

# ASPHALT MAINTENANCE & REPAIR



By: Ron La Porte

# TOPICS COVERED

- **TYPES OF PAVEMENT DISTRESS**
- **LIFE EXPECTANCY/RECOMMENDATIONS**
- **MAINTENANCE OPTIONS**
- **REPAIR OPTIONS**
- **DRAINAGE**
- **BASIC ASPHALT DESIGN**



# TYPES OF ASPHALT DISTRESS

- **SURFACE RAVELING**
- **RUTTING**
- **CRACKS**
- **POTHOLES**

This section has a video [WATCH THE VIDEO](#)



# TYPES OF ASPHALT DISTRESS



## **SURFACE RAVELING**

Raveling is the loss of fines and aggregate material from the surface of asphalt. This happens over time with traffic wear. – Oxidation, traffic wear, and drainage can sometimes be blamed for this. Seal Coat protects against this.

## **RUTTING**

Rutting- This is a great indication of unstable base below the asphalt. It can also happen over time in areas where cars sit such as at the wheels in a parking stall. Places of constant stress like dumpster enclosures are common.

Most likely, stone/dirt should be removed to a depth of stability



# TYPES OF ASPHALT DISTRESS

## CRACKS



Cracks are normal and should be expected, especially along paving joints. This is asphalt's way of making its own control joints like you see in concrete, allowing stresses to expand and contract with ease.

Water must be prevented from entering the sub base below the asphalt by regularly sealing cracks.

The picture shown here shows what we refer to as "alligator cracking" or "spider web cracking". Once asphalt reaches this point, there is very little maintenance options available.

## POTHOLES

These are often what happens when maintenance is not performed. This is an indication that the asphalt has failed.



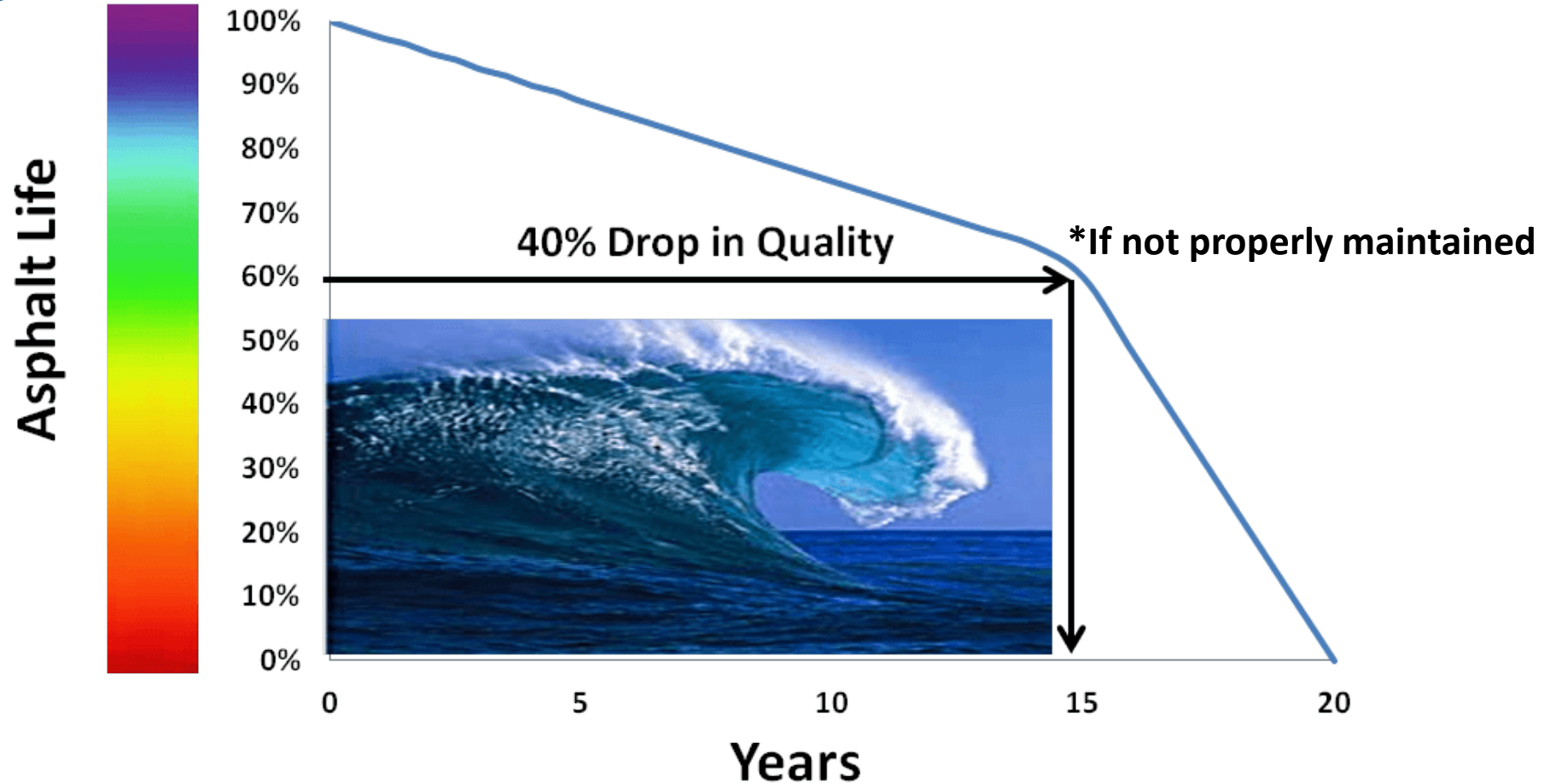
**Sully Says**

*Beware of the Asphalt Tsunami*



# LIFE EXPECTANCY

## Pavement Deterioration Curve



## Sully Says

*Extend asphalt life before reaching 60% by routine maintenance*



ASPHALT LIFE	SIGNS OF DISTRESS	RECOMMENDATIONS
100 - 90%	New asphalt pavement. 0 - 3 years old	Crack seal & seal coat within first year
90 - 80%	3 - 7 years old. Possible longitudinal cracks along joints and occasional transverse cracks less than 1/4" wide.	Crack sealing program every year
80 - 70%	7 - 12 years old. Very slight raveling. Longitudinal cracks along joints. Transverse cracks 10'+ apart.	Crack seal every year, Seal coat every other
70 - 60%	12 - 15 years old. Raveling more pronounced. Longitudinal cracks & transverse cracks opening to 1/2" wide.	Patching, crack sealing, seal coating
60 - 50%	Surface is aged moderate/severe raveling. Cracks are 1/2"+ wide & closer together <10' apart.	40% loss of life- Mill/resurface (2")
50 - 40%	Severe raveling and significant aging. Block cracking up to 50% of pavement.	Structural overlay could extend life
40 - 30%	Alligator cracking up to 25% of pavement surface. Slight rutting. Potholes forming.	Base patching and overlay (2"+)
30 - 20%	Potholes prevalent. Alligator cracking over 25% of surface. Rutting over 2" deep.	Major repairs. Possible reconstruction in spots
20 - 10%	Approaching the end of asphalt life. Severe distress including alligator cracking up to 50% of surface.	Pulverization and base stabilization
10 - 0%	The end of asphalt life. Extensive loss of integrity.	Failed. Needs total reconstruction

# VIDEO

This section has a video [WATCH THE VIDEO](#)





# OTHER WAYS PAVEMENT CAN FAIL

- **POOR DRAINAGE**

The idea is simple: if water has nowhere to go on the surface, it will find a way to enter the sub base below the asphalt.

- **TRAPPED GROUND WATER**

This could happen if a drainage pipe becomes crushed or water runoff from a nearby hill or berm is accumulating in the sub base

- **UNSTABLE SUB GRADE**

If an asphalt section is constructed and it was installed on poor sub grade, the pavement will fail prematurely

- **SETTLING**

Similar to unstable sub grade, if the stone is not compacted correctly below the asphalt or the asphalt layers are not compacted appropriately, they will fall apart much sooner than anticipated



# MAINTENANCE

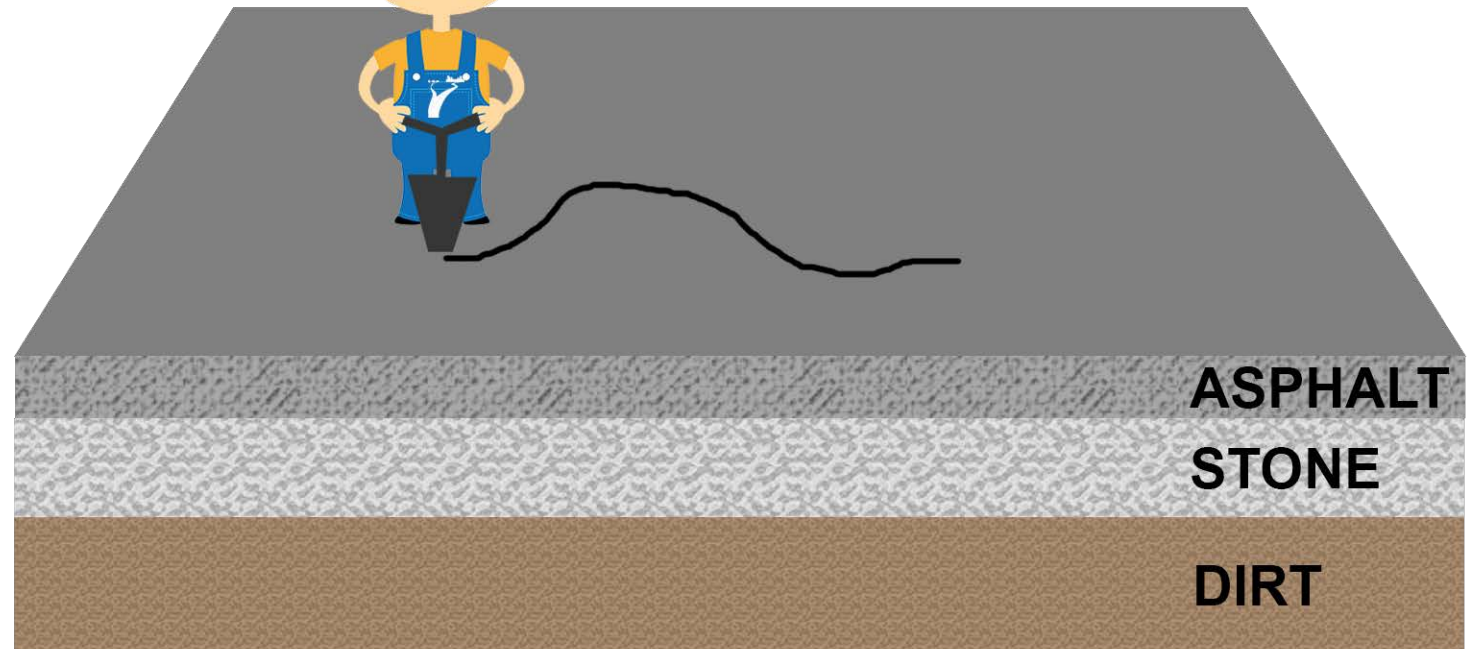
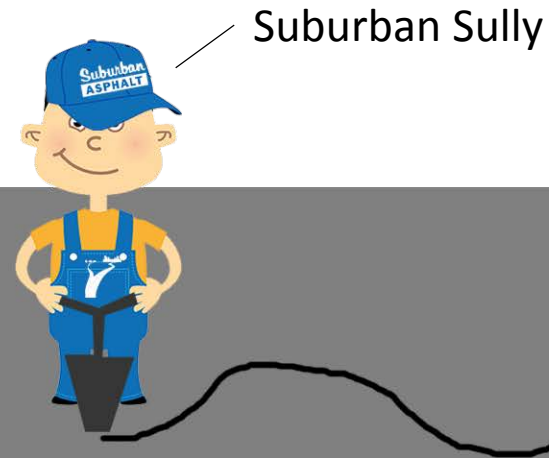
This section has a video [WATCH THE VIDEO](#)



# MAINTENANCE

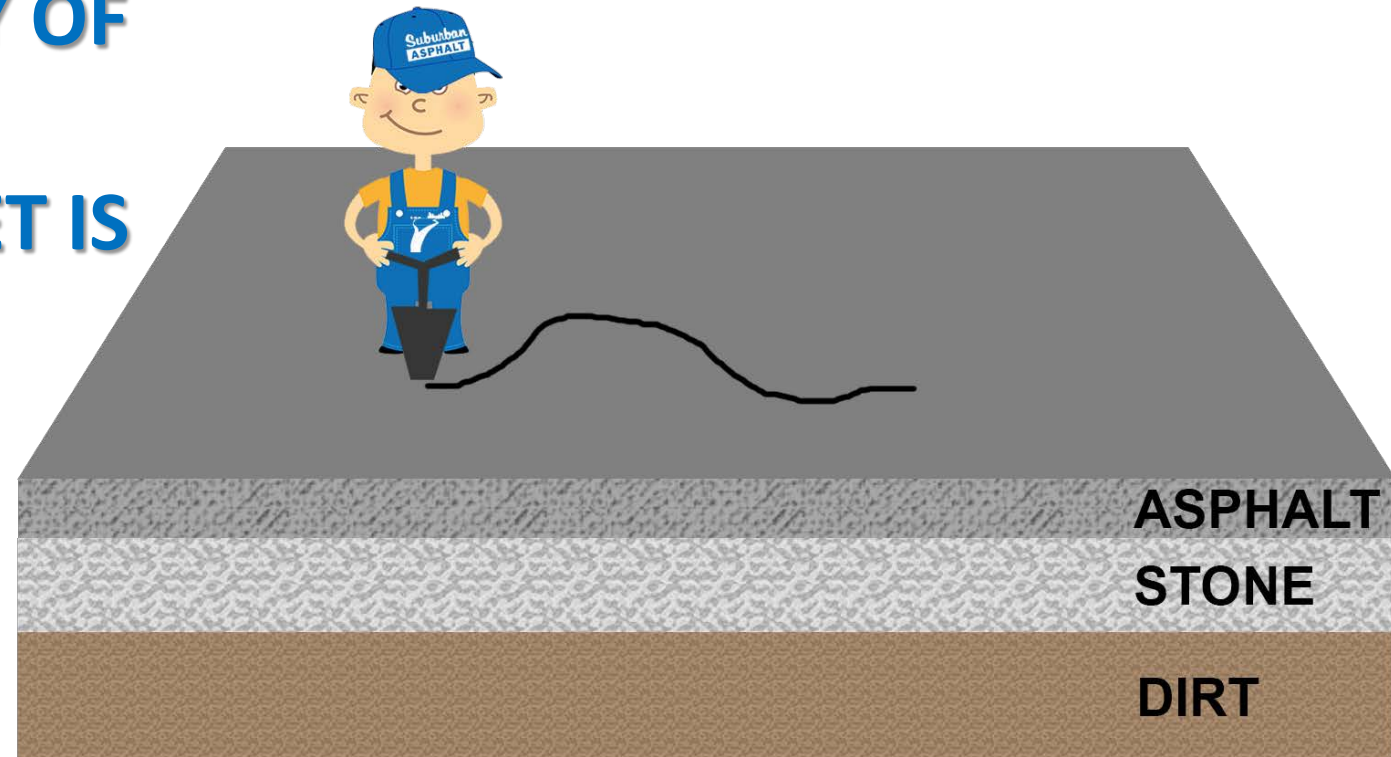
**THERE ARE TWO TYPES OF MAINTENANCE  
THAT EXTEND ASPHALT LIFE:**

- **CRACK SEALING**
- **SEAL COATING**



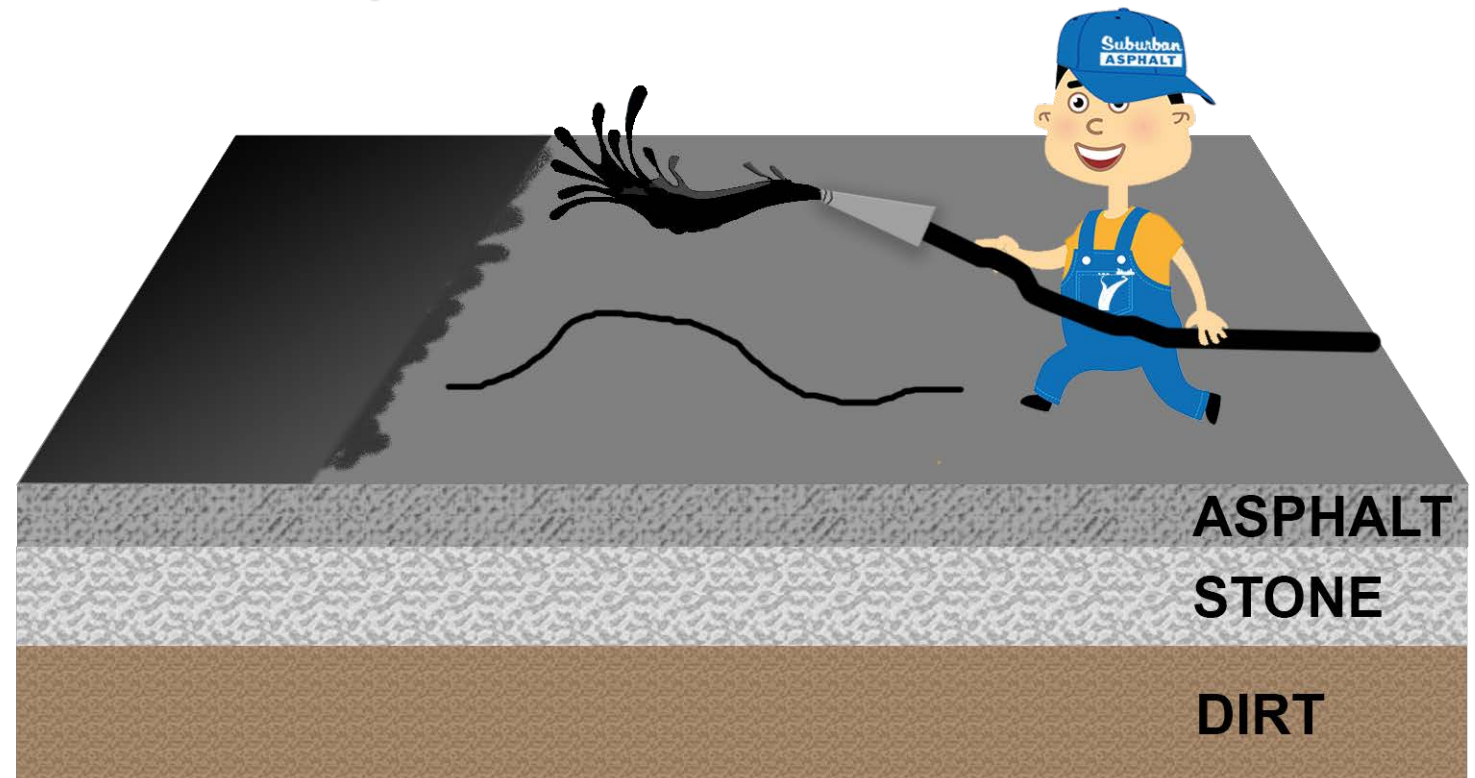
# CRACK SEALING

- **CRACK SEALING SHOULD BE BUDGETED TO DO EVERY YEAR**
- **THE MOST COST EFFECTIVE FORM OF MAINTENANCE**
- **REDUCES THE POSSIBILITY OF FUTURE REPAIRS**
- **HIGH PRIORITY IF BUDGET IS LIMITED**



# SEAL COATING

- **PRIORITIZE AFTER THE FIRST YEAR**
- **SOONEST: 8 WEEKS (THEN SEAL EVERY 2-3 YEARS)**
- **PROTECTS AGAINST OXIDATION, OIL AND CHEMICAL SPILLS, BLOCKS ULTRAVIOLET RAYS, AND EROSION**
- **2 COATS**



# SEAL COATING: AESTHETICS

*Before*



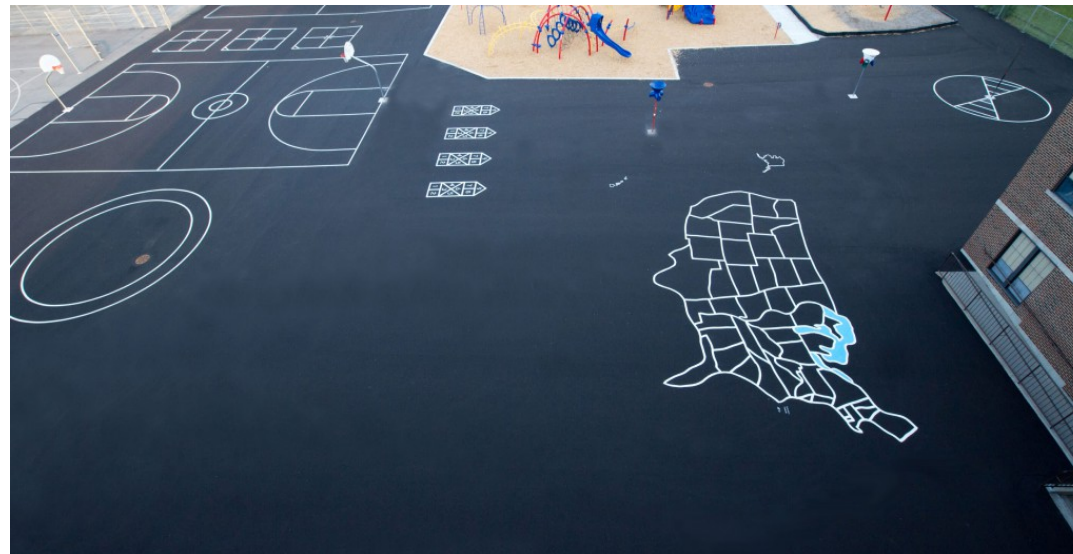
*During*



*After*



# SEAL COATING: AESTHETICS



**Sully Says**

*Sealing is a perfect way to add or change pavement markings*





# SEAL COATING

## **Sully Says**

*Seal new and old pavement together to avoid different cure rates.*







# SEAL COATING

## COAL TAR

## vs. Asphalt Emulsion



**Durability**  
**Cold Weather**  
**Safety**  
**Smell**



deep dark

**Aesthetics**

matte



**\*Coal tar is outlawed in Milwaukee & Dane County**

# SEAL COATING

**WHAT IF THE PAVEMENT HAS NOT BEEN  
SEALED BEFORE?**

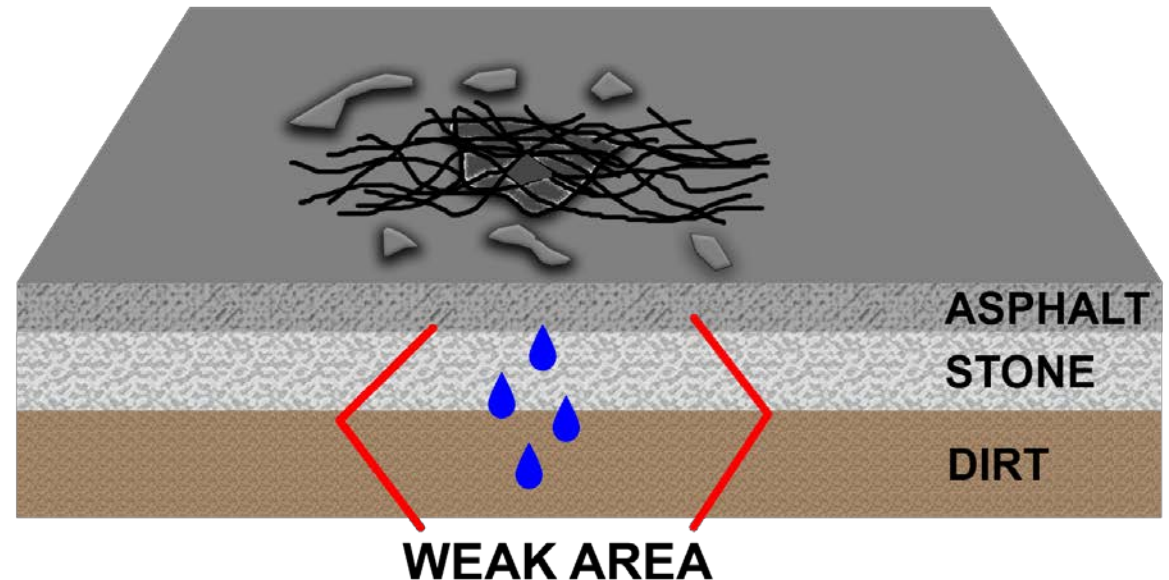
**THERE IS STILL HOPE!!!!**

- **3 COATS**
- **2 COATS THE FOLLOWING YEAR**
- **RETURN TO 2-3 YEARS**



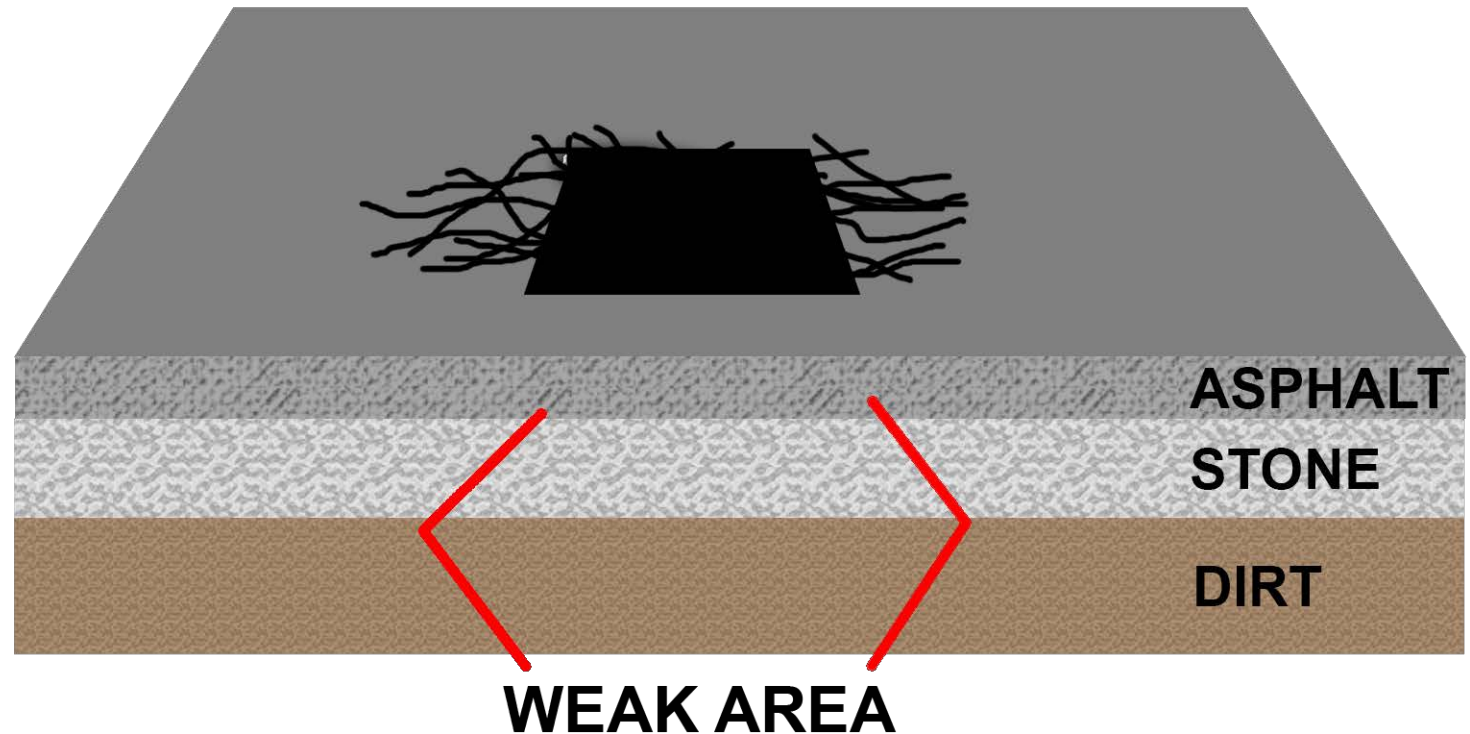
# TYPES OF REPAIR

- “SKIN” PATCHING
- REMOVAL & REPLACEMENT
- MLL/OVERLAY
- PULVERIZE/PAVE
- FULL DEPTH RECONSTRUCTION



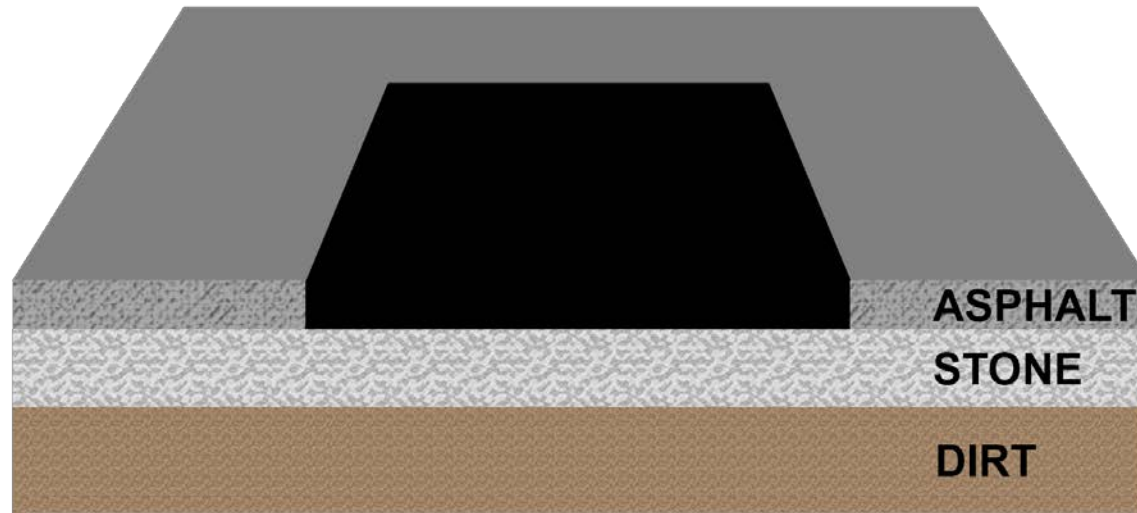
# “SKIN” PATCHING

- OTHERWISE KNOWN AS POTHOLE PATCHING
- NO REMOVAL INCLUDED
- LESS EXPENSIVE
- SHORT TERM SOLUTION- MAY NOT LAST THROUGH WINTER



# REMOVAL & REPLACEMENT

- REMOVES & REPLACES ASPHALT SECTION
- LASTS LONGER THAN “SKIN PATCH” BUT NOT AS LONG AS FULL DEPTH REPLACEMENT
- IF BASE IS ADDRESSED, LONG TERM SOLUTION



## **Sully Says**

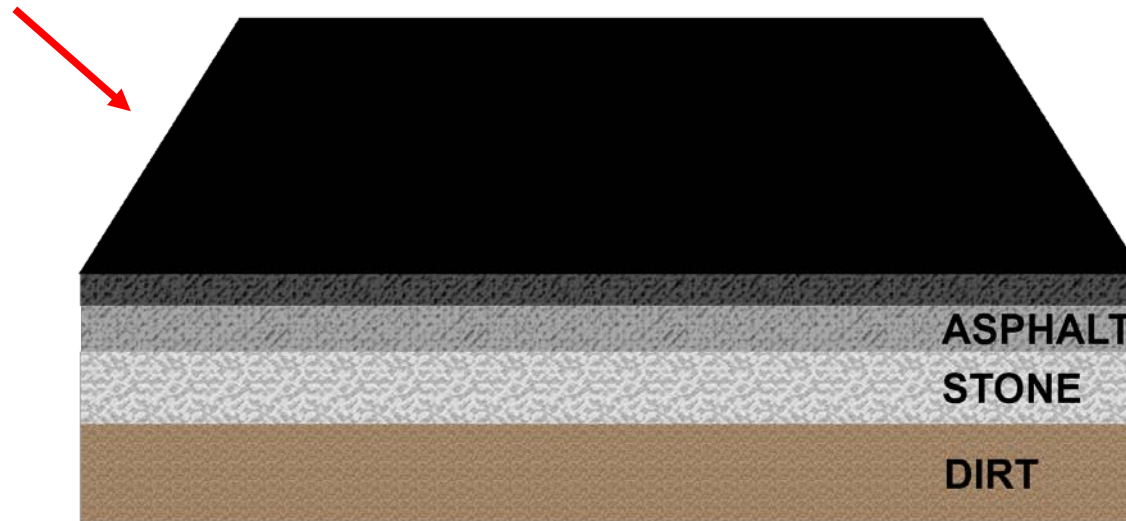
*Make sure to include all heavily cracked areas with large replacements*



# ASPHALT OVERLAY

- **NEW ASPHALT IS LAID UPON OLD ASPHALT CREATING A NEW SURFACE**
- **CAN ONLY BE DONE IF ELEVATIONS ALLOW IT**
- **MID-TERM SOLUTION 7-10 YEARS**

NEW ASPHALT "OVERLAID" ON OLD



Learn more about this [HERE](#)

BLOG

March  
29  
2016  
2032  
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By Ron La Porte in Solutions

RESURFACING AND SEAL COATING ASPHALT

# PULVERIZE/PAVE

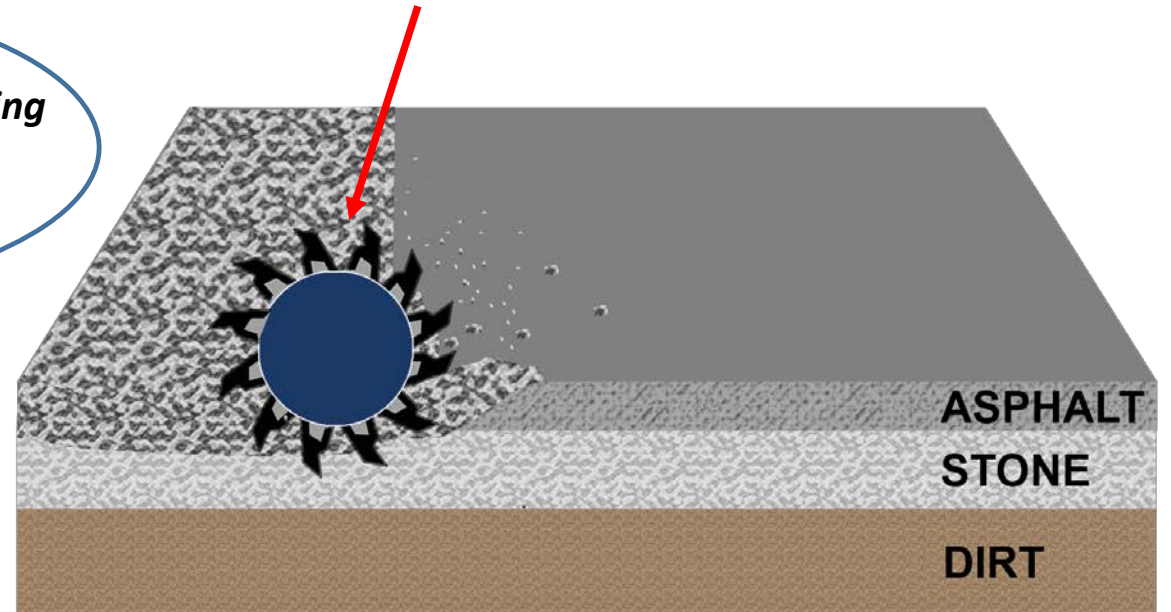
- PULVERIZING MACHINE GRINDS ASPHALT WITH STONE
- RAISES ELEVATION OF PAVEMENT
- LONG TERM 15-20 YEAR REPAIR

## Sully Says

*Pulverizing may “mask” an underlying dirt issue. Cores should be done to determine stone/dirt make up*



ASPHALT GROUND UP & MIXED WITH STONE

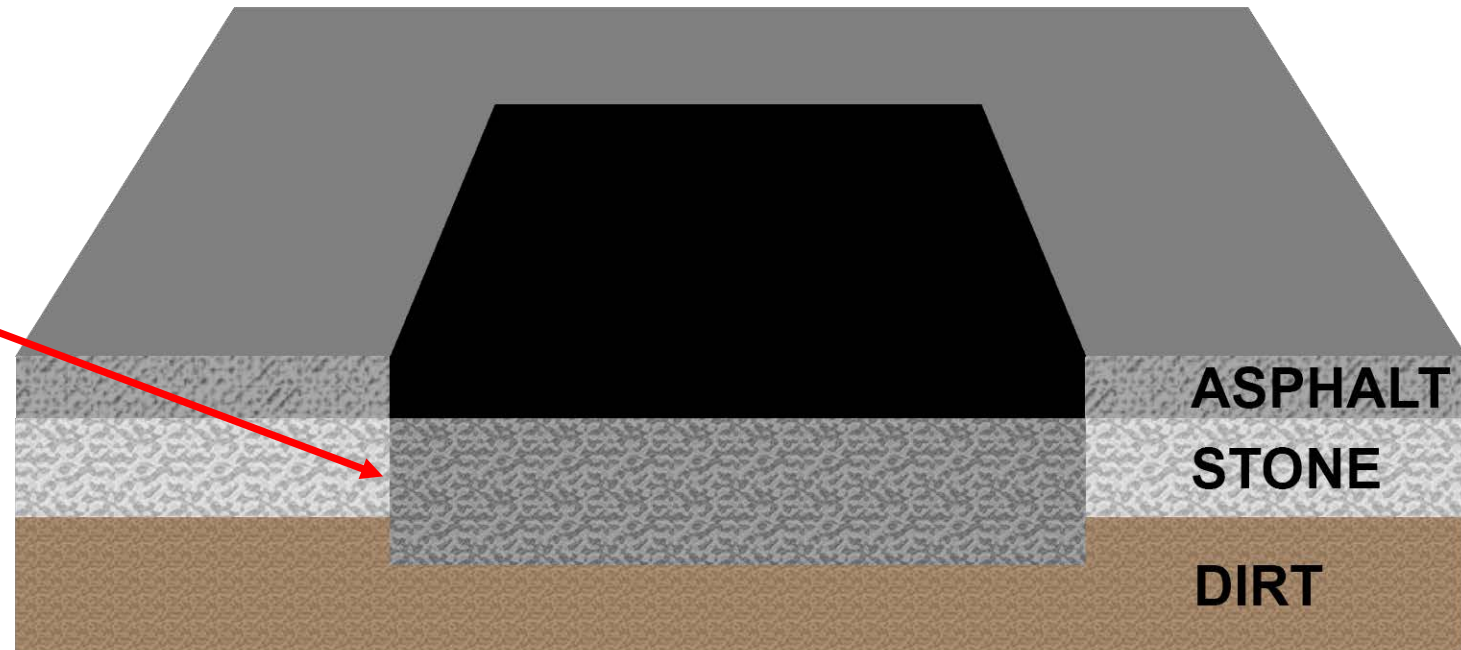


# FULL DEPTH RECONSTRUCTION

- REMOVES & REPLACES ASPHALT SECTION AND STONE/DIRT
- DEPTH VARIES & IS DETERMINED BY STABILITY
- LONG TERM SOLUTION 20+ YEARS



UNSTABLE STONE  
REMOVED & REPLACED





# DRAINAGE

- **REQUIRED TO MAINTAIN ASPHALT LIFE**
- **PUDDLES ARE A NUISANCE**
- **SLOPE AT LEAST 1.5%**

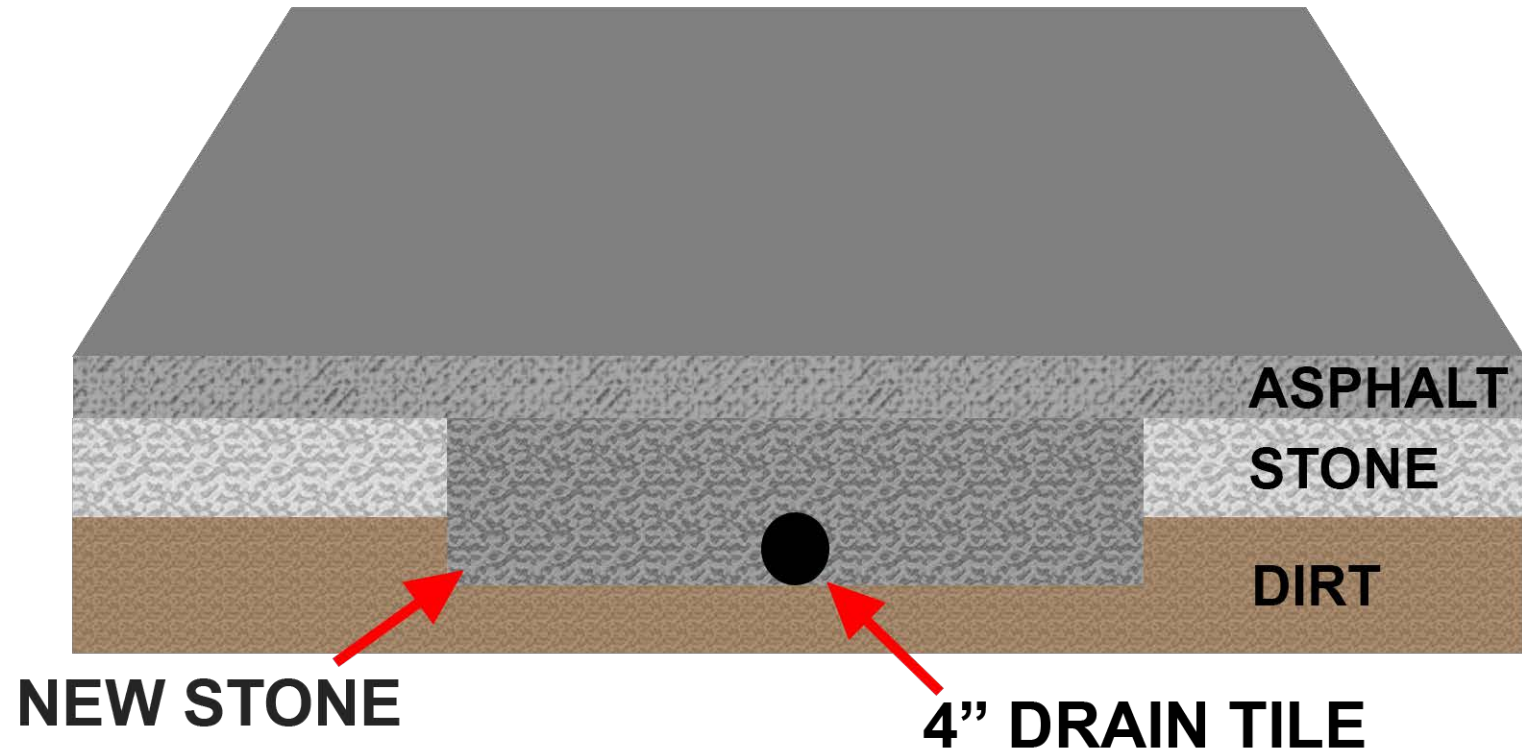
**Sully Says**

*Slope = Rise/Run*



# DRAINAGE

- **GROUND WATER NEEDS TO DRAIN TOO!**
  - **IF BASE IS UNSTABLE, INSTALL DRAIN TILE**
- ## TILE



# DRAINAGE

- **USE RIGID DRAIN TILE INSTEAD OF CORRUGATED**
- **CORRUGATED CAN BECOME CRUSHED**
- **RIGID MAINTAINS SLOPE**



# DRAINAGE

- **A TRENCH DRAIN IS A NICE OPTION WHERE DRAINAGE IS LESS THAN REQUIRED**



# DRAINAGE






- **DAMAGED CATCH BASINS CAN RESULT IN COLLAPSED PAVEMENT SECTIONS**



# BASIC DESIGN: DETERMINING THICKNESS

## • **BASED ON ESALS & SUB GRADE STABILITY**

**ESAL = equivalent single axle load (Approx. 18,000 lbs.)**

Truck Profile	Designation	Application	ESAL Factor
	2D	Local delivery School buses	0.3
	3SU	General delivery Refuse	0.8
	2S-1, 2S-2	General delivery	0.5
	3S-2	Interstate transport Mass transit buses	0.9
	2-S1-2	Interstate transport	2.0

Truck Type (Designation)	Number <sup>[1]</sup>	ESAL Factor	Daily ESALS
3-axle single unit (3SU)	25	× 0.8 =	20.0
+ 3-axle semitrailer (2S-2)	15	× 0.5 =	7.5
+ 3-axle tractor-semitrailer-trailer (2-S1-2)	10	× 2.0 =	20.0
Sum to design daily ESALS			= 47.5

Daily × 365 days per year × 20 years = 346,750, round up

**20-year design ESALS = 350,000**

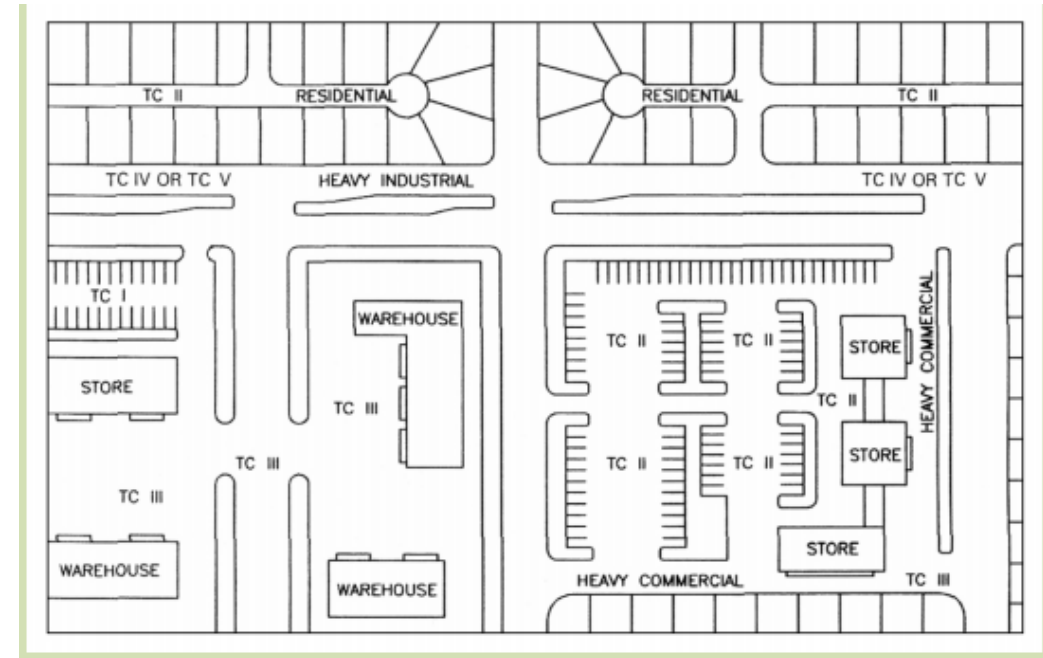


# BASIC DESIGN: DETERMINING THICKNESS

## • DETERMINE TRAFFIC CLASS OF AREA

**Table 6.3. Simplified Assignment of Traffic Class and 20-Year Design ESALs**

Traffic Class	Pavement Class (see Table 4.1)	20-Year Design ESALs Range	Typical Use
I	LT	< 2 million	Residential driveways School and recreational areas Playgrounds and tracks Bike paths Sidewalks Parking lots (<50 stalls)
II	LT	< 2 million	Low-volume roadways Subdivision streets Collector streets Town roads County roads Parking lots (≥50 stalls)
III	MT	2-8 million	Medium-volume roadways Arterial streets Town roads County roads Bus stops
IV	MT	2-8 million	Roundabouts Slow-moving traffic Town roads (slow-moving) County roads (slow-moving) Industrial parking lots Loading docks
V	HT [1,2]	> 8 million	Truck terminals Industrial roadways Arterials



# BASIC DESIGN: DETERMINING THICKNESS

- **ESAL + SUBGRADE TYPE = Thickness**

20-Year Design ESALs	Typical Use	Asphalt Mixture Type	Subgrade Type		Asphalt with Crushed Aggregate Base		Recommended Surface Layer PG Binder Designation
			Rating	Description	Total Asphalt Thickness (in.)	Base Thickness (in.)	
< 2 million	Low-volume roadways Subdivision streets Collector streets Town roads County roads Parking lots ≥50 stalls	LT	Good-to-excellent	Gravels and coarse sands. SSV ≥ 5.0	3.0 - 3.5	6.0 - 10.0	S or H
			Medium	Clays and silts with low plasticity. SSV = 4.0 - 4.9.	3.5 - 4.0	6.0 - 12.0	S or H
			Poor	Clays and silts with high plasticity; sugary (incompactable) sands. SSV = 2.5 - 3.9.	4.0 - 4.5	9.0 - 14.0	S or H

