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WHY, WHEN AND HOW TO REINFORCE SLABS-ON-GROUND AND PAVING

Supplementary Seminar Reading
(This is not a transcript of seminar proceedings.)

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INNOVATIVE WAYS TO REINFORCE SLABS-ON-GROUND

Background

Engineers have been designing slabs-on-ground both with and without reinforcing steel for most of the century. The logical conclusion could be drawn that slabs with reinforcing should perform in a superior manor than slabs without reinforcing. This only holds true, however, when adequate reinforcment is supplied. Determining what is adequate has often been a source of controversy both in opinion and performance. The following explanations and formulas are intended to clarify for the design professional the function of reinforcing steel and subsequently provide a guide for selecting the proper procedure.

WWR sheets retain their flatness and do not deflect when placed on appropriately spaced supports, even during concrete placement.

Purpose of Reinforcement

In elevated concrete structures, the purpose of reinforcement is fairly well understood as being necessary to control positive and negative moment and to control shear. Since concrete has little tensile strength, all tensile components are expected to be serviced by the tensile capacity of the reinforcing in these elevated structures.

In slab-on-ground design, slab thickness is a function of the modulus of rupture of the concrete. This brings us to the evident conclusion that the concrete is not supposed to crack. Since the normal role of steel reinforcement hinges on the fact that the concrete must crack for the steel to perform, the designer is faced with a paradox. It is therefore necessary to define both the purpose of reinforcing slabs-on-ground and how this is effectively accomplished.

There are three primary purposes for reinforcing slabs-on-ground and they are as follows:

1. Shrinkage Control
2. Temperature Control
3. Moment Capacity

Some may consider increased joint spacing as a purpose, but this is simply an extension of shrinkage control.

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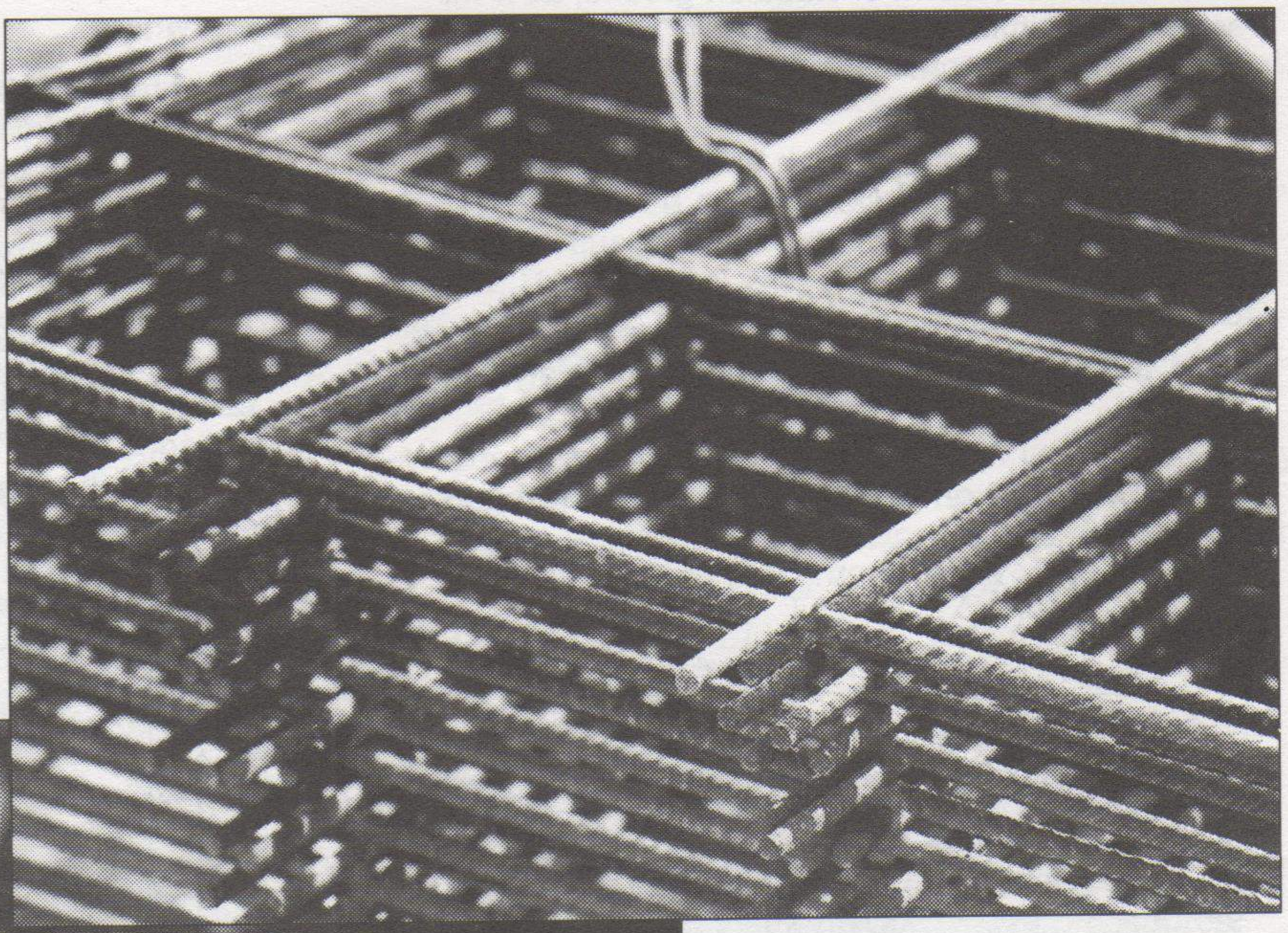
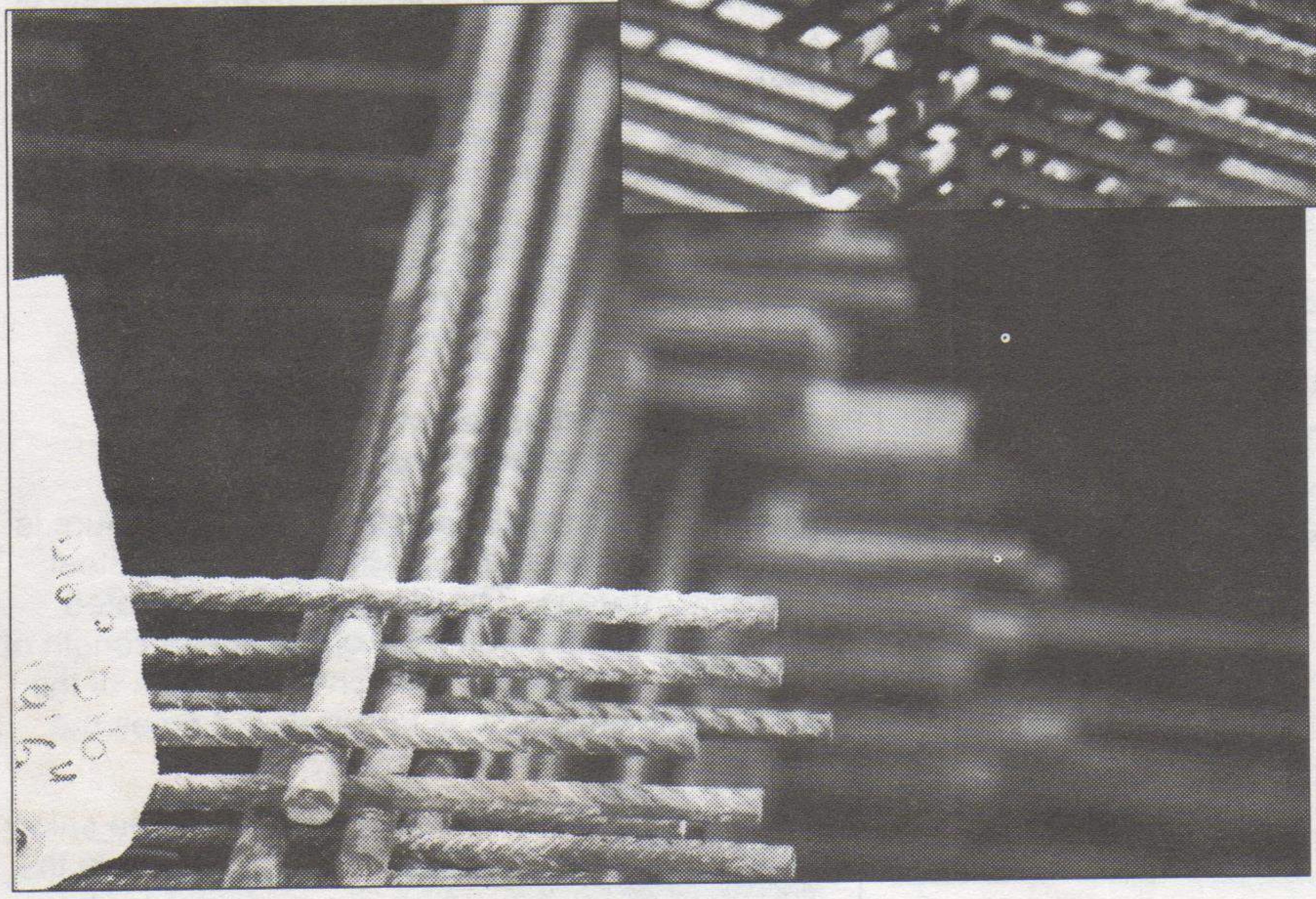
These high-strength WWR sheets of 12x12 – D16 x D16 compares to #4 @ 12" rebar and can be used for slabs ongrade, paving and parking lots.





Note two smaller close-edge wires provide greater splice efficiency.

Crack Restraint Procedure

A procedure for providing maximum control of shrinkage cracks is available. The likelihood of its implementation based on the steel requirements becomes restrictive.

Although microcracking cannot be absolutely guaranteed, the favorability of microcracking is dependent on the shrinkage potential of the concrete. For most industrial floors this can be taken as

$$A_s = \frac{9360t}{f_y}$$

where

A_s = cross-sectional area in square inches of steel per lineal foot of slab width

t = thickness of the slab in inches

f_y = yield strength of steel reinforcing

This formula is the result of equating unit concrete shrinkage to a steel cross sectional area capable of resisting this potential change in length.

This procedure would be applied primarily to food processing operations, hospitals and other applications requiring more restraint of microcracking, which works out to 1% of the slab cross sectional area.

A simple derivation of the crack restraint formula can be found in Appendix 2.