Rules-To-Remember

Engineering Rules-To-Remember

#1-Do I Speak "Engineering" or "Klingon"? (As If There is a Difference)

You will generally be in 1 of 2 distinct worlds, the "Textbook, Academic or **Calculator World**" or the "Business, Social or **People World**". Know the difference and talk/act accordingly.

#2-All the World's a Stage - So Don't Get Heckled by the Clients Paying You

When you are working in the "People World", you are making "some kind of a presentation" even if it is just presenting your own ability to function in the People World. Do your presentation professionally and when necessary communicate in a manner to better reach the critical audience members.

#3- I Promise to Make All My Employees FILTHY RICH

Not all words have the same meaning to everyone. In critical conversations, be cautious of "Relative" words like hot, cold, fast, slow, cheap, expensive, light, heavy etc. There is **NO** definition of these words that is applicable to their use in a critical conversation. "Don't let this get hot" is not the same as "Don't let this get above 112 degrees".

#4- 911 Told Me to Make Sure the Accident Victim Was Dead-So I Shot Them

Many words have multiple meanings or do not have the same meaning to everyone. In critical conversations, be cautious of words like this. When you say something using these words, you get 100% positive head nods of understanding, but in fact the people may have all used different versions of the word. "Make sure you **tie** the beams down to the top of the columns". One person connects it with bolts while another one uses a rope. Incidentally, the person who used the rope looks at the one who used the bolts and says "What an idiot, they don't know what tie means."

#5-Never Say Never

Be cautious of "all-inclusive" words like "all, none, never, always, etc." If you use words like this, you need to be sure they are applicable. If you are listening to someone who is using words like this, be cautious and confirm critical points. There is a big difference in the statements "All load bearing walls are perpendicular to the floor joist" and "Most load bearing walls are perpendicular to the floor joists". The first one is totally inaccurate while the 2nd one is better but still misleading. "Most load bearing walls I have ever looked at were perpendicular to the floor joists" is a more accurate statement. Also, if the joists were 45 degrees to the wall it would not be load bearing? People like easy rules to remember but there are consequences at times. Your careless wording can lead to serious consequences. When listening to someone using these words, before you "form a solid but critical opinion" based on those words, confirm they were used properly. (**This would include your Mentor or Associates you have asked something.**)

#6-A Picture is Worth a 1,000 Words and 3 Lawsuits

Learn to communicate both verbally and visually. Some people are more visual than verbal and vice versa. Sketches, drawings and other visual presentations will sometime trigger new ideas that verbal would not. Additionally, engineering designs are better communicated visually during construction.

#7-Preach to the Choir But in the Manner They Listen and Learn

Not everyone communicates the same in all aspects of communication. Most of us believe our communication style is correct or we would not use it. In reality, given an audience of 100 randomly chosen people, you would be a great communicator if you could do your presentation the way 25% of the audience communicated. This is called "reaching an audience". Start practicing now on different ways of "reaching the audience". This is not verbal versus visual. It is more far more complex than that. People take in information differently and they mentally process the information differently. To make it even more difficult to "reach" someone, they make decisions differently. **You need to invest time in learning to communicate effectively.**

#8-Company Motto-"We Are No Worse Than Our Competition"

The standard of care for your professional can vary from place to place. Besides learning and practicing a reasonable degree of care, you need to make sure you provide services on par or better than provided by other local firms.

#9-Software Can Help You Make Mistakes More Efficiently and to the 7th Decimal Place

You are ultimately responsible for your design, not the software you used. You need to have enough experience and knowledge that you can more easily recognize possible software output that does not appear correct. Most of time it will be input errors by you, but not all of them.

#10-If It Can't Be Built-<u>YOU</u> Haven't Designed It

While an engineering design may appear efficient, it must also be constructible. Designing something that cannot be built without extraordinary effort/cost is not practical and is viewed as inexperience combined with lack of knowledge. Mentally go through the construction of your wondrous design in case it is actually a unicorn.

#11-Make Sure You "Hire Yourself" a Good Employer

Taking a position at a company (especially your first one) is a 2-way street. Both parties need something from the other. No one is hiring a recent college graduate because they just want to. The need some help and do not think they need the cost and experience of a seasoned engineer. You need to really think about what you need. All of you need much more from an employer than just an income. They are the ones who are going to mentor you and provide the specialized training you did not get in college. (Sorry folks but college gave you about 20% of what you will ultimately need. It is a critical and mandatory 20% that you must have to attain the other 80%.) **You had better interview and research them more closely than they are doing you.** How good are their Engineers? Do they specialize in something you actually want to specialize in? Do they even have a Registered Engineer in the field you are interested in (some don't). Is their idea of training letting you put in a lot of hours learning what college did not teach you? And I could go on for hours.

Structural Engineering Rules-To-Remember

#1- Structural Integrity is Non-Negotiable (Nothing Humorous About This)

You should/will never compromise structural integrity of your PROPERLY designed structure to allow more money for other features even if those features are necessary. This will be a constant topic your entire career.

#2-That is the 3rd Surgery Patient I Have Lost Today BUT IT IS ALL THEIR FAULT-
Those 3 Should Have Paid for Me to Go to Better Medical School

Only Work in an Area That You and/or Your Mentor are Qualified to Work In. You will probably never learn everything there is to know about every aspect of this profession. Making a career out of poor performance designs is not good for the Structural Engineering field as a whole. Besides the potential for structural collapse, poor performance by a Structural Engineer can cause a Client to spend more money than needed overall OR spend it in areas that were not needed at all (Example: When in doubt, make it stout). When a Structural Engineer knows they are performing poorly in an area they should either quit working in that area or adequately improve their skills in that area.

#3-It Works GREAT IF We Assume a Cow is a Hollow Sphere of Finite Dimensions

Regardless of how you designed something, a completed structure behaves based on **ALL** the installed components, how they are connected to each other, the geotechnical properties of the supports, the forces it is subjected to and physics. Your "design intent" or "design concept" is not a factor **at all**.

#4- There Are 3 Kinds of People - Those That Can Count and Those That Can't

All structural designs have 3 phases: design loads, structural analysis and material code check. It is up to you to learn the limitations of all 3 phases because the limitations do exist.

#5- $F = ma$ & $E = mc^2$ What is Mc2? Oh Yeah-A #2 Combo at McDonalds.

Weights are forces but all forces are not weights. The term "Weight" is generally associated with something that has mass such as a steel beam or a person. Wind is an example of Force that is not a weight. The terms Weight and Force are generally used interchangeably but it is best to know the difference. Force and weight have the same units (pounds, pounds per square foot etc.). You are generally capable of seeing a weight but some forces you cannot see at all. Weights and Forces are also called **Loads**.

#6- I AM Going to Pay You Back the $100 I Borrowed From You by Taking Five $20 Bills Out of Your Wallet and Placing Them in Mine

All Forces have a Magnitude **AND** a Direction. Examples are 100 lbs up or 14 psf to the left. "The wall can hold a 1,000 pounds" is not the same as "The wall can hold a 1,000 pounds straight down only". In addition to these 2 values, the application point of Force onto a structural component can drastically affect how the component reacts to the Applied Force.

#7- Leg Bone's Connected to the Thigh Bone

The route that the effects of a Force take from its point of application to the supports is called a "**Load Path**". Your ability to visually trace a load path is key to a successful career. Many of your classical structural analysis methods will aid you in learning this valuable concept <u>if you let them</u>. Sophisticated structural software can assist in learning this concept but **ONLY** if you apply only 1 force at a time to your structural model and then review the member forces and support reactions. The limitation of 1 load means it would have to be done with no Dead Load for this to work. In short, it is better to learn Load Paths the old fashioned way.

#8-It is Not Whether You Will Stand By Your Design, it is Will You Stand <u>UNDER</u> It.

Investigation Rules-To-Remember

#1-I Know I Am Irritable, Opinionated, Rude and Stink, but Which One Do People Dislike?

Anytime there is more than one possibility of what caused something, there is also **ANY** combination of those same possibilities.

#2-See Investigation Rules-To-Remember #1

It is far more difficult to determine what happened when it is a combination of causes and not a single cause.

#3- Sherlock, I Astutely Noticed That I Didn't Notice Anything

Sometimes it is just as important that you know what evidence **is not** present as it is to know what evidence **is** present.

#4- I Could Not Be Condescending to You-I Don't Know What Condescending Means

Evidence that is not present is in fact evidence.

#5-Holmes-The Butler MUST Have Done It. They Don't Have a Maid or Chauffer to Blame

Ensuring evidence **reasonably** matches theory is key to establishing the cause of something.

#6-I Would Have Noticed That I Didn't Notice That

People rarely look at their property (house, building, land, vehicles etc.) as closely when they buy it or live/work in it than they do when they think new problems or issues have occurred. When they do look **CLOSELY** for the first time, it is logical to them that everything they find is a new occurrence. Regardless of how sure they are, keep an open mind and apply Investigation Rule #5. While they are not lying, they could **easily** be incorrect.

#7- Get Out of Here Because You REALLY Suck at Jenga & Pick-Up-Sticks

Every collection of physical things is a structural system of some kind. Even a totally collapsed building became a new structural system when it ceased moving. Don't go tinkering with components unless you know what you are doing. This new structural system can collapse again if the forces change (i.e. a new gust of wind, a drizzling rain or your weight with $2.97 in change in your pockets) or you remove a single "innocent" component such as cutting a tightly pulled electrical wire since it was never designed to be a structural component. All structural systems are constantly seeking a new way to fail.

#8- I have Déjà vu and Alzheimer's Simultaneously-It Seems I Have Forgot This Before

Learning to "Look in Detail" is something you achieve over time and with practice. Start practicing this now. Looking in detail is mentally noting smaller details of what you see as compared to just the Big Picture. Two people look at the same building frame for the same brief amount of time. One person saw a steel frame that had two columns and a rafter. The other person saw a steel, non-prismatic frame that had two pin-based columns with a 3-piece rafter that used a vertical splice at the columns. As you learn and practice more, your **brain-to-senses** communication reminds you what to note the detail of. The more you practice, the more information you could have noted in the same length of time. You now see a rusty steel, non-prismatic frame that had two 4-bolt pin-based columns that were about 12" at the base with a 3-piece rafter that used a vertical splice at the web-stiffened columns.