

NON-DESTRUCTIVE TESTING OF AN EXISTING BUILDING SUBJECT FOR STRUCTURAL RETROFITTING: A CASE STUDY

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ABSTRACT

The Philippine's Heritage Province of Ilocos is a place where most of the old and historical buildings are located particularly at Vigan City. This city is one of the New Seven Wonder Cities of the World (N7WC) because of its well-preserved old structures including school buildings which were built almost a century ago. Amongst these old structures, the reinforced concrete school building located at Vigan situated near the famous Heritage Village's Calle Crisologo was chosen for the case study. This school building was partially damaged during the M7.8 1990 Great Luzon Earthquake; the second most powerful but most disastrous earthquake ever recorded in the country. The building was retrofitted using section enlargement on frontal columns and its foundations only after the earthquake. This study aims to increase the seismic resistance of the structure and preserve the retrofitted building damaged by the 1990 earthquake due to structural weakening which includes cracks, corrosion and strength deficiencies 29 years after it was retrofitted. This study will also serve as a benchmark for other weak buildings and will promote structural retrofitting and Non-destructive Testing (NDT) in the province. While the City and the Province is on its face lifting for safer and more resilient school buildings it is deemed necessary to study and establish the application of different state of the art retrofitting methods being adapted worldwide to school buildings. Retrofitting methods used in the study include Carbon Fiber Reinforced Polymer (CFRP), RC Jacketing, and steel jacketing. NDT equipment from a Well-built Specialty Contractor was used on the structural investigation and assessment of the building to avoid the stressful effect of traditional destructive testing. NDT equipment includes the rebound hammer for concrete compressive strength, ultrasonic pulse velocity test (UPV) to establish homogeneity of concrete and rebar locator for reinforcement mapping. ETABS and MIDAS structural software were utilized for structural analysis and detailing. The selection of retrofitting methods is based on structural strength, economy, and space considerations. From the analysis, the existing retrofitted columns are still capable of resisting axial and lateral loads generated from structural software. On the other hand, interior columns, beams and slabs are required to be retrofitted using CFRP which passed the design requirements and saves building spaces. The rear exterior columns must have section enlargement due to some exposed reinforcement which had caused cracks and corrosion to be treated first before retrofitting structural elements. Maintenance and repair were recommended for non-structural members and all foundations except at the front row shall be retrofitted using section enlarge to satisfy the most recent design code requirements.

Keywords: structural retrofitting, resiliency, NDT, UPV, rebound hammer, rebar locator, CFRP, RC jacketing, school building