



To : MIH

Re : Commentary on Technical Bulletin – Control Joints

Hi Brian,

Enjoyed reading the article on control joints. Here are some thoughts on masonry wall joints, reinforcing and masonry walls in general for your perusal.

Wall Joints: Wall joints in general detract from the architectural appeal of a building. So one of the objectives we face as structural engineers is to try to eliminate or minimize wall crack control joints. There are many factors that affect joint location and frequency in a masonry building. Wall height to length ratio, wall openings, building configuration to name a few. These parameters are often set by the Architect and thus we as structural engineers have little or no control over these factors. The one thing that we can control is how we reinforce masonry walls. This is the one tool that structural engineers have to try and control joint spacing among other things. Our philosophy at SAG is to use reinforcing to minimize or eliminate wall crack control joints in a structure. It is my opinion that the minimum level of reinforcing called for in the masonry code is too little for the structures of today.

Decline in Masonry Use: In the recent past there has been a slight decline in the use of masonry construction (in Hawaii). This I think, is due in part to three reasons - termites, water infiltration and wall cracking. Many of the older buildings suffer from water infiltration and corner cracking. And more recently masonry has been frowned upon by termite experts. This has cast a cloud over the masonry industry. The good news is that the sun is peaking through the clouds. Our understanding of masonry design and construction techniques has taken giant strides in recent years. There are many products in the marketplace today, that address water infiltration problems and architects today understand the importance of proper detailing. Structural engineers are rethinking the way masonry is designed, as tools and knowledge are available to push masonry to new limits and solve the problems of yesterday.

Cost: Cost, I don't think has had a major impact on the decision to use masonry on a project or not. Surely, if you compare masonry to stud construction or light steel construction, it would be difficult to bring in masonry at the same or lower cost but if you want a hard shell around your building then masonry is certainly a consideration. In most cases, for mid and low rise construction, masonry will come in cheaper than cast concrete. Anyway, just my opinion.

SAG Philosophy: The short discussion on wall joints and masonry use and cost leads up to what SAG's philosophy is in regards to designing masonry walls. It is my opinion that the "conventional" masonry wall built in the past is too lightly reinforced and the unreinforced or partially grouted construction is to blame for much of the problems older buildings see today. In recent past the typical masonry wall would consist of 8" cmu with #4 bars at 24" oc vertical and bond beams at 48: oc. The wall would be partially grouted. This leaves a lot of voids in the wall, a potential for water and termite migration. The light reinforcing leaves the wall susceptible to cracking due to volume changes or vertical movements.

SAG's in house criteria addresses this and creates a wall that is less likely to crack and is less susceptible to water infiltration and termites. Here are some of things we do.

- 1) We use a grout-lok or H or open ended block for the masonry runs. This eliminates a lot of the voids between adjacent blocks that can channel termites and water.
- 2) We grout our walls solid for the same reason above.
- 3) The so called "conventional" cmu wall is reinforced with bond beams at 48" oc usually with two #4 or #5 bars in them. This pattern of reinforcing makes sense if you are going to partially grout a wall, as this will minimize the grout volume. This may not make sense if you are grouting the wall solid. SAG's approach to masonry wall reinforcing is to detail the wall similar to a cast concrete wall. Our typical wall reinforcing is #4 @16" each way with 2-#4 cont at the top of the wall. The advantage of this is a more uniform distribution of reinforcing in the wall and easier grouting due to only one bar in the cell. The higher percentage of steel helps to resist volume changes and minimize wall joints. I'm not saying that all engineers should reinforce masonry walls this way but it is absolutely important that engineers understand what level of reinforcing is required in a wall and how that reinforcing is distributed.

Granted, the solid grouting and higher reinforcing level adds a little cost to the project but value and performance are also important considerations in a project. Eliminating wall joints saves a little money. Careful design and detailing and a little added cost can solve most of the problems that have plagued masonry structures in past and add value to a project way into the future.

Just some of my thoughts. Something to debate.

Regards, Les Nagata