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The ABC's of Roadway Planning: Thinking Beyond the Pavement

Functional Planning

Presented by

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INTRODUCTION

The roadway system is a vital element of our lifestyle.

We, the elected and appointed officials performing roadway administration, are the stewards of the roadway system. This is true for all jurisdictions - state, county, city or town.

Stewardship is the careful and responsible management of something entrusted to one's care.

Good stewardship requires developing a well-considered, long-range plan, based on enlightened, defendable, logic. The first step of stewardship is to study and learn the subject well enough to set appropriate objectives. The next step is to formulate a game plan for accomplishing those objectives.

This can be a daunting task. This presentation will introduce a method of roadway planning that can be called Functional Planning. Functional planning is planning based on the functions of roadways.

The three points that participants (roadway administrators) should take home from this presentation are:

1. There are two (and only two) purposes (functions) of roadways: 1) mobility and 2) access.
2. Mobility and access conflict. Increasing access reduces mobility.
3. Mobility reductions caused by access cannot be undone in the future.

The reason for stressing these points in this presentation is that my purpose today is to explain what is Access Management & why Access Management is needed. (Not saying “Asset Management”).

These three points sum up why Access Management is needed.

“Access” is one of the most important, but most under-discussed subjects in the road management business. Most people, including myself, have had little or no training on this important subject. When I was hired as the County Highway Engineer in 1998, I didn’t understand what the term “roadway access” meant. I had no understanding of its significance.

I could see that there were problems being created, but I couldn’t put into words, and for several years didn't know, that there was a simple solution - access management.

I now have a deep concern because planning and foresight for roadways is not being implemented.

The purpose of this presentation

1) Demonstrate the need for access management.
2) Show that access management is in-fact fairly simple.
3) To provide a tool for your long-range roadway planning process.
ROADWAY FUNCTIONS

There are two and only two functions of roadways. The first roadway function is the movement of vehicles, referred to hereafter as mobility. The second roadway function is access.

Access means getting onto or off of a public roadway. This can be either to or from: 1) another roadway; or to or from 2) land abutting the roadway, via a private driveway.

Side note - Access in this context does not refer to knocking down a freeway fence and crossing the roadside ditch to get onto the travel lanes. The definition of access includes the word ‘lawful’ for this reason.

Two figures will be used in this presentation, taken from a widely used traffic engineering reference and textbook: Fundamentals of Traffic Engineering (14th edition), Homburger, et al, Institute of Transportation Studies, University of California, Berkeley.

See Figure 13-1 - The Schematic Relationship Between Access and Movement Function of Streets (next page)

Note: The purpose of the graph is not to be mathematically technical. The graph is an aid for visualizing & explaining the affects that access has on mobility.

Description of the Graph

The graph has two axis. A vertical and a horizontal axis. The two axis represent levels of mobility and access provided, from low to high (left to right, and bottom to top.)

The horizontal axis is the level of mobility that can be provided (either now, or in the future if other aspects of the roadway are improved.)

The vertical axis is the amount of access to the roadway. (In traffic engineering thinking, this is the Axis of Evil.)

Discussion of the Mobility vs Access Relationship

The graph is a visual representation of the relationship between the two functions. The higher on the access axis (i.e. the more access there is), the lower the level of mobility that is provided (or could potentially be provided, if other roadway improvements were made.)

Every roadway must supply both functions. But, some roadways are designed to emphasize movement over access, and others to emphasize access over movement.

The range of emphasis is a spectrum, with the movement function at one end of the spectrum, and the access function at the other. Freeways are at one end of the spectrum, emphasizing movement. Residential neighborhood cul-de-sac streets are at the other end of the spectrum, emphasizing access.

The bottom line is, the higher the level of mobility that is desired, the lower the level of access that can be tolerated.
Fig. 13-1—Schematic Relationship between Access and Movement Function of Streets

Referenced from: Fundamentals of Traffic Engineering (14th edition), Homburger, et al, Institute of Transportation Studies, University of California, Berkeley
ACCESS DISCUSSION

For this discussion, we will look at individual access points
Drop a culvert into the roadside ditch, spread a few loads of gravel, and an access point has been created.

To examine the important aspects of access, we must think about it from two perspectives.
1) The perspective of the roadway owners and users.
2) The perspective of the access owner and / or users of the access point.

Road users perspective
The predominant goal from the roadway users perspective is mobility. The roadway user is trying to travel somewhere, and does not want to be impeded.
Safety is a major aspect and concern relative to mobility.

Access user perspective
A frequent goal of access users is slower speeds and lower traffic volumes of the roadway being accessed.
This is evidenced by the calls the highway department receives from homeowners upset about people driving too fast past their homes. The calls usually are requesting lowered speed limits.
Unfortunately, most of these cases are on roads that other road users need to use for travel, and therefore we can’t accommodate the requests.
MOBILITY DISCUSSION

Mobility is the ability to get from one place to another.

The public wants mobility. We all want mobility. Mobility is highly desired.

Aspects or traits of mobility that are important to roadway users:

   - Travel time (the flip-side of average travel-speed);
   - Safety;
   - Reliability;
   - Economy.

How can the mobility of a roadway be gauged? The average safe travel speed that can be maintained is most important, usually. The higher the average speed that can safely be maintained, the shorter the travel time. The shorter the travel time, the higher the level of mobility.

Anecdotal evidence of the importance of reduced travel time to motorists – most drivers will travel at the highest speed that they feel is safe, regardless of the trip length. This is true for trips to the corner store, across county, or across the state.

This is not promoting or suggesting that every roadway should emphasize movement (high speed travel) over access. Not every roadway should tolerate high-speed traffic.

There are conditions where slower speeds are appropriate and desired. A residential subdivision, pictured below, is an example.

This presentation is promoting long-range planning, to ensure that enough appropriate roadways that emphasize mobility will be provided, in a strategically spaced grid of thoroughfares, to let road users drive predominantly on higher speed roads when traveling.
HOW DO WE OBTAIN ROADWAY MOBILITY?

Changing gears from wanting mobility, to: how do we obtain or supply mobility?

Mobility Doesn’t Come Easy
Access is easy. Mobility is not. Acceptable mobility on a roadway doesn’t just happen. Nor will it happen automatically in the future.

What is needed to provide acceptable mobility?
Three aspects of roadways determine the level of mobility.

1) The riding surface (appropriate pavement is required for higher mobility).
2) The geometry of the roadway (the driving lane and shoulder widths; the amount and severity of curves and hills; the shaping of the roadsides; etc).
3) The level of Access (the quantity and design of access points; etc) determines where on the functional graph the roadway is. No matter how good the pavement and geometry are, the level of access will limit the mobility.

We will briefly compare and contrast the residential neighborhood roadway pictured above, and the freeway roadway pictured below, to illustrate the three determinant factors.
Discuss the three Mobility Determinant Aspects of the two prior photographs (a residential subdivision street, and a rural freeway)

This section of the presentation points out that the residential subdivision street has many similarities to the freeway in some of the mobility determinant aspects. Yet, the freeway offers a much greater level of mobility than does the subdivision street. The key difference in mobility is the level of access.

**Pavement - The 1st determinant** To the motorists eyes, both cases have similar pavements. They are both asphalt and smooth. (It’s a sure bet that the subdivision pavement wasn’t built to have the strength of the freeway pavement, but that is unimportant and indeterminate to the user.)

**Geometry – the 2nd Determinant** The geometry of the two roadways are similar in many ways. The driving lanes are fairly wide; the roads are fairly straight, and not too hilly. (Obviously, this picture is of a divided highway. If this picture were of a two-lane rural highway, which one side of this freeway resembles considerably, the analogy would be more striking.)

**Access – the 3rd Determinant** The biggest difference is that one is highly accessed, while the other is not accessed at all (for a long distance.)

The above part of the presentation is to emphasize that it is the position on the Mobility-Access graph (see next page) that determines the level of mobility that can be offered by a roadway.
The bottom line is that increasing access (higher on the Access Function axis of the graph), means lower mobility (the Movement Function axis of the graph).
MOBILITY AND ACCESS ARE CONFLICTING FUNCTIONS

Anecdotal evidence of the affect access has on mobility

Will use examples to demonstrate the affects of access on mobility.

Freeways offer the highest levels of mobility. The defining characteristic of a freeway is the total control of access to the freeway travel lanes. This is no coincidence. Whoever conceived of the idea for freeways realized that controlling access is the key to high mobility.

Will compare and contrast two segments of freeway. Both segments have three travel lanes in each direction. The first segment has no interchanges for many miles. The second segment has numerous interchanges with other major freeways or other heavily traveled roadways.

On the non-accessed freeway segment, traffic can be bumper to bumper in all lanes, and still flow smoothly at 75-mph. The segment with interchanges will have much lower average travel speeds, a gauge that mobility has been reduced.

As further evidence, consider where the maximum capacity of a roadway is first noticeable. When freeways begin to reach their maximum capacity, it is first evident at their interchanges, which are their access points. This is true of all other roadway types as well. The access points, which are intersecting roadways or driveways, will have evidence of congestion and delay first. The delays caused by those access points actually are the limiting factors of the roadway’s mobility capacity.

Compare average travel speeds outside of versus within developed areas. SR-26 and US-52 through Lafayette and West Lafayette quite vividly demonstrate the adverse affects of access on mobility. Note also that I-65 traffic is hardly slowed, if slowed at all, at it swings by Lafayette, whereas SR-26 and US-52 have very low average travel speeds in this same vicinity.

Compare and contrast the mobility of a city street (which may have better pavement and lane widths) with a rural roadway. Even a well-paved city street, with wide traffic lanes, cannot offer the same level of mobility (i.e. higher safe average travel speeds) as a rural roadway with narrower and poorly paved travel lanes.
MOBILITY IS ALWAYS THE BIG LOSER -
WHEN ACCESS & MOBILITY CONFLICT

Mobility is the ability of a roadway to offer movement of vehicles. The better the mobility, the higher the average travel speed that can safely be maintained by motorists.

I’ll use an extreme example to illustrate how mobility loses to access. I created a subdivision for you. I call it I-65 Extreme-Access-Acres.

Notice the homemade speed limit sign. A resident wasn’t happy, thought the freeway drivers were being inconsiderate by traveling by too fast.

Consider the two roadway functions in this situation. Other than being a freeway, this is a scene that is routinely seen along many high-speed roadways.

The access is not desirable, but it’s do-able. The residents probably won’t be happy with the traffic, but they made the choice to move there.

The mobility function would certainly be lowered. (That is, moved to a lower point on the functional graph).

Notice that the motorists would have no choice about driving past these driveways and having a reduced level of mobility. Is this fair?
ACCESS CANNOT BE UN-DONE  
(WHY ACCESS MANAGEMENT IS NEEDED NOW)

A quick review -
- Roadways have two, and only two, functions.
- The two functions conflict.

With that basis, we can think about why Access Management is needed now.

Providing access is an easy, simple process.

In contrast, mobility functionality is very hard to provide. All three of the aspects that determine the level of Mobility (pavement, geometry, access) must be properly attended to.

And, access cannot be “un-done” without great disruption to individuals, or without great financial cost.

The only way to ‘un-do’ access that is in-place is to remove it.

Whether homes or businesses, removing them to eliminate access would be a very expensive proposition. Not to mention disruptive to lives. Thus, there is no practical way to eliminate access after it is granted.

Practically speaking, access is not going to be undone on many roads.

For example – how could the access of this roadway be removed now?
**New Roadways Will Not Replace Existing Roadways**

Another hope might be to construct entirely new roadways, to get away from and solve problems of too much access.

Two problems will prevent the option of new roadways from becoming a practicality. The $ cost is an obvious problem.

But even if money were available, a second problem will prevent new routes in the future. New right-of-way corridors will not be available in most cases. Land subdivision and wide-spread development is making the possibility for finding new routes for roadways very unlikely.

That leaves only today’s existing roadways as candidates to be tomorrow’s thoroughfares.

**Fairness – a very important consideration**

Most thoroughfares of tomorrow must be on the roadway corridors that exist today. But we’re losing mobility daily on those corridors. New access points are being generated by the continual allowance of parcels to be created along our existing roadways.

It’s not fair to the general public. And it’s especially unfair to the future generations that will follow us. They will foot the bill tomorrow for our actions of today.

If Access Management isn’t implemented during this period of rapid growth, the future effects and costs will be huge.

There’s the $ dollar cost of buying and relocating homes and businesses that might need to be moved.

And there’s the disruption to lives resulting from poorly planned development along the roadways.

**This cost will be borne by those that follow us, not us.**

**That is entirely unfair.**

**Two wise, old sayings**

* A stitch-in-time saves nine.  
* An ounce of prevention is worth a pound of cure.

**How to apply** the wisdom of these sayings in our highway planning:

Identify the routes that should remain or become thoroughfares, and maintain their mobility potential for use in the future.
HOW TO IMPLEMENT ACCESS MANAGEMENT

How To Implement Access Management

1) Establish a functional classification system.
2) Determine which roadways within the jurisdiction should emphasize movement, which should emphasize access.
3) Enact an ordinance reflecting these.

Functional Classification Categories

**Regional Arterial:** Regional arterials are for high-speed through traffic. Regional arterials are not intended to provide direct access to land use activities.

**County Arterial:** County Arterial roads carry both intermediate and regional traffic, link various communities, provide cross-county movement, and move traffic to and from major traffic generators. Arterials are not intended to provide direct access to individual properties.

**County Collector:** County Collector roads take traffic from local roads, carry it over a short distance and distribute it to arterials. Collectors provide some access to land uses.

**Local:** Local roads are intended to provide direct access to directly adjoining land, to provide access to other local roads, and are not intended to serve through traffic.

(These are example classifications, appropriate to a rural county.)
This example demonstrates a grid of higher speed roadways – freeway, arterials & collectors – emphasizing mobility. The areas between the thoroughfares are in-filled with local roads emphasizing access.

The benefits of this type of planned layout include - Access points mostly on local roads, away from higher speed traffic. Motorists don’t have to travel far from the Local roads to reach a roadway where higher speeds, and less interrupted travel is possible.
IMPLEMENTATION REALITIES

The Concepts of Access Management are Simple

The Realities of Implementing are A Challenge

Political pressures applied by influential landowners and developers. An education of the public to the concepts of mobility and access will lessen the opportunity for political pressure.