TRANSPORTATION SECURITY AND EMERGENCY RESPONSE

At the Transportation Research Board’s Annual Meeting in January 2006, the training subcommittee of AASHTO’s Special Committee on Highway Transportation Security (SCOTS) presented a draft strategic plan that was developed to help state highway departments of transportation (DOTs) understand and meet their expectations for transportation security and emergency response. The strategic plan was developed by the U.S. Department of Transportation’s Volpe National Transportation Systems Center, by working closely with the AASHTO, TRB, and the Federal Highway Administration (FHWA). It focuses on the concept of professional capacity building (PCB) to address the challenges that State DOTs now face related to homeland security.

Through a collaborative outreach effort, the PCB plan was developed to maximize the overlapping areas of homeland security and emergency response and effectively use existing processes and resources. Thus, the PCB plan treats security and emergency response as related needs, with opportunities for integrated solutions. The concept of PCB is to supply tailored, targeted and timely help by offering an integrated set of resources including, but not limited to, training and awareness.

The SCOTS subcommittee outlined a multi-year plan to provide state DOTs with a trusted, reliable, and reasonably comprehensive source of information and assistance for their homeland security and emergency response needs. The PCB plan also outlines learning needs for each of 17 topics, spanning five areas. It offers recommendations for addressing those needs over a three-year period. Finally, it provides a detailed set of actions for year one, summarized as follows:

- Establish a steering committee and technical working groups comprised of partners and stakeholders.
- Support a series of regional workshops on emergency response coordination.
- Support development and delivery of a seminar designed for executive-level staff, with a goal of elevating transportation's role in security/emergency response.

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Transportation Security, (Continued from Page 1.)

- Conduct seminars on implementing a security/emergency response program.
- Conduct peer exchanges on addressing security in transportation operations.
- Support a technical advisory team to provide assistance in identifying critical assets and assessing their vulnerability, and pilot this approach with one state DOT.
- Research and publish information on design methods for facilities security.
- Deploy a searchable database of training and other PCB resources.

For more information contact Paul Gavin, Office of the Commissioner at pgavin@dot.state.ny.us

AIR VOID ANALYZER (AVA)

The Materials Bureau is investigating the use of the Air Void Analyzer (AVA) for testing field placed concrete. The two units being used in this study were purchased in 2005. In the past, plastic air contents were determined using either a pressure or volumetric meter. These methods only give the total air content of the concrete. In order to determine the characteristics of the air void system a linear traverse had to be performed. These characteristics include the specific surface (how small the bubbles are) and the spacing factor (how close the bubbles are together). A linear traverse can only be done on hardened concrete so any corrective actions are difficult. Both sample preparation and conducting a linear traverse are very time consuming.

The new method of AVA testing is done on plastic concrete and the results tell you the characteristics of the air void system. This means that decisions on the acceptability of the concrete can be made while the concrete is still plastic. Sampling and testing using the AVA is much faster than a linear traverse.

AVA testing was successfully completed on three bridge deck placements in the 2005. The Materials Bureau is developing the rate of sampling and sampling location (i.e. the truck, after pumping, after vibration, or after finishing). At the conclusion of this study the Department intends to include AVA test results as a pay factor in future QC/QA specifications for bridge deck placements.

For additional information contact David Z. Graves, P.E., Materials Bureau at dzgraves@dot.state.ny.us

IMPROVED SYSTEM SPEEDS ANALYSIS OF THE SEISMIC SUCSEPTIBILITY OF NEW YORK CITY BRIDGE SITES

The Geotechnical Engineering Bureau (GEB) has developed a system using simple desktop products (Access 2000 and Visual Basic Application) for analyzing the liquefaction potential of soils at a structure site. The program “Soil Liquefaction Resistance And Lateral Spreading Analysis” (LIQLAS), developed by Johnbull Bello under the supervision of Teh Sung, also esti-
mates the post-liquefaction lateral deformation of the soil supporting the structure foundation.

LIQLAS calculates the safety factor against liquefaction based on the site’s subsurface soil conditions (deposit type and its relative compactness) as determined from subsurface borings and sample blow counts. It estimates earthquake-induced shear stresses using the Seed-Idriss Simplified procedures when given a maximum design value for ground acceleration (amax) selected from the NYSDOT Standard Specifications for Highway Bridges, or it requires input of the earthquake-induced stress profiles if a more fine-tuned seismic ground response analysis such as the SHAKE automated analysis is involved.

LIQLAS is user-friendly for multiple analyses, ‘remembering’ the administrative information such as: PIN, Region, Project Name, County, while allowing variable entries for soil data at any substructure at a site such as: exploration type, boring number, hammer type, hammer energy ratio, sample blow count, depth to groundwater and soil type.

Liquefiable soils have the undesirable characteristic of losing grain-to-grain contact when subjected to dynamic loads, thus losing ability to support load, even its self-weight. Particularly susceptible are saturated clean sands. You can think “quicksand” though it’s really not a type of sand but rather a condition from a combination of circumstances. That is, when the water “stored” between the fine grains of solid soil particles is pressurized, the particles become suspended in the water, creating what is known as a “quick” condition. You can easily mimic this condition at the beach by scooping a handful of wet sand into the palm of your hand, then using your free hand to slap the bottom of the hand full of soil and notice how water appears at the surface and the sand actually flows. Imagine the effect a seismic-induced quick condition could have on a bridge pier! Thus, seismic vulnerability is an increasingly important aspect of structure foundation design for bridges which are classified as critical or essential. Currently, most of GEB’s liquefaction evaluation analyses are performed for structures in Region 11.

A critical structure must provide immediate access to all traffic, allowing a few hours for inspection, after a lower level seismic event (10% probability of being exceeded in 50 years – 500 years return period). After the lower level event, the bridge shall suffer no damage to primary structural elements and minimal damage to other components. After the upper level event (2% chance of being exceeded in 50 years – 2500 years return period), a critical structure must provide limited access to emergency and defense vehicles within 48 hours and general traffic within months. A critical structure must survive the upper level event with repairable damage.

An essential structure must provide limited access of one or two lanes within 3 days for emergency vehicles and full service within 3 months, after a seismic event equal to two-thirds of the 2500 years return period. Essential bridges shall survive this event with repairable damage.

Any crossing structure which spans a critical or essential route must meet the performance criteria of no collapse and no restriction on operation of the highway below, when evaluated for the corresponding hazard level.

Recognizing the importance of the seismic survivability of structures to provide a continuous route for civil defense, police, fire, and public health agencies to respond to a disaster after a seismic event, New York City and Region 11 are conducting a seismic vulnerability study of

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New York City structures. GEB is analyzing the existing subsurface information to determine appropriate input for the Liquefaction program at each structure site or each substructure unit where subsurface information is available.

To date, 415 structure sites have been evaluated on the following routes:
- Bruckner Expressway
- Brooklyn-Queens Expressway
- Clearview Expressway
- Cross Bronx Expressway
- Gowanus Expressway
- Hutchinson River Parkway
- Long Island Expressway
- Major Deegan Expressway
- Nassau Expressway
- Staten Island Expressway
- Van Wyck Expressway
- Whitesone Expressway

This program reduces the process from 1 or 2 days effort per substructure evaluation to 2 to 5 hours per substructure evaluation.

For additional information please contact Teh Sung at TSUNG@dot.state.ny.us

ADVANCED BUS TECHNOLOGY: TRANSPORTATION R & D AT NYSERDA

The transportation sector poses some of the most challenging energy problems in New York State. Most vehicle fuel comes from petroleum, a resource increasingly susceptible to supply disruptions and volatile prices, and combustion of this fuel produces significant air pollution as well as greenhouse gases. To address these problems, the New York State Energy Research and Development Authority (NYSERDA) sponsors development of transportation technology that improves energy efficiency, reduces environmental impacts and fosters a shift toward alternative, renewable fuels. NYSERDA’s programs span a wide range of transportation modes and vehicle sizes, from cars and trucks to commuter trains and marine vessels.

In one notable project, NYSERDA sponsored work at BAE Systems in Johnson City, NY to develop a hybrid-electric powertrain for large, 40-passenger transit buses built by Orion Bus in Oriskany, NY. New York City Transit is acquiring more than 800 of these buses (Figure 1) and orders also are being received from cities such as Toronto and San Francisco. This technology significantly reduces air pollution while cutting fuel consumption by about 40 percent.

The BAE powertrain is configured as a series-hybrid, that is, there is no mechanical driveline between the engine and the vehicle’s drive-wheels. Instead the engine is coupled to an electric generator that maintains the charge level of two large battery packs, which in turn provide power to a large electric traction motor that propels the vehicle’s drive-wheels. This arrangement works
best for low-speed, stop-and-go urban bus routes. The energy savings arise from several factors. Peak acceleration energy requirements are handled by the batteries, so the engine can be downsized and constrained to operate within a high-efficiency portion of its speed-torque envelop. Also, during braking, the traction motor is electrically switched to act as a generator, supplying electricity to help charge the batteries. Thus, energy normally lost as heat in the brakes is recovered and is later reused to propel the bus.

Besides supporting development of hybrid-electric powertrains for large transit buses, NYSERDA sponsors work to apply this technology to smaller buses, where market barriers include cost, limited space for components, and other factors. A prototype hybrid-electric shuttle bus is being developed in a joint effort between NYSERDA and Odyne Corporation (Hauppauge, NY), using an approach that promises to be a practical and cost-effective solution for this market. The powertrain system under development, may be sold to a variety of companies that manufacture small/medium buses and medium trucks, and should provide significant fuel economy and emissions benefits.

The initial 20-passenger unit (Figure 2) comprises Odyne’s powertrain fitted to a chassis supplied by Champion Bus, Inc. This bus is targeted for use by a Long Island municipality, where the bus will be used to shuttle senior citizens to shopping and other activities. Odyne also is developing a 30-passenger bus, which may be used in a field test with a transit operator. In addition, the company is looking at other vehicle platforms that potentially could be propelled by the same basic system, with various components resized to fit the fleet operator’s specific duty cycle requirements. Vehicle types of interest include school buses and delivery trucks.

For more information, contact: Joe Wagner at 862-1090 ext 3228 or jrw@nyserda.org

Are you working on something new and innovative that could be included in the next news letter?

Please contact Ossama Elrahman or Colin Campbell, Transportation Research and Development, or send us an e-mail trdb@dot.state.ny.us

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