GENERAL CONTROL
BUFFALO
Mr. A. G. Schmitt

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Five Star Signal

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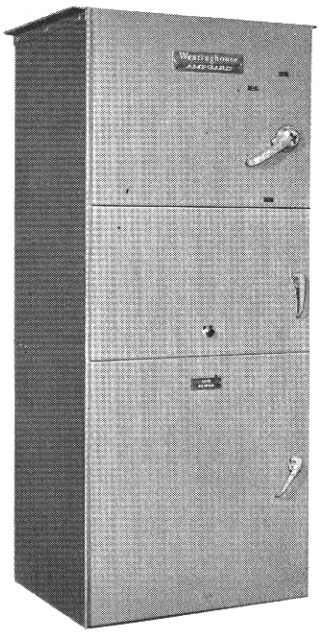
STANDARDIZE? or *OPTIMIZE* ?

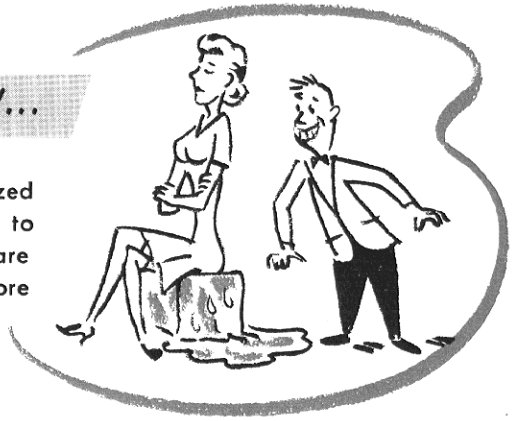


AMI Design
400 Amps, 5000 Volt

This was the fundamental decision we had to make early in 1960 in our Medium Voltage Starter product planning:

Play it Cool...

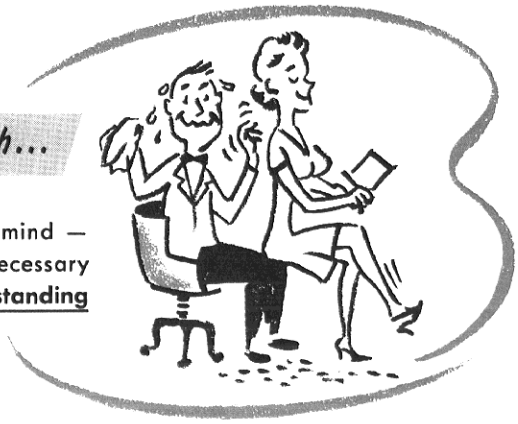
Stay with the historical standardized approach — build one design to cover all ratings — components are bigger — heavier and "Look" more rugged.

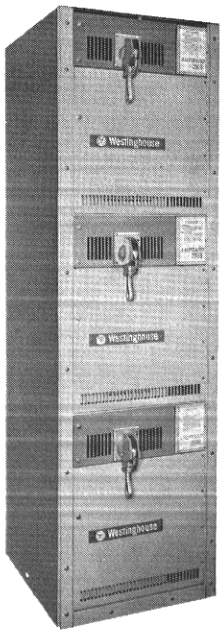


OR

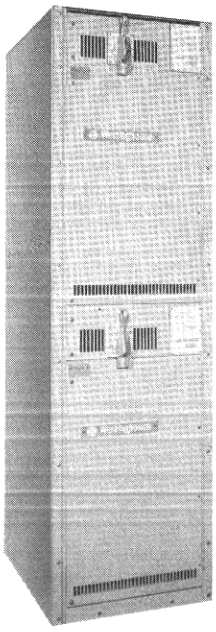
Start from Scratch...

Design with the customer in mind — design a line of starters if necessary — but optimize for **outstanding customer benefits.**





Ampgard 2500
200 Amps, 2300 Volt



Ampgard 5000
200 Amps, 4160 Volt

As you know we decided on the "Optimized Design" approach, but there's more to the story.

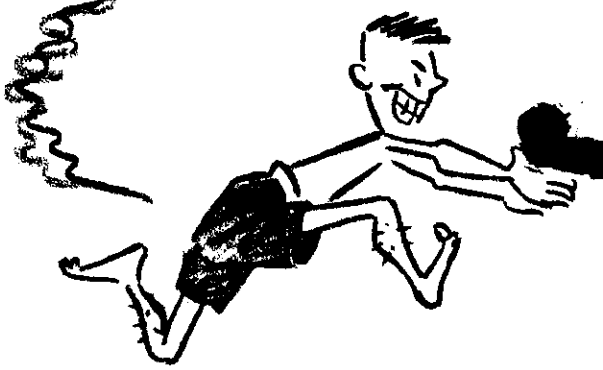
Now, with hundreds of Ampgard 2500 and Ampgard 5000 starters in service on all sorts of the roughest applications, their truly outstanding performance is a matter of actual record. We call them "Optimized Designs" because they provide the optimum in customer benefits and advantages. They are full Nema rated designs, and our published information explains their safety, reliability, installation, maintenance, economy and operational features. No need to go into these again here.

NOW...

"EXTRA" unusable capacity . . . .

1 We don't provide 400 amp contactors!

200 amp contactors meet Nema standards and are entirely adequate for the ratings of these designs, (700 Hp, 2300 volt and 1250 Hp, 4160 volts). For purpose of standardization, competition offers only one contactor design rated 400 amp, from the smallest to the largest HP ratings. Customer disadvantages of this unused capacity are:



OR . . . . . .

- contactors are much larger so the enclosure must be larger — more installation space

- contactors are much heavier — too heavy to lift manually, so they put them on wheels to move them — inconvenient and more costly to install and maintain.

- contactor armature has much more mass — more shock must be absorbed in opening and closing — more wear on bearings and moving parts which means shorter life.

What Doesn't - Ampgard 2500 and 5000 give our customers . . . . and why?

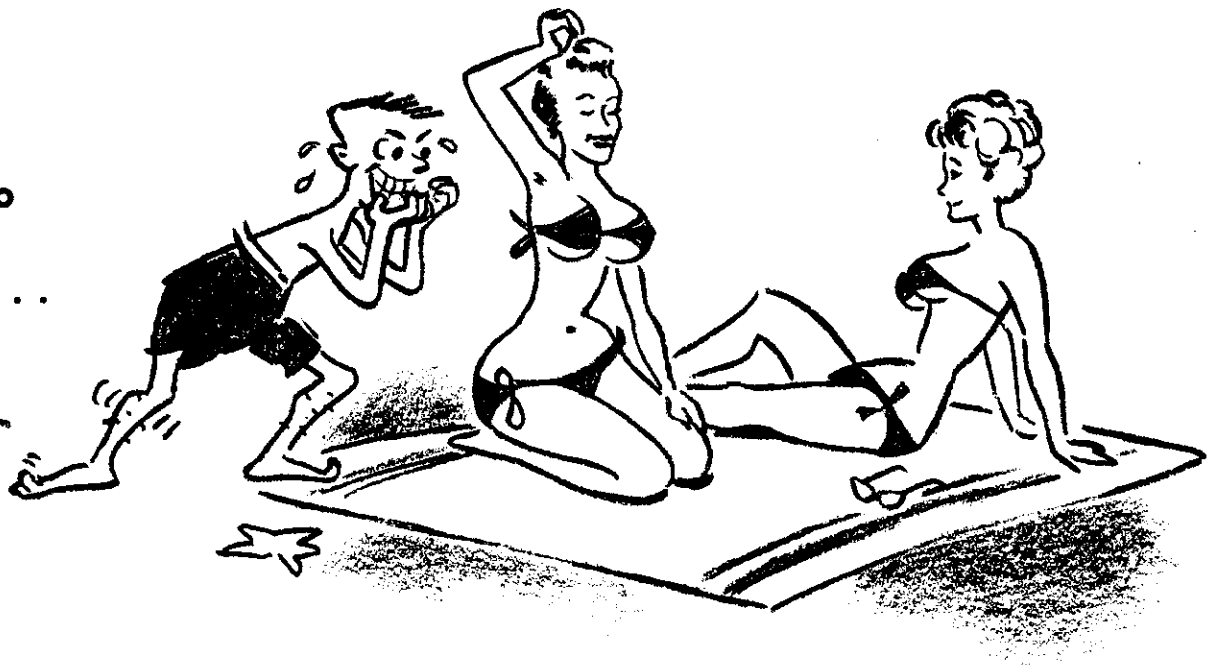
❷ We don't provide 60,000 volts Basic Impulse Level (B.I.L.)!

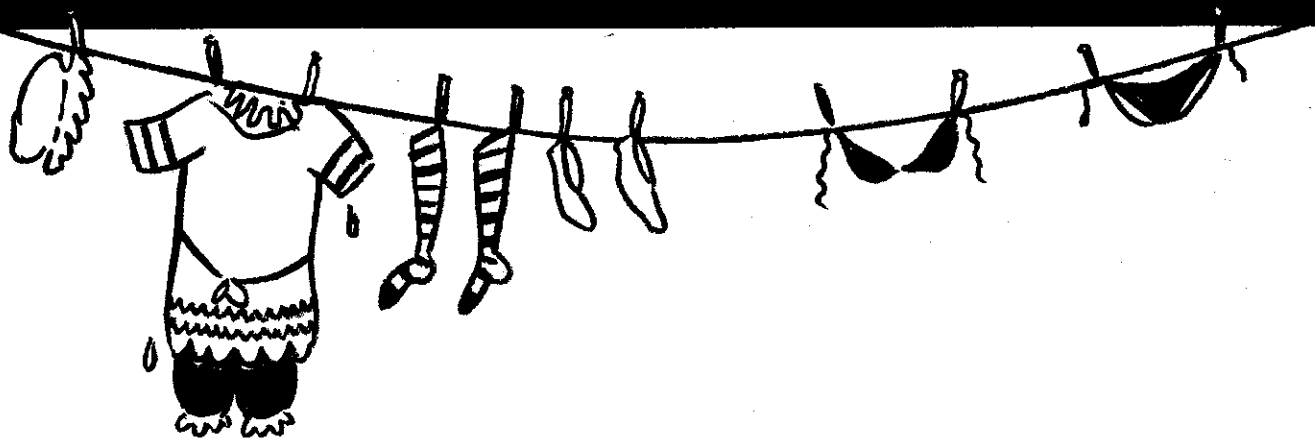
Nema standards call for a BIL rating of 45,000 volts for 2500 volt starters and show only a "Suggested Standard for Future Use" of 60,000 volts for 4000 to 4600 volt starters. Competition provides 60,000 volts BIL only as a by-product of their basically larger design. Designing to this as a specific requirement would mean a ridiculous sacrifice in extra weight, larger size and even more important would result in considerably shorter life. The BIL rating is intended to offer protection against surges caused by switching or line faults. The BIL is never intended as protection against lightning surges — this is a job for lightning arresters.

Studies indicate that switching and line fault surges seldom, if ever exceed six (6) times normal line voltage and only 5% ever exceed five (5) times. Our 45,000 volt BIL provides a healthy margin of safety, even at ten (10) times on a 4160 volts system — which just doesn't occur. Assure your customers that our BIL rating of 45,000 volts is entirely adequate and more than commensurate with the BIL ratings of other associated apparatus. For example, dry type distribution transformers have a BIL of only 25,000 volts and motors are estimated to be normally about 16,500 volts.

After this, if there's still any doubt in your customer's mind, you can point out that there was no such thing as a BIL rating for a medium voltage Control until the late 1950's and that probably most of the starters in service today would not test at even close to 45,000 volts BIL.

Designed to cover the essentials . . .





❸ We don't provide 50,000 KVA interrupting capacity in our bare contactor!

Nema has two (2) major classifications of medium voltage starters:

E_1 = Non-combination type starters without fuses: 25,000 or 50,000 KVA for either 2500 volt or 5000 volt apparatus.

E_2 = Combination type starters with fuses for short circuit protection: 150,000 KVA on 2500 volts; 250,000 KVA on 5000 volts.

Nema does not list any standard on interrupting capacity of medium voltage contactors alone. However, since there are no power fuses in the type E_1 starter the contactors must clear any faults that occur. Therefore, the implied rating of the contactor is the interrupting rating of type E_1 starters. Here, for purpose of optimizing our design and as we'll explain, we elected to design our contactors, or an E_1 starter if we were to build one, to the lower of the two (2) ratings set by Nema. That is 25,000 KVA.

Our Ampgard 2500 and 5000 designs meet the **starter** standards set by Nema and as mentioned above, there is no standard for medium voltage contactors alone — only for starters.

Most power systems today have short circuit capacity far in excess of 50,000 KVA. Therefore, contactors alone, or type E_1 starters normally will not offer adequate protection and for this reason are very seldom sold: only in very rare cases of low capacity systems or where system reactance will limit fault currents to within the contactor rating.

For, practically all applications, fuses are required for safe short circuit protection.

In a fused starter, the fuses and overloads are carefully coordinated so that the overloads provide motor protection and the fuses provide high current fault protection for the starter and the power system. That is, the contactor only needs to interrupt locked rotor KVA and any faults materially beyond this level are cleared by the fuses. As further assurance against the contactor trying to do the fuses job — we use a DC magnet on the contactor. This provides just the right time delay on drop out to let the fuses clear first. For this reason, and since we seldom, if ever, apply contactors alone or as E_1 starters, we feel it is poor engineering to over design the contactor to do the fuses' job.

The fact of the matter is that we optimized our starter designs for complete safety, without sacrificing important customer benefits in installation, maintenance and operational features.

J. W. Bryant
Field Sales Manager