REMR TECHNICAL NOTE CS-MR-3.5

CRACK REPAIR METHOD: STITCHING

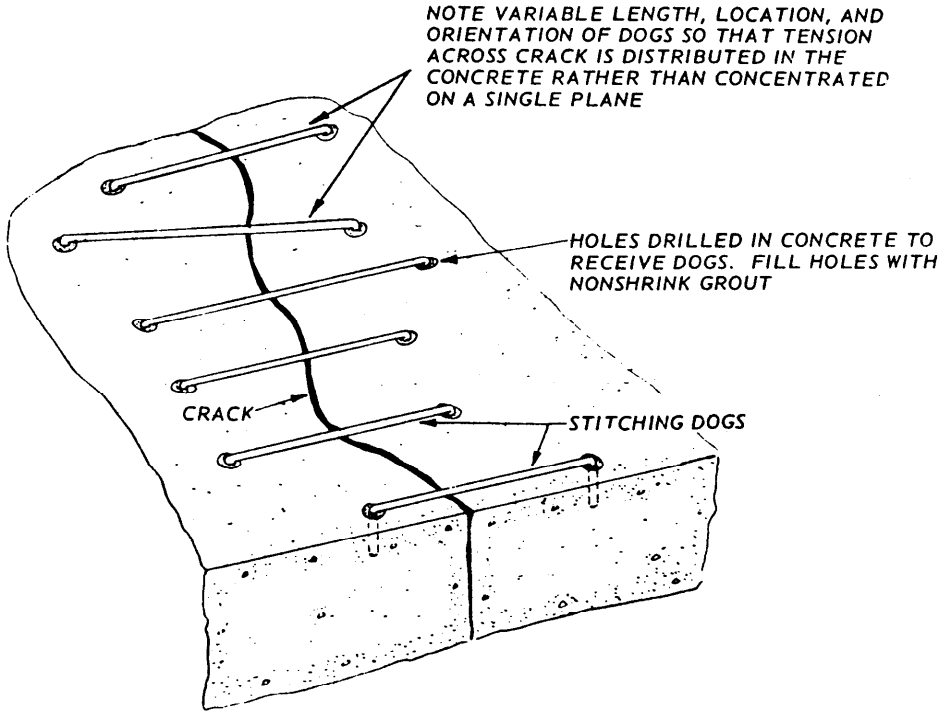
PURPOSE: To provide guidance on use of stitching to repair cracks in concrete. (NOTE: Before selecting any method for repair of cracks, REMR Technical Note CS-MR-3.1, "Selection of a Crack Repair Method," should be reviewed.)

DESCRIPTION: This method involves drilling holes on both sides of a crack and grouting in stitching dogs (U-shaped metal units with short legs) that span the crack.

EQUIPMENT, TOOLS, AND PERSONNEL REQUIREMENTS: A concrete drill and normal hand tools are required. One man can repair cracks using this method, but a two- or three-man operation is more efficient.

APPLICATIONS AND LIMITATIONS: Stitching may be used when tensile strength must be reestablished across major cracks. Stitching a crack tends to stiffen the structure, and the stiffening may accentuate the overall structural restraint, causing the concrete to crack elsewhere. Therefore, it may be necessary to strengthen the adjacent section using external reinforcement embedded in a suitable overlay. The stitching method should be used only after a structural analysis of the section indicates that this repair will perform under the applied loads. If a water problem exists, the crack should be sealed as well as stitched to minimize corrosion of the stitches and because the stitching itself will not seal the crack. Additional stitch protection can be achieved by the use of proper coatings on the stitches.

STEP-BY-STEP PROCEDURE: The stitching procedure consists of drilling holes on both sides of the crack, cleaning the holes, and anchoring the legs of the dogs in the holes, with either a nonshrink grout, expanding mortar, or an epoxy-resin-based bonding system. The stitching dogs should be variable in length and orientation or both, and they should be located so that the tension transmitted across the crack is not applied to a single plane within the section but is spread over an area. Spacing of the stitching dogs should be reduced at the end of cracks. In addition, consideration should be given to drilling a hole at each end of the crack to blunt it and relieve the concentration of stress. Where possible, both sides of the concrete section should be stitched so that further movement of the structure will not pry or bend the dogs. If a member is in a state of axial tension, then the dogs must be placed symmetrically, even if excavation or demolition is required to gain access to the opposite side of the section. For bending members, stitch one side of the crack only. This should be done on the tension face, where movement is occurring. The dogs are relatively thin and long, and cannot take much compressive force. Accordingly, if there is a tendency for the crack to close as well as to open, the dogs must be stiffened and strengthened, for example, by encasement in an overlay.



REFERENCES: a. Maintenance and repair of concrete and concrete structures. US Army Corps of Engineers, Washington, DC, 1979. Engineer Manual 1110-2-2002.

b. Causes, evaluation, and repair of cracks. ACI Committee 224. In: Journal of the American Concrete Institute, Vol 81, No. 3, American Concrete Institute, Detroit, MI, 1984. ACI 224.1R-84.