



The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.



Canadian
Transportation
Research
Forum

Le Groupe
de Recherches
sur les
Transports
au Canada

GOING THE DISTANCE
Franchir le fil d'arrivée

PROCEEDINGS
of the 29th
Annual Meeting

ACTES
de la 29ième
Conférence
annuelle

Victoria
B. C. / C.-B.
May 15-18,
15 au 18 mai,
1994

TRANSPORTATION PLANNING FOR MINOR LEAGUE BASEBALL STADIUMS

Christine Whalen¹, Dean Cooper¹, and William J. Sproule²

INTRODUCTION

Minor league baseball is experiencing a resurgence in North America. Many cities are building new baseball stadiums or expanding existing facilities. This paper examines some of the transportation aspects of minor league baseball stadiums including attendance, parking, modal split, auto occupancy, and arrival and departure characteristics. Current literature is reviewed and is supplemented with field studies in Edmonton and other AAA Pacific Coast League cities⁽¹⁾.

TRANSPORTATION PLANNING FACTORS

For a new or expanded stadium, the key ingredients for transportation planners will be the location and data on the stadium and the types of events planned. This includes the time that events are to occur and their potential conflicts with other traffic activities. Additionally, planners consider that the following are most critical when planning transportation facilities and developing operations plans:

- potential transit usage
- auto occupancy factors
- acceptable walking distances
- parking requirements
- distribution of arrivals over time
- acceptable exit time following the event

An insight on existing facilities and their specific circumstances becomes an invaluable guide in planning. Some information is available in the literature^(2,6) for selected large or major league baseball and football stadiums, but very little information is published for smaller or minor league baseball stadiums. As a result, work was undertaken in Edmonton, Alberta to determine if the characteristics and guidelines for larger stadiums would be applicable for minor league baseball stadiums.

EDMONTON FIELD STUDIES

Edmonton has a Triple A (AAA) minor league baseball team in the Pacific Coast League (PCL). Triple A baseball is one level below the major league and teams are affiliated with a major league team and during the season players may be "called up" to the parent team. The parent team for the Edmonton Trappers is the Miami

¹ I.D. Engineering, Edmonton, Alberta

² Department of Civil Engineering, University of Alberta, Edmonton, Alberta

The PCL is divided into two divisions, a Northern and Southern Division, and each division has five teams. The Northern Division is made up of the Calgary Canons, Edmonton Trappers, Portland Beavers, Tacoma Tigers, and the Vancouver Canadians. The Southern Division is comprised of the Albuquerque Dukes, Colorado Sky Sox, Las Vegas Stars, Phoenix Firebirds, and Tucson Toros.

There are two other AAA leagues – the American Association, and the International League. Ottawa has a team in the International League.

The Edmonton Trappers play their home games at John Ducey Park. The stadium is located on the edge of the downtown area, southeast of the CBD along the Saskatchewan River, and adjacent to the South Rosedale residential community. The stadium is an older city owned facility with seating for 6,200 spectators, but the Trappers and the City have an agreement in principle to build a new baseball stadium. The proposed development would see the demolition of the current stadium and the erection of a new 10,000 seat stadium on the site⁽⁷⁾. To assist in the planning for the proposed stadium, field studies were undertaken to determine auto occupancy rates, arrival and departure characteristics, and the number of vehicles parked on-street in the Rosedale area and in all off street lots within walking distance of the stadium. An in-stadium survey was also conducted to determine modal split and spectator characteristics. The field studies were done during eight baseball game event days, and the in-stadium survey was carried out on two baseball game event days. In addition, a mailback survey was sent to other teams in the PCL to determine attendance characteristics and available transportation information.

MINOR LEAGUE BASEBALL STADIUMS

The planning of a stadium is a complex problem. In addition to meeting the geometric and functional requirements of the teams and spectators in the stadium itself, the planner must consider how to get the spectators to and from the stadium. Five elements are examined in this paper – stadium usage, estimating crowd size, travel mode, parking, and access requirements.

Stadium Usage

One of the initial steps in a transportation analysis is to determine the number of days per year that the stadium will be used, the time of day when events will take place, and the number of spectators that can be expected.

Minor league baseball games are generally scheduled during weekday and Saturday evenings or on Sunday and holiday afternoons. Games are scheduled so as to reduce conflicts with normal working hours and attract the largest crowds. PCL baseball begins in April and ends in September with the championship series. Each team plays 144 games during the season, half of which are played in their home stadium. The average number of home game dates for PCL teams varies from 60 to 72 depending on rainouts and double headers. During the 1993 season, over 80% of PCL home games were played during the evening with a start time of either 7:00 p.m. or 7:30 p.m. Evening double headers generally begin at 6:00 p.m. Lower levels of minor league baseball have fewer games during the year but exhibit similar day and game time characteristics. Games are about 2 – 2½ hours in duration. Minor league baseball games are scheduled outside of normal peak hour traffic and peak parking demand

periods. As a result, there are opportunities for sharing parking facilities at many stadium sites⁽⁶⁾.

How many persons attend a game and what affects the attendance? Attendance can be examined in a number of different categories – annual total spectators, average game, highest game, paid attendance, etc.

One of the most important factors which influence attendance at minor league stadiums is a winning team. Fans will go to see a good team play regardless of any inefficiencies in the transportation system and any other inconveniences⁽²⁾.

Annual attendance at a minor league stadium is influenced by won-lost percentages, publicity and sales promotion, a new team or a new stadium, a team which has built up a loyal following, and admission cost^(2,4).

Day to day attendance is influenced by weather, won-lost percentages, special promotions such as giveaways or reduced ticket prices, holidays, and presence of other activities in the city⁽⁴⁾.

Attendance figures vary considerably from one day to another as well as from one year to another. Attendance figures for the 1992 season for the Pacific Coast League teams are displayed in Table 1. The PCL stadiums have seating capacities between 6,200 (Edmonton) and 21,000 (Portland). The average attendance for the 1992 season varied between 2,707 (Portland) and 5,328 (Albuquerque). The average attendance as a percentage of capacity of the stadium varies from 12.9 percent (Portland) and 76.6 percent (Vancouver).

Estimating Crowd Size

Three terms could be used to describe the number of spectators at a game – capacity crowd, average crowd, and design crowd.

"Capacity" is the total number of seats in the stadium. In the planning of a stadium the seating capacity would be determined by examining the economics of operation, league requirements, and the market potential in the area.

The "average" crowd is a measure of the success of the team. The average crowd is useful in site selection procedures and a cost analysis for a stadium project.

The third term, the "design" crowd is a value that the transportation planner would use to determine access and parking requirements and traffic operations strategies. Careful selection of the design crowd is necessary. Overestimating the crowd would result in uneconomical facility usage, and underestimating would overload the facilities for many games which may be unacceptable to spectators.

When planning transportation facilities for a new or expanded stadium, the design crowd value is usually less than the capacity crowd. There are typically only a few games during a season that would attract a capacity crowd. A concept similar to the 30th highest hour for highway design has been used. The design crowd for a major league baseball stadium is typically the crowd attending the 10th highest game⁽²⁾. The 10th highest game corresponds to a design crowd of 80 to 85 percent of the stadium capacity.

Table 1 Pacific Coast League Team Attendance Summary

PACIFIC COAST LEAGUE TEAMS	STADIUM NAME	STADIUM SEATING CAPACITY	TOTAL ATTENDANCE 1992 SEASON (HOME GAMES)	TOTAL NUMBER OF HOME GAMES GAME DATES 1992 SEASON	AVERAGE ATTENDANCE 1992 SEASON (HOME GAMES)	AVERAGE ATTENDANCE AS A PERCENTAGE OF CAPACITY
NORTHERN DIVISION						
Calgary Canons	Foothills Stadium	7,500	277,307	61	4,546	60.6%
Edmonton Trappers	John Ducey Park	6,200	254,095	62	4,098	66.1%
Portland Beavers	Civic Stadium	21,000	184,097	68	2,707	12.9%
Tacoma Tigers	Cheney Stadium	10,000	329,000	71	4,634	46.3%
Vancouver Canadians	Nat Bailey Stadium	6,500	333,564	67	4,979	76.6%
SOUTHERN DIVISION						
Albuquerque Dukes	Albuquerque Sports Stadium	10,510	362,283	68	5,328	50.7%
Colorado Springs Sky Sox	Sky Sox Stadium	10,000	187,645	68	2,759	27.6%
Las Vegas Stars	Cashman Field	9,370	382,238	72	5,309	56.7%
Phoenix Firebirds	Scottsdale Stadium	10,000	278,798	72	3,872	38.7%
Tucson Toros	Hi Corbett Field	8,000	300,134	67	4,480	56.0%

REGULAR SEASON GAMES ONLY (PLAYOFFS GAMES NOT INCLUDED)

SOURCE: - 1993 Trappers Program
 - Mail-out Survey, August, 1993

Assuming the 10th highest game approach, an analysis was made to determine if a similar relationship between design crowd and stadium capacity occurs at minor league baseball stadiums.

Table 2 shows the attendance as a percentage of capacity for the 15 highest games at John Ducey Park in Edmonton and at Cashman Field in Las Vegas. It can be seen that the 10th highest game falls between 80 and 85 percent of capacity for the teams and seasons listed. It is therefore assumed that a design crowd equivalent to the 10th highest game be used for a stadium expansion and a design crowd equivalent to a 80 to 85 percent of capacity be used for a new stadium. However, the consequences of a capacity crowd should be examined and parking and traffic facilities should be able to handle this ultimate load⁽³⁾. Often a capacity crowd game is known to occur in advance and can be handled with advanced announcements or temporary parking facilities.

Travel Modes

In order to develop access and parking requirements for a stadium, estimates of the number of spectators by travel mode to and from the stadium must be made. Spectators generally have a choice among private automobile, transit, taxi, walking, or bicycling. The use of a particular mode will be influenced by stadium location, transit availability, parking cost, and parking availability.

The automobile is the primary mode used by spectators and studies at larger stadiums have indicated that 40 to 100 percent arrive by private automobile. The general average is almost 85 percent⁽⁶⁾. However, at several stadiums transit is a popular alternative. There are two basic types of transit for baseball games – regular transit and special service. Regular transit is service that takes place whether or not there is a baseball game at the stadium. Although service frequency will often increase to handle game spectators, the route(s) are already serving the stadium area.

Special transit includes all other types of transit service which takes place on baseball game days only and serves uniquely to take spectators to the stadium before the game and return them to their point of origin once the game has ended. Special bus service includes charter buses, special route bus service, express service, and shuttle buses. Special transit services are not common at minor league stadiums, but as stadiums increase in size, special transit can help alleviate some traffic and parking problems.

Taxis, walk, and bicycle modes are used by only a few spectators, although the percentage of spectators using taxis or walking is typically higher if the stadium is downtown.

The mode split for selected major and minor league baseball stadiums is summarized in Table 3. As observed for larger major league stadiums, the private automobile is the primary travel mode for spectators at minor league stadiums. The surveys at John Ducey Park indicated that over 85 percent of spectators arrived by private automobile.

Another aspect of travel mode is auto occupancy rates – the number of spectators per auto or vehicle. For planning facilities, it is necessary to convert the number of spectators by mode into numbers of vehicles. The suggested design occupancy rate for baseball is 2.5 persons per vehicle^(3,5), however vehicle occupancy rates do vary from city to city as shown in Table 4. The auto occupancy rates at John Ducey Park averaged 2.34 persons/vehicle for weekday games and 2.73 persons/vehicle for

Table 2 Edmonton and Las Vegas Attendance as a Percentage of Stadium Capacity

RANK	EDMONTON TRAPPERS (CAPACITY = 6,200)				LAS VEGAS STARS (CAPACITY = 6,200)			
	ACTUAL APPROXIMATE ATTENDANCE 1991 SEASON	ATTENDANCE AS A PERCENTAGE OF CAPACITY	ACTUAL APPROXIMATE ATTENDANCE 1992 SEASON	ATTENDANCE AS A PERCENTAGE OF CAPACITY	PAID ATTENDANCE 1992 SEASON	ATTENDANCE AS A PERCENTAGE OF CAPACITY	PAID ATTENDANCE 1993 SEASON	ATTENDANCE AS A PERCENTAGE OF CAPACITY
1	6,200	100.0%	6,200	100.0%	14,135	150.8%	14,321	152.8%
2	6,200	100.0%	6,200	100.0%	9,828	104.9%	10,088	107.7%
3	6,200	100.0%	6,200	100.0%	9,377	100.1%	8,277	88.3%
4	6,200	100.0%	6,200	100.0%	9,018	96.2%	8,024	85.6%
5	6,200	100.0%	6,200	100.0%	8,810	94.0%	8,019	85.6%
6	5,863	94.6%	6,200	100.0%	7,927	84.6%	8,004	85.4%
7	5,826	94.0%	5,549	89.5%	7,698	82.2%	7,946	84.8%
8	5,684	91.7%	5,269	85.0%	7,645	81.6%	7,849	83.8%
9	5,586	90.1%	5,212	84.1%	7,604	81.2%	7,767	82.9%
10	5,184	83.6%	5,086	82.0%	7,526	80.3%	7,691	82.1%
11	5,175	83.5%	5,070	81.8%	7,493	80.0%	7,576	80.8%
12	5,061	81.6%	5,053	81.5%	7,491	80.0%	7,192	76.7%
13	4,775	77.0%	5,037	81.2%	7,399	79.0%	6,767	72.2%
14	4,702	75.8%	4,996	80.6%	7,314	78.1%	6,668	71.2%
15	4,500	72.6%	4,783	77.2%	7,309	78.0%	6,526	69.7%

Table 3 Mode Split for Selected Baseball Stadiums

MAJOR LEAGUE BASEBALL STADIUMS					
STADIUM		% AUTO	% TRANSIT & CHARTER	% WALK & TAXI	% OTHER
Oakland, California	(1)	97%	3%	0%	0%
New York (Shea Stadium), NY	(1)	65%	33%	2%	0%
San Diego, California	(1)	97%	3%	0%	0%
New York (Yankee Stadium), NY	(1)	40%	55%	5%	0%
Anaheim, California	(1)	100%	0%	0%	0%
Atlanta, Georgia	(1)	87%	11%	2%	0%
Los Angeles, California	(1)	85%	15%	0%	0%
MINOR LEAGUE BASEBALL STADIUMS					
STADIUM		% AUTO	% TRANSIT	% WALK	% OTHER
Albuquerque, New Mexico	(2)	98%	0%	2%	0%
Colorado Springs, Colorado	(2)	98%	1%	1%	0%
Columbus, Ohio	(1)	90%	9%	1%	0%
Edmonton, Alberta	(3)	86%	4%	4%	6%
Las Vegas, Nevada	(2)	97%	1%	0%	2%
Phoenix, Arizona	(2)	95%	3%	0%	2%
Tacoma, Washington	(2)	90%	5%	3%	2%

(1) Source: Traffic Considerations for Special Events, ITE, 1976.

(2) Source: Mail-out Survey, August 1993.

(3) Source: In-Stadium Survey, May 1993.

Table 4 Auto Occupancy Rates for Selected Stadiums

LEAGUE	STADIUM	AUTO OCCUPANCY RATE (persons/vehicle)
MAJOR LEAGUE BASEBALL (1)	Oakland, California	3.2
	San Diego, California	2.8-3.0
	Anahcim, California	3.4
	Los Angeles, California	2.6
	Atlanta, Georgia	3.0
MINOR LEAGUE BASEBALL	Edmónton, Alberta (2)	2.5
	Colorado Springs, Colorado (3)	3.2
	Phoenix, Arizona (3)	3.0

- (1) Source: Traffic Considerations for Special Events, ITE, 1976.
 (2) Source: In-Stadium Surveys, May 1993.
 (3) Source: Information Form Replies, August 1993

weekend games. The weekend games tend to attract more families. The overall average of 2.5 persons/vehicle seems to agree with the suggested design value.

Parking

To develop estimates of parking requirements, the proportion of spectators who will be driving to the stadium must be estimated. This would be as part of the modal split analysis. Generally, as the number of parking spaces is increased the transit usage decreases. By providing a large number of parking spaces with good access, the automobile mode becomes more attractive. If transit use were to be encouraged, a limited amount of parking may assist this policy decision. This approach has been effectively implemented at Toronto's Skydome Stadium. However, for stadiums which have poor or no transit service, it is important to recognize that insufficient parking may, in the long term, result in lower attendance at games.

In a parking analysis, it is first necessary to make an accurate inventory of available parking spaces within a "reasonable" walking distance from the stadium. The literature suggests special event spectators are willing to walk between 450 and 700 metres which translates to walking for 10 to 15 minutes^(3,9).

Information received from two minor league teams, the maximum walking distance seems to agree with the stated interval. The Edmonton Trappers and Phoenix Firebirds baseball club officials estimated the maximum walking to be approximately 450 metres. However, on occasion, walking distances as high as 600 metres have been observed.

The effect of providing too few parking spaces must be examined. Besides encouraging the transit, automobile users may be willing to walk farther distances and vehicle occupancy rate may increase. The cost of providing additional parking could be weighed against these options. When the inventory information is combined with the parking requirements and policy decisions or targets, the number of additional spaces required can be estimated. The additional spaces can be accommodated through the use of a combination of facilities⁽⁸⁾:

- on-site parking facilities
- remote parking with shuttle bus operation
- available parking facilities near the stadium to be used as shared parking facilities (example: office building parking facility)

Table 5 shows the number of parking spaces and a ratio of seats to parking spaces for selected stadiums. Stadiums within the downtown area or a stadium which is well served by the public transit network provide on average one parking space for every 7 to 16 stalls. A stadium which has poor or no transit service and little existing parking facilities may have to provide as much as one parking space for every two seats⁽⁸⁾. The number of parking spaces per seat in minor league PCL stadiums ranges from 3.6 (Las Vegas) to 34.8 (Albuquerque).

Access Requirements

The arrival and departure characteristics of spectators must be considered to determine requirements that will be used in the design of entrances, exits, and parking lots.

Table 5 Parking at Selected Stadiums

STADIUM		SEATING CAPACITY	NUMBER OF PARKING SPACES OPERATED BY THE STADIUM	NUMBER OF SEATS/SPACE
MAJOR LEAGUE STADIUMS				
Atlanta Stadium, Atlanta	(1)	58,850	4,000	14.7
Astrodome, Houston	(1)	53,000	25,000	2.1
Dodger Stadium	(1)	56,000	16,000	3.5
Riverfront Stadium, Cincinnati	(1)	56,200	4,550	12.5
Shea Stadium, New York	(1)	55,000	7,400	7.4
Veterans Stadium, Philadelphia	(1)	65,300	11,000	5.9
MINOR LEAGUE STADIUMS				
Albuquerque Sports Stadium, Albuquerque	(2)	10,510	302	34.8
Cashman Field, Las Vegas	(2)	9,370	2,608	3.6
Cheney Stadium, Tacoma	(2)	10,000	1,500	6.7
John Ducey Park, Edmonton	(3)	6,200	1,000	6.2
Scottsdale Stadium, Phoenix	(2)	10,000	300	33.3
Sky Sox Stadium, Colorado Springs	(2)	10,000	2,000	5.0

(1) Source: Parking for Institutions and Special Events, E.M. Whitlock, 1982.

(2) Source: Information Form Replies, August 1993.

(3) Source: I.D. Engineering Company Ltd. Study, May 1993.

The arrival pattern to a stadium is influenced by the surrounding street network as well as the internal circulation of the stadium site. Given that the internal and surrounding street network is designed properly, the arrival pattern of baseball patrons is dependent on weather, pre-game activities, general admission seating (patrons wanting to get a good seat), and pre-game giveaways to the first X number of patrons⁽⁵⁾.

The literature on larger stadiums indicates that the peak inbound traffic occurs approximately 60 minutes before the start of the sporting event. The 15 minute peak period normally occurs 30 minutes before the beginning of the game. During this peak 15 minutes, approximately 35 percent of the inbound traffic occurs⁽⁴⁾. A survey of the arrival pattern was conducted at John Ducey Park and is illustrated on Exhibit 1. The 15 minute inbound peak period occurs between 20 and 35 minutes before the start of the game when approximately 30 percent of the inbound traffic occurs.

The departure or exiting pattern of spectators is influenced by the weather, the score, and post-game activities. However, usually the exiting pattern of spectators is sharp and immediate after the game, unlike the arrival pattern of patrons which is spread out over more than 60 minutes. This creates a great impact on the transportation network. Not only must the street network surrounding the stadium be able to accommodate this instantaneous increase in traffic but so must the internal circulation network, the parking ramps, and exit facilities. The exiting patterns for six baseball games at John Ducey Park are shown on Exhibit 2. There is a peak exiting time which occurs between 10 minutes prior to the end of the event to 20 minutes after the end of the event. During this peak period over 75 percent of the vehicles left the parking lots and entered onto the street system.

To measure this outbound exiting or departure traffic, the term "dump time" or "dispersal time" is often used as a measure of service. The dump time is the length of time from the end of the game until all the parking lots are empty and the last vehicle has left the area. Studies at John Ducey Park indicate dump times of 35 to 60 minutes with an average dump time of 35 minutes.

For planning and design, a dump time would be specified and the internal circulation of the stadium, the parking lot exits, and streets and intersections serving the stadium area would be planned or operated to achieve the dump time. The literature suggests a design dump time of 30 to 60 minutes.

CONCLUSIONS

Minor league baseball stadiums have many of the same characteristics as larger major league stadiums only on a different scale. The same basic approach that is used for the planning of transportation facilities at major league stadiums can be used for minor league baseball stadiums. Several conclusions can be summarized:

1. Minor league baseball games are scheduled during weekday and Saturday evenings, and Sunday and holiday afternoons. They do not conflict with peak hour traffic periods.
2. Attendance at minor league baseball games varies considerably from team to team, and game to game.
3. The use of 10th highest game is suggested for the planning of stadium transportation facilities. This is about 80 to 85 percent of seated capacity.

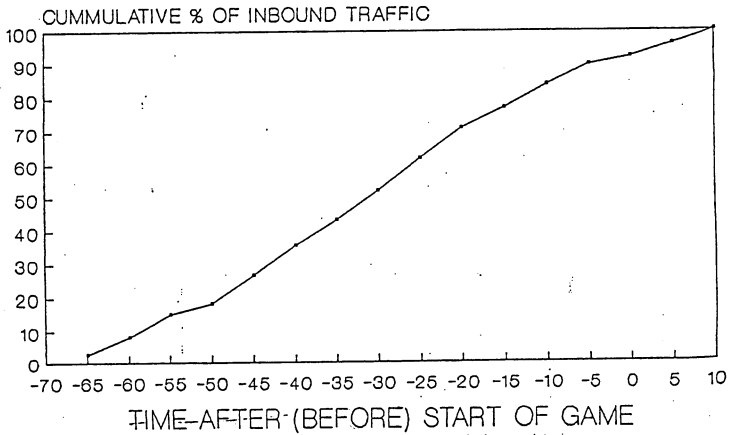


Exhibit 1 Arrival Pattern of Spectators at Edmonton's John Ducey Park

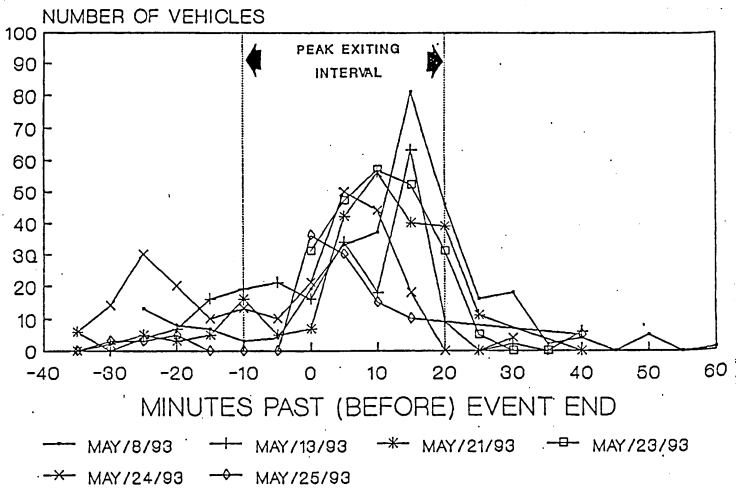


Exhibit 2 Departure Pattern at Edmonton's John Ducey Park

4. The private automobile will be the primary access mode for spectators. The average occupancy rate will be about 2.5 persons/automobile.
5. The peak arrival of spectators at a game will be about 30 minutes prior to the game.
6. "Dump time" is a measure of service for exiting spectators and for planning purposes a dump time will be specified for the design of exit facilities.

REFERENCES

1. C. Whalen. *Transportation Planning for Minor League Baseball Stadiums*, M. Eng. Project Report. University of Alberta, Edmonton, Alberta, 1993.
2. J.M. Hunnicutt. *Parking Demand for a Large Downtown Stadium*. Traffic Engineering, July 1969.
3. J.E. Ashwood. *Transportation Planning Considerations for New Stadiums*. Traffic Engineering, July 1973.
4. W.J. Sproule. *Some Transportation Aspects of a Sports Stadium*. Research Report No. 14, University of Toronto - York University Joint Program in Transportation, Toronto, Ontario, 1973.
5. *Traffic Considerations for Special Events*. ITE Technical Council Committee 6A5. Informational Report, Institute of Transportation Engineers, Washington, DC, 1975.
6. *Traffic Operations Planning for Stadiums and Arenas*. ITE Technical Council Committee 6A5 Informational Report. Institute of Transportation Engineers, Washington, DC, 1994.
7. I.D. Engineering. *The New Edmonton Baseball Stadium - Environmental Impact Assessment and Traffic Impact Assessment*. Edmonton, Alberta, 1993.
8. E.M. Whitlock. *Parking for Institutions and Special Events*. ENO Foundation for Transportation, Westport CT, 1982.
9. R.A. Weant and H.S. Levinson. *Parking*. ENO Foundation for Transportation, Westport CT, 1990.