Two fundamental mathematical formulations for railway timetabling are compared on a common set of sample problems, representing both multiple track high density services in Europe and single track bidirectional operations in North America. One formulation, ACP, enforces against conflicts by constraining time intervals between trains, while the other formulation, RCHF, monitors physical occupation of controlled track segments. The results demonstrate that both ACP and RCHF return comparable solutions in the aggregate, with some significant differences in select instances, and a pattern of significant differences in performance and constraint enforcement overall. (C) 2013 Elsevier Ltd. All rights reserved.