



CONSOLID Facts

TECHNICAL BULLETIN

5- 2004

DEGREE OF IMPROVEMENT WITH ALL KINDS OF SOIL, Vol.5

CALIFORNIA BEARING RATIO

This volume shows the excellent test results of an official test series in ECUADOR, South America, where all main types of soils had been collected and investigated without our assistance. This means that the C.B.R. testing followed the classic specification, which asks for a soaking at O.M.C.

We demonstrated to you in our Vol.4 that soaking at O.M.C. may lead to wrong measurements in respect of the water sensibility of the tested soil at 100% O.M.C.; dried-back sample blocks show more realistic figures, because untreated test blocks develop in this stage their real sensitivity and show substantially decreased test results.

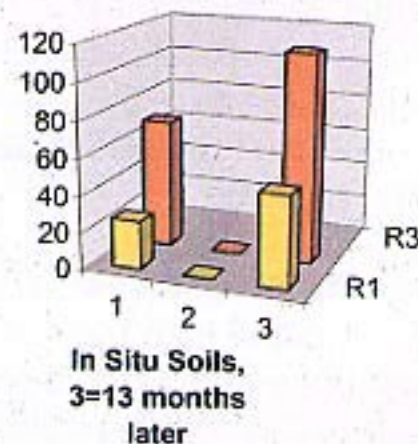
On this page you see on two diagrams the results from certain kinds of soils, similar in their physical appearance but from different sites. Above: Test results from Las Lagunas, Quito; below: those from Tulcan and Chungi-Zhud, from different types of organic and clayey silts, usually the most water sensitive types of soil.

They can be classified in the AASHTO classes A-4 or A-5 and A-2-7.

ECUADOR, S.A., Las Lagunas, Quito 1996

Soil Type	Limo organico / Org. Silt	
C.B.R.	A-4	A-4
	treated with C + SD	
Untreated	26	13 months
Treated	70	later:
		50
		114

1996 ; Soaked C.B.R. values

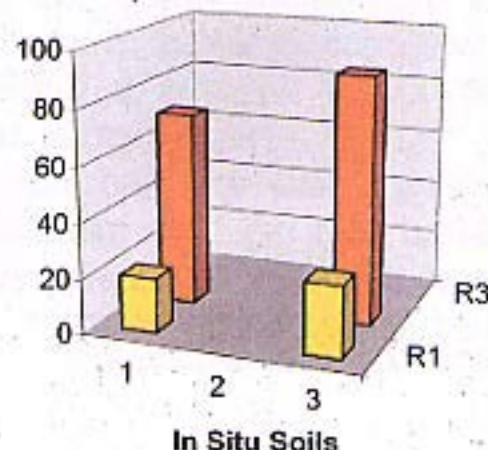


C.B.R. Increase 2.5 times 2.3 times

ECUADOR, S.A., Tulcan + Chungi-Zhud 1996

Soil Type	Arena limosa+ Limo organico / Org. Silt	
C.B.R.	A-4	A-2-7
	treated with C + SD	
Untreated	20	26
Treated	71	90

1996 ; Soaked C.B.R. values



C.B.R. Increase 3.6 times 3.5 times

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In the official soil laboratory in Quito the dominant types of clayey, silty sands and gravels had been tested and yielded, irrespective of their origin, a massive improvement of the soaked C.B.R. values.

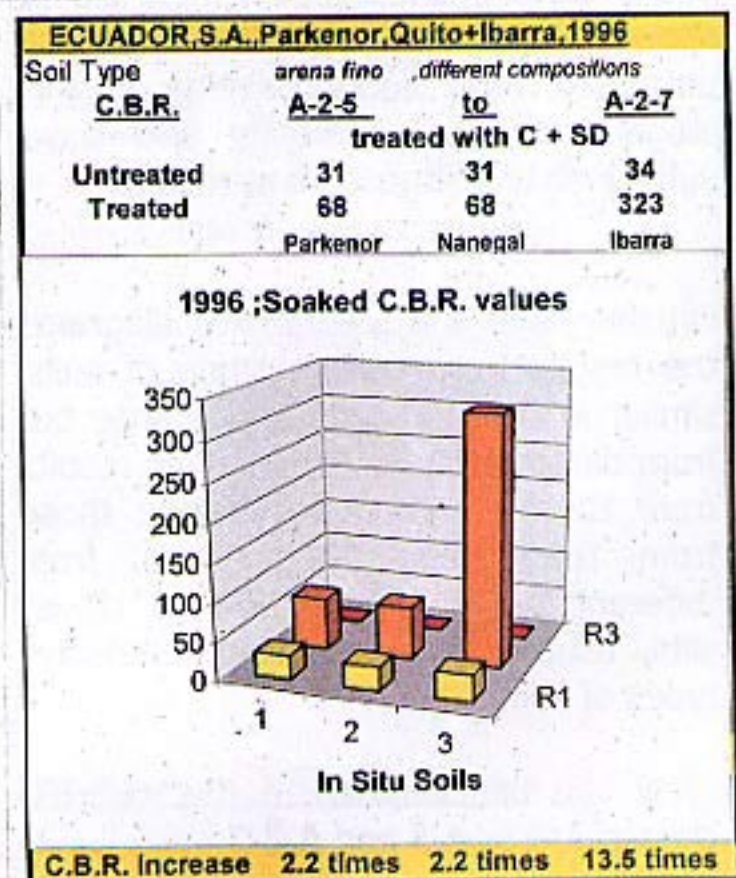
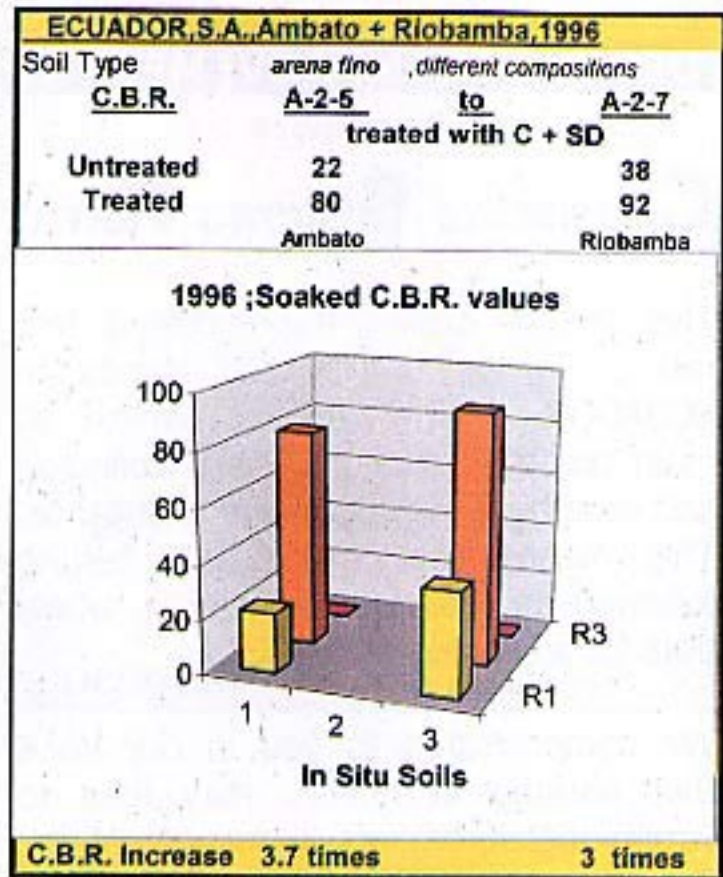
There is no doubt that the positive differences to the results with untreated soaked test blocks would have been even greater if they had followed our recommendation to dry back the test blocks ahead of soaking to less than 100% O.M.C. , because the drier a soil, the more sensitive it is against softening and swelling by water.

The improvements differ between 2 to 40 times, compared with the test results of the same untreated, soaked soil.

What does this mean?

Take here in consideration that for the construction of roads certain levels of C.B.R. are required for the sub-base and base course.

For rural roads a base course with a C.B.R. of 35% might already be satisfactory, while for highways / motorways the base course requires a C.B.R. of 80%. If you read these results under these aspects, you will find out that most treated soils get such massive improvements that they can easily replace otherwise required borrowed material.



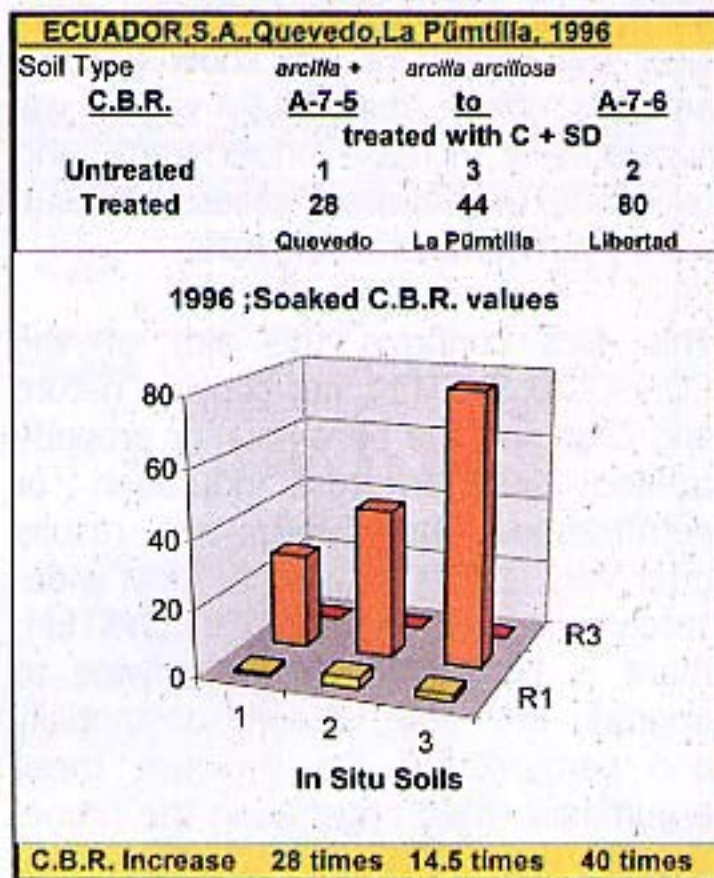
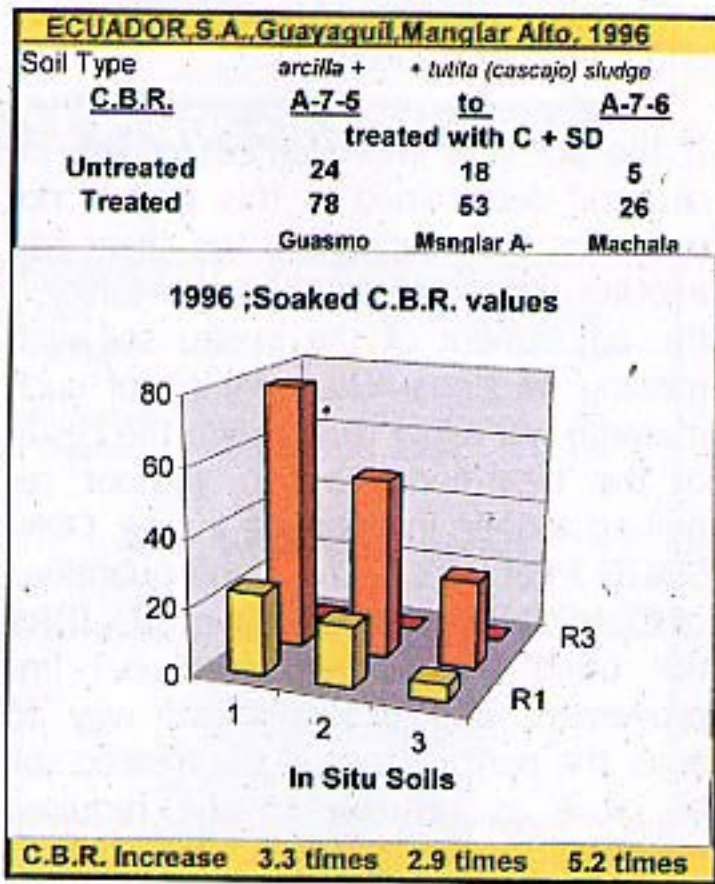
CALIFORNIA BEARING RATIO

Further test results are shown in the graphs on this page, especially very poor types of soils, which normally cannot be used for construction purposes. They have to be excavated, disposed of and replaced by better material. This causes substantial costs, not only for the soil exchange and disposal, but also for transportation. If such exchange work becomes substantial, it is always accompanied by severe destruction of the access roads used for these transports – a further fact to be considered.

The CONSOLID SYSTEM improves any kind of soils substantially but, as shown in this collection of soaked C.B.R. values the worse the soil quality, the more impressive the improvement, rising to 40 times the comparable values of the same untreated soil, when soaked.

No doubt it substantially pays to check each site in respect of improving the in-situ soil with the CONSOLID SYSTEM in all layers – subgrade as well as subbase and base course, because this will enable to change the design of the construction and allows apart from the improvement of the construction also in respect of durability and low maintenance requirement substantial savings in the construction costs.

This makes the way free to use any soil material in construction and fulfil easily all requirements of any "performance-base specification", as increasingly required for projects, especially those under BOT or PPP arrangements



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The C.B.R. tests of our collection show the native C.B.R. values in comparison with ever the same soil, one untreated and the other treated.

If the possible improvement of the in-situ soil determined in this way is not yet more than satisfying, the client has another very cost saving opportunity – the adjustment of the in-situ soil with missing fractions. The addition of such material will allow to improve the result of the treatment further, without requiring higher investment in the CONSOLID treatment – the same quantities of CONSOLID, CONSERVEX or SOLIDRY will bring the desired additional improvement and allow in this way to tailor the performance of the treated soil as close as possible to the required stability.

Checking soil treated with the CONSOLID SYSTEM periodically years after the treatment will show another amazing effect: the C.B.R. values will substantially increase under traffic and over time, and in many cases the result will be a real mineral concrete.

This fact confirms the aim of the CONSOLID SYSTEM, i.e. copying nature and changing the behaviour of properly treated soil towards induration or petrification. The C.B.R. test results offer very strong arguments for a widespread use of the CONSOLID SYSTEM; there is no better way worldwide to upgrade any type of soil substantially and permanently. Do you use these arguments when negotiating the proper use of the CONSOLID SYSTEM? You should! Your clients will be amazed.

