USE OF TROPICAL SOILS IN LOW COST AND SUSTAINABLE PAVEMENTS - EXPERIENCE IN BRAZIL

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INTRODUCTION

In Brazil, the most widely used soil classification system in the study of road construction materials was based on US specifications. But, it presented limitations and difficulties when applied to tropical soils.

In the 1970s, engineers Nogami and Villibor verified that lateritic sandy soils, were present in more than 50% of the State of São Paulo.

Although, these soils were considered unsuitable by US specifications, they have been used successfully in layers of pavements for low traffic (rural roads).
In 1981, was developed **MCT Technology**, which considered the peculiarities of lateritic soils and developed practical applications in the area of highway construction in tropical countries.

Nowadays, MCT Technology is adopted in several Brazilian specifications, which includes the classification of tropical soils called **MCT Classification**.

In Brazil, our **company** was a **pioneer** among engineering companies in the implementation and dissemination of this **technology**.

\[
\text{M = miniature} \quad \text{C = Compacted} \quad \text{T = Tropical}
\]
The map shows areas of lateritic sandy and clay soils found in 65% of the Brazilian territory. In these areas there are promising soil deposits for the execution of pavements.

Lateritic soils are found in large areas of Brazil and other tropical countries.
MCT Technology

Some laboratory tests are part of MCT:

1. Mini-CBR
2. Compaction test
3. Expansion test
4. Contraction test
5. Infiltrability test
6. Loss of Mass on Immersion
The Brazilian Experience

- The use of tropical lateritic soils as a construction material for highways allowed cost reduction of over 30% associated with the sub-base and base layers, which accelerated the implementation of low cost pavement in Brazil.

- In Brazil, there are 12,300 km of rural roads, which were paved using MCT technology.

- Currently, 75% of the rural roads in the State of São Paulo are paved with lateritic sandy soils.

Roads paved with lateritic sandy soils in Brazil

<table>
<thead>
<tr>
<th>STATE</th>
<th>ROAD [km]</th>
<th>URBAN STREET [m²] x 10⁶</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acre</td>
<td>-</td>
<td>0.4</td>
</tr>
<tr>
<td>Bahia</td>
<td>700</td>
<td>0.6</td>
</tr>
<tr>
<td>D. Federal</td>
<td>-</td>
<td>0.8</td>
</tr>
<tr>
<td>Goiás</td>
<td>600</td>
<td>0.5</td>
</tr>
<tr>
<td>Mato Grosso</td>
<td>1,200</td>
<td>0.8</td>
</tr>
<tr>
<td>Paraná</td>
<td>1,800</td>
<td>2.3</td>
</tr>
<tr>
<td>São Paulo</td>
<td>8,000</td>
<td>6.8</td>
</tr>
<tr>
<td>Total</td>
<td>12,300</td>
<td>12.2</td>
</tr>
</tbody>
</table>
The Brazilian Experience

- The use of tropical lateritic soils instead of granular materials or rock, has brought considerable cost reduction in the enlargement construction of the highways for private companies (concessionaires) in São Paulo;

- The **cost reduction of over 30%** associated with the use of the sub-base and base layers constituted of lateritic soil and lateritic soil with cement;
Brazilian Experience

Preliminary Pavement Structure

(Public Notice)

Traffic $N_{usage} = 4.9 \times 10^7$

Cost - Preliminary Pavement Structure

R$\ 186.82/m^2$  
$\ 60.07/m^2$

Proposal of Pavement Structure

Cost - Proposal Pavement Structure

R$\ 122.62/m^2$  
$\ 39.42/m^2$

Cost reduction 34%
Benefits for environmental with MCT

- Use of local materials;
- **Reduction in cost** of base and subbase layers;
- Reduction on **environmental impacts**;
- Reduction in the **Carbon footprint**;
- Reduction in **transport distance**;
- Reduction in Maintenance costs compared to the traditional ones.
CONCLUSIONS

✓ With MCT Technology it was possible to use local materials;
✓ Tropical soils have good performance when used in bases and sub-bases layers;
✓ With the use of the tropical soils, it was possible to realize rural roads programs in Brazil;
✓ Brazil is one of the several countries where this technology can be used;
✓ This technology can be used also for urban and aerodromes pavements.
BOOKS – Lateritics Soil

Books Downloads:  www.portaldetecnologia.com.br
Thank you!

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