

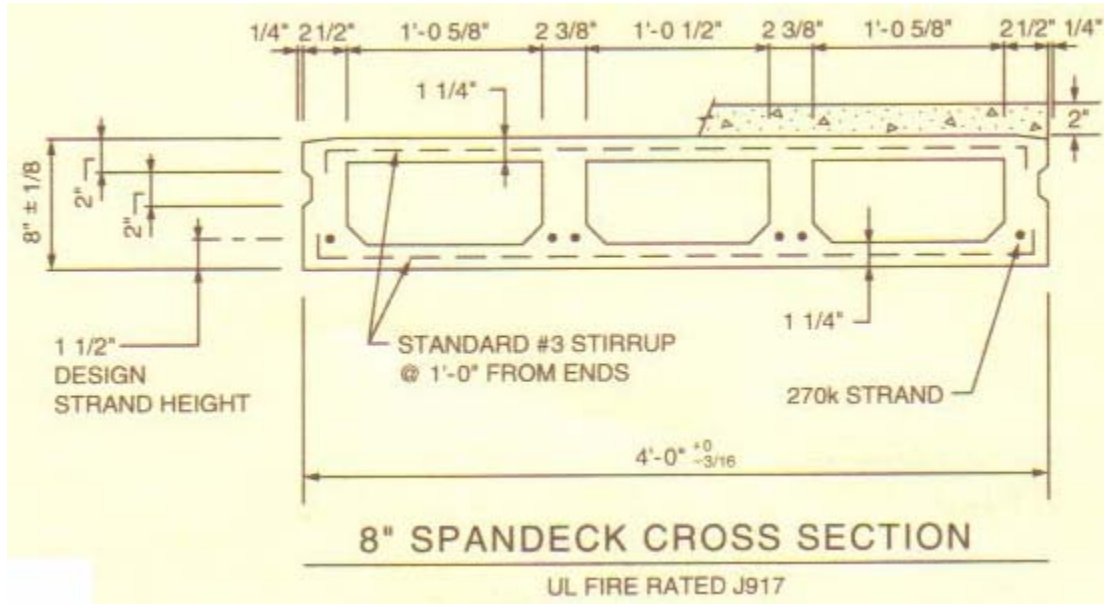


## Breadth Analysis

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### MECHANICAL DUCTWORK LAYOUT

With the column locations being changed, the mechanical ductwork layout and paths were taken into consideration for changes. Originally, the ductwork followed the paths of the existing column layout and the flat plate slab dictated where the ductwork would pass vertically through the floor system. The purpose of this analysis is to determine whether or not the ductwork would need to be re-routed to accommodate the new column locations. After analyzing the layout of the ductwork, it was determined that there would not be a need to have to re-route the path of the ductwork across the floor plan. However, the layout for the exhaust ducts that move vertically throughout the system would have to be examined to adjust the size to make sure they will be able to pass between the strands in the planks. With the existing system, the ductwork passes between the locations of the rebar in the slab. The locations of the rebar and not mapped out in any particular grid setup, they are designed to support the areas of the slab where it is needed most. In some spots, the reinforcement is very close and in other spots it is spaced farther apart. It is within these more open, un-reinforced areas that the ducts are designed to pass vertically through the floor system. Since the pre-cast concrete planks will have a uniform rebar design throughout the system, it is important to make sure the location of the ducts will coincide with the gaps in the planks to make sure the floor system is not weakened to the point where it will fail. It is allowable to remove only a small length of one set of strands along a plank. It is not suggested that many of these cuts be made in each plank; only one or two openings per plank would still allow for enough bearing capacity while allowing the space needed to accommodate the ductwork openings. The diagram below illustrates the distance between reinforcing strands that the ducts will have allowable clearance.



Section view of an 8" pre-cast concrete plank showing reinforcing strand locations

The design of these planks does, however, allow for the removal of the open spaces between the reinforcing strands with little consequence. Overlaying the floor plan with the locations of the pre-cast planks showed that the exhaust ducts were spread out far enough that only one duct that needed strands removed would be required to pass through any given plank. Any other ductwork was placed where it would be able to pass through the voids in the planks.

## CONSTRUCTION MANAGEMENT TIME ANALYSIS

A schedule or cost breakdown was not able to be acquired, but this analysis will be done given the known relative costs and times associated with each system. The first and most important factor when considering a floor system as it relates to the construction process is installation time. The pre-cast concrete planks will come straight from the factory where they are produced in an optimal environment and can be installed as soon as they arrive at the site. There is no installation is that the planks can be cut to shape any architectural features. This will cut down on even more forming time which would be required to lay out a more intricately shaped floor plan. Because the planks can be installed so quickly, they can be grouted, sealed, and topped with a cast-in-place topping to



help stiffen the system. These things will help the pre-cast system set up quickly and allow for fast floor system erection time. An issue that goes along with the system setting up quickly is the fact that after the topping is applied, the planks are ready for finish work. The floor can simply be covered with padding and carpeting and the ceiling can be painted or sprayed with texture coating which can also help the acoustics of the system. While the existing system requires taking time to place conduit into the slab before pouring it, the pre-cast plank system provides built-in channels where conduit can be placed. Another secondary system which places an effect on the pour time for the flat plate slab is any kind of hangers which will be placed in the slab for placement of mechanical ductwork. The pre-cast plank system allows for drilling into the plank to place hangers which will go much quicker during installation.