CONSTRUCTIVELY SPEAKING

US Army Corps of Engineers—Afghanistan Engineer District—North

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Inside this issue:

Documenting E&C Lessons Learned	1
Combining Key Elements for Success	3
No Clay for You	5
Electrical Site Assessment	7
Subcontractor Payments	8
Safety-Electrical	10

MESSAGE FROM CHIEF ENGINEERING & CONSTRUCTION

Hello, I am Mark Jones, P.E., the new Engineering and Construction Chief for the district. I hail from the Pittsburgh District, home of the three rivers, where I am the Engineering and Construction Chief there as well. There are many opportunities, as well as challenges, facing the Engineering and Construction Division this year and I am excited and keen to get started as a member of the E&C team. I am looking forward to traveling out to as many of the Construction sites as I can in the coming months to see the projects, but more importantly to meet the staff and our contractor partners.
ESSAYONS

DOCUMENTING ENGINEERING AND CONSTRUCTION LESSONS LEARNED

BY: Rosa Affleck, Research Civil Engineer, USACE, ERDC-CRREL

The Engineer Research and Development Center-Cold Regions Research and Engineering Laboratory (ERDC-CRREL) is funded by the Army Study Program to address the challenges in engineering design and construction used in Afghanistan. This requires modifying the existing standard practices currently used in country. This study also includes capacity development at the regional level. The three objectives for this project are as follows:

1. To compile lessons learned related to construction projects in Afghanistan,
2. To gather material parameters of in-situ conditions for Nangahar Province and,
3. Provide the information to supplement training and associated training materials for Nangahar University Engineering Department.

The first objective is to produce a database of lessons learned related to construction projects in Afghanistan. The lessons learned database will capture the experiences and knowledge encountered at various levels ranging from programming and contracting awards, planning and site assessments, design and construction, material selection, quality control and quality assurance, training and education, maintenance and operation of infrastructure. Input is to be gathered from various key players including: USACE AEN and AES engineering and construction personnel; US military engineers; US and international contractors; and local engineers and contractors in order to have holistic perspective.

Cont'd

DOCUMENTING ENGINEERING AND CONSTRUCTION LESSONS LEARNED

Both AEN and AES have been very supportive of this effort since the very beginning. COL McCormick and COL Wilson are major proponents and their respective previous and current Chiefs of Engineering and Construction Division have been providing me with significant information for data collection, including several Branches.

Sandy Higgins, Rosa Affleck

I was fortunate to visit Afghanistan Engineer District from June 19th to July 8th to conduct interviews, research, and gain familiarity of construction activities in the country in order to gather relevant data. In addition to having meetings and conducting interviews of staff at both AEN and AES, I was able to visit a couple of field offices including FOB Fente in Jalalabad, and FOB Lindsey at KAF. The input and responses I received from the staff are overwhelming, yet positive.

Prior to my TDY, I had collected several responses from redeployed and a few from currently deployed staff by sending out a questionnaire or conducting an interview. The preliminary analysis from the responses echoed similar problems from various responders. Based on this preliminary assessment, an example list of problems encountered from the responses include:

- Multiple contracts for Afghan firms have not been appropriate
- Limited access to work sites due to security & logistics has a negative impact on site assessment, ground truthing and quality control
- Westernized requirements and specifications are not applicable in some cases
- Different types of material are available, there is no consistency, and quality varies dramatically
- Local culture—significant difference in work ethics and no concept or meaning to time leads to difficult planning
- In-country lack of engineering and modern construction skills

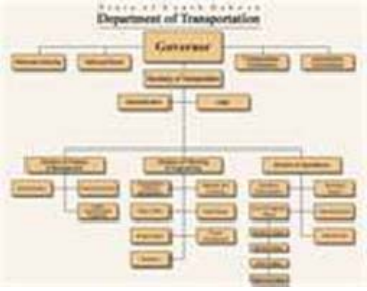
The list goes on and on but these lessons learned, if documented, can provide insight and guidance on perspectives for planning and execution of construction projects as the Corps continues to serve our customers for the reconstruction effort in Afghanistan. Also, the lessons learned can be used for future reference at home and abroad.

As I am compiling the data, this trip has provided me with the understanding on how the Districts execute, manage and handle projects and contracts for various programs, including ANA, ANP, CERP and MILCON. Thank you for your support on this project and I hope the outcome of the study is beneficial to the Districts' mission.

COMBINING KEY ELEMENTS FOR SUCCESS

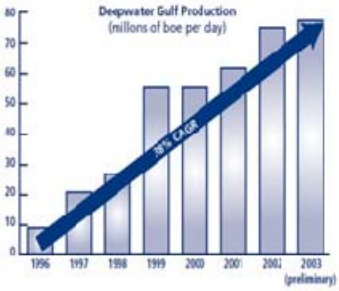
Production Rates vs. Activity Durations vs. Unit Costs

By: Scott Tate, Project Team Leader, Baker Group



Production rates, activity durations and unit costs; each an in depth topic worthy of exclusive discussion but combined they share a common thread that is a direct link to project success.

Development of a project schedule begins with the organizational breakdown of the main categories of design, procurement and construction. While durations of tasks for design and procurement are relatively straightforward based on stipulated design stage milestones or vendor furnished equipment lead times, durations for construction activities require additional input from various other source such as known production rates. Understanding production rates is critical in developing accurate and meaningful construction activity durations.



A production rate is the rate at which a quantity of material can be installed during a specified timeframe. The use of production rates in determining activity durations is standard practice in construction related to the oil and gas industry. Moreover, transportation projects such as roads and utilities are more prone to utilize production rates because of the linear progression of these types of construction.

However, application of production rates in other types of construction such as commercial and military aren't as widely used since complexity of building size and type can vary greatly between projects; and a historical production rate on one type of building may vary greatly if applied to a new project due to major differences in size and scope or the complexity of design. Nevertheless, known production rates, applied in concert with other factors, can be a basis for establishing activity durations on similar tasks. The practice of using all known factors to deduce accurate activity durations can transform a schedule from colored bars on paper to a vital tool with which to properly monitor the project.

Production rates may be obtained from reference manuals, experience from previously completed jobs with adequately documented history, or derived from current project data. Least reliable of these sources is reference manuals since conditions and requirements from one project to the next can be so vastly different that the as-built production rate has no relevance. Without the contribution of other factors, activity durations gleaned only from reference manuals is a poor choice. Similar concerns may also be applied to the use of experiential data as a sole source for determining activity durations. To only choose experience as a source for applying production rates is not an altogether wise one either.

Each project and thus each associated work task must be evaluated on its own merit using project-specific requirements such as weather during time of installation, skill level of installers, complexity of construction, and unknown conditions including a site where underground obstacles will be discovered, among a host of other factors. A blended mixture of historical data, experience, and a current assessment of the new project's ingredients are necessary to determine accurate production rates.

COMBINING KEY ELEMENTS FOR SUCCESS

Production Rates vs. Activity Durations vs. Unit Costs

The process of applying a production rates to determine activity durations may be explained by the following example. An activity consists of installation of 1000 lineal meters of water line. Assuming one crew of 7 workers can install 100 lineal meters per day; then 1000m/100m (per day) would equate to an activity duration of 10 days.

This application also lends itself to determining if one crew or multiple crews might be needed to complete a specified task within a desired time frame. Therefore, if due to time constraints it is determined that only 5 days can be allowed for this work, then based on our assumed production rate it would take two crews to meet this timeline. Key to determining the number of required crews is having knowledge of the quantity of work to be installed.

While accurate quantity take-offs are the key to developing legitimate production rates, another fundamental factor is developing a cost breakdown structure that is compatible with the work breakdown structure used to organize the schedule. Understanding the constructability of a project or how a building or road must be constructed is fundamental to creating a work breakdown structure, followed by an associated cost breakdown (estimating) structure. Without this correlation between the work and cost breakdown structures, the value of the estimate in applying costs in the development of schedule activity durations is minimized.

Like production rates, unit costs are more accurate when using actual costs from recent projects combined with project specific and regional data such as updated subcontractor proposals, material and wage rates adjusted for cost of living in the geographic area of the project, and a multitude of other factors that might impact cost. When properly used, cost loading a construction schedule with accurate unit costs will provide the contractor with a cash flow plan that will support effectively overall project management.

Using production rates in conjunction with activity durations allows for more effective monitoring of an activity's daily progress and makes it easier to verify if the project is falling behind schedule.

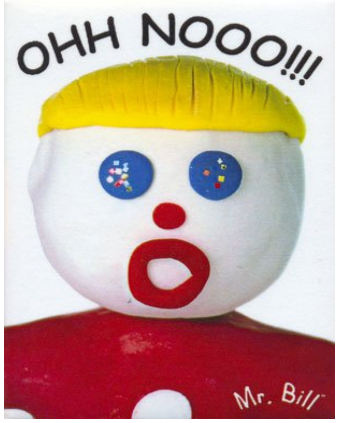
For example; reference a two day activity representing 200m of underground water line. On the first day only 75m of the pipe was actually installed. The lack of production would alarm the contractor that he must recover this loss of production over the remaining duration of this activity or the overall project schedule might be impacted. Having this type of safety gauge within the schedule allows for daily correction when issues arise. Daily monitoring and corrections to critical and near critical activities is more effective than trying to make corrections for cumulative issue that might occur over the course of a monthly update period. Likewise, accurate application of cost to a schedule activity provides more precise information when evaluating work in place for monthly payment requests. In turn, the forecasted cash flow for work remaining also is more valid.

Production rates, activity durations, and unit costs are each important in their own right. When correctly implemented together they combine to form the framework for a cost loaded schedule that provides the proper guidance for project success.

If you have any questions regarding this topic, please contact the Baker Group via email TAN.BAKER.GROUP@USACE.ARMY.MIL, or stop by the Azadi Office. Baker provides construction management support services to the Corps of Engineers, including analysis of contractor schedules (baseline and update), BCOE recommendations and claims evaluations. The Baker group also provides scheduling assistance to contractors, in addition to offering formal schedule training classes.

"NO CLAY FOR YOU"

By: Keith Rudie, Civil Engineer, Quality Assurance Branch (A.K.A. "The Soil Nazi")



"That's right, Mr. Bill, you are not welcome here, not on our construction sites." Sure, clay was fun when we made lopsided baskets and pots as children for Mother's Day, but clay under a structure can be both destructive and expensive. The expansive and slow draining nature of clay can often have unexpected and undesirable impacts on structures and roads including:

- Differential settlement
- Ponding of water and subsequent flooding of basements
- Displacement of building and road structures due to subsidence of underlying soils (as a result of expansion and contraction)
- Frost heave in colder climates

The trick to determining the presence of this "culprit" is usually an adequate site soils investigation by a geotechnical engineer. However, project managers, con reps, and others working at a construction site can perform a few simple field tests to gain insight into the soils beneath their projects. A detailed description of these Tests can be found in *ASTM D 2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).*

While it is true that much of the soil found in Afghanistan is silty in nature, I have encountered golf-ball sized clumps of clay in Bamyan, and clay layers several meters thick in Kabul. If you notice a large percentage of fine materials in your project during excavation, grab a few handfuls and get a little dirty.

Dry Strength

Mold a 1 inch diameter ball using the fine material and water, if necessary, until a putty-like consistency is achieved. Make three ½ inch diameter balls and set them aside to air dry (the other two tests can be completed while the soil balls dry). Ensure that the balls are completely dry before crushing. Determine the strength of the balls by crushing them between the fingers. Note the strength according to the following criteria:

None - The dry specimen crumbles into powder with mere pressure of handling.
Low - The dry specimen crumbles into powder with some finger pressure.
Medium - The dry specimen breaks into pieces or crumbles with considerable finger pressure.
High - The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface.
Very high - The dry specimen cannot be broken between the thumb and a hard surface.

Dilatency

Mold another ½ inch ball, but add a bit more water until the sample is soft, but not sticky. Flatten and smooth the ball into the palm of one hand. Shake and strike the hand with the sample against the other hand, similar to the age-old technique used to extract catsup (*ketchup* for all you whipper snappers) from the bottle. Note any water that appears on the surface of the soil. Squeeze the sample and note if the water disappears. The reaction is the speed at which the water appears and disappears during the shaking and squeezing, respectively. Use the following criteria for describing dilatency.

None - No visible change in the specimen
Slow - Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing
Rapid - Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing

"NO CLAY FOR YOU"

Plasticity

Based upon the results of the toughness test, describe the plasticity of the soil using the next three criteria.

Nonplastic - A 1/8-in. (3-mm) thread cannot be rolled at any water content.
Low - The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium - The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled and he lump crumbles when drier than the plastic limit.
High - It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times and the lump can be formed without crumbling when drier than the plastic limit.
FINALLY (Thanks for hanging in there)!

If you can remember the three aforementioned tests, here is the part you can tear off and put in your pocket.

Soil Symbol	Dry Strength	Dilatency	Toughness and Plasticity
ML	None to low	Slow to rapid	Low or thread cannot be formed
CL	Medium to high	None to slow	Medium
MH	Low to Medium	None to slow	Low to medium
CH	High to very high	None	High

ML = Silt CL = Lean Clay MH = Elastic Silt CH = Fat Clay

Don't hesitate getting a little dirty, and if you have any questions, just give me a shout. Good luck!

DID YOU KNOW?……..We have preparation guides in Dari for the Accident Prevention Plan and the Quality Control Plan. These guides are located on our public website at: http://www.aed.usace.army.mil. There is also other useful information for your contractors such as QCS User Guide and How-To Instructions as well as Engineering Design Requirements. From the homepage go to AED-N Departments and check out the Engineering and the Construction links.

SITE ASSESSMENT—ELECTRICAL

By: Linda Lopez, Quality Assurance Branch

ASSESSEMENT 1: PANEL BOARDS—A two-Story Barracks and a BOQ Barracks were assessed and found technical electrical deficiencies with the Panel board of both structures. Figure 1 is an illustration of a 3-Phase @220V panel board. The panel board's L1, L2 and L3 phases and ground meet pre-2006 IEC color code standards and British Standard color code however the Neutral does not comply. The arrow identifies the blue neutral which was previously used as a phase color is now the color for neutral and the color black which was previously used for neutral now indicates a phase. Labels on panel board are missing and should comply in accordance to NEC Article 110.16.

CORRECTIVE ACTION: The neutral wire can be replaced with a black wire it will comply with British Standard Color Code. Contractor should provide labels at each panel.

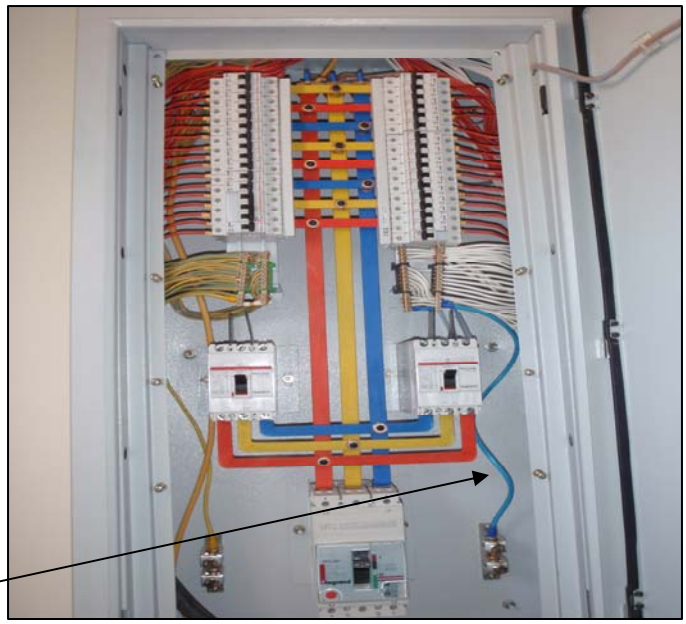


FIGURE 1

FIGURE 2

ASSESSMENT 2: WIRING—Physical damage was present in some electrical wiring. The NEC does not define what constitutes "physical" or "severe physical "damage. However, in accordance to NEC Article 110.7, complete wiring installation shall be free from short circuits, ground faults or any connections to ground other than as required or permitted. Figure 2 is an illustration of physical damaged to the wiring and poses an electrical hazard. The installation shall comply with NEC Article 300.3 and Article 300.4.

CORRECTIVE ACTION: All wiring with physical damage should be replaced.

ASSESSMENT 3: GENERATORS—At the time of the assessment, the FG Wilson 3-Phase @1100 kVA generator (2 each) frame/housing was secure however, the exterior of the apparatus contained excessive dust. The illustration on Figure 3 points to areas with excessive dust. There is a possibility that the generators may not work properly at the time of commissioning because of the excess dust regardless of the new filters in the generators.

CORRECTIVE ACTION: To prevent any technical issues with the generators, protect them from dust or debris by placing plastic around the apparatus especially the air filter in order to provide a continuous free flow of air so that the engine contains no dirt or dust.

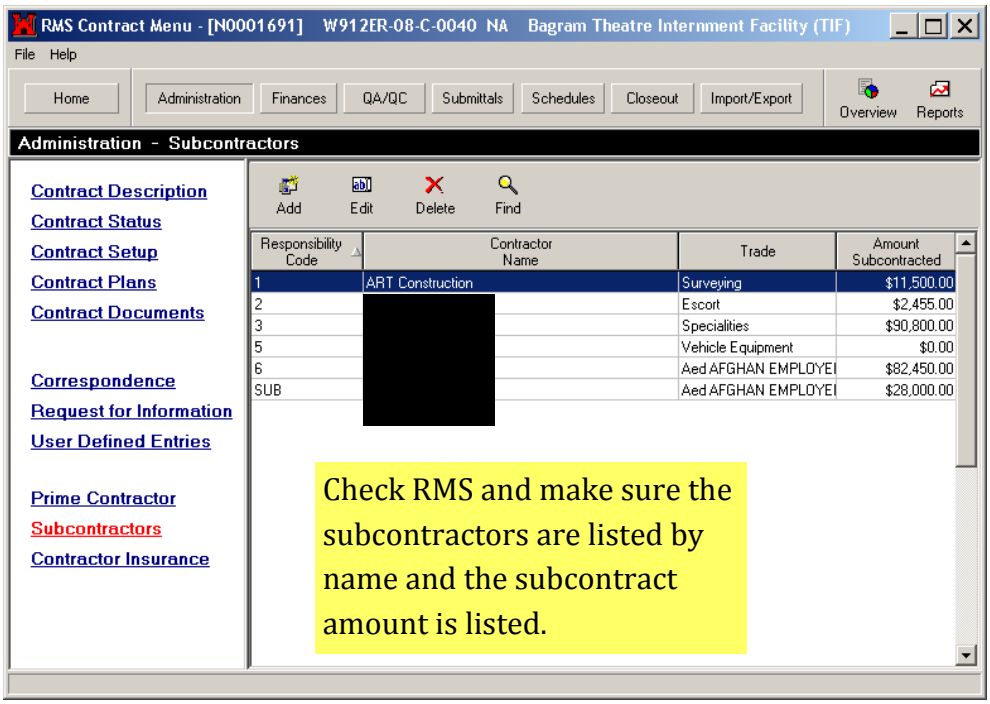
FIGURE 3

SUBCONTRACTOR PAYMENTS

By: Sandy Higgins, Chief, Quality Assurance Branch

Here we are again. This will be the 3rd time we've discussed subcontractor's payments in the Constructively Speaking Newsletters. This won't be the last. This has become a serious issue and steps are going to be taken to ensure that the Area Offices/Resident Offices take the proper measures to help ensure the subcontractors are first, listed in RMS and secondly, that the Prime is showing payment to those subcontractors. I hope this will help you get an understanding of the serious implications we're having for failure to follow the contract requirements. This is a twofold solution, by that I mean that by following the contract requirements not only are we enforcing that prime contractor to pay their subcontractors, but also creating the reputation to our subcontractors out there that it's not the US Army Corps of Engineers that isn't paying them and we will have documentation to prove that. We need all of you to do your part by telling your subcontractors that "The Corps of Engineers **DOES NOT TOLERATE** non-payment to subcontractors.

Contract Administration Branch is currently doing an assessment on all contracts by Area Office to see what steps need to be taken to correct this immediately. One thing to consider, if you have a Prime and you're withholding or retaining those earnings because they've been overpaid, behind schedule, or liquidated damages, then more than likely those sub-contractors are out there are working for free.



In accordance FAR 52.232-5—"Payments Under Fixed-Price Construction Contracts", RMS and QCS have been provided with screens to accommodate the information specified to be furnished by the Prime Contractor relative to any Subcontractor used on the contract.

You will undoubtedly encounter Contractors reluctant (or even refusing) to indicate the Contract Amount of their Subcontractors. Reasons vary for Prime Contractors. Some are fearful that the government will determine WAY TOO MUCH overhead and profit while others want to live off of the subcontractors money. You never have to argue with a Prime Contractor on this, simply point out the FAR requirement and refuse to pay them anything until they comply. Prime Contractors have been barred from Government work due to violations of the Prompt Payment Act. If the Prompt Payment Certification isn't right, then you should return it to the contractor by day 3. Do this by serial letter and give specific reasons why the pay request is rejected.

The first thing to look for is that the Prime Contractor has properly listed their subcontractors under the administration tab as show below. Once they have properly entered them here, they will show up on the Prompt Payment Certification each month. You must make sure they put a contract amount. Stress to them that we don't care how much the contract is as long as we see payment being made.

SUBCONTRACTOR PAYMENTS

Contractor Requested Earnings

Request Close

Activity Earnings | Subcontractor Earnings | Additional Earnings | Payment POCs

☐ Update Previous Subcontractor Payments

Subcontractor Name	Total Amount Subcontracted	Previous Subcontractor Payments (Excluding Deductions)	Subcontractor Amount Included in this Payment Estimate (Excluding Deductions)	Subcontractor Earnings Deducted by Contractor (Total to Date)
Accurate Concrete	$621,830.00	$0.00	$0.00	$0.00
FP Erectors, LLC	$0.00	$0.00	$0.00	$0.00
HIRE ELECTRIC	$216,400.00	$0.00	$0.00	$0.00
JH KELLY	$117,828.00	$0.00	$0.00	$0.00

This is a screenshot from QCS when a contractor is preparing their pay request. Note the box that can be checked if the contractor wants to report previous payments and get on track. If the contractor wants to hold money from the subcontractor, they need to indicate in the last column and we will essentially hold the money for them.

Payment No. 7 Thru 03/31/2006 Invoice Date 03/31/2006 Requested Earnings Completed ☐ Yes

Prompt Payment Certification And Supporting Data For Contractor Payment Invoice

Page 1 of 8 pages

(1) Contract No.: W912ER-08-C-0040 NA

(2) Location and Description of Work: Bagram, Afghanistan, Bagram Theatre Internment Facility (TIF)

(3) Estimate No.: 10

(4) Invoice Date: 08/23/2009

(5) Contractor Official (name and address) to whom payment is to be sent:
Prime Projects International General Trading LLC
502, Twin Towers, Baniyas Road
Dubai Deira 42252

(6) Discount Terms:
0 Days
0 Percent

(7) If Notice of Assignment has been filed, enter name of Assignee to whom payment is to be sent:
John T. Michael, Project Engineer

(8) Name, Title, phone number, and mailing address of person to be notified in event of a defective invoice:

(9) Subcontractor Name	(10) Total Amount Subcontracted	(11) Previous Subcontractor Payments (Excluding Deductions)	(12) Subcontractor Amount Included in this Payment Estimate (Excluding Deductions)	(13) ** Subcontractor Earnings Deducted by Contractor (Total to Date)
Afghan Operators/Drivers	$0.00	$0.00	$0.00	$0.00
Afghan Rehabilitation Team	$11,500.00	$11,500.00	$0.00	$0.00
BAHARE KAHKASHAN Co	$28,000.00	$28,000.00	$0.00	$0.00
Geotechnical Team	$90,800.00	$90,800.00	$0.00	$0.00
IHSAN QUDRAT CONSTRUCTION COMPA	$73,420.00	$73,420.00	$0.00	$0.00
MUMTAZ CONST GROUP	$82,450.00	$82,450.00	$0.00	$0.00
RONCO Consulting Corporation	$2,455.00	$2,455.00	$0.00	$0.00
TOTAL	$288,625.00	$288,625.00	$0.00	$0.00

** A written notice of any withholding shall be issued to a subcontractor (with a copy to the Contracting Officer) of any such notice issued by the Contractor, specifying (1) the amount to be withheld, (2) the specific causes for the withholding under the terms of the subcontract, and (3) the remedial actions to be taken by the subcontractor in order to receive payment of the amounts withheld. Attach copy of notification to pay estimate. Reference FAR 52.232-27(g).

I herby certify, to the best of my knowledge and belief, that:

(1) The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the contract;

(2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payments covered by this certification, in accordance with subcontract agreements and the requirements of Chapter 39 of Title 31, United States, Code; and

(3) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract.

(4) This certification is not to be construed as final acceptance of a subcontractor's performance.

Signature Date

Stephen Shed, Project Manager
Typed Name and Title

Please make no commitment to the sub-contractor that his issue will be resolved to his satisfaction. However, the above documentation will allow us to confront the contractor with a request/demand that proof of payment for work is done and accepted. Once we have convincing evidence that the prime contractor may not have paid a direct sub-contractor, we will need to do the following:

Confirm by review of the previous payment estimates that the work described by the sub-contractor is work that we have paid the Prime.

Confirm that the Prime Contractor does not have any exceptions to payment listed on his Prompt Payment Certificate.

Validate % complete paid. If we paid 50% for the wall, and the sub built the wall, then he should be paid for 50% of his sub-contract agreed to price. Don't become a street accountant, keep it simple.

If it appears after review of the above that the Contractor may not have paid the Sub-Contractor of accepted and paid contract work, then meet with the Contractor. Explain the sub-contractor's dispute and your conclusion of possible non-payment. Give your Prime Contractor an opportunity to either explain or to review and confirm.

Conclusion is when the Prime shows convincing evidence that he has paid the sub for issue at hand. This would then be sent to the Sub, concluding that AED has done all that they can do to resolve, and that any other action will have to be between the Sub and the Prime through the local legal system.

FOR CONTRACTS IN WHICH YOU HAVE BEEN CONTACTED BY A SUB-CONTRACTOR concerning dispute in payment from the Prime Contractor:

Contact the sub-contractor via email and request the following information for ***disputes concerning payment:***

1. On sub-contactor letterhead, state the AED contract number, the specific work activity done and in dispute, a copy of the sub-contract with the Prime Contractor, and the percent paid for the work activity in dispute, if any.
2. Request a copy of the Sub-Contractor's latest request for payment to the Prime Contractor and last invoice.

By: Clint Henker, Safety Office

ELECTRICITY is one of the many hazards associated with construction sites. Here at the AEN Safety Office we consider it to be one of the "Big Three" along with scaffolding and excavation/trenching. For electrical safety, USACE uses the follow standards:

* EM 385-1-1, Section 11
* 29 CFR 1926.400; Subpart K
* 29 CFR 1910.300; Subpart S
* UFGS 01 39 26
* National Electrical Code/ANSI/NFPA

Using these standards can minimize, if not prevent, your construction site electrical hazards.

On-site hazards related to electricity are shocks and electrocutions, arc blast and burns, falls, fires, and explosions. These hazards could result in construction site stoppage, property damage, injury, and death. On average one worker is electrocuted on the job every day. Here a few examples of electrical hazards in Afghanistan:

1. Defective or make shift wiring of electrical tools
2. Failure to maintain clearance distances
3. Failure to follow standard lockout/tagout/groundout procedures
4. Improper PPE
5. By-passing electrical protective devices
6. Un-qualified personnel

The most common result of an electrical hazard is the non-fatal injury of an electrical burn. This occurs when you touch electrical wiring or equipment that is improperly used or maintained.

Electrical hazards can be prevented by having electrical qualified personnel on the construction site. USACE defines eletrical qualified personnel in the EM 385-1-1, section 11.A.01. Electrical work is also noted is the Accident Prevention Plan (APP) and Activity Hazard Analysis (AHA) as a means to prevent a hazard. Daily electrical safety reminders can be put out during the morning tailgate safety brief and / or at the shift change brief. Training and recurring training is another preventive measure that can be use to make sure the qualified personnel are up to date on the standards and any new standards. One of the best electrical hazard preventative is the construction site inspection. This inspection can be conducted by the contractor to make sure his employees are meeting the electrical standards to keep the construction site safe. USACE personnel should be conducting daily and random inspections to ensure that the contractor is meeting the techincal specfications and keeping a safe working environment.

GOOD

BAD

To conclude, electrical hazards can be minimized and/or prevented on your construction site. Use the resources that USACE and other the agencies have provided. These resources range from the reference and standards materials, trained qualified personnel, and even yes the Safety Office. Until next time stay SAFE!