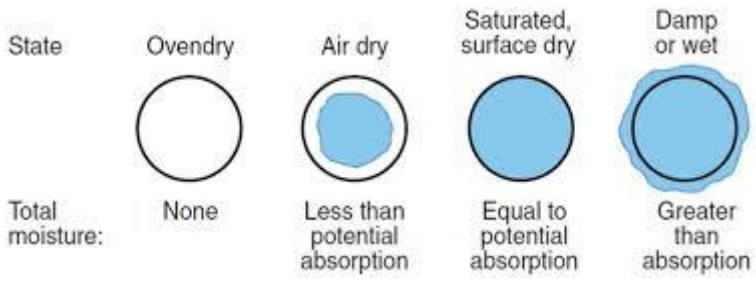
TECHNICAL BULLETIN # 14

Sample Moisture Corrected Concrete Batch

Concrete Alberta's Tech Tip # 31: Concrete Aggregate Moisture Content may be used to determine the moisture contents of representative in-production samples of concrete aggregates using hot plate, oven, or microwave to dry the aggregate. The moisture values obtained for each aggregate should be used to determine the corrected batch water target based upon the moisture state of each of the coarse and fine aggregates.

Moisture States of Aggregate Refresher:



(Cement Association of Canada 2022)

The four potential moisture conditions of aggregate are illustrated above.

Oven Dry – fully absorbent.

SSD - aggregates pores are full of water, aggregates neither take away (absorbs) nor add water to the mix.

Air Dry – dry at the particle surface but containing some interior moisture, thus still somewhat absorbent.

Damp or Wet – containing an excess of moisture on the surface that can contribute to the mix.

Sand typically remains in a "wet" condition with moisture values above SSD, while coarse aggregate may at times be within an "absorptive" range. In those situations, resulting negative moisture values are corrected through either the contributions of the sand if an excess exists and/or by increasing the batch water target.

Sample problem: Adjustment of batch water for variations from saturated surface dry (SSD) aggregates:

Constituent	Quantity (kg/m³)	MC (%)	ABS (%)
Blended Cement	300	N/A	N/A
Mix Water	150	N/A	N/A
Coarse aggregate	1030	1.2	1.0
Fine Aggregate	900	5.0	1.5

where **MC**= Total measured moisture content of the aggregate in % (surface and interior), and,
abs =Absorption, the amount of moisture in % held by the aggregate interior in an SSD state.

Note: in the calculations below the MC/abs percentages are expressed in decimal form, i.e. 10% = 0.10

20-5 mm stone - 1030 kg/m³ @ 1.0% absorption, 1.2% MC

Sand - 900 kg/m³ @ 1.5% absorption, 5% MC.

SSD Mix water - **150 kg/m³.**

Adjustment for moisture in stone is usually small whether it's dry (absorbing) or wet (contributing):

SSD Mass of Stone = 1030 kg/m³
Dry mass of stone = 1030 /(1 + abs) = 1030/(1.010) = 1019.8 kg/m³
Batched mass of stone = 1019.8*(1+MC) = 1019.8*(1.012) = 1032 kg/m³

Most of the extra batch water tends to hide in the sand:

SSD Mass of Sand = 900 kg/m³
Dry mass of sand = 900 /(1 + abs) = 900/(1.015) = 886.7 kg/m³
Batched mass of sand = 886.7*(1+MC) = 886.7*(1.05) = 931 kg/m³

The moisture correction is the difference between the SSD and MC adjusted aggregate batch masses.

Total SSD = 1030 + 900 = 1930 kg/m³

Total Batched = 1032 + 931 = 1963 kg/m³

Difference = SSD – Batched = 1930 - 1963 = -33 kg/m³

Therefore, mix water after adjustment for aggregate MC = 150 kg + (-33) = **117 kg/m³**

This process should help you determine the moisture content (%) of your aggregates and to calculate how much water (kg) is in each one. In some instances, some of the aggregates may not be fully saturated to an SSD state and will absorb mix water that must be corrected for while others may be beyond SSD and contribute water to the mix which must be considered and adjusted for appropriately.

Note that most batching software platforms can be configured to automatically adjust the batch water targets using the moisture data it receives either from moisture probes or from manual input.