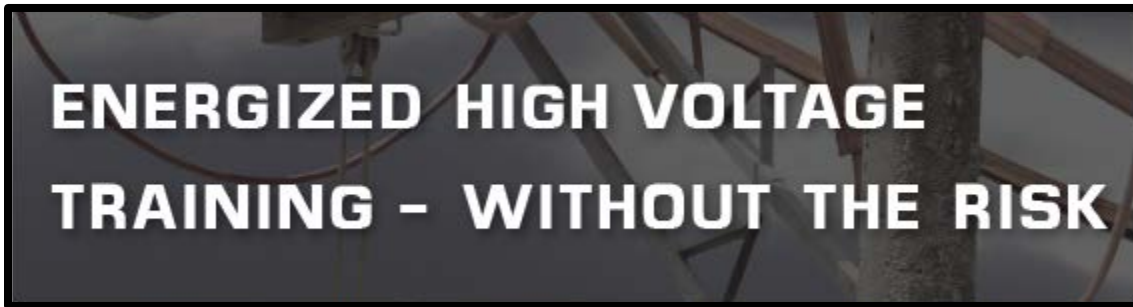


Training Yard Panel

Bulletin 6052: Safety Understanding



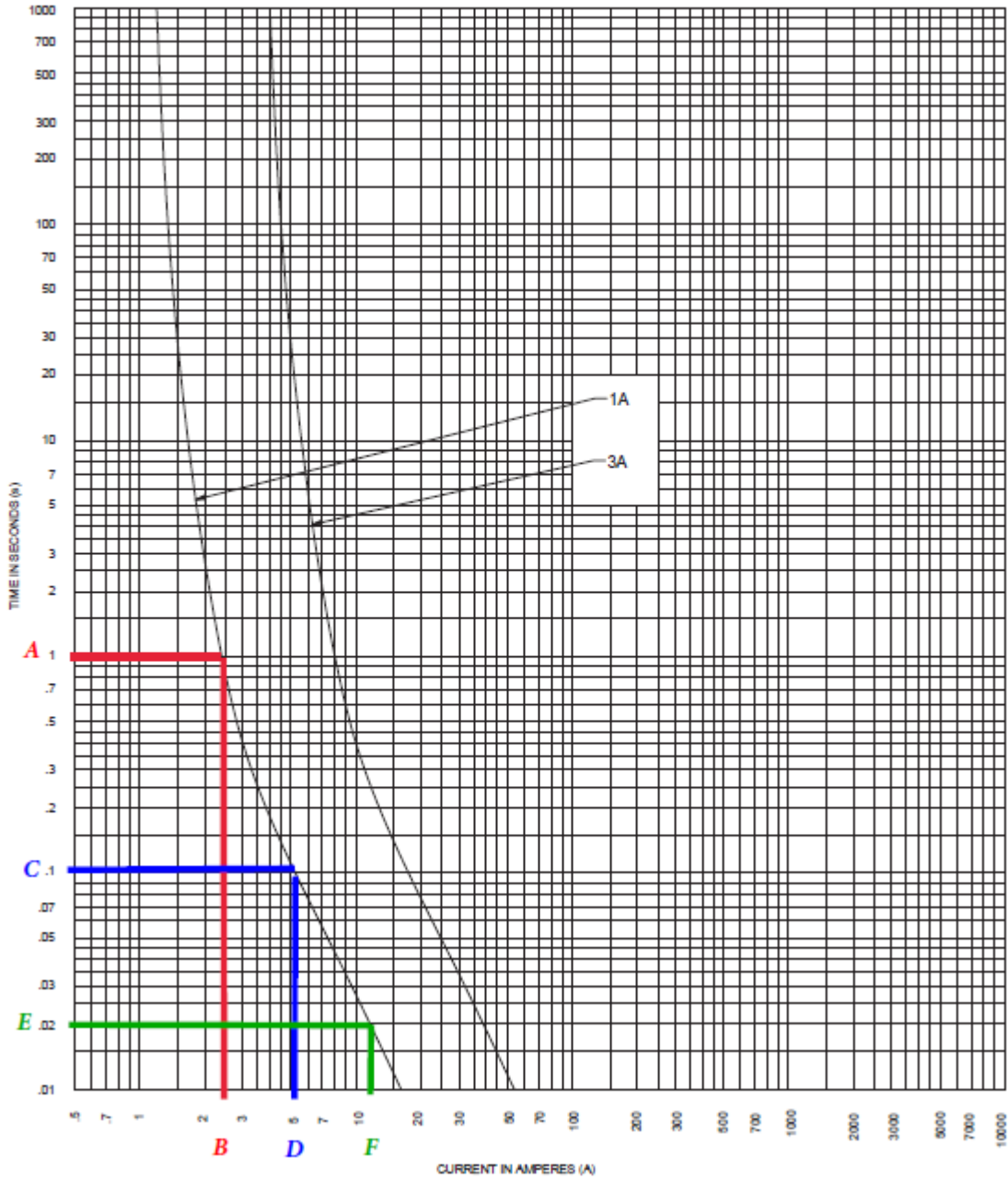
... .. *But How?*

One of the most often asked questions about our Training Yard Panel is *“how is this any different than me back-feeding my training yard with a 1-amp fuse?”*

An honest question, so let’s look into this and some of the other safety features offered by the Timpson Training Unit.

So, what would happen if your yard was “protected” with a 1-amp fuse? For the benefit of the argument, let us assume this fuse is of the Fast-Acting type. For this example, we are using a Mersen A2K1R Fast-Acting/Class RK1 fuse. (All data herein pertaining to this fuse comes from the Mersen website). This is a standard, off the shelf fuse that can be inserted into a disconnect on the 120-volt side of your back-fed transformer. Let us also assume the yard is running 7,200-volt primary so the transformer steps up 120-volt to 7,200-volt, and gives us a ratio of 60:1.

On the following page, we have inserted the melting time curve (opening curve) of this 1-amp fuse. Outlined are three separate instances that we will reference. The first, in Red, shows points A and B. Point AB shows us that if there were 2.5-amperes on the line it would take this fuse 1 second to open. Point CD shows in order for the fuse to open in 1/10th of a second, there would need to be 5-amperes on the line. Lastly, if this unit were to open as fast as the Timpson Training Unit, in 20-milliseconds, there would need to be over 10-amperes of current.



To be fair and transparent, these currents are on the low voltage side and we have to use the 60:1 ratio to realize the high voltage side currents. The 2.5-amp translates to 41-milliamps, 5-amps becomes 83-milliamps, and 10-amps becomes 166-milliamps.

What does that mean for the trainee on the line?

According to an Ohio-State paper referencing a bulletin by the New Jersey State Council of Electrical Contractors Association, Inc., death can occur after 100-milliamps. As a rule of thumb, it can be thought of as one milliamp per pound of body weight thus making it more dangerous for smaller people. This research shows the current levels shown in the 1-amp fuse examples above are approaching and inside the lethal zone. One must remember it is not only the amount of current that matters, but the amount of time exposed plays a role here as well.

The bottom line is: fuses and circuit breakers are designed and made to protect wire and “sometimes” equipment. Not life.

Now let us take a look at a familiar device we all have in our homes that is designed to protect life; a GFCI (Ground Fault Circuit Interrupter) or more simply, GFI. GFIs are design to trip between 4-6 milliamps and in times under 100-milliseconds. If these are the current and time levels that life safety regulators and commissions have deemed acceptable for life safety in your home, the referenced fuse examples above are not only unacceptable, but could be considered ***willful negligence in a training yard.***

So how does the Timpson Training Unit operate with respect to life safety?

The Timpson Training Unit (TTU) is specifically designed to allow linemen to train at full voltage while mitigating the risk to them. Let us review our most common product, a 7,200-volt aerial circuit. Upon depressing the “High Voltage Energize” pushbutton, an audible horn sounds for four seconds alerting the yard that a circuit is about to become energized. Once the yard becomes energized, within the first second, the TTU has measured the excitation current of the wire and any transformers/equipment on the line. Taking this as the base line, the TTU will add a 1.5-milliamp (nominal) trip threshold on top of the excitation baseline. All in all, 1.5-milliamp is the trip setting of the unit. Our processor monitors the current reading on the line 500-1000 times per second. Should the current threshold of 1.5-milliamps be reached/exceeded the TTU will begin the make-safe process to de-energize the circuit. After registering a threshold exception, it typically takes the TTU 20-milliseconds (nominal) to fully de-energize the circuit. The current monitoring system has a resolution of 10-microamps. Therefore, if the TTU is set to open at 1.5-

milliamps the latest it could begin the opening process is at 1.51-milliamps with such a fine resolution.

As a secondary means of protection, Timpson uses custom designed current-limited transformers that have a maximum short-circuit current of 60-milliamps. This means that all other SIL 3 safety systems within our panel aside, the most current an aerial circuit can contain is much less than that of the lethal range.

What standards are used when designing the TTU?

The Timpson Training Unit, with respect to safety, is designed to the following standards:

- Processor and I/O SIL 3 per IEC 61508
- Safety Relays SIL 3 per IEC 62061
 - International Electro-Technical Commission (IEC)
- UL 508A
- NFPA 70
- NFPA 79
- NFPA 70E

Conclusion

In order to survive in the field and/or mitigate risks linemen must be able to think critically & clearly, and solve problems quickly under extreme stress. This can be difficult, so training instructors must develop these skills within the trainee. Situational awareness can now be taught safely with energized training in your yard rather than exposing the trainee to dangerous situations on live systems in the field. Key takeaways are:

- ✓ The Timpson Training Unit was designed to provide safe, energized training within your current yard.
- ✓ The TTU was designed to behave and protect life just like a GFCI receptacle in your home.
- ✓ Are you currently training your people in a safe, efficient manner?