ENHANCEMENTS TO THE MECHANISTIC-EMPIRICAL PAVEMENT DESIGN GUIDE:

A MANUAL OF PRACTICE, JULY 2008 INTERIM EDITION

ADDENDUM NUMBER: FY2015.1

ADDENDUM TITLE: ADDITIONAL DEFAULT NORMALIZED AXLE LOAD SPECTRA INCLUDED IN THE MEPDG SOFTWARE

Addendum Date: July 12, 2015

CHAPTER 9 – DETERMINING SITE CONDITIONS AND FACTORS

9.1 Truck Traffic

9.1.2 Inputs Extracted from WIM Data

AXLE LOAD DISTRIBUTION FACTORS

Four normalized axle load spectra (NALS) have been added as default distributions to the MEPDG software. Table 1 lists and provides a description of the four new default NALS along with the default distribution that was derived from NCHRP project 1-37A. Table 1 also includes some recommendations for selecting the default NALS to be used for a specific roadway.

The four new default NALS were determined from selected LTPP sites with the highest quality WIM data and relatively few over loaded trucks (Selezneva, et al., 2013). Figures 1 and 2 include a graphical comparison of the five default NALS. As shown, the default NCHRP 1-37A NALS includes an appreciable percentage of overloaded trucks.

Figures 3, 4, and 5 provide a comparison of the predicted rut depth, fatigue cracking, and IRI for new flexible pavements, respectively, to estimate the relative effect the different default NALS have on the predicted distresses. Figures 6, 7, and 8 provide a similar comparison of predicted faulting, fatigue cracking, and IRI for new JPCP, respectively. It is important to note that the NCHRP 1-37A NALS has been used in all national studies prior to 2016 to determine the global calibration coefficients for the flexible and rigid pavement transfer functions.

In selecting a default NALS, it is recommended that the expected traffic loading pattern be understood along the project site or roadway segment. To get an understanding of the loading pattern, an analysis of the truck traffic characteristics should include the following:

- The percentage of through trucks versus local delivery trucks.
- The dominant commodities being carried by the trucks.
- The normalized truck volume distribution.

An effort should also be made to identify the loading condition for class 9 trucks. In some instances portable WIM data may be available for the site. These data may be inaccurate for

computing the NALS for a site but may be useful in establishing a descriptive loading condition or to confirm the selection of the default NALS included in Table 1.

Table 1—Normalized Axle Load Distribution included with the Pavement ME Design Software

Axle Loading Classification	Description of Normalized Axle Load Distribution	Recommended to be Used for:
NCHRP 1-37A	NALS default developed under NCHRP 1-37A and includes higher percentages of overloaded trucks.	Highways with a higher percentage of overloaded trucks.
Heavy	Freight routes: rural and urban interstate roadways with an AADTT greater than 2,000 in both directions. This heavy loading NALS is representative of roads where a sizeable majority of tandem axles are heavily loaded. It is commonly found on rural highways that serve significant long haul truck movements.	Rural highways that serve significant long haul truck movements.
Typical	Non-Freight routes: urban and rural routes with an AADTT greater than 1,000 in both directions (principle and non-interstate routes). This NALS has more loaded axles (between 30,000 and 34,000 pounds) than unloaded axles (between 12,000 and 16,000 pounds). This is a balanced distribution with similar total percentages of light and heavy loads. In this NALS, 55 percent of axles carry loads greater than 20,000 pounds.	Highways that serve a mix of urban and long haul truck movements.
Light	Non-Freight routes: urban and rural routes with an AADTT less than 1,000 in both directions (minor arterials, collectors and state routes). This NALS has more lightly loaded tandem axles (axles between 12,000 and 16,000 pounds) than heavily loaded axles (30,000 and 34,000 pounds). In this NALS, 40 percent of axles carry loads greater than 20,000 pounds.	Rural and urban highways and other roads where 70 percent or more of trucks are not fully loaded.
Global	This NALS is very similar to the “Typical” classification and represents the average NALS for many of the LTPP WIM sites.	See “Typical” classification.

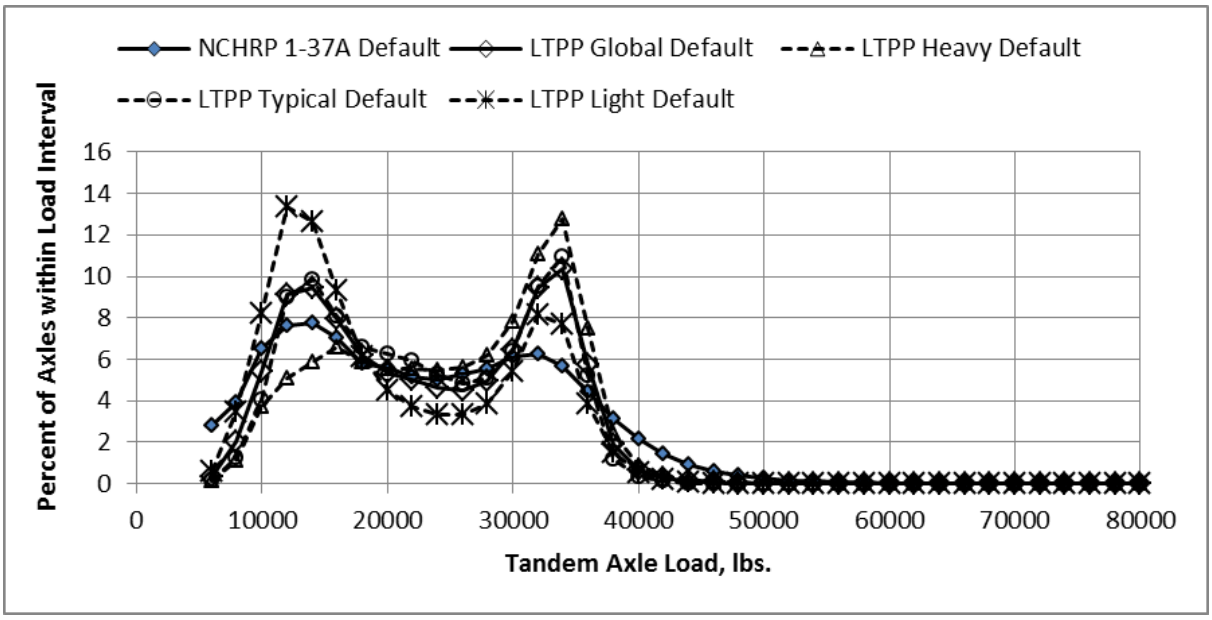

Figure 1. Comparison of the Five NALS Defaults for Vehicle Class 9 Tandem Axles – Entire Range of Axle Loads

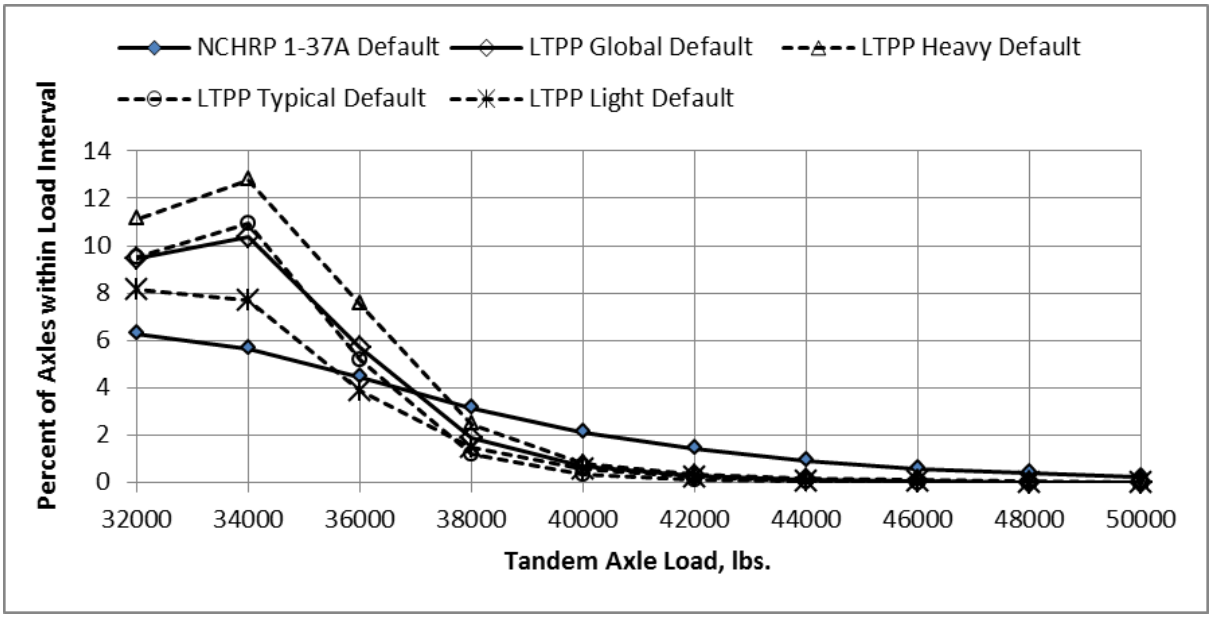

Figure 2. Comparison of the Five NALS Defaults for Vehicle Class 9 Tandem Axles – Axle Loads between 23,000 and 50,000 lbs.

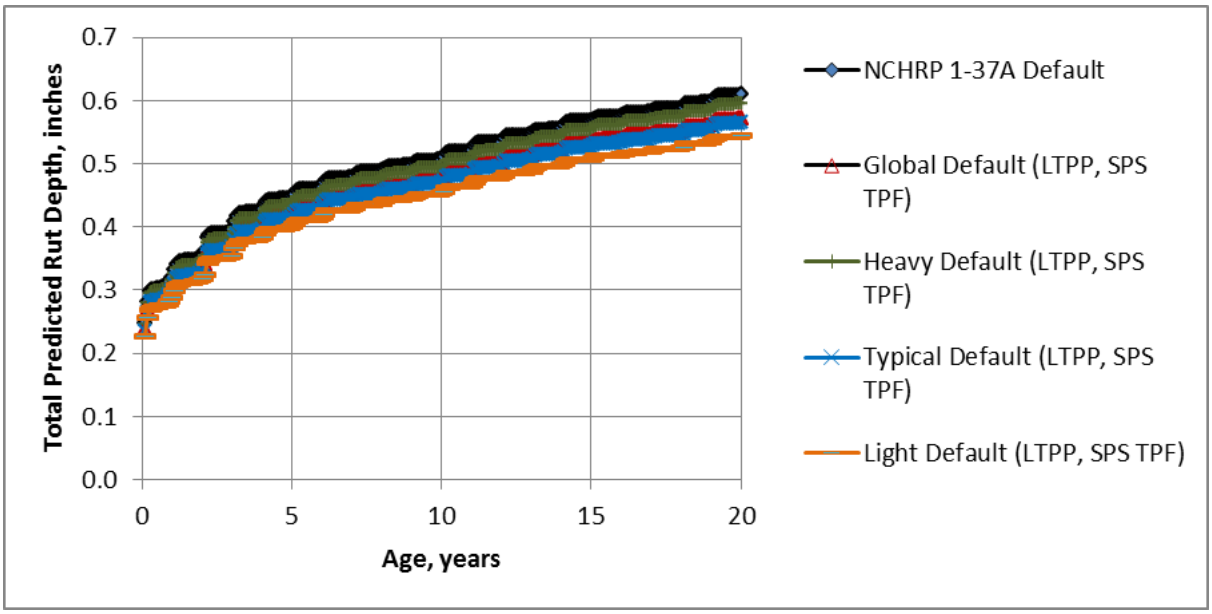

Figure 3. Comparison of the Predicted Rut Depth of a Flexible Pavement for the Five NALS Defaults

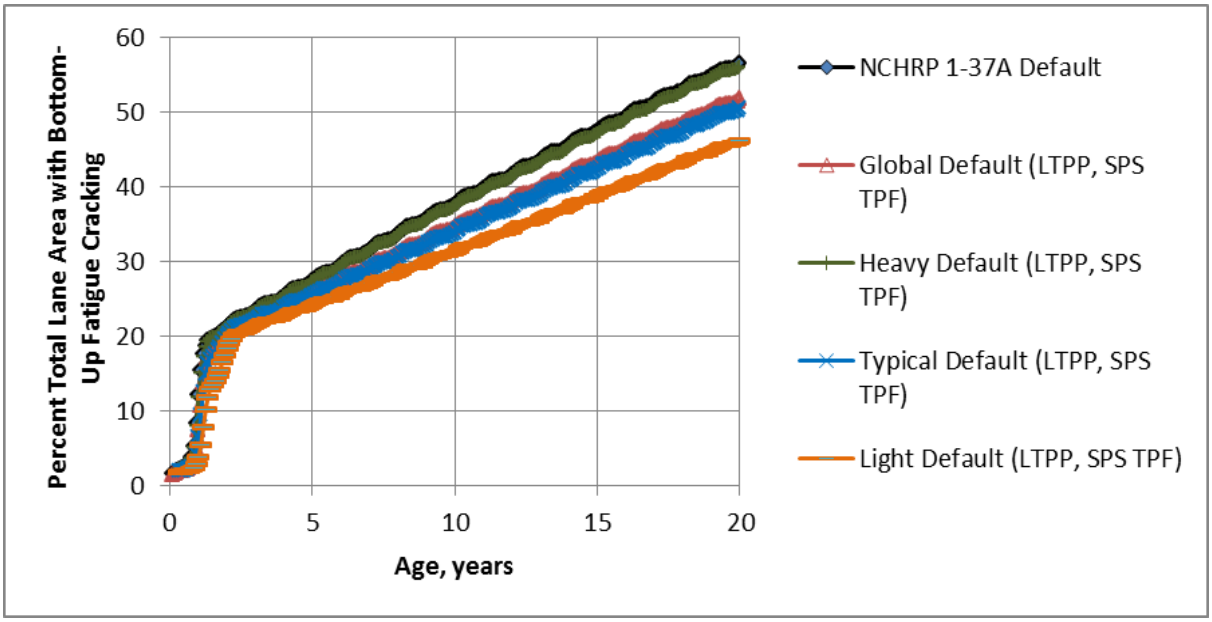

Figure 4. Comparison of the Predicted Bottom-Up Fatigue Cracking of a Flexible Pavement for the Five NALS Defaults

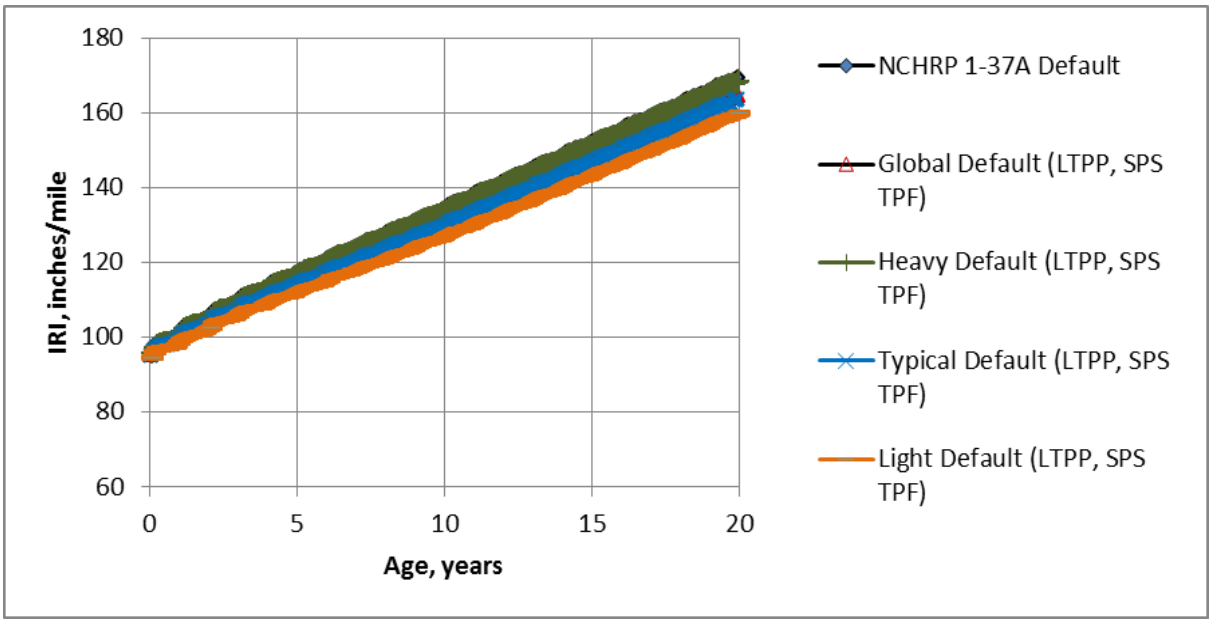

Figure 5. Comparison of the Predicted IRI of a Flexible Pavement for the Five NALS Defaults

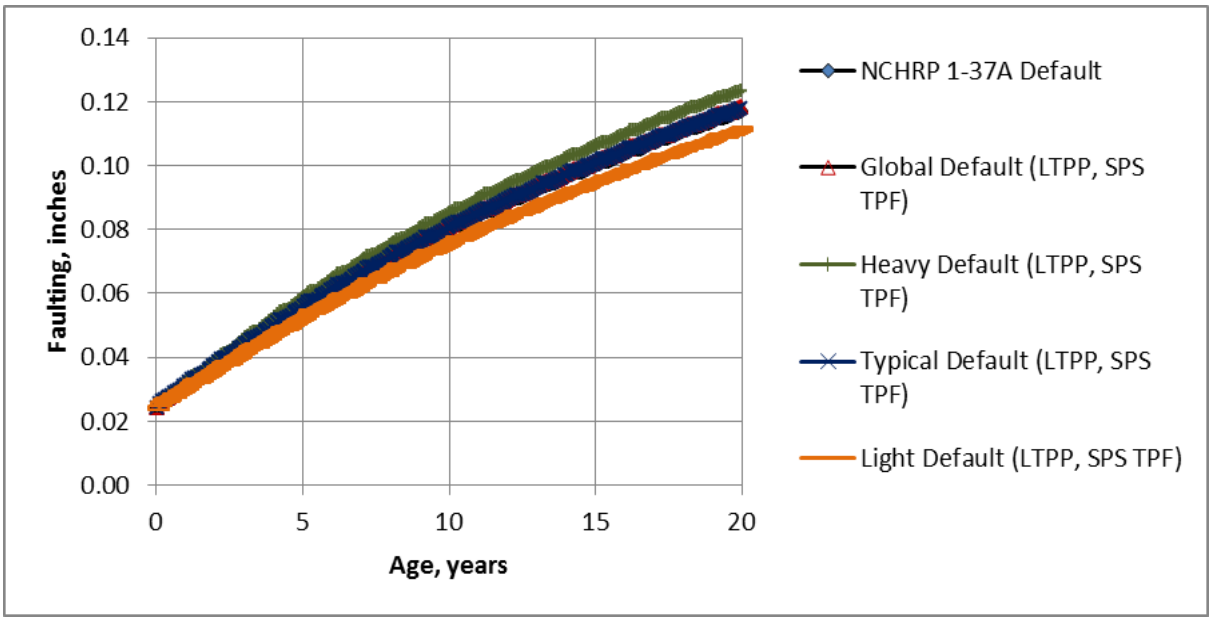

Figure 6. Comparison of the Predicted Faulting of a JPCP for the Five NALS Defaults

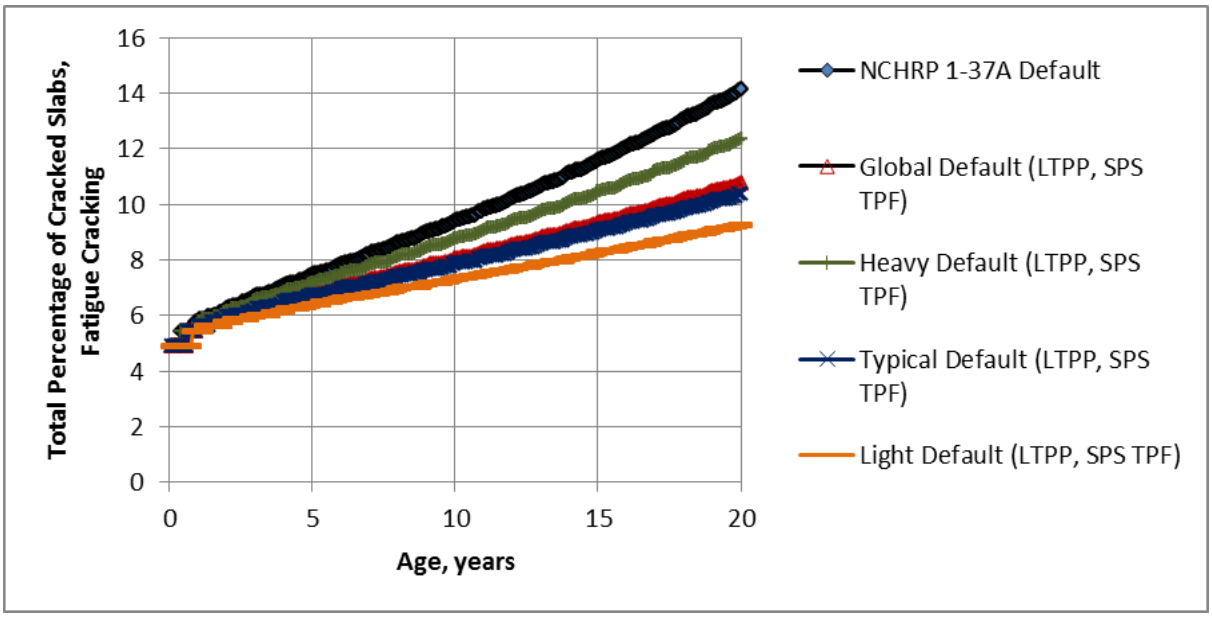

Figure 7. Comparison of the Predicted Fatigue Cracking of a JPCP for the Five NALS Defaults

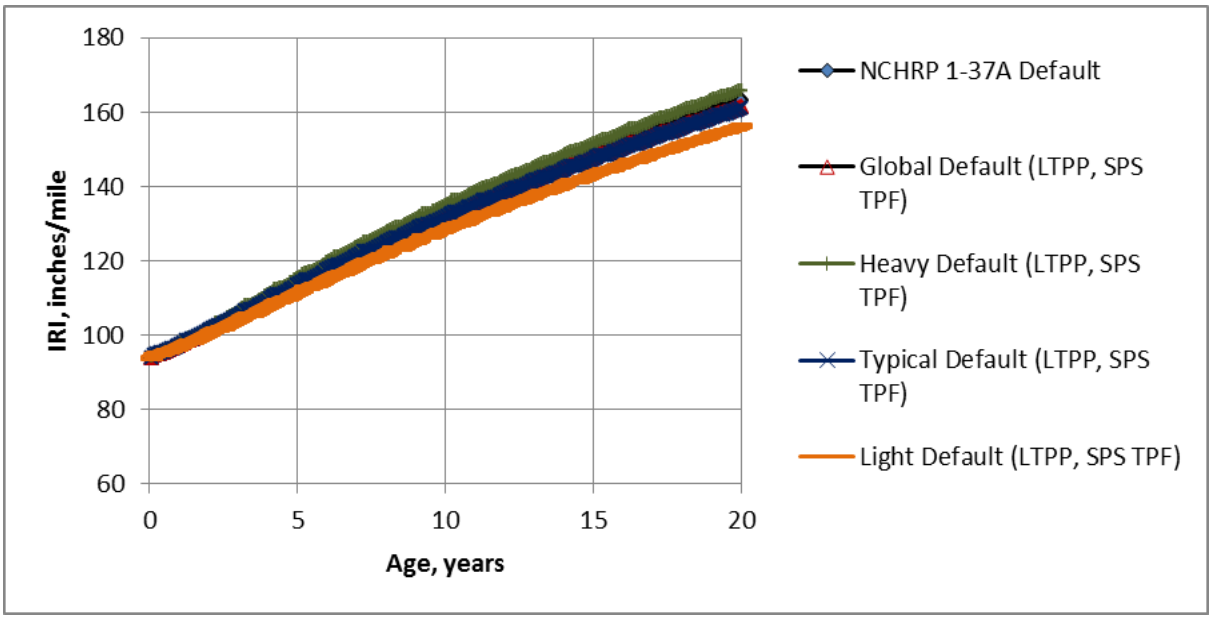

Figure 8. Comparison of the Predicted IRI of a JPCP for the Five NALS Defaults