



## ENGINEERING SPECIFICATIONS

### **RAMMED EARTH STRENGTH**

- Rammed earth is a gravity system. Tested according to ASTM D698, it weighs 110 - 130 pounds per cubic ft.
- The earthen building materials industry accepts 300 psi as the minimum unconfined compressive strength for rammed earth, tested according to ASTM D1633 or C39. The generally accepted design strength is 10 percent of the minimum or tested psi.
- Using expansive clay or plastic soils is inconsistent with the concept of compaction, which requires that particles are granular and slide into place, locking together with a minimum of lubricating moisture.
- The structural purpose of stabilizing rammed earth is to maintain the minimum required compressive strength, wet or dry. Stabilization also excludes water, which prevents wall decomposition during freeze-thaw cycles.
- Tested according to ASTM D1556, a rammed earth wall's density must exceed 95 percent of the density of a molded sample of the wall material.



### **BEARING SUPPORT**

- Although it is a soft material, the compressive strength and weight of rammed earth can support massive steel beams that span large rooms and window- and door -openings.
- More than 1,000 steel anchors are embedded in the walls of Univision's new rammed earth headquarters. These anchors, made of rebar and held in place by friction, join steel and concrete beams to the mass of the rammed earth walls. (In Arizona, rebar is not used to strengthen rammed earth walls.)
- At left, the steel I-beam is welded atop a 3/4" x 20" x 30" steel bearing plate. Four anchor bolts, made of threaded #5 rebar, anchor the steel plate into 1,440 pounds (12 cubic feet) of rammed earth.
- At 10 percent of the minimum 450 psi compressive strength specified for this job, the rammed earth is capable of bearing up to 27,000 pounds of roof load on the 600-square-inch steel plate.

### **LATERAL RESISTANCE**

- The I-beam at left, is anchored into the concrete bond beam by a 1/2" x 8" x 8" steel weld plate atop the I-beam, with two 24-inch-long #5 rebar tails embedded diagonally into the concrete bond beam.
- The concrete bond beam picks up extra lateral resistance by being anchored into the rammed earth wall by 36-inch-long 3/4- inch diameter rebar anchor bolts, 24 inches on center. This bond beam, which weighs 300 pounds per lineal foot now provides more than 500 pounds per lineal foot of drag-weight.