Lights, and... go

An introduction to lighting design, part two: from rendering to light plot

BY SCOTT C. PARKER
In an article in our January 2009 issue, Scott C. Parker described the fundamental objectives of the lighting designer’s work and guided readers through the designer’s process of script analysis and the use of visual research to arrive at a vision of what the show should look like. (If you’d like to review, you can find that article on our website.) This month he outlines the next steps: figuring out where to hang the lighting instruments and how to control them to achieve the effects shown in the rendering, and communicating those solutions to the stage crew who will hang the lights in the theatre.

By the end of the first article in this introduction to lighting design we had created a light rendering for the robbery scene (Act II, Scene 2) in Carousel. Let us now assume that after multiple meetings (and probably some revisions) the director has approved the lighting ideas expressed in this and other renderings. It’s time to figure out where to put our lighting equipment to achieve the look the director likes.

This particular scene (rendering, Fig. 1) will require many layers of color with light coming from many different directions. As you begin to translate renderings into a lighting plot, keep in mind the elements of the designer’s job description:

1. To create an environment in which the event will take place.
2. To make the actors visible.
3. To assist the audience in understanding the story.

Like all of the design jobs in the theatre, the lighting designer’s work happens at the intersection of creativity and technical expertise, and that is especially true of this part of the process. It is the technical part—knowing what each type of instrument will look like when focused on the stage from the available hanging positions in your space—that enables the creativity. We’ll address some of the basics of this knowledge in this article, but experience—ideally, the chance to work alongside an experienced designer at first—is the best way to acquire it.

We’ll begin by making a shopping list of what the rendering is calling for.

1. An overall wash of dark blue light.
2. A slightly smaller wash of lighter blue light for the dock/acting area.
3. A system of light, from stage left, with a light blue color for light blue highlights.
4. Another system of lights from stage left for the “white” highlights. I put the word white in quotations because using actual white (no color) light on stage would read as amber against all that blue in the background. In reality, I used a very light blue (Lee 201) for these highlights.
5. A system of diagonal backlight from over the performers’ shoulders from the stage right side. This will give the performers a bit of an outline to separate them from the dark blue background.
6. A system of amber light to give us highlights that are motivated by the oil lantern hanging from the pier piling.
7. A system, perhaps even two, of patterned breakups to create the mysterious shadowy feel this scene requires.
8. Billy’s death special. A very bright, very “white” light from above and slightly back. (This light is not in the rendering, but I know it will be needed for the very next cue.)

**Magic sheets**

Now that we have our list, the demands of the rendering are not quite so overwhelming. We are able to deal with each needed element, one at a time. My next step is to draw small ground plans representing the scenery and the stage, on which I will sketch the placement and direction of lights for each item in the shopping list. These small ground plans, called “magic sheets,” are a valuable tool for visualizing the final light plot.

The ground plans used to draw the magic sheets for Act II, Scene 2 of Carousel (one is reproduced as Fig. 2 above) were created in a computer-aided design/drafting program and ganged together six at a time on a single letter-size sheet of paper. Even though I have these images in my computer, I prefer to print them out and use pencils for my preliminary work. (CAD programs will be discussed in the third article of this series.)
I use these small magic sheets to help me figure out where the lighting units will hang and which direction they will point. I also begin to assign channel numbers to each of the systems at this point in the process.

The specimen magic sheet addresses item 7 on the shopping list. The horizontal rules represent the approximate locations of pipes. Arrows indicate the direction of the light. The numbers in parentheses (137, 155) are channel assignments. I’ll also make notes to myself in the margins. The magic sheet is essentially a tool to help you organize your thoughts, not one to share information with others.

**Preliminary channel assignments**

Experienced lighting designers anticipate which channels are to be used most often, and which lights are used together, well in advance of the first technical rehearsal. Spending a little extra time thinking about the overall control system at this stage will save a lot of rehearsal time. It is much faster to ask the board operator to bring up channels 1 through 12 at full, rather than having to press the “and” button several times to link together channels that aren’t numbered consecutively. If you have a board with sliders that you control by hand, having your systems of lights together allows you to use a pencil to pull down a bunch of sliders at the same time. Years ago, running control systems that used large levers, the technicians would use broomsticks to push groups of levers up or down together.

Fig. 3 shows part of a spreadsheet used to keep track of channel systems. Note that each channel is keyed to an item in the shopping list. Remember channel 137 on the magic sheet? You will find it in Column D, Line 32 of the spreadsheet, and on the same line, the note “breakups on boxes areas,” which matches the text in the shopping list. All this cross-referencing may seem unnecessarily complicated. Believe me, it’s not. Once I adopted these methods of tracking my thoughts, I found my time at the drafting table became more efficient, and I became much less prone to anxiety.

Fig. 4 shows an Excel worksheet that replicates the screen layout of the lighting console used for the production. The display screen layout for the computer board used for this production shows twenty-four channels across. This board could control over a thousand dimmers using 240 channels. Due to the resolution of the screen, it is not possible to fit 240 channels onto a single display at one time, so the board can “page” between different ranges of channel dis-

<table>
<thead>
<tr>
<th>Shopping List</th>
<th>Channel Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curtains Warmers</td>
<td>2 DSR 3 DSC 4 DSL 5 MSR 6 MSL 7 USR 8 USC 9 USL 10 USL FAR</td>
</tr>
<tr>
<td>Front VSR Warm</td>
<td>11 12 13 14 15 16 17 18 19 20</td>
</tr>
<tr>
<td>Front VSL Cool</td>
<td>21 22 23 24 25 26 27 28 29 30</td>
</tr>
<tr>
<td>Bax Warm and Bright</td>
<td>31 32 33 34 35 36 37 38 39 40</td>
</tr>
<tr>
<td>Diag Bax VSL</td>
<td>41 42 43 44 45 46 47 48 49 50</td>
</tr>
<tr>
<td>Diag Bax VSR</td>
<td>51 52 53 54 55 56 57 58 59 60</td>
</tr>
<tr>
<td>Side breakup wash</td>
<td>61 62 63 64 65 66 67 68 69 70</td>
</tr>
<tr>
<td>Diag Bax VSR</td>
<td>71 72 73 74 75 76 77 78 79 80</td>
</tr>
<tr>
<td>Diag Bax VSL</td>
<td>81 82 83 84 85 86 87 88 89 90</td>
</tr>
<tr>
<td>Diag Bax VSR</td>
<td>92 93 94 95 96 97 98 99 100 101</td>
</tr>
<tr>
<td>Shins for dance VSR</td>
<td>102 103 104 105 106 107 108 109 110 111</td>
</tr>
<tr>
<td>Shins for dance VSL</td>
<td>112 113 114 115 116 117 118 119 120 121</td>
</tr>
<tr>
<td>Shins for dance VSR</td>
<td>122 123 124 125 126 127 128 129 130 131</td>
</tr>
<tr>
<td>Shins for dance VSL</td>
<td>132 133 134 135 136 137 138 139 140 141</td>
</tr>
<tr>
<td>Shins for dance VSR</td>
<td>142 143 144 145 146 147 148 149 150 151</td>
</tr>
</tbody>
</table>

**Pattern Washes.**

27 Diag Bax breakups VUSR 121 122 123 124 125 126 127 128 129 130
28 Diag Bax breakups VUSL 131 132 133 134 135 136 137 138 139 140
29 Breakups on floor for path 141 142 143 144 145 146 147 148 149 150
30 Colorful diag-bax pattern wash. 151 152 153 154 155 156 157 158 159 160
31 Side breakup wash 161 162 163 164 165 166 167 168 169 170
32 Breakups on boxes areas. 171 172 173 174 175 176 177 178 179 180
33 Breakups on Chorus. 181 182 183 184 185 186 187 188 189 190
34 Trees for backdrops 191 192 193 194 195 196 197 198 199 200
35 Tree patterns around stage 201 202 203 204 205 206 207 208 209 210

**Fig. 3.** A simple spreadsheet helps keep track of channel assignments as they’re made.
I use a printout of the design paperwork as a cheat sheet during technical rehearsals. These are useful when the designer or the board operator observes an errant channel level on the lighting console’s screen and needs to determine its purpose. Now that we are able to control the lights through this system of channel numbers, we will build a map of where all the lighting units are going to go.

**Choosing the equipment and figuring out where to put it**

Lighting units project light onto the stage through a set of lenses. The optics of the lenses determine the beam spread, also known as the angle of light, which comes out of the unit and hits the stage. A unit with a beam spread of 45 degrees will give you approximately a twenty-foot circle from a distance of twenty feet. Differences in beam characteristics are important considerations as you select lighting instruments and decide where to hang them.

One way to visualize beam spread is to compare the shape and size of the beam to different kinds of ice cream cones: sugar cones, waffle cones, wafer cones, and even large waffle bowls. How many sugar cones would it take to cover the same amount of area as one waffle bowl? Hypothetically, let’s say that four sugar cones focused so that they overlap would have the same coverage as one bowl. If all of the lamps are the same wattage and the lights are hung at the same distance from the stage, the four sources of light together would be four times brighter than the single source, while covering the same area. Using four narrow beam lighting fixtures would also allow for greater control should one wish to focus tightly on a desired acting area.

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**Fig. 4.** An Excel worksheet duplicates the display screen layout on the lighting console, making it easier to see channel assignment groupings.
Fig. 5. Four ways to light three actors, some better than others.

The chart at below right from the Altman Lighting Company shows the approximate sizes of the circle projected if the units were hung thirty feet from the stage area you want to light. As you can see, when the diameter of the spot increases, the brightness (foot candles) decreases substantially.

Let’s consider that we want to light three downstage acting areas, stage right, center stage, and stage left. The illustration in Fig. 5 represents a stage that is thirty feet wide by twenty feet deep. The lighting pipe shown is drawn at forty-two feet long and is located ten feet in front and fifteen feet above the front edge of the stage.

Our desire is to light each area from a front diagonal position—let’s say stage right. Because the stage right acting area is so close to our lighting position, we are going to want a relatively wide-angle lighting unit. The center stage acting area will require a slightly narrower beam, since it is farther away. The furthest acting area, stage left, requires a more concentrated beam of light in order to maintain an even brightness with its neighbors.

The illustration shows a number of ways of lighting the three areas, some better than others.

Panel 1 shows the use of a single unit with a 50-degree beam angle. Of the three actors standing in the light, the one stage right will be significantly brighter than the one standing all the way stage left. This type of “lighting design” should be avoided.

A single wide-angle lighting unit offers very little control and insufficient light output for most applications. They certainly do have their place in theatres with extremely low hanging positions or for the “near shot” used from side lighting boom positions.

The set of three lighting units in panel 3 are all the same 40-degree beam angle. Again, the actor at stage right will be brighter than the actor standing stage left. Notice that the circles of light increase in size (and diminish in intensity) the further they are projected.

The most consistent lighting would be delivered by the setup shown in
Fig. 6. A hand-drawn light plot. Actual size: 30 x 48”.

Panel 2. These three units are evenly spaced and project a 30-degree beam angle. Each one is hitting its own performer from an angle that gives us a consistent set of highlights and shadows. When all three lights are turned on, we have a nice overlap allowing the performers to travel the stage without passing through any dark spots.

Panel 4 demonstrates a hybrid of sorts. This set of lights maintains the illusion that the light is coming from a single light source location, as the shadow for the performer stage left will end up being much longer than the performer stage right. The significant detail here is that these three lights do not match in their beam angle. The short throw unit covering the actor at stage right is a 40-degree unit. The light pointing toward center stage is a 30-degree unit, and the light covering the far end is a 20-degree unit. This is an extremely important technique to understand: using the narrower beam units for the farther throws ultimately balances out the brightness hitting those distant locations. This allows us to maintain a relatively even brightness upon the performer as she travels across the stage. This is also the technique used when a high sidelight is desired. Placing two or more lights at the top of a vertical pipe (also known as a boom) calls for narrower beam units for the “far shots” and wider beam units for the closer “near shots.”

In the example above, I used three control channels for these three different acting areas. If we were to add a light for each acting area from stage left and another set of lights from the rear, we would need a total of nine channels. Add sidelight, rear diagonal light, down lights, etc. and we have the makings for multiple layers of lighting angles, shadows, and color that will allow us to paint our stage as designers are wont to do.

**Light plots and sections**

When the designer has selected all of the lighting units for the production and decided where to hang them and how to control them, it’s time to create a set of paperwork that communicates the needs of the lighting design to the electrics crew. The type and location of each light and corresponding control channel will need to be put to paper.

A light plot is a visual representation of every piece of lighting equipment the lighting designer plans to use. It is drawn as a bird’s eye view, as if you are looking down at the stage from above. This is basically the lighting designer’s version of a ground plan. The light plot is drawn in either ¼” scale or ½” scale. This means every ¼” or ½” of space on the paper equals 1 foot in real life. It is written this way: Scale: ½”=1'-0”. Personally, I prefer ½” scale as it allows me a bit more room to write in detailed information. Your scale will be determined by the size of the stage and how large your piece of paper is. The example above (Fig. 6) was drafted on a 30”x48” sheet of drafting paper.
Fig. 7 is a close-up look at one small area of the light plot. Here we see a select section of three pipes with various symbols representing lighting units. The pipes are numbered from downstage to upstage as electrics and the lighting units are numbered from stage left to stage right. The symbols used to identify different types of units are identified in the key (Fig. 8), which is placed in the lower left corner of the light plot. You can use any symbol you wish—bananas, coconuts, or something more conventional—as long as your key guides the electricians to hang what you want, where you want it.

The rear-facing symbols on the second electric, numbers 8, 11, and 13, represent 8" Fresnels. These three units have an additional symbol indicating the desire to use barn doors. Many of the units have the letter T within the barrel, telling the crew that the units require template holders. Please note the curved staircase is drawn with a light touch pencil for reference only. The most important information on the plot is the units themselves, which are also the darkest objects. Another piece of very important information shown is the dimension between the units. While we could ask our electricians to pull out their scale rulers and measure for themselves, I believe that taking a little extra time during the drafting process to include the dimensions will increase the accuracy and speed of the light hang. The faster your crew gets your equipment in the air, the sooner you will be able to focus and start writing cues.

The hookup is a list that contains a lot of information about each lighting unit we plan to use. We list the pipe name, the unit number, the channel number, the dimmer number, color, template and any other notes about each unit we wish to track. Using lined paper works just fine for simple shows. For more complicated shows, a spreadsheet program is a must. Figure 10 is a part of a specimen hookup sheet for the production of Carousel we’ve been working on.
Turning the design over to the crew

We have arrived at the point when the lighting designer turns over responsibility for the execution of the design to the electricians, who will run the light hang. The head honcho of the electrics crew is often known as the “production electrician” or “master electrician.” It is this person’s responsibility to take the lighting designer’s equipment specifications and make it all work.

The designer has enough to worry about: visits to rehearsals, meetings with the director and other designers to discuss cueing, and so on. With the communication paperwork discussed here, lighting designers are able to communicate easily with the stage crew. After the crew has hung and plugged the equipment according to the paperwork you supply, you can call for any channel you need for a fast focus and quick cueing.

The moment of truth will come during tech rehearsals. Because the design can only exist as an observable phenomenon in the performance space, lighting designers often ply their craft under the gaze of just about everyone in the theatre. When we sit at the tech table, in the center of the audience, and the stage manager says, “lights go,” an interesting kind of parallel speculation occurs. The lighting designer sits and wonders if the director likes the look. Simultaneously, the director stares at the stage wondering if the look is what the lighting designer actually intends to keep. If you have been following your own process and you have continually communicated with your director, then what pops up on the stage should be very close to what is expected.

There’s channel 137 again. See how much information is being communicated? The hookup shows that the light itself is unit no. 5 on the position called “Light Bridge 2.” The light is an ETC Source4 36-degree with a 750 watt lamp. Under color it lists “N/C” (no color). The template slot needs two templates: R-208 + R-7760.
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