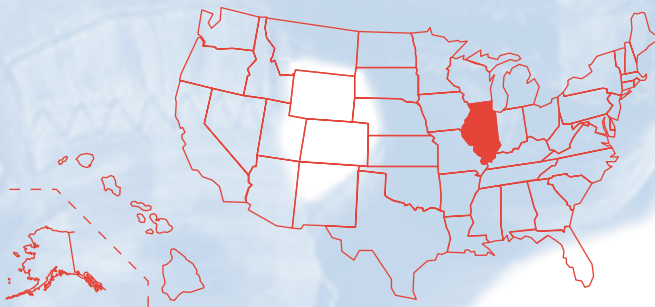


CRCP

THE ILLINOIS
EXPERIENCE

Ever since first resident of Chicago, fur trader Jean Baptiste Point du Sable, built a trading post at the mouth of the Chicago River, Chicago has served as the commerce and business hub of the Midwest.

Early access to reliable transportation solidified Chicago as an industrial giant. In 1848, the 100-mile Illinois and Michigan Canal was completed, and the first locomotive arrived from the Galena & Chicago Union Railroad.

Fast-forward a hundred years when the nation was poised to link its great cities with a network of interstate highways. Engineers at the Illinois Department of Public Works and Buildings, (now the Department of Transportation – IDOT) were experimenting with a new pavement—continuously reinforced concrete pavement (CRCP) —on US 40 west of Vandalia.

US 40 demonstrated the positive benefits of using reinforcing steel to strengthen the concrete pavement, and gave IDOT the confidence to use CRCP extensively throughout the Illinois interstate system. About two-thirds of the interstate pavements were originally constructed with CRCP.

Today, the Illinois freeway system consists of over 2,000 centerline miles of heavy traffic. Illinois ranks third (behind California and Texas) in states with the greatest miles of interstate that carry the heaviest traffic volumes (100,000 vehicles per day or greater).

CRCP is Illinois' number one pavement for every heavily traveled road, including the Interstate Expressways—Edens, Kennedy, Eisenhower, Stevenson, and Dan Ryan—that transport people and goods into, out of, and around Chicago. This case history chronicles IDOT's successful use of CRCP on Illinois' vital expressways.

"The Edens was built with a quality of construction virtually unprecedented anywhere in the U.S. or the world. It will be the strongest, safest, and most modern expressway in the world. The new pavement on which some of us are standing will last until beyond the year 2000."

— John D. Kramer, Secretary of Transportation, Illinois Department of Transportation, at the **Edens Expressway rededication ceremony, 1980**



Continuously reinforced concrete pavement on the Edens Expressway, shown here soon after reconstruction in 1980, continues to provide an outstanding ride surface.

Heavy Traffic — and Getting Heavier

When the Interstate and Defense Highway Act of 1956 was passed, traffic volume and loads were a mere fraction of what they are today. The Stevenson Expressway (I-55), for example, was designed in 1965 for 22,000 vehicles per day. It now sees upwards of 175,000, light compared to the nation's busiest interstates (see table).

But traffic volume only tells part of the story. The percentage of trucks is increasing, as are truck weights. The net result of more and heavier trucks is a *doubling* of pavement loads every decade.

Pavements constructed in the 50's and 60's, for example, saw only a fourth or fifth of the loading on pave-

ments built in the 80's. Furthermore, research indicates that a tractor-trailer only 5 percent above the maximum permissible weight can cause pavement damage equivalent to that of 10,000 automobiles.

Interstate pavement, especially in urban areas, takes a beating. But Illinois' roads built with CRCP have out-performed roads built with all other pavement types. If built properly with good materials, a high enough percentage of steel, and a well-prepared subgrade, CRCP will provide a smooth, very-low-maintenance ride for many years of heavy traffic.

If the surface requires an overlay for ride quality, CRCP continues to serve as a super-strong foundation with no reflective cracking, thereby extending the life of the pavement almost indefinitely.



The Nation's Twenty-Five Busiest Interstates

Interstate	Location	Vehicles per day (1000s) ^(a)
I-75	Atlanta	415
I-90	Chicago (Kennedy/Ryan)	400
I-5	Los Angeles	339
I-405	Los Angeles	339
I-10	Los Angeles	325
I-290	Chicago (Eisenhower)	297
I-5	Seattle	292
I-95	New York	288
I-95	Washington ^(b)	286
I-95	Fort Lauderdale	283
I-80	San Francisco	279
I-285	Atlanta	279
I-110	Los Angeles	273
I-580	San Francisco	272
I-605	Los Angeles	271
I-85	Atlanta	269
I-210	Los Angeles	264
I-610	Houston ^(b)	264
I-495	Washington	262
I-635	Dallas-Ft. Worth	257
I-8	San Diego	254
I-45	Houston	252
I-395	Washington	251
I-94	Chicago (Edens)	249
I-15	San Diego	248

(a) Highest seasonal average annual daily traffic, in thousands, 1998. (b) Also built with CRCP.
Source: Federal Highway Administration, Highway Performance Monitoring System

The Successful History of CRCP

key:

- Continuously Reinforced Concrete Pavement (CRCP)
- Jointed Reinforced Concrete Pavement (JRCP)
- Portions CRCP, Portions JRCP
- Asphalt Overlay



1951 1953 1955 1957 1959 1961 1963 1965 1967 1969 1971 1973

Edens Expressway (15 mile segment of I-94)

John F. Kennedy Expressway (I-90/94)

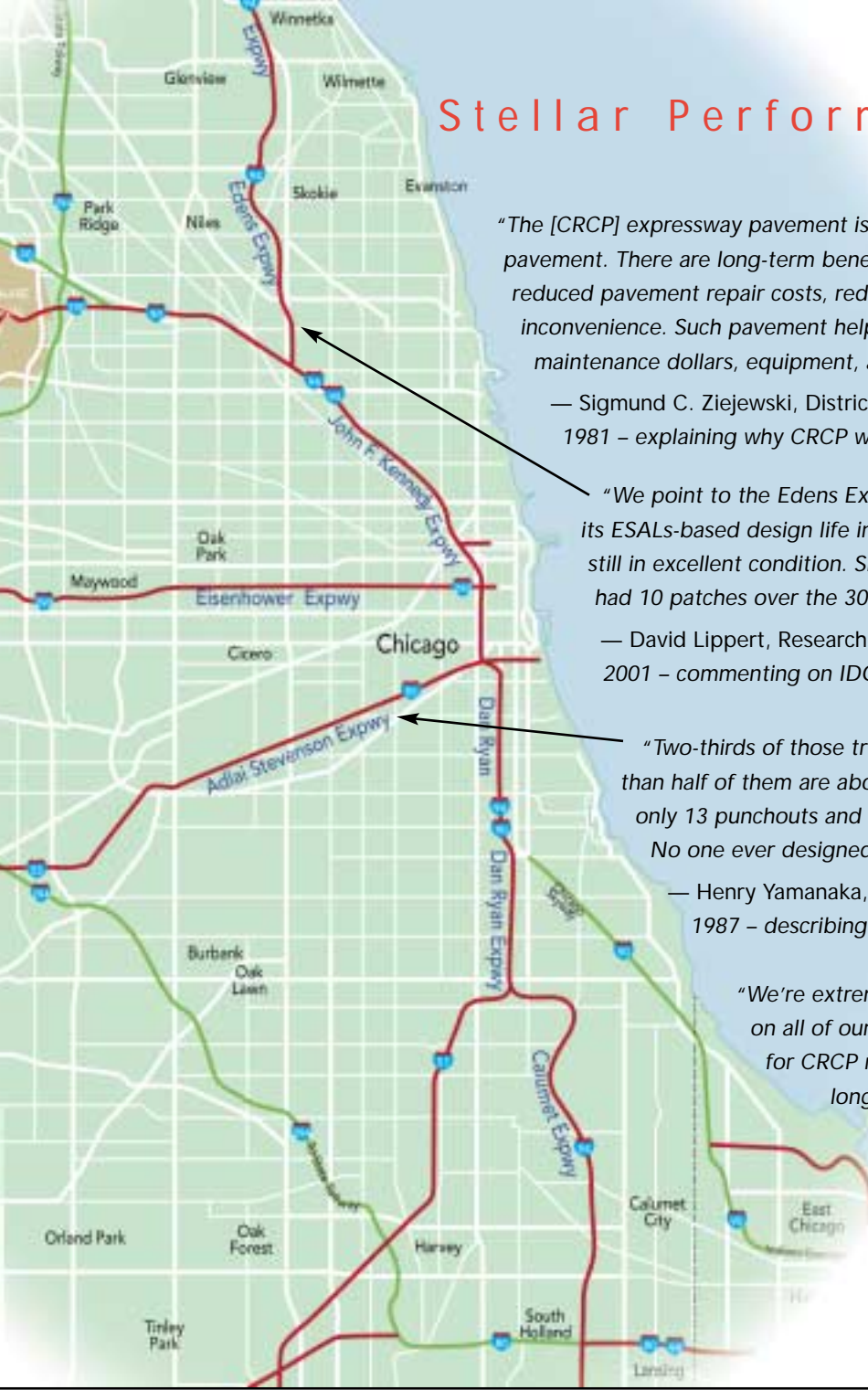
Dan Ryan Expressway (I-90/94)

Stevenson Expressway (I-55)

Eisenhower Expressway (I-290)



Stellar Performance in the Windy City



"The [CRCP] expressway pavement is the closest thing we have to a zero-maintenance pavement. There are long-term benefits to such a pavement on a heavily traveled expressway: reduced pavement repair costs, reduced exposure to safety hazards, and reduced motorist inconvenience. Such pavement helps to conserve the Division of Highways' limited maintenance dollars, equipment, and manpower."

— Sigmund C. Ziejewski, District Engineer, District 1, Illinois Dept. of Transportation
1981 – explaining why CRCP was chosen to reconstruct several *Chicago expressways*

"We point to the Edens Expressway as our true success story. The Edens reached its ESALs-based design life in 1996, 18 years after construction, and the pavement is still in excellent condition. Since we reconstructed with CRCP in 1978, we've only had 10 patches over the 30-mile length. Amazing, considering the loading."

— David Lippert, Research Engineer, Illinois Dept. of Transportation
2001 – commenting on IDOT's satisfaction with CRCP on *Edens Expressway*

"Two-thirds of those trucks are tractor-trailer variety, and spot checks have shown more than half of them are above legal load limits. Yet in the first 19 years of service, we had only 13 punchouts and less than 2 percent of the pavements needed any patching at all. No one ever designed for the loading that road is taking, but it has held up."

— Henry Yamanaka, Engineering Manager, District 1, Illinois Dept. of Transportation
1987 – describing CRCP's exceptional performance on the *Stevenson Expressway*

"We're extremely satisfied with the performance of CRCP and specify it on all of our heavily traveled roadways. The increased initial investment for CRCP more than pays for itself with respect to durability and longevity. Now we're experimenting with a 40-year CRCP 'super-section' consisting of treated subbase with drainage, high quality aggregate base, epoxy-coated reinforcing steel, and 12-13-inch CRCP."

— Bruce Kinkheller, Engineer of Project Implementation, District 1, Illinois Dept. of Transportation
2001 – Describing the next generation of CRCP performance



1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001

Important Advantages of CRCP

The State of Illinois has used continuously reinforced concrete pavement extensively throughout its roadway system. CRCP is a jointless concrete pavement sufficiently reinforced to control cracking. There are no transverse joints—such as are used in conventional jointed concrete pavement—to weaken the pavement.

Reinforcing bars are lapped to form continuous reinforcement holding the pavement together in all kinds of weather. This prevents formation of large cracks that would otherwise reduce the service life of the pavement.



Longitudinal joint sawed at 12-foot centers to create highway lanes. Transverse rebar can serve as tie bars across longitudinal joints.

CRCP is incredibly strong. Inch-for-inch of thickness, CRCP has the capacity to handle higher traffic loads and volumes than any other pavement type.

Because of its inherent durability, CRCP provides long-term value—less maintenance and the lowest total annual cost of any pavement. Because of less maintenance, CRCP reduces motorist and worker exposure to work-zone safety hazards.

CRCP starts smooth and stays smoother longer. Not only does it provide a more comfortable ride, but riding on concrete's hard

surface can result in fuel and vehicle repair savings.

IDOT built much of its original Interstate pavements with CRCP. CRCP continues to be IDOT's preferred pavement as the aging roadways are systematically being replaced. Despite harsh weather and brutal traffic, CRCP has demonstrated outstanding value in Illinois—then, now, and in the future.

10" CRCP Performed Best Under Heaviest Traffic

Research shows that in Illinois . . .

Despite much heavier traffic loads . . .

Concrete pavement delivered more than its expected life. . .

But proportionately, CRCP out-performed JRCP.

	Mean Cumulative ESALs (millions)		Mean Life (years)		Actual Mean ESALs/Actual Mean Life (millions/year)
	Design	Actual	Design	Actual	
10" JRCP	4.8	16.6	20	24.1	0.69
7" CRCP	2.1	14.8	20	20.6	0.72
8" CRCP	4.8	15.6	20	21.4	0.73
9" CRCP	10	28.5	20	26.3	1.08
10" CRCP	21	39.1	20	22	1.78

ESAL – equivalent single axle load

JRCP – jointed reinforced concrete pavement

CRCP – continuously reinforced concrete pavement

Comparative data for asphalt pavement not available.

Source: "Performance of Original and Resurfaced Pavements on the Illinois Freeway System," Project IHR-540, Illinois Cooperative Highway Research Program, February 1997



Recycled concrete and asphalt. Coarse size is a maximum of 3".



Fine recycled material is a maximum of 1.5". This meets gradation requirements for Illinois CA-6 base aggregate.

(Edens Expressway 1979)



Concrete Reinforcing Steel Institute
933 North Plum Grove Road
Schaumburg, IL 60173

www.crsi.org

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