Features of the New ITE Parking Generation Manual


- 60 percent new data than previous versions
- Additional analysis capabilities (e.g., day of the week variations, seasonal variations)
- Presents information for 121 land uses—including 19 new uses
- Available in both hardcopy and electronic formats
- Web-based app ITEParkGen allows convenient electronic access to entire data set
The 5th Edition of the ITE Parking Generation Manual (PGM) represents a significant improvement in the content and capabilities from previous editions with more than 60 percent new data, additional analysis capabilities (e.g., urban setting, day of the week variations, seasonal variations), consistency with the recently updated Trip Generation Manual, 10th Edition, time of day distributions and parking supply ratios for the majority of land uses, and a web-based app that enables the analyst access to the full database for specialized analysis.

The PGM contains text, tables, data plots, and statistics that describe current state-of-the-practice understanding of the relationship between parking demand and the many characteristics associated with an individual development site or land use. The manual presents land use descriptions and data plots for all combinations of available land uses, time periods, independent variables, and settings contained in the ITE database. The intended use of PGM is to forecast parking demand at a specific development site by time of day on a specific day of the week.

The manual is available in both hardcopy form and as an electronic file. The publication is supplemented by ITEParkGen, a desktop web-based application that allows electronic access to the entire ITE parking generation dataset. The web-based app enables an analyst to reproduce the data plots and statistics presented in the manual. The web app also provides numerous filtering capabilities for the analyst to view subsets of the complete database. Subsets can be created according to the geographic location of the study site, the age of the parking demand count, and the development size.

**Land Uses**
The 5th Edition land uses have been reorganized and are compatible with those presented in Trip Generation Manual, 10th Edition. Rental and owner-occupied multi-family residential sites have been categorized as Multifamily Housing (Low-Rise) (220), Multifamily Housing (Mid-Rise) (221), and Multifamily Housing (High-Rise) (222). Office buildings are categorized as General Office Building (710), Small Office Building (712), Corporate Headquarters Building (714), Single-Tenant Office Building (715), Medical-Dental Office Building (720), Government Office Building (730), Office Park (750), and Research and Development Center (760).

The 5th Edition presents information for 121 land uses, of which the following 19 are new:
- Utility (170)
- Specialty Trade Contractor (180)
- Affordable Housing (223)
- Batting Cages (433)
- School District Office (538)
- Free-Standing Emergency Room (650)
- Small Office Building (712)
- Variety Store (814)
- Automobile Sales (New) (840)
- Automobile Sales (Used) (841)
- Recreational Vehicle Sales (842)
- Wholesale Market (860)
- Discount Home Furnishing Superstore (869)
- Marijuana Dispensary (882)
- Fast Casual Restaurant (930)
- Quick Lubrication Vehicle Shop (941)
- Automobile Parts and Service Center (943)
- Super Convenience Market/Gas Station (960)
- Winery (970)

**Settings**
Parking demand is directly related to both the characteristics of a development site and its setting. In general, as the potential for walk, bike, and transit trips increase with increased development density, parking demand has the potential to decrease. Each individual study site in the parking generation database is now classified within one of the following four settings: Center City Core, Dense Multi-Use Urban, General Urban/Suburban, and Rural.

Center City Core is the downtown area for a major metropolitan region at the focal point of a regional light- or heavy-rail transit system. This area type is typified by multi-storied buildings, a wide range of land uses, an extensive pedestrian sidewalk network, and shared and priced parking both on-street and in structured garages or surface lots.

Dense Multi-Use Urban is a fully developed area (or nearly so), with diverse and interacting complementary land uses, good
pedestrian connectivity, and convenient and frequent transit. This area type can be a well-developed urban area outside a major metropolitan downtown or a moderate size urban area downtown.

General Urban/Suburban is an area associated with almost homogeneous vehicle-centered access. Nearly all person trips that enter or exit a development site are by personal passenger or commercial vehicle.

Rural is an area that is agricultural or undeveloped except for scattered parcels and at very low densities.

For 42 land uses in the 5th Edition, data plots are presented for sites in dense multi-use urban and center city core sites as well as general urban/suburban sites. All of the multi-family housing land uses and half of the lodging and office land uses have urban data plots.

**Proximity to Rail Transit**
The proximity to a regional light- or heavy-rail transit station was measured for many of the study sites contained in the database. Analysis found distinct differences in parking demand for residential sites within one-half mile of a rail transit station. Separate parking demand data plots are presented for the low-, medium, and high-rise multifamily housing land uses (220, 221, and 222) for study sites within one half-mile of a rail transit station.

**Day of the Week**
Past editions of *Parking Generation Manual* presented parking demand for weekday (Monday through Friday), Saturday, and Sunday as data were available. For land uses for which parking demand on a Friday is substantially different than on the other weekdays, separate parking demand data plots are now provided in the 5th Edition for Friday and Weekday (Monday through Thursday).

The number of land uses with weekend data has increased to 72 with weekend data plots presented for nearly all residential, lodging, recreational, retail, and services land uses. The land uses with separate Friday parking demand data include recreational uses such as Racquet/Tennis Club (491), retail uses such as Shopping Center (820) and Supermarket (850), and service uses such as Quality Restaurant (931) and High-Turnover Sit-Down Restaurant (932).

**Seasonal**
During the holiday shopping season between the weekend after Thanksgiving in late November (U.S.) and Christmas in late December, parking demand can be greater for some land uses. The 5th Edition presents December parking demand data plots for seven land uses: Movie Theater (444), Multiplex Movie Theater (445), Free-Standing Discount Superstore (813), Variety Store (814), Free-Standing Discount Store (815), Shopping Center (820), and Discount Club (857).

Parking demand can also vary seasonally for some other land uses. To supplement the actual parking demand data presented in data plots, PGM presents tables with retail sales by month.

**Time of Day Distribution of Parking Demand**
An understanding of the distribution of parking demand throughout the course of a day for a particular land use can be useful information when the parking facility is shared with other land uses. If there is potential for the peak period of parking demand for one land use to coincide with a lower demand period for another land use, ultimate peak parking demand for the parking facility will not be simply the sum of the two peaks.

The 5th Edition presents hourly time-of-day distribution tables for 86 land uses (more than two-thirds of the PGM land uses). The time-of-day distributions are presented by setting (e.g., Dense Multi-Use Urban), by day of the week (e.g., Friday), and by season of the year (e.g., December), as available.

Guidance is also provided in *Shared Parking*, 3rd Edition, produced by National Parking Association, Urban Land Institute, and International Council of Shopping Centers. This updated report is expected to be released during the first quarter of 2019.

**Parking Supply Ratios**
The actual parking supply has been tabulated for many of the study sites in the ITE database. The 5th Edition presents calculated parking supply ratios for one or more independent variables for 97 land uses.

**ITEParkGen Web-based App**
*Parking Generation Manual*, 5th Edition includes a web-based app—ITEParkGen—that allows electronic access to the entire ITE parking generation dataset. The tool allows users to recreate every data plot in the hard copy version of *Parking Generation Manual* and to zoom in to portions of the data plots to better examine individual data points. The desktop application enables the analyst to create customized data plots based on the age of data, site geography, setting, and a range of values for the independent variable. Electronic data sorts provide a filtered subset of the entire dataset for individual review and analysis. This new ability to filter data may provide useful insights.
“As the potential for walk, bike, and transit trips increase with increased development density, parking demand has the potential to decrease.”

Land Use Description Pages
Data and analysis for each of the 121 Parking Generation Manual land uses are presented in a format consistent with that used in Trip Generation Manual, 10th Edition. There are one or more pages of text and tables that describe the characteristics of the development sites in the given land use code. If sufficient data are available, a distribution of parking demand by hour of the day is presented as are parking supply ratios for study sites in the database. For each land use, lists are provided for the decades during which parking generation data were collected, the states and provinces for the study sites that comprise the land use, and the data sources.

Following the text pages are data plots and associated statistics for the land use study sites. For each land use, parking demand statistics and data plots are presented for at least one independent variable and for at least one time period (e.g., weekday, Friday, Saturday). Data pages are organized first by area type, then by independent variable, and then by time period.

The statistics summary on data plot pages has been reorganized from the previous editions. The presented statistics are weighted average rate, the observed range of rates, the 33rd and 85th percentile rates, and a 95 percent confidence interval for rates.

For every data plot (i.e., for every combination of land use, land use subcategory, setting, time period), regression analysis has been used to derive a fitted curve that relates parked vehicles to the magnitude of the independent variable. The curve and equation are presented if the $R^2$ value for the fitted curve is at least 0.50 (threshold has been changed to be compatible with Trip Generation Manual). Both non-linear and linear curves have been considered (again, to be compatible with Trip Generation Manual).

Next Steps
ITE is continually seeking to further improve its library of parking generation products. Immediate next steps may include:

- Conduct multi-variable analysis to potentially improve the accuracy of parking demand estimates
- Refine study site setting definitions and consider including additional factors (such as proximity to rail transit)
- Identify new land uses for which data and analysis are needed
- Investigate new sources and techniques for acquiring parking demand data
- Analyze seasonal and day of the week variations in parking demand for additional land uses
- Continue to partner with other organizations

Review Panel
ITE appointed a Parking Generation Review Panel to assist staff with development of the 5th Edition. The panel provided insights in the screening of data submittals and in the analysis of land use data plots and statistics. The diligence of the panel members throughout the process was critical to the development of this product.

The review panel members are Joseph C. Balskus (M), Justin C. Barrett (M), Paul E. Basha (M), Christopher L. Brehmer (M), Kenneth P. Cram (F), Kristina M. Currans (M), Darlene A. Danehy (M), Brian E. Dempsey (F), Cheuk Y. (Billy) Dong (M), Bryant J. Ficek (M), Jon D. Fricker (F), Rebecca Goldberg (M), Wes Guckert (F), Daniel K. Hardy (M), Louis J. Luglio (M), Ransford S. McCourt (F), Gordon E. Meth (F), Nadereh Moini (M), David Nevarez (M), Johnny Ojeil, Sanjay Paul (M), Joseph A. Regis (M), Peter Richards (M), Gerald Salzman (F), Scott A. Schell (M), Vijayaraghavan Sivaraman (M), Mary S. Smith (M), Fernando J. Sotelo (M), Mark E. Spencer (F), Kathrin M. Tellez (M), Peter A. Terry (F), Jane Wilberding, Michael J. Workosky (M), Bradley W. Yarger (M), and Aaron T. Zimmerman (M).

Throughout the development of the 5th Edition, ITE staff coordinated parking demand data collection and analysis with National Parking Association and its development of Shared Parking, 3rd Edition. ITE staff assisted NPA in understanding the significant changes made in Parking Generation Manual that could affect Shared Parking (e.g., reclassification of multifamily housing, introduction of new independent variables, introduction of new land uses). ITE staff provided updated time-of-day distribution data for parking demand. In addition, ITE staff determined parking demand statistics for numerous filtered subsets to aid NPA in understanding the parking demand differences by development size range and by the age of data. As practical, terminology and statistics are compatible between the two publications. itej

Kevin G. Hooper, P.E. (F) is a sole-proprietor based in Falmouth, Maine, USA and Strategic Projects consultant for the Institute of Transportation Engineers. He has served as technical editor for numerous ITE publications including Parking Generation Manual, 5th Edition; Trip Generation Manual 10th Edition; and Trip Generation Handbook 3rd Edition. For the past 40 years, he has participated in too-many-to-count local, state, and national research projects addressing travel characteristics in urban settings, such as NCHRP Reports 758, 684, and 323. Kevin developed and currently maintains the Maine Statewide and Portland (Maine) Region Travel Demand Models.