# Electrical Safety Task Group

If you have ever walked upon a construction site during the early stages of construction, you soon realize how many utilities will eventually be hidden when the project is done. Water lines, electric lines, sewer lines, and communication lines are installed underground prior to the construction of the building. Soon after the framing of the structure begins to take shape, these utilities are once again installed in areas of which will not be exposed upon completion such as walls, floors, and ceilings.

Construction drawings can usually be relied upon to indicate where the utilities are located underground but when they enter the structure and are then routed inside of walls or under floors, the process of knowing the path to their location becomes a challenge.

Take for example, the carpenter who was installing a marker board on a cement block wall with ½" plaster. While drilling through the wall with a masonry bit, he penetrated a piece of electrical metallic tubing (EMT) that contained non-metallic cable. The drill bit contacted the cable and created both a ground fault and short circuit.

Or consider the electrician who was trying to make a wall penetration for a conduit. After measuring and marking the location on the outside of the building and drilling a pilot hole, he never checked inside the building to see where the penetration occurred resulting in damaged wires when he began using a hole saw.

Just recently a carpenter cut through a non-metallic cable with a reciprocating saw while cutting out a damaged piece of roof framing. Even though it was evident there were electrical cables in the area and he had felt around for any existing wiring prior to cutting, it was not enough to keep the cable from getting cut and tripping a circuit.

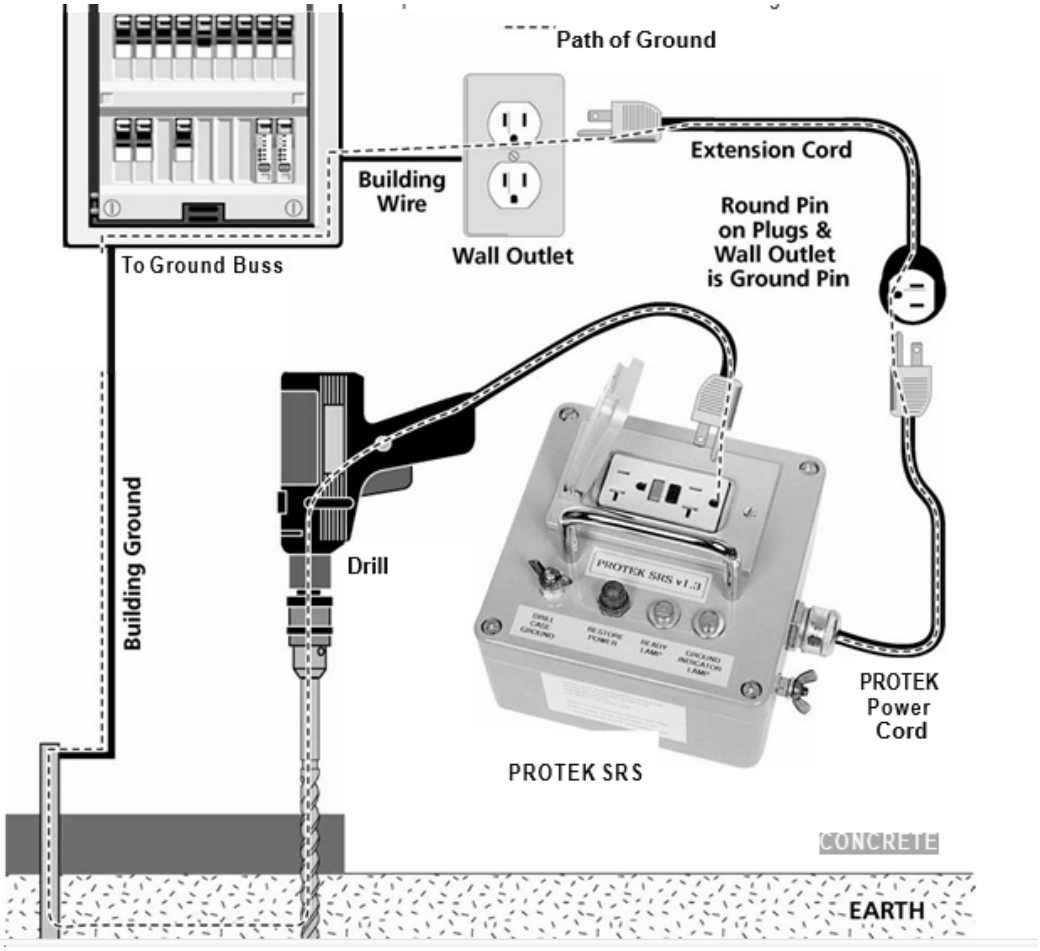
What do all of these events have in common? *There was an opportunity during the course of the work activity to stop and evaluate their next step to prevent an event from occurring.* Let's evaluate each one.

**Drilling through Cement Block or Floors**

A quick look at where you are about to drill may indicate the presence of hidden objects. Drawings that are certified for construction will always show the location of where devices such as receptacles outlets, communication hook ups and lighting outlets should be located but they seldom give any information on the path taken to get there. You can see in the pictures below that after a box is placed, the path to get there is no longer obvious.

The same goes for poured cement floors. While the location of where the equipment is known, the route that raceways take to get there is not always in straight lines or 90 degrees turns.

Using penetration permits is always a good practice when making any kind of penetrations into walls, floors, or ceilings. It can provide more details about the way things may have been constructed but they are not fool-proof. A permit may also instruct the user on providing additional measures such as minimizing the length of the drill bit with drill stops, or using drill interrupters that can detect the presence of grounded metal underground.




Other simpler methods such as recognizing the placement of outlet boxes in walls would indicate that the area above it could possibly contain cables or raceway that house the circuit.

**Drilling through Walls and Ceilings**

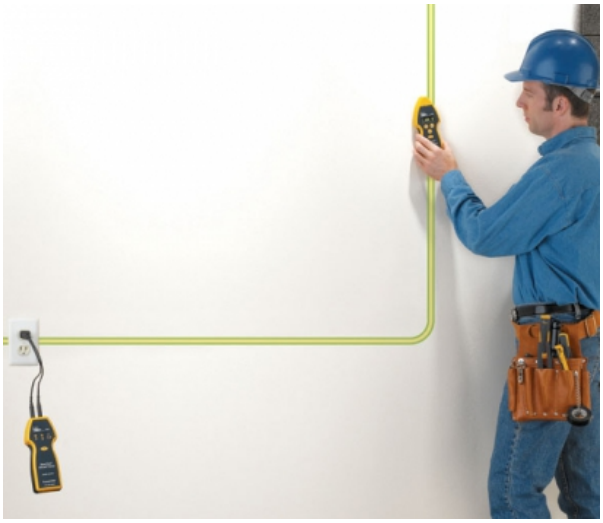
If you were able to see inside the walls or ceilings of your home they would probably look a little like this.

Now imagine all of it covered in drywall and see if you would remember where the wires are located.

While there are requirements in the National Electrical Code on supporting and securing wiring inside the walls of your home, any additional wiring that is installed after the walls have been put up will probably not meet the same restrictions. This means that the requirement for keeping cables at least 1-1/4” away from the edge of a stud will not be adhered to properly and the chances of that nail plate being installed is slim.

There are many techniques for trying to identify electrical wiring inside of walls and above ceilings. The most common method is using a stud finder to indicate where the studs are in the wall. They are capable of detecting wood and metal in the wall where the cable is likely attached or water lines may be located but they cannot detect wiring that is running horizontally through the studs as seen in the previous photo. One of the oldest methods is using an AM radio to detect electrical interference through the antennae. When the radio is held close to the wall, you will notice a more prevalent static interference when you are close to an energized circuit. While it can be effective, there are other methods that can be more precise.

Circuit tracers are another option for identifying circuits but they will only identify the circuit that is connected. It will not identify multiple circuits that may be running together through a wall.



A little more invasive way is to poke a small hole through the drywall with a wire then spin the wire in the void of the wall to see if you hit any interferences.

If you can afford to put a slightly larger hole in the wall, the market these days is filled with camera scopes that can give you a real time look inside of walls.

All of these methods can be used for ceilings as well or if you have access above the ceiling into attic space, you may be able to physically see the location of the wiring.

**Cutting into Walls or Surrounding Structures**

Up until now, we have been discussing using the process of drilling into material whether it is with drill bits or hole saws. These methods are concentrated to a smaller specific area that we can control by drilling smaller holes at first to see if we may encounter any interferences. In the last example given at the beginning of this briefing, electrical wires were damaged by a reciprocating saw when a section of damaged wood was being cut out.

It is suspected that this circuit was installed after the walls and ceilings were in place because the wiring was not secured to the framing members. Had it been, it is likely that the cable would have been placed farther back on the stud and would not have been cut into.

In situations where the job task involves cutting out components that could be in the vicinity of electrical wiring, it is always best to look the area over closely for signs that wiring or conduits may be in the area.

Electrical heat trace circuits are notorious for being cut by utility knives when removing insulation. Always look for evidence such as power boxes or labels on pipe lines before cutting insulation away from piping.

**Tips to Avoid Hidden Hazards**

Take extra time to look at work area from different angles, some views will be difficult to achieve and may require getting in awkward positions or using mirrors.

Look above drop ceilings or in attics to see if there are cables or conduits running down the inside of walls

If need be, feel around the work area, but make use you have adequate PPE (gloves, long sleeves) to prevent personal injury from sharp edges in unseen hazard areas.

Use the shortest blade reasonable when using a reciprocating saw.

Use a permit process when penetrations exceed a specified distance. This will force discussion and research before any work is performed.

Look at the layout of the area you are about to work on. Are there outlet boxes in the wall? What about water valves or any other form of piping?

Implement the use of drill stops or place depth gauge markings on the drill bit to ensure you don't penetrate deeper than needed.

Drill interrupters can be useful when conduits are hidden in concrete.

Scope cameras are very useful and can be fairly inexpensive.

Utilize circuit tracers, toners, or stud finders to search for hidden utilities. Stud finders will also detect metal pipes within walls in most cases.

When drilling through walls, double check your measurements to ensure you will not hit objects on the other side. Pay attention to elevation changes from one side to the other and start with small pilot holes to see where you come out on the other side.

Pay attention to the pressure you are putting on the drill bit. Even though copper is a soft metal, you should be able to feel a difference in the amount of pressure you use when drilling through wood or drywall compared to when you hit a metal pipe.

If you suspect that you may encounter wiring or piping, consider shutting off the power or water lines in case you do cut into something.

# BE AWARE OF THE HIDDEN HAZARDS AROUND YOU

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