Non-Destructive Site Air-Permeability Test (SIA 262/1-E Standard Method)

Relation with other transport test methods

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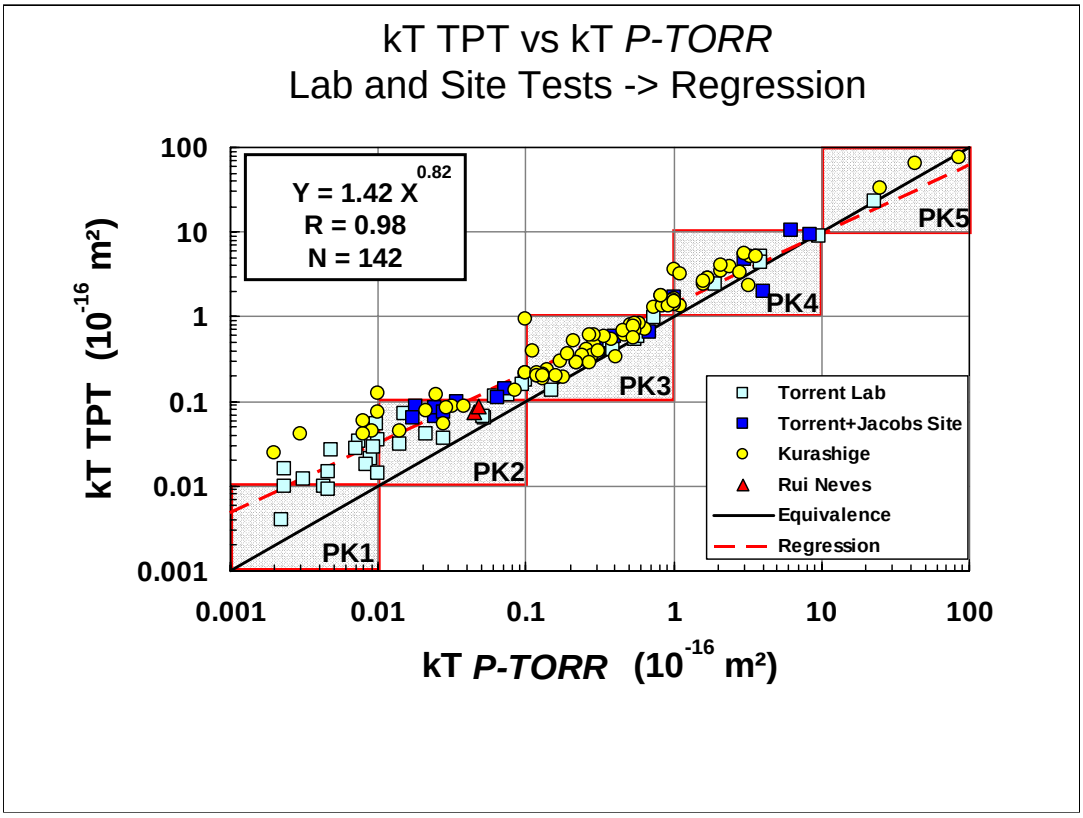
The following slides show comparative data obtained with the non-destructive test method for measuring the coefficient of air-permeability covered by Swiss Standard 262/1-E (Concrete Construction – Complementary Specifications) and with other methods that measure transport properties of concrete. Most of the data come from independent sources.

The References quoted correspond to numbering of the Bibliography list that can be downloaded from this web page (www.m-a-s.com.ar).

The data cover tests performed with the two instruments currently available in the market: Proceq‘s „Torrent Permeability Tester“ and our *PermeaTORR*, as well as with previous prototypes.



The results shown in the slide correspond to comparative laboratory tests between the „Torrent Permeability Tester“ (TPT), manufactured by Proceq SA and the "*PermeaTORR*" (*P-TORR*), manufactured by Materials Advanced Services SRL. by:

Torrent Lab (Switzerland)

Both instruments were applied by R. Torrent in the laboratory on discs (Ø150, h= 50 mm), corresponding to young concretes and mortars (about 2 months old) and to old concretes (about 15 years old). The young samples were pre-conditioned by oven drying at 50°C prior to the test. The old samples had been kept for years in a dry room (20°C, 50% RH).

Torrent+Jacobs Site (Switzerland)

The *P-TORR* was operated by R. Torrent and the TPT by F. Jacobs. Notice that both instruments were exactly the same used for the laboratory investigation reported above. Both instruments were applied on 16 spots of the wall of a Tunnel in Switzerland, trying to place the cell exactly on the same spot as the previous tester (outer circle drawn with pencil on the wall). The second test was applied approximately 1½ hours after the first one.

Kurashige (Japan)

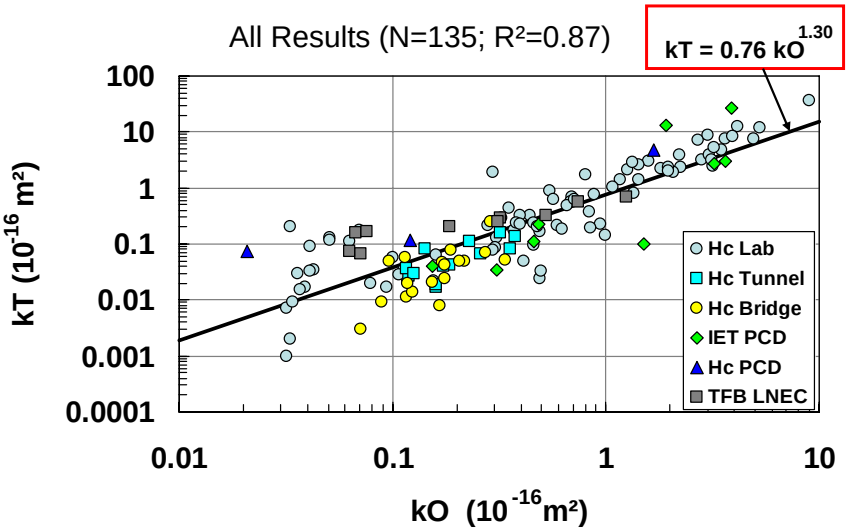
Results reported by Dr. Isao Kurashige with different instruments to those reported above. No indication of type of measurements disclosed.

Rui Neves (Portugal)

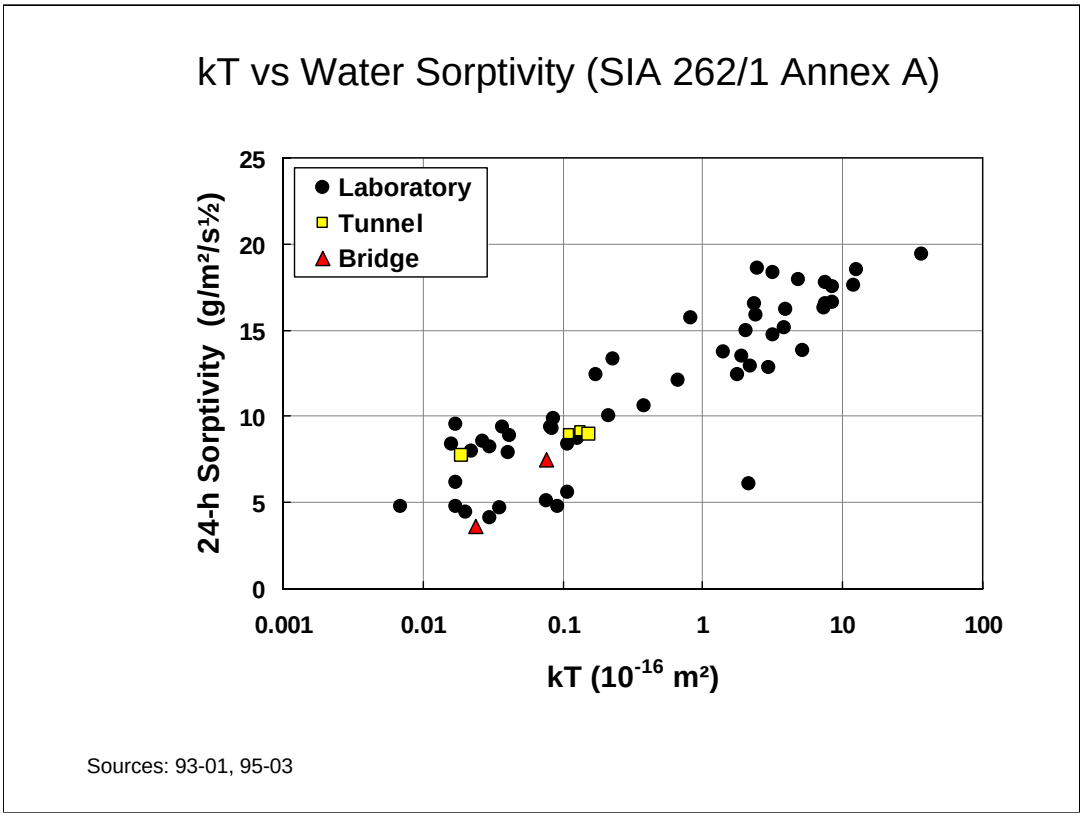
Results reported by Rui Neves with different instruments to those reported above. No indication of type of measurements disclosed.

As shown in the graph, both instruments do not give exactly the same results, but results that correlate very well with each other. The difference in values is due to the fact that *PermeaTORR's* automatic operation of the valves controls that the working pressure of the instrument is always above the water vapour pressure, thus avoiding the undesirable influence of evaporation phenomena during the measurements (see Ref. 05-05). This factor has a stronger effect on concretes of low permeability.

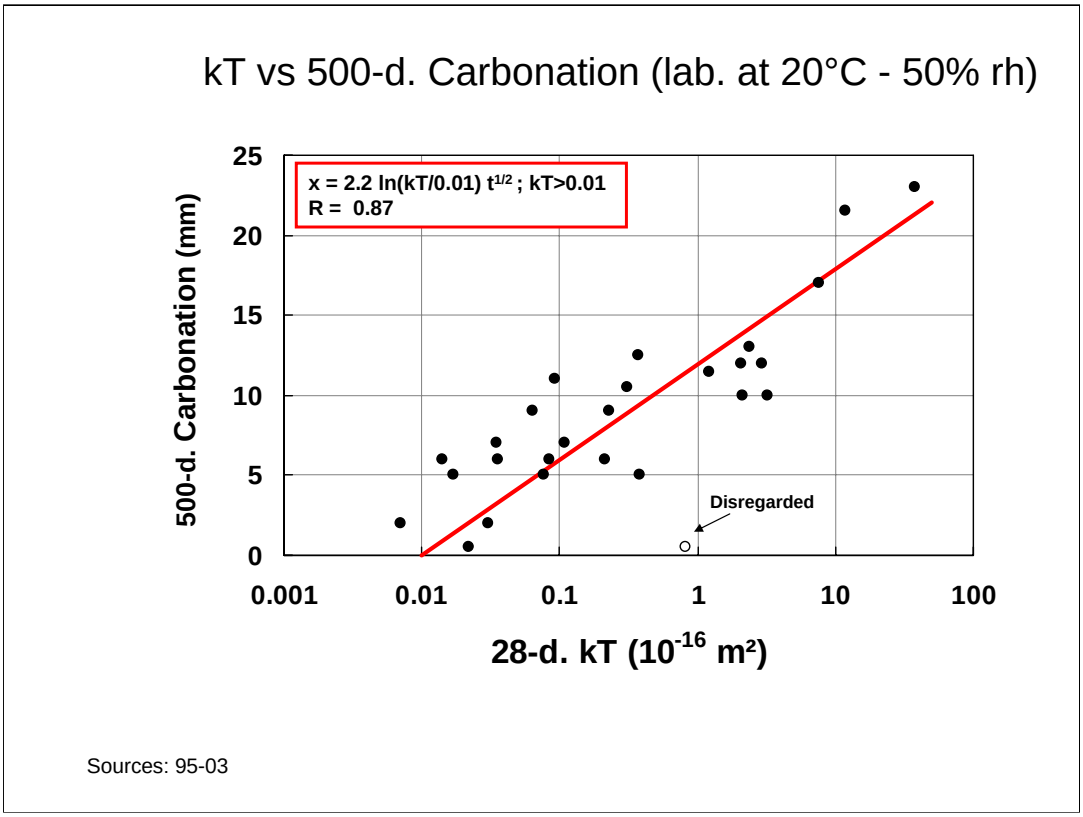
kT vs RILEM-Cembureau kO



Sources (from Annotated Bibliography): 93-01, 95-03, 00-03, 05-14

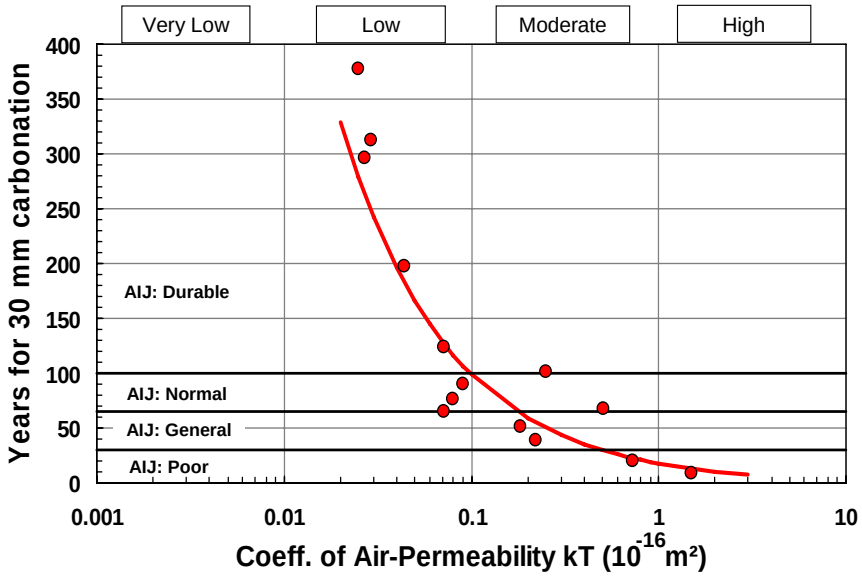


Tests conducted on discs Ø 150 x 50 mm, dried at 50°C for 6 days and cooled in an exsiccator for 1 day and placed in contact with 3 mm of water. Reported value is the mass of water absorbed per unit surface area and per square-root of time (24 hours). The discs were drilled from larger specimens (Lab tests) or from the structure, where previously kT had been measured.

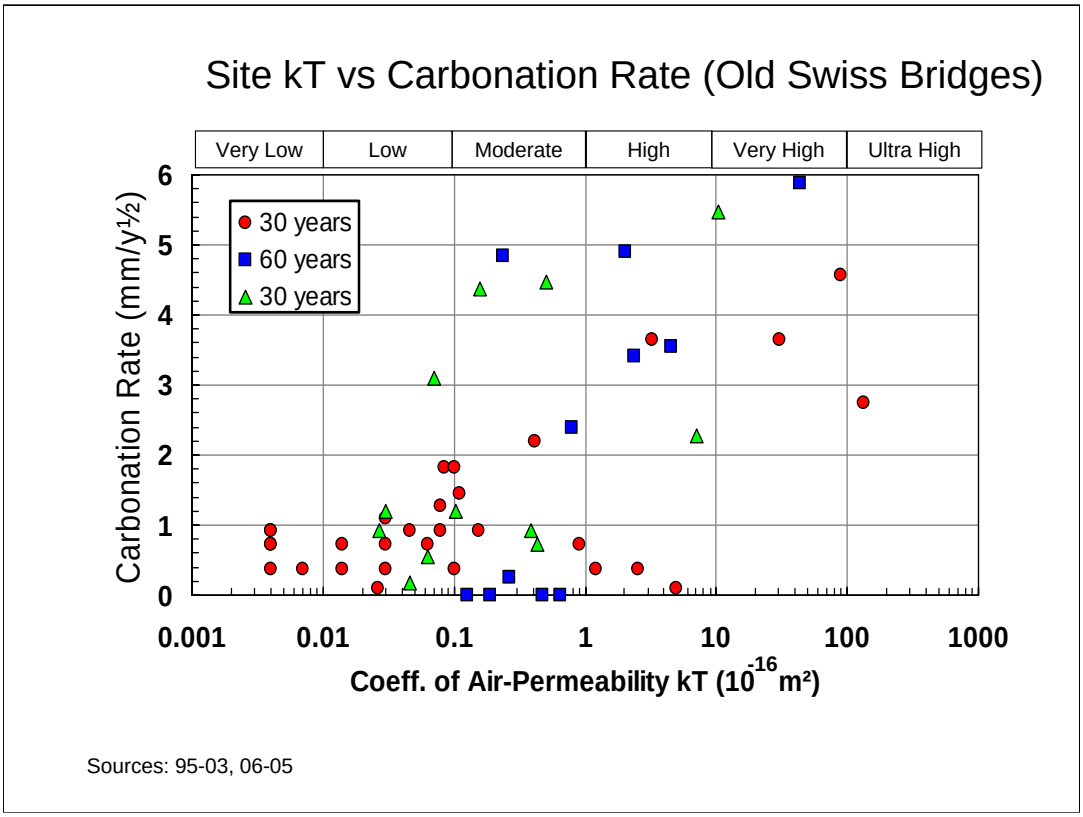


Tests conducted on specimens stored under the indicated conditions. Specimens cured 0 or 7 days in moist room, then transferred to the dry room (20°C, 50% RH); kT measured at 28 days, carbonation depth (phenolphtalein) at 500 days.

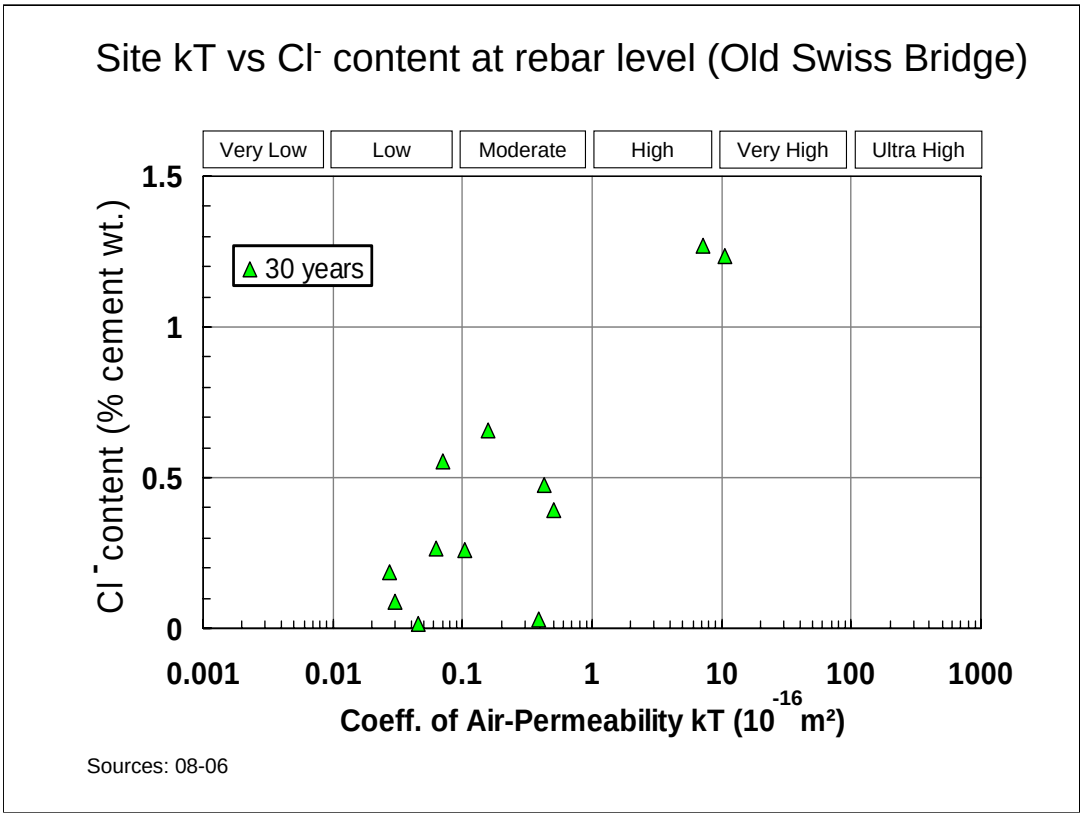
kT vs Estimated age for 30 mm Carbonation (square root law), with Japanese AIJ Classes



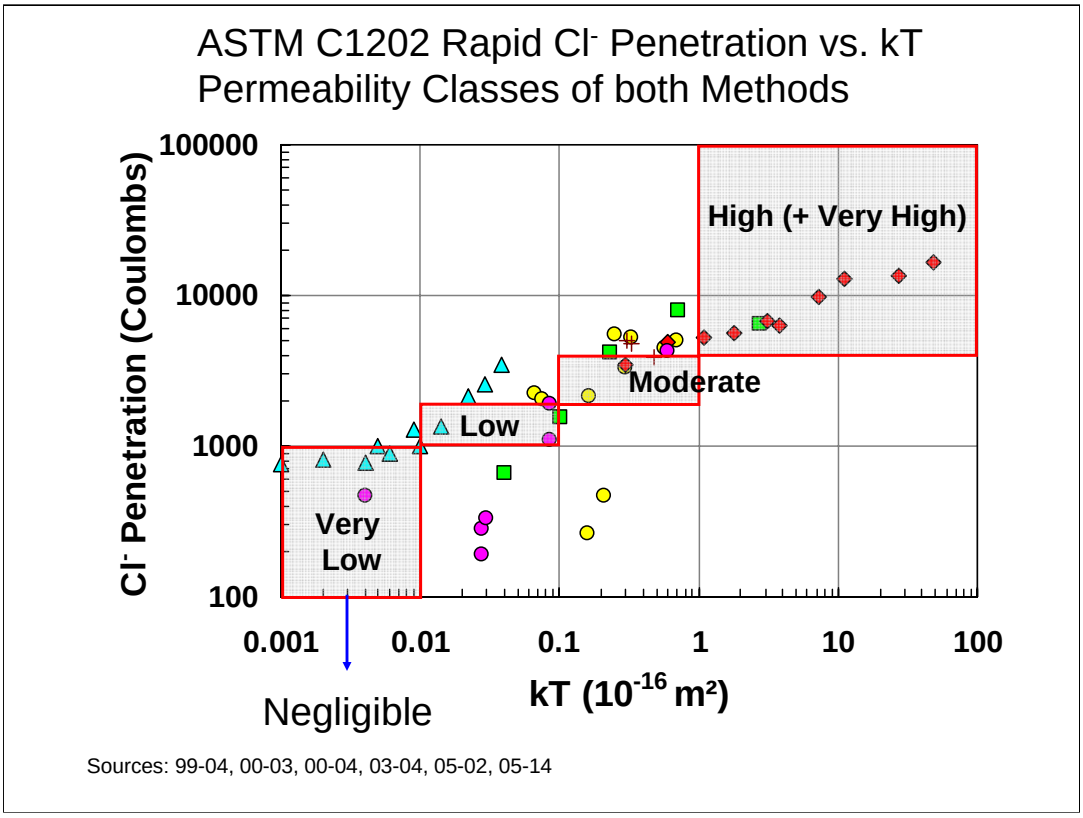
Source: 08-02



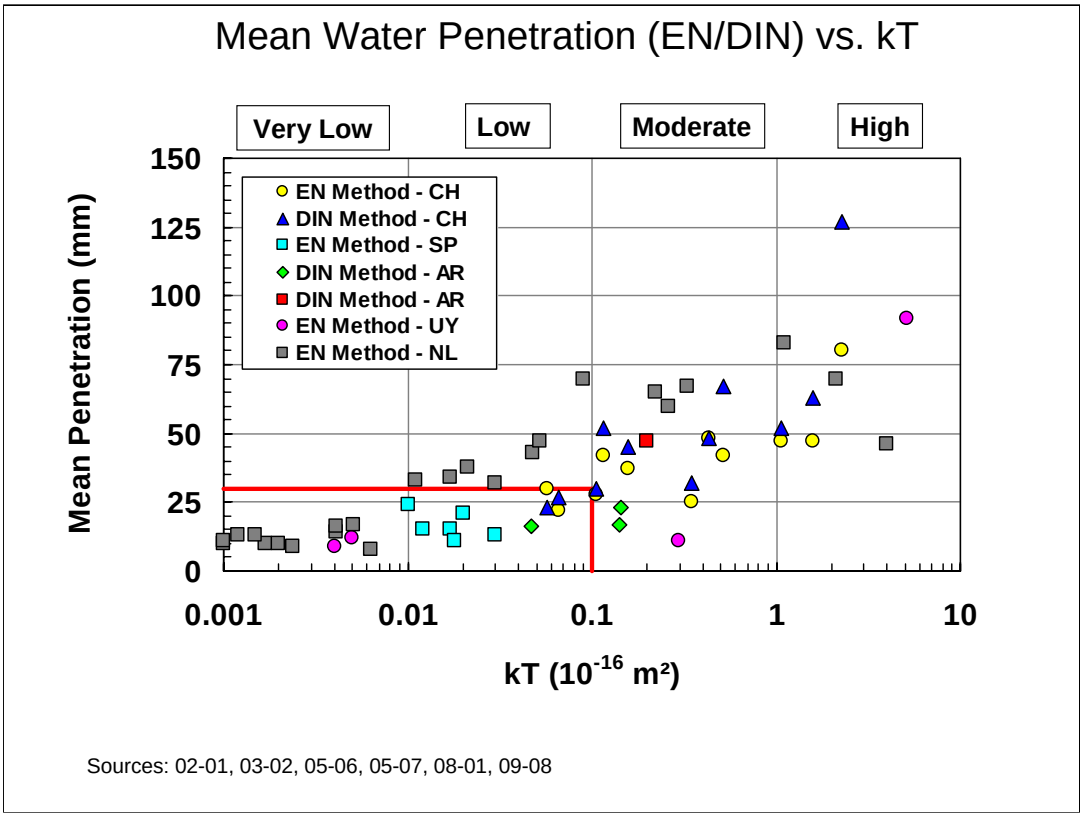
The graph shows results of kT measured on site and the carbonation depth measured at the same spot. It seems that concretes with permeabilities below Class PK3 (Moderate) show quite low rates of carbonation. For higher permeabilities, there are cases with low carbonation rates (may be due to cracking or to particular microclimate conditions of exposure) and with high carbonation rates.



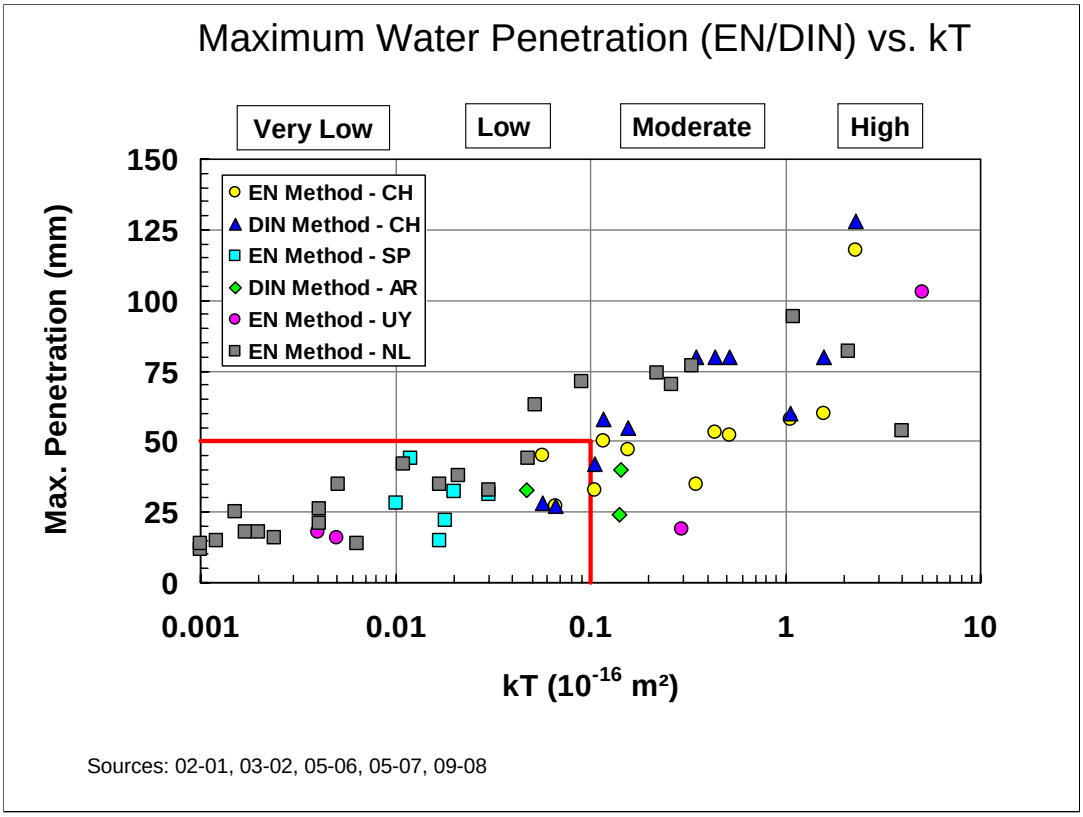
The graph shows results of kT measured on site and the Chloride content determined at the level of reinforcement (% cement wt.)



Reasonably good correlation between both variables, given the great variety of sources (the magenta circles even correspond to pavement cores). Interesting to notice that the classification of the „penetrability“ by both methods is quite coherent.



Again, concretes with permeability below Class PK3 (Moderate) have a low mean water penetration under the test EN 12390-8 (or its equivalent DIN 1048 with different sequence and level of water pressures applied).



Sources: 02-01, 03-02, 05-06, 05-07, 09-08