Discussion Paper

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Novel Empirical Expression to Predict Shear Strength of Reinforced Concrete Walls Based on Particle Swarm

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The authors have to be congratulated for developing a new method for shear analysis of structural walls. We do have some queries that we hope the authors can help clarify. They are as follows:

1. In engineering practice, structural reinforced concrete (RC) walls are always provided with shear or web reinforcements. Therefore, our method[2] assumed that RC walls were always provided with web reinforcements and the derivations of the governing equations for our method[2] assumed that web reinforcements were provided. As such, specimens that have no web reinforcement were excluded from our database[2]. The excluded specimens were specimens B4-2 and B5-4 tested by Barda, et. al.[14]; specimens SW-10, SW-11, and SW-12 tested by Cardenas, et. al.[15]; specimens 24, 28, and 32 tested by Hidalgo, et. al.[39]. However, those excluded specimens were included in the authors' database (Table 2). Naturally, our method[2] should not be used to calculate the shear strengths of those excluded specimens. Doing so would not be right and it could unnecessarily make our method[2] to appear less accurate than it actually is.

2. Our method[2] is intended for calculating shear strengths, not flexural strengths of RC walls. For calculating the flexural strengths of RC walls, a reasonably accurate procedure using the flexural theory for RC flexural members can be used. Therefore, our method[2] as presented in our paper[2] is only for calculating the shear strength of RC walls. Thus, comparisons between experimental shear strengths and calculated shear strengths as calculated by our method[2], the authors' own method, as well as ACI shear strength equations, should only be done for specimens failing in shear (not in flexure). Yet, the authors included in their comparisons, specimens that failed in flexure, such as: specimens HW1, HW2, and HW3 tested by Yun, et. al.[25]; specimens Wall-7, Wall-8, and Wall-9 tested by Li and Li[27]; all specimens tested by Li, et. al.[29]; all specimens tested by Kuang and Ho[36]. The shear resistances that were recorded when the specimens failed in flexure were not the shear strengths of the specimens and they could not be used for comparison between experimental shear strengths and nominal shear strengths of RC walls as calculated by our method[2] or by other shear strength methods. Furthermore, those specimens tested by Hidalgo, et. al.[39] were loaded in such a way to model double curvature walls. Our method[2] is not intended for double curvature walls since the derivation of the governing equations and boundary conditions were intended for normal cantilever walls.

3. The authors might have made some errors when comparing the shear strengths of specimens as calculated using our method[2] against the experimental shear strengths of the specimens as tested by Looi, et. al.[26]. Our method[2] was shown (as calculated by the authors) in Table 2 to produce V_{exp}/V_{ana} of 0.00 for three specimens (ALR02, ALR03, and ALR04). However, according to our calculations, the V_{exp}/V_{ana} should be 0.76, 0.73, and

0.74 for specimens ALR02, ALR03, and ALR04, respectively. Those errors would affect the statistics significantly.

4. In the current paper, the authors show in Table 3, that the minimum value for V_{exp}/V_{ana} for our method[2] is 0.10. However, we could not find this number (0.10) in the detailed results as presented in Table 2. In addition, the authors also show in Fig. 5 that there are three specimens that have the values of V_{exp}/V_{ana} of around 0.10. Again, we could not find those specimens in Table 2. We hope that the authors can list those specimens since the minimum value for V_{exp}/V_{ana} of 0.10 shows that our method[2] can be very unsafe, which may not be true.

We hope that the authors can clarify those four issues that we mentioned above.

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