

HAND AND PORTABLE POWER TOOL USE

Purpose This Water Quality and Hydrology Group procedure assists employees in identifying and controlling hazards associated with the use of hand tools and portable power tools.



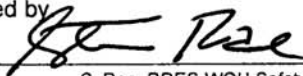
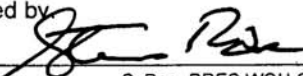
Scope This procedure applies to all RRES-WQH personnel, including contract and subcontract employees and students, performing work for WQH.

In this procedure This procedure addresses the following major topics:

Topic	See Page
General Information About This Procedure	2
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Hazard Control Plan The hazard evaluation associated with this work is documented in Attachment 1: Initial risk = Medium. Residual risk = Low. Work permits required: none
First authorization review date is one year from group leader signature below; subsequent authorizations are on file in group office.

Signatures

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General Information About This Procedure

Attachments This document has the following attachments:

Number	Attachment Title	No. of pages
1	Hazard Control Plan	8

History of revision This table lists the revision history and effective dates of this procedure.

Revision	Date	Description Of Changes
0	7/03	New document
1	6/04	Added procedure and hazard control for chainsaw use.

Who requires training to this procedure The following personnel require training before implementing this procedure:

- All RRES-WQH staff, contract personnel, and students who use hand tools and portable power tools to perform work.

Training method The training method for this procedure is “self-study” (reading) and is documented in accordance with the procedure for training (RRES-WQH-QP-024, *Training*).

Prerequisites In addition to training to this procedure, the following training is also required.

- Proper use and handling of tools and equipment
- Manufacturer manuals

References The following documents were referenced in creating this procedure:

- Engineering Services Safety. Office of Health and Safety Information System (OhASIS), Centers for Disease Control and Prevention (CDC), Health and Safety Manuals, Engineering Safety Manual (1997, January 2), Chapter16-00-20, "General Shop/Work Area Safety"

General information about this procedure, continued

Definitions Hand tools – Tools that are powered manually. Hand tools include anything from axes to wrenches.

 Pneumatic tools – Tools that are powered by compressed air and include chippers, drills, hammers, and sanders.

 Fuel powered tools or liquid fuel tools – Tools that are typically operated with gasoline.

Note Actions specified within this procedure, unless preceded with “should” or “may,” are to be considered mandatory guidance (i.e., “shall”).

Using tools to perform work

Policy

Tools are such a common part of our lives that it is difficult to remember that they may pose hazards. Tragically, a serious incident can occur before steps are taken to identify and avoid or eliminate tool-related hazards.

Supervisors and personnel who use hand and power tools and are exposed to the hazards of falling, flying, abrasive, and splashing objects, or to harmful dusts, fumes, mists, vapors, or gases must be provided with the appropriate personal protective equipment.

All electrical connections for these tools must be suitable for the type of tool and the working conditions (wet, dusty, flammable vapors). When a temporary power source is used for construction a ground-fault circuit interrupter should be used.

Personnel should be trained in the proper use of all tools. Employees should be able to recognize the hazards associated with the different types of tools and the safety precautions necessary.

Safe working environment

Supervisors and personnel should work together to establish a safe working environment. If a hazardous situation is encountered, it should be brought immediately to the attention of the proper individual for hazard abatement. The following sections identify various types of hand and power tools and their potential hazards. They also identify ways to prevent worker injury through proper use of the tools and through the use of appropriate personal protective equipment.

Five basic safety rules

Five basic safety rules can help prevent hazards associated with the use of hand and power tools:

- Keep all tools in good condition with regular maintenance.
- Use the right tool for the job. If not sure what is the right tool, ask.
- Examine each tool for damage before use and do not use damaged tools.
- Operate tools according to the manufacturers' instructions.
- Provide and use properly the right personal protective equipment.

Hand tools

Definition

Hand tools are tools that are powered manually. Hand tools including anything from axes to wrenches. Incidents with hand tools are usually the result of misuse or using the wrong tool for the work to be conducted. Hand tools are precision tools capable of performing many jobs when used properly. Training and proper use of the tools can prevent accidents.

General precautions

To prevent hazards associated with the use of hand tools, employees should observe the following general precautions:

- Tools should be of good quality and adequate for the job. All tools should be kept in good repair and maintained.
- Racks, shelves, or tools boxes shall be provided for storing tools which are not in use.
- When using tools while on ladders, scaffolds, or platforms, carrying bags shall be used for tools not in use.

Supervisors and **employees** shall frequently inspect all hand tools used in the work being performed. Defective tools shall be immediately removed from service and tagged.

Portable power tools

Definition Portable power tools increase mobility and convenience but are frequently more hazards to use than hand tools. Types of power tools are determined by their power source: electric, pneumatic, liquid fuel, hydraulic, and powder-actuated.

Employees who are required to use portable power tools in their work shall be thoroughly aware of safe operating practices. Safe operation shall be consistent with the manufacturer's instructions.

Supervisors are responsible for ensuring that personnel are authorized to use portable power tools and have met the requirements for authorization.

Portable power tools, continued

General precautions

To prevent hazards associated with the use of power tools, employees should observe the following general precautions:

- Never carry a tool by the cord or hose.
- Never yank the cord or the hose to disconnect it from the receptacle.
- Keep cords and hoses away from heat, oil, and sharp edges.
- Disconnect tools when not using them, before servicing and cleaning them, and when changing accessories such as blades, bits, and cutters.
- Keep all people not involved with the work at a safe distance from the work area. Secure work with clamps or a vise, freeing both hands to operate the tool.
- Avoid accidental starting. Do not hold fingers on the switch button while carrying a plugged-in tool.
- Maintain tools with care; keep them sharp and clean for best performance.
- Follow instructions in the user's manual for lubricating and changing accessories.
- Be sure to keep good footing and maintain good balance when operating power tools.
- Wear proper apparel for the task. Loose clothing, ties, or jewelry can become caught in moving parts.
- Remove all damaged portable electric tools from use and tag them: "Do Not Use."
- Power tools must be fitted with guards and safety switches. Safety guards must never be removed when a tool is being used.

Supervisors and **employees** shall frequently inspect all portable power tools used in the work being performed. Defective tools shall be immediately removed from service and tagged.

Portable power tools, continued

- Portable circular saw** Portable circular saws having a blade greater than 2 inches (5.08 centimeters) in diameter must be equipped at all times with guards.
- An upper guard must cover the entire blade of the saw.
 - A retractable lower guard must cover the teeth of the saw, except where it makes contact with the work material.
 - The lower guard must automatically return to the covering position when the tool is withdrawn from the work material.
-

- Electric tools** Employees using electric tools must be aware of several dangers, the most serious of which is electrical burns and shocks.
- The following general precautions shall be followed when using electric tools.
- Operate electric tools within their design limitations.
 - Use gloves and appropriate safety footwear when using electric tools.
 - Store electric tools in a dry place when not in use.
 - Do not use electric tools in damp or wet locations unless they are approved for that purpose.
 - Keep work areas well lighted when operating electric tools.
 - Ensure that cords from electric tools do not present a tripping hazard.
 - Use protected by ground-fault circuit interrupters.
 - Follow instructions in the manufacturer's manuals

Portable power tools, continued

Portable abrasive wheel tools

Portable abrasive grinding, cutting, polishing, and wire buffing wheels create special safety problems because they may throw off flying fragments. Abrasive wheel tools must be equipped with guards that:

- Cover the spindle end, nut, and flange projections
- Maintain proper alignment with the wheel
- Do not exceed the strength of the fastenings.

Before an abrasive wheel is mounted:

- Inspect for damage
- Conduct sound- or ring-test to ensure that it is free from cracks or defects.

To test:

- Tap wheels gently with a light, non-metallic instrument.
- If the wheels sound cracked or dead, do not use the wheels because they could fly apart in operation.
- A stable and undamaged wheel, when tapped, will give a clear metallic tone or “ring.”

To prevent an abrasive wheel from cracking:

- Ensure wheel fits freely on the spindle.
- Tightened spindle nut enough to hold the wheel in place without distorting the flange.
- Always follow the manufacturer’s recommendations.
- Take care to ensure that the spindle speed of the machine does not exceed the maximum operating speed marked on the wheel.

An abrasive wheel may disintegrate or explode during start-up. Precautions include:

- Allow the tool to come up to operating speed prior to grinding or cutting.
- Never stand in the plane of rotation of the wheel as it accelerates to full operating speed.
- Ensure portable grinding tools are equipped with safety guards to protect against injury from the moving wheel surface, but also from flying fragments in case of wheel breakage.

Portable power tools, continued

Liquid fuel tools Fuel-powered tools are usually operated with gasoline. The most serious hazard associated with the use of fuel-powered tools comes from fuel vapors that can burn or explode and also give off dangerous exhaust fumes.

The following precautions shall be taken:

- Be careful to handle, transport, and store gas or fuel only in approved flammable liquid containers, according to proper procedures for flammable liquids.
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Chainsaws Chainsaws, like other power tools, provide a valuable service, but they are inherently dangerous. Upon completion of a recognized hands-on saw training course (USFS, BLM, Park Service, etc) WQH personnel may use chainsaws to limb and cut downed trees. For standing trees a work order will be used through KSL for their removal. All chainsaw operators must observe the below practices:

- Read owners manual thoroughly. Learn the saws capabilities and limitations.
- Never operate equipment unless you are in good physical condition and mental health and not under the influence of any substance (alcohol, drugs) which may impair vision, dexterity or judgment.
- Wear protective clothing and equipment to reduce the risk of injury should an accident occur.
- Know all your saw parts. Reference your owner's manual. Be familiar with all switches and adjustments.
- When transporting the saw, always make sure the engine is off or for short distances less than 50 ft., make sure the chain brake is on and functional. Always protect yourself from the saw chain. Cover the chain whenever possible with a bar scabbard. Always try to carry the saw with the muffler and saw bar away from your body, pointing to the rear.
- Check your saw over at least once a day during use and especially before work each day.
- It is important to make sure the safety items on the saw are all on the saw and working properly. They are: The chain catcher or chain stop, the throttle lock found on the rear operation handle, and the chain brake.
- Fuel your saw in a well ventilated area or outdoors only. Always turn the saw off and allow for the outer surfaces to cool down before fueling. When fueling the saw, avoid spilling oil fuel. If any fuel is spilled, make sure you wipe off the saw before starting it.

Continued on next page.

Portable power tools, continued

Chainsaws (cont)

- Never operate a chain saw that will not idle properly or is hard to start.
 - Always hold the saw firmly in both hands. Never use only one hand when operating a chain saw.
 - Start your saw using one of the starting methods in your owners manual. Never drop start a chain saw. You may loose control of the saw. Always use the chain brake when starting. This can eliminate the chance of the saw starting and coming in contact with something before you are ready.
 - Remember the reactive forces and their hazards.
 - Always operate the saw below shoulder height.
 - Never work alone.
 - Plan escape routes.
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Hydraulic jacks

The fluid used in hydraulic power tools must be an approved fire resistant fluid and must retain its operating characteristics at the most extreme temperatures to which it will be exposed.

The exception to fire-resistant fluid involves all hydraulic fluids used for the insulated sections of derrick trucks, aerial lifts, and hydraulic tools that are used on or around energized lines. This hydraulic fluid shall be of the insulating type.

The following rules and practices are suggested to avoid personal injury, equipment damage, and potential environmental impact:

- Do not exceed the manufacturer's recommended safe operating pressure for hoses, valves, pipes, filters, and other fittings.
- All jacks—including lever and ratchet jacks, screw jacks, and hydraulic jacks—must have a stop indicator, and the stop limit must not be exceeded.
- Manufacturer's load limit must be permanently marked in a prominent place on the jack, and the load limit must not be exceeded.
- Never be use a jack to support a lifted load. Once the load has been lifted, it must immediately be blocked up. Put a block under the base of the jack when the foundation is not firm, and place a block between the jack cap and load if the cap might slip.

Portable power tools, continued

Compressed air sources

Compressed air has the appearance of a relatively harmless gas. However, to avoid accidents, compressed air must be used correctly. The improper or inadvertent connection of items not designed for shop air pressure, i.e., equipment, storage vessels, or containers, to a shop air supply may cause serious personal injury and more than likely will damage the item being connected.

The maximum air pressure approved for general use in the shop is 30 psi (pounds per square inch). This pressure is sufficient for most shop operations and is not significantly hazardous. Use discretion and good judgment when using compressed air, even at this low pressure.

The following rules and practices are suggested to avoid personal injury, equipment damage, and potential environmental impact:

- All personnel assigned to shops with air compressors shall be familiar with compressor operating and maintenance instructions.
- Compressed air is not to be used to blow dirt, chips, or dust from clothing.
- Never apply compressed air to any part of a person's body.
- Air compressors shall be maintained strictly in accordance with the manufacturer's instructions.
- Never use compressed air where particles can be accelerated by the air stream.
- Do not use compressed air to clean machinery or parts unless absolutely necessary. Where possible, use a brush. If necessary, use a minimum pressure and provide barriers or clean the area of personnel. Wear goggles to protect your eyes.
- Do not use a compressed air line that does not have a pressure regulator for reducing the line pressure.
- The maximum working pressure of compressed air lines shall be identified in psi. Pipeline outlets shall be tagged or marked showing maximum working pressure immediately adjacent to the outlet.

Continued on next page.

Portable power tools, continued

Compressed air sources (cont)

- Keep the hose length between tool housing and the air source as short as possible.
- Where possible, attach a short length of light chain between the hose and the housing on air-operated tools. This keeps the hose from whipping should the hose-tool coupling separate.
- Inspect air supply and tool hoses before using. Discard and label unfit hoses. Repair hoses where applicable.
- Turn valve off and vent pressure from a line before connecting or disconnecting it. Never work on a pressurized line.
- Do not use compressed air to transfer materials from containers when there is a possibility of exceeding the safe maximum allowable working pressure of the container.

WARNING: It is dangerous to pressurize any container not designed for that purpose.

Portable power tools, continued

Operating controls and switches

The following hand-held power tools must be equipped with a constant-pressure switch or control that shuts off the power when pressure is released:

- drills
- tappers
- fastener drivers
- horizontal, vertical, and angle grinders with wheels more than 2 inches in diameter
- disc sanders with discs greater than 2 inches
- belt sanders
- reciprocating saws
- saber saws, scroll saws, and jigsaws with blade shanks greater than 1/4-inch wide
- other similar tools.

These tools also may be equipped with a “lock-on” control, if it allows the employee to also shut off the control in a single motion using the same finger or fingers.

The following hand-held power tools must be equipped with either a positive “on-off” control switch, a constant pressure switch, or a “lock-on” control:

- disc sanders with discs 2 inches or less in diameter
- grinders with wheels 2 inches or less in diameter
- platen sanders, routers, planers, laminate trimmers, nibblers, shears, and scroll saws
- jigsaws, saber and scroll saws with blade shanks a nominal 1/4-inch or less in diameter

It is recommended that the constant-pressure control switch be regarded as the preferred device.

Other hand-held power tools such as circular saws having a blade diameter greater than 2 inches, chain saws, and percussion tools with no means of holding accessories securely must be equipped with a constant-pressure switch.

Do not rewire any tools or modify the operating switches

[Click here to record self-study training to this document.](#)

HAZARD CONTROL PLAN

Scope

This RRES-WQH procedure and hazard control plan assists employees in identifying and controlling hazards associated with the use of hand tools and portable power tools.

Potential hazards

Material, equipment, and/or conditions in the office setting which may expose the worker to hazards include:

Hand tools:

- A. Cuts, abrasions, pinches: dull tools, cracked saw blades, splintered wooden tool handles,
- B. Ignition sources: iron or steel hand tools produce sparks that can be an ignition source around flammable substances

Portable power tools:

- C. Electrical burns/fire: faulty electrical equipment, power tools, small portable generators
- D. Bodily injury: lack of or inadequate guards, improper use of tools.
- E. Electrical shock: shock from improper use and maintenance of electric tools
- F. Eye or face injury: flying fragments when using abrasive wheel tools or other power tools
- G. Struck-by injury: improper installation of a tool attachment or fastener
- H. Fatigue and strain injury: use of heavy jackhammers
- I. Excessive noise injury: use of pneumatic tools
- J. Inhalation injury: breathing carbon monoxide when using fuel-powered tools in an enclosed area

HAZARD CONTROL PLAN, continued

Initial risk level

For each hazard, list the likelihood and severity, and the resulting initial risk level (before any work controls are applied, as determined according to LIR300-00-01, section 7.2)

- A. Cuts, abrasions, pinches: medium
- B. Ignition sources: low
- C. Electrical burns/fire: low
- D. Bodily injury: low
- E. Electrical shock: low
- F. Eye or face injury: low
- G. Struck-by injury: medium
- H. Fatigue and strain injury: medium
- I. Excessive noise injury: minimal
- J. Inhalation injury: low
- K. Chainsaw use: medium

Overall *initial* risk: Minimal Low Medium High

Operational requirements

List applicable Laboratory, facility, or activity operation requirements directly related to the work:

None List: Work Permits required? No List:

Occupational Safety and Health Administration (OSHA)
Facility Management Procedures and Protocols

LIR201-00-04, *LANL Incident Reporting Process*

LIR402-150-01, *Working Alone*

LIR402-600-01, *Electrical Safety*

LIR402-840, *Welding, Cutting, and Other Spark - or Flame-Producing Operations*

LIR402-860-02, *Locking and Tagging Equipment, Machinery, and Systems*

LIR402-1310-01, *Field Work Safety*

HAZARD CONTROL PLAN, continued

Mitigating hazards

Describe how the hazards listed above will be mitigated (e.g., safety equipment, administrative controls, etc.):

A. Cuts, abrasions, pinches:

- Do not use tools with handles that are cracked, split, broken or splintered.
- Ensure tools handles are well-fitted and securely fastened.
- Ensure tools with tangs (files, wood chisels) are fitted with suitable handles.
- Do not use impact tools with mushroomed heads.
- Ensure that knives and scissors are sharp.
- Do not use wrenches when jaws are sprung to the point that slippage occurs.
- Wear personal protective equipment, such as goggles and gloves.

B. Ignition sources:

- Where flammable gases, highly volatile liquids or other explosive substances are stored or used, use spark-resistant tools made of non-ferrous materials.
- Do not use a powder-actuated tool in an explosive or flammable area.

C. Electrical burns/fire:

- Ensure tools have three-wire cord with a ground and use a grounded receptacle.
- If using an adapter to accommodate a two-hole receptacle, ensure the adapter is attached to a known ground.
- Always use ground-fault circuit interrupters.
- Handle, transport, and store gas or fuel in approved flammable liquid containers.
- Before refilling a fuel-powered tool tank, shut down the engine and allow it to cool to prevent accidental ignition.
- Fire extinguishers must be available in the immediate area where power tools are being used, both in the field and in the shop.

HAZARD CONTROL PLAN, continued

**Mitigating
hazards
(cont)**

D. Bodily injury:

- Maintain clean and dry workplace floors to prevent slips while using tools.
- Use power tools with machine safety guards. Safety guards must never be removed when a tool is being used.
- Operate tools within their design limits.
- Ensure cords from electric tools do not present a tripping hazard.
- Ensure abrasive wheels are free from cracks or defects.
- Wear appropriate personal protective equipment.
- Turn off power when tool not in use.
- When using pneumatic tool, use a short wire or positive locking device to attach the air hose to the tool.
- Never point a hand or power tool towards anyone.

HAZARD CONTROL PLAN, continued

**Mitigating
hazards
(cont)**

- E. Electrical shock:
- Ensure tools have three-wire cord with a ground and use a grounded receptacle.
 - If using an adapter to accommodate a two-hole receptacle, ensure the adapter is attached to a known ground.
 - Always use ground-fault circuit interrupters.
 - Do not use electric tools in damp or wet locations unless approved for that purpose.
 - Follow all manuals for equipment operation.
 - Inspect all extension cords and power tools for signs of aging (frayed or broken cords, scorched contacts, etc). If a cord is found in disrepair:
 - Remove from service,
 - Cutup extension cord and discard,
 - Repair cord on power tool
 - Observe lockout/tag out processes.
 - Use GFI protected circuits or extension cords for all outdoor and shops area uses.
 - Assure that the temporary wiring equipment is rated for its intended use (wet/ dry, indoors/ outdoors, flammable or explosive etc.)
 - Assure that the load rating of the temporary wiring is not exceeded.
 - Assure there is a firm connection when plugging equipment into a receptacle outlet or an extension cord.
 - Badges and jewelry must be removed, long hair and clothing must be kept clear of moving parts or powered equipment.
 - Do not overload electrical outlets. Do not “daisy chain” extension cords and “Fat Phoebe’s” together.
 - Unplug any equipment that sparks, smokes, or delivers an electrical shock. Have it inspected by appropriate repair personnel.
 - Use only UL-listed equipment or components

HAZARD CONTROL PLAN, continued

**Mitigating
hazards
(cont)**

- F. Eye or face injury:
 - When using all power and hand tools tools, wear eye, head, and face protection

- G. Struck-by injury:
 - Set up screens to protect nearby workers from being struck by flying fragments around chippers, riveting guns, staplers, or air drills.

- H. Fatigue and strain injury:
 - Heavy rubber grips on jack hammers reduce fatigue and strain by providing a secure handhold.

- I. Excessive noise injury:
 - Wear appropriate hearing protection when working with noisy tools such as jackhammers and pneumatic tools.

- J. Inhalation injury:
 - When a fuel powered tools is used in a closed area, ensure effective ventilation and/or use proper respirators such as atmosphere-supplying respirators.

- K. Chainsaw use:
 - Loss of control and physical injury as a result of kickback:
 - Hold the chainsaw firmly with both hands and maintain a secure grip.
 - Be aware of the location of the guide bar nose at all times.
 - Never let the nose of the guide bar contact any object. Do not cut limbs with the nose of the guide bar. Be especially careful when cutting small, tough limbs, small size brush and saplings, which may easily catch the chain.
 - Don't overreach.
 - Don't cut above shoulder height.
 - Begin cutting and continue at full throttle.
 - Cut only one log at a time.
 - Use extreme caution when reentering a previous cut.
 - Do not attempt to plunge cut.
 - Be alert for shifting of the log or other forces that may cause the cut to close and pinch the chain.
 - Maintain saw chain properly. Cut with a correctly sharpened, properly tensioned chain at all times.
 - Stand to the side of the cutting path of the chainsaw.

HAZARD CONTROL PLAN, continued

**Mitigating
hazards
(cont)**

- Physical injury resulting from improper use of chainsaw:
 - Do not operate chainsaw with one hand.
 - Do not operate chainsaw when fatigued.
 - Wear appropriate PPE: field boots, snug-fitting clothes, gloves, protective chaps, helmet and shield, and eye and ear protection.
 - Keep coworkers out of the immediate work area.
 - Do not start cutting until the work area is cleared of debris to allow a secure foothold and to allow a planned retreat path if needed.
 - Keep all body parts away from the saw chain when the engine is running.
 - Carry the chainsaw with the engine stopped, guide bar and chain to the rear, and muffler away from body.
 - Do not operate a chainsaw that is damaged, improperly adjusted, or not completely and securely assembled. Be sure that the saw chain stops moving when the throttle trigger is released.
 - Shut off the engine before setting the chainsaw down.
 - Use extreme caution when cutting small size brush and saplings because slender material may catch the saw chain and be whipped toward you or pull you off balance.
 - When cutting a limb that is under tension be alert for springback so that you will not be struck when the tension in the wood fibers is released.
 - When transporting your chain saw, use the appropriate chain guard (scabbard).

HAZARD CONTROL PLAN, continued

Training List knowledge, skills, ability, and training necessary to safely perform this work (check one or both):

- Group-level orientation and training to this procedure.
- Other → See training prerequisites on procedure page 2.

Wastes, residual materials Are there any wastes and/or residual materials? (check one) None List:

Residual risk Consider the administrative and engineering controls to be used, the residual risk level (as determined according to LIR300-00-01, section 7.3.3) is (check one):

Minimal Low Medium (requires approval by Division Director)

Emergency actions Emergency actions to take in event of control failures or abnormal operation (check one): None List:

Step	Action
1	Administer first aid.
2	Contact the RRES-WQH group office.
3	Contact EM&R at 667-6211.

Signature by group leader on procedure title page signifies authorization to perform work for personnel properly trained to this procedure. This authorization will be renewed annually and documented in WQH records. Controlled copies are considered authorized. Work will be performed to controlled copies only. This plan and procedure will be revised according to RRES-WQH-QP-023, *Preparation, Review, and Approval of Procedures*, and distributed according to RRES-WQH-QP-021, *Document Distribution*.