
Text for Fair Lawn Avenue Bridge Interpretation

For nearly 150 years Fair Lawn Avenue has been conveyed across the Passaic River by a bridge, connecting the dense industrial city of Paterson in Passaic County to the suburban borough of Fair Lawn in Bergen County. The most recent iteration of the Fair Lawn Avenue Bridge - historically known as the Fifth Avenue Bridge after the original street name - was the third structural crossing in this location. It was built circa 1905 to replace an iron truss bridge destroyed by a major flood along the Passaic River in 1903. The Fair Lawn Avenue Bridge represented a transitional period in bridge construction, utilizing both pinned and riveted field connections to join truss members. The bridge carried vehicular and pedestrian traffic between Fair Lawn and Paterson for over a century.

Flooding Along the Passaic

Due to its location on the Passaic River and relatively low elevation compared to the surrounding land, Paterson and its historic bridges have been repeatedly inundated by floodwaters over the course of its history. While major flooding events in 1810 and 2011 bookend two centuries of an increasing number of major flooding events, the floods of 1902 and 1903 loom largest in the city's history.¹ Paterson had been devastated by a fire in early February 1902 that destroyed 456 buildings in the city, largely in the commercial center of the city and more affluent residential neighborhoods. Less than a month later the city experienced a disastrous flood when heavy rains and snowmelt upriver flowed into the Passaic River and downstream to Paterson. The river rose to fifteen feet above normal, surpassing by about seven feet the flood of 1882, which had been the highest in living memory up to that point. The silk mills of the city—largely spared by the previous month's fire—were greatly damaged, as were the streets and sidewalks. Though most Paterson's bridges survived the flood, many lost railings and were damaged by debris. Despite relief that rumors of more bridge collapses turned out to be false, property damage from the flood was estimated to exceed \$1,000,000.²

On October 10, 1903, Paterson was once again inundated by an unprecedented flood. Caused by what *Engineering News* called a "very heavy and unusually concentrated rainfall," the 1903 flood surpassed that of the previous year in terms of both height and damage – the high-water mark was approximately three to four feet higher than the flood of 1902.³ Five individuals were killed and damage for the Passaic River Valley was conservatively estimated at around \$7,000,000. The waters swept away nine bridges in Paterson and more outside the city limits. Even those bridges that technically survived - such as Arch Street, Main Street, Wesel (Market) Street, West Street, and Broadway - endured significant damage. The Fair Lawn Avenue Bridge was one of the bridges washed away. Newspapers reported that the entire iron superstructure and two masonry piers were destroyed, and an abutment heavily damaged.⁴

The back-to-back floods also spurred efforts at flood prevention and mitigation along the Passaic River, resulting in the establishment of the Northern New Jersey Flood Commission of 1903 and the Passaic River Flood District Commission of 1906. Problems such as encroachment on the river channel, overdevelopment, and the draining of wetlands were identified and a number of solutions were proposed, though ultimately never implemented. After a flood in 1936, the Army Corps of Engineers was tasked with developing flood control measures for the river, but plans were rejected in the following years.⁵

Rebuilding the Fair Lawn Avenue Bridge

¹ Northern New Jersey Flood Commission [NNJFC], *Report of the Northern New Jersey Flood Commission* (Somerville, New Jersey: Unionist-Gazette Association, 1904), 6; Sam Dolnick, "River, at 100-Year High, Ravages a City That Once Thrived on It," *New York Times*, August 31, 2011, <http://www.nytimes.com/2011/09/10/nyregion/paterson-nj-is-devastated-by-floods-after-hurricane-irene.html>.

² "Rushing Waters Engulf Our City," *Paterson Evening News*, March 3, 1902, 1; "Worst of the Flood is Over," *Paterson Evening News*, March 4, 1902, 1; "Six Dead in the Flood," and "Paterson Flood is Falling," *New York Times*, March 4, 1902, 2.

³ "Flood Damage to Bridges at Paterson, N.J.," *Engineering News*, vol. 50, 1903, 377.

⁴ "It Rained Bridges At Freeholders' Meeting," *The Paterson Evening News*, October 16, 1903, 1.

⁵ Charles H. Capen Jr., "History of the Development of the Use of Water in Northeastern New Jersey," *Journal of the American Water Works Association*, vol. 28, 1936, 977; NNJFC, Report, 8-9, 12-13; J. Sanderson Stevens, *Phase 1A Archaeological Investigations for the Proposed Bridge Replacement or Rehabilitation of Bridge No. 1600009 (Fair Lawn Avenue Over Passaic River)* (Newark: North Jersey Transportation Planning Authority and the Passaic County Engineer, February 2000), MULT F 536a, 4-20.

Passaic County Engineer William Whitmore developed plans for many of the replacement bridges over the Passaic River, including the original plans drafted for the Fair Lawn Avenue Bridge. The plans called for a three-span Pratt truss – characterized by vertical members and diagonals that slope down towards the center – with concrete piers finished to imitate ashlar stone construction. Whitmore also called for the spans to be reused from the 33rd Street Bridge in Paterson, which had been damaged in the flood and were being stored on the banks of the river. Sometime after this initial design, the plan was revised to a two-span Pratt truss with a simple concrete pier. The Fair Lawn Avenue Bridge became one of only three through truss bridges constructed in the wake of the 1903 flood, along with the Straight Street Bridge and Arch Street Bridge. The primary structural components of the bridge were fabricated by the largest steel manufacturer in the world at the time, United States Steel, which formed in 1901 when the Carnegie Steel Company merged the Federal Steel Company and National Steel Company.

Notably, the Fair Lawn Avenue Bridge utilized both pinned and riveted connections. Most nineteenth-century American metal trusses used pin connections, with structural members connected by round pins that were reasonably easy to erect in the field but were susceptible to loosening under the shaking caused by fast-moving vehicular loads. By around 1890, stronger riveted connections began to be utilized, with the riveting done by machine in the erection shop and the span shipped to its location already assembled. Pinned truss connections largely fell out of use by the twentieth century, making the Fair Lawn Avenue Bridge a rare example of a transitional period in truss bridge construction.

As the Riverside neighborhood continued to develop in the twentieth century, the Fair Lawn Avenue Bridge grew incompatible with increasing traffic in the area. A 1922 report of the City Plan Commission suggested replacement and realignment of the bridge to better integrate with the Paterson street system. The bridge was never replaced and remained largely unchanged until 1967 when the arched concrete deck was removed and replaced with a steel grate deck. New stringers were added to replace the deteriorated members and support the modern deck. Additional bracing was added at the portals in the 1980s. In 2014 it was announced that, due to structural and functional deficiencies, the bridge would be replaced with a wider, two-span bridge. The construction of the new bridge will start in 2020.



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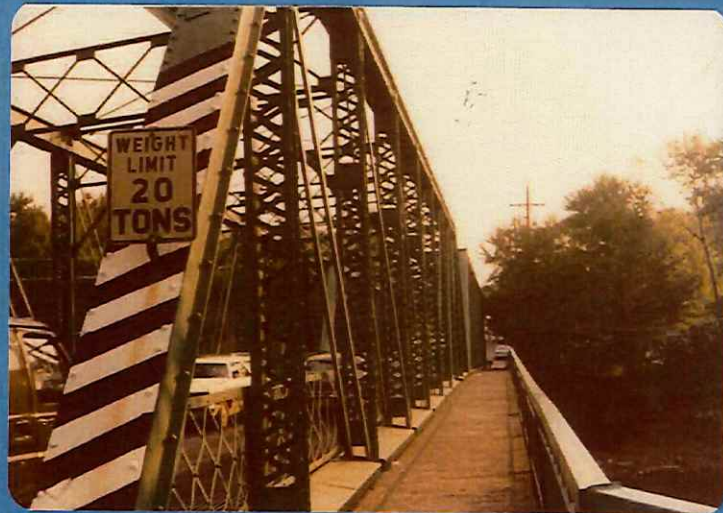


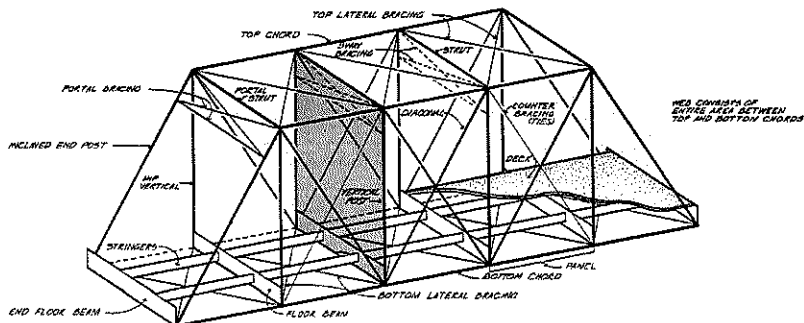


Photo_Information

Photos taken by Rob Tucher for the Historic American Engineering Record, 2017.

1. Oblique view of south elevation. View looking northwest.
5. West skewed portal and view through barrel of trusses. View looking east.
13. Detail view of southeast upper end connection. View looking northwest.





TRUSSES

A STUDY BY THE HISTORIC AMERICAN ENGINEERING RECORD

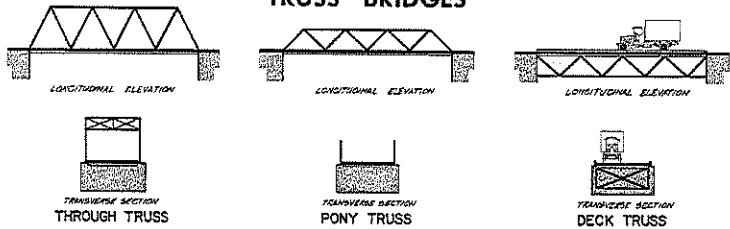
A TRUSS IS COMPOSED OF STRUCTURAL TRIANGLES JOINED TOGETHER WITH FINISHED OR RIVETED CONNECTIONS. THE MAIN PURPOSE OF TRUSSES IS TO BE STRENGTHENED TO SUPPORT LOADS OF VARIOUS KINDS BY THE ARRANGEMENT OF THESE MEMBERS AND RESTRAINING OR SUPPORTING THEM.

STRUCTURAL MEMBERS RESIST LOADS IN TWO PRIMARY WAYS — COMPRESSION AND TENSION. HEAVY RIGID MEMBERS MAY RESIST BOTH COMPRESSION AND TENSION LOADS, BUT THE LIGHTER MEMBERS RESIST TENSION AND THESE CHARACTERISTICS ARE MAJOR CLUES IN TRUSS IDENTIFICATION. NOTE THAT THE MAJOR TENSION MEMBERS OF A TRUSS PANEL MAY BE SUPPLEMENTED BY SMALL DIAGONALS. THESE REGULAR TRUSS TYPES ARE DETERMINED BY THE MAIN MEMBERS. THESE MEMBERS THESE COUNTER BRACES (INDICATED BY DOTTED LINES).

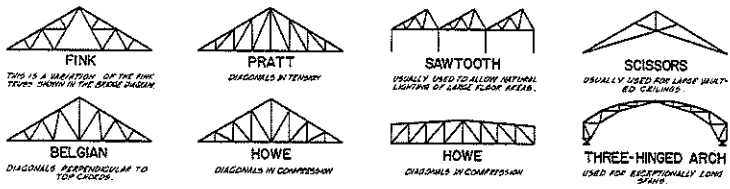
THE BASIC TRUSS TYPE IS IDENTIFIED. THE SHEET OF TRUSS DRAWINGS PRESENTS ONLY THE REPRESENTATION OF THE MOST COMMON TRUSSES. THESE ARE BUILT UP OF MEMBERS THAT DO NOT FALL INTO EARLY-DEFINED CATEGORIES. IN SOME CASES, THE IDENTIFICATION NUMBER IS HIGH AS COMPARED TO OTHERS IN THE LIST OF THE STANDARD DESIGNS. ADDITIONALLY, THERE ARE OTHER TYPES OF TRUSSES WHICH ARE NOT REPRESENTED IN THIS DRAWING. FROM THE ORIGINAL TENSION MEMBERS DIFFERING FROM THE ORIGINAL COMPRESSION MEMBERS. DESIGNING A TRUSS IS NOT REPRESENTED ON THE DRAWING. CHECK TO SEE IF IT IS AN INVERTED TRUSS.

MOST BRIDGE TRUSSES ARE OF THREE BASIC TYPES. IF THEY HAVE A POLYGONAL TOP CHORD, THEY ARE CLASSIFIED AS ARCH TRUSSES. IF THEY HAVE A POLYGONAL TOP CHORD AND A POLYGONAL BOTTOM CHORD, THEY ARE CLASSIFIED AS BEDSTEAD TRUSSES. IF THEY HAVE A POLYGONAL TOP CHORD AND A POLYGONAL BOTTOM CHORD AND A POLYGONAL TOP CHORD, THEY ARE CLASSIFIED AS ARCH TRUSSES. IF THEY HAVE A POLYGONAL TOP CHORD AND A POLYGONAL BOTTOM CHORD AND A POLYGONAL TOP CHORD, THEY ARE CLASSIFIED AS ARCH TRUSSES.

TRUSS BRIDGES



ROOF TRUSSES



STRUCTURAL CONNECTIONS



OFFICE OF ARCHITECTURE AND ENGINEERING PRESENTATION
 TECHNICAL INFORMATION PROJECT
 HISTORIC AMERICAN ENGINEERING RECORD
 TRUSS IDENTIFICATION: NOMENCLATURE

 KING POST (WOOD) A TRADITIONAL TRUSS TYPE WITH ITS ORIGINS IN THE MIDDLE AGES. LENGTH: 20-50 FEET 6-18 METERS	 PRATT 1844 - 20TH CENTURY DIAGONALS IN TENSION, VERTICALS IN COMPRESSION. VERTICALS ARE PERPENDICULAR TO INCLINED END POSTS. LENGTH: 20-50 FEET 6-18 METERS	 BALTIMORE (PETIT) 18TH-EARLY 20TH CENTURY 1. A PRATT WITH 5/8" STUFS. 2. A PRATT WITH 3/4" STUFS. LENGTH: 20-50 FEET 6-18 METERS	 WARREN 1848 - 20TH CENTURY TRIANGULAR IN OUTLINE THE DIAGONALS CARRY BOTH COMPRESSION AND TENSION LOADS. VERTICALS SERVE AS EQUILATERAL TRIANGLES. LENGTH: 20-400 FEET 15-120 METERS
 QUEEN POST (WOOD) A LENGTHENED VERSION OF THE KING POST. LENGTH: 20-60 FEET 6-18 METERS	 PRATT HALF-HIP LATE 19TH-EARLY 20TH CENTURY A PRATT WITH INCLINED END POSTS THAT DO NOT PERPENDICULARLY CROSS THE LENGTH OF A FULL PANEL. LENGTH: 20-50 FEET 6-18 METERS	 PENNSYLVANIA (PETIT) 18TH-EARLY 20TH CENTURY 1. A PRATT WITH 5/8" STUFS. 2. A PRATT WITH 3/4" STUFS. LENGTH: 20-50 FEET 6-18 METERS	 WARREN WITH VERTICALS AND HIP 18TH-EARLY 20TH CENTURY DIAGONALS CARRY BOTH COMPRESSION AND TENSION LOADS. VERTICALS SERVE AS BRACING FOR TRIANGULAR WEB SYSTEM. LENGTH: 20-100 FEET 15-120 METERS
 BURR ARCH TRUSS 1804-LATE 19TH CENTURY COMBINATION OF A WOODEN ARCH WITH A MULTIPLE KING POST. EACH ALSO COMBINED WITH LATER WOODEN TRUSSES. LENGTH: 20-125 FEET 6-38 METERS	 TRUSS LEG BEDSTEAD LATE 19TH-EARLY 20TH CENTURY A PRATT WITH VERTICAL END POSTS INCLINED IN THEIR FOUNDATIONS. LENGTH: 30-100 FEET 9-30 METERS	 LENTICULAR (PARABOLIC) 18TH-EARLY 20TH CENTURY A PRATT WITH BOTH TOP AND BOTTOM CHORDS PARABOLICALLY CURVED OVER THEIR ENTIRE LENGTH. LENGTH: 20-120 FEET 6-38 METERS	 DOUBLE INTERSECTION WARREN MID 19TH-20TH CENTURY STRUCTURE IS INDETERMINATE. MEMBERS SET IN BOTH 20TH CENTURY AND TRIANGULAR WEB SYSTEM WITH VERTICALS. LENGTH: 20-100 FEET 15-120 METERS
 TOWN LATTICE 1825-LATE 19TH CENTURY A SYSTEM OF WOODEN DIAGONALS WITH NO VERTICALS. INCLINED IN BOTH COMPRESSION AND TENSION. LENGTH: 40-120 FEET 12-37 METERS	 PARKER MID-LATE 19TH-20TH CENTURY A PRATT WITH A POLYGONAL TOP CHORD. LENGTH: 40-120 FEET 12-37 METERS	 GREINER 18TH-EARLY 20TH CENTURY PRATT TRUSS WITH THE DIAGONALS EXTENDED TO THE CENTER OF A FULL PANEL. LENGTH: 20-50 FEET 6-18 METERS	 PEGRAM 1867-EARLY 20TH CENTURY A HYBRID BETWEEN THE WARREN AND PARKER TRUSSES. VERTICALS ARE ALL OF EQUAL LENGTH. LENGTH: 20-100 FEET 15-120 METERS
 HOWE 1840-20TH CENTURY (WOOD, VERTICALS OF METAL) DIAGONALS IN COMPRESSION, VERTICALS IN TENSION. LENGTH: 30-120 FEET 9-37 METERS	 CAMELBACK LATE 19TH-20TH CENTURY A PARKER WITH A POLYGONAL TOP CHORD OF EXACTLY FIVE SLOPES. LENGTH: 100-200 FEET 30-60 METERS	 DOUBLE INTERSECTION PRATT 1867-20TH CENTURY (WHIPPLE, WHIPPLE-WURPHY, LEVILLÉ) AN INCLINED END POST PRATT WITH DIAGONALS THAT EXTEND ACROSS TWO PANELS. LENGTH: 20-50 FEET 6-18 METERS	 POST 1848-LATE 19TH CENTURY A HYBRID BETWEEN THE WARREN AND THE DOUBLE INTERSECTION PRATT. LENGTH: 100-200 FEET 30-60 METERS
 BOWSTRING ARCH-TRUSS 1840-LATE 19TH CENTURY A TRUSS WITH THE DIAGONALS SERVING AS BRACING AND THE VERTICALS SUPPORTING THE CHORD. LENGTH: 20-120 FEET 6-37 METERS	 CAMELBACK LATE 19TH-20TH CENTURY A POLYGONAL TRUSS WITH A POLYGONAL TOP CHORD OF EXACTLY FIVE SLOPES. LENGTH: 100-200 FEET 30-60 METERS	 SCHWEDLER LATE 19TH CENTURY A DOUBLE INTERSECTION PRATT POSITIONED IN THE CENTER OF A FULL PANEL. LENGTH: 100-200 FEET 30-60 METERS	 BOLLMAN 1851-MID-LATE 19TH CENTURY VERTICALS IN COMPRESSION, DIAGONALS IN TENSION. COMPLETE DIAGONALS AND FIRM END POSTS TO EVERY PANEL POINT. LENGTH: 25-100 FEET 7.5-30 METERS
 WADDELL 'A' TRUSS LATE 19TH-EARLY 20TH CENTURY SKEWED VERSION OF THE KING POST TRUSS. USUALLY MADE OF METAL. LENGTH: 20-75 FEET 6-23 METERS	 KELLOGG LATE 19TH CENTURY A VARIATION ON THE PRATT WITH ADDITIONAL DIAGONALS RUNNING FROM UPPER CHORD TO LOWER CHORD TO THE CENTER OF THE LOWER CHORD. LENGTH: 25-100 FEET 7.5-30 METERS	 K-TRUSS EARLY 20TH CENTURY SO CALLED BECAUSE OF THE DISTINCTIVE OUTLINE OF THE STRUCTURAL MEMBERS. LENGTH: 200-300 FEET 60-90 METERS	 FINK 1811-MID-LATE 19TH CENTURY (FINK) VERTICALS IN COMPRESSION, DIAGONALS IN TENSION. COMPLETE DIAGONALS AND FIRM END POSTS TO EVERY PANEL POINT. LENGTH: 25-100 FEET 7.5-30 METERS
 WICHERT 1851-MID-LATE 20TH CENTURY IDENTIFIED BY A CHARACTERISTIC PIN-CONNECTED JOINT. THE TRUSS IS COMBINED WITH A KING POST. LENGTH: 20-50 FEET 6-15 METERS	<h2>TRUSSES</h2> <p>A STUDY BY THE HISTORIC AMERICAN ENGINEERING RECORD</p> <p>1. A TRUSS IS COMPOSED OF STRUCTURAL TRIANGLES JOINED TOGETHER WITH FINISHED OR RIVETED CONNECTIONS. THE MAIN PURPOSE OF TRUSSES IS TO BE STRENGTHENED TO SUPPORT LOADS OF VARIOUS KINDS BY THE ARRANGEMENT OF THESE MEMBERS AND RESTRAINING OR SUPPORTING THEM.</p> <p>2. STRUCTURAL MEMBERS RESIST LOADS IN TWO PRIMARY WAYS — COMPRESSION AND TENSION. HEAVY RIGID MEMBERS MAY RESIST BOTH COMPRESSION AND TENSION LOADS, BUT THE LIGHTER MEMBERS RESIST TENSION AND THESE CHARACTERISTICS ARE MAJOR CLUES IN TRUSS IDENTIFICATION. NOTE THAT THE MAJOR TENSION MEMBERS OF A TRUSS PANEL MAY BE SUPPLEMENTED BY SMALL DIAGONALS. THESE REGULAR TRUSS TYPES ARE DETERMINED BY THE MAIN MEMBERS. THESE MEMBERS THESE COUNTER BRACES (INDICATED BY DOTTED LINES).</p> <p>3. THE BASIC TRUSS TYPE IS IDENTIFIED. THE SHEET OF TRUSS DRAWINGS PRESENTS ONLY THE REPRESENTATION OF THE MOST COMMON TRUSSES. THESE ARE BUILT UP OF MEMBERS THAT DO NOT FALL INTO EARLY-DEFINED CATEGORIES. IN SOME CASES, THE IDENTIFICATION NUMBER IS HIGH AS COMPARED TO OTHERS IN THE LIST OF THE STANDARD DESIGNS. ADDITIONALLY, THERE ARE OTHER TYPES OF TRUSSES WHICH ARE NOT REPRESENTED IN THIS DRAWING. FROM THE ORIGINAL TENSION MEMBERS DIFFERING FROM THE ORIGINAL COMPRESSION MEMBERS. DESIGNING A TRUSS IS NOT REPRESENTED ON THE DRAWING. CHECK TO SEE IF IT IS AN INVERTED TRUSS.</p> <p>4. MOST BRIDGE TRUSSES ARE OF THREE BASIC TYPES. IF THEY HAVE A POLYGONAL TOP CHORD, THEY ARE CLASSIFIED AS ARCH TRUSSES. IF THEY HAVE A POLYGONAL TOP CHORD AND A POLYGONAL BOTTOM CHORD, THEY ARE CLASSIFIED AS BEDSTEAD TRUSSES. IF THEY HAVE A POLYGONAL TOP CHORD AND A POLYGONAL BOTTOM CHORD AND A POLYGONAL TOP CHORD, THEY ARE CLASSIFIED AS ARCH TRUSSES.</p>		 STEARNS 1810-EARLY 20TH CENTURY SIMPLIFICATION OF KING POST WITH VERTICALS CONNECTED BY A SERIES OF HORIZONTALS. LENGTH: 20-100 FEET 15-30 METERS

OFFICE OF ARCHITECTURE AND ENGINEERING PRESENTATION
 TECHNICAL INFORMATION PROJECT
 HISTORIC AMERICAN ENGINEERING RECORD
 TRUSS IDENTIFICATION: BRIDGE TYPES

Source_Information

WPA1_1934

- Works Progress Administration Riparian and Stream Survey of the Passaic River, showing the Fair Lawn Avenue Bridge site plan, section, and elevation in 1934.
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- <https://doi.org/doi:10.7282/T39S1QX0>

HAER truss poster

- Trusses: a study by the Historic American Engineering Record
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- <https://www.loc.gov/pictures/item/97515080/>

Bridge file photos_1978

- On file with the Passaic County Engineering Department

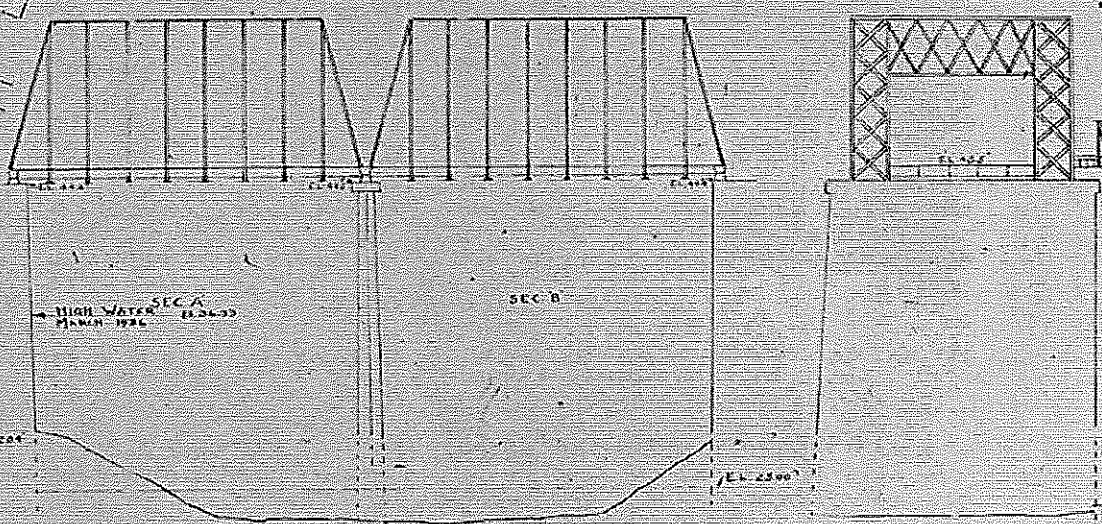
BERGEN COUNTY

BOROUGH OF FAIRLAWN

PASSAIC RIVER

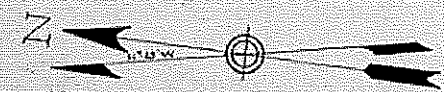
FAIRLAWN AVE (5th AVE) BRIDGE
NORTH SIDE Profile Sta. 220+15

SECTION



CITY OF PATERSON

PASSAIC COUNTY



C & G COORDINATES		
STATION	Y	X
1+00	742 124.57	2 124 274.24
1+10	742 124.57	2 124 274.24
1+20	742 124.57	2 124 274.24
1+30	742 124.57	2 124 274.24
1+40	742 124.57	2 124 274.24
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5+30	742 124.57	2 124 274.24
5+40	742 124.57	2 124 274.24
5+50	742 124.57	2 124 274.24

Scale
Hor. 1" = 30 FT
Vert. 1" = 3 FT

Scale
Hor. 1" = 10 FT
Vert. 1" = 3 FT

Pas 8

NEW JERSEY STATE E.P.A.		
RIPARIAN STREAM & WATERWAYS SURVEY		
COUNTY	PASSAIC	PROJECT 57-2-190
STREAM# 3	STREAMNAME	PASSAIC RIVER
DRAINAGE BASIN	PASSAIC RIVER	
SCALE	1 INCH = 100 FEET	
DRAWN BY	CHECKED BY	

NOTE: All bearings unless otherwise noted are True Meridian bearings, and all elevations shown taken from M.D. datum.