CONSTRUCTIVELY SPEAKING

US Army Corps of Engineers—Afghanistan Engineer District—

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Issue No. 9

IDENTIFYING COUNTERFEIT U.S. WIRE

Inside this issue:

Electrical Inspection/QA Course: The initiative to train up more people so they are more familiar with electrical construction techniques is in full swing. We have 48 people that have registered for the class and 18 graduates. Two of the graduates are local engineers. The knowledge gained while taking the courses improves your ability to assure quality electrical construction on our projects. Contact Tom Urbaniak in the QA Branch for more information.

BY: The Engineering Branch Electrical Team—Drew Lange, Paul Cravens, Danny Shaver, John Puvogel, and George Mallery.

Quality U.S.-manufactured wire is available in Afghanistan, and is in use on some AED-N projects. However, counterfeit wire is also available, and at first glance, appears very similar to genuine wire. An individual approving wire for USACE construction contracts should be very cautious during his or her inspection, to ensure that counterfeit wire is not installed on any USACE project. This guide will identify a few ways to spot counterfeit U.S. wire.

Inconsistencies in Print Legend

The sample of wire shown below was given to AED-N Engineering for inspection. At first glance, the wire appears to be made by Cerrowire, a reputable U.S. wire manufacturer. The first clue that the wire is counterfeit is that "UL" is mislabeled "OL." A picture of the wire was taken and sent to the manufacturer, who confirmed that the print legend had several inconsistencies.

"OL" instead of

The print legend for the counterfeit wire reads:

"CERRO VINYLON-A 12 AWG (3.31 mm2) GR2 V2-1 600V-c(OL) TWN75 OR T90 NYLON"

The print legend should read:

"CERRO VINYLON-A 12 AWG (3,31 mm2) (UL) THHN OR THWN-2 OR MTW OR AWM GR2 VW-1 600V - c(UL) TWN75 OR T90 NYLON".

Misspelled words or abbreviations are indicators that a wire sample is likely counterfeit.

Quality of Print

The manufacturer also noted the style of print on the counterfeit wire differs from legitimate wire. The print on the counterfeit wire is obviously from an ink-jet style printer: characters are formed by numerous individual dots. Cerrowire uses a contact printer for 12AWG wire, which results in smooth, solid characters in the print legend.

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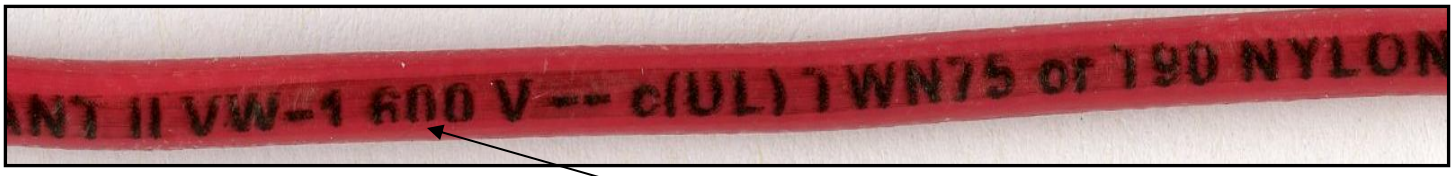
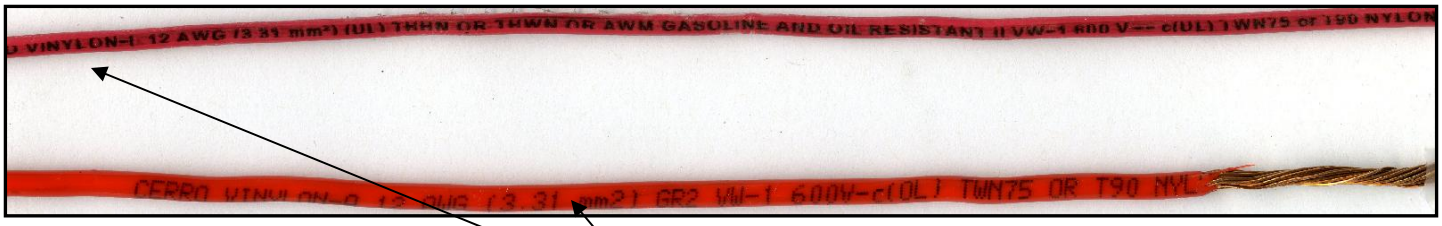
IDENTIFYING COUNTERFEIT U.S. WIRE

Print legend on counterfeit wire. Individual characters formed by small dots.



Print legend on genuine wire. Smooth, solid characters.



Counterfeit wire (red, stranded) adjacent to genuine Cerro wire (red, solid). Notice the difference in print style between the wires.

Different manufacturers use different print styles, so the only way to determine if the print style is incorrect is to contact the manufacturer. For assistance with this, contact AED-N Engineering.

Lack of Nylon Sheath

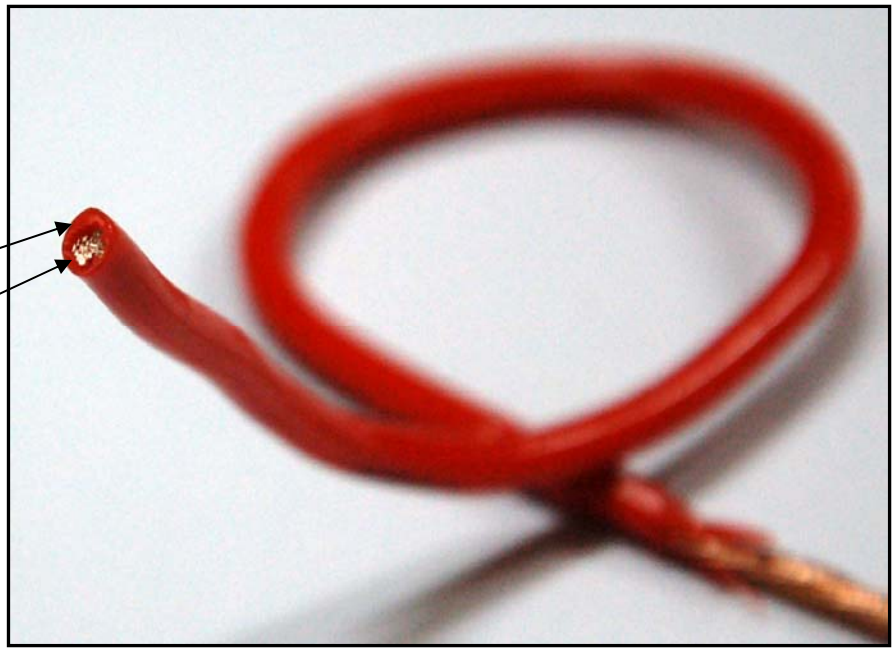
Some American wire has a clear nylon sheath added to the exterior of PVC insulation to reduce pulling tension and reduce damage to the PVC insulation. A closer inspection of the counterfeit wire revealed that although it was labeled as having a nylon sheath, the sheath was not present. The nylon sheath can be easily be identified by taking a cross-section of the wire, and checking for 2 –layers of insulation: one colored PVC layer, and a second clear nylon layer. The nylon will easily peel back from end of the wire. A nylon-sheathed wire will be identified by the "N" in "THHN," "THWN," or may have "NYLON" printed directly in the print legend. A wire having any of these designations, but lacking the nylon sheath, is undoubtedly counterfeit.

Nylon sheath pealed back from end of a genuine THHN/ THWN solid 12AWG wire.

IDENTIFYING COUNTERFEIT U.S. WIRE

Uneven Distribution of Insulation

Inspecting the cross section of the counterfeit wire revealed an uneven distribution of insulation. A legitimate, UL-listed wire manufactured in the U.S. will have an even distribution of insulation surrounding the copper conductor(s).



If there is any suspicion of whether a wire sample is counterfeit, the AED-N Engineering Electrical Section should be contacted immediately to assist in determining if the wire is counterfeit.

MILESTONE RULE OF THUMB

By: Sandy Higgins, Chief, Quality Assurance Branch

Finish Milestones are an excellent tool for analyzing and monitoring Construction Schedules. A Finish milestone is an activity that represents the end of a series of related activities or an accomplishment in the course of the project. A milestone activity has zero original and remaining durations.

The use of finish milestones in the Contractor's Initial and Updated NAS is an excellent tool for assuring "on-time" completion. Using the Partnered Schedule Approach the ACO and the Contractor can agree that a Finish Milestone Sort Report from the contractor will be a critical document in accepting initial schedules and for monitoring progress throughout each Monthly Update until Contract Completion.

Milestone Work Activity	% of Total Duration	Milestone Work Activity	% of Total Duration	Milestone Work Activity	% of Total Duration
NTP	0%	Mechanical/Electrical Rough-In	70%	Finish Paint	96%
Grade Site Building Pad	5%	Windows	73%	QA System Test (Acceptance)	96%
Foundation	15%	Plumbing	85%	CQC Inspection	96%
Underslab Utilities	20%	Mechanical/Electrical Above Ceiling	85%	Testing and Balancing	97%
Slab on Grade	25%	Flooring	86%	Pre-Final Inspection	98%
Structural Frame	36%	HVAC—Ductwork Controls	89%	Commissioning HVAC	99%
Roof Framing Deck	40%	Mechanical/Electrical Systems	90%	Final/Acceptance Inspection	100%
Exterior Walls- Dry-in Windows	44%	QC System Test (Debugging)	92%	Verify Final Punchlist Complet	100%
Roofing – Temp Dry-In	46%	Doors-Hardware	93%	CCD	100%
Building Dry-In	48%	Ceiling Finish	93%		
Interior Walls – Framing	59%	Light Fixtures	94%		
Permanent Power	64%	Sitework-Utilities-Paving	95%		
Permanent Roofing	65%	Carpet/Tile	95%		
Finish Interior Walls	67%	Casework/Cabinets	95%		
Prime Paint	68%	Landscaping/Grassing	95%		

Although these activities and percentages may not all apply to every project, this gives you the general idea behind establishing Finish Milestone Activities

HONEYCOMB HIDEOUT

By: Keith Rudie, Civil Engineer, Quality Assurance Branch

I always assumed that I had a pretty average childhood, until I met my wife. Oh, sure, I got smacked a little here and there, but at least I got to eat the boxed sugar that we called cereal. My wife was not so fortunate: no Fruity Pebbles, no Cap'n Cruch with crunch berries, no Count Chocula, and no Honeycomb. Honeycomb, in fact, embodied all my fond memories of childhood food. Imagine, then, my shock and dismay when I discovered that my beautiful "Honeycomb" also referred to one of the "plagues" afflicting contemporary concrete construction.

Honeycombs, according to a Portland Cement Association definition, are "voids left in concrete due to failure of the cement mortar to effectively fill all the spaces between the coarse aggregate particles." My research has revealed several causes for honeycomb, but for the sake of this article, I will limit the scope to five: Rebar Congestion, Mix Design, Lift Depth, Inadequate Vibration, and Form Leaks. In his article "Honeycomb and Void Repairs in New Concrete Repairs," Jay Thomas provides a concise description of these five causes of honeycombs in the April 2008 issue of *Strengthening E-News*. The portion of the article relating to the causes of honeycombs is reproduced below, but the entire article, which includes repair techniques, may be found at:

http://www.spsrepair.com/Article/tabid/436/contentid/537/Default.aspx

Primary causes of voids or honeycombs in reinforced concrete:

Rebar Congestion - if rebar is placed too close together or too close to formwork it will trap the larger pieces of aggregate while the mortar in the mixture may or may not pass through. Other causes related to rebar congestion include excessive reinforcement splices that prevent the concrete from properly filling the forms.

Mix Design - Improper mix design can lead to low workability, early stiffening or an aggregate that is too large to properly consolidate the concrete for a given application. A good mix design should take in consideration the issues noted for rebar congestion and lift depth.

Lift Depth - When single concrete placements or "lifts" are too deep, proper vibration can become very difficult or impossible. Excessive lift depths can also allow too much free-fall of the concrete that can create a separation of the cement mortar and aggregate as the aggregate impacts the reinforcing steel when falling through the forms.

Inadequate Vibration - When the concrete is properly vibrated it acts more like a liquid allowing it to better settle in the form, consolidate around the reinforcement and completely fill the forms. It also helps in releasing any of the air voids in the mix to the surface. Improper vibration can be related to:

- Too small or large a vibrator for the size of the pour and mix design
- Too low a frequency or amplitude of the vibrator for the size of the pour and mix design
- Too short or long an insertion time of the vibrator in the concrete in a single location
- Too wide of a spacing between each insertion of the vibrator
- Lift depths too deep to actually vibrate the concrete

Congested reinforcing that will not allow a standard vibrator to reach all areas required

Form Leaks - Leaks in the formwork can allow the cement paste to escape out of the form leaving behind only unbonded aggregate and rock pockets.

FLOAT

By Philip DiSalvi, Senior Scheduler, Baker Group

Wikipedia defines float in various way, such as:

Float (fishing), a bite indicator used in angling.

Float (parade), a decorated vehicle or platform, animal-or man-drawn or motorized, used in a festive parade.

Floats (nautical), the air filled structures on a pontoon boat

Float, also known as ice cream soda

Float, (project management), project time management device.

While the various definitions of float are interesting, of which there are no doubt considerably more than mentioned herein, the later definition, a "project time management device", is the concept of float that is of particular interest to this organization.

Float, or Project Float (also called Slack), is the amount of time an activity or series of activities can be delayed without delaying a following task (free float) or the project (total Float).

As might be associated with a specific task or activity, free float is defined as the number of days by which the finish of such scheduled task or activity may be delayed without delaying the start of the following activity(s). Free float is the amount of extra days in a logic path that can be consumed without delaying the early start and early finish dates of the activities within the project.

Total float (or critical float), on the other hand, is more accurately defined as the amount of time an activity or series of activities can be delayed without delaying the project completion date.

How is float relevant to your construction project? As activities are linked together with logic relationships they create what is known as a logic path. Each logic path has a direct link to the start of the project and to the end of the project. Each logic path then has float associated with it. The amount of float in a logic path is a result of the overall duration of that logic path when compared to the overall project duration. For example if a project duration is 100 days and the duration of a specific logic path is 90 days, the logic path has 10 days of float associated with it.

Float that is more than zero (+1) is called positive float while float that is less than zero (-1) is referred to as negative float. By default, a task with 0 slack is considered a critical task (critical task: A task that must be completed on schedule for the project to finish on time. If a critical task is delayed, the project completion date might also be delayed. A series of critical tasks makes up a project's critical path.). If a critical task is delayed, the project finish date is also delayed. Activities with float that is zero (0) cannot be delayed without impacting the project completion. Should all work on the project be completed earlier than planned, positive float is created – and even though positive float is never critical, it may still be the longest path (or critical path) through the project.

A project's critical path will be the longest logic path through the project from the NTP start milestone to the Project Completion finish milestone – this path can be either positive or negative float. By default and by definition, an activity with zero (0) float is considered a critical activity. If a critical activity is delayed, the project finish date is also delayed. A baseline schedule is not allowed to contain negative float paths. However, as work progresses on a project the critical path will invariably change.

A project schedule is never static and will change as the project progresses to reflect the as-built conditions and reflect a current plan for completion of the work. For example, should work on the original critical path be completed ahead of schedule, the next longest logic path may become the new critical path; or if work on a logic path with positive float becomes delayed, it may become the critical path by further extending the end date.

Who owns project float? Industry standards, and a range of construction contracts, identify the ownership of project float as belonging to the project. In other words, the contractor nor the client / owner own the float. It may be used by which ever entity needs and uses it first. However should the user consume all available float in a logic path, and more such that it delays the project, that entity, whether owner or contractor, is responsible for the delay.

Monitoring the various float paths on your project is a manner in which the COR is able to evaluate the progress and status of the work. Relevant questions might be; is the project on time or falling behind? What activates are critical and which activities can slide without impacting the project's completion date?

Cont'd

FLOAT

But before a schedule can be used to effectively manage a project, it is essential that the COR is confident in the schedule's accuracy and that the schedule reflects a realistic plan. Accordingly, it is necessary to analyze the schedule to ensure, among other things, that its logic is not convoluted or manipulated to sequester available float. Contractors have been known to prepare schedules in which available float is sequestered by artificially extending activity durations, or using lags or constraints which will corrupt the logic and associated float calculations. Manipulating the schedule in this manner will cause the schedule to be ineffectual as a tool with which to manage a project.

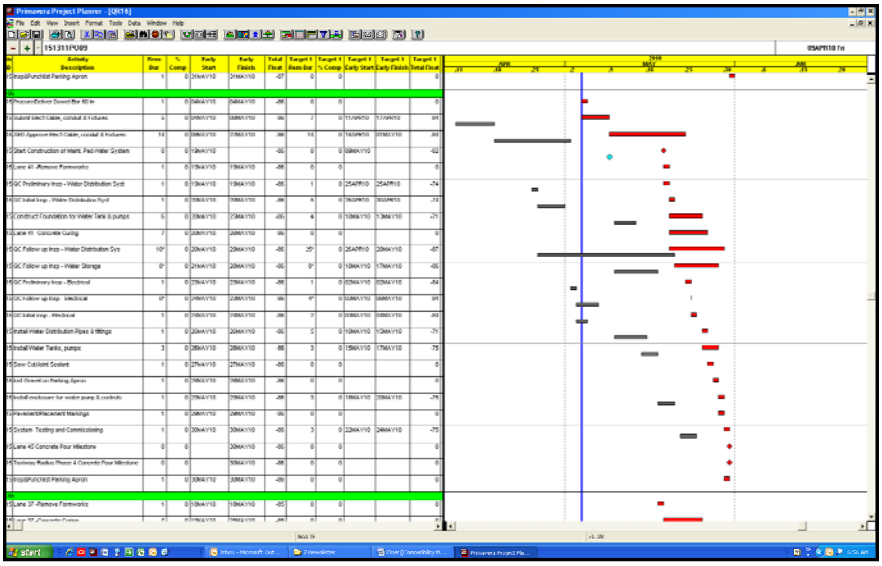
However, if used properly and to its fullest potential a schedule that has been evaluated by a qualified analyst and deemed acceptable, is a very effective management tool.

How can we use float to manage a project? Each time a schedule is updated, reviewed, and judged to be acceptable, that schedule can be sorted into specific layouts that will allow the COR to identify problem areas though the monitoring of the various float paths. A total-float report is one that identifies the various float paths individually. Using this report, on each time the schedule is updated will tell the COR how critical the work associated with that logic path is, and if it has slipped. By incorporating certain columns in the report, such as early-start, early-finish, late-start and late-finish and total float, the COR can additionally identify the available float in any of the float paths along with the latest dates the work can start without delaying the project.

This too will assist with monitoring, on a month to month basis with each update, any slippage in the subject float paths. Using the total float report with the various columns will help the COR in identifying and prioritizing specific work activities that need to be completed in order to keep the project moving ahead on schedule; to help identify and mitigate problems, and to identify areas that need special attention.

In addition, using the previous update as a target, the current update can be evaluated in light of its progress specific to the previous update A variance column may also be added indicating the activity's progress or lack thereof as a numeric comparison to the previous update. Again, the target columns can be added to shed more light on the status of the float paths and more specifically, certain activities of one's choosing. This type of report layout in either P3 or P6 can be complimented by analyzing the current update against both the baseline schedule as well as the previous update in order to garner the big picture as to the status of the project, and how much it has slipped or advanced, when compared to both the baseline and previous update.

In conclusion, the use of schedule reports detailing project float, total float, and free float can assist the COR with identifying problem areas in advance of their occurrence, can provide the means for a comparative analysis to previous schedules, and can help with the development of work around plans. The use of float reports is one of the construction manager COR's best tools in supporting the effective management of any project.



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.

COST LOADED CONTRACTOR SCHEDULES

By: Bill Bolte, Cost Estimator, Engineering Branch

The primary issue to consider when evaluating a cost loaded schedule is checking for possible front loading of costs by the contractor. Areas where the contractor would typically distribute front loaded costs include Site Survey, Contractor Design, Mobilization, Demining or Site Grading. These are typically pay activities performed early in the contract performance period and are somewhat ambiguous to define. In some contracts, these may be separate Contract Line Item Numbers (CLINS), or the contractor has one CLIN and has to develop these items as cost loaded pay activities.

An additional area the contractor may attempt to front load costs is in the construction of the building facilities. Most contractors are comfortable and confident in the construction of the building structure while the interior electrical and mechanical features are often more difficult and are sometimes never completed. The contractor may attempt to front load facility construction costs from the building electrical and mechanical systems into the building's structural pay activities. It is therefore import**ant** to verify the contractor allocates sufficient funds to allow completion of the building electrical and mechanical systems.

More focus is now being placed on As-Built drawings which meet CADD standards given the increase in Operations and Maintenance workload and the fact that additional projects are being added to existing facilities. An SOP is being written on this subject, but in general, payment for this pay activity should only be made after the Contractor's CADD product is acceptable, and red-line markups to account for changes during construction can be validated.

Payment for Contractor design costs should also be coordinated each month with Engineering Branch or use feedback from that office at the conclusion of Design Submittal reviews. Multiple Design Submittals, at any Design Stage, are a frequent occurrence and care must be taken not to make partial payment amounts that will reduce or eliminate leverage needed to obtain final 100% Designs prior to work being accomplished at the job site(s).

Relative percentages of costs are summarized below with typical construction falling near these ranges. Unique projects that require specialized contractor effort however may fall outside these typical norms and must be evaluated on a case by case basis.

Base Items	Description	PERCENT TOTAL CONTRACT	
0001 DESIGN PROGRAM		LOW	HIGH
	SITE SURVEY	0%	2%
	A/E DESIGN	2%	5%
	AS-BUILT DRAWINGS	1%	1%
0002 SITE DEVELOPMENT / IMPROVEMENTS			
	MOBILIZATION	2%	5%
	DEMOBILIZATION	1%	3%
	SITE IMPROVMENTS / GRADING	1%	3%
	DEMINING	TYPICALLY ~ $1 / SM	
	Description	**PERCENT TOTAL BUILDING COST**	
0003 FACILITIES			
	INTERIOR MECHANICAL / ELECTRICAL	25%	35%

More guidance will be forthcoming on cost analysis and additional training to the Resident Offices on how to check for front loading of Project Schedules.

Rebar Capping

By: John Lindsay, Chief, Safety Office

It never ceases to amaze me at the ingenuity of the Afghan construction worker. Case in point is the protective caps that are used on rebar to protect workers from being impaled. In our OSHA 1926 manual and the US Army Corps of Engineers Health and Safety Requirements Manual (EM 385-1-1) references are made to address this: "All protruding reinforcing steel, onto and into which employees could fall, shall be guarded to liminate the hazard of impalement." I have 2 pictures of examples of these protective caps. The square orange caps are easily procured and used in the United States, and the wooden blocks are used here in Afghanistan. They both do essentially the same thing, by protecting the worker from impalement. Why am I bringing this up? Because when I conduct a safety visit on a construction site here in AED-N and see the effort that these folks put forth to provide a workplace that is free from recognizable hazards, I am impressed. These workers face hazards every day. Not just on the construction site, but even getting to work can be a dangerous undertaking. With all the obstacles that they face, it makes me feel good that they keep trying new approaches to meet our safety requirements. Please check for impalement hazards during your site visits.

Picture above unsafe work site.
Picture left, results of unsafe work site

Quality Assurance Branch

By: Sandy Higgins, Chief, Quality Assurance Branch

I recently sent out an email to the field offices letting you know that our branch is here to help serve you with training needs, QA site visit assistance, submittal reviews, etc…….We get feedback from the field offices that the majority of you think that we're coming out there to report back to the district. Well that can't be further from the truth. The QAB staff is primarily folks that work in construction back home so we understand your challenges. The after action of the site visits are reviewed with the field offices. Often there is a need for a follow-up. With the constant turnover of personnel we find a lot of mistakes get made when a person gets the wrong information on how to do something (passed down bad habits). Please refer to the sharepoint for the most up-to-date information on how to do things and if you are in doubt, please don't hesitate to consult us and if we don't know the answer, we will find someone that does.

You will be seeing a lot of information in the upcoming months regarding standardization of processes here in AEN. We are currently focusing on the most critical issues such as electrical and mechanical issues, overpayment of contractors, aggressive schedule management, standardization of designs, submittal registers, and standard QA Plans. It's important that you in field start documenting lessons learned so that we can better define those standards. Without your input, it's not a team effort and it's not necessarily the most practical way of doing things.

KEENUM'S QUOTE

"The unreal is more powerful than the real, because nothing is as perfect as you can imagine it because its only intangible ideas, concepts, beliefs, fantasies that las.t. Stone crumbles, wood rots, people, well, they die, but t hings as fragile as a thought, a dream, a legend, they can go on and on." *Chuck Palahniuk*

CONSTRUCTION TERM: ANCHOR BOLTS

In residential construction, Bolts to secure a wooden sill plate to concrete, or masonry floor or wall. In commercial construction, Bolts which fasten columns, girders or other members to concrete or masonry such as bolts used to anchor sills to masonry foundation.