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A flying look
Safely operating your counterweight system
By Beth Rand

You've built your set and rented your drops. Now it's time to hang your flats and to adjust your drapes. Whether you're a seasoned professional or a novice, it's also a good time to review your counterweight system policies and practices—for your technicians, your volunteers, your students, and yourself.

Consider this: would you be happy if your students got 95 percent on a math test? Now ask: would you be happy if your students working the counterweight system had a 95 percent success rate? In the theatre we can never become complacent about systems operations. This article will help you to review your protocol if you're practiced or to learn new protocol if you're inexperienced.

Your construction site

A theatre is often likened to a construction site, only worse. And the counterweight system (aka fly system or rigging system) can be the most dangerous in the theatre. Have you ever seen a construction site where a crane dangles an eight-hundred pound object above someone's head? Do they allow anyone to work in the dark or without a hard hat? Would OSHA allow such practices and would contractors accept such risks? No. Yet not only are these common practice in many theatres but we also allow minors to work under these conditions in school theatres.

And although the movements of flying scenery may be choreographed and practiced during tech week, no one calls out warnings during performances when hundreds of pounds of set pieces come flying down to the deck. The actors on stage simply cannot be in the wrong place at the wrong time. So, if your theatre has a fly system, it is imperative to have strict protocol about its operations and to train your crew and your actors in using it safety.

Operations

Every theatre has a different procedure for operating their counterweight system, but there is a general set of standards. One important standard is that the fly crew must have a direct visual line to the stage area below the pipe (aka batten) that they are

bringing in or out. If they don't have direct visual contact, they must have a spotter to relay information to them. The crew must also not fly any pieces until they have received an all-clear from the stage manager, and even after they receive that all-clear, they (or a spotter) should still watch the stage.

During rehearsals, operators should call out the fly movements in loud and clear voices, so that by opening night, the actors and crew know when and where set pieces and drapes will be flying. Of course, the crew can't yell during performances, so operators need to rely on all-clear cues from the stage manager. Again, different theatres have different procedures, but the goal is to ensure that movements happen as they were rehearsed to happen. See the SIDEBARS section below for sample protocols of fly system operation and stage management cues.

Reweighting

As the name suggests, the system relies on counterweighting (or balancing) objects, like on a seesaw. Every time you change the load on a pipe, by adding or removing sets and lights, you have to similarly adjust the load on the arbor (that is, the assembly of plates and rods that carries the counterweights), by adding or removing metal bricks (aka pig irons).

Not only does this balancing have to happen, but it also has to happen in a specific order. You always need to keep the majority of weight on the stage, so that nothing comes crashing from above—not that you would allow someone to be underneath a batten when you're reweighting! When you add weight, you load the sets or lights first; when you remove weight, you unload the arbor first.

Fly systems are usually built with safety locks that can hold an imbalance of about fifty pounds during reweighting, but you shouldn't rely on them. Instead, learn the correct knots that will secure your ropes. The techniques for tying off ropes that are out of balance is beyond the scope of this article, but you can learn more from the Entertainment Technician Certification Program for stage rigging (www.etcp.plasa.org).

As a high school theatre manager, I arrange annual sessions with local certified riggers and allow only those students who attended to operate the fly system, but I don't allow them to reweight unless they are supervised by a professional. Of course, most schools don't have certified riggers on staff, but you should still have a standard loading policy and protocol. See the SIDEBARS section below for a sample protocol for reweighting.

Measuring weight

Buy a good bathroom scale or, better yet, an industrial hanging scale. At your fly rail and at your loading bay, post a list of the weights of commonly used objects. Larger scenery pieces may be hard to weigh, so it's a good idea to also keep a list of the weights of previous set pieces (and a list of the weights of lumber pieces), so you can judge the weights of current set pieces. Sometimes, you can weigh each component

separately to figure the total weight of a set piece.

As well as the weight of each set piece, you also need to know the weight limit of each batten. You should check your specifications, but the average weight limits on battens are 1,044 pounds for a five-foot batten, 1,300 pounds for a six-foot, and 1,567 pounds for a seven-foot. The demands of educational theatres rarely exceed batten weight limits.

The average weight of some lighting instruments: a six-inch Fresnel is 14 pounds; a ten-inch Fresnel is 15 pounds; an ellipsoidal is 19 pounds, not including the zoom, which is another 21 pounds; a Source Four PAR is 12 pounds; a three-cell LED cyc is 41 lbs.; and hid work lights are 25 pounds. The average weight of drops: a cardboard wall is 120 pounds; a flat is 150 pounds; and French windows are 300 pounds.

Rigging hardware

No protocol will be useful if the scenery has not been attached properly to the battens. The specific techniques for attaching set pieces to pipes are beyond the scope of this article. If you don't understand how to use rigging hardware, hire a certified rigger. USITT's Rigging Safety Initiative (www.usitt.org/rsi) and local nonprofits like Western Washington Theatrical Training (www.theatricaltraining.com) can provide professional assistance and training. Remember, students should never attach rigging to scenery without supervision from a trained professional.

Inspections

In addition to training, supervision, and following proper procedure, it is also important to have your system inspected every couple of years. The inspector will visually assess the accessible components and physically check the system for any hazardous conditions that might compromise the safety of your crew and performers.

They should fully raise and lower each line set to determine its functional condition, including if any lines are out of weight, and examine the physical condition of the ropes, blocks, cables, and other parts. The inspector should then present you with a full written report, which will recommend any repairs or replacements and any preventative maintenance. Again, USITT or a local company, such as Stagecraft (www.stagecraftindustries.com) in the Pacific Northwest, can help you find an ETCP-certified rigger for your safety inspection.

Counterweight versus electric winch

Most school theatres have counterweight systems. Recently, many architects and engineers have begun designing new theatres with electric winch systems, which allow the operator to raise and lower the battens with the push of a button. These systems are also strong enough to hold a wide range of weight, nearly eliminating the need to re-weight every time you add or remove a piece of scenery. In my high school theatre, I recently hung fourteen instruments by myself!

The more sophisticated systems come with a computer that can program "cues." You enter a cue number for your preset, and all the curtains come down simultaneously. You enter a cue number for your scene change, and three pieces of scenery fly out and two fly in. This may sound preferable to a counterweight system, but there are drawbacks to an automated system.

One pedagogic drawback is that you only need one person to program and to execute all your cues, which eliminates opportunities for students who want to work backstage. Another is that you lose Career and Technical Educational value, and high school students who haven't learned counterweighting and rigging will most likely encounter a college or professional venue with a counterweight system.

Computerized systems do have auto-stop, which sounds sensible, but one operational drawback is that you have to hit an object before the system stops, and that object could be an actor. Another drawback is that students may become complacent and distracted by, say, a text message—as if that would happen! In either case, neither the automatic winch nor the distracted student can engage the emergency button before a potential accident.

So, automated systems may be more convenient, but they are not necessarily safer. My experience has been that, with a properly trained crew, a counterweight system is safer than a winch system. If you are consulting on a new system or a new theatre, encourage the architect and insurance agent to carefully consider the safety factors of both manual and automatic operations.

Lastly, if the computer goes down, the whole system goes down and so does the whole show. If you were unable to fly in one piece of scenery with a counterweight system, you could still continue with the show and the other pieces of scenery.

The system I like the best is a hybrid: the light pipes on a winch system and the scenery pipes on a counterweight system. This allows students to move lighting instruments quickly without closing the stage for reweighting. And since electrics aren't typically moved during a show, there is no danger of an unattended electric on a winch. Hanging scenery usually occupies the whole stage regardless of which system you use, but scenery is moved in and out during a show, and a student pulling a counterweight rope can halt as soon as someone yells "Stop!"

Locking off

This article took a flying look at general information about counterweight protocols for high school theatres. For more information about rigging safety, visit www.plasa.org or www.usitt.org/rigsafe.

Happy flying!

SIDEBARS

Sample protocol for fly system operation

1. Stand by the fly rail and look on stage to see if the area is clear.
2. Release the safety ring and lower the handle.
3. With both hands on the rope, turn your body and your head to face the stage.
4. In a loud voice, call your warning "[Batten name] coming in" or "[Batten name] going out."
5. Wait for a response of "Clear" or "Thank you" from someone on stage who has actually checked that the area is clear. If you do not hear a response, call your warning again.
6. Using both hands, begin pulling the rope to lower or raise the batten, while continually looking on stage. If you need to stop at a spiked tape mark or arbor, glance occasionally at the rope but only take your attention off the stage when you are close to your mark.
7. Slow down when approaching the end and stop pulling the rope when the batten is all the way in, all the way out, or on spike. Do not let the arbor crash when you stop.
8. Raise the handle and secure the safety ring around it.

Sample protocol for stage management cues

1. The stage manager will call or signal "Standby rail" or "Standby [batten name]."
2. Respond by voice or signal with "Rail standing by" or "[Batten name] standing by."
3. Release the safety ring and lower the handle, then place both hands on the correct side of the rope. IMPORTANT: Do not do anything else until stage manager gives you the "Go."
4. The stage manager will call or signal "Go."
5. Unless otherwise instructed, pull the rope in a quick yet controlled manner.
6. Watch the stage, if it is in your visual line.
7. Slow down when approaching the end and stop pulling the rope when the batten is all the way in, all the way out, or on spike. Do not let the arbor crash when you stop.
8. Raise the handle and secure the safety ring around it.
9. Respond to the stage manager with "Rail complete" or "[Batten name] complete."

Sample protocol for reweighting

For the following loading procedure, have crew on the fly locking rail, on the deck, and on the loading gallery. To unload, reverse the procedure.

1. Fly crew calls "[Line set name] coming in" and lowers the batten to floor.
2. Fly crew gives clearance to the deck crew to place the load on the batten.
3. Fly crew calculates the load weight and directs the loaders to add equal weight to the arbor.
4. Primary loader calls "Clear the rail," and the fly and deck crews move to either side of deck's center line.
5. Fly crew calls "Rail clear."
6. The primary loader calls "Loading weight on [line set name]," and loaders raise the keeper nuts and spreader plates, leaving one on top of the batten weight.
7. Loaders place the required counterweights on the arbor. If many "bricks" are needed, a spreader plate should be inserted between the weights as marked.
8. When finished, loaders slide down the remaining plates and keeper nuts, locking them in place with thumb screws. Only then do they call "Loaded and locked."
9. Fly crew calls "Testing weight."
10. Fly crew removes the keeper ring and opens the lock handle, testing the load for balance.
11. If the load is out of balance, repeat the above procedure to adjust.
12. Once the weight is correct, fly crew calls "All clear. [Line set name] flying out" and flies the load to trim, securing the rope lock and the safety ring.