**Guest Column**

## What's Equal?

By Randell C. Riley, P.E.

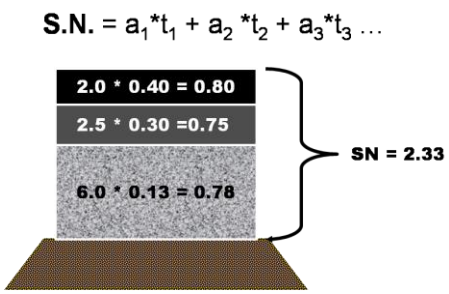
As long as engineers have been debating asphalt versus concrete, they have been wrestling with the issue of "What's Equal" in terms of pavement cross-sections. No where is this more important to IRMCA members than in the parking lot market for this is one of the single greatest opportunities for rapid return on your investment of time in promotion. However, rarely in this market do we get designs that are anywhere near close to being equal. Let's see if we can address that problem.

Most of what we know and use today in pavement design is based on the old AASHO Road Test. This road test, conducted in the late 1950's and early 60's was the basis of the AASHTO *Guide for Design of Pavement Structures*, a guide in use in many highway departments across the country today. Though detractors will say that it is based on old information and is no longer relevant, many of those detractors are asphalt guys that took a beating in the test results. We don't really care what they think, do we?

The reality is that the AASHO (the "T" was added many years later) road test, to this day, still reflects the typical axle loads and pavement cross sections that we are likely to encounter in the local roads and parking lot market. The fact that the road test was conducted right here in Ottawa Illinois makes the results and the resulting performance forecast equations even more credible.

Asphalt pavements are designed using the AASHTO guide in a manner different from concrete pavements. Asphalt sections are designed using what is called a "structural number" that is analogous to concrete pavement depth, but accounts for the differences in strength in the layers. Structural coefficients are assigned to each layer. Typical values for Illinois if you do not know anything else are 0.40 for surface course, 0.30 for base course and 0.13 for granular layers. You can get more sophisticated than this in the analysis, but the differences are usually small for making a basic pavement comparison when you really don't know what the asphalt producer would have actually provided anyway.

Development of the structural number is simply the summation of the layer thicknesses multiplied by their respective layer coefficient as shown to the right.




*Calculation of the structural number for a proposed asphalt section.*

Structural coefficients for concrete are not really part of the standard AASHTO design system. However, back in the '60's, shortly after the Road Test was complete, satellite studies in Louisiana proposed that deteriorated existing concrete pavement that is overlaid with asphalt should have structural coefficient of approximately 0.50, the oft cited value that you will see in some of the existing older concrete industry literature. In reality, this is a minimum value. The discussion is beyond this article, but I can mathematically demonstrate that the value ranges up to 0.74 new concrete typical of Illinois. In addition, the structural coefficient is in reality higher for thinner concrete sections and lower for thicker concrete sections. The value of 0.50 for concrete is a conservative value!

So, what is a realistic comparison? To solve that problem included in this issue is a nomograph you can use to solve for the equivalent concrete pavement section for typical Illinois DOT Class PV concrete given an architect or engineer's proposed asphalt pavement section. Simply compute the recommended structural number and follow through on the nomograph to determine the equivalent concrete pavement thickness that would result using the 1993 AASHTO *Guide for Design of Pavement Structures*. The startling fact is that you should find that ready mix concrete will be competitive in most cases even using more conservative concrete designs. In the case above is the minimum calculated section is four inches of concrete placed on compacted clay subgrade. Normally, you could use five inches, double the carrying capacity, sell more concrete and still be competitive!

One word of caution though when using the nomograph. Though the nomographs are technically accurate, and do produce equivalent sections, there is one area in virtually every parking lot that I would insist on you using a 6.5-inch minimum concrete section. That is in the fifteen feet or so leading up to the garbage dumpster where the garbage truck loads. Front-loading garbage trucks in particular create an odd loading situation in a static condition. The front wheels behave as a fulcrum for a lever arm as the hydraulics lift the dumpster into the garbage truck. In simple terms, the loads are much greater

than the simple gross vehicle weight of the loaded truck. Have you ever accidentally pinched your finger under a crowbar while doing some carpentry or demolition work? The same effect is at work at the moment the garbage truck first lifts the dumpster and this is the single point in most concrete parking lots where I see problems occur.

If everything else is built right, then you should be able to promote a long-lasting concrete parking lot typical of most of fast-food establishments and shopping centers. And building them right is what I will discuss next time…

*About Randell C. Riley, P.E.*

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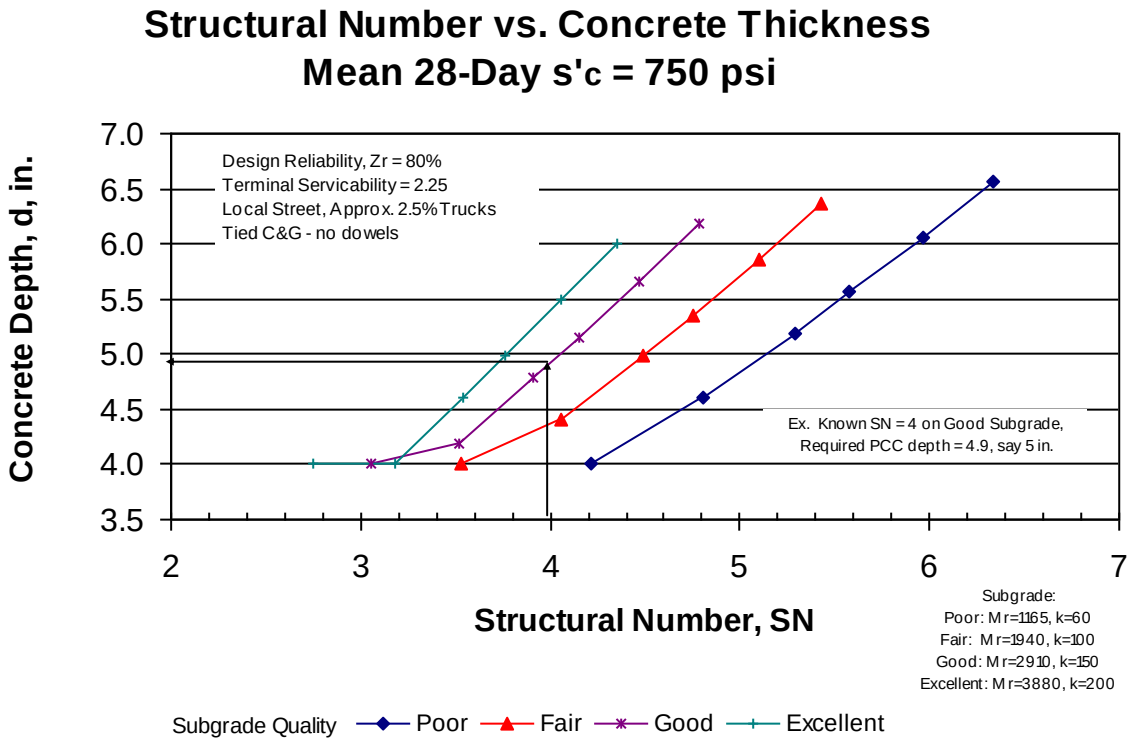


*This nomograph allows you to determine the equivalent concrete section given a computed structural number for an existing asphalt section based on the 1993 AASHTO "Guide for Design of Pavement Structures" and is appropriate for use in automobile traffic loadings.*