Spatter Up!

How to build and use an overhead bloodspatter cage

By Anthony (Bud) Bertino and Patricia Nolan Bertino

In the fall of 2007 my wife Patti and I were excited to began an in-depth study of blood spatter analysis with Dr. Herbert Leon MacDonell, author of *Blood Stain Patterns* and expert witness in many high profile crimes. The week-long course, presented in Corning, NY is devoted to EVERY aspect of blood spatter analysis with hands-on lab activities dove-tailed with Herb's fascinating narratives and photos describing some of his most famous cases.

Our class was composed of twenty five people – twenty one crime scene investigators, a lawyer, a New Zealand medical examiner and Patti and I, Herb's first teacher participants. A phlebotomist was available to draw blood if we wished to use our own blood in a self-devised experiment!

The course was one of total immersion devoted to learning by doing. We simulated arterial spurts, dropped blood from various heights onto different surfaces, shot blood-soaked sponges with a .22 rifle and many other fun activities. One of my favorites was the study of medium velocity impact spatter (MVIS) patterns produced by blunt instruments. The accompanying pictures illustrate Herb's clever device to simulate blood spatter patterns found on walls, ceiling and floor of crime scenes.

The device itself is simple to construct, use, dismantle, and store. I visited Lowe's and created a list of necessary supplies costing about $170. There is a little sawing and drilling but nothing too complicated. We built, photographed and refined the structure for teacher use and storage. Tools pictured in Figure 1 include a drill, drill bit, hacksaw, marking pen, measuring tape, file, clamps (for holding paper), a mallet and PVC cement.

Materials needed: (prices based on 7/22/10)

13 2" PVC pipe (10 foot length) ($4.93 each)
8 2" Street L connectors ($2.05 each)
18 2" T connectors ($1.63 each)
12 48" bungee cords ($2.77 each)
1 36" wide roll of butcher paper x 25 yds. ($20)
1 can PVC glue (optional)

*1 ½" PVC pipes and fittings can be substituted for a savings of about $45.

Construction:
1. Cut all thirteen of the 10' lengths of PVC in half producing twenty-six 5' lengths. Cut six of these 5' lengths into 3' lengths. Use the file to smooth the cut edges.

Construct the bottom frame:
2. Form a 10' x 5' rectangle using six T connectors and six 5' lengths of PVC. Make sure all T connectors are arranged symmetrically (facing each other as mirror images). Use a rubber mallet to securely join the PVC pipe to the connectors.
3. On the 10' side of the rectangle, drill a hole about 4" from each corner for a total of four holes. Attach the hook end of the bungee to a hole and stretch the bungee across the width of the structure. Attach the second bungee across the other end of the structure.

End construction:
4. Connect a street L connector to a 5' piece of PVC pipe. Connect the L connector to a corner of the base. Hammer this into place at one corner of the base. Repeat for each of the other three corners. Add a 5' section of pipe and a T connector as the middle support on each side. A total of six upright pipes are now in place. Attach two T connectors to the ends of a 5' piece of PVC pipe. Attach this support across the end of the structure connecting two of the upright pieces of pipe. Figure 2 shows what the structure should look like to this point.

Top construction:
5. Form a 10' x 5' rectangle using six T connectors and six 5' lengths of PVC as in Step 2.
6. On the ten foot side, drill 8 equally spaced holes in a line along the surface facing up. Repeat the process for the other ten foot side so holes on each side line up. These holes will be used for bungee attachment.
7. Connect the eight bungees across the rectangle into the drilled holes so that the bungees are all parallel with each other when in position.
8. Connect a 3' section of PVC pipe with an L connector to a corner of the rectangle. Repeat for each of the other three corners. Add the remaining two 3' sections of PVC to the middle positions. Figure 3 shows what the upper should look like. Notice I have added an optional center support which is discussed later in the 'Optional' section.
9. Turn over the entire top section and rest it on the six PVC pipes. Attach a couple additional bungees along the middle of the length of this structure to help hold everything in place.
10. Assembly to this point can be done by one person. It will take at least three people on ladders to attach the top section.
11. After the frame is complete, position the roll of paper (as pictured) and wrap under the lower right corner support, inside the middle right support, over the top right corner support, over all the upper bungees, over the left end support, inside the left middle support, under the lower left corner support across the floor and tuck the edge in under the paper roll or use clamps to secure the paper to the frame. Figure 4 shows the beginning of the process.

Optional: To increase stability, you may want to label and glue corner fittings to one of their respective PVC pipes for easier reassembly later. Additional support can be provided for the top section by adding another 5' section of PVC across the center. Attach this 5' pipe across the width of the apparatus

using a T connector at each end. If this is desired, you will need to shorten two of the 5' side members opposite each other (on the 10' side) to insert the additional T connector. Figure 5 shows how this connection might look. Connect the two T connectors with a short length of cut PVC pipe (between them) and glue one side of PVC pipe to T, then glue short length, then glue other T connector leaving other 5' length of PVC free to disconnect for storage. Figure 5 shows how these might be connected. Between the L connectors is a small section of PVC pipe to how the sides together.

Storage is simple. Use the bungee cords as binders and handles for transport. Figure 6 shows how the bound sections might appear for storage. Notice many pipes have a connector glued to one end and each pipe is labeled as to where it fits in the overall structure.

Procedure:

1. Obtain a Tyvek Bunny Suit (see photos) for the spatter expert to wear while creating the pattern. Local law enforcement agencies or paint stores may be able to provide one. Figure 7 & 8 demonstrate use of the structure.

2. Choose your blunt instrument and position the body receiving the impact (such as a saturated bloody sponge on a table) within the structure about two or three feet from the front wall of paper. A hammer, baseball bat, rolled newspaper, or broom handle can be used as a blunt weapon.

3. Strike the body sponge. Try to bring the impact weapon back and overhead as you swing. Get angry and focus your effort on the downward stroke. This mirrors a real life attack. Limit yourself to 3-4 swings. This makes the ceiling pattern more distinct and easier to read.

4. Observe blood spatter patterns. Three different blood spatter patterns may be observed.
   a. Passive circular droplets from blood dripping from the weapon
   b. Linear, cast off blood spatter from swinging the bloody weapon after striking the victim
   c. Impact spatter produced when the bloody victim is struck by the weapon. The impact blood spatter will appear as a wide spray of blood as opposed to the linear arrangement of cast off blood spatter.

5. Using the blood spatter evidence, try to determine:
   a. Where in the room was the victim located when attacked
   b. How many blows were administered
   c. If the victim moved or more than one person administered the beating

Things to consider when working with blood spatter produced by blunt force:

1. Typically, the first blow does not produce cast off blood. It may take several blows to break the skin (and blood vessels) to coat the weapon sufficiently to produce a cast off pattern
2. The direction of the blood can be determined by the shape of the blood droplets. The elongated tails of the droplets point in the direction of travel away from the source.

Castoff from a bloody blunt weapon will resemble that which you see here on this butcher paper-colored sidebar.

Photos of the figures described in the text can be seen by turning the page.

a. If the victim moved or more than one person administered the beating.

Things to consider when working with blood spatter produced by blunt force:

1. Typically, the first blow does not produce cast off blood. It may take several blows to break the skin (and blood vessels) to coat the weapon sufficiently to produce a cast off pattern
2. The direction of the blood can be determined by the shape of the blood droplets. The elongated tails of the droplets point in the direction of travel away from the source.
3. Blood spatter cast off produced as a result of the backward swing, will produce blood droplets at smaller angles producing more elongated blood droplets along a single line configuration.
4. Cast off patterns can also be produced on the downward or beating movement. Directionality can be indicated by the pointed end of the blood stain. Because more blood is released from the weapon on the downward swing (due to greater velocity), you may see a double or triple linear file of bloodstain.
5. If the victim was struck with a series of blows, multiple cast off patterns may be observed.
6. Drip patterns on the floor will be mostly circular (passive) droplets produced from blood dripping from attacker or weapon.
7. The number of strikes can also be approximated based on the number of linear cast patterns produced plus one. The droplets within each pattern will follow a slightly curved path.

Application: By analyzing the blood stain pattern, investigators can determine if events are consistent with reports of observers or victims. The blood patterns created can be used to help students determine the approximate number of blows and position of victim when the blows were administered.

This device could also be used to help the instructor create crime scene information for student analysis or testing. Student teams could also generate their own scenarios using this device. These teams could then generate crime scene data for other teams of students to analyze.

References:

Bloodstain Patterns, by Herbert Leon MacDonell
On the Geometric Interpretation of Bloodstain Patterns, by Herbert Leon MacDonell
Bloodstain Pattern Analysis, by Anita Wonder

For more information please contact Anthony (Bud) and Patricia Nolan Bertino at bud@bertinoforensics.com or Google Bertino Forensics. ■

Figure 1: Tools needed.

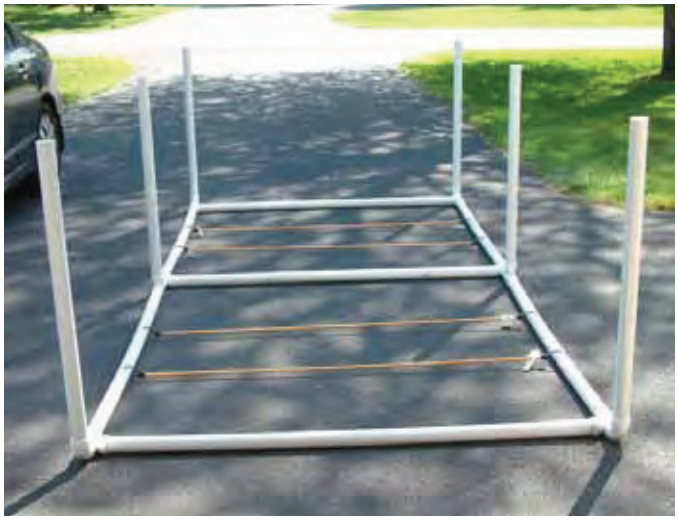

Figure 2: construction of the base.

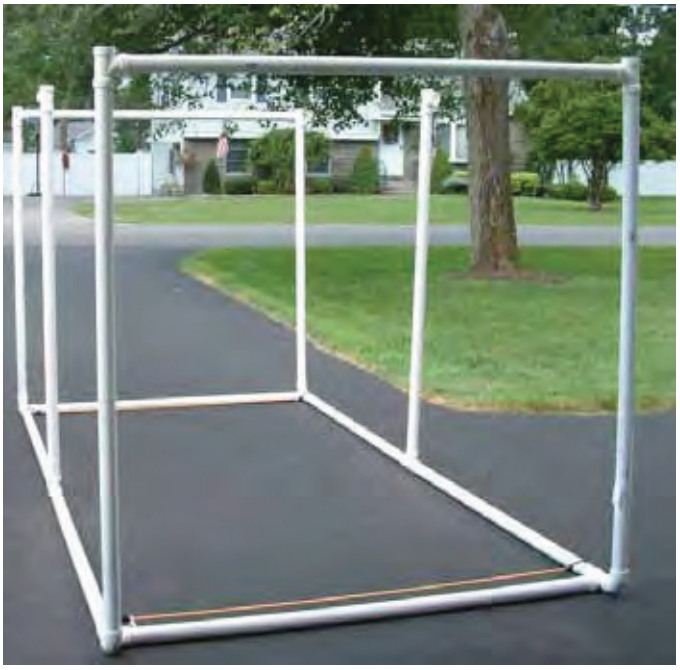

Figure 3: The next step, the base flipped over with bungies.

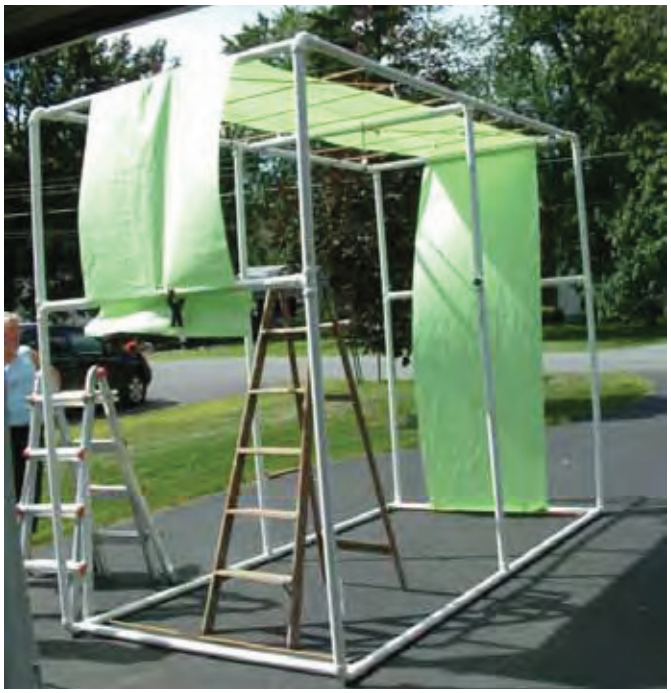

Figure 4: Putting on the paper.

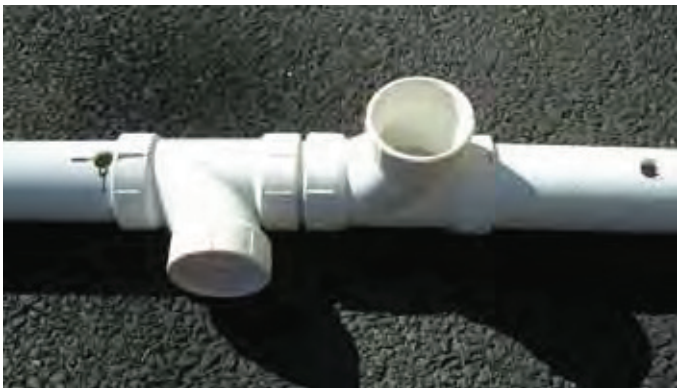

Figure 5: The connection

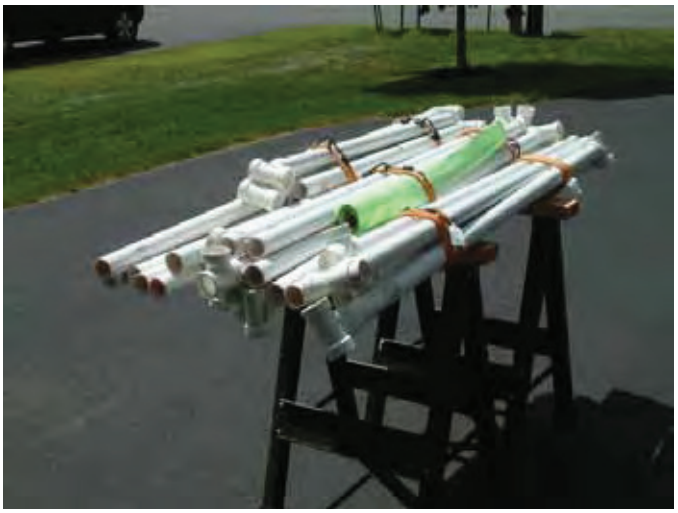

Figure 6. Packed for storage.

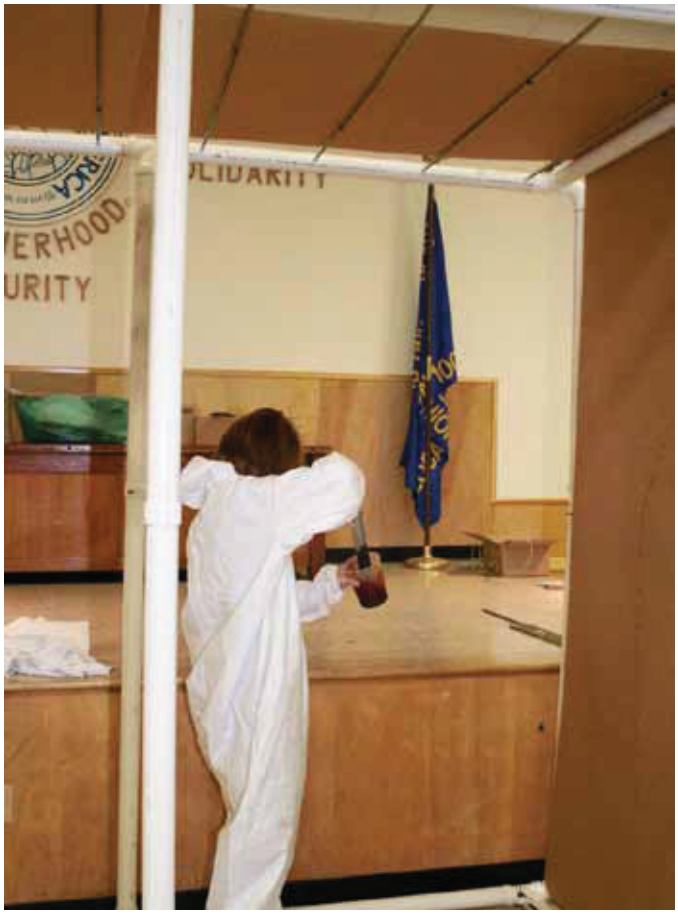

Figure 7: Applying blood to the tool

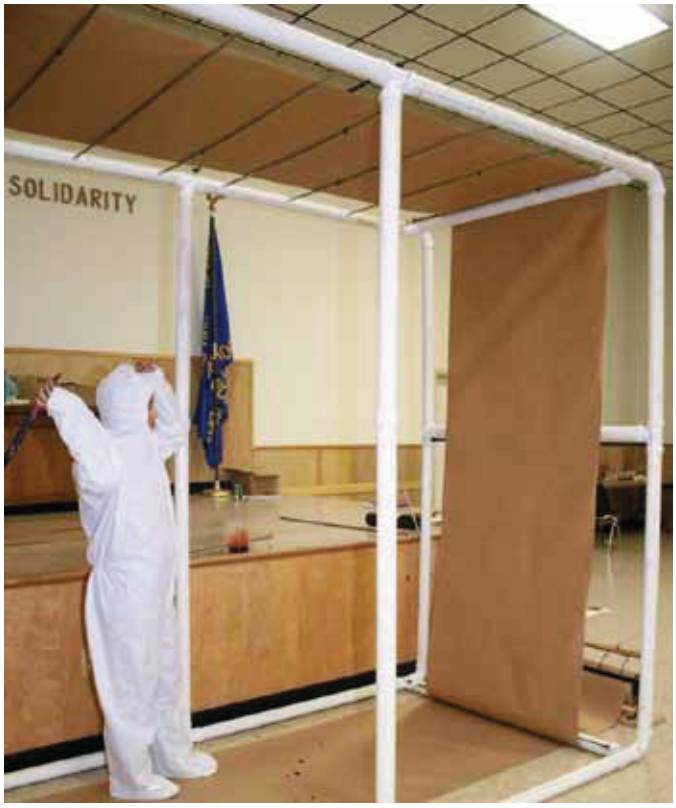

Figure 8: Casting off blood onto the ceiling