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FORENSIC ENGINEERING NEWSLETTER

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This Edition's Joke

The pessimist says the glass is half empty; The optimist says it is half full; the engineer says the glass is designed twice as big as it should be.

Going Where The Evidence Takes Us

The world of forensic engineering is not always as glamorous as portrayed by television shows. In order to conduct a thorough investigation, we find ourselves in some pretty precarious situations. Sifting through charred remains or wading through flooded structures is an everyday part of the job. What about being suspended in a crane 100 feet in the air, above a city, in the middle of January, or squeezing into a collapsed structure with barely enough space for a camera. "I don't remember going to school for this," is a common saying in this industry, but well-qualified forensic engineers know gathering data at the scene is perhaps the most important and crucial part of their work. Without this data, there would be no way to accurately determine what caused the loss.

Fire Damage taken by one of our engineers from a crane boom.

When Is The Last Time You Looked At Your Extension Cords?

When's the last time you looked at your extension cords? This probably sounds like a silly question, but it's one that could save many lives. It is estimated that each year there are 3300 residential fires originating at extension cords. Many of these incidents could be avoided by following a few simple steps.

- Examine your extension cords
- Discard any cords with damaged insulation
- Never overload them
- Always unplug them when not in use
- Never use them as permanent wiring
- Never place under rugs, carpets or furniture

The life you save may be your own!

In This Edition

Why is My Check Engine Light On?

In our daily commutes between driving to work, home, the market, and taking the kids to soccer and dance, we often forget how much stress and wear our vehicles endure. Under the hood of our car, inside the engine, thousands of well timed explosions are taking place every minute due to the combustion process. While this process has been refined with various sensors, computers and other electrical components, this also increases the possibility of a component malfunction or defect. The various sensors that control the engine management system, operate within specific parameters. When one of these parameters are exceeded, the check engine light will illuminate.

Today's motor vehicles utilize computer diagnostics and software that is proprietary to the vehicle manufacturer. The days of the backyard mechanic have since past.

The best way to avoid many of these issues is to follow the vehicle maintenance procedures recommended by the manufacturer, promptly address malfunction indicator lamps to avoid subsequent engine damage, and let a certified professional handle any advanced issues that arise. If you take care of your vehicle, your vehicle will take care of you.

That Pretty Snow Isn't So Innocent!

The weight of snow is the greatest expected load most roofs will ever support. All the effort by designers in selecting appropriate roof sheathing, trusses, rafters, beams and columns is expended for those rare, but inevitable precipitation events that result in snow accumulations measured in feet instead of inches. But it is not the average height of the measured snow fall alone that causes the greatest threat to structural stability. The stress imposed on a roof due to snow is dependent on several criteria.

The most commonly reported criterion is the average depth of accumulation. This alone can be misleading. There is an old rule of thumb that equates 10 inches of snow to one inch of water. If this rule was true, snow would weigh approximately 6.2 pounds per cubic foot (pcf); which is the density of water, 62.4 pcf, divided by 10. However, building codes establish a much higher snow density for design purposes. In the Philadelphia area, the design snow density averages approximately 17 pcf.

The effects of wind can result in drifts which multiply the amount of snow on a roof; in some configurations drifting can double the snow load. Snow can be driven by wind from other areas of the same building, such as from the windward sides to the leeward sides of gabled roofs. Parapet walls form vertical barriers which cause the accumulation of wind driven snow. Wind can also drive snow from adjacent, higher buildings or ground surfaces. (The photograph below shows the corner of a building roof which failed because of snow drifting from the hill where the engineer was standing.)

Based on the old 10:1 rule of thumb, a theoretical 24-inch snowfall would impose a roof load of 12.4 psf (2 ft x 6.2 pcf). However, based on the criteria of depth, density and drifting, a theoretical 24-inch reported snowfall could result in:

- Average accumulations imposing loads of 34 psf (2 ft x 17 pcf)
- Localized loads due to drifts of 68 psf (34 psf, doubled)

These design loads far exceed the 12.4 psf load calculated with the old "rule of thumb".

Mold, It Grows On You

Not that long ago, awareness of the potential for structural damage caused by mold to homes and buildings was not widespread. Mold was considered a cleaning problem fixed by bleach and water. Today news programs and magazine articles provide ample mis-information regarding mold. So, what is the real story behind mold? Where does it come from? Where does it live? What potential structural damage can it cause? How can it be identified and remediated if it is present?

Mold can grow on almost any organic substance, including common items in your home such as paper, wood, drywall, insulation, carpet, leather and food. All that is required is oxygen and a source of moisture. Molds utilize the surface where they grow as a source of nutrition. They slowly digest and destroy that surface and possibly the underlying structure.

Mold spores are everywhere and can grow when excessive moisture is present. Typical sources of excess moisture in homes include water leaks from pipes or roofs. Excess humidity, which results in condensation on interior surfaces, is another common moisture source. Some sources of excess humidity in homes include improperly vented appliances, such as clothes dryers and gas-fired water heaters, and HVAC systems that are improperly designed and/or installed or are not functioning correctly.

Many types of mold exist. Identification of the amount and variety of mold species can be obtained by sampling and laboratory sample analysis. Samples should be collected by a Certified Industrial Hygienist (CIH).

Control of moisture is the key to preventing or halting mold growth in a home. Removing mold without removing the moisture source will only result in more mold growth. Repair and maintenance of roofing, gutters, siding and windows can prevent moisture from infiltrating from the outside. Repair of leaky plumbing and prompt cleaning and drying of wet or damp locations can eliminate interior moisture. Proper operation and servicing of HVAC systems and home appliances can reduce or eliminate excess humidity in the home.

Assessment and control of the moisture sources and determination of the extent of contamination are the first steps in the clean-up of a mold problem. A remediation plan can be developed by a CIH based on the lab test results, and the actual remediation work overseen by an experienced mold remediation manager. A structural analysis may also be required if the structure has been damaged.

When the proper steps are taken to control moisture, to identify the type and extent of contamination, and to design a remediation plan, a mold remediation job can be successfully completed and the cost of property damage caused by mold can be controlled.