

## **INTRODUCTION TO BLACKSMITHING - General Handout Summer 2008**

### **SAFETY**

**EYES:** minimum polycarbonate lens with side shields,  
a dark lens should be worn during forge welding, recommend use of #4 lens  
full face shield should be worn for grinding and wire brush

**HIGHLY RECOMMEND** the use of special 'Didymium' lenses for extended use  
available through : Nortell Manufacturing / 2040 Ellesmere Rd unit 18 / Scarborough M1H 3B6 /  
(416) 4383325. plastic frames about \$65 / metal about \$100

These lenses ground to your eyeglass prescription are available from: Hussein Rahal / Eyeglass  
World / 5633 Younge St / North York M2M 3S9 / (416) 2248408

[www.jodelglass.com/shopsite\\_sc/store/html/page26.html](http://www.jodelglass.com/shopsite_sc/store/html/page26.html)  
has the best selection of types. Ships orders to Canada, uses Paypal

[www.glassmart.com/didymium.asp](http://www.glassmart.com/didymium.asp)  
is the best price. Ships to Canada but only via credit card. I normally order from them myself. Their  
sales guys have been extremely fast on any questions. The package arrived quickly and in good  
order.

**FUMES:** excellent ventilation required to reduce exposure to sulfur dioxide fumes, ash, dust  
although a good passive system is acceptable , a fan equipped, forced draw system is recommended

**HEARING:** recommend the use of at least insert type ear plug in lead (right) ear.

**JOINTS:** to avoid possible joint and tendon damage, always warm up, stop when tired, work loose,  
avoid or 'break up' heavy work  
for extended work consider buying a forearm brace (for tendonitis)  
remember that the hand need only grip tight enough to control the hammer's angle

**OTHER:** clothing should be natural fibers, leather apron should be worn  
boots should be steel toe, pants worn over tops  
use of gloves is not generally recommended, kevlar ideal for punch work & welding  
care should be taken to maintain body fluid levels

### **MATERIALS**

**MILD STEEL:** main material used in forging operations  
available in a wide assortment of round, square, flat, octagonal, sizes  
suggest use of 'hot rolled' stock (cost, uniform finish, rust resistance)  
most commonly used: 1/4, 3/8, 1/2 in square and round, 1/8 x 1/2, 1/8 x 3/4 flat  
see 'sources' section

**CARBON STEEL:** straight high carbon steel (rather than alloys) is recommended for use in knives, chisels, punches  
sources include files, coil and leaf springs remember that recycled materials often have hidden flaws!  
these materials will require extra care during forging followed by proper heat treating

**ALLOY STEELS:** also known as 'tool steels' come in a huge assortment of alloy contents for specialized purposes  
alloy contents create the need for extreme care during forging and heat treating, generally not recommended for forging operations  
see 'sources' section

**WROUGHT IRON:** a type of metal that is essentially pure elemental iron, with special processing has a fibrous texture and flexibility that make it ideal for forging  
has not been in commercial production in North America for over 75 years  
available as scrap only: old wagon tires, farm machines, windmill towers  
distinguished by fibers that show when cracked apart, red ball sparks on grinding

**NOTE:** Modern commercial steels often have rust resistant coatings applied at the mill, some of which are extremely poisonous if allowed to remain in open cuts.

**COAL:** smithing coal is bituminous coal, averaging from pea to walnut size, containing 10-15% dust (or fines) and as free of sulfur as possible.  
anthracite (home heating coal) can be used, but it is tricky to control the fire and it requires a forced air electric blower on the forge, will give short duration fires

hardwood charcoal can be used, but will require a special forge set up (side blast); it is a clean fire, but produces high (welding) temperatures only with difficulty, and will require about 5 times the volume of fuel  
see 'sources' section

## TOOLS

**ANVIL:** suggest 100 lb minimum, 150 lb for any production work  
when struck, the tone should be high, sharp, clean, and persistent  
face should be flat, free of gouges, edges not chipped, no cracks in hardy hole area  
'old is better', best is a wrought anvil, look for marks cut in giving weight in hundred weight (112 lbs), quarters (28 lbs) and lbs, fairly thick body, tong slots on body, the name 'Peter Wright' / 'Mouse Hole', 'Sheffield', or English made  
take care with cast anvils, quality can vary widely (raised letters, mold seams, weight in kilos)  
current fair price is around \$1.75 to \$2.00 per lb  
always buy the best anvil you can find and afford remember you can always trade up!  
mount your anvil on a section of stump, best is sunk into ground several feet  
on concrete suggest use of barrel filled with sand, mount anvil on 1" plywood disk that floats on top  
secure to stump with clips, blocks or chain

**FORGE:** in its simplest form, the forge is a heavy metal box with a hole in the bottom to allow air into the fire  
for professional use, a cast iron fire box with integral chip breaker, mounted in a large table

old portable forges, with cast iron bodies are suitable for the hobbyist, current fair price \$100  
a small forge can be built using an old truck brake drum and a few lengths of threaded steel pipe

**BLOWER:** there are three basic systems possible

traditional bag bellows has large size, can be home built, takes practice to control but is capable of delivering large volumes of air yet at the same time is quite capable of subtle changes in air flow.

rotary fan is compact, easy to use, however has a considerable 'hang time' of air delivery, current fair price \$75 to \$100

electric blower with a rheostat controller can be rigged up cheaply from an old vacuum cleaner or squirrel cage blower and a light dimmer switch, gives subtle control of air, will allow you to heat metal with your back turned

**HAMMERS:** a large smiths shop will have dozens of different types, sizes and patterns of hammers suggest a minimum of 750 gm and 1000 gm crosspeen and 500 gm ballpeen  
remember that a \$50 hammer is not always 10 times better than a \$5 one  
the 'China' hammers available at flea markets for \$5 to \$10 are acceptable quality for the beginner and for reforging into special use hammers  
most new hammers will have to have their faces reground to round off the edges, handles reduced in thickness and thinned out near the head to reduce shock, shortened to give correct balance

**TONGS:** tongs as well come in a wide assortment of styles, all with specialized functions  
first required are simple flat jaw tongs, spaced to hold small flat and bar stock  
although you should be able to make any tongs you require, there are still available from antique and junk sales, current fair price \$5 to \$10  
watch out for cracks in the area where the jaws bend to form the pivot surface  
remember that any solid pair of tongs can be reforged to a new useful shape

**ANVIL TOOLS:** generally too much work to forge by one man, so buy old tools where possible  
Cutoff Hardie steel hot cutting wedge, can be made from a hatchet head mounted on a shaft  
Bic or Beak Iron small 'horn', for decorative curls  
Shouldering tool used for forming curved (or square) shoulders  
Fullers used for forming grooves, consist of a bottom held in the anvil, and a top mounted with a handle

**REFERENCES:**

The Edge of the Anvil Jack Andrews, Rodale Press, Emmaus Pa  
Probably the best all round guide for the beginner, covers tools, set up, practical exercises, metallurgy

Decorative and Sculptural Ironwork Donna Meilach, Crown Publishers, New York  
A good survey of the current art metalsmith movement, has stepbystep photos of various techniques

Blacksmith's and Farriers Tools H. Bradley Smith, Shelburne Museum Inc, Shelburne Vt  
An excellent reference for identifying tools, has good information of the history of smithing

The Blacksmith, Ironworker and Farrier Aldren Watson, W. W. Norton, New York  
A good section on the history of Iron, especially in the USA, with an excellent section detailing the construction of a full size 1800's style forge.

Practical Blacksmithing M. T. Richardson, Weathervane Books, New York  
A reprint of a 1890's trade magazine for professional smiths, fairly heavy going for the beginner, but a great source for period methods for the experienced smith.

An Introduction to Blacksmithing Darrell Markewitz, the Wareham Forge (DVD)  
Covers equipment, setting a fire and basic forming exercises.

#### SOURCES:

Coal : Schaner Fuel, : 2282 Floradale Rd, Floradale ON N0B 1V0 : (519) 6600721 :  
inquires@thak.ca / www.thak.ca

Robb Martin has assumed sales of coal. Good idea to call ahead. Cost (July 2008) is roughly \$30 per 75 lb bag. Only good source for coal in this end of Canada. It also may prove possible to have a single bag ordered through and delivered to your local Home Hardware.

Steel : What source you use for steel will largely depend on your location and the volume you buy. Many local steel fabrication and welding shops will sell full rods / sheets over the counter. Large suppliers usually have \$500 \$1000 minimum orders.

the Metal Supermarket, various locations (check your local directory) Mississauga, Kitchener.  
Will sell you small quantities of mild steel bar, cut to order. Various tool steels available by the lb. Prices about 20% over industrial, but well worth it if you only need a few feet of one size. No delivery.

Kruger Custom Steel : 2045 16th Ave.East, Owen Sound, Ont, (519) 3717930  
This is the local supplier I use in the Grey / Bruce region. A medium sized fabrication shop that keeps a good selection of sizes and profiles. Generally they are competitive with the larger industrial suppliers but with excellent personal service (which I sure appreciate!).

#### Tools

Atlas Machinery Supply, 233 Queen St W, Toronto, 4165983553  
A good selection of small tools, quality from 'China' hammers to Makita power tools.

Kayne & Son Custom Hardware Inc : 100 Daniel Ridge Road, Candler, NC 28715, (828) 6678868 /  
www.kayneandson.com  
Good selection and prices on hammers, tongs, hardies and other small tools. The hammers especially are excellent quality (I have several) and competitive prices.

Centaur Forge, bx 340, 117 N. Spring St, Burlington Wis, 4147639175 A complete selection of blacksmithing & farriers tools, books. New cast iron fire pots about \$100 US. Send for the catalogue.

John Newman : 536 Upper Wentworth St, Hamilton, (905) 3188551

John has been casting swage blocks, small cone mandrels and most importantly rectangular fire pots. His price on fire pots is about \$275 Canadian better than Centaurs. These are very heavy castings look here for an image of the outside and the inside.

David Robertson : Pinkerton, ON, (519)3662334 / [www.artistblacksmith.com](http://www.artistblacksmith.com)

David is an old friend we have worked on an number of projects together over the last two decades. He runs a series of courses (similar to those I offer) and we teach two programs together. He builds a line of simple and economical GAS FORGES and also an excellent small AIR HAMMER. (I have the first production model in my shop.)

the Wareham Forge, RR 2, Proton Stn, 5199239219

Used blacksmithing equipment by chance to former students.

## COURSES

More extensive training programs are available at the Wareham Forge:

'Basic Blacksmithing' is an 18 hour hands on course held in early April, June, September each year. Course fee is \$300, includes all materials, each session is limited to four students.

Intermediate Blacksmithing is a 16 hour course held in July and October each year (alternates with Bladesmithing). Course fee is \$300, includes all materials, each session is limited to four students.

Basic Bladesmithing is a 16 hour course held in July and October each year (alternates with Intermediate). Course fee is \$300, includes all materials, each session is limited to four students.

Introduction to Layered Steels is a 16 hour course held in May and October with the assistance of blacksmith David Robertson. Course fee is \$350, includes one completed 150 layer billet, and all materials, each session is limited to four students.

Introduction to Iron Smelting is a 16 hour course held in June each year. Course fee is \$375, includes all materials, each session is limited to four students.

Fundamentals of Blacksmithing is a special 40 hour / five day program held in July with the assistance of blacksmith David Robertson. Course fee is \$600, includes all materials and a text book or video, each session limited to six students.

For more information contact the Wareham Forge.

Hamlet of Wareham  
RR TWO Proton Station ON N0C 1L0  
(519) 9239219  
[courses@warehamforge.ca](mailto:courses@warehamforge.ca)  
[www.warehamforge.ca](http://www.warehamforge.ca)

## SELECTED INTERNET RESOURCES

Ron Reil's Plans for home built propane forges...

Seems to have dropped off the net! You will find a full discussion of his simple and effective designs on: Anvilfire and also by Brain Boorman  
[www.reill.net/design.shtml](http://www.reill.net/design.shtml)

Anvilfire' a large reference with discussions, FAQ, working tips. One of the first and largest resources on the net.

[www.anvilfire.com](http://www.anvilfire.com) '

'The Blacksmith's Virtual Junkyard', one of the oldest and largest Metalwork related discussion group, was closed down on Dec 31, 2004. A lot of the members moved over to the 'Virtual Hammer In' maintained on the ANVILFIRE site

[www.anvilfire.com/hammerin](http://www.anvilfire.com/hammerin)

The Artisan Blacksmith Association of North America. This organization supports members from hobbyist to professional artists. Explore the site for resources and contacts.

[www.abana.org](http://www.abana.org)

North Carolina chapter of ABANA, a lot of reference materials  
[sunsite.unc.edu/ncabana](http://sunsite.unc.edu/ncabana)

Ontario Artisan Blacksmith's Association

[www.ontarioblacksmiths.ca](http://www.ontarioblacksmiths.ca)

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the Wareham Forge

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