Location, Design, and Operation of Accident Investigation Sites in Urban Freeway Corridors

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In this paper, current recommendations for locating, designing, and operating Accident Investigation Sites (AISs) in urban freeway corridors are summarized. The recommendations are based on (a) interviews with freeway corridor traffic management teams in Texas who have had experience with AISs and (b) experiences of the authors. Some of the guidelines can be summarized as follows: The AIS locations must be easily accessible from the freeway. The most desirable location is within one block of the freeway exit ramp terminals. Because the freeway patrol officers are essential to a successful system, local police should be involved in locating and designing AISs. An AIS should be paved, illuminated, have a minimum of 1,000 ft^2, and be equipped with some form of telephone communications system. Police officers must understand and be convinced of the merits of AISs. A public campaign is essential to inform the motoring public about the system. In addition, a formalized process of feedback from the patrol officers concerning any problems with the sites, followed by a reply, action, or both by the highway agency, is important. Although AISs can provide considerable benefits without formalized freeway incident management approaches, it is better to install AISs as part of a citywide freeway incident management program involving traffic engineers and law enforcement personnel.

Accident Investigation Sites (AISs) are specially designated and signed areas off the freeway where damaged vehicles can be moved, motorists can exchange information, and police and motorists can complete the necessary accident forms. These areas are located so that the motorists involved in the accident, investigating police, and tow truck operators are out of view of freeway drivers. This reduces "rubbernecking," which is a major cause of congestion at a freeway accident scene.

General guidelines for the design of AISs were presented in 1972 by Pittman and Loutzenhieser of the Texas Transportation Institute (*1*). In this paper, current recommendations for the design and operation of AISs are summarized. These recommendations are based on interviews with freeway corridor traffic management teams in Texas who have had experience with designing, implementing, and operating AISs and on the experiences of the authors (*2*). Promotional issues related to AISs are discussed elsewhere (see companion paper by Dudek et al. in this Record).

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AIS LOCATION AND DESIGN

Access and Distance

AIS locations must be easily accessible from the freeway. There must be a minimum number of turns and distance to travel after leaving the freeway. The most desirable location is within one block of the freeway exit ramp terminals.

Location Alternatives

The following four alternatives for locations of AISs have been used:

- Alternative 1: Specially constructed sites on the freeway right-of-way out of the view of freeway traffic. These sites may be located under bridge structures (Figure 1) or in the outer separation of the freeway.

FIGURE 1 AIS under bridge structure.

- Alternative 2: Specially constructed sites between the frontage road and the right-of-way line.
- Alternative 3: Existing parking facilities on private commercial property abutting the freeway right-of-way (Figure 2).
- Alternative 4: Public curb parking spaces on local streets (Figure 3) or frontage roads in the vicinity of the freeway.

FIGURE 2 AIS on private commercial property.

FIGURE 3 AIS on city street.

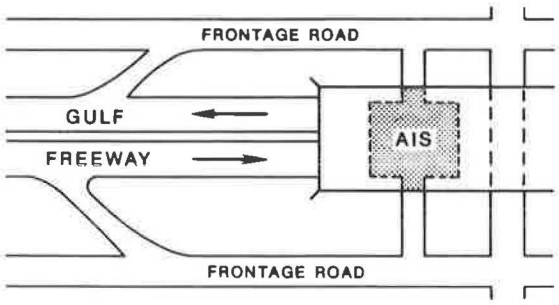

FIGURE 4 AIS under overpass.

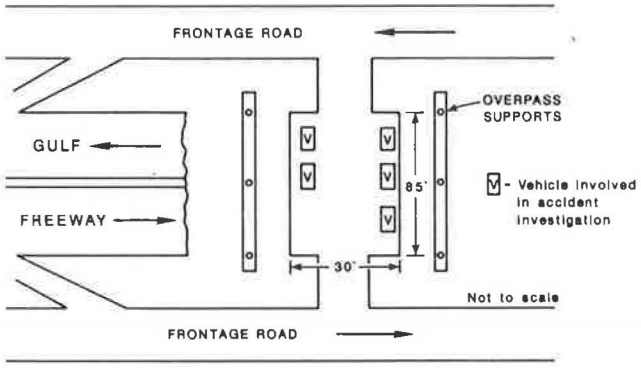

FIGURE 5 AIS schematic.

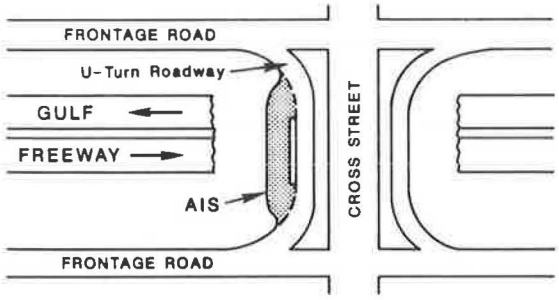

FIGURE 6 AIS combined with U-turn roadway.

As examples, the location and layout for a site out of view of freeway motorists that was constructed in Houston on the Gulf Freeway right-of-way are presented in Figures 4 and 5. The access to the site and the drainage are simplified with this design, and the 85 × 30–ft (26 × 9–m) parking area is more than adequate. An innovative design that combines an AIS with a U-turn lane constructed under a bridge structure is shown in Figure 6.

The advantages of locating AISs in the outer separation of the freeway are that there is direct access from the main lanes (and the frontage roads, when available) and the potential locations are not dependent on the location of the exit ramps. When AISs are located in the outer separation, they should be shielded by some type of screen to keep the accident and emergency vehicles out of sight of freeway motorists. The screens can be constructed of natural or artificial materials. A disadvantage of using the outer separation is that the sites may not provide as much protection from traffic as the other, alternative locations, but the outer separations offer benefits over the normal shoulders for accident investigation. In addition, representatives of one state noted a potential problem with using screens to hide accident vehicles: the AISs could be very susceptible to collecting debris.

Alternative locations 2, 3, and 4 may not always be completely out of sight of freeway traffic. Even if they are visible, however, the disruption factor is significantly reduced when the accident scene is removed by some 50–100 ft (15.2–30.5 m) from the traveled lanes.

The need for cooperation with local jurisdictions and private property owners during installation and operation of AISs cannot be overemphasized. It is rare that all AISs can be located on state- or city-owned right-of-way.

Police Involvement in Site Location and Design

Because the freeway patrol officers are essential to a successful system, local police should be involved in locating and designing AISs. Because of their intimate knowledge of the freeway corridor and their experience with accident investigations, the patrol officers are in the best position to help select locations that will optimize the use of AISs. Police inputs to design will enable the highway agencies to include features that will also enhance the probability of AIS usage.

AIS System Continuity

Because of the experimental nature of previous AIS systems, AISs previously were installed on only a small segment of the metropolitan freeway system of the cities in which they were implemented. Experience has indicated that although AISs are beneficial, an incomplete system can sometimes have an adverse effect on the use of AISs by motorists. Having an accident on a freeway, let alone on a given section of freeway in which AISs may be located, is a rare event for most motorists, and therefore motorists may not have too many opportunities to use AISs. Thus motorists are inclined to forget about the existence of the AISs that are located on a small segment of the freeway system.

Installing a complete system of AISs throughout a metropolitan area within a relatively short time frame may not always be possible because of constraints such as funding. However, it may be possible to install AISs selectively along the freeway sections in which accident frequencies are the highest. Frequent advertisements and public information announcements are necessary in these cases, in addition to the normal AIS signing along the freeway to remind motorists of the specific segments of the freeways on which AISs are located.

Size

An AIS should have space for parking a minimum of five vehicles (one police car, two damaged vehicles, and two wreckers). Additional space is desirable to accommodate multivehicle accidents and additional wreckers, but provisions can be made for emergency parking on streets for these situations. Therefore a typical specially constructed site or private parking area (off street) should have a minimum of 1,000 ft^2 (304.8 m^2) of parking space, and curb parking sites should be a minimum of 100 ft (30.5 m) in length.

Signing and Marking

Signs can be placed on the freeway ahead of the exit ramp (Figure 7) and on the frontage roads (Figure 8) and local streets (Figure 9) as required to guide drivers to the AISs. These signs also serve as reminders to the public and police of the AIS system. The sites should be identified on the signs by a number. "No Parking" signs should also be placed at the sites to lessen the misuse of the sites as parking areas. Supplemental pavement markings may be required on private parking areas and curb parking.

FIGURE 7 AIS signing on freeway.

FIGURE 8 AIS signing on frontage road.

Communications from AISs

If motorists are to use the AIS system before an accident investigator arrives, some form of telephone communications must be provided. For the sites within the freeway right-of-way, a dedicated telephone system to the police dispatcher's office should be provided (Figure 10). On the private parking areas or local streets, public telephones may be provided within walking distance of the site. Public telephones could also be provided at the sites on the freeway right-of-way to allow motorists to contact other sources of help or to make personal or business calls.

FIGURE 9 AIS signing on local street.

FIGURE 10 Telephone to police dispatcher.

Security

Concern for the personal safety of motorists who use the out-of-the-way parking areas must be considered in the design and location of the sites. High-risk areas should be avoided if possible. The sites should have paved surfaces and good illumination for night usage. Street lights and telephones promote safety. Other techniques that can be used to improve security are as follows:

- Have the sites checked regularly by police, highway maintenance crews, and emergency service crews.
- Park emergency and maintenance vehicles in or near the sites when they are not on patrol or in service (e.g., during lunch).
- Place the sites near locations that will have high volumes of vehicle and pedestrian traffic (e.g., near a bus stop).

OPERATION

Selling the Concept to Individual Police Officers

One of the first steps to ensure successful use of AISs is to make sure individual police officers understand the benefits of AISs and will support the use of the AIS system. Accident investigation is not a favored function of many police departments. Some police officers complain that it consumes substantial time and human resources in the field and in the courtroom. Positive efforts by highway and police supervisors are essential in overcoming a problem that exists with some accident investigators. These investigators prefer to complete reports at or near the scene of the accident because they believe that this reduces the time needed to complete the paperwork and enhances the accuracy of the report and possible court testimony. Positive efforts are also necessary to overcome some investigators' preferences to move several vehicles to the shoulder of the freeway instead of to a site several hundred feet off the freeway. These officers believe that it is more hazardous to lead a platoon of vehicles from the freeway than it is to conduct the investigation adjacent to a lane of moving traffic. The operations agency must change these attitudes if the AIS system is to be successful.

Formalized Instruction and Information

To obtain high AIS usage rates, the freeway police patrols and accident investigation units must be convinced of the merits of the AIS system and provided with

- A description of the AIS system and instructions on how and when to use the sites,
- A map of AIS locations and a description of the use of the sites (short forms could also be made available for distribution to motorists involved in accidents), and
- A procedure for monitoring the use of the AIS system.

Public Information

As previously noted, information concerning the location and use of AISs must be given to the motoring public. All sources of information transfer should be used (e.g., radio, television, newspaper, etc.). In addition to special brochures for distribution to the public, press release packages should be prepared for the media so that they have all the information necessary for dissemination to the public via all media modes. Motorists and media must be made aware of the AIS system during the early phases of development (i.e., planning and design phases) so that they are able to provide input if necessary. Motorists must be reminded of the AIS system periodically so that they become familiar with the locations of the sites and so that they have appropriate expectations about the use of the sites and the overall improvements to freeway traffic. This news release, which was used in Houston, Texas, is an example of the kind of media communication that might be used:

> The Texas Highway Department in cooperation with the City of Houston Police Department and the Department of Traffic

and Transportation recently constructed 16 sites along a section of the Gulf Freeway for accident investigation purposes. These sites, constructed along the freeway between Dowling Street and Broadway Boulevard, are to be placed into operation by the Houston Police Department on Monday, June 12, 1971.

Studies conducted by the Texas Transportation Institute and the Highway Department have indicated that an average minor accident on Freeways directly affects traffic for some 41 minutes. The removal of an accident to a location out of view of the freeway would have the net effect of screening the accident and removing the "gapers block" for an average of 25 minutes. This in turn would result in renewed flow on the freeway and reduced secondary collisions.

The Police Department advises that motorists involved in minor accidents where their cars are driveable should move to one of these sites before calling the police. The sites, accessible from the frontage roads, are marked by blue signs and are constructed under grade separations or on existing city streets.

By quick removal of the accident to these sites, traffic flow along the freeway can recover, minimizing the usual stop-and-go operation on the freeway.

The City of Houston and the Texas Highway Department solicit your cooperation in the use of these sites. The sites, now termed experimental, will become permanent and expanded if good results are obtained.

A videotape demonstrating the intended use of the AISs would also be helpful in enhancing public understanding and encouraging motorists to use the sites.

Monitoring and Feedback

The chances are that in spite of careful planning and the direct involvement of the police in designing and locating the AISs, certain sites or site characteristics may be found to be less than acceptable after a period of use. A formalized process of feedback from the patrol officers about any problems with the sites, followed by a reply, action, or both from the highway agency, is very important if the sites are to be regularly used by the police investigators.

To determine the effectiveness and benefits of the AIS systems, information on the frequency and usage rate of the sites is needed. The police officers who respond to accident scenes are the best source for this information. Although police in general and accident investigators in particular are opposed to any additional paperwork, a brief form can be devised that should take no more than 2 or 3 min to complete. The form used for the Houston Surveillance Project is shown in Figure 11. It is important that each patrol vehicle be supplied with the forms. These forms may be combined with the booklet and maps that are provided to the police to explain the location and use of the AIS system.

The completed forms should be collected by the AIS manager at frequent intervals and the results reviewed with the supervisor of the traffic investigation section. To obtain information on the rate of usage, the number of total accidents in the same area as the AIS must be obtained. For those systems that attempt to get the motorists to move voluntarily from the freeway to the AIS before notifying the police, the remarks

Complete For ALL accidents Investigated On Freeways

1. Freeway (name)_____

2. Date_____ Time _____ AM____ PM____

3. Accident Investigation Site No. _____ (if used)

4. Approximate Location of Accident: Block No. _____

5. Location of Investigation

____ Shoulder ____ Accident Investigation Site

____ Frontage Road ____ Median

____ City Street ____ Other _____

6. In View of Traffic?

____ Yes ____ No

7. How Long Did Investigation Take?

_____ Minutes

8. Remarks _____

Signed _____

Investigating Officer

FIGURE 11 Houston Police Department supplemental freeway accident report form.

section should include the motorists' reasons for moving or not moving to the AIS system.

These forms will also be helpful in monitoring the operations of the police investigators and determining their reasons for not using the AIS system. The most common reasons cited by the field investigators are as follows:

- The length of investigation was too short to justify moving the vehicles.
- Because of the prevailing conditions, the officer determined that the investigation could be conducted more safely adjacent to the freeway main lanes.
- The accident investigator forgot about the AIS system or did not know where the nearest site was located.

Most of these reasons can and should be answered by the supervisor of the accident investigators. First, no investigation should be so short that it should not be removed from the freeway and freeway shoulder as soon as possible. Second, the AIS system's major advantage is that it puts the officer and motorists into a situation that is safer than remaining in the area adjacent to the moving lanes of a freeway. Third, the purposes of the signs, bulletins, and maps are to remind the police of the location of the sites. Frequent reminders to new and old investigators could be provided in various forms.

An alternative to having a special short form for recording AIS usage would be to include statements on the potential use of an AIS site on the normal accident report form. If the report form can be modified to include a specific question concerning AIS usage, this would provide a constant reminder to the investigator of the system. In the absence of a modified form, investigators could be told to include the required information on use or nonuse of the AIS system in the remarks section for

location of the accident. This second approach will not be as successful as the use of the special form because it does not immediately call attention to the need for using the AIS system.

A third method for monitoring the use of the AIS system would be to use personal contacts with the officers involved with accident investigation and to use an interview method at frequent intervals to obtain the information. This is obviously less desirable for several reasons, but often it is the only method to get information.

If motorists are to be induced to use the AIS system before the police investigator arrives, they must be informed of the system's existence and the actions that they should take. The administrators of most of the projects issue news releases when the systems are first opened. However, project personnel frequently fail to follow up with subsequent public relations actions to remind the public of the use and benefits of the AIS system.

Freeway Incident Management

AISs can provide considerable benefits even without formalized freeway incident management approaches. Significant benefits in reduced delays and increased safety can be gained merely by having the AISs available for accident investigations. Sophisticated electronic surveillance systems are not required for a jurisdiction to benefit significantly from AISs.

However, the primary consideration in reducing the congestion and safety impacts of accidents and other incidents is to remove the involved vehicles from the freeway lanes as soon as possible and to move them out of sight of freeway motorists. Consequently, one issue is to encourage motorists involved in PDO accidents to move their vehicles off the freeway as quickly as possible instead of waiting for the police to arrive before the vehicles are removed. Ideally, the vehicles should be moved to AISs. If efforts to encourage motorists to move off the freeway lanes are unsuccessful, then surveillance approaches to detect incidents may be necessary to reduce the delays and safety problems associated with PDO accidents on freeways.

Surveillance systems are effective in detecting accidents and other incidents rapidly. This rapid detection reduces the overall adverse effects of these incidents because police and other emergency vehicles can be dispatched to the incident scene promptly. There are a number of surveillance options that can be used to detect accidents and incidents. These can be used either individually or in combination, each with different degrees of cost and effectiveness (*3*). The key issue to be considered is the time that it would take to detect accidents by using one or more of the surveillance techniques. The options are as follows (*4*):

- *Increased Police Patrol Frequency:* Increasing the number of patrolling vehicles during periods when an incident would cause significant delay.
- *Peak Period Motorcycle Patrol:* As the previous option but using motorcycles (which have greater mobility than patrol cars for traveling through congestion) to obtain the additional patrol frequency during peak periods.
- *CB Radio Monitoring:* Capturing the freeway incident information by monitoring the CB radio and ensuring that the information obtained is forwarded to the proper response service.
- *Service Patrol:* Increasing the existing patrol frequency with publicly or privately operated service vehicle patrols or tow trucks.
- *Stationary Response Vehicle:* Strategically placing response vehicles, such as tow trucks, along the freeway at vantage points so that the driver can detect incidents and respond immediately.
- *Aircraft:* Using public (police) or private (radio station) aircraft to patrol and detect incidents.
- *Call Boxes:* Installing roadside communication devices that motorists can use to alert the proper authority that an incident has occurred and that a response is required. Two systems are available: coded push-button or two-way voice. The two-way voice systems (special telephones or commercial telephones) have proven to be more effective than the push-button systems.
- *Closed Circuit Television (CCTV):* Using CCTV to detect incidents. This is considered a low-cost FIM technique only on bridges, in tunnels, or at high-accident locations.
- *Loop Detectors:* Employing sensors buried in the roadway to detect incidents. These sensors are usually installed as part of a more sophisticated electronic surveillance and control system.
- *Volunteer Observers:* Using individuals at vantage points to detect incidents in critical locations and to report to the appropriate agency.
- *Cellular Telephones:* Urban areas with the 911 emergency number system can promote use (without charge to individual motorists) of the mobile telephones.

It would be desirable for the AISs to be installed and operated as part of a citywide freeway incident management program involving traffic engineers and law enforcement personnel. With such a program, the law enforcement personnel will continue to be trained and encouraged to use the AISs. Also, the engineers will keep the AIS system in mind and continually remind and inform the public. Without such a program, the AIS emphasis could be a "one-shot" effort that is forgotten as personnel changes occur and individuals get involved in other activities.

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