Congreso de Suelos Dispersivos y Sulfatados

Asunción, 24-25/10/19

SPG Sociedad Paraguaya de Geotécnia

APC ASOCIACIÓN PARAGUAYA DE CARRETERAS

COMITÉ NACIONAL PARAGUAYO

WORLD ROAD ASSOCIATION MONDIALE DE LA ROUTE

Congreso de Suelos Dispersivos y Sulfatados
Asunción, 24-25/10/19

Sociedad Paraguaya de Geotécnia

APC
ASOCIACIÓN PARAGUAYA DE CARRETERAS

Contextualización de Proyectos Viales en el Chaco Paraguayo

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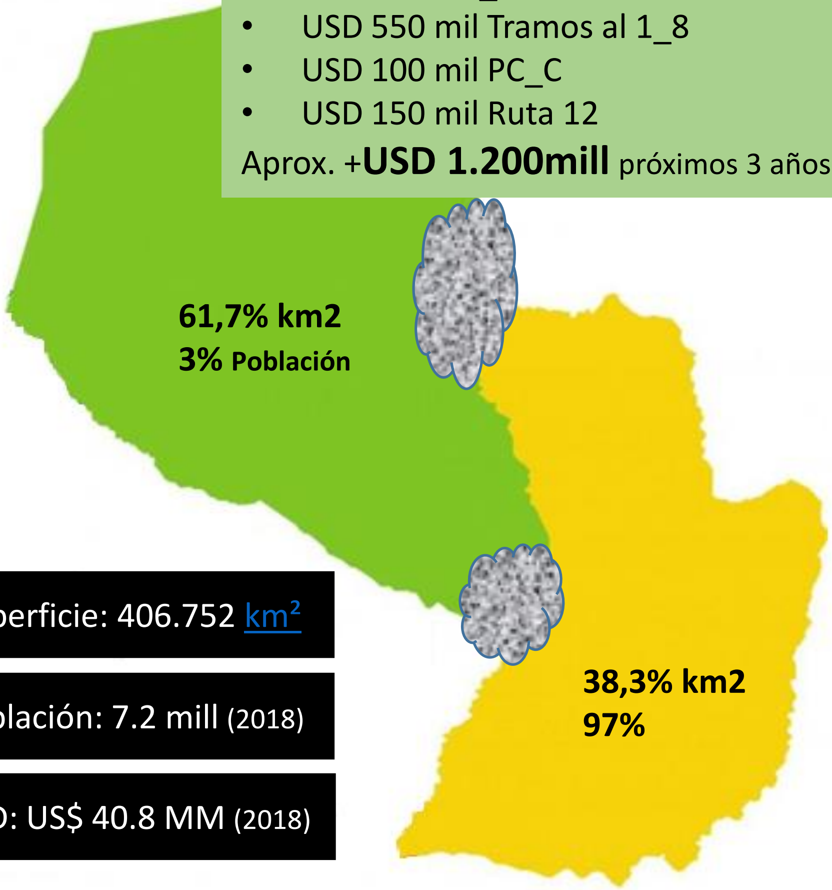
Octubre 2019

MÉTRICA
INGENIERÍA

CHACO Py

- USD 443 mil_ Bioceánica
- USD 550 mil Tramos al 1_8
- USD 100 mil PC_C
- USD 150 mil Ruta 12

Aprox. +**USD 1.200mill** próximos 3 años



Superficie: 406.752 km²

Población: 7.2 mill (2018)

GPD: US$ 40.8 MM (2018)

Topografía

Niveles entre: 250 y 70 m.s.n.m.

Variación Altimétrica (cada 100km) entre: 20 y 40 m

Condiciones de Implantación

- En tiempo de lluvias, agua con lento o nulo escurrimiento
- Suelos Marginales ??(CBR: +3 y 12)
- Distancia Media de Transporte de Agregados (canteras de piedras) aprox. 300km

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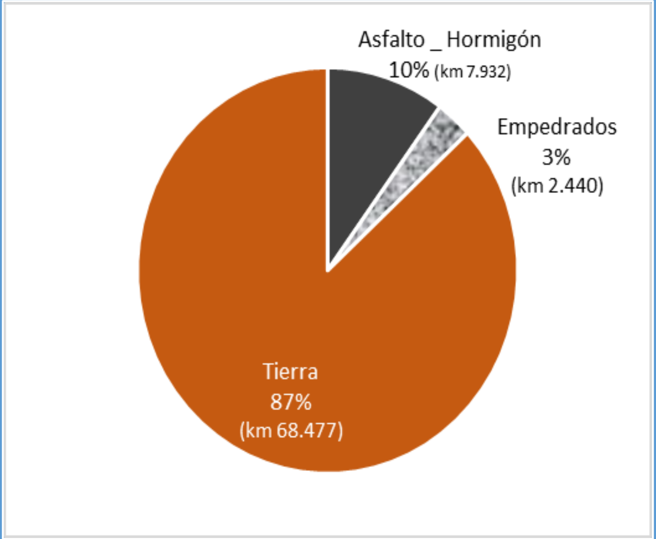
CONTEXTO VIAL

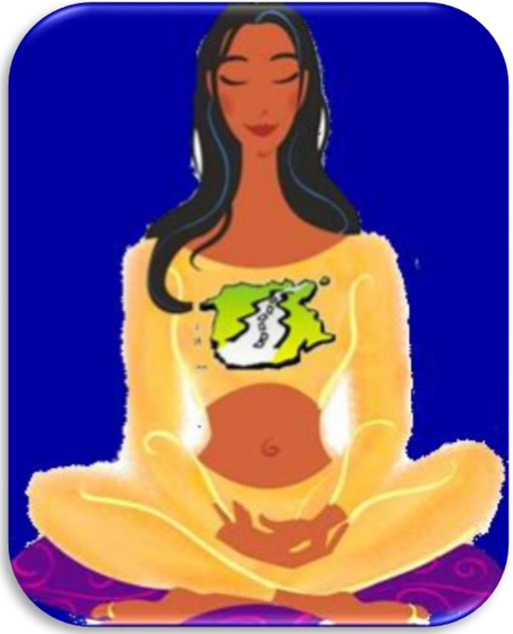
Red de Caminos Py (MOPC 2019)



CAMINO DE TIERRA

* Mantenimiento constante / intransitable en témpora de lluvias

3 Consideraciones:

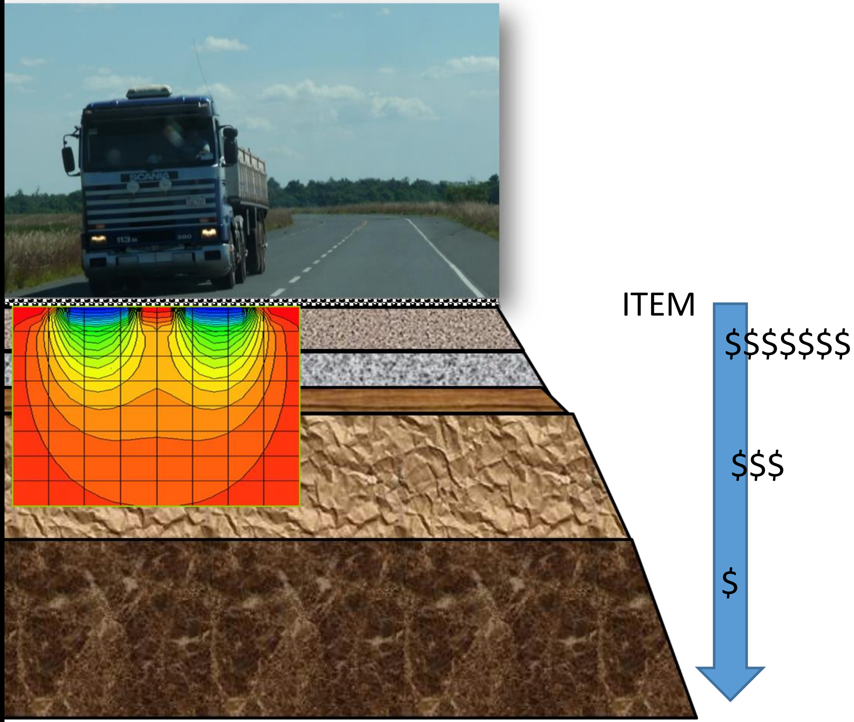


Estructuras de Pavimentos
sobre apoyo/ fundación con suelos marginales/no tratados

Seguridad Vial fuertemente afectada, simplemente porque los perjuicios a los usuarios los omitimos o la muerte de personas en accidentes viales son normales

$

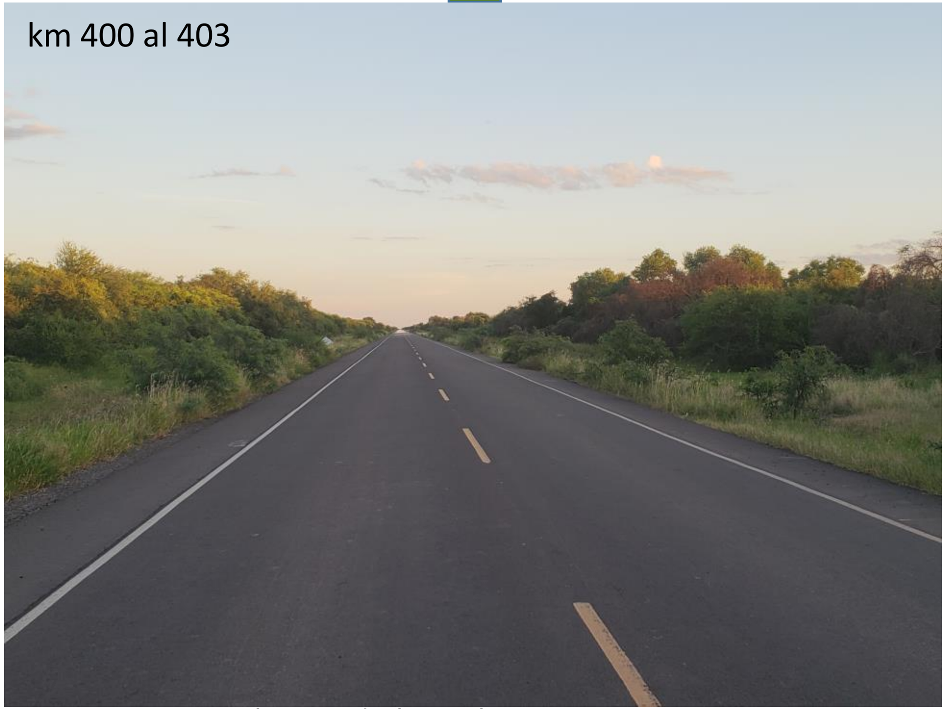
Inversión $ mala, pensando que nuestras soluciones durarían X anos y terminan durando menos



REFLEXION 1/3:

Estructuras Caras sobre fundación MALA=

REFLEXION :



+ sectores urbanos de las colonias
Actual tramo

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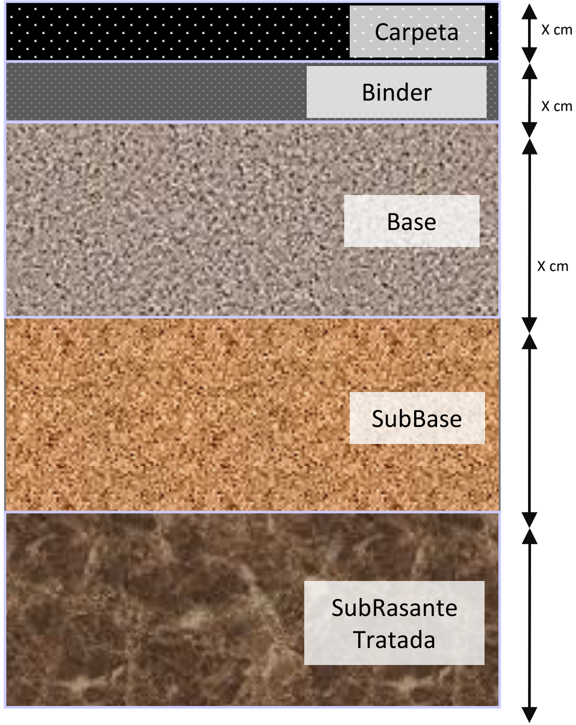
Paquete Estructural



Capas	Transchaco 164km Espesor (cm)	Bioceánico 276km Espesor (cm)	Ruta Leche 103km Espesor (cm)	Filadelfia 54km Espesor (cm)	Km 400 Espesor (cm)
C.A Modificado	5	4	5	4	5
C. A. Convencional	7	4	5	4	6
Base Granular (CBR 100%)	15	18	-		17 Virgen+RAP +3%Cem
Subbase Suelo Cemento (UCS ≥ 20 kg/cm2)	20	20	30 (2capas)	18	17
Suelo Seleccionado Mejorado	30 (CBR≥15%)	30 (CBR≥15%)	20 (2% Cemento)	18	20 Reciclado
Ejes Equivalentes	4,3 mill 10 años (Δ)	1,6 mill 10 años	7,4 mill 15 años	x mill x años	(Δ)


Diseño
Tecnología
Construcción
Evaluación

LITERATURA !

National Lime Association

LIME — The Versatile Chemical — **Technical Brief**

Mixture Design and Testing Procedures for Lime Stabilized Soil

Steps for Mixture Design and Testing for Lime Stabilized Soil

Evaluate soil to gain a general understanding of its suitability for lime stabilization.

Determine minimum amount of lime required for stabilization.

Evaluate lime-stabilized soil strength for long term durability within its exposure environment, with special attention to cyclic freezing and thawing and periods of extended soaking.

If soils to be stabilized are expansive, evaluate using capillary soaking and expansion measurements.

The use of lime to dry, modify, and stabilize soil is a well established construction technique, documented in studies dating back to the 1950s and 1960s [see Ref. 1]. A variety of mixture proportioning procedures have evolved, as various agencies have developed criteria and procedures to fit their specific design needs and objectives, often reflecting local conditions and experience [1].*

The procedures outlined in this publication are intended for soil that is to be stabilized with lime, not merely dried or modified. These procedures are intended to help ensure the long term strength and durability of a lime stabilized soil and are not typically required when soil drying and modification is the desired goal. Other laboratory tests, such as measuring decrease in soil moisture content or reduction in plasticity index (PI), are more appropriate when soil drying/modification is the intended result.

In 1999, the National Lime Association commissioned Dr. Dallas Little to evaluate various procedures and develop a definitive lime stabilization mixture design and testing procedure (MDTP) that specifying agencies, design engineers, and laboratory personnel could use with confidence for soil conditions and environmental exposures throughout the United States. The resulting series of reports summarize the literature on lime stabilization [2, 3]; describe mix proportioning and testing procedures for lime stabilized soil [4]; and present a field validation of the protocol [5].

Lime-Treated Soil – Drying, Modification, and Stabilization

TSP GRUPO ALTAVIA

Asesoría para Elaboración de Guía de Evaluación y Selección de Aditivos Estabilizadores de Materiales Granulares y Suelos

Preparado Para:

MOPC – Ministerio de Obras Públicas y Comunicaciones
BID - Banco Interamericano de Desarrollo

GUÍA DE EVALUACIÓN Y SELECCIÓN ADITIVOS PARA ESTABILIZACIÓN DE MATERIALES GRANULARES Y SUELOS

Rev/v	FECHA	ELABORADO	REVISADO	CONTROL DE CAMBIOS
A	2017-05-30	F.Halles	G.Thenoux	---
B	2017-12-30	F.Halles	G.Thenoux	---
Mandante:	BID – Banco Interamericano de Desarrollo			
Cliente Final:	MOPC – Ministerio de Obras Públicas y Comunicaciones			
Código Documento:	2016-AT-BID-MOPC-IT-005			
Área:	Gerencia Infraestructura		Número Páginas: 61	

TRANSPORTATION RESEARCH RECORD 1652

Effectiveness of Portland Cement and Lime in Stabilizing Clay Soils

JAN R. PRUSINSKI AND SANKAR BHATTACHARJA

A Quick Test to Determine Lime Requirements For Lime Stabilization

JAMES L. EADES and RALPH E. GRIM
Respectively, Research Assistant Professor and Research Professor, Department of Geology, University of Illinois

The use of hydrated lime, Ca(OH)₂, for modifying, upgrading, and stabilizing soils is increasing greatly. This means highway laboratories have had their work loads increased, and in many instances, more than doubled for a particular job. Before

Guide to Pavement Technology Part 4D: Stabilised Materials

8.4.9 Capillary Rise

The Capillary Rise test (Figure 8.10) is associated with lime, cement, cementitious and chemical binders. It is defined as the ratio, in per cent, of the capillary rise in the specimen to the initial specimen height.

There is no absolute level of acceptance for capillary rise of stabilised materials. Capillary rise testing is currently being undertaken for comparative purposes on large projects for the selection of binder types or contents. In addition, current research is studying the rate of capillary rise as well as the absolute value.

The Australian Standard test (AS 5101.5-2008 (R2017) for capillary rise also determines the absorptivity and the swell of the specimen, thus providing additional data.

Figure 8.10: Capillary rise test

Source: Georgees and Hassan (2017).

ASTM **Designation: D 4647 – 93 (Reapproved 1998)ε1**

Standard Test Method for Identification and Classification of Dispersive Clay Soils by the Pinhole Test[1]

This standard is issued under the fixed designation D 4647; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

ε1 NOTE—Keywords were added editorially December 1998

Combined Lime–Cement Stabilization for Longer Life of Low-Volume Roads

Chakkrit Sirivitmaitrie, Anand J. Puppala, Sireesh Saride, and Laureano Hoyos

NCHRP

Web-Only Document 144:

Recommended Practice for Stabilization of Subgrade Soils and Base Materials

Dallas N. Little
Syam Nair
Texas Transportation Institute
Texas A&M University
College Station, Texas

Contractor's Final Task Report for NCHRP Project 20-07
Submitted August 2009

National Cooperative Highway Research Program
TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

Guide to Pavement Technology Part 4D
Stabilised Materials

Austroads

CONTEXTO VIAL_Chaco

Guide to Pavement Technology Part 4D: Stabilised Materials

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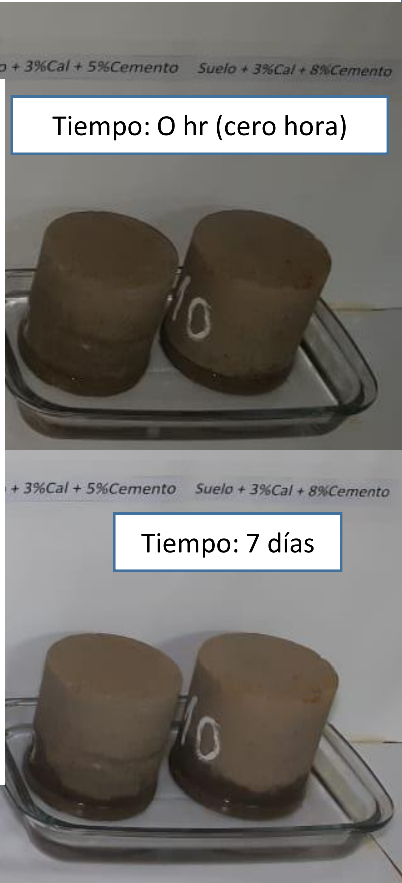
Figure 8.10: Capillary rise test

Source: Georgees and Hassan (2017).

Tesis: Klaseen/Urbieta (2019)

SUCEPTIBILIDAD A LA humedad!

Integridad Física + Absorción + Capilaridad



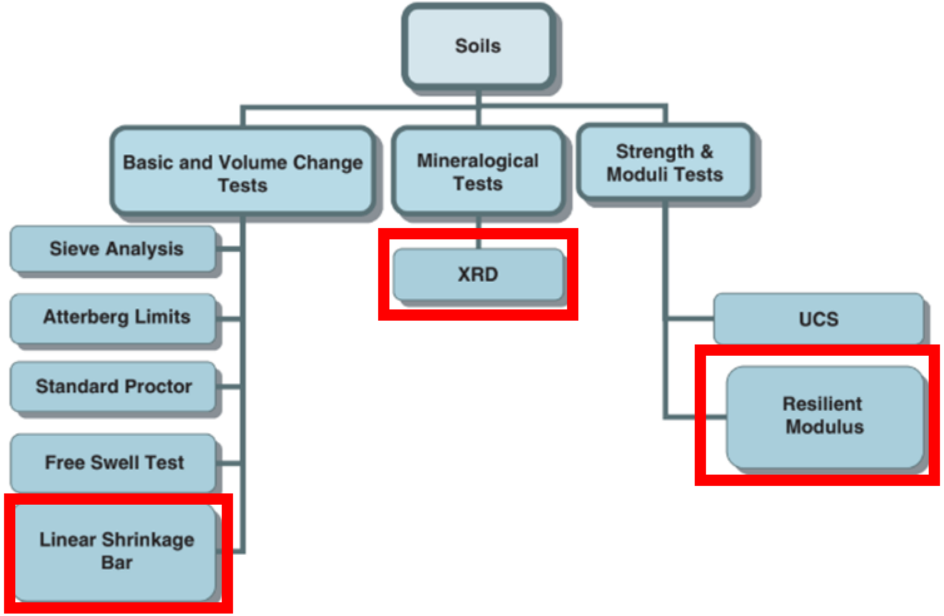
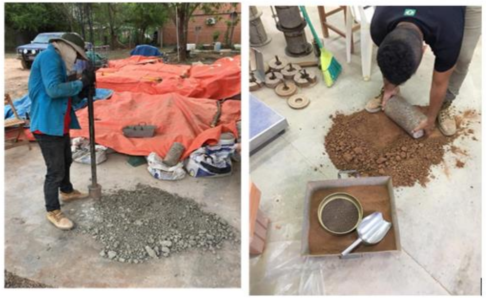
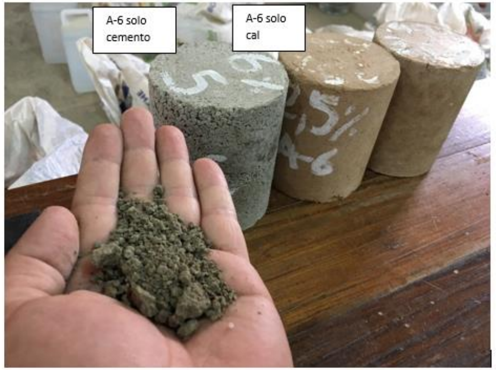


FIGURE 1 Laboratory studies on treated subgrade soils (XRD = X-ray diffraction; UCS = unconfined compressive strength).



ra 19. *Trabajos Previos a los ensayos_ Secado y Desmenuzado*

DOSIFICACION cal / cemento



Pobreta sin cal (con grumos) y probeta con cal

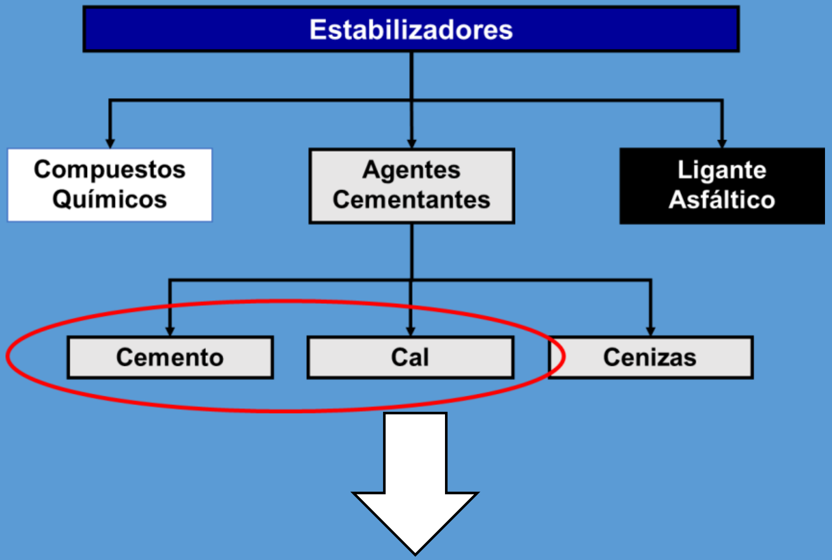
PULVERIZACION DE SUELO
ANTE LA ADICION DEL ESTABILIZADOR

USO CAL


POR SEGURIDAD
CON POLVO MANTENER DISTANCIA
1 KM
CAMIONES CEDER EL PASO


GOLONDRINA
2490

Pavimentación Bioceánica
Cal_3% + Cemento_8%



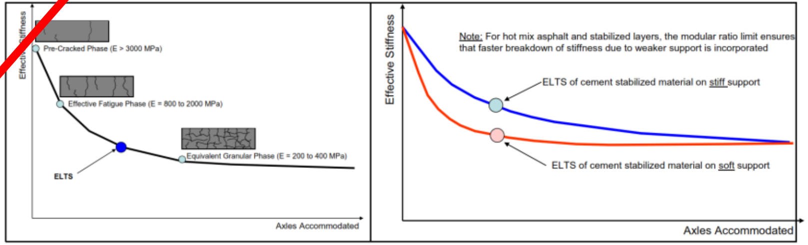


Figure 38. ... aterial


NOS VEMOS
PRONTO
PROPANO
GAS INFLAMABLE
290
VOLVO
PELIGRO INFLAMABLE
PELIGRO EXPLOSIVO

Protocolo Mínimo de Laboratorio