

Weather Conditions – Pumping

Concrete pumping operations can be affected by weather conditions in a number of ways. The following procedures detail the actions to be taken where appropriate.

Prolonged Rain

- It is possible that the hirer may cancel the pour/pump operation should there be prolonged rainfall.
- However, where heavy rainfall occurs during a pour, and water is able to enter the hopper, the CPO should be aware that the water may affect the mix, resulting in segregation and changes to the quality of the concrete.
- The CPO should where practicable, cover the hopper, and complete the pumping of remaining concrete, before seeking approval from the hirer to accept and pump the subsequent loads of concrete.

Electrical Storms (Thunder & Lightning)

- Should an 'electrical' storm occur during a pumping operation, the pump – especially an extended boom – could be at risk of a lightning strike.
- Where practicable, and where time permits, the boom should be retracted and returned to its folded position for the duration of the storm.
- Where this is not possible, the pump and boom should be left in a position of safety.
- In either case, to reduce the likelihood of personal injury from lightning the CPO should ensure that he, and any other persons, are kept away from the pump body, boom and pipelines until the storm has passed.

Wind

- High Winds can damage extended placer booms by placing undue strain through the boom components. This can cause the sections to bend.
- The pump manufacturer has specified the maximum wind speed during which the boom may be used – this information is contained in the machine manual for the specific pump.
- As general rule, booms of 42m or above should not be used in winds of more than 38mph. Booms of length less than 42m should not operate in winds greater than 46mph.
- The tunnelling effect of the wind between buildings should be taken into account – the actual wind speed may be double that measured out in the open.
- Similarly, high speed 'side streams' may be created at the face, corners and sides of buildings.
- It should also be noted that wind speeds may be stronger at height – e.g. at a height of 20m, the wind speed may be 50% greater than it is at ground level.

Wind Speed Measurement

- Accurate measurement of wind speed can only be achieved using a suitable instrument, e.g. an anemometer.
- However, an estimation can be made using the 'Beaufort Scale', based upon visual interpretation of the surrounding environment. The following table details this scale.

Weather Conditions – Beaufort Scale

Beaufort*	Avg Miles Per Hour	Knots	Surroundings
0 Calm		0 – 1	Smoke rises vertically and the sea is mirror smooth
1 Light air	1.2 - 3.0	1 – 3	Smoke moves slightly with breeze and shows direction of wind
2 Light breeze	3.7 – 7.5	4 – 6	You can feel the breeze on your face and hear the leaves start to rustle
3 Gentle breeze	8.0 – 12.5	7 – 10	Smoke will move horizontally, and small branches start to sway. Wind extends a light flag
4 Moderate	13.0 – 18.6	11 – 16	Loose dust or sand on the ground will move and larger branches will sway, loose paper blows
5 Fresh Breeze	19.3 – 25.0	17 – 21	Surface waves form of water and small trees sway
6 Strong Breeze	25.5 – 31.0	22 – 27	Trees begin to bend with the force of the wind and causes whistling in telephone wires. Some spray on the sea surface
7 Moderate gale	32.0 – 38.0	28 – 33	Large trees sway. Moderate sea spray
8 Fresh gale	39.0 – 46.0	34 – 40	Twigs break from trees and long streaks of foam appear on the ocean
9 Strong gale	47.0 – 55.0	41 – 47	Branches break from trees
10 Whole gale	56.0 – 64.0	48 – 55	Trees are uprooted and the sea takes on a white appearance
11 Storm	65.0 – 74.0	56 – 63	Widespread Damage
12 Hurricane	75+	64+	Structural damage on land, and storm waves at sea

Weather Conditions – Pumping

Cold

- Reduced ambient temperatures do not generally affect the concrete that is to be pumped, or how the pump performs once pumped concrete flow has been established, however cold conditions can affect the reliability of the pump under other conditions, and also affect the CPO directly.

Pump Performance Effects

- Cold conditions can affect the effectiveness of the pipeline priming process – mainly due to the reduced temperature affecting the primer/water chemical reaction time. The CPO should take this into account when introducing and pumping the primer mix through the pipeline.
- There may also be a perceived reduction in pumping speed, however this should not be major, and should improve as the pump/line warms through use.

Heat

- Pumping concrete when ambient temp above 25oc can be problematic. Fresh concrete will typically increase in temp by 5oc above ambient during early cement hydration (0 to 3 hours after water and cement come into contact).
- Pumping can add additional temperature to this through line friction and by lines exposed to direct sunlight.
 - Consider placing temperatures THROUGH THE WORKING DAY not just at start of a pour. Prudent to delay until cooler weather or pour at night / early am, avoid peak temps mid afternoon.
 - Schedule loads more frequently and pump faster if possible but be careful trucks are not sitting for more than 15 minutes waiting to discharge. Steady stream of deliveries needed no gaps greater than 20 mins.
 - If delayed consider pumping back into hopper to keep fresh material going through pump lines in a closed circuit. On site retarder dosed at approved rate will also be beneficial if this occurs.
 - Keep pump lines shaded if possible, exposed lines painted white will help, black lines will absorb heat. Occasional cooling by hose pipe is beneficial also although not always possible.
 - Ensure lines are properly pre grouted and are not excessive in length or configuration, if you can get closer to discharge point the better chance you will have.
 - Reject any load more than 2 hours from batching time (not arrival on site time).
 - Mix composition may require increased consistence to S5 with allowance to drop down to S4 if evaporation excessive. On hot days S3 consistence should be avoided if pumped further than off the boom.
 - Consider using admixtures based on lignosulphonates rather than polymer technology.
 - If wcr below 0.45 are required (doubtful on slabs), concrete will need a retarder added.
 - Minimum of 35% GGBs recommended 50% better.
 - Cement rich mixes >380kg/m³ will present more of a challenge.
 - Travel time from plant to site needs to be considered, anything more than 30mins should be avoided where practicable.
 - Make sure that all deliveries spin on full revs for at least 3 mins prior to discharge to reconstitute any dry material on inside of barrel / blades.