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2 **A method for evaluating the local failure of short polypropylene fiber-reinforced**
3 **concrete plates subjected to high-velocity impact with a steel projectile**

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7 **Abstract**

8 This study investigated the local failure of short polypropylene (PP) fiber-reinforced concrete
9 (PPFRC) plates that were subjected to high-velocity impact using a steel projectile. To examine the
10 differences in the mechanical properties of the PPFRC obtained under static and dynamic loadings,
11 static and rapid-speed uniaxial compressive and tensile tests were conducted. Subsequently, high-
12 velocity impact tests were conducted to investigate the impact resistance performance of the PPFRC
13 plates. In a series of tests, a steel projectile, with a mass of 46 g, collided into a PPFRC plate, with a
14 thickness of 60 mm or 80 mm. The impact velocity was set between 190m/s and 420m/s to examine
15 the variation in the failure modes of the PPFRC plate. The experimental results revealed that the
16 scabbing damage induced by the impact was significantly suppressed for the PPFRC plate compared
17 with that of a plain concrete (PC) plate. High-velocity impact tests were also conducted on short PP
18 fiber-reinforced mortar (PPFRM) plates to investigate how the matrix type influences the local
19 failure. **To evaluate the scabbing and perforation limit thicknesses of the PPFRC plates, we proposed**
20 **an assessment method, in which the modified formula, developed by the US National Defense**
21 **Research Committee (NDRC), is multiplied by a reduction factor.** Furthermore, the relationship
22 between the limit thickness of a PPFRC plate and the kinetic energy of a projectile was formulated
23 based on the proposed method.

24 **Key Words**

25 High-velocity impact, Fiber-reinforced concrete, Polypropylene fiber, Local failure

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