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STRUCTURAL ENGINEERING / EARTHQUAKE ENGINEERING

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[\[PDF \(942K\)\]](#) [\[References\]](#)**A VIBRATION FINDING SURVEY OF EXISTING STEEL
PENSTOCKS AND NATURAL FREQUENCY CALCULATION
FORMULAE**Hideharu NAKAMURA¹⁾ and Kosuke YAMAMOTO

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When a momentary pressure pulsation takes place in a turbine, and its frequency coincides with the natural frequency of a steel penstock, resonance occurs resulting in noticeable vibration. While the current tendency is to increase the rotation frequency of turbines, penstock plates are gradually becoming thinner. As a result of these trends, the occurrence of oval vibration has been reported at some hydraulic power stations. Since rules on vibration prevention do not always include oval vibration, we sought out detailed information on existing penstocks constructed within the last 30 years. Based on this information and a numerical study, formulae to calculate the natural frequencies of steel penstocks including those with circumferential stiffeners were proposed.

Key Words: steel penstock, pressure pulsation, resonance, numerical analysis, design formula

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