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CONVERSATION WITH SEBLE
SOIL COMPACTION AND STABILIZATION

AEEC celebrated Engineers week February

16 – 22, 2014

CIRCUIT BREAKERS, CURRENT-SENSING PROTECTIVE DEVICES
LIST OF ENGINEERING OPPORTUNITIES

AEEC

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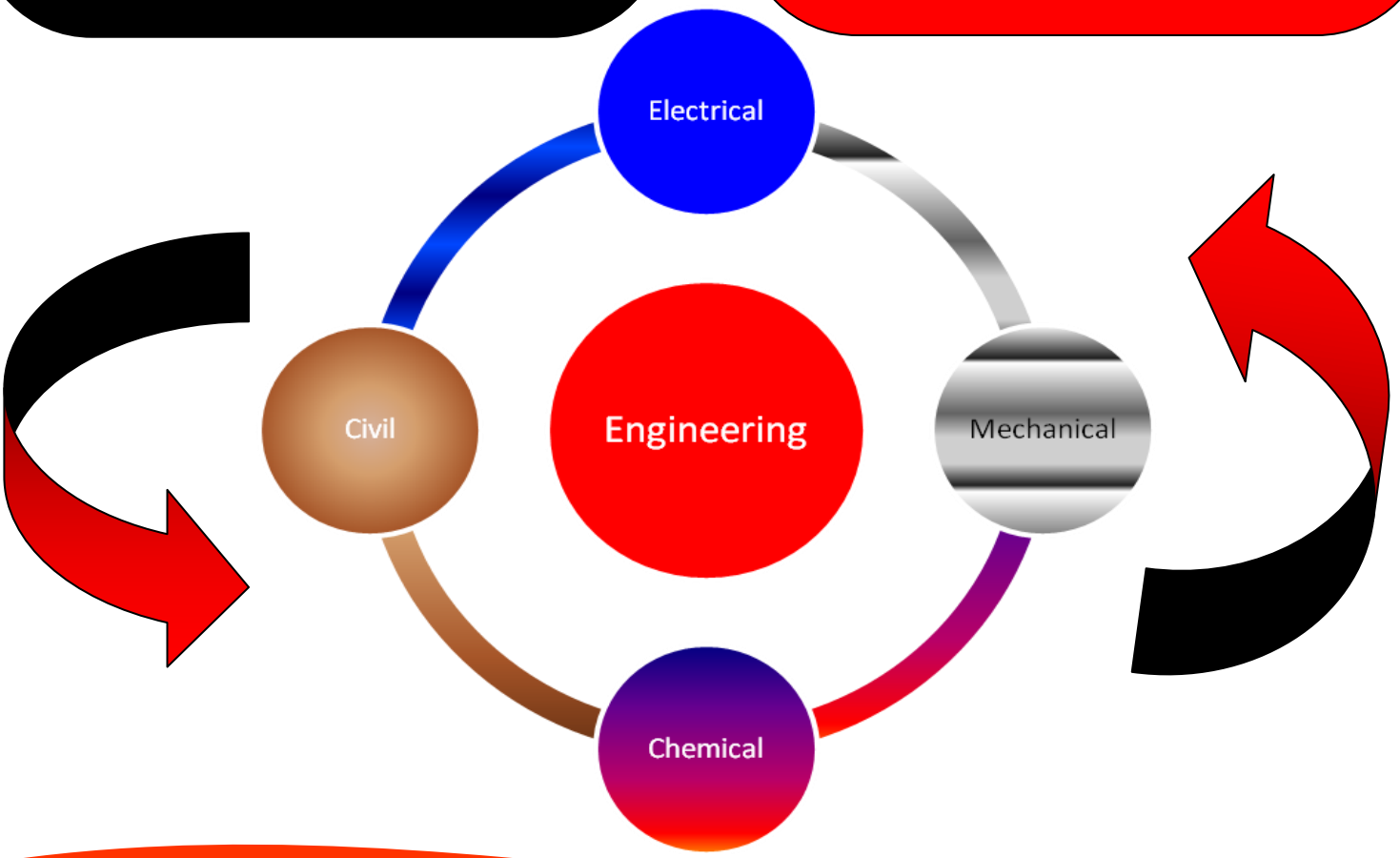


Conversation with Seble

Recently we were lucky enough to track down our lovely, brilliant and highly educated editor, Seble who has been with us from the beginning and asked if she would be kind enough to share her own life accomplishments and her constant and consistent experience with Alpha Eritrean Engineers Magazine. Alpha invites the reader to be part of the conversation.

***Alpha:* Would you briefly tell us about yourself?**

Seble: My name is Seble and I am currently a practicing School Psychologist working with children age three to twenty-one in a public school setting. The best way to describe my job as described on the National Association of School Psychologist website, www.nasponline.org *is that* "School psychologists help children and youth succeed academically, socially, behaviorally, and emotionally. They collaborate with educators, parents, and other professionals to create safe, healthy, and supportive learning environments that strengthen connections between home, school, and the community for all students. School psychologists are highly trained in both psychology and education, and this training emphasizes preparation in mental health and educational interventions, child development, learning, behavior, motivation, curriculum and instruction, assessment, consultation, collaboration, school law, and systems. School Psychologists Work with Students and Their Families to Identify and address learning and behavior problems that interfere with school success, evaluate eligibility for special education services (within a multidisciplinary team), support students' social, emotional, and behavioral health, teach parenting skills and enhance home–school collaboration and Make referrals and help coordinate community support services."

***Alpha*: Which college or university did you go to?**

Seble: I attended University of California Irvine, and received my BS in Psychology. Going through my undergraduate I was fascinated in how the brain functioned and its impact. The idea of how the brain influences each individual's mental, physical and emotional being allowed me understand how the brain functions. During my undergraduate study, I took classes such as abnormal psychology, cognitive psychology, social psychology etc. I also got involved in a research program which targeted specific parts of the brain that identified emotional, social and developmental abilities. After completing my undergraduate studies, I attended California State University Los Angeles, to pursue my Master's

degree in Counseling and a credential in School Psychology.

***Alpha:* Did you enjoy school?**

Seble: I enjoyed my master's program since it was much focused. I was able to concentrate specifically in a program that I was very much interested in; which was working in a field which combined psychology and education related to helping children learn.

***Alpha:* Are you still friends with anyone from that time in your life?**

Seble: As part of my graduate education, I had a cohort whom I went through the program with. I still see and collaborate with some of my classmates. I am also very much involve in my professional organization, The California Association of School Psychologist, which keeps me informed as to new legislation, advocating for our profession and provides continuing education.

***Alpha:* What are your best memories of grade school/high / College & graduate school?**

***Seble*:** The best memories I have throughout my educational experience is the fact that I still have close friends whom I still communicate with. The support we gave each other throughout our education endeavor has helped us become successful professionals.

Some of the professions my friends have pursued and have become very efficacious in ranging from optometrist to teacher to sigh language interpreters to clinical psychologist and lawyer to name a few

***Alpha:* How did you hear about AEEM?**

Seble: I have been involved in AEEM as a contributing editor since its inception. I believed in Yosief's, one of the creators of AEEM, goals in helping others become more aware of their profession since it is such a huge field. I recognize AEEM as a way of informing, educating, making others aware of job opening as well as other possibilities and opportunities available. Since I have been involved, I have read and edited articles from many amazing professionals from around the world. It has been a pleasure and I look forward in continuing to assist AEEM to be most successful and continue to cultivate in it endeavors.

***Alpha:* How many articles in a magazine have you edited?**

Seble: I have been editing articles since its inception, and I would say at least two articles per publication.

***Alpha:* What is your impression of the engineer's articles you have edited so far?**

Seble: I have been very impressed with each of the articles that I have read and edited and I look

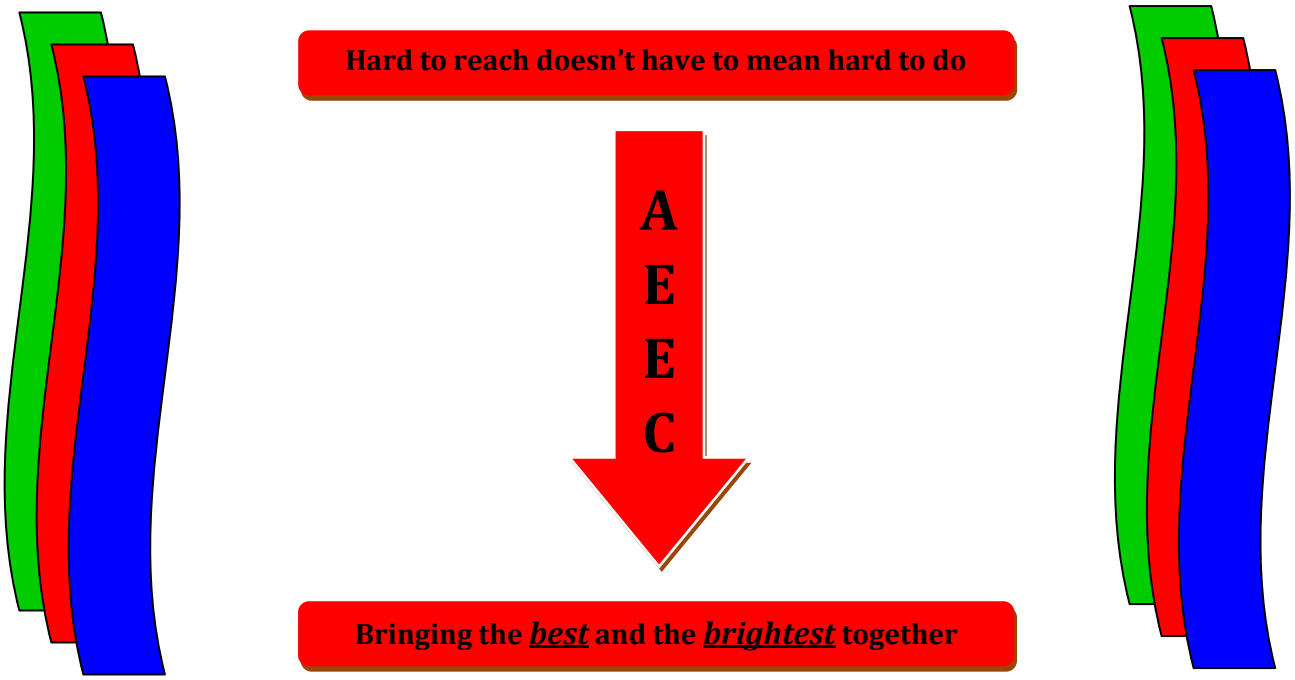
forward to reading more.

***Alpha:* Would you tell us the importance of AEEM magazine since you have been an active participant?**

Seble: AEEM is a great way of reaching out to all engineers and to keep them abreast of what is happening in the field. It informs, educates, provides listing of job opportunity and other opportunities that may be available. This magazine specifically focuses in informing and allowing engineers to share their professional expertise. I am very proud to have the opportunity to participate and contribute to AEEM. Finally, I want to conclude by quoting Henry Ford "***Coming together is a beginning; keeping together is progress; Working together is success"*** and I believe AEEM stands for this.

"We may not be able to prepare the future for our children, but we can at least prepare our children for the future."

– **Franklin D. Roosevelt**



Comments & Suggestions Page

I commend your tireless dedication and truly appreciate the role you are playing in making the Alpha Eritrean Engineers an ongoing success. Thank you for staying on top!!

Filipos Abraham, Software engineer/ Designer

Few months ago, a good friend of mine showed me one of your magazine and being inspired that's where I decided to join your group.

Yonatan H Fessehaye, Jr. Network Administrator

This is, I believe, the second issue of your publication I have read. It is outstanding presentation and contents. It is very informative and educational. I want to congratulate all of those involved; I believe this magazine is the brain child of the emerging young Eritrean engineers who are trying to excel in the different fields of engineering. I commend all of those who had a vision to start such a noble publication.

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ALPHA ERITREAN ENGINEERS

Soil Compaction and Stabilization

An ideal site for residential buildings, commercial buildings, paving, airports, and other infrastructures would have a suitable soil subgrade on which we can build. Suitable characteristics of the subgrade would be adequate shear strength, good bearing capacity, undergo minimum change due to water infiltration, and its ability to retain its strength with time after construction.

In the Houston area, the soil property is usually improved by compaction or stabilization and sometimes by both. These improvements increase the strength, reduce compressibility, and also reduce permeability of the soil. Of the two methods, compaction is the least expensive method. Compaction method is used to densify in-situ soil materials. The second method, stabilization, introduces chemical agents into the soil. Some of the stabilizing agents used are lime, fly-ash, cement, and a combination of these. The agent used to stabilize the soil is determined primarily by the type of soil.

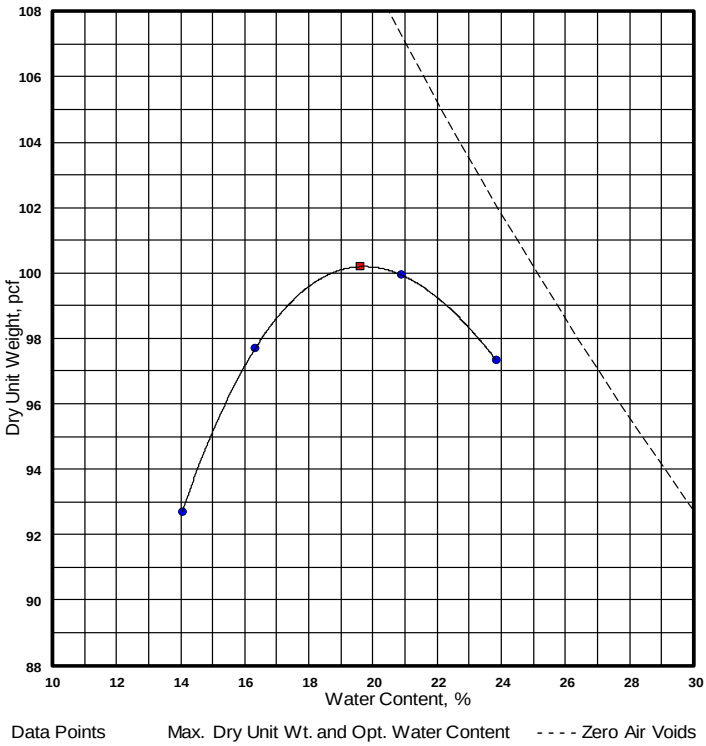
Compaction of soil

Soils are generally classified as fine grained/cohesive soils such as clay, or coarse grained/cohesionless soils such as sand. An important characteristic of cohesive soils is that compaction improves their shear strength and compressibility properties. Such characteristics follow the principles stated by R.R. Proctor in 1933. The most recognizable development of his theory was a test now known as the "Standard Proctor," and the "Modified Proctor" which are laboratory tests used to estimate the maximum dry density and its optimum moisture content required to attain that maximum density of the soil, at a constant volume.

The Standard Proctor test, which meets the requirements of ASTM D-698 Method A is performed in a 1/30-cubic-foot cylindrical mold using three layers. Each layer is compacted by 25 blows of a 5.5-pound hammer dropped 12 inches, which subjects the soil sample to a 12,375 foot-pounds per cubic foot of energy. The Modified Proctor meets the requirements of ASTM D-1557 Method A. It may be compacted in the 1/30-cubic-foot mold, using five layers; however, each layer is compacted by 25 blows of a 10-pound hammer dropped 18 inches, exerting 56,520 foot-pounds per cubic foot.

For both the Standard and Modified proctors, when all the layers are compacted, the soil in the mold is weighted and the water content measured. This is repeated several times for the same soil but at different moisture contents. The test results are then plotted on a unit weight vs water content curve.

(Fig. 1)



(Figure 1-Proctor Curve)

- **Relative Compaction (Density) of in-place soils**

The result of a proctor test is then used to determine the relative density at the construction site. Typically, field compaction test results are expected to achieve 95 % to 98% of the lab proctor tests to ensure structural strength acceptance. So if the target is 95% relative compaction, meaning the field result should be 95% of the maximum dry density attained in the lab. The most common equipment used for relative compaction test is the nuclear density gauge. (Fig. 2)

Chemical Stabilization

Soil stabilization involves the use of stabilizing agents (binder materials) in weak and friable soils to improve the geotechnical properties of the soil, such as compressibility, strength, permeability and durability. Most of stabilization has to be undertaken in soft or weak soils (silt, clayey peat or organic soils) in order to achieve desirable engineering properties.

The commonly used binders for soil stabilization are:

- Lima
- Fly Ash, and
- Cement

- **Lime**

Lime provides an economical way of stabilizing soil.

Lime modification increases the strength of the soil by cation exchange capacity rather than cementing effect brought by pozzolanic reaction. In soil modification, clay particles flocculates transforms natural plate like clay particles into needle like interlocking metal like structures.

During stabilization clay soils turn drier and less susceptible to water content changes. However, when lime is mixed with wet soils, it immediately takes up to 32% of its own weight in water from the surrounding soil to form hydrated lime; the generated heat accompanied by this reaction will further cause loss of water. This in turn results in increased plastic limit of soil and reduction in Plasticity Index (PI). Thus it is very important to introduce ample water not only for hydration process but also for efficient soil compaction.

- **Fly Ash**

Fly-Ash is defined in Cement and Concrete Terminology (ACI Committee 116) as "the finely divided residue resulting from the combustion of ground or powdered coal, which is transported from the firebox through the boiler by flue gases." Fly-Ash is a by-product of coal-fired electric generating plants.

Two classifications of fly-Ash are produced, according to the type of coal used. Anthracite and bituminous coal produces fly-Ash classified as Class F and Class C fly-Ash is produced by burning lignite or sub-bituminous coal.

Fly ash has little cementitious properties compared to lime and cement. Most of the fly Ashes belong to secondary binders; these binders cannot produce the desired effect on their own. However, in the presence of a small amount of activator, it can react chemically to form cementitious compound that contributes to improve the strength of soft soil.

(**Figure 3-Lime Placement)**

Pulverization and mixing (Fig.4) is used to thoroughly combine the lime and or fly ash with the soil. For heavy clays, preliminary mixing may be followed by 24 to 48 hours (or more) of moist curing, followed by final mixing.

(***Figure 4-Pulverization and mixing)***

Field gradation tests are done to check if the pulverization and mixing are up to the design specifications.

- **Cement**

Cement is one of the oldest binding agents still in use today. It is also the more expensive than lime and fly-Ash. Cement can stabilize all soil types, from gravelly and sandy to fine-grained silts and clays. Generally, cement is used in more granular materials because it pulverizes and mixes readily, and requires the least amount of cement. Cement may be considered as primary stabilizing agent or hydraulic binder because it can be used alone to bring about the stabilizing action. Cement reaction is not dependent on soil minerals, and the key role is its reaction with water (hydration) that is usually available in soil. This can be the reason why cement is used to stabilize a wide range of soils.

Hydration process is a process under which cement reaction takes place. The process starts when cement is mixed with water and other components for a desired application resulting into hardening phenomena. The hardening of cement will enclose soil as glue, but it will not change the structure of soil. Hydration process can be affected by water-cement ratio and the presence of impurities such as organics (roots, grass, etc.)

Numerous types of cement are available in the market; these are ordinary Portland cement, blast furnace cement, sulfate resistant cement and high alumina cement. Usually the choice of cement for stabilization depends on type of soil to be treated, and the desired final subgrade strength.

Compaction and stabilization of soil and tremendous value to the longevity of the structure and is generally recommended. However, soils vary throughout the world, and the engineering properties of soils are equally varied. The key to successful soil stabilization is soil laboratory and field testing, and a good quality control and quality assurance program. The method of soil stabilization selected should be verified in the laboratory before construction and preferably before specifying or ordering materials. As with all engineering designs, geotechnical engineers are responsible for selecting or specifying the correct stabilizing method, technique, and quantity of material required.

~ Engineer Haddis Tewolde

Simple facts

- ***The Eritrean Cycling National team of both man and women*** **ranked first at the African Cycling Championship. Men Cycling Team won the African Championship in the 9th continental competition in Sharm Al-Sheikh, Egypt, which constitutes its 4th consecutive achievement. (**allafrica.com**)**
- **An early form of circuit breaker was described by *Thomas Edison* in an 1879 patent application. (**Wikipedia**)**

Transportation of choice!

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Asmara, a shining city with its bright transportation will never lose its luster.

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Circuit breakers, current-sensing protective devices

On Sunday the 6th of October 2013, I had a great pleasure been part of Zaid Teame's, my favorite niece, extraordinary wedding in the ever delightfully shining quintessential city of Asmara, Eritrea in East Africa. What made this event extraordinary besides of my dear siblings and members of extended family was the presence of two remarkable individuals who are pillars of strength to our family named **Mr. Woldemariam** and **Ms. Nighsti G/Rufael** whom I am proud to call my parents with revered. I felt lucky growing up with my siblings in a world where young people were starving for encouragement and hope my parents been the primary source of our empowerment. Constant encouragement and relentless guidance streamed from them helped me exam the love of higher education in Asmara University. After migrated to America I continued my education by fulfill my parents and my own dreams of acquiring two associate degrees, one in Mathematics and the other in general science before graduating in electrical engineering from San Francisco State University. In retrospect, my parents wish for my safety from harm's way was always their priority and the protection they provided me was impeccable.

The value of Safety and protection is immeasurable whether it is provided to humans, animal or equipments. In this modern world we live in, we see a great deal of safety and protection given to technological devices which are near and dear to us in our everyday life.

Every technology driven devices we invent and/or modify requires some sort of electrical power to properly function. This electrical power is conceptually simple. It is no more than a device that has a voltage across it and a current flowing through it. This electric power is paramount for many uses, from simple house hold equipments like refrigerator, microwave, toaster and dishwasher up to industrial level equipments like CAT (computerized axial tomography) or MRI (Magnetic Resonance Imaging) scanners. Not to mention lighting, computer operation, and entertainment applications. It comes to house hold or industrial equipments through power distribution systems.

Current-sensing protective devices, amongst others, called circuit breakers play an important role in detecting abnormal Overcurrent and halt flow of current to protect equipment, property and personnel.

Protect equipment:

Electric power comes to house hold or industrial equipments through power distribution systems. The function of the electrical power distribution systems in a building or an installation site is to receive

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power at one or more supply points and to deliver it to the individual electrically operated devices

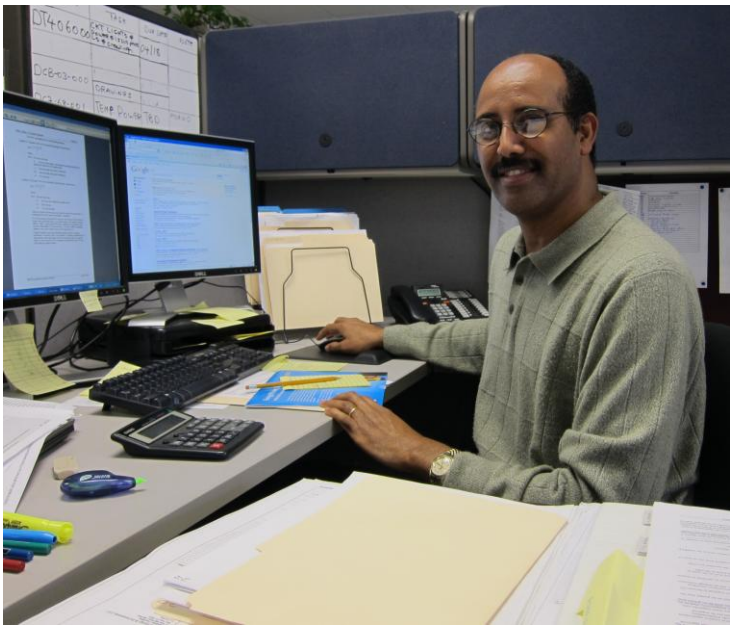
(equipments) which require some sort of protection from excessive current than they require. This power comes as a form of voltage and current. However, more than what is a needed current (Overcurrent) can flow through a device and damage it. During flow of current to devices that Overcurrent protection called circuit breaker need to protect device or devices.

A circuit breaker is an absolutely essential device in the modern world, and one of the most important safety mechanisms in our homes. It is an automatic electrical device used in an electrical panel that monitors and controls the amount of amperes (amps) being sent through the electrical wiring as safety measure. Circuit breakers come in a variety of sizes. For instance, in the typical home , 10, 15 and 20 amperage breakers are used for most power and lighting needs. Some appliances and specialty items (washers, dryers, freezers, whirlpools, etc.) will require a larger circuit breaker to handle the electrical load required to run that appliance. There are also industrial level circuit breakers which are categorized by voltage level.

If there is too much current flowing through electrical wiring, the breaker will trip. These simple automatic machines cut the power until somebody can fix the problem. In a laymen term, a breaker that was in the "on" position will flip to the "off" position and shut down the electrical power leading from that breaker. Essentially, a circuit breaker is a safety device. When a circuit breaker is tripped, it does prevent a fire from starting on an overloaded circuit and it can also prevent the destruction of equipment that is drawing the electricity.

Protect property:

A circuit breaker's function is to cut off the circuit whenever current purportedly going through jumps above a safe level which in turn protects electrical overload. Without it, as overload or short circuit happen, electrical wire may turn into a red hot wire then burn down anything near the wires. Without circuit breakers household electricity would be impractical because of the potential for fires and other mayhem resulting from simple wiring problems and equipment failures.



There are plenty of electrical fires as a result of frayed wires, loose electrical connections, faulty switches and outlets and other common sources. It is not uncommon to read million dollars worth of

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property damage resulting from these types of electrical equipment failures. It is estimates that over 50 percent of fires are caused by low level arcing faults in typical household wiring. Low level arcing can generate enough heat and sparks to produce ignition of nearby flammable materials and cause major damage in the form of electrical fires. The heat and sparks created by arcing can cause a home to be completely destroyed by fire.

There are circuit protection device which is designed to detect and mitigate the effects of low level arcing before it can become a source of ignition of nearby combustible materials. This product is called an Arc Fault Circuit Interrupter or AFCI. Every major manufacturer of circuit protection devices makes and sells this product today. This protective device can not only detect hazardous electrical arcing, but also will shut the flow of electricity off to the location and prevent the nearby combustible material from fire ignition that would normally follow an undetected arcing.

Protect personnel:

The Arc Fault Circuit Interrupter and Ground Fault Circuit Interrupter (AFCI) are two products serve similar, yet completely different functions. The GFCI is designed to protect people from severe or fatal shock hazards, while the AFCI, as previously stated, protects property against fires caused by electrical arcing faults. The GFCI can also protect against some electrical fires by detecting arcing and other faults between the line or neutral wires and ground. The GFCI cannot detect the hazardous series or parallel arcing faults, which can cause fires.

A ground fault is an unintentional electrical path diverting current to ground. A ground fault occurs when current escapes outside the normal flow within the circuit, usually flowing outside the circuit to ground. If a person's body happens to provide that pathway for the current flow, the person could be injured, burned, severely shocked or electrocuted.

The GFCI is designed to interrupt the circuit by opening the circuit breaker contacts when current of more than 4 milliamps is detected as missing out of the circuit. This value of current is less than the lethal dose of electricity for a human body and furthermore the skin can absorb this level of current without electrical injury or burns. It should be noted that manufacturers of the AFCI are incorporating the GFCI functions within the same circuit breaker package, making safety a very real issue, for both homeowner and property.

Conclusion:

It is very unfortunate that there will be devices (equipments), property damage and even loss of life as a result of low level arc faults and absence of breakers. There are, however, devices available to the average consumer that are easily installed by a licensed electrician, which can and will minimize equipments and properties damage due to electrical arcing. GFCI & AFCI's can be easily installed in present circuit breaker panel and will provide instant protection against any electrical fires damage to equipment, people and property resulting from low level arcing. Circuit breaker should be used specially AFCI and GFCI since they are here to protect property and lives.

~ Engineer Yosief Woldemariam

Reference:

Power distribution systems system design, EATON, august 2013

http://electronics.howstuffworks.com/circuit-breaker.htm

http://www.mikeholt.com/

www.controleng.com/single-article/circuit-breaker

www.eaton.com

Golden Gate Bridge was when it was opened in 1937 and still is an engineering marvel

……. Sense of humor from engineer's prospective

WOMAN ENGINEER V MANAGER

A man in a hot air balloon realized he was lost. He reduced altitude and spotted a woman below. He descended a bit more and shouted,
"Excuse me, can you help me? I promised a friend I would meet him an hour ago, but I don't know where I am."
The woman below replied,
"You're in a hot air balloon hovering approximately 30 feet above the ground. You're between 40 and 41 degrees north latitude and between 59 and 60 degrees west longitude."
"You must be an engineer," said the balloonist.
"I am," replied the woman, "How did you know?"
"Well," answered the balloonist, "everything you told me is technically correct, but I've no idea what to make of your information, and the fact is I'm still lost. Frankly, you've not been much help at all. If anything, you've delayed my trip."
The woman below responded, "You must be in Management."
"I am," replied the balloonist, "but how did you know?"
"Well," said the woman, "you don't know where you are or where you're going. You have risen to where you are due to a large quantity of hot air. You made a promise, which you've no idea how to keep, and you expect people beneath you to solve your problems. The fact is you are in exactly the same position you were in before we met, but now, somehow, it's my fault."

www.microwavesoftware.com

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Current Job Opportunities

Companies or Government Jobs	Location & Number	Closing Date
Electrical Engineering		
http://jobs-boeing.com/huntington-beach/electrical-engineering/jobid4962906-program-lead-electrical-engineer-5_6-jobs	**Program Lead Electrical Engineer 5\6, 14-1003184, Huntington Beach, CA**	**March 05, 2014**
http://jobs-boeing.com/los-angeles/electrical-engineering/jobid4956144-electronics-packaging-design-engineer-1_2-jobs	**Electronics Packaging Design Engineer 1\2, 14-1003107, El Segundo, CA**	**February 25, 2014**
http://jobs-boeing.com/huntington-beach/electrical-engineering/jobid4952110-design-and-analysis-engineer-1_2-jobs	**Design and Analysis Engineer 1\2, 14-1003118, Huntington Beach, CA**	**February 25, 2014**
Flight Engineering		
http://jobs-boeing.com/los-angeles/flight-engineering/jobid4945640-guidance-navigation-%EF%B9%A0-control-engineer-1_2-jobs	**Guidance Navigation & Control Engineer 1\2, 14-1002671, El Segundo, CA**	**May 12, 2014**
http://jobs-boeing.com/huntington-beach/flight-engineering/jobid4942407-guidance-navigation-%EF%B9%A0-control-engineer-1-jobs	**Guidance Navigation & Control Engineer 1, 14-1002843, Huntington Beach, CA**	**February 28, 2014**
http://jobs-boeing.com/los-angeles/flight-engineering/jobid4689581-guidance-navigation-%EF%B9%A0-control-engineer-1_2-jobs	**Guidance Navigation & Control Engineer 1\2**, 13-1022979, El Segundo, CA	**March 20, 2014**
Mechanical Engineer		
http://jobs-boeing.com/huntsville/mechanical-and-structural-engineering/jobid4968863-technical-drafter-1_2-jobs	**Technical Drafter 1\2, 14-1001085, Huntsville, AL**	**March 13, 2014**
http://jobs-boeing.com/st-louis/mechanical-and-structural-engineering/jobid4962917-structural-%EF%B9%A0-payload-design-engineer-1-jobs	**Structural & Payload Design Engineer 1, 14-1003106, Saint Louis, MO**	**May 17, 2014**
http://jobs-boeing.com/huntsville/mechanical-and-structural-engineering/jobid4968860-tech-drafter-jobs	**Tech Drafter, 14-1001854, Huntsville, AL**	**March , 13, 2014**
Information Technology		
http://jobs-boeing.com/north-charleston/information-technology/jobid4962908-it-process-analyst-1_2-jobs	**IT Process Analyst 1\2, 14-1003212, North Charleston, SC**	**March 12, 2014**
http://jobs-boeing.com/washington/information-technology/jobid4963142-it-programmer-analyst_developer-1_2-jobs	**IT Programmer Analyst\Developer 1\2, 14-1003018, Renton, WA**	**March 05, 2014**

The authors

Seble Gebremedhin
seble.bg@gmail.com received her BS in Psychology from University of California Irvine, and MS in in Counseling and a credential in School Psychology from California State University Los Angeles. Currently Seble is practicing School Psychologist in a public school setting.

Haddis Tewolde *htewolde@all-terra.com* received his Architectural Engineering From Tubman University, Harper Liberia & Civil Engineering from University of Houston. Currently he is president of All-Terra Engineering, Inc

Yosief Woldemariam
meharigrw@yahoo.com earned his B.S. in Electrical Engineering from San Francisco State University. Currently he is working with Syska Hennessy Group, consulting firm as designer.

If you need an updated information, discussions or got an Engineering experiences that you want share your knowledge or ideas with your fellow professionals.

You will find us on www.linkedin.com/groups/Alpha-Eritrean-Engineers-Community

ALPHA ERITREAN ENGINEERS COMMUNITY

When we get too caught up in the busyness of the world, we lose connection with one another and ourselves. Never lose sight that we are better when connected.