

BUILDING STRUCTURE MONITORING WITH A FIBRE BRAGG GRATINGS SENSOR

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Abstract. *The distance changes between structural elements inside a building (e.g. walls, pillars, stairs, etc.) ought to be monitored, especially in seismic-prone areas, in order to assess its stability. Fibre Bragg grating (FBG) sensors are now the most interesting choice for this purpose, since several gratings can be included in the fibre, resulting in a quasi-distributed sensor, which can be illuminated using a single light source and interrogated simply by a single optical spectrum analyser (OSA).*

The paper deals with such a sensor, which was installed for monitoring the distance changes in a construction joint between two building blocks inside the University "Politehnica" of Bucharest. Since this city is placed in a seismic-prone area, we use a fast scanning OSA, so that the dynamic behaviour of the monitored construction joint is expected to be captured during future earthquakes. Slow drifts of the construction joint width will be also monitored.

The paper describes the sensor structure and working principle, the experimental tests and main parameters evaluation. The reported sensor is temperature compensated.

Keywords: FBG, temperature compensation, strain, calibration tests

1. Introduction

Civil engineers are interested to know in detail the buildings vibrational behaviour during earthquakes. Slow drifts in distance between structural elements of the building and induced strains are also of great interest. For this purpose, FBG sensors are ideal due to their capability of being easily embedded (smart structure) or surface mounted and their ease of interrogation. Advanced FBG strain sensors were reported as early as 1992 [1], and then structural monitoring for buildings and bridges using FBGs became a constant concern for researchers [2-6].

The paper reports on a simple FBG sensor, which monitors the distance changes in a construction joint between two building blocks inside the University "Politehnica" of Bucharest and which has the capability of covering a wide displacement range of up to +/- 20 mm. This sensor is temperature compensated.

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