JEUDI 28 MAI 2009, 12.15 H.- 13.15 H. – SALLE GC A3 30

BRIDGE INFRASTRUCTURE REHABILITATION IN THE U.S. USING FIBER-REINFORCED POLYMER COMPOSITES

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RESUME

The poor condition of the ageing highway infrastructure in the United States has been highlighted by recent catastrophic failures (e.g. Interstate 35 highway bridge collapse in Minneapolis, MN). The American Society of Civil Engineers (ASCE) has consistently rated the U.S. infrastructure as “poor” and has encouraged lawmakers to allocate increased funding levels to confront this current problem. Given the large number of existing bridges in the U.S. highway infrastructure it is not economically feasible to replace those that are in poor condition. Techniques to rehabilitate existing bridges have, therefore, received considerable attention in recent years. Fiber-reinforced composites provide a viable alternative to rehabilitate or upgrade existing concrete bridges. Transportation agencies across the U.S. are increasingly interested in using these materials but have proceeded quite cautiously. To date many of the field applications are still seen as demonstration projects primarily because engineers require guidelines and design methods that allow them to specify these materials more widely. Nevertheless, the types of applications are numerous and the rehabilitation objectives may be various, including the need to increase the capacity of existing bridges to accommodate heavier traffic loads, rehabilitating existing elements that contain details prone to poor seismic performance, or restoration of deteriorated structural elements due to environmental damage.

This seminar provides an overview of research advances made on the use of fiber-reinforced polymer composites in the bridge rehabilitation field. These research studies are motivated by the need to develop a better understanding of the behavior of rehabilitated elements using fiber-reinforced composites and to develop practical design tools that engineers can readily use. For illustration purposes this seminar focuses on research efforts related to applications requiring an increase in flexural capacity of existing elements, and applications to rehabilitate bridge columns in moderate seismic zones. Finally, a summary of design and specification documents published recently in the U.S. to advance the practical use of fiber-reinforced composites in the U.S. is presented.