This study guide covers all eleven sections of the IHSA Line Clearing Operations Safe Practice Guide, which is one of three chapters tested on the Utility Arborist 444B Certificate of Qualification exam. The guide is organized to mirror the structure of the official IHSA document, Section I through Section XI, so you can study one section at a time, in any order, and easily cross-reference the source material.

Before we get into the rules themselves, let's go over the kinds of call out boxes you'll see throughout this material, because each one means something different. A CRITICAL call out is used for where the rule is highly likely to appear on the exam. Treat these as non-negotiable. An EXAM TIP call out is used to highlight specific exam strategies, common test traps, and information about how a concept is typically tested. Look for these to focus your study time efficiently. A CROSS-REFERENCE call out is used to show how a concept connects to other rules within Line Clearing Operations, or to the other two chapters of the curriculum, which are Arborists in Proximity and Electrical Utility Safety Rules. Many exam questions test these connections. And a NOTE call out is used for clarifying context, practical examples, terminology explanations, and background information that supports the rule but isn't a rule in itself.

Now, before we even get into the sections, we need to go over the definitions used throughout this chapter. The following terms appear repeatedly in this chapter and on the certification exam. Master these definitions before moving into the rule sections.

"Apparatus" means all equipment pertaining to the generation, transmission, distribution and use of electrical power.

"Authorized Worker or Workers" means a worker who has been given formal permission by the owner and employer, and is competent to perform work in proximity to equipment energized at voltages greater than 750 V nominal.

"Competent Person" means someone who, (a), is qualified by knowledge, training and experience to organize work and its performance; (b), is familiar with the OHSA and Regulations that apply to the work; and (c), has knowledge of any potential or actual danger to health or safety in the workplace.

"Controlling Authority" means the person or persons responsible for performing, directing or authorizing changes in conditions or position of specific apparatus or devices.

"De-energized" means where electrical energy has been discharged through a mechanically-secure connection to an effective ground potential.

"Energized" means capable of delivering energy by reason of being dynamically alive or charged.

"Isolated" means separated from all sources of dynamic energy.

"Proximity" means within: (a), 3 m, or 10 ft., of apparatus energized above 750 V to 150 kV; (b), 4.5 m, or 15 ft., of apparatus energized above 150 kV to 250 kV; (c), 6 m, or 20 ft., of apparatus energized above 250 kV. This definition does NOT apply to apparatus designed and installed to be intrinsically safe for human touch.

"Supervisor" means a person who has charge over a workplace or authority over a worker.

And "Worker or Workers" means a person who performs work or supplies services for monetary compensation.

Now here is your first exam tip. Memorize the Proximity distances. These three distances, 3 m, 4.5 m, and 6 m, tied to voltage ranges of greater than 750 V to 150 kV; greater than 150 kV to 250 kV; and greater than 250 kV, underlay almost every rule about working near energized apparatus throughout all three chapters of the curriculum.

Section I, General.

Section I lays out the foundational requirements that apply to every line clearing job: who can perform the work, how it must be planned, when it must be suspended, and the basic methods that apply throughout. This section is the most heavily cross-referenced part of the chapter, because concepts introduced here reappear in nearly every later section.

Rule 100, Safe Execution of Work.

Safe execution of line clearing operations requires six things. Hazard assessment. Competent personnel. Job planning, which must be documented. Detailed rescue plans and open communication with the controlling authority. Work methods. And teamwork. That's it, those are the six. Your exam tip here: expect a "which of the following is NOT a requirement" question on this one.

Rule 101, Competent Personnel.

Only competent personnel, or personnel in training under direct supervision of a competent person, may attempt line clearing operations. Personnel must have been previously instructed, or be currently under instruction, in the proper use of the technique. All work must be carried out on a "go slow" basis until proficient. And only personnel instructed in proper care and use may work from insulated aerial devices.

A note to recall here: a Competent Person is someone qualified by knowledge, training, and experience; familiar with the OHSA and Regulations; with knowledge of any potential or actual danger to health and safety.

Rule 102, Job Planning.

Documented job planning is of prime importance. All workers must be involved. The purpose is to ensure work is performed safely AND efficiently. The exam tip here is to note the word "documented," because verbal planning alone is insufficient. And "all workers" means everyone on the crew participates, not just the supervisor.

Rule 103, Work Methods.

Rule 103 is the largest rule in Section I, organized into twelve sub-areas. Expect heavy testing here.

Sub-area A, General Requirement.

Only competent personnel, or trainees under continuous direction, may perform line clearing in proximity to outdoor transmission and distribution systems, per OHSA Construction Regulations. Before work starts, the supervisor must: notify the power authority of the work location; AND acquire work protection on the lines and apparatus.

Sub-area B, Protection for Work.

Workers in proximity to live lines must be governed by the Utility Work Protection Code, or UWPC, or equivalent. Workers are legislated to acquire hold-offs, work permits, or other forms of guaranteed protection. When a circuit is isolated for line clearing, it must also be de-energized by the local controlling authority.

Sub-area C, Working Aloft.

(a), No worker may work aloft in trees without a second worker in attendance. (b), The second worker must be competent to perform rescue operations. Trees must be closely inspected before climbing, including both branch strength and conductor location. Suitable fall protection must be used when working aloft. When changing locations aloft using recrotching, fall protection must be maintained at all times.

Sub-area D, Conditions Under Which Work Must Be Suspended.

Work must not start, or must be suspended, when: during electrical storms in the vicinity, OR when, in the supervisor's opinion, weather conditions make the job hazardous.

Sub-area E, Felling Trees.

Fell away from power and telecom lines after removing limbs that could contact them. If felling toward lines is unavoidable, top the tree low enough to clear all conductors, poles, and guys. Trees must NOT be pulled down by ropes connected to moving vehicles. Use guy ropes, felling bars, and wedges to control direction of fall. Anchors for guy ropes must be located so workers handling them stand well outside striking distance. Anyone not actively cutting must stay clear of the striking distance. Cutters must: establish a suitable escape path before felling; give ample

warning before the tree falls; and stand clear of the butt while the tree is falling. And partially cut trees must be felled before vacating the work area.

Sub-area F, Lowering Severed Branches from Trees.

Use a crotched, or otherwise attached, rope to remove branches above energized conductors. Avoid shock loading any trees. Give ample warning before dropping any limb or stub. Branches must NOT fall on or contact energized conductors. Severed branches, also called hangers, must be removed before leaving the work area.

Sub-area G, Use of Safety Rope.

Safety ropes must be suitable for the purpose. Specific rules: (a), Climbers must verify ropes are set in an appropriate anchor union; friction hitches safely tied; safety saddles properly adjusted before working aloft. Do not descend with friction hitch untied. (b), Anchor ropes away from any live circuit to prevent swinging or falling into conductors. Maintain two points of attachment while climbing. (c), In public areas, free ends of ropes must not dangle on or near the ground and must be kept free from debris. (d), Keep climbing ropes taut at all times when working in trees. (e), The full length of climbing ropes must be inspected each day prior to use. (f), Climbing ropes must NOT be used for lowering branches or guying trees. (g), Climbing ropes must be long enough to reach the ground safely.

And here is the critical safety rope specification: polypropylene and natural fibre ropes must NOT be used as safety ropes. The minimum requirement is 12.7 mm, or 1/2 inch, diameter nylon, or equivalent durable material of equivalent impact strength and elasticity.

Sub-area H, Use of Portable Ladders.

Non-conductive fibreglass ladders with non-slip bases are required. Trucks or other moveable objects must NOT be used to support ladders. Ladders must be secured at top or bottom, or both, if there's a slip or fall danger. Ladders must be removed from trees when not in use.

Sub-area I, Handling Tools and Equipment.

On long and difficult climbs, employees carry only their safety saddle and climbing rope with lanyard, and must be tied in from the ground before ascending. Use a rope or tool bag for passing tools to and from workers aloft. Tools and material must NEVER be thrown aloft. When not in use: handsaws must be fastened securely to the belt or saddle. Pruners or pole saws that are temporarily out of use must be hooked securely over a limb strong enough to hold them. Pruners or pole saws must NEVER be hung on a conductor.

Sub-area J, Chainsaws.

Gasoline-powered chainsaws must have an anti-kickback chain, or device, and a chain brake. Only competent employees may operate chainsaws. No one except the operator within 1.83 m, or 6 ft., of an operating chainsaw, except when used aloft in an aerial bucket. Chainsaws must

NOT be used above shoulder level. Hold gas-powered chainsaws firmly when starting. Don't start the motor until the saw is within the immediate work area.

Further chainsaw precautions: (a), Install a guard on the chain when walking or carrying a non-running saw. (b), Don't insert cutting chains in the guiderail groove while the motor is running. (c), The saw must be at suitable operating speed before starting the cut. (d), Use an approved safety container for gasoline storage and refuelling. (e), Allow saws to cool before refuelling. (f), No smoking while filling the tank. (g), Wear suitable eye protection when operating chainsaws. (h), Wear leg protection when operating chainsaws, except when working from an aerial bucket. (i), Wear hearing protection, per legislation, with gasoline-powered saws. (j), Handle, maintain, and ground electric saws, cords, and generators per safe work practices. (k), Shut off the motor when moving the saw between locations, with the exception being when trees are close together and the approach is unobstructed. (l), These rules also apply to hydraulically-powered chainsaws.

Chainsaws used aloft must be secured with a rope independent of the climber's rope. And shut off the motor when repositioning an aerial device.

Sub-area K, Work Near Energized Conductors.

Only competent persons, or trainees under direct supervision, may work in proximity to conductors above 750 V. Communication must be maintained at all times between the power supply authority and crews working above 750 V. Where practical, climb on the side of the tree farthest from energized conductors. Never climb between energized conductors. Branches in proximity to energized conductors should be pruned or cut into short lengths, or removed using accepted rigging methods. If a still-attached limb is in contact with a conductor energized above 750 V: (a), do not climb the tree directly from the ground; (b), clear using live line equipment from the ground, from an aerial device, or via portable non-conductive ladder; (c), the circuit must be isolated and de-energized before limb removal.

Sub-area L, Pole Pruners.

When working in proximity to conductors energized between 750 V and 50,000 V phase-to-phase: (a), Use suitable, well-maintained, non-conductive pole pruners. (b), Pole pruner ropes shall have insulated inserts. (c), FRP pruners must be tested per the EUSR.

Sub-area M, Removing Limbs from Conductor Contact.

Notify the controlling authority immediately. If a limb falls and lodges on conductors, maintain adequate clearance in case of conductor burn-off. Use insulated pole pruners and rubber gloves when removing. If the limb is too large for pruners or any hazardous situation exists, the circuit must be isolated and de-energized first.

Sub-area N, Aerial Devices and Cranes.

When a worker is aloft in an aerial device, a second worker must be available and competent to effect a rescue. Trucks must not be moved until aerial devices are in the stowed position. Only one worker per aerial ladder. The ladder position may only be changed when safe to do so. When working from an aerial ladder or device, workers must be protected from falling by a suitable fall protection system fastened to an approved attachment. A rope of sufficient length must be carried to raise a rescue rope or controlled descent device. Workers must NOT remain in the bucket during emergency lowering operations when hydraulic pressure is being manually released. Aerial devices, including cranes, must be operated within: (a), manufacturer's specifications; (b), safe limits of approach, which is Table Number 1, and current legislation. Aerial devices must be dielectrically retested per current legislation. Aerial ladder devices must have electrical testing per the current CSA standard for Vehicle Mounted Aerial Devices.

Now let's go over Table Number 1, which is the Safe Limits of Approach for Authorized Workers, or workers under their direct supervision. For voltage range 750 V to 35,000 V, minimum clearance is 0.9 m, or 3 ft. For greater than 35,000 V to 50,000 V, it's 1.2 m, or 4 ft. For greater than 50,000 V to 150,000 V, it's 1.5 m, or 5 ft. For greater than 150,000 V to 250,000 V, it's 2.1 m, or 7 ft. For greater than 250,000 V to 550,000 V, it's 3.7 m, or 12 ft. These will be tested. They match the Authorized Worker column in EUSR Rule 129. Memorize them.

Continuing with additional aerial device rules: testing criteria for extensible boom devices and radial boom derricks with insulated booms and buckets per current legislation. Aerial devices must be inspected for structural, mechanical, and hydraulic defects at regular intervals. Aerial devices raising workers in proximity to energized apparatus must have upper and lower controls, with lower controls capable of positively overriding upper controls. Aerial devices with upper boom insulation only must be adequately grounded, preferably to system neutral, OR isolated with a barricade when raised in proximity to apparatus above 750 V. When two or more aerial devices are working at the same location, vehicles must be connected to the same ground medium.

Sub-area O, Mechanical Brush Saws.

Must NOT be used aloft. Non-operators must maintain 4.5 m, or 15 ft., clearance from operating brush saws. Wear suitable PPE, including head, foot, eye, hearing, and leg protection.

Sub-area P, Mechanical Brush Chippers.

Before servicing: ignition switch OFF, key removed, or otherwise rendered inoperable. Drums must be locked and blocked before maintenance to prevent rotation. Blocks stay in place until done. Wear suitable PPE, including head, foot, eye, and ear protection. Don't stand or walk directly in front of the exhaust chute when operating. Workers feeding brush wear loose-fitting gloves and stand to one side of the feeder chute, due to kickback risk. Never use hands or feet to push brush past the face of the feeder chute.

Rule 104, Teamwork.

The best teams are people who work compatibly with one another. Good communication is essential while work is performed. Only when all preceding requirements, Rules 100 through 103, are met can the job be carried out safely and efficiently.

Let's go over the Section I key facts to memorize before we move on. The six requirements for safe execution are: hazard assessment, competent personnel, documented job planning, rescue plans plus communication, work methods, and teamwork. The trainee supervision standard is direct supervision by a competent person. The new technique work pace is "go slow" until proficient. Job planning must be documented and signed by all workers. The work protection framework is the Utility Work Protection Code, or UWPC. The working aloft minimum crew is 2 workers, with the second being competent in rescue. Weather suspension triggers are electrical storms OR the supervisor's judgment. Direction of fall preference is away from power lines; if not possible, top low enough. Pulling trees with vehicles is NEVER permitted with moving vehicles. The climbing rope spec is 12.7 mm, or 1/2 in., nylon or equivalent; never polypropylene or natural fibre. Climbing ropes must NEVER be used for lowering branches. Tools and material must NEVER be thrown aloft; use a rope or tool bag. Pruner and pole saw temporary storage is on a limb of sufficient strength; NEVER on a conductor. Chainsaws require an anti-kickback chain or device plus a chain brake. The chainsaw exclusion zone is 1.83 m, or 6 ft., except aloft in an aerial bucket. The chainsaw maximum work height is below shoulder level. Leg protection is not required when working from an aerial bucket. The conductor burn-off response is to maintain clearance and use insulated pruners plus rubber gloves. Aerial device controls require upper plus lower controls, with the lower must positively overriding the upper. Multiple aerial devices at one site must be connected to the same ground medium. The mechanical brush saw clearance from non-operators is 4.5 m, or 15 ft. Mechanical brush saws must never be used aloft. And drum lockout before chipper maintenance is required.

Section II, Basic Electricity for Foresters.

Section II provides the electrical theory you need to anticipate hazards and protect yourself. Most exam questions involving voltages, currents, and shock paths trace back to the concepts in this section.

Rule 200, Introduction.

Line clearing is different from all other tree work because electrical conductors are almost always close by, and special types of work protection are required to guard against accidental contact. This section covers electrical hazards only. There are other hazards in line clearing with their own corresponding safety devices. Workers need a basic understanding of electricity to anticipate hazards, avoid them, and protect themselves.

Your exam tip here: expect a question about why line clearing is unique among tree work. The answer always involves the presence of energized conductors.

Rule 201, The Nature of Electricity.

Electricity can be understood by comparing it to a water system. In a water system: pressure corresponds to voltage, or potential difference; flow corresponds to current flow; and restriction corresponds to resistance.

How it works in a circuit: a battery or generator supplies the pressure, which is the voltage. This causes electricity to flow through the resistance of wires. If the switch is open, no current flows. If the switch is closed and voltage is high, a lot of current flows. If voltage is low, flow is also lower. A return path is necessary to complete the circuit, the same as a water system.

Factors that affect current flow in a wire: short length or large diameter means more flow; long length or small diameter means less flow; and poor quality wire restricts flow.

Exam tip: pressure equals voltage; flow equals current; restriction equals resistance. The water comparison is the standard teaching tool and questions often reference it.

Rule 202, Units of Electricity.

There are three core units to memorize.

First, VOLTS, the Unit of Electric Pressure. Voltage equals electrical pressure. It is divided into two categories. Secondary voltage is anything up to 750 V. For example, a typical home is 120/240 V, that is 120 V conductor-to-ground or neutral, and 240 V across two 120 V conductors. Primary voltage is anything above 750 V. For example, many urban areas use 16,200/27,600 V, that is 16,200 V conductor-to-neutral and 27,600 V conductor-to-conductor. "kV" means kilovolt, one thousand volts. For example, 27.6 kV equals 27,600 V.

Critical note: the 750 V threshold is the dividing line between secondary and primary voltage. This number appears throughout EUSR and Arborist rules. All Ontario utility line clearing is done around circuits of at least 120 V.

Second, AMPERES, the Unit of Current Flow. The severity of electric shock depends on how much current flows through the body and what part of the body is contacted. Current through an arm only may not be serious. Current hand-to-hand can kill, because it passes through the vital organs. Critical: as little as 0.1 A, which is one-tenth of an ampere, can stop a human heart. For scale, 0.5 A lights a 60-watt bulb, and that is far less than line clearing circuits carry.

Third, OHMS, the Unit of Resistance. All materials fall into three categories. Insulators conduct so little electricity it's often undetectable; examples are glass, porcelain, and rubber. Conductors transfer electricity easily; examples are metals and the human body. Semiconductors conduct better or worse depending on moisture and contaminants; examples are wood, rope, and earth.

Critical safety principle: electricity always seeks the easiest path to ground. The human body is a reasonably good conductor. When performing line clearing, never bridge yourself between two conductors, OR between a conductor and a ground such as a tree.

Exam tip: wood, rope, and earth are semiconductors, not insulators. Students often get this wrong. Their conductivity changes with moisture, which is why wet ropes and damp wood are dangerous near energized lines.

Rule 203, Types of Electrical Contact.

There are two types of contact. Direct contact is touching an energized component with some part of the body. Indirect contact is touching a conductive object that, in turn, is touching an energized component.

Exam tip: indirect contact is the more common hazard in line clearing, because a worker may be touching a branch, rope, or pole that is itself touching an energized conductor.

Rule 204, Step and Touch Potentials.

When electricity is released into the ground, for example a live wire on the ground, it fans out from the point of contact, like ripples from a stone in water. This is called voltage drop or ground gradient. As energy moves outward from the source, resistance causes voltage to drop with distance. This creates different potential levels, or gradients, at different distances from the source.

Step Potential occurs when a person walks through a ground gradient. The worker's feet are in two different potential zones at once. Current flows into one foot and out the other, passing through the lower torso. A common scenario: a branch falls on an energized primary conductor, the conductor falls to the ground, the ground beneath and nearby becomes energized, and an unaware worker walks into the gradient.

Critical: if you see a broken conductor lying on the ground, stay away from it; keep others away; and contact the utility immediately for repairs.

Touch Potential occurs when a person touches a conductive object, like a tree branch, that is in contact with an energized component, while another part of the body is at a different potential, for example touching another part of the tree. A common scenario: a worker without rubber gloves cuts a branch that falls on an energized primary conductor, then reaches out and grasps the energized branch while still in contact with the tree. The result is that current flows hand to foot through the upper torso, near the heart and lungs, and this is potentially fatal.

Note on protection against touch potential: use personal protective equipment, which includes rubber gloves; use insulated tools; and follow proper work procedures.

Exam tip: be able to distinguish step potential, which is foot-to-foot through a ground gradient, from touch potential, which is hand-to-foot by bridging between a conductive object and a different potential. The body's current path differs, and so does the cause.

Section II key facts to memorize: secondary voltage range is up to 750 V; primary voltage range is above 750 V; typical residential voltage is 120/240 V; example urban primary voltage is

16,200/27,600 V, or 27.6 kV; lethal current to the human heart is as little as 0.1 A, or 1/10 A; current to light a 60 W bulb is 0.5 A; the three material categories are insulators, conductors, and semiconductors; wood is classified as a semiconductor in Rule 202, but treated as a conductor for safety in Rule 800; the two types of contact are direct and indirect; the two types of potential hazard are step and touch; step potential current path is foot to foot through the lower torso; touch potential current path is hand to foot through the upper torso near the heart and lungs; and for a broken conductor on the ground, stay away, keep others away, and contact the utility.

Section III, Job Preparation.

Section III is one of the densest sections of the chapter. It covers everything that must be in place before work begins, including pre-job questions, personal protective equipment, daily tool inspections, work area protection, the tailboard talk, and the Utility Work Protection Code. The PPE and rubber glove inspection material in Rules 301 and 302 is heavily tested.

Rule 300, Job Considerations.

Before starting any line clearing job, ask yourself these 8 questions. Is your clothing appropriate for the season and the job? Do you have all your personal protective equipment, or PPE? Do you have all other necessary equipment? Do you have all the necessary tools? Are your equipment and tools safe? Have you properly prepared by learning good work practices and techniques? Do you know the dangers and hazards of the job? And are you ready to practice the correct methods and techniques as you work?

Exam tip: don't memorize this as a list of 8. Focus on the categories: clothing, PPE, equipment, tools, safety, training, hazard awareness, and correct technique.

Rule 301, Suggested Tools and Equipment.

Rule 301 has two main parts: PPE, which is part 1, and Tools and Equipment, which is part 2. Let's go through each one.

Part 1, Personal Protective Equipment.

A. Head Protection. You need a CSA-approved Class "E" hard hat. The shell and suspension must protect against impact, and it must withstand a dielectric strength test at 20,000 V phase-to-ground. A note: spraying chemicals and bug repellent can deteriorate the hard hat material.

B. Eye Protection. Wear eye protection when: working in, observing, or supervising areas with possible eye injury; operating chainsaws, chippers, brush saws, or circular saws; pouring or mixing chemicals; or any time there is a danger of foreign objects or particles striking the eye. Types of eye protection include: protective spectacles with side shields; cover goggles; a full

face screen mounted on the hard hat, but you must also wear spectacles or goggles with this; and a full face shield mounted on the hard hat, but you must also wear spectacles or goggles with this one too.

C. Foot Protection. You need CSA-approved safety boots with safety toe caps and non-slip, impermeable soles. For ground chainsaw work, the tongue and sides should be lined with ballistic nylon or Kevlar. For climbing, boots should have soft soles.

D. Hand Protection. The required glove varies by task. For climbing, pruning, brush handling, and chipping, you need leather gloves. For operating a chainsaw, you need chainsaw gloves or mitts with ballistic nylon or Kevlar on the back of the hand and thumb. For handling oils and chemicals, you need neoprene-covered cotton gloves. And within 3 m, or 10 ft., of apparatus energized between 750 V and 50,000 V, you need at minimum Class 2, or 20,000 V, rubber gloves with leather protectors.

Critical: within 3 m, or 10 ft., of energized apparatus between 750 V and 50,000 V, wear Class 2, or 20,000 V, rubber gloves as a minimum. This applies whether the worker, the tree, or the branch being trimmed is within 3 m. Note: leather gloves are NOT for handling oils, chemicals, or operating chainsaws.

E. Hearing Protection. Allowable exposure is 85 decibels for 8 hours. The three-decibel exchange rate means exposure time halves for every 3 dB increase. So, 88 dB gives you 4 hours, and 91 dB gives you 2 hours. Look for a Noise Reduction Rating, or NRR. Follow manufacturer and legislative requirements. "At the worker" noise level tests are advisable.

Exam tip: memorize the 85 dB and 8 hour baseline, and the three-decibel halving rule. A common exam question format is: "At 91 dB, what is the maximum exposure?"

F. Leg Protection. Required when operating a chainsaw, EXCEPT when in the bucket of an aerial device. Must contain ballistic nylon or Kevlar in leggings and calves. Three acceptable types are: chainsaw leggings, also called chaps; a chainsaw apron; or chainsaw pants.

G. Protective Clothing, general. Wear flame-resistant, or FR, clothing that resists ignition and flame propagation when working around energized apparatus. Shirts must have full-length sleeves extending to the wrists.

H. Protective Clothing for Spraying. All of the following must be neoprene: coveralls, apron, jacket, overalls, and boots.

I. Fall Protection Equipment. Critical standards: fall protection is required where a worker could fall more than 3 m, or 10 ft. It must prevent a fall greater than 1.5 m, or 5 ft. It must absorb twice the energy and twice the load of the fall. And the maximum arresting force is limited to 8 kilonewtons, or 1,800 lbs.

For aerial device operation: you need a full body harness of the parachute type plus a shock-absorbing lanyard. The lanyard must have a nominal diameter of at least 16 mm, or 5/8 in., nylon or equivalent.

For tree climbing: you need a forestry saddle made of synthetic web material, with a subpelvic support system and two D-rings. You need a safety rope of minimum 12.7 mm, or 1/2 in., diameter, nylon or equivalent. You need a pole strap made of rubber-impregnated fabric or nylon fabric, with steel snaps at each end and a buckle adjustment. Many pole straps have a coloured strip through the middle, and the rule is: when the coloured strip becomes visible, discard the strap. Pole straps without coloured strips must be inspected regularly and discarded at first visible decay. When used for work positioning, the position must prevent a fall greater than 0.6 m, or 2 ft. This is typically used as part of a fall restrict system in wood pole climbing. You also need arborist lanyards, which are easily adjusted and allow for double attachment. And rope pole straps must have a nominal diameter of 16 mm, or 5/8 in., nylon or equivalent.

For climbers, also known as spurs, the critical rule is: ONLY used when the tree is to be completely removed and safe to climb. Spurs must NEVER be used on a tree that will continue to live. The type of climber depends on bark. For smooth, thin bark trees, use pole climbers with 45 mm, or 1-5/8 in., gaffs. For rough, thick bark, use tree climbers with 70 to 90 mm, or 2-3/4 to 3-1/2 in., gaffs.

J. Reflective Vest and Clothing. Required when directing traffic or when a worker could be endangered by vehicular traffic. Must be reflective fluorescent and coloured blaze orange or red.

Now let's move on to Part 2, Tools and Equipment. A standard line clearing setup includes the following categories. A, Pruners: hand pruners and hydraulic pruners. B, Saws: pruning saw, pole saw, gas chainsaw, hydraulic chainsaw, brush saw, and hydraulic pole saw. C, Axes. D, Wedges. E, Felling bars. F, Ladders. G, Ropes. H, Pulleys, locks, and lowering devices. I, First aid kit. J, Appropriate slings. K, Fire extinguisher. L, Approved fuel container. M, Aerial devices. N, Chippers. O, Traffic cones and signs. P, Respiratory protection. Q, Portable eye wash unit. And R, Files, gauges, and guides.

Rule 302, Daily Inspection and Maintenance of Tools and Equipment.

The general principle is: tools and equipment must be inspected daily for wear, aging, damage, or defects. Any problems means remove from service for repair or replacement.

1. Rubber Gloves. Only rubber gloves with initial acceptance tests per CSA and ASTM standards may be used.

Critical, Rubber Glove Classes, Table Number 4: Class 00 is beige, maximum use voltage of 500 V, retest frequency every 90 days. Class 0 is red, maximum use voltage of 1,000 V, retest frequency every 90 days. Class 1 is white, maximum use voltage of 7,500 V, retest frequency every 90 days. Class 2 is yellow, maximum use voltage of 17,000 V, retest frequency every 90 days. Class 3 is green, maximum use voltage of 26,500 V, retest frequency every 90 days. Class 4 is orange, maximum use voltage of 36,000 V, retest frequency every 90 days.

Note: all classes retest every 90 days. Memorize the colours and voltages, because these match EUSR Rule 134 Table 1.

Now for the Minimum Cuff Distance, which is Table Number 3. For Class 00, distance D is 0.5 inches, or 13 mm. For Class 0, distance D is 0.5 inches, or 13 mm. For Class 1, distance D is 1 inch, or 25 mm. For Class 2, distance D is 2 inches, or 51 mm. For Class 3, distance D is 3 inches, or 76 mm. For Class 4, distance D is 4 inches, or 102 mm.

Note: the leather cover must extend down enough that this distance D, between the rubber glove gauntlet and the cover cuff, is maintained.

Rubber gloves must be: (a), stored and maintained in serviceable condition; (b), NEVER worn inside out or without leather protectors; (c), lab retested at least every 90 days; (d), exchanged whenever damaged, or whenever the worker doubts their condition; (e), air tested and visually inspected immediately before each use; and (f), appropriately sized for the user.

Under "What Gets Tested": only the portion under the cover is dielectrically tested. The area from the glove bead to the cover cuff is only visually inspected and air tested. This is why maintaining the minimum cuff distance from Table Number 3 is critical.

The Daily Air Test Procedure: (a), turn gloves inside out and inspect for cuts, splits, and wear spots. (b), Reverse to original side out and inspect the same way. (c), Twirl gloves to fill with air, then roll cuffs to trap the air, squeeze with the free hand to inspect the surface, and hold near the face to feel or hear air leaking.

Note: most rubber gloves have a black outer surface and a yellow or red inner surface. The inner surface is about 80% of glove thickness. If you see the contrasting colour through a cut or wear spot, don't use the glove.

When NOT to use rubber gloves: when a puncture is located in the glove; when a hard spot or foreign material is located in the glove; or when the contrasting inner or outer colour is visible through a cut or wear spot from the reverse side.

Rubber Glove Storage: keep in a clean, cool, dark, dry location. No distortion, bending, mechanical stress, or compression. When returned from the test lab but not in immediate use, keep them in the protective plastic bag in the manufacturer's box on a shelf. When not in use, keep them in leather protectors inside a protective rubber glove bag, fingers down, with the flap closed.

For leather protectors: inspect daily for wear, cuts, chemicals on leather, and embedded items that could damage the rubber.

Critical: the enemies of rubber are chemicals, lubricating and hydraulic oils, sunlight, ultraviolet light, dampness, and heat.

2. Chainsaw, Daily Inspection Checklist. Use the right saw for the job. Know your saw. Use all PPE, including head, eye, ear, hand, foot, and leg. PPE in good condition. Saw chain is sharp. Saw chain is properly tensioned. Chain brake works properly. Bar is in good condition. Air filter and air intake screen clean. Visually inspect for worn ignition parts, loose nuts and screws, and cracked or worn parts. Correct faults before use. Ramped depth gauge set at .25 degrees. Clean thoroughly, wipe spilled oil and gas, and remove sawdust and debris, especially around cylinders and cooling fins. Fill the oil reservoir and verify the oiler functions.

3. Pole Pruner, Daily Inspection Checklist. (a), Use suitable, well-maintained, non-conductive pole pruners when working in proximity to conductors energized above 750 V. (b), Pole pruner ropes must have insulated inserts. (c), Fibre handle pruners must be tested at least every 36 months. (d), Inspect for loose nuts and bolts, cracked or worn parts, and inspect rope for wear and aging. (e), Use all PPE, including head, eye, hand, and foot. (f), The cleaning procedure is: wipe down the pole and insulating link insert with a clean cloth using an approved live line tool cleaner, for example isopropyl alcohol. Spot clean stubborn contaminants with a petroleum distillate, for example Varsol. Wash with mild detergent and water, rinse thoroughly, and towel dry. (g), Keep moving metal parts loose enough for free action; lubricate as required. (h), Check the coil spring for excessive stretching. (i), Blade is sharp. (j), Examine the pulley for proper function. (k), Look for excessive wear inside the hook, which prevents a clean cut. (l), When wet or moist, wipe down before use near energized conductors. (m), Maintain Epoxiglas poles in best possible condition for dielectric qualities.

4. Pruning Saw, Daily Inspection Checklist. (a), Inspect for loose rivets, cracked or worn parts. (b), Correct faults before use. (c), PPE: head, eye, hand, foot. (d), Saw blade is sharp and set. (e), Wipe down handle with clean cloth, using approved cleaner if needed, using the same procedure as the pole pruner.

5. Brush Saw, Daily Inspection Checklist. (a), Know your saw and review the operator's manual. (b), PPE: head, eye, ear, hand, leg, foot. (c), PPE in good condition. (d), Blade is sharp and set. (e), Inspect for bare ignition wires, loose nuts and screws, and cracked or worn parts. (f), Inspect and lubricate the throttle linkage. (g), Lubricate the driveshaft bearings.

Rule 303, Work Area Protection.

Set out appropriate work area protection, including cones, signs, barricades, and so on, in accordance with the Ontario Ministry of Transportation's Ontario Traffic Manual Book 7, Temporary Conditions. The purpose is to prevent injury to workers and the general public. Exam tip: know the document name, which is OTM Book 7, Temporary Conditions.

Rule 304, Tailboard Talk.

Conduct tailboard talks to ensure all crew members thoroughly understand the job or jobs. Document and have the crew sign on three occasions: before any work begins; when there is any change in the job procedure; and when there are any changes in the personnel performing the work. Exam tip: three triggers for documenting and signing are start of work, procedure change, and personnel change.

Rule 305, Utility Work Protection Code.

The supervisor must be completely familiar with the appropriate section of the Utility Work Protection Code, or UWPC, to obtain proper protection for the crew.

Work Permit: used when the supervisor wants a section of electrical apparatus isolated for safer work. Requested from the local power authority. When granted, the supervisor receives guaranteed isolation. Note: apparatus, when isolated, must also be de-energized by the controlling authority.

Hold-Off Protection: used when personnel, tools, equipment, trees, or limbs could inadvertently cause an outage. Under hold-off protection, apparatus will not become re-energized following an outage.

Critical distinction: hold-off protection does not equal apparatus isolation. Under a hold-off, the equipment is still energized. The hold-off is used to protect EQUIPMENT, not PEOPLE.

Exam tip: this is one of the most likely test questions in the chapter. Be able to clearly distinguish: a work permit provides isolation plus de-energization and protects people; a hold-off prevents auto-reclose and protects equipment, with the apparatus still being energized. This concept reappears throughout EUSR Rules 117, 119, 135, and 141, and also in Arborists in Proximity.

Section III key facts to memorize: hard hat class is CSA-approved Class "E"; hard hat dielectric test is 20,000 V phase-to-ground; hearing exposure baseline is 85 dB and 8 hours, halving every 3 dB; rubber glove rule at 750 to 50,000 V within 3 m is Class 2 minimum plus leather protectors; Class 2 rubber glove maximum voltage is 17,000 V; Class 2 rubber glove colour is yellow; all rubber glove retest frequency is every 90 days; pole pruner fibre handle test interval is every 36 months; fall protection trigger height is more than 3 m, or 10 ft.; maximum allowed fall arrest is 1.5 m, or 5 ft.; maximum arresting force is 8 kN, or 1,800 lbs.; lanyard minimum diameter is 16 mm, or 5/8 in.; safety rope minimum diameter is 12.7 mm, or 1/2 in.; pole strap work positioning maximum fall is 0.6 m, or 2 ft.; spurs on smooth bark use pole climbers with 45 mm, or 1-5/8 in., gaffs; spurs on thick bark use tree climbers with 70 to 90 mm, or 2-3/4 to 3-1/2 in., gaffs; spurs usage rule is removals ONLY, never on a tree that will live; reflective vest colours are blaze orange or red; traffic protection reference document is OTM Book 7, Temporary Conditions; tailboard talk signing triggers are before work, procedure change, and personnel change; work permit purpose is isolation plus de-energization, protecting PEOPLE; hold-off purpose is to prevent auto-reclose, protecting EQUIPMENT, with the apparatus still being energized; approved pole pruner cleaner is isopropyl alcohol, with petroleum distillate

such as Varsol for stubborn contaminants; and Class 2 minimum cuff distance D is 51 mm, or 2 in.

Section IV, Aerial Devices, Boom Trucks, Cranes, and Extensible Boom Platforms.

Section IV is procedure-heavy. The Holding Valve Check in Rule 402 is the most technically detailed and most heavily tested portion. The pressure intoxification warning and the "total spring weight on outriggers" concept are likely standalone exam questions.

Rule 400, Daily Vehicle Checks.

Vehicle checks must be performed each day prior to vehicle operation, following both this rule and the operator's manual. Here is the 10-point daily check.

First, the circle check. Inspect for unusual conditions: pools of hydraulic fluid or oil under the chassis; cracked, bent, loose, or missing components; and obvious external damage or improper maintenance. Second, check the level of engine oil, radiator coolant, and fuel. Third, check operation of brake lights, turn signals, four-way flashers, beacon, arrow boards, headlights, horn, and windshield wipers. Fourth, check the hydraulic oil level in the reservoir, with all cylinders retracted. Fifth, check the breather cap on the reservoir and make sure it's not clogged. Sixth, check tire pressure using a tire gauge. Seventh, adjust mirrors for proper rearview vision. Eighth, air brakes: drain moisture from the tank at least once a day, preferably at the end of the shift, especially in winter to prevent freezing. Ninth, valves: (a), check control valves for proper operation; (b), check holding valves, per Rule 402. Tenth, bucket and boom check: (a), check the bucket levelling system for proper tension; (b), inspect the fibreglass bucket for damage; (c), check for cracks around welds, hinge pins, and rod eye bolts; (d), inspect the cable at anchor brackets at the upper, middle, and lower hinge points; (e), check for flattening or fraying of cable as it passes around sheaves; (f), check for foreign material inside the boom.

Critical: NEVER check hydraulic leaks by touch. This can cause pressure intoxification, which is high-pressure fluid injection into the body, and it is a serious medical emergency. Exam tip: expect a question about why hydraulic leaks must not be checked by touch. The answer is pressure intoxification, also called hydraulic fluid injection injury.

Rule 401, Vehicle Setup.

Operators must be familiar with the manufacturer's operator's manual before using equipment. The manual covers machine limitations and proper stabilization for that specific vehicle. Here is the 11-step vehicle setup procedure.

First, turn on emergency lighting, including four-way flashers, rotating beacon, and so on. Second, set out traffic control devices per local by-laws and OTM Book 7, Temporary Conditions. Third, check the job site to determine the best location for the truck, then position

accordingly. Fourth, set the parking brake and or brake lock. Fifth, engage the Power Take Off, or PTO. Sixth, engage spring lockouts if equipped. Seventh, position wheel chocks. Eighth, for outriggers if equipped: extend outriggers after placing pads; ensure outriggers are centered on outrigger pads for maximum stability; on uneven ground, level the pads before extending outriggers; if the work location is not level, extend the low side outrigger first to level the truck, then extend the high side; if firm contact cannot be made, crib up the outrigger pads.

Critical: for maximum stability, the total spring weight of the vehicle should be resting on the outriggers. The truck's tires should effectively be lifted off the suspension's spring load.

Ninth, perform daily vehicle checks per Rule 400, and also reference the IHSA Safe Practice Guide, Hydraulics. Tenth, ground the vehicle per the IHSA Safe Practice Guide, Temporary Grounding and Bonding Techniques. Eleventh, conduct a tailboard talk per Rule 304.

Exam tip: memorize the outrigger sequencing, which is low side first then high side. Also know that total spring weight must rest on the outriggers for maximum stability.

Rule 402, Holding Valve Check.

Note: what are holding valves? They lock hydraulic cylinders in position so that if hydraulic pressure is lost, the boom, outriggers, or extension cannot drift or collapse under load. A failed holding valve means uncontrolled descent.

General rule: check holding valves on hydraulic equipment daily, prior to use, using the lower controls. For electro-hydraulic equipment, check per manufacturer's recommendations.

1. Outrigger Valve Integrity. (a), With outriggers extended to remove total spring weight, shut down the hydraulic system by one of the following: (i), disengaging the PTO; (ii), depressing the clutch; (iii), turning off the ignition key; or (iv), using the by-pass button for the main frame or outriggers. (b), Attempt to retract each outrigger individually. There should be no observable movement.

Critical: any movement indicates problems. Have the valve overhauled or replaced. Outrigger holding valves are usually non-adjustable.

Note on shutoff cocks: some aerial devices have outriggers equipped with shutoff cocks. These must be closed, otherwise outriggers could activate if the controls are moved, whether the PTO is engaged or not. In this case, outriggers are usually also equipped with holding valves.

2. Holding Valves on Aerial Devices. Note: before starting, ensure bucket covers, lanyards, chainsaw scabbards, and any other tools are clear. (a), After checking outrigger valves, reactivate the hydraulic system. (b), Put the unit through all operations, including raise, lower, rotate, extend, and retract booms. This purges air from the lines. (c), For over-centre and fully articulating models: bring the lower boom to 10 degrees above rest, and the upper boom to 180 degrees to the lower boom. (d), Shut down the hydraulic system. (e), Using lower controls, operate the upper boom control to unfold the upper

boom. No observable movement should occur. (f), Reactivate the hydraulic system. (g), For all models: bring both upper and lower booms to 10 degrees above their rests. (h), Shut down the hydraulic system. (i), Operate each control lever individually to lower the booms. No observable movement should occur.

Critical: any movement indicates problems. Have the valve or valves re-adjusted, overhauled, or replaced by qualified personnel.

3. Holding Valves on Boom Trucks, Cranes, and Extensible Boom Platforms. (a), After checking outrigger valves, reactivate the hydraulic system. (b), Put the boom through its operations, then raise the boom to approximately 60 degrees. (c), Extend the stinger or extension boom halfway out. (d), Shut down the hydraulic system. (e), Operate levers individually to retract the stinger and lower the boom. No observable movement should occur.

Note: some older models do not have holding valves on the extension boom.

Here is the Holding Valve Check Summary. For outriggers: test position is outriggers extended with full weight removed; what to check is to operate each lever individually and confirm no movement. For aerial device articulating upper boom: test position is lower boom 10 degrees above rest with upper boom 180 degrees to lower; what to check is to unfold upper boom via lower controls and confirm no movement. For aerial device both booms: test position is both booms 10 degrees above rest; what to check is to operate each lever individually and confirm no movement. For boom truck, crane, or extensible: test position is boom at approximately 60 degrees with stinger half-extended; what to check is to retract stinger and lower boom and confirm no movement.

Exam tip: this is one of the most heavily tested areas in Section IV. Know the four ways to shut down the hydraulic system, which are PTO disengage, clutch, ignition key, and by-pass button. Know the "no observable movement" standard, because any movement is a fail. And know the specific positions: 10 degrees above rest, 180 degrees upper to lower, 60 degrees boom angle, and halfway stinger extension.

Rule 403, Securing for Travel.

Before moving the vehicle, complete this 10-step shutdown procedure. First, return the booms to the stowed position. Note: the booms must always be stowed, even if only moving a short distance. Second, raise the outriggers and ensure they are fully retracted. Third, store pads in their proper place. Fourth, secure the boom with tie-down straps if required. Fifth, disengage spring lockouts as required. Sixth, remove wheel chocks. Seventh, remove traffic control devices. Eighth, disengage the PTO. Critical: if the PTO is not disengaged before road travel, the pump can be severely damaged. Ninth, turn off all warning lights. Tenth, disengage the parking brake and or brake lock.

Section IV key facts to memorize: hydraulic leak inspection means NEVER check by touch due to risk of pressure intoxification; hydraulic oil level is checked with cylinders retracted; air brake

tank is drained of moisture at least once daily, especially in winter; outrigger extension on uneven ground requires levelling pads first, then extending low side first, then high side; maximum stability requirement is total spring weight of vehicle resting on outriggers; outrigger holding valves are usually non-adjustable, requiring overhaul or replacement; articulating aerial test position is lower boom 10 degrees above rest with upper boom 180 degrees to lower; both-boom test position is both booms 10 degrees above their rests; boom truck test position is boom at approximately 60 degrees with stinger halfway extended; pass and fail criterion for all holding valve tests is no observable movement; hydraulic shutdown methods are the four methods of PTO disengage, clutch, ignition off, and by-pass button; stowing booms before travel means always stowed, even for short moves; PTO disengagement must occur before road travel, because failure damages the pump; the reference manual for hydraulics is the IHSA Safe Practice Guide, Hydraulics; and the reference manual for grounding is the IHSA Safe Practice Guide, Temporary Grounding and Bonding Techniques.

Section V, Tree Inspection.

Section V is short but procedurally important. It's the mandatory pre-work inspection that gatekeeps everything that follows in Sections VI, VII, VIII, and IX.

Rule 500, General.

When to Inspect: a tree must be inspected for hazards before pruning or tree removal work commences, AND after the surrounding area has been secured, for example work area protection per Rule 303.

Note: sequence matters. Work area protection comes first per Rule 303, then tree inspection per Rule 500, then the actual work. Securing the area first prevents public and traffic hazards from interfering with a careful inspection.

The 5-Point Tree Inspection, for all jobs, whether pruning OR removal: every inspection must include the following. Bore test if integrity is in doubt. When there are signs such as cavities or dying or dead branches, bore testing for internal integrity must be conducted to ensure the tree is safe to climb. Check for limbs in contact with conductors. Check for dead wood, hangers, or decaying limbs. Examine the tree for the best ascent approach to the work area. And check for the best branch union to secure the safety rope.

Exam tip: "bore testing" is the diagnostic technique for assessing internal trunk integrity, typically using a drill bit or a resistance-recording tool such as a Resistograph. The trigger conditions are cavities or dying and dead branches, which are visible signs of possible internal decay.

Cross-reference: tree inspection ties directly back to Rule 103, Work Methods, Working Aloft, point 2, which also requires close inspection before climbing for both branch strength AND conductor location.

Additional 4-Point Inspection for tree removals only: when removing a tree, the inspection must also cover the following four points. Examine nearby trees that could cause problems. Ensure sufficient room for the task. Check the weight distribution of the crown. And check for splits in limbs, crotches, and any other tree defects.

Note: binoculars are recommended when assessing a tree from the ground. Exam tip: be able to distinguish the 5 points required for any line clearing job from the 4 additional points required specifically for removals. A "which of these is only required when removing a tree" question is very likely.

Section V key facts to memorize: when to inspect is after work area protection is set up and before work begins; bore testing trigger is doubt about tree integrity due to cavities or dying and dead branches; purpose of bore testing is to verify the tree is safe to climb; required for all jobs are the 5 points of bore test if needed, limbs on conductors, dead wood and hangers, ascent route, and branch union for rope; required for removals are the additional 4 points of nearby trees, sufficient room, crown weight distribution, and splits and defects; and the recommended assessment tool is binoculars from the ground.

Section VI, Tree Pruning.

Section VI is conceptually straightforward but contains some highly testable specifics: the three reasons for pruning, three types of pruning, the 30% crown rule, and pruning cycle durations.

Rule 600, General.

Three Main Reasons for Pruning: Number 1 is line clearance, which means to remove sufficient growth in an approved arboricultural manner, consistent with good public relations, to provide optimum electrical service. Number 2 is sanitation, which means to remove diseased branches, branches rubbing each other, and jagged or broken branches from storm damage. Number 3 is aesthetic, which means pruning to restore the desired form to the tree.

Exam tip: be able to recognize all three. Line clearance is the primary reason in utility arboriculture, but sanitation and aesthetic are valid secondary reasons that may appear in test questions.

Hazards eliminated by proper pruning: a limb caught on a conductor could energize the tree and introduce a partial ground to the conductor; fast-growing trees under the line may force conductors to contact one another; trees too close to power lines are hazardous to children who climb them; and heavy limbs falling on the line cause power outages.

Cross-reference: the "partial ground" concept and the "tree becomes energized" risk tie directly back to Rule 204, Step and Touch Potentials, in Section II.

Pruning Standards: standards must protect the tree, workers, AND the general public. Use climbers, or spurs, for removals only, because this protects the bark of trees that will continue to live. Carry out corrective pruning, which means removing stubs and dead branches and so on, to eliminate existing hazards. Remove weak and diseased limbs. And use an insulated pole pruner and pruner saw for safe and proper pruning.

Cross-reference: the "climbers and spurs for removals only" rule reinforces what was already stated in Rule 301-I, Fall Protection, Climbers. This is a major point likely to appear on the exam.

Rule 601, Types of Pruning.

There are three basic types of pruning in line clearing operations. Crown pruning, also called crown reduction, is used at the top of the tree. Side pruning is used on the sides of the tree. Under pruning is used below the tree. The choice depends on four factors: tree species; position of conductor in relation to the tree; line voltage; and cycle clearance requirements.

Crown Pruning, Crown Reduction: this is the most difficult type because of the awkward working position, working in the body of the tree, and the need to visualize the end result. Reasons for crown pruning include: to control trees growing under the conductors; to control trees growing beside the line with dead wood and broken branches close enough to be a problem; and to control large and small trees weakened by storm damage or shallow root systems.

Aesthetic principles: preserve the natural shape of the tree wherever possible; and avoid the "V", "L", "U", or flat-top shapes.

Critical, the 30% Rule: removing more than 30% of crown growth could result in stress-related problems and early mortality of trees. Opening up crowns too much may lead to premature structural failure.

Tree Species and Growth Rates, Table Number 5: species are grouped into four growth-rate categories. Very Fast: Carolina Poplar, Cottonwood, and Lombardy Poplar. Fast: Willow, Locust, and Manitoba Maple. Medium: Tulip, Black Cherry, Aspen, Red Pine, Elm, Red Maple, White Pine, Sycamore, Scotch Pine, Birch, Jack Pine, Red Oak, Basswood, Walnut, Ash, Larch, and Norway Spruce. Slow: Sugar Maple, Horse Chestnut, Hickory, White Oak, Beech, Balsam Fir, White Spruce, Black Spruce, Hemlock, and White Cedar.

Exam tip: don't memorize every species. Focus on recognizing representative species in each category. For example, Sugar Maple equals slow; Willow equals fast; and Cottonwood equals very fast.

Rule 602, Pruning Clearances.

To maintain a pruning standard, you must maintain pruning clearances and establish a pruning cycle.

Three Voltage Categories: subtransmission voltage lines are 22,000 to 44,000 V; distribution lines are 2,300 to 15,000 V; and service lines are 115 to 230 V, or 120 to 240 V.

Winter Sag Allowance: the tables include allowance for sag, BUT in the middle of winter, extra clearance is required. For spans up to 91 m, or 300 ft., add 0.30 to 0.60 m, or 1 to 2 ft. For spans over 91 m, or 300 ft., add 0.60 to 1.3 m, or 2 to 4 ft. This extra clearance is applied to trees at centre span, which is the lowest point of the conductor sag.

Maximum Pruning Cycles: the maximum time between pruning cycles is as follows. For voltage range 2.4 kV to 27.6 kV, the maximum cycle length is 6 to 8 years. For voltage range 27.6 kV to 44 kV, the maximum cycle length is 4 years.

Exam tip: higher voltage equals shorter cycle, meaning more frequent pruning, because clearance failures matter more on higher-voltage lines. You may set a more stringent, meaning shorter, cycle, but these are the maximums. Note: tables are guidelines, because environmental conditions or poor pruning habits may accelerate growth rates in most species.

Section VI key facts to memorize: three reasons for pruning are line clearance, sanitation, and aesthetic; three types of pruning are crown, side, and under; maximum crown removal is 30% of crown growth, because more risks stress and mortality; climbers and spurs usage is for removals ONLY, never on a tree that will live; shapes to avoid are V, L, U, and flat top; subtransmission voltage range is 22,000 to 44,000 V; distribution voltage range is 2,300 to 15,000 V; service line voltage range is 115 to 230 V, or 120 to 240 V; winter sag for short spans of 91 m or 300 ft. or less requires plus 0.3 to 0.6 m, or 1 to 2 ft., of clearance; winter sag for long spans over 91 m or 300 ft. requires plus 0.6 to 1.3 m, or 2 to 4 ft., of clearance; maximum cycle for 2.4 to 27.6 kV is 6 to 8 years; maximum cycle for 27.6 to 44 kV is 4 years; sample species that are very fast are Carolina Poplar, Cottonwood, and Lombardy; sample species that are slow are Sugar Maple, White Oak, Beech, and Hemlock; and the four factors when choosing pruning type are species, conductor position, voltage, and cycle clearance.

Section VII, Tree Climbing Techniques.

Section VII is the longest section in the chapter. It covers crotch selection, knots, three ascent methods, ladder use, manoeuvring, positioning, descending, and repositioning. The Force Formula in Rule 705 and knot strength percentages in Rule 702 are heavily tested.

Rule 700, General.

Before climbing the tree, visibly inspect the path of ascent and decide where the tying in will take place. The inspection must include: conductor location; possible electrical hazards, which includes branch contacts; and location for final tying in.

Note: the tying in process is the tree worker's choice, regardless of the method used to climb.

Rule 701, Crotch and Branch Union Selection.

Selection of suitable crotches is the ultimate responsibility of the climber, who must rely on training and experience to identify all hazards.

The 7 Selection Criteria: identify the tree species and its characteristics, for example the brittleness of white pine, poplar, and willow; ambient temperature, because winter versus summer matters; the main stem and support branch must be sound, and the joint size must be capable of supporting the climber's weight, with a 10:1 safety ratio to be considered; the crotch must be open to allow free running of the rope; wherever possible, locate the crotch so that if a slip occurs, the climber cannot swing into any conductors; a secondary point of attachment must be maintained at all times, for example a lanyard or double crotch; and crotch height above the work location and crotch accessibility.

Critical, the 10:1 Safety Ratio: the crotch, or joint, size must be capable of supporting 10 times the climber's weight.

Setting the Climbing Line: best practice is to ensure the climbing line encompasses the main trunk, or bole. This is the best-practice configuration. A configuration not around the bole is less stable.

Methods to place the rope include: using the pruner head and sections of the pruner handle; using a throwing ball or "monkey's fist" with attached light nylon line; and using a roping tool designed to catapult a line through the tree crotch, though this is rarely used.

Critical: fall protection is mandatory at 3 m, or 10 ft., above ground. Best practice is that climbers should be secured from ground level.

Rule 702, Friction Hitch and Termination Knot Selection.

As of February 1, 2006, the Arborist Industry Committee standardized acceptable friction hitches and termination knots.

Acceptable Industry-Tested Friction Hitches: Taut Line Hitch is a closed system; Blake's Hitch is a closed system; Prusik Hitch with 6 coil is a double static line; Gripping Hitch is a closed system; Klemheist is a double static line; and Swabish using 10 mm Tenex has no designated system type listed.

Acceptable Industry-Tested Termination Knots and their tensile strength retained: Girth Hitch off spliced eye retains 100%; Becket's Bend retains 80%; Anchor Bend retains 73%; Bowline retains 72%; Figure Eight on a Bight retains 72%; Double Fisherman's Knot is not rated with a percentage; and Triple Fisherman's Knot is not rated with a percentage.

Exam tip: expect a question asking which knot retains the highest strength, which is the Girth Hitch off spliced eye at 100%, or asking you to rank knots. Becket's Bend at 80% is significantly stronger than the Bowline, Figure 8, and Anchor Bend group at 72 to 73%.

Rule 703, Ascending Rope Assisted on a Conventional Closed Climbing System.

Three primary ascent methods are described. Universal rule: a second point of attachment must be maintained at all times while climbing.

Method 1, Body Thrust with Friction Hitch: the body thrust used in conjunction with a friction hitch is a safe method because the climber is tied in with a friction hitch prior to leaving the ground. Position the rope close to the tree trunk for best results.

Procedure: (a), With the rope properly crotched, snap the locking captive eye karabiner to the saddle. (b), Using a 1 to 2 m, or 3 to 6 ft., tail from the karabiner, tie a figure eight hitch and a friction hitch around the other end of the rope. (c), Tie a figure eight knot in the tail after the friction hitch. (d), Slide the friction knot as far up as possible without leaving the ground, then position feet on the trunk. (e), Place both hands below the friction knot, with the stronger or holding arm below the hand that slides the knot. (f), Walk up the tree to waist height, then lean back to nearly horizontal. (g), Simultaneously brace feet, bend knees, pull down on the running end, and thrust upward with the hips. This is a rhythmic technique. (h), With the strong arm locked, slide the top hand up the running end beneath the friction hitch. (i), Once a rhythm is established, continue to the first limb.

Method 2, Body Thrust on Belay: similar to body thrust with friction hitch, but a person on the ground prevents the climber from falling on a secondary rope.

Critical, belay weight differential rule: a Münter hitch is tied into a karabiner. The karabiner attachment depends on the weight difference. If the climber is more than 11 kg, or 25 lbs., heavier than the belayer, the tree method MUST be used, meaning the karabiner is attached to the tree. Otherwise, the karabiner can be attached to the "D" rings of the belayer's saddle.

Communication protocol: the climber calls "OFF BELAY" before repositioning the rope, at which point the belayer undoes the rope from the karabiner. Once the locking captive eye karabiner is reconnected, the belayer ties another Münter hitch and shouts "ON BELAY," which tells the climber it's safe to disconnect the lanyard and continue.

Note: many mechanical belay devices are available today that replace the Münter hitch.

Method 3, Secured Foot Lock: redundant fall protection is required with this technique. This method is for advanced climbers only. A prusik loop is used to secure the climber to the rope. Prusik loops come pre-made with serial numbers and manufactured dates.

Rule 704, Ascending with Climbers, Spurs.

Critical: climbers and spurs may ONLY be used on trees that are to be REMOVED. This rule appears for the third time in this chapter, after Rules 301-I and 600.

Before Climbing: visually inspect the tree for loose bark, cracks, decay spots, and knots and stubs.

Selecting the Right Spurs: for thin barked trees where the gaff penetrates wood, use pole climbers with 45 mm, or 1-5/8 in., gaffs. For deeply fissured or thick bark, use tree climbers with 70 to 90 mm, or 2-3/4 to 3-1/2 in., gaffs.

Once Aloft: secure the worker using the tree worker's friction knot, then begin work. Remain well under the crotch containing the rope to use it most effectively. Never crotch in the immediate work zone.

Rule 705, Formula for the Forces Created.

This formula calculates the force perpendicular to the tree at the crotch.

The Force Formula is: F equals W times L, divided by D. F is the force perpendicular to the tree at the crotch. W is the climber's weight. L is the horizontal length from the saddle to the tree. And D is the distance from where the rope is crotched to the climber's feet.

To decrease the force at the crotch: (a), decrease the climber's weight, W; (b), decrease the horizontal length L, or reduce the angle the rope makes with the tree; (c), increase the distance D, which is the rope crotch to the climber's feet.

The Force Table is based on a 90 kg, or 200 lb., climber. When L is 0.9 m and D is 0.6 m, force is 136.0 kg or 300 lbs. When L is 0.9 m and D is 0.7 m, force is 107.3 kg or 236.6 lbs. When L is 0.8 m and D is 0.9 m, force is 85.5 kg or 188.5 lbs. When L is 0.7 m and D is 1.0 m, force is 67.3 kg or 148.4 lbs. When L is 0.6 m and D is 1.2 m, force is 50.7 kg or 111.8 lbs. When L is 0.5 m and D is 1.3 m, force is 33.4 kg or 73.7 lbs. And when L is 0.2 m and D is 1.4 m, force is 14.2 kg or 31.3 lbs.

Exam tip: a 200 lb. climber can generate 300 lbs. of force in a poor position, or as little as 31 lbs. in a good position, which is a 10 times difference. Expect a conceptual question such as: "What does increasing D do to the force at the crotch?" The answer is: it decreases it.

Rule 706, Climbing Using a Portable Ladder.

Ladder Type: only approved, non-conductive ladders in forestry work. Fibreglass ladders must conform to the appropriate CSA standard.

The 11 Ladder Rules: never place a ladder on a truck or other movable object; the ladder must be secured at top and bottom to avoid pendular swing; remove ladders from trees when not in use and while heavy branches are being lowered; don't use sectional ladders consisting of more than 3 sections.

Critical, the 4:1 Rule: place the ladder so the horizontal distance from base to vertical plane of support is approximately one-quarter of the ladder length between supports. If the base distance is greater than the 4:1 ratio, block the ladder footing OR have another worker hold it. If the base distance is less than the 4:1 ratio, hold the ladder until the top is tied.

Continuing the ladder rules: clean mud, snow, or substances from boots before climbing; always face the ladder climbing up or down, keep hands on the centre of the rung, and maintain a firm grip; never climb a ladder wearing climbers, or spurs, and instead use a tree body belt and safety lanyard passed around the ladder; don't stand on the top 3 rungs; if the ladder isn't long enough for the job, don't use it; don't overreach from any position, instead move the ladder; and two workers are NEVER allowed on the same ladder at the same time.

Safe Practices Recap: check the ladder for defects before using; make sure it's the proper length; set it on firm, level ground; remember the 4:1 rule; maintain three-point contact while climbing and always face the ladder; maintain a firm grip; and tie off whenever possible.

Rule 707, Manoeuvering in the Tree.

Free movement in trees comes only through experience. Natural balance, aided by proper use of the safety rope, is key.

Manoeuvering Principles: no slack in the safety rope between the tie-in point and the climber; the safety rope and saddle are NOT intended as a seat, instead lean against the rope so it supports a portion of your weight while the legs supply balance; the best position for pruning is to be just below the work area and looking up and out; and when working above conductors, mind the location of the free end of the rope and small tools, and always maintain safe limits of approach.

Rule 708, Positioning and Tying In.

To properly position a safety rope in a crotch and tie in while protected from falling, for example using a lanyard: pass the safety rope through the selected crotch and around the main stem; fasten the locking captive eye karabiner to the saddle "D" rings, passing it through both "D" rings and securing the keeper; tie the friction knot to the running end of the climbing line; and test the friction knot before trusting your full weight to it.

Critical, climbing line specs: the acceptable forester's climbing line is 12.7 mm, or 1/2 in., nylon or equivalent durable material of equivalent impact strength and elasticity.

Rule 709, Double Positioning.

When the original crotch position can't supply the support and balance needed everywhere, temporarily crotch a second time at the new location. This is double positioning, which provides redundancy at all times while climbing.

Procedure: select a location through a crotch or around a limb for desired support. Using the terminal end of the running portion of line, pass it over the new crotch or limb and tie it to the saddle "D" rings using a secure knot such as an anchor bend or Becket's bend, and so on. Tie the securing knot approximately 1 m, or 3 ft., from the rope end. Tie the rope end to the new running end using an acceptable friction hitch. By adjusting the two friction hitches, the forester is held in the desired position.

Note, alternative: the forester's body belt is equipped with "D" rings, so it may be more convenient to use the adjustable lanyard instead of double positioning.

Rule 710, Descending the Tree.

To descend safely: the running end is free from obstructions and follows a clear path to the ground; if a slip occurs, the forester will not swing into any conductors; and the running end has a figure eight knot tied at the end and is long enough to reach the ground.

Critical: once tied into the tree, remain tied in at all times until back on the ground. Do NOT untie the friction hitch to descend, except when repositioning. Always secure a lanyard as a second attachment point when repositioning.

Rule 711, Repositioning.

In exceptionally high trees, the fall line may not be long enough to descend completely. Repositioning solves this. The procedure is similar to double positioning.

Repositioning Procedure: descend to a point where, after repositioning, sufficient fall line will be available to reach the ground; select a suitable branch union; retrieve the running line end and pass it through the new union; using a termination knot, tie it to the safety saddle "D" rings and tie the knot approximately 1 m, or 3 ft., from the rope end; using the 1 m, or 3 ft., rope end now tied to the "D" rings, tie a friction hitch to the rope that will become the new running end; untie the original friction hitch, then untie the locking captive eye karabiner; pull the running end from the original crotch and lower it to the ground, and ensure a figure eight stopper knot is secured to the distal end; then continue descending to the ground.

Critical: where practical, line clearing operations should be performed from the bucket of an approved insulated aerial device. All these climbing techniques are valid, but the safest method is the aerial device when conditions permit.

Section VII key facts to memorize: fall protection is mandatory at 3 m, or 10 ft., above ground; best practice for securing is from ground level; crotch joint safety ratio is 10:1, meaning it must support 10 times the climber's weight; climbing line specification is 12.7 mm, or 1/2 in., nylon or equivalent; knots were standardized as of February 1, 2006 by the Arborist Industry Committee; highest-strength termination knot is the Girth hitch off spliced eye at 100%; Becket's Bend strength is 80%; Anchor Bend strength is 73%; Bowline and Figure 8 on a Bight strength is 72%; the belay weight differential rule is that if the climber is more than 11 kg, or 25 lbs., heavier, the tree method MUST be used; belay communication calls are "OFF BELAY" and "ON BELAY"; climbers and spurs usage is removals ONLY; spurs on thin bark use 45 mm, or 1-5/8 in., gaffs and are pole climbers; spurs on thick bark use 70 to 90 mm, or 2-3/4 to 3-1/2 in., gaffs and are tree climbers; the force formula is F equals W times L, divided by D; force reduction methods are to decrease W, decrease L, or INCREASE D; the ladder rule is 4:1 meaning base distance equals 1/4 of ladder length; maximum ladder sections is 3 sections; the top rungs rule is don't stand on the top 3 rungs; never wear climbers or spurs on a ladder; only one worker per ladder at a time; ladder contact requirement is three-point contact and always face the ladder;

karabiner type for the saddle is locking captive eye karabiner through both "D" rings; the running-end safety knot is a figure eight stopper knot; and the preferred line clearing method is the bucket of an approved insulated aerial device where practical.

Section VIII, Working Near Energized Conductors and Apparatus.

Section VIII is one of the most important sections for the exam. It codifies the three "always treat as alive" rules, which cover wood, broken conductors, and covered conductors, as well as the controlled limb-removal procedure.

Rule 800, General.

Critical: wood, whether dry, green, or wet, must be deemed at all times to be a conductor of electricity.

Note: this builds on Rule 202, Units of Electricity, where wood was classified as a semiconductor. Rule 800 takes the safety-conservative position: always treat wood as a conductor, never as an insulator.

Other key principles: when working above conductors, use an approved insulated aerial device; maintain personal safe limits of approach at all times; if a limb is in contact with, or about to contact, an energized conductor, whether by wind or limb movement, contact the controlling authority for appropriate work protection; when pruning near energized conductors or apparatus, use a pole pruner that has been dielectrically tested, and cut an insulated link insert into the pruner rope, with a standard length of 215 mm, or 8.5 in.; and face the conductors whenever possible and remove foliage obstructing your view.

Critical, pruner cut diameter limit: pruner cuts are safely made up to a diameter of 2.5 cm, or 1 in. Use a saw for larger cuts.

Be constantly aware of conductor position when pruning above and beside energized lines, and maintain safe limits of approach at all times per the EUSR.

Critical: the insulating link cut into the pruner rope must NEVER be bridged by any portion of the body or apparatus when within contact distance of energized equipment. Bridging the link defeats its entire purpose, because the worker becomes the conductive path.

Broken Conductors: if a power conductor is broken by any circumstance, consider it alive. Do not touch it until protection is established per the Utility Work Protection Code, or UWPC. Report the location at once to the appropriate operating or utility authority. The person reporting must be governed by the instructions received.

Critical: weatherproof covering is NOT insulation. Treat covered conductors as bare and alive unless positively known to be isolated and de-energized.

Cross-reference: this matches EUSR Rule 145, Overhead Conductor Insulation, which states "All covered, jacketed, or insulated overhead conductors energized at voltages greater than 750 V shall be treated as bare conductors."

Exam tip: there are three "treat as alive" rules in this single section. Wood must always be treated as a conductor. Broken conductors must always be treated as alive. And covered or jacketed conductors must always be treated as bare and alive.

Rule 801, Working Above the Level of Energized Conductors.

This is one of the most hazardous positions, because anything you cut falls toward the energized circuit. Carefully remove branches that are likely to break and fall on the conductors, and any branches likely to whip into the circuit. Large branches directly above a line must be controlled and lowered using appropriate rope and rigging techniques. Branches too small to require roping, when being pruned or removed from above a line, must be cut into short lengths, with each length SHORTER than the distance between power line conductors.

Critical, conductor spacing rule: when you cut a small branch above a line, the maximum length of any piece must be shorter than the spacing between the two nearest conductors. This ensures the falling piece cannot bridge two conductors simultaneously, which would cause a phase-to-phase fault.

Use approved pruners, and never touch by hand any branch in position to contact a live conductor.

Rule 802, Limb Removal in Proximity to Energized Conductors.

Limb removal is one of the most hazardous jobs in line clearing.

Awareness Checklist: know the location of (a), live conductors; (b), private property including fences, houses, flower beds, and vehicles; (c), equipment including trucks, chippers, and guy wires; and (d), co-workers, both aloft and on the ground. Do not let limbs swing in a way that could cause contact with energized conductors or co-workers.

The 7-Step Controlled Limb-Removal Method: attach a lowering rope to the limb to be lowered out beyond the balance point; crotch the rope in at the main trunk ABOVE the limb to be lowered; the ground worker must NOT exert pressure to raise the limb yet; the aloft worker begins the undercut; the ground worker now applies pressure to the lowering rope to (a), relieve the bind on the saw, and (b), pull the limb up to where the rope is crotched; when the limb is nearly vertical, the aloft worker completes the cut; and on completion of the cut, the limb is lowered safely to the ground.

Note: for larger limbs, guide ropes may be needed for better control, and additional rigging may be required for mechanical advantage and control.

Exam tip: the key principle is undercut first, ground tension second, top cut third, and lower fourth. Premature tension on the rope can pinch the saw blade.

Rule 803, Removing Limbs from Conductor Contact.

This rule applies when a limb has already fallen and lodged on conductors, making it a recovery operation. If a limb falls and becomes lodged on conductors: warn workers to stay clear in case the conductor burns off and falls to the ground, and contact the controlling authority. Use insulated pole pruners and rubber gloves when removing limbs in close proximity to energized conductors, from the bucket of an approved insulated aerial device. If the limb is too large for the pruners OR a hazardous situation exists, contact the controlling authority for isolation and de-energization before starting work.

Note: what is "burn off"? When a limb contacts an energized conductor, it creates an arcing and fault current path. The current can heat the conductor until it physically melts and severs, or burns off, dropping a live broken wire to the ground.

Section VIII key facts to memorize: wood in all conditions is always a conductor, whether dry, green, or wet; working above conductors requires using an approved insulated aerial device; a limb about to contact a conductor means contact the controlling authority for work protection; pole pruner requirement is that it must be dielectrically tested with an insulated link in the rope; the insulated link and pole head length is 215 mm, or 8.5 in., each; maximum pruner cut diameter is 2.5 cm, or 1 in., and use a saw for larger; bridging the insulated link is NEVER permitted within contact distance; a broken conductor must be considered alive and not touched until UWPC protection is in place; weatherproof covered conductors must be treated as bare and alive, which matches EUSR Rule 145; branch length above lines when no rope is required must be shorter than the spacing between conductors; never touch branches by hand if they are in position to contact a live conductor; limb removal sequence is undercut, then ground tension, then top cut, then lower; conductor "burn off" is a risk when a limb is lodged on a conductor and workers must be warned; for a limb on a conductor that is small, use insulated pole pruners and rubber gloves from an insulated aerial bucket; and for a limb on a conductor that is large or hazardous, isolation and de-energization is required.

Section IX, Tree Removal.

Section IX is a single rule, Rule 900, with 22 numbered points. It's heavier than it first appears.

Rule 900, Safe Practices for Tree Removal.

A. Tree Assessment Before Felling. Mature oak, beech, and basswood, plus all over-mature trees of doubtful strength, should, if necessary, be diagnosed with a brace and bit. ALL trees must be visually inspected before felling. Respect the hazards of dry stumps, chicots, which are also called "widow makers," or dead trees.

Note: key term "chicot." This is a French-Canadian forestry term for a dead standing tree or hung-up dead branch, also called a "widow maker" because of the deadly hazard of unexpected falls.

B. Felling Direction and Roping. Trees that could damage power lines or property must be properly roped, guyed, and anchored. DO NOT use pike poles. Fell trees directly AWAY from power lines and associated equipment. When not possible, top trees sufficiently to provide adequate clearance. A guide rope may be attached to a stationary vehicle, provided the vehicle is rendered inoperative and of appropriate weight for the tree being felled. The climber's climbing rope MUST NEVER be used as a pulling or guide rope; use appropriate diameter and strength. And employ felling wedges and felling bars where applicable.

C. The Felling Area and Danger Zone. Critical: the felling area must be at least equal in radius to the height of the tree. The danger zone equals the felling area plus an additional area designated by the supervisor.

D. The Saw Operator's Escape Route. Critical: saw operators must have a clear and adequate escape route at an angle of approximately 45 degrees to the rear of the notch. NEVER directly away from the direction of fall, because the tree could kick backward off the stump. Always move uphill when felling trees on a slope.

Abandon the saw if it hampers your escape. Saw operators must be clear of the area directly beneath the tree before it is pulled over. And never turn your back on a falling tree; keep it in sight while watching your escape path.

E. Chainsaw Operation During Felling. Exclusion zone: no one except the operator within 1.8 m, or 6 ft., of a power chainsaw in operation. Holding wood: leave a minimum of 2.5 cm, or 1 in., holding wood uncut to hinge the tree. Saw operators must be constantly alert for falling deadwood. PPE required is eye, ear, head, hand, foot, AND leg protection. And leg protection exception: NOT required when working from the bucket of an aerial device.

F. After the Tree Falls. When the tree strikes the ground, the butt portion may move a considerable distance. Ensure the tree has completely settled before approaching to remove rigging or begin bucking. Take extra care while wearing snowshoes during felling.

G. Crew Communication. Maintain good communication between saw operator or operators and other crew members. Don't leave a partially cut tree standing when work has been suspended.

H. Trees Lodged on Energized Apparatus. If a tree becomes lodged on energized electrical apparatus and cannot be removed by approved work procedures: notify the power authority for isolation and de-energization before removal begins.

I. Competent Personnel. Only competent employees OR employees under the direct supervision of a competent person may attempt felling procedures.

Section IX key facts to memorize: mandatory diagnostic species are mature oak, beech, and basswood plus over-mature doubtful trees, and the method is brace and bit; universal pre-felling requirement is all trees visually inspected; hazard tree term is chicot, meaning "widow maker"; roping equipment means roped, guyed, and anchored, with NO pike poles; direction of fall is directly AWAY from power lines, and the top tree if not possible; felling area radius must be at least equal to tree height; danger zone equals the felling area plus supervisor-designated additional area; escape route angle is approximately 45 degrees to the rear of the notch; escape direction restriction is NEVER directly away from fall direction; slope rule is always move uphill; chainsaw exclusion zone is 1.8 m, or 6 ft., from the operator; holding wood minimum is 2.5 cm, or 1 in., uncut to hinge; required PPE for chainsaw is eye, ear, head, hand, foot, and leg; leg protection exception is not required in the bucket of an aerial device; for a falling tree, never turn your back and keep it in sight; after the tree falls, ensure it is completely settled before approaching; a partially cut tree at end of work must be felled before vacating; a tree lodged on energized apparatus requires isolation and de-energization; the climbing rope as a pulling or guide rope is NEVER permitted; a vehicle as an anchor must be inoperative and of appropriate weight; felling aids are wedges and felling bars; and who may fell is a competent employee or a trainee under direct supervision.

Section X, Safe Limits of Approach.

Section X is the anchor of the entire chapter. It sets the actual electrical clearance distances that govern almost every work decision in line clearing, and it ties directly to EUSR Rule 129. Almost every clearance-related question on the exam either tests Table Number 9 directly, the four authorization conditions, or the 3 m and Class 2 rubber glove rule.

Rule 1000, General.

What Are Safe Limits of Approach? When working near energized apparatus and equipment, there are limits on how close workers may come to that equipment. These limits are called "Safe Limits of Approach" and are essentially warning barriers.

Critical: crossing inside the Safe Limit of Approach means the worker has entered the danger zone. These limits are the outer edge of safe, not the inner edge of working clearance.

The Two-Tier System: Section X establishes two distinct sets of clearance limits. The OHSA General Worker tier applies to any worker not meeting authorized conditions, with a minimum clearance of 3 m, or 10 ft., for any line over 750 V. The Authorized Person tier, per Table Number 9, applies to workers meeting ALL four authorization conditions, with a minimum clearance of 0.9 m, or 3 ft., at 750 V to 35 kV.

Exam tip: be ready to explain WHY there are two different clearances for the same voltage. The general 3 m, or 10 ft., clearance applies to everyone by default. The reduced clearance applies only when all four authorization conditions are met.

Tier 1, The OHSA General Rule. Critical: Ontario Regulations for Construction Projects state: workers shall not bring any object, including themselves, closer than 3 m, or 10 ft., to a power line rated more than 750 volts. This is the default rule. Without authorization, no worker and no object they handle may come within 3 m, or 10 ft., of any line over 750 V, regardless of the specific voltage.

Cross-reference: this matches the "OHSA Minimum" column in EUSR Rule 129's Limits of Approach table.

Tier 2, The Four Conditions for Authorized Person Approach. The reduced clearances in Table Number 9 may ONLY be used when ALL FOUR of the following conditions are met. Condition (a): work is being performed in accordance with rules, techniques, and procedures approved by E&USA, now IHSA, for close-proximity work. Condition (b): work is being performed by persons who are qualified to do such work. Condition (c): work uses tools, clothing, and equipment specifically designed for such work. Condition (d): work is being supervised by a competent person.

Critical: all four conditions are required. If even ONE of the four conditions is not met, the worker reverts to the OHSA general 3 m, or 10 ft., minimum.

Note, historical note: E&USA stood for the Electrical and Utilities Safety Association, which amalgamated with other associations in 2010 to form IHSA, the Infrastructure Health and Safety Association. The reference to E&USA reflects the document's age. The standards remain in effect under IHSA.

Table Number 9, Safe Limits of Approach for Authorized Persons. Memorize this table cold. For 750 V to 35,000 V, minimum clearance is 0.9 m, or 3 ft. For greater than 35,000 V to 50,000 V, it's 1.2 m, or 4 ft. For greater than 50,000 V to 150,000 V, it's 1.5 m, or 5 ft. For greater than 150,000 V to 250,000 V, it's 2.1 m, or 7 ft. For greater than 250,000 V to 550,000 V, it's 3.7 m, or 12 ft.

Note, memory aid: the pattern climbs in non-uniform jumps. 750 V to 35 kV equals 3 ft. Then 35 to 50 kV equals 4 ft., which is plus 1. Then 50 to 150 kV equals 5 ft., which is plus 1. Then 150 to 250 kV equals 7 ft., which is plus 2. Then 250 to 550 kV equals 12 ft., which is plus 5. Note the doubling effect at the upper voltages. Transmission voltages need much more clearance because of the larger flashover gap risk at very high potentials.

Cross-reference: these match EUSR Rule 129 "Authorized Worker" column exactly. EUSR splits the 750 V to 35 kV band into 750 V to 15 kV and greater than 15 kV to 35 kV, both at 0.9 m, but the LCO collapses these into a single band. Otherwise the tables are identical.

Two Key Application Rules for Table Number 9. Application Rule 1, Authorized workers only: only authorized workers, or workers under the continuous direction of an authorized worker, may approach, work, or allow material or conductive tools to approach exposed energized electrical apparatus to the limits stated. Application Rule 2, Plan for movement: in planning the task, consider the worker's position in relation to exposed energized apparatus such that

planned movements of the worker's body, conductive tools, material, or vegetation will NOT result in any encroachment upon these limits.

Exam tip: the limit applies to everything within the worker's control, including body, tools, material, and vegetation, and it accounts for planned movements, not just a static position. A worker who is 1 m from a 25 kV line but is about to swing a saw 0.5 m toward it is already at 0.5 m planned distance, which is inside the 0.9 m limit.

Unknown Voltage Protocol. Critical: when either the supervisor OR any worker working near energized conductors or apparatus is NOT SURE of the voltage levels, contact the local power authority BEFORE anyone goes aloft. Exam tip: "When in doubt about voltage, no one goes aloft until the controlling authority confirms." This is a likely test question.

Aerial Device Controls: any aerial device used to raise a worker in proximity to energized apparatus must be equipped with upper and lower controls, and the lower controls must be capable of positively overriding the upper controls.

Cross-reference: this matches Rule 103-N in Section I, Aerial Devices, point 12. The override capability ensures a ground operator can recover or rescue a worker in the bucket whose upper controls have failed or who is incapacitated.

The Rubber Glove Rule within 3 m. Critical: approved rubber gloves with a minimum Class 2 rating of 20,000 V, with leather protectors, shall be worn when the worker is within 3 m, or 10 ft., of apparatus energized between 0 and 50,000 V phase-to-phase, OR when what is being worked on, including branches and limbs, is within 3 m, or 10 ft., of that apparatus.

Exam tip: the two formulations matter. Rule 301-D covers 750 V to 50,000 V within 3 m, requiring Class 2 minimum. Rule 1000 number 5 covers 0 to 50,000 V within 3 m, also requiring Class 2 minimum. Rule 1000 is the broader, safer standard. When in doubt, use Class 2 minimum within 3 m of any energized apparatus up to 50 kV.

A Note on the Three-Tier EUSR System: EUSR Rule 129 uses a three-tier personnel zone system. The OHSA Minimum tier is the default for any worker when there is no authorization. The Authorized Worker tier provides reduced clearance when all four authorization conditions are met. The Restricted Zone tier provides even smaller clearance when live line procedures, cover-up, a dedicated observer, and 4th-year apprenticeship requirements are all in place. The Line Clearing Operations document only shows the first two tiers.

Critical: the Restricted Zone clearances exist in EUSR but are only available to powerline technicians performing live line work, not to utility arborists doing line clearing. The reduced Restricted Zone clearances do not apply to arborist work.

Section X key facts to memorize: OHSA Construction minimum is 3 m, or 10 ft., for any line over 750 V; Authorized Person at 750 V to 35 kV is 0.9 m, or 3 ft.; Authorized Person at greater than 35 to 50 kV is 1.2 m, or 4 ft.; Authorized Person at greater than 50 to 150 kV is 1.5 m, or 5 ft.; Authorized Person at greater than 150 to 250 kV is 2.1 m, or 7 ft.; Authorized Person at greater

than 250 to 550 kV is 3.7 m, or 12 ft.; four conditions for Authorized Person clearance are (a) approved procedures, (b) qualified persons, (c) specific tools, clothing, and equipment, and (d) competent supervisor; unknown voltage protocol is to STOP and contact the power authority before going aloft; what the limit applies to is body plus conductive tools plus material plus vegetation plus planned movements; rubber glove rule within 3 m of 0 to 50 kV is Class 2 at 20,000 V minimum plus leather protectors; aerial device controls for proximity work require upper plus lower controls with lower able to override upper; and Restricted Zone clearances are NOT available to utility arborists.

Section XI, Safe Clean Up Procedures.

This is the final section of the chapter. Brush chippers are among the most dangerous pieces of equipment in line clearing. Rule 1100 alone contains 30 numbered safety practices.

Rule 1100, Safe Procedures for Use of Brush Chippers.

A. Training, PPE, and Pre-Operation. All workers must be trained in maintenance and safe use of brush chippers. Maintain chippers per standard practices and manufacturer's specifications. Critical: required PPE for chipping is face, eye, ear, hand, head, AND foot protection. Face protection is added versus general PPE because of debris ejection from feed and exhaust chutes. Use work area protection per Rule 303.

B. Starting the Chipper. Inspect for chipper blade obstructions before starting. Check the feeder chute for foreign objects. Bring the chipper up to recommended RPM gradually, and reduce speed slowly to stop. Use all guards and protective devices installed by the manufacturer. Check for and remove any wire, stones, or other non-wood debris embedded in brush.

Critical: wire or stone in a chipper can shatter the blades, send shrapnel back through the feed chute, or cause catastrophic failure. Inspecting brush before feeding is a life-safety step.

C. During Operation, Feeding Brush. Critical: feeding position is to stand off to either side of the feed table, NEVER directly behind it. Best practice is to stand on the curbside to avoid vehicular traffic.

Wear loose-fitting gloves while feeding brush. Stand to one side of the feeder chute due to kickback risk.

Critical: do NOT use hands or feet to push brush past the face of the feeder chute. Use a push stick or brush. Beware of kickback when chipping dead wood.

Brush must be sectioned into appropriate lengths and free of bends. Feed only the amount the chipper can readily accept. Do NOT force brush; if it doesn't self-feed, blades are dull or improperly set. NEVER stand or pass directly in front of the exhaust chute. NEVER stand or sit

on the chipper during operation or while being moved. And do not chip brush close to pruning or felling operations, because chipper noise may interfere with spoken instructions.

D. Worker Approach and Traffic Safety. Workers approach a chipper in single file. After feeding, turn away from the travelled portion of the road. Keep the chipper as far to the side of the road as possible.

Critical: tear-away vest required. If a traffic vest is required at a chipper, it must be of the TEAR-AWAY type. A standard vest could catch on brush and pull the worker into the chipper. A tear-away vest releases under pulling force.

E. Emergencies and Irregularities. Shut down the engine immediately if any irregularity occurs, and do not restart until remedied. NEVER leave a chipper unattended while in operation.

F. Wood Chip Disposal, Health Hazard. Critical: wood chips left for MORE THAN 2 DAYS can cause nausea and headaches in workers unloading them. If chips are left in the dump box for extended periods, the worker should wear a respirator while working in the enclosed dump box. Best practice is to unload chips from the truck the same day chipping is done.

Note: why the 2-day rule? Wood chips begin biological decomposition once piled, producing carbon dioxide, organic acids, and bioaerosols in confined spaces. The hazard is highest in enclosed dump boxes where ventilation is poor.

G. Maintenance and Servicing. Turn the ignition switch to "OFF" and remove the key before servicing. Lock and block drums to prevent rotation before maintenance, leave blocks in place, and TAG the chipper until maintenance is complete. Wear hand protection while working on or near blades. Sharp edges of used and new blades must be covered with a designed guard or masking tape during maintenance. When changing blades: ensure bolts and bolt holes in wedges and cylinders are in good condition and free of dirt and debris.

Critical, wedge locking bolt check schedule. For the first 2 days after changing blades: check at the job site before starting the chipper, AND again after chipping for the first 5 minutes. For the first 2 days and until the next blade change: check once a week at the job site before starting.

H. Wood Chip Permission and Public Relations. Permission to dispose of chips: with permission from the Ministry of the Environment, road authorities, or adjacent property owners, chips may be blown along the roadside. Otherwise, chips may need to be loaded and disposed of at an approved location.

Public relations rules: move the chipper frequently to avoid unsightly piles, and spread chips manually if necessary; do NOT chip onto driveways, lawns, flower beds, hedges, or anywhere annoying to the public; do NOT blow chips across the road; and remove chips from culverts, drains, and ditches so drainage isn't interfered with.

I. Coupling and Uncoupling Trailer-Mounted Chippers. Use enough workers to safely handle and control the chipper's weight. Only ONE person gives signals to the truck driver. Do NOT push

the chipper by hand to the vehicle, instead BACK the vehicle to the chipper. Check the trailer hitch locking mechanism before attaching. Install approved chains and connectors, and cross the safety chains beneath the trailer tongue with only enough slack to permit turning. When coupling or uncoupling, the trailer must be properly blocked. Do NOT walk between the vehicle and a connected trailer while in motion. Before moving: attach brake and light cables; check trailer brakes and lights.

Note: safety chain crossing. The crossed-chain pattern beneath the tongue is intentional. If the trailer detaches from the hitch, the crossed chains form a "cradle" that catches the tongue rather than letting it drop and dig into the road.

Rule 1101, Stump Removal.

This rule covers mechanical stump removal, for example stump grinders.

8-Point Stump Removal Procedure: remove loose material around the stump, including rocks, snow, and ice; ensure machine stability and wheel chocks in place; all protective devices must be properly maintained; PPE required is head, ear, eye, hand, and foot protection; warn people to stay away using signs and warning barriers; if the operator must leave the machine, work ceases, machine is stopped, and key is removed; take small incremental passes across the stump, not large ones; and when done, clean up the area and fill in the depression.

Note: why small passes? Aggressive cuts in stump grinders can throw debris dangerously, damage cutter teeth, stall or kick the machine, and increase operator strain.

Rule 1102, Hauling of Brush.

Critical: definition of "brush." All limbs under 10 cm, or 4 in., in diameter are considered to be brush.

5-Step Brush Hauling Procedure: place brush in a convenient location for loading; place butt ends in the same direction for ease of handling; place "brush ropes" on the truck platform BEFORE loading, because they secure brush during transport and ease unloading; load on the side of the truck OPPOSITE to traffic flow; and cover and secure the load with a tarp while transporting.

Exam tip: the 10 cm, or 4 in., definition of "brush" is a likely test fact. Don't confuse it with the 2.5 cm, or 1 in., pruner cut limit from Rule 800. So to be clear: 2.5 cm, or 1 in., is the maximum diameter for pruner cuts; and 10 cm, or 4 in., is the maximum diameter to be classified as "brush" for hauling.

Rule 1103, Work on Customer Premises.

Principles: good housekeeping equals good public relations. The supervisor must ensure a safe work environment for both workers AND the general public.

Cut wood disposal: remove piled wood the same day it is cut; offer cut timber to property owners for personal use; and if the owner doesn't want it, dispose of it per company policy.

Public safety on premises: use barricades, warning signs, and common courtesy to warn the public of hazards. Hazards include falling limbs, chipper exhaust, chainsaw operation, and so on. Utilize ground support to maintain a safe work zone.

Rule 1104, Tool Clean Up.

Inspect tools and equipment and take precautions at the end of the work shift, when changing locations, and when not in use.

Chainsaws, 7-Step Cleanup: allow the saw to cool before working on or storing it; wipe to remove oil, sawdust, and so on; touch up the cutting chain with the proper file, using eye and hand protection; visually inspect the bar; cover the saw blade with the chainsaw guard; secure the saw on the vehicle while in transit; and store saws in a well-ventilated area.

Hand Saws, 5-Step Cleanup: clean off tree sap with an approved cleaner; inspect for broken teeth and missing handle bolts; touch up the cutting teeth with the proper file; check the sheath for missing rivets or worn stitching; and store the saw in an approved sheath, also called a scabbard.

Pruners, 6-Step Cleanup: inspect for damage or loose fittings; remove material such as tree paint with an approved cleaner; inspect the rope and pulley; clean the insulated insert with an approved cleaner; ensure the pruner head is hooded; and store in a container or secure in a tool rack.

Cross-reference: approved cleaner per Rule 302 number 3 is isopropyl alcohol. Spot clean with petroleum distillate, for example Varsol, then wash with mild detergent and water, rinse, and towel dry.

Clothing, 3-Step Cleanup: discard contaminated clothing if cleaning won't decontaminate it; clean neoprene gloves, aprons, and so on with mild soap and warm water; and discard breathing apparatus cartridges when spent or clogged.

Note: when using chemicals, always check for proper labelling and safe handling procedures.

Section XI key facts to memorize: chipper PPE is face, eye, ear, hand, head, and foot, with face being added versus general PPE; standing position when feeding is off to either side of the feed table, NEVER directly behind; best-practice side is the curbside to avoid traffic; pushing brush requires a push stick or brush, never hands or feet; kickback risk is highest in dead wood; traffic vest type at a chipper is the tear-away type; wood chip respiratory hazard begins after 2 days and can cause nausea and headaches, requiring a respirator in the enclosed dump box; best disposal practice is to unload chips the same day; wedge locking bolt check for the first 2 days requires checking before starting and after the first 5 minutes of chipping; wedge locking bolt ongoing check is weekly before starting until the next blade change; trailer coupling means back

the vehicle to the chipper, never push the chipper to the vehicle; trailer safety chains are crossed beneath the tongue; brush definition is limbs under 10 cm, or 4 in., in diameter; pruner cut limit versus brush definition is 2.5 cm, or 1 in., for pruner cuts, which is a different measurement; brush truck loading side is opposite to traffic flow; brush load securing requires a tarp that is covered and secured; stump grinder pass size is small incremental passes, never large; if the operator leaves the stump grinder, work stops, machine is stopped, and key is removed; customer wood disposal requires same day removal and offering it to the property owner first; chainsaw storage requires it to be cool, covered with guard, and in a well-ventilated area; and the approved pole pruner cleaner is isopropyl alcohol per Rule 302.

And that completes Chapter 1, Line Clearing Operations, all eleven sections, from the foundational requirements of Section I through the clean-up procedures of Section XI. Review the key facts at the end of each section regularly, and pay particular attention to any topic marked critical, because those are the rules where failure to comply can cause serious injury or death, and they are the most likely to appear on the exam.