



ROCKCRETE

EQUIPMENT (PTY) LTD

Company Reg. No: 1947/024677/07

**Basic understanding,
preparation and
application of sprayed
Concrete**

Contents

- Understanding the mix
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Mix Design

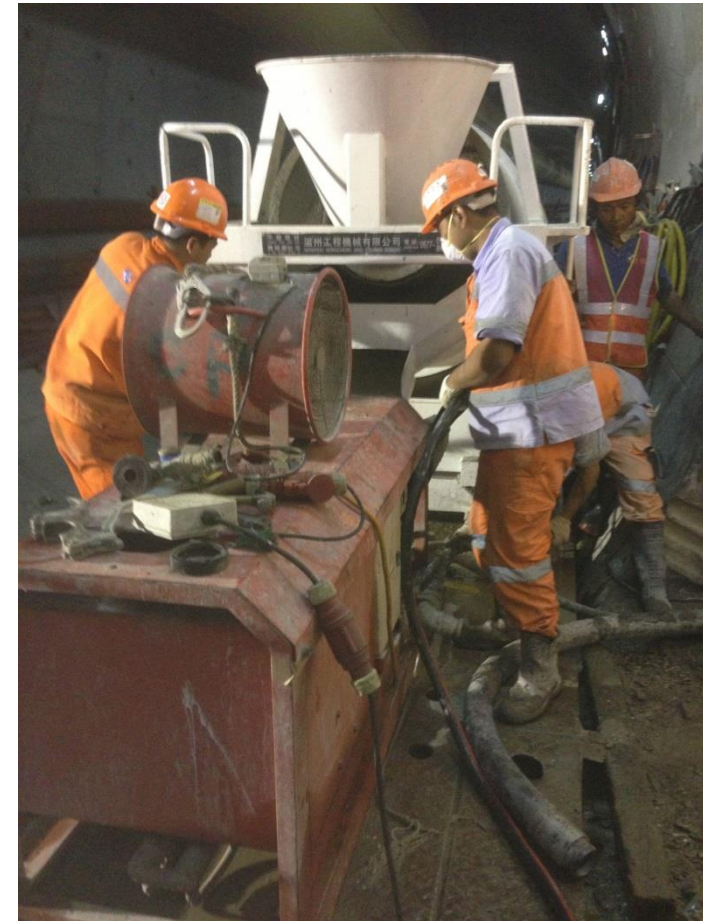
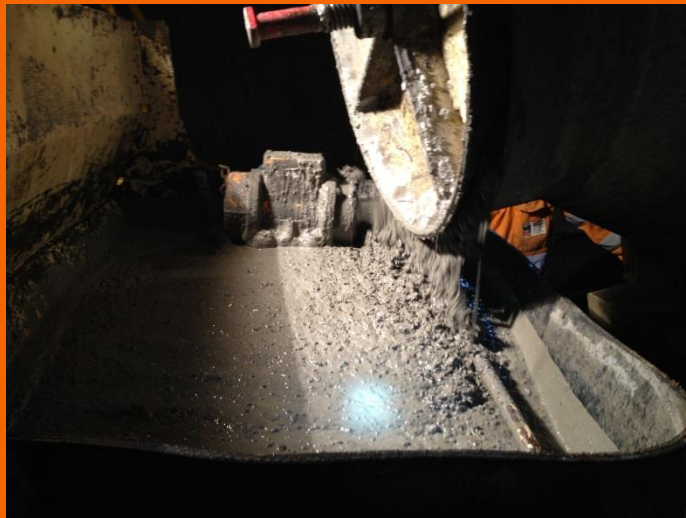
The operator does not need to know the whole mix design but it is to his/ her advantage to know the basics of it.

- Cement
- Aggregates
- Sand
- Water
- Additives
- Superplasticizers/Hyperplasticizers
- Fibers

Accepting the load

It is important for the operator to check and accept the load as it is his/her responsibility to ensure the product is suitable

- Check the docket
- Check the slump/flow
- Check the temperature
- Visually check for balling or segregation



Testing the Slump/Flow

Always test the slump/flow as this will cause you pumping problems if the mix is too dry or too wet.

- Mix the truck for 5-10 minutes
- Take a sample of the shotcrete
- Test the temperature



Slump Testing

You will need:

- Steel slump plate
- Slump cone
- Slump cone rod
- Tape measure
- Scoop
- Damp cloth



Slump Testing

Step by step instructions:

- Dampen the surface of the steel slump plate and slump cone
- Place the slump cone in the center of the plate and apply pressure
- Using the scoop fill the cone half way up
- Prod the shotcrete 15 times with the rod
- Fill the cone to the top
- Prod another 15 times
- Level of the top of the cone and clean any shotcrete off the plate
- Using the handle slowly lift the cone straight up in one continuous motion
- Turn the cone upside down and place it on the steel plate beside the shotcrete
- Place the rod on the cone and measure the distance from the bar to the highest point of the shotcrete

Flow Testing

You will need:

- Flow table
- Flow cone
- Tamping timber
- Scoop
- Tape measure
- Damp cloth



Flow Testing

Step by step instructions:

- Dampen the surface of the flow table and the flow cone
- Place the cone in the middle of the table and apply pressure
- Using the scoop fill the cone 1/3rd of the way up
- With the tamping timber lightly tamp the surface of the shotcrete till its level
- Fill 2/3rd and repeat the last step
- Fill to the top and repeat again then clean off any excess from the cone and table
- Slowly lift the cone up in one continuous motion
- Using the handle on the flow table lift the table up to the stopper and drop 15 times, keep your feet on the foot bar of the table to prevent from moving
- Take the tape measure and measure the width of the shotcrete

Use of Chemicals

Different chemicals used in shotcrete:

- Water reducing admixtures – used to gain a more pumpable mix without adding water. If you find that the slump/flow is too low then you add this chemical as per instructed to achieve the correct slump/flow. Can be added at the batch plant or on site if required
- Hydration control admixtures – used to increase the open time of the shotcrete. Can be added at the batch plant or on site if required
- Shotcrete accelerators – used to kill the slump of the shotcrete once the accelerator is introduced at the nozzle. Correct dosing rate depends on the mix, ground conditions and the amount of shotcrete required to be applied per layer.

Note: Never overdose with the chemicals as this can cause negative effects in the shotcrete.

Preparation of Shotcrete

Preparing your work area:

- Check ventilation
- Check air and water services if required
- Check your work area and ground conditions
- Wash the surface area to remove loose rock and dust starting at the top and working down
- Check work plan and ensure you understand the instructions for the work to be carried out



Preparation of Shotcrete

Preparing your equipment:

- Check oil levels
- Check fuel level
- Do a walk around visual inspection
- Check equipment functions
- Fill out pre-start book if available and check for any previous faults you may have missed
- Check your accelerator level



Preparation of Shotcrete

Setting up equipment:

- Extend boom fully and position the machine at the furthest point away
- Always work back so you are never under wet shotcrete
- Connect power and services if required
- Connect nozzle ensuring not to go under unsupported to do so
- Power up machine and check functions
- Use hydroscaler if fitted to scale the surface working from the highest point down
- Apply form oil to the boom and hopper to ensure easy cleaning
- Check display is reading correctly if fitted
- Run accelerator manually to ensure accelerator is at the nozzle ready for shotcrete
- Mix a grout to lubricate the hoses before shotcrete



Application of Shotcrete

Start application:

- Pour the grout into the hoses just in front of the hopper
- Fill the hopper with shotcrete
- Point the nozzle down
- Turn on the air
- Start the concrete pump
- Once you see the grout coming out the nozzle start the accelerator
- Once you see the accelerator reacting with the shotcrete begin applying to the surface

Application of Shotcrete

Spraying technique:

- Start at the bottom and work up
- Use a spraying pattern so you have good control of how much you apply
- Always keep the nozzle on a 90degree angle to the spraying surface
- Keep the nozzle 1-2meters away from the surface
- Apply in thin layers to reduce fall out and waste
- Once you reach the highest point go back to the bottom and repeat the pattern. This allows an even application and gives each layer chance to go off before you reapply
- Monitor pressure gauge's to reduce the chance of a blockage
- If fall out occurs never try to re-spray immediately
- If there is ingress of water try to apply a thin layer and let it go off, never try to stop the water



Application of Shotcrete

Shut down procedure:

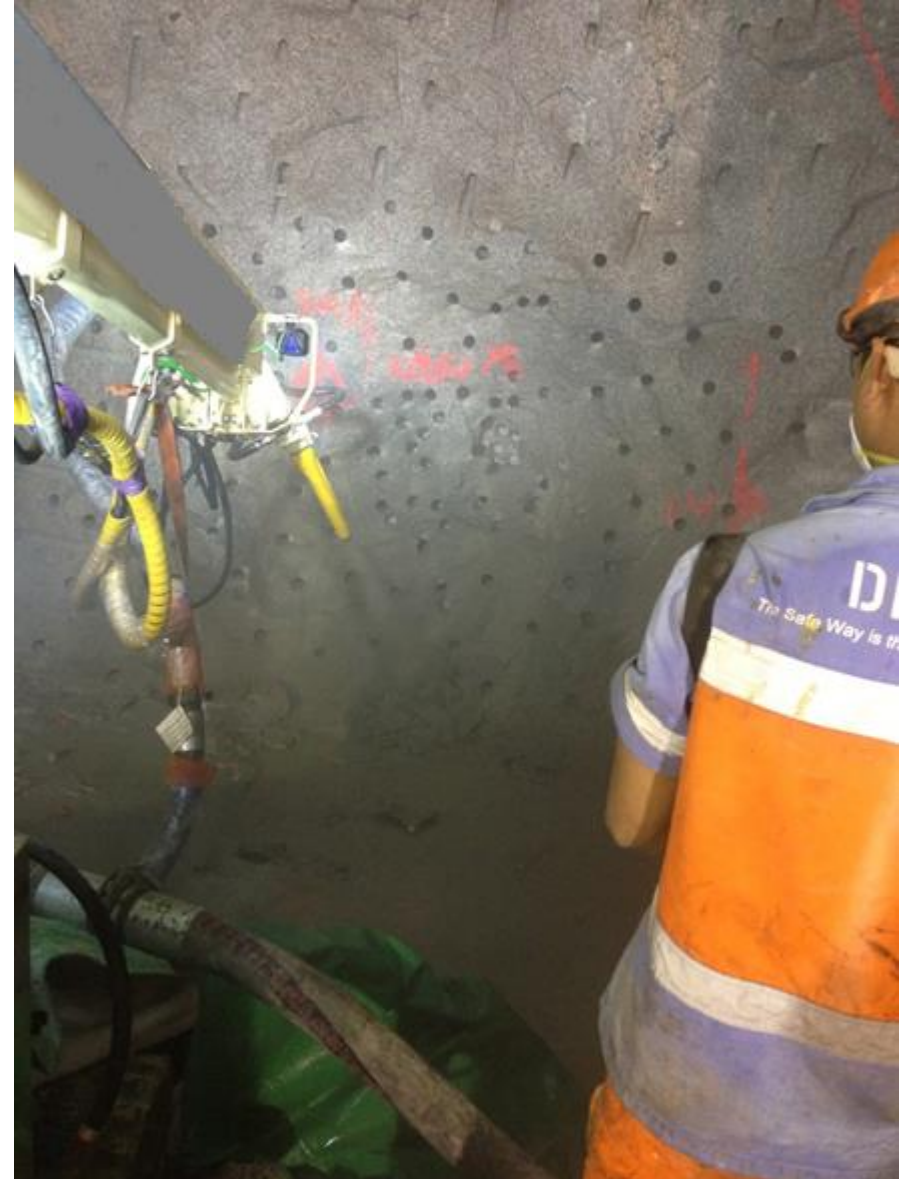
- Point the nozzle down
- Shut down the concrete pump and accelerator
- Reverse the concrete pump
- Flush the nozzle with air and water
- Shut off the air



Application of Shotcrete

Restart procedure:

- Turn on the air
- Start the shotcrete pump and accelerator
- Once you see the accelerator reacting with the shotcrete turn the nozzle to the surface and resume shotcrete



Spraying Test Panels

Step by step instructions:

- Always check the shotcrete before you start
- Check your accelerator dosing rate is correct
- Position the panels vertical to the wall and ensure they are stable
- Follow your normal start up procedure
- Fill the bottom of the panel out first and work up to prevent any rebound from getting sprayed in
- Keep your nozzle at 90degrees and maintain your correct spraying distance
- Ensure not to spray the panels until your accelerator is reacting with the shotcrete and you have a nice steady output of shotcrete
- Don't move the panels for at least 16hours after been sprayed



Washing out

Preparation for cleaning:

- Point the nozzle down
- Shut down the concrete pump
- Shut down the accelerator
- Reverse the concrete pump
- Flush the nozzle with air and water
- Take off nozzle and replace with blow out cap
- Open trap door at bottom of hopper
- Disconnect pipes from hopper

Washing out

Cleaning:

- Using air blow out any remaining shotcrete left in the hoses
- Once empty flush with water
- Repeat this cycle 2-3 times to ensure hoses are clean
- Flush the accelerator line until it is clean water running through
- Run the pump in reverse and clean the hopper
- Ensure the cylinders are clean inside
- Use a pressure cleaner to clean the boom and the rest of the machine



Shut Down

- Turn off services from the source
- Release any pressure from the hoses
- Remove the services from the machine
- Turn off the power and disconnect if required
- Return machine to parking bay
- Report any faults to supervisor

Troubleshooting a Blockage

- Point the nozzle down
- Shut off the concrete pump and accelerator
- Shut down the air
- Reverse the pump to release the pressure
- Bleed any air pressure if required
- Locate and free the blockage

Note: Never try to push the blockage through as this will only cause further problems.