

**ESTUDIO DEFINITIVO REHABILITACIÓN DE LA CARRETERA
PANAMERICANA NORTE, TRAMO KM 557+600 – KM 886+600**

TRAMO II: KM 736+600 AL KM 886+600

N° 181154-66-INF-003



CALCULO DEL REFUERZO ESTRUCTURAL

Rev. 1

APROBADO POR:

Jefe de Proyecto: Abdón Arévalo Cotrina

Cliente Concesionaria vial del Sol – Covisol S.A.

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1. OBJETIVO

El objetivo del presente informe es efectuar la actualización del expediente para la puesta a punto de la carretera Panamericana Norte, Tramo II Km. 736+600 al Km. 886+600, elaborado por el Ministerio de Transportes y Comunicaciones en el año 2010.

2. ALCANCE

La actualización efectuada esta circunscrita al cálculo de los refuerzos necesarios para garantizar el requerimiento estructural de la vía para el periodo de 05 años, para lo cual se efectuará:

- ✓ Medición de deflexiones en la vía, a partir de lo cual se calcularan los Números Estructurales a la fecha de evaluación (Enero 2013).
- ✓ La proyección del tráfico, a partir de los datos del estudio de trafico efectuado por el MTC y que forman parte del estudio de Mantenimiento del 2010, para un nuevo año base (2015).

3. CONDICIÓN ESTRUCTURAL DEL PAVIMENTO

La evaluación de la Condición Estructural del Pavimento tuvo por finalidad calcular la deformabilidad del paquete estructural mediante ensayos de deflexión, a partir de lo cual se estableció la capacidad estructural del mismo.

La condición estructural del pavimento fue evaluada mediante el empleo del Deflectómetro de Impacto (FWD por sus siglas en ingles Falling Weigth Deflectometer).

El deflectómetro de impacto posee las siguientes componentes:

- El sistema de instrumentación (a).
- El dispositivo generador de impacto (b).
- Placa de carga (c).
- Transductor de deflexión (d).
- Celda de carga (e).

(a) El sistema de instrumentación es aquel que realiza los cálculos y procesamiento de datos que se recolectan a través del ensayo de deflectómetro de impacto, debe estar separado físicamente del equipo (en nuestro caso una camioneta remolcó el equipo).

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(b) El dispositivo generador de impacto es aquella que provoca la caída libre de una masa o varias masas del deflectómetro, es importante que este sistema evite la fricción de la masa con el sistema de guía, adicionalmente asegurar que la masa caiga de forma perpendicular al pavimento.

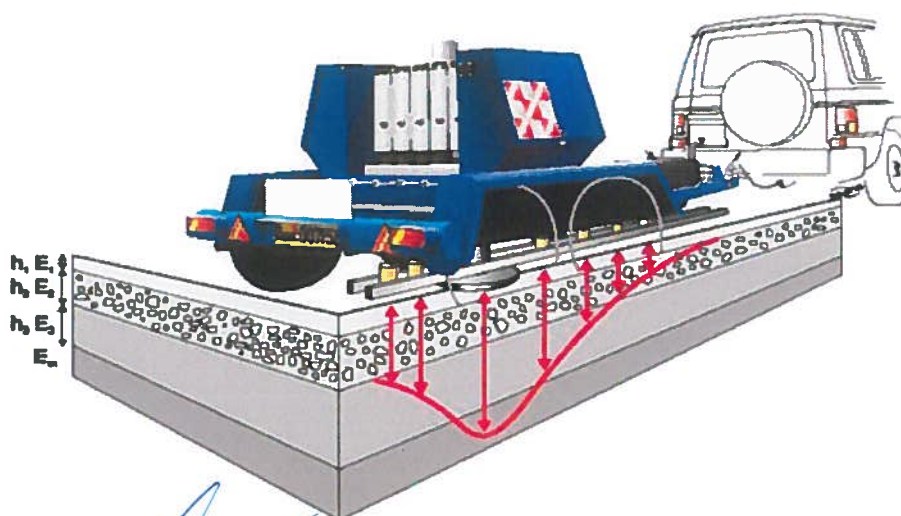
(c) La placa de carga es un disco metálico partido en cuatro, tiene un diámetro de 300 mm. Una propiedad importante es que debe permitir la medición de la deflexión al centro de la placa.

(d) El transductor de deflexión es el encargado de medir la deflexión debajo del centro de la placa de carga, adicionalmente posee un conjunto de sensores encargados de tomar las mediciones de deflexión, el número de sensores y su espaciamiento son a discreción del profesional encargado de la evaluación, pero hay algunas instituciones como el AASHTO (American Association of State Highway and Transportation Officials) y el SHRP (Strategic Highway Research Program) que nos recomiendan ciertas combinaciones.

(e) La celda de carga mide directamente la carga aplicada al pavimento por la masa, debe ser muy resistente al impacto y al agua.

El deflectómetro de impacto es un equipo que realiza un ensayo no destructivo del pavimento, aplicándole una carga dinámica la cual produce su deformación, las cuales son cuantificadas mediante sensores adecuadamente distribuidos denominados geófonos.

Figura N° 1: Esquema gráfico del ensayo con el Deflectómetro de Impacto



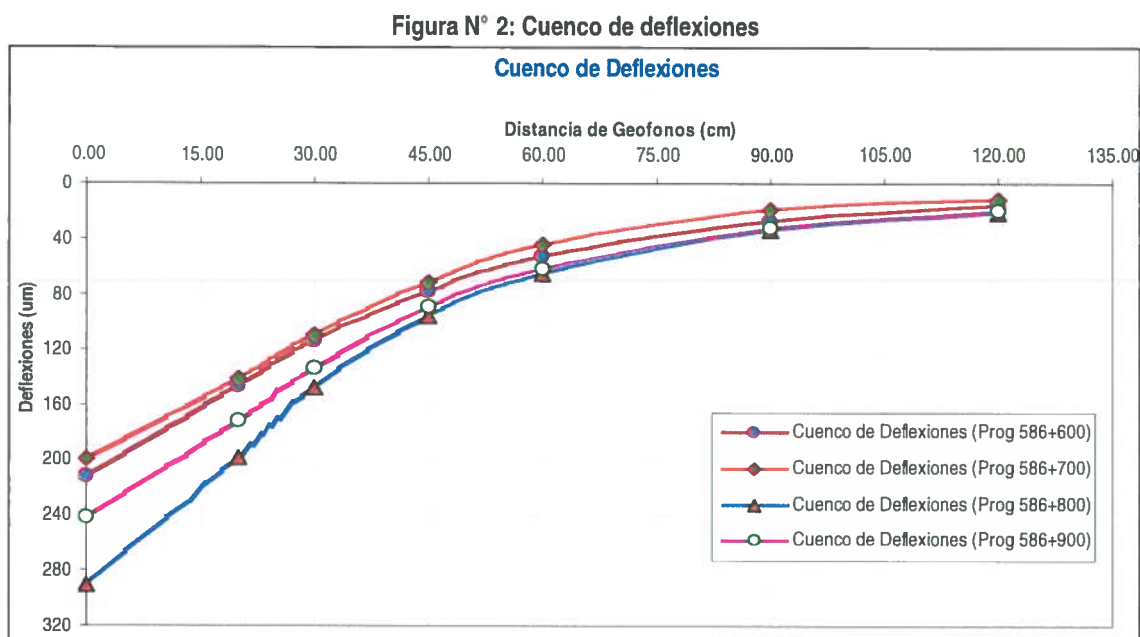
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El gráfico de la distribución de los geófonos (en el eje "X" o abscisas) vs. Las deflexiones verticales (en el eje "Y" u ordenadas) son denominadas cuenco de deflexiones.



El método por el cual se calculan los parámetros geomecánicos del pavimento (módulo resiliente, módulo elástico y número estructural del pavimento) a través de las mediciones en campo del deflectómetro de impacto (cuenco de deflexiones), es denominado Retrocálculo.

3.1. RETROCALCULO CON EL DEFLECTÓMETRO DE IMPACTO

El proceso del retrocálculo está descrito en la guía AASHTO 93¹. Tiene como consideraciones fundamentales lo siguiente:

- Asume una cimentación sólida.
- Considera la teoría elástica lineal, como un sistema bicapa, en donde el pavimento es una capa con espesor definido y la subrasante con espesor infinito.

Las consideraciones se pueden observar en el siguiente gráfico:

¹ AASHTO Guide For Design Of Pavement Structures 1993

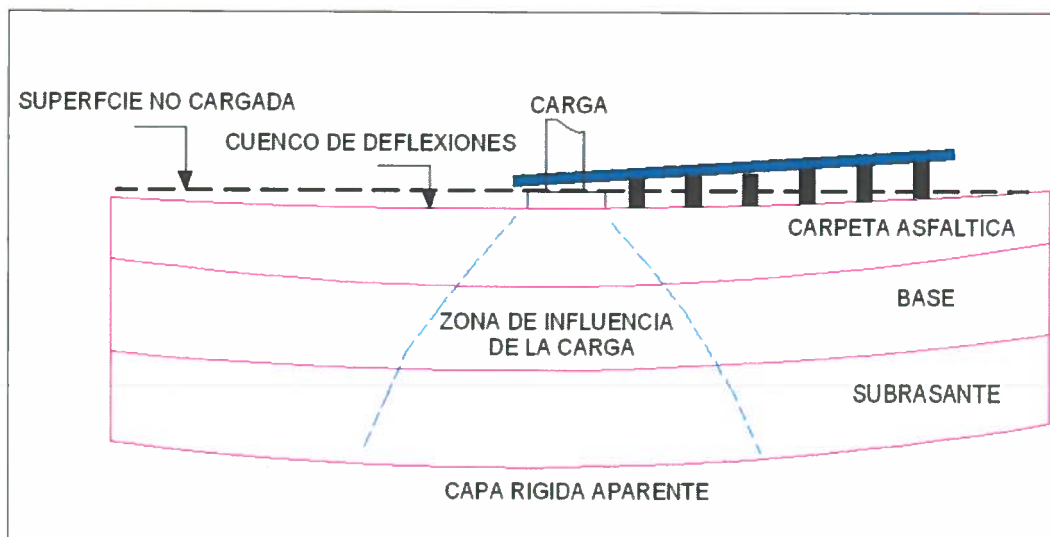
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Figura N° 3: Consideraciones para el procedimiento del Retrocálculo



De acuerdo al diagrama, se observa un sistema usual de la sección del pavimento, constituido por una carpeta asfáltica, una base y una subbase, todo el conjunto del pavimento, está apoyado sobre una subrasante, adicionalmente se observa los sensores que miden la deflexión el pavimento, la zona colocada de color azul representa la zona de esfuerzos en donde es aplicada la carga; del gráfico ya se pueden tener 2 conclusiones básicas para el procedimiento del retrocálculo:

- ✓ Se puede observar que las deflexiones medidas por los 4 sensores están influenciados principalmente por las propiedades de la carpeta asfáltica, la base y la subbase, debido a su presencia dentro de la zona de esfuerzos.
- ✓ Adicionalmente se puede concluir que las deflexiones medidas con los últimos 3 sensores están fuera de la influencia de las propiedades constitutivas del pavimento, y solo dependen de la subrasante (en este caso del módulo resiliente de la subrasante).

De acuerdo a este análisis, el fundamento de retrocálculo es obtener en principio, el módulo resiliente de la subrasante (de acuerdo a los 3 últimos sensores), luego, una vez calculado el módulo resiliente de la subrasante, mediante iteraciones, o valores de inicio asumidos como módulos elásticos de las capas constitutivas del pavimento, se compatibilizan las deflexiones medidas con las deflexiones calculadas, hasta obtener la mayor aproximación posible (de acuerdo con los primeros sensores).

De acuerdo a la primera consideración (Cimentación Sólida), se tiene la ecuación propuesta por Boussinesq, en donde:

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$$w = \frac{P * (1 + \mu)}{2 * \pi * R * M_R} * \left[2 * (1 - \mu) + \cos^2(\theta) \right]$$

Donde:

w = Deflexión vertical

P = Carga aplicada

R = Distancia inclinada entre la carga y la medición de la deflexión; $R^2 = r^2 + z^2$

M_R = Módulo recipiente del suelo de fundación.

μ = Módulo de poisson del suelo de fundación.

θ = Ángulo formado entre la carga aplicada y la posición de la medición de la deflexión.

Así, el valor de: $\cos(\theta) = \frac{z}{R}$

Reemplazando el valor de $z=0$ (debido a que la medición de la deflexión con el deflectómetro de impacto se realiza en la superficie de la estructura a evaluar), se tiene la siguiente ecuación:

$$w = \frac{P * (1 - \mu^2)}{\pi * r * M_R}$$

De acuerdo al AASHTO, asumiendo un Módulo de poisson de 0.5 y simplificando la ecuación tenemos:

$$w_{i,j} = \frac{0.24 * P_j}{E_r * d_{i,j}}$$

Reordenando la ecuación se tiene lo siguiente:

$$M_r = \frac{0.24 * P}{d_r * r}$$

P_j = P = Carga aplicada en el ensayo con el deflectómetro de impacto

$w_{i,j} = d_r$ = Deflexión de cada sensor en el deflectómetro

$r = d_{i,j}$ = Distancia entre la carga de ensayo y el sensor

$E_r = M_r$ = Módulo resiliente de la subrasante

La dificultad, se traduce en cual sensor escoger para realizar los cálculos del módulo resiliente, se puede escoger el último sensor, pero esto puede traer errores debido a la dificultad de medir las deflexiones muy pequeñas, razón por el cual, se tiene la ayuda de las siguientes ecuaciones que nos ayudaran a escoger el sensor óptimo para realizar el retrocálculo.

Se debe cumplir que: $r \geq 0.7 * a_e$

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Donde:

r = Distancia entre el geófono y la carga de ensayo con el deflectómetro de impacto.

a_e = Distancia efectiva del bulbo de presiones entre la interfase de pavimento y suelo de fundación.

El valor de la distancia efectiva del bulbo de presiones a_e , puede obtenerse de acuerdo a la siguiente ecuación:

$$a_e = \sqrt{a^2 + \left[D \cdot \sqrt[3]{\frac{E_p}{M_r}} \right]^2}$$

Finalmente se tiene la siguiente consideración Final

De acuerdo a Boussinesq, se tiene la siguiente ecuación de la deformación para una carga distribuida:

$$d = \frac{(1+\mu) \cdot q \cdot a}{E} \cdot \left[\frac{a}{(a^2 + z^2)^{0.5}} + \frac{1-2\mu}{a} \cdot \left((a^2 + z^2)^{0.5} - z \right) \right]$$

Como en el caso anterior, se asume un módulo de poisson $\mu = 0.5$, así la ecuación se reduce a:

$$d = \frac{1.5 \cdot q \cdot a}{E} \cdot \left[\frac{a}{(a^2 + z^2)^{0.5}} \right]$$

Luego reemplazando los valores de la deflexión en la parte superior y en la parte inferior de la subrasante, se tiene la siguiente ecuación, el cual es considerado como la ecuación fundamental para el retrocálculo.

$$\frac{M_r \cdot d_0}{q \cdot a} = 1.5 \cdot \left[\frac{1}{\sqrt{1 + \left[\left(\frac{D}{a} \right) \cdot \sqrt[3]{\frac{E_p}{M_r}} \right]^2}} + \frac{1 - \frac{1}{\sqrt{1 + \left(\frac{D}{a} \right)^2}}}{\left(\frac{E_p}{M_r} \right)} \right]$$

Donde:

r = Distancia del sensor.

a_e = Distancia efectiva del bulbo de presiones a nivel de la subrasante.

a = Radio de la placa de carga

D = Espesor total del pavimento

E_p = Módulo efectivo de todas las capas del pavimento

M_r = Módulo resiliente de la subrasante

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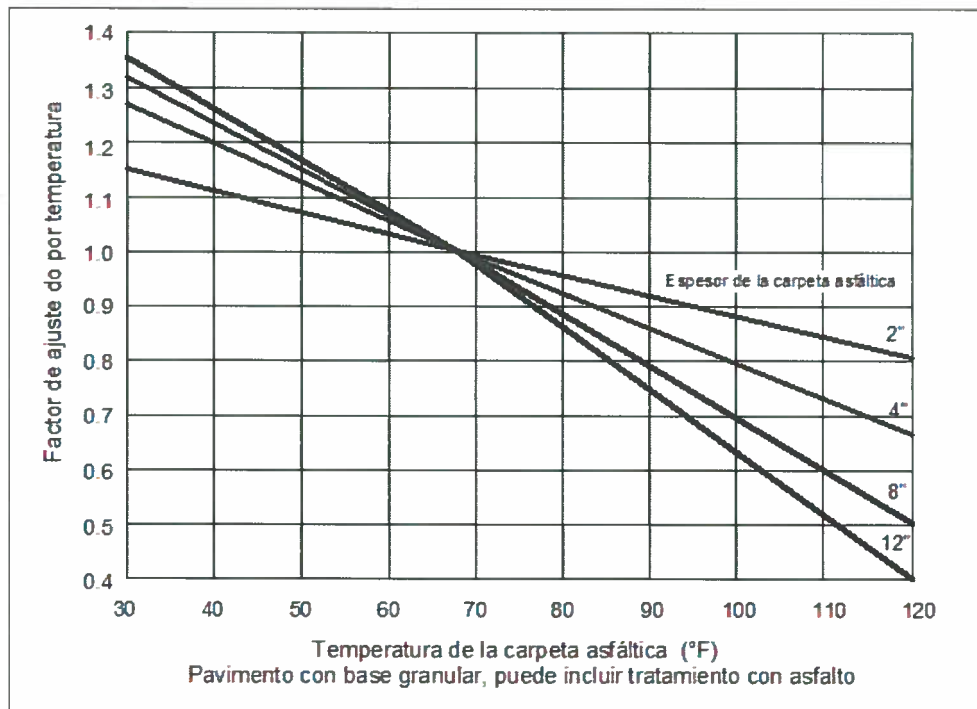


q = Presión en la placa de carga

d_0 = Deflexión medida al centro de la placa de carga, ajustado a la temperatura estándar de 68° F

Para realizar la corrección por Temperatura, se usa el ábaco siguiente:

Figura N° 4: Factor de Corrección por Temperatura de la Deflexión Máxima



Para realizar el cálculo del módulo resiliente de la subrasante, según el método AASHTO se debe realizar de manera iterativa, es decir, se inicia con el segundo sensor, se calcula el modulo resiliente de la subrasante, luego se calcula el módulo elástico del pavimento en su conjunto, para posteriormente hallar el radio del bulbo de presiones de la subrasante, hasta que la distancia del sensor sea mayor a 0.7 veces el radio de bulbo de presiones.

Para un mejor entendimiento, se tiene un diagrama de flujo de los cálculos que se tienen que realizar

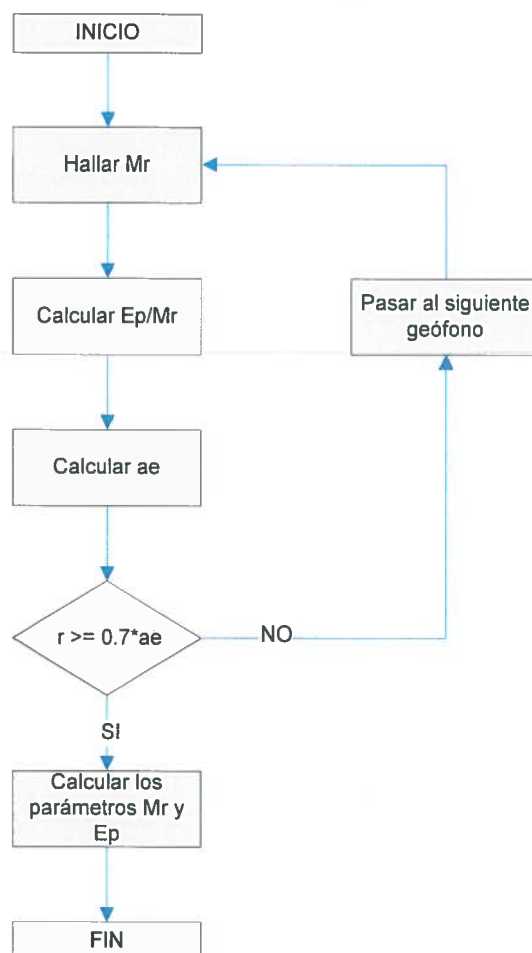
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Figura N° 5: Diagrama de Flujo para el Retrocálculo



Finalmente una vez calculado el Módulo Resiliente de la Subrasante y el Módulo Elástico del pavimento se procede a calcular el número estructural efectivo de acuerdo a la siguiente ecuación:

$$SN_{\text{efect}} = 0.0045 * D * \sqrt[3]{E_p}$$

Donde:

SN_{efect} = Número estructural efectivo.

D = Espesor total del pavimento.

E_p = Módulo efectivo del pavimento.

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3.2. ACTIVIDADES EN CAMPO

El trabajo de campo consistió en realizar la medición de las deflexiones con el Deflectómetro de Impacto (FWD), cada 250 metros en cada carril desfasados en 125 metros entre carriles.

Las medidas de deflexiones se efectuaron en la huella interna de cada carril de circulación, cada 250 y seis (06) geófonos más la placa de carga (D₀) distribuidos de la siguiente manera:

Tabla N° 1: Distribución de los Geófonos del FWD

Geófono	Distancia (cm)
D ₀	0
D ₁	20
D ₂	30
D ₃	45
D ₄	60
D ₅	90
D ₆	120

3.3. TRABAJO DE GABINETE

El trabajo de gabinete, incluye el procesamiento de la totalidad de datos de campo de acuerdo a la teoría y procedimiento antes descrito. Se calcularon los siguientes Parámetros:

3.3.1. DEFLEXION MÁXIMA

Para el caso el cálculo de la deflexión máxima, se uso la siguiente fórmula:

$$\Delta_{ir} = \Delta_i * \left(\frac{P_r}{P} \right) * \lambda_T$$

Donde:

Δ_{ir} = Deflexión Máxima corregida por Temperatura y por Carga

Δ_i = Deflexión máxima (medida en campo)

P_r = Carga de referencia (40 KN).

P = Carga aplicada durante el ensayo.

λ_T = Corrección por Temperatura

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3.3.2. MÓDULO RESILIENTE DE LA SUBRASANTE

El módulo resiliente de la subrasante se calculó de acuerdo al procedimiento sugerido en la Guía AASHTO 93 (Retrocálculo), el cual fue afectado con el Factor de corrección $C=0.62$ para el caso de una subrasante debajo de un pavimento con presencia de base y/o sub base.

3.3.3. NÚMERO ESTRUCTURAL EFECTIVO DEL PAVIMENTO

El número estructural efectivo del pavimento (SN_{efect}) fue también calculado de acuerdo a las recomendaciones de la Guía AASHTO 93 para el retrocálculo.

Tabla N° 2 : Resultados obtenidos del Retrocálculo-Carril izquierdo

Sector	De	Hasta	Do max	MR	SN
1	736 + 600	742 + 150	147.25	31865.86	4.95
2	742 + 150	744 + 400	338.85	12507.32	4.10
3	744 + 400	744 + 900	377.68	8020.28	4.63
4	744 + 900	746 + 900	163.09	30104.86	5.74
5	746 + 900	748 + 150	177.16	29654.39	6.13
6	748 + 150	756 + 650	179.22	31503.74	6.35
7	756 + 650	758 + 250	111.28	46811.15	5.15
8	758 + 250	759 + 150	114.70	40463.10	4.87
9	759 + 150	763 + 250	135.51	36513.79	4.54
10	763 + 250	769 + 850	217.91	21258.60	4.65
11	769 + 850	771 + 050	330.01	12416.74	3.96
12	771 + 050	773 + 750	284.65	14518.00	3.50
13	773 + 750	779 + 050	352.02	12774.75	4.39
14	779 + 050	783 + 250	412.13	10316.90	3.27
15	783 + 250	785 + 650	493.14	6420.48	4.15
16	785 + 650	788 + 050	464.73	10046.90	3.56
17	788 + 050	789 + 250	209.99	18214.77	4.49
18	789 + 250	791 + 450	295.01	14128.29	5.09
19	791 + 450	794 + 650	576.88	9025.68	3.50
20	794 + 650	795 + 550	461.24	12355.18	3.23
21	795 + 550	797 + 350	778.93	5799.02	2.68
22	797 + 350	799 + 350	439.34	14959.81	3.69
23	799 + 350	804 + 300	614.56	8971.02	3.11
24	804 + 300	805 + 200	450.65	11366.31	3.67
25	805 + 200	807 + 350	619.98	7435.08	2.65
26	807 + 350	812 + 550	432.96	10321.29	2.91
27	812 + 550	815 + 300	325.36	16360.85	3.62
28	815 + 300	816 + 800	408.72	12341.07	4.55
29	816 + 800	820 + 250	220.63	24212.16	5.71
30	820 + 250	820 + 750	340.07	16542.10	4.67
31	820 + 750	825 + 850	386.34	12159.42	3.98
32	825 + 850	827 + 050	516.17	6717.56	2.83

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Sector	De	Hasta	Do max	MR	SN
33	827 + 050	828 + 900	456.20	9427.95	2.93
34	828 + 900	829 + 200	473.26	10987.70	2.94
35	829 + 200	830 + 450	344.17	12442.23	3.55
36	830 + 450	831 + 750	324.84	13904.93	3.53
37	831 + 750	834 + 750	420.55	12114.82	3.46
38	834 + 750	835 + 900	327.33	13880.05	3.82
39	835 + 900	839 + 350	483.58	9522.80	3.68
40	839 + 350	842 + 950	397.77	14216.49	3.81
41	842 + 950	850 + 500	197.14	28397.10	4.53
42	850 + 500	853 + 550	389.24	14462.65	3.72
43	853 + 550	854 + 600	287.23	21988.46	3.88
44	854 + 600	863 + 350	451.58	11841.31	2.88
45	863 + 350	867 + 350	689.67	7886.02	2.32
46	867 + 350	872 + 750	282.54	20837.48	3.75
47	872 + 750	886 + 600	480.00	10061.98	3.59

Tabla N° 3 Resultados obtenidos del Retrocálculo-Carril derecho

Sector	De	Hasta	Do max	MR	SN
1	736 + 600	742 + 150	139.44	32364.10	5.05
2	742 + 150	744 + 400	404.51	10612.44	3.85
3	744 + 400	744 + 900	354.92	11692.96	4.79
4	744 + 900	746 + 900	146.34	35179.86	5.85
5	746 + 900	748 + 150	173.97	30283.79	6.47
6	748 + 150	756 + 650	201.20	28745.43	5.96
7	756 + 650	758 + 250	108.51	49982.03	5.09
8	758 + 250	759 + 150	131.10	34409.03	4.71
9	759 + 150	763 + 250	180.25	30676.51	4.15
10	763 + 250	769 + 850	308.52	16722.21	4.11
11	769 + 850	771 + 050	386.26	10672.88	3.43
12	771 + 050	773 + 750	246.01	16140.26	3.62
13	773 + 750	779 + 050	380.78	12850.71	4.14
14	779 + 050	783 + 250	511.06	8494.08	3.11
15	783 + 250	785 + 650	351.51	12186.40	3.74
16	785 + 650	788 + 050	378.47	12698.04	3.64
17	788 + 050	789 + 250	231.78	14889.62	4.14
18	789 + 250	791 + 450	333.45	11931.00	4.89
19	791 + 450	794 + 650	558.83	9439.84	3.45
20	794 + 650	795 + 550	441.06	10570.67	3.45
21	795 + 550	797 + 350	680.39	6356.97	2.82
22	797 + 350	799 + 350	497.74	10949.00	4.14
23	799 + 350	804 + 300	722.97	8807.26	2.90
24	804 + 300	805 + 200	478.47	10086.54	3.56

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Sector	De	Hasta	Do max	MR	SN
25	805 + 200	807 + 350	625.62	6695.05	2.58
26	807 + 350	812 + 550	520.71	10007.29	2.79
27	812 + 550	815 + 300	323.71	16511.75	3.41
28	815 + 300	816 + 800	521.01	10328.75	4.10
29	816 + 800	820 + 250	258.87	24422.32	5.24
30	820 + 250	820 + 750	331.28	13927.03	4.85
31	820 + 750	825 + 850	325.57	13611.40	4.31
32	825 + 850	827 + 050	381.99	8082.92	3.33
33	827 + 050	828 + 900	370.30	11489.50	3.06
34	828 + 900	829 + 200	409.55	12991.07	2.82
35	829 + 200	830 + 450	344.42	10533.21	3.61
36	830 + 450	831 + 750	267.68	16085.11	3.75
37	831 + 750	834 + 750	389.41	11326.56	3.57
38	834 + 750	835 + 900	340.13	14167.90	3.81
39	835 + 900	839 + 350	393.74	10758.96	3.99
40	839 + 350	842 + 950	355.81	15126.17	3.94
41	842 + 950	850 + 500	199.07	27942.78	4.53
42	850 + 500	853 + 550	432.73	13430.90	3.57
43	853 + 550	854 + 600	210.81	30453.47	4.04
44	854 + 600	863 + 350	421.17	13385.51	2.95
45	863 + 350	867 + 350	757.30	7731.40	2.16
46	867 + 350	872 + 750	393.25	15998.84	3.34
47	872 + 750	886 + 600	543.94	9207.68	3.35

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3.3.4. SECTORIZACIÓN POR EVALUACIÓN ESTRUCTURAL

Se considero la misma sectorización señalada en el informe de mantenimiento periódico correspondiente al tramo II:

Tabla N° 4: Sectorización Carretera Panamericana Norte Tramo II

Sector	De	Hasta	Sector	De	Hasta
1	736 + 600	742 + 150	25	805 + 200	807 + 350
2	742 + 150	744 + 400	26	807 + 350	812 + 550
3	744 + 400	744 + 900	27	812 + 550	815 + 300
4	744 + 900	746 + 900	28	815 + 300	816 + 800
5	746 + 900	748 + 150	29	816 + 800	820 + 250
6	748 + 150	756 + 650	30	820 + 250	820 + 750
7	756 + 650	758 + 250	31	820 + 750	825 + 850
8	758 + 250	759 + 150	32	825 + 850	827 + 050
9	759 + 150	763 + 250	33	827 + 050	828 + 900
10	763 + 250	769 + 850	34	828 + 900	829 + 200
11	769 + 850	771 + 050	35	829 + 200	830 + 450
12	771 + 050	773 + 750	36	830 + 450	831 + 750
13	773 + 750	779 + 050	37	831 + 750	834 + 750
14	779 + 050	783 + 250	38	834 + 750	835 + 900
15	783 + 250	785 + 650	39	835 + 900	839 + 350
16	785 + 650	788 + 050	40	839 + 350	842 + 950
17	788 + 050	789 + 250	41	842 + 950	850 + 500
18	789 + 250	791 + 450	42	850 + 500	853 + 550
19	791 + 450	794 + 650	43	853 + 550	854 + 600
20	794 + 650	795 + 550	44	854 + 600	863 + 350
21	795 + 550	797 + 350	45	863 + 350	867 + 350
22	797 + 350	799 + 350	46	867 + 350	872 + 750
23	799 + 350	804 + 300	47	872 + 750	886 + 600
24	804 + 300	805 + 200			

4. DISEÑO DE REFUERZO ESTRUCTURAL

4.1. ANÁLISIS DE TRÁFICO

Del estudio de tráfico correspondiente se ha obtenido la información necesaria sobre el tipo de tránsito que circula por esta vía, con el objetivo de cuantificar, clasificar y conocer el volumen de los vehículos que transitan por este tramo de la carretera; información que es indispensable para determinar las características de diseño del pavimento para el presente proyecto.

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El análisis de tráfico, determinó el tránsito actual; sus características y proyecciones para el periodo de vida útil, en número acumulado de repeticiones de carga de ejes equivalentes de 8.2 toneladas, dato necesario para el diseño de la estructura del pavimento. Considerando exclusivamente la acción de los buses B2, B3-1, B4 y camiones C2, C3, C4, 2S2, T2S3, T3S2, T3S3, 2T2, 3T3 dado que el efecto destructivo de los vehículos ligeros se puede considerar prácticamente despreciable.

El estudio de tráfico estableció cinco (05) estaciones de conteo, dividiendo así el tramo en estudio, los cuales se presentan a continuación:

Tabla N° 5: Ubicación de Estaciones de Conteo

Estacion	Nombre	Ubicación
E1	Morrope	Peaje Morrope Panamericana Km 820+800
E2	Mocce	Pesaje Mocce, a 2km del ovalo desvío a Olmos (antigua Panamericana Norte Km 2+100)
E3	Reque	Frente a colegio Diego Ferrer a 200m del desvío a Puerto Etén, Panamericana Norte Km 770+280
E4	Nuevo Mocupe	Paradero municipal de Nuevo Mocupe a 10 metros de la comisaria de Nuevo Mocupe, Panamericana Norte Km 747+804
E5	Ovalo Leguía	A 50 metros del Ovalo Leguía, Panamericana Norte Km 788+750

En las siguientes tablas se muestran el volumen de tráfico correspondiente a las estaciones indicadas previamente; los que transitan diariamente por la zona de estudio.

Tabla N° 6: Distribución por Tipo de Vehículo (IMDa). Estación E1

SENTIDO	B2	B3	B4	C2	C3	C4	T2S2	T2S3	T3S2	T3S3	3T2/2T3	3T3
Ambos Sentidos	46	219	47	110	95	46	6	21	61	322	28	22

Tabla N° 7: Distribución por Tipo de Vehículo (IMDa). Estación E2

SENTIDO	B2	B3	B4	C2	C3	C4	T2S2	T2S3	T3S2	T3S3	3T2/2T3	3T3
Ambos Sentidos	106	308	67	451	193	59	7	30	83	477	44	42

Tabla N° 8: Distribución por Tipo de Vehículo (IMDa). Estación E3

SENTIDO	B2	B3	B4	C2	C3	C4	T2S2	T2S3	T3S2	T3S3	3T2/2T3	3T3
Ambos Sentidos	197	358	126	764	324	64	20	38	130	602	58	35

Tabla N° 9: Distribución por Tipo de Vehículo (IMDa). Estación E4

SENTIDO	B2	B3	B4	C2	C3	C4	T2S2	T2S3	T3S2	T3S3	3T2/2T3	3T3
Ambos Sentidos	179	352	107	469	223	50	12	30	117	626	57	37

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Tabla N° 10: Distribución por Tipo de Vehículo (IMDa). Estación E5

SENTIDO	B2	B3	B4	C2	C3	C4	T2S2	T2S3	T3S2	T3S3	3T2/2T3	3T3
Ambos Sentidos	218	370	83	1074	408	80	12	27	92	651	50	59

En la tabla "Tasas de Crecimiento del Tráfico por Tipo de Vehículo", se muestran las tasas de crecimiento en base a los datos recopilados en las estaciones establecidas en el estudio de tráfico y carga.

Tabla N° 11: Tasas de Crecimiento del Tráfico por tipo de Vehículo

Tipo de vehículo	Tasa (2010-2020)
Vehículos de pasajeros	1.80%
Vehículos de carga	2.50%

4.2. FACTORES CAMIÓN (DESTRUCTIVOS) Y EJES EQUIVALENTES DE CARGA

El cálculo del tráfico de diseño (ESAL) se efectúa a partir del IMD anual del estudio de tráfico corregidos por todos los factores y las tasas de crecimiento igualmente definido en el referido estudio.

Para esto se aplican las ecuaciones generales de AASHTO para calcular los Factores Camión (esto es por iteración, partiendo de valores iniciales de SN y Factores Camión calculados a partir de las ecuaciones simplificadas), con fines de análisis se calcularon los factores camión en base a los pesos del Censo de Pesaje efectuado.

Tabla N° 12: Factores de Carga por Tipo de Vehículos

Tipo de vehículo	Factor destructivo
B2	2.96
B3	2.245
B4	0.352
C2	1.62
C3	2.043
C4	3.029
T2S2	1.048
T2S3	0.602
T3S2	2.968
T3S3	3.03
3T2/2T3	7.03
3T3	3.593

Para el diseño se requiere calcular el número de repeticiones de ejes equivalentes en función de las cargas de tráfico, el factor de crecimiento y el número de años, las fórmulas que se aplicaron para dichos cálculos son las siguientes:

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$$ESAL = \sum_{i=1}^m F_i n_i$$

$$n_i = (n_o)_i (G) (D) (L) (365) (Y)$$

Donde:

ESAL: el número de repeticiones de eje equivalente (18 kips) aplicada en el periodo de diseño.

Fi: factor de daño por cada eje calculado como:

Pavimentos Flexibles AASHTO

$$F_i = \log \left(\frac{W_{18}}{W_i} \right) = 4.79 \log(18+1) - 4.79 \log(L_x + L_2) + 4.33 \log L_2 + \frac{G_i}{\beta_x} - \frac{G_i}{\beta_{18}}$$

$$G_i = \log \left(\frac{4.2 - p_i}{4.2 - 1.5} \right) \quad \beta_x = 0.40 + \frac{0.081(L_x + L_2)^{3.23}}{(SN + 1)^{5.19} L_2^{3.23}}$$

L_x : Carga del eje en kips

L_2 : factor que depende del tipo de eje (1 para eje simple, 2 eje tandem y 3 eje tridem)

p_i : serviciabilidad final,

SN : número estructural,

G : factor de crecimiento del tráfico

D : factor de distribución direccional (D=0.50)

L : factor de distribución por carril (L=1.0).

Y : número de años del periodo de diseño (Y=5, 10 años)

Calculados los FC, mediante la fórmula AASHTO, se calcula el ESAL proyectado.

En los siguientes cuadros se muestra el resumen de los ejes equivalentes de diseño por tipo de vehículo, para dicho cálculo, se utilizó la información brindada por el estudio de tráfico, el cual tiene por finalidad cuantificar, clasificar y determinar el volumen de los vehículos que transitan por el Tramo II: Km. 736+600 – Km. 886+600; información que es indispensable para determinar las características de diseño del pavimento para el presente proyecto.

Tabla N° 13: Cálculo de Esal

Año	E1	E2	E3	E4	E5
2013	7.00E+05	1.17E+06	1.23E+06	1.08E+06	1.80E+06
2014	7.14E+05	1.20E+06	1.26E+06	1.11E+06	1.85E+06
2015	7.32E+05	1.23E+06	1.29E+06	1.13E+06	1.90E+06
2016	7.47E+05	1.25E+06	1.31E+06	1.16E+06	1.92E+06
2017	7.67E+05	1.29E+06	1.35E+06	1.18E+06	1.98E+06
2018	7.85E+05	1.32E+06	1.38E+06	1.21E+06	2.03E+06

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2019	8.02E+05	1.35E+06	1.41E+06	1.24E+06	2.08E+06
2020	8.23E+05	1.38E+06	1.45E+06	1.27E+06	2.13E+06
2021	8.33E+05	1.40E+06	1.48E+06	1.30E+06	2.15E+06

4.3. MÓDULO RESILIENTE (MR)

En base a la sectorización final del tramo indicada en el ítem 3.3.4 se han determinado los módulos resilientes, que se indican a continuación:

Tabla N° 14: Valores de Módulo Resiliente, según sectorización

Sector	De	Hasta	Mr (psi)	Sector	De	Hasta	Mr (psi)
1	736 + 600	742 + 150	32114.98	25	805 + 200	807 + 350	7065.07
2	742 + 150	744 + 400	11559.88	26	807 + 350	812 + 550	10164.29
3	744 + 400	744 + 900	9856.62	27	812 + 550	815 + 300	16436.30
4	744 + 900	746 + 900	32642.36	28	815 + 300	816 + 800	11334.91
5	746 + 900	748 + 150	29969.09	29	816 + 800	820 + 250	24317.24
6	748 + 150	756 + 650	30124.58	30	820 + 250	820 + 750	15234.56
7	756 + 650	758 + 250	48396.59	31	820 + 750	825 + 850	12885.41
8	758 + 250	759 + 150	37436.07	32	825 + 850	827 + 050	7400.24
9	759 + 150	763 + 250	33595.15	33	827 + 050	828 + 900	10458.72
10	763 + 250	769 + 850	18990.41	34	828 + 900	829 + 200	11989.38
11	769 + 850	771 + 050	11544.81	35	829 + 200	830 + 450	11487.72
12	771 + 050	773 + 750	15329.13	36	830 + 450	831 + 750	14995.02
13	773 + 750	779 + 050	12812.73	37	831 + 750	834 + 750	11720.69
14	779 + 050	783 + 250	9405.49	38	834 + 750	835 + 900	14023.97
15	783 + 250	785 + 650	9303.44	39	835 + 900	839 + 350	10140.88
16	785 + 650	788 + 050	11372.47	40	839 + 350	842 + 950	14671.33
17	788 + 050	789 + 250	16552.20	41	842 + 950	850 + 500	28169.94
18	789 + 250	791 + 450	13029.64	42	850 + 500	853 + 550	13946.77
19	791 + 450	794 + 650	9232.76	43	853 + 550	854 + 600	26220.97
20	794 + 650	795 + 550	11462.93	44	854 + 600	863 + 350	12613.41
21	795 + 550	797 + 350	6078.00	45	863 + 350	867 + 350	7808.71
22	797 + 350	799 + 350	12954.40	46	867 + 350	872 + 750	18418.16
23	799 + 350	804 + 300	8889.14	47	872 + 750	886 + 600	9634.83
24	804 + 300	805 + 200	10726.43				

*Obtenido de retrocálculo (2013)

4.4. NÚMERO ESTRUCTURAL EFECTIVO (SN efectivo)

En base a la sectorización final del tramo se han determinados los números estructurales que se indican a continuación:

Tabla N° 15: Valores de SN efectivo, según sectorización

Sector	De	Hasta	SN efectivo 2013	Sector	De	Hasta	SN efectivo 2013
1	736 + 600	742 + 150	5.00	4	744 + 900	746 + 900	5.80
2	742 + 150	744 + 400	3.98	5	746 + 900	748 + 150	6.30
3	744 + 400	744 + 900	4.71	6	748 + 150	756 + 650	6.16

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Sector	De	Hasta	SN efectivo 2013
7	756 + 650	758 + 250	5.12
8	758 + 250	759 + 150	4.79
9	759 + 150	763 + 250	4.34
10	763 + 250	769 + 850	4.38
11	769 + 850	771 + 050	3.70
12	771 + 050	773 + 750	3.56
13	773 + 750	779 + 050	4.26
14	779 + 050	783 + 250	3.19
15	783 + 250	785 + 650	3.94
16	785 + 650	788 + 050	3.60
17	788 + 050	789 + 250	4.32
18	789 + 250	791 + 450	4.99
19	791 + 450	794 + 650	3.48
20	794 + 650	795 + 550	3.33
21	795 + 550	797 + 350	2.70
22	797 + 350	799 + 350	3.91
23	799 + 350	804 + 300	3.01
24	804 + 300	805 + 200	3.62
25	805 + 200	807 + 350	2.62
26	807 + 350	812 + 550	2.85
27	812 + 550	815 + 300	3.51

Sector	De	Hasta	SN efectivo 2013
28	815 + 300	816 + 800	4.32
29	816 + 800	820 + 250	5.48
30	820 + 250	820 + 750	4.76
31	820 + 750	825 + 850	4.14
32	825 + 850	827 + 050	3.08
33	827 + 050	828 + 900	3.00
34	828 + 900	829 + 200	2.88
35	829 + 200	830 + 450	3.58
36	830 + 450	831 + 750	3.64
37	831 + 750	834 + 750	3.52
38	834 + 750	835 + 900	3.82
39	835 + 900	839 + 350	3.83
40	839 + 350	842 + 950	3.88
41	842 + 950	850 + 500	4.53
42	850 + 500	853 + 550	3.65
43	853 + 550	854 + 600	3.96
44	854 + 600	863 + 350	2.92
45	863 + 350	867 + 350	2.24
46	867 + 350	872 + 750	3.54
47	872 + 750	886 + 600	3.47

*Obtenido de retrocálculo (2013)

4.5. NÚMERO ESTRUCTURAL REQUERIDO (SN requerido)

Para el cálculo se necesita conocer los parámetros que exige la metodología AASHTO 93 que se indican a continuación:

a) Confiabilidad (Desviación Estándar Normal)

Básicamente, es una forma de incorporar cierto grado de certeza en el proceso de diseño, para garantizar que la sección del pavimento proyectado se comportará satisfactoriamente bajo las condiciones de tráfico y medio ambiente durante el periodo de diseño, esto dependen de la importancia de la vía, los valores fluctúan entre 50% para vías locales a 99.9% en vías nacionales, tal como se aprecia en la siguiente tabla.

Tabla N° 16: Valores de confiabilidad (Tabla 2.2 de la Guía de diseño AASHTO 1993)

Clasificación	Niveles de Confiabilidad Recomendado	
	Urbana	Rural
Autopistas interestatales y otras	85 – 99.9	80 – 99.9
Arterias Principales	80 - 99	75 – 95
Colectoras de Tránsito	80 - 95	75 – 95
Carreteras Locales	50 - 80	50 - 80

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En la siguiente tabla, se muestra los valores de Desviación Standard Normal que se adopta en base al Nivel de Confianza, según la Guía de Diseño AASHTO.

Tabla N° 17: Valores de Desviación Estándar Normal

Niveles de Confianza	Desviación Estándar Normal
60	-0.253
-	-
95	-1.645
96	-1.751
97	-1.881
98	-2.054
99	-2.327
99.9	-3.090

La confiabilidad considerada en la verificación del diseño es de 95% para un periodo de 5 años.

b) Desviación Estándar Total (So).

Es la desviación estándar de la población de valores obtenidos por AASHTO, varía de 0.40 a 0.50 para pavimentos flexibles.

Para la presente verificación la desviación estándar considerada es de 0.42.

c) Variación del Índice de Serviciabilidad

La Serviciabilidad es un parámetro que relaciona la condición funcional con la condición estructural de la vía. El Índice de Serviciabilidad Presente (PSI), varía de 0 (carretera imposible) hasta 5 (carretera perfecta). En el ensayo AASHTO, se obtuvo una Serviciabilidad inicial (Po) de 4.2 para pavimentos flexibles y el índice de Serviciabilidad más bajo (Pt) es de 2.0, que puede tolerarse antes de que sea necesario un refuerzo o una rehabilitación para las carreteras.

A fin de profundizar el análisis se ha realizado una evaluación integral de la guía en este acápite, verificándose que sugiere emplear un PSI final mínimo de 2.5 para vías como las que nos ocupa, por lo que en nuestro caso concordante con este criterio se define

$$\text{PSI inicial} = 4.2$$

$$\text{PSI Final} = 2.0$$

$$\Delta \text{PSI} = 2.2$$

d) Periodo de Diseño

El periodo de diseño para la presente verificación es de 5 años.

e) Coeficiente de Aporte Estructural

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El coeficiente estructural de la carpeta asfáltica fue estimada a partir de las correlaciones que la guía de diseño, el cual es presentada en la figura N°6:

Figura N° 6: Coeficiente de aporte estructural de la Carpeta asfáltica.

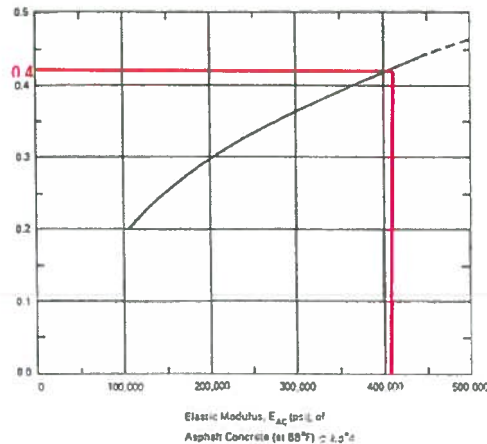


Tabla N° 18: Coeficiente Estructural de la carpeta asfáltica en el pavimento nuevo

Capa	Mr (psi)	Coef. Estruct
Carpeta Asfáltica	420,000	0.42/pulg

f) Fórmula AASHTO 93

Para poder calcular el valor del SN requerido, hay que conocer los parámetros anteriormente ya mencionados y la siguiente fórmula:

$$\log W_{18} = Z_R S_o + 9.36 \log(SN + 1) - 0.20 + \frac{\log\left(\frac{\Delta PSI}{4.2 - 1.5}\right)}{0.40 + \frac{1094}{(SN + 1)^{5.19}}} + 2.32 \log(M_R) - 8.07$$

Donde:

- W_{18} : Número de repeticiones de eje equivalente (ESAL)
- Z_R : confiabilidad
- S_o : desviación estándar
- SN : número estructural
- ΔPSI : Pérdida de Serviciabilidad
- M_R : Módulo resiliente de la subrasante

Tabla N° 19: Número Estructural Requerido, según sectorización

Sector	De	Hasta	SN Requerido Año 5
1	736 + 600	742 + 150	2.53
2	742 + 150	744 + 400	3.62

Sector	De	Hasta	SN Requerido Año 5
3	744 + 400	744 + 900	3.82
4	744 + 900	746 + 900	2.51

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Sector	De	Hasta	SN Requerido Año 5
5	746 + 900	748 + 150	2.59
6	748 + 150	756 + 650	2.59
7	756 + 650	758 + 250	2.17
8	758 + 250	759 + 150	2.39
9	759 + 150	763 + 250	2.49
10	763 + 250	769 + 850	3.05
11	769 + 850	771 + 050	3.91
12	771 + 050	773 + 750	3.55
13	773 + 750	779 + 050	3.77
14	779 + 050	783 + 250	4.18
15	783 + 250	785 + 650	4.20
16	785 + 650	788 + 050	3.93
17	788 + 050	789 + 250	3.46
18	789 + 250	791 + 450	3.78
19	791 + 450	794 + 650	4.23
20	794 + 650	795 + 550	3.94
21	795 + 550	797 + 350	4.76
22	797 + 350	799 + 350	3.71
23	799 + 350	804 + 300	4.52
24	804 + 300	805 + 200	4.26
25	805 + 200	807 + 350	4.86
26	807 + 350	812 + 550	4.33
27	812 + 550	815 + 300	3.69

Sector	De	Hasta	SN Requerido Año 5
28	815 + 300	816 + 800	4.18
29	816 + 800	820 + 250	3.23
30	820 + 250	820 + 750	3.79
31	820 + 750	825 + 850	4.01
32	825 + 850	827 + 050	4.79
33	827 + 050	828 + 900	4.29
34	828 + 900	829 + 200	4.10
35	829 + 200	830 + 450	4.16
36	830 + 450	831 + 750	3.81
37	831 + 750	834 + 750	4.13
38	834 + 750	835 + 900	3.89
39	835 + 900	839 + 350	4.33
40	839 + 350	842 + 950	3.84
41	842 + 950	850 + 500	3.06
42	850 + 500	853 + 550	3.90
43	853 + 550	854 + 600	3.14
44	854 + 600	863 + 350	4.03
45	863 + 350	867 + 350	4.71
46	867 + 350	872 + 750	3.55
47	872 + 750	886 + 600	4.41

4.6. REFUERZO ESTRUCTURAL

Para obtener el refuerzo adicional respecto al definido por el estudio de mantenimiento, al número estructural remanente ($SN_{Rem\ 2014}$) se le resta el espesor a fresar en cada sector, obteniéndose el número estructural fresado ($SN_{Fresado\ 2014}$).

Luego, la diferencia del $SN_{Req\ 2014-2018}$ y el $SN_{Fresado\ 2014}$ entre el coeficiente de aporte estructural de la carpeta asfáltica (0.42) nos proporciona el espesor estructural necesario en pulgadas; a este valor se le resta el definido en cada sector obteniéndose el refuerzo adicional para cada caso.

Para el cálculo se aplica la siguiente expresión:

$$D_{01} = \frac{SN_{01}}{a_{01}} = \frac{SN_{2014-2018} - SN_{Fresado}}{a_{01}}$$

Donde:

SN_{01} = Numero estructural requerido para el periodo de 5 años (2014-2018)

a_{01} = Coeficiente estructural para recapeo de concreto asfáltico, es igual a 0.42

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D_{01} = Espesor requerido de recapeo.

$SN_{REQ\ 2014-2018}$ = Número estructural requerido para el transito futuro periodo 0-5 años.

$SN_{Fresado}$ = Número Estructural Remanente del periodo 0 - 5 años.

Los resultados obtenidos se indican a continuación:

Tabla N° 20 Calculo de espesores de refuerzo adicional

Sector	De	Hasta	Mr (psi)	SN Requerido Año 5	Refuerzo necesario AÑO 5 (pulg)	Refuerzo requerido adicional (pulg)	Espesores Constructivos adicionales 2013
1	736 + 600	742 + 150	32114.98	2.53	-5.79	0.0	0.0
2	742 + 150	744 + 400	11559.88	3.62	-0.67	0.0	0.0
3	744 + 400	744 + 900	9856.62	3.82	-1.97	0.0	0.0
4	744 + 900	746 + 900	32642.36	2.51	-7.70	0.0	0.0
5	746 + 900	748 + 150	29969.09	2.59	-8.70	0.0	0.0
6	748 + 150	756 + 650	30124.58	2.59	-8.37	0.0	0.0
7	756 + 650	758 + 250	48396.59	2.17	-6.91	0.0	0.0
8	758 + 250	759 + 150	37436.07	2.39	-5.62	0.0	0.0
9	759 + 150	763 + 250	33595.15	2.49	-4.33	0.0	0.0
10	763 + 250	769 + 850	18990.41	3.05	-3.06	0.0	0.0
11	769 + 850	771 + 050	11544.81	3.91	0.86	0.9	1.0
12	771 + 050	773 + 750	15329.13	3.55	0.23	0.2	0.0
13	773 + 750	779 + 050	12812.73	3.77	-1.01	0.0	0.0
14	779 + 050	783 + 250	9405.49	4.18	3.57	1.6	1.5
15	783 + 250	785 + 650	9303.44	4.20	0.99	0.0	0.0
16	785 + 650	788 + 050	11372.47	3.93	1.20	0.0	0.0
17	788 + 050	789 + 250	16552.20	3.46	-1.92	0.0	0.0
18	789 + 250	791 + 450	13029.64	3.78	-2.75	0.0	0.0
19	791 + 450	794 + 650	9232.76	4.23	2.85	0.3	0.0
20	794 + 650	795 + 550	11462.93	3.94	2.23	0.2	0.0
21	795 + 550	797 + 350	6078.00	4.76	5.28	2.3	2.0
22	797 + 350	799 + 350	12954.40	3.71	-0.27	0.0	0.0
23	799 + 350	804 + 300	8889.14	4.52	4.33	2.3	2.0
24	804 + 300	805 + 200	10726.43	4.26	2.29	1.3	1.0

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Sector	De	Hasta	Mr (psi)	SN Requerido Año 5	Refuerzo necesario AÑO 5 (pulg)	Refuerzo requerido adicional (pulg)	Espesores Constructivos adicionales 2013
25	805 + 200	807 + 350	7065.07	4.86	5.60	3.1	3.0
26	807 + 350	812 + 550	10164.29	4.33	4.21	2.7	2.5
27	812 + 550	815 + 300	16436.30	3.69	0.76	0.0	0.0
28	815 + 300	816 + 800	11334.91	4.18	-0.10	0.0	0.0
29	816 + 800	820 + 250	24317.24	3.23	-5.24	0.0	0.0
30	820 + 250	820 + 750	15234.56	3.79	-2.17	0.0	0.0
31	820 + 750	825 + 850	12885.41	4.01	-0.08	0.0	0.0
32	825 + 850	827 + 050	7400.24	4.79	4.82	2.8	2.5
33	827 + 050	828 + 900	10458.72	4.29	3.79	1.8	1.5
34	828 + 900	829 + 200	11989.38	4.10	3.60	1.1	1.0
35	829 + 200	830 + 450	11487.72	4.16	2.07	0.6	0.5
36	830 + 450	831 + 750	14995.02	3.81	0.74	0.0	0.0
37	831 + 750	834 + 750	11720.69	4.13	2.22	1.2	1.0
38	834 + 750	835 + 900	14023.97	3.89	0.49	0.5	0.5
39	835 + 900	839 + 350	10140.88	4.33	1.77	0.3	0.0
40	839 + 350	842 + 950	14671.33	3.84	0.16	0.0	0.0
41	842 + 950	850 + 500	28169.94	3.06	-3.39	0.0	0.0
42	850 + 500	853 + 550	13946.77	3.90	0.99	0.0	0.0
43	853 + 550	854 + 600	26220.97	3.14	-1.82	0.0	0.0
44	854 + 600	863 + 350	12613.41	4.03	3.35	1.9	2.0
45	863 + 350	867 + 350	7808.71	4.71	6.15	3.2	3.0
46	867 + 350	872 + 750	18418.16	3.55	0.53	0.0	0.0
47	872 + 750	886 + 600	9634.83	4.41	4.12	3.1	3.0

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5. CONCLUSIONES

- La condición estructural del pavimento, fue evaluado mediante el empleo del Deflectómetro de Impacto (FWD por sus siglas en ingles Falling Weigth Deflectometer).
- El trabajo de campo consistió en realizar la medición de las deflexiones con el Deflectómetro de Impacto (FWD), cada 250 metros en cada carril, desfasados en 125 metros entre carriles.
- El cálculo del tráfico de diseño (ESAL) se efectúa a partir del IMD anual del estudio de tráfico corregidos por todos los factores y las tasas de crecimiento igualmente definido en el referido estudio. Para esto se aplican las ecuaciones generales de AASHTO para calcular los Factores Camión (esto es por iteración, partiendo de valores iniciales de SN y Factores Camión calculados a partir de las ecuaciones simplificadas)
- El módulo resiliente de la subrasante se calculó de acuerdo al procedimiento sugerido en la Guía AASHTO 93 (Retrocálculo), el cual fue afectado con el Factor de corrección $C=0.62$ para el caso de una subrasante debajo de un pavimento con presencia de base y/o sub base.
- El valor del factor $C=0.62$ empleado en el retrocálculo y el ΔPSI de 2.2, son correspondientes con los valores empleados en el expediente de Mantenimiento Periódico del tramo en evaluación, los mismos que han sido evaluados y aprobados por PVN.
- En lo referente a la colocación del base granular y complementariamente a lo establecido en las E.T. se indica que la extensión de la misma podrá efectuarse además de con terminadora mecánica con otro equipos debiendo estos ser verificados por la supervisión antes de su empleo.
- La adición del Pavimento Asfáltico Recuperado (RAP) a la berma, se efectuará previa escarificación de la misma y posterior compactación. El espesor de RAP de adición será variable de 7.0 a 10.0 cm y su tamaño máximo será de 1.0".
- El número estructural efectivo del pavimento (SNefect) fue también calculado de acuerdo a las recomendaciones de la Guía AASHTO 93 para el retrocálculo.
- Se calculo los refuerzos estructurales adicionales a los establecidos en el estudio de mantenimiento periódico de la carretera: Panamericana Norte Tramo II:

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1	736 + 600	742 + 150	32114.98	2.53	-5.79	0.0	0.0	1.0
2	742 + 150	744 + 400	11559.88	3.62	-0.67	0.0	0.0	1.0
3	744 + 400	744 + 900	9856.62	3.82	-1.97	0.0	0.0	1.5
4	744 + 900	746 + 900	32642.36	2.51	-7.70	0.0	0.0	0.0
5	746 + 900	748 + 150	29969.09	2.59	-8.70	0.0	0.0	0.0
6	748 + 150	756 + 650	30124.58	2.59	-8.37	0.0	0.0	0.0
7	756 + 650	758 + 250	48396.59	2.17	-6.91	0.0	0.0	1.0
8	758 + 250	759 + 150	37436.07	2.39	-5.62	0.0	0.0	1.0
9	759 + 150	763 + 250	33595.15	2.49	-4.33	0.0	0.0	1.0
10	763 + 250	769 + 850	18990.41	3.05	-3.06	0.0	0.0	0.0
11	769 + 850	771 + 050	11544.81	3.91	0.86	0.9	1.0	1.0
12	771 + 050	773 + 750	15329.13	3.55	0.23	0.2	0.0	0.0
13	773 + 750	779 + 050	12812.73	3.77	-1.01	0.0	0.0	0.0
14	779 + 050	783 + 250	9405.49	4.18	3.57	1.6	1.5	3.5
15	783 + 250	785 + 650	9303.44	4.20	0.99	0.0	0.0	2.0
16	785 + 650	788 + 050	11372.47	3.93	1.20	0.0	0.0	2.5
17	788 + 050	789 + 250	16552.20	3.46	-1.92	0.0	0.0	0.0
18	789 + 250	791 + 450	13029.64	3.78	-2.75	0.0	0.0	0.0
19	791 + 450	794 + 650	9232.76	4.23	2.85	0.3	0.0	2.5
20	794 + 650	795 + 550	11462.93	3.94	2.23	0.2	0.0	2.0
21	795 + 550	797 + 350	6078.00	4.76	5.28	2.3	2.0	5.0
22	797 + 350	799 + 350	12954.40	3.71	-0.27	0.0	0.0	2.0
23	799 + 350	804 + 300	8889.14	4.52	4.33	2.3	2.0	4.0
24	804 + 300	805 + 200	10726.43	4.26	2.29	1.3	1.0	2.0
25	805 + 200	807 + 350	7065.07	4.86	5.60	3.1	3.0	5.5
26	807 + 350	812 + 550	10164.29	4.33	4.21	2.7	2.5	4.0
27	812 + 550	815 + 300	16436.30	3.69	0.76	0.0	0.0	1.0
28	815 + 300	816 + 800	11334.91	4.18	-0.10	0.0	0.0	0.0
29	816 + 800	820 + 250	24317.24	3.23	-5.24	0.0	0.0	0.0

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Sector	De	Hasta	Mr (psi)	SN Requerido Año 5	Refuerzo necesario AÑO 5 (pulg)	Refuerzo requerido adicional (pulg)	Espesores Constructivos adicionales 2013	Espesores Constructivos totales 2013
30	820 + 250	820 + 750	15234.56	3.79	-2.17	0.0	0.0	0.0
31	820 + 750	825 + 850	12885.41	4.01	-0.08	0.0	0.0	1.0
32	825 + 850	827 + 050	7400.24	4.79	4.82	2.8	2.5	4.5
33	827 + 050	828 + 900	10458.72	4.29	3.79	1.8	1.5	3.5
34	828 + 900	829 + 200	11989.38	4.10	3.60	1.1	1.0	3.5
35	829 + 200	830 + 450	11487.72	4.16	2.07	0.6	0.5	2.0
36	830 + 450	831 + 750	14995.02	3.81	0.74	0.0	0.0	1.0
37	831 + 750	834 + 750	11720.69	4.13	2.22	1.2	1.0	2.0
38	834 + 750	835 + 900	14023.97	3.89	0.49	0.5	0.5	0.5
39	835 + 900	839 + 350	10140.88	4.33	1.77	0.3	0.0	1.5
40	839 + 350	842 + 950	14671.33	3.84	0.16	0.0	0.0	1.0
41	842 + 950	850 + 500	28169.94	3.06	-3.39	0.0	0.0	0.0
42	850 + 500	853 + 550	13946.77	3.90	0.99	0.0	0.0	1.5
43	853 + 550	854 + 600	26220.97	3.14	-1.82	0.0	0.0	1.0
44	854 + 600	863 + 350	12613.41	4.03	3.35	1.9	2.0	3.5
45	863 + 350	867 + 350	7808.71	4.71	6.15	3.2	3.0	6.0
46	867 + 350	872 + 750	18418.16	3.55	0.53	0.0	0.0	1.0
47	872 + 750	886 + 600	9634.83	4.41	4.12	3.1	3.0	4.0

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181154-66-INF-003 Revisión: 1	ESTUDIO DEFINITIVO REHABILITACIÓN DE LA CARRETERA PANAMERICANA NORTE, TRAMO KM 557+600 – KM 886+600 TRAMO II: KM. 736+600 – KM. 886+600 CALCULO DEL REFUERZO ESTRUCTURAL	Fecha: 03/12/2013
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ANEXO A

CÁLCULO DE REFUERZO ESTRUCTURAL

181154-66-INF-003	ESTUDIO DEFINITIVO REHABILITACIÓN DE LA CARRETERA PANAMERICANA NORTE, TRAMO KM 557+600 – KM 886+600 TRAMO II: KM. 736+600 – KM. 886+600 CALCULO DEL REFUERZO ESTRUCTURAL	Fecha: 03/12/2013
Revisión: 1		



Sector	De	Hasta	Mr (psi)	Fresado (pulg.)	Reposición con MAC (pulg.)	Refuerzo estructural o funcional (pulg.)	Sobrecapa (pulg.)	SN efectivo 2013	SN remanente 2014	SN Requerido Año 5	OBSERVACION	SN luego de fresar	Refuerzo necesario ANO 5 (pulg.)	Refuerzo requerido adicional (pulg.)	Espesores Constructivos 2013
1	736 + 600	742 + 150	32114.98	0.00	0.00	1.0	1.00	5.00	4.96	2.53	NO REQUIERE REFUERZO	4.96	0.00	0.0	0.0
2	742 + 150	744 + 400	11559.88	0.00	0.00	1.0	1.00	3.98	3.90	3.62	NO REQUIERE REFUERZO	3.90	0.00	0.0	0.0
3	744 + 400	744 + 900	9856.62	0.00	0.00	1.5	1.50	4.71	4.65	3.82	NO REQUIERE REFUERZO	4.65	0.00	0.0	0.0
4	744 + 900	746 + 900	32642.36	0.00	0.00	0.00	0.00	5.80	5.75	2.51	NO REQUIERE REFUERZO	5.75	0.00	0.0	0.0
5	746 + 900	748 + 150	29969.09	0.00	0.00	0.00	0.00	6.30	6.25	2.59	NO REQUIERE REFUERZO	6.25	0.00	0.0	0.0
6	748 + 150	756 + 650	30124.58	0.00	0.00	0.00	0.00	6.16	6.10	2.59	NO REQUIERE REFUERZO	6.10	0.00	0.0	0.0
7	756 + 650	758 + 250	48396.59	0.00	0.00	1.0	1.00	5.12	5.08	2.17	NO REQUIERE REFUERZO	5.08	0.00	0.0	0.0
8	758 + 250	759 + 150	37436.07	0.00	0.00	1.0	1.00	4.79	4.75	2.39	NO REQUIERE REFUERZO	4.75	0.00	0.0	0.0
9	759 + 150	763 + 250	33595.15	0.00	0.00	1.0	1.00	4.34	4.30	2.49	NO REQUIERE REFUERZO	4.30	0.00	0.0	0.0
10	763 + 250	769 + 850	18990.41	0.00	0.00	0.00	0.00	4.38	4.34	3.05	NO REQUIERE REFUERZO	4.34	0.00	0.0	0.0
11	769 + 850	771 + 050	11544.81	0.00	0.00	0.00	0.00	3.70	3.55	3.91	SI REQUIERE REFUERZO	3.55	0.86	0.9	1.0
12	771 + 050	773 + 750	15329.13	0.00	0.00	0.00	0.00	3.56	3.45	3.55	SI REQUIERE REFUERZO	3.45	0.23	0.2	0.0
13	773 + 750	779 + 050	12812.73	0.00	0.00	0.00	0.00	4.26	4.19	3.77	NO REQUIERE REFUERZO	4.19	0.00	0.0	0.0
14	779 + 050	783 + 250	9405.49	0.00	0.00	2.0	2.00	3.19	2.68	4.18	SI REQUIERE REFUERZO	2.68	3.57	1.6	1.5
15	783 + 250	785 + 650	9303.44	0.00	0.00	2.0	2.00	3.94	3.78	4.20	SI REQUIERE REFUERZO	3.78	0.99	0.0	0.0
16	785 + 650	788 + 050	11372.47	0.00	0.00	2.5	2.45	3.60	3.42	3.93	SI REQUIERE REFUERZO	3.42	1.20	0.0	0.0

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Revisión: 1	CALCULO DEL REFUERZO ESTRUCTURAL	



Sector	De	Hasta	Mr (psi)	Fresado (pulg)	Reposición con MAC (pulg)	Refuerzo estructural o funcional (pulg)	Sobrecapa (pulg.)	SN efectivo 2013	SN remanente 2014	Δ	SN Requerido Año 5	OBSERVACION	SN luego de fresar	Refuerzo necesario ANO 5 (pulg)	Refuerzo requerido adicional (pulg)	Espesores Constructivos 2013
17	788 + 050	789 + 250	16552.20	0.00	0.00	0.00	0.00	4.32	4.26	0.05	3.46	NO REQUIERE REFUERZO	4.26	0.00	0.0	0.0
18	789 + 250	791 + 450	13029.64	0.00	0.00	0.00	0.00	4.99	4.93	0.06	3.78	NO REQUIERE REFUERZO	4.93	0.00	0.0	0.0
19	791 + 450	794 + 650	9232.76	0.00	0.00	2.5	2.50	3.48	3.04	0.44	4.23	SI REQUIERE REFUERZO	3.04	2.85	0.3	0.0
20	794 + 650	795 + 550	11462.93	0.00	0.00	2.0	2.00	3.33	3.01	0.32	3.94	SI REQUIERE REFUERZO	3.01	2.23	0.2	0.0
21	795 + 550	797 + 350	6078.00	0.00	0.00	3.0	3.00	2.70	2.54	0.16	4.76	SI REQUIERE REFUERZO	2.54	5.28	2.3	2.0
22	797 + 350	799 + 350	12954.40	0.00	0.00	2.0	2.00	3.91	3.82	0.09	3.71	NO REQUIERE REFUERZO	3.82	0.00	0.0	0.0
23	799 + 350	804 + 300	8889.14	0.00	0.00	2.0	2.00	3.01	2.70	0.30	4.52	SI REQUIERE REFUERZO	2.70	4.33	2.3	2.0
24	804 + 300	805 + 200	10726.43	0.00	0.00	1.0	1.00	3.62	3.29	0.32	4.26	SI REQUIERE REFUERZO	3.29	2.29	1.3	1.0
25	805 + 200	807 + 350	7065.07	0.00	0.00	2.5	2.51	2.62	2.51	0.10	4.86	SI REQUIERE REFUERZO	2.51	5.60	3.1	3.0
26	807 + 350	812 + 550	10164.29	0.00	0.00	1.5	1.50	2.85	2.56	0.28	4.33	SI REQUIERE REFUERZO	2.56	4.21	2.7	2.5
27	812 + 550	815 + 300	16436.30	0.00	0.00	1.0	1.00	3.51	3.37	0.14	3.69	SI REQUIERE REFUERZO	3.37	0.76	0.0	0.0
28	815 + 300	816 + 800	11334.91	0.00	0.00	0.00	0.00	4.32	4.22	0.10	4.18	NO REQUIERE REFUERZO	4.22	0.00	0.0	0.0
29	816 + 800	820 + 250	24317.24	0.00	0.00	0.00	0.00	5.48	5.43	0.05	3.23	NO REQUIERE REFUERZO	5.43	0.00	0.0	0.0
30	820 + 250	820 + 750	15234.56	0.00	0.00	0.00	0.00	4.76	4.70	0.06	3.79	NO REQUIERE REFUERZO	4.70	0.00	0.0	0.0
31	820 + 750	825 + 850	12885.41	0.00	0.00	1.0	1.00	4.14	4.04	0.10	4.01	NO REQUIERE REFUERZO	4.04	0.00	0.0	0.0
32	825 + 850	827 + 050	7400.24	0.00	0.00	2.0	2.00	3.08	2.77	0.31	4.79	SI REQUIERE REFUERZO	2.77	4.82	2.8	2.5
33	827 + 050	828 + 900	10458.72	0.00	0.00	2.0	2.00	3.00	2.70	0.30	4.29	SI REQUIERE REFUERZO	2.70	3.79	1.8	1.5

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Revisión: 1	CALCULO DEL REFUERZO ESTRUCTURAL	



Sector	De	Hasta	Mr (psi)	Fresado (pulg)	Reposición con MAC (pulg)	Refuerzo estructural o funcional (pulg)	Sobrecapa (pulg.)	SN efectivo 2013	SN remanente 2014	Δ	SN Requerido Año 5	OBSERVACION	SN luego de fresar	Refuerzo necesario ANO 5 (pulg)	Refuerzo requerido adicional (pulg)	Espesores Constructivos 2013
34	828 + 900	829 + 200	11989.38	0.00	0.00	2.5	2.49	2.88	2.59	0.29	4.10	SI REQUIERE REFUERZO	2.59	3.60	1.1	1.0
35	829 + 200	830 + 450	11487.72	0.00	0.00	1.5	1.50	3.58	3.29	0.29	4.16	SI REQUIERE REFUERZO	3.29	2.07	0.6	0.5
36	830 + 450	831 + 750	14995.02	0.00	0.00	1.0	1.00	3.64	3.50	0.14	3.81	SI REQUIERE REFUERZO	3.50	0.74	0.0	0.0
37	831 + 750	834 + 750	11720.69	0.00	0.00	1.0	1.00	3.52	3.20	0.32	4.13	SI REQUIERE REFUERZO	3.20	2.22	1.2	1.0
38	834 + 750	835 + 900	14023.97	0.00	0.00	0.00	0.00	3.82	3.69	0.13	3.89	SI REQUIERE REFUERZO	3.69	0.49	0.5	0.5
39	835 + 900	839 + 350	10140.88	0.00	0.00	1.5	1.50	3.83	3.59	0.24	4.33	SI REQUIERE REFUERZO	3.59	1.77	0.3	0.0
40	839 + 350	842 + 950	14671.33	0.00	0.00	1.0	1.00	3.88	3.77	0.11	3.84	SI REQUIERE REFUERZO	3.77	0.16	0.0	0.0
41	842 + 950	850 + 500	28169.94	0.00	0.00	0.00	0.00	4.53	4.49	0.05	3.06	NO REQUIERE REFUERZO	4.49	0.00	0.0	0.0
42	850 + 500	853 + 550	13946.77	0.00	0.00	1.5	1.50	3.65	3.48	0.16	3.90	SI REQUIERE REFUERZO	3.48	0.99	0.0	0.0
43	853 + 550	854 + 600	26220.97	0.00	0.00	1.0	1.00	3.96	3.91	0.05	3.14	NO REQUIERE REFUERZO	3.91	0.00	0.0	0.0
44	854 + 600	863 + 350	12613.41	0.00	0.00	1.5	1.50	2.92	2.63	0.29	4.03	SI REQUIERE REFUERZO	2.63	3.35	1.9	2.0
45	863 + 350	867 + 350	7808.71	0.00	0.00	3.0	3.00	2.24	2.13	0.11	4.71	SI REQUIERE REFUERZO	2.13	6.15	3.2	3.0
46	867 + 350	872 + 750	18418.16	0.00	0.00	1.0	1.00	3.45	3.33	0.12	3.55	SI REQUIERE REFUERZO	3.33	0.53	0.0	0.0
47	872 + 750	886 + 600	9634.88	0.00	0.00	1.0	1.00	2.82	2.68	0.14	4.41	SI REQUIERE REFUERZO	2.68	4.12	3.1	3.0

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181154-66-INF-003



ANEXO B

MEDICIONES DE DEFLEXIONES

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)									
181154										
										 181154-70-LABC-33

STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	DERECHO	EQUIPO:	FWD KUAB

Prog	Distancia	Carga	D0	D1	D2	D3	D4	D5	D6	Temp	Espesor (cm)	Base + Sub base	A Temp	A Carga	D max (FWD)	a _v	M _R	E Pav	SN Elevat	D max (VB)
	Km	KN	µm	µm	µm	µm	µm	µm	µm	°C					µm	cm	Psi	Psi		
736+500	0.00	40.00	217.00	161.00	127.00	88.00	65.00	40.00	26.00	23.40	10.0	40.0	0.96	1.00	208.7	54.1	10,817	114,450	4.30	33.61
736+750	0.25	40.00	136.00	98.00	80.00	60.00	47.00	32.00	23.00	23.80	10.0	40.0	0.96	1.00	130.2	58.0	15,880	208,053	5.25	20.97
737+000	0.25	40.00	146.00	100.00	79.00	59.00	48.00	33.00	24.00	23.90	10.0	40.0	0.96	1.00	139.6	56.2	15,826	187,968	5.07	22.48
737+250	0.25	40.00	146.00	102.00	80.00	59.00	44.00	30.00	21.00	23.80	10.0	40.0	0.96	1.00	139.8	54.6	16,352	177,886	4.98	22.51
737+500	0.25	40.00	132.00	93.00	74.00	55.00	45.00	30.00	22.00	24.00	10.0	40.0	0.96	1.00	126.1	56.9	17,041	211,069	5.27	20.30
737+750	0.25	40.00	97.00	67.00	53.00	38.00	30.00	22.00	17.00	23.50	10.0	40.0	0.96	1.00	93.2	54.7	24,911	272,414	5.74	15.01
738+000	0.25	40.00	165.00	123.00	100.00	76.00	62.00	42.00	31.00	23.80	10.0	40.0	0.96	1.00	158.0	60.1	12,364	180,852	5.01	25.44
738+250	0.25	40.00	119.00	78.00	65.00	50.00	41.00	29.00	21.00	24.00	10.0	40.0	0.96	1.00	113.7	57.8	18,471	240,292	5.51	18.30
738+500	0.25	40.00	134.00	91.00	71.00	52.00	40.00	30.00	22.00	24.30	10.0	40.0	0.95	1.00	127.6	54.7	18,197	198,841	5.17	20.54
738+750	0.25	40.00	157.00	114.00	93.00	71.00	57.00	40.00	30.00	23.60	10.0	40.0	0.96	1.00	150.7	59.3	13,296	166,738	5.06	24.26
739+000	0.25	40.00	150.00	110.00	88.00	63.00	48.00	31.00	23.00	23.10	10.0	40.0	0.97	1.00	144.8	55.2	15,431	173,317	4.94	23.31
739+250	0.25	40.00	126.00	90.00	74.00	56.00	46.00	33.00	25.00	22.60	10.0	40.0	0.97	1.00	122.3	59.1	16,558	229,864	5.43	19.70
739+500	0.25	40.00	168.00	126.00	102.00	75.00	57.00	36.00	24.00	22.70	10.0	40.0	0.97	1.00	162.9	57.0	12,839	159,612	4.81	26.23
739+750	0.25	40.00	133.00	95.00	75.00	54.00	42.00	28.00	20.00	22.30	10.0	40.0	0.97	1.00	129.6	54.8	17,570	193,411	5.12	20.86
740+000	0.25	40.00	112.00	75.00	58.00	43.00	33.00	23.00	16.00	22.40	10.0	40.0	0.97	1.00	109.0	53.5	22,012	224,409	5.38	17.55
740+250	0.25	40.00	116.00	72.00	56.00	40.00	31.00	21.00	15.00	22.00	10.0	40.0	0.98	1.00	113.4	50.5	23,481	200,493	5.18	18.26
740+500	0.25	40.00	184.00	128.00	96.00	65.00	48.00	31.00	23.00	22.40	10.0	40.0	0.97	1.00	179.1	50.2	14,640	122,538	4.40	28.83
740+750	0.25	40.00	167.00	119.00	97.00	72.00	57.00	39.00	27.00	22.10	10.0	40.0	0.98	1.00	163.1	57.2	13,016	163,292	4.84	26.26
741+000	0.25	40.00	113.00	76.00	58.00	43.00	36.00	25.00	21.00	21.80	10.0	40.0	0.98	1.00	110.7	53.4	22,169	224,318	5.38	17.83
741+250	0.25	40.00	116.00	79.00	62.00	47.00	39.00	25.00	19.00	22.30	10.0	40.0	0.97	1.00	113.0	55.2	20,118	226,749	5.40	18.20
741+500	0.25	40.00	147.00	99.00	75.00	53.00	40.00	27.00	19.00	22.30	10.0	40.0	0.97	1.00	143.2	51.4	17,795	160,358	4.81	23.06
741+750	0.25	40.00	127.00	75.00	57.00	39.00	31.00	23.00	20.00	21.90	10.0	40.0	0.98	1.00	124.3	47.2	24,659	169,700	4.90	20.01
742+000	0.25	40.00	208.00	147.00	111.00	78.00	59.00	41.00	35.00	21.70	10.0	40.0	0.98	1.00	204.0	51.1	12,756	112,955	4.28	32.85
742+250	0.25	40.00	299.00	235.00	196.00	148.00	113.00	69.00	46.00	21.80	10.0	40.0	0.98	1.00	293.0	59.5	6,596	93,442	4.02	47.17
742+500	0.25	40.00	391.00	292.00	234.00	165.00	121.00	72.00	52.00	22.10	10.0	40.0	0.98	1.00	381.8	53.9	5,978	62,367	3.51	61.47
742+750	0.25	40.00	415.00	292.00	227.00	156.00	113.00	68.00	49.00	22.00	10.0	40.0	0.98	1.00	405.7	51.0	6,204	54,511	3.36	65.32
743+000	0.25	40.00	498.00	351.00	273.00	189.00	136.00	83.00	61.00	22.10	10.0	40.0	0.98	1.00	486.3	51.1	5,169	45,719	3.17	78.29
743+250	0.25	40.00	450.00	360.00	299.00	223.00	171.00	106.00	73.00	21.50	10.0	40.0	0.98	1.00	442.4	59.5	4,378	62,244	3.51	71.23
743+500	0.25	40.00	538.00	416.00	334.00	239.00	176.00	103.00	71.00	21.90	5.0	55.0	0.99	1.00	530.9	63.9	4,404	45,170	3.79	85.48
743+750	0.25	40.00	369.00	276.00	225.00	164.00	128.00	83.00	64.00	22.10	5.0	55.0	0.99	1.00	363.6	66.2	6,170	70,368	4.39	58.55
744+000	0.25	40.00	489.00	348.00	271.00	177.00	116.00	61.00	41.00	22.10	5.0	55.0	0.99	1.00	481.9	56.1	5,894	40,278	3.64	77.58
744+250	0.25	40.00	259.00	219.00	191.00	153.00	126.00	87.00	64.00	22.30	5.0	55.0	0.98	1.00	254.9	79.8	6,044	122,456	5.28	41.04
744+500	0.25	40.00	461.00	389.00	341.00	277.00	230.00	156.00	109.00	22.30	10.0	50.0	0.97	1.00	449.1	80.8	3,330	69,981	4.38	72.31
744+750	0.25	40.00	442.00	388.00	344.00	283.00	235.00	162.00	108.00	22.10	10.0	50.0	0.98	1.00	431.6	83.7	3,229	75,708	4.50	69.49
745+000	0.25	40.00	188.00	137.00	112.00	83.00	64.00	42.00	31.00	21.90	10.0	50.0	0.98	1.00	184.0	66.2	12,112	138,262	5.50	29.62
745+250	0.25	40.00	162.00	118.00	91.00	65.00	50.00	35.00	28.00	22.20	10.0	50.0	0.98	1.00	158.0	63.6	15,608	157,838	5.74	25.44
745+500	0.25	40.00	150.00	104.00	87.00	67.00	54.00	37.00	27.00	22.30	10.0	50.0	0.97	1.00	146.1	68.6	14,185	180,498	6.01	23.53
745+750	0.25	40.00	137.00	94.00	75.00	56.00	46.00	34.00	28.00	22.30	10.0	50.0	0.97	1.00	133.5	66.6	16,845	196,409	6.18	21.49
746+000	0.25	40.00	113.00	67.00	48.00	33.00	26.00	21.00	17.00	22.00	10.0	50.0	0.98	1.00	110.5	56.1	28,924	198,017	6.20	17.79
746+250	0.25	40.00	150.00	87.00	61.00	44.00	34.00	26.00	22.00	22.10	10.0	50.0	0.98	1.00	146.5	55.1	22,549	146,278	5.60	23.58
746+500	0.25	40.00	220.00	174.00	152.00	64.00	51.00	33.00	27.00	22.10	10.0	50.0	0.98	1.00	214.8	55.2	14,397	93,732	4.83	34.59
746+750	0.25	40.00	127.00	90.00	74.00	55.00	43.00	28.00	22.00	22.40	10.0	50.0	0.97	1.00	123.6	65.8	18,267	204,715	6.26	19.90
747+000	0.25	40.00	141.00	91.00	68.00	50.00	41.00	32.00	27.00	22.10	10.0	50.0	0.98	1.00	137.7	62.2	19,023	179,035	5.99	22.17
747+250	0.25	40.00	162.00	119.00	95.00	71.00	56.00	40.00	29.00	22.10	10.0	50.0	0.98	1.00	158.2	67.8	13,645	167,633	5.86	25.47
747+500	0.25	40.00	210.00	151.00	122.00	88.00	68.00	41.00	28.00	22.00	12.0	60.0	0.97	1.00	204.7	74.7	12,610	120,906	6.31	32.95
747+750	0.25	40.00	205.00	140.00	108.00	78.00	60.00	40.00	29.00	21.90	12.0	60.0	0.98	1.00	200.1	73.0	13,799	123,218	6.35	32.21
748+000	0.25	40.00	196.00	145.00	119.00	88.00	68.00	44.00	30.00	22.10	12.0	60.0	0.97	1.00	190.8	78.2	12,307	135,488	6.55	30.72
748+250	0.25	40.00	119.00	76.00	58.00	39.00	28.00	17.00	11.00	21.90	12.0	60.0	0.98	1.00	116.1	66.3	28,233	187,120	7.30	18.70
748+500	0.25	40.00	161.00	114.00	93.00	69.00	55.00	30.00	23.00	22.20	12.0	60.0	0.97	1.00	156.5	7				

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)									
181154										



STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	DERECHO	EQUIPO:	FWD KUAB

Prog	Distancia	Carga	D0	D1	D2	D3	D4	D5	D6	Temp	Espesor (cm)				D max (FWD)		a _e	M _p	E Pav	SN _{Elect}	D max (VB)
	Km	KN	µm	µm	µm	µm	µm	µm	µm		Carpeta	Base + Sub base	A Temp	A Carga	µm	cm	Psi	Psi			
753+250	0.25	40.00	234.00	170.00	134.00	93.00	68.00	38.00	25.00	21.60	10.0	55.0	0.98	1.00	229.8	64.8	11,606	97,759	5.30	37.00	
753+500	0.25	40.0	135.00	93.00	70.00	47.00	35.00	21.00	14.00	21.50	10.0	55.0	0.98	1.00	132.7	62.4	21,985	164,893	6.31	21.37	
753+750	0.25	40.00	195.00	132.00	96.00	63.00	45.00	26.00	19.00	21.40	10.0	55.0	0.98	1.00	191.9	59.2	16,851	107,040	5.47	30.90	
754+000	0.25	40.0	154.00	109.00	88.00	66.00	50.00	25.00	17.00	21.60	10.0	55.0	0.98	1.00	151.2	66.3	16,539	149,004	6.11	24.35	
754+250	0.25	40.00	227.00	165.00	132.00	96.00	73.00	46.00	31.00	21.30	10.0	55.0	0.99	1.00	223.7	68.7	10,859	109,313	5.51	36.02	
754+500	0.25	40.0	254.00	186.00	147.00	104.00	73.00	39.00	25.00	21.60	10.0	55.0	0.98	1.00	249.5	64.4	10,650	87,703	5.12	40.16	
754+750	0.25	40.00	248.00	155.00	120.00	87.00	69.00	47.00	34.00	21.30	10.0	55.0	0.99	1.00	244.4	64.9	11,274	95,321	5.26	39.35	
755+000	0.25	40.0	176.00	120.00	95.00	69.00	52.00	34.00	23.00	21.10	10.0	55.0	0.99	1.00	173.8	66.7	14,841	136,149	5.92	27.99	
755+250	0.25	40.00	189.00	138.00	109.00	77.00	57.00	34.00	22.00	20.90	10.0	55.0	0.99	1.00	187.1	66.3	13,777	124,384	5.75	30.12	
755+500	0.25	40.0	183.00	130.00	100.00	68.00	49.00	29.00	20.00	20.90	10.0	55.0	0.99	1.00	181.2	63.0	15,757	121,662	5.71	29.17	
755+750	0.25	40.00	131.00	97.00	77.00	57.00	42.00	27.00	19.00	20.90	10.0	55.0	0.99	1.00	129.7	68.8	18,769	189,668	6.62	20.88	
756+000	0.25	40.0	185.00	126.00	104.00	77.00	61.00	41.00	26.00	20.80	10.0	55.0	0.99	1.00	183.3	70.1	12,627	135,469	5.91	29.52	
756+250	0.25	40.00	150.00	99.00	75.00	52.00	40.00	27.00	19.00	20.80	10.0	55.0	0.99	1.00	148.7	63.7	19,276	154,046	6.17	23.93	
756+500	0.25	40.0	97.00	74.00	61.00	50.00	42.00	31.00	22.00	20.70	10.0	55.0	0.99	1.00	96.2	81.3	17,804	299,960	7.71	15.49	
756+750	0.25	40.00	114.00	80.00	60.00	42.00	30.00	18.00	12.00	20.40	10.0	55.0	1.00	1.00	113.5	62.7	25,347	192,756	6.65	18.27	
757+000	0.25	40.0	97.00	65.00	49.00	35.00	25.00	17.00	12.00	20.30	10.0	55.0	1.00	1.00	96.7	63.2	29,945	232,648	7.08	15.56	
757+250	0.25	40.00	99.00	61.00	46.00	33.00	26.00	17.00	13.00	20.30	11.0	34.0	1.00	1.00	98.6	44.5	28,734	225,598	4.85	15.88	
757+500	0.25	40.0	99.00	65.00	51.00	36.00	26.00	16.00	11.00	20.20	11.0	34.0	1.00	1.00	98.8	45.7	26,524	226,294	4.86	15.90	
757+750	0.25	40.00	103.00	62.00	49.00	37.00	30.00	22.00	16.00	20.20	11.0	34.0	1.00	1.00	102.8	47.1	25,521	239,310	4.95	16.54	
758+000	0.25	40.0	116.00	64.00	47.00	34.00	26.00	17.00	12.00	20.30	11.0	34.0	1.00	1.00	115.6	41.9	27,777	179,828	4.50	18.61	
758+250	0.25	40.0	139.00	89.00	59.00	43.00	34.00	23.00	16.00	20.20	11.0	34.0	1.00	1.00	138.7	43.6	21,119	155,348	4.29	22.33	
758+500	0.25	40.0	99.00	65.00	53.00	42.00	34.00	22.00	14.00	20.80	11.0	34.0	0.99	1.00	98.1	51.5	22,420	278,253	5.20	15.79	
758+750	0.25	40.00	104.00	70.00	54.00	39.00	30.00	20.00	14.00	20.70	11.0	34.0	0.99	1.00	103.1	47.6	24,109	233,292	4.91	16.60	
759+000	0.25	40.0	162.00	124.00	96.00	69.00	55.00	35.00	24.00	20.30	11.0	34.0	1.00	1.00	161.4	51.1	13,434	163,192	4.36	25.99	
759+250	0.25	40.00	162.00	125.00	95.00	69.00	54.00	37.00	24.00	20.10	11.0	34.0	1.00	1.00	161.8	51.5	13,295	165,274	4.38	26.05	
759+500	0.25	40.0	152.00	111.00	91.00	68.00	53.00	36.00	26.00	20.30	11.0	34.0	1.00	1.00	151.5	52.1	14,016	180,806	4.51	24.38	
759+750	0.25	40.00	210.00	145.00	113.00	81.00	63.00	41.00	29.00	20.10	11.0	34.0	1.00	1.00	209.7	48.1	11,590	116,088	3.89	33.77	
760+000	0.25	40.0	125.00	95.00	77.00	59.00	46.00	29.00	22.00	20.30	11.0	34.0	1.00	1.00	124.6	52.8	16,562	222,366	4.83	20.05	
760+250	0.25	40.00	552.00	349.00	260.00	170.00	119.00	67.00	42.00	20.10	11.0	34.0	1.00	1.00	551.3	42.5	5,299	35,836	2.63	88.77	
760+500	0.25	40.0	154.00	103.00	80.00	54.00	38.00	19.00	11.00	20.10	11.0	34.0	1.00	1.00	153.8	44.5	17,118	134,533	4.09	24.76	
760+750	0.25	40.00	190.00	139.00	109.00	79.00	62.00	40.00	28.00	20.20	11.0	34.0	1.00	1.00	189.5	50.1	11,880	135,723	4.10	30.52	
761+000	0.25	40.0	160.00	104.00	80.00	56.00	41.00	24.00	14.00	20.00	11.0	34.0	1.00	1.00	160.0	45.4	16,497	137,430	4.11	25.76	
761+250	0.25	40.00	183.00	125.00	97.00	67.00	50.00	27.00	16.00	19.90	11.0	34.0	1.00	1.00	183.3	46.2	13,746	121,061	3.94	29.50	
761+500	0.25	40.0	132.00	89.00	69.00	47.00	35.00	23.00	17.00	20.00	11.0	34.0	1.00	1.00	132.0	45.6	19,997	169,595	4.41	21.25	
761+750	0.25	40.00	107.00	69.00	56.00	44.00	37.00	25.00	19.00	19.90	11.0	34.0	1.00	1.00	107.1	50.4	21,543	249,979	5.02	17.25	
762+000	0.25	40.0	150.00	105.00	84.00	61.00	46.00	29.00	20.00	20.10	11.0	34.0	1.00	1.00	149.8	48.8	15,655	164,533	4.37	24.12	
762+250	0.25	40.00	128.00	83.00	65.00	41.00	36.00	24.00	15.00	20.30	11.0	34.0	1.00	1.00	127.5	46.5	20,400	183,866	4.53	20.53	
762+500	0.25	40.0	116.00	68.00	49.00	35.00	29.00	18.00	14.00	20.40	11.0	34.0	1.00	1.00	115.4	42.8	26,589	184,641	4.54	18.59	
762+750	0.25	40.00	151.00	103.00	76.00	50.00	33.00	20.00	16.00	20.30	11.0	34.0	1.00	1.00	150.5	42.6	19,129	130,268	4.04	24.22	
763+000	0.25	40.0	184.00	128.00	94.00	59.00	41.00	24.00	17.00	20.10	11.0	34.0	1.00	1.00	183.8	43.1	15,188	107,419	3.79	29.59	
763+250	0.25	40.00	196.00	122.00	86.00	53.00	37.00	21.00	13.00	20.90	10.0	35.0	0.99	1.00	194.0	40.8	16,036	95,157	3.64	31.24	
763+500	0.25	40.0	268.00	182.00	136.00	86.00	57.00	28.00	17.00	20.50	10.0	35.0	0.99	1.00	266.5	42.7	10,389	71,263	3.31	42.91	
763+750	0.25	40.00	265.00	179.00	138.00	92.00	64.00	32.00	17.00	20.60	10.0	35.0	0.99	1.00	263.2	44.5	9,895	77,817	3.40	42.38	
764+000	0.25	40.0	327.00	232.00	178.00	119.00	81.00	39.00	21.00	20.60	10.0	35.0	0.99	1.00	324.8	45.1	7,715	62,919	3.17	52.29	
764+250	0.25	40.00	248.00	166.00	125.00	85.00	60.00	33.00	21.00	20.70	10.0	35.0	0.99	1.00	246.1	44.4	10,896	84,860	3.50	39.62	
764+500	0.25	40.0	319.00	233.00	178.00	115.00	79.00	40.00	22.00	21.30	10.0	35.0	0.99	1.00	314.4	45.5	7,809	65,491	3.21	50.61	
764+750	0.25	40.00	337.00	223.00	170.00	112.00	77.00	39.00	14.00	21.10	10.0	35.0	0.99	1.00	332.9	44.2	7,857	60,119	3.12	53.59	
765+000	0.25	40.0	343.00	218.00	157.00	94.00	58.00	27.00	16.00	21.00	10.0	35.0	0.99	1.00	339.2	40.0	9,083	50,544	2.95	54.61	
765+250	0.25	40.00	196.00	138.00	110.00	78.00	59.00	37.00	25.00	21.30	10.0	35.0	0.99	1.00	193.1	48.8	12,073	126,889	4.01	31.10	
765+500	0.25	40.0																			

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)									
181154										



STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	DERECHO	EQUIPO:	FWD KUAB

Prog	Distancia	Carga	D0	D1	D2	D3	D4	D5	D6	Temp	Espesor (cm)		A Temp	A Carga	D max (FWD)	a _v	M _R	E Pav	SN Efect	D max (VB)
	Km	KN	µm	µm	µm	µm	µm	µm	µm	°C	Carpeta	Base + Sub base			µm	cm	Psi	Psi		
770+000	0.25	40.0	417.00	308.00	255.00	190.00	147.00	92.00	63.00	23.00	15.0	50.0	0.96	1.00	398.6	72.3	5,485	64,582	4.62	64.18
770+250	0.25	40.00	247.00	191.00	159.00	118.00	94.00	59.00	42.00	22.10	10.0	30.0	0.98	1.00	241.2	49.7	6,060	127,628	3.57	38.83
770+500	0.25	40.0	526.00	422.00	348.00	257.00	192.00	110.00	69.00	21.80	10.0	30.0	0.98	1.00	515.4	49.0	3,738	56,748	2.72	82.98
770+750	0.25	40.00	257.00	201.00	175.00	134.00	113.00	75.00	53.00	22.00	10.0	30.0	0.98	1.00	251.2	54.1	6,869	141,772	3.70	40.45
771+000	0.25	40.0	535.00	400.00	319.00	223.00	160.00	86.00	54.00	21.70	10.0	30.0	0.98	1.00	524.8	44.5	4,252	47,520	2.57	84.50
771+250	0.25	40.00	299.00	209.00	165.00	114.00	85.00	52.00	39.00	22.10	10.0	30.0	0.98	1.00	292.0	43.0	8,371	83,637	3.10	47.01
771+500	0.25	40.0	341.00	260.00	216.00	161.00	125.00	80.00	55.00	22.00	10.0	30.0	0.98	1.00	333.4	49.2	5,932	90,669	3.18	53.67
771+750	0.25	40.00	183.00	132.00	109.00	81.00	63.00	40.00	29.00	21.60	10.0	30.0	0.98	1.00	179.7	46.9	11,945	157,799	3.83	28.94
772+000	0.25	40.0	254.00	202.00	172.00	138.00	114.00	82.00	62.00	21.70	10.0	30.0	0.98	1.00	249.2	55.2	6,760	148,914	3.76	40.12
772+250	0.25	40.00	269.00	190.00	155.00	118.00	93.00	65.00	49.00	21.50	10.0	30.0	0.98	1.00	264.5	47.0	8,228	109,174	3.39	42.58
772+500	0.25	40.0	190.00	129.00	103.00	77.00	63.00	46.00	37.00	21.40	10.0	30.0	0.98	1.00	187.0	45.1	12,591	146,360	3.73	30.11
772+750	0.25	40.00	320.00	238.00	192.00	137.00	104.00	64.00	48.00	21.80	10.0	30.0	0.98	1.00	313.6	45.7	7,048	85,467	3.12	50.48
773+000	0.25	40.0	146.00	107.00	95.00	83.00	77.00	64.00	55.00	21.60	10.0	30.0	0.98	1.00	143.4	62.2	9,888	314,832	4.82	23.09
773+250	0.25	40.00	292.00	211.00	173.00	129.00	107.00	76.00	56.00	21.60	10.0	30.0	0.98	1.00	286.8	48.5	7,249	105,960	3.35	46.17
773+500	0.25	40.0	223.00	163.00	141.00	105.00	97.00	68.00	54.00	21.80	10.0	30.0	0.98	1.00	218.5	52.2	8,524	156,916	3.82	35.18
773+750	0.25	40.00	243.00	183.00	153.00	119.00	99.00	72.00	57.00	21.80	10.0	30.0	0.98	1.00	238.1	51.4	7,962	139,752	3.68	38.34
774+000	0.25	40.0	233.00	180.00	155.00	125.00	108.00	82.00	69.00	22.00	10.0	30.0	0.98	1.00	227.8	55.7	7,357	166,008	3.89	36.67
774+250	0.25	40.00	483.00	373.00	294.00	204.00	146.00	84.00	61.00	21.80	9.0	50.0	0.98	1.00	474.0	60.9	5,222	48,477	3.81	76.31
774+500	0.25	40.0	319.00	235.00	189.00	130.00	101.00	65.00	49.00	21.90	9.0	50.0	0.98	1.00	312.7	62.6	7,713	78,085	4.47	50.34
774+750	0.25	40.00	578.00	431.00	337.00	227.00	156.00	89.00	64.00	21.80	9.0	50.0	0.98	1.00	567.2	58.3	4,667	37,862	3.51	91.32
775+000	0.25	40.0	442.00	330.00	265.00	188.00	141.00	85.00	60.00	22.60	9.0	50.0	0.97	1.00	430.1	62.9	5,467	55,981	4.00	69.24
775+250	0.25	40.00	297.00	207.00	164.00	114.00	88.00	57.00	43.00	22.80	9.0	50.0	0.97	1.00	288.4	61.1	8,754	82,119	4.54	46.42
775+500	0.25	40.0	317.00	227.00	181.00	126.00	98.00	63.00	46.00	22.20	9.0	50.0	0.98	1.00	309.7	62.1	7,873	77,830	4.46	49.87
775+750	0.25	40.00	464.00	325.00	255.00	170.00	123.00	69.00	51.00	22.20	9.0	50.0	0.98	1.00	453.4	57.4	6,055	46,858	3.77	73.00
776+000	0.25	40.0	505.00	363.00	285.00	197.00	145.00	91.00	68.00	22.10	9.0	50.0	0.98	1.00	494.0	60.1	5,220	46,546	3.76	79.53
776+250	0.25	40.00	434.00	311.00	245.00	162.00	128.00	80.00	60.00	22.60	9.0	50.0	0.97	1.00	422.3	60.5	6,097	55,382	3.98	67.99
776+500	0.25	40.0	397.00	286.00	225.00	158.00	117.00	74.00	57.00	23.00	9.0	50.0	0.97	1.00	384.6	61.0	6,567	61,149	4.12	61.92
776+750	0.25	40.00	307.00	203.00	154.00	102.00	77.00	51.00	40.00	22.30	9.0	50.0	0.98	1.00	299.7	56.7	9,741	72,456	4.36	48.25
777+000	0.25	40.00	327.00	241.00	188.00	131.00	99.00	61.00	49.00	22.60	9.0	50.0	0.97	1.00	318.2	61.0	7,981	74,504	4.40	51.22
777+250	0.25	40.00	306.00	216.00	164.00	108.00	79.00	48.00	38.00	22.20	9.0	50.0	0.98	1.00	299.0	57.0	9,550	72,081	4.35	48.14
777+500	0.25	40.00	305.00	207.00	162.00	105.00	82.00	52.00	30.00	22.10	9.0	50.0	0.98	1.00	298.3	59.2	8,767	74,520	4.40	48.03
777+750	0.25	40.00	342.00	233.00	184.00	130.00	98.00	64.00	51.00	22.40	9.0	50.0	0.98	1.00	333.5	60.0	7,846	69,595	4.30	53.69
778+000	0.25	40.00	361.00	261.00	207.00	151.00	117.00	79.00	62.00	22.50	9.0	50.0	0.97	1.00	351.6	63.9	6,658	71,598	4.34	56.61
778+250	0.25	40.00	321.00	231.00	185.00	136.00	109.00	80.00	63.00	22.20	9.0	50.0	0.98	1.00	313.7	66.1	7,045	84,252	4.58	50.50
778+500	0.25	40.00	496.00	377.00	306.00	222.00	170.00	106.00	77.00	22.20	9.0	50.0	0.98	1.00	484.7	65.0	4,600	52,122	3.90	78.03
778+750	0.25	40.00	566.00	453.00	373.00	280.00	217.00	141.00	103.00	22.20	9.0	50.0	0.98	1.00	553.1	69.0	3,617	49,353	3.83	89.04
779+500	18.75	40.00	831.00	537.00	386.00	240.00	166.00	110.00	81.00	22.20	10.0	45.0	0.98	1.00	810.5	49.4	3,901	23,344	2.78	130.50
797+750	0.25	40.00	631.00	425.00	321.00	210.00	148.00	93.00	74.00	23.10	10.0	45.0	0.97	1.00	609.1	52.1	4,760	33,608	3.14	98.07
798+000	0.25	40.00	370.00	276.00	224.00	161.00	120.00	77.00	60.00	23.10	10.0	45.0	0.97	1.00	357.2	60.1	6,338	69,738	4.01	57.50
798+250	0.25	40.00	754.00	494.00	362.00	230.00	157.00	88.00	61.00	21.90	10.0	45.0	0.98	1.00	738.0	49.8	4,112	25,208	2.86	118.81
798+500	0.25	40.00	734.00	515.00	375.00	237.00	161.00	91.00	63.00	21.70	10.0	35.0	0.98	1.00	720.0	43.3	3,793	27,286	2.40	115.93
799+250	0.75	40.00	192.00	155.00	138.00	113.00	96.00	69.00	53.00	23.30	10.0	35.0	0.96	1.00	184.9	65.9	7,812	208,160	4.72	29.77
799+500	0.25	40.00	66.00	60.00	58.00	54.00	52.00	44.00	39.00	22.10	10.0	35.0	0.98	1.00	64.4	114.7	10,078	1,456,472	9.04	10.39
799+750	0.25	40.00	269.00	210.00	181.00	141.00	115.00	78.00	59.00	21.50	10.0	35.0	0.98	1.00	264.5	58.3	6,659	121,675	3.95	42.58
800+000	0.25	40.00	264.00	196.00	162.00	121.00	96.00	65.00	52.00	21.30	10.0	35.0	0.99	1.00	260.2	52.8	8,001	107,436	3.79	41.89
800+250	0.25	40.00	426.00	297.00	230.00	158.00	114.00	67.00	46.00	21.20	10.0	35.0	0.99	1.00	420.3	46.3	5,969	53,141	3.00	67.67
800+500	0.25	40.00	396.00	304.00	248.00	180.00	133.00	78.00	52.00	21.20	10.0	35.0	0.99	1.00	390.7	51.3	5,372	66,127	3.22	62.90
800+750	0.25	40.00	1008.00	661.00	495.00	311.00	199.00	103.00	58.00	21.10	10.0	35.0	0.99	1.00	995.6	42.1	2,850	18,768	2.12	160.29
801+000	0.25	40.00	802.00	529.00	394.00	245.00	164.00	91.00	50.00	21.00	10.0	35.0	0.99	1.00	793.0	42.6				

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)									
181154										



STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTG PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	DERECHO	EQUIPO:	FWD KUAB

Prog	Distancia Km	Carga KN	D0 µm	D1 (30 cm) µm	D2 (45 cm) µm	D3 (60 cm) µm	D4 (75 cm) µm	D5 (90 cm) µm	D6 (105 cm) µm	Temp °C
805+750	0.25	40.00	638.00	478.00	394.00	290.00	221.00	132.00	86.00	21.70
806+000	0.25	40.00	1002.00	693.00	517.00	331.00	216.00	105.00	64.00	21.70
806+250	0.25	40.00	426.00	338.00	284.00	218.00	178.00	123.00	91.00	21.30
806+500	0.25	40.00	500.00	373.00	298.00	212.00	159.00	100.00	72.00	21.80
806+750	0.25	40.00	397.00	302.00	253.00	194.00	155.00	102.00	73.00	21.60
807+000	0.25	40.00	644.00	489.00	395.00	280.00	209.00	125.00	85.00	21.90
807+250	0.25	40.00	765.00	583.00	475.00	342.00	251.00	141.00	88.00	21.70
807+500	0.25	40.00	602.00	411.00	317.00	219.00	159.00	94.00	62.00	21.70
807+750	0.25	40.00	440.00	342.00	286.00	215.00	169.00	107.00	73.00	22.50
808+000	0.25	40.00	474.00	379.00	320.00	248.00	199.00	134.00	97.00	22.00
808+250	0.25	40.00	433.00	327.00	266.00	194.00	151.00	100.00	70.00	21.50
808+500	0.25	40.00	312.00	238.00	199.00	154.00	127.00	91.00	69.00	21.30
808+750	0.25	40.00	768.00	605.00	495.00	359.00	267.00	157.00	103.00	21.70
809+000	0.25	40.00	725.00	486.00	380.00	260.00	189.00	103.00	61.00	21.70
809+250	0.25	40.00	298.00	218.00	176.00	129.00	102.00	70.00	52.00	21.90
809+500	0.25	40.00	448.00	338.00	276.00	203.00	155.00	94.00	64.00	21.40
809+750	0.25	40.00	729.00	539.00	425.00	296.00	215.00	130.00	88.00	21.40
810+000	0.25	40.00	1456.00	933.00	669.00	413.00	273.00	155.00	104.00	22.00
810+250	0.25	40.00	397.00	302.00	253.00	194.00	155.00	102.00	73.00	22.10
810+500	0.25	40.00	286.00	216.00	175.00	129.00	101.00	69.00	51.00	21.60
810+750	0.25	40.00	244.00	169.00	132.00	94.00	75.00	52.00	40.00	21.50
811+000	0.25	40.00	336.00	242.00	197.00	142.00	108.00	66.00	43.00	21.40
811+250	0.25	40.00	439.00	295.00	227.00	154.00	115.00	71.00	50.00	21.20
811+500	0.25	40.00	553.00	396.00	319.00	228.00	174.00	111.00	79.00	21.30
811+750	0.25	40.00	508.00	343.00	261.00	171.00	121.00	71.00	49.00	21.10
812+000	0.25	40.00	1045.00	659.00	566.00	380.00	276.00	149.00	96.00	21.20
812+250	0.25	40.00	348.00	227.00	171.00	109.00	77.00	47.00	37.00	21.30
812+500	0.25	40.00	382.00	268.00	209.00	141.00	103.00	61.00	47.00	21.20
812+750	0.25	40.00	357.00	257.00	199.00	137.00	100.00	65.00	50.00	21.00
813+000	0.25	40.00	389.00	287.00	232.00	170.00	131.00	85.00	61.00	21.20
813+250	0.25	40.00	300.00	223.00	176.00	125.00	97.00	64.00	48.00	21.40
813+500	0.25	40.00	363.00	285.00	232.00	175.00	137.00	89.00	62.00	21.20
813+750	0.25	40.00	325.00	227.00	176.00	124.00	94.00	62.00	46.00	21.20
814+000	0.25	40.00	185.00	145.00	123.00	98.00	83.00	62.00	48.00	21.30
814+250	0.25	40.00	265.00	158.00	118.00	78.00	59.00	39.00	31.00	21.30
814+500	0.25	40.00	204.00	133.00	96.00	64.00	47.00	31.00	23.00	21.40
814+750	0.25	40.00	478.00	282.00	210.00	151.00	116.00	75.00	53.00	21.10
815+000	0.25	40.00	521.00	283.00	192.00	109.00	67.00	36.00	27.00	20.90
815+250	0.25	40.00	220.00	134.00	97.00	64.00	48.00	32.00	23.00	20.90
815+500	0.25	40.00	650.00	430.00	319.00	206.00	142.00	83.00	58.00	21.40
815+750	0.25	40.00	537.00	414.00	334.00	238.00	177.00	105.00	72.00	21.70
816+000	0.25	40.00	560.00	400.00	318.00	226.00	170.00	104.00	70.00	21.90
816+250	0.25	40.00	611.00	472.00	375.00	263.00	190.00	110.00	71.00	22.40
816+500	0.25	40.00	518.00	361.00	273.00	181.00	128.00	76.00	52.00	22.30
816+750	0.25	40.00	320.00	228.00	179.00	125.00	92.00	59.00	43.00	22.20
817+000	0.25	40.00	215.00	135.00	102.00	68.00	51.00	34.00	27.00	21.60
817+250	0.25	40.00	163.00	106.00	84.00	60.00	47.00	34.00	27.00	21.50
817+500	0.25	40.00	245.00	168.00	125.00	81.00	53.00	28.00	19.00	21.60
817+750	0.25	40.00	203.00	132.00	96.00	63.00	46.00	33.00	26.00	21.40
818+000	0.25	40.00	174.00	122.00	96.00	69.00	53.00	36.00	27.00	21.40
818+250	0.25	40.00	159.00	52.00	44.00	34.00	32.00	26.00	23.00	21.30
818+500	0.25	40.00	297.00	214.00	171.00	123.00	93.00	56.00	38.00	21.70
818+750	0.25	40.00	283.00	204.00	166.00	124.00	96.00	63.00	45.00	22.20
819+000	0.25	40.00	367.00	275.00	220.00	159.00	120.00	75.00	54.00	22.40
819+250	0.25	40.00	328.00	202.00	150.00	94.00	70.00	44.00	33.00	21.90
819+500	0.25	40.00	478.00	334.00	261.00	179.00	127.00	75.00	54.00	21.80
819+750	0.25	40.00	281.00	172.00	136.00	100.00	81.00	60.00	47.00	21.70
820+000	0.25	40.00	362.00	211.00	142.00	82.00	57.00	35.00	28.00	21.60
820+250	0.25	40.00	142.00	103.00	80.00	57.00	44.00	32.00	28.00	21.70
820+500	0.25	40.00	347.00	250.00	198.00	139.00	102.00	64.00	50.00	21.40
820+750	0.25	40.00	325.00	252.00	205.00	154.00	115.00	73.00	51.00	21.10
821+000	0.25	40.00	250.00	172.00	126.00	82.00	58.00	37.00	28.00	20.60
821+250	0.25	40.00	205.00	143.00	110.00	78.00	62.00	41.00	26.00	20.40
821+500	0.25	40.00	186.00	133.00	106.00	81.00	66.00	49.00	40.00	20.30
821+750	0.25	40.00	314.00	217.00	169.00	117.00	90.00	60.00	45.00	20.10
822+000	0.25	40.00	251.00	168.00	132.00	83.00	75.00	49.00	39.00	20.70

Espeor (cm)	Base + Sub base	A Temp	A Carga	D max (FWD)	a _e	M _R	E Pav	SN Elect	D max (VB)
Carpeta				µm	cm	Psi	Psi		10 ⁻³ mm
10.0	30.0	0.98	1.00	625.9	47.5	3,299	45,371	2.53	100.76
10.0	30.0	0.98	1.00	982.9	39.6	2,716	20,810	1.95	158.25
10.0	30.0	0.99	1.00	419.8	52.5	4,317	81,088	3.07	67.59
10.0	30.0	0.98	1.00	489.9	45.6	4,514	54,432	2.69	78.88
10.0	30.0	0.98	1.00	389.9	50.4	4,923	81,638	3.07	62.77
10.0	30.0	0.98	1.00	630.3	46.2	3,397	42,740	2.48	101.48
10.0	30.0	0.98	1.00	750.4	46.5	2,796	35,825	2.34	120.82
10.0	30.0	0.98	1.00	590.6	42.0	4,277	39,783	2.42	95.08
10.0	30.0	0.97	1.00	427.7	50.5	4,424	73,601	2.97	68.86
10.0	30.0	0.98	1.00	463.4	53.0	3,826	74,200	2.98	74.61
10.0	30.0	0.98	1.00	425.7	47.8	4,879	68,188	2.90	68.54
10.0	30.0	0.99	1.00	307.5	51.5	6,117	108,483	3.38	49.50
10.0	30.0	0.98	1.00	753.4	47.9	2,670	37,562	2.37	121.30
10.0	30.0	0.98	1.00	711.2	41.8	3,567	32,551	2.26	114.50
10.0	30.0	0.98	1.00	291.7	47.0	7,387	98,086	3.27	46.96
10.0	30.0	0.98	1.00	441.0	47.3	4,727	64,147	2.84	71.00
10.0	30.0	0.98	1.00	717.6	44.3	3,195	35,092	2.32	115.53
10.0	30.0	0.98	1.00	1423.4	37.5	2,108	13,630	1.69	229.17
10.0	30.0	0.98	1.00	299.8	46.1	7,287	90,857	3.19	48.27
10.0	30.0	0.98	1.00	280.9	47.9	7,409	104,407	3.34	45.22
10.0	30.0	0.98	1.00	239.9	43.9	10,095	108,009	3.37	38.62
10.0	30.0	0.98	1.00	330.7	45.8	6,678	81,505	3.07	53.25
10.0	30.0	0.99	1.00	433.1	41.4	6,037	53,608	2.67	69.73
10.0	30.0	0.99	1.00	545.0	45.1	4,184	48,604	2.59	87.74
10.0	30.0	0.99	1.00	501.7	40.3	5,362	43,552	2.49	80.78
10.0	35.0	0.99	1.00	1031.0	46.2	2,341	20,623	2.19	165.99
10.0	35.0	0.99	1.00	342.9	42.6	8,504	57,887	3.08	55.21
10.0	35.0	0.99	1.00	376.9	45.9	6,783	58,838	3.10	60.68
10.0	35.0	0.99	1.00	353.0	47.0	7,024	65,472	3.21	56.83
10.0	35.0	0.99	1.00	383.8	51.3	5,623	69,123	3.27	61.79
10.0	35.0	0.98	1.00	295.3	50.2	7,604	87,022	3.53	47.54
10.0	35.0	0.99	1.00	358.1	54.6	5,436	80,887	3.45	57.66
10.0	35.0	0.99	1.00	320.6	47.6	7,658	74,413	3.35	51.62
10.0	35.0	0.99	1.00	182.3	60.6	9,176	189,604	4.58	29.35

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)									
181154										



STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	DERECHO	EQUIPO:	FWD KUAB

Prog	Distancia	Carga	D0	D1	D2	D3	D4	D5	D6	Temp	Espesor (cm)		A Temp	A Carga	D max (FWD)	a _e	M _R	E Pav	SN _{Elect}	D max (VB)
	Km	KN	µm	µm	µm	µm	µm	µm	µm	°C	Carpeta	Base + Sub base			µm	cm	Psi	Psi		10 ⁻² mm
822+500	0.25	40.00	485.00	368.00	303.00	227.00	177.00	117.00	88.00	20.50	10.0	55.0	0.99	1.00	482.3	72.8	4,513	54,364	4.36	77.65
822+750	0.25	40.00	299.00	236.00	195.00	144.00	110.00	66.00	43.00	20.20	10.0	55.0	1.00	1.00	298.3	71.8	7,396	85,249	5.07	48.03
823+000	0.25	40.00	310.00	252.00	216.00	174.00	144.00	105.00	79.00	20.70	10.0	55.0	0.99	1.00	307.6	84.4	5,159	97,509	5.30	49.52
823+250	0.25	40.00	301.00	216.00	175.00	129.00	103.00	74.00	58.00	20.90	10.0	55.0	0.99	1.00	298.0	71.9	7,575	87,819	5.12	47.97
823+500	0.25	40.00	575.00	459.00	388.00	296.00	233.00	150.00	103.00	20.60	10.0	55.0	0.99	1.00	571.1	76.1	3,450	47,542	4.17	91.95
823+750	0.25	40.00	226.00	177.00	153.00	118.00	106.00	82.00	64.00	20.20	10.0	30.0	1.00	1.00	225.5	55.9	7,439	169,761	3.92	36.30
824+000	0.25	40.00	277.00	217.00	181.00	138.00	109.00	72.00	55.00	20.40	10.0	30.0	1.00	1.00	275.8	50.0	7,034	113,776	3.43	44.40
824+250	0.25	40.00	333.00	274.00	241.00	197.00	165.00	115.00	83.00	20.10	10.0	30.0	1.00	1.00	332.6	58.3	4,641	120,791	3.50	53.55
824+500	0.25	40.00	605.00	463.00	384.00	287.00	224.00	141.00	99.00	19.90	10.0	30.0	1.00	1.00	605.8	48.5	3,346	48,931	2.59	97.53
824+750	0.25	40.00	252.00	197.00	165.00	129.00	106.00	77.00	61.00	19.80	10.0	30.0	1.00	1.00	252.7	51.8	7,384	133,171	3.62	40.68
825+000	0.25	40.00	359.00	272.00	224.00	159.00	128.00	82.00	64.00	19.90	10.0	30.0	1.00	1.00	359.5	46.8	5,997	78,736	3.03	57.87
825+250	0.25	40.00	254.00	194.00	164.00	130.00	107.00	81.00	65.00	19.80	10.0	30.0	1.00	1.00	254.7	52.0	7,322	133,407	3.62	41.00
825+500	0.25	40.00	375.00	299.00	255.00	202.00	165.00	113.00	81.00	19.90	10.0	30.0	1.00	1.00	375.5	53.8	4,652	94,204	3.22	60.45
825+750	0.25	40.00	355.00	267.00	218.00	162.00	127.00	87.00	68.00	19.60	10.0	30.0	1.01	1.00	356.9	47.2	6,008	80,584	3.06	57.46
826+000	0.25	40.00	445.00	345.00	295.00	228.00	180.00	118.00	83.00	19.40	10.0	30.0	1.01	1.00	446.5	50.9	4,211	71,855	2.95	72.21
826+250	0.25	40.00	384.00	325.00	287.00	234.00	196.00	134.00	95.00	19.40	10.0	30.0	1.01	1.00	387.0	59.0	3,901	105,501	3.35	62.31
826+500	0.25	40.00	311.00	268.00	240.00	203.00	174.00	127.00	97.00	19.40	10.0	30.0	1.01	1.00	313.5	63.6	4,321	147,046	3.74	50.47
826+750	0.25	40.00	463.00	374.00	322.00	252.00	200.00	129.00	91.00	19.30	10.0	30.0	1.01	1.00	467.3	52.8	3,805	72,618	2.96	75.23
827+000	0.25	40.00	291.00	238.00	209.00	172.00	146.00	104.00	77.00	19.30	10.0	30.0	1.01	1.00	293.7	58.3	5,272	137,507	3.66	47.28
827+250	0.25	40.00	242.00	168.00	142.00	111.00	90.00	63.00	50.00	19.30	10.0	30.0	1.01	1.00	244.2	47.5	8,847	121,206	3.51	39.32
827+500	0.25	40.00	405.00	333.00	291.00	229.00	186.00	120.00	80.00	19.20	10.0	30.0	1.01	1.00	409.3	54.8	4,094	88,079	3.15	65.89
827+750	0.25	40.00	362.00	305.00	274.00	231.00	197.00	139.00	99.00	19.20	10.0	30.0	1.01	1.00	365.8	62.0	3,841	120,877	3.50	58.89
828+000	0.25	40.00	364.00	271.00	216.00	153.00	114.00	70.00	52.00	19.20	10.0	30.0	1.01	1.00	367.8	44.3	6,307	69,555	2.91	59.22
828+250	0.25	40.00	497.00	368.00	294.00	205.00	149.00	84.00	56.00	19.20	10.0	30.0	1.01	1.00	502.2	43.8	4,637	49,226	2.60	80.86
828+500	0.25	40.00	364.00	263.00	204.00	138.00	100.00	60.00	45.00	19.20	10.0	30.0	1.01	1.00	367.8	41.9	6,862	63,329	2.82	59.22
828+750	0.25	40.00	331.00	214.00	167.00	117.00	90.00	63.00	49.00	19.10	10.0	30.0	1.01	1.00	334.9	40.9	8,220	69,926	2.92	53.92
829+000	0.25	40.00	443.00	276.00	184.00	102.00	64.00	35.00	23.00	19.10	10.0	30.0	1.01	1.00	448.2	34.7	7,556	38,124	2.39	72.17
829+250	0.25	40.00	367.00	272.00	217.00	154.00	119.00	77.00	57.00	19.20	10.0	35.0	1.01	1.00	370.9	49.6	6,174	68,016	3.25	59.71
829+500	0.25	40.00	280.00	235.00	210.00	172.00	149.00	109.00	84.00	19.10	10.0	35.0	1.01	1.00	283.3	66.5	5,033	137,996	4.12	45.61
829+750	0.25	40.00	320.00	272.00	243.00	202.00	169.00	118.00	83.00	19.00	10.0	35.0	1.01	1.00	324.2	66.1	4,408	118,772	3.92	52.20
830+000	0.25	40.00	427.00	359.00	312.00	246.00	197.00	123.00	80.00	19.00	10.0	35.0	1.01	1.00	432.6	59.8	3,831	75,967	3.38	69.65
830+250	0.25	40.00	400.00	322.00	271.00	207.00	165.00	108.00	76.00	19.10	10.0	35.0	1.01	1.00	404.7	56.4	4,567	75,268	3.37	65.16
830+500	0.25	40.00	274.00	190.00	143.00	90.00	58.00	31.00	22.00	19.10	10.0	35.0	1.01	1.00	277.2	42.4	10,192	68,298	3.26	44.64
830+750	0.25	40.00	266.00	163.00	122.00	82.00	68.00	49.00	38.00	19.10	10.0	35.0	1.01	1.00	269.1	43.3	11,139	80,055	3.44	43.33
831+000	0.25	40.00	192.00	141.00	115.00	78.00	62.00	37.00	28.00	19.20	10.0	35.0	1.01	1.00	194.0	48.8	12,034	126,134	4.00	31.24
831+250	0.25	40.00	264.00	204.00	173.00	133.00	107.00	72.00	52.00	19.10	10.0	35.0	1.01	1.00	267.1	55.8	7,083	113,163	3.86	43.01
831+500	0.25	40.00	350.00	277.00	236.00	185.00	148.00	94.00	66.00	19.10	10.0	35.0	1.01	1.00	354.1	56.8	5,143	86,763	3.53	57.02
831+750	0.25	40.00	251.00	193.00	163.00	127.00	102.00	69.00	49.00	19.10	10.0	35.0	1.01	1.00	254.0	56.0	7,409	119,842	3.93	40.89
832+000	0.25	40.00	408.00	333.00	287.00	225.00	180.00	114.00	74.00	19.30	10.0	35.0	1.01	1.00	411.8	58.6	4,177	77,732	3.40	66.29
832+250	0.25	40.00	334.00	273.00	234.00	184.00	148.00	97.00	65.00	19.20	10.0	35.0	1.01	1.00	337.5	59.0	5,081	96,209	3.65	54.34
832+500	0.25	40.00	475.00	392.00	327.00	247.00	189.00	114.00	71.00	19.10	10.0	35.0	1.01	1.00	480.6	55.4	3,870	60,353	3.13	77.38
832+750	0.25	40.00	422.00	347.00	295.00	228.00	181.00	112.00	72.00	19.10	10.0	40.0	1.01	1.00	427.0	62.4	4,178	68,707	3.63	68.75
833+000	0.25	40.00	359.00	289.00	242.00	183.00	140.00	82.00	51.00	19.10	10.0	40.0	1.01	1.00	363.2	59.2	5,308	74,239	3.72	58.48
833+250	0.25	40.00	406.00	328.00	275.00	208.00	161.00	97.00	64.00	19.00	10.0	40.0	1.01	1.00	411.3	59.7	4,663	66,858	3.60	66.23
833+500	0.25	40.00	490.00	391.00	324.00	243.00	186.00	112.00	75.00	19.00	10.0	40.0	1.01	1.00	496.4	58.4	4,011	53,809	3.34	79.93
833+750	0.25	40.00	447.00	360.00	298.00	222.00	169.00	100.00	63.00	19.00	10.0	40.0	1.01	1.00	452.9	58.4	4,368	58,536	3.44	72.91
834+000	0.25	40.00	278.00	193.00	151.00	104.00	75.00	44.00	29.00	19.00	10.0	40.0	1.01	1.00	281.7	50.2	9,139	76,617	3.76	45.35
834+250	0.25	40.00	484.00	344.00	265.00	183.00	136.00	87.00	62.00	18.90	10.0	40.0	1.01	1.00	491.0	51.0	5,195	45,733	3.17	79.05
834+500	0.25	40.00	182.00	124.00	97.00	71.00	58.00	46.00	3											

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)									
181154										
										 181154-79-LABC-33

STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	DERECHO	EQUIPO:	FWD KUAB

Prog	Distancia	Carga	D0	D1	D2	D3	D4	D5	D6	Temp	Espesor (cm)		A Temp	A Carga	D max (FWD)	a _e	M _R	E Pav	SN Efect	D max (VB)
	Km	KN	µm	µm	µm	µm	µm	µm	µm	°C	Carpeta	Base + Sub base				cm	Psi	Psi		
839+250	0.25	40.00	453.00	331.00	270.00	200.00	151.00	92.00	61.00	19.00	10.0	45.0	1.01	1.00	459.0	59.6	4,921	52,829	3.66	73.89
839+500	0.25	40.00	397.00	300.00	238.00	168.00	123.00	71.00	47.00	18.90	10.0	45.0	1.01	1.00	402.7	57.5	5,918	56,659	3.74	64.84
839+750	0.25	40.00	392.00	294.00	237.00	169.00	124.00	74.00	49.00	18.90	10.0	45.0	1.01	1.00	397.7	58.2	5,877	58,694	3.79	64.02
840+000	0.25	40.00	230.00	172.00	142.00	108.00	86.00	58.00	43.00	19.40	10.0	45.0	1.01	1.00	231.8	63.4	8,886	115,576	4.75	37.32
840+250	0.25	40.00	559.00	445.00	368.00	272.00	203.00	115.00	72.00	19.10	10.0	45.0	1.01	1.00	565.6	61.6	3,696	43,828	3.44	91.06
840+500	0.25	40.00	539.00	464.00	392.00	298.00	233.00	139.00	88.00	19.00	10.0	45.0	1.01	1.00	546.1	67.1	3,328	51,381	3.62	87.92
840+750	0.25	40.00	372.00	277.00	223.00	159.00	118.00	68.00	44.00	18.90	10.0	45.0	1.01	1.00	377.4	58.0	6,208	61,242	3.84	60.76
841+000	0.25	40.00	278.00	187.00	140.00	93.00	68.00	43.00	31.00	18.90	10.0	45.0	1.01	1.00	282.0	52.2	10,280	73,008	4.07	45.41
841+250	0.25	40.00	243.00	165.00	127.00	85.00	61.00	37.00	26.00	18.90	10.0	45.0	1.01	1.00	246.5	52.8	11,389	83,771	4.26	39.69
841+500	0.25	40.00	337.00	230.00	177.00	119.00	87.00	52.00	35.00	18.90	10.0	45.0	1.01	1.00	341.9	53.4	8,038	61,179	3.84	55.04
841+750	0.25	40.00	375.00	253.00	184.00	114.00	76.00	38.00	26.00	19.00	10.0	45.0	1.01	1.00	379.9	48.5	8,179	46,034	3.49	61.17
842+000	0.25	40.00	433.00	318.00	257.00	182.00	134.00	79.00	51.00	18.90	10.0	45.0	1.01	1.00	439.3	57.7	5,404	52,286	3.64	70.72
842+250	0.25	40.00	237.00	158.00	117.00	73.00	54.00	30.00	21.00	19.00	10.0	45.0	1.01	1.00	240.1	50.3	12,621	79,671	4.19	38.66
842+500	0.25	40.00	334.00	239.00	186.00	130.00	95.00	57.00	38.00	19.20	10.0	45.0	1.01	1.00	337.5	55.7	7,522	65,532	3.93	54.34
842+750	0.25	40.00	376.00	254.00	195.00	131.00	96.00	57.00	40.00	19.10	10.0	45.0	1.01	1.00	380.4	53.0	7,352	54,583	3.70	61.25
843+000	0.25	40.00	166.00	113.00	86.00	59.00	45.00	33.00	25.00	19.00	10.0	43.0	1.01	1.00	168.2	53.1	16,067	134,260	4.81	27.08
843+250	0.25	40.00	216.00	152.00	120.00	87.00	70.00	49.00	38.00	19.00	10.0	43.0	1.01	1.00	218.8	56.9	10,911	113,323	4.54	35.23
843+500	0.25	40.00	179.00	138.00	110.00	80.00	61.00	39.00	28.00	19.00	10.0	43.0	1.01	1.00	181.4	58.4	12,259	138,281	4.86	29.20
843+750	0.25	40.00	296.00	196.00	147.00	100.00	74.00	45.00	33.00	18.90	10.0	43.0	1.01	1.00	300.3	50.6	9,560	68,793	3.85	48.34
844+000	0.25	40.00	169.00	103.00	75.00	51.00	41.00	29.00	23.00	19.00	10.0	43.0	1.01	1.00	171.2	49.5	18,217	122,015	4.66	27.57
844+250	0.25	40.00	423.00	296.00	232.00	162.00	121.00	75.00	53.00	18.90	10.0	43.0	1.01	1.00	429.1	53.9	5,962	52,170	3.51	69.09
844+500	0.25	40.00	189.00	130.00	98.00	64.00	45.00	28.00	22.00	19.00	10.0	43.0	1.01	1.00	191.5	49.8	15,267	104,588	4.42	30.83
844+750	0.25	40.00	198.00	148.00	118.00	87.00	68.00	44.00	34.00	19.00	10.0	43.0	1.01	1.00	200.6	58.2	11,283	125,474	4.70	32.30
845+000	0.25	40.00	317.00	201.00	140.00	85.00	56.00	31.00	23.00	18.90	10.0	43.0	1.01	1.00	321.6	44.9	10,608	52,321	3.51	51.77
845+250	0.25	40.00	220.00	167.00	136.00	103.00	82.00	54.00	37.00	18.90	10.0	43.0	1.01	1.00	223.2	61.2	9,212	119,959	4.63	35.93
845+500	0.25	40.00	190.00	127.00	92.00	60.00	45.00	30.00	24.00	19.10	10.0	43.0	1.01	1.00	192.2	49.4	15,822	105,431	4.44	30.95
845+750	0.25	40.00	182.00	119.00	90.00	60.00	44.00	26.00	18.00	19.10	10.0	43.0	1.01	1.00	184.2	50.2	15,664	109,783	4.50	29.65
846+000	0.25	40.00	199.00	146.00	115.00	79.00	58.00	35.00	26.00	19.10	10.0	43.0	1.01	1.00	201.4	54.1	12,508	111,148	4.51	32.42
846+250	0.25	40.00	145.00	109.00	88.00	64.00	48.00	27.00	17.00	19.30	10.0	43.0	1.01	1.00	146.3	57.3	15,294	161,952	5.12	23.56
846+500	0.25	40.00	141.00	96.00	78.00	60.00	50.00	36.00	27.00	19.20	10.0	43.0	1.01	1.00	142.5	59.9	15,304	186,061	5.36	22.94
846+750	0.25	40.00	178.00	116.00	89.00	62.00	48.00	31.00	24.00	19.20	10.0	43.0	1.01	1.00	179.9	52.0	15,487	121,389	4.65	28.96
847+000	0.25	40.00	279.00	218.00	175.00	128.00	96.00	56.00	38.00	19.20	10.0	43.0	1.01	1.00	281.9	58.3	7,763	86,964	4.16	45.39
847+250	0.25	40.00	191.00	133.00	102.00	71.00	53.00	33.00	24.00	19.20	10.0	43.0	1.01	1.00	193.0	53.1	13,636	114,268	4.56	31.07
847+500	0.25	40.00	164.00	111.00	86.00	57.00	38.00	21.00	17.00	19.30	10.0	43.0	1.01	1.00	165.5	49.1	17,777	116,395	4.58	26.65
847+750	0.25	40.00	208.00	139.00	106.00	75.00	58.00	41.00	31.00	19.10	10.0	40.0	1.01	1.00	210.5	50.7	12,614	108,611	4.23	33.88
848+000	0.25	40.00	202.00	133.00	92.00	55.00	36.00	24.00	18.00	19.10	10.0	40.0	1.01	1.00	204.4	43.4	16,092	84,911	3.89	32.91
848+250	0.25	40.00	208.00	137.00	99.00	66.00	48.00	33.00	26.00	19.20	10.0	40.0	1.01	1.00	210.2	46.8	14,342	95,905	4.05	33.84
848+500	0.25	40.00	173.00	124.00	100.00	71.00	52.00	33.00	27.00	19.00	10.0	40.0	1.01	1.00	175.3	51.9	14,183	131,655	4.51	28.22
848+750	0.25	40.00	132.00	86.00	67.00	47.00	38.00	26.00	22.00	19.00	10.0	40.0	1.01	1.00	133.7	50.1	20,424	169,435	4.90	21.53
849+000	0.25	40.00	326.00	226.00	174.00	120.00	89.00	58.00	42.00	19.00	10.0	40.0	1.01	1.00	330.3	50.4	7,926	67,168	3.60	53.18
849+250	0.25	40.00	83.00	56.00	47.00	39.00	30.00	15.00	12.00	19.10	10.0	40.0	1.01	1.00	84.0	54.6	26,611	288,948	5.86	13.52
849+500	0.25	40.00	116.00	65.00	48.00	34.00	29.00	21.00	18.00	19.10	10.0	40.0	1.01	1.00	117.4	46.3	27,649	178,733	4.99	18.90
849+750	0.25	40.00	108.00	76.00	58.00	43.00	34.00	26.00	20.00	19.30	10.0	40.0	1.01	1.00	109.0	54.0	21,976	231,332	5.44	17.55
850+000	0.25	40.00	129.00	84.00	65.00	49.00	42.00	34.00	30.00	19.70	10.0	40.0	1.01	1.00	129.5	53.5	19,150	195,489	5.14	20.85
850+250	0.25	40.00	162.00	116.00	92.00	61.00	34.00	24.00	19.00	19.30	10.0	40.0	1.01	1.00	163.5	47.0	17,164	116,690	4.33	26.32
850+500	0.25	40.00	178.00	114.00	86.00	61.00	47.00	33.00	25.00	19.20	10.0	40.0	1.01	1.00	179.9	49.4	15,518	123,051	4.41	28.96
850+750	0.25	40.00	152.00	99.00	78.00	56.00	42.00	25.00	20.00	19.20	10.0	40.0	1.01	1.00	153.6	49.6	17,669	141,975	4.62	24.73
851+000	0.25	40.00	376.00	272.00	212.00	145.00	106.00	66.00	49.00	19.60	10.0	40.0	1.01	1.00	378.0	51.1	6,679	59,129	3.45	60.85
851+250	0.25	40.00	439.00	341.00	277.00	200.00	149.00	87.00	56.00	20.00	10.0	40.0	1.01	1.00	439.0	55.8				

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)									
181154										
										 181154-70-LABC-33

STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	DERECHO	EQUIPO:	FWD KUAB

Prog	Distancia Km	Carga KN	D0 µm	D1 (30 cm) µm	D2 (45 cm) µm	D3 (60 cm) µm	D4 (75 cm) µm	D5 (90 cm) µm	D6 (105 cm) µm	Temp °C	Espesor (cm) Carpeta	Base + Sub base	A Temp	A Carga	D max (FWD) µm	a _v cm	M _R Psi	E Pav Psi	SN Efect	D max (VB) 10 ⁻² mm
854+500	0.25	40.00	185.00	124.00	90.00	58.00	42.00	28.00	23.00	19.70	10.0	35.0	1.00	1.00	185.7	42.3	16,034	107,286	3.79	29.90
854+750	0.25	40.00	197.00	133.00	101.00	70.00	53.00	36.00	27.00	19.90	10.0	35.0	1.00	1.00	197.3	45.7	13,438	114,828	3.88	31.76
855+000	0.25	40.00	607.00	454.00	347.00	232.00	161.00	88.00	57.00	19.70	10.0	35.0	1.00	1.00	609.4	46.2	4,017	35,366	2.62	98.11
855+250	0.25	40.00	517.00	398.00	322.00	225.00	166.00	95.00	59.00	19.30	10.0	35.0	1.01	1.00	521.8	49.9	4,186	47,048	2.88	84.00
855+500	0.25	40.00	410.00	299.00	233.00	153.00	106.00	61.00	41.00	19.40	10.0	35.0	1.01	1.00	413.2	45.7	6,084	51,881	2.97	66.53
855+750	0.25	40.00	126.00	92.00	74.00	49.00	38.00	29.00	24.00	19.20	10.0	35.0	1.01	1.00	127.3	47.7	19,407	189,444	4.58	20.50
856+000	0.25	40.00	271.00	195.00	160.00	117.00	89.00	54.00	37.00	19.00	10.0	35.0	1.01	1.00	274.6	49.9	8,201	92,126	3.60	44.20
856+250	0.25	40.00	323.00	237.00	189.00	130.00	97.00	57.00	39.00	19.00	10.0	35.0	1.01	1.00	327.2	48.0	7,238	71,935	3.32	52.69
856+500	0.25	40.00	199.00	134.00	103.00	71.00	55.00	38.00	31.00	18.90	10.0	35.0	1.01	1.00	201.9	45.3	13,451	111,529	3.84	32.50
856+750	0.25	40.00	482.00	354.00	286.00	207.00	154.00	90.00	59.00	19.20	10.0	35.0	1.01	1.00	487.1	49.5	4,627	50,650	2.95	78.42
857+000	0.25	40.00	508.00	370.00	292.00	201.00	145.00	81.00	52.00	19.00	10.0	35.0	1.01	1.00	512.7	47.2	4,682	44,264	2.82	82.54
857+250	0.25	40.00	417.00	308.00	250.00	181.00	136.00	81.00	53.00	19.00	10.0	35.0	1.01	1.00	422.5	49.9	5,267	52,393	3.11	68.02
857+500	0.25	40.00	431.00	302.00	235.00	161.00	116.00	72.00	50.00	18.90	10.0	35.0	1.01	1.00	437.2	46.0	5,853	51,062	2.96	70.39
857+750	0.25	40.00	317.00	201.00	151.00	101.00	76.00	50.00	36.00	18.90	10.0	35.0	1.01	1.00	321.6	43.3	9,073	63,366	3.21	51.77
858+000	0.25	40.00	339.00	258.00	209.00	152.00	116.00	72.00	50.00	19.00	10.0	35.0	1.01	1.00	343.5	51.0	6,288	75,919	3.38	55.30
858+250	0.25	40.00	487.00	352.00	281.00	196.00	140.00	80.00	50.00	18.90	10.0	35.0	1.01	1.00	494.0	47.5	4,830	46,452	2.87	79.54
858+500	0.25	40.00	147.00	104.00	83.00	64.00	53.00	39.00	31.00	18.90	10.0	35.0	1.01	1.00	149.1	51.7	14,778	185,715	4.55	24.01
858+750	0.25	40.00	374.00	274.00	221.00	158.00	116.00	65.00	38.00	18.90	10.0	35.0	1.01	1.00	379.4	48.9	5,980	63,186	3.18	61.08
859+000	0.25	40.00	557.00	404.00	314.00	208.00	145.00	77.00	48.00	18.90	10.0	30.0	1.01	1.00	565.1	41.6	4,427	39,728	2.42	90.97
859+250	0.25	40.00	251.00	165.00	126.00	87.00	68.00	48.00	37.00	18.90	10.0	30.0	1.01	1.00	254.6	40.7	10,848	91,317	3.19	41.00
859+500	0.25	40.00	222.00	162.00	127.00	86.00	61.00	33.00	25.00	18.90	10.0	30.0	1.01	1.00	225.2	41.8	11,134	101,845	3.31	36.26
859+750	0.25	40.00	312.00	231.00	185.00	131.00	97.00	59.00	39.00	18.90	10.0	30.0	1.01	1.00	316.5	44.6	7,239	81,258	3.07	50.96
860+000	0.25	40.00	516.00	362.00	277.00	181.00	124.00	66.00	44.00	19.20	10.0	30.0	1.01	1.00	521.4	40.3	5,080	41,232	2.45	83.95
860+250	0.25	40.00	383.00	255.00	192.00	121.00	82.00	45.00	29.00	18.90	10.0	30.0	1.01	1.00	388.5	38.7	7,375	52,464	2.65	62.55
860+500	0.25	40.00	617.00	424.00	325.00	212.00	150.00	82.00	56.00	19.00	10.0	30.0	1.01	1.00	625.1	40.1	4,323	34,599	2.31	100.64
860+750	0.25	40.00	474.00	318.00	239.00	157.00	108.00	60.00	41.00	19.00	10.0	30.0	1.01	1.00	480.2	39.3	5,857	43,775	2.50	77.32
861+000	0.25	40.00	571.00	382.00	278.00	181.00	123.00	67.00	43.00	18.90	10.0	30.0	1.01	1.00	579.3	38.6	4,970	35,256	2.32	93.26
861+250	0.25	40.00	514.00	312.00	212.00	131.00	95.00	59.00	42.00	18.90	10.0	30.0	1.01	1.00	521.4	35.8	6,492	36,065	2.34	83.95
861+500	0.25	40.00	598.00	432.00	335.00	232.00	167.00	97.00	64.00	18.90	10.0	30.0	1.01	1.00	606.6	42.5	4,055	39,133	2.41	97.67
861+750	0.25	40.00	594.00	410.00	314.00	207.00	144.00	82.00	57.00	18.90	10.0	30.0	1.01	1.00	602.6	40.2	4,477	36,030	2.34	97.02
862+000	0.25	40.00	618.00	426.00	327.00	221.00	157.00	94.00	64.00	18.90	10.0	30.0	1.01	1.00	626.9	40.9	4,224	35,902	2.34	100.94
862+250	0.25	40.00	241.00	168.00	127.00	86.00	61.00	35.00	29.00	18.90	10.0	30.0	1.01	1.00	244.5	40.0	11,202	89,148	3.17	39.36
862+500	0.25	40.00	428.00	286.00	208.00	134.00	93.00	56.00	41.00	18.90	8.0	32.0	1.01	1.00	433.4	38.4	6,756	47,130	2.56	69.77
862+750	0.25	40.00	249.00	172.00	127.00	88.00	68.00	37.00	26.00	19.00	8.0	32.0	1.01	1.00	251.8	41.1	10,513	90,886	3.19	40.54
863+000	0.25	40.00	530.00	389.00	297.00	198.00	139.00	80.00	57.00	19.20	8.0	32.0	1.01	1.00	534.8	41.6	4,713	42,335	2.47	86.11
863+250	0.25	40.00	531.00	375.00	291.00	204.00	148.00	85.00	52.00	22.30	8.0	32.0	0.98	1.00	519.3	43.3	4,588	46,829	2.55	83.61
863+500	0.25	40.00	610.00	453.00	355.00	249.00	190.00	115.00	72.00	22.10	8.0	32.0	0.98	1.00	597.7	45.4	3,706	43,982	2.50	96.24
863+750	0.25	40.00	763.00	536.00	404.00	266.00	184.00	95.00	58.00	22.00	8.0	32.0	0.98	1.00	748.4	40.9	3,415	29,114	2.18	120.49
864+000	0.25	40.00	747.00	511.00	385.00	243.00	160.00	78.00	46.00	21.80	8.0	32.0	0.98	1.00	733.4	39.5	3,663	27,836	2.15	118.08
864+250	0.25	40.00	818.00	535.00	391.00	245.00	162.00	83.00	30.00	21.80	8.0	32.0	0.98	1.00	803.9	38.7	3,487	24,836	2.07	129.43
864+500	0.25	40.00	688.00	432.00	312.00	199.00	131.00	73.00	47.00	21.80	8.0	32.0	0.98	1.00	676.1	37.6	4,472	29,083	2.18	108.86
864+750	0.25	40.00	1213.00	741.00	509.00	288.00	187.00	93.00	52.00	21.70	8.0	32.0	0.98	1.00	1193.3	35.5	2,754	14,890	1.74	192.11
865+000	0.25	40.00	1001.00	627.00	391.00	241.00	172.00	100.00	60.00	21.70	8.0	32.0	0.98	1.00	984.7	35.9	3,332	18,641	1.88	158.54
865+250	0.25	40.00	824.00	557.00	412.00	261.00	174.00	90.00	44.00	21.90	8.0	32.0	0.98	1.00	809.0	39.5	3,341	25,360	2.08	130.25
865+500	0.25	40.00	835.00	558.00	410.00	256.00	171.00	85.00	48.00	21.90	8.0	32.0	0.98	1.00	819.8	38.8	3,401	24,442	2.06	131.99
865+750	0.25	40.00	976.00	685.00	502.00	327.00	218.00	107.00	49.00	21.80	7.0	35.0	0.98	1.00	960.7	41.6	2,721	21,190	2.06	154.67
866+000	0.25	40.00	627.00	364.00	238.00	119.00	64.00	30.00	21.00	21.80	7.0	35.0	0.98	1.00	617.2	34.0	6,052	24,285	2.15	99.36
866+250	0.25	40.00	894.00	564.00	396.00	236.00	148.00	69.00	32.00	21.80	7.0	35.0	0.98	1.00	880.0	37.9	3,496	20,189	2.03	141.67
866+500	0.25	40.00	671.00	429.00	303.00	180.00	120.00	67.00	20.00	21.70	7.0	35.0	0.99	1.00	661.1	39.0	4,450	28,194	2.26	106.43
866+750	0.25	40.00	536.00	320.00	226.00	132.00	91.00	58.00	39.00	21.80	7.0	35.0	0.98	1.00	527.6	37.3	6,278	34,453	2.42	84.94
867+000	0.25	40.00	477.00	308.00	219.00	127.00	89.00	62.00	44.00	21.80	7.0	35.0	0.98	1.00	469.5	38.6	6,566	40,088	2.55	75.59
867+250	0.25	40.00	644.00	412.00	289.00	176.00	118.00	67.00	33.00	21.70	7.0	35.0	0.99	1.00	634.5	39.0	4,708	29,747	2.31	102.15
867+500	0.25	40.00	624.00	361.00	234.00	120.00	69.00	34.00	22.00	21.70	7.0	35.0	0.99							

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)	
181154		181154-70-LABC-33

STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	DERECHO	EQUIPO:	FWD KUAB

Prog	Distancia	Carga	D0	D1	D2	D3	D4	D5	D6	Temp	Espesor (cm)						D max (FWD)	a ₀	M ₀	E Pav	SN _{Efect}	D max (VB)
	Km	KN	µm	µm	µm	µm	µm	µm	µm		Carpeta	Base + Sub base	Δ Temp	Δ carga	µm	cm	Psi	Psi	10 ⁻³ mm			
869+750	0.25	40.00	411.00	250.00	176.00	105.00	74.00	48.00	32.00	21.80	8.0	42.0	0.98	1.00	403.9	43.9	8,090	44,400	3.14	65.03		
870+000	0.25	40.00	481.00	320.00	237.00	145.00	99.00	55.00	36.00	21.80	8.0	42.0	0.98	1.00	472.7	46.1	6,144	39,161	3.01	76.11		
870+250	0.25	40.00	191.00	105.00	77.00	59.00	51.00	41.00	33.00	21.60	8.0	42.0	0.98	1.00	188.1	49.0	15,730	122,051	4.39	30.28		
870+500	0.25	40.00	307.00	194.00	148.00	101.00	74.00	47.00	28.00	21.70	8.0	42.0	0.98	1.00	302.0	49.1	9,027	70,369	3.66	48.62		
870+750	0.25	40.00	299.00	188.00	133.00	85.00	61.00	44.00	34.00	21.70	8.0	42.0	0.98	1.00	294.1	45.3	10,795	65,404	3.57	47.36		
871+000	0.25	40.00	282.00	175.00	128.00	77.00	60.00	47.00	34.00	21.60	8.0	42.0	0.98	1.00	277.7	46.3	11,164	72,108	3.69	44.71		
871+250	0.25	40.00	279.00	186.00	133.00	83.00	63.00	41.00	37.00	21.50	8.0	42.0	0.99	1.00	275.0	45.6	11,446	70,747	3.66	44.27		
871+500	0.25	40.00	229.00	152.00	121.00	90.00	75.00	54.00	38.00	21.50	8.0	42.0	0.99	1.00	225.7	55.5	10,086	115,602	4.32	36.34		
871+750	0.25	40.00	457.00	287.00	205.00	121.00	77.00	41.00	25.00	21.50	8.0	42.0	0.99	1.00	450.4	43.4	7,053	37,180	2.96	72.52		
872+000	0.25	40.00	253.00	157.00	114.00	75.00	57.00	43.00	26.00	21.60	8.0	42.0	0.98	1.00	249.1	48.3	11,550	85,355	3.90	40.11		
872+250	0.25	40.00	484.00	309.00	231.00	150.00	111.00	73.00	54.00	21.70	8.0	42.0	0.98	1.00	476.1	47.3	6,148	42,735	3.10	76.66		
872+500	0.25	40.00	281.00	170.00	125.00	84.00	67.00	32.00	9.00	21.70	8.0	42.0	0.98	1.00	276.4	47.4	10,084	70,392	3.66	44.50		
872+750	0.25	40.00	478.00	322.00	244.00	164.00	117.00	69.00	48.00	21.50	8.0	42.0	0.99	1.00	471.1	48.7	5,765	43,897	3.12	75.85		
873+000	0.25	40.00	459.00	343.00	280.00	202.00	147.00	83.00	45.00	21.50	8.0	42.0	0.99	1.00	452.4	55.1	4,739	52,878	3.32	72.84		
873+250	0.25	40.00	621.00	422.00	314.00	199.00	130.00	62.00	32.00	21.60	13.0	47.0	0.98	1.00	607.7	53.8	4,794	28,807	3.26	97.84		
873+500	0.25	40.00	555.00	375.00	280.00	179.00	119.00	60.00	47.00	21.60	13.0	47.0	0.98	1.00	543.1	53.3	5,858	34,116	3.45	87.44		
873+750	0.25	40.00	484.00	332.00	257.00	171.00	119.00	63.00	37.00	21.60	13.0	47.0	0.98	1.00	473.6	57.1	5,818	41,995	3.69	76.26		
874+000	0.25	40.00	634.00	451.00	347.00	228.00	152.00	67.00	29.00	21.60	13.0	47.0	0.98	1.00	620.4	55.9	4,251	28,821	3.26	99.89		
874+250	0.25	40.00	599.00	439.00	350.00	239.00	169.00	85.00	41.00	21.60	13.0	47.0	0.98	1.00	586.2	60.0	4,174	35,179	3.48	94.38		
874+500	0.25	40.00	763.00	563.00	443.00	300.00	207.00	107.00	62.00	21.60	13.0	47.0	0.98	1.00	746.7	59.2	3,424	27,626	3.21	120.21		
874+750	0.25	40.00	451.00	324.00	259.00	182.00	134.00	81.00	53.00	21.70	13.0	47.0	0.98	1.00	440.7	62.1	5,586	52,391	3.98	70.96		
875+000	0.25	40.00	563.00	385.00	293.00	190.00	134.00	73.00	20.00	21.60	13.0	47.0	0.98	1.00	551.0	57.4	4,708	34,578	3.46	88.70		
875+250	0.25	40.00	600.00	436.00	332.00	214.00	144.00	76.00	35.00	21.50	13.0	47.0	0.98	1.00	588.0	57.2	4,485	32,681	3.40	94.66		
875+500	0.25	40.00	813.00	536.00	390.00	239.00	158.00	85.00	36.00	21.40	13.0	47.0	0.98	1.00	797.8	53.4	3,727	21,883	2.97	128.44		
875+750	0.25	40.00	643.00	435.00	316.00	194.00	130.00	73.00	46.00	21.50	13.0	47.0	0.98	1.00	630.1	53.5	4,928	29,088	3.27	101.45		
876+000	0.25	40.00	708.00	507.00	370.00	266.00	171.00	125.00	83.00	21.50	13.0	47.0	0.98	1.00	693.8	50.5	5,387	26,560	3.17	111.70		
876+250	0.25	40.00	485.00	348.00	280.00	205.00	153.00	93.00	37.00	21.40	13.0	47.0	0.98	1.00	475.9	64.5	4,683	49,384	3.90	76.62		
876+500	0.25	40.00	406.00	310.00	255.00	185.00	143.00	85.00	55.00	21.40	13.0	47.0	0.98	1.00	398.4	66.3	5,473	62,821	4.23	64.14		
876+750	0.25	40.00	380.00	281.00	224.00	161.00	125.00	82.00	56.00	21.40	13.0	47.0	0.98	1.00	372.9	65.3	6,155	67,259	4.32	60.03		
877+000	0.25	40.00	695.00	479.00	362.00	229.00	153.00	83.00	39.00	21.40	13.0	47.0	0.98	1.00	682.0	55.7	4,098	27,361	3.20	109.80		
877+250	0.25	40.00	668.00	473.00	355.00	227.00	150.00	85.00	43.00	21.40	13.0	47.0	0.98	1.00	655.5	56.3	4,225	29,247	3.28	105.53		
877+500	0.25	40.00	483.00	352.00	280.00	194.00	140.00	81.00	53.00	21.40	13.0	47.0	0.98	1.00	474.0	61.1	5,310	47,256	3.84	76.31		
877+750	0.25	40.00	539.00	396.00	308.00	209.00	149.00	87.00	56.00	21.50	13.0	47.0	0.98	1.00	528.2	60.1	4,896	41,554	3.68	85.04		
878+000	0.25	40.00	585.00	436.00	344.00	238.00	169.00	93.00	30.00	21.40	13.0	47.0	0.98	1.00	574.0	61.6	4,025	36,885	3.54	92.42		
878+250	0.25	40.00	673.00	483.00	379.00	258.00	176.00	91.00	47.00	21.40	13.0	47.0	0.98	1.00	660.4	58.6	3,894	30,448	3.32	106.32		
878+500	0.25	40.00	515.00	391.00	312.00	219.00	158.00	92.00	60.00	21.30	13.0	47.0	0.98	1.00	506.0	62.6	4,764	45,711	3.80	81.47		
878+750	0.25	40.00	510.00	371.00	295.00	205.00	147.00	77.00	42.00	21.40	13.0	47.0	0.98	1.00	500.5	60.5	4,931	42,662	3.71	80.57		
879+000	0.25	40.00	594.00	426.00	323.00	207.00	134.00	61.00	21.00	21.40	13.0	47.0	0.98	1.00	582.9	55.3	4,510	29,521	3.29	93.84		
879+250	0.25	40.00	472.00	358.00	281.00	191.00	129.00	65.00	13.00	22.60	13.0	47.0	0.97	1.00	455.6	60.1	4,966	42,095	3.70	73.35		
879+500	0.25	40.00	619.00	458.00	364.00	247.00	167.00	78.00	22.00	21.50	13.0	47.0	0.98	1.00	606.6	58.8	3,901	30,921	3.34	97.66		
879+750	0.25	40.00	495.00	338.00	250.00	154.00	95.00	38.00	19.00	21.30	13.0	47.0	0.98	1.00	486.4	51.6	6,115	32,202	3.38	78.31		
880+000	0.25	40.00	597.00	403.00	303.00	190.00	119.00	47.00	19.00	21.10	13.0	47.0	0.99	1.00	588.2	52.2	4,886	26,662	3.18	94.70		
880+250	0.25	40.00	571.00	394.00	293.00	181.00	114.00	45.00	17.00	21.20	13.0	47.0	0.98	1.00	561.8	52.3	5,039	27,668	3.22	90.46		
880+500	0.25	40.00	561.00	404.00	314.00	211.00	143.00	68.00	20.00	21.20	13.0	47.0	0.98	1.00	552.0	57.7	4,485	33,502	3.43	88.87		
880+750	0.25	40.00	538.00	425.00	348.00	255.00	191.00	108.00	51.00	21.30	13.0	47.0	0.98	1.00	528.6	66.6	3,953	46,071	3.81	85.11		
881+000	0.25	40.00	440.00	336.00	268.00	188.00	133.00	69.00	35.00	21.30	13.0	47.0	0.98	1.00	432.4	61.7	5,439	50,053	3.92	69.61		
881+250	0.25	40.00	718.00	492.00	368.00	235.00	149.00	62.00	30.00	21.20	10.0	40.0	0.99	1.00	708.4	46.0	3,839	24,415	2.57	114.05		
881+500	0.25	40.00	492.00	349.00	269.00	178.00	117.00	50.00	14.00	21.20	10.0	40.0	0.99	1.00	485.4	48.3	5,037	37,330	2.92			

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)	 181154-78-LABC-33
181154		

STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

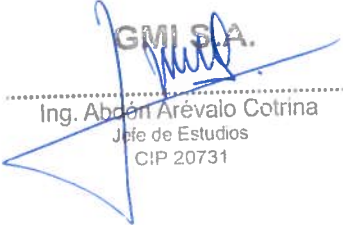
ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	DERECHO	EQUIPO:	FWD KUAB

Prog	Distancia	Carga	D0	D1	D2	D3	D4	D5	D6	Temp	Espesor (cm)								D max (FWD)	a _p	M _R	E Pav	S _N Elef	D max (VB)
	Km	KN	µm	(30 cm)	(30 cm)	(45 cm)	(60 cm)	(80 cm)	(120 cm)		Carpeta	Base + Sub base	λ Temp	λ Carga	µm	cm	Psi	Psi						
885+000	0.25	40.00	484.00	334.00	259.00	176.00	122.00	68.00	35.00	21.20	10.0	40.0	0.99	1.00	477.5	50.1	5,249	43,583	3.12		76.88			
885+250	0.25	40.00	601.00	376.00	267.00	152.00	98.00	57.00	36.00	21.20	10.0	40.0	0.99	1.00	592.9	43.0	5,479	28,104	2.69		95.46			
885+500	0.25	40.00	780.00	488.00	308.00	159.00	98.00	54.00	36.00	21.30	10.0	40.0	0.99	1.00	768.7	39.9	4,672	18,780	2.35		123.75			
885+750	0.25	40.00	824.00	557.00	399.00	238.00	149.00	80.00	47.00	21.20	10.0	40.0	0.99	1.00	812.9	44.7	3,630	21,085	2.45		130.88			
886+000	0.25	40.00	639.00	386.00	262.00	146.00	92.00	53.00	35.00	21.30	8.0	47.0	0.99	1.00	631.0	44.5	5,715	24,555	2.83		101.60			
886+250	0.25	40.00	378.00	243.00	165.00	94.00	58.00	34.00	21.00	21.30	8.0	47.0	0.99	1.00	373.3	45.9	9,010	42,625	3.40		60.10			
886+500	0.25	40.00	693.00	465.00	346.00	218.00	144.00	75.00	37.00	21.20	8.0	47.0	0.99	1.00	685.0	50.4	4,134	26,267	2.90		110.29			
886+600	0.10	40.00	607.00	409.00	293.00	181.00	109.00	54.00	22.00	21.30	8.0	47.0	0.99	1.00	599.4	48.5	4,831	27,227	2.93		96.51			

GMI S.A.

ING. JOSÉ IGNACIO MELCHOR ARECHE
CIP 59767
Especialista en Suelos y Pavimentos

GMI S.A.

Ing. Abdón Arévalo Cotrina
Jefe de Estudios
CIP 20731

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)									
181154										



STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	IZQUIERDO	EQUIPO:	FWD KUAB

Prog	Distancia Km	Carga KN	D0 µm	D1	D2	D3	D4	D5	D6	Temp °C	Espesor (cm)				D max (FWD)		a _g cm	M _R Psi	E Pav		D max (VB)
				(20 cm) µm	(30 cm) µm	(45 cm) µm	(60 cm) µm	(80 cm) µm	(120 cm) µm		Carpeta	Base + Sub base	A Temp	A Carga	µm	cm			Psi	Psi	
736+625	0.00	40.00	151.00	98.00	76.00	51.00	43.00	27.00	16.00	25.40	10.0	40.0	0.94	1.00	141.9	52.9	17,046	167,435	4.88	22.84	
736+875	0.25	40.00	159.00	98.00	80.00	61.00	51.00	34.00	26.00	25.40	10.0	40.0	0.94	1.00	149.4	55.1	15,350	171,870	4.93	24.05	
737+125	0.25	40.00	159.00	106.00	86.00	66.00	54.00	37.00	28.00	24.90	10.0	40.0	0.95	1.00	150.3	57.2	14,253	178,722	4.99	24.20	
737+375	0.25	40.00	191.00	127.00	98.00	68.00	50.00	31.00	22.00	24.80	10.0	40.0	0.95	1.00	180.7	50.9	14,084	123,203	4.41	29.10	
737+625	0.25	40.00	150.00	91.00	72.00	45.00	42.00	24.00	20.00	25.00	10.0	40.0	0.94	1.00	141.6	49.4	19,611	156,106	4.77	22.80	
737+875	0.25	40.00	142.00	93.00	74.00	55.00	43.00	31.00	21.00	25.10	10.0	40.0	0.94	1.00	133.9	55.4	16,913	191,996	5.11	21.56	
738+125	0.25	40.00	130.00	80.00	64.00	46.00	41.00	31.00	25.00	25.10	10.0	40.0	0.94	1.00	122.6	54.5	19,427	210,540	5.27	19.74	
738+375	0.25	40.00	127.00	89.00	72.00	54.00	46.00	32.00	19.00	25.20	10.0	40.0	0.94	1.00	119.6	60.3	16,264	240,854	5.51	19.26	
738+625	0.25	40.00	147.00	88.00	69.00	49.00	40.00	27.00	21.00	25.10	10.0	40.0	0.94	1.00	138.6	50.9	19,137	166,885	4.88	22.32	
738+875	0.25	40.00	113.00	72.00	56.00	39.00	34.00	26.00	17.00	24.80	10.0	40.0	0.95	1.00	106.9	54.9	21,935	242,124	5.52	17.22	
739+125	0.25	40.00	130.00	78.00	64.00	48.00	43.00	32.00	20.00	24.60	10.0	40.0	0.95	1.00	123.3	57.2	17,721	222,809	5.37	19.85	
739+375	0.25	40.00	105.00	64.00	52.00	38.00	36.00	29.00	18.00	24.40	10.0	40.0	0.95	1.00	99.8	58.7	21,147	287,526	5.85	16.07	
739+625	0.25	40.00	156.00	105.00	83.00	58.00	47.00	30.00	21.00	24.40	10.0	40.0	0.95	1.00	148.3	53.7	15,923	164,264	4.85	23.88	
739+875	0.25	40.00	114.00	77.00	61.00	46.00	36.00	26.00	19.00	24.30	10.0	40.0	0.95	1.00	108.5	55.8	20,593	240,148	5.51	17.47	
740+125	0.25	40.00	140.00	99.00	80.00	58.00	46.00	29.00	22.00	26.20	10.0	40.0	0.93	1.00	130.3	56.3	16,641	198,703	5.17	20.98	
740+375	0.25	40.00	151.00	104.00	81.00	56.00	43.00	26.00	20.00	26.20	10.0	40.0	0.93	1.00	140.5	52.4	17,304	165,887	4.87	22.62	
740+625	0.25	40.00	172.00	89.00	63.00	43.00	35.00	27.00	24.00	26.00	10.0	40.0	0.93	1.00	160.5	43.9	22,115	121,323	4.39	25.83	
740+875	0.25	40.00	153.00	110.00	82.00	52.00	36.00	18.00	12.00	25.20	10.0	40.0	0.94	1.00	144.1	48.7	17,885	135,979	4.56	23.20	
741+125	0.25	40.00	193.00	133.00	103.00	67.00	54.00	33.00	25.00	25.80	10.0	40.0	0.94	1.00	180.5	51.8	13,827	127,178	4.45	29.06	
741+375	0.25	40.00	139.00	100.00	81.00	62.00	52.00	37.00	30.00	25.40	10.0	40.0	0.94	1.00	130.6	60.3	15,029	222,211	5.37	21.03	
741+625	0.25	40.00	299.00	201.00	154.00	103.00	75.00	42.00	31.00	25.40	10.0	40.0	0.94	1.00	280.9	49.6	9,323	75,182	3.74	45.23	
741+875	0.25	40.00	140.00	92.00	71.00	48.00	42.00	30.00	27.00	25.60	10.0	40.0	0.94	1.00	131.2	52.2	19,531	184,858	5.05	21.13	
742+125	0.25	40.00	236.00	180.00	150.00	111.00	91.00	50.00	43.00	25.10	10.0	40.0	0.94	1.00	222.5	58.5	9,041	122,036	4.39	35.83	
742+375	0.25	40.00	297.00	198.00	157.00	111.00	85.00	47.00	34.00	25.10	10.0	40.0	0.94	1.00	280.1	52.0	8,721	81,304	3.84	45.09	
742+625	0.25	40.00	389.00	290.00	227.00	153.00	116.00	69.00	56.00	25.40	10.0	40.0	0.94	1.00	365.5	53.1	6,482	64,686	3.56	58.85	
742+875	0.25	40.00	352.00	268.00	218.00	157.00	122.00	71.00	56.00	25.10	10.0	40.0	0.94	1.00	331.9	56.7	6,366	78,037	3.79	53.44	
743+125	0.25	40.00	366.00	275.00	228.00	168.00	135.00	85.00	67.00	25.10	10.0	40.0	0.94	1.00	345.1	59.0	5,788	80,123	3.82	55.56	
743+375	0.25	40.00	498.00	386.00	313.00	223.00	171.00	96.00	71.00	25.90	10.0	40.0	0.93	1.00	465.1	56.9	4,466	55,162	3.37	74.89	
743+625	0.25	40.00	275.00	207.00	172.00	129.00	107.00	74.00	64.00	25.00	5.0	55.0	0.97	1.00	265.5	71.3	7,379	106,076	5.03	42.74	
743+875	0.25	40.00	364.00	268.00	219.00	157.00	126.00	79.00	62.00	24.70	5.0	55.0	0.97	1.00	352.2	66.0	6,406	72,553	4.43	56.70	
744+125	0.25	40.00	351.00	249.00	196.00	136.00	102.00	57.00	47.00	24.90	5.0	55.0	0.97	1.00	339.1	60.1	7,876	66,664	4.31	54.59	
744+375	0.25	40.00	315.00	230.00	191.00	142.00	124.00	84.00	66.00	24.50	5.0	55.0	0.97	1.00	305.2	71.0	6,430	91,134	4.78	49.14	
744+625	0.25	40.00	440.00	375.00	326.00	264.00	228.00	159.00	116.00	24.10	10.0	50.0	0.95	1.00	419.8	84.0	3,324	78,734	4.56	67.59	
744+875	0.25	40.00	355.00	287.00	243.00	192.00	153.00	96.00	67.00	24.90	10.0	50.0	0.95	1.00	335.5	74.7	5,213	86,267	4.70	54.02	
745+125	0.25	40.00	210.00	146.00	116.00	82.00	64.00	42.00	33.00	24.40	10.0	50.0	0.95	1.00	199.7	63.3	12,306	122,574	5.28	32.15	
745+375	0.25	40.00	144.00	108.00	78.00	56.00	46.00	32.00	27.00	24.50	10.0	50.0	0.95	1.00	136.8	64.8	17,958	191,632	6.13	22.02	
745+625	0.25	40.00	186.00	132.00	109.00	80.00	74.00	55.00	50.00	24.30	10.0	50.0	0.95	1.00	177.1	73.8	10,445	166,515	5.85	28.51	
745+875	0.25	40.00	172.00	112.00	87.00	61.00	52.00	33.00	26.00	24.30	10.0	50.0	0.95	1.00	163.7	62.0	15,684	146,701	5.61	26.36	
746+125	0.25	40.00	122.00	74.00	55.00	38.00	35.00	25.00	24.00	24.00	10.0	50.0	0.96	1.00	116.5	59.9	24,484	205,627	6.27	18.76	
746+375	0.25	40.00	204.00	128.00	99.00	71.00	60.00	43.00	37.00	23.90	10.0	50.0	0.96	1.00	195.1	62.0	13,390	124,775	5.31	31.41	
746+625	0.25	40.00	182.00	124.00	99.00	72.00	59.00	42.00	34.00	24.10	10.0	50.0	0.95	1.00	173.7	65.7	13,304	148,440	5.63	27.96	
746+875	0.25	40.00	148.00	91.00	68.00	47.00	41.00	30.00	30.00	23.50	10.0	50.0	0.96	1.00	142.2	59.2	20,617	166,447	5.85	22.89	
747+125	0.25	40.00	163.00	108.00	85.00	63.00	52.00	36.00	28.00	23.20	10.0	50.0	0.96	1.00	157.2	64.6	15,121	159,930	5.77	25.30	
747+375	0.25	40.00	221.00	163.00	134.00	100.00	80.00	49.00	35.00	24.70	10.0	50.0	0.95	1.00	209.4	68.1	10,009	124,886	5.31	33.71	
747+625	0.25	40.00	153.00	98.00	72.00	46.00	33.00	18.00	13.00	24.70	12.0	60.0	0.94	1.00	143.9	63.6	25,011	146,328	6.72	23.17	
747+875	0.25	40.00	216.00	154.00	122.00	85.00	63.00	33.00	21.00	24.20	12.0	60.0	0.95	1.00	204.5	70.8	13,871	112,867	6.16	32.92	
748+125	0.25	40.00	180.00	128.00	103.00	75.00	59.00	33.00	21.00	24.00	12.0	60.0	0.95	1.00	170.9	74.7	14,907	142,944	6.67	27.51	
748+375	0.25	40.00	182.00	136.00	112.00	84.00	68.00	45.00	34.00	23.80	12.0	60.0	0.95	1.00	173.2	82.1	12,220	156,187	6.87	27.89	
748+625	0.25	40.00	187.00	128.00	102.00	73.0															

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)									
181154										
										 181154-79-LABC-33

STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	IZQUIERDO	EQUIPO:	FWD KUAB

Prog	Distancia Km	Carga KN	D0 (30 cm)	D1 (30 cm)	D2 (45 cm)	D3 (60 cm)	D4 (60 cm)	D5 (60 cm)	D6 (120 cm)	Temp °C	Espesor (cm) Carpeta	Base + Sub base	A _{Temp}	A _{Carga}	D _{max} (FWD) µm	a _s cm	M ₀ Psi	E Pav Psi	SN Efect	D _{max} (VB) 10 ² mm
753+375	0.25	40.0	170.00	109.00	82.00	56.00	40.00	22.00	16.00	22.60	10.0	55.0	0.97	1.00	165.1	59.6	19,100	123,827	5.74	26.57
753+625	0.25	40.0	225.00	163.00	130.00	92.00	70.00	41.00	29.00	22.80	10.0	55.0	0.97	1.00	218.0	67.2	11,639	109,365	5.51	35.09
753+875	0.25	40.00	162.00	107.00	82.00	55.00	42.00	25.00	18.00	22.00	10.0	55.0	0.98	1.00	158.4	62.1	18,755	138,259	5.95	25.50
754+125	0.25	40.0	201.00	142.00	112.00	82.00	66.00	41.00	31.00	22.20	10.0	55.0	0.98	1.00	196.1	68.8	12,486	126,438	5.78	31.56
754+375	0.25	40.00	207.00	162.00	134.00	101.00	85.00	55.00	42.00	22.40	10.0	55.0	0.97	1.00	201.4	77.1	9,652	138,243	5.95	32.43
754+625	0.25	40.0	152.00	101.00	77.00	55.00	40.00	24.00	18.00	22.30	10.0	55.0	0.97	1.00	148.1	62.7	19,634	149,495	6.11	23.84
754+875	0.25	40.00	174.00	125.00	98.00	68.00	52.00	32.00	23.00	21.90	10.0	55.0	0.98	1.00	170.3	66.2	15,494	139,371	5.97	27.42
755+125	0.25	40.0	210.00	153.00	126.00	96.00	78.00	51.00	37.00	21.80	10.0	55.0	0.98	1.00	205.8	73.6	10,266	127,726	5.80	33.13
755+375	0.25	40.00	155.00	108.00	82.00	57.00	42.00	26.00	19.00	21.50	10.0	55.0	0.98	1.00	152.4	63.6	18,728	148,733	6.10	24.54
755+625	0.25	40.0	141.00	89.00	66.00	45.00	35.00	20.00	15.00	22.50	10.0	55.0	0.97	1.00	137.1	60.5	22,886	155,609	6.19	22.07
755+875	0.25	40.00	197.00	133.00	105.00	75.00	56.00	29.00	21.00	22.30	10.0	55.0	0.97	1.00	191.9	63.3	14,488	113,358	5.57	30.90
756+125	0.25	40.0	126.00	76.00	57.00	41.00	35.00	23.00	16.00	21.90	10.0	55.0	0.98	1.00	123.3	64.3	22,882	187,810	6.59	19.85
756+375	0.25	40.00	164.00	107.00	80.00	55.00	49.00	33.00	26.00	22.50	10.0	55.0	0.97	1.00	159.4	66.2	17,095	153,500	6.17	25.67
756+625	0.25	40.0	135.00	97.00	77.00	58.00	49.00	35.00	27.00	22.10	10.0	55.0	0.98	1.00	131.8	74.1	16,115	205,027	6.79	21.22
756+875	0.25	40.00	167.00	57.00	44.00	32.00	27.00	18.00	15.00	22.10	10.0	55.0	0.98	1.00	163.1	50.3	29,525	113,107	5.57	26.26
757+125	0.25	40.0	113.00	76.00	59.00	40.00	36.00	23.00	18.00	22.30	11.0	34.0	0.97	1.00	109.9	48.3	22,347	226,337	4.86	17.69
757+375	0.25	40.00	92.00	57.00	45.00	33.00	26.00	17.00	13.00	22.10	11.0	34.0	0.97	1.00	89.7	46.6	29,137	263,727	5.11	14.44
757+625	0.25	40.0	94.00	64.00	52.00	38.00	30.00	19.00	15.00	22.30	11.0	34.0	0.97	1.00	91.4	49.3	25,502	276,653	5.19	14.72
757+875	0.25	40.00	107.00	83.00	73.00	61.00	55.00	31.00	24.00	22.40	11.0	34.0	0.97	1.00	103.9	62.1	14,978	332,994	5.53	16.73
758+125	0.25	40.0	114.00	60.00	46.00	35.00	28.00	18.00	14.00	23.20	11.0	34.0	0.96	1.00	109.6	43.2	28,004	200,354	4.67	17.65
758+375	0.25	40.0	88.00	50.00	41.00	31.00	29.00	21.00	16.00	22.60	11.0	34.0	0.97	1.00	85.3	49.2	28,924	311,435	5.40	13.73
758+625	0.25	40.0	130.00	95.00	77.00	59.00	49.00	34.00	25.00	22.10	11.0	34.0	0.97	1.00	126.7	54.5	15,720	233,101	4.91	20.40
758+875	0.25	40.00	147.00	96.00	71.00	45.00	32.00	17.00	12.00	22.50	11.0	34.0	0.97	1.00	142.6	42.7	19,954	137,305	4.11	22.96
759+125	0.25	40.0	107.00	75.00	59.00	43.00	36.00	24.00	18.00	22.20	11.0	34.0	0.97	1.00	104.2	50.7	21,549	255,508	5.06	16.77
759+375	0.25	40.00	213.00	158.00	128.00	93.00	69.00	30.00	27.00	21.70	11.0	34.0	0.98	1.00	208.7	48.1	11,164	111,977	3.84	33.60
759+625	0.25	40.0	167.00	112.00	90.00	68.00	59.00	39.00	30.00	21.70	11.0	34.0	0.98	1.00	163.6	51.2	13,631	166,590	4.39	26.34
759+875	0.25	40.00	171.00	120.00	94.00	65.00	48.00	26.00	17.00	22.10	11.0	34.0	0.97	1.00	166.7	47.2	14,455	136,320	4.10	26.84
760+125	0.25	40.0	112.00	73.00	58.00	39.00	36.00	23.00	18.00	22.30	11.0	34.0	0.97	1.00	108.9	48.2	22,689	229,218	4.88	17.54
760+375	0.25	40.00	137.00	89.00	71.00	50.00	36.00	20.00	14.00	22.50	11.0	34.0	0.97	1.00	132.9	45.9	19,325	166,822	4.39	21.40
760+625	0.25	40.0	112.00	75.00	57.00	35.00	27.00	15.00	12.00	22.40	11.0	34.0	0.97	1.00	108.8	43.5	25,681	187,763	4.57	17.51
760+875	0.25	40.00	127.00	88.00	73.00	56.00	50.00	33.00	22.00	22.10	11.0	34.0	0.97	1.00	123.8	55.2	15,825	244,092	4.98	19.93
761+125	0.25	40.0	97.00	61.00	50.00	39.00	33.00	24.00	19.00	21.70	11.0	34.0	0.98	1.00	95.0	50.6	24,187	285,243	5.25	15.30
761+375	0.25	40.00	98.00	66.00	50.00	34.00	26.00	14.00	11.00	22.00	11.0	34.0	0.98	1.00	95.7	45.0	27,822	226,536	4.86	15.40
761+625	0.25	40.0	107.00	62.00	50.00	39.00	36.00	26.00	22.00	22.30	11.0	34.0	0.97	1.00	104.1	48.9	23,862	251,417	5.03	16.75
761+875	0.25	40.00	151.00	104.00	82.00	55.00	47.00	26.00	19.00	22.40	11.0	34.0	0.97	1.00	146.7	48.0	16,433	163,725	4.36	23.61
762+125	0.25	40.0	147.00	103.00	79.00	50.00	39.00	21.00	14.00	22.50	11.0	34.0	0.97	1.00	142.6	45.9	17,678	152,443	4.26	22.96
762+375	0.25	40.00	98.00	68.00	54.00	40.00	35.00	24.00	17.00	22.40	11.0	34.0	0.97	1.00	95.2	52.6	22,407	296,982	5.32	15.33
762+625	0.25	40.0	116.00	80.00	60.00	37.00	28.00	17.00	12.00	22.60	11.0	34.0	0.97	1.00	112.4	44.6	23,719	186,834	4.56	18.10
762+875	0.25	40.00	141.00	98.00	71.00	44.00	33.00	20.00	16.00	22.50	11.0	34.0	0.97	1.00	136.8	43.4	20,444	148,306	4.22	22.02
763+125	0.25	40.0	233.00	158.00	119.00	78.00	56.00	27.00	17.00	22.40	11.0	34.0	0.97	1.00	226.3	44.3	11,636	89,755	3.57	36.44
763+375	0.25	40.00	248.00	163.00	128.00	89.00	68.00	37.00	24.00	22.60	10.0	35.0	0.97	1.00	240.8	46.4	10,462	93,865	3.62	38.77
763+625	0.25	40.0	299.00	199.00	150.00	98.00	68.00	32.00	19.00	22.00	10.0	35.0	0.98	1.00	292.3	43.5	9,242	67,369	3.24	47.06
763+875	0.25	40.00	184.00	117.00	85.00	56.00	41.00	23.00	16.00	22.40	10.0	35.0	0.97	1.00	179.1	42.8	16,141	112,176	3.84	28.83
764+125	0.25	40.0	270.00	184.00	137.00	85.00	56.00	24.00	13.00	22.90	10.0	35.0	0.97	1.00	261.2	42.7	10,298	70,534	3.29	42.06
764+375	0.25	40.00	226.00	138.00	102.00	68.00	57.00	36.00	27.00	22.70	10.0	35.0	0.97	1.00	219.2	43.9	13,151	99,058	3.69	35.29
764+625	0.25	40.0	201.00	134.00	102.00	69.00	50.00	29.00	21.00	22.50	10.0	35.0	0.97	1.00	195.4	44.9	13,619	109,686	3.82	31.46
764+875	0.25	40.00	229.00	153.00	112.00	69.00	46.00	21.00	14.00	22.60	10.0	35.0	0.97	1.00	222.3	41.9	12,790	82,475	3.47	35.80
765+125	0.25	40.0	149.00	120.00	102.00	76.00	64.00	39.00	26.00	22.60	10.0	35.0	0.97	1.00	144.7	58.1	12,082	218,394	4.80	23.29
765+375	0.25	40.00	134.00	102.00	86.00	65.00	53.00	32.00	23.00	22.50	10.0	35.0	0.97	1.00	130.3	55.2	14,600	225,791	4.85	20.97
765+625	0.25	40.0	177.00	148.00	127.00	98.00	83.00	51.00	34.00	22.30	10.0	35.0	0.97	1.00	172.4	61.0	9,360	197,075	4.64	27.76
765+875	0.25	40.00	138.00	95.00	75.00	52.00	39.00	21.00	15.00	22.40	10.0	35.0	0.97	1.00	134.3	46.9	18,311	169,244	4.41	21.62
766+125	0.25	40.0	344.00	273.00	232.00	181.00	143.00	78.00	47.00	22.70	10.0	35.0	0.97	1.00	333.6	56.7	5,317	88,943	3.56	53.71
766+375	0.25	40.00	264.00	208.00	170.00	124.00	95.00	53.00	34.00	22.80	10.0	35.0	0.97	1.00	255.7	53.1	7,716	105,386	3.77	41.17
766+625	0.25																			

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)	
181154		181154-70-LABC-33

STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	IZQUIERDO	EQUIPO:	FWD KUAB

Prog	Distancia	Carga	D0	D1	D2	D3	D4	D5	D6	Temp	Espesor (cm)	Base + Sub base	A Temp	A Carga	D max (FWD)	a ₂	M _R	E Pav	SN Elect	D max (VB)
	Km	KN	µm	µm	µm	µm	µm	µm	µm											
770+125	0.25	40.0	202.00	147.00	127.00	101.00	84.00	56.00	42.00	21.90	15.0	50.0	0.97	1.00	196.4	78.4	9,264	140,032	5.98	31.62
770+375	0.25	40.00	744.00	553.00	444.00	312.00	228.00	121.00	79.00	22.30	10.0	30.0	0.97	1.00	724.9	44.8	3,055	34,919	2.32	116.70
770+625	0.25	40.0	280.00	229.00	199.00	158.00	132.00	86.00	62.00	22.10	10.0	30.0	0.98	1.00	273.4	56.4	5,887	136,618	3.67	44.02
770+875	0.25	40.00	272.00	208.00	175.00	133.00	110.00	70.00	51.00	21.80	10.0	30.0	0.98	1.00	266.5	50.9	7,102	121,125	3.51	42.91
771+125	0.25	40.0	193.00	153.00	135.00	114.00	101.00	72.00	57.00	21.90	10.0	30.0	0.98	1.00	188.9	60.6	7,737	226,792	4.32	30.41
771+375	0.25	40.00	214.00	166.00	138.00	103.00	84.00	53.00	40.00	21.70	10.0	30.0	0.98	1.00	209.9	49.9	9,260	148,511	3.75	33.80
771+625	0.25	40.0	233.00	172.00	141.00	105.00	86.00	56.00	43.00	21.60	10.0	30.0	0.98	1.00	228.8	48.1	9,101	129,670	3.59	36.84
771+875	0.25	40.00	162.00	123.00	102.00	75.00	68.00	43.00	33.00	21.80	10.0	30.0	0.98	1.00	158.7	50.7	12,122	204,455	4.17	25.56
772+125	0.25	40.0	276.00	210.00	176.00	138.00	117.00	82.00	69.00	21.40	10.0	30.0	0.98	1.00	271.7	51.5	6,939	122,818	3.52	43.74
772+375	0.25	40.00	302.00	233.00	196.00	149.00	123.00	79.00	59.00	21.10	10.0	30.0	0.99	1.00	298.3	50.8	6,369	108,060	3.38	48.02
772+625	0.25	40.0	395.00	299.00	248.00	188.00	155.00	107.00	83.00	21.30	10.0	30.0	0.99	1.00	389.3	49.9	5,058	81,305	3.07	62.67
772+875	0.25	40.00	601.00	354.00	211.00	102.00	58.00	26.00	17.00	21.00	10.0	30.0	0.99	1.00	594.3	32.3	6,454	25,411	2.08	95.68
773+125	0.25	40.0	233.00	164.00	136.00	102.00	88.00	61.00	51.00	20.80	10.0	30.0	0.99	1.00	230.9	47.4	9,384	127,865	3.57	37.18
773+375	0.25	40.00	235.00	190.00	167.00	138.00	121.00	89.00	74.00	21.40	10.0	30.0	0.98	1.00	231.3	59.7	6,464	181,566	4.01	37.24
773+625	0.25	40.0	244.00	180.00	150.00	113.00	99.00	71.00	57.00	21.10	10.0	30.0	0.99	1.00	241.0	50.1	8,215	133,711	3.62	38.80
773+875	0.25	40.00	281.00	229.00	200.00	163.00	139.00	95.00	73.00	21.30	10.0	30.0	0.99	1.00	276.9	57.9	5,635	143,479	3.71	44.58
774+125	0.25	40.0	306.00	249.00	214.00	168.00	142.00	97.00	74.00	21.00	9.0	50.0	0.99	1.00	302.8	76.1	5,438	100,185	4.85	48.75
774+375	0.25	40.00	293.00	221.00	182.00	134.00	108.00	70.00	57.00	21.00	9.0	50.0	0.99	1.00	290.0	66.6	7,412	90,845	4.70	46.68
774+625	0.25	40.0	366.00	265.00	211.00	152.00	118.00	76.00	57.00	20.90	9.0	50.0	0.99	1.00	362.6	62.9	6,589	67,495	4.26	58.37
774+875	0.25	40.00	366.00	277.00	225.00	164.00	125.00	74.00	57.00	20.70	9.0	50.0	0.99	1.00	363.3	63.6	6,359	67,524	4.26	58.50
775+125	0.25	40.0	264.00	190.00	153.00	111.00	88.00	55.00	44.00	20.40	9.0	50.0	1.00	1.00	262.9	63.0	9,069	93,340	4.74	42.33
775+375	0.25	40.00	289.00	216.00	169.00	119.00	93.00	62.00	53.00	22.40	9.0	50.0	0.98	1.00	281.8	63.0	8,649	89,241	4.67	45.37
775+625	0.25	40.0	361.00	274.00	226.00	168.00	138.00	92.00	74.00	22.20	9.0	50.0	0.98	1.00	352.7	68.7	5,769	77,526	4.46	56.79
775+875	0.25	40.00	480.00	351.00	276.00	190.00	144.00	88.00	65.00	22.10	9.0	50.0	0.98	1.00	469.5	60.9	5,360	49,787	3.85	75.59
776+125	0.25	40.0	507.00	375.00	301.00	216.00	167.00	102.00	78.00	22.10	9.0	50.0	0.98	1.00	495.9	63.2	4,742	49,488	3.84	79.84
776+375	0.25	40.00	380.00	279.00	223.00	158.00	128.00	80.00	66.00	22.70	9.0	50.0	0.97	1.00	369.3	63.7	6,376	68,142	4.27	59.46
776+625	0.25	40.0	361.00	253.00	199.00	139.00	110.00	72.00	59.00	22.40	9.0	50.0	0.98	1.00	352.0	61.3	7,219	68,381	4.27	56.67
776+875	0.25	40.00	403.00	290.00	230.00	158.00	120.00	73.00	57.00	22.20	9.0	50.0	0.98	1.00	393.8	60.4	6,509	59,022	4.07	63.40
777+125	0.25	40.00	291.00	209.00	169.00	121.00	95.00	63.00	52.00	22.30	9.0	50.0	0.98	1.00	284.0	63.5	8,330	88,132	4.65	45.73
777+375	0.25	40.00	478.00	324.00	247.00	167.00	123.00	69.00	47.00	21.60	9.0	50.0	0.98	1.00	470.0	56.8	5,949	44,423	3.70	75.68
777+625	0.25	40.00	327.00	231.00	184.00	130.00	98.00	60.00	46.00	21.40	9.0	50.0	0.99	1.00	322.2	60.6	7,890	71,994	4.35	51.88
777+875	0.25	40.00	244.00	167.00	136.00	101.00	83.00	58.00	48.00	20.80	9.0	50.0	0.99	1.00	242.0	64.7	9,455	105,598	4.94	38.96
778+125	0.25	40.00	231.00	177.00	147.00	114.00	97.00	68.00	57.00	20.60	9.0	50.0	0.99	1.00	229.6	72.2	8,020	125,984	5.24	36.96
778+375	0.25	40.00	390.00	304.00	253.00	190.00	153.00	98.00	75.00	20.70	9.0	50.0	0.99	1.00	387.2	68.7	5,199	69,956	4.31	62.33
778+625	0.25	40.00	461.00	349.00	286.00	209.00	164.00	102.00	79.00	20.90	9.0	50.0	0.99	1.00	456.7	65.3	4,856	55,836	4.00	73.53
797+625	19.00	40.00	806.00	548.00	417.00	276.00	199.00	115.00	84.00	22.60	10.0	45.0	0.97	1.00	782.6	52.9	3,550	26,339	2.90	125.99
797+875	0.25	40.00	166.00	120.00	100.00	72.00	64.00	44.00	35.00	23.00	10.0	45.0	0.97	1.00	160.4	65.0	12,461	174,657	5.45	25.83
798+125	0.25	40.00	593.00	398.00	301.00	191.00	138.00	86.00	67.00	22.40	10.0	45.0	0.97	1.00	577.1	51.7	5,086	35,063	3.19	92.91
798+375	0.25	40.00	443.00	334.00	249.00	168.00	128.00	73.00	46.00	23.10	10.0	45.0	0.97	1.00	427.6	56.8	5,685	52,577	3.65	68.85
798+625	0.25	40.00	534.00	381.00	295.00	203.00	152.00	80.00	49.00	22.90	10.0	35.0	0.97	1.00	516.7	47.6	4,555	44,167	2.82	83.18
799+375	0.75	40.00	177.00	101.00	76.00	50.00	49.00	36.00	24.00	22.70	10.0	35.0	0.97	1.00	171.7	45.5	16,438	138,827	4.13	27.64
799+625	0.25	40.00	352.00	266.00	214.00	156.00	119.00	73.00	51.00	22.50	10.0	35.0	0.97	1.00	342.2	51.7	6,148	77,398	3.40	55.09
799+875	0.25	40.00	888.00	509.00	386.00	257.00	192.00	103.00	66.00	22.10	10.0	35.0	0.98	1.00	867.1	42.0	3,531	23,059	2.27	139.61
800+125	0.25	40.00	283.00	215.00	184.00	140.00	124.00	83.00	55.00	21.50	10.0	35.0	0.98	1.00	278.3	58.9	6,263	118,292	3.91	44.80
800+375	0.25	40.00	402.00	310.00	253.00	187.00	145.00	85.00	38.00	22.30	10.0	35.0	0.97	1.00	391.7	53.9	4,890	70,245	3.29	63.06
800+625	0.25	40.00	1031.00	667.00	491.00	287.00	190.00	102.00	68.00	22.20	10.0	35.0	0.98	1.00	1005.6	41.0	2,969	17,899	2.09	161.91
800+875	0.25	40.00	671.00	463.00	350.00	230.00	166.00	96.00	65.00	22.20	10.0	35.0	0.98	1.00	654.5	45.1	3,975	32,547	2.55	105.37
801+125	0.25	40.00	888.00	594.00	435.00	269.00	180.00	93.00	61.00	22.10	10.0	45.0	0.98	1.00	847.6	49.8	3,470	21,287	2.70	

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)									
181154										
										 181154-70-LABC-33

STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	IZQUIERDO	EQUIPO:	FWD KUAB

Prog	Distancia Km	Carga KN	D0 µm	D1	D2	D3	D4	D5	D6	Temp °C	Espesor (cm)				D max (FWD)		a ₁	M ₀	E Pav		D max (VB) 10 ⁻³ mm
				(20 cm)	(30 cm)	(45 cm)	(60 cm)	(80 cm)	(120 cm)		Carpeta	Base + Sub base	Δ Temp	Δ Carga	µm	cm	Psi	Psi	SN Efect		
806+125	0.25	40.00	575.00	423.00	336.00	242.00	183.00	107.00	64.00	23.00	10.0	30.0	0.97	1.00	555.7	46.1	3,868	48,365	2.58	89.47	
806+375	0.25	40.00	348.00	265.00	216.00	170.00	140.00	94.00	68.00	23.00	10.0	30.0	0.97	1.00	336.3	51.6	5,553	98,749	3.28	54.15	
806+625	0.25	40.00	360.00	275.00	228.00	173.00	147.00	101.00	68.00	23.10	10.0	30.0	0.97	1.00	347.5	52.5	5,238	98,401	3.27	55.95	
806+875	0.25	40.00	681.00	499.00	405.00	301.00	242.00	157.00	107.00	23.10	10.0	30.0	0.97	1.00	657.4	48.4	3,117	45,292	2.53	105.84	
807+125	0.25	40.00	725.00	528.00	418.00	296.00	227.00	135.00	89.00	22.90	10.0	30.0	0.97	1.00	701.5	45.4	3,162	37,677	2.38	112.94	
807+375	0.25	40.00	351.00	274.00	228.00	173.00	139.00	88.00	60.00	22.90	10.0	30.0	0.97	1.00	339.6	51.3	5,454	95,347	3.24	54.68	
807+625	0.25	40.00	488.00	355.00	282.00	203.00	159.00	99.00	65.00	24.30	10.0	30.0	0.95	1.00	464.5	46.8	4,591	59,992	2.77	74.79	
807+875	0.25	40.00	610.00	442.00	358.00	266.00	215.00	140.00	97.00	22.80	10.0	30.0	0.97	1.00	590.9	47.9	3,532	49,818	2.61	95.13	
808+125	0.25	40.00	397.00	305.00	250.00	192.00	158.00	111.00	81.00	23.20	10.0	30.0	0.96	1.00	382.8	51.7	4,867	87,242	3.14	61.63	
808+375	0.25	40.00	306.00	248.00	201.00	160.00	131.00	76.00	45.00	22.80	10.0	30.0	0.97	1.00	296.4	53.0	5,864	113,731	3.43	47.72	
808+625	0.25	40.00	299.00	227.00	181.00	130.00	104.00	62.00	41.00	23.50	10.0	30.0	0.96	1.00	287.3	47.8	7,137	99,615	3.29	46.25	
808+875	0.25	40.00	424.00	325.00	254.00	174.00	129.00	67.00	31.00	23.00	10.0	30.0	0.97	1.00	409.8	45.3	5,178	61,307	2.79	65.97	
809+125	0.25	40.00	457.00	354.00	291.00	220.00	178.00	118.00	82.00	23.20	10.0	30.0	0.96	1.00	440.6	51.1	4,259	73,556	2.97	70.94	
809+375	0.25	40.00	343.00	249.00	197.00	141.00	111.00	68.00	46.00	23.40	10.0	30.0	0.96	1.00	330.0	46.1	6,625	82,663	3.09	53.12	
809+625	0.25	40.00	446.00	346.00	282.00	215.00	174.00	117.00	78.00	23.30	10.0	30.0	0.96	1.00	429.5	51.5	4,322	76,469	3.01	69.15	
809+875	0.25	40.00	861.00	642.00	516.00	370.00	285.00	167.00	107.00	23.30	10.0	30.0	0.96	1.00	829.2	46.8	2,536	33,251	2.28	133.50	
810+125	0.25	40.00	730.00	558.00	450.00	327.00	253.00	151.00	91.00	23.40	10.0	30.0	0.96	1.00	702.2	48.2	2,850	41,063	2.44	113.06	
810+375	0.25	40.00	357.00	256.00	201.00	144.00	115.00	75.00	52.00	23.20	10.0	30.0	0.96	1.00	344.2	45.9	6,454	79,715	3.05	55.42	
810+625	0.25	40.00	359.00	262.00	205.00	144.00	108.00	61.00	38.00	23.00	10.0	30.0	0.97	1.00	347.0	44.7	6,470	73,516	2.97	55.86	
810+875	0.25	40.00	279.00	183.00	141.00	95.00	76.00	45.00	27.00	23.10	10.0	30.0	0.97	1.00	269.3	42.3	9,400	89,485	3.17	43.36	
811+125	0.25	40.00	359.00	249.00	192.00	134.00	102.00	62.00	39.00	23.10	10.0	30.0	0.97	1.00	346.5	43.6	6,875	72,061	2.95	55.79	
811+375	0.25	40.00	466.00	331.00	244.00	160.00	119.00	67.00	36.00	23.00	10.0	30.0	0.97	1.00	450.4	42.1	5,451	50,889	2.63	72.51	
811+625	0.25	40.00	625.00	484.00	381.00	270.00	201.00	117.00	66.00	23.30	10.0	30.0	0.96	1.00	601.9	46.9	3,421	44,994	2.52	96.91	
811+875	0.25	40.00	333.00	225.00	164.00	103.00	71.00	36.00	27.00	23.50	10.0	30.0	0.96	1.00	320.0	39.0	8,681	63,359	2.83	51.51	
812+125	0.25	40.00	423.00	294.00	232.00	166.00	132.00	84.00	52.00	23.30	10.0	35.0	0.96	1.00	407.4	50.2	5,493	63,131	3.17	65.59	
812+375	0.25	40.00	423.00	292.00	227.00	160.00	122.00	74.00	51.00	22.90	10.0	35.0	0.97	1.00	409.3	47.9	5,867	58,227	3.09	65.89	
812+625	0.25	40.00	634.00	491.00	403.00	304.00	243.00	154.00	98.00	22.90	10.0	35.0	0.97	1.00	613.4	55.6	3,063	48,345	2.90	98.76	
812+875	0.25	40.00	333.00	223.00	167.00	114.00	88.00	60.00	46.00	22.90	10.0	35.0	0.97	1.00	322.2	45.8	8,178	70,478	3.29	51.87	
813+125	0.25	40.00	402.00	291.00	227.00	160.00	121.00	73.00	50.00	23.00	10.0	35.0	0.97	1.00	388.5	49.1	5,890	62,927	3.17	62.55	
813+375	0.25	40.00	389.00	297.00	243.00	184.00	145.00	90.00	66.00	23.10	10.0	35.0	0.97	1.00	375.5	54.1	5,245	76,061	3.38	60.46	
813+625	0.25	40.00	354.00	267.00	217.00	161.00	133.00	89.00	61.00	23.10	10.0	35.0	0.97	1.00	341.7	54.9	5,692	86,572	3.53	55.02	
813+875	0.25	40.00	326.00	228.00	177.00	125.00	98.00	63.00	47.00	23.40	10.0	35.0	0.96	1.00	313.6	48.7	7,543	78,639	3.42	50.49	
814+125	0.25	40.00	263.00	189.00	153.00	109.00	92.00	61.00	41.00	23.60	10.0	35.0	0.96	1.00	252.4	52.8	8,235	110,934	3.83	40.64	
814+375	0.25	40.00	306.00	188.00	130.00	77.00	54.00	30.00	18.00	23.60	10.0	35.0	0.96	1.00	293.7	40.4	10,625	61,163	3.14	47.28	
814+625	0.25	40.00	340.00	256.00	197.00	138.00	105.00	63.00	41.00	23.50	10.0	35.0	0.96	1.00	326.7	50.0	6,732	76,315	3.38	52.60	
814+875	0.25	40.00	334.00	224.00	166.00	110.00	79.00	39.00	24.00	23.90	10.0	35.0	0.96	1.00	319.4	44.4	8,230	63,917	3.19	51.43	
815+125	0.25	40.00	227.00	152.00	112.00	76.00	59.00	39.00	28.00	24.50	10.0	35.0	0.95	1.00	215.6	46.2	11,994	105,644	3.77	34.71	
815+375	0.25	40.00	148.00	104.00	70.00	44.00	36.00	29.00	26.00	23.90	10.0	55.0	0.96	1.00	141.5	62.4	23,071	172,640	6.41	22.79	
815+625	0.25	40.00	467.00	345.00	272.00	197.00	153.00	88.00	49.00	23.80	10.0	55.0	0.96	1.00	447.1	69.2	5,259	54,027	4.35	71.99	
815+875	0.25	40.00	216.00	153.00	120.00	86.00	68.00	44.00	29.00	23.90	10.0	55.0	0.96	1.00	206.6	69.1	11,742	120,418	5.69	33.26	
816+125	0.25	40.00	465.00	353.00	282.00	208.00	165.00	107.00	72.00	23.70	10.0	55.0	0.96	1.00	445.8	72.8	4,919	59,159	4.49	71.77	
816+375	0.25	40.00	561.00	399.00	310.00	218.00	164.00	95.00	54.00	23.30	10.0	55.0	0.96	1.00	540.3	66.1	4,741	42,380	4.01	86.99	
816+625	0.25	40.00	434.00	314.00	243.00	167.00	128.00	65.00	24.00	22.80	10.0	55.0	0.97	1.00	420.4	65.1	5,900	50,346	4.25	67.69	
816+875	0.25	40.00	403.00	287.00	221.00	153.00	116.00	69.00	46.00	22.40	10.0	55.0	0.97	1.00	392.2	65.2	6,850	58,823	4.48	63.14	
817+125	0.25	40.00	282.00	196.00	147.00	96.00	70.00	35.00	20.00	23.10	10.0	55.0	0.97	1.00	272.2	60.8	10,661	73,529	4.82	43.83	
817+375	0.25	40.00	134.00	80.00	57.00	38.00	30.00	19.00	13.00	23.40	10.0	55.0	0.96	1.00	128.9	59.3	25,469	163,228	6.29	20.75	
817+625	0.25	40.00	298.00	212.00	165.00	112.00	83.00	47.00	34.00	23.30	10.0	55.0	0.96	1.00	287.0	64.0	9,708	78,591	4.93	46.21	
817+875	0.25	40.00	169.00	109.00	84.00	59.00	51.00	37.00	24.00	22.90	10.0	55.0	0.97	1.00	163.5	68.5	15,320	152,616	6.15	26.33	
818+125	0.25	40.00	212.00	154.00	114.00	74.00	63.00</														

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)									
181154										
										 181154-70-LABC-33

STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	IZQUIERDO	EQUIPO:	FWD KUA8

Prog	Distancia Km	Carga KN	D0 µm	D1 (20 cm) µm	D2 (30 cm) µm	D3 (45 cm) µm	D4 (60 cm) µm	D5 (80 cm) µm	D6 (120 cm) µm	Temp °C	Espesor (cm)				D max (FWD) µm	a _s cm	M ₀ Psi	E Pav Psi	SN Elect	D max (VB) 10 ⁻² mm
											Carpeta	Base + Sub base	A Temp	A Carga						
822+875	0.25	40.00	262.00	202.00	170.00	130.00	105.00	66.00	45.00	23.20	10.0	55.0	0.96	1.00	252.6	76.2	7,757	107,323	5.47	40.67
823+125	0.25	40.00	323.00	258.00	213.00	169.00	142.00	86.00	60.00	22.80	10.0	55.0	0.97	1.00	312.9	78.5	5,883	88,984	5.14	50.37
823+375	0.25	40.00	319.00	239.00	198.00	151.00	131.00	94.00	69.00	22.70	10.0	55.0	0.97	1.00	309.4	79.2	5,923	92,203	5.20	49.81
823+625	0.25	40.00	567.00	416.00	328.00	233.00	180.00	107.00	65.00	22.80	10.0	30.0	0.97	1.00	549.2	45.9	3,964	48,790	2.59	88.43
823+875	0.25	40.00	362.00	261.00	212.00	158.00	129.00	88.00	67.00	22.50	10.0	30.0	0.97	1.00	351.9	47.7	6,026	83,700	3.10	56.65
824+125	0.25	40.00	334.00	271.00	232.00	184.00	165.00	118.00	64.00	22.40	10.0	30.0	0.97	1.00	325.0	60.0	4,582	130,480	3.59	52.33
824+375	0.25	40.00	835.00	605.00	484.00	342.00	256.00	139.00	80.00	22.40	10.0	30.0	0.97	1.00	812.6	45.0	2,732	31,517	2.24	130.83
824+625	0.25	40.00	394.00	282.00	226.00	165.00	136.00	92.00	56.00	21.60	10.0	30.0	0.98	1.00	386.9	47.6	5,492	75,690	3.00	62.30
824+875	0.25	40.00	758.00	514.00	403.00	288.00	219.00	132.00	83.00	21.80	10.0	30.0	0.98	1.00	742.7	43.5	3,259	33,774	2.29	119.58
825+125	0.25	40.00	328.00	241.00	195.00	152.00	124.00	89.00	64.00	22.60	10.0	30.0	0.97	1.00	318.5	50.1	6,194	100,443	3.29	51.27
825+375	0.25	40.00	383.00	281.00	233.00	182.00	153.00	113.00	88.00	22.20	10.0	30.0	0.98	1.00	373.6	51.0	5,166	88,389	3.16	60.15
825+625	0.25	40.00	332.00	254.00	207.00	152.00	132.00	93.00	67.00	22.60	10.0	30.0	0.97	1.00	322.3	51.0	5,926	101,996	3.31	51.90
825+875	0.25	40.00	481.00	369.00	304.00	232.00	191.00	123.00	84.00	22.70	10.0	30.0	0.97	1.00	466.5	51.1	4,024	69,638	2.92	75.10
826+125	0.25	40.00	461.00	370.00	318.00	255.00	216.00	144.00	88.00	22.70	10.0	30.0	0.97	1.00	447.1	57.3	3,531	87,102	3.14	71.98
826+375	0.25	40.00	580.00	435.00	355.00	258.00	206.00	122.00	75.00	22.50	10.0	30.0	0.97	1.00	563.8	48.1	3,596	51,442	2.64	90.77
826+625	0.25	40.00	552.00	425.00	352.00	262.00	209.00	124.00	80.00	22.20	10.0	30.0	0.98	1.00	538.4	49.6	3,596	56,467	2.72	86.68
826+875	0.25	40.00	521.00	385.00	326.00	248.00	202.00	118.00	73.00	22.20	10.0	30.0	0.98	1.00	508.2	49.9	3,799	60,865	2.79	81.82
827+125	0.25	40.00	536.00	427.00	363.00	280.00	227.00	140.00	91.00	22.10	10.0	30.0	0.98	1.00	523.4	53.0	3,356	64,788	2.85	84.27
827+375	0.25	40.00	545.00	426.00	362.00	284.00	234.00	149.00	101.00	22.20	10.0	30.0	0.98	1.00	531.6	53.3	3,300	65,160	2.85	85.59
827+625	0.25	40.00	450.00	326.00	261.00	184.00	149.00	94.00	60.00	22.00	10.0	30.0	0.98	1.00	439.9	46.4	4,955	62,986	2.82	70.83
827+875	0.25	40.00	252.00	217.00	199.00	175.00	158.00	119.00	88.00	22.30	10.0	30.0	0.97	1.00	245.5	72.4	4,533	229,778	4.34	39.53
828+125	0.25	40.00	732.00	541.00	433.00	306.00	229.00	124.00	75.00	22.60	10.0	30.0	0.97	1.00	710.7	45.4	3,068	36,440	2.35	114.42
828+375	0.25	40.00	528.00	369.00	289.00	198.00	152.00	88.00	57.00	22.40	10.0	30.0	0.97	1.00	513.8	43.4	4,648	48,069	2.58	82.73
828+625	0.25	40.00	386.00	263.00	203.00	138.00	118.00	70.00	50.00	22.40	10.0	30.0	0.97	1.00	375.6	43.4	6,526	67,209	2.88	60.48
828+875	0.25	40.00	387.00	239.00	164.00	107.00	86.00	60.00	42.00	22.50	10.0	30.0	0.97	1.00	376.2	38.3	8,098	56,038	2.71	60.56
829+125	0.25	40.00	672.00	399.00	260.00	137.00	83.00	35.00	20.00	22.10	10.0	30.0	0.98	1.00	656.2	34.0	5,374	25,040	2.07	105.65
829+375	0.25	40.00	299.00	232.00	191.00	145.00	124.00	85.00	65.00	22.60	10.0	35.0	0.97	1.00	290.3	57.2	6,323	109,013	3.81	46.74
829+625	0.25	40.00	243.00	198.00	170.00	140.00	124.00	91.00	60.00	22.60	10.0	35.0	0.97	1.00	235.9	67.0	6,009	168,791	4.41	37.98
829+875	0.25	40.00	273.00	203.00	166.00	124.00	98.00	59.00	37.00	22.20	10.0	35.0	0.98	1.00	266.3	53.1	7,568	103,693	3.75	42.87
830+125	0.25	40.00	411.00	325.00	278.00	219.00	181.00	118.00	77.00	22.50	10.0	35.0	0.97	1.00	399.5	59.9	4,191	83,316	3.48	64.32
830+375	0.25	40.00	553.00	451.00	379.00	294.00	239.00	150.00	98.00	22.60	10.0	35.0	0.97	1.00	536.9	59.0	3,175	60,185	3.12	86.44
830+625	0.25	40.00	291.00	177.00	128.00	78.00	33.00	25.00	20.00	22.70	10.0	35.0	0.97	1.00	282.2	37.3	12,169	53,956	3.01	45.44
830+875	0.25	40.00	221.00	131.00	92.00	57.00	51.00	37.00	18.00	22.60	10.0	35.0	0.97	1.00	214.6	43.8	13,623	101,437	3.72	34.55
831+125	0.25	40.00	286.00	213.00	170.00	122.00	96.00	57.00	34.00	22.90	10.0	35.0	0.97	1.00	276.7	51.8	7,543	95,187	3.64	44.55
831+375	0.25	40.00	296.00	222.00	181.00	137.00	112.00	74.00	51.00	22.80	10.0	35.0	0.97	1.00	286.7	55.0	6,771	103,115	3.74	46.16
831+625	0.25	40.00	470.00	355.00	292.00	219.00	175.00	103.00	62.00	22.90	10.0	35.0	0.97	1.00	454.8	54.2	4,262	62,207	3.16	73.21
831+875	0.25	40.00	405.00	309.00	254.00	191.00	156.00	100.00	63.00	23.00	10.0	35.0	0.97	1.00	391.4	55.7	4,805	76,414	3.38	63.02
832+125	0.25	40.00	552.00	417.00	341.00	252.00	200.00	116.00	70.00	23.10	10.0	35.0	0.97	1.00	532.9	53.5	3,705	51,825	2.97	85.79
832+375	0.25	40.00	416.00	311.00	254.00	184.00	151.00	90.00	58.00	23.20	10.0	35.0	0.96	1.00	401.1	53.3	5,001	69,308	3.27	64.58
832+625	0.25	40.00	580.00	437.00	359.00	264.00	205.00	117.00	74.00	23.20	10.0	40.0	0.96	1.00	559.2	57.4	3,641	46,221	3.18	90.04
832+875	0.25	40.00	472.00	351.00	281.00	202.00	156.00	88.00	55.00	22.90	10.0	40.0	0.97	1.00	456.7	55.5	4,713	53,946	3.35	73.53
833+125	0.25	40.00	216.00	152.00	120.00	86.00	68.00	41.00	29.00	23.20	10.0	40.0	0.96	1.00	208.3	54.2	11,048	117,236	4.34	33.53
833+375	0.25	40.00	227.00	127.00	94.00	67.00	57.00	40.00	30.00	23.10	10.0	40.0	0.97	1.00	219.1	48.3	13,558	100,733	4.12	35.28
833+625	0.25	40.00	380.00	248.00	199.00	156.00	128.00	88.00	56.00	22.90	10.0	40.0	0.97	1.00	367.7	57.0	5,860	73,002	3.70	59.19
833+875	0.25	40.00	566.00	384.00	303.00	217.00	169.00	100.00	64.00	22.90	10.0	40.0	0.97	1.00	547.6	53.1	4,319	43,126	3.11	88.17
834+125	0.25	40.00	607.00	406.00	322.00	229.00	176.00	105.00	65.00	23.00	10.0	40.0	0.97	1.00	586.6	52.7	4,078	39,765	3.02	94.45
834+375	0.25	40.00	539.00	359.00	266.00	177.00	135.00	76.00	39.00	22.50	10.0	40.0	0.97	1.00	523.9	49.7	4,959	40,055	3.03	84.35
834+625	0.25	40.00	385.00	259.00	195.00	132.00	104.00	69.00	47.00	22.50	10.0	40.0	0.97	1.00	374.2	51.1	6,879	60,802	3.48	60.25
834+875	0.25	40.00	276.0																	

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)									
181154										
										 181154-70-LABC-33

STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	IZQUIERDO	EQUIPO:	FWD KUAB

Prog	Distancia Km	Carga KN	D0 (30 cm)	D1 (30 cm)	D2 (45 cm)	D3 (60 cm)	D4 (60 cm)	D5 (60 cm)	D6 (120 cm)	Temp °C	Espesor (cm)						D max (FWD) µm	a _r cm	M _R Psi	E Pav Psi	SN (Elast)	D max (VB) 10 ⁻³ mm
											Carpeta	Base + Sub base	Temp	Carga								
839+625	0.25	40.00	619.00	474.00	381.00	267.00	209.00	122.00	70.00	23.60	10.0	45.0	0.96	1.00			594.1	61.3	3,573	41,778	3.38	95.65
839+875	0.25	40.00	429.00	317.00	251.00	178.00	139.00	86.00	54.00	23.60	10.0	45.0	0.96	1.00			411.7	60.5	5,369	60,256	3.82	66.29
840+125	0.25	40.00	551.00	390.00	300.00	206.00	152.00	85.00	55.00	23.70	10.0	45.0	0.96	1.00			528.2	55.8	4,728	41,380	3.37	85.04
840+375	0.25	40.00	548.00	346.00	273.00	197.00	149.00	88.00	55.00	23.60	10.0	45.0	0.96	1.00			525.9	55.7	4,863	42,247	3.39	84.67
840+625	0.25	40.00	578.00	424.00	332.00	230.00	171.00	97.00	60.00	23.60	10.0	45.0	0.96	1.00			554.7	57.7	4,236	41,078	3.36	89.31
840+875	0.25	40.00	262.00	164.00	119.00	79.00	61.00	42.00	31.00	23.60	10.0	45.0	0.96	1.00			251.4	52.2	11,789	83,933	4.27	40.46
841+125	0.25	40.00	335.00	221.00	166.00	118.00	95.00	67.00	48.00	23.70	10.0	45.0	0.96	1.00			321.1	57.2	7,899	74,424	4.10	51.70
841+375	0.25	40.00	464.00	301.00	227.00	154.00	118.00	71.00	44.00	23.80	10.0	45.0	0.96	1.00			444.3	54.4	6,015	48,445	3.55	71.53
841+625	0.25	40.00	418.00	295.00	232.00	166.00	131.00	84.00	58.00	23.60	10.0	45.0	0.96	1.00			401.2	59.4	5,766	61,301	3.84	64.59
841+875	0.25	40.00	298.00	202.00	155.00	105.00	78.00	46.00	32.00	23.70	10.0	45.0	0.96	1.00			285.7	54.7	9,233	75,632	4.12	45.99
842+125	0.25	40.00	280.00	174.00	128.00	82.00	62.00	38.00	27.00	23.60	10.0	45.0	0.96	1.00			268.7	51.0	11,256	74,209	4.09	43.26
842+375	0.25	40.00	283.00	178.00	129.00	84.00	63.00	37.00	24.00	24.30	10.0	45.0	0.95	1.00			269.4	51.5	10,889	73,959	4.09	43.37
842+625	0.25	40.00	194.00	122.00	91.00	62.00	48.00	32.00	23.00	24.30	10.0	45.0	0.95	1.00			184.7	53.8	15,161	118,124	4.78	29.73
842+875	0.25	40.00	553.00	377.00	280.00	179.00	131.00	85.00	58.00	24.10	10.0	43.0	0.95	1.00			527.6	51.7	5,161	39,737	3.20	84.95
843+125	0.25	40.00	165.00	92.00	65.00	44.00	34.00	26.00	21.00	24.00	10.0	43.0	0.96	1.00			157.6	47.6	21,295	126,658	4.72	25.38
843+375	0.25	40.00	208.00	127.00	92.00	59.00	44.00	28.00	20.00	24.10	10.0	43.0	0.95	1.00			198.5	48.8	15,447	99,154	4.35	31.95
843+625	0.25	40.00	350.00	220.00	161.00	100.00	73.00	42.00	23.00	24.10	10.0	43.0	0.95	1.00			333.9	49.3	8,656	57,227	3.62	53.77
843+875	0.25	40.00	291.00	190.00	142.00	96.00	75.00	48.00	36.00	24.10	10.0	43.0	0.95	1.00			277.7	52.4	9,828	78,994	4.03	44.70
844+125	0.25	40.00	191.00	118.00	90.00	66.00	56.00	37.00	28.00	24.20	10.0	43.0	0.95	1.00			182.0	55.0	14,036	131,195	4.77	29.31
844+375	0.25	40.00	325.00	206.00	151.00	102.00	79.00	55.00	42.00	24.10	10.0	43.0	0.95	1.00			310.1	51.4	9,209	69,753	3.87	49.92
844+625	0.25	40.00	206.00	132.00	102.00	71.00	54.00	33.00	23.00	24.20	10.0	43.0	0.95	1.00			196.3	53.1	13,410	112,215	4.53	31.61
844+875	0.25	40.00	304.00	204.00	155.00	106.00	79.00	49.00	34.00	24.30	10.0	43.0	0.95	1.00			289.4	53.2	8,998	75,939	3.98	46.59
845+125	0.25	40.00	136.00	90.00	70.00	58.00	56.00	48.00	29.00	25.10	10.0	43.0	0.94	1.00			128.2	70.0	13,005	255,542	5.96	20.65
845+375	0.25	40.00	182.00	113.00	85.00	62.00	53.00	38.00	29.00	25.20	10.0	43.0	0.94	1.00			171.4	55.7	14,735	142,745	4.91	27.60
845+625	0.25	40.00	178.00	111.00	84.00	62.00	53.00	37.00	25.00	25.10	10.0	43.0	0.94	1.00			167.8	56.7	14,433	148,383	4.97	27.02
845+875	0.25	40.00	213.00	120.00	81.00	49.00	37.00	25.00	19.00	25.30	10.0	43.0	0.94	1.00			200.4	45.2	17,736	89,436	4.20	32.26
846+125	0.25	40.00	168.00	105.00	78.00	47.00	41.00	25.00	18.00	25.10	10.0	43.0	0.94	1.00			158.4	50.7	18,259	132,369	4.79	25.50
846+375	0.25	40.00	167.00	99.00	70.00	47.00	38.00	28.00	21.00	25.10	10.0	43.0	0.94	1.00			157.5	50.2	19,257	135,074	4.82	25.35
846+625	0.25	40.00	149.00	77.00	56.00	39.00	34.00	22.00	17.00	25.30	10.0	43.0	0.94	1.00			140.2	48.8	23,171	148,409	4.97	22.57
846+875	0.25	40.00	249.00	159.00	117.00	76.00	59.00	37.00	27.00	25.00	10.0	43.0	0.94	1.00			235.1	50.9	12,128	88,967	4.19	37.85
847+125	0.25	40.00	194.00	121.00	88.00	60.00	48.00	32.00	22.00	25.00	10.0	43.0	0.94	1.00			183.1	52.2	15,133	119,939	4.63	29.49
847+375	0.25	40.00	200.00	137.00	108.00	77.00	65.00	42.00	28.00	24.70	10.0	43.0	0.95	1.00			189.5	58.7	11,803	134,594	4.81	30.51
847+625	0.25	40.00	231.00	150.00	113.00	74.00	61.00	36.00	23.00	25.00	10.0	43.0	0.94	1.00			218.1	53.1	12,027	100,780	4.37	35.11
847+875	0.25	40.00	211.00	137.00	100.00	67.00	52.00	33.00	23.00	25.20	10.0	40.0	0.94	1.00			198.7	49.5	13,596	108,896	4.23	31.99
848+125	0.25	40.00	250.00	147.00	102.00	67.00	52.00	33.00	24.00	25.40	10.0	40.0	0.94	1.00			234.9	45.9	13,328	83,793	3.88	37.82
848+375	0.25	40.00	295.00	196.00	148.00	101.00	76.00	44.00	30.00	25.40	10.0	40.0	0.94	1.00			277.2	50.4	9,277	78,505	3.79	44.63
848+625	0.25	40.00	142.00	95.00	73.00	51.00	43.00	28.00	20.00	25.30	10.0	40.0	0.94	1.00			133.6	53.8	17,805	184,721	5.04	21.51
848+875	0.25	40.00	148.00	93.00	73.00	55.00	45.00	28.00	24.00	25.10	10.0	40.0	0.94	1.00			139.6	52.6	17,844	172,277	4.93	22.47
849+125	0.25	40.00	177.00	98.00	76.00	55.00	47.00	31.00	22.00	25.20	10.0	40.0	0.94	1.00			166.7	50.2	16,505	138,094	4.58	26.84
849+375	0.25	40.00	171.00	99.00	69.00	47.00	38.00	29.00	23.00	25.10	10.0	40.0	0.94	1.00			161.2	46.6	19,468	129,175	4.48	25.96
849+625	0.25	40.00	103.00	66.00	51.00	39.00	34.00	25.00	19.00	25.30	10.0	40.0	0.94	1.00			96.9	56.4	23,110	277,702	5.78	15.60
849+875	0.25	40.00	113.00	65.00	49.00	33.00	32.00	21.00	15.00	25.30	10.0	40.0	0.94	1.00			106.3	50.8	25,524	221,155	5.36	17.11
850+125	0.25	40.00	285.00	193.00	139.00	83.00	60.00	40.00	22.00	25.20	10.0	40.0	0.94	1.00			268.4	48.3	10,047	74,389	3.73	43.22
850+375	0.25	40.00	172.00	98.00	69.00	44.00	40.00	30.00	22.00	25.20	10.0	40.0	0.94	1.00			162.0	47.3	19,043	131,887	4.51	26.08
850+625	0.25	40.00	288.00	180.00	131.00	88.00	68.00	45.00	33.00	25.40	10.0	40.0	0.94	1.00			270.6	48.6	10,442	78,670	3.80	43.57
850+875	0.25	40.00	463.00	305.00	223.00	138.00	99.00	59.00	42.00	25.40	10.0	40.0	0.94	1.00			435.0	47.1	6,542	44,842	3.15	70.04
851+125	0.25	40.00	567.00	407.00	318.00	218.00	160.00	87.00	53.00	25.30	10.0	40.0	0.94	1.00			533.4	52.6	4,339	42,079	3.08	85.87
851+375	0.25	40.00	415.00	304.00	238.00	169.00	129.00	78.00	51.00	25.60	10.0	40.0	0.94	1.00			389.0	55.3	5,630	63,594	3.54	62.63
851+625	0.25	40.00	451.00	308.00	231.00	155.00	116.00	65.00	45.00	25.10	10.0	45.0	0.94	1.00			425.3	54.3	6,234	49,989	3.59	68.47
851+875	0.25	40.00	412.00	306.00	255.00	194.00																

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)									
181154										
										 181154-70-LABC-33

STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	IZQUIERDO	EQUIPO:	FWD KUAB

Prog	Distancia Km	Carga KN	D0 µm	D1 (30 cm) µm	D2 (30 cm) µm	D3 (45 cm) µm	D4 (60 cm) µm	D5 (80 cm) µm	D6 (120 cm) µm	Temp °C	Espesor (cm)							D max (VB) 10 ⁻² mm	
											Carpeta	Base + Sub base	A Temp	A Carga	D max (FWD) µm	a _v cm	M _R Psi	E Pav Psi	
854+875	0.25	40.00	680.00	458.00	342.00	226.00	164.00	87.00	54.00	25.50	10.0	35.0	0.94	1.00	638.2	45.3	3,997	33,083	2.56
855+125	0.25	40.00	717.00	510.00	394.00	269.00	199.00	111.00	73.00	25.70	10.0	35.0	0.94	1.00	671.3	48.0	3,464	34,518	2.60
855+375	0.25	40.00	579.00	394.00	295.00	196.00	142.00	75.00	47.00	25.80	10.0	35.0	0.94	1.00	541.4	45.6	4,639	39,358	2.71
855+625	0.25	40.00	566.00	400.00	313.00	217.00	162.00	89.00	52.00	25.60	10.0	35.0	0.94	1.00	530.5	48.8	4,254	44,557	2.83
855+875	0.25	40.00	416.00	301.00	244.00	179.00	140.00	81.00	46.00	25.50	10.0	35.0	0.94	1.00	390.4	52.5	5,190	68,616	3.26
856+125	0.25	40.00	546.00	369.00	281.00	186.00	139.00	78.00	54.00	25.70	10.0	35.0	0.94	1.00	511.2	46.0	4,933	42,957	2.79
856+375	0.25	40.00	618.00	426.00	329.00	222.00	165.00	93.00	60.00	25.50	10.0	35.0	0.94	1.00	580.0	47.2	4,145	39,151	2.71
856+625	0.25	40.00	417.00	259.00	189.00	121.00	89.00	52.00	35.00	25.40	10.0	35.0	0.94	1.00	391.8	43.0	7,306	51,315	2.96
856+875	0.25	40.00	547.00	379.00	283.00	182.00	127.00	62.00	37.00	25.10	10.0	35.0	0.94	1.00	515.8	44.7	4,920	39,099	2.71
857+125	0.25	40.00	351.00	230.00	170.00	109.00	81.00	45.00	29.00	25.10	10.0	35.0	0.94	1.00	331.0	44.3	8,100	62,540	3.16
857+375	0.25	40.00	371.00	238.00	176.00	116.00	89.00	57.00	34.00	25.40	10.0	35.0	0.94	1.00	348.6	45.5	7,525	63,303	3.18
857+625	0.25	40.00	531.00	361.00	271.00	177.00	127.00	66.00	41.00	25.20	10.0	35.0	0.94	1.00	500.1	45.1	5,097	41,688	2.76
857+875	0.25	40.00	529.00	382.00	299.00	205.00	155.00	89.00	57.00	25.20	10.0	35.0	0.94	1.00	498.2	49.1	4,512	48,377	2.90
858+125	0.25	40.00	268.00	181.00	143.00	108.00	90.00	62.00	44.00	24.90	10.0	35.0	0.95	1.00	253.3	52.0	8,530	109,527	3.81
858+375	0.25	40.00	572.00	395.00	295.00	196.00	144.00	82.00	53.00	24.60	10.0	35.0	0.95	1.00	542.6	46.0	4,627	40,179	2.73
858+625	0.25	40.00	522.00	349.00	262.00	174.00	126.00	68.00	39.00	24.70	10.0	35.0	0.95	1.00	494.6	45.3	5,157	42,871	2.79
858+875	0.25	40.00	248.00	146.00	109.00	74.00	64.00	44.00	31.00	24.80	10.0	35.0	0.95	1.00	234.7	45.2	11,883	97,631	3.67
859+125	0.25	40.00	167.00	106.00	82.00	59.00	52.00	37.00	19.00	24.90	10.0	30.0	0.95	1.00	157.8	45.8	14,669	179,118	3.99
859+375	0.25	40.00	552.00	382.00	290.00	192.00	141.00	74.00	43.00	24.90	10.0	30.0	0.95	1.00	521.7	42.2	4,673	43,984	2.50
859+625	0.25	40.00	355.00	230.00	174.00	116.00	88.00	51.00	31.00	24.90	10.0	30.0	0.95	1.00	335.5	41.4	7,730	68,504	2.90
859+875	0.25	40.00	472.00	321.00	240.00	161.00	112.00	58.00	35.00	25.00	10.0	30.0	0.94	1.00	445.6	41.2	5,678	49,542	2.60
860+125	0.25	40.00	442.00	318.00	243.00	161.00	113.00	56.00	34.00	25.40	10.0	30.0	0.94	1.00	415.3	42.5	5,672	54,763	2.69
860+375	0.25	40.00	330.00	239.00	190.00	139.00	110.00	67.00	50.00	25.00	10.0	30.0	0.94	1.00	311.5	46.7	6,895	89,684	3.17
860+625	0.25	40.00	581.00	406.00	314.00	216.00	166.00	92.00	57.00	24.60	10.0	30.0	0.95	1.00	551.1	43.8	4,235	44,940	2.52
860+875	0.25	40.00	526.00	372.00	285.00	194.00	143.00	79.00	50.00	24.80	10.0	30.0	0.95	1.00	497.8	43.2	4,738	48,244	2.58
861+125	0.25	40.00	546.00	381.00	288.00	194.00	141.00	78.00	50.00	24.60	10.0	30.0	0.95	1.00	517.9	42.3	4,717	44,850	2.52
861+375	0.25	40.00	624.00	418.00	316.00	216.00	159.00	85.00	51.00	24.40	10.0	30.0	0.95	1.00	593.3	41.8	4,241	38,804	2.40
861+625	0.25	40.00	427.00	264.00	168.00	105.00	84.00	51.00	39.00	24.10	10.0	30.0	0.95	1.00	407.4	36.6	7,910	47,143	2.56
861+875	0.25	40.00	692.00	461.00	339.00	220.00	148.00	77.00	44.00	23.90	10.0	30.0	0.96	1.00	661.8	39.7	4,054	31,507	2.24
862+125	0.25	40.00	209.00	142.00	110.00	79.00	68.00	49.00	36.00	23.80	10.0	30.0	0.96	1.00	200.1	45.6	11,545	139,078	3.67
862+375	0.25	40.00	185.00	123.00	94.00	70.00	68.00	41.00	30.00	23.60	8.0	32.0	0.97	1.00	178.6	46.2	12,774	160,635	3.85
862+625	0.25	40.00	711.00	505.00	385.00	260.00	188.00	104.00	63.00	23.60	8.0	32.0	0.97	1.00	686.5	42.6	3,513	34,105	2.30
862+875	0.25	40.00	616.00	437.00	335.00	223.00	163.00	94.00	59.00	23.80	8.0	32.0	0.96	1.00	593.6	42.7	4,070	39,692	2.42
863+125	0.25	40.00	253.00	167.00	123.00	81.00	58.00	34.00	20.00	24.00	8.0	32.0	0.96	1.00	243.3	40.4	10,991	89,942	3.18
863+375	0.25	40.00	531.00	392.00	314.00	223.00	169.00	93.00	57.00	23.60	8.0	32.0	0.97	1.00	512.7	45.8	4,206	51,456	2.64
863+625	0.25	40.00	694.00	524.00	423.00	297.00	220.00	124.00	79.00	23.80	8.0	32.0	0.96	1.00	668.7	46.1	3,176	39,585	2.42
863+875	0.25	40.00	818.00	599.00	455.00	296.00	199.00	97.00	60.00	23.50	8.0	32.0	0.97	1.00	790.6	41.5	3,077	27,503	2.14
864+125	0.25	40.00	808.00	528.00	393.00	246.00	165.00	74.00	43.00	23.40	8.0	32.0	0.97	1.00	781.7	38.7	3,576	25,512	2.09
864+375	0.25	40.00	495.00	381.00	309.00	223.00	168.00	93.00	56.00	23.10	8.0	32.0	0.97	1.00	480.3	47.3	4,238	57,441	2.73
864+625	0.25	40.00	654.00	477.00	374.00	254.00	181.00	88.00	51.00	23.00	8.0	32.0	0.97	1.00	635.2	43.1	3,651	36,837	2.36
864+875	0.25	40.00	860.00	577.00	410.00	262.00	189.00	103.00	63.00	22.70	8.0	32.0	0.97	1.00	837.8	39.3	3,308	24,844	2.07
865+125	0.25	40.00	892.00	639.00	481.00	313.00	220.00	112.00	62.00	20.60	8.0	32.0	0.99	1.00	886.9	41.1	2,846	24,625	2.06
865+375	0.25	40.00	879.00	606.00	446.00	282.00	192.00	95.00	56.00	20.20	8.0	32.0	1.00	1.00	877.3	39.3	3,116	23,276	2.02
865+625	0.25	40.00	707.00	483.00	359.00	230.00	157.00	79.00	47.00	20.30	8.0	32.0	1.00	1.00	705.0	39.4	3,869	29,354	2.19
865+875	0.25	40.00	853.00	590.00	438.00	281.00	200.00	100.00	55.00	20.50	7.0	35.0	1.00	1.00	849.3	41.6	3,120	24,295	2.16
866+125	0.25	40.00	929.00	633.00	471.00	306.00	211.00	109.00	67.00	20.50	7.0	35.0	1.00	1.00	924.9	41.2	2,936	22,114	2.09
866+375	0.25	40.00	725.00	472.00	335.00	201.00	130.00	64.00	44.00	20.50	7.0	35.0	1.00	1.00	721.8	38.2	4,252	25,068	2.18
866+625	0.25	40.00	519.00	323.00	230.00	147.00	111.00	70.00	39.00	20.40	7.0	35.0	1.00	1.00	517.2	40.0	5,780	39,636	2.54
866+875	0.25	40.00	507.00	337.00	253.00	171.00	127.00	76.00	49.00	20.30	7.0	35.0	1.00	1.00	505.7	42.3	5,321	43,664	2.62
867+125	0.25	40.00	312.00	199.00	142.00	89.00	68.00	44.00	32.00	20.70	7.0	35.0	0.99	1.00	310.1	39.6	9,761	65,010	2.99
867+375	0.25	40.00	545.00	373.00	273.00	171.00	120.00	72.00	48.00	20.60	7.0	35.0	0.99	1.00	542.1	40.8	5,129	37,547	2.49
867+625	0.25	40.00	370.00	245.00	174.00	53.00	46.00	34.00	29.00	20.80	7.0	35.0	0.99	1.00	367.4	33.2	9,759	36,317	2.46
867+875	0.25	40.00	164.00	116.00	97.00	78.00	70.00	54.00	42.00	21.20	7.0	35.0	0.99	1.00	162.3	54.6	11,431	209,333	4.42
868+125	0.25	40.00	203.00	136.00	107.00	82.00	70.00	47.00	29.00	21.20	7.0	35.0	0.99	1.00	200.9	48.6	11,096	140,99	

Proyecto:	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)	
181154		181154-70-LABC-33

STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	IZQUIERDO	EQUIPO:	FWD KUAB

Prog	Distancia Km	Carga KN	D0 µm	D1 (20 cm) µm	D2 (30 cm) µm	D3 (45 cm) µm	D4 (60 cm) µm	D5 (80 cm) µm	D6 (100 cm) µm	Temp °C	Espesor (cm) Carpeta	Base + Sub base	A _{Temp}	A _{Carga}	D _{max} (FWD) µm	a _e cm	M _R Psi	E Pav Psi	SN _{Efect}	D _{max} (VB) 10 ⁻² mm
870+125	0.25	40.00	324.00	225.00	174.00	118.00	95.00	62.00	44.00	20.50	8.0	42.0	1.00	1.00	322.4	52.0	7,754	72,479	3.69	51.91
870+375	0.25	40.00	160.00	96.00	67.00	47.00	39.00	30.00	26.00	20.60	8.0	42.0	0.99	1.00	159.1	46.4	20,130	131,599	4.51	25.61
870+625	0.25	40.00	284.00	194.00	146.00	99.00	77.00	54.00	43.00	20.70	8.0	42.0	0.99	1.00	282.1	50.1	9,564	79,434	3.81	45.42
870+875	0.25	40.00	264.00	178.00	133.00	87.00	63.00	38.00	29.00	20.50	8.0	42.0	1.00	1.00	262.7	47.6	10,860	76,921	3.77	42.30
871+125	0.25	40.00	244.00	174.00	131.00	86.00	63.00	40.00	31.00	20.50	8.0	42.0	1.00	1.00	242.8	49.3	11,101	87,660	3.94	39.10
871+375	0.25	40.00	257.00	187.00	142.00	95.00	70.00	45.00	34.00	20.60	8.0	42.0	0.99	1.00	255.5	50.6	10,080	86,604	3.92	41.14
871+625	0.25	40.00	142.00	98.00	70.00	44.00	44.00	35.00	28.00	20.20	8.0	42.0	1.00	1.00	141.7	51.7	18,743	171,818	4.92	22.82
871+875	0.25	40.00	185.00	134.00	100.00	64.00	52.00	34.00	25.00	21.10	8.0	42.0	0.99	1.00	183.1	51.0	14,068	123,648	4.41	29.47
872+125	0.25	40.00	189.00	128.00	92.00	49.00	40.00	29.00	23.00	20.80	8.0	42.0	0.99	1.00	187.6	45.1	16,840	100,333	4.12	30.20
872+375	0.25	40.00	267.00	188.00	132.00	82.00	63.00	41.00	32.00	20.90	8.0	42.0	0.99	1.00	264.7	47.3	11,008	76,170	3.76	42.62
872+625	0.25	40.00	208.00	168.00	136.00	76.00	57.00	36.00	24.00	21.00	8.0	42.0	0.99	1.00	206.0	51.7	11,568	106,037	4.19	33.17
872+875	0.25	40.00	476.00	338.00	264.00	180.00	133.00	69.00	44.00	20.90	8.0	42.0	0.99	1.00	471.9	50.8	5,251	45,429	3.16	75.98
873+125	0.25	40.00	530.00	386.00	301.00	209.00	153.00	78.00	42.00	20.80	13.0	47.0	0.99	1.00	524.3	60.0	4,776	40,248	3.64	84.42
873+375	0.25	40.00	525.00	378.00	292.00	198.00	140.00	68.00	39.00	21.10	13.0	47.0	0.99	1.00	517.3	58.0	5,098	38,629	3.59	83.28
873+625	0.25	40.00	377.00	306.00	256.00	191.00	149.00	81.00	47.00	21.10	13.0	47.0	0.99	1.00	371.5	68.6	5,385	68,670	4.35	59.80
873+875	0.25	40.00	660.00	482.00	367.00	236.00	159.00	74.00	44.00	21.20	13.0	47.0	0.98	1.00	649.4	55.8	4,262	28,702	3.25	104.55
874+125	0.25	40.00	410.00	298.00	234.00	163.00	120.00	62.00	38.00	21.20	13.0	47.0	0.98	1.00	403.4	60.2	6,258	53,441	4.00	64.95
874+375	0.25	40.00	412.00	299.00	244.00	177.00	138.00	83.00	53.00	21.10	13.0	47.0	0.99	1.00	405.9	64.9	5,602	60,061	4.16	65.36
874+625	0.25	40.00	432.00	331.00	266.00	189.00	146.00	83.00	53.00	21.10	13.0	47.0	0.99	1.00	425.6	64.5	5,371	56,640	4.08	68.53
874+875	0.25	40.00	579.00	420.00	329.00	227.00	168.00	89.00	54.00	21.10	13.0	47.0	0.99	1.00	570.5	60.2	4,446	37,945	3.57	91.85
875+125	0.25	40.00	645.00	450.00	334.00	213.00	146.00	77.00	51.00	21.30	13.0	47.0	0.98	1.00	633.8	55.0	4,684	30,118	3.31	102.04
875+375	0.25	40.00	674.00	457.00	327.00	192.00	127.00	56.00	30.00	21.30	13.0	47.0	0.98	1.00	662.3	51.4	4,688	24,410	3.08	106.63
875+625	0.25	40.00	526.00	411.00	333.00	237.00	181.00	103.00	67.00	21.30	13.0	47.0	0.98	1.00	516.9	65.1	4,349	47,214	3.84	83.21
875+875	0.25	40.00	412.00	286.00	216.00	144.00	106.00	59.00	38.00	21.20	13.0	47.0	0.98	1.00	405.4	57.7	6,869	51,362	3.95	65.27
876+125	0.25	40.00	617.00	453.00	353.00	242.00	179.00	98.00	61.00	21.20	13.0	47.0	0.98	1.00	607.1	60.5	4,179	36,167	3.52	97.74
876+375	0.25	40.00	401.00	297.00	247.00	185.00	147.00	89.00	56.00	21.30	13.0	47.0	0.98	1.00	394.0	67.6	5,320	64,887	4.27	63.44
876+625	0.25	40.00	391.00	286.00	227.00	159.00	121.00	72.00	49.00	21.70	13.0	47.0	0.98	1.00	382.1	62.7	6,379	61,598	4.20	61.52
876+875	0.25	40.00	355.00	259.00	205.00	146.00	111.00	68.00	49.00	23.30	13.0	47.0	0.96	1.00	339.3	63.7	7,048	71,456	4.41	54.63
877+125	0.25	40.00	412.00	323.00	267.00	198.00	155.00	87.00	52.00	21.40	13.0	47.0	0.98	1.00	404.3	67.6	5,125	62,513	4.22	65.09
877+375	0.25	40.00	311.00	243.00	201.00	152.00	125.00	79.00	54.00	21.50	13.0	47.0	0.98	1.00	304.8	70.9	6,386	89,975	4.76	49.07
877+625	0.25	40.00	361.00	273.00	221.00	160.00	128.00	79.00	53.00	21.50	13.0	47.0	0.98	1.00	353.8	66.7	6,179	72,202	4.43	56.96
877+875	0.25	40.00	289.00	223.00	183.00	138.00	111.00	65.00	43.00	21.60	13.0	47.0	0.98	1.00	282.8	68.5	7,253	92,120	4.80	45.53
878+125	0.25	40.00	364.00	292.00	248.00	194.00	161.00	105.00	74.00	21.70	13.0	47.0	0.98	1.00	355.7	74.9	4,898	81,772	4.61	57.27
878+375	0.25	40.00	470.00	359.00	296.00	214.00	166.00	90.00	55.00	22.00	13.0	47.0	0.97	1.00	457.4	65.6	4,770	53,035	3.99	73.65
878+625	0.25	40.00	475.00	366.00	295.00	212.00	155.00	75.00	42.00	22.00	13.0	47.0	0.97	1.00	462.3	62.8	4,943	47,877	3.86	74.43
878+875	0.25	40.00	436.00	324.00	268.00	196.00	150.00	79.00	45.00	21.90	13.0	47.0	0.97	1.00	424.9	64.7	5,192	55,361	4.05	68.41
879+125	0.25	40.00	548.00	405.00	308.00	199.00	143.00	73.00	42.00	21.90	13.0	47.0	0.97	1.00	534.1	58.1	4,967	37,881	3.57	85.99
879+375	0.25	40.00	561.00	406.00	316.00	211.00	140.00	63.00	33.00	22.00	13.0	47.0	0.97	1.00	546.0	56.8	4,805	34,131	3.45	87.91
879+625	0.25	40.00	479.00	326.00	240.00	154.00	101.00	38.00	17.00	22.30	13.0	47.0	0.97	1.00	464.3	52.8	6,124	34,623	3.46	74.75
879+875	0.25	40.00	454.00	317.00	235.00	150.00	99.00	43.00	21.00	22.30	13.0	47.0	0.97	1.00	440.0	54.2	6,377	39,149	3.61	70.85
880+125	0.25	40.00	455.00	305.00	223.00	138.00	90.00	34.00	14.00	22.10	13.0	47.0	0.97	1.00	442.2	51.8	6,579	35,143	3.48	71.20
880+375	0.25	40.00	598.00	428.00	323.00	208.00	140.00	60.00	32.00	21.80	13.0	47.0	0.98	1.00	583.6	55.0	4,721	30,470	3.32	93.96
880+625	0.25	40.00	377.00	294.00	244.00	182.00	144.00	82.00	49.00	22.10	13.0	47.0	0.97	1.00	366.4	68.5	5,535	70,236	4.39	58.99
880+875	0.25	40.00	475.00	370.00	302.00	217.00	163.00	81.00	42.00	22.10	13.0	47.0	0.97	1.00	461.7	64.3	4,739	49,556	3.90	74.33
881+125	0.25	40.00	497.00	365.00	291.00	200.00	144.00	66.00	34.00	21.90	13.0	47.0	0.97	1.00	474.6	60.1	5,086	43,095	3.73	76.41
881+375	0.25	40.00	473.00	345.00	269.00	183.00	131.00	63.00	34.00	21.80	10.0	40.0	0.98	1.00	463.5	51.0	5,122	44,981	3.15	74.62
881+625	0.25	40.00	448.00	300.00	220.00	135.00	89.00	35.00	15.00	21.80	10.0	40.0	0.98	1.00	440.0	45.1	6,356	38,036	2.98	70.83
881+875	0.25	40.00	525.00	393.00	303.00	202.00	140.00	63.00	33.00	21.80	10.0	40.0	0.98	1.00	514.4	50.2	4,624	38,620	2.99	82.82
882+125	0.25	40.00	522.00	378.00	291.00	185.00	121.00	68.00	40.00	21.70	10.0	40.0	0.98	1.00	512.1	48.9	4,990	38,466	2.99	82.44
882+375	0.25	40.00	428.00	316.00	252.00	175.00	131.00	69.00	39.00	21.50	10.0	40.0	0.98	1.00	420.8	53.3	5,370	54,022	3.35	67.75
882+625	0.25	40.00	650.00	449.00	339.00	220.00	151.00	69.00	36.00	21.40	10.0	40.0	0.98	1.00	639.8	47.7	4,120	29,328	2.73	103.01
882+875	0.25	40.00	476.00	343.00	264.00	170.00	118.00	56.00	35.00	21.70	10.0	40.0	0.98	1.00	466.9	48.8	5,484	41,854	3.08	75.18
883+125	0.25	40.00	497.00	356.00	269.00	177.00	122.00	57.00	32.00	21.60	10.0	40.0	0.98	1.00	488.1	48.7	5,221	39,686	3.02	78.58
883+375	0.25	40.00	530.00	401.00	330.00	245.00	190.00	112.00	69.00	21.50	10.0	40.0	0.98	1.00	521.1					

Proyecto: 181154	ACTUALIZACION DEL ESTUDIO DE MANTENIMIENTO PERIODICO DE LA CARRETERA: PANAMERICANA NORTE TRAMO II, (KM. 736+600 AL KM. 886+600)	 181154-79-LABC-33
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STANDARD TEST METHOD FOR DEFLECTIONS WITH A HEAVY-WEIGHT-TYPE IMPULSE LOAD DEVICE

ASTM D4694 -96 (2003)

CLIENTE:	MTC PROVIAS NACIONAL	SECTOR:	TRAMO II	FECHA:	ENERO-2013
DEPARTAMENTO:	LA LIBERTAD-LAMBAYEQUE	CARRIL:	IZQUIERDO	EQUIPO:	FWD KUAB

Prog	Distancia Km	Carga KN	D0	D1	D2	D3	D4	D5	D6	Temp	Espesor (cm)					D _{max} (FWD)					D _{max} (VB)				
			µm	µm	µm	µm	µm	µm	µm	°C	Carpeta	Base + Sub base	A _{Temp}	A _{Carga}	µm	cm	M ₀ Psi	E Pav Psi	SN _{Efect}		10 ⁻² mm				
885+375	0.25	40.00	693.00	430.00	291.00	168.00	112.00	61.00	43.00	21.60	10.0	40.0	0.98	1.00	680.6	42.2	4,977	24,047	2.56		109.58				
885+625	0.25	40.00	775.00	509.00	351.00	203.00	126.00	64.00	46.00	21.70	10.0	40.0	0.98	1.00	760.3	42.7	4,239	21,175	2.45		122.40				
885+875	0.25	40.00	560.00	358.00	253.00	148.00	99.00	51.00	32.00	21.80	10.0	40.0	0.98	1.00	548.7	43.8	5,705	30,900	2.78		88.34				
886+125	0.25	40.00	571.00	352.00	245.00	144.00	97.00	55.00	38.00	21.80	8.0	47.0	0.98	1.00	561.2	46.4	6,098	29,933	3.03		90.35				
886+375	0.25	40.00	567.00	386.00	286.00	187.00	138.00	79.00	51.00	21.90	8.0	47.0	0.98	1.00	556.7	52.7	4,992	36,510	3.23		89.63				
886+650	0.28	40.00	392.00	221.00	144.00	74.00	55.00	37.00	28.00	22.40	8.0	47.0	0.98	1.00	383.0	43.1	10,452	40,435	3.34		61.66				

GMI S.A.

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