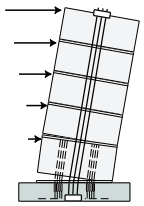
HYBRID PRECAST WALL SYSTEMS
FOR SEISMIC REGIONS



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July 15, 2011

Industry Meeting Resolutions

Meeting Date: July 11, 2011
Meeting Venue: Tele-Conference
Attendance: W. Korkosz, M. McGinnis, Y. Kurama, B. Smith

The following resolutions were made during the meeting:

Results from Specimen #5 (Hybrid Wall with Panel Openings)

- The performance of Specimen #5 was reviewed with specific focus on comparing the measured behavior of the hybrid wall with both the ACI ITG-5.1 validation criteria and the measured behavior of the previously tested solid hybrid wall (Specimen #4).
- Specimen #5 sustained three cycles at the validation-level drift of ±2.30% followed by three cycles at a maximum-level of ±3.05%. The specimen satisfied all validation criteria (i.e., strength loss, energy dissipation, etc.), with the possible exception of horizontal shear-slip at the foundation-to-base-panel joint, where the data was still being analyzed.
- The improved performance of Specimen #5 (i.e. larger sustained lateral displacements) was related to modifications made to the concrete confinement details, which included:
    (a) Using two shorter closed confinement hoops (with a length-to-width ratio of 2.22) instead of one long hoop (length-to-width ratio of 3.56) with an intermediate tie. This reduction in the length-to-width ratio of an individual hoop eliminated the bowing in the longer confinement hoop legs (which was observed in Specimen #4), resulting in less damage to the confined concrete in Specimen #5;
    (b) Placing the distributed horizontal No. 3 bars at the bottom of the base panel through the confinement cages at the ends of the base panel, thereby limiting the extent of the cover concrete spalling.
- While still satisfying the ACI ITG-5.1 validation criteria, Specimen #5 exhibited less energy dissipation as compared to Specimen #4. This was due to the increased contribution of shear deformations to the overall wall drift (related to the presence of the panel openings), resulting in a smaller contribution from gap opening. Thus, the base joint gap opening at the energy dissipating bars was smaller in Specimen #5 than in Specimen #4, resulting in smaller bar elongations, bar strains and energy dissipation.

This project is funded by the Charles Pankow Foundation and the Precast/Prestressed Concrete Institute. Any opinions, findings, conclusions, and/or recommendations expressed in this material are those of the researchers and do not necessarily represent the views of the sponsors.

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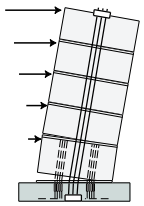

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Action Plan for Specimen #6: Conceptual Design

- Specimen #6 will be a hybrid wall that incorporates panel openings. If possible, the widths of the openings will be increased by reducing the width of the center vertical pier in the wall panels.
- The ratio of the PT and E.D. steel area will be changed, with the PT steel area reduced and the E.D. steel area increased. The reduction of self-centering due to the decreased PT steel area will be partially offset by increasing the externally applied gravity load. The relative contribution of the PT steel, E.D. steel, and gravity load to the overall lateral strength will be designed to reduce the overall self-centering effect and increase the energy dissipation.
- The E.D. bars will be placed away from the centerline of the wall, with bars located on both sides of the panel openings (i.e. in both the exterior and center vertical piers of the base panel). If necessary, the allowable design E.D. bar strain will be increased as compared to Specimens #4 and #5.
- All other design parameters (i.e., panel geometry, etc.) in Specimen #6 will remain similar to the previous hybrid specimens.
- A conceptual design for the specimen (including the size and location of the PT and E.D. steel) will be created by B. Smith and distributed to the advisory panel for review.

Action Plan for Specimen #6: Reinforcement Detailing

- The reinforcement details implemented in Specimen #5 will also be utilized in Specimen #6. These details include:
  (a) E.D. bars cast into the base panel with the full development length of the bars projecting beyond the bottom of the panel and grouted into corrugated metal ducts cast inside the foundation beam;
  (b) Two shorter closed confinement hoops to create the confined concrete region instead of one long closed hoop with an intermediate tie;
  (c) One additional confinement hoop placed within the cages located at the toes of the base panel (note that the formalization of this potential detailing requirement will need to be further discussed by the panel);
  (d) Distributed horizontal No. 3 bars at the bottom of the base panel placed through the confinement cages at the ends of the base panel
  (e) Closed hoops placed at the bottom of the base panel around the E.D. bars and the PT ducts as well as at the bottom of the upper panel around the panel-to-panel reinforcement.

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