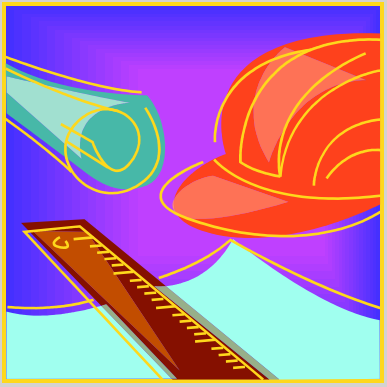

CONSTRUCTIVELY SPEAKING

US Army Corps of Engineers—Afghanistan Engineer District—North

Issue No. 1

Fire Investigation Report by Yvan Nobile and John Blandamer

Inside this issue:

This newsletter was designed to be an informative source for our field offices. The district is committed to provide several resources for assistance to the field for administering construction contracts. If you have any suggestions on how we can improve those resources or you would like to share leesons learned, please contact Sandy Higgins or Beth Nash in the Quality Assurance Branch.

On 6 December 2009 a fire occurred in a newly installed duct heater located at a Gymnasium. There were no injuries. The heater was completely destroyed and there was smoke damage to adjacent walls but no structural damage. Prior to completion of a formal fire investigation the contractor removed the damaged heater, replaced it with a new one, and repaired/repainted the walls. He indicated that the cause of the fire was "incorrect wiring" but did not communicate the exact nature of the error. On 20 December 2009, Mr. Yvan Nobile (QAB Electrical Lead) and Mr. John Blandamer (District Safety Chief) visited the project location and inspected several buildings including all circuit panels and wiring from the transformer to the heater at multiple locations.

The wiring from the main panel to subpanels did not comply with code requirements. The main feeder lines and the feeder lines to other panels were not connected via a subpanel. The neutral wire in the circuit breaker panels was not correctly connected. The bus bar for the neutral bus is under-sized for the incoming neutral wire. In order to connect the neutral line to the bus the contractor had cut over 50% of the stands to create a smaller wire to connect to the bus. This was causing overheating and feedback of the wiring due to inadequate wire size.

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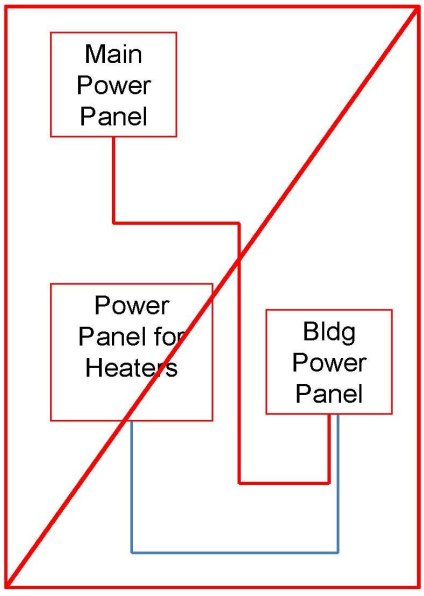
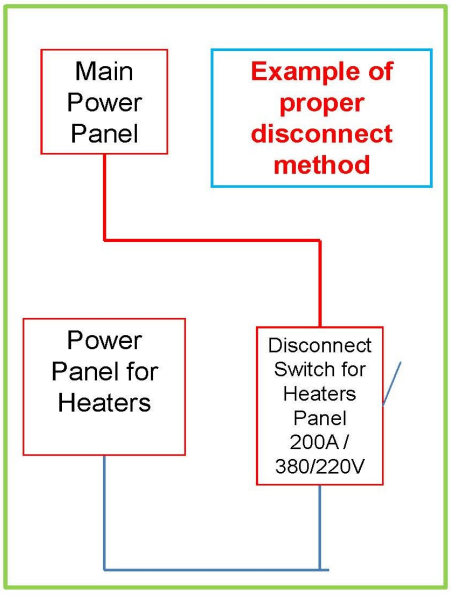
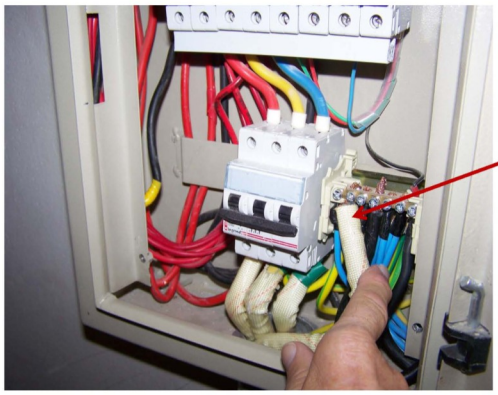




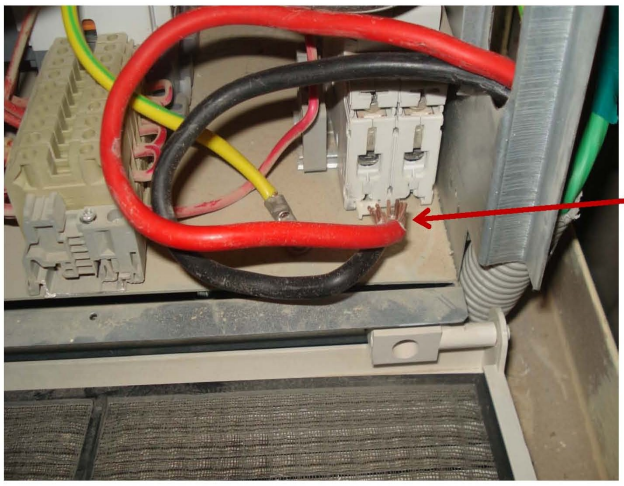
Fire Investigation (continued)

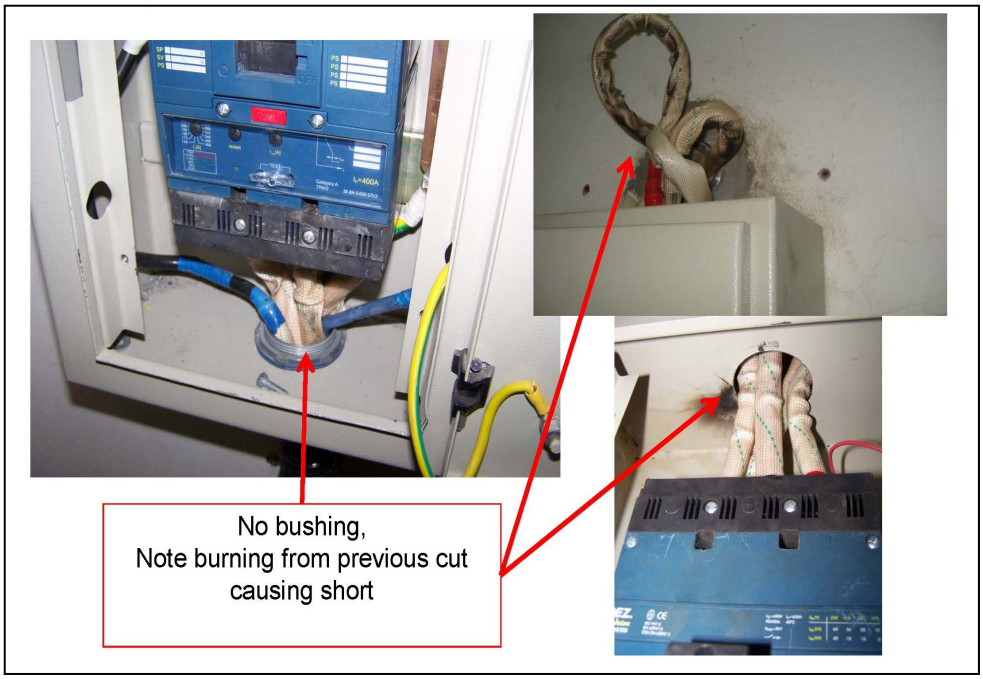


The neutral bus must be isolated from the panel box in order to prevent feedback in the system. The current neutral bus is not isolated resulting in the ground and neutral being connected and causing feedback. This is further complicated by failure to maintain color coding and therefore polarity throughout the system.

Incorrect wiring size is seen throughout the systems. Power is provided via two undersized wires rather than one properly sized wire. This is seen on all heater phase and neutral lines.

All stranded wire connections are incorrectly capped & crimped. This creates an inadequate bond and arcing and loss of connectivity between the line and the bus bar connection.

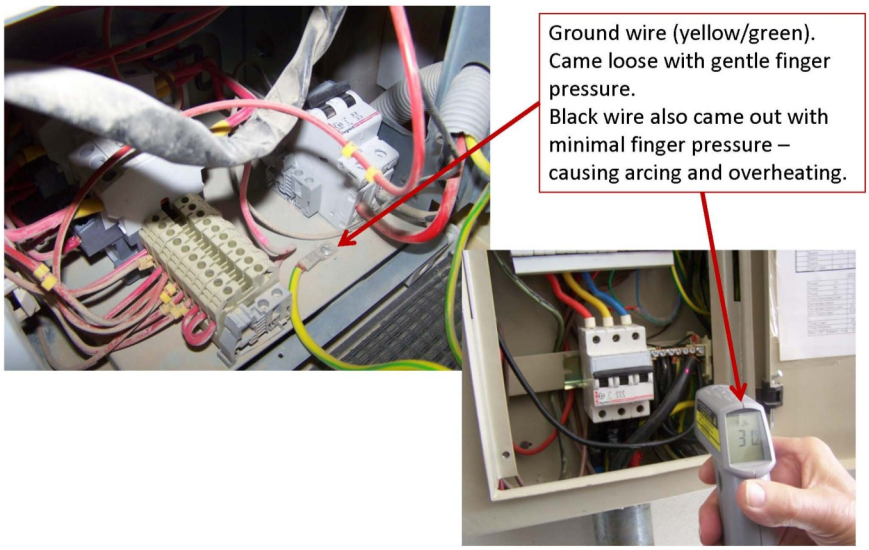




At all points where wiring passes through openings it should be protected from chafing by a bushing. This should occur where the conduit enters any panel. No bushings were observed at multiple locations including some where the feeder lines passed through site-built sheet metal enclosures. This creates a high potential for the sharp sheet metal edge to cut into the wire insulation causing shorts and the potential for fires or electrocution.

At multiple locations large diameter wires are twisted or bent, which creates additional resistance in the line and therefore heating. This heating can result in insulation failure and again the potential for shorts leading to fires or electrocution.

Fire Investigation (continued)



Multiple examples of loose connections with associated overheating of the wiring were observed. In some cases it was simply failure to properly tighten the connection. In other cases it was failure to properly cap and crimp stranded wire. In still further cases it was an attempt to double feed wire into a connection.
Several locations were noted where sheet metal screws were used in lieu of tapping screws.
The contractor failed to provide proper quality control of electrical materials and workmanship. There was no properly qualified electrician overseeing the work either during actual construction or upon completion of the work.
The APP is grossly deficient. It does not identify competent persons (e.g. no electrician) nor does it contain an Activity Hazard Analysis (AHA) for electrical work.
The findings noted above show systematic lapses in materials and workmanship that should have been observed by the contractor's quality control personnel including the supervisory electrician. The combination of findings noted above creates both individually and collectively a high fire and electrocution hazard.

GENERAL CORRECTIONS:

1. The contractor must obtain the services of a qualified electrician to provide quality control of both materials and workmanship on the project.
2. A qualified electrician from QAB should be stationed at Area/Resident office during the initial correction to one set of panel and heaters. This "type" building should then serve as the standard by which all subsequent buildings are judged. If the QAB electrician or AO/RO personnel discover additional issues then the lead QAB electrical engineer / master electrician should be contacted.
3. The APP should be updated to reflect who the competent electrical person is and also to add an AHA for all electrical work.

SITE SPECIFIC CORRECTIONS:

1. All main / subpanels must be re-wired per Figure 1 on page 1.
2. The neutral bus in all circuit panels must be replaced with properly sized ones that allow connection of the neutral line without compromising wire gauge.
3. All stranded wire connections must be properly capped and crimped using the right tool (no crimping with pliers).
4. The neutral bus must be isolated from the panel box by a rubber, plastic or other non-conductive isolation material.
5. Wiring gauge. All double-wired circuits must be removed and replaced with properly sized wire gauge based on the heater or other loads. For example, assuming the heater is 8 kW then the wire should be 16mm.
6. At all points where wiring passes through openings it should be protected from chafing by a bushing. This includes where wiring enters via a conduit into a panel but also other locations such as where wiring enters and leaves site-built sheet metal enclosures.
7. Wiring should be properly laid so as to create minimal bend or kinks in lines. This is especially true in larger gauge wires such as those from the main disconnect outside into the interior panels.
8. All loose connections must be installed or corrected properly including main breaker torque, proper capping and crimping of stranded wire, and use of proper bus bars for the gauge of wiring being secured to the bar.
9. All sheet metal screws must be replaced with tapping screws on all panels.
10. All panels must be properly labeled to indicate which circuit / heater they control. All heaters must be labeled to match the circuit panel numbering.

The Importance of Project Calendars

By Scott Tate

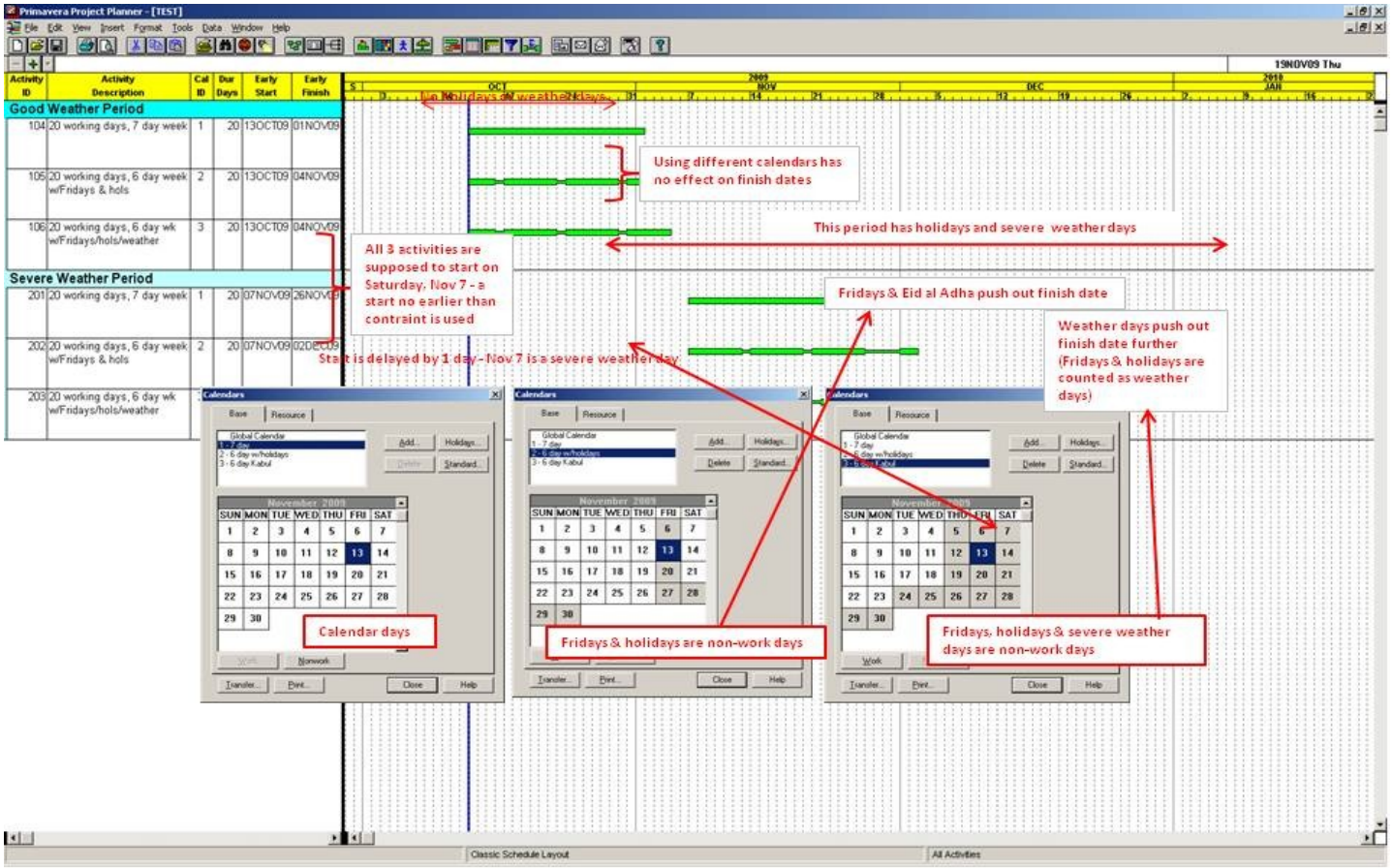
With winter weather upon us, inclement weather plays a bigger role in determining when exterior construction activities can occur. Most contracts include days for inclement weather (anticipated weather) as specified under the "Special Clauses" section.

In order for the contractor's project schedule to forecast accurate completion dates within their required period of performance, their schedule should include multiple project calendars with the applicable one being assigned to each activity dependent upon the type of activity. For example, a 7 day calendar is applicable for a design preparation or design review activity; while a 6 day calendar that includes observed Afghanistan holidays and contractual unfavorable weather days is conducive to exterior construction activities.

Project calendars are used to designate planned work days versus non-work days. If no calendar is specified when utilizing scheduling software, then the default is a 7 day work week. Observed holidays, days of religious observance, and days of inclement weather as specified in the contract need to be accounted for as non-work days and applied as such in the project calendar so that the schedule will forecast more accurate completion dates. Otherwise, if these non-work days are not accounted for within the project calendar, then the forecasted dates of individual tasks as well as that of the overall completion date will continue to vary greatly and slip to later dates as the project progresses.

In order for a project schedule to be accurate, project calendars must be included or the schedule's effectiveness as an accurate planning tool is greatly diminished.

To learn more about this topic, please go to the AED SharePoint page/ Construction/Baker A-E Services/ Effect of Scheduling Calendars to download and read the full article or contact the Baker Group via email: TAN Baker Group (aed.baker.group@usace.army.mil) for information or assistance with your scheduling needs.



NOTE: The calendars must be changed to reflect the actual days of the Muslim holidays and severe weather. The corrections for weather will be retroactive.

Cold Weather Concreting

By Reed Freeman

Remember the following key points when placing concrete during the winter, in climates that include freezing air temperatures.

Our contracts require conformance to ACI 318, which references ACI 306, "Cold Weather Concreting." Read this committee report to understand requirements for producing satisfactory concrete during cold weather.

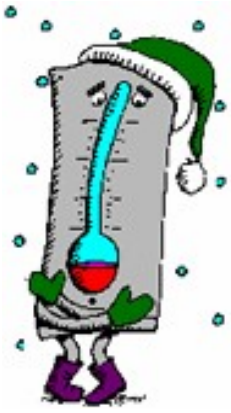
As part of your 3-phase construction control process, you will have a preparatory meeting with the contractor to discuss concrete production, placement, and curing. Cold weather concreting must be discussed at the preparatory meeting, if applicable. The initial and follow-up inspections must verify that the cold weather concreting plans are implemented.

Prior to placing concrete, ensure the ground is not frozen; all surfaces to be in contact with newly placed concrete must be at a temperature above freezing.

Temperature of concrete at the time of placement must be between 10◦ C (50◦ F) and 24◦ C (75◦ F).

Do not allow finishing operations while bleed water is still visible on the surface of the concrete.

Concrete must NOT be allowed to freeze until it attains a strength of at least 3.5 MPa (500 psi). If green concrete freezes, the concrete will never attain its original design strength.



For curing, the best practice for cold weather is to simply prevent loss of moisture from the concrete using a curing compound or an impervious membrane. Water curing is not recommended.

Field-cured concrete cylinders are very useful in cold weather. They can be used to verify strength before cold weather protection is stopped. Also, they can verify that the in-place concrete did not freeze and will eventually attain a strength commensurate with the mixture design. The field-cured cylinders should be exposed to the same temperature and curing conditions as the structural or pavement concrete.

Admixtures labeled as "antifreeze" do not actually lower the freezing temperature for concrete. They simply accelerate the rate of hardening and strength gain. Do not allow contractors to become complacent due to the use of "antifreeze admixtures."

Quality Assurance Branch

Reed Freeman, *Chief*
Geotechnical/Materials
Tom Urbaniak, *Team Lead Technical*
Civil/Materials
Sandy Higgins, *Team Lead Training*
CQM/RMS/Contract Admin
Yvan Nobile, *Team Lead Electrical*
Steve Baughman
Mechanical/Plumbing
Hahns Copeland
Civil/Structural
Bal Multani
Mechanical/Plumbing
Beth Nash
Lab certification/QA testing
Mike Vonbuhr
Civil/Structural
Nikki Yerkes
BCOE/customs/training coordination
If you travel through Kabul, come visit us in the old Engineering Branch building, Loma Linda Building #203.

The purpose of the Quality Assurance Branch is to support field offices. We will travel to your office and construction sites to offer training and/or quality verification assistance in the following technical areas: construction/contract administration, RMS/QCS software, construction materials, and civil/structural/mechanical/electrical engineering. In order to provide the services listed above, we work closely with both the Contract Administration Branch and the Engineering Branch.

The Quality Assurance, Contract Administration, and Engineering Branches also work together to distribute written guidance intended to be helpful to field personnel. This guidance can be found on the AED Sharepoint intranet site by selecting "Departments" and then "Engineering and Construction." The Sharepoint has a new, friendlier appearance and we are working diligently to keep posted documents as current and all-inclusive as possible.

MUTUAL UNDERSTANDING CONFERENCE

By Sandy Higgins

I've been traveling around to the different offices for almost a year now and one of the things I've noticed is that there is a little confusion about the purpose of the Mutual Understanding Conference. First of all, the Mutual Understanding Conference (MUC) has an entirely different purpose than the Pre-Construction Conference. Although the PreCon is an extremely important meeting and your first opportunity to partner with the contractor, the MUC is equally important in that it defines the Quality Control Program, Safety Program and the submittal process , all of which are keys to success for both you and the contractor in building a quality product safely. Many times the QC Manager doesn't have a clue what's in his QC Plan and possibly you don't either. As a construction representative, you are probably aware that we spend a lot of our time acting in the role of the QC Manager primarily because a lot of contractors have difficulty assuming this role. The MUC will help to establish those roles and expectations of the QC Manager. Another great thing about the MUC is that it's never too late to have this meeting and it can be held more than once throughout the duration of the contract. If you start to see your QC Program failing, it's time to have another MUC. If you have a change in staff either from the contractor's side or ours, then it's time to have another MUC. If you have any questions regarding how to conduct this meeting, please feel free to contact me anytime. There are example MUC Meeting Notes located on the district Sharepoint or we can send the information to you upon request.