AREMA
AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION

CHAPTER 1

ROADWAY AND BALLAST[1]

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[1] The material in this and other chapters in the *AREMA Manual for Railway Engineering* is published as recommended practice to railroads and others concerned with the engineering, design and construction of railroad fixed properties (except signals and communications), and allied services and facilities. For the purpose of this Manual, RECOMMENDED PRACTICE is defined as a material, device, plan, specification, principle or practice recommended to the railways for use as required, either exactly as presented or with such modifications as may be necessary or desirable to meet the needs of individual railways, but in either event, with a view to promoting efficiency and economy in the location, construction, operation or maintenance of railways. It is not intended to imply that other practices may not be equally acceptable.

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1.1.4.2 Rock Exploration Methodology

1.1.4.2.1 New Construction

a. The first step of the exploration process involves a detailed geological reconnaissance and mapping of site. Utilize visible outcroppings to predict the strike and dip of beds, as well as to identify obvious faults, discontinuities, jointing and fracture patterns. Utilize auger borings or test trenches through soil overburden to determine initial rock surface profiles when rock is not visible.

b. From this information an exploration plan should be devised which will provide a continuity of data regarding structure of rock. Undisturbed rock samples should be obtained from fresh unweathered exposures at the site or from core samples recovered from borings. To the extent possible, the subsurface exploration program should be designed in an attempt to reveal potential structural discontinuities. Core recovery should be monitored by a qualified geotechnical professional, so that necessary changes may be made to maximize recovery of useful data. The spacing and depth of bores will be project specific. All bores should be advanced to a depth which is sufficient to verify the competency of the proposed subgrade. At minimum, this depth will be the proposed subgrade elevation. On cuts of significant depth, exploration should extend well outside the proposed centerline as significant discontinuities may exist which could affect design of the upper portions of slopes. Detailed drilling logs should be maintained and the recovered samples should be preserved for a mutually agreed upon period of time.

c. Undisturbed core samples are typically obtained using a standard diamond-tipped rock boring machine equipped with a continuous recovery tube. The minimum size for a recovery tube should be type BX (1-5/8"), with sizes NQ (2") and NX (2-1/8") being more commonly used. For projects in areas of suspected geologic irregularities use of even larger recovery tubes may be of value. Such a determination can be based on the preliminary geologic data for the site.

1.1.4.2.2 Maintenance

Exploration of rock as related to roadbed maintenance problems will rely primarily on visual examination of exposed rock surfaces. When existing surface conditions do not obviously reveal the causes of the problem, it may be necessary to use intrusive exploration techniques to identify the depths at which competent material is present. This may reveal the presence of faults, fracture patterns, and structurally weak layers that could affect the stability of the associated rock mass.

1.1.4.3 Examination and Testing

a. Rock samples and cores provide an important record of visible structural information. Samples should be examined and a final geologic log accurately prepared. See Table 1-1-4 for a list of recommended descriptive terminology. The resulting data should be consolidated in a usable format which may include detailed boring logs, rock core photos, and cross-sectional mapping of the rock structure. In general this detailed information provides the primary tool for the Design Engineer in predicting the theoretical structural behavior of the rock mass. This base information provides only qualitative design values which are used in part for detailed strength and stability analysis.

b. Representative samples from the rock cores can be utilized to determine the strength and deformation characteristics of the rock as well as its potential for weathering. See Table 1-1-5 for a list of possible test methods. These tests can provide much more precise design values, but test suitability is job specific and should be determined with the assistance of a geotechnical professional.

c. Since many variables exist regarding rock mechanics, providing the most comprehensive information available in a usable format will greatly assist the Design Engineer in development of a viable design or corrective scheme. Additional testing may be required to evaluate the potential for use of the rock to meet aggregate needs of the project.