



DEGREE OF IMPROVEMENT WITH ALL KINDS OF SOIL, Vol. 1

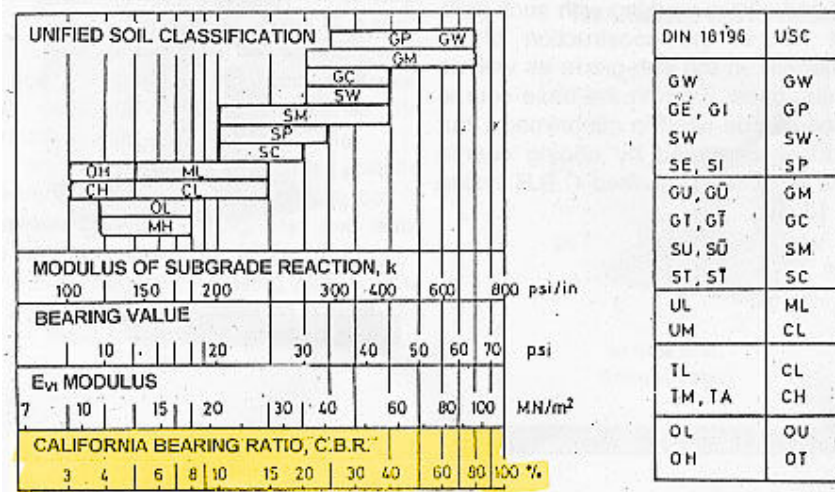
The CONSOLID SYSTEM can upgrade any type of soil permanently and by classes. This fact is proved by different measurements, which allow to specify a given material as risk-free construction material in earthworks.

In the TECHNICAL BULLETINS we will collect comprehensive documents, proving the unique excellence of the CONSOLID SYSTEM by reliable test results from all over the world.

We will start with a collection of test results, showing the difference between untreated and treated soil of the same type on the soaked C.B.R. values.

California Bearing Ratio

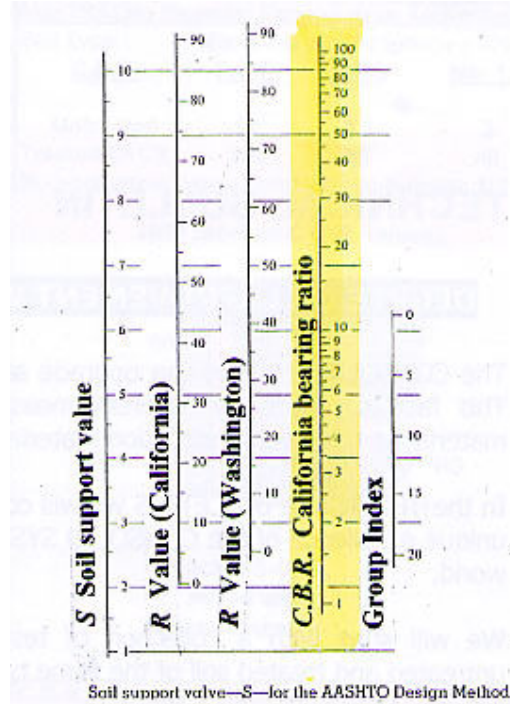
Is one of the guiding measurements used world wide to indicate the loading capacity of a certain construction material, a figure which shows compliance with the specified requirement of certain layers in an embankment.



The CBR (California Bearing Ratio) is one of the guiding measurements for the loading capacity of a compacted soil layer, be it the sub-grade, sub-base or base course. It is widely used, but there are also other methods to get the desired information, and therefore you find on page 1 as well as here a graph which converts the CBR values into Evi modules, R values, S Soil Support value and Group Index.

Important are the "soaked CBR values measured after 96 hours immersion in water.

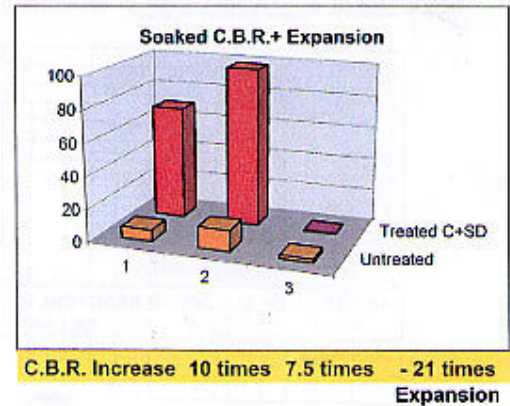
In the following we will show you the impressive comparing test results with any soil type of untreated and treated soil blocks where the CONSOLID SYSTEM shows the full effectiveness.



The first example is from an official test report carried out at the UPSA in Bolivia with a soil type of A-4, silt, a material sensitive to water and with a high potential for the capillary rise of moisture.

The CONSOLID SYSTEM is able to bring this undesired behavior fully under control and allows working with such soils without risk in the construction of an embankment, in the sub-grade as well as in the sub-base. Even in the base course such soil can be used in minor roads, but also further upgraded by adding coarse material to obtain a soaked CBR value above 100%.

| BOLIVIA, Soil Laboratory of CONNAL SRL 2001 | | | |
|---|------------|---|------------------|
| Soil Type | A - 4 | d: 2.040 kg/m ³ , w _p : 11% | |
| <u>C.B.R.</u> | <u>95%</u> | <u>100%</u> | <u>Expansion</u> |
| Untreated | 7 | 13 | 2.11 |
| Treated C+SD | 70 | 98 | 0.10 |



In **SPAIN** the effectiveness of the CONSOLID System was tested on typical silty clay as found close to rivers – a material which is usually exchanged for better material due to the great sensibility to softening by moisture.

The results confirm very impressively that the worse the classification of the in-situ soil, the better the possible improvement of the soil if treated with the CONSOLID SYSTEM.

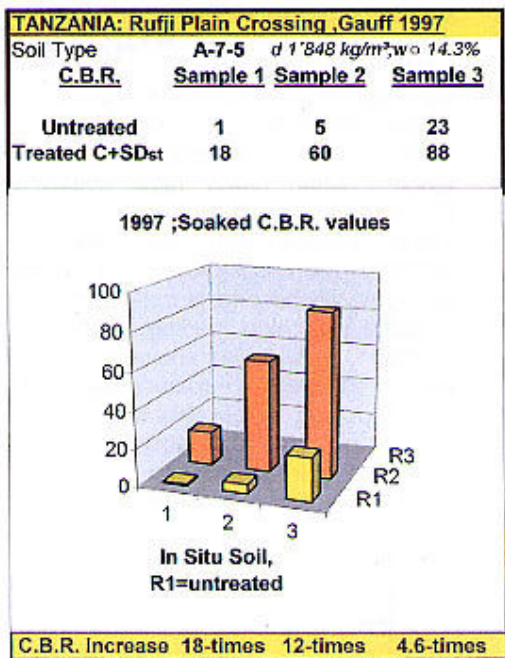
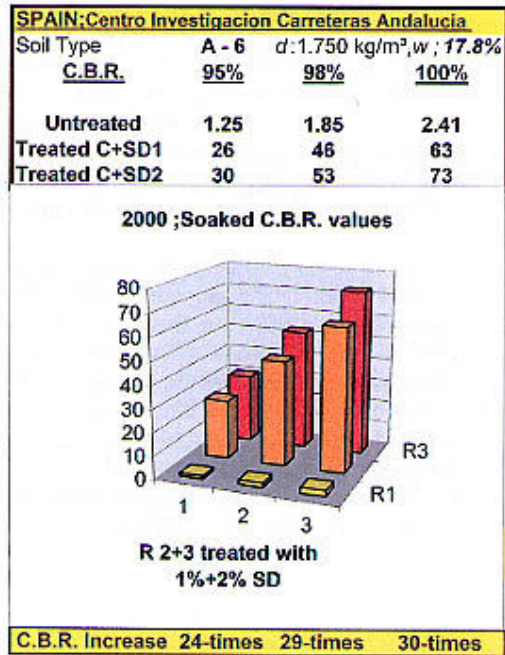
Already with only 1% SOLIDRY together with CONSOLID, the soaked CBR values increased substantially and reached with 2% of SOLIDRY 24 to 30 times the values of the untreated material, enabling in this way the use of this soil in any sub-grade and sub-base and in low traffic roads even in the base course.

The density of this treated soil will increase further under traffic and remains permanently over time.

Another impressive example of the increase of the soaked CBR value is shown in a test report from **TANZANIA**, East Africa.

There again, a very poor soil, a dark, expansive sandy-silty-calay, was improved by the CONSOLID SYSTEM in a way, that it could be used in all layers of a road construction, preventing the exchange of the soil for the better, borrowed material, which was not available close to the construction site.

With an improvement of the soaked CBR values up to 18 times, this soil is acceptable for the sub-grade and sub-base and can easily be further improved for the base course by adding 25% coarse material (sand, aggregate) to the in-situ clay.



Already in the early days of the CONSOLID SYSTEM the impressive effectiveness of the upgrading was shown in official tests in **AUSTRALIA**. There a black sandy-silty clay with extremely low CBR values was treated and mixed with base course material up to 40mm in relation 1:1.

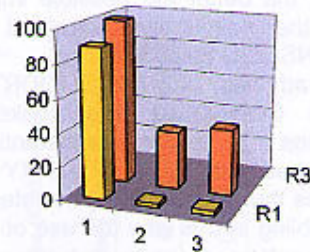
Even the base course material with a high soaked CBR value could be further improved by 10%, but the plain clay as well as the mixture with coarse material allowed an increase of the soaked CBR of the clay itself by 14 times. Making this soil acceptable for the sub-base and even base course in low-traffic roads.

In this case the treatment was done with CONSOLID and CONSERVEX.

AUSTRALIA; Victoria: Parking Area Archerfield

| | | | |
|---|--|--------------|----------------|
| Soil Type | Mix A-7-6 $d \leq 0.075 \text{ kg/m}^3; w \leq 10\%$ | | |
| <u>C.B.R.</u> | <u>F.C.R.</u> | <u>A-7-6</u> | <u>Mix 1:1</u> |
| Untreated | 90 | 2.5 | 3 |
| Treated C+CX | 100 | 35 | 40 |
| Non-cohesive base, mixed with sub-grade 1:1 | | | |

1984 ; Soaked C.B.R. values



Black S-S-Clay,
mixed with
Base course 0-

C.B.R. Increase 10% 14-times 13.3-times

Another impressive example was upgrading of LAHAR to a risk free road construction material in the **PHILLIPPINES**. LAHAR is volcanic ash, as erupted in this case during the outbreak of the Pinatubo in the middle of the 90's - this material tends to form dangerous sludge avalanches when heavy rain liquefy the material.

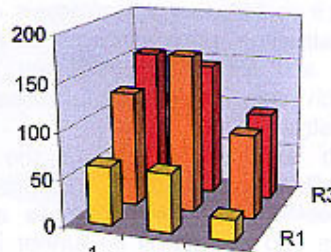
When treated with the CONSOLID SYSTEM the lahars (classified as sandy silt A-1-7) become a road construction material with a high loading capacity and soaked CBR values above 100%, to be used in all layers of a road embankment.

It is important that in this way the Lahar can be permanently stabilized; it will be protected from liquefaction by water and from further sludge problems.

PHILLIPPINES: DPWH -EDSA Quezon City, M.M.

| | | | |
|----------------|---|---------------|-------------------------------|
| Soil Type | A-2-7 $d \leq 1.891 \text{ kg/m}^3; w \leq 8.5\%$ | | |
| <u>C.B.R.</u> | <u>98% ST</u> | <u>98% DB</u> | <u>98%</u> |
| | | | $d \leq 1.415 \text{ kg/m}^3$ |
| Untreated | 63 | 63 | 23 |
| Treated C+SDst | 124 | 169 | 90 |
| Treated C+SDd | 155 | 145 | 95 |

1996 ; Soaked C.B.R. values



LAHAR vulc.ash
Pinatubo

C.B.R. Increase 2.5-times 2.3times 4.1-times