（ ※本報告書は英語で記述してください。ただし、産業利用課題として採択されている方は日本語で記述していただいても結構です。 ）

MLF Experimental Report	提出日 Date of Report Oct 4th, 2016
課題番号 Project No. 2015A0163 実験課題名 Title of experiment Application of neutron diffraction to structural engineering issues on reinforced concrete structure 実験責任者名 Name of principal investigator Hiroshi Suzuki 所属 Affiliation Japan Atomic Energy Agency	装置責任者 Name of responsible person Kazuya Aizawa, Stefanus Harjo, Takuro Kawasaki 装置名 Name of Instrument/（BL No.） TAKUMI/ BL19 実施日 Date of Experiment Feb 26th – Mar 4th, 2016 Mar 28th – Mar 30th, 2016

試料、実験方法、利用の結果得られた主なデータ、考察、結論等を、記述して下さい。（適宜、図表添付のこと）
Please report your samples, experimental method and results, discussion and conclusions. Please add figures and tables for better explanation.

1. 試料 Name of sample(s) and chemical formula, or compositions including physical form.

Rectangular-shaped reinforced concrete specimens with a post-installed adhesive anchor, shown in Fig. 1, were utilized for this experiment. The size of concrete was 70 mm in thickness, 200 mm in width and 400 mm in height, and the deformed rebar with a diameter of 10 mm was fixed in an anchor hole with 150 mm in depth by using three different types of adhesive; epoxy, vinyl-ester and cement resins. The diameters of the anchor hole were 12 mm for epoxy and vinyl-ester resins and 14 mm for cement resin, which were fabricated by a wet core drilling method.

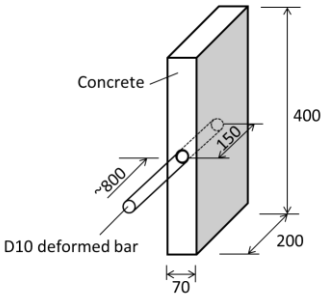

Fig. 1 Sample shape.

2. 実験方法及び結果（実験がうまくいかなかった場合、その理由を記述してください。）

Experimental method and results. If you failed to conduct experiment as planned, please describe reasons.

The engineering diffractometer, TAKUMI, installed at BL19 in MLF (Materials and life Science Experimental Facility) of J-PARC (Japan Proton Accelerator Research Complex) was utilized. The reinforced concrete specimen mounted on the loading device was set up on the XYZθ positioner, oriented 45° to the incident beam, as shown in Fig. 2. The gauge volume was 5×10×10 mm^3, defined by the incident gauge definition slit and the radial collimators. The high intensity mode was selected, and diffraction patterns from the embedded rebar over the range of *d*-spacing from 0.5 to 2.7 Å were measured in the axial and lateral directions simultaneously using both detector banks installed at ±90°. The average lattice constants in these directions were determined by multi-fitting procedure using Z-Rietveld. The stress distributions

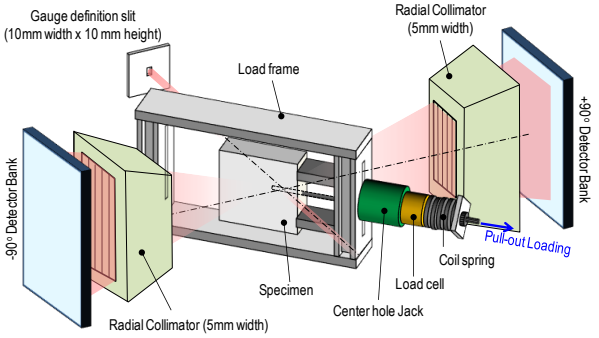

Fig. 2 Measurement configuration.

were measured at 10 mm intervals along the embedded rebar under different tensile loadings, i.e. approximately 20 MPa and 250 MPa.

Figure 3 shows the comparison of the axial stress distributions along the embedded rebar in concrete fixed by three different resins, i.e. epoxy, vinyl-ester and cement resins, measured by neutron diffraction. As shown in this figure, the stress distributions exhibit different trend depending on the type of resin. The bond stress estimated from the slope of the stress distribution in anchorage region is approximately correlated to their bond strengths. For instance, the anchor with vinyl-ester resin showing lowest bond strengths exhibits the lowest bond stress in three types of adhesive, while that with epoxy resin showing highest bond strengths exhibits the highest bond stress. Based on this result, the deformation component and the failure mechanism for the post-installed anchor will be evaluated in near future.

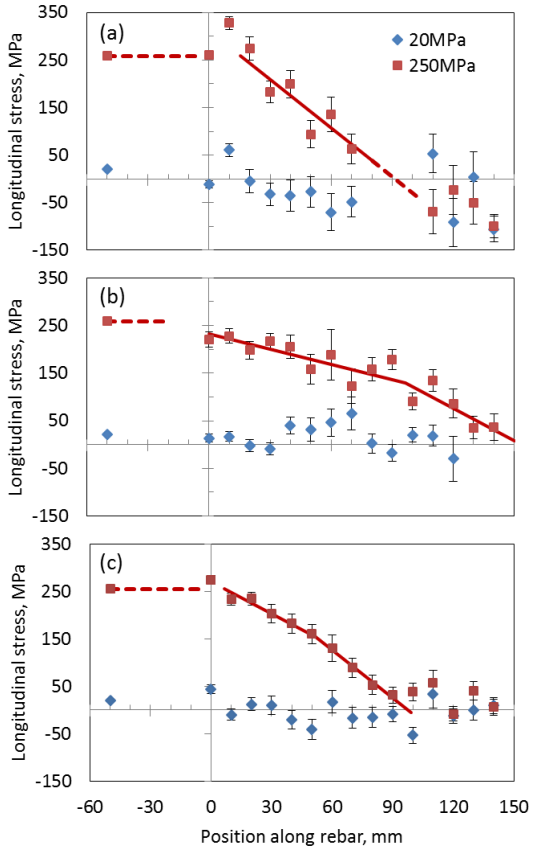

Fig. 3 Stress distributions along the embedded anchor bar measured by neutron diffraction. (a) Epoxy, (b) vinyl-ester and (c) cement resins.