Appendix 1 – Mounts for Acoustic Doppler Velocity Meters

Introduction

Mechanisms for mounting sidelooker and uplooker acoustic Doppler velocity meters (ADVMs) are an important component of collecting high-quality data. This appendix provides information on a selection of mounts for ADVMs.

The ADVM mount should be rigid and should resist vibration or any kind of movement due to flow or other causes. The mount should allow for the adjustment of the ADVM pitch, roll, and heading and should be designed so that the ADVM can always be returned to the same location and orientation after servicing or replacement. The mount should allow for the depth of the ADVM to be changed if it becomes necessary. When possible, the ADVM mount should facilitate servicing of the instrument at all stages and conditions (during high flows as well as low flows, or when ice cover is in the channel, for example). ADVM mounts should be constructed of materials that will not easily corrode. Aluminum pipe and slip-on fittings, such as Speed-Rail™ (*http://www.hollaender.com/*, accessed October 29, 2010), are commonly used for constructing ADVM mounts. In some environments, it may be necessary to coat the mount, mounting pipe, and ADVM with antifouling paint.

Mounts for Sidelooker ADVMs

In addition to the general requirements listed above, mounts for sidelooker ADVMs need to be made so that the ADVM can be raised and lowered for servicing and so that the cable running from the ADVM to the data logger is protected. The ADVM mount should have some means of adjusting the pitch and roll without having to adjust the entire mounting assembly. The mount must allow for the ADVM to be returned to the same depth and orientation to the mean flow after being serviced. This often requires careful planning prior to installation. Examples of sidelooker ADVM mounts are shown in figures 1-1 to 1-6.

Mounts for Uplooker ADVMs

Requirements for vertically oriented (uplooker) ADVM mounts are similar to those for sidelooker ADVM mounts, with some additional requirements. Some uplooker ADVM mounting methods may require the use of divers to service or replace the ADVM. Uplooker ADVMs may also be installed using a combination of above-the-water/below-the-water mounts (figs. 1-7, 1-10, and 1-11). The uplooker ADVM mount should allow for adjustment in pitch, roll, and heading while allowing for relatively easy removal and replacement of the ADVM. It might be possible to install a bottom mount in such a way as to negate the need to adjust the pitch, roll, and heading; however, experience has shown that it is often very difficult to install a level bottom mount with the proper heading that does not change over time. The mount for uplooker ADVMs should also be designed to minimize the possibility of sediment or debris accumulating on the ADVM transducers. A possible solution is to elevate the ADVM above the streambed on the chosen mount, and in some instances (Argonaut™-SW) reversing the orientation of the ADVM might help prevent sediment accumulation on the downstream transducer face. Examples of uplooker ADVM mounts are shown in figures 1-7 to 1-11.

Figure 1-1. H-beam and Speed-Rail™ mount for sidelooker ADVM. (Photographs by Keith Ging, Lower Colorado River Authority; used with permission.)

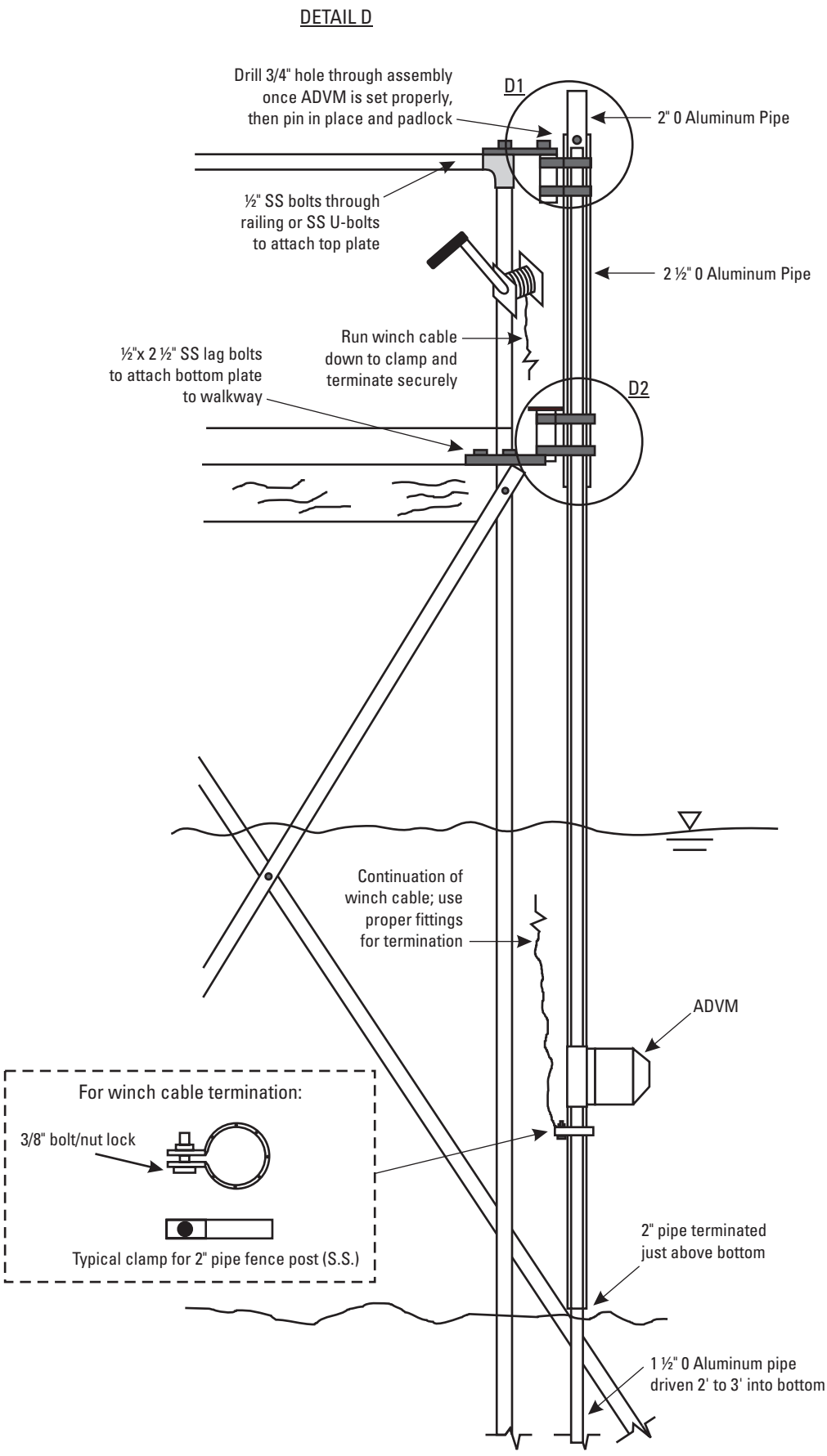

Figure 1-2. Schematic showing pipe mount for sidelooker ADVM. (Adapted by Molly S. Wood, USGS, from South Florida Water Management District specifications.)

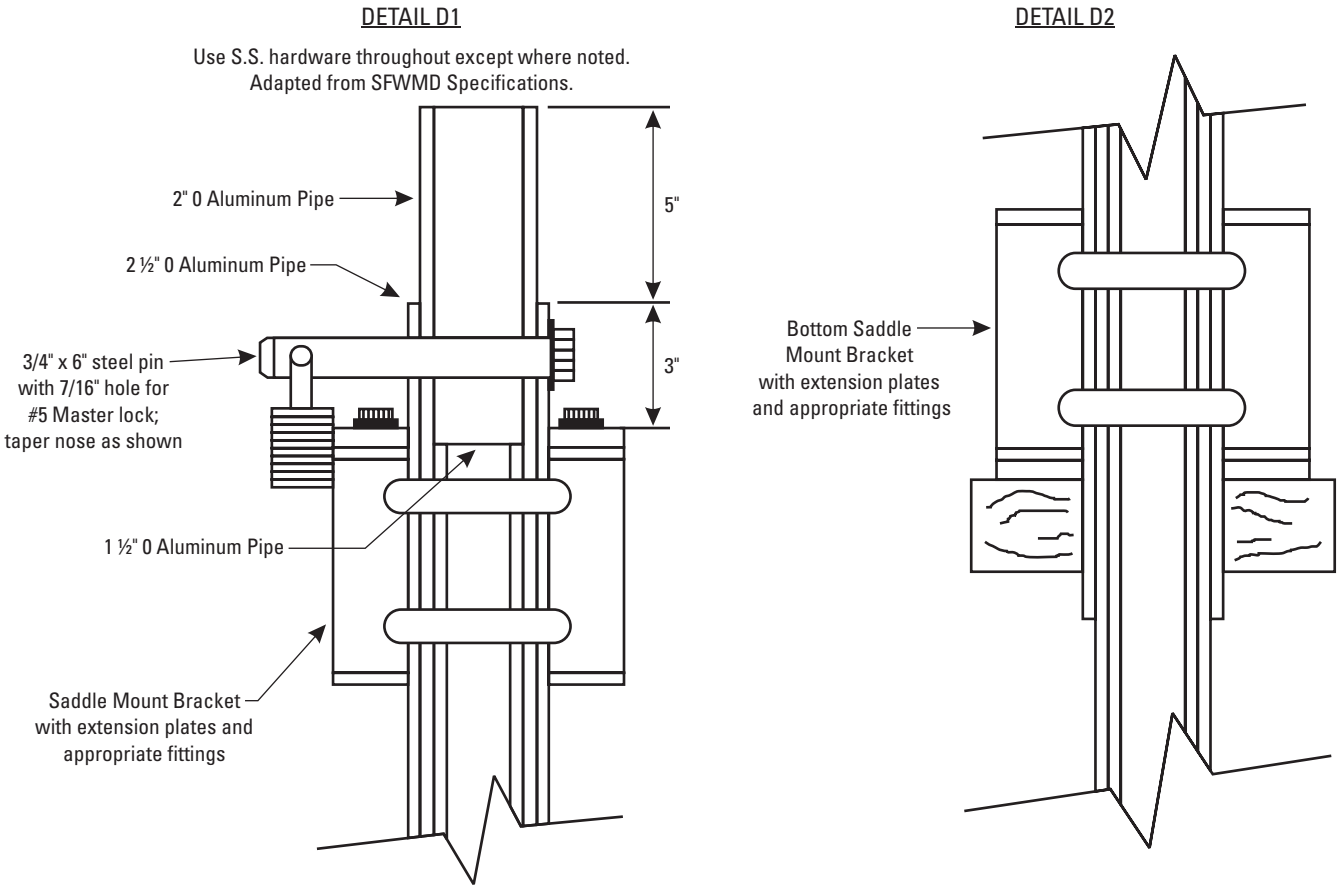

Figure 1-2—Continued. Schematic showing pipe mount for sidelooker ADVM. (Adapted by Molly S. Wood, USGS, from South Florida Water Management District specifications.)

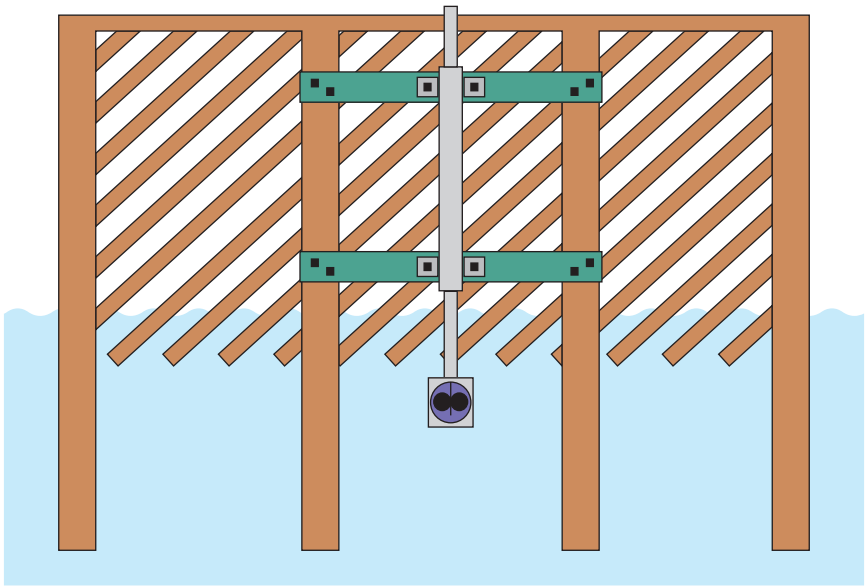

Figure 1-3. Schematic of ADVM mount on shear fence along a navigable waterway.

Figure 1-4. Track mount and assembly for a sidelooker ADVM made by Approtek International. (Photograph by Molly S. Wood, USGS.)

Figure 1-5. Speed-Rail™ mount for sidelooker ADVM. (Left photograph by Marc Zucker, USGS; right photograph by Victor Levesque, USGS.).

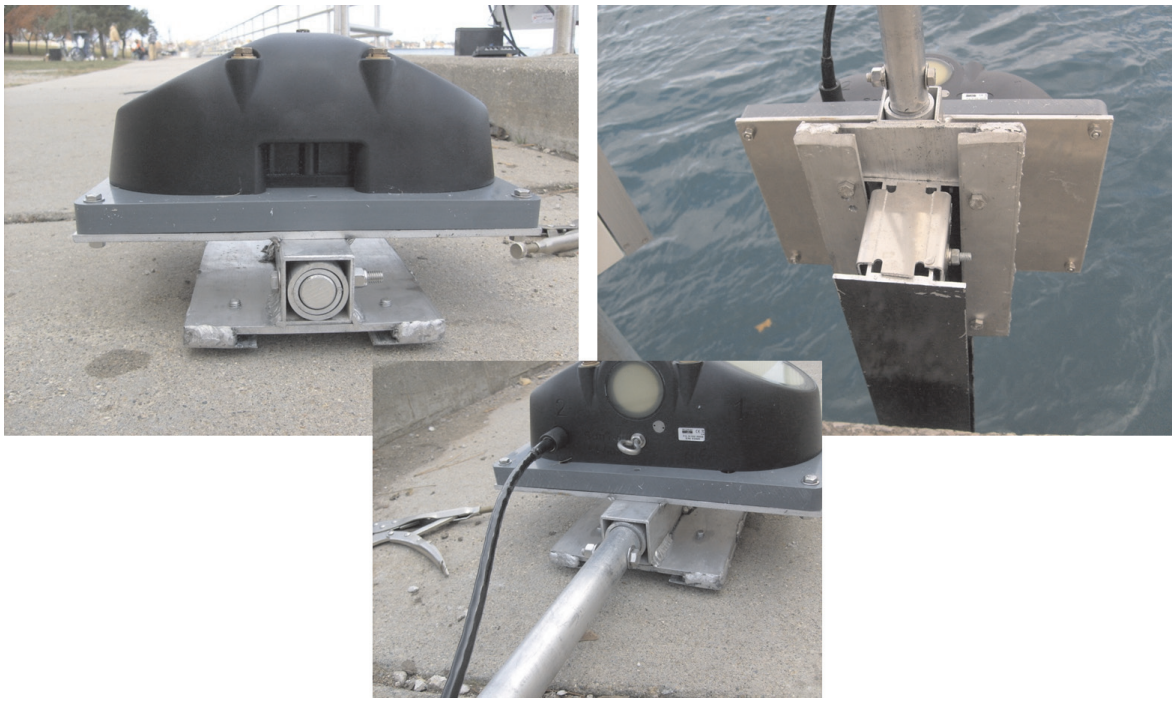

Figure 1-6. ADVM mount for I-beam mounted to channel wall. (Photograph by Don James, USGS.)

Figure 1-7. Speed-Rail™ mount with sidelooker and uplooker ADVMs mounted to it. (Photograph by Molly S. Wood, USGS.)

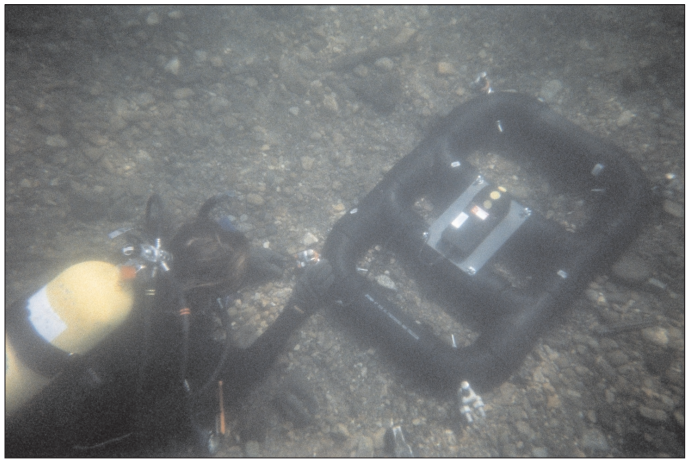

Figure 1-8. Diver securing uplooker ADVM and mount to streambed. (Photograph by Greg Clark, USGS.)

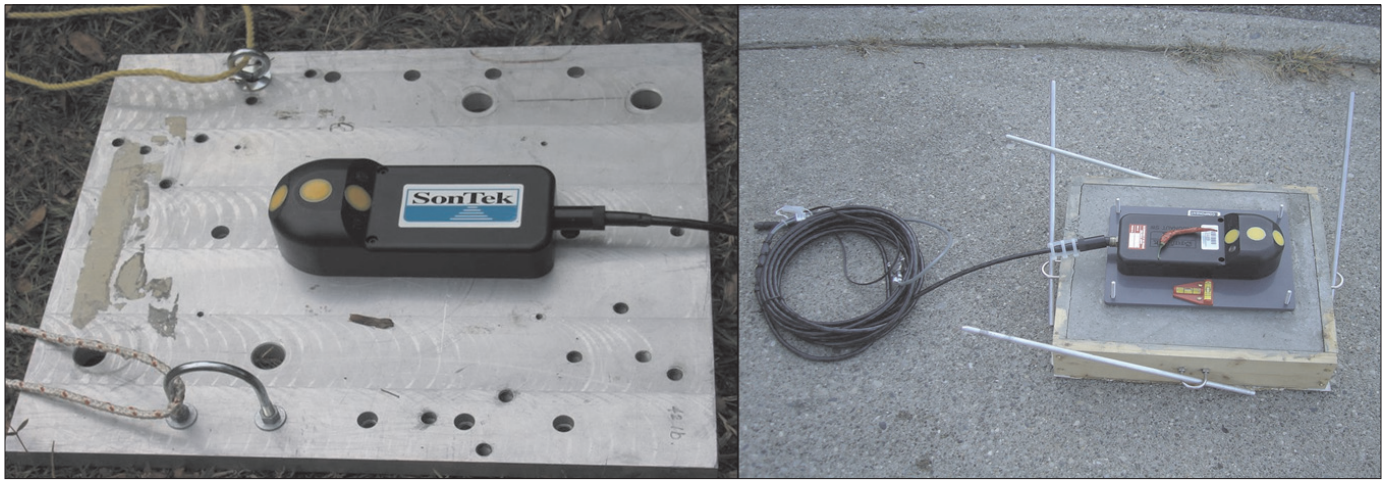

Figure 1-9. Mounting plates for uplooker ADVMs. (Left photograph by Molly S. Wood, USGS; right photograph by Marc Blouin, USGS.)

Figure 1-10. Uplooker ADVM mount with ADVM and Speed-Rail™ coated with antifouling paint. (Photograph by Lars Soderqvist, USGS.)

Figure 1-11. ADVM mount with a winch assembly for raising and lowering the ADVM. (Photograph by Jeff Banner, Sarasota County, Florida, Used with permission.)

Preventing Biological Fouling

Biofouling or biological fouling is the undesirable accumulation of microorganisms, plants, algae, and (or) animals on wetted structures. Biofouling (Callow and Callow, 2002) is divided into microfouling (biofilm formation and bacterial adhesion) and macrofouling (attachment of larger organisms, such as barnacles, mussels, seaweed, etc.). Macrofouling is the main concern for ADVMs and other sensors because it can affect the performance of these instruments. Biofouling is especially prevalent in the marine environment (fig. 1-12), but the kind of fouling that occurs and the rate of development vary from location to location. Biofouling can also occur in upland rivers. Zebra mussels have become quite prevalent in many streams in the United States (fig. 1-13). The movement of the transducer induced by the electromagnetic pulse used to generate sound waves may inhibit growth on the transducers, at least for some species. When biofouling is a concern, the manufacturer's recommendations regarding use of antifouling paint should be followed (fig. 1-14).

Reference

Callow, M.E., and Callow, J.E., 2002, Marine biofouling—A sticky problem: The Biologist, v. 49, no. 1, p. 10–14.

Figure 1-12. Sidelooker ADVM with biofouling. (Photograph by Lars Soderqvist, USGS.)

Figure 1-13. Sidelooker ADVM coated with zebra mussels. (Photograph by Paul Baker, USGS.)

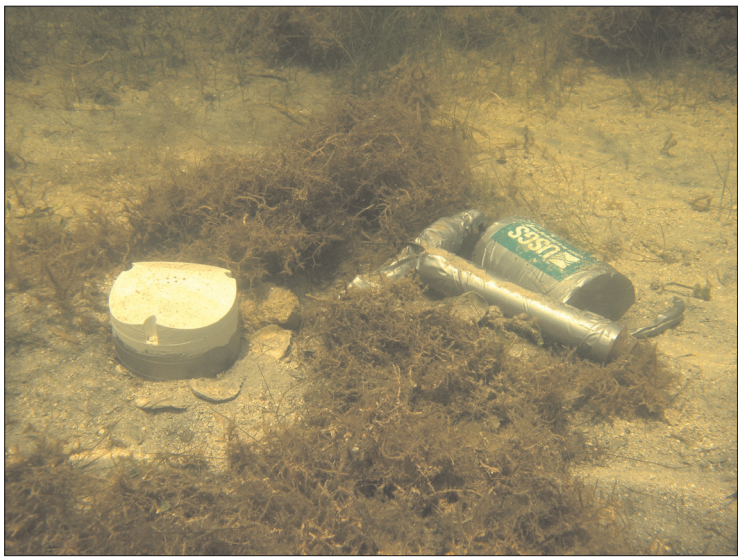

Figure 1-14. Uplooker ADVM on the streambed with biofouling paint applied. (Photograph by Victor Levesque, USGS.)