

Lighting The Stage: A Beginner's Process

Bridgewater State College Theatre

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Table of Contents

Introduction	2
The Project begins	3
Read the script I	3
Read the script II	4
Research the show.....	4
Meet the Artistic Team: the first general design meeting	5
Research the lighting.....	5
Research.....	6
Sources	6
Observation	7
Imagination	8
Is all this REALLY necessary?.....	8
The first lighting design conference	9
Confer with the designers and technical directors	9
The Project takes shape	10
Put it on a schedule.....	10
DESIGN WEEK (3 weeks before open).....	10
PRE-TECH WEEK (2 weeks before open)	11
OPENING WEEK	11
Rehearsal research	12
Cue the script	12
Cues you will need.....	13
Defining the cues	15
Write cue 1	16
Working with color	16
Working with direction	18
Plotting the design	18
Requirements list and magic sheet (lighting key).....	18
Layers and functions	19
Dividing the stage.....	19
Placing the equipment.....	21
Layer 1:	21
Plotting the mainstage layer 1	21
Plotting the small stage layer 1	23
Layer 2	24
Layer 3	24

Layer 4	25
Developing the equipment list I	26
Developing the paperwork.....	27
The equipment order	29
Hanging and focusing the plot	29
Hanging your plot	29
Tasks in the hang.....	30
Focusing the plot	31
Writing the cues	32
Cue structure in a show	33
Preparation.....	33
The day in the hall	35
Writing the cue	36
Working with the director.....	37
Wrapping up.....	38
First Technical Rehearsal	38
Morning setup	38
Afternoon tech run-thru.....	39
Evening rehearsal.....	40
Tech, run and strike	41
Run and strike.....	42
Archive your work	42
Appendix	44
Lighting Equipment	45
Basic Instrument: 3 parts.....	45
Parts of the lighting instrument:.....	45
Instrument types:.....	45
Profiles/Spotlights	45
Floods:	46
New Technology instruments	47
Other parts:.....	47
Mounting Procedure.....	48
Hang sequence	48
Cable sequence:	48
Focus Procedure	48
Stage Lighting Operator Check List.....	49
Please follow this procedure to ensure that everything is prepared and properly secured.....	49
At Call	49
Trouble Shooting Procedure.....	51

Introduction

You have taken on the assignment of lighting a play. This manual assumes you have worked with lighting equipment enough to know the various kinds in general use, and you have some direct experience with how it is connected together. You have played with lighting equipment, participated in a hang, focused a lighting position, plugged and patched circuits and dimmers, walked a dimmer check, pushed the “go” button for a show, and probably written cues on the control board. But you have never designed lighting for a play.

This manual takes it from the top with minimum assumptions about lighting background, but there are some important qualifications:

- You must have had some prior experience with the technical processes and protocols of the stage. You need to have some experience with technical crews and roles and responsibilities of technical personnel. You also need to understand the way creative responsibilities are shared among the artistic team.
- You must be INTERESTED in the equipment and making it work for you. If you are interested, you can learn easily what you need to know. You must refuse to be intimidated by it.
- You must be able to SEE light. It is likely that you haven't paid much attention to it, but for lighting design you must look deliberately at how light illuminates, shapes, colors and transforms objects and spaces. Beyond seeing, you also must be able to IMAGINE it.
- You must be able to sense and identify units of action in a play and the transitions between them that can be punctuated by changes in lighting.

The Project begins

You are the designer. You have 4 to 6 weeks to opening curtain. Time to begin.

It is important always to begin with the reading of the play itself, rather than material *about* the play. You may or may not have had prior experience with the play or with the author. One cannot deny past experiences, but do your best to forget about them while reading the play. Try not to discuss it or have any discussion about approach before your first two readings. If the director or designers try to discuss design direction in any way, put them off until you have read the play, but do it very soon. Set a specific appointment for the discussion to begin.

Read the script I

Step 1: Get a complete copy of the script. Block off two hours, find a comfortable chair, pour a cup of coffee, lock the door, turn off the phone, and read. You should not pause to make notes; just read. If it is a musical and you have the music, play it in the background while you are reading so you can sense the spirit of the show. Don't think about lighting or anything but following the playwright through the work, going where he leads you, enjoying the unfolding of the work. You will never have this experience again.

Step 2: After completing the reading, think about what you read and make some beginning notes. If distinct lighting images came to you while reading, write them down now, but this is not the time to think about light. Think about the dramatic work and how it unfolds. Think about its qualities and write down your impressions. Write down your questions and what it makes you think about. Then make notes regarding:

- Context. What is the time period and setting of the action?
- Sweep. Is it grand or small?
- Flow. How does it move – in short, pointed scenes or in longer playing out of ideas?
- Mood. Is it heavy or light? Does it move from dark to light or light to dark?
- Theme. What is your initial impression of the subjective sum of the play?

Step 3: Sleep on it. Get away from it and forget about it, but turn your mind back to it periodically. Puzzle it a little. Make yourself curious about it until you WANT to return to it. Then re-read your notes to have them in mind. In the next reading you will want to test them.

Read the script II

This is the first working reading. Some scripts require multiple readings to get a handle on the ideas, so this may be more than one actual reading. You should have a copied script rather than the acting edition so that you can have it on regular paper, printed one side only, allowing notes on the facing pages. It is a good idea to get the script bound by this time. A ring binder is pretty unwieldy in your lap, in rehearsal and at the tech table. Comb or spiral binding is recommended because you can fold it back on itself.

Step 1: Get paper and pencil. Read the script scene by scene and take good notes. It would be good to do this in one sitting, but it will take several hours for a full length play and you may be less inclined to take the notes you should if you stay with it too long in a sitting.

Every designer notes some different things, but this reading should lead to a preliminary understanding of the task, sufficient to hold a knowledgeable discussion with the director and other designers. It is much better to put the ideas down on paper as they occur, rather than trying to construct them out of the ether in discussion.

It is common for the designer to outline the action in each scene. In unbroken acts, scenes are defined clearly by entrances and exits of principle characters, and less clearly by changes in direction in the dialogue or action.

Typical annotation for each scene:

- Create at least one or two sentences about what occurs in the action.
- Note specific references to light and qualities of light in the text and dialogue. Also circle them in the script.
- Note the lighting circumstances: time of day, indoors or outdoors, logical sources of light in the scene (sun, overhead fluorescents, moonlight, etc.).
- Note any action involving light sources (flashlights, room fixtures, fires, torches, etc.).

Step 2: Think about style. For the show as a whole, revisit your ideas regarding sweep, flow, mood, and theme. Chances are that you read the play like a movie, but now you must think deliberately about the levels of realism and abstraction. Think about how the play might engage the audience best. Does it push at the audience or does it invite it inside? How should the play leave the audience? What should the audience feel? Make notes.

Research the show

It is time to learn something about prior productions of the play and the critical views of the work. Summaries, reviews of productions, academic analyses, and sometimes directors' notes are all available on the Internet for any known work. Often a brief summary will provide some insight into a theme you may have overlooked. Perhaps you misread the climactic moments. Perhaps you overlooked the importance of the sunset to the closing moment of Act II. Maybe your thinking about the audience experience is different from that in other productions. You also may find out something about how it has been lit, but do not allow this to frame your approach uncritically.

If the playwright has written about the play, there may be some value in knowing what he or she said, even if you do not intend to follow it. Scholarly perspectives also can be useful, but less helpful than performance reviews that articulate specific responses to what occurred on stage.

Regardless of what you read, you must not focus on recreating the experience of other productions. This survey is to understand the cultural history of the play. It also allows you to consider

what you may have missed, and perhaps to discover how other designers solved particular lighting problems in the script. It is NOT to find a roadmap to success.

Think about the play again. Make a list of *key moments* in the play – introductions of important characters or ideas, confrontations, reversals, revelations, climactic moments, resolutions. In a comedy, also look for slapstick bits and crisp bits of cleverness. Think specifically about moments that must work particularly well. Your research on the play may help you understand key moments that don't jump out of the script but become significant in performance.

Compile all your notes, review them and think about them.

Meet the Artistic Team: the first general design meeting

The first design meeting is very important. It is very likely that discussions between the director and the scenic and costume designers already have begun. They may or may not be involved with your first discussion with the director, but you need to approach them on your own as soon afterward as possible.

The director will outline some ideas about the show, about its themes, and about the style. There is, or should be, discussion of key moments and the kind of imagery they should involve or evoke. If the other designers are involved, they also will make contributions. The discussion typically will progress through indirection, almost never in a linear way. It will leap around in the script and associate ideas and moments from various parts of the play. It will involve references to external ideas – paintings, music, dance – that convey or evoke the spirit of the play.

This will be the occasion to resolve questions and come together on the sense of sweep, flow, mood and theme. There should emerge a consensus on matters of style and how the play should engage the audience. The director may have some clear ideas regarding how some moments of the play should occur. And the lighting designer takes good notes to capture it all. In technical rehearsals, the last thing a designer wants to hear is that he was told about a particular choice in the first design meeting.

If the scenic and costume designers are not at the first meeting, it is critical that you meet with them yourself to get their perspectives on the show. They will have begun thinking about the ideas, and will have made important style choices, perhaps including colors, which will affect your work.

Research the lighting

Designers often begin lighting research immediately after first reading but is not among the steps required for the first meeting. In fact, lighting research is ongoing through the design process, but beginning designers often give it insufficient attention. Any design that omits this step is the weaker for it.

You must begin the design with ideas about how the lighting appears to the audience. You cannot begin a design with considerations of equipment, lighting locations, colors, control technique, or anything else that is used to implement the lighting idea. You have to begin with the lighting ideas themselves. Developing them is a three step, reiterative process:

- Research
- Observation
- Imagination

Research

It is likely that you have never really looked at light in the way that is required of a lighting designer. We respond to the mood and evocative imagery of light, but the controllable properties of direction (or distribution), intensity, and color must be observed specifically and thoughtfully. Those are the choices you will make as a designer. You must build your repertory of lighting ideas for this project so that you can construct your design deliberately.

To feed your ideas for the lighting image you need to *observe* images of light, and to design the show you must *imagine* how the lighting might appear on the stage. Your ability to achieve exactly what you imagine is affected by many factors, but you must start with the goal of a lighting idea. You have to *research* to collect images and ideas. What you collect need not be images specific to the period or environment – it could be a period play, but the objects in your lighting research images may be modern. The “subject” of these images is the light, not the objects in them.

You also need to look for images illuminating the specific circumstances of the show. What do you know about the colors and quality of light in Grover’s Corners? The other members of the design team are researching those specific questions and should be willing to share their research with you. In fact, shows usually work better if the entire design team is looking at the same visual research.

If research is unending, you may wonder when you’ve researched enough. You should think in terms of finding a dozen or more useful lighting ideas in the research process, with additional attention to specific moments in the play. Begin by making a list of moments, scenes and their circumstances. “Act I: dark interior, 1880s Norway”, “bright day in Grover’s Corners”, “noon on Mediterranean”, “fight in Irish pub”, etc. – anything to help define your search. You will know you’ve researched enough when you have a clear lighting idea for each of the major scenes or important moments.

Sources

You must learn to LOOK and SEE in detail. There are several possible sources for lighting images. Although you need not visit the whole list below, do not stop at one resource. Give yourself as much foundation as you can within the time available.

Magazines: A large variety of publications provide a rich treasure of lighting ideas. Photography magazines are particularly useful, such as annuals with collections and portfolios. These will feature a wide range of lighting ideas as photographers seek a distinctive expression. Fashion and style magazines explore distinctive and creative lighting ideas in their features. All magazines have advertising, which usually is designed specifically to be evocative but focused on expressing the product. The advantage of magazines is that the pages may be torn from them and collected for reference.

Books: Photography books showing collections of photographs are invaluable. Libraries have good collections of these expensive publications. Scan the shelves in LC numbers TR, especially the oversize (if they are separately shelved). The shortcoming is that most collections dating before about 1970 will not be in color.

It is important to look at art books. If a play comes from or is set in a specific era, look closely at the painters from that era. Look at how color is used and how light is presented. There will be a significant difference among historical periods in painting styles and how light is handled. Look for works that are expressive of the same tone as the play. Spending some of your research time in the ND section of the library should be rewarding.

Museums and galleries: Visit the museum. Ideally, you can explore a museum featuring a collection dating from the era of your play, but it usually is worthwhile just to spend a couple of hours looking at paintings of any era and how they express light. You can analyze your subjective responses, the feelings evoked by the works, and the artists' techniques of placing light sources and subjects, how the lighting is colored, and qualities of atmosphere. On your way out, look for the postcards.

Postcards: An inexpensive and compact source of lighting ideas is picture postcards. They also can be collected for future use. Museums and card shops sell distinctive high quality images, and they can be stored in a shoebox.

Internet: The first place people often look is online. There are resources there, but their convenience does not compensate for their limited range. A short list would include art history and artwork sites, photo file-sharing sites, search indexes of web page images, and sites associated with locations suggested in the play. The images must be acquired (saved or through a screen-capture utility). They can be stored locally or on media for sharing, or they can be printed with a layout utility and a good color printer. It is important that you be able to reference multiple images, viewing several at a time or moving among them quickly.

Personal photographs: With the advent of digital photography, we have a tremendous tool for capturing moments and analyzing them later. Unfortunately, digital cameras adjust for the lighting and fail to reproduce faithfully what we see in person. Nevertheless, it may be worthwhile to review your personal collection. There may be images that are expressive of lighting moments you want to consider.

Observation from life: Go there and look. Look purposefully and carefully at the detail. Take notes.

Observation

The process of research demands careful observation. You must observe in detail, thinking about direction (or distribution), intensity, color, and contrast. Force yourself to see what is there and what is not.

Direction: In any image there are multiple light sources, but some are stronger than others. In every lighting image there will be a "key", which is the strongest light direction, and there will be "fill" that will illuminate areas not struck by the key light. Some of that fill will be direct, as with another source of light, and some will be indirect, as with "bounce", or keylight that is bouncing off a light-colored object. Occasionally you will find what might be considered a "secondary key" from another direction that is not really a fill, but one key usually will dominate. Look carefully at the shadows, because those will tell you which direction the light is *not* coming from.

Intensity: The depth of the shadows will tell you how direct or indirect (diffuse) the lighting is. The contrast between lit and unlit areas will tell you how bright the key is, and the amount of detail in the shadows will tell you how bright the fill is. Often there are multiple lit areas in an image that are of differing intensity. Observe how emphasis (focus) is achieved in this way.

Color: The keylight color may be less evident where it illuminates the object most strongly, and it is affected greatly by the colors in the subject. Usually, however, you can find something of assumed or known color in life, and how it appears in the image can be compared – skin tones, for example. The color of the light in the shadows will tell you about the fill, and whether it complements or contrasts with the key light. Typically there are multiple fill sources.

In thinking about color, think about “cool” and “warm”. Warm colors are centered on orange, and cool colors are centered on blue. Other colors are relatively more or less cool or warm (and can relate to each other as cooler or warmer). Typically, key light is more warm because warm colors “advance”, and fill colors are more cool because cool colors “recede”. In life, most light sources can be considered “warm”, and shadows are therefore “cool”. Inverting this expectation must be done thoughtfully.

Contrast: In many ways, lighting is about contrast: the foreground in contrast to the background, the keylight in contrast to the fill, the lighting in one moment in contrast to the one that preceded it. The contrast can be in direction, intensity and color. Look carefully at how contrast plays in each chosen lighting image.

Imagination

Return to the script and your selected lighting imagery. Reread each scene with your lighting imagery in mind. Play the movie in your head with the lighting from your sample images. Consider separately the key moments in the play, turning points, images that conclude a scene (and remain in the audience mind), and other distinctive moments. Consider alternatives and options. Think broadly about overall look of sections of the play and the whole play in general. Think about change or progression in the lighting, such as intensity or color or contrast, and how it might bear on movement through the play.

In graduate programs you are required to do value sketches. In this case make notes, and do a thumbnail map of lighting directions to remind yourself of the lighting idea. Gather your research images so you can show them. Prepare for a lighting design meeting with the director.

Is all this REALLY necessary?

It is a fact of life that you will not, even under the best of circumstances, be able to recreate faithfully the lighting images you have found. Your research images are static, but actors move -- they turn their faces from the light and shadow each other. You do not have hanging positions where the sources in the painting or photograph are, and you do not have the reflective surfaces and other subtle influences on color and light quality in the image. So what is the point?

You need an anchor idea. You need a goal or target. You need a TANGIBLE idea. Only after years of work can designers develop a repertory of lighting ideas that can offer up the best options for the moments before them without a research picture. They store images of light as a habit of life, and living is an act of ongoing research. Even then, established designers collect books and pictures to stimulate their creative ideas and help communicate them to directors and other designers.

While this discussion has been lengthy, it does not necessarily mean the research process takes a great deal of time if you can target your efforts. An hour or so of looking at Winslow Homer and Caravaggio can produce a wealth of lighting ideas. This pales vastly in comparison to the image research for your fellow scenic and costume designers.

The second important function of image research is communication. You must decide on what footing you want to work with your creative colleagues on the artistic team. Do you want to contribute ideas to the effort, or simply implement what others specify? How then do you communicate your lighting ideas? Words and waving hands in the air can go only so far, and they have a tremendous capacity for misinterpretation. Pictures are the answer, and you must provide them.

You can get by without “all this research”, if getting by is all you are interested in. But it will cost you later in an inability to communicate well, in a lack of clarity for making choices, and in trial-and-error changes. It is not a happy moment when the director demands time-consuming changes because you did not communicate clearly in the design phase.

The first lighting design conference

Different directors work differently, but there are some consistent practices. Most directors don't want a lot of meetings – lives are busy and they spend a tremendous amount of time in rehearsals. They do like to talk through their thinking about how the show should flow and work. For this meeting get an hour appointment.

Show up with your script, your notes, and your images. Revisit your list of *key moments* in the play – those confrontations, reversals, revelations, climactic moments, resolutions, slapstick bits and crisp bits of cleverness – and update it.

Plan to “feel your way through” the play with the director. Start off by talking about the things that stuck with you from the first meeting. Get the director to talk about flow and mood, and about how he or she sees the critical scenes. Review the list of key moments with the director. Open the script and start from the top of the show. Let the director talk about his or her ideas for the opening and first scene, THEN you talk, perhaps showing a research image. When you think the two of you have communicated clearly enough and you have ideas for moving forward, push on to the next scene. If there is insufficient time to do every scene, focus on the important or critical ones.

You should leave this meeting with clear ideas about the look of major scenes, and which scenes and moments the director feels strongly about. This is not a cue meeting, but a concept meeting. Don't let it get bogged down in cues, but do be alert to the director's interest in timing for specific moments. In such a fast-moving and free-flowing meeting it is easy to forget to take notes. Do not fail to do so.

Confer with the designers and technical directors

A critical step in gathering information is to confer with the Scenic and Costume Designers to ensure the coherence of the project. Meet with the **Costume Designer** and review her or his designs. Look carefully at the colors and textures. Obtain swatches of the dominant colors so you can test what happens to them with your color choices. Encourage her to talk about her plans and listen carefully to what she cares about most. Discover any fears about what will happen to specific pieces under the lights.

Meet with the **Scenic Designer**, who will become your most important collaborator. It is important that you communicate well on an ongoing basis. Look closely at the model or sketch with him. This provides a tangible vision of the production and often includes specific lighting ideas and effects. *Discuss any difficulties in where the lighting can be placed and where it may be obstructed.* Obtain a **ground plan** of the stage setting with the electric positions marked, and a **sightline section**. [In some cases with a guest designer, these will be obtained from the Faculty Technical Director.]

Changes and transitions of scenery and scenic elements are a significant concern for you. The Technical Director plans and staffs the scenic changes to make them work smoothly, but you are responsible for setting their timing to happen gracefully with the lighting. Be certain you place these scene changes in your script and understand what is involved. They may be as simple as a slipstage or a few actor-strikes and actor-sets of properties, but you need to manage the transition with your lighting.

Meet with the **Faculty and Auditorium Technical Directors** to arrange for the lighting production schedule, and to obtain several items of information before you begin the design. You will want the following:

- Current equipment inventory
- Current equipment status (dimmer conditions, equipment out of service, etc.)
- Equipment rental budget and parameters
- Hang and focus crew availability
- Calendar and schedule constraints

The Project takes shape

You now have a sense of the shape and dimension of the project. You know the script, you know what the director is looking for, and you know where the other members of the artistic team are going. You have concepts and ideas for the show. It is now time to begin the plan.

Put it on a schedule

Up to this point you may have been working with general ideas about the calendar. It is critical to lay out a specific schedule of work. You have tasks you have to complete that must coordinate with the work of others. You have to plan when you will need help from others and how you will use them.

As a beginning designer you will not know what all must happen and how long it will take. Seek the advice of the Faculty Technical Director and the Auditorium Technical Director. Following is an *ideal* outline of the process and its timing at Bridgewater.

DESIGN WEEK (3 weeks before open)

Sunday:

Rehearsal research (map blocking)

Monday:

Production meeting
Cue the script I
Rehearsal research (map blocking)

Tuesday:

Cue the script II (include shift cues)
Rehearsal research (map blocking)

Wednesday:

Review cues with director
Rehearsal research (map blocking)

Thursday:

Prepare lighting key (magic sheets)
Prepare requirements list
Review color with scenic, costume designers
Gather ground plan, section, lighting inventory

Friday:

Lay out light plot

Begin hookup

Saturday: Work Day

PRE-TECH WEEK (2 weeks before open)

Sunday:

Complete light plot for hang
Complete hook-up
Complete color
Rental order prepared

Monday: Work Day

Begin hang
Order rentals and color
Production meeting:
 Final schedule
 Personnel

Tuesday:

Hang complete
Cable, patch, circuit

Wednesday:

Focus I (2-3 hours)

Thursday:

Focus II (2-3 hrs)
Pick up rentals
Install rentals & focus
Final rehearsal research (usually a run-thru)

Friday:

Final focus (4-6 hours)
Complete patch and hookup
Complete board setup
Complete dimmer and focus check
Cue Writing I (evening)

Saturday: Lighting Tech

Cue writing complete
Review with director

OPENING WEEK

Sunday: Tech day

Monday: First Dress/Tech

Tuesday: Final Dress/Tech

Lighting desk moves to booth.

Wednesday: Preview

Thursday: Opening night

Rehearsal research

Lighting the stage requires knowing where the acting is placed, what the feel or sense of the scene is as it is played, and how scenes transition from one to the next. The only place to understand this is in rehearsal. You can get a sense of things in early rehearsals, but decisions are in flux until they have been worked on for some time. The lighting designer needs to be on the distribution list for the rehearsal schedule and updates.

Each director works differently, and there are several approaches. The show may be rehearsed in order or out of order, musicals will have dance and chorus rehearsals apart from acting scenes, and rehearsals may be scheduled based on group scenes or small scenes, or around availability of choreographers and other associates. Some directors work out the whole schedule, others work week-by-week.

Ideally, you want to see run-throughs of sections of the show, whether an act or a series of scenes. You may need to see certain sequences to understand them, especially in a musical. You must build rehearsal attendance into your schedule. By the second week before tech (“Design Week”) you need to begin writing cues, and you need to see as much of the show put together as you can.

Although directing practices and circumstances differ, often there is a run-thru rehearsal of sorts on Sunday nights. Directors want to review a large section of the show to refresh memories from the Friday-Saturday break and to determine rehearsal tasks ahead. This is a good time to observe a rehearsal to get a feel for the flow and document how the stage is being used. Some directors will schedule an early “limp-through” in collaboration with the lighting designer.

Prior to watching rehearsals, reduce the scenic designer’s ground plan to fit 2 or 3 on a letter-sized page. Make 20-30 copies initially. Organize your script and these pages of plans to allow you to take notes quickly during rehearsal. Binders are useful for many things, but they are difficult to manage on your lap. A clipboard with stapled copies of these maps and a stapled copy of the script are more easily managed, but every designer develops her own paper-management methods. The principal challenge is to manage the paper, make the notes, and keep your eye on what is happening on stage simultaneously. You also need a .7 lead pencil and a big eraser.

During rehearsal you will mark the script page number by each diagram and map the action of the scene or the moment. There is no standard for this; whatever you can produce quickly that is meaningful. One possibility is the “football play” technique of circles and arrows. As you write cues, these remind what areas of the stage are covered and need to be lit. The diagrams also can be converted to small lighting keys or “magic sheets” for cue writing.

Cue the script

The next step is to cue the script. This involves two actual processes. One is **placing** the cues in the script, which can be done at any time, even before seeing rehearsals. These placements won’t be final, but you make no marks in your script that are not in pencil. EVERYTHING can change. The second process is **describing** what actually happens in the cue. This must wait until you see what is going on in the show, because it involves knowing what has to be lit where, and what the look of the cue should be.

A note about cue numbering: A cue number is a *label* for the cue. It is numbered as a convenience for making things occur in an order. The numbers themselves do not have to be successive but must be in order: cue 12 can follow right after cue 9. The lighting console also accepts “point cues” as in 12.1, 12.2, etc. You may number in any sequence you wish, but in order. You may begin preshow with cue 1, begin Act I, scene 1 with cue 11, and begin Act II with cue 111. Just

remember to allow several whole cue numbers for spots where there are likely to be many cues that will be added later. Skipping numbers allows you to cue the show out of sequence (set cues for later scenes before setting earlier ones) and add new cues at any time. It also can help you tell quickly from the cue number where it occurs in the show.

Cueing the script may be done at once, or in sections. It may be dictated by the order in which you see the parts of the show in rehearsal. The process can be quite time consuming as you plan the look of each cue, and long sessions can make you less careful and thorough in describing them. But you should try to complete a group of related cues in one session so you can maintain a sense of flow and reuse your looks efficiently.

Cues you will need

There are at least four kinds of cues:

Transition cues occur at the beginnings and endings of scenes, acts, and the performance as a whole. Another type of transition cue occurs with “step-outs”, when the action steps out of the scenic context, such as musical numbers.

Emphasis cues shift lighting emphasis and audience focus to one part of the stage for some dramatic purpose. They also temporarily brighten entrances, usually without drawing attention.

Bumps change to brighter or more colorful levels to punctuate dynamic changes in musical numbers.

Effects cues provide specific lighting features, such as headlights or explosions or the apparent light from practicals (light sources in the setting).

Several *transition* cues are standard practice. Cue 1 always will be the preshow or preset that is entered at house open, about 30 minutes before curtain. Usually, some low seductive lighting is played on the set or on the act curtain (“curtain warmers”). House lights are at full.

The house lights in the Campus Center auditorium are not controlled through the lighting system and must be run manually, for which there are specific instructions. During technical rehearsals while the lighting control board is operated in the house, an Assistant Stage Manager operates house lights from backstage. When the lighting operator is in the control booth, he or she operates house light switches there.

Cue 2 usually is “house to half”. House lights are dimmed to 50% for about 30 seconds to encourage audience members to find their seats. While at half, sometimes there will be a live or prerecorded curtain speech regarding cellphones and exits. Also there may be preshow music that is timed to the opening of the show.

Cue X will begin the show. Typically this is house-out, then scene-up. The preset may or may not go out with the house before scene-up, and the opening look may be a transition from the preset, or come up from black. There also may be a transition cue while the curtain is opening/rising or some initial action takes place.

For performances with the audience seated on stage, the auditorium houselights dim to very low, and a light on the orchestra pit bridge stays on low for latecomers. After two or three minutes into the action, the auditorium is taken out and the pit bridge light stays on very low. The house lighting for the small-stage seating is included with stage lights and is run from the control board.

The director will have strong ideas about transitions between scenes and acts, and when, if ever the stage should go to black. In almost every case, some lighting change will punctuate a transition from one place or moment in time to another.

When there is an intermission, the scene will end in a cue, usually to black, and the next cue will bring up curtain warmers or preset lighting and the house almost simultaneously. At the end of the intermission, the house will go to half, then out as the stage goes out or transitions to the opening cue of the new scene.

At the end of the show, the stage typically fades out, usually (but not always) slowly, then quickly brightens immediately (or after a brief pause) for bows. It is an easy answer simply to throw up a lot of light for bows, but it misses an opportunity to leave a lasting artful impression on the audience. Certainly, the actors must be seen well, but it should be in flattering light. Be prepared that the director will not stage the bows until the night before preview.

After bows usually is awkward with amateur casts. Rarely does a show use a curtain in a way that they simply can step back and let it close in front of them. Watching the cast turn their backs and flee without ceremony is ungraceful, but they cannot exit in black because they really can't see. It also is ungraceful for the house lights to be half-way up before the last cast member is off, but holding the house in black forces them to watch the exit. The trick is to time the houselights well, and be sure to bring the stage back up in a nice preset for the audience exit.

After the public is out of the theatre (and we like to have the theatre doors closed), the work lights can go on and the stage lights can be saved. The final cue is a full blackout of the stage lighting, and it should have a -99 number so that it is recognizable. Above this cue number will be partial looks used in cue writing, experimental cues, and special cues such as components of chases.

Shifts are executed within the context of transition cues. Usually there is a specific lighting effect for scene shifts that are not covered by a curtain, such as blue backlight at low level. This requires that a scene change have at least 2 cues: 1 - scene down and shift lighting up, 2 - shift lighting down and scene up. The timing of these cues is important to the sense of flow in the show. Scenes usually end in fast cues, 1-2 seconds. If the change light is low enough, it can come up in the cross-fade because initially it will appear to be a blackout. At other times, the final image of the scene may be important for the audience and a more graceful fade is needed. This may require going to black before coming up in change lighting, and there will be 3 cues. Scene up can vary between 1 and 3 seconds according to the spirit of the action, and should be held for 1 or 2 seconds after change is complete.

An in-scene shift may require an emphasis cue. As furniture is brought on, a prop is switched, or a slipstage travels on, the lighting will de-emphasize the area of the stage in which the shift is occurring.

Emphasis can be created by changing intensity, color, or direction over the stage or parts of the stage. These cues can be noticeable or unnoticed. Noticeable ones compare to transition cues in that they flag a surprise or other change in beat. More frequent are those that aren't intended to be noticed by the audience, as attention is drawn to a particular character or grouping in a scene. The stage also may be warmed or cooled to suit changes in tone during the scene. One emphasis trick also is the "lag-out" on a transition cue, with lights fading out over the stage but one area of emphasis fading later or more slowly (written as a complex cue – see cue writing below).

In your rehearsal research, watch the blocking carefully for opportunities to achieve emphasis through lighting. In most cases it should not be gratuitous or done for its own sake. The light should bring dramatic strength to the moment and not detract from it by calling attention to itself. Usually the

audience should not be conscious of these cues, which means they should take some time to change. You score points if the director doesn't notice them, either.

Pay particular attention to emphasis on entrances. Dramatically, a character entrance punctuates a scene and sometimes it needs to be enhanced with light. The light must be there as the character enters. It is more elegant for a character to enter into light than to have it come up after he is on. This applies when action moves to an unemphasized part of the stage, as well. The nature and placement of doorways sometimes requires an emphasis light that is part of the general stage setting and it may or may not be separately cued.

Bumps are not always as easy to create as they might seem. When levels are already at 100%, they can't go to 110%. Musical numbers almost always have at least one bump, and big chorus numbers will have at least 2 or 3. In more modern musicals the problem becomes more complicated where the finale of an act or other musical number can be a sizable section of action in the scene. These require bumps, emphasis changes, more bumps, then a new series of bumps and emphasis changes. At some point it is difficult not to throw in follow spots just to solve the problem. It usually is appropriate to begin a musical number by refocusing emphasis and actually reducing some light, giving more room for bumps. Changes in cyclorama and side colors allow the musical number to be set off from the action and provide visible change while reserving large intensity bumps.

Effects cues are specialty cues, and are very popular with many designers. Isolation spots, patterns, projections, firelight on stage fog, rain, moving lights, and concert lighting effects find their way into many productions. Sometimes it is a fine line between their contribution and their use for their own coolness, but they can be legitimate contributions to the overall effect. Effects cues also include some uses of real light on stage, such as fluorescents, porch lights, floor lamps and other practical fixtures. In most cases these real light sources are enhanced with additional stage lighting to fill shadows or change color temperature.

The Follow Spot can be an effect cue or an emphasis cue. An effect would be a hard-edged bright spot on a singer or dancer. It is noticeable and "plugs in" the moment by separating it completely out of its context, both visually and dramatically. An emphasis would be a barely noticeable soft-edged punch-up for a character or an action. Remember that the lighting always is frontal, and will kill shadows in the subject.

Defining the cues

The second part of cuing the script is defining each cue. After the major transition cues are placed in the script, the designer enters some of the most difficult work of the design process. Each cue is imagined, planned and described. The more thoroughly it is done at this stage, the less time is spent in cuing sessions and the fewer installation (hang, focus, patch, color) corrections will have to be made. Every decision made now will reduce time in the hall and the demand on labor resources while you make up your mind at the tech desk. You also are far more likely to have a lighting look that is not a default choice.

Every designer develops his or her process for this. Start by gathering and organizing your materials and work environment. Cuing will take at least a couple of sessions over a couple of days. The order in which you engage the tasks may depend on circumstances and personal preferences, but this process is suggested.

First, try to get a sense of which looks are most important to spend time on, which looks are likely to be repeated and which can be "parted out" or subdivided into submasters for cue writing. For a multi-scene play or musical, it is worth the time to make a list scene-by-scene of the base lighting looks, sometimes called a basic restore list. Base lighting is the cue to which specials may be added

or minor adjustments may be made for emphasis. Two scenes in the living room in different parts of the play may have the same base lighting except for the practicals and some effects specials. There may be 4 scenes with the same sunset on the cyclorama. Locating these repeated cues will help focus your energies. It is important that the repetition of looks has been discussed with the director, or will be before cue writing. Sometimes the director has a different sense of the scene in question.

Write cue 1

Lay out your rehearsal maps, research images, color media swatch books, mini-flashlight (for looking at color media) and script. You also will need sheets of paper, a .7 or .9mm mechanical pencil, and a big eraser. Start by heading your first sheet of paper: PAGE [space] CUE [space] TIME [space] DESCRIP. Draw a line across and write PRESET below. On a new line, the first page number of the script, 1 (for Cue #1), and def (for default time). Then describe the lighting or look as the audience enters, such as "House full, blue back, lav R side low". You have defined the first cue clearly enough that you can construct it easily and quickly during the cue writing session.

You then proceed through the cues. You may concentrate first on those determined to be repeated or important in the list above, or you may go in order. If you define them out of order, be certain you go back through the show carefully to work out transitions and internal changes and to ensure that all the cues that need to be written are defined. Be clear about the placement of each cue at a specific spot in the dialogue, but you need not be precise about where it is called. That will be determined in technical rehearsals. Try to be as clear as you can in constructing cue sequences.

Think about your cues in the same perspective that you brought to observation of lighting research. Think specifically and deliberately about *direction* (or distribution), *intensity*, *color*, and *contrast* in each and every cue. Think in terms of key and fill, and consider contrast in direction, intensity and color.

You will have to document your thinking about the lighting in most of the main looks of the show so that you can place equipment appropriately. For this you return to the stage maps and the rehearsal maps you made and turn them into lighting keys. Make choices from the color media swatch book based on your research image for the scene. On the rehearsal map of the selected scene, place arrows and *color numbers* pointing in the lighting directions that will give you the light you describe. [See the discussions below about color and direction.]. Add any notes that will be helpful when you write the cue itself.

Working with color

Familiarity with some color theory and the color wheel is critical for designing stage lighting. The mixing differences between color in pigment and color in light are significant. The effects of filters, and additive and subtractive mixing is critical knowledge for a designer. You probably should play with color experimentally, but much of that time can be saved by knowing what to expect normally. In any case you must *understand and accept* the following concepts:

- The primaries in light are red, green and blue (RGB). Red and green light make yellow light.
- A filter removes part of the spectrum from the light. It adds nothing.
- The balance of color output in lamps changes with intensity.
- The color something appears is the color in the light that is not absorbed by the object. It cannot reflect a part of the color spectrum that is not in the light.
- White or neutral light is created by mixing two complementary colors (from opposite sides of the wheel – a primary and a secondary color).

- Colors are considered *relatively* “cool” and “warm”. Warm colors are centered on orange, and cool colors are centered on blue.
- Two colors projected on an object from different angles will fill each other’s shadows, maintaining visibility without sacrificing 3-dimensional definition.

Designers differ significantly in how they use color. Some highly regarded working designers rarely use any color, or use it very sparingly. In recent years it has become more conventional to use color boldly, expressionistically, and more for its own statement, but it lends itself to cliché applications.

Strong color has found very significant application in dance lighting because of its emphasis on form and visual expression. Strong color often is used to separate a moment from realistic conventions in the theatre. Singing and dancing in musical theatre usually is heightened by greater use of color, particularly in side and back angles. Strong color is used as side or back lighting to make something “pop”, as in popping visually out of its background, and as in relating to popular tastes. In almost every case its use is intended to draw attention, to stimulate the audience’s attention to the visual element.

When the focus is on the dialogue most use of color is more subtle. It is used gently to communicate the degree and quality of warmth in an environment; to make a romantic moment captivating, an office scene cold and impersonal, or a Christmas hearth warm and comforting. On professional stages all faces are clearly lit if they are speaking characters. Mood lighting is used deliberately and sparingly, usually more suggestive than expressionist. Strong color is used in shorter scenes and moments.

Conventional uses of color have developed as color media have expanded and improved. A classic 1950s universal combination was comparable to modern Roscolux 02 Bastard Amber and 51 Surprise Pink. It was flattering in the shadows and brightly warm on the key, and the colors transmit most of the light. Contemporary color media with high transmission (over 50%) offer a wide range of subtle shadings for color media. Designers usually use at least one cool and one warm for the high keys and fills in area lights.

These warm and cool keys are used in combination with each other and with more intense complements from other lighting positions. For instance a scene might use a strong color blue right fill from a side-front position with a high key warm 02 from the beam slot. The cool 51 from the beam slot would be warm in relation to 365 daylight blue from a side-front position. In both cases the balances of transmission differ significantly, and the stage will tend to appear more deeply shadowed than an 02-51 combination. The process of developing a plot involves developing an optimum number of combinations that will meet the needs of the show. Often this leads to the palette settling in with one or two controlling colors that give the show a theme-like feel.

Remember also that warm colors advance and cools recede, suggesting that fills should be cooler than the key. Stronger color may be used in fills than in keys for a conventional lighting look.

It is not easy to work out all of these matters with a swatch book and a mini light. Sometimes you need to set up two or three lights and try it out. This may be prudent particularly when color is important to the costumer, and you should test light some of his or her fabrics. At BSC this can be done in the follow-spot booth where there is an old portable dimmer set up. You will be able to compare colors at varying intensities and directions.

These complications and compromises may make the research phase seem irrelevant. If the color research was done well you have an intuitive feel for what seems right. You will be surprised at how well you know if a particular color or look is right for the show.

Working with direction

You considered lighting direction when you selected research images, and now want to replicate it on the stage. The likelihood is that you won't be able to do it precisely. There are limits to installed theatre lighting positions, but with some acceptable augmentation, they are pretty good. They can be improved for specific purposes, but you need to assess whether the improvement is worth the difficulty in reaching or establishing some creative location.

Lighting positions for full-auditorium seating in Campus Center Auditorium include:

- medium high front position in the beam slot or cove
- two apron side and side-front positions in the torm slots
- all directions above the stage (front L&R, high-side, top, back L&R)
- stage booms for lower side lighting, placed when needed
- special lighting mounted in other show-specific positions, such as footlights.

There are limits to how many instruments can occupy a favorable position, it is difficult to get a steep front light angle on the apron, and distance of the instruments is significant for beam and high side-front positions, but most vertical and horizontal angles are covered. Shows with on-stage seating have no benefit from the beam slot or torm slot positions, but the entire space over the stage is available.

These lighting directions can be mapped easily on the rehearsal diagrams with short arrows. Each arrow is labeled with its color and at least one arrow is marked key. When the plot is drawn, instruments will be placed to focus on the lighting areas in the direction of the arrow.

Plotting the design

Your lighting design now exists. You've researched the show, cued it, colored it, and determined lighting directions. Plotting the design is the first step in implementing that design idea.

Requirements list and magic sheet (lighting key)

The first thing you need to grasp is what exactly the task is. What is going to be demanded of the lighting equipment you put in the air? You have to begin with a requirements list.

To make a requirements list, methodically begin with the first cue definition, and list everything that cue has to be able to do. Also include the color and other additional information from the enhanced rehearsal maps. In the case of the example given above: "House full, blue back, lav R side low":

1. house lights –Q 1, 2
2. blue back R64 –Q 1
3. lavender right R54 -Q 1

Continue through the cue definitions. Then *consolidate the list* by looking at where requirements can be served by the same equipment. The result is a master list of what you need for your lighting to be able to do. Prepare a new consolidated lighting key (magic sheet) that shows all the lighting vectors (directions) and colors that are included in the requirements list.

Set up to draft the plot. Tape down the current ground plan from the scene designer and overlay with tracing paper. Lay in the centerline, plaster line (or set line) and each of the electrics with an ultra-fine point Sharpie or other ink pen that is likely to blueprint. On each electric, make a small cross line every 4 feet from centerline using your Sharpie, as an aid to the Master Electrician that will

hang your plot (even if it is you). You ink these lines because you will be making a lot of erasures and don't want them to go away. Don't bother drawing anything else yet. When you do draw instruments, they will be positioned with the electric crossing the middle of the symbol, and they will be oriented generally in the direction of the focus. You will be placing focus information at the lens of the symbol as you place the equipment. Later you will add an instrument number in a circle at the back, but don't draw the circles until the end when you have all the equipment placed. Making space in the drawing for all the equipment on the hang position is a higher priority. The circles can be connected by a line.

Layers and functions

It is a luxury of an established theatre with a good standing inventory of equipment that you can risk designing for lighting that you may never use, and you don't need to wring as much utility as possible out of every single rented instrument. In Campus Center Auditorium the limitations come in control capacity and the number of dimmers, but they are not unreasonable currently.

The best approach to constructing the plot is to conceptualize the structure of the plot in terms of function. A common list of general functions drawn from your requirements list might include:

- Coverage of the entire stage by lighting area with one or more base looks.
- Toning washes from several directions.
- Color washes from several directions.
- Specials for various purposes.
- Practicals

You can think of each of these functions as a *layer* in your plot. You develop your base looks as a layer, then build layers to serve each of the more specialized functions. The additional layers are built to interact with the base layer – a warm toning wash comes in from a cool side of the area lighting so they can be used to balance each other, for instance. This scheme also gives an order of design: area lights, then toning washes, then strong color, then specials for emphasis, effect, and what can't be covered. Specials usually are placed to reinforce practicals and suggest their lighting more dramatically.

Dividing the stage

The first thing to do in constructing the first layer of lighting is to define the areas of the stage for focus. The idea is to divide the stage in such a way that all of the acting areas can be covered effectively and efficiently. There are two ways of doing this: *grid* coverage, and *acting area* coverage.

Grid coverage is most effective in covering open expanses of stage where the action might take place anywhere. This is typical over the whole stage for dance lighting, and in repertory situations and similar circumstances where definitions between acting areas are fluid and flexibility is required. The stage is divided into a grid and each cell is lit individually from multiple directions, allowing the greatest flexibility within the grid structure.

Acting area coverage is most effective where parts of the stage are consistently used in specific ways defined by the ground plan. Action tends to relate to features of the set and acting areas of various sizes make irregular divisions of the stage. These settings do not lend themselves to grid coverage because important acting areas will not coincide with grid cells. For instance, an area around a sofa in the middle of the set includes several sub-areas where action may need more or less emphasis, including on the sofa, in front of the sofa, behind it, and at each end of it. The area in front of the entrance door is an acting area that needs to flow out into the room, and the area at the foot of the stairs might be needed for some key interaction there. All of these acting areas are linked by transition areas until the entire set is fully covered.

The size of lighting area needed can determine the lighting instruments to be used, or the choice of instrument can determine the size of the lighting area. The problem with several instruments of different beam characteristics sometimes can be achieving balance among them: a wider beam will require a higher dimmer level to match a narrower beam. The two lamps at different intensities also might have visibly different color outputs, making smooth transitions between areas more difficult. Control and cue writing become more delicate.

Whether the grid method or the acting area method is used, a smooth flow is needed among almost all of the areas. There are two methods for dealing with movement from one area to another: beam shaping, and overlapping. With profile instruments (focus with shutters) it is possible to match instruments side by side and cut the shutters at the transition, but this beam shaping technique seldom yields the best results unless the acting areas are very tightly defined.

Almost every successful plot requires overlapping focus in the first layer, whether using grid or acting area method. Focus areas are overlapped either on the fields or to the centers. All instruments, but particularly older instruments, have a distinctive fall-off over about the outer third of the diameter of the focus area. This is the field. The 2/3 that is brighter is the beam. A plot will overlap only the fields if it seeks to use the instruments sparingly and doesn't need to control settings in smaller increments of the stage area. Whenever possible it is better to overlap lighting areas as close to beam centers as you can.

The first layer of lighting is usually done with "workhorse" instruments that have a reasonable beam size for the throws. They are matched for the throw in order to provide even fields of light. The workhorses from the beam slot in Campus Center are ETC 10-degree Source 4s, and from the stage, 26 and 36-degree Source 4s. Each provides about a 10' diameter of good controllable light at its usual throw distance. The specific *parametrics* of the various lighting instruments can be downloaded from the manufacturers' web sites.

The ten 10-degree Source 4s in the beam slot hit the stage with a field about 10' across. Assuming a grid method of lighting, they do pretty well with five areas across the apron up to 30' wide, but the ends may need some supplemental lighting from the side-front tormentors. A wider setting will require two more lighting areas on the ends. The centers of the *second row* of lighting areas will be upstage about 8 feet from the centers of the first row, overlapping and staggered between them. There will be only 4-6 areas in second row.

Notice that the first row is 5 or 7, an uneven number. Emphasis almost always is needed at stage center, so build it in from the beginning. It is less of an issue for the small stage setup, and four areas across can be used. That stage setting has additional challenges in covering the downstage corners. These coincide with aisles and directors like to park actors there where they are not blocking audience view. The lighting for them is not typically part of the first layer, however.

In Campus Center Auditorium the angle of the beam lights is about 40 degrees off horizontal. That makes the length of the beam along the axis much longer than its width. First electric cannot pick up lighting areas much less than 12' behind the proscenium, so the beam slot instruments must cover all the space downstage of that line. Two rows require all but two of the 10 degree instruments. It is helpful to understand how close the actors will play to the apron edge to determine how much the focus can be lifted further back. Yet it should not fall on the background in most designs, and care must be taken that it not produce shadows on scrims and drops.

Determine the centers of your lighting areas on your layout for the plot. You may use a grid system or a hybrid. You can begin with a grid system and adjust centers to acting area centers, or you can develop lighting areas exclusively in relation to acting areas. It is helpful to use a compass set at about 10 scale feet diameter. Light arcs for the beams will help visualize overlaps, but

remember that the light is striking the stage at an angle and the actual lighting area is longer on the axis of the instrument. The distortion is determined by the angle of the instrument and the height of the object being lit (see vertical templates in the appendices). Mark each lighting area center precisely. Draft the centers as crossed lines and label each one clearly, perhaps with a lettering template, so that it can't be mistaken for other marks. Convention calls for lettering from house left to house right (as the designer sees the stage while writing cues) from stage front to back. "A" is the first area down stage right. Some designers omit ambiguous characters such as I and W. Some of these focus centers will fall under electrics and instruments will be drawn over them, but you probably should not ink them. They may move.

Placing the equipment

Layer 1:

To light this first layer, you need to look at your master magic sheet. The discussion of using color above referred to several possibilities, and you must shape your ideas from the lighting key. The leanest idea would be one warm instrument and one cool instrument from the front (beam slot for full stage; 1st electric for on-stage productions) on each lighting area, one from right front and one from left front. Convention has it that these are high-key choices, with colors that pass over 50% of the light. One would be considered cool for a fill, and the other warm for a key. In devising the grid system in the 1940s at Yale, Stanley McCandless double-hung the warm side of the front light with a secondary cool, allowing the designer to control the color of the key. Another possibility is to move the secondary colder cool to a side front position on the same side as the warm and it becomes a fill for the front cool used as a key. The cool choice in the beam slot could appear warm in relation to a colder side color from the opposite side.

It is popular to place a key in a high side front position, usually not a strong color. This is the traditional "first box" position, and sometimes called jewel lighting. The fill is provided by front lighting. When done well it can have a crisp dramatic feel. It must be done carefully and requires delicate balancing of the sources and the colors.

You have to use your magic sheet to determine how you want to lay out your keys and fills. The first layer should provide you all of your major base lighting options through most of the show. A conventional complete first layer will include front key and fill, and back and side lights on each area, and ideally all would be individually controlled. At BSC we don't have 6 dimmers for each stage area in the first layer, and we have to group them or turn some lighting vectors (directions of light) into washes (which go on another layer). Don't worry yet about grouping them. That will come with the control phase.

Plotting the mainstage layer 1

For full auditorium, the beam slot equipment is in fixed positions. A copy of the beam layout is placed under the tracing paper in an appropriate position on the plot, and the equipment is traced using a lighting template. Each must then be assigned its focus. For the conventional plot, begin with the outside house-left 10-degree Source 4 and assign it to Area A. At the lens of the instrument symbol label it A-R-[W or C, for warm or cool] unless you are specifically making a choice to light that outside extreme from a tormentor position. At the house-right end of the beam, mark the first 10-degree E-L-[C or W], assuming 5 areas across. Then progress toward center. The next 10-degree instrument on house left likely will hit F, the first in your second row of areas. This scheme provides the maximum diagonal separation possible in the beam slot, although it rarely can be particularly substantial. As the plot develops you may find that you need to adjust these assignments. If you

cover 9 areas (5 first row, 4 second), you also will have 2 10-degree instruments left at center for special assignment.

Next, move to the downstage form slots (HLT-2, HRT-2). This is the side-front position. Equipment here should be 19-degree Source 4s, which have to be rented, and 26-degree Source 4s. There really are only 6 or 7 good lighting positions on each side, and the vertical angle is problematic until we can find a way to put more instruments near the top. If the tormentor is being used as a strong fill position, five are needed to cover the first row of the grid. The instrument focused on the farthest area has the longest throw because it needs to be the top instrument. That is the only way to maintain a similarity of vertical lighting angle across the row, but more importantly, it is the only way to reduce lighting on the far proscenium wall. The lowest one or two positions can be 26-degree Source 4s because they are so close to their focus points, less than 20% of the distance to the far one from the top. Light obeys the inverse square law rule, meaning the near focus gets 25 times more light than the far focus from the same instrument at the same intensity. This poses a barrier to grouping these instruments together in any way.

Draw in the instruments, and mark each as area – left or right – cool or warm at the lens position. Move now to the upstage form slots if they are to be used as side-front lighting for the second row. Draw and assign those instruments in the same way. Note that this position can be difficult for focusing upstage on the close side, because of the bow of the wall.

As you move to placing equipment on the electrics, you will need to refer to your sightline section drawing. On your plot, measure the distance of the centers of the 3rd row lighting areas from the plasterline and mark it on the floor line of the section drawing. Then draw a scale 5' line up from the center point of the area, representing an actor standing at center. Assuming the electric is trimmed at about 20' to the pipe, A 36-degree Source 4 on 1E will cover the feet of an actor on the front edge of the area, and the head of an actor (or lighting designer), standing on the focus point as the vertical line represents will be in the center of the beam. The vertical angle in the section will look something like 30 degrees off vertical, but combined with a horizontal angle as it is placed on the pipe, the angle of light should come in at about 45 degrees. The challenge will be to focus this lighting and control intensity so that it blends smoothly without shadows and transitions from the lighting in the first rows of the grid, which are lit with very different instruments at very different throws.

To draw this, use a drafting triangle at 30 or 45 degrees off vertical (depending on the effect you want), and make light hash marks across the electric for instrument positions. It is a good idea to stand a 45-degree template cut to the scale height of the electric under the instrument position to verify your lighting angles and positions (see vertical templates in the appendices). Then draft the lighting instruments using a template. Mark each symbol at the lens for the lighting area, as you did with the other equipment you have placed. Then move on using the same process to place equipment on other electrics to serve the front lighting needs of each area.

Be certain to use the sightline section to check the focus of the equipment in case there are scenery or overhead borders obstructing the light. On occasion, scenic borders and legs are placed in such a way that 1E cannot adequately serve areas upstage because of an obstructing border or portal, and 3E is too far upstage to light the areas. In those cases a 2.5E can be created on a line upstage of the obstruction. This must be cabled manually to floor pockets on each end or directly to the dimmers cabled from the patch panel, because there will be no raceway. [Why 2.5E? Because a 6E would sort after 5E.]

Next, turn your attention to the side-front lighting, if you are using it. The placement of this equipment is more difficult over the stage. The idea will be to place equipment at a comparably radical side angle to that in the form slots. These should be aimed at 30 degrees off horizontal, at most. Check the vertical lighting template to determine the best distance from the focus point. The

outside areas may be difficult to hit from the outside at that angle because scenery may obstruct and creative positioning may be required. For distance from focus point the pipe can be lengthened a few feet with an extension, but the outside angle usually is more vertical for the outside instruments.

Finally, position your back lighting. Back lighting places a rim of light on a subject and separates it from the background. Your lighting research will offer some ideas on how it might be used. If it comes directly from the back at too low an angle, not much rim will show. If it is off to the side and at a steep angle, more of that rim will be visible to the audience. The steep angle also minimizes the amount of floor that is lit. In Campus Center, begin with 2nd Electric for backlight. It will get in under the first teaser or portal and hit the downstage lighting areas without getting in audience eyes. When the stage is built out over the orchestra pit, much of it cannot be covered with backlight.

Using your vertical angle template and a triangle, place instruments on 2E about 30 degrees to the SL side and behind each focus area. Mark them A-L-bk, or as appropriate. You will need to refer to the sightline section to locate back lighting further upstage. If a backlight position conflicts with another area light instrument, move the backlight further to left or right as appropriate.

Instrument choices vary, but PARs are useful for their unobstructed punch and fairly smooth field, and backlight doesn't demand the control of beam character that front light requires. An 8" Fresnel is another option with more focusable character, but with slightly less punch. Use of 36-degree and 50-degree Source 4s or, indeed, any instrument is possible.

Plotting the small stage layer 1

Most of the theories applied to the mainstage also apply to the small stage, but there is a significant difference due to audience perspective. The audience is seated on three sides, and each side needs to see a balanced show, although we have tended to favor the view of the 60-seat front section over the two 30-seat side sections. The best way to think about balance is to relate colors on the diagonals. A warm downstage right should be mirrored with a warm in upstage left. These need not be identical colors, because one will serve as a form of diagonal backlight for two of the sections opposite. If the cools also are mirrored, there is a possibility of giving each audience a cool/warm balance of lighting. If a direction is doubled with a warm and a cool, it should be mirrored on the diagonal.

It is still possible with the small stage to place high angle keys and washes. In fact, steep angles are preferable, but plotting them can be difficult. It is a great aid to use a plotting template, as mentioned above. Cut a piece of cardstock to show the beam angles of instruments at trim height. Show the instrument beam spread for an instrument at trim height and 30-degree and 45-degree angles. One template is included in the appendix. This shows you clearly how much of the stage will be hit by the instrument at that angle from that height. The template allows you to place the figure on the focus center and then position the instrument.

Side color is best served from the diagonals to avoid giving any audience section an overwhelming dose of color. For layers 2, 3 and 4 below, toning and color washes can come straight on at a 45-degree vertical angle from the front and sides, but they do their work efficiently and can wash out everything else easily. Plant your specials where you need them.

Depending on the production, scenes on the small stage are more likely to be specifically lit by acting area, and the focus is much more tightly controlled for its limits and its tendency to bounce. A single light can have much more impact on the acting area than in the full stage setting.

A critical concern when focusing is to keep the light from going beyond the lap of the first floor row of audience. This requires quite steep angles and some light fill from the lower-angled toning wash can illuminate shadows if it doesn't get in the eyes of the opposing audience.

Almost every instrument for the small stage has to be a profile instrument with carefully controllable light. It is very difficult to keep light out of the eyes of the audience. At the 20-foot throw the Source 4s are difficult to blend. They maintain a clear beam edge. Roscolux #114 Hamburg Frost or #119 Light Hamburg Frost can be used with the color to blend beam edges without losing much control.

Whether for a mainstage or small stage show, once these basic areas have been lit, you have completed your first layer of lighting.

Layer 2

The second layer consists of toning washes. The purpose of a toning wash is to warm up or cool down a general setting. They may or may not be appropriate for a given plot or design. Whenever possible you should select appropriate colors for the first layer, but mood changes within a scene or musical number can suggest a color shift. If you have cues that are written essentially the same as other cues, but cooler or warmer, you may find toning washes helpful. These are not strong color, but more dense than the high keys. Generally a toning wash is cast from the front, but may be used from either side. Remember that any wash from the front is likely to flatten your lighting, because it will fill more shadows that are visible to the audience and that give three-dimensional depth to the subject.

For the mainstage, if you decide to use toning washes from the front, select three 19-degree Source 4s in the beam slot at center and middle of each side. Each will cover approximately twice as much as a 10-degree instrument, and three should cover most of the width of the stage. Since the beam slot is wired dimmer-per-circuit it will be easy to control them individually, giving you control over scenes placed center or either side of the stage. These instruments will cover both first and second row of the lighting grid, and may be lifted some to cover the third row. Mark them AB-F-Wsh (for area, front, wash), etc. Depending on the depth of the set, you might prefer to use 3 additional instruments in the beam slot to hit more upstage areas. Light from equipment on 3E will be difficult to blend with downstage areas lit from the beam slot.

Toning washes from the side also are useful. They are a bit more difficult unless scenes are localized below the proscenium or above it. It is a challenge to make a smooth transition from lighting from HLT-1 to lighting from the SL end of 1E. If you decide to use them they will reduce the number of other full-width functions that can be served from that slot. As in the beam slot, the instruments will cover near, center, and far sides of the apron. Space 3 26-degree Source 4s or 6x12 ERSs on alternate pipes from the top if you intend to use another side color or high side key. The bottom instrument could be a 36-degree Source 4 or a 6x9 ERS, because the throw is so much closer. Mark them AB-R-Wsh, etc. If these are the only instruments in the slot, place them on the top 3 pipes.

For small stage settings, the color washes can be served directly from the sides and front.

Layer 3

The third layer is color washes. Typically, color washes are served from the side. They may be localized to specific lighting areas, or they may be grouped to wash several areas. For side washes over the full mainstage width, place equipment in the first tormentor positions. Use near, center and far focuses, as with the toning washes. Use 26-degree Source 4s and 6x12 ERSs, with 36-degree and 6x9 instruments on the bottom. Mark them AB-R-Col1 (for color 1 or some other function designation), etc.

On stage, place an instrument on the ends of 1E and 3E, at mid-sides, and at middles, all focused across the stage. If your lighting image calls for lower altitude sources, you can drop a pipe

off of an electric, or even use a side boom, but obviously the side boom cannot obstruct actor or scenery movement, and the dropped pipes must be out of sightlines.

For small stage these color washes should come from the diagonals. If they come straight on from any side they will become toning washes instead of framing color.

Layer 4

The fourth layer includes all the specials:

- Specific specials on specific areas to bring up lighting for specific scenes.
- Specific keylight for tightly spaced individual scenes.
- Instruments placed for emphasis on doorways or other features of the setting or highlighting moments in the play.
- Lighting on the cyclorama, both high and low, and washes on backgrounds.
- Patterns and textured washes over any part of the stage.

Placing specials can be a challenge. Your electrics can be pretty full by this point making it difficult to find a hanging position exactly where you need it, and precise placement usually is important. Remember that there are no real rules on placement of specials, they can go anywhere you can get power to them. Choice of instrument depends on specific use, but usually it is a profile instrument with its highly controllable beam. Specials may be any appropriate fixture, such as MR16s located in the setting, or behind a scenic blind as firelight, or as supplemental floor-level front light along the apron edge. If there are visible light sources on stage, such as chandeliers and lamps that appear to be turned on, place specials to suggest their specific lighting effect, and also add the practical itself in its place. The plot symbol for a practical need not be pictorial, just a small triangle at its playing position with its own circle and reference line. The "hang position" for all practicals generally is "stage" and they are numbered from apron edge up and SL to SR, but use whatever scheme makes sense to you.

Don't forget to backlight your daytime windows and wash the backings for doors or windows if that is appropriate. Sometimes you have to warm a show portal, and curtain warmers are a good ideal if you use a curtain. Some of the specials may come from the beam slot if you have saved 10-degree instruments there. These do not figure into your dimmer count calculation since they are dimmer/circuit.

A scenery plan may have specific locations around the stage in which discrete scenes are played that require their own keylight. These may be as limited as a single area around a park bench, requiring perhaps 3 high angle instruments to cover the space evenly for direct sun, thereby providing a high key for the scene. As noted above, doorways sometimes need punch for entrances. Doorway dialogue, doorway announcements and parting shots are common in plays. These specials usually sneak in and sneak out.

When designing for the small stage, a consideration is the use of voms (for Latin *vomitoria*). Voms are the archways in inclined seating through which there is access to the interior of the stadium. On a thrust stage they are the exits through the house seating for actors and action. These also are useful areas to park actors onstage where they won't be blocking anybody's sightlines. You can light these usefully, but not quite gracefully, from instruments focused onstage from 1E, and instruments focused offstage from the center of 4E.

In the case of all of these specials, be certain that you refer to the sightline section to ensure that the lighting instrument can actually see its focus.

Cyclorama lighting is almost an art of its own if it is prominent in the design. Usually you do not need to use bottom strips if there is low scenery blocking the bottom half of the cyc, but the top cyc lights will not cover the full height. Color is a pain. We try to keep a useful series of color in the top strips to avoid having to change them out for every show, and usually they can be blended for most of the color needs. On the bottom you can use the glass roundels or place color. The roundels don't pass as much light as most other color media. To conserve dimmers, do not plot any more colors than you know you probably will use. Almost always you will find yourself deciding whether to spend that last 6k dimmer on a 4th color or an extra side color or special. Note that it is easy to put too much emphasis on cyc color, and lovely transitions can be quite a bit of work to program. But when the cyc constitutes a large percentage of the scenery, it gets focus whether you plan it that way or not.

Patterns (gobos) are very useful and bring a substantial sense of texture to the light. They often have to be part of the keylight in the scene or they can be washed out by the key. Windows are common pattern specials that add light to a scene, but with shadows of muntins or blinds. An outdoor scene easily could have light filtered through tree leaves or winter branches. If not in the key, patterns usually give a texture to the environment and washing them out in localized keylight is a deliberate choice. Think about how textures can be used in the preset and transitions, outdoor scenes, office scenes, scenes with windows and windows with blinds. Always be careful that the attention they draw is not at the expense of the scene. Patterns also are used in the preset on the setting or on the act curtain.

This also is the point at which you would place any special equipment you might be using such as rain loops, color scrollers, automated lights, or other unusual effects equipment.

For a small stage production, the bridge over the orchestra pit must be lit. Usually this is done with one instrument from house left in the beam slot, and a 6" Fresnel, about mid-high in the first house right tormentor slot. The beam instrument does not cost a dimmer since it is hardwired, and the tormentor slot instrument can be cabled back to the dimmers cabled from the patch panel.

Developing the equipment list I

When all of these layers are complete, you need to double check against your requirements list. Have you, indeed, placed the equipment that will do everything you need to have done? Next is the first phase of triage: conforming to inventory.

Begin by listing across the top of a piece of paper all of the kinds of instruments you are using, and down the left side of the page, each of the hang positions. Now, go through your plot position by position and make a strike mark for each instrument in the appropriate column. Cross four strikes with the fifth. Then add them all up at the right and at the bottom. Make sure that the count on the right matches a visual count from the plot. Then determine if the numbers at the bottom representing instrument count are the optimal use of inventory, or within the rental budget. IF NOT, it is time to make the first set of hard choices. First determine what equipment in the inventory is under utilized and review to determine if any of that equipment can substitute for the instruments we don't own, and if some substitutions and switches can be made. Use PARs instead of 50-degree Source 4s, 6x9 ERS for 36-degree Source 4s, 6x12s for 26-degree Source 4s, etc. Continue until you have made all the switches or compromises you can.

Next, look closely at functions that can be cut. Can you punch up an area light instead of using a door special? How important is the green stage effect when the hero feels sick? Assess realistically what each function of the requirements list adds to the show (not just to the lighting).

Developing the paperwork

The first priority is to clean the plot. You will continue to make changes as you adjust, but clean up your erasures, redraw important lines, emphasize your focus points and the letter designations, and otherwise make it clear. At this point each instrument on the plot gets a small circle joined by a line to the back end of the instrument. You couldn't really draw them until after the equipment was placed because of tight spacing on the hang positions, but the circle can go anywhere nearby that the line can visually connect to the instrument. In each circle goes a number corresponding to the count of instruments from the stage left end of the electric, or from the top of the side pipe or stage boom. This gives each instrument a number at its hang position, and this will be its unique reference.

Initially, it usually is simplest to do a hand schedule from your plot because it is easier to keep your place in your process and it works as a reviewing step. After conforming to the inventory you may have made changes that have a more reaching effect than you realized. If your design isn't very complex you may be able to take your plot to the computer and enter the information directly into the BSC lighting spreadsheet or lighting paperwork software such as Lightwrite. To create a quick hand schedule, label a sheet of paper with the following columns: No./ Focus / Color / Inst / LorR / Rem. On the first line below put Beam Slot. Then from SL to SR describe each instrument. The instrument number in the circle, the focus of the instrument, the color number, the instrument type, whether it is on the left or right side of the pipe (or top or bottom), and any remarks. Go through each hang position and list every instrument in the plot. Don't forget to include practicals.

Next, enter the data into the BSC schedule spreadsheet, which has macros for sorting. If you use Lightwrite or Softplot software you may have to do some manual calculations for channel wattage. The full schedule in the spreadsheet also will include the instrument frame size, the lamp size, the hang position, and remarks. Circuit, dimmer and channel will be filled in later except for the beam slot instruments. Since the beam circuits are hardwired to the dimmers you should enter the dimmer numbers immediately to avoid confusion later (although it still could be confusing). Once this is complete, you are ready to do the analysis.

The Remarks column contains a variety of information. Accessories, cable and two-fer numbers, and ganging information is filled in as it is developed. Patterns are specified for instruments that receive them. All tormentor slot instruments should be labeled for a tophat. Patch switching must be indicated here. You may want to specify where Altman or Century or Strand ERSs are to be used, what lamp spread goes in a PAR, and which equipment is to be rented. Many designers specify distance from CL, but it is questionable whether that level of precision is generally necessary if you have the electrics marked in 4-foot intervals. On the other hand, with measurements one could hang the electrics from the schedule without the drafted plot.

First sort **instrument** to see if your instrument counts conform to inventory (or rental plan). Next sort on **function**. Check to see if you have all the cools for all of the areas, all the warms, all the LBk and RBk, etc., and that they cover the areas you intended. Also be sure the equipment is correct and will balance as you intend. It is very highly recommended that all the equipment to be grouped or ganged be exactly the same. Check the colors and see if all instruments for the same function have the same color numbers, if that is your plan.

Then using this function sort, begin assigning preliminary channel numbers. Perhaps you want the first group of channels when you write your cues to be the front left cools. Assign individual channels to multiple areas or groups of areas that you are certain will run together and will balance. For instance, all of your cyc top blue could be in one channel. But do not yet group any instruments you are not certain that you will run together. It is entirely likely your channel count will exceed your dimmer count.

Once all your channels are assigned, sort by **channel**. Review them to be sure everything translated properly, and you didn't assign one red instrument to the blue cyc channel, etc. If you sorted by channel using the macro, it should sum the wattages for the instruments in the channel. If you are using other software you may have to do it manually.

- Find the highest wattages, and if any exceed 6kw, break them down into multiple channels. Then find all wattages above 2.4kw and assign them to the 6kw dimmers.
- If it appears you need more than the current number of working 6kw dimmers, you will need to find the channels that can be broken down into groups using 2.4kw or less and use the 6kw dimmers for the ones that can't.
- Review all other channels and find any that exceed 2.4kw, and divide them into additional channels.
- Count the remaining channels in your plot without dimmer numbers (you filled in the beam slot instrument dimmer numbers above), and compare to the number of current working 2.4kw dimmers.
- If you have too many channels, first look for any lighting that doesn't have to be dimmed, and that can be switched on and off. Assign them as dimmer SW1, SW2, etc. This equipment will not be powered through the dimmer system.
- Next find any that can be cabled directly to the 6 connectors at the patch panel, and assign them to those dimmer numbers.
- Then look for any lights that are used once only, and determine if any occur far enough apart during the show that they can share the same dimmer and channel by *patch switching* at a scene change or intermission.
- Next take a hard look at your plot and functions. Make some careful choices regarding instruments that can be grouped. Solving this problem may increase wattage in a channel and you will need to reassess your 6kw dimmer assignments.
- Finally, if all else fails, determine what you can give up.

After you have completed these assignments, run through the various sorts again to double check your changes and make sure that some of your adjustments haven't created problems elsewhere.

If you have created groupings through this process, it is important that these be reflected on the drafted plot. Instruments that will be in the same channel can be in the same circuit. Bridge lines should be drafted between the grouped instruments in the same hanging position to show that they could be two-ferred. Your instrument schedule also needs to reflect the ganging in the Remarks column, as "w/#25" or at least with a note that it is ganged. On the printed version of the schedule it also is very helpful to draw bridge lines between the ganged instruments in the Remarks column.

It is important that you now reassign channel numbers in any way that makes clear sense to you, particularly if you had to divide channels. Since all channel numbers can address any dimmer numbers, they can be arranged for ease of cue writing and management. Most designers group by function in a way that allows for quickest reference and some measure of memorization. Think also about how you might group them to set levels more quickly in cue writing and tech. Cools may be 1 through 12, Warms 15 through 27, etc. A few open channels may be left between series groups for clarity and possible expansion of a series, but more than a couple between groups can make it more difficult to spot level problems quickly and increase the need to scroll the screen in cue maintenance.

Create a preliminary Cheat Sheet or channel list for quick reference. In the BSC instrument schedule spreadsheet, one worksheet is reserved for a cheat sheet. It is possible to use a simple list by function, but in cue writing you will want a sheet that is laid out visually in a way that you can spot

the channels very quickly. Later you will create a rapid reference version of the sheet. Each designer develops his or her own layout with experience.

The equipment order

When you have arrived at your best plot within parameters, compile your rental instrument list. That list should include the lighting instruments, tophats or any other accessories, cables and adapters for all the connections to the house system. It needs to be specific.

Also compile your color and pattern needs. The BSC spreadsheet has one sort for a color inventory report, but you will need to compile your list of patterns manually. If at all possible, the color and patterns should be pulled from stock immediately so deficiencies can be found, substitutions considered, and purchase ordered for pickup with the rental equipment.

You will need at least one day to install and focus your rental equipment before beginning to write cues.

Hanging and focusing the plot

You have completed the design work and all you can accomplish without the help of others. The work now passes to craft members. Ideally the Master Electrician is responsible for the hang, but the equipment has to be laid out properly for you to implement your design effectively. It is important that you be involved in the hang. Normally the designer focuses the plot but requires the help of the lighting staff.

Hanging your plot

Regardless of who will be hanging your plot, you need to be respectful of the work time. You are obliged to use your time in the space and allotted crew time as efficiently as you can. That means preparing carefully for the hang.

When you are satisfied that you've done the best you can to plan the equipment and the control you need to realize your design, print out at least two copies each of the schedule and the hookup:

- By location (hang position). This is the *instrument schedule* which will be used for hanging the plot
- By dimmer. This is the *hookup* which will be used to do both the hard patch and the soft patch.

You may notice that you have not yet filled in circuit numbers. There will be no circuit numbers for the beam slot instruments because they are wired directly to specific dimmers. The others will be written in during hang.

Return to your drafted light plot and count the instruments in each hang position and compare it to the number of working circuits in the house specification for each position. If the count is more:

- Refer to the instrument schedule and determine if there are instruments already designated for the same dimmer and channel. Those instruments might be ganged.
- Next consider running cables to the floor pockets for the extra circuits. On stage left, perhaps cable directly to the dimmer leads on the patch panel, if you have not used them.
- Then review the position for instruments that might run together. This always is a trade for some control, so select the instruments carefully.

Remember that *you are still limited by the dimmer's capacity*. It is easy to see that several instruments in two channels all do the same thing and could run together, but not notice that it will overload. It is best if you can catch those errors on the paper.

- Update your drafting by showing how instruments are ganged. This also will show how long the ganging cable must be. You might do this in pencil on the blueprint for that hang position. It could change during the hang and need to be redrawn.

Develop an equipment inventory by hanging position. There is a macro in the BSC schedule spreadsheet that will provide a distribution of equipment. This is very helpful if the electricians already have equipment in place. The equipment can be redistributed on paper, saving re-weighting time for the fly crew.

- Do equipment counts and order the needed rentals. It is unlikely that the rental equipment will be on site immediately. Be certain you allow room and resources for it during the hang.
- Make as many of the final color decisions as you can and print the color list macro.
- Print out plenty of the Hanging Procedure sheet in the appendix.
- Plan the hang itself. What processes need to occur in what order, and a worklist.

Tasks in the hang

- Move equipment to the proper hanging position. Work through the electricians thoughtfully to reduce the amount of re-weighting needed.
- Pull additional equipment from inventory for each position.
- Prepare and configure equipment as needed, such as swapping lens barrels, changing clamps to sidearms, constructing stage booms.
- Install the equipment according to the plot. For the most efficient use of crew when other work is going on, it is best to hang the required equipment on the electric first and re-weight, then return later to place, focus and plug.
- Cable, plug, patch and *test* all of the equipment installed. The circuit numbers and cable numbers must be written into the instrument schedule before the cable is tied up. Place the cable and two-fer numbers in the remarks column to save significant amounts of time troubleshooting.
- Pull, cut and replace color media as called for in the plot. Beam slot and tormentor slot instruments can be colored when they are focused.
- Do not fail to test. Focus call time must be for focus and not electrician issues.
- You or the Master Electrician must check each hang position. Specifically check for adequate cable slack for focusing, safety chain slack for focusing, instruments hung upside down, shutters not pulled out, broken color frame ears, and anything else that could possibly slow down the focus call. It is much easier to solve the problem with the equipment down and crew on hand than to take time in focus call with somebody on a ladder.
- All cables across walkways or draped from battens must be secured. Multiple cables from an electric to a floor pocket must be bundled together, coiled and tied, and plugs marked specifically for the pocket connector number on a flag of tape. Muslin flags are tied on the cables at eye and waist level when the batten is in playing position so that people will see them. Cables across walkways should be covered with secure rugs or taped and marked so people don't trip.
- Finally, if the hard and soft patch are complete, do a complete dimmer check and count instruments. Mark the problems and fix them before focus.

Focusing the plot

It may appear as if designers focus by the seat of their pants, but every designer has his own focus style. Some are very demanding, others almost casual. Even the most casual focus must be done with care. Every problem that can be solved in the focus call saves a touch up.

Consider that small focus problems can affect a cue dramatically. If a cue is written to add light to compensate for a poorly focused instrument, and then the light is focused properly, that cue may be the base for a dozen cues and is time consuming and difficult to correct. A bad blend can make it impossible to bring grace to a delicate moment and your effect may be overruled. Take the time to get it right in the focus, but spend the time on getting it right, not on sorting out cables, circuits, patches and colors.

Take all of the data that was entered on the hookup and schedule during hang, verify it where necessary, and enter it all in the spreadsheet. Thoroughly proof your hang.

Run through several sorts in the spreadsheet. Sort by **circuit number** and see if any circuit was entered twice for two different dimmers. This sometimes happens when things are two-ferred during hang. Sort by **dimmer** and look for ganged instruments that have different functions, such as a left warm and a right cool. Then sort by other columns to see if everything makes sense.

Although it is not totally necessary, it is better to complete the hard patch and the soft patch before focus. If focus must occur before the patch schedule is ready, each position can be temporarily patched and the control board defaulted to a 1-to-1 softpatch. You will need to revisit the focus after the patch is correctly entered in order to work out the transitions between lighting areas.

Professional practice provides a series of focus diagrams for each channel and each instrument in the schedule. The diagrams have a schematic profile and plan view, and the designer draws the limits of the lighting on the diagrams. You don't need to go that far, but you do need to be clear about the use of each instrument in the plot.

Place your focus spikes on the setting. These are small bits of tape at the center of each focus with the focus letter on it, oriented to be read facing the audience. They will be pulled before open.

Be sure that you will be able to be able to focus at performer level. Platforms and stairs should be in place. Maskings and other light barriers must be represented in place for performance so that you don't try to focus through them.

Ensure that the hang is as complete as possible before focus, and that all the equipment is cabled and working. It is good to be able to have the rental equipment in place early, but if it is a minor rental don't hold off the focus of installed equipment. If possible, the hard patch and soft patch should be complete.

The practice of focus is somewhat individual to the designer. Following is a typical process:

- Stand on the focus spike, back to the light. Verify what is required from that instrument.
- Refer to the schedule and call out the channel. A crew member on the board brings that channel to full.
- If it is a ganged or grouped channel, it may be necessary to switch off some dimmers, throw other instruments off the focus, or unplug them. If color has been installed at hang, it may be enough just to pull the color on the instrument to be focused.
- Ask that the instrument be centered on you. That means the hot spot of the instrument should be on the back of your neck as you stand on the focus spike, back to light.

- Look at the area of light that is provided. Ask the crew member to sharpen the focus so you can see the edges of the beam well. At an angle, not all edges of the beam can be the same sharpness, especially on close focuses. It may be necessary to ask that a shutter be pushed in and the focus adjusted “sharp to shutter”.
- Walk the area according to your expectation of its use. Understand where the limits of light are. This is particularly critical for small stage and other short throw lighting. The area of light on the stage floor is not the same geography as the area of light 5 feet above the floor where actors’ heads are. Ask that the instrument be re-centered to another spot if necessary.
- Ask that shutters be put in to take light off of things that should not be lit. Typically, we don’t light parts of the theatre such as the proscenium walls and the show portal (unless the director uses them). Particular concerns are scrims and drops, which will show arcs from the stage lighting or their effect will be marred in some way.
- Ask that the focus be softened to your choice.
- Ask that the color be put in. Verify that it is the correct color. Make a mental note of what that color does to the stage.
- Mark the instrument as focused on your instrument schedule and move to the next.

The focus generally is done instrument-by-instrument along a position, and adjacent instruments do not always serve the same function. After a position is focused, before crew move to other positions, ask that all instruments installed there for the same function be brought up together to check for blends. Face the light and move back and forth between the areas to test the transition. You will feel when you move from one light to the next, and a drastic transition with substantial change in light intensity must be addressed. Ask a crew member to walk through while you watch. You must either fix it now (with the crew on hand) or determine exactly when you will fix it later. If you don’t fix it, you will not be able to write an accurate cue.

There always will be an instrument problem during focus. A lamp will die, a plug won’t work, a shutter gets broken, an instrument is hung upside down, something was miss-cabled. If you have the crew, mark it and move on while another member of the crew makes the repair.

For speed of focus, it is sometimes possible to work on two hanging positions at the same time if you have enough crew. The beam slot and tormentor slots require some time to move from one instrument to the next, and an instrument in another position can be focused while the crew members move and loosen up the next instrument for focus.

A common plot will run up to 120 instruments. In a fast focus it takes about one minute per instrument, if everything goes well, but don’t expect to be able to do 60 instruments in an hour. Do not expect the focus to be completed in a single 4-hour call. Access to the beam and tormentor positions is strenuous. Waiting for color to be brought up can cost time. People need a break, including you. Try not to schedule yourself for longer than a 4-hour call. It is too easy to begin “satisficing” the focus and your looks will show it. Some retouch is expected during or after cue writing, but don’t depend on it. Try to get it right the first time.

When it is done, at least do a full dimmer check. This requires hard patch and soft patch to be complete. Run through all the channels, check transitions between areas, and make sure the right light comes up on each channel. Ask an assistant to walk the areas and watch the light change on him or her. Allow and take the time to fix problems.

Writing the cues

It has been a busy time up to this point. Most of the work above has happened in a 10 day period. You now need to prepare for the cuing session.

When the focus is complete and the patches are done, use your cheat sheet and familiarize yourself with the light you now have in place. If you have time, sketch in some trial cues, preferably with an assistant to walk stage. Format a save disk on the lighting console and save a show (current board readings), then reload it. Cue writing will go much more efficiently and you will use everyone's time better if you can pre-enter some master cues or parts of cues and assign submasters in blind.

The ETC Expression 250, as with most advanced lighting consoles, has an off-line editor. ETC Edit is a PC based editor that emulates the console on screen. It can be moused, but it is much faster to use the keystrokes. It might take a little time to become efficient, but off-line editing is a useful capability. You can blind edit cues for the first cue session without being in the theatre. Note that the save disk is a 3.5" dos diskette; you will need a means of loading it.

The alternative is to work in blind on the console. If you plan what you want to do, you can save considerable time in the theatre.

Cue structure in a show

Few cues in a show begin with a blank canvas each time. Usually they can be broken into parts, such as background, main lighting (layer 1), foreground (layer 2, 3) and highlights (layer 4). These parts can function somewhat independently. For instance, the background lighting may change and the highlights may be different, but the main lighting and the foreground remain the same. If these situations occur frequently among the cues, you can:

- Record the new identical cue.
- Store the main part of the settings that will be repeated as a cue in a number series designated for partial cues.
- Write the parts of the cue to submasters to be brought in as needed.

What you decide depends on how much it is needed and how easily it can be broken down. If you will need to rewrite the same channel levels with modification more than 3 times in the session, you need to consider writing them once only and storing the readings. This does require planning and analysis prior to getting into the hall.

Preparation

Be sure you understand how the director will want to start the show and transition to and from intermissions. It is unlikely the director will think much at all about lighting except when talking to you. Also be sure you understand clearly how scene changes are supposed to run. What props need to be moved, what wagons or scenic pieces will move and to where, and how much time it will all take.

Following are things you can do the night before you write cues live in the hall:

- Freshen your cue analysis

Restore list:

You have made many decisions during the plot process that probably have implications for the lighting you intended when you defined the cues. Create a new restore list of looks that will be reused, or reused with minor modification. Particularly look for cues which:

- Add lighting into an existing look (add for emphasis)
- Subtract lighting from an existing look (subtract for emphasis)
- Duplicate a look from another scene, exactly or with minor change (restore after an emphasis or effects cue, base for new scene in same lighting environment)

Once the first use is written, the rest of the list can be written immediately as saves. When you begin to write a cue for a new scene, you will begin with a unifying base. If you improve the base:

- You can replace immediately the exact duplicate cues
- You can write it to a submaster to be brought into other cues

It is important that you have this restore analysis before cue writing. It will save at least an hour or two of cue writing, and it will bring a consistency into your lighting over the show.

- Plan the writing order:

It is highly likely that the first look in the show itself could take most of an hour to write. You can't write a cue competently until you have people walking through the space. You need a sense of context in the lighting environment to get a feel for what each of the control options will do. It would be nice to do this before the cue-writing session, but there rarely is much opportunity.

Determine the best order for writing cues and plan the process. Most designers find it difficult to jump around the show initially, particularly if they don't feel like they have a good grasp of the project yet. It is more efficient to write some things out of order if you can. You can begin with partial looks, such as backgrounds, and as cues are written save parts or all of them for reuse.

You will want to write Cue #1 first just to get everybody settled into a way of working. It should be relatively simple and not in dispute. Or it may be an adjustment of a cue you pre-wrote. Then write your first scene. This should have everybody working together and you have some feel for your lighting.

Decide if it would be better for the cue that is repeated 8 times through the show to be written in the first few cues you write, or if you need to see it in context with other cues. You also want to be able to spend your time most efficiently on looks that are important and need the attention, rather than tweaking less important cues more than warranted. See working in the hall, below.

- Write submasters.

You need to find a way to bring lights up to level quickly. The digital board allows you to set all your channels individually by entering a digital number for the level. This is highly controllable but not an intuitive or kinetic way of working. The Expression and most consoles have several pages of submasters that can be assigned to a group of any channels. It is simpler to bump up a submaster than enter a digital value for a group of channels, and it can remain up to be adjusted or not and written into a series of many cues. Following are suggestions for submasters.

The first bank of submasters represent whole cues and are operational during the show:

- Submaster 1 should be a failsafe, a setting with a lot of light that can be thrown up instantly if something happens that needs light.
- One submaster should be house lights for small stage productions.
- Another submaster can control the bridge light.
- The aisle lights for actor entrances in small stage productions.
- Scene change lighting
- Narrator or conductor lighting

The following are some of the other submasters that contain specific lighting groups as an aid in cue writing. These would be on other banks and pages:

- Each color in the cyclorama or other background lighting
- Toning washes, by color/direction and perhaps by general stage area (L, R, C, U, D)
- Side color by color/direction, upstage and downstage

- Backlight by color/direction and perhaps by general stage area if appropriate
- Frequently used specials, such as practicals, lights on signs, etc.
- Door and window backings
- Frequently used emphasis lights, such as doorways

All of these can be written to the submaster at full. Partial looks also can be written and stored in submasters. One bank of one page might be reserved for partial looks storage during cue writing, allowing them to be added to any cue.

If there are enough submasters and few enough channels, nearly all channels can be set to submasters, but that could be as difficult to call up efficiently. When cue writing, don't forget to take submasters out after you've written, or they will show up in the next cue. You may want to maintain your own notes on submaster levels in a cue, since the program records only the channel levels.

- Write known cues

There are some cues you can sketch in immediately. The preshow preset probably is very few lights and can be set in blind, to be adjusted later. The show will end ultimately with a blackout of the board. You can go through your cues and look for simple cues using a small number of channels, such as scene change lighting. These can be adjusted easily.

- Set up your table and your crews and plan the day.

Double check with the stage manager and technical director regarding calls for support people, and ensure the scenic elements you need will be in place. Arrange your space and check the layout of equipment and lighting at the tech desk. Arrange it as much as you can for your efficient work.

The day in the hall

Cue writing at BSC occurs on the Saturday before the Sunday technical and tech-dress rehearsals. Usual practice at BSC is for the designer to write cues and later in the day show them to the director. There is no luxury of time to write cues over multiple sessions. Best practice is to write them in two four-hour calls, one for the designer, perhaps 9 to 1, and one with the director perhaps 2 to 6.

Working with you today will be the stage manager and possibly an assistant, your lighting operator, perhaps an ME or ALD, and lighting stand-ins, usually an actor or two. It is your session and they are present to do what you need to have done. The major surfaces of the play usually are in place and things are operational.

There is a preferred practice in tech table arrangement in different theatres. At BSC the director's table is about 8-10 rows back at center. The lighting table is 2 rows in front on the left aisle. The lighting designer can sit at the end of the director's table and confer with the stage manager and director to his or her right. She or he has a clear view of the whole stage, with the board operator in front and a seat or so to the left, and with the controller screen visible to the designer. The designer can communicate directly or over headset to the operator. If the designer has a master electrician or assistant, she or he can be beside or behind to the left within earshot. It is a good idea to keep the row clear to the aisle left so you can move around to evaluate your looks.

For a small stage setup, the director's table is set up a few feet away from the front-facing side of the stage. The lighting cart usually is to the designer's left, and stage manager and director to his or her right.

As in all of the steps above, designers work differently. Some designers must have their hands on the controller. Experienced designers often are much quicker at the controls initially than a board operator. Usually the board operators lack previous experience, but most come up to speed very quickly when challenged. Inexperienced designers sometimes have difficulty translating kinetic movement into instructions for somebody else, because it requires a cognitive reprogramming. At first it feels very awkward to have to think in terms of instructions, but it really is simply articulating the keystroke syntax outloud.

What is of critical importance to the designer is the ability to *keep his eyes on the stage*, to see the change take place when a glance away at a keystroke might make him miss something subtle. The situation is a bit easier with extensive use of submasters where the fader can be brought up without looking at it. But the important idea is that the designer needs to focus on mentally probing the lighting in front of him and thinking about the light plot: is everything covered that needs to be lit, is the balance what it should be, how might it be improved, where might better light come from, and does the lighting express the scene? These are questions he is asking every second he is watching.

The designer comes prepared to the session. The last best iteration of the light plot and section can be spread on the seats in front. Beside him is the script, cue definition list, instrument schedule, hookup, rehearsal research maps, restore lists, and the cheat sheet and magic sheet in a plastic sleeve so it can be found quickly in a mess of paper. He has a color swatch book, a .7 or .9mm mechanical pencil and a big eraser. He also has a penlight, a lighting wrench, and some refreshment.

Before the session begins, you must check the hard patch and run a standard dimmer check, even if you just did it last night. If a focus has dropped or something doesn't come up, it **MUST** be fixed before beginning. If a soft patch error appears, sort it out now, if it takes an hour. Every cue you write with the problem light will be wrong.

You will have lighting stand-ins, but you need some dummy subjects. Arrange with the costume department for swags of some colorful fabric, or fabric from the costumes in the show. Drape it over 3 or 4 chairs and ladders in various positions around the stage. Castered stools can be moved easily from area to area.

Then you sit down and write cue #1. This is easy, and it will allow everyone to settle into the way of working. Move on to the cues in the order you planned above. If the scene change light doesn't get worked out before the director comes in, it is of little consequence, regardless of the number of times it is used.

Writing the cue

There are preferred ways for writing a cue, and you will develop yours. Using your cue definition list, build the cue from back to front: background, backlight, sidelight, foreground, specials. Or begin with the lighting you want most to preserve. If you begin with frontlight, you will never be able to get enough backlight or sidelight for the effect you want. If you begin at the back, you will add in only as much front as you need.

- Go to black
- Bring in submasters to be used in the base cue.
- Call the channel levels to the operator in groups using the keyboard syntax. Keep your eyes on the stage as the levels change.
- Ask the stage manager to place the lighting stand-ins in the locations of action in the scene. Particularly ask them to show the limits of the scene so that you can be certain it is all covered as you want it.

- Add or adjust levels as appropriate by adjusting individual intensities or changing submaster levels.
- Say "Record as cue L-#".
- Set the count, the transition time and method.
- Specify linking or other information that applies to the cue.
- Instruct the stage manager on when and how the cue should be called, and how it can be expected to run. He or she will place it TEMPORARILY in the call book. Precise timing and placement will be set with the director.

This is the best opportunity to make sure that the stage manager understands how the light changes and what the point of the cue is. Be sure he watches the change. If he is doing other things while you construct the cue, demonstrate the sequence or a series at once and clarify how they fall in the dramatic context. A good stage manager will grasp it quickly.

- Move on to the next scene cue to be written. You may need to jump into a scene to write the end of a series of changes. You may jump over the between-scene lighting if it is consistent. Be certain you set cues clearly that involve scene shifts.

Cover as much ground as you can in 4 hours, take a break, set up for the director and then bring her or him in.

Working with the director

It is important as a matter of professional reliability that you be prepared for the director at the time you specify. Accidents and unexpected problems do occur, and you need to keep the director informed. But you should strive to meet your specified time frame. Even if you cannot show the whole show, be prepared to work through the major looks and transitions.

You usually will have difficulty delivering all you dreamed for the show. You probably have a few compromises that need to be resolved, some of which might be major. As busy as you have been, however, you should have had some conversation with the director in the past 24 hours to manage expectations.

Begin with some brief discussion about intentions. Be positive about your lighting. Don't apologize. Then begin the show. After the first scene try to work quickly through the utility cues as they occur (if they are written). The director may need to see them for context, but try to spend your time on the major looks. Typical concerns for directors include:

- Coverage of all actors in the scene.
- Clarity of the central focus of the action
- General "feel" of the lighting environment
- Too much of the stage lit, lighting as a distraction
- Lighting transitions that relate to dramatic action
- Timing for changes and transitions, getting actors on and off stage, scene and prop shifts
- Exactly when the cue is to be called, and how the transition occurs visually, especially when timed with actor movement.

Be prepared to articulate what you were trying to do with every light cue, and how it relates to what is going on in the scene. It is common to have some cues that you "don't know where to go with," and seek input from the director. If you know the director will want to design a moment herself, let her. Present the options, or begin constructing the look and give options at various points. The director will be successful or not, but will understand the constraints.

It also is common for you to have overlooked a lighting moment that is important to the director. It may be easy to solve, but it could require equipment changes. Meet the need. If you can't do it immediately, take the note and make an appointment for the director to see the result. Move on.

As a student lighting designer, it is unlikely that you will prevail in a disagreement on concepts when few working lighting designers do. Our directors are quite good in trying to work well with student designers. Try to understand the perspective of the director clearly, and make it work with everything else.

Wrapping up

At the end of the day, save the show to diskette. With good fortune you won't have equipment issues. All the cables worked, all the lights hit focus, all the colors were good, the correct lights came up when you called them, and there were no two-fer or ganging problems. Rarely is this completely accurate, and you will need to address these things before the tech rehearsal.

Clean up your work list. Your lighting operator and your stage manager will have kept their own list of problems and you need to capture them. Determine when equipment problems will be corrected and set the adjusted timetable for the tech with the stage manager and crew. Thank your crew, the stage manager and the lighting stand-ins. Let them go as early as you can.

Decide how you will address cue corrections. You can work directly on cues at the console, or you can take the diskette home and work in an off-line editor. Working in the hall has the advantage of being able to see the light on the fabric draped on the chairs. If the problem is significant rewrite of major looks, this is best.

Usually you will have substantial cue maintenance that doesn't require you to see the cue, and you can check the effect quickly the next day. If you just need to write in the utility cues, change times in cues, change the same 2 lights in 20 cues, or other maintenance situations, they can be done in the off-line editor at your leisure in a more comfortable environment.

First Technical Rehearsal

The Sunday technical rehearsal and first dress bring the components of the show together: the actors with lighting and sound in the afternoon, and all with costumes in the evening. Everybody involved with the show is present.

Morning setup

You need to begin early enough to accomplish two tasks before the rehearsal with actors: the corrections and changes you made after setting cues need to be implemented, and you need to set up for an effective run.

- Load your corrected show into the console.
- Work through your worklist of equipment issues: divide channels, exchange equipment, adjust patches and cables, replace color, touch up focuses.
- Do a thorough and complete dimmer check.
- Set up your materials at your seat for the run.
- Give the stage manager the cue corrections. Discuss process and communication during the rehearsal, and sharing of responsibility for calling cues during the afternoon tech. It may be appropriate for you to call particular cues if the timing is critical, allowing the SM to observe your intent.

- Get a bite to eat.

Afternoon tech run-thru

Prior to beginning the rehearsal, make a point to have discussion with the director about changes you implemented since you last spoke with each other. Discuss her and your goals for the rehearsal and agree specifically whether the rehearsal should run with or without jumps. Get a sense of all the other things that may be happening during the rehearsal, such as costume fittings, dance run-thrus and scene coachings. Agree also on timing for supper break, and the evening call and curtain. Make sure the stage manager is informed of all the plans for the rehearsal.

Understand that this may be the first rehearsal for a number of things in addition to lighting. It will be the first rehearsal for scene changes and for scenic effects. Audio cues may be running for the first time and those levels need to be set. The backstage crew will have to run house lights and change patch switches, and they must be given specific instruction before and during the rehearsal. Normally this is done by the assistant stage manager acting as deck manager in prompt position. You need to help facilitate those events and make them happen gracefully.

When all is set, load the preshow preset and have the actors called to places. Have the stage manager start the show. During cue writing you frequently didn't use the headset because you were close enough to speak. From this point on, communication is over the show intercom. [I like to use a handset because I feel less tied to the system.] Listen carefully, and ensure that the calls are properly made. The lighting operator and others must sort out your instructions from those of the stage manager on the intercom. During the cue you will be adjusting levels in discussion with the operator as actors move about the stage. Be clear when you are calling the cue and when the stage manager is calling it. Be certain everybody is using proper cuing language so it can stand out from the discussion that is going on.

If you need to stop, insist on it. This is the only time the show can be stopped short of a full-stop failure. You need to watch the clock and be mindful of the goals discussed above, but if people need to be instructed or something needs to be run again to resolve a problem, stop the rehearsal. Sometimes it is a discussion with the director about how to move from one moment to the next, or it is a confusing cluster of cues confronting the stage manager. Solve the issue as efficiently as possible.

The critical thing for the designer is keeping his eye on the stage. He is watching his lighting in real time as actors move through it. Focus problems become moving shadows across people. Color and intensity imbalance shows up sometimes with weird results. This is the last best time to make big adjustments, and they should be made before the evening run-thru.

The light cue actually is the *change* in lighting. What takes place on either side of the change is the look. Evaluate both the look and the change itself. As the actors perform you will get a much better feel for transition time in the context of the energy in the scene.

As the rehearsal runs, it can be a good idea to notify the stage manager when you are satisfied with the run of a cue or series of cues. You can then discuss cueing matters or a choice to jump ahead. If you still need to see the use of the stage, ask the stage manager if the actors can *mark their blocking* by walking their movement in the scene. If they step out of light, you need to correct it. Depending on what you want to see and what the lighting can do, either you can bring up light for them, or you can appeal to the director regarding the blocking. Sometimes an actor just needs to find his light, but it's your problem. If he can't find it, you look bad and the director may not be your ally.

Watch the clock and be prepared to triage the time. If the time is short, determine which looks or transitions are most important to see and work through. Lighting that crews and performers have to

work with is most important to rehearse, particularly when it might be dangerous. Timing of cues with stage action, shifts and other technical elements is important to resolve. You will want to see and the stage manager will want to rehearse involved series of cues like those in musical numbers, dance scenes and fight scenes. Straightforward simple, single cues that are called on a line need little rehearsal and can be passed over to evening.

You usually will find that there is a problem to be fixed at supper break. Order out. An instrument has slipped, you missed some cross-colored channels in dimmer check, a lamp blew, a replacement instrument was only rough focused, you need to see a 26-degree instead of a 36-degree on a focus, the soft patch needs to be tweaked, or any of a hundred problems. Don't involve the stage manager and try to give the operator the break.

Evening rehearsal

This is the first straight run-thru with planned stops and full stop failures only. If it is a musical, it may be the first with musicians. It should try to run in performance mode. The actors should be mostly in costume, which will help you see and evaluate problems with your lighting. If there is strong interest in getting started early, there may be no dimmer check. Be sure the lighting operator knows what is involved for the next rehearsal.

Assist the stage manager as needed in running the show from the director's house table. Usually there are questions about how or when a cue is to be called. Understand that for the next rehearsal or two, the stage manager may be hard pressed to look at the stage. He must stay "in the book" and try to sort out in real time what he needs to do or say next. Clarity and specificity at this point are critical. It may be more effective to emphasize the nuance of particular cues in the next rehearsal.

If the show has scene changes, this is the first time the crew will run it on their own. Observe them carefully and resolve any cue timing issues. Problems may turn up regarding timing for an actor in costume to make a cross during a cue, or some stage action takes longer in costume. There will be blocking moments that differ from the afternoon session, or were not seen in the afternoon. With costumes, some lighting will seem a very different brightness from the afternoon rehearsal, perhaps brighter or duller, and the eye will be drawn differently to the scene. You will need to correct the problems on the spot if there is time while the cue runs, or at least note them for later correction. When you instruct your operator over the show intercom, be as brief and efficient as possible and try to respect standbys.

This is the best rehearsal to get a comprehensive list of notes. Use this opportunity to examine all you've done from top to bottom. The structure of everything is in place – the plot, the patch, the control, the cues and the looks. You have 2 or 3 rehearsals to get it all working properly. You probably should plan on a touch-up focus call, but you need to be surgical about it because everybody is busy. Look carefully at each of your lighting functions – backlight, front cool - and determine if it is doing its job. Look carefully at focus and watch transitions for shadows and sudden transitions in intensity or lighting direction. Assess your color relationships and decide if a color change should be made. Look at the balance in your looks and decide if attention is where it should be. It is a fumble-through but you can tell whether a cue will be elegant or if needs to be changed.

At the conclusion of the rehearsal, discuss any calling questions with the stage manager. Give the director a chance to give you notes before talking to the actors. Then lay out the work and the next call for the crew. Set the calls for the following day and thank everybody for their work. Record to diskette, pull the grand master down, shut off the board, clear with the stage manager, and get some sleep.

Tech, run and strike

The next tech/dress at BSC is Monday after the tech Sunday. Presumably there have been changes during the day. It is worth the effort to make plot changes such as focus and color as early as possible. You must adjust for the changes during rehearsal and everybody needs to be comfortable by open. For this rehearsal there usually is more scenery, more costumes and more makeup, all of which can change the lighting environment.

You also have made look and cue changes during the day, either in the off-line editor or on the console. Making look changes at this point is much more difficult. You need to see the look to make the change and you need to see people in the setting to balance things properly, but it is difficult to do that. You must schedule your time in the mix of other work taking place on the stage and it is best to try to get dark time during the noon lunch hour. Otherwise, you must edit blind. You can keep a list of the cues that are changed and run through them before the evening tech begins.

This is the "first proof" version of the production. On Sunday night everything was rough as people tried to figure out what they were doing in real time. This is the first opportunity to get a realistic sense of the look and feel of the show. You've tried to fix the biggest problems both in the plot and in the cues, and this is the first look at that.

Help the crews understand and do their jobs. Insist on a careful dimmer check by the operator and walk her through it if needed. Make sure she understands the paperwork, the patch panel and the dimmer bay. Stay close to the intercom, but not on it all the time. Move around the space a little and get a sense of the show from other seats. Consider using the push-button handset, allowing you to pick up only when you need to speak or hear how a cue is being called.

Watch the stage carefully throughout the rehearsal. Carefully observe movement through the lighting environment, and absorb the feeling of each light change. Watch scene changes. Adjust cue timing immediately after the cue or sequence has run and sharpen the stage manager's call point. Help the stage manager understand the nuance of a cue if he is missing it, but save extended discussion so that he doesn't miss the next cue.

At the conclusion of the rehearsal, try to trade notes with the director while the actors are getting out of costume. Meet with the lighting crew to lay out the work from your notes and leave them to be dismissed by the stage manager. Meet with the stage manager at first opportunity later to clarify cueing. Consolidate your own notes.

The Tuesday tech/dress should run nearly as a show. Before call, prepare an updated version of the hookup and schedule, a clean print of the plot, and a version of the cheat sheet that the operator can understand. Discuss these with the operator and ensure she knows how to use them. Be sure she has the troubleshooting procedure handout. Observe the setup and critique it with the operator and stage manager as appropriate. Discuss cuing changes with the stage manager. Often it is better to write out the notes for the stage manager because time and focus is pretty limited for him. Prefer to take notes, but if a cue or look can be cleaned up simply, you still can do it on the spot if there is time.

By Wednesday the console will be moved to the light booth for a full auditorium show, and to the stage booth for a small stage show. Keep a house connection to the intercom until opening night. You can ask about a cue number to note a cue correction, and you can listen to the calls to determine how a timing problem needs to be addressed.

On preview, photography is allowed. If you have a camera that will capture your lighting, you are free to use it. A film camera with an incandescent filter, or an adjustable digital camera are useful in documenting your looks.

Run and strike

It is customary and part of the United Scenic Artists agreement for the designer to attend opening night. Ideally, you and your collaborators are happy with the lighting results at this point. You should share in the enthusiasm for the opening, congratulate the artists, and brush up any looks or cueing as needed. Initiate a final critique with the director and reach agreement on any further adjustments. If all is done and everybody knows their jobs, you need not attend more performances unless requested by the stage manager.

A BSC designer needs to be present for strike. It is the designer's responsibility to see that the lighting strike is done as needed. Rental equipment must be struck immediately, separated from local equipment, and packed and inventoried for return.

It is rare that lighting is completely struck from the electrics, according to the preferences of the auditorium technical director. On one occasion each fall, the theatre show closes as a dance show must tech the next day. The electrics are loaded for the dance as the play is struck. On other occasions there is some preference for the way the hang is left. Usually the cables are struck, equipment is unplugged, focus dropped, color pulled, shutters in, and the line is re-weighted. In all cases, any equipment not on a regular electric must be struck. Boom stands, floor cables and direct cables to the patch panel must be struck. If a 2.5E or 7E is used in the show, it must be struck and re-weighted. Practicals must be struck, and any equipment in the tormentors that will be needed elsewhere. Pull patterns out of any instruments and remove accessories. All equipment needs to be stored properly in the lighting form. Depending on time and available personnel, the color and patterns should be sorted and filed.

Archive your work

As a student, you need to retain documentation of your work. It is important both as a presentation and as a reference for yourself. Things you should gather from the production include:

- Program
- Your script, with your cues marked and numbered, and any associated annotations
- Your textual research notes
- All visual research and found lighting images
- Notes or diagrams analyzing that research, such as colors, directions and components
- Rehearsal research, including blocking diagrams and notes
- Magic sheets and color swatches
- Master cue list, cue planning, restore lists, cue analysis lists
- Paperwork: Schedule and hookup, and associated paperwork
- Drafted lighting plot.
- Any photography of the show in your lighting.

If you are serious about this work, you should add two other pieces for your personal benefit. It would be good to get a specific critique from somebody who knows the difference, preferably in writing, of your lighting cues and looks. You need to request this directly and before the Monday

tech/dress, so that your respondent can watch carefully and thoughtfully. You may decide later whether you want to use it for anything but the critique will be helpful to you in any case.

You also need to document your own process in some way. You don't need a blog or anything elaborate to do this. Keep a simple text file on your computer desktop, and add to it whenever you have a moment to reflect.

The matter of photography and video is difficult. Lighting for the stage doesn't translate accurately to still or moving photography. Consumer level digital cameras automatically rebalance the lighting. A good film or digital camera with adjustable exposure settings is required for reasonable still representation of stage lighting. No video camera provides a reasonable moving representation of the experience in the theatre. Nothing will capture the subtlety and scale in the lighting.

It is important to try to capture some of what you achieved and the flavor of the experience. Photographs of dramatic lighting moments doesn't show much about the general lighting qualities of the show, but it implies a sense of the style of the design. It implies something about what you consider to be good and it is a reminder to you of your goals and ideas in the lighting.

Collect all of this material, along with this guide in a large pocket folder. You probably will return to it as you face other shows. You will develop your own procedures, but it is worthwhile to return periodically to the instructions. You'll find new value in steps you no longer emphasize.

Then pack it up and move on to the next show.

Appendix

1. Stage Lighting Equipment
2. Hang and Focus Procedure
3. Lighting Operator Duties
4. Vertical Lighting Template 45 degrees
5. Vertical Lighting Template 30 degrees

Appendix 1**Lighting Equipment**

Basic Instrument: 3 parts

- a) Lamp and socket: Provides illumination
- b) Reflector: Directs the illumination
- c) Lens: Focuses the illumination

Parts of the lighting instrument:

- | | |
|--------------------|---------------------|
| 1. Housing or hood | 6. Filter holder |
| 2. Reflector | 7. Shutters or iris |
| 3. Lamp | 8. Pipe clamp |
| 4. Socket | 9. Yoke |
| 5. Lens(es) | 10. Safety chain |

Instrument types:**Profiles/Spotlights**

- ERS or Leko:
 - 1 or more lenses, available in a variety of beam spreads. Typically 6"x9" for a 36-40-degree beam spread, and 6"x12" for 26-30-degree beam spread.
 - Ellipsoidal reflector
 - Shutters or iris, pattern slot.
 - Newer versions have more adjustments including joystick lamp positioning, zoom controls for variable beam spread.
 - Use: Highly focusable, crisp beam which may be softened: primary general use stage lighting luminary.

- Source 4 (ETC) and Shakespeare (Altman) are very similar technologies and beam characteristics as above, but with improvements in light efficiency and operation.
 - Beam spreads in use: 10-degree (beam slot), 19-degree (beam slot and tormentor slots), 26-degree (tormentor slots, over stage), 36-degree (over stage), 50-degree (stage washes).

- Follow spot:
 - Multiple lenses
 - Internal color frames
 - Very high intensity lamps
 - Beam shaping and management controls
 - Use: continuous operator control, moving beam of light as needed during performance.



Floods:

- ERF or Scoop:
 - No lens
 - diffuse reflector
 - Ellipsoidal reflector
 - No built-in filter holder
 - Aim rather than focus.
 - Use: wide-spread, unfocused light; general illumination: worklights, drop washes. Heavily used in video, film, still photography.

- Strip lights:
 - No lens
 - diffuse reflector, if any
 - multiple circuits for multiple colors
 - permanent color media (roundels)
 - Aim rather than focus.
 - Use: Border strips, foot lights, drop washes with color changes.

- Beam Projector:
 - No lens
 - spherical reflector
 - Lamp baffle
 - Aim rather than focus.
 - Use: strong parallel beam - intended to be intense: replicate sunlight through windows and in limited areas; more modern equipment is more efficient and lighter.

- PAR – Parabolic Anodized Reflector lamp
 - Instrument has no lens or reflector, just housing and connector for the lamp. Lamp is self contained filament, lens, reflector.
 - Limited focusing capacity, very evident hot spot.
 - Lamps are available in Narrow, Medium and Wide beam.
 - Use: controlled general illumination, usually in multiples: bright stage washes, punches, backlight.

- Fresnel:
 - Lens stepped on curvature with pebbled diffusion on flat side.
 - Spherical reflector
 - Use: soft edge, moderate intensity beam; focus limited to size of hot spot (flood or spot positions): soft directional lighting, fills, toplights and backlights.
 - 8" and 6" configurations.



- Parnel:
 - Hybrid instrument with characteristics of PAR punch and Fresnel beam character.
 - Comparable to 8" Fresnel but smaller, lighter, and lower wattage.



New Technology instruments

- Moving lights



Other parts:

- Tophat or snoot: reduces halation on nearby walls and hides the lens, especially on profiles.
- Barn doors: used to confine spill and hide front lens, especially on Fresnels. Pattern or Gobo: shadow pattern projected by instrument from template in gate.
- Donut: round opening for pattern slot that sharpens pattern focus.
- Also: color frames, color scrollers.



Appendix 2**Mounting Procedure**

Hang sequence

- a) Place clamp on pipe and finger-tighten.
- b) Tighten pipe clamp one-quarter to one-half turn.
- c) Pull all shutters out of beam.
- d) Check adjustments for freedom, including barrel.
- e) Generally orient instrument as in the plot (US, DS, SL, SR)
- f) Snug all adjustments with wrench.
- g) Attach safety chain.
- h) Let connector dangle until position is cabled.
- i) Re-weight line as needed (typically every 4-6 instruments)

Cable sequence:

- a) Plug all connectors at position to nearest outlet, or as plotted. Cable and jumper to more distant outlets.
- b) Tie cable socket end to pipe **at instrument clamp**. USE BOW KNOT.
- c) Plug remaining instruments.
- d) If there are more instruments than sockets, consult plot to determine which instruments will run together. DO NOT TWO-FER FOR CONVENIENCE.
- e) Note all instrument circuits on paperwork.**
- f) Test patch entire position and power up everything.
- g) Correct ALL problems: lamps, shutters, cables, focus freedom, etc.
- h) Pick up and dress cable: Coil excess cable at the plug location. Bundle cable lines, lift to pipe, and tie at appropriate intervals. USE BOW KNOTS.
- i) Fly electric out to clear the stage.

Focus Procedure

- j) Approach from behind the instrument, if possible.
- k) Pull the shutters out of the beam.
- l) Remove color.
- m) Loosen the yoke bolt. This often can be done with a sharp pull with the right hand and push with the left. If this doesn't loosen it, put the wrench on it. If it is still seized loosen the set screw on the side of the clamp.
- n) Loosen the vertical axis handle.
- o) Aim the instrument as directed.
- p) Tighten the yoke bolt or set screw securely.
- q) Tighten the vertical axis handle securely.
- r) Move the barrel to sharpen the focus.
- s) Insert shutters as directed.
- t) Move the barrel to soften the focus as directed.
- u) Insert color media.
- v) Check safety cable

Parnels and Fresnels have an adjustment knob for focus on the back or bottom.
 PARs may require loosening the lamp ring and turning the connector to adjust bright axis.

APPENDIX 3**Stage Lighting Operator Check List**

At BSC the stage lighting operator usually functions also as Master Electrician and Lighting Design Assistant beginning with cue writing. Complex productions may include more support.

Responsibilities:

The lighting operator is responsible for operating and maintaining all lighting involved in the stage production, including:

- a) **Operation** of the lighting board to set and record lighting levels and times, etc., as they are written in technical rehearsals, and to execute the lighting cues in rehearsals and performances.
- b) **Maintenance** of the lighting design of the show as prepared by the Lighting Designer. This means ensuring that the equipment is working properly and instruments are illuminating what they are intended to light. This includes all practicals and lighting effects used in the show.
- c) **Support** other lighting needs, such as musicians, backstage operations, change areas, etc.

Process:

The Lighting Operator should participate in the setup of lighting and is required for the production beginning with the first cue-writing sessions. At Bridgewater, this typically is the Saturday before the production opens.

- 1. **Record cues** in the system as the Lighting Designer specifies them. The Operator also notes such requirements as patch changes and lighting controls not part of the controller system (including main house lights).
- 2. **Learn the plot focus.** After the lighting for a production is stabilized the Lighting Designer provides the Lighting Operator with the lighting paperwork, minimally including:
 - a) The **Hookup** [the instruments and circuits assigned to each dimmer, and the characteristics of each instrument]. This will include all hard and soft patches.
 - b) A **Magic Sheet** [a rough visual layout of lighting directions and basic information (color, dimmers and channels, function) about each direction].
 - c) The **Run Patch Sheet** [a schedule for repatch during the performance].

In addition the Lighting Designer should provide:

 - e) The **Light Plot** [a graphical layout of all the instruments in plan view].
 - f) A **Cheat Sheet** [a layout of the channels and their functions].
 - g) The **Instrument Schedule** [listing of instrument information by location and position].
- 3. **Setup** for each rehearsal and performance.

Please follow this procedure to ensure that everything is prepared and properly secured.

At Call

- a) -Set up all running lights (crossover and backstage work area lighting).
- b) -Set up and all stage lighting equipment required for the show.

- c) -Turn on power.
- b) -Check dimmer breakers in dimmer room.
- c) -Check all patch switches. Turn all on to set for dimmer check (unless it overloads a multi-use dimmer).
- d) -Check all stage cables for solid connection, including practicals. Make sure all items that can be unplugged are replugged properly.
- e) -Check controller connections
 - Power up the controller
 - Load proper show into controller
- f) -Conduct complete dimmer check (requires assistant to run dimmers).
 - Check trims on all electrics and borders (check flags in ropes).
 - Check each dimmer for correct number of instruments
 - Check each dimmer for proper focus and color.
 - Correct all problems: dropped focus, burned lamps, missing or burned color media, etc.
- g) -Set patch panel switches for top of show.
- h) -Check house lights and set up for dimming.
- i) -Check orchestra lighting, and crossover, backstage, props, dressing area and service area lights. Make sure all are turned on and cables are dressed out of the way.
- k) -Test several random cues, especially chases and other specialized and questionable cues.
- l) -Test intercom.
- m) -Report stage electrics readiness to Stage Manager .

4. Operate the lighting for the rehearsal or performance:

- a) At Half-hour:
 - Personally verify that all worklights and tormentor lights are turned off, rail lights and patch panel lights are dimmed, crossover lights are on, houselights are set, aisle lights are on.
 - Enter cue #1
- b) - Execute all cues as directed by the Stage Manager
- c) -Make running cue changes as directed by the Lighting Designer (in rehearsals).

5. At House Close (after performance or rehearsal):

- a) -Restore worklights.
- b) -Power down all stage lights.
- c) -Make cue corrections as needed.
- d) -Store show on disc.
- e) -Power down:
 - Pull down grand master and clear faders on the controller.
 - Turn off controller
 - Turn off main power breaker if specified.

- f) -Unplug or store any stage cables or practicals as specified.
- g) -Verify that crossover and backstage lighting is turned off.
- h) - Verify that house lights are reset and aisle lights are turned off.
- h) -Check for notes from lighting designer and technical director
- i) -Clean the production workspace [collect papers, food wrappers, etc.].
- j) -Put out ghost light.
- k) –Assist other crews in completing their assignments.
- i) –Collect notes and verify status of lighting and next call with Stage Manager. Obtain release before departing.

Trouble Shooting Procedure

A light doesn't come up. Check, in the following order:

1. Patch and switch on patch panel.
2. Dimmer switch in dimmer room.
3. All connectors to the instrument.
4. Examine lamp.
5. Cross-connect instrument: Connect instrument to known working circuit or cable, and/or connect a known working instrument to the circuit or cable.
6. To replace lamp, see lamp selector in SR form. Follow directions carefully to replace.
8. Double-check focus after replacement.

