

Sims General Building, Inc.

Dallas Parks & Recreation Rammed Earth Wall

Action Submittal

January 22, 2019

Attn: Shawnee

Minimum Performance of Rammed Earth Wall

Shop Drawing attachment:

Rammed Earth Materials

The soil for Rammed Earth (RE) will be predominately sand and gravel, (not to exceed $\frac{3}{4}$ " in diameter), 85% to 90%. The remaining 10% to 15% will be silt and clay fines passing through 200 mesh sieve. To this soil the following is added (by weight), 10% grey Portland Cement, .02% Crystalline Waterproofing (Zypex C-2000) and .04% to .08% pigment and 10% to 14% water will be mixed with the dry ingredients to create the RE mix. In New Mexico the compressive psi cannot be lower than 300, I normally achieve 1000 to 1300 psi using 7% cement. 1500 psi should not be an issue using 10% cement. It is easy to achieve high psi using only sand, gravel and cement but the walls are rough and ugly, not smooth and they lose the beautiful RE appearance.

These RE materials are mixed in a custom built RE mixer. The soil is added into a hopper on the end of the machine. The soil falls onto a conveyor belt that travels under a second hopper that contains the Portland cement, Zypex C-2000 powder and the powdered pigment (this material is mixed separately before being deposited in the second hopper). The cement blend in the second hopper falls onto the soil that is traveling along the conveyer belt. These two materials fall into a trough with a rather aggressive auger that mixes the two materials together and pushes the material along the trough towards the opposite end where there is an attached water spray bar. Water is sprayed onto the mix is then fully blended with the RE dry ingredients. The mixture is pushed along and out of the auger and falls onto a separate conveyor. This conveyor is positioned over the top of the wall forms. The RE mixture travels along the conveyor and is deposited into the forms in less than 30 seconds after the water is added. The mixture is then rammed using pneumatic compactors. The RE mixer will run continuously while the RE blend is being rammed and/or run until each lift of RE soil is deposited and then rammed, turning the mixer off in between lifts.

The forms will be faced with $\frac{3}{4}$ " HDO plywood for a smooth exterior wall surface. The wall will be built in sections creating joints every 12'. Joints will match the location and spacing of the nearby Canopy columns. The 12' sections will deter large shrinkage cracks from developing. Hairline cracks may develop but that is normal in rammed earth walls. Every 36' we will install expansion joint material per the specifications. The forms will be built so as not to deflect during the ramming operations.

I recommend a $\frac{3}{4}$ " chamfer along the top of the stem wall and the bottom of the rammed earth. It creates a very clean junction where the two meet.

Walls will be constructed so as not to vary within $\frac{3}{8}$ " vertically and not to bow more than $\frac{1}{2}$ " from the beginning if the RE wall to the end. Plywood joints will be visible.

The walls will be rammed to the pattern as shown on A-051B. PLEASE NOTE: Rammed earth is not fluid it has a slump of 0. To be able to ram the lifts in a perfectly level lift from end to end is not possible. The lifts will vary considerably up to 2" from plan view. The color pattern may not align perfectly from one section to the next although every effort possible will be made.

I have included #5 rebar at 32" OC. The foundation concrete should also include dowel reinforcing to match this.

We will install a "puddle earth" lift at the top of the wall per the specifications.

We will assist the electrician and sign subcontractor in the placement of embeds for their work.

We will spray a rammed earth sealer onto the wall at the completion of construction.

I will need sufficient room along the street side of the wall for all of my equipment. I will need several feet on the back side of the RE wall for forming activities.

PLEASE NOTE: The canopy, as now designed, is going to drain onto the RE wall. I strongly recommend that the runoff from the canopy not be allowed to drain onto the wall. RE walls will not stand up over time to that volume of runoff, especially the amount of runoff from a Dallas rain.

Thank you,

Michael Sims

Sims General Building, Inc.