Technology to Build On!

General Recommendations & Suggested Guidelines for Utilization of a KB "SMART" Excavation Fluid

Addressing the Construction of the Slurry Plant, the Setup of Associated Equipment and Materials, Along with the Application, Use and Testing of a SlurrySMART or Enhanced "SMART" Excavation Fluid

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Table of Contents

I. Introduction

KB's "SMART" fluids have introduced an unparalleled level of applications simplicity coupled with a new standard of excavation stabilization and foundation element performance. SlurrySMART is the culmination of 14 years of continued research & development dedicated to the design of innovative, highly functional synthetic stabilization fluids for the geoconstruction industry. SlurrySMART's ease of application and use combined with performance in a broad range of formation conditions make it the logical choice when slurry is required.

The same performance achieved with SlurrySMART can also be obtained when applying SlurrySMART CDP in combination with EnhancIT 100 and EnhancIT 200. Application of these three polymers in combination, yields a highly functional and effective "SMART" fluid system. This fluid possesses virtually all of the unique performance characteristics and features of a SlurrySMART fluid.

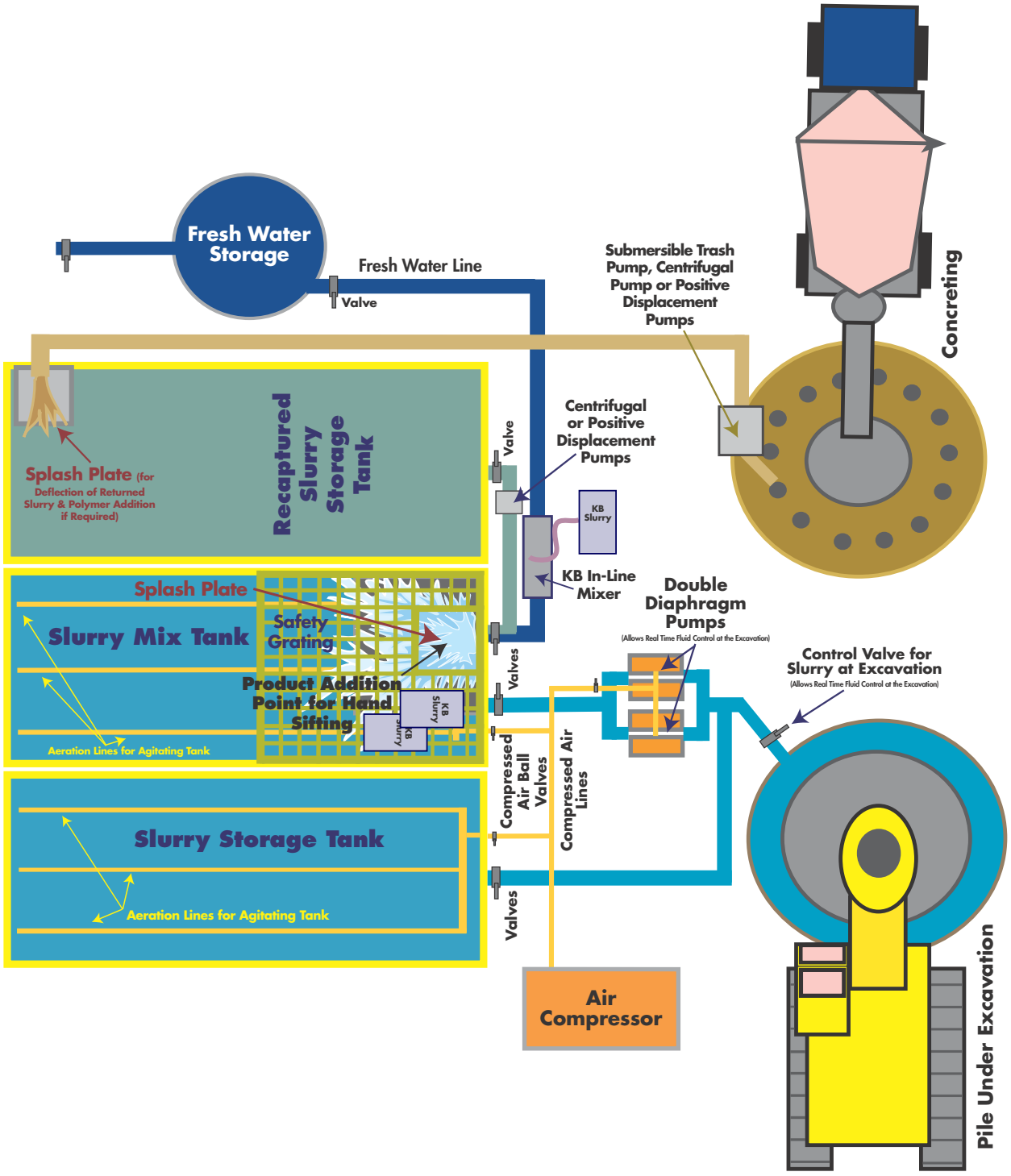
Additionally, by applying the three materials as individual components performance properties can be zeroed in to the desired level while also providing a means of cost optimization and savings for larger or less difficult projects. In exceptionally difficult soils an additional high performance additive, designed specifically for the problem at hand may, be required.

II. Project Pre-Planning - the Importance & Considerable Benefits Realizable with Proper Pre-Project Communications and Planning

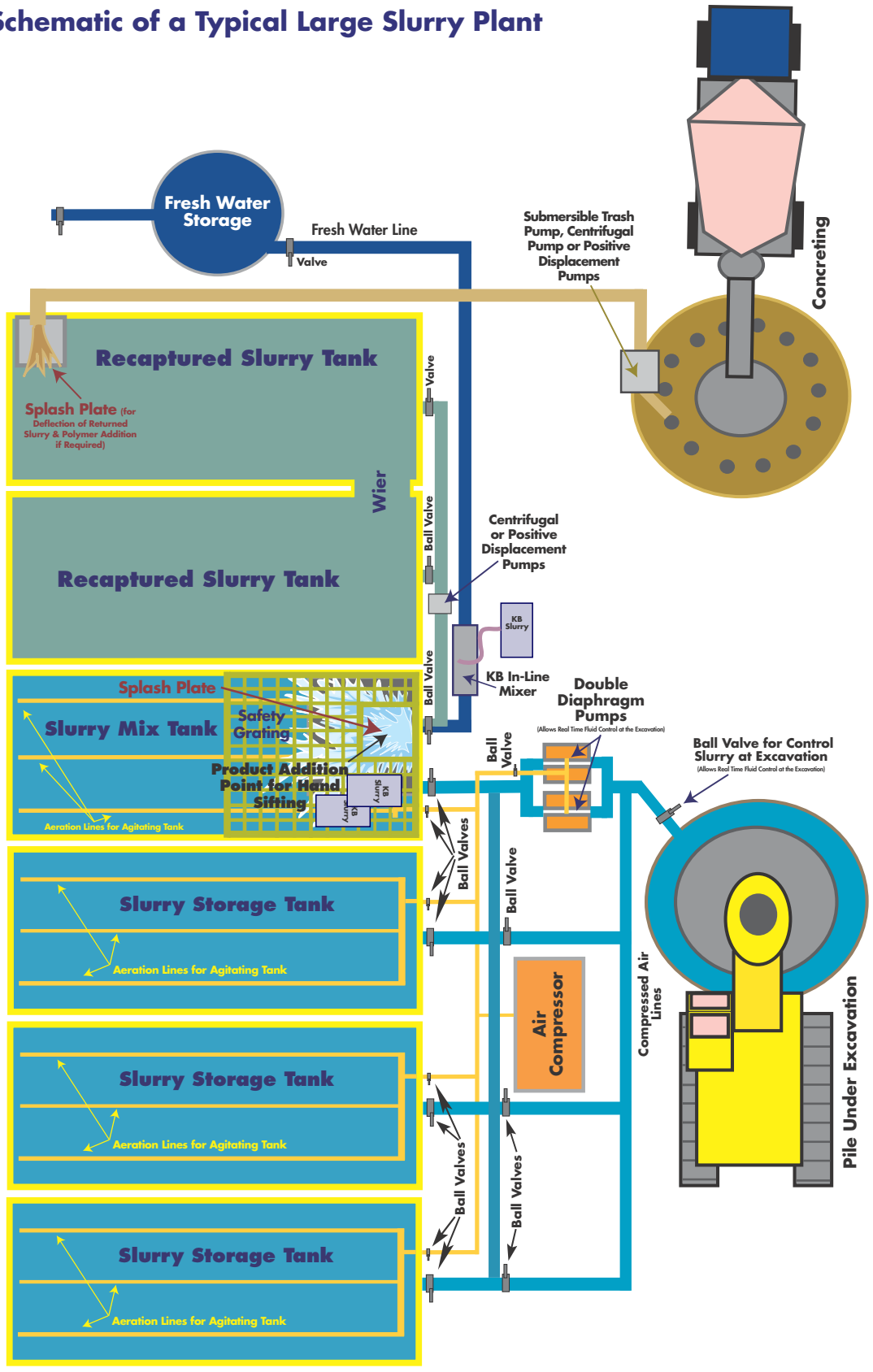
Project specific pre-planning between at least the foundation contractor and KB International LLC is always recommended. This normally consists of KB receiving copies of the Soils Investigation Report, the Soil Boring Report, a copy of the project plans along with any other pertinent information. It is also beneficial to have a pre-project meeting or meetings when a project has a high difficulty factor or is of significant size. On larger projects it is typically beneficial to bring in the design engineering firm and the project owner when they are technically interested, such as a government agency (Dept. of Transportation or Corp. of Engineers). In some projects it can also be of benefit to include the structural engineering firm and the general contractor. By doing this, we insure all parties are aware of the various points of concern and each party's specific concerns in combination with the steps which will be taken to insure each concern along with each of the various soil conditions in appropriately stabilized insuring a high success rate within each area of concern as well as in excavation / soil stabilization.

Within these meetings various beneficial contributions of KB's SMART Excavation Fluids can be reviewed and the various positive contributions to foundation performance and quality considered. Through this technology exchange it is often possible to redesign a bored pile foundation system, shortening the depth of the piles as a result of the enhanced skin friction realized with KB's SMART Technology. This can result in considerable savings to the owner, decreased construction times, and increased profit for the foundation contractor. This increased profit is derived from the foundation contractor's ability to modify his bid, to share the project cost savings realized as a result of the decreased construction time and the decrease in pile depth and excavation depth. The contractor can also use this information on future bids to increase his probability of securing a contract while allowing him to also retain and realize increased profit on the project.

III. Schematic of a Typical Small Slurry Plant



IV. Schematic of a Typical Large Slurry Plant



V. Pumps for Slurry Delivery to Excavation

V.I Double Diaphragm Pumps

Double Diaphragm Pumps Setup in Tandem for Rapid Slurry Supply on Large Excavation

Ball Valve Connected to Casing

Key Benefit Derived from Use of Diaphragm Pump:

By utilizing double diaphragm pumps to move slurry from the storage tanks to the excavation, the slurry may be controlled at the excavation with a simple ball valve. The back pressure from stopping the flow of slurry by closing the ball valve, automatically shuts down the diaphragm pump. There are no deleterious effects to the pump or to the slurry. This allows for control of the slurry at the excavation and eliminates the need for constant recirculation of the slurry or communications between an individual at the excavation and another individual at the plant where the pump is located and controlled.

When a typical centrifugal pump is setup in an open loop configuration to allow flow control at the excavation there is continuous damage to the slurry. This damage decreases the slurry's efficacy. This impact is typically seen as either an decrease in excavation quality coupled with increased consumption of concrete or as an increase in the quantity of product required to maintain the appropriate slurry properties.

By controlling the delivery of slurry at the excavation the individual, or "oiler" is able to insure that the level of the slurry within the excavation is properly maintained and never falls within 2 meters (7 feet) of the ground water level. This insures positive pressure is always being exerted against the excavation sidewall thereby insuring its stability.

Single Unit Double Diaphragm Pump

Positive Displacement Screw Pumps

V.I Double Diaphragm Pumps - Continued

Double diaphragm pumps can be setup individually or in tandem, using two double diaphragm pump units. On smaller piling projects where the excavation diameter is not much more then one meter (3 feet) it is typically fine to use a single double diaphragm pump. However, if porous conditions may be encountered or if the excavations are in excess of 1.25 meters (4 feet) it is advisable to setup a pair of double diaphragm pumps in tandem. This allows for an increase in slurry delivery of approximately three times that of a single unit.

V.II Positive Displacement Screw Pumps

On projects where very large excavations are being dug, such as diaphragm wall projects, the use of large positive displacement screw pumps may be advantageous. These units are capable of moving exceptionally large volumes of slurry quickly and efficiently. They are able to handle large pieces of debris without damage, which may be seen when using a standard centrifugal pump or even a centrifugal trash pump. This makes the screw pumps ideal for transfer of slurry from a large excavation back to the slurry plant. Positive displacement screw pumps are also very quiet making them a great choice for projects in an urban environment.

V.III Heavy Duty Solids Handling Trash Pump

Gurman-Rupp
V Series Pumps

Gurman-Rupp HS Series
Submersible Pumps

Gurman-Rupp
10 Series Pumps

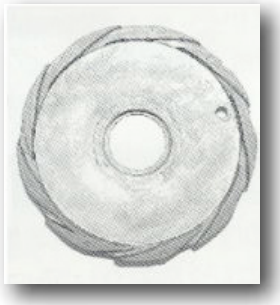
Gurman-Rupp
T Series Pumps

Key Benefit Derived from Use of Heavy Duty Trash Pumps:

By utilizing heavy duty trash pumps to move slurry from tank to tank in the storage farm or from an excavation being poured with concrete or filled with some other material, there is little, if any negative effect on the polymeric slurry. Unlike conventional centrifugal pumps, many high volume solids handling pumps have a uniquely designed impeller which does not produce the high shear environment seen with a standard impeller. Below are typical impeller designs used in a preferred type of trash pump and a standard centrifugal impeller. High Pressure Centrifugal Pumps should not be used to transfer any polymeric / synthetic slurry! High Pressure Centrifugals induce EXTREME SHEAR that will cause detriment and diminished performance from virtually all polymer based slurries.

Standard
Centrifugal Pump
Impeller

Preferred
Centrifugal Trash
Pump Impeller



High Pressure
Centrifugal Pump
Impeller

VI. How to Mix SlurrySMART and other KB Powder Additives

VI.I Adding SlurrySMART or Additives by Hand - Sifting Over a Splash Plate

Mixing SlurrySMART or any of KB's granular and powder products is quite easy and straight forward. The primary objective is to allow the polymer particles to separate as much as possible before entering a moving stream of water or recaptured slurry. By separating the polymer particles the polymer will more rapidly and completely dissolve into the water or recaptured slurry. Sifting the product from a cup or a sifter onto a plate with water or recaptured slurry deflecting, fanning or splashing over it is a simple and straight forward method for product addition. The splash plate can be constructed from plywood or from scrap metal available around the site. The scoop can be a anything from a plastic soft drink bottle with the top cut off to a soft drink cup to a plastic measured scoop or a household baking sifter. It is important that the water be flowing over the splash plate at a decent rate to insure that each particle of polymer entering the water or slurry is immediately carried away from the sifting plate and into the agitating slurry mix tank. If the polymer particles are not rapidly and consistently removed from the splash plate the polymer particles will begin to build up on the plate as a gel mass. or will ball up to form "fish eyes" or larger gel masses of polymer. These "fish eyes" and gel masses are difficult to mix back into the slurry and therefore are typically wasted material.

Correct Sifting Method

Correct Sifting Method

VI.I Adding SlurrySMART or Additives by Hand - Sifting Over a Splash Plate - Continued

Proper Sifting Method with Wind Blind

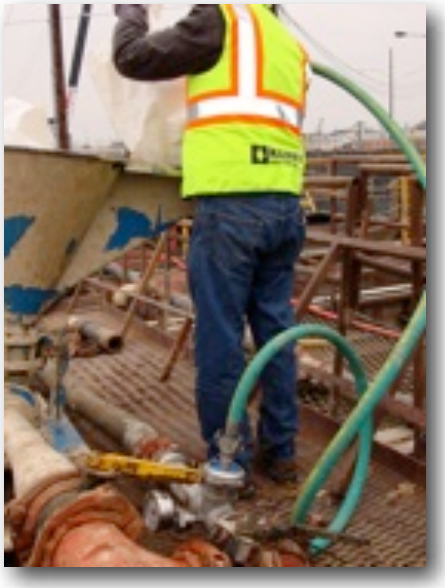
These masses of polymer can also be produced when the product is not sifted onto the splash plate, but is dumped onto it. The quantity of polymer powder and granules entering the water or recaptured slurry when dumped directly out of a cup all at once will create balls and masses of polymer to form, thereby wasting product. When using this mixing method it is also important to consider an enclosure around the mix area so wind will not carry product away as it is being sifted onto the splash plate.

SlurrySMART and KB Additives should always be premixed at the slurry plant before addition to an excavation. Typically, they should be aerated or mixed for 15 minutes prior to use. **ONLY IN EXTREME EMERGENCIES SHOULD PRODUCT BE ADDED DIRECTLY TO AN EXCAVATION.**

Adding Direct to the Excavation, this should Only be Done in Emergency Situations with the Guidance from KB

VI.II Adding SlurrySMART or Additives - Using a KB In-Line Eductor

Mixing SlurrySMART or any of KB's granular and powder products may also be accomplished using a KB In-Line Eductor. This is a 3" unit which is placed in the fresh water line feeding into the slurry mix tank or aerated slurry storage tank. Polymer addition is made simple with this unit as it vacuums polymer from the bag or pail it is supplied in through a plastic line feeding it directly into an optimized mixing chamber in the main unit where the polymer is introduced into the water. The rate of product introduction into the water is accomplished at an optimized rate controlled by the volume of water flowing through the eductor's chamber. A photograph of a KB In-Line Eductor is to the immediate left. The KB In-Line Eductor may be placed on the ground and the discharge hose run up and over the side of the slurry mixing tank or slurry storage tank, or it may be set on the top of the slurry mix tank along side of a slurry splash plate. By placing the two together the contractor has the ability to readily change between each method of product addition. This can be of benefit when there is not a need for making up much fresh slurry as the In-Line Eductor may become clogged from time to time when recaptured slurry is run through it and fresh slurry is being added to the recaptured slurry in the mix chamber. A schematic of the KB In-Line Eduction Unit is above and photograph of the 3" KB In-Line Eductor being used is adjacent to the schematic. A photograph of the 3" KB In-Line Eductor is also to the right.

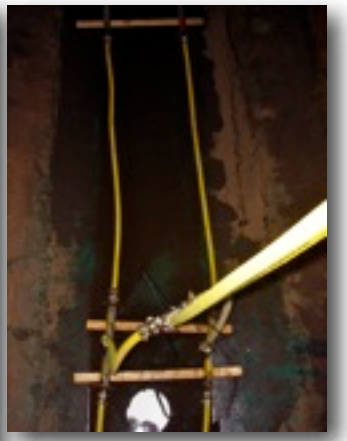


VI.III Aeration of Slurry Mix Tank and Slurry Storage Tanks for Agitation

It is very important to provide a form of mild agitation in the slurry mix tank and in all slurry storage tanks used to hold fresh slurry or slurry that has been refreshed with polymer after being recaptured from an excavation during concreting. The most effective and efficient means of agitation is to install an aeration system within the base of each tank. This is typically accomplished by drilling holes in pieces of PVC or steel tubing in a predefined angle and design shown in the ***"KB Mix Tank Schematic"*** and the ***"KB Storage Tank Schematic"*** on page 14 and 15 respectively. Below are several photographs of a few different aeration piping designs used on numerous large scale projects KB has been involved with over the past 20 years. Note the inclusion of both a slurry splash pan and the aeration tubes.

Steel Tube Being Run Over the Side of a Storage Tank and Divided into Aeration Lines

Steel Tube Aeration Lines Running the Length of a Slurry Storage Tank



Heavy Duty Reinforced Hose Aeration Lines dropped into a Closed top Tank Running the Length of a Slurry Storage Tank

Properly Agitating Tank

Steel Tube Aeration Tube Being Run Over the Side of a Storage Tank

Steel Tube Aeration Lines Running the Length of a Slurry Storage Tank

VI.IIII Paddle Mixer in Slurry Mix Tank and Slurry Storage Tanks for Agitation:

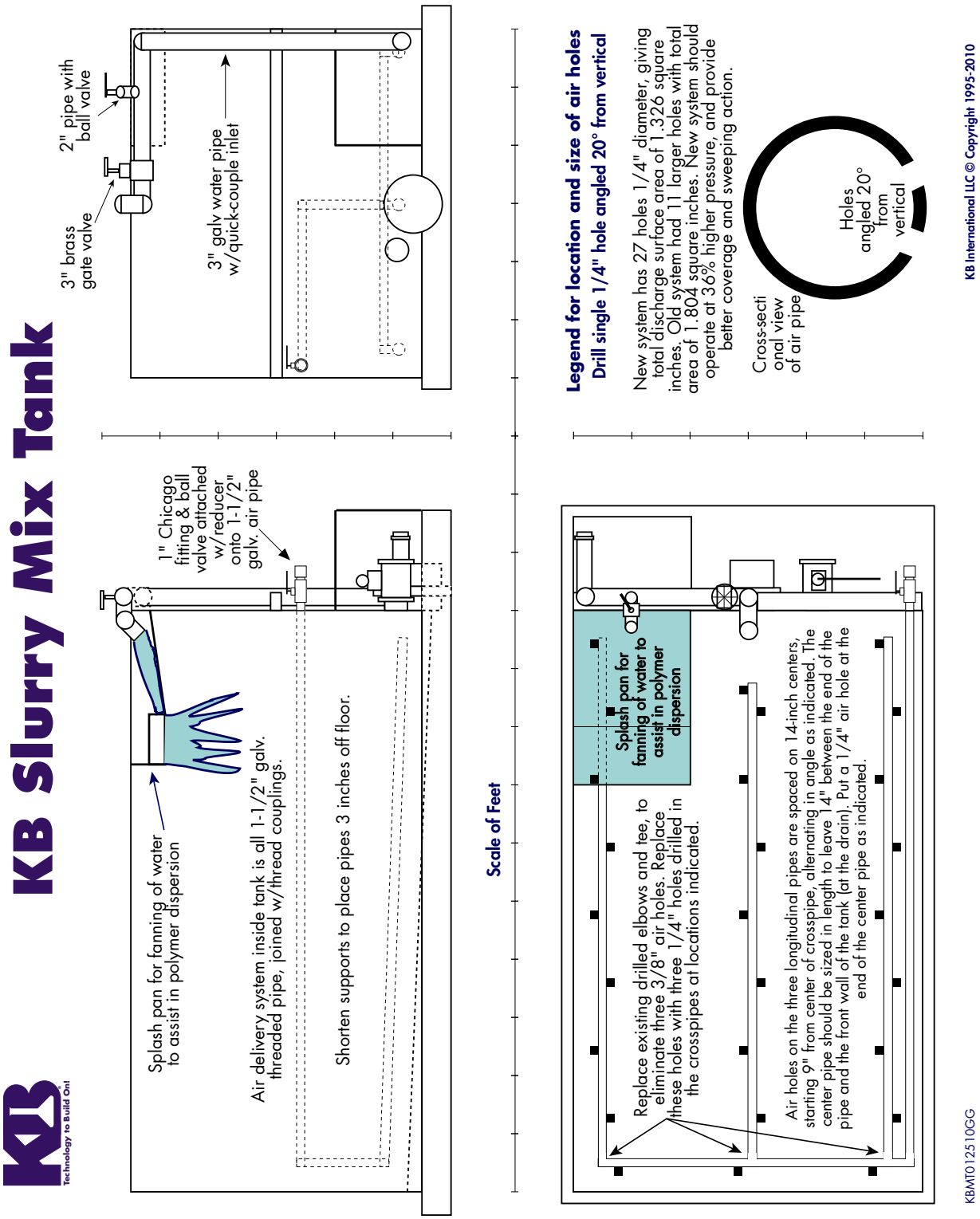
Another way of providing mild agitation in the slurry mix tank and in all slurry storage tanks when a compressor is not available is with a paddle mixer. When setting up a paddle mixer it is best to use circular slurry storage and mix tanks to eliminate dead spots which are typically present in rectangular tanks. To setup a paddle mixing system a low gear ratio motor is required to drive the shaft of the paddle mixer. These are typically used electric motors. Below are several photographs of a project recently completed where a paddle mixing system was installed. Note the inclusion of a slurry splash pan in the slurry mix tank.

Circular Slurry Mix Tank showing Splash Pan

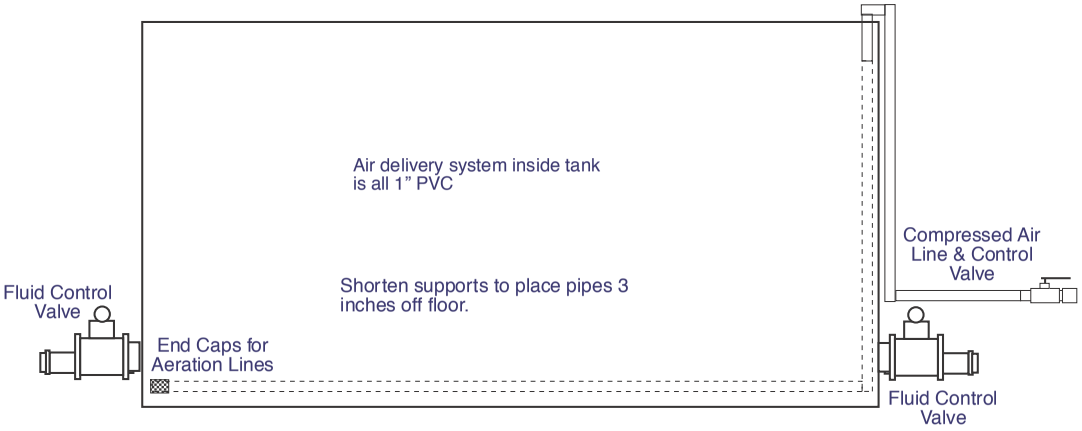
Circular Slurry Mix Tank showing Paddle Mixer Blades

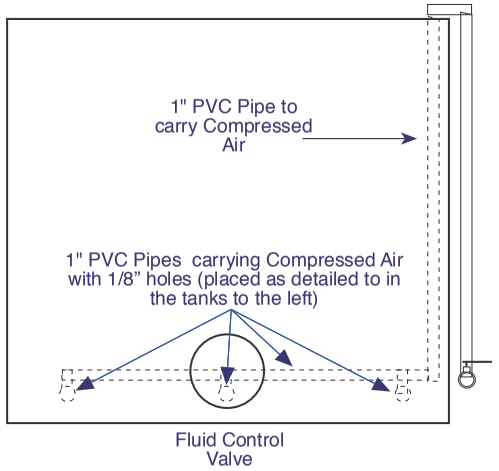
Circular Slurry Mix Tank showing Slurry Filling Tank and being Stirred, or Agitated with Paddle Mixer

Circular Slurry Mix Tank showing Slurry thickening, or Yielding while being Stirred, or Agitated with Paddle Mixer

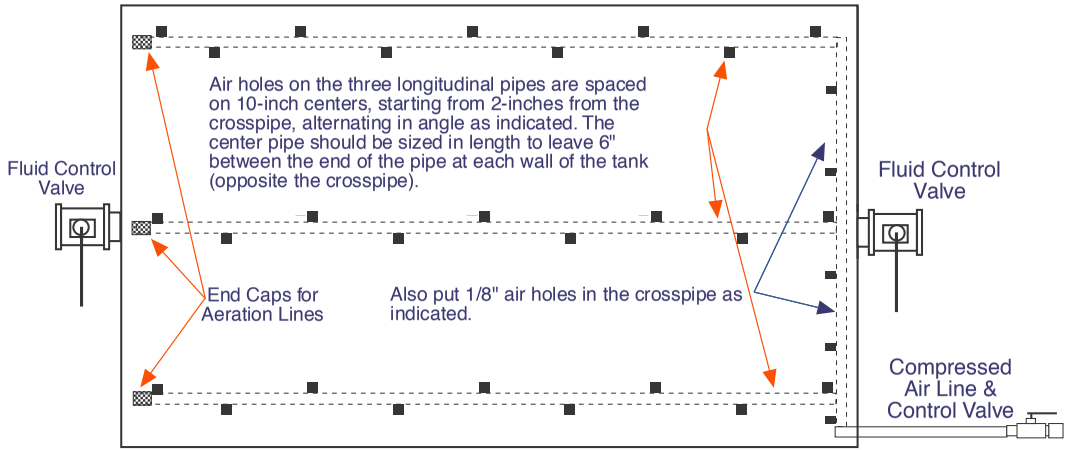


KB Slurry Storage Tank





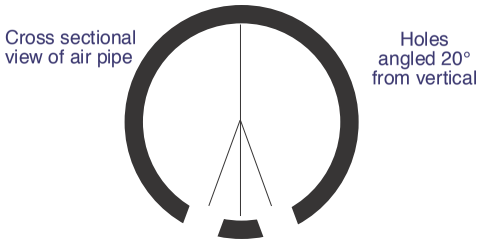
THE INFORMATION PRESENTED IN THESE DIAGRAMS SHOULD BE FOLLOWED FOR TYPICAL SIZED OPEN TOP HORIZONTAL TANKS. THE DEMENSION OF THESE TANKS MAY VARY SLIGHTLY. THE LARGER THE TANK THE LARGER THE AIR DEMAND. LARGER STORAGE TANKS WILL REQUIRE LARGER COMPRESSORS.



Legend for location and size of air holes

- Single 1/8" hole angled 20° from vertical

New system has 1/8" diameter holes spaced at 10 inch intervals with alternation of the side of the PVC pipe. Pipes are elivated approximately 3 inches of the bottom of the tank.



IX. SlurrySMART Tests to Verify it is Within Specification:

Caution, All KB Slurry Specifications and Guidelines are based on Slurry Values obtained using the "API RP 13B-1 Recommended Practice for Field Testing Water-based Drilling Fluids". If different testing protocols, incorrect test methods or incorrect testing equipment is utilized the values obtained will not correspond to those presented by KB and the slurry's properties may be erroneously assumed to be within specification when they are in fact out of compliance.

IX.I KB's Standard Slurry Sampling Unit for Proper Securement of a Representative Slurry Sample from Within a Deep Excavation such as a Pile of Panel

One of the most important activities in the process of verification of any drilling fluid or excavation slurry is the obtaining of a truly representative sample from the specific depth of interest. Many slurry sampling units available to the market are not reliable for this purpose. Therefore, KB highly recommends the use of a ***KB Down Hole Slurry Sampler*** for procurement of all slurry samples from the excavation. KB also recommends samples be drawn from a meter off the base of the excavation and from the mid point of the excavation each time a slurry test is run for verification of its various properties. A series of photographs showing the KB sampler and the use of it in procuring a slurry sample are shown below:

Preface: It is vital to obtain accurate Marsh Funnel Viscosities and Slurry Specific Gravity (S.G.) Measurements in order to determine the "true" condition of KB's polymer slurries. The slurry's Marsh Funnel Viscosity without a corresponding Slurry S.G. is meaningless with regard to the state of the slurry. The S.G. allows the determination of the degree of influence suspended soils may be having on the slurry. Without this piece of information, the S.G., one cannot discern whether the slurry's viscosity is due to polymer or solids content and therefore the slurry's viscosity is useless to determining the condition it is in.

IX.II Marsh Funnel Viscosity Test Using *API 13B-1 Recommended Standard Procedure for Field Testing Water-Based Drilling Fluids*

It is "**CRITICAL**" to utilize the API API 13B-1 Testing Method with the specific Marsh Funnel Cone and Cup cited in the API Procedures. While the API Slurry Testing Procedures are the most broadly used in the industry there are other protocols and different designs and sized pieces of equipment available to the market. This includes different Viscosity Funnels and Cups which correspond to various other test methods within the industry. Please be aware that the ***ASTM D6910 / D6910M-09 Standard Test Method for Marsh Funnel Viscosity of Clay Construction Slurries*** has been modified from the ***13B-1 Recommended Standard Procedure for Field Testing Water-Based Drilling Fluids. Additional Test Methodologies and Protocols also exist for the testing of an excavation slurry throughout various parts of the world. If the ASTM test method or any of these other test procedures are utilized the slurry viscosity test results will not correspond with those set forth by KB in its Slurry Specifications and Guidelines.*** Typical Slurry Viscosities range between 60 seconds per quart and 90 sec. / qt. Freshly made SlurrySMART may initially present a higher "Flash Viscosity" in the range of 125 sec. / qt. to 145 sec / qt. which will decrease to the above range over a several hour period. A visual review of the procedure is presented below:

IX.III Slurry Specific Gravity, or Density Test Using *API 13B-1 Recommended Standard Procedure for Field Testing Water-Based Drilling Fluids*

KB follows the exact procedures set forth in the API 13B-1 Procedure, however it emphasizes the use of the Specific Gravity (S.G.) scale on the mud balance's arm in place of the slurry's density. This is due to the S.G. scale relating quite nicely with the percentage of solids suspended within the fluid. The base reading for water on the S.G. scale is 1.00. The S.G. units increase in a scale of 0.01 which approximately equate to a 1% increase in suspended soils, or fines. Therefore, one can readily correlate the S.G. with the actual loading of suspended soils within the slurry allowing them to more meaningfully visualize the condition of the slurry. The typical operating range of a KB slurry in between a S.G. of 1.00 to 1.03. If a slurry's S.G. begins to rise above 1.03 actions should be implemented to reduce it. When a slurry's S.G. has increased past 1.045 all active polymer has typically been consumed by the soils in the slurry. In other words the slurry has converted to being a native mud fluid and it should be understood that the impact of the slurry on a pile's or panel's performance and quality of a diaphragm wall will be that typically seen when using a low grade bentonite slurry or a water and native soils produced slurry. When this occurs it is advisable to displace the slurry in the excavation with fresh slurry and isolate the recaptured fluid until it can be disposed of. A visual review of the procedure is presented below:

IX.IIII Slurry pH Test - Using KB Testing Procedure Specifying a Portable pH Meter as Primary Method and a Four Color pH strip when a pH Meter is Not Available

When using a SlurrySMART fluid it is normally not necessary to adjust pH using soda ash, sodium bicarbonate or caustic soda. SlurrySMART fluids do not require any pH adjustment unless they are being used in a marine project where the pile or panel has some volume of seawater in it prior to the slurry being introduced or when seawater is being used for slurry makeup in place of fresh water or in some combination with fresh water.

When pH is required a pH pen or portable pH meter is always preferable due to their increased sensitivity and accuracy over pH strips. If pH strips are to be used KB specifies a four color pH strip be used as other pH strips and litmus paper are not reliable or accurate. Even the Four color pH strip is documented to be up to 1.5 pH points off as the pH scale increases above 9.0. Please refer to KB's "Slurry Testing Methods" to see specifics regarding the full test procedure.

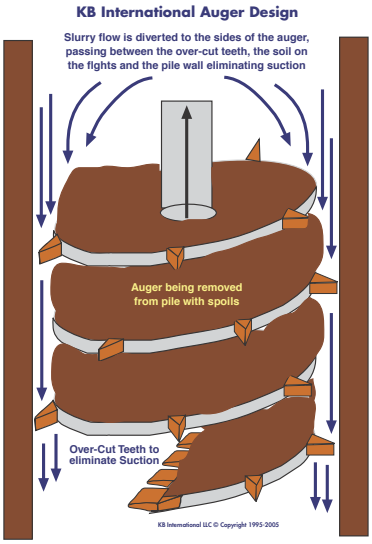
IX.IV Excavation Fluid Sand Content Test - After Procedure Published by Caltrans for Polymer Slurries

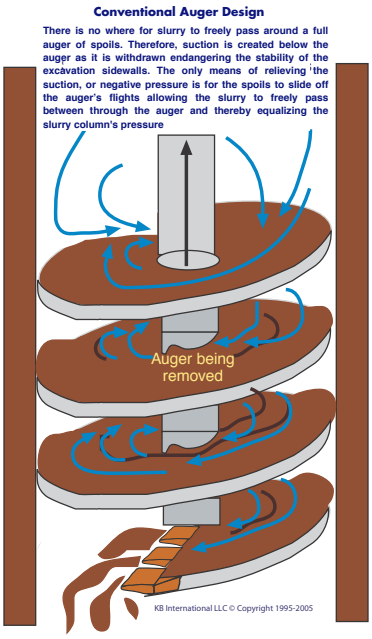
Sand Content testing is only required at the completion of the excavation prior to allowing the rebar cage to be placed into the excavation.

KB utilizes the Sand Content test it codeveloped with Dr. Mike O'Neill of the University of Houston in the early 1990's. This testing protocol and allowable sand content percentage were later adopted by the California Department of Transportation, or Caltrans. When running this test it is important that a 10% sodium hypochlorite, household bleach be used to fill the glass sand content tube in place of water. When testing polymer slurry for sand content one may initially notice what looks like a large quantity of sand granules in the glass tube. Much of this material is in fact small agglomerations or flocculated particles of fines produced during the dilution of the slurry. The tube should be vigorously shaken for a few minutes before pouring its contents onto the test screen. The material deposited on the screen should then be thoroughly washed using the same full strength chlorine bleach. Typically it is permissible to allow the individual running the test to very lightly run his finger over this material as he is washing it to assist with breaking the small agglomerates of fines form in the dilution step. If this is done gently, no sands will be forced through the 200 mesh screen. The production of small agglomerates or flocculated particles of fines will be especially problematic if water is used for the slurry dilution step in place of the chlorine specified above. When this is noted the test should not be considered accurate and it should be repeated using the correct strength bleach with the above washing and light running of a finger over the materials deposited onto the screen.

In this test method the upper limit for allowable retained sand content level is currently set at 0.25% prior to placement of the cage. Other U.S. Departments of Transportation have since relaxed the allowable sand content to be less then 0.5% prior to placement of the cage. Please refer to KB's "Slurry Testing Methods" to see specifics regarding the full test procedure and Caltrans Polymer Slurry Specifications for the specific guidelines set forth for acceptable sand content level. A visual review of the procedure is presented below:

X. KB Recommended Auger Design





Augers need to have a minimum of 1.25 cm to 3.75 cm (0.5 to 1.5 inch) clearance from the side of the casing and excavation walls on all sides depending on the diameter of the pile. This can be achieved by decreasing the auger flight size and by adding 2.5 cm (1 inch) or greater, dependent on the tools diameter, over-cut tooth around the sides of the auger flights. If the 2.5 cm (1 inch) minimum clearance is not met, collapse of the excavated pile is highly likely due to suction or piston effects created by the excavation tools. If a drilling bucket is utilized it should be internally vented with a built in half moon pass-through from the top to the bottom of the bucket or with 2.5 cm minimum over-cut teeth to assist with suction relief. The "excavation tool" must also be slowly placed into the pile and slowly withdrawn from the pile. Quickly entering or exiting the pile may result in sudden collapse. KB can supply diagrams of a properly modified auger and a proper bucket on request. Properly modified augers are highly preferred for drilling vs. buckets. Augers can drill faster and waste significantly less slurry than a bucket. When drilling with the auger the operator must torque down, or apply crowd, as he is slowly cutting into the earth. This process is analogous to the principals involved with opening a bottle of wine with a corkscrew. The operator should not simply spin the auger into the soil as this only serves to disperse significant solids within the slurry thereby increasing the amount of product required to stabilize the excavation.

Example of Actual Solid Clay Loaded Auger which Collapsed Pile due to Piston Effect and Suction

The operator must also take care when breaking the load from the bottom of the excavation. If the auger sticks he should slowly rotate backwards while lifting. If the slurry column rises with the auger continue to counter rotate slowly lifting only slightly until the slurry level has re-stabilized and is no longer being lifted with the auger. Once the loaded auger has been broken from the bottom of the pile the operator should slowly bring the auger to the surface while rotating slowly forward.

XI. KB Recommended Bucket Design

It is just as important that the slurry be able to freely pass by an excavation bucket as it is a loaded auger. Therefore KB recommends the use of the bucket shown below. There are other designs where a wedge the shape of a piece of pie is dedicated within the bucket for slurry to freely pass through the tool as well.

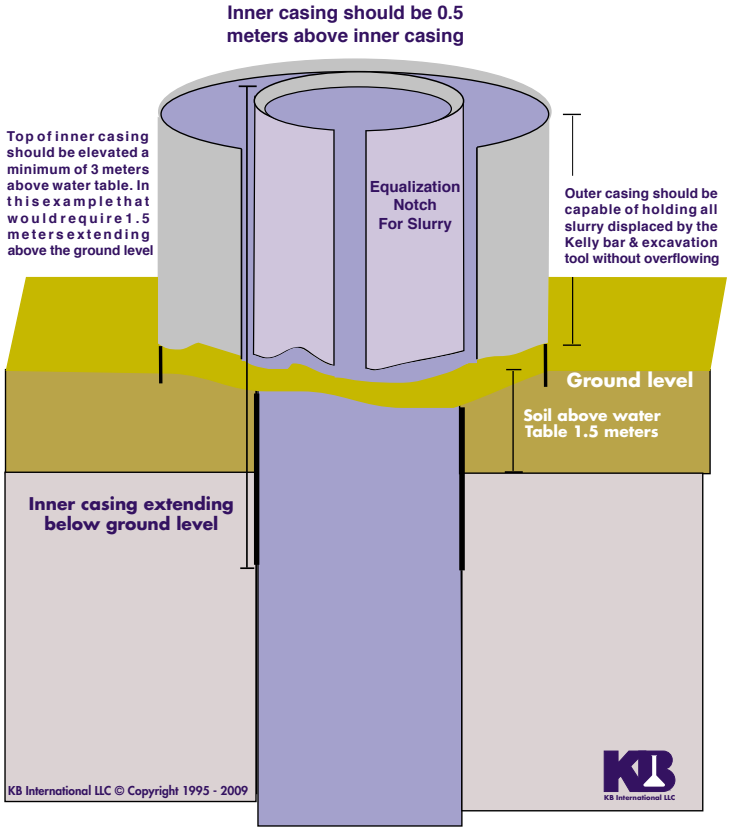
XII. KB Recommended Method for Maintaining Constant Hydrostatic Pressure in Small Diameter Piles and High Water Table Situations

If the water table is less then 3 meters (10 feet) from ground level a slurry reservoir should be constructed to insure the slurry level is maintained at a minimum of 1.5 meters (5 feet) above the water table after the Kelly bar and a loaded excavation tool are withdrawn. By constructing a slurry reservoir of adequate diameter the fluctuation of the level of the slurry during insertion and withdrawal of the Kelly bar and tool can be greatly minimized. The photographs below clearly illustrate how significant the fluctuation in slurry level can be when drilling small diameter piles with todays large hydraulic rigs. Fluid displacement resulting from the Kelly bar and loaded tool can be as much as several meters within the pile. If ground water is near the surface, this degree of slurry drop within the excavation could easily result in a pile collapse due to the absence of and counter weight to offset the pressure being exerted into the void excavation by the groundwater and the saturated formation.

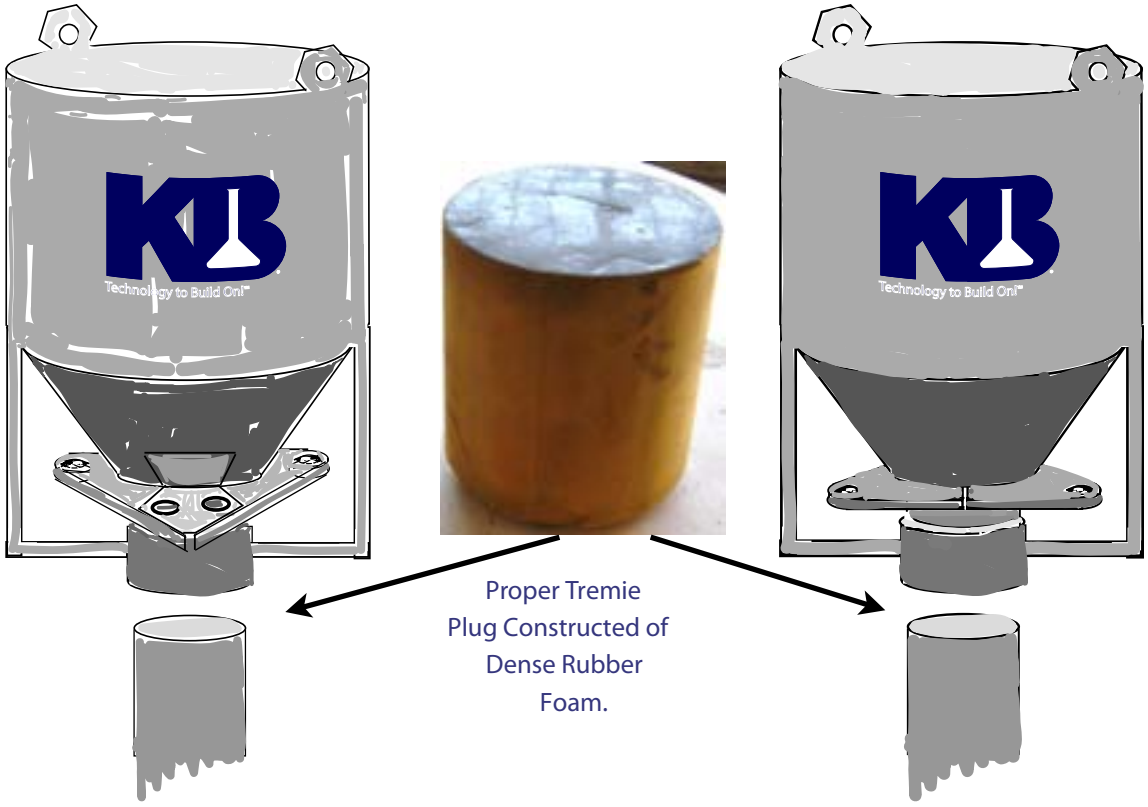
When constructing a slurry reservoir in this manner the outer casing reservoir should be just below the inner casing. This will insure the rig operator can clearly visualize the excavation. The inner casing should have a vertical slice in it running from the top to just above ground level to insure proper flow of slurry between the reservoir and the inner casing. The photograph and the schematic below illustrate how to construct a reservoir as well as the benefits provided by it.

There are various other methods for constructing a reservoir, however those typically applied in the field, such as the building of a small berm, are limited in the volume of slurry they can contain. These types of solutions also make it difficult to approach the hole to monitor the actual level of the slurry, thereby complicating matters as much as assisting with them.

The maintenance of a proper positive slurry head, or slurry level above that of the ground water at all times throughout the excavation process and holding process is crucial to an excavation's stability. a considerable percentage of excavations become unstable and begin to slough, have isolated collapses or completely collapse due to the oversight of the importance of maintaining counter pressure against saturated soils. Virtually all of these complications could have been easily avoided through the use of the above reservoir system. The benefits of proper stability are clearly realized in pile and panel quality and performance.



XIII. KB Recommended Concrete Hopper Design and Tremie Plug Design and Their Direct Impact on Proper Concrete Placement

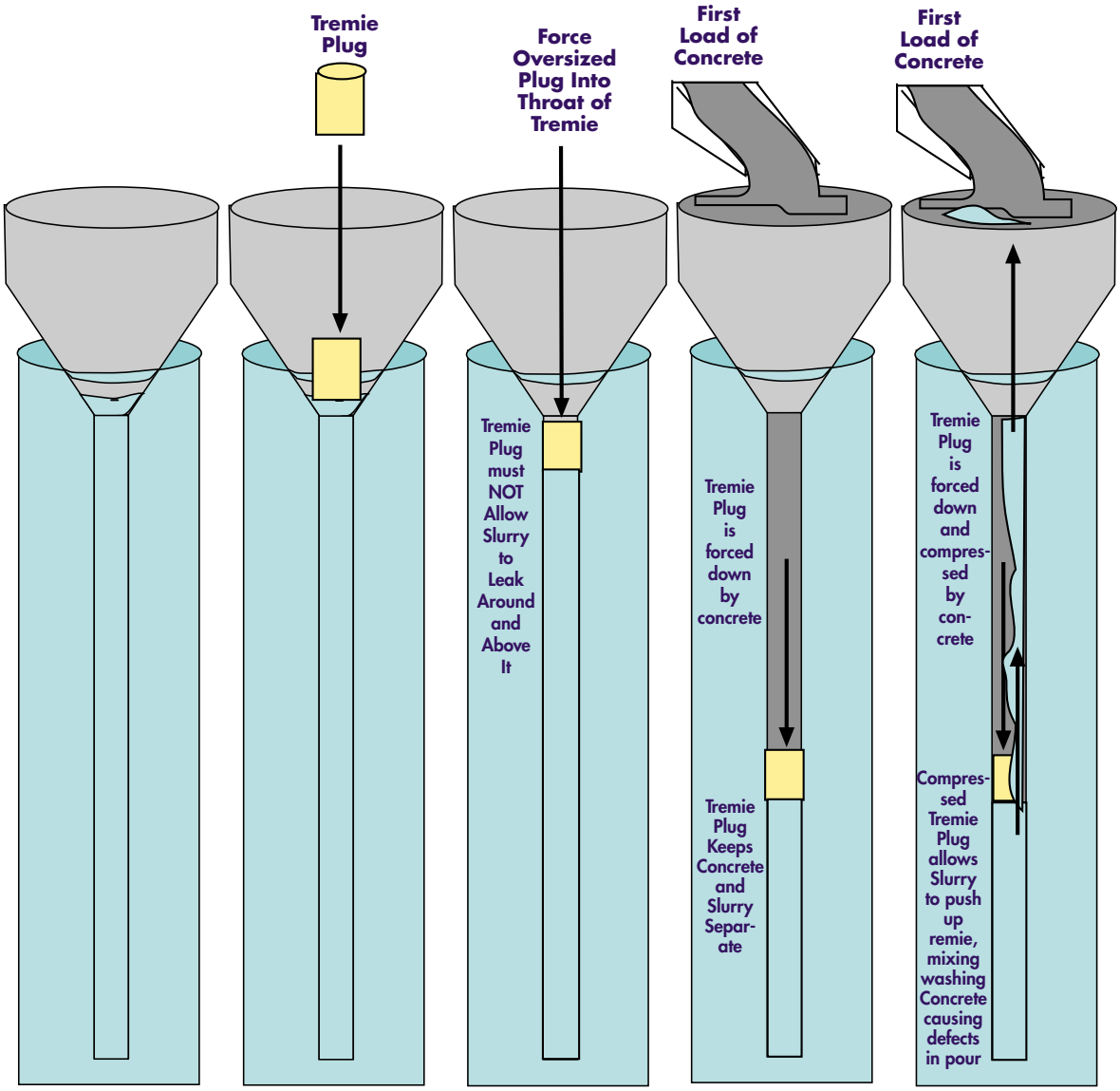


The tremie plug should be a minimum of 105% the diameter of the tremie tube and a minimum of 2 times the diameter of the tremie tube in length.

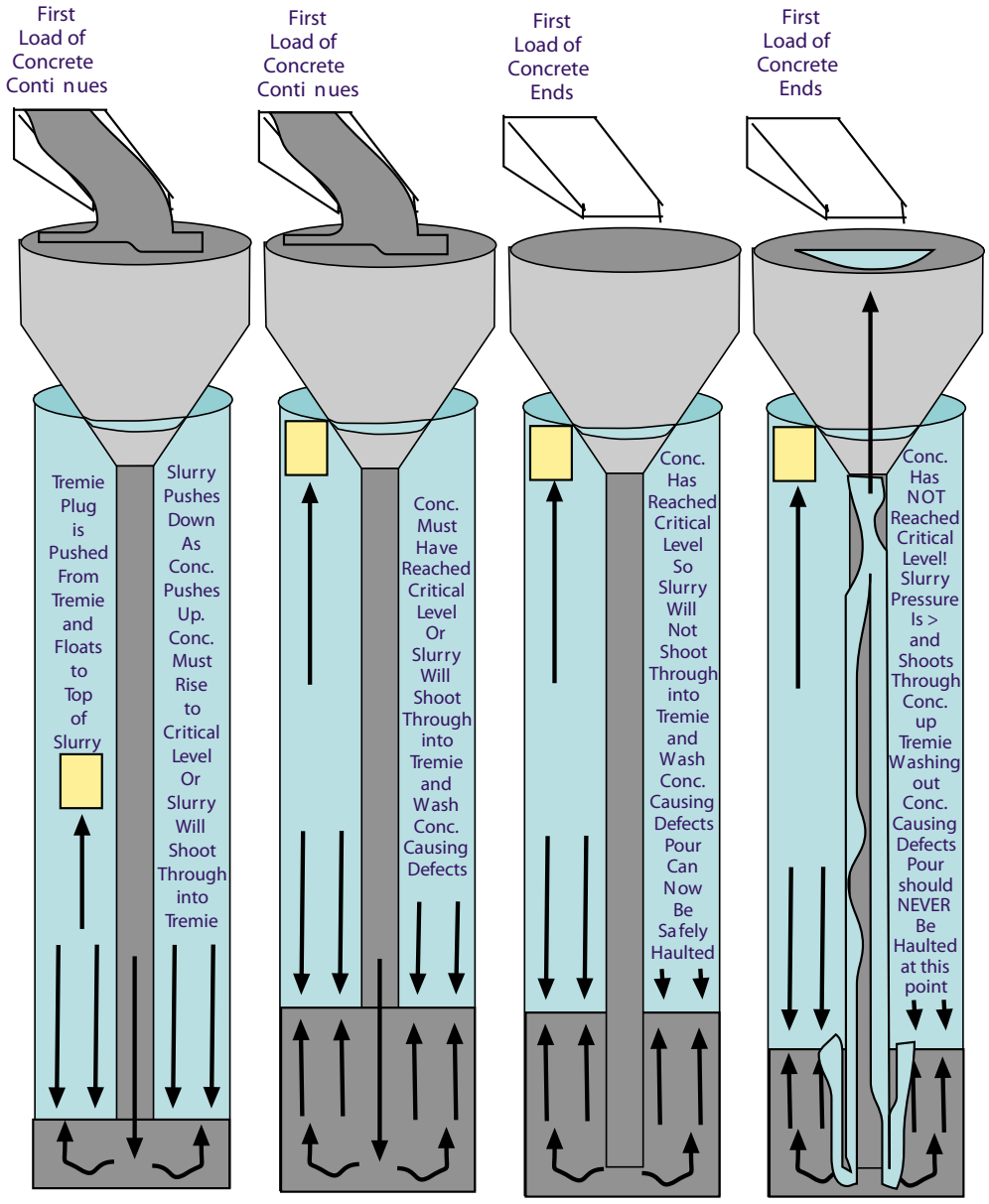
When pouring larger diameter piles the use of a concrete hopper is critical as it may take more then a single truckload of concrete to achieve a proper seal around the tremie tube within the base of the pile. From KB's 20 years of experience and comparisons of cross sonic logs and visual observations on numerous piles over this period any time less than 3 meters of initial concrete rise is present increased potential exists for slurry and concrete commingling. KB has also noted on a number of occasions the slurry □nding a channel back to the tremie's mouth and channeling through the concrete in the base of the tremie re□lling the upper potion of the tremie. When this occurs obvious low density areas or defects are noted within the cross sonic logs. This is due to wash occurring within the tremie on subsequent placement of secondary batches of concrete. This wash of the concrete by the slurry alters the concrete by removing small quantities of the concrete paste or binder allowing pockets of the more course sand and aggregate to form with low paste content. It is believed this same phenomenon occurs under bentonite, however the bentonite commingled within the concrete yields basically the same frequency response as the concrete paste and therefore is not properly detected by our current cross sonic test methodology. Therefore, it is critical to insure the initial quantity of concrete placed is adequate to achieve a rise within the pile or panel in excess of 3

meters or 10 feet. If this is greater than one truckload of concrete the hopper should be modified to an adequate size, holding in excess of one truckload up to the required quantity of concrete such that the initial charge will obtain the minimum 3 meter or 10 foot rise. When the hopper size is increased it should retain the entire required quantity of concrete by having a gate at the tremie throat which can be easily opened once the full required quantity of concrete is held within the hopper. This insures the entire concrete volume is placed at once and a proper seal is achieved. KB recommends that the KB hopper design as seen on the adjacent page be utilized. Similar concerns do exist when a concrete pump is used and appropriate steps implemented to achieve proper seal must be implemented.

Regardless of the hopper utilized and the size of the excavation, proper tremie plug application is critical. All of the above efforts will be for naught without an appropriately designed and sized tremie plug being correctly placed within the top of the tremie tube prior to concrete placement. A proper tremie plug should compress when put into the tremie to form a water tight seal keeping the



concrete from intermingling with the slurry. If the plug does not fit snugly and keep the concrete and slurry separated within the tremie the concrete may have paste and fines washed from it. Should a proper seal not be maintained within the tremie column during the concreting operation slurry will begin to commingle with the concrete within the tremie and it will begin to migrate up the tremie pipe. The slurry will continue to commingle with additional concrete for sometime. Commingling of the slurry with polymer will typically cause increased cure times as the product acts as a mild retarder. In severe cases, commingling of slurry with concrete the aggregate may be somewhat washed and low density, low strength areas may be formed within the pour.



XIV. Recommended Slurry Sampling Points & Intervals / Record Keeping

I. Test Points in Tank Farm For Fresh Slurry:

The Slurry should be Checked for Viscosity at Five Points in the Tank Farm:

1. immediately after receiving the slurry back from the excavation
2. before recycled slurry is transferred from the sedimentation tanks to the mix tank or storage tanks
3. at the mix tank both before addition of any new products and prior to release from the mix tank to either the storage tanks or directly to the excavation
4. in the storage tanks
5. just prior to the slurry being discharged to the point of excavation

II. Test Points in the Excavation Throughout the Excavation and and clean-out process:

The Slurry in The Excavation Should be Checked for Viscosity and Specific Gravity at the Following Two Levels:

1. one sample should be taken from 1 to 2 meters off the base, or bottom, of the excavation
2. a second sample should periodically be taken from the mid-point of the excavations existing depth.

A KB Down Hole Slurry Sampler is Highly Recommended for Retrieval of All Slurry Sample.

The Two Tests Immediately Above Should be Run Every 1 to 2 Hours Throughout Excavation

Both Viscosity and Specific Gravity MUST also be taken:

1. at completion of the piles excavation
2. at completion of final clean out pass
3. prior to placement of the pile cage!

III. Test Point for the Slurry being Recaptured from the Pile:

The Slurry should be sampled from the point it is spilling from the return line into the Dedicated Slurry Receivable Tank

1. one sample should be taken from 1 to 2 meters off the base, or bottom, of the excavation
2. a second ample should periodically be taken from the mid-point of the excavations existing depth.

The slurry should also be checked for viscosity and specific gravity at the excavation using a down hole sampler and/or from the excavated spoils:

1. whenever fluid loss increases, decreased excavation rates occur, decreasing slurry viscosities are noted, or excavation instability is noted
2. prior to leaving a panel open over night

The specific gravity should also be checked at the excavation:

1. slurry entering excavation
2. whenever fluid loss increases, decreased excavation rates occur, decreasing slurry viscosities are
3. just prior to setting the cage
4. prior to leaving an excavation open over night

The slurry should be checked for entrained solids at five points in the tank farm:

1. immediately after receiving the slurry back from the excavation
2. before recycled slurry is transferred from the sedimentation tanks to the mix tank or storage tanks
3. at the mix tank both before addition of any new products and prior to release from the mix tank to either the storage tanks or directly to the excavation
4. in the storage tanks
5. just prior to the slurry being discharged to the point of excavation

The sand content and S.G. should be checked within the excavation prior to cage placement:

1. just prior to setting the cage from two thirds of a meter or a couple of feet off the bottom of the excavation
2. just prior to setting the cage from the mid level of the excavation
3. just prior to setting the cage from a few meters or several feet from the top of the excavation

Proper detailed concrete records should be kept at all times. Charting of the concrete rise vs. the quantity of concrete delivered vs. time into the pour should be done for each excavation. Concrete slumps should be recorded from each truckload of concrete. Detailed concrete formulation records should also be obtained from the concrete supplier.

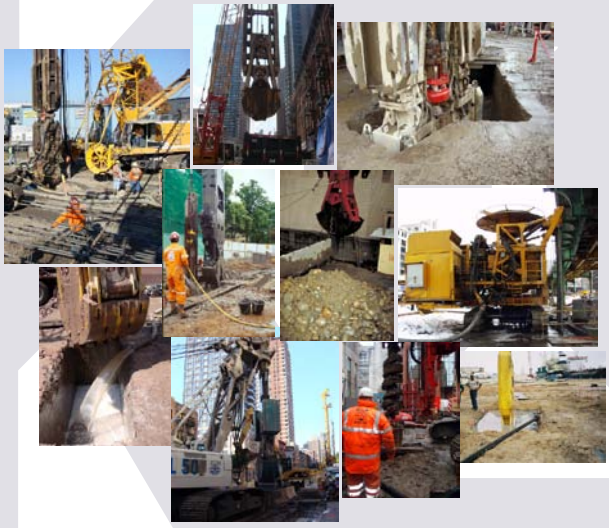
All of this should be documented and kept in an organized manner for QA/QC purposes and to assist in trouble shooting, if the need arises.

General Recommendations and Guidelines for Use of a SlurrySMART Fluid

In 1991 KB International, LLC patented and introduced "Vinyl" polymer technology to the foundation industry. The holder of multiple international patents, KB continues to be dedicated to the advancement of polymer chemistry in excavation fluids. Pioneering the use of nano-chemistry for geotechnical applications, KB now offers its SMART polymer technology. With the introduction of SMART technology, KB has the most advanced, yet simple and dependable, line of slurry products in the industry.

KB now, more than ever, offers its customers Simplicity, Affordability and Effectiveness

KB's synthetic slurry technologies, including SlurrySMART, have been successfully used on some of the largest and most challenging diaphragm wall and piling projects on six continents. Over the past two decades KB's synthetic slurries have been used on major portions of the Boston Central Artery, New York 2nd Avenue Subway System, the Taipei MRT, the Singapore MRT, the Singapore Port expansion, the Vasco da Gamma Bridge in Portugal, the Channel Tunnel Rail Link in England, the KL Metro, the Bangkok Metro, the Taiwan High Speed Rail, and skyscraper and transportation systems foundations throughout Southeast Asia, Europe, America and Africa.



Technology To Build On!®

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