Small Engine and Chain Saw Safety

Rick Bryan’s presentation on safety in the maintenance building was not only informative but potentially life altering depending on whether or not one paid attention. The presentation started off with five important steps that should be done before ever starting a job in case of an emergency. The first is designating a person to get help as well as take a head count. The second is designating someone to be first aid of CPR in order to eliminate hesitation in an emergency. Third check and make sure you have a first aid kit and all the necessary components. Fourth know your allergies and those of your coworkers and plan accordingly. Fifth make sure you have a fire extinguisher that is good to go showing the green sign. The reasons that most accidents occur are because of minors, alcohol and drugs, fatigue, and failure to read the owner’s manual. Rick then informed us on the importance of body mechanics when using a chain saw how the saw should be positioned at your core. He then went over the five important pieces of safety equipment that included: helmet and face shield, ear protection, upper body and hand protection, leg protection with chaps, and foot protection with the steel toed boots. There were then several examples given of what happens when the following were not used.
Safety & Maintenance Seminar

Ohio Safety Congress & Expo
Instructor: Rick Bryan
Date: March 2009

STIHL®

What we’ll cover today...

• History of Stihl
• Protective Clothing
• Safety Features of Chain Saws
• Starting Procedures
• Safe Operating Procedures

Quite often we ask ourselves hard-to-answer questions, like, “What is a sonofabitch?”

And we wax philosophic with metaphysical postulations, incomplete aphorisms and inconsistent sophisms that make one more and more sure that the only true thing is that a picture is worth a thousand words.

In this photo, the guy on the right is a member of a bomb squad in midst of a deactivation. The guy behind him, well, he’s a sonofabitch.
Summary of Course

The class will enable everyone to:

- Safely start and operate a chain saw.
- Improve productivity and increase production.
- Reduce injuries and accidents - decrease insurance rates, workmen’s compensation, hospital bills and down time.
Job Brief
Follow these points before starting work

1. Call for help/ Head Count.
   Designate person to call for help.
   Make sure to have proper numbers & location.
   Park last vehicle facing out with keys in location that everyone is aware of.
2. Designate First Aid CPR Person.
3. First Aid Kit - location and contents!
5. ID Fire Extinguisher and check for green indication.

Andreas Stihl
“Founder” - 1926
Germany
USA
Switzerland
Brazil
China

In 1926, the mechanical engineer Andreas Stihl, the man who later came to be known as the “father of chainsaws”, laid the foundation for the world company STIHL with his idea of a mobile chainsaw

Stihl
Invented Safety!

1926 The First Electric Chain Saw
1934 Automatic Chain Oiler
1950 The First One Man Chain Saw
1964 First Anti-Vibration System
1968 Stihl Electronic Ignition System

1972 Manually Activated Chain Break
1972 Stihl Throttle Trigger Interlock
1976 Single-Lever Master Control™
1982 Stihl Quickstop™, Inertia Chain Brake
1991 ElastoStart™ Starter Grip
1995 Stihl 023L, The World's Quietest Chain Saw
1997 036QS, The First Chain Saw with a Triple-Activated Chain Brake

**Stihl 036QS**

**Stihl continues to develop safety features**

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**Safety Basics**

- Minors
- Alcohol & Drugs
- Fatigue
- Read Owners Manual

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**Head & Face Protection**

- Limit use to 3,500 hours or 5 years of intermittent use
- Face shields & visors are considered secondary protection - always wear safety glasses behind screen

3,418 yearly injuries - 8.1%

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**Personal Protective Equipment (PPE)**

- Head injuries 25%
- Arm & hand 9.5%
- Lower Body 0.5%
- Legs 14.0%
- Feet 100%

Head & Face Protection:

- Head injuries 25%
- Face shields & visors are considered secondary protection - always wear safety glasses behind screen

3,418 yearly injuries - 8.1%
Ear Protection

- Noise induced hearing loss is the #1 occupational injury
- Hearing loss develops over a long period (5-15yrs)
- Level of hazard=85 dBA
- Poor comfort = poor utilization

OSHA Required

Upper Body & Hand Protection

Upper Body:
2,141 yearly injuries
5.1%

Hand:
17,994 yearly injuries
42.6%

Leg Protection

OSHA Required

16,345 yearly injuries - 38.7%

Interwoven Fibers Designed To Rip Apart...
Pulls into Sprocket to Clog Chain.

Foot Protection

- OSHA Required
- Red Line on Boots to determine Safety Boots
- Steel Toed
- Leather or Rubber above ankle
- For more information call OSHA

1-800-582-1708

2,885 yearly injuries - 6.8%
Safety Features

1. Throttle Interlock
   - Ergonomic handle bar
   - Hand guard
   - Low Kickback Chain

   - Anti-vib mounts
   - Rear hand guard

2. Quickstop™ inertia chain brake

3. Reactive Forces of the Saw Bar

   3. Kickback

   4. Push
   5. Pull

   Inertia-Activated Chain Brake

Safe Starting Procedures

1. Visually inspect saw
2. 10 feet or more from fuel can
3. Chain Brake ON
4. Starting Stance
5. Firm grip with thumbs & fingers encircling saw handles
   - Check Operation of Chain Brake
   - Unsafe Methods

How to Start a STIHL® Chain Saw
Rules For Chopping Your Own Wood

1. Never park down hill of a tree you are cutting.
2. When in doubt, park tricer as far from the tree as the tree is tall.
3. Just because you live within driving distance of a forest, does not make you a Lumber Jack.
4. Always use the neighbors truck.
**Saw Chain Cutters**

**Hard Chromium Cutters**
- Cutter made from high quality steel alloys
- More durable & stays sharper longer
- Cutters sharpened BEFORE assembly

**Parts of the Cutter**
1. Depth Guage
2. Working Corner
3. Chisel Angle
4. Top Plate
5. Side Plate

**Rapid-Micro RM**
- Great Fire Department Chain in 3/8 pitch
- Ideal for general use including professional
- Round cutter shape stays sharper
- Easy to maintain

**Rapid-Duro RD**
- Good Fire Department Chain
- Special carbide tipped cutter
- Best for abrasive cutting conditions
- Increased durability and stays sharp

**Rapid-Super RS**
- Best for higher power saws
- Fast cutting for professionals and those with special needs
- Square corner cutter
Picco-Micro PM
Picco-Micro Mini PMN

• All-round low profile chain for small saws
• Smooth cutting
• EXCLUSIVE PMN Narrow kerf chain

How A Cutter Works

There are three basic angles which determine how efficiently your chain will cut.

TOP PLATE ANGLE
The top horizontal angle controls the kerf or width of cut the cutter makes in the wood, the angle being increase, the width of cut or kerf being greater.

TOP PLATE CHISEL ANGLE
The top plate chisel angle feeds the cutter into the wood. This splits the cross grain of the wood fibers.

SIDE PLATE CUTTING SURFACE
This is the vertical surface of the cutter, which forms the side cutting edge, of the cutter. This joins the top plate cutting surface to form the working corner.

WORKING CORNER
The top and side plates join, forming the working corner, this severs the cross grain of the wood.

Cutter has too much back slope
Side plate should be 90 degree

This puts too much hook in cutter

90 degree

The cutter becomes smaller as it is filed back

When filed back the cutter also gets smaller on the side as well.

The high point of the cutter and the sharp edge must be together

High point

Sharp edge

Damage to the side of the cutter must be removed, this will put the high point and the sharp edge together

High point

Sharp edge

Filling depth gauges. Check the depth gauge for the correct height every time you sharpen the cutters. If the depth gauge sticks up above the filing gauge, first file it level with a flat file. Then make sure that all the other depth gauges are filed to the same height. Finally, slightly file each leading edge to round the corner back to its original shape.

Use a depth gauge tool for accurate measurement and filing. These tools, to fit different gauges of saw chain, are available from your Stihl dealer.
Adjusting Depth of Cut

The depth of cut on a cutter tooth is adjusted by lowering the depth gauge lower than the cutters top cutting edge.

When the cutter bites into the wood it is tilted and lifted up, shivering the shaving.

The extent the cutter tilts is determined by the depth gauge adjustment.

The depth gauges must be progressively lowered as the cutters are filed back.

Perform a lubrication checkup:
Check the oil level every time you refuel the engine.
To check chain lubrication before and during cutting, position the bar nose over a light background (tree stump, sawdust, etc.), and run the engine at half throttle, making sure it throws out an increasing trace of oil. Be careful not to allow the tip of the bar to contact any surface. If you do, kickback may result.
Keep the oil inlet holes and bar groove open and free from dirt.

Saw Chain
Location: Cutters
Condition: Damaged depth gauges and cutting edges
Causes: Contact with solid objects, e.g. stone, metal

Saw Chain
Location: Tie strap and drive link
Condition: Severe wear
Causes:
• Abrasive dirt
• Excessive feed pressure
• Drive link worn thin, oil channel non-existent in some cases

Saw Chain
Location: Rivets
Condition: Damaged rivet head
Causes: Riveting not performed properly in workshop
Consequences: Broken cutters and tie straps

Guide Bars

Saw Chain
Location: Rivets
Condition: Damaged rivet head
Causes: Riveting not performed properly in workshop
Consequences: Broken cutters and tie straps
**Proper Chain Tension**

Solid bars are laser cut for perfect contours to minimize frictional losses for extended bar life.

**Stihl Guide Bars have induction-hardened rails for long life...**

Rails will appear blued

**Guide Bar**
- Location: Underside of bar, just behind nose
- Condition: Battered bar rails - rippled appearance
- Causes: Saw chain run too slack over an extended period has knocked against rails on undersides of bar

**VIBRATION CHAIN SAW**

**Worn Sprocket**
- 7-tooth sprocket running @ 10,000 rpm = 70,000 hits per minute (vibrations)
- 1 bar = 2 sprockets = 12 chains
Fuel Quality

Always use 50:1 Stihl Oil

Regardless of equipment age

AIR INTAKE

Air needs to be filtered

Use of Circular Saw Blades on Stihl Cutquik

- Forbidden!! The use of toothed blades on any nature are not authorized for use on Stihl Cutquik.
- Use of circular saw blades, including carbide tipped blades, rescue blades, wood cutting will greatly increase the risk of severe personal injury.
- OSHA authorities have determined that the use of carbide-tipped and other saw blades on cut-off machines without hinged or telescopic guards is in violation.
- Note the slots or segments on diamond wheels are not cutting teeth. Diamond wheels continue to be authorized for use on Stihl Cutquiks.

Open-Face Felling

Five Information Points Prior To Felling

1. Hazards
2. Good side/Bad side
3. Escape Route
4. Hinge
   - Length
   - Thickness
5. Cutting Techniques
Hazards
- Dead stubs, widow makers, forked trees, vines, wind, snow load and other hazards common to your area must be evaluated and identified

Good Side/Bad Side
- **Bad Side:** The side of the tree that has greater lean and weight, the side of the tree that we want to start on.
- **Good Side:** Always finish on the good side of the tree.

Escape Route
- Always determine and clear an escape route prior to cutting.
- 45 degree angle from direction of felling
- 10-15ft. if possible
- Never behind the tree
- Always watch tree as it is falling.

The Open-Face Notch
The function of the notch is to allow the tree to fall without breaking the hinge prematurely.
- Notches less than 70% close-up before the tree has fallen even 1/2 way to the ground. Stress is put on the hinge causing fiber pull, splitting of the butt log or barber chairing.

The Open-Face Notch
- 70-90 degrees is a proper notch.
- Always start with the top cut. Work downward and slightly inward until the length of the notch is approx. 20% into the tree.
- Finish the notch by making the second cut slightly upward or parallel to the ground.

The Open-Face Notch
**Advantages to Top Cut First**
- Easily Establish Hinge Length
- Can look into top cut and actually see second cut.
- Eliminates by-pass which is hazardous.
- Allows for use of sight-line found on all professional chain saws.
The Hinge

The Hinge is the single most important part of the felling cut. It controls:
- Felling direction
- Reduces the chance of hang-ups
- Dramatically increases production.

Hinge Thickness should be the same all the way across the stump.

Safe Felling Techniques

Advanced Tree Felling

The Back Cut

Small Trees and Trees with little or no Forward Lean: Make open face notch and cut straight in from back. Back cut should be at the exact same level of the face cut.

Trees with backward or forward lean

It is recommended to use the BORE or PLUNGE cut to establish the hinge on these trees.

Trees With Forward Lean

Good Side/Bad Side: utilize the bad side if tree is bigger than our bar length.
- Bore bad side first, work your way to back of tree
- Bore cut good side of tree
- Release tree by cutting the strap of wood in back of the tree.

Trees with Forward Lean

Advanced Tree Felling
Trees With Back Lean

**Tree < Bar Length**

- Use wedge
  - Face cut tree
  - Bore cut through back
  - Leave strap or leg in back
  - Place wedge in back
  - Remove back leg
  - Set saw away from tree
  - Feed wedge in until tree falls

**Tree > Bar Length**

- Use wedge
  - Bore cut bad side
  - Place wedge in this cut
  - Bore cut good side-releasing tree
  - Set saw down
  - Feed wedge in

There are 240 different ways to cut down a tree.

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**Trees With Back Lean**

- Preventing Fiber Pull & Splitting
  - Remove last 6-10 years of growth by making side cuts into hinge to reduce fiber pull.
  - Bore cut heart of tree out with chain saw creating the three leg system.
  - Remove the last leg to release the tree.

**Limbing**

1. Overhead Hazards
2. Spring Poles
3. Butt Movement forward (creates back pressure on limbs)
4. Butt twist (creates sideways pressure on limbs).
5. Butt off the ground (creates tension on the tree stem).

**Safe Operating Procedures**

- **Beware of wood under strain:**
  - Risk of pinching!
  - Always start relieving cut (1) at compression side (A)
  - Then cut (2) at tension side
  - If saw pinches, stop the engine and remove saw from log
Limbing

**Limb Lock:** Back and Sideways pressure
The purpose is to prevent the limb from kicking out and injuring the operator.
☆ Make the first cut into the compression side of the limb first.
☆ Make second cut on stress side by-passing all of the fiber.

![Limb Lock Diagram](image)

**Top Lock:** Twisting of trees and butts off the ground can be handled safely with the Top Lock.
☆ First cut is on compression side of tree.
☆ Second cut is made on the tension side of the tree.
☆ Top cut is made closer to the top of tree and bottom cut is made closer to the bottom of tree. We must by-pass all of the fiber in order for the top to break completely off.

![Top Lock Diagram](image)

**Tongue and Groove:**
☆ Bore cut center of tree
☆ Make top and bottom cuts to either top or bottom side of tree depending on pressure
☆ Severe fiber by by-passing bore cut from top and bottom.

![Tongue and Groove Diagram](image)

**Spring Poles**
We want to release the spring pole at its maximum point of tension slowly. In order to find the max. point of tension we can look at the diagram below:

![Spring Poles Diagram](image)

At this point we have two options
Spring Poles
Option 2: Release the pressure from the inside of the max tension point. Standing at a 90 degree angle we carefully shave the inside of the pole off until it starts to release on its own. Then we back up and let it do its work.

Safe Operating Procedures

1. Do not overreach or cut above shoulder height
2. Do not operate a chain saw with one hand
3. Do not operate a chain saw in a tree unless you have been specifically trained to do so
4. Engage the chain brake when walking with the saw
5. Avoid Fatigue

Read your Chain Saw Safety Manual!
And Your Owner’s Manual

The Power of Five
Knowledge can be passed along, person to person, generation to generation, but wisdom can never be communicated. It has to be experienced.

Job Brief

1. Call for Help/Exit.
2. First Aid/CPR Person.
3. First Aid Kit.
4. Allergies to Medications/Bees.
5. Fire Extinguishers.

Cutter

1. Depth Gauge.
2. Cutting Corner.
3. Top Plate.
4. Side Plate.
5. Chisel Angle.

Limbing Hazards

1. Overhead Hazards.
2. Springpoles.
3. Butt Twist.
5. Butt off Ground.

PPE

1. Foot Protection.
2. Leg Protection.
3. Eye Protection.
4. Ear Protection.
5. Head Protection.

Carburetor

1. Clean air filter.
2. Balance settings.
3. Rollover test.
5. Wide-open throttle. (WOT)

Felling

1. Hazards.
2. Good-side/bad-side.
3. Escape route.
4. Hinge Thickness.

Chainsaw*
1. Kickback.
2. Push-back.
3. Pull-in.
4. Chain Brake.
5. Throttle Interlock.

Starting
1. Inspect saw. (loose chain, etc.)
2. Use name brand fuel. 89+
3. Ten feet from fuel can.
4. Chain brake on.
5. Saw secured. (ground or leg lock)

Operating
1. Use chain brake two-step rule.
2. Thumbs under handles.
3. Never one handed or above shoulder.
4. Operate at WOT.
5. Avoid fatigue.

Safety
1. Pride.
2. Professionalism.
3. Teamwork.
4. Respect.
5. Knowledge.