BASE MATERIALS FOR SLABS-ON-GROUND

Sometimes there may be confusion with respect to the materials used for support of concrete for slabs constructed on the ground. A drawing or specification may indicate that the slab concrete shall be placed on a layer of granular materials, but there might not be a specific material mentioned for that application. There are several materials that could provide adequate uniform support to the slab concrete, but some of the materials have as many advantages as disadvantages, and may not be desirable from a constructability viewpoint of the flatwork contractor who has to place and finish the slab and be responsible for its performance. Owners of slabs-on-ground want the slab to perform without excessive maintenance.

Several industry groups, including ACI (American Concrete Institute) and ACPA (American Concrete Pavement Association), provide guidance in their documents for use of a well-graded or densely graded base material, sometimes commonly referred to as "crusher run" stone. The use of this type of base stone is desirable because it compacts well to provide a stable, uniform surface for the contractor to place and finish the concrete. Additionally, that uniform surface may allow the slab to "slip" when the concrete shrinks, reducing the potential for cracks to form between the construction or control joints.

Open-graded or clean stone, such as ASTM No. 57 or 67 coarse aggregates have been specified on many projects as the base materials beneath the concrete slab-on-ground; however, those materials present some issues that can affect the long-term performance of the slab. Because the open-graded stone lacks any fines, the stone is relatively uncompactible and remains "unlocked" or loose, such that disturbance or rutting can occur at the surface as the contractor attempts to place the concrete. This movement can result in a non-uniform surface that could affect the final slab thickness if not corrected prior to concrete placement, but more importantly, the uneven surface results in restraint to the movement of the underside of the concrete during shrinkage, thereby increasing the potential for early-age and long-term intermediate cracks between planned control joints.

It is important to understand that the slab support condition is part of the design process in determining the function of the base material. Most typical applications might consist of slabs-on-ground for industrial, warehouse or retail facilities where the slabs are subjected to storage or traffic loads. In those cases, the slab designer is typically interested in a uniform support condition for the concrete to properly distribute stress from the applied loads. Because the dense-graded stone can be compacted to a non-yielding surface, those materials generally satisfy the design requirements. The flatwork contractor has a uniform surface to assure the design thickness is achieved, and the concrete can move with minimal restraint.

In some instances, such as basement slabs subject to moisture intrusion, a layer of open-graded or clean stone is desirable to promote drainage from beneath the slab. In that situation, it may be appropriate to install the necessary thickness of open-graded stone to satisfy the capillary or drainage requirements to prevent moisture migration up to the slab, but install a "choker" layer of dense-graded aggregate above the open-graded drainage layer to facilitate construction of the slab itself, thereby avoiding most of the undesirable aspects of concrete placement on open-graded stone.

While this discussion has mentioned manufactured stone products beneath slabs-on-ground, other materials may satisfy the design intent of uniform support for the slab. In coastal areas where aggregates are scarce and relatively expensive, support may be achieved using well-graded sand and gravel, sometimes referred to as "bank run" materials. Projects have requested the use of recycled concrete for the base materials. Other materials for slab support could include lime- or cement-stabilized soils, or in some cases, manufactured "geofoam". The use of non-traditional materials should be thoroughly evaluated by the design and construction teams to understand the pros and cons of those materials from both short and long-term performance including the design function of the base materials.

In closing, the base materials for slabs-on-ground are very important to the constructability and performance of the slab and need to be fully evaluated for proper use. Careful planning of the slab construction sequence and proper execution of accepted construction methods can lead to a successful project. We hope this Lessons Learned is beneficial to you in achieving that goal.

Respectfully,
ECS Corporate Services, LLC