# A Study on Health Monitoring of Prestressed Concrete Slab Bridge

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***Abstract*- This undertaking depicts a Civil Structural Health Monitoring (CSHM) technique for evaluation of common structures by utilizing a blend of cutting edge observing gear with probabilistic based appraisal. The quantities of common structures, for example, spans, burrows, holding dividers, dams, and so forth have expanded significantly the most recent a long time since an expansion in development were available in the sixties. In the most recent decade's new procedures in upkeep, review and evaluation of out foundations have been created to make it conceivable to keep on utilizing the structures longer than the planned administration life. Additionally the requests of the structures are diverse currently contrasted with when they were raised, for instance the heaps are higher, less unsettling influences in rush hour gridlock are acknowledged and higher traffic streams are available. Thusly new innovations for review, evaluation, upkeep, reinforcing are required. In this undertaking we are thinking about psc piece connects by and large oppressed gravity stacks just and managing the wellbeing checking by utilizing probabilistic put together evaluation with respect to psc chunk spans.**

**Index terms- Civil Structural Health Monitoring, probabilistic based assessment, maintenance, inspection, psc slab bridges.**

## I. INTRODUCTION

Solid, similar to stone, is solid in pressure and functions admirably when utilized as a vertical segment or supporting post, for instance. At the point when utilized on a level plane as a chunk or shaft, cement can commonly traverse just short separations before it starts to break and fizzle except if it is made thicker. The profundity and weight of a plain solid bar before long turn out to be excessively huge and illogical for longer level traverses required in structures and extensions.

Manufacturers discovered that the expansion of metal strengthening bars in a solid bar or chunk would permit it length more prominent separations before breaking. Subsequently, strengthened cement turned into an imperative basic material for scaffold development after 1900. For all intents and purposes all advanced cement is fortified with metal.

Indeed, even fortified cement has restricted ability to traverse removes before splitting and bombing under pressure. In the prior years World War II, European architects explored different avenues regarding another arrangement of getting solid increment the range length much further with less weight. This framework ended up known as "prestressed" concrete, since strain or stress was connected to the solid pillar before it was set in position.

One of the early architects, GustaveMagnel, contrasted this framework with holding up a line of books by squeezing them firmly from each end and lifting them noticeable all around. Along these lines, a solid bar could be held firmly from each end by the utilization of a steel pole or link. A solid shaft is "prestressed' on the grounds that pressure is made previously, or "pre," the genuine utilization of the pillar when the working pressure is connected.

Fig.: Prestressed Beam

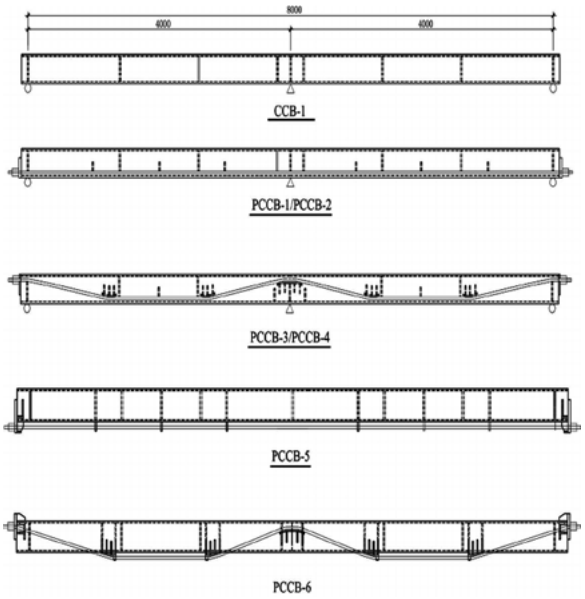
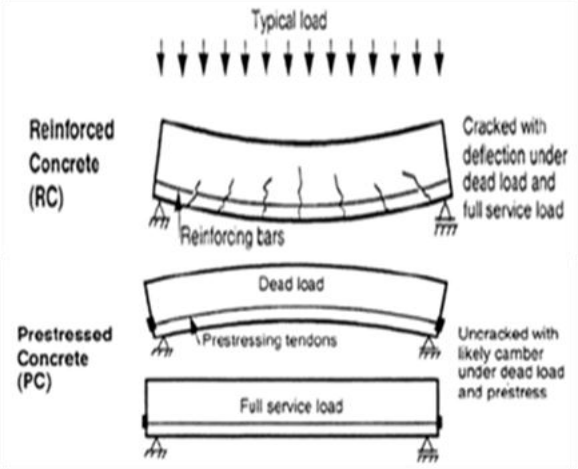



Fig.: Prestressing Phenomenon




The vibration based basic wellbeing checking strategies are progressively normal. The fundamental reason is that auxiliary reactions, quite frequencies, modular damping and mode shapes, are elements of the physical properties of structure, for example, mass, firmness and vitality scattering systems. Accordingly, changes in the physical properties will prompt discernible changes in the modular parameters. Uses of this innovation are fruitful in both mechanical designing and aviation design. Be that as it may, mechanical difficulties are stood up to in the application in structural designing, considering the trouble of account the aggregated changes in a genuine structure over wide time scales under antagonistic ecological/operational conditions

## II MONITORING PROCESS

Monitoring of the curing process and experimental setup

Crisp cement is in a fluid stage before solidifying. It is hard to gauge the plastic shrinkage strain of bond glue in its initial relieving stages utilizing traditional techniques. The strain check or uprooting meter, used to gauge the plastic shrinkage strain of the new concrete, can't be joined to the solid before a specific measure of solidifying has occurred. Shrinkage strains, along these lines, are generally estimated at the season of demolding. In this investigation, a FBG strain and temperature sensor was mounted on a steel fortification territory, found 3 cm over the base surface of the PC shaft. The PC shaft, with measurements of 400 cm × 20 cm× 30 cm, as represented in figure 1, was made of self-compacting concrete (SCC), prestressed steel ligaments and gentle steelreinforcements. Of note is the way that all the optical filaments were ensured in a free sleeve to avert harm amid the throwing and salt assault stages.

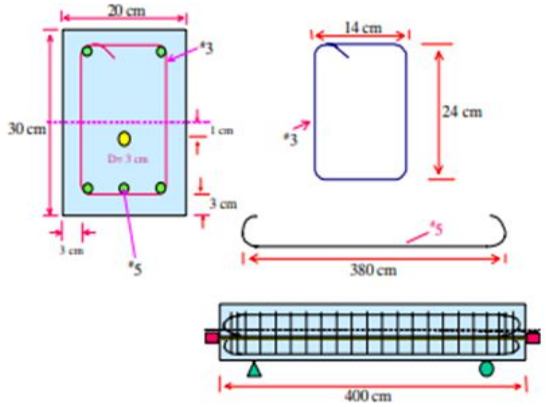



Figure: A schematic diagram of the PC beam

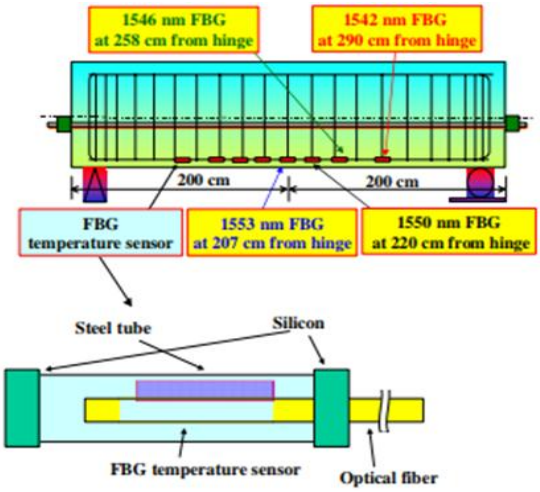



Figure: The locations of the FBG sensors in the PC beam

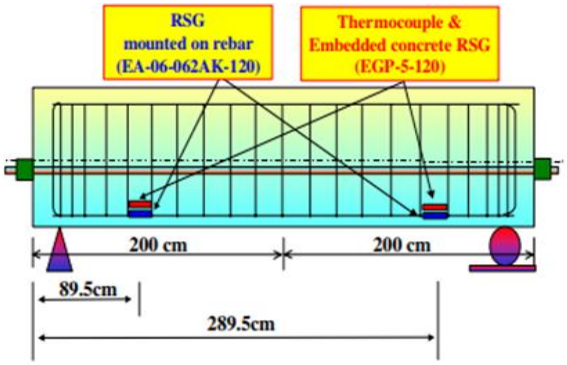



Figure: The locations of the thermocouples and the RSG sensors in the PC beam

In any case, the wavelength move, the temperature and the strain can't be estimated at the same time with a solitary grinding, since there is just a single detecting parameter in this application. So as to isolate the strain reaction from the temperature flag, the FBG temperature sensor, appeared in figure 2, was placed in a 1 mm width steel tube, fixed with silicone at the two finishes, to permit calm relocation of the temperature misshapening of the FBG. This sensor was used to quantify the temperature inside the PC shaft. For examination, solid strain measures and thermocouples (figure 3) were inserted in the PC shaft. The safe kind strain measures (RSG) were additionally put on the fortification, in closeness to the FBG sensors. Likewise, a reference thermocouple was utilized to screen the encompassing temperature. Figure 4 demonstrates a run of the mill hydrated response temperature amid the solidifying procedure. Around 6 h after the solid throwing, hydration starts, and the temperature keeps on expanding, until coming to roughly the 22 h stage. As can be found in figure 4, somewhere in the range of 6 and 14 h in the wake of throwing, the

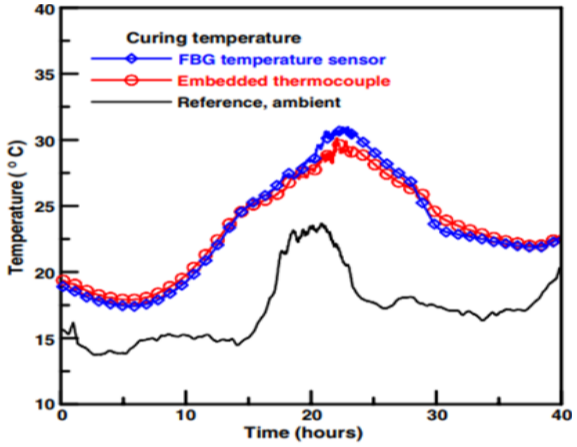



Figure.A schematic diagram of the hydrated reactions

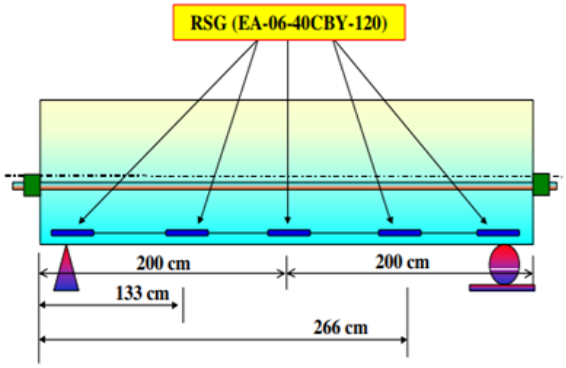



Figure: Diagram of the RSG sensors on the PC beam—surface mounted

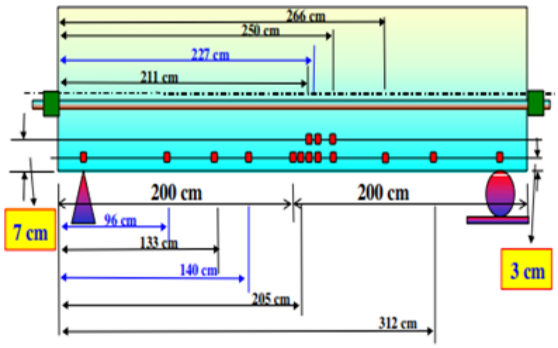



Figure. A schematic diagram of the FBG sensors on the PC beam—surface mounted

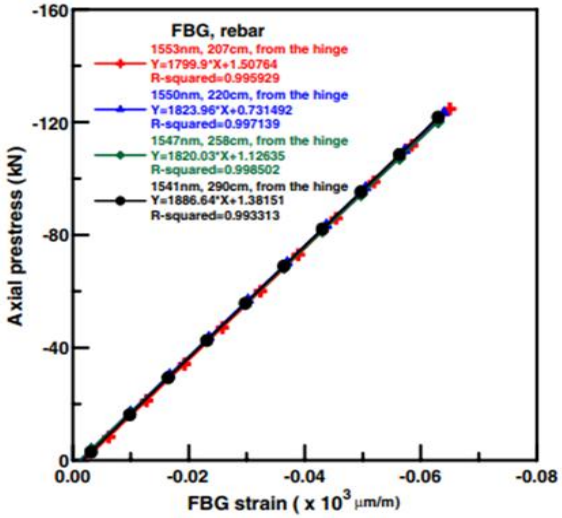
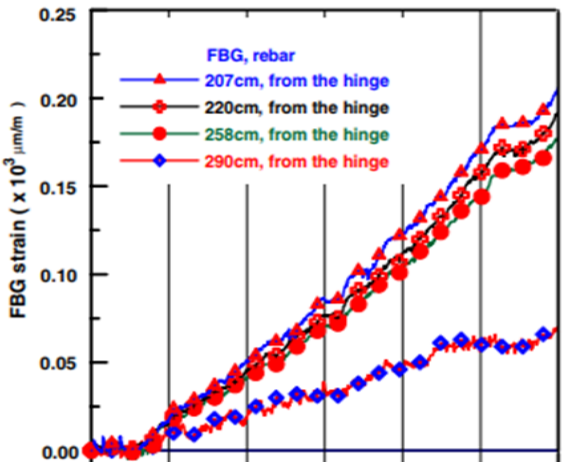



Figure.The strain response of the FBG sensors under axial prestress on the rebar

Crack monitoring

It was assessed that the PC bar at first split at a vertical stacking of around 21.8 kN, under 100 kN pivotal prestressed stacking; the solid compressive quality was 10 000 psi for this PC pillar that had restored for 90 days. The harm to the PC pillar, under

outside stacking, is appeared in figure. As can be seen, as the splits engendered, they cut over the sensors. At the point when the connected stacking surpassed as far as possible, the started breaks harmed or split the RSG and FBG sensors. In the interim, the area of the harm or splits could be evaluated from the reaction of the RSG or FBG sensors, since these checks did not work legitimately because of the breaks. Inferable from clamor and electromagnetic rise, the RSG was sometimes dormant and instigated slip-ups. The FBG sensors, in view of a silica material, which does not consume and isn't influenced by electromagnetic impedance, were utilized as a progression of sensors along a solitary optical fiber. Along these lines, the area of harm or breaks could be resolved straightforwardly. Figure uncovers that the FBG sensor (point B, in figure), with a wavelength of 1550 nm, was harmed under the connected stacking, at around 70 kN. Flags between point An and C (the FBG sensor at point B had not been working legitimately) uncovered that the signs of the 1550 and 1553 nm wavelengths went undetected. To decide whether point B was harmed or broke, the reflection motion between focuses B and C was reconfirmed, and a wavelength of 1553 nm was acquired. A comparable method to evaluate break areas can be utilized when splits or harm happen between any two measures (for example between the measures of 1550 and 1553 nm). The wavelengths of 1540, 1545 and 1550 nm can be acquired from point, sometime the flag of 1553 nm can be reconfirmed from point C (see figure). At the point when a line of FBG sensors is installed in a structure, a comparable technique can be utilized to recognize conceivable areas of breaks between them.



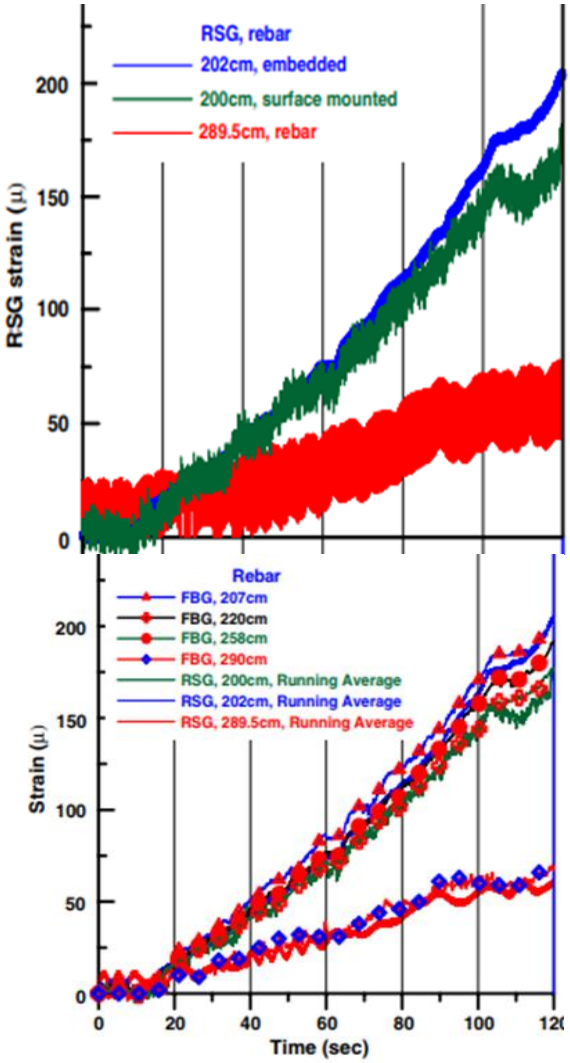
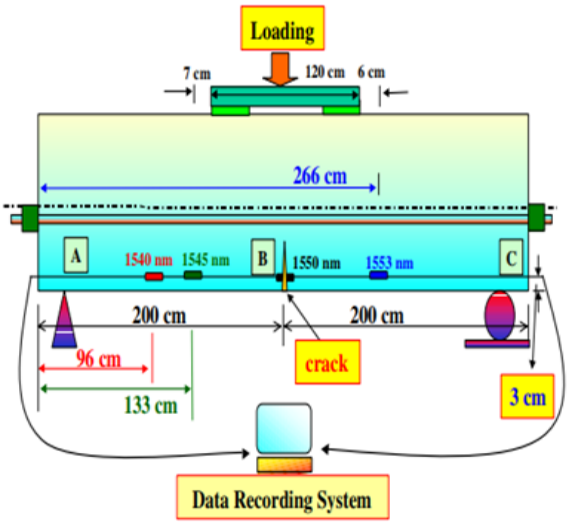




Figure: The comparison of the strain response between the RSG and the FBG sensors under real-time measurement at different locations.

Prestressed shafts are generally utilized in structural building structures. Somewhere in the range of 1945 and 1965, 1000 prestressed solid extensions were built, 550 were of the VIPP type (free range viaducts with prestressed bars). In this manner, the support of such structures is a focal issue. To decrease support costs, the harmed shafts in the structure must be recognized early. To accomplish this reason, the pillars ought to be checked and non-dangerous control strategies ought to be utilized. Backwards strategies utilizing dynamic reactions have been created in [2] to distinguish the prestress constrain in a pillar, considering a one-dimensional (1D) shaft modelisation.




A schematic illustration of the transmission–reflection data recording method and the location of the crack

## III. CONCLUSION

In the model refreshing system, the material parameters, for example, youthful's modulus, shear modulus, mass thickness, mass snapshots of latency and the neighborhood structure parameters like cross segment regions torsional constants, plate thicknesses and spring firmness are taken into considering. The modular parameters ought to relate to the exploratory ones inside as far as possible: Eigen-recurrence deviation does not surpass □0.3Hz and comparing MAC esteem is bigger than 90%.

The distinguishing proof system dependent on 2D elastodynamics model and dynamic strain reactions is proposed. On the 2D solid shaft with single link, the demand in the link and the prestress in the solid are recognized after 4 emphasess with a blunder under 1%. Later on work, genuine information yields will be considered and increasingly agent 2D pillar model will be utilized in the reverse strategy.

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