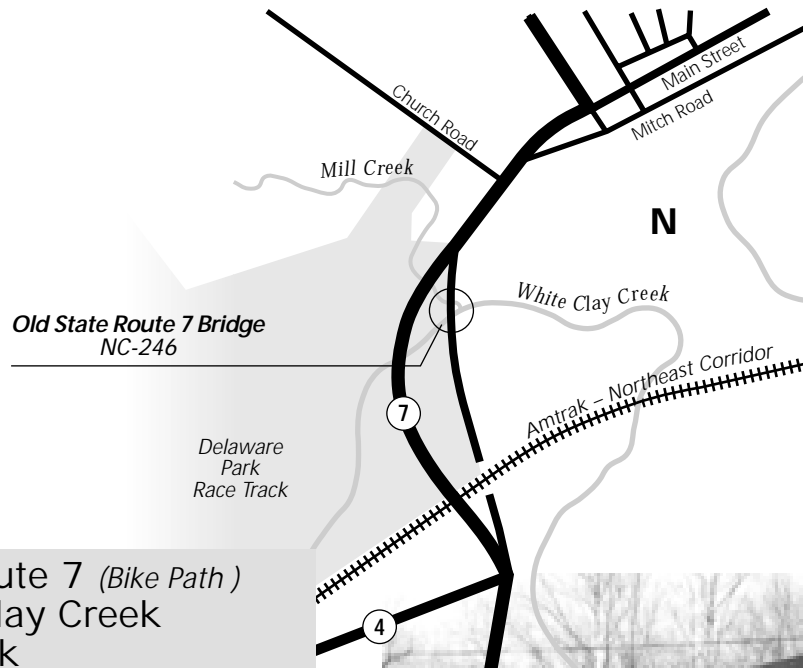


# Reinforced Concrete Bridges



## Old State Route 7 (Bike Path) over White Clay Creek and Mill Creek

State Bridge NC-246

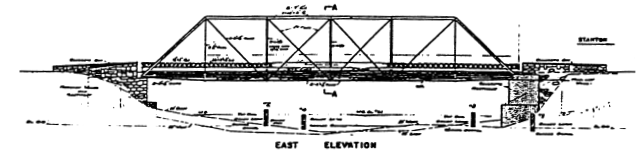
Near Stanton, New Castle County

Designer/Builder: Delaware State Highway Department/J. A. Bader Company

1941-42

The Old State Route 7 bridge is a reinforced concrete tied thru arch. The arch consists of two parallel ribs that are tied by reinforced concrete girders, which resist the thrust of the arch. The structural action of the arch is similar to an archer's bow, and the bridge type is sometimes also called a

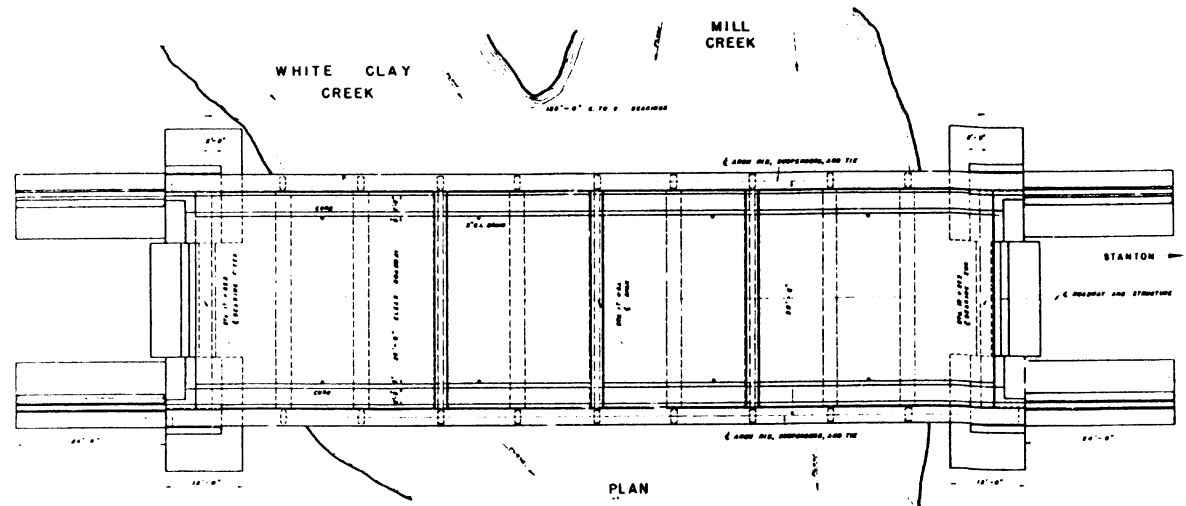
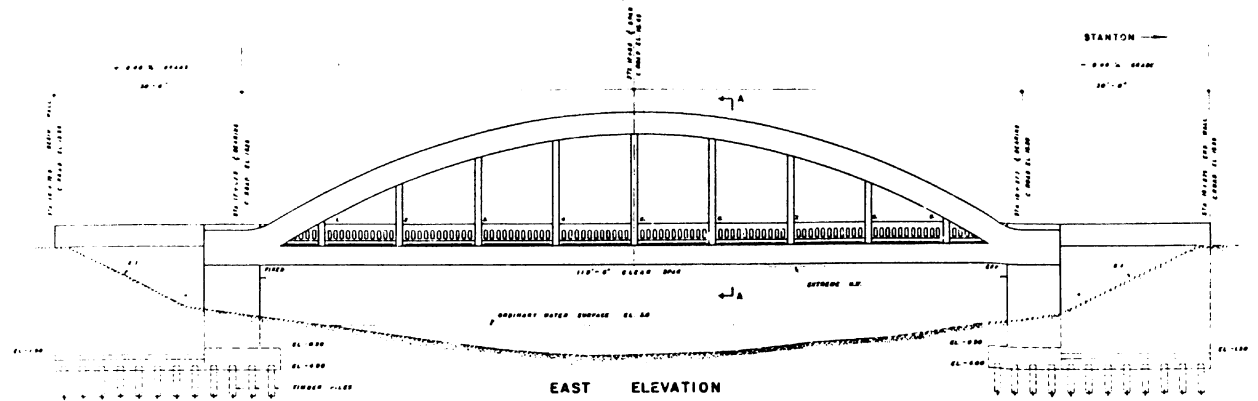
The old SR 7 thru arch bridge replaced a Pratt thru truss bridge, shown here in preliminary drawings for the current bridge, and as seen in photo archives for New Castle County.



State Bridge NC-246 (1940-42) is Delaware's only reinforced concrete thru arch bridge.



Construction photos for State Bridge NC-246.



APPROVED *ab* *Burgett* BRIDGE ENGINEER  
 APPROVED *bl* *Bease* CHIEF ENGINEER

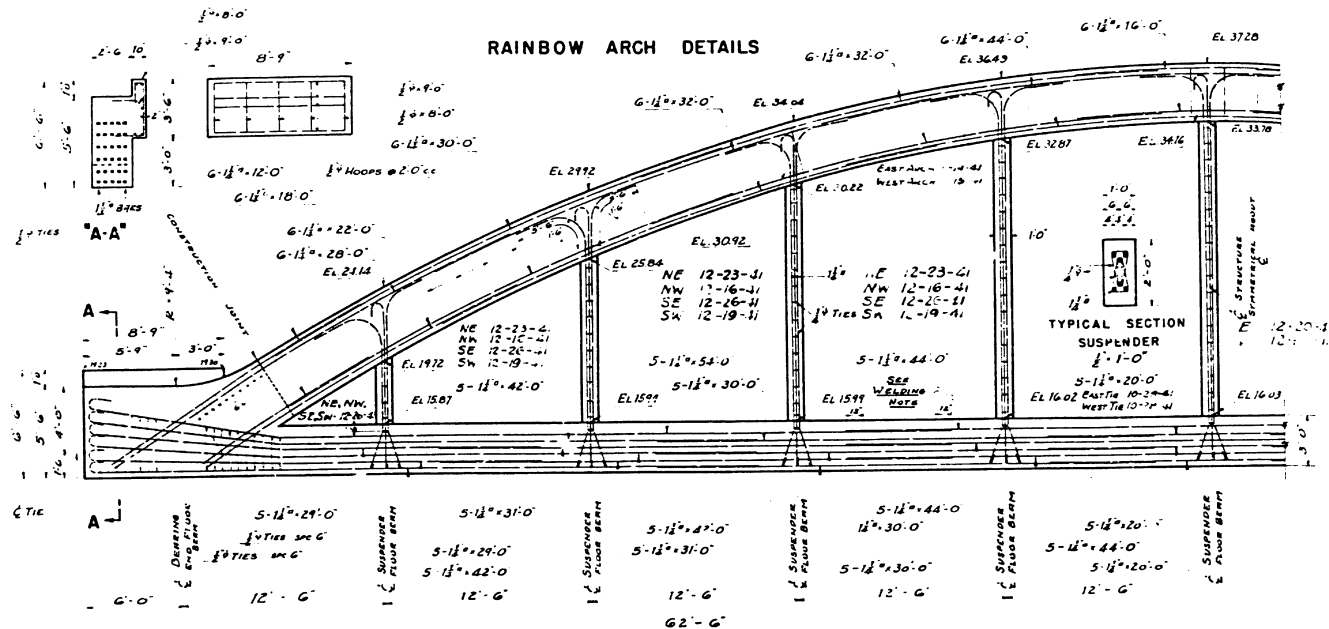
STARTED JULY 1  
 FIN. B.L. MAY 9, 1942

Elevation and plan from original 1940 drawings for State Bridge NC-246.

# Reinforced Concrete Bridges

bowstring arch for that reason. Vertical suspenders support floorbeams and a concrete slab deck. Upper lateral ties brace the arch ribs. The roadway is enclosed by concrete balustrades inside the line of the suspenders. The bridge is supported on concrete abutments with wingwalls.

The bridge is Delaware's only example of a reinforced concrete tied thru arch. The Delaware State Highway Department's *Annual Report* (1941-42) reported that it "was the first bridge of its type to be constructed in Delaware," however, the bridge type had been used in other parts of the country for over 30 years. The reinforced concrete tied thru arch bridge type was developed in the early 1910s, with the best-known variation a patented design by German-born engineer James B. Marsh of Des Moines, Iowa. State Bridge Engineer Arthur G. Livingston did not state in any of his reports why the bridge type was chosen for this location,



**The plans for State Bridge NC-246 clearly show the concentration of reinforcing bars in the tie girders (bottom), which primarily act in tension to resist the thrust of the arch.**

but often tied thru arch bridges are built in locations where an aesthetic arch bridge is desired, but substructure conditions do not permit massive abutments or piers. The tied arch design reduces the size of the required substructure by resisting the horizontal thrust of the arch by the tie girders rather than massive abutments.

The thru arch bridge replaced a 102'-long steel Pratt thru truss bridge, which

had been built in 1904. The contractor for the thru arch was the J. A. Bader Company of Wilmington. Construction began in July 1941 and was completed in January 1942, except for the final rubbing of the concrete and placement of the bituminous wearing surface, which was suspended due to cold weather. Work on the final details resumed in April 1942 and was completed a few weeks later.

# Reinforced Concrete Bridges

appeared in the United States during the early 1910s, and they are sometimes referred to as Marsh arches, after engineer James B. Marsh of Des Moines, Iowa, who received a patent for a thru arch design in 1911. The thru arch usually consists of two arch ribs carrying the deck on vertical hangers suspended from the arch. Many thru arches were built throughout the Midwest in the 1910s and 1920s, but they were never greatly popular on the East Coast, and as a class, they were not important to the development of Delaware's highways. The state's only known reinforced concrete thru arch bridge is the old SR 7 bridge over White Clay and Mill creeks near Stanton (State Bridge NC-246). Designed by the Delaware State Highway Department in 1940 and opened to traffic in 1942, it is a late example of the thru arch bridge type.

By the late 1920s, the great era of reinforced concrete arch bridges had ended nationally and in Delaware. After 1929, reinforced concrete arch bridges were built less frequently as plain utilitarian structures because of their comparatively high cost of



***State Bridge NC-246, a reinforced concrete thru arch over White Clay and Mill creeks near Stanton, New Castle County, erected in 1940-1942.***

construction and material in comparison to steel and other reinforced concrete bridge types, such as T beams, slabs, and rigid frames. They did, however, continue to be built in small numbers in urban or park-like settings where an aesthetically pleasing bridge was desired. Among the later reinforced concrete arch bridges in the state are three

Colonial Revival-style arch bridges in Dover that were designed to complement the nearby state house complex. The three bridges are the 1934 Lockerman Street bridge over St. Jones River (State Bridge K-23A), the 1937 US 13 Business bridge over Silver Lake (K-3C), and the 1956 Court Street bridge over St. Jones River (K-67A).