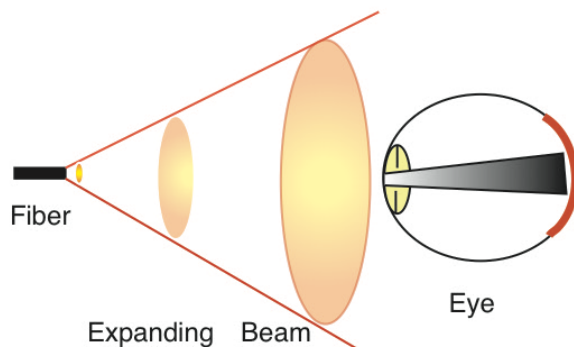


Fiber U Basic Skills Workbook

Safety

When one speaks of safety in fiber optic installation, the first image that comes to most people's minds is a laser burning holes in metal or being used in place of a scalpel for surgery. While these images may be real for their applications, they have no relevance to fiber optics. Optical sources used in fiber optics are of much lower power levels and are not focused into a time spot like these applications.

In fact, most communications links use LEDs or lasers of relatively low power levels; only high-power systems like fiber amplifiers and DWDM systems have dangerous amounts of power. The light that exits an optical fiber is also spreading out in a cone, so the farther away from the end of the fiber you are, the lower the amount of power striking a given sized spot. Furthermore, the light is of a wavelength that cannot penetrate your eye easily because of the absorption of the water in your eyeball at infrared wavelengths.



That said, some fiber optic links, like telco DWDM (dense wavelength division multiplexing) systems that may contain power from up to 64 different sources and is amplified by fiber amplifiers or CATV systems using high-power DFB lasers or optical amplifiers has enough power to be of concern.

Also, using a microscope to inspect an operating system can be hazardous as the microscope can concentrate the power into your eye.

Heed this warning: One should never look directly at the end of a fiber, especially those in working systems, because the light is infrared and invisible to the eye, so there is no warning of potential damage. On operating systems, always test the power in the fiber before inspecting it with a microscope. Many microscopes have filters to remove harmful levels of infrared light without compromising visibility of fiber defects, but make sure yours has one before trusting it. Video microscopes are also available and

recommended to inspect operating systems safely - and they are great for the classroom to share views of dirty connectors.

Fiber optics installation, however, is not without risks. Outside plant construction when installing the fiber often means working around heavy machinery – trenching machines, backhoes, bucket trucks, trailers of cable reels, workers vehicles and even vehicles on roadways near the construction. Workers should be trained in safety practices (OSHA in the USA), be supplied with appropriate personal protective equipment (PPE) and monitored to ensure they follow all safety practices.

See the FOA Guide Section on OSP Construction, especially the section Project Preparation an Guidelines for more details:

https://foa.org/tech/ref/OSP_Construction/Preparation.html

The FOA Online Guide website has a comprehensive discussion of safety. which you should read. A complete eye safety study and report is in ANSI Z136.2.

FOA Guide page: <https://foa.org/tech/ref/safety/safe.html>

FOA YouTube Video:

https://www.youtube.com/watch?v=qhgclWudh7s&list=PLC7CC6B17EF009849&index=27&feature=plpp_video

Bare Fiber Safety

As part of the termination and splicing process, you will be continually exposed to small scraps of bare fiber cleaved off the ends of the fibers being terminated or spliced. These scraps are very dangerous. If they get into your eyes, they are very hard to flush out. Always wear safety glasses when working with bare fibers. A pair of safety glasses should be included in every tech's kit. Use them, keep them clean, and protect them from damage like any other tool.



X-ray of fiber in a finger. Courtesy Brian Brandstetter, FOA Instructor.

The cleaved ends are extremely sharp and can easily penetrate your skin! Be careful to not stick the broken ends into your fingers, since they invariably break off and are very hard to find and remove. Most times, you have to wait for them to infect and painfully work themselves out. A pair of tweezers are included in the kit for removing splinters. Carefully pull the glass splinters out before they have a chance to break off and become lodged in the skin.

Avoid these painful accidents by exercising a little caution. Dispose of all scraps properly. Keep a piece of double stick tape on the bench to stick them to or put them in a properly marked paper cup or other container to dispose of later. Do not drop them on the floor where they will stick in carpets or shoes and be carried elsewhere. Do not eat anywhere near the work area.

Other Considerations for Safety

Fiber optic splicing and termination use various chemical cleaners and adhesives as part of the processes. Normal handling procedures for these substances should be observed. If necessary, download and post MSDS for each substance involved. Even simple isopropyl alcohol, used as a cleaner, is flammable and should be handled carefully.

Note: Fusion splicers use an electric arc to make splices, so care must be taken to ensure no flammable gasses are present in the space where fusion splicing is done.

Note: Installation of fiber optic cabling does not normally involve electrical hazards unless the cable includes conductors. However, these cables are often installed in proximity to electrical and conductive cables. Whenever you are near these cables, there is always a potential shock hazard. Be careful! If you are not familiar with electrical safety, we recommend you take a course on the NEC (National Electrical Code) and safety practices for installers!

Below is a page of fiber optic safety rules that should be posted in the lab in a prominent place and reviewed at the beginning of each lab.



Fiber Optic Installation Safety Rules

- Work in a well-lighted area with a black mat on the table top to help find fiber scraps.
- Keep all food and beverages out of the work area. If fiber particles are ingested they can cause internal hemorrhaging.
- Always wear safety glasses with side shields and protective gloves. Treat fiber optic splinters the same as you would treat glass splinters.
- Keep track of all fiber and cable scraps and dispose of them properly. If available, wear disposable lab aprons to minimize fiber particles on your clothing. Fiber particles on your clothing can later get into food, drinks, and/or be ingested by other means.
- Never look directly into the end of fiber cables – especially with a microscope - until you are positive that there is no light source at the other end – having tested it with a power meter. Use a fiber optic power meter to make certain the fiber is dark. When using an optical tracer or continuity checker, look at the fiber from an angle at least 6 inches away from your eye to determine if the visible light is present..
- Only work in well-ventilated areas.
- Contact lens wearers must not handle their lenses until they have thoroughly washed their hands.
- Do not touch your eyes while working with fiber optic systems until your hands have been thoroughly washed.
- Keep all combustible materials safely away from the curing ovens and fusion splicers.
- Dispose of all fiber and cable scraps properly. Put all fiber scraps in a properly marked container for disposal.
- Thoroughly clean your work area when you are done.
- Do not smoke while working with fiber optic systems.

For more information see the FOA Online Guide / Safety or FOA Lecture 2 on YouTube.