FORTA®

FORTA CORPORATION

Proposal for Fiber Reinforced Concrete Slabs on Ground

"Reinforcing the Future"

FORTA CORPORATION
100 FORTA Drive
Grove City, PA 16127
(800) 245-0306
(724) 458-5221
Fax: (724) 458-8331
www.fortacorp.com

16 July 2015

[redacted]

Re: [redacted]

Subject: Fiber Reinforced Concrete Slab Recommendations

Dear [redacted]

Per your request for the above referenced project, FORTA Corporation would like to make the following recommendations for your slab on ground project. FORTA's recommendations are based on the project information that has been provided to us, as set forth below:

Design Criteria

- Original Steel Reinforcement
  - Steel spacing is 18" center to center
  - Steel rebar number is 4
  - Steel yield is 60 ksi
- Concrete Properties
  - F'c = unknown psi
  - Concrete thickness is 6"

Fiber Reinforcement

- Macrosynthetic Alternative
  - Use 3.0 - lbs./yd^3 2-1/4" FORTA-FERRO® for equivalent force (tension)

The relative engineering mechanics Substitution Calculations are attached for understanding the force and moment from the given steel in the slab converted to an equivalent fiber reinforcement dosage. (These calculations are not the design but a mathematical analysis of the given design.) These calculations incorporate data derived from laboratory tests conducted in accordance with ASTM 1399 ARS.

Additional Project Considerations

- The use of larger aggregates, such as 3/4" (19mm) and well-graded, reduces the risk of concrete shrinkage and curling.
- Experience has shown that a W/C ratio of 0.47 to 0.53 best accommodates the surface area characteristic of macrosynthetic fibers.
- Chemical admixtures such as water-reducers and superplasticizers are recommended as needed for sufficient workability at point of placement. Next-generation polycarboxylate chemistries are preferred, especially for fiber dosages exceeding 5 lbs./yd^3.
- Follow ACI-recommended construction, contraction, and isolation joint practices, along with conventional joint spacing. If extended contraction joint spacing is desired, contact your FORTA representative for additional considerations.

FORTA-FERRO Features

Macrosynthetic fibers have been successfully used to replace steel reinforcement in slab-on-ground applications for over fifteen years. These fibers have many advantages over steel reinforcement and earlier generations of synthetic fibers, including: tighter crack control, non-corrosive, 3-D reinforcement, safe, easy to work with, and economical.

The use of macrosynthetic fibers improves the performance of concrete by adding ductility, increases impact strength, reduces shrinkage, and reduces curling.

FORTA-FERRO's patented technology makes it one of the best performing, mixing, pumping, and finishing macrosynthetic fibers on the market today.

Respectfully submitted,

Enclosure:

FORTA Corporation
100 Forta Drive
Grove City, PA 16127-6399 U.S.A.
1-800-245-0306
www.fortacorp.com

FORTA Corporation has no control over the design specifications or the materials placement on the job site, and therefore, FORTA Corporation disclaims liability for the end project. FORTA Corporation's liability is limited to the replacement cost of the fiber.

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Equivalent Fiber Dosage Calculations

The following is an illustration of the calculations to determine an equivalent dosage of fiber to replace the proposed steel reinforcement.

This is accomplished by calculating the post-crack strength of the concrete with the steel, compared to the average residual strength (ARS) of concrete reinforced with FORTA-FERRO®. The steel can act in either force (tension) or in moment (bending). FORTA-FERRO® dosage calculations for both are included.

INPUT

Rebar Number	#4	
Steel Yield	60	ksi f_y
Rebar Spacing	18	in. R_s
Concrete Strength	Unk.	ksi f'c
Concrete Thickness	6	in. t

CALCULATIONS

1. Calculate the area of steel in a unit width (12 in.) of concrete (A_s).

   $A_s = (\pi d^2/4) * (12/R_s) = 0.131$ in^2/ft-width.

2. Calculate the force of the steel (F).

   $F = A_s * f_y = 7{,}853$ lbs.

3. The ARS equals the force divided by the area of concrete (A_c).

   $ARS = F/A_c = 109$ psi.

The fiber dosage for equivalent force would be 3.0 lbs/yd^3 of FORTA-FERRO®.

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