet-stream of water from high-pressure washers used to clean vehicles and machinery blasts from 150 to 3000 PSI and can severely damage human tissue if inadvertently targeted at close range. Hydraulic systems on agricultural equipment also operate at high pressure greater than 2500 PSI and can cause major tissue damage if a leak occurs. Injuries from high pressure injection should receive medical attention immediately. See Compressed Air. See Pin-Hole Leak.

**High Speed Tractor** - a tractor designed and capable of operating at speeds greater than 25 MPH on public roads. Tractors meeting the definition of “high speed tractors” should display the “Speed Identification Symbol (SIS)” which identifies the machine’s maximum speed. The SMV emblem can be used in conjunction with the SIS. Some states may require a driver’s license to operate any equipment at speeds over 25 MPH on roadways. See Speed Identification Symbol (SIS).

**Hitch Pin** - a strong, round, steel pin used to connect wagons and other implements to the drawbar or hitch of the pulling vehicle. Safety hitch pins must have a clip or latch to prevent the pin from bouncing out and causing collisions or property damage from runaway trailing implements. An ASABE standard exists for hitch pins to classify them by size and strength. Bolts should never be used in place of a hitch pin.
**Horsepower** - a unit of power equal to 746 watts or 550 foot-pounds/second. This term was originally used as an estimate of the amount of power a horse could exert while pulling. Horsepower is now used to designate the power of tractor engines, drawbar power, and PTO power.

**Hydraulic** - refers to operating by the flow of liquid, such as oil or water. Hot hydraulic oil and high pressures greater than 2500 PSI can cause serious injury to skin, muscle tissues, and eyes if a leak occurs. Hydraulic systems are used widely on modern agricultural equipment.

**Hydraulic Accumulator** – See Accumulator.

**Hydraulic Conduit** - typically a solid pipe used to convey the flow of hydraulic fluid from the pump to the actuator. If a hydraulic conduit ruptures under pressure, a dangerous spray of hot oil can result. Leaking conduits and hoses can also cause hydraulically activated components to unexpectedly fail or lower, causing a crushing injury.

**Hydraulic Control Valve** - a valve which starts, stops, or regulates the flow of hydraulic fluid. Before control valves are opened or closed, the operator must be sure that no one is in danger of being injured by the equipment being operated.

**Hydraulic Couplings** - the devices that connect the hydraulic hoses on an implement to the hydraulic lines of a tractor. To prevent oil sprays, the operator should always release the pressure from the lines before disconnecting the couplings. Hydraulic couplers are becoming increasingly standardized to allow easy attachment between different makes of equipment.

**Hydraulic Cylinder** - a cylinder with an internal piston and an external rod that extends and retracts by pressurized oil flow. Many farm implements are raised and lowered by hydraulic cylinders. A failure in a cylinder can cause a rapid, unexpected drop of an implement. Farmers should never perform maintenance under an implement supported by a hydraulic cylinder unless it is locked or blocked in the raised position.

**Hydraulic Cylinder Safety Lock** - a device that allows the hydraulic cylinder of an implement to be locked in the transport or raised position. Hydraulic cylinder safety locks should be used any time implements are transported or stored in the upright position, or when maintenance or repair work is being completed. Failure of a cylinder or accidental release of hydraulic pressure can cause the implement to fall and crush workers.

**Hydraulic Filter** - a filter designed to remove contaminants from hydraulic oil. Hydraulic systems on farm equipment typically have one or more hydraulic filters. Filters should be replaced at regular intervals, based on operator’s manual recommendations, to ensure performance and prevent damage to hydraulic components.

**Hydraulic Hose** - a strong, flexible hose used to conduct high pressure oil from the pump outlet to remote locations. They are frequently found on agricultural equipment to carry oil from the tractor to hydraulic cylinders and pumps on various machines. Pin hole leaks in these hoses can cause penetration injuries to the skin. Care should be taken to prevent hydraulic hoses from contacting moving parts that can cause damage and leaks. Seek medical attention immediately if a penetration injury occurs due to a high-pressure leak.
**Hydraulic Jack** - a device that lifts heavy objects by using the pressure of hydraulic oil. Sometimes referred to as a “bottle jack”, hydraulic jacks are used by farmers for many lifting tasks, such as changing tires. A safety jack stand should always be used in conjunction with a hydraulic jack to prevent the supported load from falling unexpectedly.

**Hydraulic Motor** - a motor that is powered by the flow of oil. Tractor hydraulics are used to power hydraulic motors on many implements, such as, grain augers and components on unloading wagons.

**Hydraulic Port (Remote)** - receptacle where a hydraulic hose coupling can be connected to receive high pressure oil from the hydraulic pump or return low pressure oil to the reservoir. The points of connection should be kept clean to prevent dirt from entering and contaminating the hydraulic system.

**Hydraulic Pump** - the mechanical device that increases the pressure of the hydraulic oil and causes it to flow through the hydraulic hoses to perform various functions, such as raising and lowering implements. Hydraulic pumps generate such high pressure that a pin-hole leak can inject hot oil through the skin into the muscle and cause extensive tissue damage. Most hydraulic pumps on modern agricultural equipment are located inside the drive train of the tractor. See pin-hole leak.

**Hydraulic Reservoir** - the tank or container that stores the hydraulic oil in farm machinery. The oil is pumped from the reservoir through lines to cylinders, hydraulic motors, and other devices, and then it is returned to the reservoir. After extended operation the hydraulic reservoir can become sufficiently hot to cause serious burns.

**Hydrogen** - a lighter than air, colorless, odorless, highly-combustible gas with the chemical formula of H2. Since the presence of hydrogen gas during recharging of a battery creates an explosion hazard, efforts should always be made to prevent electrical shorts and sparks near a battery. Hydrogen was used in blimps such as the Hindenburg until its explosion and the catastrophic loss of life ended that practice. Batteries should be charged in a well-ventilated area.

**Hydrogen Sulfide** - a heavier than air, colorless, very toxic, combustible gas that has the pungent odor of rotten eggs and has the chemical formula of H2S. This gas often occurs in manure pits in sufficient concentration to cause the death of a farmer or worker entering the pits. Two different farm families lost the lives of five members as they consecutively entered a manure pit in an attempt to rescue the previously fallen relative. A total of 10 individuals died in the two incidents.

**Hydrostatic Transmission (HST)** - a type of tractor transmission that does not require use of a clutch or manually shifting gears, making it very useful for front-end loader operation. Forward and reverse foot pedals are depressed to move the machine. The farther the pedal is depressed, the faster the travel. Most HST tractors have 3 or more speed ranges, but speed is infinitely variable within each range. Since the HST system requires additional power resulting in total horsepower reduction, it is most commonly found on self-propelled lawn mowers, utility tractors and combines rather than larger row crop tractors.

**Hygroscopic** - referring to the process of moisture being absorbed by a substance from the atmosphere. Under high humidity conditions, road salt is hygroscopic and can cause roads to stay wet and less icy for long periods of time. Grain in a bin is hygroscopic which can cause the grain to go out-of-condition if exposed to moisture.
**Ignition Switch** - the switch that, when turned on, initiates the flow of electrical current to start an engine. The ignition switch should be turned off and the key removed before maintenance on a tractor or engine-operated machine so that no one can start the engine inadvertently and seriously injure the mechanic.

**Implement** - any tool that is pulled, powered, carried, or functions by being connected to a tractor to perform work. Safety features on implements that reduce the incidence of collisions during roadway transport are extremity reflectors, SMV signs, and fold-up wings. Heavy, three-point hitch mounted implements can change the center-of-gravity of the tractor.

**Independent Brakes** - used to stop a self-propelled machine by independently applying a brake to the wheels on each side of the machine. Tractors are equipped with two brake pedals that independently brake the rear wheels to allow for a tighter turning radius. When traveling on the highway, the brake pedals should be locked together to prevent sharp turns that can cause overturns.

**Inhalation Exposure** - exposure to a hazardous substance that enters the body through the respiratory system. Breathing in the mist formed during pesticide application can be avoided by using a respirator approved by NIOSH for the particular pesticide being used. An N-95 dust respirator can be used to reduce inhalation exposure to dusts and molds when handling hay bales.

**Inhalation Hazard** - airborne material that can damage a worker's health when breathed or inhaled. Inhalation hazards of dust, chemical vapors, pesticide fumes, and paint sprays can be avoided by the proper use of respirators to protect a worker's health. Environmentally controlled cabs on farm tractors can reduce an operator's exposure to inhalation hazards.

**Injury** - physical harm or damage to some part of the body. Farming is one of the most hazardous industries due to many potential sources of injury such as chemicals, machines, electricity, temperature extremes, large animals, confined spaces, and climbing. If there is any doubt concerning the severity of an injury, medical attention should be sought as soon as possible. Some minor injuries can become easily infected in farm settings.

**Insecticide** - an agent used to kill insects. Many insecticides are rated among the chemicals that are most hazardous to human health. They must be handled and applied while using all the safety precautions recommended by the manufacturer. Youth under age 16 are restricted by federal law from handling or applying insecticides that are labeled with the words DANGER or WARNING. See www.EPA.gov.

**Instructional Seat** - a seat on self-propelled equipment in addition to the operator's seat where an instructor or student can safely sit during operator training. Newer combines and larger tractors provide instructional seats with seat belts which greatly reduce the risk that an extra rider will fall and be run over.

**Insulated** - refers to a material that does not conduct electricity. Insulated electrical wires and insulated plastic cases on hand power tools prevent electrical shock or electrocution of the tool operator. Electrical conductors with worn or damaged insulation should be replaced. Nearly all overhead high voltage power lines are uninsulated and pose a risk of electrocution.

**Integral** - an adjective meaning "essential to completeness." In other words, it refers to an extremely important part of a machine. Shields are integral parts of all machinery to assure operator safety. The starter on an agricultural machine is an integral part of the machine that is essential to starting the engine.
**Integral-Journal or Spinner Shield** - a round-shaped PTO shield which flares out at both ends to provide protection all around the PTO driveline and most or all of the universal joints. The integral-journal or spinner shield can be stationary while the driveline spins inside the shield, helping to prevent contact and entanglement with the rotating driveline.

**Internal Combustion Engine** - an engine that utilizes the explosive burning of fuel and air inside the engine to generate power. The explosive nature of gasoline and diesel that make them valuable as fuel for an internal combustion engine in farm machinery also makes them the prime cause of farm machinery fires when fuel leaks occur. All internal combustion engines produce carbon monoxide during operation, and therefore must be adequately ventilated.

**International Symbols** - graphical images or symbols adopted by the International Standards Organization (ISO) that are used to communicate important information to operators of agricultural equipment. International symbols can be used to help identify operator controls for operators who speak and read different languages or for operators with a low level of reading skill.

**Jackknife** - a collision, or near-collision, between a towed trailer and its towing vehicle that occurs when the trailer slides sideways and forward. On slick roads, semi-tractors and trailers often jackknife when brakes are applied abruptly to avoid a collision. Attempting to pull a heavy load of grain or hay with a small tractor can result in a jackknife.

**Jack Stand** - a stand used to support heavy objects, such as pickup trucks or farm machinery, after they have been raised by a jack. A person should never work under equipment raised on a jack until jack stands have been installed to prevent a fall and crushing injuries. Concrete blocks, cinder blocks, and bricks should never be used as jack stands because of their tendency to crumble.

**Jump Start** - a technique used to start an engine with a discharged battery by the connection of cables from a charged battery to the discharged battery and a grounded location. Jump-starting is a dangerous procedure that can cause sparks and a battery explosion if not performed properly. Chemical-type eye protection should be worn when jump starting a vehicle to protect against acid spray if a battery explodes.

**Jumper Cables** - a set of heavy-duty cables or wires used to conduct electricity from a charged battery to a discharged battery in order to start a vehicle. Eye protection should always be worn when using jumper cables due to the potential for sparks, battery explosion and acid spray. The connections of a set of jumper cables usually come in black and red so that they can be attached to the correct terminals of the battery. Red for positive (+), black for negative (-).

**Kickback** - a sharp, violent release of energy. When a worker is pulling the starter rope of a small engine, kickback can stop or jerk the rope backward and cause injury. If the tip of the bar on a chainsaw contacts an object while sawing a log, the chainsaw can kickback and strike the operator in the head or shoulder causing severe injuries.

**Knotter** - the mechanism found on a hay baler that ties the twine, binding the compressed bale. When making adjustments to the knotter, always disengage the PTO and shut off the tractor to prevent entanglement injuries.

**Label** - the information found on a product container or that comes with a product. The label is provided by the manufacturer to instruct the user on the product's safe and appropriate use. Before using any agricultural chemical carefully read the label and follow its directions to learn safety precautions and first aid instructions in case of a spill or contamination.
**Lanyard** - a part of a safety harness that is designed to connect the harness to an appropriate anchor point or to a lifeline. Most current lanyards used as fall prevention systems include a fall arresting component that limits the distance the user will fall. Fall protection should be worn when completing some tasks on farms.

**LD50** - the lethal dose or amount of a chemical that will kill 50 percent of the animals in a test population. The LD50 is measured in mg of chemical dose per kg of body weight. Therefore, the lower the LD50 rating, the more toxic the chemical is. Some insecticides with an LD50 of 5 or less are so toxic that it would require only a few drops to kill a person.

**Leakage Current** - electrical current that is flowing to the ground because of dirty connections, faulty insulation, or damaged wiring. Leaking current can cause the battery to discharge. If the leakage current flows through the body when one touches a faulty high voltage circuit, serious injury or death can occur.

**Lifting Arms** - the two long, heavy steel beams that lift the bucket of a front-end loader or the two arms on the rear of a tractor which are used to raise and lower implements. To reduce the risk of a crushing injury, equipment operators should not place themselves in the dangerous position between the tractor and the implement when attaching an implement to the lifting arms of the tractor.

**Lightning** - a flash of light in the sky caused from a discharge of atmospheric electricity between clouds or between a cloud and the earth, usually occurring during a thunderstorm. Farmers and ranchers are among the most frequent victims of electrocutions due to lightning strikes because of their exposure when working in open areas. If lightning becomes visible, workers should seek cover immediately.

**Livestock** - animals kept for sale, raised for food or other products, or kept for use, especially farm animals such as beef and dairy cattle, pigs, and poultry. Large livestock, such as bulls and cows with calves can be very aggressive and cause serious injury or death to anyone in their path. Working safely with livestock takes training and experience.

**Load Capacity** - the maximum volume or weight that a container can hold, or the maximum weight a lifting device can safely lift or support. Loading an overhead crane beyond its load capacity can cause crane failure, a falling load, and operator injury. Placing higher sides on a grain truck can increase the load capacity but can cause the truck to be overloaded beyond its weight limit, thus causing drivability problems and breakdowns. See Weight Limit.

**Lockout/Tagout** - a safety procedure used to lock out the supply of stored energy to a machine, preventing unintentional start-up. Prior to working inside a grain bin, the control to the unloading auger should be locked out to prevent start-up and injury to someone inside the bin. In most industrial applications, the power source must not only be locked out, but also tagged to warn any potential user that the equipment is out-of-service.

**Log-Skidder** - a large rubber-tired, self-propelled machine used to drag and push logs from the forest. Log-skidder operators must always be alert for stumps, rough terrain, logs, and lumbermen while maneuvering through the forest. Logging is one of the most hazardous of all occupations.

**Lubricant** - oil, grease, graphite, and many other compounds used to reduce friction and wear. Clean up spilled lubricants to prevent slips and falls, and avoid contact with lubricants in recently operated machinery to prevent burns from hot oil.
Manure - the urine and feces of animals, including their mixture with bedding material that is often used to fertilize land. Manure contains many types of bacteria that sometimes cause disease in livestock handlers. Manure stored in a confined space can produce a high concentration of hydrogen sulfide, ammonia, carbon dioxide, and methane which presents serious risks to anyone who enters the facility. See Manure Gas.

Manure Gas - a mixture of toxic gases that forms in a manure pit or in the space above the pit, commonly including methane, hydrogen sulfide, carbon dioxide, and ammonia. Hundreds of deaths have occurred from suffocation or asphyxiation in or near manure pits. Two cases involved the deaths of five relatives in each incident who consecutively entered a pit to rescue the previous victims. See www.agconfinedspaces.org.

Master Shield - the shield attached to the tractor that surrounds the short PTO stub shaft that protrudes from the tractor. The master shield provides some protection from PTO entanglements, even when no implement is attached to the PTO stub-shaft. If the master shield is removed for maintenance or repair, it must always be replaced before operating the tractor or PTO to prevent operator entanglement.

Methane - a colorless, odorless, combustible gas with the chemical formula of CH4. It is a very common gas found in natural gas, coal mines, bubbles in stagnant ponds, and manure pits. Methane must not be allowed to accumulate in high concentrations, or an explosion can occur. Livestock buildings have been destroyed when a build-up of methane gas caused an explosion.

Migrant Agricultural Worker - a person employed in agricultural work on a temporary basis, who is required to be absent from his or her permanent place of residence. OSHA enforces regulations that require sanitary living conditions and safe work practices for migrant agricultural workers. See Seasonal Agricultural Worker.

Mg - Milligram, a unit of measuring weight equal to 1/1000th of a gram.

Momentum - the property of a moving object that causes it to stay in motion until a force is applied to stop it. The greater the weight of an object, the greater the momentum. Consequently, the momentum of an 80,000 pound, loaded semi-truck causes its stopping distance to be much greater than that of a 3,000 pound car.

National Institute for Occupational Safety and Health—NIOSH - the federal agency responsible for conducting research and making recommendations for the prevention of work-related disease and injury. NIOSH publishes news alerts to warn workers when it discovers a significant number of injuries occurring in a particular occupational task. To learn more about NIOSH visit www.cdc.gov/NIOSH.

National Safety Council—NSC - a non-profit, non-governmental, international public service organization that develops training, educational programs and materials, consulting, and leadership for improving the safety, health, and environmental well-being of all people. The National Safety Council provides a tremendous amount of information on health and safety at www.nsc.org.

Neutral-Start Switch - a switch that will only allow an engine to be started when the transmission is in neutral or the combination direction-and-speed-control is in neutral. A neutral-start switch prevents a farmer from standing beside a tractor and starting it in gear, preventing many run-over incidents, which are often fatal.
Nitric Oxide - a chemical gas consisting of one molecule of nitrogen and one molecule of oxygen, NO. Nitric oxide is formed during the fermentation of silage and then is quickly converted to nitrogen dioxide. Nitrogen dioxide is the major component of highly toxic silo gas that is formed in silos for approximately 21 days following the filling of the silo. Silos should not be entered during the fermentation process or only after adequate ventilation.

Nitrogen Dioxide - a toxic gas with the pungent and irritating odor of bleach and having the chemical formula of NO₂. Nitrogen dioxide may be present in newly filled silos and is the major component of silo gas which can cause permanent lung damage or death when inhaled, even at very low concentrations. Silo gas is heavier than air and becomes concentrated in the feed room at the base of the silo.

Occupational Safety and Health Administration—OSHA - the agency within the United States Department of Labor that provides standards, regulations, inspections, and enforcement for the safety of workers. OSHA requires farms with more than ten employees to provide safety training annually and meet other worker safety and health requirements. For more information on how OSHA applies to agriculture visit www.OSHA.gov.

Oil Cooler - a radiator or heat-transfer device used to cool engine oil or hydraulic oil. Because of the high operating temperature of engine and hydraulic systems, the oil must be allowed to cool to prevent burns before performing maintenance on an oil cooler. The oil cooler must be kept clean of debris to allow adequate air circulation.

Oil Filter - a filter designed to remove contaminants from engine oil (or transmission oil). Oil filters should be replaced at regular intervals, based on operator’s manual recommendations, to prevent possible engine damage from dirty, contaminated oil.

Oil-Pressure Gauge - a gauge indicating the pressure of the oil which lubricates the engine. A low oil pressure indicates a failure in the lubrication system or insufficient lubricant which may damage the engine. If the low oil pressure warning occurs, the engine should be shut off immediately.

Operator’s Manual - the book provided by the equipment manufacturer that explains proper and safe use and maintenance of that equipment. Before operating equipment, the operator should read the operator’s manual to become aware of all the hazards associated with that equipment. Operator’s manuals should be located in a central location, or on the machine, so they are easily accessible.

Operator’s Manual Storage - most modern farm equipment has a designated storage container for the Operator’s Manual mounted on the machine for easy access. If an implement or machine has storage for the Operator’s Manual (usually a plastic tube or case) it is recommended to leave the manual in the storage container so it will always be easily located and accessible.

Operator’s Station - the area where a machine operator stands or sits to operate the machine. The operator station in an enclosed cab provides protection from weather, noise, dust, and overturns. Most smaller tractors do not have enclosed cabs. On tractors built since 1985, the ROPS is an integral part of the cab.

Oral Exposure - exposure to a hazardous substance that enters the body through the mouth. Hand washing prior to eating as well as thorough washing of fruits and vegetables that may be contaminated with pesticides are two of the most effective methods to prevent oral exposure. Regular handwashing also prevents the spread of infectious diseases such as the flu.
Out-of-Condition Grain - when grain is stored at too high of a moisture content, such as over 14%, there is a high risk of it spoiling and overheating. This results in damaged or out-of-condition grain that can become unstable or crusted together. The most significant contributing factor to grain entrapments and suffocations is out-of-condition grain.

Overcharged Battery - a battery that has been charged to a voltage that is higher than the voltage for which it was designed. Better battery chargers are designed with an automatic shut-off to prevent overcharging and the excessive release of hydrogen, an explosive gas. Overcharging a battery can cause permanent damage to the battery.

Overload Clutch - a mechanical device that will automatically stop machinery when the machinery is near its breaking point or overloaded. An overload clutch on a combine header will stop the header when a rock jams in the machinery, thus preventing major equipment damage. An overload clutch is sometimes referred to as a slip clutch.

Over-Width Equipment - equipment that is wider than the regulatory restrictions for a roadway. Even though farm equipment is usually exempt from over-width regulations, a farmer must take extra precautions during transport on a roadway, such as using escort vehicles to prevent roadway collisions. Over-width equipment should not be transported on the highway during periods of darkness.

Oxygen-Deficient - an environment where there is a lower concentration of oxygen than in the earth’s atmosphere, usually at approximately 19%. Oxygen-deficient environments sometimes occur in manure pits, silos, fruit storage, and tanks. This condition requires workers to wear a self-contained breathing apparatus or to properly ventilate prior to entry. Federal law restricts youth under the age of 16 from being employed to work in oxygen deficient structures. The only way to be sure that the work space is not oxygen deficient is to test it with a meter.

Paramedic - a person licensed and trained to provide emergency medical treatment. Paramedics work as part of an ambulance service or in an emergency room and take charge of patient care as soon as they arrive at an emergency scene.

Personal Protective Equipment—PPE - equipment used to protect a worker’s body, such as goggles, gloves, ear plugs, dust mask, etc. Chemical manufacturers publish Material Safety Data Sheets which instruct chemical handlers regarding the use of appropriate PPE. Most major hardware stores carry a variety of PPE.

Pesticide - an agent used to kill or control pests. Herbicides, insecticides, and fungicides are examples of pesticides which can be harmful to life and health if not handled properly. The Environmental Protection Agency regulates pesticides under authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Federal law prohibits youth under the age of 16 from being employed to handle, mix, or apply pesticides labeled with the words DANGER or WARNING. To learn more about the hazards of pesticides visit www.EPA.gov.

Pinch Point - a location on machinery where the danger of getting pinched occurs. The areas where belts go around pulleys and chains travel over sprockets are pinch points that have injured many farmers’ hands and fingers when shields have been removed for maintenance and not replaced.

Pinhole Leak - the leak of a fluid through a tiny hole having nearly the same diameter as that of a straight pin used in sewing. High-pressure oil spraying from a pinhole leak in a hydraulic hose can penetrate human tissue causing serious injury, infection, or gangrene, sometimes requiring amputation of affected extremities. Never use bare hands to locate leaks in hydraulic hoses. If an injury occurs seek medical attention immediately.
**Portable Auger** - an auger which has a metal wheeled framework that can be raised and lowered to fill storage bins of different heights, and can be transported to different farm locations. The safety grate over the intake of the rotating auger must always be in place to prevent injury if one should fall or step into the intake hopper. Portable augers are one of the leading causes of electrocution on the farm when they contact overhead power lines. See Auger.

**Post-Hole Digger** - an implement, usually attached to the three point hitch, consisting of a heavy auger powered by the PTO or hydraulic system that is used to bore holes in the ground for fence posts. Bystanders must stay a safe distance from the rotating PTO and auger of a post-hole digger so that their clothes or extremities will not become entangled. No one should ever attempt to push down on the post-hole digger during operation.

**Pounds Per Square Inch—PSI** - a unit for measuring pressure. Tractor hydraulic systems can exceed 2500 PSI and cause extensive injury to soft tissue if pin-hole leaks occur. Inflating a tractor tire to excessive pressure can result in an explosion. Always follow manufacturer's recommendations. When using air to clean parts, the pressure should not exceed 30 PSI.

**Power Take Off—PTO** - an external shaft, usually on the rear of a tractor, which provides rotational power to implements. The PTO system consists of a stub shaft on the tractor and a drive shaft with a universal joint on each end. Most PTO guards used today are integral-journal shields which include a molded plastic shield covering both the shaft and universal joints. Entanglement in the PTO driveline can cause severe or fatal injuries.

**Pressure Relief Valve** - a valve designed to prevent the over pressurization of a storage tank. They are found on farms on anhydrous ammonia tanks, L.P. gas tanks and air compressors. Damaged or poorly maintained pressure relief valves can lead to a catastrophic explosion of the storage tank.

**Public Road** - a road that a government agency maintains and has legally obtained the right to provide for public travel. Since wide farm machinery creates a hazard for motorists on a public road, special precautions must be made when moving machinery on roadways. Examples include using escort vehicles, hazard lights, SMV emblems, and making sure the independent brakes are locked together.

**Pull-in Point** - the location on machinery where the danger of being pulled into the machinery can occur. The gathering reel on a mechanical harvester has many aggressive components that form a pull-in point where a farmer can suffer serious injury or death. The engine should be turned off before working in close proximity of a pull-in-point.

**Pump Sprayer** - a sprayer with a pump that is powered by the tractor’s PTO, hydraulics, or an independent engine. A pump sprayer often sprays hazardous pesticides that require the operator to use appropriate PPE. Federal laws prohibit youth under the age of 16 to handle, mix, or apply pesticides labeled with the signal words DANGER or WARNING. Pump sprayers are sometimes known as mist sprayers or blowers.

**Push-Pin Connector** - a connector often used to connect the PTO shaft of an implement to the stub-shaft of a tractor. A spring-loaded pin is pushed in to release the locking mechanism, and then the coupler can be slid on or off the stub-shaft. Because of the slight protrusion of the push-pin connector, it must always be shielded to prevent a worker's clothing from becoming entangled. Keeping the stub shaft and connector clean and lubricated can make attachment easier. The tractor master shield is designed to guard the push-pin connector.
Quick-Connect/Disconnect (Coupler) - a connecting coupler that can be connected and disconnected quickly by pushing a spring-loaded collar. These couplers are used to connect onto hydraulic, air, and other hoses. To prevent a blast of high-temperature hydraulic oil, the operator must never attempt to disconnect a quick-coupler while the oil is pressurized.

Radiator - the heat-transfer device used to cool engine coolant or antifreeze. To prevent a spray of boiling coolant, a person must never remove the radiator cap while the engine is hot. The radiator must be kept free of debris that can restrict air flow and cause overheating.

Railroad Crossing - the area where a roadway intersects with railroad tracks. School bus drivers are required to stop, look, and listen before proceeding through a railroad crossing. This is a good practice for operators of agricultural equipment also, since there are many unguarded railroad crossings in rural farm communities.

Ranch - a place for raising horses, beef cattle, sheep, or specialty animals. Many injuries occur on ranches when workers are stepped on, kicked, gored, crushed, or bitten by large animals. Ranches also contain many of the same hazards found on farms.

Reaction Time - the lapse of time between stimulation and response. Consumption of alcohol or certain drugs decreases one’s reaction time in an emergency situation, which is the cause of many alcohol related automobile injuries and deaths. Typical reaction time for a tractor operator to move his or her foot to the clutch pedal after recognizing a hazard is nearly three seconds.

Rear-Axle Torque - the force that generates the rotation of the rear axle. If a chain is attached too high on the rear of a tractor, the rear-axle torque can cause an overturn to the rear. Loads should never be attached above the drawbar.

Red Cross - a non-profit organization that provides medical and relief services for disasters all around the world. Red Cross is a good source of first-aid and CPR training. For more information visit www.redcross.org.

Reflective Tape - tape that reflects light and shines brightly at night when headlights shine on it. The DOT requires school buses and semi-trailers to have reflective tape on the sides and rear for better night-time visibility to prevent collisions. If agricultural equipment is transported on highways after dark, reflective tape should be installed on both the rear and sides of the equipment.

Regulations - rules or laws that control how people behave. Regulations adopted by the various federal and state legislatures are designed to protect youth in agricultural workplaces, prevent the misuse of agriculture chemicals, and improve the safety of public highways. The Hazardous Occupation Orders for Agriculture (HOOA), adopted in 1968, is an example of regulations that prevent youth under the age of 16 from being hired to perform certain hazardous tasks on a farm.

Respirator - the mask, filters, and, in some cases, air supply tanks that workers use to provide clean air for safe breathing. Respirators must be certified to meet strict safety standards. When applying pesticides that are restricted by the EPA, a respirator may be required. According to current OSHA regulations, respirator use requires specialized training, and may require approval by a physician. See www.CDC.gov.

Restricted Use Pesticides - a pesticide that has been restricted by the EPA for use by only those who have received special training and are licensed. Federal law restricts youth under the age of 16 from mixing, handling, or applying restricted use pesticides.
**Revolution** - the turning of an object about a center point. One complete revolution returns the object back to the exact position of its starting point. Most older tractor PTOs operate at 540 revolutions per minute (RPM); newer tractors operate at 540 and/or 1000 RPM. See Revolutions Per Minute.

**Revolutions Per Minute—RPM** - the speed that a shaft rotates. The RPM speed of the crankshaft of an engine is often displayed on a tachometer, with unsafe operating speeds shown in red. Farm equipment is designed for PTO shafts to operate at either one of two speeds: 540 RPMs or 1000 RPMs.

**Risk** - a potentially dangerous choice. Taking a risk increases the possibility of injury or harm. People will sometimes take a risk such as jumping off the steps of a tractor or combine in order to show-off or to complete a job more quickly. When mounting or dismounting a tractor or combine, always keep your belt buckle facing the machine.

**Road Lights** - are lights on farm tractors and other farm equipment used for safe operation on public roads and highways. Headlights, taillights, turn signals, and warning flashers may be found on self-propelled equipment, and towed implements may be equipped with taillights, clearance lights, and turn signals. Road lights should be kept in working order and used any time equipment is transported on roadways. Do not use field lights while operating on public roads because the bright field lights may blind or disorient motorists. See Field Lights.

**Road Signs** - signs located along public roadways to provide motorists with information and warnings of danger. If a road sign becomes damaged or is stolen, report it immediately to local law enforcement so that it can be replaced before a collision occurs.

**Rodenticide** - poison used to kill rodents such as mice and rats. Rodenticides must be stored where small children and pets cannot access them because serious poisoning can occur.

**Roll-Over Protective Structure—ROPS** - a frame or cab meeting certain design standards that protects a tractor operator when a tractor rolls over. A seat belt should always be used with ROPS-equipped tractors to contain the operator in the zone of protection provided by the ROPS in the event of an overturn. Some tractors are equipped with “foldable” ROPS for low-clearance applications. Cab-equipped tractors are designed with the ROPS incorporated into the cab structure.

**Rotary Cutter/Mower** - a farm implement that uses rotating blades or cutters to cut grass, weeds, and crops. A rotary cutter/mower is similar to a rotary lawnmower but on a much larger scale. Serious hand and foot injuries can occur if the blades are not stopped before maintenance is performed. Objects thrown from under the machine are another cause of injury related to the use of rotary cutters. Chain guards along the front of a mower protect the operator from being struck by thrown objects.

**Round Baler** - a baler that forms round bundles of hay or other crops. Never attempt to kick loose hay into the pickup head of a round baler because round balers have pull-in points where serious injuries can occur. No one should ever stand at that rear of the baler when the round bale is being discharged. See Baler.

**Running Gear** - the undercarriage of a wagon that includes the wagon frame, wheels, tires, and wagon tongue. The running gear of any wagon used to transport materials on the highway should be inspected regularly for wear and damage to prevent roadway spills and collisions. Certain running gears are designed to be more adaptable to highway transport, with better steering and higher speed tires.
**Safety** - the freedom from those conditions that can cause danger, risk, or injury. Car seats and seat belts greatly improve the safety of children and youth riding in cars and trucks that all states have laws requiring their use. Improving safety on farms and ranches requires constant effort to identify and remove hazards, or to protect workers from the hazards. Safety should be everyone's job.

**Safety Alert Symbol** - a triangle with an exclamation point in the center. This symbol alerts machinery operators to a point of danger on machinery or a safety message in instruction manuals.

**Safety Chain** - a chain used to attach an implement or trailer to the pulling vehicle so that the implement or trailer cannot detach from the vehicle if the primary hitching device (e.g. hitch pin or ball and socket) fails. In most states, safety chains are mandatory when pulling a trailer or implement on a roadway.

**Safety Data Sheets (SDS)** - information provided by the manufacturer of a pesticide or hazardous chemical that includes physical and health hazards, safety procedures, such as required personal protective equipment and first aid procedures. The SDS sheets should be readily available to all workers so that they can familiarize themselves with necessary safety precautions before handling or applying chemicals. These sheets are sometimes known as Material Safety Data Sheets (MSDS).

**Safety Glasses** - glasses that have been certified to meet safety standards for different work tasks, such as mixing chemicals or grinding. In factory environments where flying debris might enter the eyes, most employers require everyone in the production area to wear safety glasses. Farm workers should also wear safety glasses when performing tasks that could cause eye injuries. On some farms, it is standard operating policy for everyone to wear eye protection in the workplace at all times.

**Safety Ground** - a means of providing added protection from electrical shock by the addition of a ground wire. Two-prong adapters should not be used on power tools because they bypass the safety ground and could cause electrocution of a worker instead of a circuit breaker disconnect. See Grounding.

**Safety Harness** - a harness fabricated from straps, connectors, and an attachment point that is worn by workers, and is used in conjunction with a life line to prevent or reduce the severity of falls. Safety harnesses are also worn when workers enter confined spaces to allow for retrieval if something goes wrong. Use of safety harnesses requires specialized training. Also, at least one other person must act as an observer, especially when entering a confined space. No youth under the age of 18 can be employed to perform work requiring a safety harness or entry into a confined space.

**Safety Interlock** - a device to prevent starting an engine unless the transmission is in neutral, the clutch is disengaged, or the combination direction-and-speed-control is in neutral. The safety interlock prevents a farmer from standing beside a tractor and starting it in gear, avoiding potential run-over injuries and deaths.

**Safety Locks (Mechanical)** - devices used to lock farm machinery in the raised position so that farm workers can safely work under the equipment for maintenance and repair. A steel U-channel pinned in place over the rod of a hydraulic cylinder provides the safety lock for a front-end or skid-steer loader.

**Safety-Toed Shoes** - safety shoes which have a steel plate or plastic composite over the toes. Safety-toed shoes prevent crushing injuries whenever a heavy object falls or is dropped on ones toes. In some settings, non-metallic safety shoes are required to prevent sparks. Plastic composites are used in these shoes, instead of steel, to protect the feet.
**Sanitizer** - a chemical or cleanser used to kill bacteria and viruses. Sanitizers are frequently used in milking operations to help keep the milk supply free from disease. Most sanitizers can cause harm to skin if exposure is frequent. Protective gloves should be worn.

**Scaffold** - framework and elevated platform where workers stand while performing tasks in high places. One should not work or walk under scaffolds because of the danger of falling objects from the work area above. Federal law restricts youth under the age of 16 from being employed to work on a ladder or scaffold at heights over 20 feet. For more information on scaffold safety visit www.OSHA.gov.

**Seasonal Agricultural Worker** - a person employed in agricultural work of a seasonal or temporary nature. Whereas a Migrant Agricultural Worker is required to be absent from his or her permanent place of residence, a Seasonal Agricultural Worker may or may not be so required. Seasonal Agricultural Workers are oftentimes not as skilled or experienced as full-time workers, receive less safety training, and incur more injuries. Seasonal workers deserve the same level of workplace safety provided to all workers.

**Seat Belt** - a strap around the lap or lap and shoulder of a tractor operator to prevent the operator from being ejected from the seat. Manufacturers of tractors are required to provide seat belts, and they should be worn on ROPS equipped tractors. All states require the use of seatbelts while operating cars on public roadways.

**Sediment Bowl** - a device found in the fuel system of most tractors that separates out sediment and water before it enters the carburetor or diesel fuel pump. It is usually clear so that the operator can check for the buildup of sediment or water. It can be cleaned by turning off the fuel flow and disassembling. It is designed to reduce the likelihood of the fuel system becoming plugged.

**Self-Contained Breathing Apparatus (SCBA)** - equipment designed to provide a worker with a safe supply of breathable oxygen while working inside a space with insufficient oxygen or a toxic environment. Silos, manure pits, certain grain storage structures, and incidents involving the release of anhydrous ammonia may require the use of SCBA. Use of this equipment requires specialized training and certification of fitness by a physician, and should never be assigned to youth under the age of 18.

**Self-Propelled Machine** - a machine designed to provide power for mobility and for performing agricultural operations. A combine is a self-propelled machine used for harvesting. The term comes from the two processes of cutting the crop and separating the grain from the plant being “combined” in the same machine. Safely operating or maintaining a combine requires extensive training because it has many aggressive components and hazardous points of operation.

**Self-Propelled Sprayer** - a sprayer that has an engine and transmission so that it can be driven through the field, in contrast to a pull-type sprayer that must be pulled through the field by a tractor or vehicle. Self-propelled sprayers are usually very high and wide, thus creating a hazard when driven on roadways.

**Shear Pin** - is a bolt or pin that acts as a “weak link” in the power train. It is designed to fail, similar to a fuse or breaker in an electrical system, if the load on the power train become too great. Shear pins are important protective devices that can prevent serious damage to a machine that becomes plugged or overloaded. Shear pins should not be replaced with standard or hardened bolts.

**Shear Point** - a location on machinery where a body part could be sheared off by one sharp component sliding very closely over another. The cutting bar of a sickle-bar mower and the space between the conveyor screw and tube of an auger are shear points where fingers can be amputated. A good example of a shear point is a pair of scissors.
**Shield** - a guard that provides protection from a machinery hazard. The shield around a radiator fan protects a person from being injured by the rotating blades. Before using a grinder the shield should be in place and properly adjusted to prevent eye and hand injuries.

**Short Circuit** - an electrical circuit where an energized (hot) wire has come into contact with a neutral wire or a grounded component. Sparks and fires often occur because of a short circuit. To reduce the risk of short circuits, make sure the breaker box is kept clean and always replace the box cover after replacing a circuit breaker. If a breaker box or receptacle feels hot, it should be checked by a qualified electrician. A short circuit can also occur in the electrical system of a tractor or combine.

**Shuttle Shift** - a type of transmission found on many agricultural tractors that allows changing direction of travel (forward or reverse) by moving a lever often located on or near the steering column. Once shifted, the machine will operate at the same speed (gear) in the opposite direction. Depending on the tractor model, the clutch pedal may or may not need to be depressed when switching the shuttle shift.

**Signal Words** - used to alert a product user of potential hazards. Signal words used to indicate the level of toxicity of a chemical are, from most to least toxic: DANGER-POISON, DANGER, WARNING, and CAUTION. Similar signal words are also used to indicate hazards found on farm equipment and facilities. There are several places on farms that have been determined to be extremely dangerous and are labeled with the DANGER signal word.

**Silage** - fermented grass, corn, and other roughage crops used for animal feed. As forage ferments into silage, the process produces silo gas that is a serious respiratory hazard. See Silo Gas. Packing silage in bunk silos with large tractors can place the operator at risk of rollover.

**Silage Bagging System** - a process of storing silage in long plastic bags filled using a silage bagging machine. An increasing number of farmers are using silage bags, which have proven safer and less expensive than tower silos that require frequent climbing. Some farms now use a similar bagging system for temporary storage of dry grain. Injuries have been reported from entanglements in the bagging equipment, which is either PTO-driven, or self-powered with a mounted engine.

**Silage Blower** - a machine that fills silos by blowing silage up a tube to the top of a silo with a high-velocity stream of air. The large fan of a silage blower must be kept well shielded to prevent injury. A silage blower can be used to help ventilate the silo to dilute silo gas produced during the fermentation process. See Silo Gas.

**Silo** - a tall, round, cylindrical structure used to store and ferment silage. Many safety precautions must be taken when climbing and working on silos which are commonly eighty feet or taller in height. The leading cause of injuries associated with silos is falls. Youth under age 16 are prohibited by federal law from being employed to work in or on silos.

**Silo Gas** - a collection of gases produced during the fermentation of silage. The most toxic component is nitrogen dioxide, which is heavier than air and can cause asphyxiation and damage to the lungs. Silo gas can be present for up to 21 days following the filing of a silo. Entering the silo during this time should be avoided or performed only after extensive ventilation. See Nitrogen Dioxide.

**Single-Acting Cylinder** - a hydraulic cylinder that operates in one direction by the force of oil pressurized by a pump and in the other direction by the force of gravity or heavy springs. A farm implement can be raised by pressurizing a single-acting cylinder and then lowered by opening a valve which allows the weight of the implement to force the oil from the cylinder into a reservoir. See Hydraulic Cylinder.
Skid-Steer - a method of steering a farm tractor or skid steer loader by applying the brake on only one side, which literally skids the tire on that side allowing a very sharp turn to be made. One should skid-steer at very slow speeds to prevent overturns and reduce wear on the tires.

Skid-Steer Loader - a small, highly maneuverable front-end loader used to load materials at construction sites and farms. Its small size and large lifting capacity make a skid-steer highly susceptible to overturns, and its use inside buildings creates a carbon monoxide poisoning risk. Skid-steer loaders used on farms should be equipped with FOPS to protect the operator from falling objects.

Skidding - pulling or pushing logs or trees to a central location. Because logs can roll, swing, or skid sideways unexpectedly, loggers need to maintain a safe distance from the skidding operation to prevent crushing injuries. Youth under the age of 16 cannot be employed to work with timber with a butt diameter greater than 6 inches.

Skin Cancer - a form of cancer that is often caused by excessive exposure to sunlight. Agricultural workers who spend long periods of time in the sun need to protect their skin from the sun by using sun block, broad-brimmed hats, long pants, and long sleeved shirts. Other contributors to skin cancer include exposure to solvents, oils, and pesticides.

Sliding Collar - a spring-loaded sliding ring that maintains the connection of the PTO shaft of an implement to the stub shaft of a tractor. The sliding collar is safer than the push-pin design because it has no protruding pin to entangle a worker’s clothing.

Slippage - a spinning of the tires which causes the actual ground speed to be less than the speedometer reading. A slight slippage of tractor tires is normal during field operations, but extensive slippage in wet fields damages the soil structure and creates a dangerous overturn risk during removal if a tractor becomes stuck. Excessive tire slippage also contributes to premature tire wear.

Slips and Falls - the loss of body control when one loses balance. Slips and falls are one of the leading causes of injury on farm and ranches. Keeping steps and platforms of tractors and combines free of mud and tools helps prevent slips and falls, as well as using handrails and maintaining three points of contact whenever climbing. Check all ladders regularly to ensure they are in good condition.

SMV Emblem—Slow Moving Vehicle Emblem - an orange and red, reflective, triangular warning sign mounted on the rear of machinery to alert motorists of a slow-moving vehicle ahead. SMV emblems by law are to be used on equipment transported at less than 25 mph. SMV emblems should not be used as driveway markers or on vehicles operated at highway speeds.

Society of Automotive Engineers—SAE - a membership of engineers, business executives, educators, and students who share information and advance the engineering of mobility systems. The SAE provides extensive resources for technical information and expertise used in designing, building, maintaining, and operating self-propelled vehicles for use on land or sea, in air or space, including agricultural tractors and combines. These resources include engineering standards, technical papers, books, periodicals, internet products, meetings, exhibitions, and research programs. Most modern tractors are designed to meet SAE standards. For more information see www.SAE.org.

Solvent - a liquid that is used to dissolve a substance. Solvents are often used for removing grease and dirt. Rubber gloves should be worn when handling solvents to prevent skin damage. Most solvents are toxic and highly flammable. Read the label carefully to determine what personal protective equipment is required.
**Sow** - a female hog used for bearing baby pigs. A sow can be very aggressive after giving birth. According to the provisions of the Hazardous Occupation Orders in Agriculture (HOOA), youth under 16 are not allowed to work with breeding livestock, including sows with baby pigs.

**Speed Identification Symbol (SIS)** - a standardized marking symbol used to identify agricultural equipment that has been designed to operate at speeds greater than 25 MPH. The SIS identifies the maximum equipment ground speeds based on the manufacturer’s design specifications. The SIS should be used in conjunction with the Slow-Moving-Vehicle (SMV) emblem.

**Spinner Shield** - See Integral Journal Shield.

**Splines** - the series of machined slots and projections on mechanical parts that are used to mesh, mate, or connect two parts together, thus allowing the parts to rotate together. PTO shafts are connected with intermeshing splines on shafts and couplers. The PTO stub shaft on a tractor, with its exposed splines, can be a point of entanglement unless the master shield and stub-shaft shield are in place.

**Spontaneous Combustion** - self-ignition of a combustible material caused by the heat generated from a chemical reaction. Wet hay, wet grain, and silage can cause spontaneous combustion resulting in disastrous fires which can be extremely difficult to extinguish and actually smolder for many days. Workers should never enter a bin or silo that contains heating or smoldering material due to toxic air quality.

**Spring** - an energy storing device, used to keep belts tight, assist in lifting implements, and absorb shock. A heavy spring can store considerable energy that can cause serious injury if unexpectedly released by component failure or improper maintenance procedure.

**Square Baler** - a baler that forms square or rectangular packages of straw, hay or other forages. One must always stay clear of the feeding mechanism of a square baler because of its aggressive pull-in components. Always review the operator’s manual before operating.

**Stability** - the state of being stable. Tractors with wide front ends are more stable with less risk for side overturns than tractors with narrow front-ends. Loads hitched above the tractor drawbar can lead to rear overturns. The use of ballast and setting the wheels farther apart can increase the stability of a tractor. See Ballast and Stable.

**Stabilize** - to make stable. Equipment should be stabilized before making repairs, and only approved jack stands or solid blocks of wood should be used to support or stabilize equipment. Never use concrete or cinder blocks that are prone to crush or crumble. See Stable. Never work under a machine that is not stabilized against falling.

**Stable** - not moving, stationary, resisting change or loss of equilibrium. When working near machinery, a person must have stable footing to prevent falling into the operating mechanisms, and equipment should be made stable before conducting maintenance and repair. The word is also used to identify a barn used to store horses and other animals.

**Static Electricity** - an electrical charge that can develop on an object due to friction. Lightning that travels between the clouds and the earth is an example of static electricity. When refueling a vehicle or filling a fuel container in the bed of a truck, the buildup of static electricity can cause a spark that could ignite fuel vapors. Place containers on the ground when filling with gasoline and touch the side of a vehicle before touching the fuel nozzle to discharge any static electricity away from concentrated fuel vapors.
**Stored Energy** - any form of energy that is stored. This includes chemical energy in a battery, potential energy in a spring, thermal energy in a hot engine, electricity, and kinetic energy stored in a coasting PTO shaft that can cause a serious entanglement injury. Before working on a machine, all sources of stored energy should be identified.

**Stress** - mental pressure, tension or strain from the response to physical, environmental, or emotional conditions that can cause fatigue or disease. Stress can cause a preoccupation with life's problems which, in turn, creates a lack of concentration that can cause injuries and mishaps when operating machinery.

**Stub-Shaft** - the short drive shaft, usually on the rear of a tractor, which is used to provide rotational power to implements. On older tractors, the stub-shaft often continually rotates even when the clutch has been disengaged, creating a continual entanglement hazard. See Power Take Off. The stub shaft is shielded by the tractor master shield and the stub-shaft guard.

**Stub-Shaft Guard** - the guard which fits around the PTO stub-shaft when the stub-shaft is not being used. The stub-shaft guard and the master shield provide entanglement protection when the stub-shaft is not in use. The stub-shaft guard is rarely found in use on farm tractors because it is seen as an inconvenience.

**Stuck** - being jammed or caught, or held in a position from which it is impossible to move. Farmers who experience being stuck in the mud or snow on a tractor, on an all-terrain vehicle, or in a truck need to exercise caution to prevent broken chains or overturns during the extrication process. Tow ropes and chains should be used with extreme care.

**Sun Block** - an ointment or lotion applied to the skin to provide protection from exposure to excessive sunlight radiation. Agricultural workers should use sun block when working for long periods outside to help prevent skin damage and cancer.

**Supervised Agricultural Experience—SAE** - a program designed to provide students with out-of-the-classroom experiences and projects during which the students develop and apply agricultural knowledge and skills. The Hazardous Occupation Orders for Agriculture (HOOA) provides exemptions for youth 14-15 years of age who are involved with a formal SAE and are employed to operate agricultural tractors in a supervised setting. For more information see www.agsafety4youth.info.

**Synergism** - the cooperative effect of mixing two or more pesticides whereby the resulting effect is greater than the sum of the effects of the pesticides if applied separately. The synergism of mixing two herbicides can have the positive effect of achieving better weed control and the negative effect of causing more crop damage than would be expected from each individual herbicide. The synergism between two chemicals can make them more toxic.

**Tachometer** - a gauge that indicates the speed in RPMs at which a component is rotating. The red area on the dial tachometer of a tractor engine indicates a dangerously high speed that will damage the engine.

**Tagout** - a safety procedure used to label controls and warn others of a potential hazard if a machine were to be started. Tags are made of tear resistant materials and contain a certain message such as “DO NOT OPERATE” or “DO NOT OPEN.” Lockout/Tagout procedures should be used when anyone enters a silo or grain bin to perform maintenance. On some agricultural operations, OSHA requires the use of Lockout/Tagout procedures before entering a confined space.
**Tandem** - one behind the other. A truck with tandem axles has two sets of wheels – one behind the other. The term is also used to refer to multiple implements pulled behind a tractor. Implements pulled in tandem, such as a disk and a harrow are likely to fishtail at roadway speeds, especially if there are worn components in the drawbars or steering components. When transporting tandem equipment consideration should be given to using an escort vehicle.

**Telehandler** - a type of self-propelled material handler found on many construction sites to lift pallets of building materials to upper floors of buildings. Many farmers who produce large quantities of hay have adapted these machines to stack large round and square bales or load trucks more easily. Stacking bales reduces storage floor space needs. Though not specifically mentioned in the HOOA regulations, telehandlers do resemble a forklift and should not be operated by employed youth under the age of 16. Due to their reach and load capacity, operators need special training to prevent upsets.

**Temperature Gauge** - a gauge that indicates the temperature of a system. When the temperature gauge for the antifreeze in a tractor is in the danger zone, boiling antifreeze can be expelled and cause serious burns. An overheating engine should be stopped immediately, and the cause of the overheating identified.

**Tetanus** - an acute, infectious disease commonly referred to as lockjaw, characterized by muscle spasms, especially of the jaw, and caused by a bacterium that is usually introduced through a wound, especially a puncture wound. It is recommended that farmers and farm workers have a tetanus inoculation and periodic booster shots because of the many incidences of punctures in the farming environment.

**Thermal Energy** - energy associated with the motion of molecules, atoms, or ions in a substance. The engines of tractors give off thermal energy from heat of combustion. An engine needs time to cool off and can remain hot for up to an hour after operation. When touching a hot muffler, it is the thermal energy that causes severe burns.

**Three-Conductor, Grounded-Type Circuits** - electrical circuits which use three conductors -- neutral, hot, and ground wires. All outlets in farm shops should be grounded-type circuits to reduce the risk of electrocution.

**Three-Point Hitch** - a hitching device used to attach and lift farm implements. It consists of two lifting arms and an adjustable third link and is usually located on the rear of a tractor. Quick-hitch devices are available so that workers do not have to be in the dangerous position between the implement and tractor during the hitching operation.

**Throttle** - the hand or foot control that regulates the speed of an engine. The accelerator on an automobile is an example of a throttle. On agricultural tractors and combines, the symbols of a rabbit and turtle are used to identify the throttle. Moving from the turtle position to the rabbit position increases the speed of the engine.

**Thrown Object** - an object that is thrown. A person standing near a rotary mower can be injured by objects thrown by the mower such as a rock, piece of wire, or part of a broken mower blade. Other farm machines that can cause thrown objects are forage choppers, straw choppers on combines, and chain saws. Machines that have the potential to throw objects such as a rotary mower are required to have a shield that will deflect the objects safely.
**Tillage** - the act of stirring, plowing, or cultivating the soil. Modern tillage implements are wide, heavy equipment that fold and lock for transport on roadways. However, even when folded they are over-width equipment and are involved in many roadway collisions with drivers who aren't observant of hazard warning lights and SMV signs.

**Tire Pressure** - the amount of air pressure, usually measured in Pounds per Square Inch (PSI), within a tire. Tires should be inflated to the pressure recommended by the manufacturer for the specific application and printed on the side of the tire. Tire pressures should be checked regularly to prevent damage to tires or sudden tire failures. Never exceed the manufacturer's pressure recommendations when inflating tires. Tire explosions caused by over-inflating tires have caused many fatalities and serious injuries.

**Tongue** - the long (usually steel) beam at the front of a wagon or implement that connects to a towing vehicle or tractor. Many injuries have occurred when an implement tongue has been dropped on a worker's foot that wasn't protected with steel-toed shoes. Crushing injuries have occurred when a worker is attempting to hitch the tongue to the drawbar, and is backed over by the tractor, or crushed between the tractor and implement.

**Top Link** - See Upper Link.

**Torque** - a turning or twisting force that tends to produce rotation. A tractor’s engine exerts torque on the drive shaft. A torque wrench measures the torque applied, allowing a mechanic to apply the correct amount of torque to each nut or bolt and preventing machine failure caused by a loose or broken bolt. The lug bolts on wheels should be torqued to prevent them from coming loose.

**Towed Implement** - an implement that is pulled by a vehicle or tractor. Towed implements generally are not designed to be pulled at highway speeds; consequently, SMV signs are required for roadway transport.

**Tow Rope/Strap** - a strong flexible rope or strap that is designed to tow heavy equipment, or to aid in removing equipment stuck in mud or snow. They are widely used to replace tow chains because they are able to absorb the shock of the initial pull when the slack is removed, thereby reducing damage to the vehicle. Because of their ability to absorb energy, they can act like a slingshot when they fail, throwing attachments, such as a hook, at high speed. There have been numerous reported injuries to operators and bystanders due to flying tow ropes and straps when they failed due to overloading.

**Toxic** - relating to a toxin, or something poisonous. Left-over agricultural chemicals are toxic waste and must be discarded in an approved manner. The bite of a poisonous brown recluse spider hiding in a dark shed or a rattlesnake under a board on a ranch can inject toxic venom that can cause serious illness and even death. See Toxin.

**Toxic Environment** - surroundings (air, water, soil) that have been contaminated by toxins. The poisonous gases in a manure pit form a toxic environment that has killed many farm workers who were unaware of the danger when they entered manure pits without a self-contained breathing apparatus or proper ventilation. See Toxic and Toxin.

**Toxicity** - the degree to which a substance is toxic or poisonous. The toxicity levels of rat poison and insecticides are very high, therefore making them potentially fatal if swallowed. Federal law prohibits youth under the age of 16 from handling, applying, or mixing toxic chemicals labeled with the words DANGER/POISON or WARNING. See Toxic.

**Toxin** - any poisonous or harmful substance. Agricultural chemicals are toxins because they have the potential to be harmful if handled or applied without using proper safety procedures and personal protective equipment.
**Tractor** - a self-propelled machine that can be used to pull mobile equipment or to supply power for stationary or mobile machinery by means of a PTO or belt-pulley. Tractor-related injuries are the leading cause of farm-related fatalities in the U.S. Tractor overturns are the most common cause of tractor-related fatalities. Tractors equipped with ROPS can significantly reduce the risk of tractor-related deaths.

**Transmissions (CVT, IVT, Shuttle Shift, Power Shift)** - A mechanical component through which power is transmitted from an engine, or motor, to the final drive. The transmission is connected to the engine of a tractor and controls the travel speed of the vehicle by varying input and output rotational speed ratios. There are many types of transmissions that affect the way travel speed is selected by the operator. (CVT - Continuously Variable Transmission, similar in characteristics to IVT; IVT – Infinitely Variable Transmission, no set gear ratio, machine can travel any speed between 0 and maximum; Shuttle Shift- Forward and Reverse travel directions of the vehicle is selected (shuttled) with a single lever; Power Shift- Individual gears can be selected by the operator by an electronic switch/hydraulic toggle/lever).

**Transport Position** - the raised and/or folded position of an implement. In the transport position, the implement can be moved on a roadway. However, large modern implements are over-width equipment even when folded in the transport position, and extra precautions must be taken to prevent roadway collisions.

**Tunnel Shield** - a shield shaped like an upside-down trough which covers the top and both sides of the PTO driveline. Since the tunnel shield offers no protection on the bottom, it is no longer considered an acceptable shield in most applications on agricultural equipment.

**Turbocharger** - also known as a “turbo”, a device that increases an internal combustion engine’s efficiency and power output by forcing extra compressed air into the combustion chamber. Turbochargers are commonly used on many types of vehicles and equipment, including tractors, heavy trucks and pickups, and some passenger vehicles.

**U.L. Label** - a symbol found on electrical power tools and equipment that indicates that the tool has been tested by the Underwriters Laboratory. When buying a new power tool look for the U.L. Label.

**Un-insulated** - not insulated. High-voltage power lines are bare, un-insulated wires used to transport high voltage electricity over long distances. Many injuries and deaths have resulted from electrocution when television antennas, augers, and ladders have contacted un-insulated overhead electrical lines.

**Universal Joint (U-Joint)** - a coupling between two shafts that is capable of transmitting rotation from one shaft to another when the shafts are not in a straight line. Unshielded universal joints on PTO shafts can lead to the entanglement of clothing and have potential to cause serious injuries and deaths to farm workers.

**Universal Symbol** - graphical representation that is approved and adopted by an industry. For example, the rabbit and turtle icons that designate fast and slow on the throttle of a tractor are universal symbols that can be recognized regardless of a worker’s native language or reading ability.

**Unloading Auger** - the swing-out auger on a combine which is used to unload grain from the combine hopper. If the operator forgets to swing the unloading auger back into the transport position, collisions with electrical poles and trees may occur. In some settings, the unloading auger can make contact with overhead power lines potentially causing a fire or electrocution. See Auger.
**Upper Link** - the upper adjustable arm of the three-point hitch system of a tractor. A chain or other towing device should never be connected to the upper link because the towing force on that high hitch point can cause the tractor to overturn to the rear and crush the operator. See Three-Point Hitch.

**Upwind** - being in a position that is in the direction from which the wind is blowing. When spraying chemicals or working in a dusty setting, being upwind of the source can reduce inhalation exposure to toxic substances.

**Utility Vehicle (UTV)** - off-road vehicle designed to carry loads to sites that are not accessible to trucks. They come equipped with four to six wheels for greater floatation and traction and can carry up to several hundred pounds in cargo. If a utility vehicle is equipped with a dump bed, the dump bed should always be in the lowered position during operation to maintain stability.

**Visibility** - the quality of how well a person can see. Visibility in a tractor cab is often reduced by the corner posts of the cab or dust on the windows. Tractor operators must be constantly alert for obstacles or bystanders in their path. New tractors are coming equipped with improved mirrors and camera systems to enhance operator visibility. Keep cab windows clean during operation to reduce glare.

**Volatile** - A substance that is easily converted to a vapor (evaporated) at normal temperatures. The more volatile a chemical is, the faster it will evaporate. These vapors may be dangerous to agricultural workers and precaution should be used when working with in near proximity. Anhydrous ammonia and propane convert from a compressed liquid to a vapor very quickly.

**Voltage** - Pressure in an electrical system that pushes charged electrons. Most tractors have 12V electrical components, however 6V and 24V are also possible. Farm buildings may have electrical wiring that is 120V or 240V. Electricity is transmitted from a powerplant long distances at high-voltage (up to 400,000V).

**Voltage Detector** - an electronic, usually hand-held device that detects the presence of flowing electricity in electrical wiring or receptacles. This device should be a part of every farmer’s toolbox in order to prevent unintentionally contacting energized electrical components. Before any electrical work is done, all power must be locked out to prevent electrical shock.

**Warning** - indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury, including hazards that are exposed when guards are removed. It can also be used to alert against unsafe practices. The word “WARNING” on a chemical label indicates an intermediate level of hazard to the worker or the environment.

**Weight Limit** - the maximum weight that a structure, vehicle, or system can safely support. Weight limits are imposed on bridges to prevent structural failure and collapse. The 80,000-pound weight limit on many semi-tractor-trailers ensures that their designed braking systems are not overburdened and that roadway surfaces do not prematurely disintegrate. A grain cart transporting 600 bushels of grain can weigh over 16-tons far exceeding the 10-ton weight limit of many rural bridges.

**Wheelbase** - the length between the center of the front wheels and rear wheels of a vehicle. Longer wheelbase on tractors increases the stability, reduces the risk of rear overturns, and provides a smoother ride over rough terrain. See Stability.
Wheel Weights - weights that are bolted directly to the wheels of a vehicle. Wheel weights are often bolted on the front and/or rear wheels of tractors to improve traction, stability, and steering. Care should be taken when installing or removing wheel weights due to their significant weight and risk of crushing injuries.

Windrower - a machine that cuts and gathers a crop (often hay) into long, narrow rows that are later picked up by a harvesting machine, such as a baler. The safety lock on the header of a windrower must be secured in the raised position before a worker performs maintenance under the header in order to prevent a crushing injury in the event of hydraulic failure.

Wings (Implement) - the outer sideways extremities of an implement that are hinged to fold upward and inward to reduce the overall width for traveling on roadways. The wings of an implement lock into the raised position to prevent them from falling onto a maintenance worker or into the path of traffic on a roadway.

Whistle Blower Law - under the provisions of the OSHAct, a worker has the right to contact the state or federal Department of Labor to report unsafe work conditions without the fear of being punished by his or her employer. To learn more visit www.OSHA.gov.

Worker Protection Standard (WPS) - regulations that were adopted to protect pesticide handlers and agricultural workers from the harmful effects of pesticides. The requirements in the standard include safety training, appropriate labeling of all pesticide containers, posting of fields in which chemicals have been applied, use of PPE, and training in appropriate emergency procedures.

Wrap Point - a location on machinery where a person's extremities, clothing or shoe laces can become wrapped. PTO operated machinery must have all guards and shields in place and in good working condition during operation to prevent entanglement at the wrap points along the PTO driveline.

Zerk - a fitting used to feed grease into a bearing or bushing. If grease is not routinely applied through the grease zerks of a machine according to the manufacturer's maintenance schedule, machine failure, fire from an overheated bearing, and operator injury can occur.

Zone of Protection - an area guarded by shields, enclosures, or barriers to prevent worker injuries. A cab with integral ROPS provides a zone of protection around the operator of a tractor protecting him or her from the sun, weather, noise, dust, and injury in the event of an overturn. Most modern combines are not equipped with ROPS, and therefore do not provide a complete zone of protection.

Zoonotic Diseases - diseases that can be transferred from animals to humans in natural ways. Zoonotic diseases can be transmitted to humans in a variety of ways: oral ingestion (mad-cow disease); bite wound (rabies); inhalation (anthrax); puncture wound (tetanus); scratch wound (cat scratch disease). Frequent hand washing and personal protective equipment (PPE) are used by veterinarians to reduce their exposure to zoonotic diseases.