CHAPTER 6 – PARAMETERS TO BE CONSIDERED IN HBSN CORROSION STUDIES

Ideally a corrosion study for HBSNs should consist of a combination of field, laboratory and numerical simulation studies to evaluate the effect of the various factors presented in Chapter 2 on the corrosion of HBSNs. These factors may be categorized as "natural" or "mechanical." Soil corrosivity and soil abrasiveness fall into the natural category while the other factors can be categorized as mechanical. The properties of the natural factors can be measured by appropriate testing as noted in Chapter 5. Most of the mechanical factors can be controlled by selecting appropriate equipment and installation procedures. Once the nails are installed the two basic considerations in a corrosion study for HBSNs are:

1. Mechanisms that provide an avenue for corrosion, i.e., causative mechanisms.
2. Corrosion of metals, i.e., metallurgical considerations.

The corrosion of metals is a well known and well documented phenomenon, as summarized in Appendix A. It is the causative mechanisms that should be the primary focus of a program of study to address the corrosion from the practical aspect of soil nail installation. For HBSNs, the primary means for controlling causative mechanisms is by preventing the formation of cracks in the grout body so that corrosive elements do not contact the HBSN. Variables that may affect crack formation include:

- Diameter of the grout body, D_G
- Compressive strength of grout, f_c
- Yield (nominal) load of steel, F_Y
- Tensile force in the nail, T_F
- Grout-to-ground (G-G) bond (shear) resistance, R_{GG}
- Grout-to-steel (G-S) bond (shear) resistance, R_{GS}
- Thread type, depth and spacing, e.g., rounded rope thread vs. deformed sharp thread
- Roughness of the grout-to-ground interface, r
- Confining pressure, p_c
- Bending and shear forces

As noted earlier, the testing program should ideally consist of a combination of field and laboratory studies. However, there are practical limitations to field studies. For example, a large number of field installations in various types of ground (soil type, density, moisture content, etc.) would be necessary. Furthermore, it would not be practical to conduct field tests in all possible soils. Therefore, it is recommended that consideration be given to a comprehensive laboratory study along with a limited field study. Before conducting the field study it is recommended that numerical simulations be performed to verify and extend the findings of the laboratory studies. Such numerical simulations will also help in the development of a design model after the field study. Consideration should also be given to a limited numerical study before the laboratory study to streamline the testing program.