MAKING THE PVC CORE DRIVER AND PVC CORING TUBES

At Tufts 3" PVC pipes are now used for all coring of new outcrops. 2" and 2.5" PVC pipe will work but you don't get as much of a look at the sediment and deformation may start to become an issue in wet sediment. We only use these smaller cores as matter of convenience when trying to match varves from sample sites on an outcrop to an existing outcrop core sequence. We have gotten great results with all sizes but 3" is the best.

To prepare the PVC pipes for coring cut them into 2-ft lengths with a table saw and bevel one end on a belt sander. Use a regular metal saw blade on the table saw. Try to get the cut ends as flat as possible because this surface will take a lot of abuse and needs to sit flat against the inside of the core driver. The cut ends can be flattened with the belt sander if necessary. Beveling or sharpening the bottom end of the PVC coring tube is essential and allows the core to easily cut into clay, silt, and fine sand. It is also important to grease the inside of the bottom of the coring tubes with Vaseline. It makes the core slide up the core barrel much easier. A coating of Vaseline about 1/8" thick and ½" wide around the base of the inside of the core is sufficient. Using Vaseline in this operation (or any carbon-bearing lubricant) can eliminate accurate radiocarbon or organic % analysis if the Vaseline comes in contact with the sediment being analyzed. All of our radiocarbon analyses have come from outcrop samples taken adjacent to our cores, using the cores to find the exact position in the varve sequence through matching to a previously collected core set or a varve curve. We often find organic samples while excavating the cores from the outcrop.

After the core is excavated in the field use damp sponges or old towels to wipe it clean of mud and excess Vaseline. Seal off the ends with duct tape and label the cores. Permanent markers work well only if the core liner is dry and free of Vaseline.

I have been able to find all of the necessary components for the coring device at building supply stores such as Home Depot except some of the larger reducing couplings, especially the 1.5" x 3" reducing coupling. Any large plumbing department can also cut and thread pipes for you. A large professional plumbing supply store should have all the harder to get reducing couplings. Unfortunately some of these stores will only deal with contractors, but they will usually give in when you explain why you need the part. (They find us entertaining!)

The reducing couplings that fit over the PVC cores need to be turned on a lathe to remove the threads from their larger ends. This allows the PVC

pipe to slide into them easily. The PVC should not be loose but also not too snug. After pounding a core you have to get the 50-lb core assembly off easily. A 2.5" pipe and its PVC end cap with a hole drilled in the top for air escape will also fit in the 3" assembly. PVC end caps come in all sizes and shapes but most commonly are either flat or domed on their ends. The flat ones are better because of the way the rest evenly on the pounding surface of the coupling. The end caps are reusable and still very durable if they are turned on a lathe so their outside fits inside the coring device and their inside loosely slides on and off of a PVC pipe.

When you fit the metal components of the core driver together grease them with Vaseline and tighten them with pipe wrenches. If the pieces are at all loose they will essentially knock themselves apart. The Vaseline will help prevent rust and silt from locking up the joints that could make unscrewing components difficult in the event that you need to take the apparatus apart (a necessity) for replacing parts.

The weak link in the device is the 1" nipple below the weights, which was originally ¾" and needed to be replaced frequently. The pounding simply compressed this section of pipe and deformed its threads when we used ¾" pipe. We haven't needed to replace the 1" nipple yet. I would have extras of this component on hand along with some pipe wrenches. Another place where the device could fail is at the base of the 9" pipe that carries the barbell weights. This joint usually takes more abuse when someone drops the device sideways on the outcrop rather than during coring. As a general rule, when I go on a long distance sampling trip I have two fully constructed devices and lots of extra parts. Your chances of finding some of the harder to get plumbing components in the woods of northern Vermont are slim.

You will need to get some barbell weights and a barbell twist lock that fits over a ¾" pipe. This is the standard barbell size. We use 30 lbs. of barbell weights, which can be a little unwieldy on an outcrop of clay. 20 lbs. doesn't really drive cores well enough. 30 lbs. has always worked well. More weight than 30 lbs. could (?) start to destroy the main shaft assembly and while PVC is tough I'm not sure how much abuse it can take. PVC is brittle and could shatter explosively so wear safety glasses. Cardboard spacers will prevent the weights from clanging together while you are pounding cores. If the barbell weights flop back and forth and clang against each other they could eventually shatter and the noise will drive you crazy.

The biggest safety concerns are 1) brittle cast iron components that could shatter with repeated pounding and 2) failure of brittle PVC pipes.

Neither has happened to us while collecting over 500 cores. We had a PVC pipe break in the Champlain Valley but we hit a cobble-sized dropstone while coring and the PVC pipe didn't fail catastrophically it simply split along its side allowing the cobble to run up the center of the tube. Another concern is that the person holding the core in place while you start pounding could get banged on the head but there appears to be enough clearance to prevent this situation. Wear safety glasses and the person below should have a hardhat.

PARTS LIST

Outer shaft/core holder (top to bottom)

1.5" to 1.25" reducing coupling **OR** 1.5" to 1.5" coupling with 1.5" x 1.25"bushing inserted in upper end. You need a sturdy flat hammering surface at this end that will allow a 1" pipe to slide through it.

2' x 1.5" pipe threaded at both ends.

Core holder – 3" x 1.5" reducing coupling with threads removed from 3" end to accept 3" PVC pipe. Make a horizontal platform in the reducing coupling that will rest on the core. You can either fill the coupling with liquid metal and then machine the epoxy on a lathe to make it flat or insert a metal plate on which the core can sit. The inside platform must be smooth and flat and it has to have a hole in it to allow air to escape up the shaft. This 3" reducing coupling can also accept a 2.5" PVC pipe with a 2.5" PVC end cap.

For 2" PVC pipe: 2.5"x1.5" reducing coupling with threads removed from 2.5" end, use 2" PVC end cap that is slightly enlarged internally on a lathe to loosely fit over a 2" PVC pipe when coring.

Inner shaft/weight-handle assembly (top to bottom)

¾" end cap

9"- ¾" pipe threaded on two ends

1" cross-junction

HANDLE: inserted into cross junction – 2 ft x ¾ or 5/8” pipe threaded on both ends plus two end caps of appropriate size. Use hose clamps to prevent handle from sliding back and forth in the cross-junction.

2” long - 1” nipple.

1.5”x1” reducing coupling

1.5”x1” bushing

2-ft x 1” pipe threaded at one end

NOTE: (plumbing jargon)

All widths are inside diameters.
Nipple – a short section of pipe threaded on both ends.
Coupling – joint in which pipes screw into both ends.
Reducing coupling – a coupling that changes pipe size with pipes screwing into both ends.
Bushing – joins two pipes with one pipe screwing into it and the bushing screwing into another component such as a coupling.

Any questions:

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