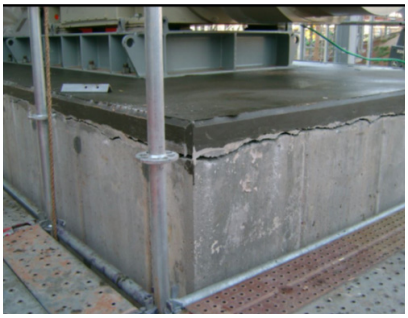
Technical Bulletin 411

Grout Shoulder Configurations

BEST PRACTICE GROUT SHOULDER



A LARGE AREA OF UNCONFINED EPOXY GROUT WAS POURED TO THE EDGE OF THE CONCRETE PEDESTAL RESULTING IN EDGE LIFTING.

Grout around the outside of a piece of equipment or baseplate that is not confined is often referred to as the grout shoulder. The primary reason for having grout shoulders is to provide a space from which the grout can be installed and to have a space on the opposite side from which air can be vented and it can be confirmed that the grout has traveled completely under the baseplate. Formwork is also easier to construct if grout shoulders are incorporated.

Large grout shoulders and areas of unconfined grout near the edges of a foundation create problems and should be avoided wherever possible. Because of the expansive nature of Five Star® cementitious and epoxy grouts*, large areas of unconfined grout are more likely to crown and develop surface cracks. Surface cracks in the grout shoulder do not affect a grout's ability to perform its load transfer function but typically need to be addressed so that they do not allow water infiltration and create additional problems in the future.

In the case of epoxy grouts, a large unconfined area of epoxy grout that is not seeing any load will expand and contract at a different rate than the concrete substrate that it is bonded to because of the difference between the two materials' coefficients of thermal expansion. A large grout shoulder (particularly one that is near the edge of the foundation) can lift and crack the concrete substrate. This unintended occurrence is referred to as edge lifting. Steps can be taken to minimize the possibility of edge lifting but the simplest solution is to limit the size of the grout shoulder.

The general recommendation is to not make the width of the grout shoulder wider than the grout depth. Grout shoulders wider than the grout depth do not perform any function in transferring the load. If a grout shoulder must be wider than the grout depth to address installation issues, the grout shoulder should be limited to a maximum width of three inches.

For cementitious grouts, the shape and configuration of grout shoulders can be controlled by finishing or cutting back stiffened product as it sets (similar to how you would cut back and finish concrete).

For epoxy grouts, the shape and configuration of the grout shoulders must be controlled by constructing formwork that will result in the grout achieving the desired shape and configuration as it sets. Epoxy grouts change from a workable product to a product that resists working too quickly to count on significant finishing and manipulation while the product is curing.

* Five Star® cementitious and epoxy grouts are expansive in their plastic state which enables the grouts to remain in contact with the bottom of the plate or equipment being grouted as the material hardens.

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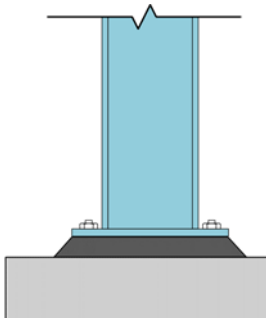
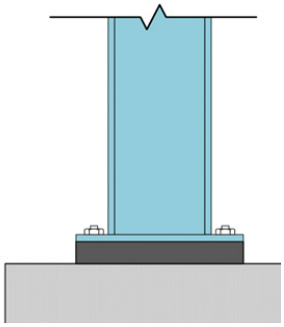


1. **Best Practice**

This is the ideal grout shoulder configuration. All of the grout under the baseplate is seeing load and there is no excess grout present to create any issues.

For **cementitious grouts** this shoulder configuration may be constructed by allowing the installed cementitious grout to partially set (so that it holds its shape), then removing the forms and striking off the excess grout at a 45° angle before the installed material takes its final set.

For **epoxy grouts** this shoulder configuration is constructed using covered forms with air vent holes.

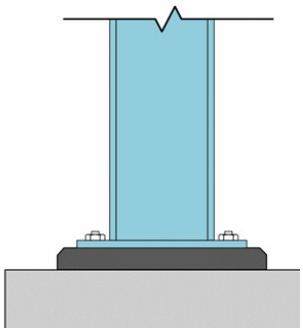


2. **Satisfactory**

When this configuration is installed all the grout under the base plate is seeing load and there is no excess grout present to create any issues.

For **cementitious grouts** this shoulder configuration may be constructed by allowing the installed cementitious grout to partially set (so that it holds its shape) then removing the forms and striking off the excess grout flush with the baseplate before the installed material takes its final set.

For **epoxy grouts** this shoulder configuration can only be employed if there are grout and vent holes in the baseplate.



3. **Satisfactory**

This configuration is an example of a grout system that has minimal grout shoulders.

The grout shoulder width is approximately the same as the grout depth. This is a good rule of thumb to follow. If installing a grout shoulder that is wider than the grout depth is necessary, then the grout shoulder should not exceed 3 inches (75 mm) in width.

90° angles have been chamfered. Best practice is to eliminate 90° angles when grouting since they create stress risers in the grout.

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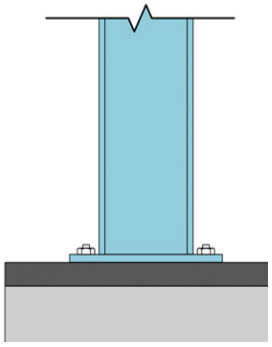
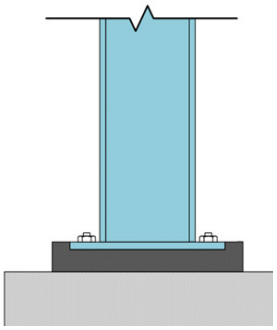


4. **Unsatisfactory**

This grout shoulder configuration will create problems. The grout shoulder was extended to the edge of the concrete pedestal presumably to make forming easier or for aesthetics.

For **cementitious grouts**, because of their expansive nature, the large grout shoulder will be more likely to crack.

For **epoxy grouts**, because of the different expansion and contraction rates of the epoxy grout and the concrete pedestal, there is an increased potential that the grout will lift at the edges and crack the concrete pedestal. There are some steps that can be employed to minimize the effects of "edge lifting" but the best practice is to limit the size of the grout shoulder to 3 inches (75 mm) or less.



5. **Unsatisfactory**

This grout shoulder configuration is sufficiently sized, but the grout has been poured such that it encases the baseplate (installed above the bottom edge).

The grout shoulders will likely experience cracking because of the different expansion and contraction rates of the grout and the steel baseplate (see photo at right).

It is always recommended that the grout surface be finished such that the grout is in contact with the bottom of the baseplate. Excess material that takes the grout above the bottom edge of the baseplate should be removed prior to grout curing.

THIS CEMENTITIOUS GROUT WAS INSTALLED ABOVE THE BOTTOM EDGE OF THE BASEPLATE. THE BASEPLATE EXPANDED AND CRACKED THE GROUT.

For additional information, contact your Five Star® Technical Sales Representative.

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