Real Scale Bridge Beam Test

Expressway & Transportation Technology Institute
Korean Institute of Construction Technology
Myong-Ji University
Korea, 2008
# Real Scale Structural Laboratory Test Overview

<table>
<thead>
<tr>
<th><strong>Aim</strong></th>
<th>To evaluate the behavior and performance of real scale bridge beam (Static &amp; dynamic laboratory loading test)</th>
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</thead>
</table>
| **Location** | Hybrid structural laboratory of Myong-Ji University  
Structural laboratory of Korea Institute of Construction Technology |
| **FOS Application** | MainTra Co., Ltd. ([http://www.maintra.com](http://www.maintra.com))  
Kyu-Wan Lee (maintra@paran.com)  
Sung-Hoon Jung (maintra3@naver.com) |
| **Customer** | Expressway & Transportation Technology Institute  
Myong-Ji University  
Korea Institute of Construction Technology |
| **Date** | December, 2008 |
| **Instrumentation** | (1) Micron Optics sm130-700, Optical Sensing Interrogator, (Tapered beam test).  
(2) Micron Optics si325, Optical Sensing Interrogator, (60m PSC beam test).  
(3) Conventional sensor DAQ system. |
| **Sensors** | (15) Bare FBG sensors (60m PSC beam test).  
(1) Micron Optics os3600 Long gage strain sensor, surface mountable sensor (60m PSC beam test).  
(2) Micron Optics os3600 Long gage strain sensor, MOI, surface mountable and embedded sensors (Tapered SC beam test).  
Many conventional sensors (Foiled strain gauge, Accelerometer, Displacement transducer, Laser Vibrometer, crack gauge, etc) |
| **FBG Benefit** | Strain measurement. |
Real Scale Structural Laboratory Test Overview

- **Project Scope**
  - The main technical requirements for this project is reliability and high accuracy.

- An FBG system selected for:
  - Strain measurement on concrete surface after crack occurrence using 30cm long gauge length FBG sensor.
  - Strain measurement of concrete using os3600 embedded FBG strain sensor.

- Electrical power provided by the laboratory’s general power.

- Data communication handled by:
  - A computer and sm130 with UTP cable.
  - No long distance communication was needed for this laboratory test.

- The key parameters are measured were:
  - Strain, force-strain curve, curvature, neutral axis position.

- This is a short term monitoring project.
World First 60m PSC Beam
Tapered PSC Beam
Foiled Strain Gauge Installation

Conventional strain gauges compared to appearance and installation of FBG sensors.
Other Conventional Sensors

- Laser Vibrometer
- Displacement Transducer
- Accelerometer
- Crack Gauge
FBG Sensor Installation

- os3600 surface mount using epoxy for short-term measurement
- Bare FBG surface mount (30cm long gauge length)
- Bottom view
- si325 FBG interrogator
FBG Sensor Installation

os3600 embedded strain sensor installation

os3600 surface mountable strain sensor installation

sm130-700 FBG interrogator

FBG & conventional system
Real Scale Structural Laboratory Test Result

- Sample data results

![Graph showing the bottom strain gauge response with various markers indicating different measurements.](image-url)
Results & Acknowledgements

• Results & Conclusion
  ß The customer was able to obtain the averaged strain of concrete surface after crack occurrence.
  ß Compared to conventional sensors:
    • There are significant installation time advantages for using multiple optical sensors from one fiber.
    • Embedded inside the concrete and surface mount using epoxy.

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  ß Kyu-Wan Lee & Sung-Hoon Jung (System integrator and on-site installer
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