TECHNICAL SOURCE GUIDE

FIRE EFFECTS FOR THE STAGE – PART I

by Michael Powers, University of Massachusetts – Amherst
edited by Patrick Immel

This is the first in a series of four articles dealing with fire effects for the stage.

There are probably a thousand ways to make fire on stage and only a few of them actually involve flame or combustion. However, long before we actually make the fire, we have to decide just what the fire is supposed to accomplish. Is it just eye candy for the set, or is it establishing the mood of the moment? What is the mood? Is the fire a warm flickering glow of romance or a feeble attempt to ward off the cold of a hovel à la *Boheme*? Maybe it is the warmth of friendship around a campfire or the despair of the homeless gathered around a fire in a trash can. Maybe it is the evil, mysterious glow beneath the witch's cauldron in Macbeth or the entire face of a building during the burning of Atlanta. Is the fire a friend that wards off the cold or an enemy that is trying to steal our home and threaten our safety?

How does the mood of the fire affect how we build or create it? First, do we need visible flames or just an indirect flickering glow? Is the color of the fire a warm glow or a cold heat? The more you use reds, oranges and yellows in the flame, the more it will seem hot, searing, arid. Colors in the amber, rose, and burgundy range tend toward the romantic. Flames that are white hot, blue-white and blue tend to give the audience a feeling of unease, of very intense heat, or strangely enough, of a cold heat. Green flashes can give a softening effect to the red range and add an eerie, unworldly effect when used as the main color or mixed with the white and blue-white flames.

For what it is worth, real flames tend to have some of all these colors in them, the balance depending on how much oxygen is present and the exact composition of the fuel. But we really don't care what the actual chemical composition of the fuel would be. Verisimilitude here is secondary to creating the right mood.

Now that we have briefly discussed what fire should be or do, we will move into some basic methods of creating it. In this issue, the method will be a small, battery-operated fire unit that can be used in a trash can or behind or under logs to simulate a wood fire. In addition, it can be used in conjunction with some of the methods discussed in the coming issues.

The fire unit for this month consists of a few basic elements. Several 12 volt lamps between 20 and 50 watts; a 12 volt battery, power supply or transformer; wire; terminal strips or buss bars; sockets; automobile turn signal flashers, and one 20 amp toggle switch.

Lamps can be any 12 volt lamp you can locate. Light bulbs from motor homes, campers, and other RVs that look like a normal, household light bulb, (medium screw base "A" lamps), but designed to operate on 12 volt DC are one type. These can be purchased at Wal-Mart, motor home/RV dealers, most KOA campgrounds, and other places that cater to the RV camper trade. Automobile tail light lamps or halogen headlight lamps are another very good type of lamp to use. Headlight lamps are brighter than tail light lamps. These can be purchased at any auto supply store, K-mart super stores, Wal-Mart etc. Twelve volt MR-16s can also be used. The MR-16 looks like a small reflector lamp about two inches across the face and comes in many types from 6 volts to 12, 24, 82, 120, 220 and other various voltage designs. This means you have to double check the voltage before you buy them. MR-16 lamps can be purchased through Grainger, McMaster Carr, Newark Electronics, Allied Electronics, and most electrical supply stores and lighting stores. Which type of lamp to use depends on availability in your

area, cost, and physically how large you need your completed unit to be. In general, the RV lamp creates the largest fire unit and auto lamp units the smallest.

Sockets: sockets can be any kind that fit the lamps you intend to use, or one can solder leads directly to the lamp contacts or base. If sockets are available, I strongly advise that you use them as this makes replacing a lamp much easier and the socket can be firmly attached to whatever you use as a base for the fire unit.

Wire should be at least 16 gauge stranded from the lamps to the flashers and from the flashers to a common buss bar or terminal strip. The single wire from the terminal strips to the switch and from the switch to the battery must be 12 gauge minimum. The reason the switch must be rated at 20 amps and the power leads to and from the battery must be at least 12 gauge is that the amperage in the system is a lot more than you may think if you are not familiar with low voltage circuits. Usually the best lamps for this effect are about 50 watts. Using Ohms law, watts equal the voltage times the amperage (W=VA), we find that a single 50 watt lamp at 12 volts equals 4.16 amps (50 = 12xA; 50/12 = A; 4.166=A). A 25 watt lamp would pull 2.08 amps. I suggest using six to nine lamps for this effect. Let's figure the amperage if all nine lamps happen to be on at the same time. We can multiply 4.16 times nine to get 37.44 amps or we can use the formula W=VA to find that 450 watts divided by 12 volts equals 37.5 amps. Either way, we are exceeding the capacity of both the switch and the wire. However, we can do what electric companies call de-rating. Since the flashers are not precision devices, the lamps are going to flash randomly and the probability is that even if all nine lamps are on at the same time (very unlikely), the time duration will be very short. In fact each lamp is only on for about half the time, so by averaging, that means the current will actually be about 18 amps at the worst. If you are using lower wattage lamps, you can figure the amperage for yourself or you can simply stick with the wire for the 50 watt situation and know that you are O.K. I'm not sure if standard auto flashers will handle 100 watt lamps since I have never tried it. I feel this would probably be too bright for most situations. However, if you need a very bright effect, try 100 watt lamps and perhaps a flasher for a tractor trailer rig. If any readers try this, please e-mail and let me know how it works.

Now for the power for our effect. If you buy or build a power supply, make sure it is rated for 100 percent of the amperage your effect can generate. Even though we de-rated the wire and switch because of the flashing effect, most power supplies have fast blow fuses or breakers that will pop when their amperage is exceeded even for a very short time. When it comes to batteries, any combination that equals 12 volts will work just fine. The question is for how long. If your effect has to be small and self contained, a series of C or D cells will probably do the trick if the effect doesn't have to last more than a few minutes. Lantern batteries, the square six volt kind, are another good solution. They will last a bit longer than the C or D cells and will take up little more room. The best battery I have found is a lawn tractor battery. It is a wet cell, 12 volt battery that looks like a half size version of your car battery. It is a very powerful power supply in a very small package. It will run a nine light effect for an hour or more. In addition, it is designed to be recharged. A small 12 volt trickle charger can recharge it between shows. The battery costs between $30 and $50 at most discount stores that sell riding mowers and lawn tractors. The charger will run about $25 at auto stores or discount stores like Wal-Mart, Home Quarters, and K-Mart. Another source for small but quite powerful batteries is the sealed, lead/acid batteries like those used in emergency exit lights. They come in many sizes from about the size of a cigarette pack to three or four inches in each direction. These are available from electronic stores and catalogs such as Allied, Newark, and Digi-Key.

Now it is time to actually build our effect. First, we have to determine just how the effect is to be used. One problem with the flashers is that they make an audible click as they cycle on and off. Whether or not this sound is objectionable depends on the size of the stage, the type of show (loud

musical, quiet drama), and just where on the set the effect is located. When possible it is usually better to build a separate container for the flasher units, sound insulate it, and locate it as far away as practical. For an example, see illustration # 1.

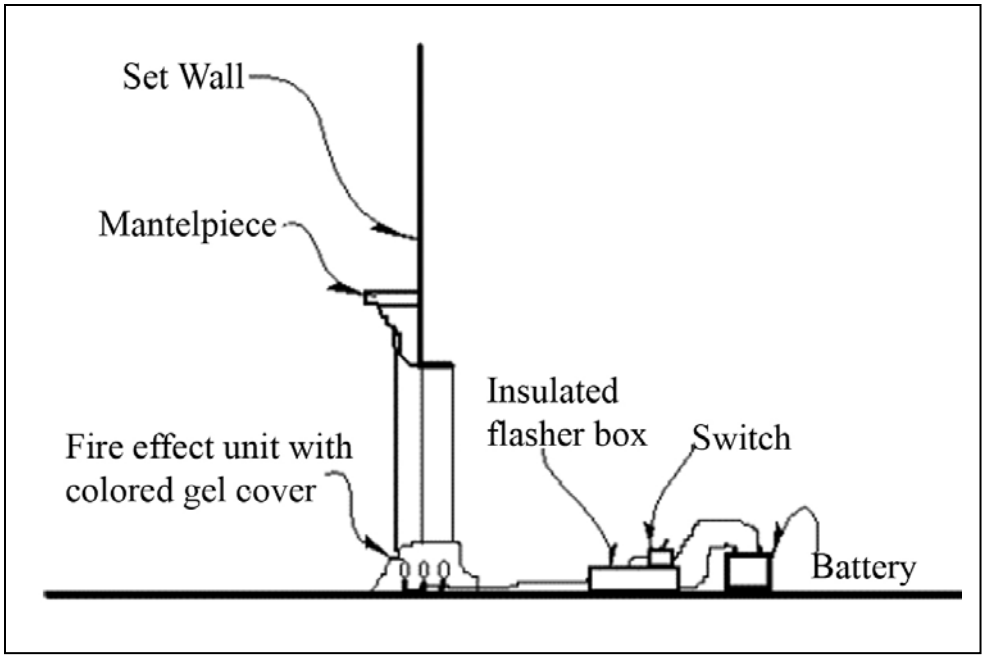
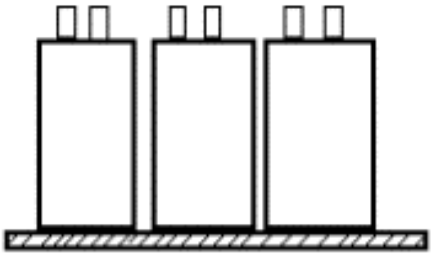


Illustration #1

An example of a sound isolated box is seen in Illustration #2.Note that the flashers need no air space for operation or cooling so they can be mounted so they are touching or very close.



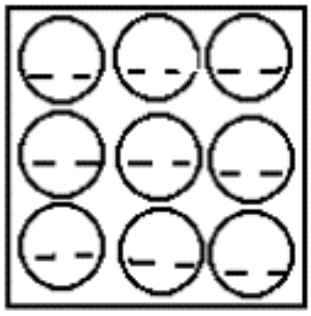


Illustration #2

After choosing the lamps and sockets, the first step is to lay out a full size circuit pattern on Kraft paper, drafting paper, cardboard or something similar. If you need to make separate boxes, containers, or mounting boards for the lamps and or flasher sections, make your drawing accordingly. As you make this layout drawing, pay attention to where the contacts are on the various elements so you don't make the wiring harder than it should be.

TECHNICAL SOURCE GUIDE

You will need a separate flasher for each lamp. This is so each lamp will flash independently of all the others. Each lamp must be wired in series with its flasher, then all the flashers need to be wired in parallel to the switch and power (See illustration # 3).

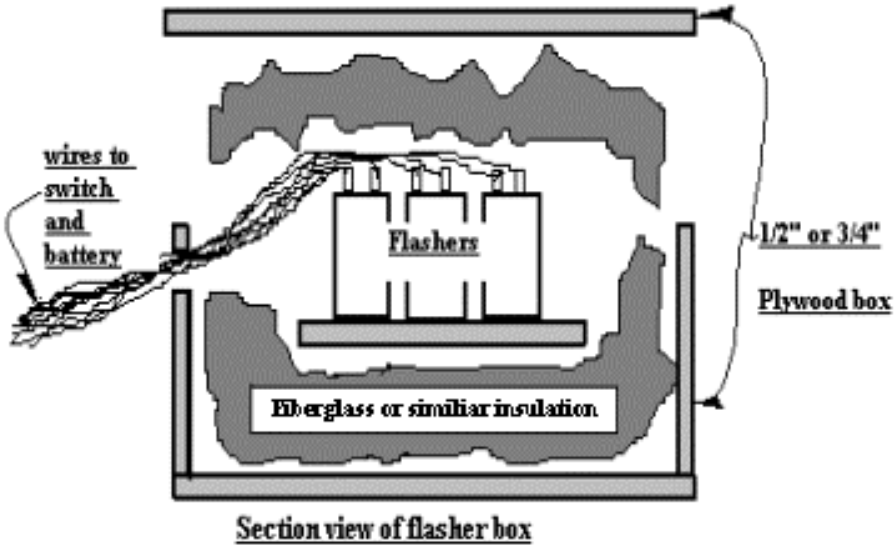
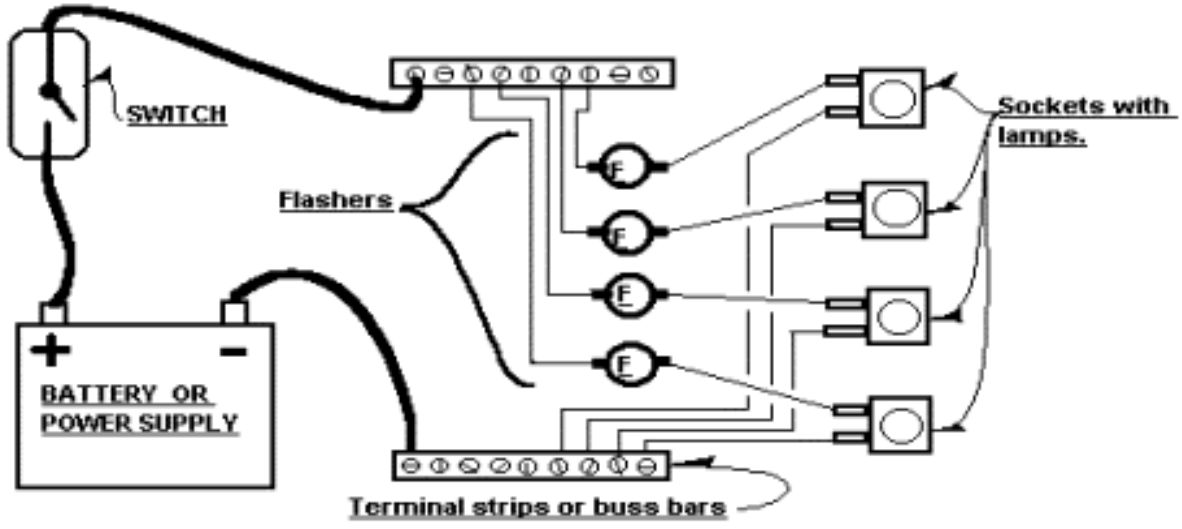


Illustration #3

Note the illustration below is not to scale and indicates the wiring connections only, not necessarily the physical location of any item in the actual construction of the effect. You can also use wire nuts to replace the terminal strips, but the number of wires quickly makes this awkward and unwieldy.



The flashers can be attached to the plywood by hot glue, epoxy, or construction adhesive like liquid nails. When buying the flashers, you will notice that some have two contacts and some have three.

Both can be used; you just have to connect a lamp across any two of the three contacts and move the wires from one contact to another until it works. The third contact is then simply ignored.

Finally, for the fire unit itself, attach the sockets to a piece of plywood, ½ inch or ¾ inch. You can space the sockets as close as the lamps and wiring convenience will allow. The plywood base should be 2 inches or 3 inches larger than your socket layout to allow ample room to attach color media. The easiest way to do the color media is to start with a sheet of clear. Next cut small, odd shaped pieces of scrap gel (leftovers from cutting gel for lighting instruments) and Scotch tape them to the clear sheet. Anything from 2 inches to 6 inches across is fine and the more irregular in shape and size, the better. Next, wad the sheet up into a tight little ball, then lay it out flat again. At this point you might have to repair your tape job in a few places. In this crumpled state, the gel sheet can be shaped into a self supporting dome that can then be stapled or taped to the plywood base over the lamps. It is best if there is at least an inch or two between the lamps and the gel. There is no fire danger if the gel touches a lamp, but the effect looks better if each lamp lights up several gel pieces as it flashes. If the gel dome will be visible to the audience, a bit of artistic dusting, mostly around the bottom, with flat black spray paint will help to make it look like coals or embers. If the effect is to be in a trash can or other "out-of-sight" location, the crumple and spray can be eliminated. Just place a piece of screen wire or chicken wire over the lamps and lay the gel pieces on top. You still need to tape them together so that air currents won't shift the gel away.

When doing the wiring, lay it out in as neat and orderly a manner as possible. Group the wires together and fasten firmly to the base where the bundle of wires goes to the flasher box. If you use nine lamps, that means you will have 10 wires going from the lamp unit to the flasher box, nine to the individual flashers and one from the terminal strip to the battery. Use tie wraps, tape, or something to create a neat bundle.

Next issue: Part II, Fire Effects for the Stage; using fluorescent starters and ballasts.

Technical Source Guide #35 - Fire Effects for the Stage Part I

- A project of the USITT Technical Production Commission

Editor: Patrick Immel

Founding Editor: Roy Hoglund

Fritz Schwenker

Please send submissions and inquiries to:

Technical Source Guide
Patrick Immel, Dept. of Communication, Theatre and Languages
Northwest Missouri State University
800 University Drive
126 PAC
Maryville, MO. 64468
tel: 660-562-1171; fax: 660-562-1911
e-mail: pimmel@nwmissouri.edu