

# AN APPROACH TO EARTHQUAKE RESISTANT DESIGN OF PRECAST CONCRETE BEARING WALL BUILDINGS

BY

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## SYNOPSIS

By the nature of precast concrete buildings, it is inherent that several joints exist between various components. The joint material may be different than those of components and furthermore, the various components may not be positively connected. The behavior of the structure is difficult to predict due to the presence of joints, however, it is necessary that all components should be well tied together. Some details are presented herein taking into account the standard products available.

## DESIGN CONSIDERATIONS

The material presented herein is limited to bearing wall type buildings where precast concrete members are utilized as the main load carrying members. Most important consideration is design of joints and connections to insure the overall stability of the structure. The connections are categorized as follows:

1. Vertical
2. Horizontal
3. Peripheral

Usually, post-tensioning is used only in connecting components vertically. If the floor units used are pre-tensioned hollow core extruded type product, it is difficult to achieve horizontal and peripheral connections, if no structural topping is used. The use of topping is highly recommended for overall integrity of building.

If walls are post-tensioned, the joint is already under compression and seismic forces in excess of code specified design forces will produce large overloads. It is recommended that post-tensioning bars be stressed to 40-50% of the ultimate stress rather than 70%. It is also advisable to use greased bars. The walls should be reinforced to resist their own seismic forces and sufficient pier type reinforcement should be provided at the top and bottom of wall to take care of "overload" situations, as well as stress concentrations due to several other effects.

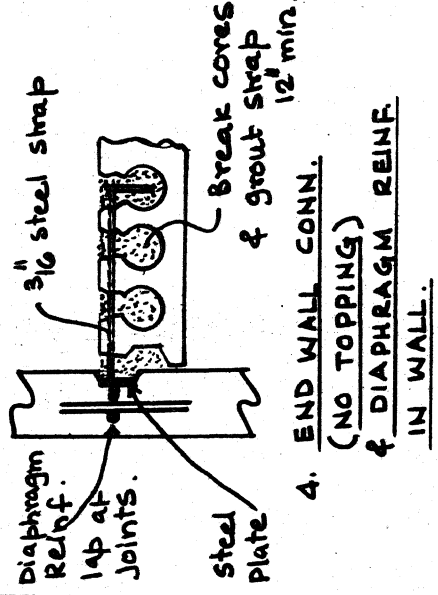
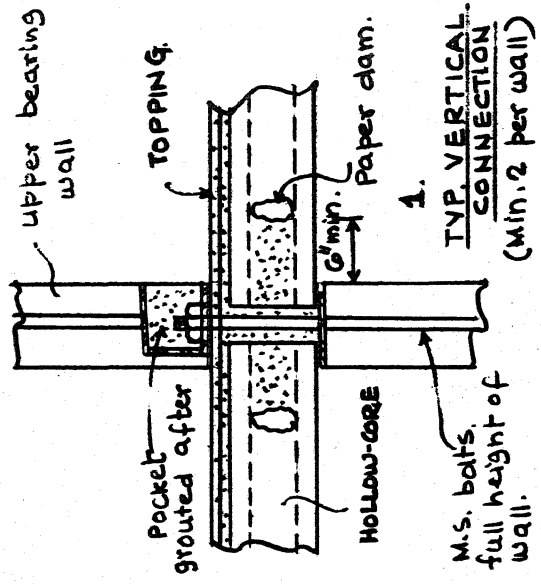
All floors and roofs should be well tied to walls to prevent separation and should be reinforced for diaphragm shear forces in addition to gravity loads. If the walls are discontinuous and supported on columns, frames, etc., careful consideration should be given to connections in addition to arch-beam action.

The problem in precast concrete buildings is one of detailing and designing of proper connections to insure strength and ductility. Much research is needed to understand the behavior of these buildings under seismic loads.

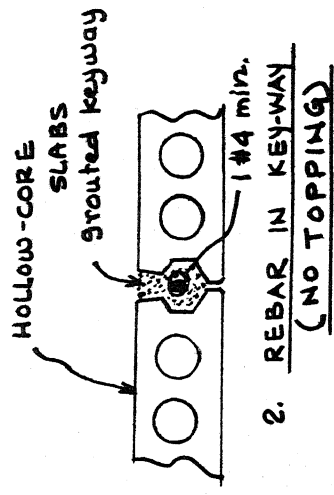
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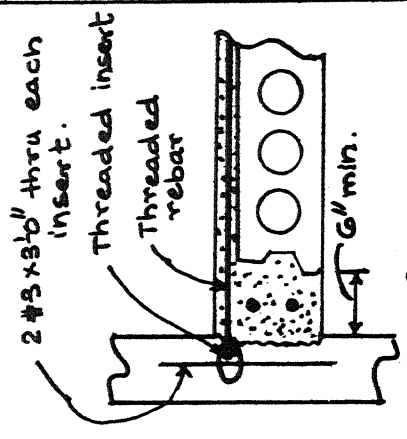
Vice-President, Precast Systems Consultants, Inc., Woburn, Massachusetts



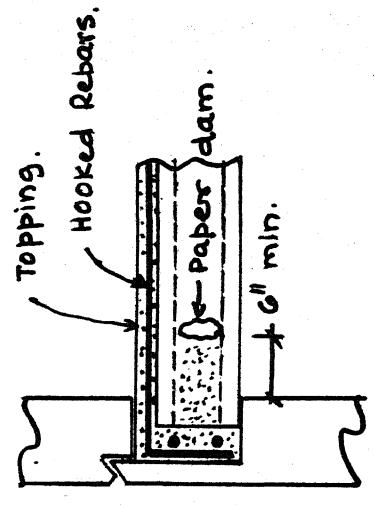
4. END WALL CONN.  
(NO TOPPING)  
& DIAPHRAGM REINF.  
IN WALL.



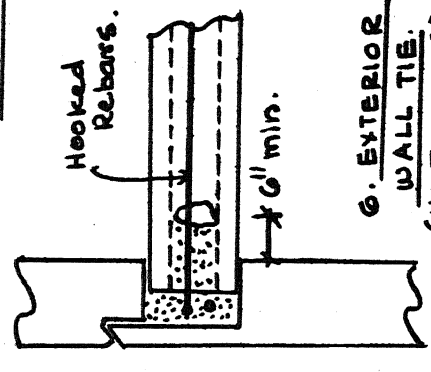
2. REBAR IN KEY-WAY  
(NO TOPPING)



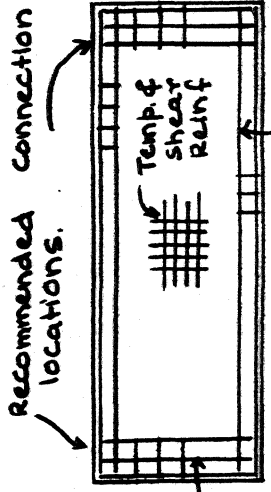
3. END WALL  
CONN. & DIAPHRAGM  
REBAR.



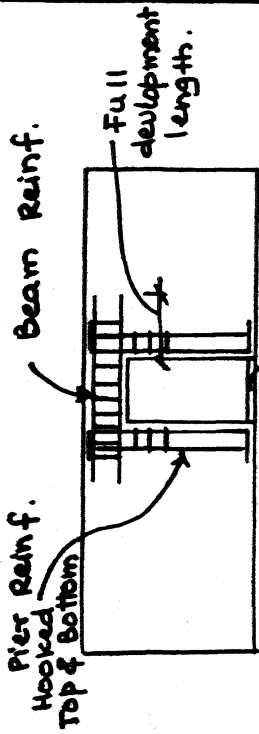
5. EXTERIOR WALL  
TIE + PERIPHERAL  
REINF.



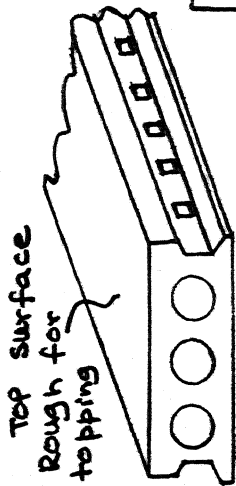
6. EXTERIOR  
WALL TIE.  
(NO TOPPING)  
REBAR IN  
KEY-WAY.



TYP. Pier Reinf. with ties. 7. TYP. BEARING WALL (NO HARDWARE SHOWN)

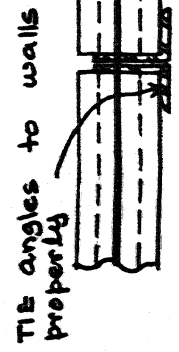


8. ADDITIONAL REINF. AT OPENINGS

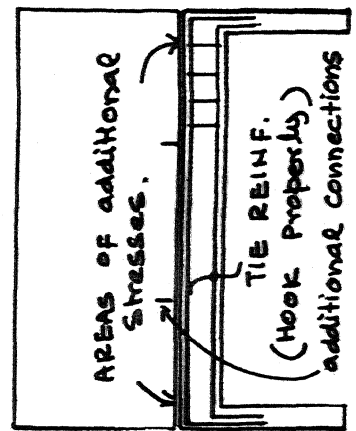


9. INDENTED SHEAR KEYS AT SIDES OF HOLLOW CORE PLANK.

Additional shear resistance without modification (Inexpensive).



12. TYP. CONDITION AT CORRIDOR. NOTCH ANGLES FOR REBAR TIES.



10. ARCH-BEAM SUPPORT.

