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CENTRAL ARTERY/TUNNEL PROJECT

Sergiu F. Luchian, PE - Projectwide Engineer

Application of Advanced Technology to Enhance Safety

The Central Artery/Tunnel (CA/T) project, the largest public works project in the United States, is currently underway in Boston. The CA/T is generally seen only as a highway construction project, but in fact includes what may be the most extensive use of Intelligent Vehicle Highway Systems elements in the world. The project, when completed and while under construction, will provide an exciting "test bed" for IVHS technology and applications. The project consists of over 7 miles of new reconstructed roadways inclucing a widened, mostly underground Interstate 93 (I-93) through Central Boston and an extension of I-90 from its current terminus at South Bay via a Seaport Access Hinghway and a new Harbor tunnel to Logan International Airport in East Boston, with a connection to Route 1A. An improved and expanded high-occupansy vehicle (HOV) system will be incorporated along I-93 and I-90, to link the downtown street network and the proposed South Station Transportation Center (SSTC) with Logan Airport and points south and west of Boston.

While the new roadways will provide additional capacity on some key links, the additional capacity which can be provided on the north-south mainline is limited. Placing the highway underground will provide a great improvement to the quality of life in downtown Boston. The underground right-of-way is limited, however, and future capacity increases are precluded. As a result, there are a number of IVHS elements being designed into the CA/T project, which are designed to provide for a greater level of safety and more efficient traffic flow. They key element of this system is the Operations Control Center, which will be most advanced of its kind in the U.S.A. The OCC, located at the entrance to the Third Harbor Tunnel in South Boston, will serve as the "brains" connecting 1,400 loop detectors, nearly 500 closed circuit TV cameras, 25 overheight detectors, and sensors reporting on the status of ventilation and electrical systems. These systems will be linked through a state-of-the-art processing system, which includes two banks of computer screens. Three screens at the lower level will show route struckture traffic patterns, facilities data, and other data. On the top console will be eight or more screens that will allow the operator viewing capacity for incidents or emergencies. The operator interface includes commands, alarms, device

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status, traffic status, and map displays which are integrated and consistent throughout the system. Status screens will be map based, color coded, and have a zoom capability.

A large-scale map, 20 feet by 40 feet, of the entire CA/T project will be displayed on a Wallsized back projection screen, identifying overall system status and traffic flows. It will display incident locations, traffic conditions, and device status, using a color coding scheme. A separate set of computers in the OCC will control the facilities sub-system.

When an incident occurs, a system Interface will automatically select the proper camera to display on the operator's monitor. The operator will also have manual control over camera selection to view the incident site, and will be able to program simultaneous scanning by a group of cameras. Once en incident is confirmed, pre-programmed response plans will be provided to the operator, with manual modification capabilities available. A checklist of manual operations will help ensure that all required activities are successfully performed.

Control devices in the tunnels, which include Variable Message Signs, Lane Use Signals, Ramp Meters, and Variable Speed Limit Signs, will be used to communicate conditions to the motoring public. Lanes can be cleared for tow trucks and emergency vehicles to reach breakdowns and incidents more quickly. This will enhance public safety by enabling injured persons to be reached more quickly and minimizing exposure of motorists to Carbon Monoxide buildup.

An advanced testing program is under way in a tunnel facility in West Virginia. Using an existing two-lane half-mile long vehicular tunnel, outfitted with state of the art instrumentation and control systems, various emergency operational strategies will be tested and verified, for future use on the CA/T and other underground systems. Over 130 different size fires will be evaluated in that environment and different ventilation response scenarios will be tested.

During the construction period, the project will have in place a Traffic Information Center. The TIC will serve as an information and emergency response notification center. Closed circuit TV monitors, Highway Advisory Radio and an limited number of fixed mobile Variable Message Signs will be used to inform motorists of traffic conditions related to construction. Computerized notification procedures will be implemented in the TIC to increase the speed and effectiveness of emergency notification procedures. While the TIC is primarly an information center, not an control center, procedures developed and implemented there will provide valuable experience for the Operations Control Center.

Close coordination with various Public Safety agencies having jurisdiction within the project limits is another on-going activity during the design and construction phases of the project. In partnership with the Boston Fire

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Department, a Tunnel Rescue team program has been started, to provide specialized emergency services for the various tunnel contractors. Agreements are being worked out with Boston and Massachusetts State Police, for Incident and Traffic Management during the project's construction, both within and outside the CA/T's geographical limits.

In summary, the CA/T project is addressing safety through sound design closely coordinated with public safety agencies and through the application of advanced technology to identify, verify and clear incidents as quickly as possible.