CONSTRUCTIVELY SPEAKING

US Army Corps of Engineers—Afghanistan Engineer District—North

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UFER GROUND

Inside this issue:

Quality Assurance Branch

Sandy Higgins, *Chief CQM/RMS/Contract Admin*
Tom Urbaniak, *Lead Technical Civil/Materials*
Keith Rudie, *Civil/Geotech*
Shafak Pervez, *Lead Electrical*
Yvan Nobile, *Lead Electrical*
Chris Devries*, Electrical*
Jason Hasenoehrl, *Electrical*
Daniel Keenum*, Mech/Elec*
Steve Baughman *Mechanical/Plumbing*
Natasha Priddle *Admin/Training Coord*

By: Daniel Shaver, P.E., Electrical Engineer

A CLOSER LOOK AT GROUND ELECTRODES

Contrary to popular belief, driving more ground rods is not always the right answer. The ground rod is the best known grounding electrode. The grounding electrode is primarily for lightning protection, and works by providing grounding (or creating a path to earth) for the lightning. All grounding electrodes are described in the National Electrical Code 250.52(A)(1) through (A)(6) that are present at each building or structure must be bonded together to form the grounding electrode (earthing) system.

1. Underground metal water pipe [250.52(A)(1)]
2. Metal frame of the building or structure [250.52(A)(2)]
3. Concrete-encased steel [250.52(A)(3)]
4. Ground ring [250.52(A)(4)]
5. Ground rod [250.52(A)(5)]
6. Grounding plate [250.52(A)(6)]

Exception: Concrete-encased electrodes are not required for existing buildings or structures where the conductive steel reinforcing bars aren't accessible without disturbing the concrete.

When an underground metal water pipe electrode, metal building or structure frame electrode, or concrete-encased electrode is not present, one or more of the following electrodes specified in 250.52(A)(4) through (A)(7) must be installed to create the grounding electrode (earthing) system.

A careful reading of this text reveals that the ground rod is a supplemental electrode and only primary if none of the first three are present in an existing building. Many people would be surprised to find out the ground rod is not your first choice. There has been a change made in the National Electrical Code so that the metal frame of the building or the concrete-encased (or Ufer ground) is the primary building grounding method instead of the ground rod. Since the metal water pipe and metal building frame are easy to identify, we will focus our attention on the concrete-encased grounding electrode or Ufer ground.

The term "Ufer" grounding is named after a consultant working for the US Army during World War II. The technique Mr. Ufer came up with was necessary because the site needing grounding had no underground water table and little rainfall. The desert site was a series of bomb storage vaults in the area of Flagstaff, Arizona (where the soil was poor for grounding). Cont'd

EUFER GROUND

Ufer techniques are used in building footers, concrete floors, radio and television towers, tower guy wire anchors, light poles, etc. Copper wire does not function well as a "Ufer" ground due to the pH factor of concrete (+7pH is common). The use of steel reinforcement as a "Ufer" ground works well and concrete does not chip or flake as has been found with copper (that is encased in concrete). Here is the picture of an installation of an approved electrode.

The footing forms and the required rebar steel are set, and the top of the 25 mm 2 (#4 AWG) rebar that will serve as the electrode has been painted bright green. This identifies the electrode location for the electrician and also allows the code inspector to inspect the electrode installation….The location of the electrode is determined by the proposed location of the entrance conductors and the service panel.

The NEC Section 250.52(A)(3) gives the details for the Concrete Encased electrode (or Ufer Ground). "An electrode encased by at least 50 mm, (2 inches) of concrete, located horizontally near the bottom or vertically, and within that portion of a concrete foundation or footing that is in direct contact with the earth, consisting of at least 6.0 m (20ft) of bare copper or zinc galvanized or other electrically conductive coated steel reinforcing bars of not less than 13mm (1/2 in) in diameter, or consisting of at least 6.0 m (20ft) of bare copper conductor not smaller than 25 mm2 (4 AWG). Reinforcing bars shall be permitted to be bonded together by the usual steel tie wires or other effective means."

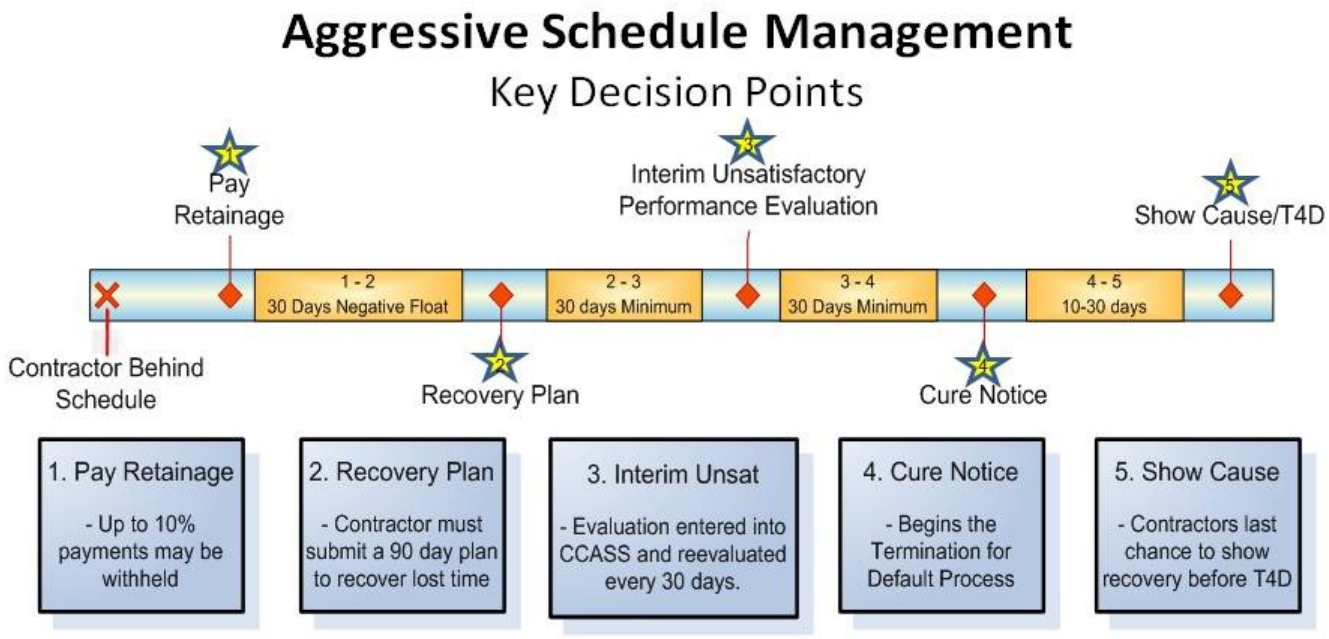
In the picture below, the foundation has been poured, the walls have been framed and the rebar electrode can be seen protruding through the mud sill. The electrician has sealed the hole around the electrode. (The red material is non-conductive foam sealant). The acorn clamp and the 25 mm2 ground wire coming from the panel have been connected to the rebar electrode.

Since most USACE projects in Afghanistan have PVC water pipes, the Ufer ground is the primary grounding electrode and should be installed on all new building. Bond building structural steel and any supplemental grounding electrodes to it. Then bond the Ufer ground to the ground bar of the main electrical service panel. When the Ufer ground is used, the ground rod is a supplemental ground and the conductor from the rod to the ground system can be smaller than the one connecting the primary electrode to the panel. So adding one piece of rebar to your footing allows you to meet the primary building ground requirement and saves money on any supplemental grounding that is needed.

AGGRESSIVE SCHEDULE MANAGEMENT

By: Braven Dyer, P.E., Deputy Chief Construction

Aggressive Schedule Management, better known as ASM, is the process the US Army Corps of Engineers uses to evaluate whether a project is on schedule or not. The first question to answer is, "Who is responsible for the project being on schedule?" The contractor bears the greatest burden to show that all work activities are progressing according to the approved schedule with a planned completion date according to the contract completion date (CCD). However, the government also shares in the responsibility to maintain project schedules. The government must review submittals in a timely manner, offer comments to improve submittals, review the project schedule in detail, and provide comments to ensure all critical activities are identified and scheduled correctly. When a contractor does not follow his schedule, the government must intervene to encourage timely material delivery, proper equipment selection, and insure that adequate labor forces are applied to recover the schedule to achieve a timely project completion. When the contractor continues to fall behind with less than satisfactory progress, the local COE resident or project office will write emails and letters and request meetings in order to have the contractor explain why progress is not satisfactory. If these less than formal steps do not produce results in getting the project back on schedule, more severe actions will be necessary, such as Interim Unsatisfactory Evaluations (IUS), retainage of payments, and liquidated damages. Ultimately, failure to meet the contractual completion date may lead to termination for default (T4D). Contractors should be aware that Interim Unsatisfactory Evaluations, Final Unsatisfactory Evaluations, and T4D's can have detrimental effects on future contract awards with the U.S. Government, not just the US Army Corps of Engineers. More details regarding the individual steps or milestones in the process will be discussed in the next edition of Constructively Speaking.

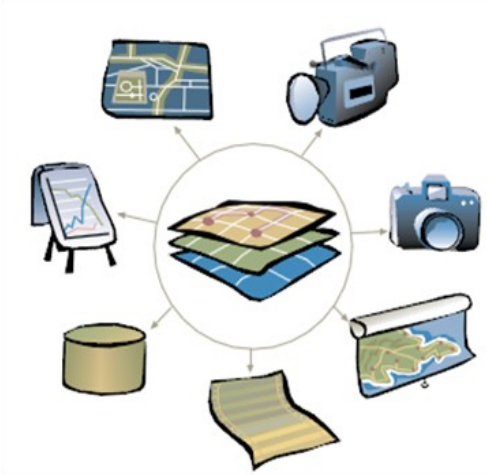


- ASM is a 12 step process with 5 major decision points applying contract remedies in a consistent, deliberate process
- Contractor's are briefed on ASM at the Preconstruction Conference
- Third point performance evaluations provide opportunities for early recognition/ early resolution
- ASM requires PDT awareness and critical thinking at each decision point – schedule and quality are aptly emphasized & managed

NAILING DOWN GIS

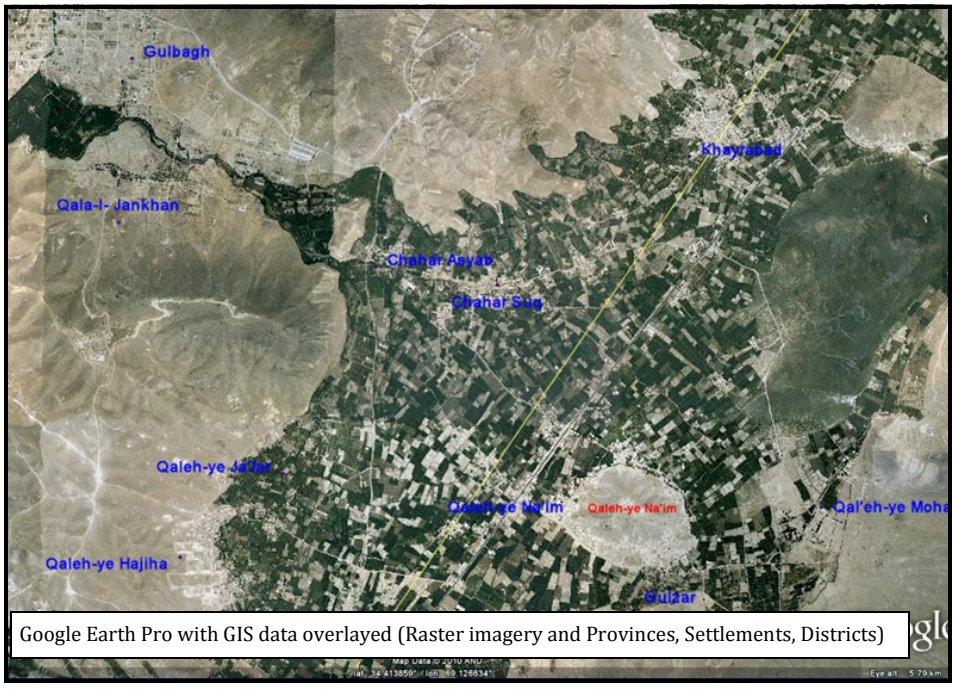
By: Nancy Towne, GIS Team Lead, AED-N

What is GIS? Why do I care about yet one more acronym? Is this going to help me do my job better? These are some questions being asked of the GIS office here in Kabul. I hope this article spikes some interest and gives more "nails" to use for construction projects.



GIS is a geographic information system consisting of software, hardware, processes, data, and people. It is a way to capture, store, analyze, manage, and present data that are linked to location such as coordinate, area, perimeter, and length. In the simplest terms, GIS is the merging of cartography and database technology supporting initial planning and environmental studies; organizing map, survey, and design documents; and sharing information with personnel in the office or the field.

Equipped with GIS tools, surveyors can quickly determine environmentally sensitive areas, local control, road networks, previously established boundaries, zoning, permit status, and other critical information. These enhanced capabilities eliminate redundant efforts and promote coordination with other planning and government agencies. They can bring data straight from the field into a seamless workflow and take GIS data back into the field via a data collector or laptop computer. Site conditions, including soil and geotechnical data can be related to other engineering information to assist with decision making. GIS takes diverse data sources and formats and integrates them into a single application platform to support unique workflows. Data can be created easily, intuitively, and correctly in both 2D and 3D environments, including CAD data for analysis and delivery.



Google Earth Pro with GIS data overlayed (Raster imagery and Provinces, Settlements, Districts)

Here at AED-North, the GIS Team has procedures and processes in place along with data in vector and raster format. The primary GIS software used is ESRI ArcGIS with several extensions. Some of the specific tools which support construction are:

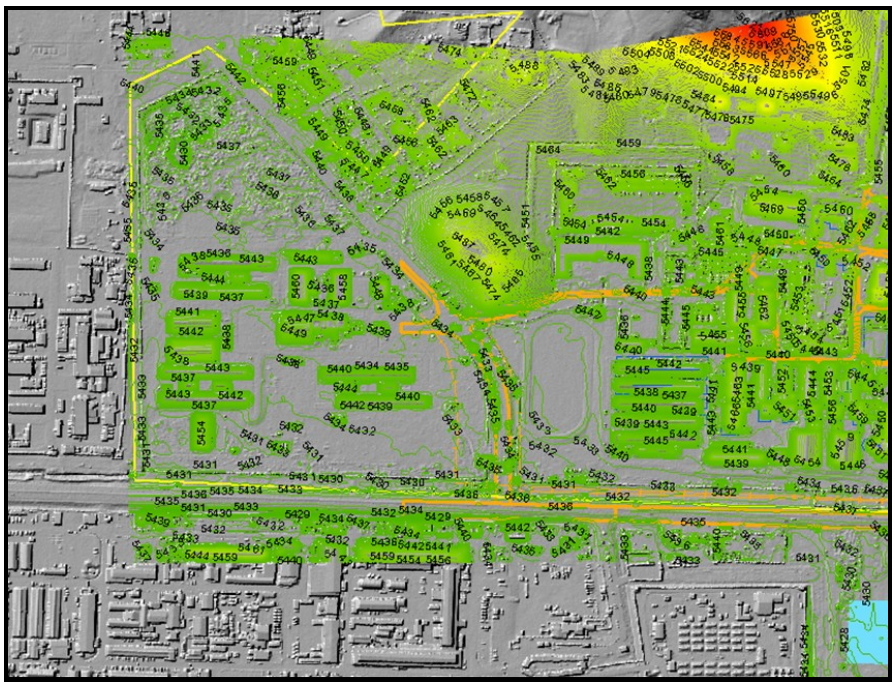
1. Collecting point data in the field: GPS (Global Positioning System): Trimble GeoExplorer XT and Garmin GPSMAP 60CS – which includes manuals, software, and cables.
2. Vector data: more than 1 TB of points, lines, and polygons detailing georeferenced roads, PPMD projects, rivers, dams, watersheds, contours, structures, boundaries, airfields, FOBS, PRTS, etc.
3. Raster data: more than 5 TB of imagery, including satellite imagery 2 m to 60 cm resolution in color and black & white, LIDAR point cloud data, elevation (DEM), hillshades, topos in 50 and 100 m, etc.
4. Convert coordinates: Geographic Translator tool and XTools
5. Process and analyze imagery: ArcGIS Spatial Analyst Extension
6. Create true 3D with LIDAR and DEM; ArcGIS 3D Analyst Extension
7. Support Military Common Installation Picture: ArcGIS Military Analyst Extension and RMTK/MIMT
8. Create Google Earth .kml files to display vector data: ESRI Export to KML tool

NAILING DOWN GIS

In addition to the specific tools, the GIS team has the following capabilities:

A) convert coordinates,
B) download and process LIDAR
C) perform watershed analysis
D) create raster catalogs
E) create customized maps
F) import and export data into CAD formats (Microstation & AutoCAD)
G) Geo-reference points, grids, and various data formats
H) solve construction problems such as site location and analysis
I) create 2D and 3D fly-thrus (.avi)

All of these tools can be utilized to provide a visual aid for seeing where a project is heading and why. Since all GIS data is georectified with a known location, it can be overlayed together to enhance consensus building and decision making, the key to "nailing down" a successful construction project.



Processed LIDAR (derived Hillshade image and 1 m contours)

TRAINING FOR A BETTER FUTURE

By: Scott Tate, Project Team Lead, Baker Group

Recently an eight week course on advanced schedule training was concluded at Qalaa House for local national contractors. Taught by Baker Group schedulers, the 8 week class featured a four hour class weekly from March to May.

The course was open to all contractors' staff as well as Corps personnel, regardless of their position. The intent was to get as much contractor involvement as possible in an effort to educate them in contract schedule requirements and minimum industry scheduling standards.

To gather information as a measurement of the course's success, a questionnaire was developed by Baker and distributed to the class near the end of the course. Students were asked to not only rate the class in its different aspects, but to provide demographic information, as well as suggestions for future classes.

Seventeen different construction companies were represented in the course, as well as NMAA students (2 instructors and 3 interns) and three USACE - LN QA representatives.

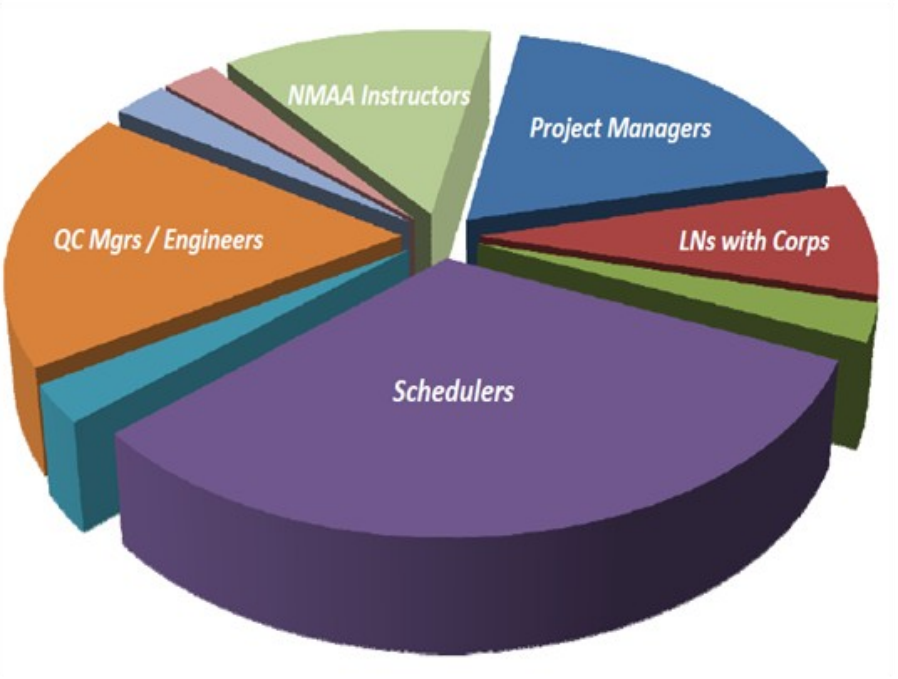
Of the construction companies represented all maintain offices in Kabul; and their average project size ranged from $0.5M to $30M. Typical sorts of projects ranged from civil (roads, waste water treatment plants) to various types of buildings and ANA base construction. Collectively, their project delivery experience included design-build and site adapt.

Of the respondents, 29% currently hold positions as schedulers, while the balance hold a variety of positions including project manager, QA/QC, as well as coordinator positions relating to design, cost and quality control.

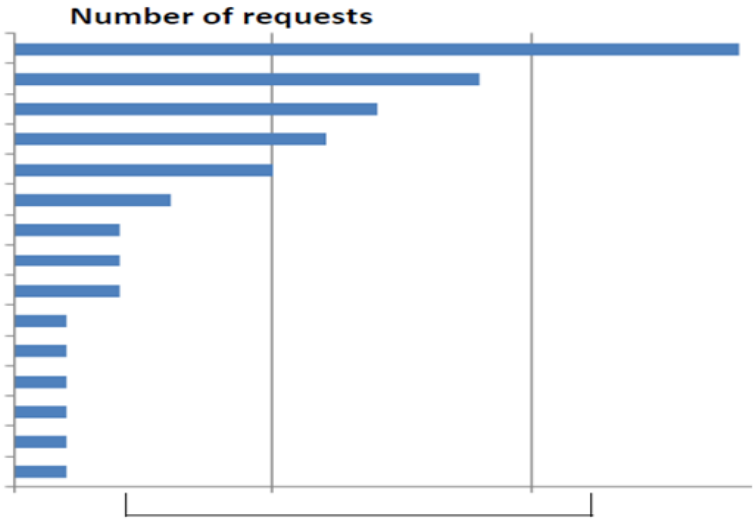
TRAINING FOR A BETTER FUTURE

Over 90% of the students are degreed in engineering or architecture, with the overwhelming majority as civil engineers. Construction experience of the students ranged from 1 to 20 years with an average of 5.5 years. Specific scheduling experience ranged from 6 months to 7 years with the average at 1.7 years.

From the results of the survey the participants indicated that they have a strong desire to participate in future training classes. The respondents also indicated that they would highly recommend these and future classes to other associates. Moreover, as a group, they overwhelmingly expressed their satisfaction with the course and that they felt they had professionally benefited as a result of the classes.



Area of Interest		
More Detailed Schedule Training	14	25%
QCS / RMS	9	16%
P6	7	13%
Cost / Resources	6	11%
Updating Schedules	5	9%
More Detailed Training	3	5%
Schedule Reports / Graphs	2	4%
Recovery Plans	2	4%
Building a schedule from start to complete	2	4%
Planning	1	2%
Time Management	1	2%
Activity IDs	1	2%
CLINs	1	2%
Activiy Coding	1	2%
Acitivy / Schedule Logic	1	2%
56 comments for additional training	56	***100%***



As can be seen in the graph, these same students also expressed the desire to have specific topics covered in greater detail. 25% of the class requested more advanced schedule training classes followed by requests for more training in QCS, Primavera P6 software, and cost and resource loading. These are all areas that could be focused on for a follow-up phase of training.

Learning is in iterative process. To continue the advancement of knowledge in the Afghanistan Contractor community, and to further support the Corps' capacity development efforts; more training is necessary. As indicated by the results of the questionnaire, it is essential to continue exposing the local nationals to the various aspects of construction scheduling, and by so doing, they will realize their need for continued training. This exposure to related schedule topics through continued training will further fuel the local contractor's burning ambitions to better their way of life by way of advanced education and training, and support contactors and the Corps in achieving more successful projects..

TRAINING FOR A BETTER FUTURE

It is a complex task to combine the fundamentals of scheduling with learning new scheduling software. This complexity increases when applied to a design-build project. Factor in that the schedule must be cost loaded and the bar is raised higher. With the addition of entering the schedule information into a project management software (QCS), the difficulty factor has increased exponentially from the initial perspective of a "simple construction schedule"; particularly considering we are dealing with a native population that has known little but war for the last 30 years.

By offering training classes, we are bringing together local contractors who can interact and develop support networks for each other. An environment like this not only helps to encourage questions but also multiplies the sources who can help answer those questions. When the local contractors are successful, the Corps shares in that success.

Encouraging an environment of learning and support will lead to improved relations between contractors and the Corps, and reinforce their understanding that we are supporting them in their project successes. This in turn will lend itself to improved schedules that in the big picture will lead to contractor achievement, projects completed on time, satisfied end users, and a sense of accomplishment for AED.

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.

KEENUM'S QUOTE:

Engineering is the practice of safe and economic application of the scientific laws governing the forces and materials of nature by means of organization, design and construction, for the general benefit of mankind." – S. E. Lindsay

CONSTRUCTION TERM:

Two Gang is a term used to refer to a particular type of electrical box. A two gang box will hold two switches, two receptacles, or one switch and one receptacle.

Submitted by:
DANIEL KEENUM, QUALITY ASSURANCE BRANCH