Welding & Oxyacetylene Cutting

Do You Know The Basics?

By Pat Norton

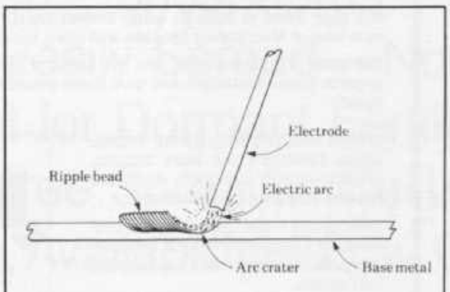
How much do you know about welding? How much do you know about oxyacetylene cutting? Do you know how to safely weld or to safely use an oxy cutting torch? Do you even think that course managers such as ourselves should "jump right in" when there's welding or cutting to be done, or should this be left to our mechanics and staff?

In this column I'll initially be talking about my past phobia with welding and/or cutting. Then I'll touch on the basics of welding - both electric arc and oxyacetylene and the basics of torch cutting. Lastly, I'll just remind everybody of the need for good, sound safety awareness when welding or cutting.

I used to be scared as hell of electric arc welding, not to mention firing up a cutting torch. Jim Love once recommended that I take a three credit welding course at the UW-Madison. Being a naive young student, I agreed to do this. I knew nothing about welding and figured that this course could help me increase my knowledge of this strange process. Taking that welding course ranks up there with my top three worst lifetime mistakes. My main memories are of strange terms like TIG, duty cycles, amperages, and MIG. (I always thought MIG referred to Soviet fighter jets!) My memories of welding lab are even worse. My electrode was either always sticking or waving harmlessly in the air, my helmet was never adjusted properly, I'd start sweating profusely, and I always imagined that my lab instructor was standing behind me saying to himself - "What is this kid doing in this class?" By the end of that class I never wanted to even look at a welding machine again. (Here! Take this! I don't want it! Get me out of here! AAAHHH!)

What I keep telling myself and my employees is that welding and cutting are not to be feared, not to be avoided. They both just take alot of practice. Don't let your mechanic do all the welding/cutting - once you get the hang of it, it's kind of fun. It's sort of like learning to operate a backhoe - fun once you learn how.

Electric arc welding, or simply arc welding, uses an electric spark created by electricity jumping across an air gap, or arc gap from the electrode, or rod, to the base metal to be welded. As electricity jumps across this gap, it creates heat which melts the base metal. The force of the arc creates a crater. Rod metal piles up at the back of the crater and cools in ripples (if you know what you're doing) to create the characteristic arc weld bead. Three variables must be properly controlled if you're going to have any chance of laying down a good bead:



Principle of the arc welder. Electricity flowing through the electrode held by the welder creates an arc as it leaps the air gap between the end of the electrode and the base metal.

1) **Angle of the electrode** - usually about 20° in the direction you want to travel.

2) **Arc gap** - the distance of the rod from the base metal should be equal to the diameter of the rod itself. If the rod is held too closely, a cold weld may result, causing the rod to stick to the metal. Holding the rod too far from the base metal causes too hot an arc due to voltage buildup, resulting in weld puddle splatter and poor control. The proper rod distance should result in a steady "frying noise" like bacon on a hot griddle.

3) **Forward movement speed** - too fast of forward movement doesn't allow much rod filler metal to be deposited, while too slow of forward movement makes the weld puddle too wide and results in burning right through the base metal.

My tendency is to always move the rod forward too fast - I get nervous and jumpy when the sparks start flying and go too fast. Slow the rod down and allow filler metal to be deposited.

There are recommended amperage ranges on any arc welding machine for each type of electrode. In general, higher amperage settings are required for thicker metals, while too low of amperage settings result in rod sticking and difficulty in striking your arc. If the amperage setting is too high, then rod and base metal will melt uncontrollably due to excessive heat buildup.

Electrode diameter has a great effect upon amperage setting. The larger the rod diameter, the greater the amperage passed through the electrode, and therefore the greater the amperage setting on the machine.

Electrodes are generally grouped into four classes:

1) **Fast-freeze group (Codes E6011, E6010)** - these are general purpose electrodes designed to give deep penetration with deposits that harden quickly. Quick freeze characteristic makes them good for overhead or vertical welding with minimal sag or drip. The E6011 and E6010 perform similarly, but if you have a simple AC welder use the E6011, not the E6010 (the flux coating on this one doesn't permit AC current use).

2) **Fill-freeze group (Codes E6012, E6013, E7014)** - produces a less penetrating arc than the fast-freeze group. Commonly used in DC straight polarity, which produces fast electrode melt and higher deposit rate. They do produce a slag covering which must be chipped off as the metal cools.

3) **Fast-fill group (Codes E6027, E6024)** - recognized mainly by the heavy iron powder flux coating the electrodes. Produce smooth beads and heavy slag deposits. Can be used in the flat down position only.

4) **Low-hydrogen group (Codes E7018, E7028)** - important where special strength is required. Produce maximum strength welds in problem steels.

Two other points to remember about electric arc welding:

1) Most welding machines will require 220 volt current and wiring in your shop. If you have only 110 volt current

(regular household current) you can get a limited amperage welding setup (up to about 90 amps). There will usually be a need for more amperage than 90 amps, either for thicker steels or for bigger electrodes.

2) Most of the steels that we encounter in our operations are easily welded. Cast iron can be welded, but requires special electrodes and special skills. Aluminums are usually brazed, I think, and in general thin metals can be pretty tricky and will need special practice.

In addition to electric arc welding, most of us are at least familiar with oxyacetylene torch cutting. The oxyacetylene cutting torch utilizes a central oxygen hole in the tip surrounded by smaller holes for the acetylene. The acetylene preheats the metal to 1200-1400° F, then a blast of pure oxygen (from the handoperated lever) actually burns* up, or oxidizes the metal. A shower of hot metal and sparks gets all over the workbench, the floor and possibly yourself. Use protective eyewear, welding gloves, and long-sleeved clothing when using either the cutting torch or the arc welder.

The torch tip is angled up to 90° for making a straight cut on heavy steel plate.

The steps in lighting an oxy torch are as follows:

1) Always use a striker, never a match or cigarette lighter.

2) Open the acetylene valve slightly (red hose), then strike a spark to ignite the torch. The acetylene will burn sooty black until the oxygen is adjusted.

3) Open the acetylene adjustment valve until only a small of sooty flame is left.

4) Open the oxygen adjustment valve (green hose) to change the flame from sooty orange to blue. Adjust until you have a distinct inner cone (the hottest point) as well as an outer cone.

Steps to shut down an oxyacetylene torch:

1) Close the acetylene adjustment valve, extinguishing the flame.

2) Close the oxygen adjustment valve.

3) Close both the oxygen and the acetylene cylinders.

4) Open and bleed both red and green lines through the torch, then close adjustment valves when pressure is bled off.

Cutting torch operating pressures should be at 5 psi for acetylene and 35 psi for oxygen with your hose lines open. These operating pressures must be preset through the use of pressure regulating valves on each of your gas cylinders. These pressure settings are recommended for steel from an eighth to a half inch in thickness, which is what most of us commonly use. Steel is easily cut with the cutting torch, but other metals can present a problem. Aluminum, stainless steel, and copper are much more difficult and are usually cut by a different procedure (use a giant hacksaw, right?).

In closing, remember these common sense points:

1) Thin metals can simply be butted together and welded, while thicker metals require beveling or V-ing to allow maximum weld and heat penetration.

2) Identify the metal to be welded and make sure it is clean before it's welded.

3) Always remove the slag either with a chipping hammer or a wire brush.

4) Don't be afraid of either welding or oxyacetylene cutting, but do have a healthy respect for the danger involved. Use safety clothing and especially safety eyewear.

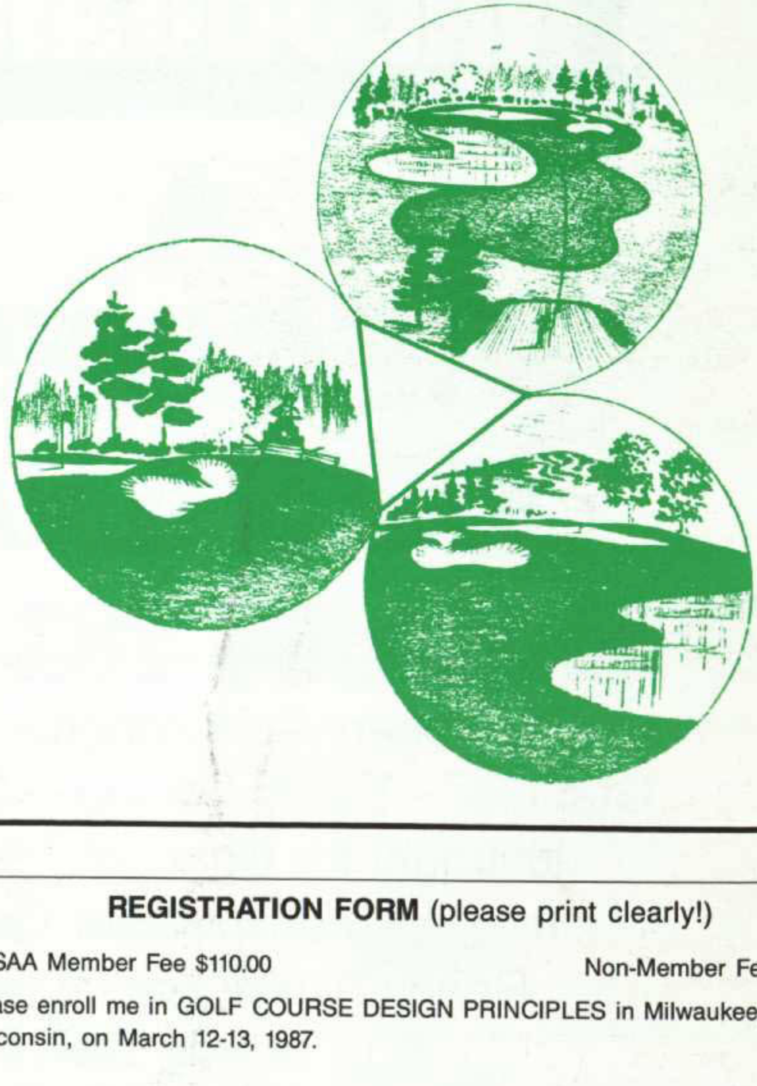
Welding and cutting require alot of practice, so "jump right in" and get to it!

WGCSA to Co-Sponsor "Golf Course Design Principles" Seminar in March

Presented by the Wisconsin Golf Course Superintendents Association and the Golf Course Superintendents Association of America, renowned golf course architects Geoffrey S. Cornish and Robert Muir Graves will teach a basic familiarization course of the art and science of golf course architecture. History, design and layout, site selection, master planning, redesign and restoration, construction management and the relationship among architect, superintendent, golf professional and owner are discussed. In a drawing workshop participants route their own 18-hole course under the supervision of the instructors. Emphasis is on the superintendents' comprehension of the philosophy and objectives of the golf course architect while the architect must recognize that the enduring integrity of the golf course lies in the superintendents' hands. This seminar is considered a prerequisite to the "Golf Course Construction and Project Management" seminar also offered by the GCSAA.

The seminar is scheduled for March 12 and 13, 1987 at the Holiday Inn West in Milwaukee. The seminar starts at 8:00 a.m. each day and concludes at 5:00 p.m. Included in the registration fee is a banquet luncheon on both Thursday and Friday, along with take-home materials. Successful completion of the seminar will earn participants two Continuing Education Units and a Certificate of Achievement from GCSAA. Space is limited and registrations will be confirmed on a first-come, first-served basis. Refunds will be allowed only for WRITTEN cancellations received at GCSAA Headquarters two weeks in advance of the seminar. Registrants are responsible for their own arrangements for overnight accommodations. The Holiday Inn West has offered a special rate of $50 for a single or double to participants of "Golf Course Design Principles". A form documenting registration in the seminar will be sent with your confirmation letter, with which you may identify yourself as eligible for the special rate.

Don't miss this opportunity! Complete the form, include your check or credit card information and mail it to the GCSAA.



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Flowers on the Golf Course: A Formula for Success in 1987

by Dr. Lois C. Berg

In recent years there has been a tremendous increase in the use of annual flowers on golf courses. It started with a few impatiens near the parking lot and some hanging baskets near the club house, and eventually expanded to flower beds on the course itself. Now that flowers are a standard feature of so many golf courses, it's time to develop a formula for success. There will always be room for experimentation, but your experiments will turn into triumphs more often if you develop a systematic approach.

What is the formula for success with annual flowers? It's a combination of (1) proper plant selection and (2) an appropriate input of labor.

Plant Selection

Many factors must be considered in selecting flowers. First, before looking at the plants themselves, evaluate the environment. You will have more success with any plant if you choose an environment that can meet the needs of the plant, rather than trying to modify the existing environment to meet those needs.

After you look at the soil, water, exposure, etc., of the environment, draw up a list of plants that might be suitable. For inspiration, consider all sources: your own experience, gardening publications and seed catalogs, suggestions from colleagues, and flowers you've seen on other golf courses, in public gardens and at trial gardens.

Next, eliminate any plants from your list that pose difficult insect, disease or cultural problems. For example, if you have had problems with powdery mildew on zinnias in the past, you can probably expect to have the same problem again.

Be sure to consider the maintenance requirements of flowers. Flowers should add beauty to the golf course without adding a maintenance problem for your grounds crew. Geraniums can be quite spectacular, but only if dead flowers are removed on a regular basis to promote rebloom. Vinca, on the other hand, blooms all season without such maintenance. Other labor required for annuals includes pruning, staking and application of pesticides.

One of the advantages of annual flowers (as opposed to other flowering plants like perennials and shrubs) is that annuals can provide spectacular color for the entire season. But not all annuals have that quality. Pansies stop flowering in the heat of midsummer, sweet alyssum produces its best flowers in the coolness of spring and fall, and dahlias don't start to flower until midsummer. On the other hand, marigolds, geraniums and vinca will produce flowers from early summer until frost. Don't limit your expectation of quality to the flowers; consider the entire plant. Zinnias may have beautiful flowers all season, but in late summer the foliage may detract from the beauty of the flowers if infested with powdery mildew.

Consider the uniformity of annuals — uniformity of size, form, color and overall quality. Individual plants of some strains of French marigolds are virtually identical. Individual plants of Kochia, however, may vary in size at maturity by more than 100%.

One last consideration in plant selection is availability. If you have a greenhouse where you can grow your own bedding plants, this is rarely a problem. One seed company or another will carry the cultivar you want. If you contract with a greenhouse operator to supply your annuals, availability is a minor problem. If given enough advance notice, most growers will try to supply the cultivars you want.

Availability can, however, be a major problem if you wait until the spring bedding plant season to select annuals. Greenhouse growers produce a rather limited number of cultivars, mostly those with shorter production times and longer shelf life during the spring sales period. Those may or may not be the cultivars that would give the best season-long performance on the golf course. In addition, some annuals do not sell well for one reason or another (they may be expensive, or they may have limited appeal to the general public), and are therefore grown by few bedding plant producers. You may plan a garden around the castor bean plant, but not be able to find it in the spring.

Some annuals pass through stages of popularity. Creeping zinnia, for example, is an outstanding heat-tolerant annual that produces masses of yellow flowers all summer. Because it is leggy and unattractive as a seedling, it has low sales potential and is generally not seen at bedding plant operations. But a recently introduced cultivar was named an AAS winner for 1987, and creeping zinnia will no doubt become more widely known and available.

The Labor Consideration

An important first task is to make wise plant selections. Choosing annuals with high performance potential can greatly reduce the amount of labor needed for maintenance all summer.

Before planting, take a soil test, add organic matter and fertilize if needed, and work the soil well to a depth of 6-8". This is critical in providing an environment where young seedlings can develop good root systems. Preemergent herbicides like Treflan are easier to apply and perhaps more effective when incorporated into the soil before planting. Rake the granules in lightly, and plant the young annuals through the layer of soil containing the herbicide. If the root balls of the flowers reach below the soil layer containing herbicide granules, new roots will develop faster.

Allow flower seedlings to "harden off" or become acclimated to the environment outside the greenhouse, before planting. Keep them well-watered. Plant on a cool, overcast day if possible, in the morning. This will minimize the stress caused by the change in environment to the seedlings. Water the plants well and check them at least once a day during the first week to see that they have enough water. After the plants have established new roots (1-2 weeks), mulch the beds if desired.

The labor needed to maintain annual flowers during the season depends on the flowers you select and the environment in which you plant them. Even though you might expect a flower garden to require very little maintenance, you should check it weekly to pull occasional weeds, clip leggy branches, and check for moisture.

One task which should not be overlooked at the end of the season is evaluation. Your past experiences with plants should be your best guide for the future. Make notes of plants that performed exceptionally well, as well as those that proved unsuccessful. Compare your notes with those of your colleagues, and keep notes from past years.

Some Successful Formulas

Success comes with a combination of recommendations from others, past experience, willingness to work and openness to change. As a starting point, here are some suggestions for annual flower beds with proven track records.

Each of these recommended gardens contains one tall, one medium and one low-growing annual. In a freestanding flower bed, plant the tallest flower in the center, and surround it with the other two. Be creative! In a flower border planted against a backdrop (building, wall or fence), plant the tallest plants in the background, the lowest plants in the foreground, and the others in between.

1. Canna - Geranium - Dusty Miller

Older canna cultivars are 3-5' tall, newer ones are 1½-3' tall. Select canna and geranium cultivars that match in color. The dusty miller's silvery leaves will compliment the red, pink, orange or coral flowers of the cannas and geraniums.

After planting, this garden should require no maintenance except watering and removal of dead geranium flowers.

2. Blue Salvia - Dusty Miller - Creeping Zinnia

The blue flowers of the salvia and the yellow flowers of the low-growing creeping zinnia will be complimented by the dusty miller. This garden is very low-maintenance. Cut off dead salvia flowers weekly. All three plant types will remain in excellent condition until hard frost.

3. Blue Salvia - Geranium - Dusty Miller

Choose a salmon-colored geranium for this garden. During the summer, remove old salvia and geranium flowers.

4. Cleome - Blue Salvia - French Marigold

Cleome, or Spider Flower, will produce white or pink flowers all summer and will reach a height of 4-5'. Surround the cleome with blue salvia and yellow French marigolds for a very colorful garden. The cleome will need no maintenance during the summer, but remove old flowers from the salvia and marigold.

5. Fountain Grass - Red Salvia - Sweet Alyssum

Fountain grass is a perennial clump grass, but it is often offered by bedding plant growers. Surround the grass with a bright red salvia and edge the garden with white sweet alyssum.

Remove old flower stalks from the red salvia on a weekly schedule. If the white sweet alyssum stops flowering in midsummer, cut it back to promote more flowers in the fall.

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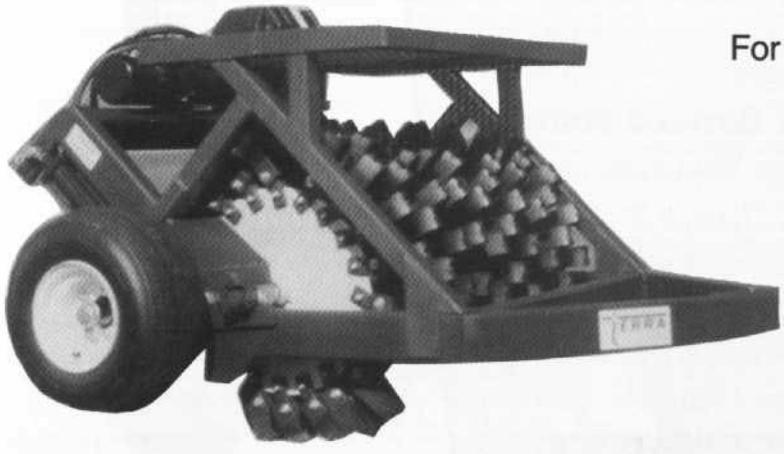

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