Cold Planing
What is Cold Planing (CP)?

► Also referred to as “Asphalt Milling”, Cold Planing (CP) is the controlled removal of the surface of the existing pavement to the desired depth, with specially designed equipment to restore the pavement surface to a specified grade and cross-slope.

► CP can be used to remove part or all of the existing pavement layers.
Originated

► Cold Planing started in the late 1970’s
► CP is now the preferred method of removing and reclaiming asphalt pavement materials.
Surface Preparation

- Hot Mix Asphalt Overlays.
- Hot In-Place Recycling.
- Cold In-Place Recycling.
- Asphalt Patching.
- Lane Widening.
- Full Depth Removal.
Treatable Distress

► Raveling
► Bleeding
► Rutting
► Corrugations from shoving
► Deteriorated, stripped or aged asphalt
► Ride Quality (swells, bumps, sags, or depressions)
Other Applications

- Curb Reveal
- Ponding or Drainage
- Shoulder Drop Off
- Staged Construction
- Overhead Clearance
Cold Planing generates “RAP” - Recyclable Asphalt Pavement

All RAP is reusable as:
- New Hot Mixed Asphalt
- Cold Mixed Asphalt
- Stabilized Aggregate Base
- Aggregate Base
CP Equipment

- Modern self-propelled front loading Cold Planer
- Haul Trucks
- Water Truck
- Power broom or vacuum sweeper
Half Lane Front Loading
Mini Planers
Electronic Controls
Equipped with either three or four tracks with separate hydraulic motors.

Increased uniform traction as the result of traction locking devices.

Diverts power away from the slipping track to the ones that have traction.
Mobility

► Track pads have greatly enhanced the mobility of cold planers.
► Available in Polyurethane or Rubber.
► Increases traction.
► Minimizes damage to roadway surface.
Track Pads
Cutting Drums

- Drums are scrolled or wrapped with 2, 3, or 4 scrolls to move the milled material to the center to be loaded onto a conveyor.
- Standard cutting drums are made with tool holders and replaceable carbide tipped cutting tools.
- With 3 scrolls, the tools are usually spaced 15 mm, (5/8”) apart horizontally.
- Generally operate in an “up-cut” direction.
- Increased rotation speed and reduced forward speed will help reduce the material size.
Standard Drum Widths

- **Trenching** –
  10, 20, 30 cm (4”, 8”, 12”)
- **Mini Planers** –
  30, 40, 50, 60 cm (12”, 16”, 20”, 24”)
- **Small Mills** – 1, 1.2 m (3’, 4’)
- **Half Lane** – 1.8, 2.1 m (6’, 7’)
- **Full Lane** –
  3, 3.4, 3.8, 4.2 m (10’, 11.25’, 12.5’, 14’)

ARRA Cold Planing
Scraper Blade

- The cutter housing holds all of the milled asphalt.
- A carbide scraper blade drags on the textured milled surface, removing all of the milled material except the dust.
Drum & Scraper Blade
Cutting Tool Holders

► Holders wear and must be replaced to keep a good quality pattern.
► Holders may also shear off if they hit something like a manhole or water valve box.
► Typically two types of holder systems
Quick Change Holder
Weld on Holder & Block
Cutting Tools

- No one style of cutting tool works everywhere.
- Aggregate hardness, size, and abrasiveness are major factors.
- A cutting tool may last one hour to several days.
- There is no fixed cost per SY or per Ton for cutting tools.
Carbide Tipped Tool
Water

► Cutting Asphalt generates a tremendous amount of Heat.
► Up to 2,000 Gallons of water per hour must be constantly sprayed on the cutting tools and drum inside the cutter housing to help cool it.
► Water also reduces airborne dust.
Water Truck - 2,500 Gal
Grade & Slope Controls

- Typically, one or more automatic leveling systems, operating independently, and a number of different sensors can be used to control the machine.

- Types of Sensors:
  - Cable sensors to mechanically scan the side plate.
  - Non-contact ultrasonic sensors to scan the side plate or any reference beside the machine.
  - Transducing sensors to scan a moving reference such as a ski or stringline.
  - Additional slope sensor may be attached to the machine for both grade and slope control.
Versatility

► Almost any geometric shape with respect to length, width or depth can be considered a candidate for Cold Planing.

► Overlapping and staging construction using asphalt in conjunction with CP is an economical and efficient way to accommodate traffic concerns.
Economic Benefits

► Cold Planing, used in conjunction with any road reclamation process, usually makes the process more economical.

► Re-profiling a deformed pavement prior to resurfacing is less expensive than padding with new asphalt and then resurfacing.
Economic Benefits

► Reusing Asphalt conserves Natural Aggregate Resources.
► Reusing Asphalt conserves Energy and Natural Oil Resources.
► Reusing Asphalt conserves Landfill Space.
► CP makes all of these easier.
Milled surfaces can be used as driving surfaces as long as the surface does not ravel.

For lower volume road, overlays are normally placed within 3 - 10 days.

For high traffic volume roads, state agencies are requiring more of the work to be milled and resurfaced the same shift before reopening the road to traffic.
For safety, state specifications require that a lane cannot be opened to traffic if the vertical joint between adjacent open lanes exceed 50 mm (2").
ARRA recommends a reasonable ratio of travel speed to cutter speed to maintain an acceptable level of quality.

Most cutter drums turn at around 100 RPM. This can be adjusted up or down by changing sheaves.

As the milling machine moves forward, a typical individual tool striation mark left in the surface of the asphalt is ~ 10 cm (4”) long.
Unacceptable Quality

- If the travel speed in feet is greater than the drum RPM, the machine is “outrunning the cutter”.
- Individual cutting tools are not overlapping their adjacent cut and a very poor quality, very rough textured milled surface results.
- The surface becomes scalloped and individually gouged.
Cutting 100’/min at 100 rpm

“UNACCEPTABLE”

50 mm (2”)

18.56 mm (.75”)
To maintain an acceptable level of production and quality, it is recommended that the travel speed in feet per minute not exceed \( \frac{2}{3} \) of the cutter RPM.

- 100 RPM > 20 m (66 FPM).
- This allows 1/3 overlap in cutting between adjacent teeth.
Cutting 33’/min at 100 rpm

2.38 mm (0.1”)
An excellent ‘End Result’ specification which ultimately controls the forward speed with respect to the cutter RPM may be specified as follows.

The difference between the high and low points of the milled surface shall not exceed \( 6 \text{ mm (0.25”)} \).
This same 6 mm (.25”) difference in depth specification also requires that the cutter drum be properly maintained with the tools aligned and set for equal cutting depth.

Most irregular, rough milled surfaces are due to the lack of proper cutter maintenance and should not be tolerated by the owner.
Quality Specifications

► Visual - The milling operation shall produce a pavement surface that is true to line, grade, and cross section, and of uniform texture.

► Straightedge - All irregularities shall be re-milled at no additional cost.

► Cross Slope - Shall be uniform with no depressions or misalignment of slope greater than 6 mm (1/4”) in 3.6m (12’).
Ride Specifications

► Road Profiler or Maysmeter indices on milled pavement surfaces and newly paved surfaces can be specified for higher speed roads.
► For milled surfaces a commonly used specification is not to exceed 900 mm/km on Interstates and 1000 mm/km, for all other on-system routes.
Note - “End Result”

► Specifications must be defined to provide the owner with the proper ‘END RESULT’.

► Method specifications do not allow creative manufacturers and contractors to improve and then pass on savings to the owner.

► This allows equipment, cutters, and cutting tool technology to continually improve.
Audible Warning Strips
Rumble Strips

► Rumble strips on the shoulder of the major highways save numerous lives every year.
► Many states have converted to milled in strips.
► They can be installed anytime after the completion of the paving.
Rumble Strip Specification

- 40 cm (16”) long
- 18 cm (7”) wide, (+/- 1.3 cm (1/2”))
- 13 mm (1/2”) to 16 mm (5/8”) deep.
- Spacing - 30 cm (12”) +/- 25 mm (1”)
- Located 25 cm (10”) from edge line to start of milled in strip.
Micro Milling

- Also referred to as “Carbide Grinding”
- Alternative to “Diamond Grinding”
- Main Benefit – Less Expensive
Concept

► Use a milling machine with a modified cutter with tools spaced close enough together to carbide grind every square inch of the milled surface.
► Produce a very fine even textured surface that will create a result equivalent to diamond grinding, with less cost.
► Use this surface as a riding surface.
Micro Milling Benefits

- Correct minor grade and profile problems quickly.
- Remove wheel ruts.
- Remove slick surfaces caused by the bleeding of binder.
- Increase skid resistance by re-cutting polished aggregate.
- Correct Drainage Problems.
Micro Milled Surfaces

- Micro Milling improves the ride very economically and delays the need for resurfacing.
- Reduces tire noise associated with standard milling.
- Micro Milling is a surface treatment only and should not be used for deep asphalt removal, maximum cut is ~ 50 mm (2”).
Quantity of Cutting Tools

- Regular Milling - 165 to 175
- Micro Milling - 450 to 500
Standard Drum

Micro Drum
Very Fine Texture
Micro Speed

- To achieve a very good even texture, the forward speed of the milling machine must be limited.
- Example - With a triple wrap drum ~ 9 m (30’) per minute per 100 RPM cutter head speed gives the desired result.
Micro Milling Spec

- For good results the tool spacing on the cutter drum must be 5 mm (0.2”)
  for typical 3 wraps configurations.
- The difference between the high and low areas of the milled surface shall
  not exceed 2 mm (1/16”).
- The micro-milled surface must meet a 3m (10’) straight edge and a
  profilograph smoothness ride spec.
Concrete Micro Milling

- Indian Nation Turnpike - Oklahoma
- Several Miles of Portland Cement Concrete road was Micro Milled a minimum of 6 mm (0.25”) all over and up to 50 mm (2”) at the joints to improve the ride.
- Smoothness requirements were met while leaving a slight texturing of the surface for skid resistance
Benefits + Safety

► The textured surface allowed a more rapid runoff of water.
► A better anti skid surface was achieved.
► Tire noise was virtually eliminated.
► Less expensive than overlaying or diamond grinding.
Questions ???