

# NWPMA 2014 CONFERENCE



## Concrete Pavements for Intersections and Roundabouts

Jim Powell, P.E.  
Executive Director

American Concrete Pavement Association, Northwest Chapter



# Concrete Intersections and Roundabouts



- Intersections and Roundabout Pavement Concerns:
  - Starting and stopping
  - Slow moving heavy loads
  - Turning movements
  - Construction staging concerns













# Issues to Consider When Choosing Pavement Type

- How often is the pavement being rehabbed?
- How significant are traffic impacts during rehabs?
- What is the truck volume?
- What is the soil type?





# How Often is the Pavement Being Rehabbed?

- Rehab intervals impact life-cycle costs

## 40 YEAR ANNUALIZED COSTS

SR	Intersection	PCCP Rebuild	4 yr Inlay	ACP Rebuild 6 yr Inlay	8 yr Inlay
27	Sprague Avenue	\$33,000	\$46,800	\$39,500	\$35,800
90	Thierman Street	\$54,300	\$66,400	\$57,600	\$53,100
2	Francis Avenue	\$73,500	\$100,900	\$87,000	\$79,900
291	Maple & Ash Street	\$33,900	\$50,800	\$42,100	\$37,600
27	Broadway Avenue	\$36,100	\$51,000	\$42,600	\$38,300
395	19 <sup>th</sup> Avenue	\$29,700	\$45,800	\$37,800	\$33,700
2	Third Avenue	\$15,200	\$18,700	\$16,500	\$15,400



# Traffic Impacts

- Difficult to quantify
- 1 multi-day impact vs. multiple impacts
- Weekend vs weekday construction
- Fast track construction



# SR 520 Avondale Rd/Union Hill Rd Redmond WA



100,000 ADT



# Customer Focused Construction

Was your business affected by the closure? Yes

- Could not get across the intersection
- It was a pain to get to the establishment
- Trucks, who are a large part of our business could not get in
- Two of three entrances were blocked off
- Traffic from 395 was shut off
- Business slowed
- Local traffic found us OK
- People avoided the area
- It was a hassle to get here
- People really wanted to eat here to go through all this



# Customer Focused Construction

Did you experience a loss in sales over the weekend closure? Yes

## Estimated Percentage Loss in Business

30-40 – fast food restaurant

20-25 – ice cream shop

25 - restaurant

0 – car dealership

30 – pet store

50 – glass and silver collectable shop

25 – card shop

25 – cigarette store

15 percent increase - Goodwill



# Customer Focused Construction

Would you support a weekend closure in the future for reconstruction purposes rather than construction occurring over a longer period? Yes

- Loss of business but it has to be done
- We can endure one weekend as long as it is not constant
- Weekend closure hurt but not too bad
- Get it done with 24 hour a day work
- WSDOT will not have to come back
- Will not interfere with as many people
- Less impact overall
- Hurts now but less disruption in the long run
- Get it over with – more clogged with doing it during the week



# What is the Truck Volume

- Heavy Trucks
  - Require thicker pavement sections which can aggravate rutting
  - Require more expensive binders for HMA



# What is the Soil Type

- Soft soils require significantly thicker HMA
- May require removal or stabilization
- May increase construction time





# Typical LCCA

- 3,000 sy intersection
- 9" PCC on 4" CSBC
- 8" HMA on 12" CSBC
- 40 year analysis period
- 2% discount rate



# Typical LCCA

- PCC \$60/sy
- HMA \$90/ton
- CSBC \$20/ton
- 2" mill and fill at 10 year intervals
- Diamond grind at 25 years



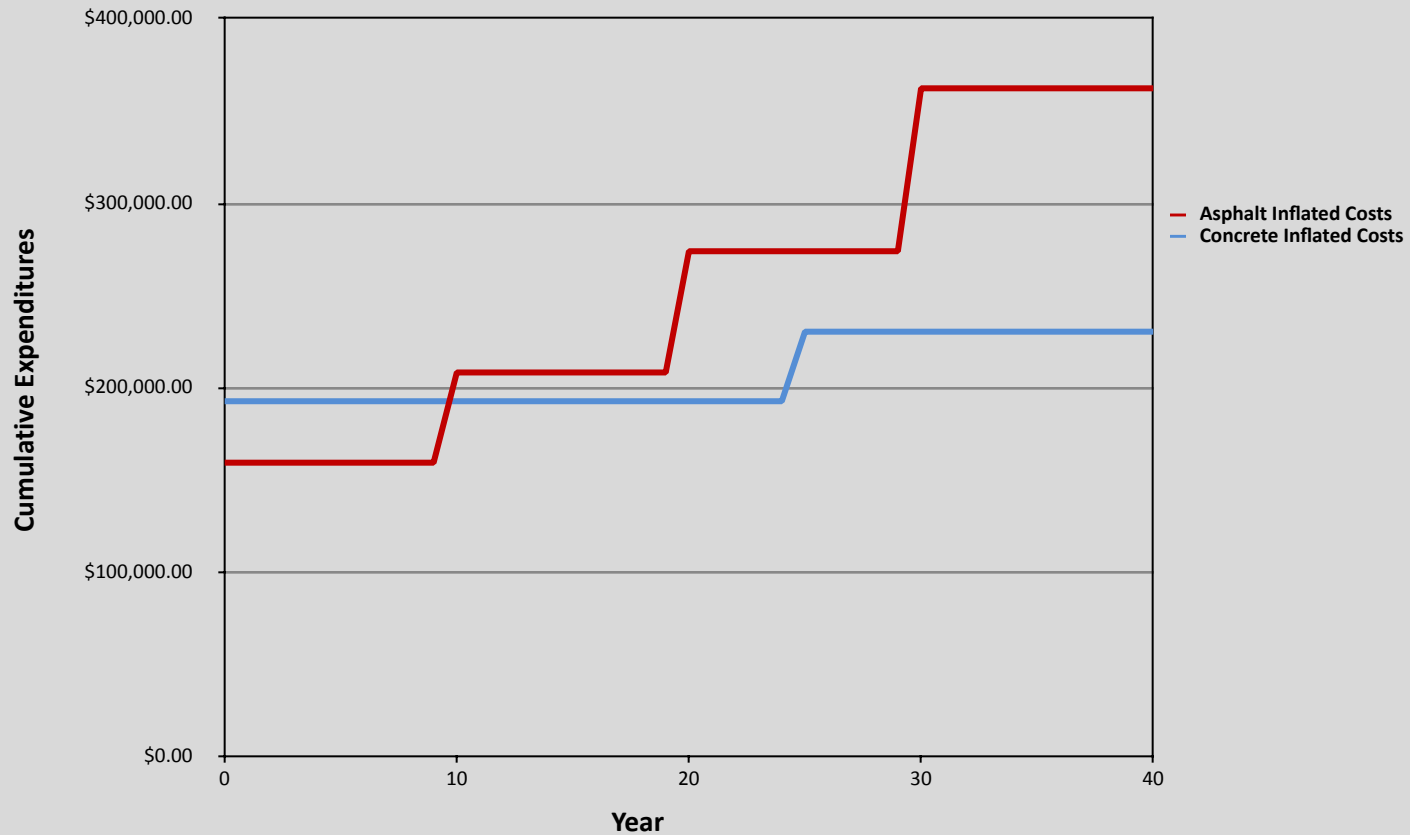
# Typical LCCA

	Base Costs				Costs with Normal Inflation			
	Initial Cost	M&R Costs	Total Cost	EUAC	Inflated M&R	Total Inflated Cost	Present Worth	EUAC
<b>Concrete Pavement</b>	\$192,600.00	\$18,000.00	\$210,600.00	\$12,273.38	\$37,688.00	\$230,288.00	\$203,729.37	\$11,872.97
<b>Asphalt Pavement</b>	\$159,300.00	\$109,125.00	\$268,425.00	\$15,643.32	\$202,873.93	\$362,173.93	\$234,500.45	\$13,666.25
<b>Difference</b>	<b>\$33,300.00</b>	<b>-\$91,125.00</b>	<b>-\$57,825.00</b>	<b>-\$3,369.93</b>	<b>-\$165,185.92</b>	<b>-\$131,885.92</b>	<b>-\$30,771.07</b>	<b>-\$1,793.28</b>



# Typical LCCA

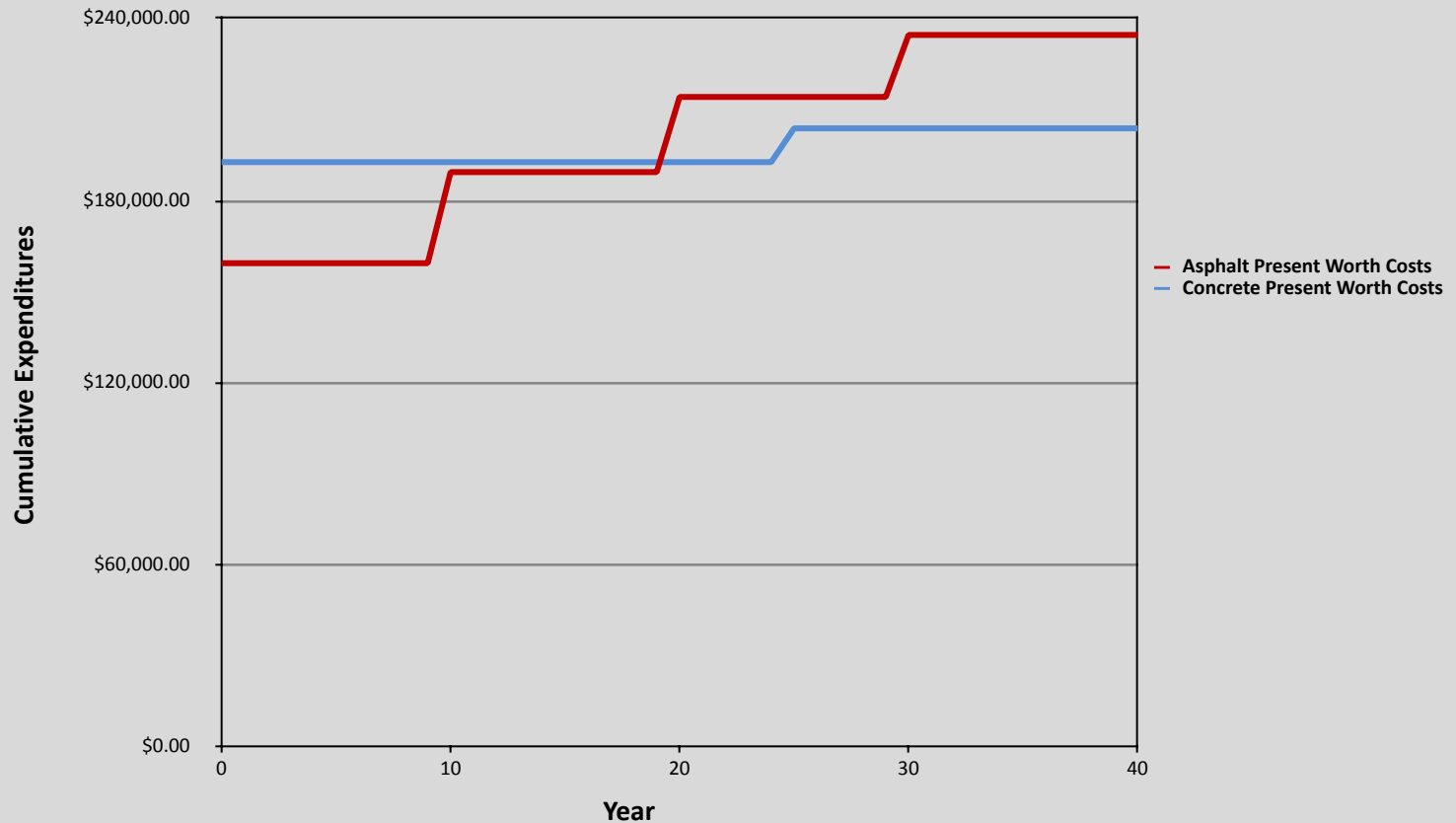
## ASPHALT vs. CONCRETE INFLATED COSTS





# Typical LCCA

## ASPHALT vs. CONCRETE PRESENT WORTH COSTS





# LCCA for Concrete Overlay

	Base Costs				Costs with Normal Inflation			
	Initial Cost	M&R Costs	Total Cost	EUAC	Inflated M&R	Total Inflated Cost	Present Worth	EUAC
<b>Concrete Pavement</b>	\$150,000.00	\$18,000.00	\$168,000.00	\$9,790.73	\$37,688.00	\$187,688.00	\$161,129.37	\$9,390.32
<b>Asphalt Pavement</b>	\$159,300.00	\$109,125.00	\$268,425.00	\$15,643.32	\$202,873.93	\$362,173.93	\$234,500.45	\$13,666.25
<b>Difference</b>	<b>-\$9,300.00</b>	<b>-\$91,125.00</b>	<b>-\$100,425.00</b>	<b>-\$5,852.58</b>	<b>-\$165,185.92</b>	<b>-\$174,485.92</b>	<b>-\$73,371.07</b>	<b>-\$4,275.93</b>

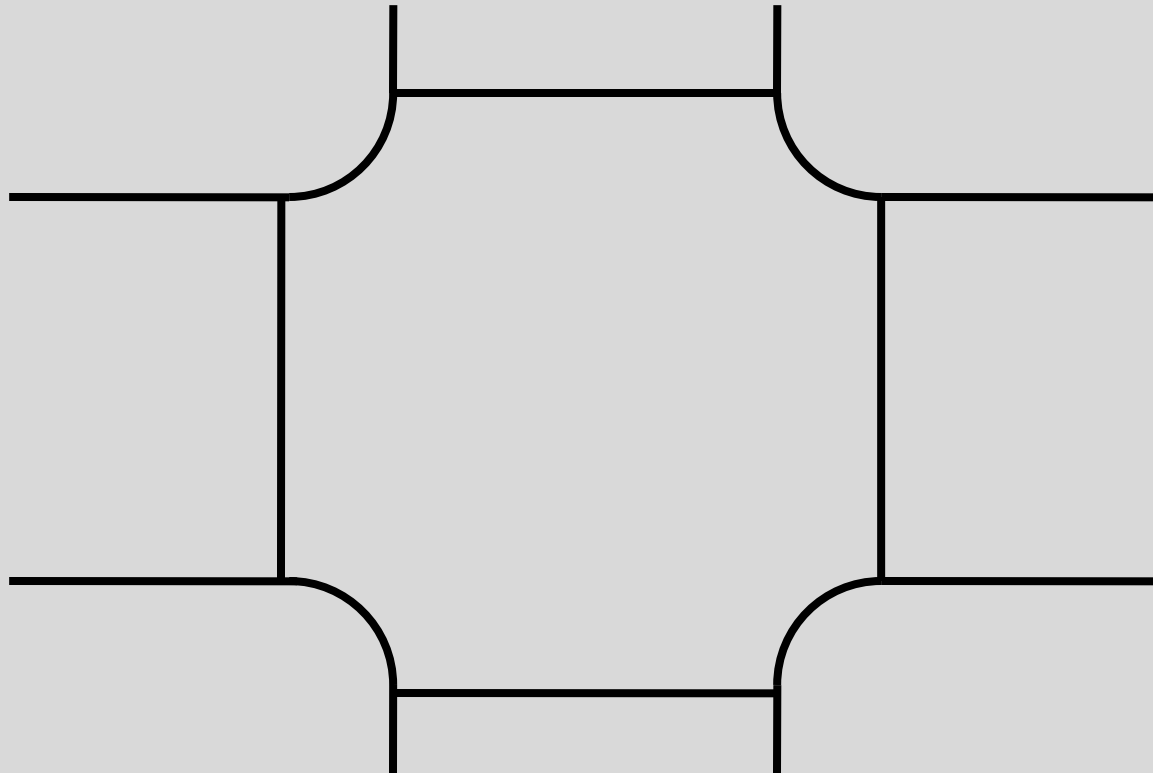


# Paving Limits?

- Average queue length
- Limits of pavement distress
- Consider placement and compaction of adjacent asphalt
- Radius return minimum



# Paving Limits







# Other Considerations

- Crown and cross slope
  - Can flatten cross slope in intersection to 1%
  - Place crown line on pavement joint



# QUESTIONS?