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Construction Practices: The Good, the Bad, and the Ugly

by Robert G. Paterson, Assistant Professor, University of Texas

Over the last two decades, numerous field and laboratory studies have tested the best techniques for preventing erosion and trapping suspended sediment at construction sites. The U.S. EPA has incorporated many of these findings into its guidance documents for the NPDES stormwater and nonpoint source control programs (U.S. EPA, 1992; 1993). However, very few of the studies have assessed how well these plans are actually implemented at construction sites.

Anecdotal evidence suggests that poor installation and maintenance of construction practices is endemic in many state and local erosion and sediment control (ESC) programs (Banach, 1988; Dawson, 1988; Doenges *et al.*, 1990; Lemonde, 1988). Detailed information, however, is lacking on the specific problems encountered during implementation (Dawson, 1988; Doenges *et al.*, 1990). Systematic analysis of ESC program implementation is needed to advance these practices. Designers need to know which construction practices are most problematic and know how to limit performance failures through better design and inspection.

Sediment control inspectors can also benefit from this kind of information. For example, many inspectors learn job skills through an apprenticeship process which unfortunately relegates much learning to trial and error despite the best efforts of senior ESC professionals to help them "learn the ropes." In other cases, problems are encountered on such a piecemeal basis that trends cannot be easily discerned.

This article sheds light on implementation problems that persist among many commonly prescribed construction practices based on a comprehensive evaluation of North Carolina's ESC Program undertaken in 1990. Problems with construction practices were identified through both expert opinion surveys and an investigation of over 1,000 prescribed construction practices in the field. Expert opinions were obtained through a mail survey of 44 North Carolina ESC administrators using the Total Survey Design method. Responses were received from 77% of the total population.

Expert opinion was sought on two key implementation issues. First, administrators were asked to rate a list of commonly used construction practices on a subjective five-point effectiveness scale (excellent, good, average, fair, and poor) based on their typical field experiences. Second, the administrators were also asked to comment on their perception of the main cause(s) of failures for each construction practice. Possible reasons for failures included that the practice was installed poorly, did not work, or was poorly maintained.

The field investigation provided an independent assessment of ESC implementation for more than 1,000 construction practices evaluated in a total of 128 ESC plans within nine North Carolina jurisdictions. The nine jurisdictions were selected to adequately represent construction sites in each of North Carolina's three physiographic regions (mountain, piedmont and coastal plain) and across three different levels of program administration (i.e., municipal, county and state administered programs).

Project sites were randomly selected from a list of active construction projects within each jurisdiction using a random assignment procedure. The selection procedure provided a fairly even mix of development types: 56% of the construction projects were residential and 44% were non-residential. The quality of ESC implementation was evaluated in terms of (a) whether the practices had been adequately installed and (b) if they were adequately maintained.

Study Results

Expert Opinion on ESC Practice Performance

Few North Carolina ESC administrators were satisfied with the typical field performance of most construction practices; only three out of the 11 construction practices were considered to be good or excellent (Figure 1). Sediment basins, sediment traps, and riprap stabilized channels received the highest percentage of favorable ratings. The worst performers, by a large margin, were brush barriers and straw bales. Only two out of 34 administrators rated typical field performance as "good" and none viewed typical brush barrier performance as satisfactory. Evaluations also tended to be negative on pre-fabricated silt fence and filter strip performance. Opinion was more varied on the adequacy of vegetatively stabilized channels, slope drains, constructed silt fence, and storm drain inlet protection (SDIP) measures.

A majority of the experts attributed construction practice failure to poor installation (Table 1). Most administrators identified poor installation as the primary cause of failure for filter strips, pre-fabricated silt