

Development of the 2020–2021 Pavement Preservation Academy

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1. Introduction

1.1 Background

In 2017, California passed Senate Bill 1 ([SB-1](#))—the Road Repair and Accountability Act of 2017—to raise billions in revenue for transportation infrastructure improvements by increasing fuel tax and other fees. Over \$5 billion annually is invested equally between state and local agencies to fix roads, freeways, and bridges, as well as going towards transit and safety, with a focus on “fixing it first.” The Pavement Preservation Academy ([PPA](#)) located at California State University (CSU), Chico was developed to provide information and training for local agency staff to recognize and understand their pavement maintenance options and to develop the most cost-effective strategies for preserving aging hot mix asphalt (HMA) pavements. Most local agencies have deferred road maintenance over many years, and there are thousands of miles of public roads that are currently in poor condition. With the new SB-1 funding available for maintenance and construction projects, the importance of selecting proper road maintenance strategies and constructing them is paramount.

The most common preservation surface treatments used in California include chip seals, slurry surfacing, Cape seals, and thin asphalt overlays. All of these treatments have the ability to extend the life of a pavement via the prevention of moisture intrusion into the existing asphalt layer, as well as the base and subgrade. When properly designed and constructed, these preservation treatments can be a cost-effective tool to improve life cycle cost benefits.

2. Purpose of the Pavement Preservation Academy

In line with SB-1’s goal of providing transportation-related workforce education, training, and development, the PPA develops and educates state and local agencies’ workforce, who understand the philosophy of pavement preservation treatments and how to utilize cost-effectively the common pavement preservation treatments to preserve and maintain pavement assets.

3. Contents of Pavement Preservation Academy

As part of the California State University Transportation Consortium (CSUTC) and led by the Mineta Transportation Institute (MTI) at San Jose State University (SJSU), the California Pavement Center (CP2C), located at CSU Chico, has developed training materials and a certificate program in pavement preservation—the PPA. The purpose of the program is to help local agencies improve the design and construction of pavement preservation treatments.

Development of the PPA began in 2018 by composing technical manuals for chip seals, slurry surfacing, Cape seals, and thin hot mix overlays. The four manuals can be found through the following links:

<https://transweb.sjsu.edu/research/1845A-Chip-Seal-Manual>

<https://transweb.sjsu.edu/research/1845B-Slurry-Surfacing-Manual>

<https://transweb.sjsu.edu/research/1845C-Cape-Seal-Manual>

<https://transweb.sjsu.edu/research/1906-Manual-Thin-Asphalt-Overlay>

The certificate program consists of four three-hour modules and a corresponding exam, which the student must pass for a certificate. The first course was offered in March 2021. We expect to offer the courses once, possibly twice, per year depending on demand. Each module covers the following topics:

- Overview of the treatment
- Project selection
- Materials and design
- Specifications
- Construction
- Safety
- Quality assurance
- Trouble shooting
- Other resources available

Through training, the Academy empowers local agency staff and contractors to select the right treatment for the right road at the right time in order to optimize funding. Due to years of neglect, public roads are in dire need of maintenance and repair. With the new state funding, treatments that can preserve pavements are crucial for delaying the need and costs associated with road reconstruction. Below is a closer look at the treatments that the Academy covers.

3.1 Chip Seals

A chip seal, also known as seal coat, is one of several valuable preservation treatments for roads (Figure 1). The treatment is normally used on roads with light to medium traffic volumes, but has also performed well on higher-volume roadways. Chip seals are usually placed over existing hot

mix asphalt (HMA) pavement by spraying the pavement with a binder—either an asphalt emulsion or a hot applied binder—from a distributor truck, then immediately applying a uniform application of a cover aggregate (chips or screenings) using a self-propelled chip spreader. The aggregate is rolled as soon as possible to ensure adequate embedment and adhesion of the aggregate to the fresh binder. The PPA chip seal manual presents the best practices for design and construction of chip seals, including variations such as “scrub seals” and Geosynthetic Reinforced Chip Seals (GRCS). The manual also includes guides for troubleshooting construction problems and specifications for both emulsion and hot applied chip seals.

Figure 1. Typical Chip Seal Operation



3.2 Slurry Surfacing

Slurry surfacing, as a pavement preservation treatment, includes both slurry seals and microsurfacing. They are a common treatment used in California by both state and local agencies.

Slurry seals were first developed in the 1930s, and they proved to be a promising strategy for maintaining road surfaces. By the 1960s, with improved emulsions and continuous flow slurry machines, real interest was shown in using slurry seal across a wide range of applications. Currently, slurry seals are used for public roads, highways, airport runways, parking lots, and a multitude of other global surfacing projects.

Microsurfacing was first developed in the 1960s in Germany and is an improved version of a slurry seal. Microsurfacing uses a more complex form of slurry surfacing involving special “engineered” polymer-modified Quick Setting (QS) asphalt emulsion, as well as mineral fillers, such as cement. It can be placed thicker than slurry seal and is often used for wheelpath rut filling. Microsurfacing is now widely used in the United States and in California, in particular.

Slurry surfacing is an economical means for maintaining and improving the functional condition of an existing pavement. It can be used repeatedly or in conjunction with other preventative treatments to slow deterioration or correct isolated pavement defects. Figure 2 shows a typical slurry seal operation for a city street.

Figure 2. Typical Slurry Seal Construction



The PPA slurry surfacing manual highlights the best practices for the design, specifications, and construction of successful slurry surfacing. Most needed information about slurry surfacing is in the Slurry Surfacing Manual, which can be easily used by both local agencies and industry.

3.3 Cape Seals

Cape seals originated in the Cape Province of South Africa, near Cape Town, hence the name Cape. They consist of a single chip seal (either using an emulsion or a hot binder), which is then covered by a slurry surfacing—either a slurry seal or a microsurfacing. In the past several years, they have evolved into maintenance treatments that can be successfully used on both low- and high-volume roads. The popularity of Cape seals is a direct result of their low initial costs in comparison to HMA overlays. Currently, with improved binders and equipment, considerable interest has been shown for using Cape seals in a wide range of applications, such as on public roads, highways, local streets, and a multitude of other surfacing needs around the world.

The PPA Cape seal manual presents the best practices for the design, specifications, and construction for successful Cape seal projects and can be easily used by both local agencies and industry. A photo of a freshly completed Cape seal project is shown in Figure 3.

Figure 3. Completed Cape Seal—Slurry Seal over Chip Seal



3.4 Thin Asphalt Overlays

All roads suffer from normal wear and tear on a daily basis. As a result, preservation treatments are regularly required to maintain these roads to meet the public's travel needs. Thin asphalt overlays are one of many preservation treatments for roads that receive mostly light to medium traffic volumes. Thin asphalt overlays are usually placed over existing hot mix asphalt (HMA) pavement by placing a new HMA layer from 1/2 inch to 1 1/2 inches in thickness, using a conventional self-propelled asphalt paving machine. The thin HMA is rolled as soon as possible to ensure compaction of the mix for the pavement's longevity. The new PPA manual provides engineering guidance from project inception to troubleshooting construction problems. The focus is on achieving best practices for the design, specifications, and construction of thin asphalt overlays within California. The information in this manual can be easily used by both local agencies and industry. In California, the two main sources of specifications are Caltrans and the Southern California "Greenbook," which are both referenced in this manual. A picture of a thin hot mix asphalt construction is shown in Figure 4.

Figure 4. Thin Hot Mix Asphalt Overlay Construction



4. The First Pavement Preservation Academy

The teaching modules and online exams are hosted on the server at the CP2 Center, and a website (<https://ce.ecst.csuchico.edu/cp2c-lms/PPacademy/>) was developed to allow participants to access these resources and take online exams.

An online service managed registration (Eventbrite, <https://www.eventbrite.com/>) and more information about registration to PPA is available via the CP2 Center's website: <https://www.csuchico.edu/cp2c/educational-opportunities/pp-academy.shtml>. The first PPA was successfully held in March 2021. The instructors for the four modules are experts in the field, including:

- Gary Hicks—Introduction and Chip Seals
- Lerosé Lane—Slurry Surfacing
- DingXin Cheng—Cape Seals
- Erik Updyke—Thin Asphalt Overlays

There were 48 participants at the first PPA, and satisfaction rates from the participants were over 90%. Participants came from a wide range of agencies and organizations from throughout California.

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This report can be accessed at transweb.sjsu.edu/research/2004



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