Title of Thesis: **Total pages:**142
The Application of Composite Index in Railroad Track Maintenance Management System
Name of Institute: Graduate Institute of Civil Engineering, Tamkang University
Graduate Date: June, 2003 **Degree Conferred:** Master of Science
Name of Student: Yuan-Ling Lan **Adviser:** Dr. Ying-Haur Lee
藍 苑 綾 李 英 豪 博士

Abstract

The demands for railroad track maintenance and rehabilitation (M & R) activities are gradually increasing due to the continuing deterioration of our old rail track systems as well as the call for expansion of domestic railroad systems. Proper selections of M & R activities can reduce their frequency and extend track service life to assure the best use of our limited resources. The major objective of this study is to conduct an in-depth investigation on the application of composite index in railroad track maintenance management system.

The current practices of domestic track M & R activities were first reviewed. The fundamental concepts and evolutions of different composite indices including Track Quality Index (TQI) and Track Structural Condition Index (TSCI) were investigated for high and low volume track systems, respectively. Track geometry signatures are usually measured through the use of an automated inspection car. A TQI derived from the number of exceptions to a performance based threshold is appropriate for allocating M & R resources. An overall TSCI is determined based on the detailed track inspections of different rail, joints, crossties, ballast, and subgrade components through visual means. Furthermore, the major concerns of the global application of composite indices are toward standardization, simplification, and automation. A preferred composite index should be determined based on its measuring ability, replicability, objectivity, consistency, and efficiency.

A total track management system consists of safety, network level, and project level management activities. Together with the utilization of "sampling", "dynamic segmentation", and "uniform section" concepts, an automated Track Maintenance Management System (TMMS) prototype program with well-organized Windows-based graphical user interfaces was developed using Microsoft Visual Basic 6.0 program. Given the original survey data, this prototype program can automatically calculate TQI and TSCI, which are applicable to future project-level and network-level track M&R management activities. Case studies were conducted to validate the correctness of this prototype program through comparisons of manual calculations and the results of the RAILER program. Ultimately, the inspection results may also be used to predict track deterioration rate and future conditions, determine required budget levels, as well as inspect the effectiveness of M & R strategies in the future.

Keywords: track management, maintenance and rehabilitation, track geometry, distress survey, composite index, dynamic segmentation, uniform section.