

TRIP GENERATION OF COFFEE SHOPS WITH COMBINATION DRIVE-THROUGH AND SIT-DOWN FACILITIES

By the Technical Committee of the Colorado-Wyoming Section of ITE¹

Abstract. A recent trend in the development of coffee shops incorporates a drive-through facility in conjunction with the traditional sit-down coffee house. A new quandary enfolds when transportation and traffic professionals plan new stores and search for the proper category of trip generation estimates to fit this type of development. Should one use “Fast-Food Restaurant with Drive-Through Window”, a category which contains a sufficient sample of data necessary for reliability? Or, should an engineer use “Coffee/Bread/Sandwich Shop”, which appears as a subcategory of Fast-Food Restaurant with Drive-Through Window, and for which only one study has been performed?

Many people, ranging from engineers and planners to politicians and the general public, rely upon trip generation data and their resulting traffic impact studies. This diverse group of personalities, each with its own unique perspective, would benefit from more reliable estimates resulting from further data collection pertaining specifically to the new breed of coffee shop with drive-through facility.

The purpose of this study entails collection of new data on the trip generation characteristics of coffee shops with a combination drive-through and sit-down facilities. Furthermore, this study ties together two recent data collection efforts. This paper will compare and analyze subtle differences in the results, differentiating between realistic trends versus mere anomalies. The measured trip generation rates for coffee houses with drive-through facilities are presented for use by the Transportation Professional. In conjunction with this study, data was recently submitted to ITE for inclusion in a future edition of *Trip Generation*².

BACKGROUND

In March of 2006, Krager and Associates³ completed a study of six Starbucks coffee houses located along the Front Range urban areas of Colorado. All six sites included a combination of drive-through and sit-down facilities. At that time, the Technical Committee of the Colorado/Wyoming Section of ITE (COWY ITE) received multiple inquiries concerning a need for trip generation data of coffee shops with drive-through facilities. Evidencing the broad need for data, requests originated from professionals in both the private and public sectors. Following completion of their study, Krager and Associates

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² *Trip Generation*, 7th Edition. Institute of Transportation Engineers, 2003.

³ Krager and Associates, Inc., Starbucks Coffee House, Study of Trip Generation Rates, Colorado Stores with both Walk-in and Drive-Through Facilities. March 2006.

generously shared their study with the Technical Committee of CO/WY ITE, who built upon the data collection efforts by Krager.

In addition to the study by Krager, the Fall 2005 edition of INCITER, the newsletter of the North Central Section of ITE, contains an article by Mike Spack and Brian Bergquist⁴ which summarizes trip generation rates for eight coffee shops in metropolitan Minneapolis-St. Paul, Minnesota. The study by the North Central Section counted four sites each of shops with and without drive-through windows. All eight sites contained sit-down facilities. As shown below in Table 1, for shops with drive-through windows, the trip generation rates per 1,000 square feet of gross floor area correlated well between the two studies.

Study	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
INCITE, Minnesota, 2005	65	66	131	18	17	35
Krager, Colorado, 2006	59	59	118	18	20	38

Table 1: From Previous Studies, Peak Hour Trip Generation Rates per 1,000 SF GFA for Coffee Shops with Combination Drive-Through and Sit-Down Facilities. Peak hours reference peak hour of adjacent street traffic.

TRIP GENERATION MANUAL

Updates to the ITE *Trip Generation*⁵ manual occur on a cycle of approximately every five years, with the most recent revision (7th edition) in 2003. When faced with a need for data on coffee shops, a transportation professional would currently find limited information. Within the category of Fast-Food Restaurant without Drive-Through Window (Land Use # 933), one specialized land use contains two studies for Coffee Shop. Under the category of Fast-Food Restaurant with Drive-Through Window (Land Use # 934), one specialized and very broad category of Coffee/Bread/Sandwich Shop is based upon only one study. Under land use category # 935 (Fast Food Restaurant with Drive-Through Window and No Indoor Seating), there exists a specialized listing of Coffee/Esspresso Stand which also contains only one study.

When attempting to analyze a combination drive-through/sit-down coffee shop, one could possibly choose between the following categories from *Trip Generation*: Coffee/Bread/Sandwich Shop or Fast-Food Restaurant with Drive-Through Window. The first category contains only one study, presumably conducted at a combination coffee/bread/sandwich shop. Therefore, utilization of this specialized land use for a drive-through/sit-down coffee shop would be conducted with caution. Perhaps, the closest land-use category would be Fast-Food Restaurant with Drive-Through Window (Land Use # 934). However, since coffee shops typically generate more morning trips than fast food restaurants, the selection of Land Use # 934 could produce skewed results in a traffic study. Krager⁶ notes that inaccurate estimates have contributed to operational or circulation problems when a site is built. Also, questionable data has occasionally caused

⁴ Spack, Mike and Bergquist, Brian, Coffee Shop Trip Generation Study. INCITER, Volume 22, Number 4, Fall 2005.

⁵ Ibid, *Trip Generation*, 7th Edition.

⁶ Ibid, Krager and Associates, Inc.

delays in access permitting where jurisdictions require more refined data. Table 2 summarizes the data available from *Trip Generation* for similar land uses.

ITE Land Use	Daily Trips (# Studies)	AM Peak Trips	PM Peak Trips
Fast-Food Restaurant without Drive-Through Window	716 (1)	44 (2)	26 (4)
Coffee Shop	No data	73 (2)	29 (2)
Fast-Food Restaurant with Drive-Through Window	496 (21)	53 (59)	35 (110)
Coffee/Bread/Sandwich Shop	No data	183 (1)	39 (1)

Table 2: Similar land uses from ITE *Trip Generation* manual, 7th edition, showing total trips generated per 1,000 SF GFA. Number of studies are shown in parentheses.

METHODOLOGY

Because of the rapidly growing trend of combination drive-through/sit-down coffee shops, it was decided to specifically focus our study on this land use. Also, since both the Krager and INCITE studies counted land uses of this type, a more suitable frame of reference was available. Since the Technical Committee was given access to the data from the Krager study and since both parties were interested in expanding upon this study, it was agreed to use similar methodology. Measurement of additional sites would provide a validity test of the privately performed study.

All traffic entering and exiting the sites were measured during weekdays (Tuesday, Wednesday or Thursday). At a minimum, all sites were counted during the morning peak period between 7:00 and 9:00 am. Evening peak counts were collected between the hours of 4:00 and 6:00 pm. Since the peak hour of adjacent street traffic typically occurs during those hours, unless a 24-hour count of the access driveways was conducted, it was assumed that the one hour peak obtained corresponded with the peak hour of adjacent street traffic. If a 24-hour count of the site accesses was obtained, then morning and evening peak hours of the generator could be determined. The Krager study obtained counts through video taping all accesses and drive-through lanes. With the exception of one site at which a 24-hour tube count was conducted, the Technical Committee manually counted all vehicles entering and exiting the site, also differentiating between sit-down and drive-through trips. As a result, both studies reported percentage of drive-through trips in addition to entering and exiting trips.

Since the Krager study restricted their analysis to only the Starbucks brand of coffee shop, the Technical Committee hoped to diversify the array of brands. However, within the category of combination drive-through/sit-down facilities, no other brand was found along the Front Range of Colorado. Perhaps, more diverse branding exists in other regions, but other than one count taken in Chicago, Illinois, we did not have the resources readily available to scout for shops outside of our region.

DISCUSSION OF DATA AND FUTURE NEEDS

Tables 3 and 4 summarize the trip generation data for the twelve shops included in this study. Table 3 shows the location and characteristics for each site, while Table 4 summarizes the trip generation data. In Table 3, the final column differentiates between stores located in-line with other facilities such as a strip-mall configuration, versus free-standing (stand-alone) coffee shops. It should be noted that traffic was properly differentiated in all cases with counts consisting solely of trips to and from the subject site. As seen from Table 3, only site # 9 is located outside of Colorado. All counts were conducted in either urban areas outside the central business district (non-CBD), or in suburban areas. For this study, no counts were taken at stores located in rural areas. Counts from six sites were taken from the Krager study while six more sites were counted by the COWY ITE Technical Committee.

Tables 3 and 4 also represent the data which was submitted to ITE for a future edition of *Trip Generation*. The averages shown at the bottom of Table 4 are weighted average trip generation rates, calculated as specified by ITE in the *Trip Generation Handbook, 2nd Edition*.⁷ The handbook states that the standard deviation should be less than or equal to 110 percent of the weighted average rate. Per 1,000 square feet of gross floor area, weighted average rates equal 113 total AM peak trips with a standard deviation of 23 percent, and 35 total PM peak trips with a standard deviation of 33 percent. Additionally, for the two sites where 24-hour counts were conducted (sites number 1 and 10), AM and PM peak hours of the generator were submitted along with the 24-hour counts. Since valid data was available for only two sites, it is probably not considered reliable for the purposes of trip generation estimates. When less than six data points exist, the *Trip Generation Handbook* recommends usage of data with caution.

#	Street(s) or Address	City (Colorado unless noted otherwise)	Square Footage	In-line (IL) or Free Standing (FS)
1	Kipling/Florida	Lakewood	2,000	FS
2	Parker/Peoria	Aurora	1,916	FS
3	Leetsdale/Holly	Denver	1,798	FS
4	4465 Centennial Blvd.	Colorado Springs	2,616	FS
5	Pearl/84th	Thornton	1,517	IL
6	Monaco/Evans	Denver	1,465	IL
7	Wildcat/Fairview	Highlands Ranch	1,750	IL
8	Sheridan/24th	Edgewater	1,520	IL
9	7101 S. Stony Island	Chicago, IL.	2,500	FS
10	Federal/44th	Denver	1,197	FS
11	1510 W. Eisenhower Blvd.	Loveland	2,646	FS
12	4320 9 th St.	Greeley	1,500	IL

Table 3: Sites included in this study.

⁷ *Trip Generation Handbook, 2nd Edition*. Institute of Transportation Engineers, 2004.

Site #	Square Footage	Trip Generation Rate per 1,000 SF GFA							
		AM Peak Hour of Adjacent Street				PM Peak Hour of Adjacent Street			
		Enter	Exit	Total	% DT	Enter	Exit	Total	% DT
1	2,000	60	58	118	28	23	23	46	
2	1,916	63	56	120	28				
3	1,798	73	81	154	26				
4	2,616	44	49	92	44	16	20	37	51
5	1,517	40	42	81	81	11	13	24	73
6	1,465	81	76	158	61	18	25	43	64
7	1,750	77	70	147	66	17	17	34	50
8	1,520	73	73	146	63	18	18	36	54
9	2,500	33	28	60	46	14	14	28	51
10	1,197	50	67	117		22	14	36	
11	2,646	37	36	73	73				
12	1,500	83	81	164	62				
Average	1,869 SF	56.81	56.63	113.44	50.8%	17.30	18.13	35.43	55.5%

Table 4: Peak Hour Trip Generation Rates per 1,000 SF. Peak hours reference peak hour of adjacent street traffic. All data rounded off to the nearest integer. Blank cells designate an uncounted value.

Table 5 pools together all referenced data in order to provide one convenient reference. It compares the data of this study with that of the previous studies of the identical land use of combination sit-down/drive-through coffee shops. It also shows the data for similar land uses from the most recent edition of *Trip Generation*.

Source of Data (Year reported)	Average Square Footage	Land Use	AM Peak Trips (# studies)	PM Peak Trips (# studies)
ITE <i>Trip Generation</i> (2003)		Fast-Food Restaurant without Drive-Through Window	44 (2)	26 (4)
ITE <i>Trip Generation</i>		Coffee Shop	73 (2)	29 (2)
ITE <i>Trip Generation</i>		Fast-Food Restaurant with Drive-Through Window	53 (59)	35 (110)
ITE <i>Trip Generation</i>		Coffee/Bread/Sandwich Shop	183 (1)	39 (1)
INCITE, Minnesota (2005)	1,675	Coffee Shop with Sit-Down and Drive-Through Facilities	131 (4)	35 (4)
Krager, Colorado (2006)	1,885		118 (6)	38 (6)
CO/WY ITE Technical Committee (2007)	1,852		109 (6)	33 (6)

Table 5: Data comparison of Peak Hour Trip Generation Rates per 1,000 SF. All values rounded off to the nearest integer.

Table 5 clearly shows the close correlation between counts conducted at the identical land use of Coffee Shop with Sit-Down and Drive-Through Facilities. It also can be clearly seen that the existing data from *Trip Generation* differs substantially from the studies conducted solely for Coffee Shop with Sit-Down and Drive-Through Facilities. Although the independent variable is identified as square footage of gross floor area (GFA), perhaps the presence of a store rather than its size more accurately determines trip generation characteristics. Table 6 shows what happens when the factor of square footage is removed from the trip generation values.

Source of Data (Year reported)	Per store, AM Peak Trips	Per store, PM Peak Trips
INCITE, Minnesota (2005)	219	57
Krager, Colorado (2006)	223	72
CO/WY ITE Technical Committee (2007)	201	57

Table 6: Data comparison of Peak Hour Trip Generation rates Per Store. All values rounded off to the nearest integer.

During the AM peak, there is little difference in variation of total trips from the average of three studies: 6.5% for trips per 1,000 square feet, versus 6.1% for trips per store. During the PM peak, the variation is clearly higher for trips per store. The statistical significance of this difference has not been analyzed. However, this bit of study shows that trip generation rates per store show no more correlation than rates per 1,000 square feet of GFA. Also, when using 1,000 square feet of GFA as the independent variable, the standard deviations of the AM and PM peak weighted average trip generation rates were well within the ITE’s recommended tolerance limit of 110 percent.

If further study is conducted on an in-depth basis, perhaps the question of the most appropriate independent variable could be clearly determined. Further speculation suggested that the number of drive-through windows could have more correlation. However, at the time of this study, no sites were identified which had more than one window while also having sit-down facilities. One site was identified with two drive-up windows, but without accommodation for sit-down patrons. If a future trend leads to development of a significant quantity of sit-down shops with multiple windows, then number of drive-up windows could be analyzed as a potential independent variable.

One element not studied in this effort was the percentage of pass-by trips. As evidenced by the tables presented in this report, coffee shops tend to attract a high percentage of morning peak hour trips. Since the nature of coffee shop patrons is such that they stop for coffee en route to work, it is likely that a large number of trips could be pass-by. Table 5.26 of the *Trip Generation Handbook, 2nd Edition*⁸ depicts data for only three espresso stands (drive-through window with no indoor seating) and shows an average pass-by percentage of 89%. Table 5.24 of the same publication shows pass-by percentages measured for 18 fast-food restaurants with drive-through window, with an average of 50%. Although one could speculate that the pass-by percentage for coffee shops with drive-through/sit-down facilities is likely at least as high as that of fast-food restaurants with

⁸Ibid, *Trip Generation Handbook, 2nd Edition*.

drive-through, future study of pass-by trips at coffee shops is needed in order to identify the appropriate percentage. Data needs for pass-by trips exist for all varieties of coffee shops with sit-down and/or drive-through facilities.

Another aspect of facilities with drive-through facilities which interests transportation professionals is queuing. Although queuing was not measured as a part of this study, it could be another area of future research. To a degree, queuing can tend to be self-regulating if drivers sense that spillback onto the street is occurring. In that case a driver may instead park in the lot and become a walk-in patron. Other times, the driver may visit a different facility rather than risk waiting in a long queue. However, in cases where a site is inadequately designed, spillback onto the street can occur, thus hindering traffic flow. In order to address this matter, it is suggested that the design incorporate sufficient parking in order to handle potential overflow situations.

CONCLUSIONS

- The need exists for trip generation data at all types of coffee shops, involving all combinations of drive-through and/or sit-down facilities.
- The study presented in this report focuses specifically upon coffee shops with a combination of both sit-down and drive-through facilities.
- Data was reported per 1,000 square feet of gross floor area (GFA), although further study is needed in order to determine the most suitable independent variable. At this time, square footage of GFA was determined to be the most likely candidate.
- Data from this study compares closely with that of two other studies of the same land use. Using 1,000 square feet of GFA as the independent variable, AM peak hour total trips between the three studies vary by no more than 6.5% from the average. PM peak hour trips also vary by no more than 6.5% from the average.
- Percentage of drive-through trips for both morning and evening peak periods are relatively consistent: 51% during the AM peak, with 56% during the PM peak hour.
- Further study is needed in order to determine the percentage of pass-by trips at coffee shops of all types of drive-through/sit-down combinations. Additionally, more study could be conducted in order to measure queuing at these facilities.
- **This study resulted in data submission to ITE for a future edition of Trip Generation. The data submitted to ITE is shown in Table 4. Traffic counts from twelve sites were submitted with an average square footage of 1,869. Trip generation rates were reported as an average per 1,000 square feet of GFA for both the AM and PM weekday peak hours of adjacent street traffic. Rounding off to the nearest integer, for the morning peak hour, the average trip generation rate of twelve sites is 113 total trips with 50% entering and 50% exiting trips and a standard deviation of 23 percent. For the evening peak hour, the average rate of eight sites is 35 total trips with 49% entering and 51% exiting trips and a standard deviation of 33 percent.**