

2015 Navajo Nation Long Range Transportation Plan

Appendix B: Pavement Maintenance Strategy



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Pavement Preservation Program
Gravel/Improved Dirt Roads Preservation Program
Navajo Nation DOT

Introduction:

The pavement preservation program for the Navajo Nation is designed to keep the existing roadways pavement condition in a good or better condition through the use of a strategy that addresses the integrity of the pavement structural section. The definition for pavement preservation and its components used in outlining this program was outlined in a letter authored by David R. Geiger, P.E, Director of the FHWA Office of Asset Management, on September 12, 2005.

***Pavement Preservation** is “a program employing a network level, long-term strategy that enhances pavement performance by using an integrated, cost-effective set of practices that extend pavement life, improve safety and meet motorist expectations.”*

Source: FHWA Pavement Preservation Expert Task Group

An effective pavement preservation program will address pavements while they are still in good condition and before the onset of serious damage. By applying a cost-effective treatment at the right time, the pavement is restored almost to its original condition. The cumulative effect of systematic, successive preservation treatments is to postpone costly rehabilitation and reconstruction. During the life of a pavement, the cumulative discount value of the series of pavement preservation treatments is substantially less than the discounted value of the more extensive, higher cost of reconstruction and generally more economical than the cost of major rehabilitation. (USDOT, FHWA, Pavement Preservation Compendium II, Publication No. FHWA-IF-06-049)

The Navajo Nation pavement preservation program would consist of four major components, those being, Routine Maintenance, Preventive Maintenance, and Minor Rehabilitation, and Major Rehabilitation. Each component provides for actions that will bring the pavement structural section to near new and defer later major reconstruction.

The gravel and improved dirt roadway surfaces are a part of this program. The components of improved surface maintenance are routine maintenance, surface preservation, and surface rehabilitation. Each component is designed to keep the surface as near to what is was when constructed and would also defer major reconstruction.

Pavement Preservation

Routine Maintenance (PCI 86 – 100) “consists of work that is planned and performed on a routine basis to maintain and preserve the condition of the highway system or to respond to specific conditions and events that restore the highway system to an adequate level of service.”

Source: AASHTO Highway Subcommittee on Maintenance

Routine maintenance consists of day-to-day activities that are scheduled by maintenance personnel to maintain and preserve the condition of the highway system at a satisfactory level of service.

Examples of pavement-related routine maintenance activities include cleaning of roadside ditches and structures, maintenance of pavement markings and crack filling, pothole patching and isolated overlays. Crack filling is another routine maintenance activity which consists of placing a generally, bituminous material into “non-working” cracks to substantially reduce water infiltration and reinforce adjacent top-down cracks. Depending on the timing of application, the nature of the distress, and the type of activity, certain routine maintenance activities may be classified as preservation. (Geiger, 2005)

Other actions can include flush, or fog, coats using emulsified asphalts or combinations of the emulsified rejuvenators and asphalts to renew the pavement surface in selected areas to complement crack sealing and patching. Additional actions may involve leveling treatment to rutted areas using cold bituminous mixture with a seal coat of some sort to seal the surface after the leveled area is allowed to cure.

These actions will generally maintain a PCI of 86 and greater for a period of 3 to 10 years depending on traffic and pavement structural section.

Preventive Maintenance (PCI 76 – 85) is “a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without significantly increasing the structural capacity).”

Source: AASHTO Standing Committee on Highways, 1997

Preventive maintenance is typically applied to pavements in good condition having significant remaining service life. As a major component of pavement preservation, preventive maintenance is a strategy of extending the service life by applying cost-effective treatments to the surface or near surface of structurally sound pavements. Examples of preventive treatments include asphalt crack sealing, chip sealing, slurry or micro-surfacing, thin and ultra-thin hot-mix asphalt overlay, concrete joint sealing, diamond grinding, dowel-bar retrofit, and isolated, partial and/or full-depth concrete repairs to restore functionality of the slab; e.g., edge spalls, or corner breaks. (Geiger, 2005)

On the Navajo system, preventive maintenance should normally consist of chip seals, flush coats, and in some cases 2” overlays or 2” mill and fill type projects. Crack sealing can be an integral part of the process since it may be required prior to seal coats or overlays to ensure the preservation of the existing structural section.

Preventive maintenance programming starts when routine maintenance is unable to return the pavement section to the higher PCI level. Preventive maintenance activities, mainly the chip seal or flush coat, will begin at years 5 to 7 and may be required at years 8 to 10 as a second treatment prior to an overlay which normally is considered at years 10 to 15. Preventive

maintenance actions can be followed for an additional two plus iterations, again depending on existing pavement section and surrounding conditions.

Pavement Rehabilitation (PCI <55 – 75) consists of “structural enhancements that extend the service life of an existing pavement and/or improve its load carrying capacity. Rehabilitation techniques include restoration treatments and structural overlays.”

Source: AASHTO Highway Subcommittee on Maintenance

Rehabilitation projects extend the life of existing pavement structures either by restoring existing structural capacity through the elimination of age-related, environmental cracking of embrittled pavement surface or by increasing pavement thickness to strengthen existing pavement sections to accommodate existing or projected traffic loading conditions. Two sub-categories result from these distinctions, which are directly related to the restoration or increase of structural capacity. (Geiger, 2005)

Minor rehabilitation (PCI 55 – 75) consists of non-structural enhancements made to the existing pavement sections to eliminate age-related, top-down surface cracking that develop in flexible pavements due to environmental exposure. Because of the non-structural nature of minor rehabilitation techniques, these types of rehabilitation techniques are placed in the category of pavement preservation. (Geiger, 2005)

Minor rehabilitation on the Navajo system would essentially focus on chip seals or 2” overlays, or some combination of both. In many cases minor rehabilitation would be used to rejuvenate existing pavements, overlaying using the 2” overlay or possibly a 1” overlay depending on structural integrity, or crack sealing the existing pavement, overlaying it, and then placing a chip seal wearing course.

Minor rehabilitation activities would most likely take place in years 10 to 15 with some sections not being addressed until year 20.

Major rehabilitation (PCI <55) “consists of structural enhancements that both extend the service life of an existing pavement and/or improve its load-carrying capability.” (Geiger, 2005)

Major rehabilitation on the Navajo system would focus on major actions to bring the pavement section back to a PCI of 85 or greater. Existing paved sections of highway the actions could be overlays of 2” to 3” with crack sealing and flush coats. Sections of extreme distress may be considered for some type of reconstruction.

If the routine maintenance, preventative maintenance, and minor pavement rehabilitation sequences are followed the need for major rehabilitation will be diminished. The pavement preservation practices in several states have shown that major rehabilitation or reconstruction is limited to those sections of their systems where there have been changes in the traffic and the composition of the traffic that resulted in severely distressed pavement sections.

Improved Surface Preservation

Routine Maintenance for improved surface conditions is similar to what is outlined for pavement routine maintenance. The difference is that routine maintenance for these roadways include the routine blading of roadways, pothole repair in both gravel and improved dirt segments, and drainage maintenance that impacts the surface. Routine activities may also include spot repairs of treated surfaces, those that have had dust suppressant or some other binder placed on the surface or mixed into the surface material.

The routine activities timing are predicated on the Average Daily Traffic (ADT) of the roadway and the classification of the roadway. Blading of the roadways should be at least four times a year depending again on traffic and weather. Using 400 vehicles per day (vpd) as the split between low volume and high volume roadways the following schedule is recommended for the gravel and improved dirt roadways. Dust abatement is included in the routine program as well.

High Volume – 5 to 10 days cycle

Low Volume – 3 to 4 weeks cycle

Low Usage – Seasonal/Minimum 4 times per year

Dust Abatement – Once a year

Surface Preservation activities are typically applied to surfaces in good condition having significant remaining service life. Surface preservation is a strategy of extending the service life by applying cost-effective treatments to the surface or nearsurface of well-performing surfaces including gravel and improved dirt surfaces. Examples of preventive treatments include repair of roadway crown, cleaning of drainage infrastructure, spot regravelling, repair of soft areas, and spot repairs using dust abatement or stabilization treatments.

Surface preservation begins when routine maintenance is unable to return the existing surface to an acceptable level. These activities will normally occur on an annual basis, especially immediately during the spring and depending on intensity, after the southwest monsoon season.

Surface Rehabilitation consists of non-structural and structural enhancements made to the existing surface sections to eliminate age-related wear and weather impacts to existing surface. These activities include reshaping roadway sections including the drainage ditches and facilities; regravelling and new gravel major segments of the roadway; and, reconstructing failed areas. These activities would be required 5 to 8 years into the life cycle of the existing surface.

In the cases of gravel and improved dirt roadway surfaces, paving should be considered when the roadway ADT exceeds 500 vpd and that rehabilitation activities are required at less than 5 years as part of the life cycle. Paving activities may include chip sealing the surface after stabilization of the surface or doing some type of bituminous treated grade assuming that there is a reasonably sound structural base.