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DEVELOPMENT OF ADVANCED FRICTIONAL SLIDING DAMPER

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1. INTRODUCTION

This paper describes three content:

- Composition and feature of damper.
- Performance test on full-scale brace-type and stud-type friction damper set in a steel frame.
- Performance test on R/C frame with friction damper.

2. COMPOSITION AND FEATURE OF DAMPER

Stable frictional force can be achieved by fastening the brake pad and the stainless plate with the high-tension bolt through the coned disc springs (Fig. 1).

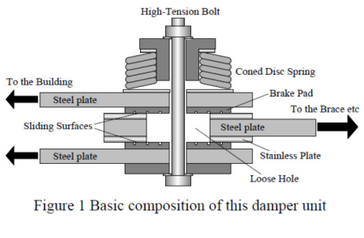

Figure 1 Basic composition of this damper unit

Photograph 1 Application of this damper

3. PERFORMANCE TEST WITH FULL-SCALE DAMPER

To consider the application form (Photo. 1), dynamic tests have been performed on full-scale brace-type and stud-type damper. The relations between the frictional force and the transformation of the damper part showed steady bi-linear type characteristic (Fig.2-Fig.6).

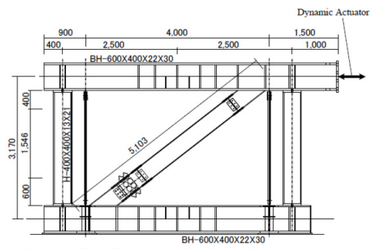

Figure 2 Loading Frame for Brace-Type Damper

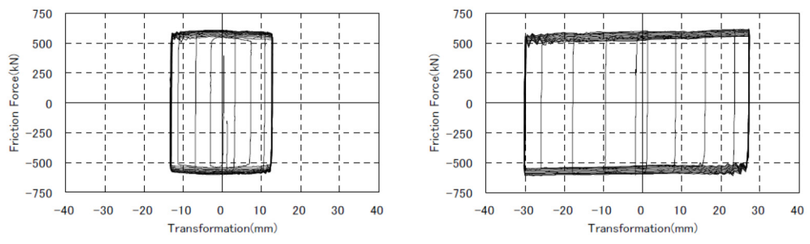

Figure 5 Relations between Frictional Force and Transformation (Brace-Type)

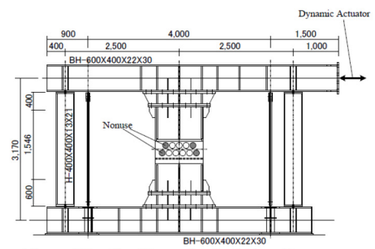

Figure 3 Loading Frame for Stud-Type Damper

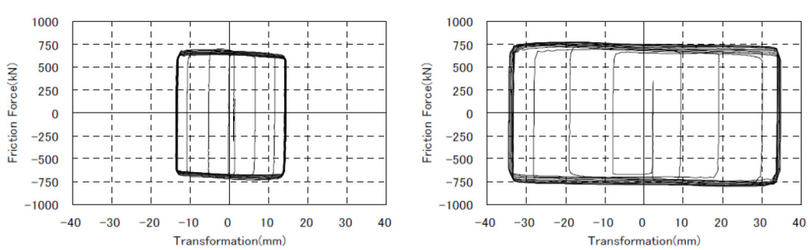

Figure 6 Relations between Frictional Force and Transformation (Stud-Type)

4. PERFORMANCE TEST ON R/C FRAME EQUIPPED WITH STUD-TYPE DAMPER

The effects of seismic retrofit when the stud-type friction damper was installed outside of the R/C frame were confirmed by dynamic tests.

Specimens:

- Scale=1/3
- The steel beam that the stud is welded was connected to the R/C beam that drove the anchor through grout (Fig.7).
- Four specimens (R1-R4) with different length of the steel beam for reinforcement (Fig.7).

The axial force loaded into the column on both sides is 0.2bdFc (Fig.8). In specimen R3 and R4, the hysteresis loop area is larger than these of specimen R1 and R2 and the damper has effectively absorbed energy (Fig.10).

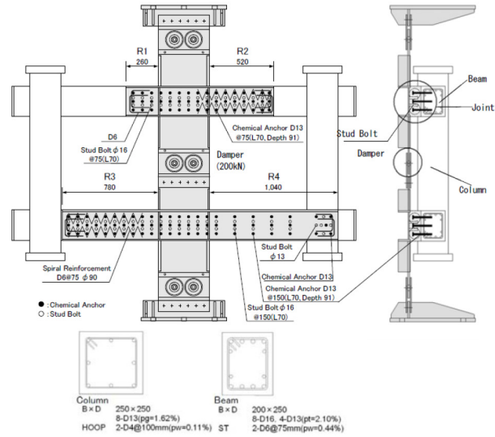

Figure 7 Outlines of Specimens

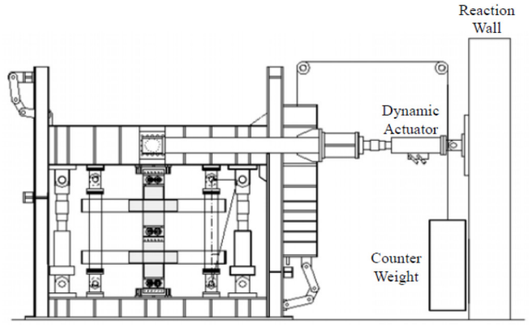

Figure 8 Loading Apparatus

5. SUMMARY

(1) This damper showed a steady frictional force.
(2) The coefficients of frictions are from 0.29 to 0.35 (0.32±10%).
(3) The effect of seismic retrofit can be improved by distributing the steel beam with the stud-type friction damper to the total length of the existing R/C beam.

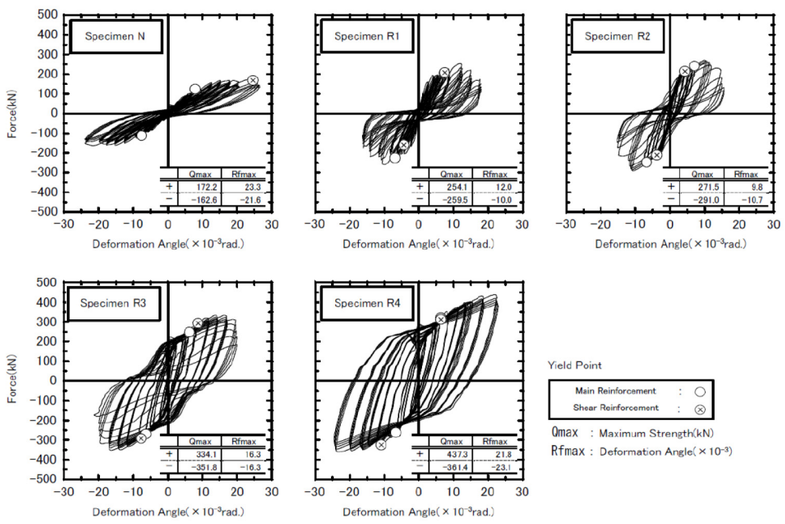

Figure 10 Relations between Loading Force and Story Deformation Angle